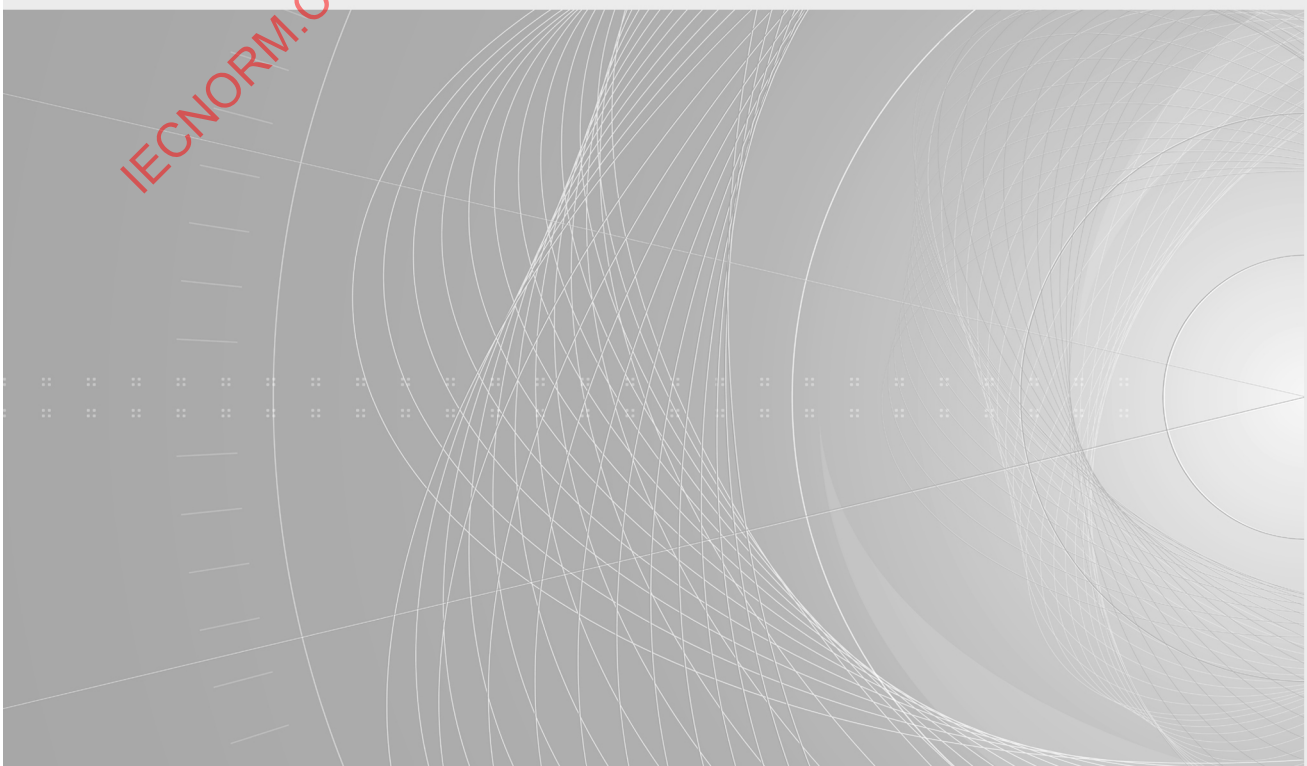
ISO/IEC 14543-5-6

Edition 1.0 2012-02

INTERNATIONAL STANDARD

Information technology – Home electronic system (HES) architecture – Part 5-6: Intelligent grouping and resource sharing for Class 2 and Class 3 – Service type



ISO/IEC 14543-5-6:2012-02(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 35.240.67

ISBN 978-2-8891-2900-3

CONTENTS

INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) ARCHITECTURE –

Part 5-6: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Service type

FOREWORD

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International Standard ISO/IEC 14543-5-6 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

The list of all currently available parts of the ISO/IEC 14543 series, under the general title *Information technology – Home electronic system (HES) architecture*, can be found on the IEC web site.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

INTRODUCTION

ISO/IEC 14543-5, Information technology – Home electronic system (HES) architecure – Part 5: Intelligent Grouping and Resource Sharing for HES (IGRS), consists of six parts:

- **IGRS Part 5-1: Core protocol**
  - Specifies the TCP/IP protocol stack as the basis and the HTTP protocol as the message-exchanging framework among devices.
  - Specifies a series of device and service interaction/invocation standards, including device and service discovery protocol, device and service description, service invocation, security mechanisms, etc.
  - Specifies core protocols for a type of home network that supports streaming media and other high-speed data transport within a home.
- **IGRS Parts 5-2#: Application profile**
  - Based on the IGRS Core Protocol.
  - Specifies a device and service interaction mechanism, as well as application interfaces used in IGRS basic applications.
  - Multiple application profiles are specified, including:
    - Part 5-21: AV profile
    - Part 5-22: File profile
  - Additional application profiles are planned (part numbers to be assigned)
    - Part 5-2w: DVD profile
    - Part 5-2x: QoS profile
    - Part 5-2y: DMCP profile
    - Part 5-2z: Universal control profile
- **IGRS Part 5-3: Basic application**
  - Includes an IGRS basic application list.
  - Specifies a basic application framework.
  - Specifies operation details (device grouping, service description template, etc.), function definitions and service invocation interfaces.
- **IGRS Part 5-4: Device validation**
  - Defines a standard method to validate an IGRS-compliant device.
- **IGRS Part 5-5: Device type**
  - Specifies IGRS Device types used in IGRS applications.
- **IGRS Part 5-6: Service type**
  - Specifies basic service types used in IGRS applications.

INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) ARCHITECTURE –

Part 5-6: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Service type

1 Scope

This part of ISO/IEC 14543-5 specifies the service types that conform to ISO/IEC 14543-5-1.

This part of the ISO/IEC 14543 is applicable to computers, household appliances and communication devices that implement media or data streaming in a local area network (LAN) or personal area network (PAN) environment by wired or wireless means.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document, including any amendments, applies.

ISO/IEC 14543-5-1:2010, *Information technology – Home electronic system (HES) architecture – Part 5-1: Intelligent grouping and resource sharing for Class 2 and Class 3 – Core protocol*

ISO/IEC 14543-5-21,— *Information technology – Home electronic system (HES) architecture – Part 5-21: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Application profile – AV profile*

ISO/IEC 14543-5-22:2010, *Information technology – Home electronic system (HES) architecture – Part 5-22: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Application profile – File profile*

ISO/IEC 29341-3-1:2008, *Information technology – UPnP Device Architecture – Part 3-1: Audio Video Device Control Protocol – Audio Video Architecture*

IETF RFC 2046, *Multipurpose Internet Mail Extensions (MIME) – Part 2: Media Types*

3 Terms, definitions, abbreviations and conventions

3.1 Terms and definitions

For the purposes of this document the following terms and defintions apply.

3.1.1
audio/video multicast device group
type of media device group consisting of a media server and media client with multicast capability for an AV multicast playback application

3.1.2
centralised device group
set of IGRS devices with one IGRS device acting as the master

NOTE The master is responsible for managing the setup, for dismissing a Device Group and for processing a join request from other devices. The master device and other IGRS Devices in such a Device Group form a centralised or master-slave relationship.

3.1.3
client identifier
unique identifier associated with a Client on an IGRS Device to which that Client belongs

3.1.4
content index service device group
type of media device group consisting of multiple media servers for managing content across multiple media servers in a distributed, collaborative and load-balancing manner

3.1.5
device group
multiple IGRS devices that are organised in a logical group through the device group management mechanism in the IGRS specification

NOTE Each IGRS device in a Device Group follows common interaction rules. Two types of Device Groups are defined: peer-to-peer Device Group and centralised (master-slave) Device Group.

3.1.6
device identifier
globally unique device identifier associated with one IGRS Device

3.1.7
device pipe
channel used to transfer device interaction messages

NOTE This channel is set up through the pipe setup mechanism in the IGRS specification.

3.1.8
IGRS client
application that draws upon the services of one or more connected IGRS Devices

NOTE Multiple client instances can exist on a network at the same time.

3.1.9
IGRS device
information device that conforms to the IGRS specification

3.1.10
IGRS dynamic service invocation module
part of the AV application logic to orchestrate the interaction of application services with respect to the capability of the device or device group involved and to coordinate the service invocation sequence between the media server and media client

NOTE The IGRS dynamic service invocation module should be implemented on a media server, a media client or a another separate device.

3.1.11
IGRS service
sharable resource encapsulated in an IGRS Device by implementing application interfaces and providing services for other IGRS Devices

NOTE An IGRS Service has an invocation interface that meets the requirements of the IGRS specification. These invocation interfaces are described and announced on the network through the IGRS Service Description Specification.

3.1.12
IGRS user
owner of an IGRS Device and Client

3.1.13
media client
audio/video device in an IGRS network that possesses multimedia decoding capability

NOTE Examples of a media client device include a TV, set top box, etc. The media client may access content on the media server as the destination device in an audio/video application.

3.1.14
media device group
embodiment of device group in an audio/video system and a type of centralised device group defined in ISO/IEC 14543-5-1

NOTE A media device group consists of two classes: content index service device group and audio video multicast device group.

3.1.15
media server
audio/video device in IGRS network that possesses storage and computing capability

NOTE Examples of a media server device include a PC, network storage server, etc. The media server may provide a network interface to other audio/video devices to access content managed by the media server as the source device in an audio/video application.

3.1.16
peer-to-peer device group
set of IGRS Devices where each IGRS Device in this set has a peer-to-peer relationship with one another

3.1.17
service attribute
variable associated with each service type to record the service status

3.1.18
service identifier
unique identifier assigned to a service provided by a specific IGRS Device

NOTE The same type of service may be provided by multiple IGRS Devices within the same network. Each instance of a service has a unique service identifier on the IGRS Device providing that service.

3.1.19
service interface
method provided by IGRS service for the IGRS clients to share resources

NOTE The service interface is composed of interface name, parameters provide by IGRS clients, etc.

3.1.20
service type
category of IGRS Service defined according to the set of resources encapsulated

NOTE The Service Type enables service applications in the same category to have common invocation interfaces.

3.1.21
service type identifier
global unique identifier to differentiate IGRS services and identify the operation methods and eventing mechanism of certain services

3.1.22
user identifier
identifier of an IGRS user

3.2 Abbreviations

BCM	Back Channel Message
CIS	Content Index Service
CMS	Connection Management Service
EPG	Electronic Program Guide
FAMS	File Access Management Service
FC	File Client
FCMS	File Connection Management Service
FS	File Server
IGRS	Intelligent Grouping and Resource Sharing
MAN	Mandatory, also refer to message definitions in ISO/IEC 14543-5-1
MCTMS	Media Client Transport Management Service
MP	Media Player
MR	Media Recorder
MS	Media Server
MSTMS	Media Server Transport Management Service
RMS	Rendering Management Service

3.3 Conventions

For the convenience of the implementer, a number of XML schemas specified in this standard can also be found on the World Wide Web. In case of any differences, the definitions within this standard shall prevail.

4 Conformance

For conformity to this International Standard the following applies.

- The IGRS generic service model shall meet the general description specification described in Clause 5.
- The IGRS service type identifier requirements shall meet the specifications described in Clause 6.
- The list of all standard IGRS service types and their detailed service-related functional requirements shall conform to meet the specification defined in Clauses 7 and 8 respectively.
- The Back Channel Message TCP Service definitions shall meet the specification defined in Clause 9.
- The content representation framework requirements for an IGRS AV application shall meet the specifications described in Annex A.
- The description requirements for metadata used in an IGRS AV application shall meet the specifications described in Annex B.

- The data type generation requirements for all IGRS services shall meet the specifications described in Annex C.
- The specific service type message formats for all IGRS services shall meet the specifications described in Annex D.
- The XML schema files used in the IGRS services shall meet the specifications described in Annex E.
- The service description wsdl files used in the IGRS services shall meet the specifications described in Annex F, Annex G, Annex H, Annex I and Annex J, respectively.

5 IGRS service overview

An IGRS service conforms to the Core Protocol and indicates the shared resource provided by IGRS devices. An IGRS service is published based on the service description template and mechanism specified by the the Core Protocol and can be invoked by IGRS clients through the operation mechanism specified by the Core Protocol.

An IGRS service is classified into many types. The service instances implementing the same service type should provide the same invocation interface and eventing mechanism. The service type is uniquely defined by the relevant service attribute and interface set.

This standard defines in detail a series of basic service types in the next few clauses. The description includes the relevant service type identifier, service attribute, service interface set and service implementation flow.

6 Definition of service type identifier

An IGRS service type can be classified into standard service type and non-standard service type.

Standard service type identifiers shall conform to the service type identifier definition in the Core Protocol, see 8.2.3 of ISO/IEC 14543-5-1:2010. According to the service type identifier definition in the Core Protocol, the syntax of the standard service type identifier shall be as follows:

<IGRSServiceTypeURN>::=“urn:”<IGRSNS>“:”<IGRSIDVAL>
<IGRSNS>::=“IGRS:Service:ServiceType”
<IGRSIDVAL>::=1*<URN chars>
<URN chars>::=<trans>
<trans>::=<upper>|<lower>|<number>|<other>
<upper>::="A" | "B" | "C" | "D" | "E" | "F" | "G" | "H" |"I" | "J" | "K" | "L" | "M" | "N" | "O" | "P" |"Q" | "R" | "S" | "T" | "U" | "V" | "W" | "X" |"Y" | "Z"
<lower>::="a" | "b" | "c" | "d" | "e" | "f" | "g" | "h" |"i" | "j" | "k" | "l" | "m" | "n" | "o" | "p" |"q" | "r" | "s" | "t" | "u" | "v" | "w" | "x" |"y" | "z"
<number>::="0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" |"8" | "9"
<other>::=“-” | “.” | “_”
The value <URN chars> is case insensitive.

A non-standard service type is a service type not defined by this standard but by the developer of the product. Non-standard service type identifiers shall conform to the servicetype identifier syntax definition in the Core Protocol, see 8.2.3 of ISO/IEC 14543-5-1. According to the service type identifier definition in the Core Protocol, the syntax of the non-standard service type identifier shall be as follows:

<IGRSSelfDefineServiceTypeURN>::=“urn:” <IGRSNS> “:” <IGRSIDVAL>
<IGRSNS>::=“IGRS:service:servicetype-p”
<IGRSIDVAL>::=1*<URN chars>
<URN chars>::=<trans>

<trans>::=<upper> | <lower> | <number> | <other>
<upper>::="A" | "B" | "C" | "D" | "E" | "F" | "G" | "H" |"I" | "J" | "K" | "L" | "M" | "N" | "O" | "P" |"Q" | "R" | "S" | "T" | "U" | "V" | "W" | "X" |"Y" | "Z"
<lower>::="a" | "b" | "c" | "d" | "e" | "f" | "g" | "h" |"i" | "j" | "k" | "l" | "m" | "n" | "o" | "p" |"q" | "r" | "s" | "t" | "u" | "v" | "w" | "x" |"y" | "z"
<number>::="0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" |"8" | "9"
<other>::= “-” | “.” | “_”
The value <URN chars> is case insensitive.

Unless specified in the document, the word “service type” shall have the meaning of “standard service type”.

7 Standard service type list

A standard service type includes the following services: Content Index Service, Connection Management Service, Media Server Transport Management Service, Media Client Transport Management Service, Rendering Management Service, File Access Management Service and File Connection Management Service.

Table 1 defines a series of the current basic service types. Clause 8 specifies the details of the service types listed in Table 1.

Table 1 – Basic service type list

Service type name	Service type identifier	Field explanation
Content Index Service	Urn:IGRS:Service:ServiceType: ContentIndex:1	The Content Index Service allows the IGRS dynamic service invocation module to discover and list the media content on a media server so that the IGRS dynamic service invocation module can retrieve the content information, including the name, creation date, size, format, etc. of the media content. This information can be used by the IGRS dynamic service invocation modules to determine whether these contents can be played on a media client. The content directory structure supports nesting of sub-directories.
Connection Management Service	Urn:IGRS:Service:ServiceType: ConnectionManagement:1	The Connection Management Service is used to create and manage the connection between media client and media server. The Media server and media client can support and manage several active connections at any one time by the Connection Management Service.
Media Server Transport Management Service	Urn:IGRS:Service:ServiceType: MediaServerTransportManagement:1	The Media Server Transport Management Service enables IGRS dynamic service invocation modules to adjust and to control the media stream transport on the media server, such as play, pause, stop, seek, etc. If this service exists, it means that the media server initiated out-of-band transport model is supported. Otherwise, it is not supported.
Media Client Transport Management Service	Urn:IGRS:Service:ServiceType: MediaClientTransportManagement:1	The Media Client Transport Management Service enables an IGRS dynamic service invocation module to adjust and to control the transport of media stream on a media client, such as play, pause, stop, seek, etc. If this service exists, it means that the media client initiated out-of-band transport model is supported. Otherwise, it is not supported.
Rendering Management Service	Urn:IGRS:Service:ServiceType: RenderingManagement:1	The Rendering Management Service allows an IGRS dynamic service invocation module to control media playing, such as volume, contrast, brightness, etc. Multiple active instances of rendering control can be supported, such as the "picture-in-picture" function in TV. The New Rendering Management Service instance is created by the PrepareForConnection of Connection Management Service on a media client. This service is only provided by a media client.
File Access Management Service	Urn:IGRS:Service:ServiceType: FileAccessManagement:1	The File Access Management Service provides the following functions to a File Client: it provides authentication for a File Client and thus gives corresponding file access rights to the File Client; it allows a File Client to retrieve a sorting/searching capability supported by a File Server; it allows a File Client to browse the content directory in the network provided by the File Server; it allows a File Client to search a specified file/directory; it allows a File Client to retrieve and modify attributes of a file/directory; it allows a File Client to retrieve and set a browsing filter; it allows a File Client to subscribe to a file/directory object update event; it allows a File Client to subscribe to a File Access Management Service update event; it supports a File Client to upload and download the specified file/directory.
File Connection Management Service	Urn:IGRS:Service:ServiceType: FileConnectionManagement:1	The File Connection Management Service is used to create and manage the connection between a File Server and a File Client. A File Server can support and manage multiple active connections at any one time through the File Connection Management Service.

8 Basic service type specification

8.1 Content index service

8.1.1 Overview

A content Index Service allows an IGRS dynamic service invocation module to discover and list the media content on a media server so that the IGRS dynamic service invocation module can retrieve the content information, including the name, creation date, size, format, etc. of media content. This information can be used by the IGRS dynamic service invocation module to determine whether this content can be played on a media client. The content directory structure supports nesting of sub-directories. A more detailed description of the IGRS AV content directory is found in Annex A of this standard (refer also to ISO/IEC 29341-3-1:2008).

8.1.2 Content index service type

Content Index Service Type is defined as:

urn:IGRS:Service:ServiceType:ContentIndex:1.

8.1.3 Content index service attribute

The Content Index Service Attribute is shown in Table 2.

Table 2 – Service attribute of content index service

Name of service attribute	Data type	Field explanation
ContentUpdateId	Type_ContentUpdateId	Changes with any modification to the content object on media server. Used to notify the IGRS dynamic service invocation module that the content object has changed.
SortCaps	Type_SortCapabilityList	List of content object attributes, used to sort the result of searching and browsing.
ObjectId	Type_ObjectId	Media object to be subscribed.
TransferInstanceIds	Type_TransferInstanceIds	List of IDs of media transfer.

Subscription and notification of update of a service attribute of the Content Index Service shall follow the general service attribute subscription and notification rules specified in the IGRS core protocol.

8.1.4 Data type of content index service

The Data Type of Content Index Service is shown in Table 3.

Table 3 – Data type of content index service

Name of data type	Data type	Field explanation
Type_ObjectId	String	Unique ID used to identify a media content object. See Clause C.1 for a specific definition on Type_ObjectId.
Type_ContentList	XML Schema struct	List result of media files. See Clause C.2 for a specific definition on Type_ContentList.
Type_AttributeList	XML Schema struct	List of metadata attribute of media content object.
Type_FilterRule	String	Search filtering rule of media content. See Clause C.3 for a specific definition on Type_FilterRule.
Type_BrowseFlag	String	Indicates the options when browsing the content directory. The legal values are: CONSTANT_CONTAINERSELFINFO – indicates the attribute of a specified content object to be returned as a result; CONSTANT_CONTAINERCHILDRENINFO – indicates the children item attribute of the specified content object to be returned as a result.
Type_SortRule	String	Indicates the sorting rule of the media content attribute list. See Clause C.4 for a specific definition of Type_SortRule.
Type_Count	Int	Indicates the number of content items.
Type_TransferInstanceId	UnsignedInt	Identifies specific transfer file.
Type_TransferInstanceIds	UnsignedInt list	List of transfer IDs.
Type_TransferState	String	Indicates the current state of the file transfer. It can be: "IN_PROGRESS", "STOPPED", "COMPLETED" or "ERROR".
Type_Length	String	Indicates the size of the media object in bytes.
Type_TagList	XML Schema struct	Tag data list in XML format.
Type_URI	String	URI. See Clause C.5 for a specific definition of Type_URI.
Type_SearchCapabilityList	String list	The Attribute name list settable as searching condition. A null string means that CIS doesn't support any searching of a content object attribute. "*" means that CIS supports all searching of content object attributes.
Type_SortCapabilityList	String list	The Attribute name list that can be sorted as the result of searching or browsing. A null string means that CIS doesn't support any sorting of content object attributes. "*" means that CIS supports all sorting of content object attributes.
Type_ContentUpdateId	UnsignedInt	Indicates whether the media content has been updated. This value changes with any modification to any content object of CIS. It is used to notify an IGRS dynamic service invocation module if any change to the content is made.
Type_SearchAttributeName	String	Media object attribute name.
Type_AttributeValueList	XML Schema struct	Media object attribute value list.
Type_MediaFormat	XML Schema struct	Media format. See Clause C.6 for a specific definition of Type_MediaFormat.
Type_UserList	XML Schema struct	List of users. See Clause C.7 for a specific definition of Type_UserList.

8.1.5 Invocation interface set of content index service

8.1.5.1 GetSearchCapabilityList

Function description: Retrieves the searching capability supported by CIS on a media server.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
SearchCaps	Output	Type_SearchCapabilityList	The Attribute list of a content object that can be used as a searching condition. A null string means that CIS does not support any searching of a content object attribute. "*" means that CIS supports all searching of content object attributes.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.1.6).

8.1.5.2 GetSortCapabilityList

Function description: Retrieves the sorting list supported by CIS on a media server.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
SortCaps	Output	Type_SortCapabilityList	The Attribute list of a content object that can be sorted as the searching or browsing result. A null string means that CIS does not support any sorting of content object attributes. "*" means that CIS supports all sorting of content object attributes.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.1.6).

8.1.5.3 GetAttributeValueSearchCapabilityList

Function description: Retrieves the capability of searchable attribute values supported by CIS on a media server.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
SearchAttributeValueCaps	Output	Type_AttributeList	Used to indicate the searchable attribute value list of a media object. If the list contains only one Attribute element and its value is empty, then it means that CIS does not support any searching of a content object attribute value. If the list contains only one Attribute element and its value is "*", then it means that CIS supports all searching of content object attribute values.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.1.6).

8.1.5.4 GetContentUpdateId

Function description: Retrieves the value of content update ID of CIS on a media server.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ContentUpdateId	Output	Type_ContentUpdateId	Changes with any modification to the content object of CIS. It is used to notify an IGRS dynamic service invocation module of any change to the content object.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.1.6).

8.1.5.5 Browse

Function description: Returns the browsed content directory object.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ObjectId	Input	Type_ObjectId	Uniquely identifies the media content object.
BrowseFlag	Input	Typt_BrowseFlag	Indicates the options when browsing a content directory. The legal values are: CONSTANT_CONTAINERSELFINFO – indicates the attribute of a specified content object to be returned as a result; CONSTANT_CONTAINERCHILDRENINFO – indicates the children item attribute of the specified content object to be returned as a result.
BrowseRule	Input	Type_FilterRule	Indicates the browsing rule for a media content object in the current directory. This rule applies only to media content not to the directory.
Offset	Input	Type_Count	Indicates the offset value between the initial browsed item to the first item. The value starts from 0.
RequestCount	Input	Type_Count	Indicates the available number of objects returned that comply with the searching rule. "−1" means the number of all objects that comply with the searching condition.
SortRule	Input	Type_SortRule	Indicates the sorting rule of the media content object to be browsed. See the data type definition of Type_SortRule.
ResultScale	Input	Type_AttributeList	Optional. Determines the content scale of the result. If the parameter does not exist, all available metadata attributes shall be returned in the content list for the object. If the parameter exists, metadata attributes specified in this structure should be returned in the content list for the object and other metadata attributes not specified shall not be returned.
Result	Output	Type_ContentList	Media object result list.
NumberReturned	Output	Type_Count	Indicates the number of media content objects returned as a browsing result.
ContainerNumberTotal	Output	Type_Count	Optional. Indicates the number of sub-containers under the media content object.
ItemNumberTotal	Output	Type_Count	Optional. Indicates the number of sub-items that comply with the browsing rule under the media content object.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5 (see error codes in 8.1.6).

8.1.5.6 Search

Function description: Specifies the content object to be searched with specific search conditions. This means searching all item information in the specified content directory (including a recursive search of the item information in the sub-directory).

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ObjectId	Input	Type_ObjectId	Uniquely identifies the media content object.
SearchRule	Input	Type_FilterRule	Indicates the search rule for searching the media content object. See the definition of the data type Type_FilterRule.
Offset	Input	Type_Count	Indicates the offset value between the initial searched item to the first item. The value starts from 0.
RequestCount	Input	Type_Count	Indicates the available number of objects returned that comply with the searching rule. "−1" means the number of all objects that comply with the searching condition.
SortRule	Input	Type_SortRule	Indicates the sorting rule of the media content object to be browsed. See the data type definition of Type_SortRule.
Result	Output	Type_ContentList	Media object result list.
NumberReturned	Output	Type_Count	Indicates the number of media content objects returned as searching result.
NumberTotalMatched	Output	Type_Count	Optional. Indicates the total number of media content objects that comply with the searching condition.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5 (see error codes in 8.1.6).

8.1.5.7 GetAttributeList

Function description: Allows the IGRS dynamic service invocation module to retrieve a list of the metadata attributes supported by the content object on CIS.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ObjectId	Input	Type_ObjectId	Uniquely identifies the media content object.
AttributeList	Output	Type_AttributeList	Media item attribute list supported by the media content object.
NumberReturned	Output	Type_Count	Indicates the number of attribute objects in the search result.

Return Value: Success: 0

Failure: E1, E2, E3, E5 (see error codes in 8.1.6).

8.1.5.8 SearchAttributeValue

Function description: Allows the IGRS dynamic service invocation module to search for a media item attribute value set by the media item attribute name. The searching capability of the media item attribute value can be retrieved by invoking the GetAttributeValueSearchCapabilityList() interface of the CIS.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ObjectId	Input	Type_ObjectId	Uniquely identifies the media content object (only applicable to container object).
SearchAttributeName	Input	Type_SearchAttributeName	Indicates the name of a media item attribute to be searched, such as the attribute value of singer, genre and author, etc. of audio files.
Offset	Input	Type_Count	Indicates the offset value between the initial searched attribute value to the first attribute value. The value starts from 0.
RequestCount	Input	Type_Count	Indicates the number of attribute value to be searched.
AttributeValueList	Output	Type_AttributeValueList	Media item attribute value list. For example, if search with the singer condition, the return value is the singers' list under the specified directory.
NumberReturned	Output	Type_Count	Indicates the number of attribute objects in the search result.
NumberTotalMatched	Output	Type_Count	Optional. Indicates the total number of attribute objects that comply with the search condition.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5 (see error codes in 8.1.6).

8.1.5.9 ConvertMediaFormat

Function description: Converts media content format. The IGRS dynamic service invocation module sends requests to the CIS to investigate whether the media content format can be converted. If the media content format can be converted before media transport takes place, a successful message is returned. Otherwise, a failure message is returned.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ObjectId	Input	Type_ObjectId	ID of media content object to be converted.
CurrentMediaFormat	Input	Type_MediaFormat	Current format of media content.
TargetMediaFormat	Input	Type_MediaFormat	Media content object format after transcoding.

Return Value: Success: 0

Failure: E1, E2, E3, E5 (see error codes in 8.1.6).

8.1.5.10 CreateObject

Function description: Creates new content objects. The object can be a new content container or new content item.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ContainerId	Input	Type_ObjectId	Content container, such as CD playlist.
Elements	Input	Type_ContentList	Initial content of the content object to be created.
ObjectId	Output	Type_ObjectId	ID of the created content directory object.
Result	Output	Type_ContentList	Content of the created content directory object.

Return Value: Success: 0

Failure: E1, E2, E3, E5 (see error codes in 8.1.6).

8.1.5.11 DestroyObject

Function description: Deletes content objects. If the specified object is a directory, then all sub-content under this directory shall be deleted.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ObjectId	Input	Type_ObjectId	ID of content object.

Return Value: Success: 0

Failure: E1, E2, E3, E5 (see error codes in 8.1.6).

8.1.5.12 UpdateObject

Function description: Modifies, deletes or inserts tag data in a content object.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ObjectId	Input	Type_ObjectId	ID of content object.
CurrentTag	Input	Type_TagList	Tag data list in form of XML.
NewTag	Input	Type_TagList	Tag data list in form of XML.

Return Value: Success: 0

Failure: E1, E2, E3, E5 (see error codes in 8.1.6).

8.1.5.13 ImportResource

Function description: Imports the specified remote media URI to the specified local location of CIS.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
SourceURI	Input	Type_URI	URI of remote media resource.
DestinationURI	Input	Type_URI	URI of local media resource.
TransferInstanceId	Output	Type_TransferInstanceId	Identifies the specific media transfer.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.1.6).

8.1.5.14 ExportResource

Function description: Exports a local media resource of the CIS to the specified remote resource location.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
SourceURI	Input	Type_URI	URI of local media resource.
DestinationURI	Input	Type_URI	URI of remote media resource.
TransferInstanceId	Output	Type_TransferInstanceId	Identifies the specific media transfer.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.1.6).

8.1.5.15 StopTransferResource

Function description: Stops the media resource transfer triggered by the ImportResource or ExportResource.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
TransferInstanceId	Input	Type_TransferInstanceId	Identifies the specific media transfer.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.1.6).

8.1.5.16 GetTransferInstanceIds

Function description: Retrieves transfer instance ids of the current active media transfer resource file on CIS.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
TransferInstanceIds	Output	Type_TransferInstanceIds	List of current active media transfer instance ids.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.1.6).

8.1.5.17 GetTransferState

Function description: Whenever there is an ExportResource or ImportResource active, this interface can be invoked to get the current state of media transfer resource file.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
TransferInstanceId	Input	Type_TransferInstanceId	Identifies the specific media transfer.
TransferState	Output	Type_TransferState	Indicates the current state of media transfer. It can be: "IN_PROGRESS", "STOPPED", "COMPLETED" or "ERROR".
TransferLength	Output	Type_Length	Indicates the size of media content that have completed transferring in bytes.
TransferTotal	Output	Type_Length	Indicates the total number of media content to be transferred in bytes.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.1.6).

8.1.5.18 DeleteResource

Function description: Deletes the media resource object identified by the ResourceURI in the content directory.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ResourceURI	Input	Type_URI	URI of the resource to be deleted.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.1.6).

8.1.5.19 PersonalizedSearch

Function description: Specifies the content object to be searched according to specific user's preferences and search conditions that include all item information in the specified content directory (including a recursive search of item information in the sub-directory).

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ObjectId	Input	Type_ObjectId	Uniquely identifies the media content object.
Users	Input	Type_UserList	Optional. Specifies the user who performs the personalized search. If this parameter is not provided, the personalised search is performed by the default user.
SearchRule	Input	Type_FilterRule	Indicates the search rule for searching media content objects. See the definition of the data type Type_FilterRule.
Offset	Input	Type_Count	Indicates the offset value between the initial searched item to the first item. The value starts from 0.
RequestCount	Input	Type_Count	Indicates the available number of objects returned that comply with the search rule. "–1" means the number of all objects that comply with the search condition.
Result	Output	Type_ContentList	The Media object result list and each media item object in the list has the rank metadata attribute (see A.2.2.2).
NumberReturned	Output	Type_Count	Indicates the number of media content objects returned as search result.
NumberTotalMatched	Output	Type_Count	Optional. Indicates the total number of media content objects that comply with the user's preference and search condition.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5 (see error codes in 8.1.6).

8.1.5.20 PersonalizedRecommend

Function description: Specifies the content object to be recommended in order to match the user's preference. The user's preference includes all item information in the specified content directory (including a recursive recommendation of item information in the sub-directory).

Input/Output parameter:

Parameter	Input/Output	Data Type	Field explanation
ObjectId	Input	Type_ObjectId	Uniquely identifies the media content object.
Users	Input	Type_UserList	Optional. Specifies the user to perform the personalised recommendation. If this parameter is not provided, the personalised recommendation is performed by the default user.
Offset	Input	Type_Count	Indicates the offset value between the initial searched item to the first item. The value starts from 0.
RequestCount	Input	Type_Count	Indicates the available number of objects returned that comply with the search rule. "−1" means the number of all objects that comply with the search condition.
Result	Output	Type_ContentList	The Media object result list and each media item object in the list has the Rank metadata attribute (see A.2.2.2).
NumberReturned	Output	Type_Count	Indicates the number of media content objects returned as the returned recommendation result.
NumberTotalMatched	Output	Type_Count	Optional. Indicates the total number of media content objects that comply with the user's preference.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5 (see error codes in 8.1.6).

8.1.6 Content index service error code definition

Error code	Error code name	Value	Field explanation
0	RETURN_SUCCESS	0	Success
E1	RETURN_FAILED	1	Failed
E2	RETURN_INVALIDPARA	2	Invalid parameter
E3	RETURN_ERRORFORMATPARA	3	Parameter format error
E4	RETURN_OFFSETOVERFLOW	4	Offset overflow
E5	RETURN_OBJECTINEXISTENCE	5	Object not exist
E6	RETURN_INTERFACEINEXISTENCE	14	Interface not exist

8.2 Connection management service

8.2.1 Overview

Connection Management Service is used to create and manage the connection between a media server and media client (also refer to ISO/IEC 29341-3-1:2008). A Media server and media client can support and manage several active connections at any time by CMS.

8.2.2 Connection management service type

Connection Management Service Type is defined as:

urn:IGRS:Service:ServiceType:ConnectionManagement:1.

8.2.3 Reference flow of connection management service interface invocation

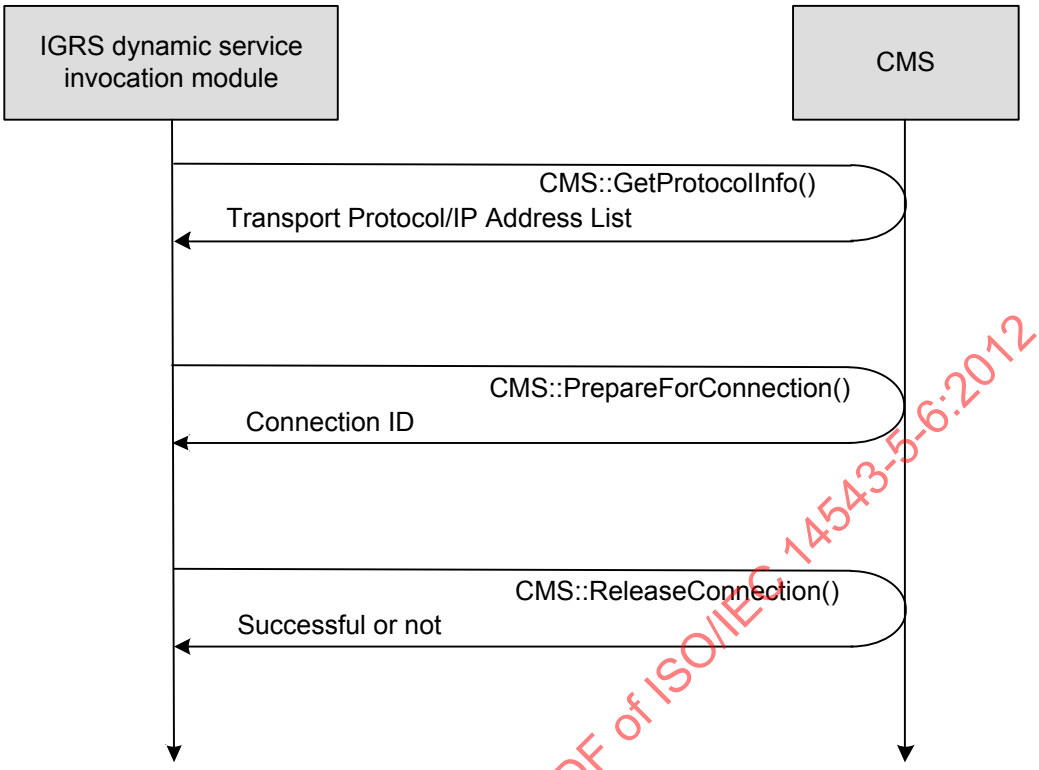

Figure 1 – Connection establishment and release flow

The process flow shown in Figure 1 is described as follows.

a) By the IGRS service discovery mechanism, the IGRS dynamic service invocation module discovers the CMS.

b) Get transport protocol, transport control mechanism and media format: Invoke CMS::GetProtocolInfo() interface of a CMS to obtain transport protocol, transport control mechanism and media format provided by the CMS and available IP address list.

c) Close the connection. When the session is ended, the IGRS dynamic service invocation module invokes CMS::ReleaseConnection() interface of CMS to close the connection.

8.2.4 Connection management service attribute

The Service Attribute of Connection Management Service is shown in Table 4.

Table 4 – Service attribute of connection management service

Name of service attribute	Data type	Field explanation
ConnectionIdList	Type_ConnectionIdList	Current active connection ID list of current device.
ProtocolInfoList	Type_ProtocolInfoList	Media transport protocol, transport control mechanism list supported by the current device.
MediaFormatList	Type_MediaFormatList	Media format list supported by the current device.
IPList	Type_IPList	Available IP address list of the current device.

Subscription and notification of any updates of the service attribute of the Connection Management Service shall follow the general service attribute subscription and notification rules specified in ISO/IEC 14543-5-1.

8.2.5 Connection management service data type

The Data Type of Connection Management Service is shown in Table 5.

Table 5 – Data type of connection management service

Data type name	Data type	Field explanation
Type_ProtocolInfoList	XML Schema struct	Includes the media ProtocolInfo list supported by the current device.
Type_ProtocolInfo	XML Schema struct	Transport protocol, the transport control mechanism information supported by CMS. The specific definition of Type_ProtocolInfo is found in Clause C.8.
Type_ConnectionManagementServiceId	String	Connection management service ID. Its format is DeviceId/ServiceId.
Type_ConnectionId	Int	Connection ID.
Type_TransportInstanceId	Int	Media server (client) transport management service instance ID.
Type_ConnectionIdList	string list	Current active connection ID list.
Type_ConnectionState	String	Current state of connection. Its value can be: "OK", "DISCONNECTED". "CONTENTFORMATMISMATCH", "INSUFFICIENTBANDWIDTH", "UNRELIABLECHANNEL", "UNKNOWN".
Type_MediaFormatList	XML Schema struct	Media format list. See specific definition of Type_MediaFormatList in Clause C.9.
Type_IPList	XML Schema struct	Available IP address list.
Type_RenderingManagementInstanceId	Int	ID of rendering management service instance.
Type_ConnectionRoleFlag	String	Used to identify the service is for MS or MC. It is an enumeration type. Its value can be ASSERVER-for MS, ASCLIENT-for MC.

8.2.6 Connection management service invocation interface set

8.2.6.1 GetProtocolInfo

Function description: Gets the protocol information supported by the current device, including transport protocol, transport control mechanism, network port, media format and available IP address list on a MS or MC.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ProtocolInfoList	Output	Type_ProtocolInfoList	The Protocol information list supported by the current device.
MediaFormatList	Output	Type_MediaFormatList	Output media format list supported by current device.
IPList	Output	Type_IPList	Optional. Available IP address list of current device.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.2.7).

8.2.6.2 PrepareForConnection

Function description: Gets the ConnectionId that is used to prepare and instantiate media data for sending and receiving the TransportInstanceId that is used for media transport.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
RemoteProtocolInfo	Input	Type_ProtocolInfo	Indicates the transport protocol, transport control mechanism and media format for media transport.
PeerCMSId	Input	Type_ConnectionManagementServiceId	Optional. Indicates the active CMS on the peer device. Its format is DeviceId/ServiceId. A null string means the value is unknown.
PeerConnectionId	Input	Type_ConnectionId	Optional. Indicates the connection ID managed by CMS on the peer device. A "−1" means the value is unknown.
ConnectionRoleFlag	Input	Type_ConnectionRoleFlag	Used to identify the interface that is used on MS or MC. Its value can be ASSERVER or ASCLIENT.
PeerIPList	Input	Type_IPList	Optional. Available IP address list on the peer device.
ConnectionId	Output	Type_ConnectionId	ID of connection that is managed and controlled by CMS of current device.
TransportInstanceId	Output	Type_TransportInstanceId	Optional. ID of media transport managed and controlled by current device.
RmsId	Output	Type_RenderingManagementIntanceId	Optional. Output the parameter when parameter ConnectionRoleFlag is ASCLIENT. Indicates the ID used to manage and to control the media rendering service on MC.
UsableIPList	Output	Type_IPList	Optional. Open IP address returned to the IGRS dynamic service invocation module by the current device based on the input available IP address list on the peer device.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5 (see error codes in 8.2.7).

8.2.6.3 ReleaseConnection

Function description: Notifies a device to disconnect the connection corresponding to ConnectionId and release resource.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ConnectionId	Input	Type_ConnectionId	ID of connection that is managed and controlled by CMS of current device.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5 (see error codes in 8.2.7).

8.2.6.4 GetActiveConnectionIdList

Function description: Gets the current active connection ID list on MS or MC.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ConnectionIdList	Output	Type_ConnectionIdList	ID list of current active connections on current device.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.2.7).

8.2.6.5 GetCurrentConnectionInfo

Function description: Gets connection information on a media server or media client corresponding to connection ID.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
ConnectionId	Input	Type_ConnectionId	ID of connection of current device.
TransportInstanceId	Output	Type_TransportInstanceId	Optional. ID that the current device is used to manage the media transport. "−1" means the value does not exist or is unknown.
ProtocolInfo	Output	Type_ProtocolInfo	Indicates the transport protocol, transport control mechanism and media format used by the media transport.
PeerCMSId	Output	Type_ConnectionManagementServiceId	Indicates the active CMS on the peer device. A null string means the value is unknown.
PeerConnectionId	Output	Type_ConnectionId	ID of connection that is managed by CMS of a peer device. "−1" means the value is unknown.
ConnectionState	Output	Type_ConnectionState	Current state of the connection.
RmsId	Output	Type_RenderingManagementInstanceId	Optional. ID used to manage the media rendering management service on MC.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5 (see error codes in 8.2.7).

8.2.7 Content management service error code definition

Error code	Error code name	Value	Field explanation
0	RETURN_SUCCESS	0	Success
E1	RETURN_FAILED	1	Failed
E2	RETURN_INVALIDPARA	2	Invalid parameter
E3	RETURN_ERRORFORMATPARA	3	Parameter format error
E4	RETURN_CONNECTIONDISABLED	4	Disabled connection
E5	RETURN_INVALIDCONNECTIONID	5	Invalid connection ID
E6	RETURN_INTERFACEINEXISTENCE	14	Interface not exist

8.3 Media server transport management service

8.3.1 Overview

The optional Media Server Transport Management Service enables the IGRS dynamic service invocation module to adjust and to control the media stream transport on a media server, such as play, pause, stop, seek, etc. If this service exists, it means that the media server initiated transport mode is supported. Otherwise, it is not supported (also refer to ISO/IEC 29341-3-1:2008).

8.3.2 Media server transport management service type

Media Server Transport Management Service Type is defined as:

urn:IGRS:Service:ServiceType:MediaServerTransportManagement:1.

8.3.3 Reference flow of media server transport management service interface invocation

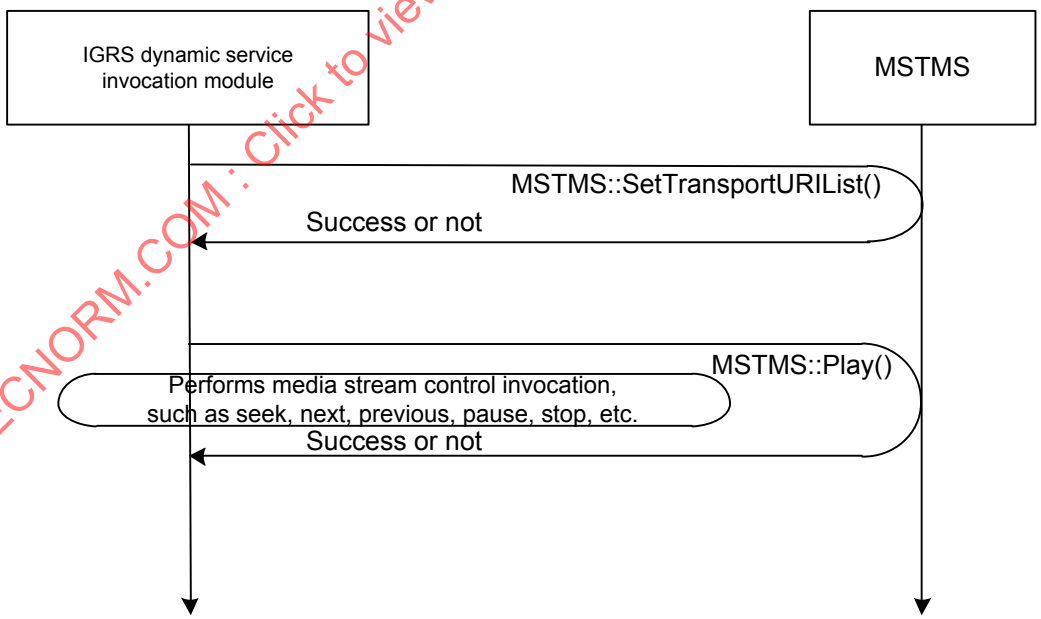

Figure 2 – Transport control flow

Flow process shown in Figure 2 is described as follows.

a) By the IGRS service discovery mechanism, the IGRS dynamic service invocation module discovers the MSTMS.

b) Select content: The IGRS dynamic service invocation module invokes the MSTMS::SetTransportURIList() to identify the content to be transported, which is located in the available IP address list returned from the MS.

c) Initiate media transport: Use the MSTMS to invoke transport management (e.g. play, stop, seek, etc.).

8.3.4 Media server transport management service attribute

The Service Attribute of the Media Server Transport Management Service is shown in Table 6.

Table 6 – Service attribute of media server transport management service

Name of service attribute	Data type	Field explanation
TransportState	Type_TransportState	Current state of media transport.
CurrentSpeed	Type_PlaySpeed	Transport speed of current media object.
TransportURIList	Type_TransportURIList	Media source URI list transferred by MSTMS.
PlayMode	Type_PlayMode	Current media playing mode.

Subscription and notification of any updates of a service attribute of the Media Server Transport Management Service shall follow the general service attribute subscription and notification rules specified in ISO/IEC 14543-5-1.

8.3.5 Media server transport management service data type

The Data Type of Media Server Transport Management Service is shown in Table 7.

Table 7 – Data type of media server transport management service

Data type name	Data type	Field explanation
Type_TransportState	string	Current state of media transport. The values include "PLAYING", "PAUSED_PLAYBACK", "PAUSED_RECORDING", "STOPPED", "RECORDING", "TRANSITIONING", "NO_MEDIA_PRESENT", "COMPLETE", "ERROR_OCCURRED".
Type_StorageMediumName	string	Storage medium for media content. See specific definition of Type_StorageMediumName in Clause C.10.
Type_PlayMode	string	Current media playing mode. The values include "NORMAL", "SHUFFLE", "REPEAT_ONE", "REPEAT_ALL", "RANDOM", "DIRECT_1", "INTRO". "DIRECT_1" means to stop after one track has been played. "INTRO" means to play a small segment of each track, for example, 10 s.
Type_PlaySpeed	string	Specifies the speed of media transport. "NORMAL" means to play with normal speed. "FASTFORWARD" means to fast forward. "SLOWFORWARD" means to slow forward. "FASTBACKWARD" means to fast backward. "SLOWBACKWARD" means to slow backward.
Type_MediaTimeLength	string	Current media playing time specified by MSTMS instance.
Type_TransportURIList	XML Schema struct	Transport URI list of several media content objects to be transported by MSTMS instance.
Type_TransportURI	string	Transport URI of the media content object to be transported by MSTMS instance. See specific definition of Type_TransportURI in Clause C.11.
Type_Item	XML Schema struct	A media item object with metadata attribute on CIS. See specific definition of Type_Item in Clause C.12.
Type_ItemList	XML Schema struct	A list of media item objects with a metadata attribute on CIS. See specific definition of Type_ItemList in Clause C.12.
Type_SeekMode	string	Indicates the target seek mode. It can be: "TRACK_NR" (track number), "TAPE_INDEX" (tape index), "ABS_COUNT" (absolute count), "REL_COUNT" (relative count), "ABS_TIME" (absolute time), "REL_TIME" (relative time), "FRAME".
Type_SeekTargetPosition	string	Seeks target position. Marks with unit.
Type_TransportInstanceId	int	MSTMS instance ID.
Type_Count	int	Offset address of the current playing media URI in the URI list.
Type_TimeLength	unsignedInt	Specified shift time (in second).
Type_TimeShiftSwitch	string	Turns on or off Timeshift. "OPEN": Turns on TimeShift. "CLOSE": Turns off TimeShift.
Type_SelectionId	string	Selection ID of subtitle or audio track.

8.3.6 Media server transport management service invocation interface set

8.3.6.1 SetTransportURIList

Function description: Sets the TransportURIList variable. Specifies the URI list of media content object to be transported by MSTMS instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
TransportURI List	Input	Type_TransportURIList	The Transport URI list of multiple media content objects to be transported by the MSTMS instance.
ItemList	Input	Type_ItemList	Optional. IGRS dynamic service invocation module gets the media item information via Browse() or Search().

Return Value: Success: 0

Failure: E1, E2, E3, E5, E6 (see error codes in 8.3.7).

8.3.6.2 GetTransportInfo

Function description: Returns the current transport state information of the transport service instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
CurrentTransportState	Output	Type_TransportState	Current state of media transport. The values include "PLAYING", "PAUSED_PLAYBACK", "PAUSED_RECORDING", "STOPPED", "RECORDING", "TRANSITIONING", "NO_MEDIA_PRESENT", "COMPLETE", "ERROR_OCCURRED".
CurrentSpeed	Output	Type_PlaySpeed	Current playing speed.

Return Value: Success: 0

Failure: E1, E2, E3, E5, E6 (see error codes in 8.3.7).

8.3.6.3 Play

Function description: Plays the media object in a media list in sequence with the specified playing speed. (The starting point is decided by Offset.) Playing is continued until the URI list has been completely played or other interfaces have been invoked, such as stop, etc. In addition, DRM transport should be established before playing copyrighted media content. The available content should include license and encrypted media content corresponding to the playing device. The encrypted media stream should be decrypted by DRM system functionality on a MS or MC.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
Offset	Input	Type_Count	The Offset address of the current playing media URI in the URI list. "−1" means the parameter is disabled.
Speed	Input	Type_PlaySpeed	Specified media playing speed.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5, E6 (see error codes in 8.3.7).

8.3.6.4 Next

Function description: Sets the the next media object in the media list to be played. The selection mode is decided by the current media-playing mode.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E5, E6 (see error codes in 8.3.7).

8.3.6.5 Previous

Function description: Sets the current media object as the previously played media object.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E5, E6 (see error codes in 8.3.7).

8.3.6.6 Stop

Function description: Stops the current media object played by the MSTMS. The current position should be reset in some devices.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.3.7).

8.3.6.7 Pause

Function description: Pauses the current transport of the media content by the MSTMS. The current transport position remains unchanged. If the MS is the source of a broadcast, then the media stream should be saved in a buffer when paused.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.3.7).

8.3.6.8 Resume

Function description: Resumes to transport paused media content by the MSTMS instance from the current position.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.3.7).

8.3.6.9 Seek

Function description: Finds the target position specified by the input parameter in accordance with the input parameter Unit.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
Unit	Input	Type_SeekMode	Indicates the target seek mode. It can be: "TRACK_NR" (track number), "TAPE_INDEX" (tape index), "ABS_COUNT" (absolute count), "REL_COUNT" (relative count), "ABS_TIME" (absolute time), "REL_TIME" (relative time), "FRAME".
Target	Input	Type_SeekTargetPosition	Seeks the target position. Marks by above unit.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.3.7).

8.3.6.10 TimeShift

Function description: When the media source is a broadcast program, the user can pause (save broadcast program in a cache and stop the current screen) or repeat (repeat program from the cache) the broadcast program at any moment with TimeShift mode on.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
ShiftTime	Input	Type_TimeLength	Specifies the shift time (in second).
TimeShiftSwitch	Input	Type_TimeShiftSwitch	Turns on or off TimeShift. "OPEN": Turns on TimeShift. "CLOSE": Turns off TimeShift.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.3.7).

8.3.6.11 GetPlayURIList

Function description: Gets the URI list transported by the specified transport service instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
TransportURIList	Output	Type_TransportURIList	URI list transported by MSTMS.

Return Value: Success: 0

Failed: E1, E2, E3, E6 (see error codes in 8.3.7).

8.3.6.12 GetAllMediaInfo

Function description: Gets the detailed content information of the media URI list transported by a specified transport service instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
ItemList	Output	Type_ItemList	All the transport media URI information in TransportURIList.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.3.7).

8.3.6.13 GetCurrentMediaInfo

Function description: Gets the media information transported by the specified transport service instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
ElapsedDuration	Output	Type_MediaTimeLength	The Time length for which the MSTMS instance has been played.
CurrentURI	Output	Type_TransportURI	The Media content URI transported and controlled by MSTMS.
Item	Output	Type_Item	The IGRS dynamic service invocation module gets the media item information via Browse() or Search().

Return Value: Success: 0

Failure: E1, E2, E3, E5, E6 (see error codes in 8.3.7).

8.3.6.14 GetPlayMode

Function description: Gets the URI playing mode controlled by the specified transport service instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
PlayMode	Output	Type_PlayMode	Current media playing mode (such as random, repeat, etc.).

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.3.7).

8.3.6.15 SetPlayMode

Function description: Sets the playing mode.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
NewMode	Input	Type_PlayMode	Sets media playing mode (such as random, repeat etc.).

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.3.7).

8.3.6.16 SelectSubtitle

Function description: Sets the subtitle to be used for media playing.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
SelectionId	Input	Type_SelectionId	Specific selection value.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.3.7).

8.3.6.17 SelectAudioTrack

Function description: Sets the audio track to be used for media playing.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MSTMS instance ID.
SelectionId	Input	Type_SelectionId	Specific selection value.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.3.7).

8.3.7 Media server transport management service error code definition

Error code	Error code name	Value	Field explanation
0	RETURN_SUCCESS	0	Success
E1	RETURN_FAILED	1	Failed
E2	RETURN_INVALIDPARA	2	Invalid parameter
E3	RETURN_ERRORFORMATPARA	3	Parameter format error
E4	RETURN_OFFSETOVERFLOW	4	Offset overflow
E5	RETURN_ OBJECTINEXISTENCE	5	Object not exist
E6	RETURN_CONNECTIONDISABLED	6	Connection disabled
E7	RETURN_INTERFACEINEXISTENCE	14	Interface not exist

8.4 Media client transport management service

8.4.1 Overview

The optional Media Client Transport Management Service enables the IGRS dynamic service invocation module to adjust and to control the transport of a media stream on a media client such as play, pause, stop, seek, etc. If this service exists, it means that the media client initiated

transport mode is supported. Otherwise, it is not supported (also refer to ISO/IEC 29341-3-1:2008).

8.4.2 Media client transport management service type

The Media Client Transport Management Service Type is defined as:

urn:IGRS:Service:ServiceType:MediaClientTransportManagement:1.

8.4.3 Reference flow of media client transport management service interface invocation

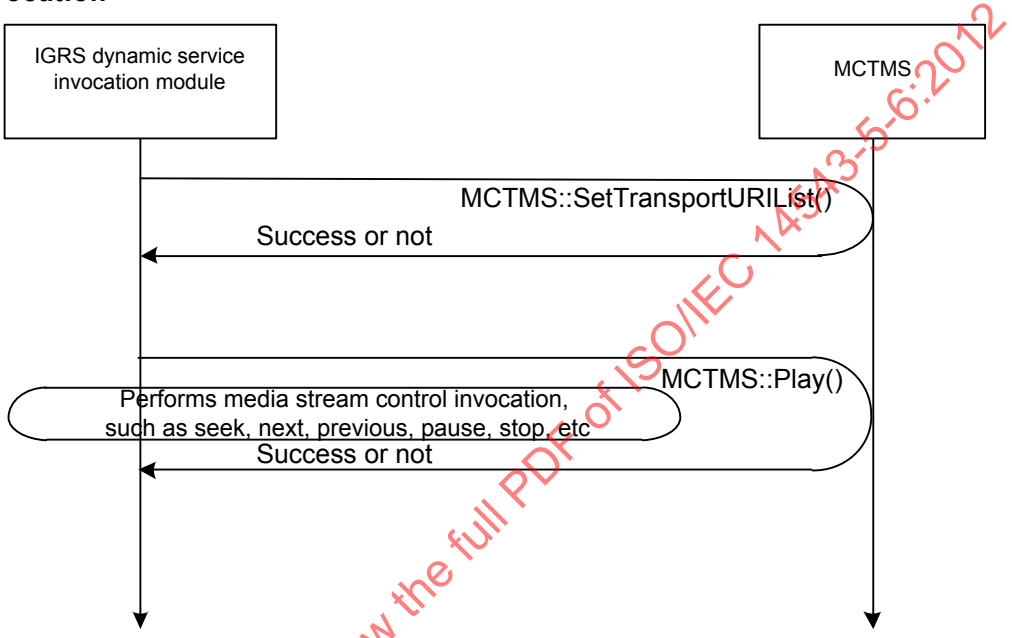

Figure 3 – Transport control flow

The Flow Process shown in Figure 3 is described as follows.

a) By the IGRS service discovery mechanism, the IGRS dynamic service invocation module discovers the MCTMS.

b) Select content: the IGRS dynamic service invocation module invokes the MCTMS::SetTransportURIList() to identify the content to be transported.

c) Initiate media transport: Use the MCTMS to invoke transport management (e.g. play, stop, seek, etc.).

8.4.4 Media client transport management service attribute

The Service Attribute of Media Client Transport Management Service is shown in Table 8.

Table 8 – Service attribute of media client transport management service

Name of service attribute	Data type	Field explanation
TransportState	Type_TransportState	Current state of media transport and service.
CurrentSpeed	Type_PlaySpeed	Transport speed of current media object.
TransportURIList	Type_TransportURIList	The Media source URI list transferred by MCTMS.
PlayMode	Type_PlayMode	Current media playing mode.

Subscription and notification of any updates of service attribute of Media Client Transport Management Service shall follow the general service attribute subscription and notification rules specified in ISO/IEC 14543-5-1.

8.4.5 Media client transport management service data type

The Data Type of Media Client Transport Management Service is shown in Table 9.

Table 9 – Data type of media client transport management service

Data type name	Data type	Field explanation
Type_TransportState	string	Current state of media transport. The values include "PLAYING", "PAUSED_PLAYBACK", "PAUSED_RECORDING", "STOPPED", "RECORDING", "TRANSITIONING", "NO_MEDIA_PRESENT", "COMPLETE", "ERROR_OCCURRED".
Type_StorageMediumName	string	Storage medium for media content. See specific definition of Type_StorageMediumName in Clause C.10.
Type_PlayMode	string	Current media playing mode, including "NORMAL", "SHUFFLE", "REPEAT_ONE", "REPEAT_ALL", "RANDOM", "DIRECT_1", "INTRO". "DIRECT_1" means to stop after one track has been played. "INTRO" means to play a small segment of each track, for example, 10 s.
Type_PlaySpeed	string	Specifies the speed of media transport. "NORMAL" means to play with normal speed. "FASTFORWARD" means to fast forward. "SLOWFORWARD" means to slow forward. "FASTBACKWARD" means to fast backward. "SLOWBACKWARD" means to slow backward.
Type_MediaTimeLength	string	Current media playing time specified by MCTMS instance.
Type_TransportURIList	string	Transport URI list of several media content objects to be transported by MCTMS instance.
Type_TransportURI	string	Transport URI of the media content object to be transported by MCTMS instance. See specific definition of Type_TransportURI in Clause C.11.
Type_Item	XML Schema struct	Metadata attribute of media item object on CIS. See specific definition of Type_Item in Clause C.12.
Type_ItemList	XML Schema struct	A list of metadata attribute of media item objects on CIS. See specific definition of Type_ItemList in Clause C.12.
Type_SeekMode	string	Indicates the target seek mode. It can be: "TRACK_NR" (track number), "TAPE_INDEX" (tape index), "ABS_COUNT" (absolute count), "REL_COUNT" (relative count), "ABS_TIME" (absolute time), "REL_TIME" (relative time), "FRAME".
Type_SeekTargetPosition	string	Seeks target position. Marks with unit.
Type_TransportInstanceId	int	MCTMS instance ID.
Type_Count	int	Offset address of the current playing media URI in the URI list.
Type_RecordInput	string	Indicates whether a specified media source being recorded comes from an analog or digital source. It can be either "DIGITAL" or "ANALOG".
Type_RecordBitRateType	string	Indicates whether a specified encoder uses a variable bit rate or fixed bit rate when recording. Applicable only for an analog source. It can be either "FIXED" or "VARIABLE".
Type_RecordBitRate	unsignedInt	Optional. When recording, if the specified encoder is of fixed bit rate type, then this parameter is the fixed bit rate. If the specified encoder is of variable bit rate type, then it is the average bit rate. Applicable only to analog sources.
Type_RecordAudioSampleRate	unsignedInt	Audio sample rate. Applicable only to analog sources.
Type_RecordAudioBitRate	unsignedInt	Audio code bit rate. Applicable only to analog sources.
Type_RecordVideoFormat	string	Indicates the format of a media source when recording.
Type_TimeLength	unsignedInt	Specified shift time (in second).
Type_TimeShiftSwitch	string	Turns on or off TimeShift. "OPEN": Turns on TimeShift. "CLOSE": Turns off TimeShift.
Type_SelectionId	string	Selection ID of subtitle or audio track.

8.4.6 Media client transport management service invocation interface set

8.4.6.1 SetTransportURIList

Function description: Sets the TransportURIList variable. Specifies the URI list of media content object to be transport by the MCTMS instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
TransportURIList	Input	Type_TransportURIList	The Transport URI list of multiple media content objects to be transported by MCTMS instance.
ItemList	Input	Type_ItemList	Optional. The IGRS dynamic service invocation module gets media item information via Browse() or Search().

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.2 GetTransportInfo

Function description: Gets the current transport state information of a transport service instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
CurrentTransportState	Output	Type_TransportState	Current state of media transport. The values include "PLAYING", "PAUSED_PLAYBACK", "PAUSED_RECORDING", "STOPPED", "RECORDING", "TRANSITIONING", "NO_MEDIA_PRESENT", "COMPLETE", "ERROR_OCCURRED".
CurrentSpeed	Output	Type_PlaySpeed	Current playing speed.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.3 Play

Function description: Plays a media object in a media list with a specified playing speed. The starting point is decided by Offset. Playing is continued until the URI list has been completely played or other interfaces have been invoked, such as stop, etc. In addition, DRM transport should be established before playing copyrighted media content. The available content should include license and encrypted media content corresponding to the playing device. The encrypted media stream should be decrypted by DRM system tool on an MS or MC.

To implement this interface for RTSP/RTP out-of-band transport, the RTSP client within the media client should send a RTSP SETUP request to the RTSP server within the media server to initialise the RTSP session between the media client and the media server, and then send a RTSP PLAY request to the RTSP server to play the content. If the previously playing media is a

RTSP/RTP stream and is still active, the RTSP client should send a RTSP TEARDOWN request to stop the RTSP session first. When the RTSP client finishes playing the current media, it should send a RTSP TEARDOWN request to stop the RTSP session.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
Offset	Input	Type_Count	Offset address of the current playing media URI in the URI list. "−1" means the parameter is disabled.
Speed	Input	Type_PlaySpeed	Specified media playing speed.

Return Value: Success: 0

Failure: E1, E2, E3, E5, E6 (see error codes in 8.4.7).

8.4.6.4 Next

Function description: Sets the next media object in the media list to be played. The selection mode is decided by the current media playing mode.

To implement this interface for an RTSP/RTP out-of-band transport, the RTSP client within a media client should send an RTSP SETUP request to the RTSP server within the media server to initialise the RTSP session between the media client and media server, and then send an RTSP PLAY request to an RTSP server to play the content. If the previously playing media is an RTSP/RTP stream and is still active, the RTSP client should send an RTSP TEARDOWN request to stop the RTSP session first. When the RTSP client finishes playing the current media, it should send an RTSP TEARDOWN request to stop the RTSP session.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E5, E6 (see error codes in 8.4.7).

8.4.6.5 Previous

Function description: Sets the current media object as the previously played media object.

To implement this interface for an RTSP/RTP out-of-band transport, the RTSP client within media client should send an RTSP SETUP request to the RTSP server within the media server to initialise the RTSP session between the media client and media server, and then send an RTSP PLAY request to RTSP server to play the content. If the previously playing media is an RTSP/RTP stream and is still active, the RTSP client should send an RTSP TEARDOWN request to stop the RTSP session first. When the RTSP client finishes playing the current media, it should send a RTSP TEARDOWN request to stop the RTSP session.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E5, E6 (see error codes in 8.4.7).

8.4.6.6 Stop

Function description: Stops the current media object played by the MCTMS. The current position should be reset in some devices.

To implement this interface for an RTSP/RTP out-of-band transport, the RTSP client within media client should send an RTSP TEARDOWN request to stop the RTSP session.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.7 Pause

Function description: Pauses the current transport of media content by MCTMS. Current transport position remains unchanged. If the MS is the source of broadcast, then the media stream should be saved in a buffer when paused.

To implement this interface for an RTSP/RTP out-of-band transport, the RTSP client within media client should send an RTSP PAUSE request to pause the RTSP session.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.8 Resume

Function description: Resumes to transport paused media content by the MCTMS instance from the current position.

To implement this interface for an RTSP/RTP out-of-band transport, the RTSP client within media client should send an RTSP PLAY request to resume the RTSP session.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.9 Seek

Function description: Finds the target position specified by the input parameter in accordance with the input parameter Unit.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
Unit	Input	Type_SeekMode	Indicates the target seek mode. It can be: "TRACK_NR" (track number), "TAPE_INDEX" (tape index), "ABS_COUNT" (absolute count), "REL_COUNT" (relative count), "ABS_TIME" (absolute time), "REL_TIME" (relative time), "FRAME".
Target	Input	Type_SeekTargetPosition	Seeks the target position. Marks by above unit.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.10 TimeShift

Function description: When the media source is a broadcast program, the user can pause (save broadcast program in cache and stop the current screen) or repeat (repeat program from cache) the broadcast program at any moment with TimeShift mode on.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
ShiftTime	Input	Type_TimeLength	Specifies the shift time (in second).
TimeShiftSwitch	Input	Type_TimeShiftSwitch	Turns on or off TimeShift. "OPEN": Turns on TimeShift. "CLOSE": Turns off TimeShift.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.11 GetPlayURIList

Function description: Gets the URI list transported by a specified transport service instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
TransportURIList	Output	Type_TransportURIList	The URI list of media content objects transported by MCTMS.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.12 GetAllMediaInfo

Function description: Gets the detailed content information of a media URI list transported by the specified transport service instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
ItemList	Output	Type_ItemList	All the transport media URI information in TransportURIList.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.13 GetCurrentMediaInfo

Function description: Gets media information transported by the specified transport service instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
ElapsedDuration	Output	Type_MediaTimeLength	Time length for which MCTMS instance has been played.
CurrentURI	Output	Type_TransportURI	Media content URI transported and controlled by MCTMS.
Item	Output	Type_Item	The IGRS dynamic service invocation module gets media item information via Browse() or Search().

Return Value: Success: 0

Failure: E1, E2, E3, E5, E6 (see error codes in 8.4.7).

8.4.6.14 GetPlayMode

Function description: Gets the URI playing mode controlled by the specified transport service instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
PlayMode	Output	Type_PlayMode	Current media playing mode (such as random, repeat etc.).

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.15 SetPlayMode

Function description: Sets playing mode.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
NewMode	Input	Type_PlayMode	Sets media playing mode (such as random, repeat etc.).

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.16 Record

Function description: Records in real-time the media stream on the specified media transport instance between the MC and MS.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
RecordInput	Input	Type_RecordInput	Indicates whether the specified media source being recorded is from an analog or digital source. It can be either "DIGITAL" or "ANALOG".
Type_Record BitRateType	Input	Type_RecordBitRateType	Indicates whether a specified encoder uses variable bit rates or fixed bit rates when recording. Applicable only to an analog source. It can be either "FIXED" or "VARIABLE".
Type_Record BitRate	Input	Type_RecordBitRate	Optional. When recording, if the specified encoder is of fixed bit rate type, then this parameter is the fixed bit rate. If the specified encoder is of variable bit rate type, then it is the average bit rate. Applicable only to analog sources.
Type_Record AudioSample Rate	Input	Type_RecordAudioSampleRate	Optional. Audio sample rate. Applicable only to analog sources.
Type_Record AudioBitRate	Input	Type_RecordAudioBitRate	Optional. Audio code bit rate. Applicable only to analog sources.
Type_Record VideoFormat	Input	Type_RecordVideoFormat	Optional. Indicates the format of the media source when recording. Applicable only to analog sources.

Return Value: Success: 0

Failure: E1, E2, E3, E6, E7, E8 (see error codes in 8.4.7).

8.4.6.17 PauseRecord

Function description: Pauses media content that is being recorded by the MCTMS instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.18 ResumeRecord

Function description: Resumes to record media content managed by the MCTMS instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.19 StopRecord

Function description: Stops recording the media content by the MCTMS instance.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.20 SelectSubtitle

Function description: Sets the subtitle to be used for media playing.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
SelectionId	Input	Type_SelectionId	Specific selection value.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.6.21 SelectAudioTrack

Function description: Sets the audio track to be used for media playing.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_TransportInstanceId	MCTMS instance ID.
SelectionId	Input	Type_SelectionId	Specific selection value.

Return Value: Success: 0

Failure: E1, E2, E3, E6 (see error codes in 8.4.7).

8.4.7 Media client transport management service error code definition

Error code	Error code name	Value	Field explanation
0	RETURN_SUCCESS	0	Success
E1	RETURN_FAILED	1	Failed
E2	RETURN_INVALIDPARA	2	Invalid parameter
E3	RETURN_ERRORFORMATPARA	3	Parameter format error
E4	RETURN_OFFSETOVERFLOW	4	Offset overflow
E5	RETURN_ OBJECTINEXISTENCE	5	Object not exist
E6	RETURN_CONNECTIONDISABLED	6	Connection disabled
E7	RETURN_BITRATEOVER	7	Bit rate of encoder overflow
E8	RETURN_SPACENOTENOUGH	8	Insufficient storage space
E9	RETURN_INTERFACEINEXISTENCE	14	Interface not exist

8.5 Rendering management service

8.5.1 Overview

The Rendering Management Service allows the IGRS dynamic service invocation module to control media playing, such as volume, contrast, brightness, etc. Multiple active instances of rendering control can be supported, such as the "picture-in-picture" function on TV. A new RMS instance is created by PrepareForConnection() of the CMS on a media client. This service is only provided by a media client (also refer to ISO/IEC 29341-3-1:2008).

8.5.2 Rendering management service type

Rendering Management Service Type is defined as:

urn:IGRS:Service:ServiceType:RenderingManagement:1.

8.5.3 Rendering management service attribute

The Service Attribute of Rendering Management Service is shown in Table 10.

Table 10 – Service attribute of rendering management service

Name of service attribute	Data type	Field explanation
CurrentPresetProfile	Type_PresetProfileList	Preset state variable list of rendering control supported by media client.
CurrentBrightness	Type_Brightness	Current brightness of playing media terminal.
CurrentContrast	Type_Contrast	Current contrast of playing media terminal.
CurrentMute	Type_MuteState	Current track of playing media terminal is mute or not.

Subscription and notification of any updates of the service attribute of the Rendering Management Service shall follow the general service attribute subscription and notification rules specified in ISO/IEC 14543-5-1.

8.5.4 Rendering management service data type

The Data Type of Rendering Management Service is shown in Table 11.

Table 11 – Data type of rendering management service

Data type name	Data type	Field explanation
Type_PresetProfileList	string	Preset state variable list of rendering control supported by the media client.
Type_Brightness	unsignedInt	Brightness.
Type_Contrast	unsignedInt	Contrast.
Type_Sharpness	unsignedInt	Sharpness.
Type_VideoGain	unsignedInt	Video gain.
Type_VideoGreyLevel	unsignedInt	Video grey level.
Type_ColorTemperature	unsignedInt	Color temperature.
Type_MuteState	boolean	Track is mute or not.
Type_Volume	unsignedInt	Volume.
Type_LoudnessSwitch	boolean	Indicates whether loudness setting of track is successful.
Type_PlayChannel	string	Channel of playing device. It can be MASTER(Master) LF(Left Front) RF(Right Front) CF(Center Front) LFE(Low Frequency Enhancement) [Super woofer] LS(Left Surround) RS(Right Surround) LFC(Left of Center) [in front] RFC(Right of Center) [in front] SD(Surround) [rear] SL(Side Left) [left wall] SR(Side Right) [right wall] T(Top) [overhead] B(Bottom) [bottom].
Type_RenderingManagementInstanceId	int	Rendering Management Service instance ID on MC.
Type_DisplayWindowId	unsignedInt	ID of playing window supported by RMS.
Type_DisplayWindowSize	unsignedInt	Window size information.
Type_DisplayWindowPosition	XML Schema struct	Window position information. Including x, y, z coordinates.
Type_DisplayWindowInfo	XML Schema struct	Playing window information supported by RMS. See the specific definition for Type_DisplayWindowInfo in Clause C.13.
Type_DisplayWindowInfoList	XML Schema struct	Playing window information list supported by RMS. See the specific definition for Type_DisplayWindowInfoList in Clause C.13.

8.5.5 Rendering management service invocation interface set

8.5.5.1 ListPresets

Function description: Gets the current rendering control state variable list.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_ RenderingManagementInstanceId	RMS instance ID on media client.
CurrentPresetProfile	Output	Type_PresetProfileList	Preset state variable list of rendering control supported by the media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.2 SelectPresets

Function description: Restores the rendering control state variable to a preset value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_ RenderingManagementInstanceId	RMS instance ID on media client.
PresetProfileList	Input	Type_PresetProfileList	Preset state variable list of rendering control supported by the media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.3 GetBrightness

Function description: Gets the current brightness state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
CurrentBrightness	Output	Type_Brightness	Indicates the current brightness setting of the media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.4 SetBrightness

Function description: Sets the brightness state variable.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
DesiredBrightness	Input	Type_Brightness	Sets the current brightness of a media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.5 GetContrast

Function description: Gets the current contrast state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_ RenderingManagementInstanceId	RMS instance ID on media client.
CurrentContrast	Output	Type_Contrast	Indicates the current contrast setting of media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.6 SetContrast

Function description: Sets the contrast state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_ RenderingManagementInstanceId	RMS instance ID on media client.
DesiredContrast	Input	Type_Contrast	Sets the current contrast of a media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.7 GetSharpness

Function description: Gets the current sharpness state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
CurrentSharpness	Output	Type_Sharpness	Indicates the current sharpness setting of media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.8 SetSharpness

Function description: Sets the sharpness state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
DesiredSharpness	Input	Type_Sharpness	Sets the current sharpness of media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.9 GetVideoGain

Function description: Gets the current video gain state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_ RenderingManagementInstanceId	RMS instance ID on media client.
CurrentVideo Gain	Output	Type_VideoGain	Indicates the current video gain setting of media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.10 SetVideoGain

Function description: Sets the video gain state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_ RenderingManagementInstanceId	RMS instance ID on media client.
DesiredVideo Gain	Input	Type_VideoGain	Sets the current video gain of a media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.11 GetVideoGreyLevel

Function description: Gets the current video grey level state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
CurrentVideo BlackLevel	Output	Type_VideoGreyLevel	Indicates the current video grey level setting of media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.12 SetVideoGreyLevel

Function description: Sets the video grey level state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
DesiredVideo BlackLevel	Input	Type_VideoGreyLevel	Sets the current video grey level of media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.13 GetColorTemperature

Function description: Gets the current color temperature state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
CurrentColorTemperature	Output	Type_ColorTemperature	Indicates the current color temperature setting of media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.14 SetColorTemperature

Function description: Sets the color temperature state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
DesiredColorTemperature	Input	Type_ColorTemperature	Sets the current color temperature of media client.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.15 GetMute

Function description: Gets the current mute state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_ RenderingManagementInstanceId	RMS instance ID on media client.
Channel	Input	Type_PlayChannel	A specific audio/video channel of media client.
CurrentMute	Output	Type_MuteState	Indicates whether the media client is currently at mute or unmute state.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.16 SetMute

Function description: Sets the mute state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
Channel	Input	Type_PlayChannel	A specific audio/video channel of media client.
DesiredMute	Input	Type_MuteState	Sets the media client to mute or unmute.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.17 GetVolume

Function description: Gets current volume state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
Channel	Input	Type_PlayChannel	A specific audio/video channel of media client.
CurrentVolume	Output	Type_Volume	Indicates the current volume of a media client in play.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.18 SetVolume

Function description: Sets the volume state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
Channel	Input	Type_PlayChannel	A specific audio/video channel of media client.
DesiredVolume	Input	Type_Volume	Sets the volume of a media client in play.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.19 GetLoudness

Function description: Gets the current loudness state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
Channel	Input	Type_PlayChannel	A specific audio/video channel of a media client.
CurrentLoudness	Output	Type_LoudnessSwitch	Indicates whether the current setting of loudness of media client channel is effective.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.20 SetLoudness

Function description: Sets the loudness state variable value.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_RenderingManagementInstanceId	RMS instance ID on media client.
Channel	Input	Type_PlayChannel	A specific audio/video channel of a media client.
DesiredLoudness	Input	Type_LoudnessSwitch	Sets the loudness of media client in play.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.21 GetPlayerDisplayAttribute

Function description: Gets the attribute of the display terminal.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
PlayerDisplayAttribute	Output	Type_DisplayWindowInfo	Indicates the attribute information of a display terminal.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.22 GetAllDisplayWindowInfo

Function description: Gets all information on the display window, including WindowId, WindowSize, WindowPosition of each window.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
DisplayWindowInfoList	Output	Type_DisplayWindowInfoList	All information of the display window list is supported by RMS.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.23 GetDisplayWindowSize

Function description: Gets the size of specified display window.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
WindowId	Input	Type_DisplayWindowId	Unique ID for display window on media client.
DisplayWindowSize	Output	Type_DisplayWindowSize	Size of display window of the media playing service.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.24 SetDisplayWindowSize

Function description: Sets the size of specified display window.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
WindowId	Input	Type_DisplayWindowId	Unique ID for a display window on a media client.
DesiredDisplayWindowSize	Input	Type_DisplayWindowSize	Size of a display window of a media playing service.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.25 GetDisplayWindowPosition

Function description: Gets the position of specified display window.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
WindowId	Input	Type_DisplayWindowId	Unique ID for a display window on a media client.
DisplayWindowPosition	Output	Type_DisplayWindowPosition	Position of a display window of a media playing service.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.5.26 SetDisplayWindowPosition

Function description: Sets the position of specified display window.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
WindowId	Input	Type_DisplayWindowId	Unique ID for a display window on a media client.
DesiredDisplayWindow Position	Input	Type_DisplayWindowPosition	Position of a display window of a media playing service.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.5.6).

8.5.6 Rendering management service error code definition

Error code	Error code name	Value	Field explanation
0	RETURN_SUCCESS	0	Success
E1	RETURN_FAILED	1	Failed
E2	RETURN_INVALIDPARA	2	Invalid parameter
E3	RETURN_ERRORFORMATPARA	3	Parameter format error
E4	RETURN_INTERFACEINEXISTENCE	14	Interface not exist

8.6 File access management service

8.6.1 Overview

The File Access Management Service provides the following functions to a File Client:

– provides authentication for a File Client and thus give corresponding file access right to the File Client;
– allows the File Client to retrieve sorting/searching capability supported by the File Server;
– allows the File Client to browse content directory in the network provided by the File Server;
– allows the File Client to search specified file/directory;
– allows the File Client to retrieve and modify attributes of file/directory;
– allows the File Client to retrieve and set a browsing filter;
– allows the File Client to subscribe to the file/directory object update event;
– allows the File Client to subscribe to the File Access Management Service update event;
– supports the File Client to upload and download the specified file/directory.

The detailed description of this service is found in Annex C of ISO/IEC 14543-5-22.

8.6.2 File access managemet service type

The File Access Management Service service type is defined as:

urn:IGRS:Service:ServiceType:FileAccessManagement:1.

8.6.3 Reference flow of FAMS interface invocation

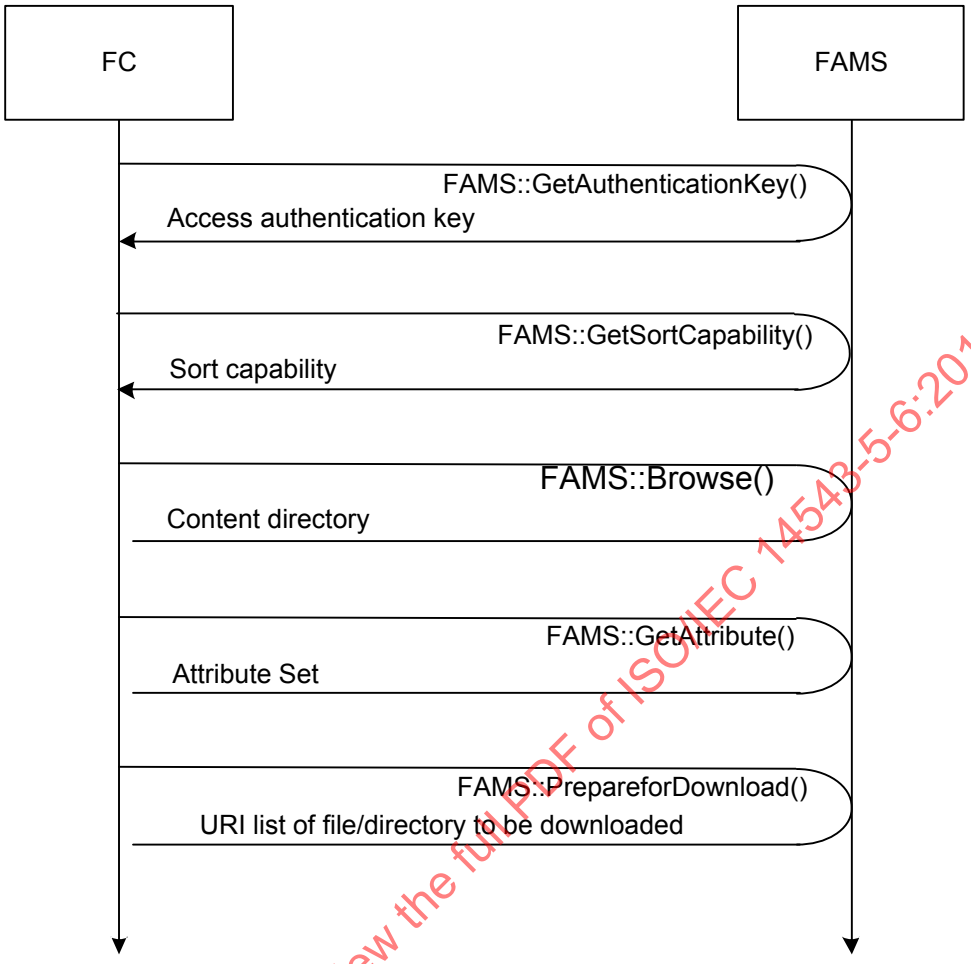

Figure 4 – File access flow

Flow process shown in Figure 4 is described as follows.

a) By the IGRS service discovery mechanism, a File Client discovers the FAMS.

b) Retrieve access right: A File Client retrieves the authentication key to get access right to the shared file on the File Server by invoking FAMS::GetAuthenticationKey() interface of the File Access Management Service on the File Server. The File Client can use any combination information of DeviceID/DeviceName, UserName/Password and Third-party authentication mode of the local device, to retrieve authentication key from File Server.

c) Retrieve sorting and searching capability of the File Server: A File Client can retrieve the shared file/directory sorting capability of the File Server by invoking FAMS::GetSortCapability() interface of the File Access Management Service on the File Server. It can also retrieve shared the file/directory searching capability of the File Server by invoking FAMS::GetSearchCapability () interface of File Access Management Service on the File Server.

d) Browse or search the shared file/directory on the File Server: A File Client can browse all files and sub-directory information in any specified shared directory by invoking FAMS::Browse() interface of the File Access Management Service on the File Server.

e) Retrieve or set attributes of the shared file/directory: the File Client can retrieve attributes of the specified shared file/directory by invoking FAMS::GetAttribute() interface of the File Access Management Service on the File Server.

f) Download shared file/directory from the File Server or upload shared file/directory to the File Server: the File Client can setup the downloading of shared file/directory and retrieve the URI list of shared file/directory to be downloaded by invoking FAMS::PrepareforDownload() interface of the File Access Management Service on the File Server.

8.6.4 File access management service attribute

The Service Attribute of the File Access Management Service is shown in Table 12.

Table 12 – Service attribute list of file access management service

Service attribute name	Data type	Field explanation
SortCaps	Type_SortCapability	The File/directory object attribute sets are sorted by searching or browsing results. Empty set signifies that File Access Management Service does not support any file/directory object sorting attributes. If the returned set is not empty, then any element in the set can be used as the sorting rule provided by File Access Management Service.
SearchCaps	Type_SearchCapability	The File/directory object attribute sets set the searching rule. Empty set implies that the File Access Management Service does not support any file/directory object sorting attributes. If the returned set is not empty, then any element in the set can be used as the searching rule provided by the File Access Management Service.

8.6.5 File access management service data type

The Data Type of the File Access Management Service is shown in Table 13.

Table 13 – Data type of file access management service

Data type name	Data type	Field explanation
Type_UserAuthenticationInfo	String	Authentication information provided by the File Client.
Type_AuthenticationKey	String	The Authentication key provided to the File Client by the File Access Management Service. The authentication key specifies the access rights of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
Type_InstanceId	UnsignedInt	The session identifier between the IGRS client and the IGRS Service.
Type_ObjectId	String	The only Object identifier that identifies a file/directory object. See detailed definition of Type_ObjectId in Clause C.14
Type_SubscriptionId	String	Subscription identifier.
Type_ObjectIdList	String	Object identifier list.
Type_SortCapability	String	The File/directory object attribute sets are sorted by searching or browsing results. Empty set implies that the File Access Management Service does not support any file/directory object sorting attributes. If the returned set is not empty, then any element in the set can be used as the sorting rule provided by the File Access Management Service.
Type_SearchCapability	String	The File/directory object attribute sets the set searching rule. Empty set implies that the File Access Management Service does not support any file/directory object sorting attributes. If the returned set is not empty, then any element in the set can be used as the searching rule provided by the File Access Management Service.
Type_FilterRule	String	Represents the searching rule when searching a file/directory object. See detailed definition of Type_FilterRule in Clause C.3
Type_SortRule	String	Represents the sorting rule when sorting a file/directory attribute list. See detailed definition of Type_SortRule in Clause C.4
Type_ObjectAttribute	String	File/directory object attribute set, which includes an ObjectType element to distinguish between a file and a directory object.
Type_ServiceAttributeName	String	Service attribute name.
Type_DeleteMode	String	Mode to delete a file/directory (temporary/permanent delete).
Type_ObjectList	String	Result list of a file/directory object.
Type_Count	Int	Object number.
Type_ObjectURI	String	URI of Object on a File Server.
Type_ObjectURITreeList	String	Tree list of the file/directory object list on FileServer, which includes a file/directory object URI and attribute.

8.6.6 File access management service invocation interface set

8.6.6.1 GetAuthenticationKey

Function description: Retrieves the assigned authentication key for the File Server based on the authentication information. The authentication key specifies the access right of a File Client. The authentication key is recommended to be only in effect during a session. During the subsequent service invocations by a File Client, the authentication key is required to be used as the input parameter.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
InstanceId	Input	Type_InstanceId	Session identifier between IGRS client and IGRS service.
UserAuthenticationInfo	Input	Type_UserAuthenticationInfo	Authentication information provided by the File Client. See detailed definition in Annex D.
AuthenticationKey	Output	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access rights of a File Client. It is recommended that the key is only valid during this session. It is disabled when the session is over.

Return Value: Success: 0

Failure: E1, E2, E3 (see error codes in 8.6.7).

8.6.6.2 GetSortCapability

Function description: Retrieves the file/directory sorting capability supported by the File Access Management Service on the File Server such that a File Client can use the file/directory attribute set as the sorting rule, such as name, time of creation, etc.

Input/Output parameter:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
SortCaps	Output	Type_SortCapability	The File/directory object attribute sets are sorted by searching or browsing results. Empty set signifies that the File Access Management Service does not support any file/directory object sorting attributes. If the returned set is not empty, then any element in the set can be used as the sorting rule provided by the File Access Management Service.

Return Value: Success: 0

Failure: E1, E2, E3, E9, E10 (see error codes in 8.6.7).

8.6.6.3 GetSearchCapability

Function description: Retrieves the file/directory searching capability supported by the File Access Management Service on the File Server, such a way that a File Client can use the file/directory attribute set as the searching rule, such as name, time of creation, etc.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of a File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
SearchCaps	Output	Type_SearchCapability	The File/directory object attribute sets the set searching rule. Empty set implies that the File Access Management Service does not support any searching of the file/directory object attributes. If the returned set is not empty, then any element in the set can be used as the searching rule provided by the File Access Management Service.

Return Value: Success: 0

Failure: E1, E2, E3, E9, E10 (see error codes in 8.6.7).

8.6.6.4 Browse

Function description: Returns to the lower level file/directory list of the specified directory on the File Server and gets back to the basic attributes of each object.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
ObjectId	Input	Type_ObjectId	The only Object identifier to identify the file/directory object.
BrowseFilter	Input	Type_FilterRule	Browsing rule of a file object in the current directory. This parameter value has two instances: The BrowseFilter value is empty. Then the preset filtering rule is used during the browsing process. The setting of the preset filtering rule is done by SetBrowseFilter interface. The BrowseFilter value is not empty. Then this value is used as the browsing filtering rule of the service invocation. This value will not affect the value of the preset filtering rule.
StartOffset	Input	Type_Count	Offset between the starting item of the returned result and the first item in all file/directory lists that comply with the browsing rule. This value shall start from 0.
RequestedCount	Input	Type_Count	Maximum number of browsing items returned. −1 denotes that all browsing results are returned.
SortRule	Input	Type_SortRule	Sorting rule of the browsed directory object.
Result	Output	Type_ObjectList	Result list of browsed file/directory file object.
NumberReturned	Output	Type_Count	Optional. The number of directory and file objects returned from the browsing results.
NumberTotalMatched	Output	Type_Count	Total number of file and directory objects that comply with the browsing rule.

Return Value: Success: 0

Failure: E1, E2, E3, E6, E7, E9, E10 (see error codes in 8.6.7).

8.6.6.5 GetAttribute

Function description: Retrieves the attribute set of the specified file/directory object on the File Server.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
ObjectId	Input	Type_ObjectId	The only object identifier to identify the file/directory object.
ObjectAttribute	Output	Type_ObjectAttribute	The Attribute set of a file/directory object. See a detailed definition in Annex D.

Return Value: Success: 0

Failure: E1, E2, E3, E7, E9, E10 (see error codes in 8.6.7).

8.6.6.6 SetAttribute

Function description: Sets the attribute of the specified file/directory object on the File Server.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
ObjectId	Input	Type_ObjectId	The only object identifier to identify a file/directory object.
ObjectAttribute	Input	Type_ObjectAttribute	The attribute of an object to be set. Only the setting of an object name and initial access rights are required to be supported. See detailed definition inAnnex D.

Return Value: Success: 0

Failure: E1, E2, E3, E7, E9, E10 (see error codes in 8.6.7).

8.6.6.7 Search

Function description: Searches for the specified file/directory object on the File Server. This function searches for all object information in a specified directory (the recursive search of the object information in a sub-directory is included) and supports searching in multiple parallel directories.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to a File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
ObjectIdList	Input	Type_ObjectIdList	Object identifier list within the search scope.
SearchRule	Input	Type_FilterRule	Searching rule of the file/directory object.
StartOffset	Input	Type_Count	The Offset between the starting item of the returned result and the first item in all file/directory lists that complies with the searching rule. This value shall start from 0.
RequestedCount	Input	Type_Count	Maximum number of searching items returned. –1 denotes that all searching results are returned.
Result	Output	Type_ObjectList	Result of the file/directory object list returned according to the searching rule.
NumberReturned	Output	Type_Count	The number of file/directory objects returned from the searching results.
NumberTotalMatched	Output	Type_Count	Optional, total number of file/directory objects that comply with the searching rule.

Return Value: Success: 0

Failure: E1, E2, E3, E6, E7, E9, E10 (see error codes in 8.6.7).

8.6.6.8 GetBrowseFilter

Function description: Retrieves the current browsing filter rule. This is a preset browsing filter rule used by the File Access Management Service.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of a File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
BrowseFilter	Output	Type_FilterRule	Current browsing filter rule used.

Return Value: Success: 0

Failure: E1, E2, E3, E9, E10 (see error codes in 8.6.7).

8.6.6.9 SetBrowseFilter

Function description: Sets the browsing filter rule. Only SetBrowseFilter() interface can change the preset browsing filter rule and the preset browsing filter rule shall remain the same until the next invocation of SetBrowseFilter() interface.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
BrowseFilter	Input	Type_FilterRule	Browsing filter rule to be set.

Return Value: Success: 0

Failure: E1, E2, E3, E9, E10 (see error codes in 8.6.7).

8.6.6.10 New

Function description: Creates a new file/directory object in the directory object specified by the File Server. The attribute of the object is specified by the parameter ObjectAttribute.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
ParentId	Input	Type_ObjectId	The object identifier of the parent directory object in which the file will be created.
ObjectAttribute	Input	Type_ObjectAttribute	The attribute of the new object, including the object name and the initial access right.
ObjectId	Output	Type_ObjectId	The only object identifier of the new object assigned by the File Access Management Service.

Return Value: Success: 0

Failure: E1, E2, E3, E7, E9, E10, E11 (see error codes in 8.6.7).

8.6.6.11 Copy

Function description: Copies the specified file/directory object to the specified target path, while reserving the source object. The file directory structure of the new directory shall follow the tree structure of the source directory at the time of copying.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
SourceObjectId	Input	Type_ObjectId	The object identifier of the source object assigned by the File Access Management Service.
DestParentId	Input	Type_ObjectId	The object identifier of the target directory.
DestObjectId	Output	Type_ObjectId	The object identifier of the new object assigned by the File Access Management Service.
DestObjectAttribute	Output	Type_ObjectAttribute	The object attribute of the new object.

Return Value: Success: 0

Failure: E1, E2, E3, E7, E9, E10, E11 (see error codes in 8.6.7).

8.6.6.12 Move

Function description: Copies the specified file/directory to the specified target destination and deletes the source object. The tree structure of the directory shall remain the same at the time of moving.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
SourceObjectId	Input	Type_ObjectId	The object identifier of the source object assigned by the File Access Management Service.
DestParentId	Input	Type_ObjectId	The object identifier of the target directory.
DestObjectId	Output	Type_ObjectId	The object identifier of the new object assigned by the File Access Management Service.
DestObjectAttribute	Output	Type_ObjectAttribute	The object attribute of the new object.

Return Value: Success: 0

Failure: E1, E2, E3, E7, E9, E10, E11 (see error codes in 8.6.7).

8.6.6.13 Delete

Function description: Deletes the specified file/directory object on the File Server, including the sub-directories and files of this directory.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
ObjectId	Input	Type_ObjectId	The object identifier of the object to be deleted.
DeleteMode	Input	Type_DeleteMode	The mode of object deletion (temporary/permanent delete).

Return Value: Success: 0

Failure: E1, E2, E3, E7, E9, E10, E11 (see error codes in 8.6.7).

8.6.6.14 PrepareforDownload

Function description: Prepares for file downloading and pre-detects the feasibility of the file/directory download. If downloading is allowed by the File Server, then the URI of the source to be transported shall be returned to the client, so that the a File Client application can download the file/directory by the out-of-band data transport; or else corresponding error codes shall be returned.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
SourceObjectIdList	Input	Type_ObjectIdList	The object identifier list of the file/directory object to be downloaded.
SourceObjectURITreeList	Output	Type_ObjectURITreeList	The tree list of the downloaded file/directory object list on FileServer, including the URI and the attributes of the file/directory object.

Return Value: Success: 0

Failure: E1, E2, E3, E7, E9, E10 (see error codes in 8.6.7).

8.6.6.15 PrepareforUpload

Function description: Verifies the file/directory objects to be uploaded by a client, including whether the storage space of the server is sufficient or the server has an object with the same object name, etc. If uploading is allowed by the File Server, the URI of the target object to be transported shall be returned to the client, so that the File Client application can upload the file/directory by the out-of-band data transport; or else corresponding error codes shall be returned.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
ObjectAttribute	Input	Type_ObjectAttribute	The attribute of the uploaded file/directory object.
DestParentId	Input	Type_ObjectId	The parent directory of the uploading object on the File Server.
DestParentURI	Output	Type_ObjectURI	The URI of the object on the File Server. This parameter denotes the URI of the destination directory of the uploading objects on the File Server.

Return Value: Success: 0

Failure: E1, E2, E3, E7, E8, E9, E10, E11 (see error codes in 8.6.7).

8.6.6.16 SubscribeObjectChange

Function description: Subscribes to the update event of file/directory objects on the File Server. If an object is changed, then the File Access Management Service shall notify the File Client of the event.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
ObjectId	Input	Type_ObjectId	The object identifier of the shared object to be subscribed.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5, E7, E9, E10 (see error codes in 8.6.7).

8.6.6.17 UnsubscribeObjectChange

Function description: Unsubscribes to the update event of file/directory objects on the File Server.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The FileAccessManagement Service assigns an authentication key to the FileClient. The authentication key specifies the access rights of the FileClient. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
ObjectId	Input	Type_ObjectId	The object identifier of the shared object to be unsubscribed.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5, E7, E9, E10 (see error codes in 8.6.7).

8.6.6.18 SubscribeServiceAttribute

Function description: Subscribes to the update event of the service attribute. If a service attribute changes, the File Access Management Service shall notify the File Client.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
ServiceAttributeName	Input	Type_ServiceAttributeName	The name of the service attribute to be subscribed.
SubscriptionId	Output	Type_SubscriptionId	The subscription identifier.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5, E7, E9, E10 (see error codes in 8.6.7).

8.6.6.19 UnsubscribeServiceAttribute

Function description: Unsubscribes from the update event of the service attribute.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
AuthenticationKey	Input	Type_AuthenticationKey	The File Access Management Service assigns an authentication key to the File Client. The authentication key specifies the access right of the File Client. It is recommended that the key is only valid during this particular session. It is disabled when the session is over.
SubscriptionId	Input	Type_SubscriptionId	The subscription identifier to be unsubscribed.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5, E7, E9, E10 (see error codes in 8.6.7).

8.6.7 File access management service error codes definition

Error code No.	Error code name	Value	Field explanation
0	RETURN_SUCCESS	0	Success
E1	RETURN_FAILED	1	Failure
E2	RETURN_INVALIDPARA	2	Invalid parameter
E3	RETURN_ERRORFORMATPARA	3	Parameter format error
E4	RETURN_INVALIDSUBSCRIBEID	4	Invalid subscription identifier
E5	RETURN_NOTALLOWEDTOSUBSCRIBE	5	Subscription not allowed
E6	RETURN_OFFSETOVERFLOW	6	Offset overflow
E7	RETURN_OBJECTINEXISTENCE	7	Object not exist
E8	RETURN_SPACENOTENOUGH	10	Not enough space
E9	RETURN_INVALIDAUTHENTICATIONKEY	11	Invalid authentication key
E10	RETURN_RIGHTNOTMATCHED	12	Right not matched
E11	RETURN_OBJECTNAMEEXISTED	13	Object name already exist
E12	RETURN_INTERFACEINEXISTENCE	14	Interface not exist

8.7 File connection management service

8.7.1 Overview

The File Connection Management Service is used to create and manage the connection between the File Server and a File Client. The File Server can support and manage multiple active connections at any time by the File Connection Management Service. The detailed service description is shown in Annex D of ISO/IEC 14543-5-22.

8.7.2 File connection management service type

File Connection Management service type is defined as:

urn:IGRS:Service:ServiceType:FileConnectionManagement:1.

8.7.3 Reference flow of file connection management service interface invocation

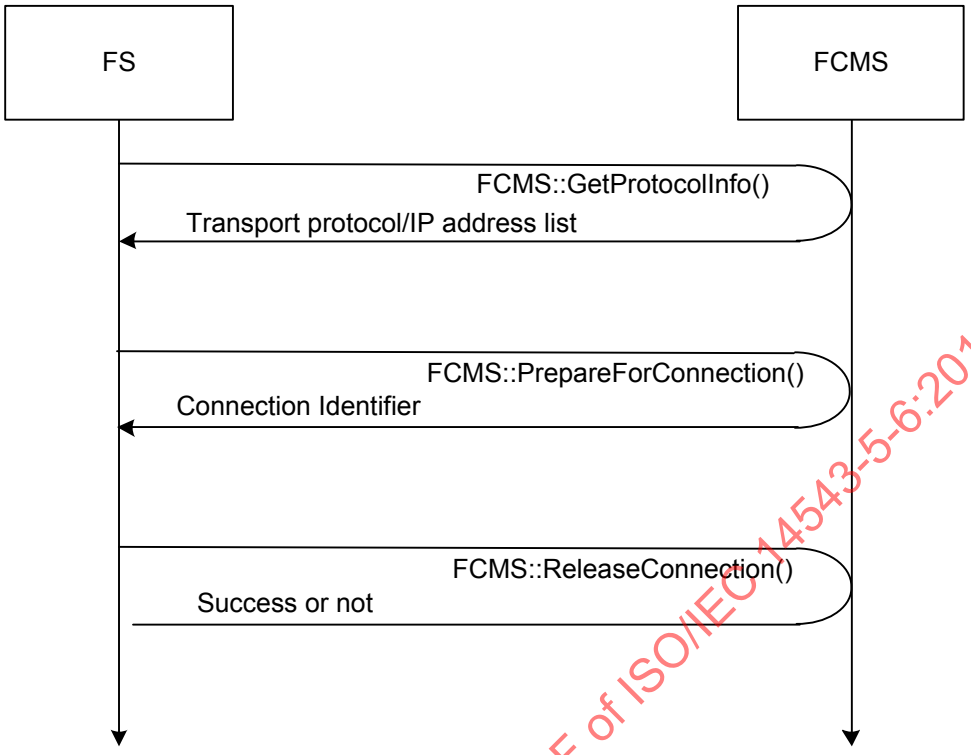

Figure 5 – Connection establishment and release flow

The flow process as shown in Figure 5 is described as follows:

a) by the IGRS service discovery mechanism, a File Client discovers FCMS;

b) retrieve transport protocols supported by the File Server: the File Client retrieves transport protocols supported by the File Serverby invoking FCMS::GetProtocolInfo() interface of the File Connection Management Service on the File Server;

c) connection preparation: A File Client notifies a File Server to prepare for a connection setup and to retrieve a connection identifier for connection management to use in the subsequent interaction process by invoking FCMS::PrepareforConnection() interface of the File Connection Management Service on the File Server;

d) close connection and release resource: When the file transport has been completed, the File Client notifies the File Server to close the connection between them and release the resource by invoking FCMS::ReleaseConnection() interface of File Connection Management Service on File Server.

8.7.4 File connection management service attribute

The Service Attribute of File Connection Management Service is shown in Table 14.

Table 14 – Service attribute of file connection management service

Service attribute name	Data type	Field explanation
ProtocolInfoList	Type_ProtocolInfo List	The transport protocol list supported by a File Server.
IPList	Type_IPList	The valid IP address list of a File Server.

8.7.5 File connection management service data type

The Data Type of File Connection Management Service is shown in Table 15.

Table 15 – Data type of file connection management service

Data type name	Data type	Field explanation
Type_ProtocolInfo	String	Transport protocol.
Type_ProtocolInfoList	String	Transport protocol list supported by a File Server.
Type_IPList	String	The valid IP address list of a File Server.
Type_ConnectionId	UnsignedInt	The connection identifier managed by a File Connection Management Service on a File Server.
Type_SubscriptionId	UnsignedInt	The subscription identifier.
Type_ServiceAttributeName	String	The name of the service attribute to be subscribed.

8.7.6 File connection management service invocation inteface set

8.7.6.1 GetProtocolInfo

Function description: Retrieves the transport protocol supported by the File Server, including the transport protocol name, network port, the content format and other protocol information, as well as the valid IP address list of File Server.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
ProtocolInfoList	Output	Type_ProtocolInfoList	The transport protocol list supported by a File Server.
IP List	Output	Type_IPList	The valid IP address list of a File Server. The format is shown in Annex D.

Return Value: Success: 0

Failure: E1, E2, E3, E6, E8, E9 (see error codes in 8.7.7).

8.7.6.2 PrepareforConnection

Function description: Retrieves the ConnectionId used to send and receive data.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
RemoteProtocolInfo	Input	Type_ProtocolInfo	The transport protocol.
ConnectionId	Output	Type_ConnectionId	The connection identifier managed by the File Connection Management service on a File Server.

Return Value: Success: 0

Failure: E1, E2, E3, E6, E7, E8, E9 (see error codes in 8.7.7).

8.7.6.3 ReleaseConnection

Function description: Notifies the device to close the the connection corresponding to the ConnectionId and release resource.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
ConnectionId	Input	Type_ConnectionId	The connection identifier managed by the File Connection Management service on a File Server.

Return Value: Success: 0

Failure: E1, E2, E3, E6, E7 (see error codes in 8.7.7).

8.7.6.4 GetActiveConnectionIdList

Function description: Retrieves the current active connection identifier list on the File Server.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
ConnectionIdList	Output	Type_ConnectionIdList	The current active connection identifier list on the current device.

Return Value: Success: 0

Failure: E1, E2, E3, E6, E7, E8, E9 (see error codes in 8.7.7).

8.7.6.5 GetCurrentConnectionInfo

Function description: Retrieves the connection information of the File Server that corresponds to the connection identifier.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
ConnectionId	Input	Type_ConnectionId	The connection identifier on the current device.
ProtocolInfo	Output	Type_ProtocolInfo	The transport protocol and transport control mechanism used for file transport.
ConnectionState	Output	Type_ConnectionState	The current connection state.

Return Value: Success: 0

Failure: E1, E2, E3, E6, E7, E8, E9 (see error codes in 8.7.7).

8.7.6.6 SubscribeServiceAttribute

Function description: Subscribes to the update event of a service attribute. If a service attribute is changed, the File Connection Management Service shall notify the File Client.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
ServiceAttributeName	Input	Type_ServiceAttributeName	The name of the service attribute to be subscribed.
SubscriptionId	Output	Type_SubscriptionId	The subscription identifier.

Return Value: Success: 0

Failure: E1, E2, E3, E4, E5, E6, E7, E8, E9 (see error codes in 8.7.7).

8.7.6.7 UnsubscribeServiceAttribute

Function description: Unsubscribes to the update event of the file/directory objects on the File Server.

Input/Output parameters:

Parameter	Input/Output	Data type	Field explanation
SubscriptionId	Input	Type_SubscriptionId	The subscription identifier of the object to be unsubscribed.

Return Value: Success: 0

Failure: E1, E3, E4, E5, E6, E7, E8, E9 (see error codes in 8.7.7).

8.7.7 File connection management service error codes definition

Error code No.	Error code name	Value	Field explanation
0	RETURN_SUCCESS	0	Success
E1	RETURN_FAILED	1	Failure
E2	RETURN_INVALIDPARA	2	Invalid parameter
E3	RETURN_ERRORFORMATPARA	3	Parameter format error
E4	RETURN_INVALIDSUBSCRIBEID	4	Invalid subscription identifier
E5	RETURN_NOTALLOWEDTOSUBSCRIBE	5	Subscription not allowed
E6	RETURN_CONNECTIONDISABLED	8	Connection disabled
E7	RETURN_INVALIDCONNECTIONID	9	Invalid connection identifier
E8	RETURN_INVALIDAUTHENTICATIONKEY	11	Invalid Authentication Key
E9	RETURN_RIGHTNOTMATCHED	12	Right not matched
E10	RETURN_INTERFACEINEXISTENCE	14	Interface not exist

9 Back channel message TCP service

9.1 Overview of Back channel message

The Back Channel Message TCP Service is a type of connection management and transport control protocol used for audio/video playback in the IGRS Audio/Video system. It is essentially a command-token control request/response protocol over TCP. It is used to setup an additional control channel beyond out-of-band data transport channel between a media server and a media client.

The Back Channel Message TCP Service includes the BCM Server and a BCM Client. The BCM Client is the initiator of connection management and transport control. The BCM Server receives the command message and status notification message from a BCM Client and executes a series of actions and returns the result to the BCM Client.

A media server and media client shall implement a Back Channel Message TCP Service. The listening TCP port of the BCM Server shall be returned in the GetProtocolInfo() interface of CMS to a BCM Client so that the BCM Client can connect to the BCM Server. With regards to the difference in the transport initiation device and location of IGRS dynamic service invocation module, the BCM Server may reside on either media server or media client (refer to 7.4.1.1 and 7.4.2.1 of ISO/IEC 14543-5-21).

9.2 Interaction flow of back channel message TCP service in audio/video playback application

Figure 6 depicts the interaction flow of the Back Channel Message service in the audio/video playback application.

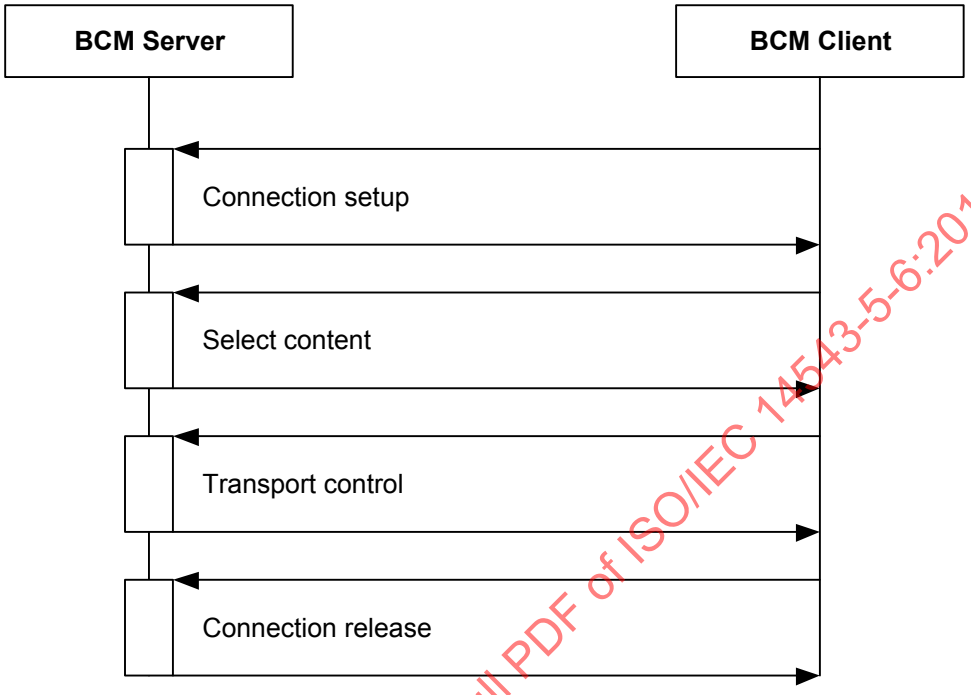

Figure 6 – Interaction flow of back channel message TCP service in audio/video playback application

The audio/video playback flow of BCM, based connection management and transport control mechanism, shall follow similar steps as described in 7.4 of ISO/IEC 14543-5-21, see below.

- Connection setup: A BCM Client sends a SETUP command to the BCM Server to request setup of a BCM channel. The BCM Server shall initialize a BCM channel, allocate a connection identifier and return the connection identifier to the BCM Client.
- Select content: after connection setup, a BCM Client sends a SELECT command to the BCM Server on this conection with the content's URI as the parameter. The BCM Server shall initialize an out-of-band channel to transport the content.
- Transport control: A BCM Client controls the transportation of the content selected in the last step, such as play (PLAY), pause (PAUSE), resume (RESUME), seek (SEEK), stop (STOP), record (RECORD), pause record (PAUSE_RECORD), resume record (RESUME_RECORD), stop record (STOP_RECORD), select subtitle (SUBTITLE) and select audio track (AUDIO_TRACK) etc.
- Connection release: A BCM Client sends a RELEASE command to the BCM Server to request to release the connection. The BCM Server and BCM Client shall stop the content transport if the transport is still active and release the out-of-band channel and BCM channel.

9.3 Interaction flow of back channel message TCP service in an audio/video multicast playback application

The audio/video multicast playback flow of a BCM-based connection management and transport control mechanism shall follow similar steps as described in 7.5 of ISO/IEC 14543-5-21, see below.

- Connection setup: A BCM Client sends a SETUP command to the BCM Server to request setup of a BCM channel. The BCM Server shall initialize a BCM channel, allocate a connection identifier and return the connection identifier to the BCM Client.
- Select content: after connection setup, a BCM Client sends a SELECT command to the BCM Server on this conection with the content's URI in the multicast form as the parameter. The BCM Server shall check the AVMCastGroupName metadata of the content on CIS to determine if there is any active multicast session for the content: if there is no multicast group setup for the content, the media server shall setup a multicast group, initialize an out-of-band channel to transport the content and notify a media client of the multicast address of the content through the inner-group information exchange mechanism; if there is an active multicast session for the content, the media client shall join the group and obtain the multicast address of the content by the inner-group information exchange mechanism.
- Transport control: A BCM Client controls the transportation of the content selected in the last step, such as play (PLAY), pause (PAUSE), resume (RESUME), stop (STOP), record (RECORD), pause record (PAUSE_RECORD), resume record (RESUME_RECORD), stop record (STOP_RECORD), select subtitle (SUBTITLE) and select audio track (AUDIO_TRACK) etc.
- Connection release: A BCM Client sends a RELEASE command to the BCM Server to request to release the connection. The BCM Server and BCM Client shall stop the content transport and release the a BCM channel.

9.4 BCM request message format definition

9.4.1 General

Three types of BCM request messages are defined below.

- Connection management message: this type of message is used between a BCM Client and the BCM Server for connection management.
- Content selection message: this type of message is used between a BCM Client and the BCM Server for content selection.
- Transport control message: this type of message is used between a BCM Client and the BCM Server for out-of-band transport control.

The basic format of BCM request message is shown in Figure 7. All fields in the message are separated by a SPACE character (SP symbol in Figure 7 and its ASCII value is 0x20). The first field is message type, a 1 byte character where "0" represents connection management message, "1" represents content selection message and "2" represents transport control. The second field is the command name. The command name is a string representation of the command name. The field starting from the third is a command parameter. More than one command parameter is allowed and is required to be separated by a SPACE character. The format of each command parameter is in the form of "command_parameter_name =command_parameter_value".

Message Type	SP	Command Name	SP	Parameter 1 =Value 1	SP	…	Parameter N =Value N

Figure 7 – Basic BCM request message format

9.4.2 Connection management message

Two commands are defined: SETUP and RELEASE.

The SETUP command is sent from a BCM Client to the BCM Server with no command parameter to setup the connection. When the BCM Server receives this command, it shall initialize a BCM

channel, allocate a connection identifier for the BCM Client and return the identifier to the BCM Client in the “ConnId” parameter of the response message. The value of “ConnId” is the string representation of the connection identifier.

RELEASE command is sent from a BCM Client to the BCM Server. Only one command parameter “ConnId” is needed to release the connection. The “ConnId” value is the string representation of the connection identifier allocated by BCM Server for BCM Client, e.g. the string representation of connection identifier 52 is “52”.

9.4.3 Content selection message

One command SELECT is defined, representing a content option for out-of-band transport. Multiple command parameters are defined for SELECT command, they are content location identifier:

URI: URI of the content;

and other transcoding related parameters:

BitRate: requested content bit rate;

Width: requested width of the resolution of the video content;

Height: requested height of the resolution of the video content;

BitCount: requested content bit count.

VideoFormat: requested video format of the video content. It could be “PAL” and “NTSC”. The default definition of Width and Height for PAL is 720 by 576 and for NSTC is 720 by 480;

AspectRatio: requested aspect ratio and it could be “PAR_SQUARE” (1:1), “PAR_43” (4:3) and “PAR_169” (16:9).

When the BCM Server receives the SELECT command with only URI parameter, the media server shall serve the original content to media client. When the BCM Server receives the SELECT command with not only URI parameter but also other transcoding-related parameters, the media server shall serve the transcoded content conforming to the specified parameter to the media client.

9.4.4 Transport control message

Eleven commands are defined: PLAY, STOP, PAUSE, RESUME, SEEK, RECORD, PAUSE_RECORD, RESUME_RECORD, STOP_RECORD, SUBTITLE and AUDIO_TRACK.

The PLAY command represents the request to play the selected content. Only one command parameter “PlaySpeed” is allowed: the value “NORMAL” represents normal speed playing, “FASTFORWARD” represents fast forward playing, “SLOWFORWARD” represents slow forward playing, “FASTBACKWARD” represents fast backward playing and “SLOWBACKWARD” represents slow backward playing.

STOP, PAUSE, RESUME command represents the request to stop, pause or resume the playing of the selected content. No command parameter is required for these.

The SEEK command represents the request to seek a specific position in the playing content. Two command parameters “Unit” and “Target” are allowed: “Unit” command parameter represents the target seek method, the value can be “TRACK_NR”, “TAPE_INDEX”, “ABS_COUNT”, “REL_COUNT”, “ABS_TIME”, “REL_TIME”, “FRAME”; “Target” command

parameter represents the seeking target position counted in unit. If no “Target” command parameter is provided, then the current position of the playing content shall be returned in the “CurrPos” parameter of the response message and the “CurrPos” is the string representation of the current position counted in unit.

RECORD, PAUSE_RECORD, RESUME_RECORD, STOP_RECORD represents the request to record, pause record, resume record or stop record the playing content. No command parameter is required for these.

The SUBTITLE command represents the request to select the subtitle for the playing content. Only one command parameter “SelectionId” is allowed. If no “SelectionId” command parameter is provided, the identifier of the currently selected subtitle is returned in the “SelectionId” parameter of the response message; if “SelectionId” command parameter is provided and its value shall denote the specific identifier of the subtitle to be selected, the specified subtitle shall be selected as the current subtitle and the identifier of the previously selected subtitle shall be returned in the “SelectionId” parameter of the response message.

The AUDIO_TRACK command represents the request to select audio track for the playing content. Only one command parameter “SelectionId” is allowd. If no “SelectionId” command parameter is provided, the identifier of the currently selected audio track is returned in the “SelectionId” parameter of the response message. If the “SelectionId” command parameter is provided, it’s the value of this parameter shall denote the specific identifier of the audio track to be selected. The specified audio track shall be selected as the current audio track, and the identifier of the previously selected audio track shall be returned in the “SelectionId” parameter of the response message.

9.5 BCM response message format definition

The BCM response message uses the same format as the BCM request message shown in Figure 7. The BCM response message shall set the message type field the same value as the received BCM request message. Three BCM response commands are defined as follows.

- BCM_OK: if the BCM request message is accepted and the related action is performed properly and no response information is to be returned, it shall return this command without any command parameter.
- BCM _INFO: if the BCM request message is accepted and the related action is performed properly and some response information is to be returned, it shall return this command with one or more command parameters. For instances, in the BCM response message of a SETUP request message, one command parameter “ConnId” with value of allocated connection identifier shall be returned. In the BCM response message of SEEK request message, one command parameter “CurrPos” shall be returned with the value of the current playing position when a “Target” parameter is not provided in the request message; in the BCM response message of a SUBTITLE request message, one command parameter “SelectionId” with the value of the currently selected subtitle (when “SelectionId” parameter is not provided in the request message) or a previously selected subtitle (when “SelectionId” parameter is provided in the request message) shall be returned. In the BCM response message of AUDIO_TRACK request message, one command parameter “SelectionId” with the value of the currently selected audio track (when “SelectionId” parameter is not provided in the request message) or previously selected audio track (when “SelectionId” parameter is provided in the request message) shall be returned.
- BCM_ERROR: if a BCM request message cannot be accepted or a related action is not performed properly, it shall return this command with “ErrCode” as its command parameter to indicate the error type encountered. Table 16 lists all standard errors.

Table 16 – Error definitions

Error code	Error description
“001”	Item object specified by the URI does not exist
“002”	Transcoding format cannot support
“003”	Cannot seek
“004”	Cannot get subtitle
“005”	Cannot set subtitle
“006”	Cannot get audio track
“007”	Cannot set audio track

Annex A
(normative)

Content representation framework of an IGRS AV content directory

A.1 Overview

There are two forms of objects in the IGRS content directory: content and content collection.

- Content represents a single object in the content directory. It can be a plain file in the device filesystem, a multimedia object such as photo, music and video, a live stream from a webcam or a live digital broadcast program from a TV station.
- Content collection represents a collection of multiple content objects in the content directory. It can be a plain folder in a device filesystem, a collection of multimedia objects such as a photo album, music album and TV series. Also it can be a collection of user generated videos recommended by an Internet video portal website according to the user's preference.

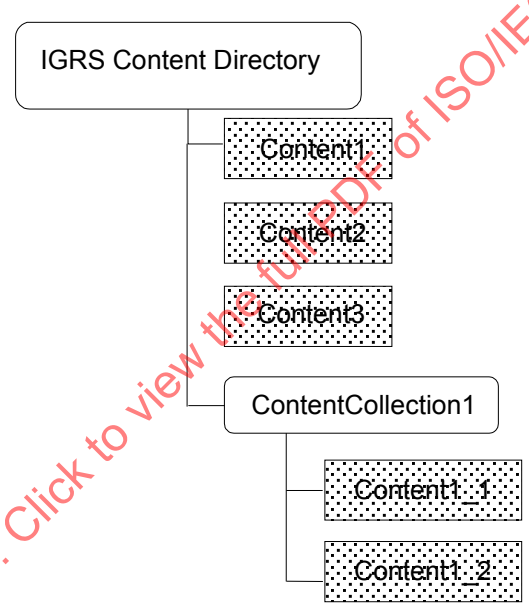

Figure A.1 – An illustrative example of the structure of an IGRS content directory

Similar to the tree hierarchical structure between a file and folder in the device filesystem, the content and content collection managed by the IGRS content index service can also form a tree-like hierarchical structure, as shown in Figure A.1. The Content and content collection can be enclosed by the parent content collection, just as a file and folder can be enclosed by the parent folder in the device filesystem. However, content is not allowed to enclose any other content or content collection. This restriction is the same as a file not allowed to enclose any other file or file folder in the filesystem. Therefore, content shall only be located in the leaf node of the tree in Figure A.1.

Figure A.1 shows an illustrative example of the IGRS content directory: the root node of the content directory named as "IGRSContentDirectory" is a content collection, and there are three content objects "Content1", "Content2", "Content3" and a content collection "ContentCollection1" that contains other two objects "Content1_1" and "Content1_2" within it.

XML is used to represent content and a content collection stored in a content directory in the IGRS content index service. XML is also used to represent the metadata attributes of content

and content collection. Refer to Clause A.2 for the definition of metadata. By using the schema definition language of XML Schema defined by W3C, the IGRS content index service defines the IGRS content representation framework in the XML Schema file "igrs-cis-framework.xsd" (see Clause E.2). In this XML Schema file, XML namespace
http://www.igrs.org/igrs/ContentIndexService
is defined with a namespace prefix of "igrs". All XML elements and attributes related to the IGRS content representation framework and metadata definition shall be defined in this namespace. Any XML string representing an IGRS content directory conforming to this specification shall use this namespace as the default namespace. The IGRS media server, media client and IGRS dynamic service invocation module shall be able to generate and interpret the XML string conforming to the definition of this XML Schema file.

In an XML Schema definition file "igrs-cis-framework.xsd", two kinds of XML elements are defined: item and container, representing content and content collection respectively. When representing the enclosure relationship between content and content collection in the content directory, it is recommended that the IGRS content index service use the flattened form of item and container in the generated content representation an XML string so that fewer resources would be required when interpreting the XML string. This means that

- an XML element should not be enclosed in a container XML element,
- a container XML element should not be enclosed in the parent container XML element,
- an item XML element shall not enclose any other item XML element and container XML element.

In order to represent the logical enclosure relationship between content and a content collection in the content directory, ObjectId and ParentId metadata attribute are defined in Clause A.2 to maintain the enclosure relationship between content and content collection in the content directory, refer to A.2.2.2 and A.2.3.2 for more details. The illustrative IGRS content directory example in Figure A.1 can be represented as the XML string in Annex K using the item and container content representation framework.

A.2 IGRS metadata specification

A.2.1 IGRS metadata definition

The IGRS content index service defines metadata to describe the attribute of content and content collection in the content directory. In general, metadata in IGRS can be categorised in two classes:

- Metadata to describe the attribute of content and a content collection, such as encoding format and access method of a multimedia object, number and type of content objects enclosed in a content collection;
- Metadata to describe the relationship between content and a content collection, such as some content (e.g. a photo) is contained in some other content collection (e.g. a photo album) or some content collection is enclosed in the parent content collection.

Similar to the definition of a content directory representation framework, the IGRS content index service uses an XML Schema to specify the definition of metadata. The corresponding XML Schema files are "igrs-cis-metadata-base.xsd" (see Clause E.3), "igrs-cis-metadata-item.xsd" (see Clause E.5) and "igrs-cis-metadata-container.xsd" (see Clause E.4) respectively. Similarly, all three XML Schema definition files use "http://www.igrs.org/igrs/ContentIndexService" as the XML namespace, whose namespace prefix is "igrs". This namespace shall be the default namespace for the content representation XML string. The IGRS media server, media client and IGRS dynamic service invocation module shall be able to generate and interpret the XML string conforming to the definition of three XML Schema files.

The ItemProperty XML sub-element of the item XML element describes metadata of content. The ContainerProperty XML sub-element of container XML element describes metadata of the content collection. Based on the differences between specific content and content collection, an item and container can be further classified into various specific types, each with a related

metadata. A.2.2 describes metadata of an item object in detail, while A.2.3 describes metadata of a container object in detail.

Based on the description of the IGRS metadata system in this specification, the IGRS content index service also allows third party vendors to define their own metadata or simply to refer to metadata defined in other standards. Specific interfaces have been defined for such extension, see A.2.4 for details. At the same time, considering the requirement of standard extension in a later version, this specification also defines related interfaces for the next version, see A.2.5 for details.

A.2.2 Metadata of item object

A.2.2.1 General

Item object contains two kinds of metadata.

- Basic metadata: this kind of metadata shall apply to all item objects, see A.2.2.2.
- Metadata related to a specific item object: this specification defines nine types of specific item objects; they are Audio, Video, LiveVideo, EPG, Photo, Doc, Camera, Screen and Bookmark respectively; see A.2.2.3.

A.2.2.2 Basic metadata of item object

The Basic metadata of an item object can be classified into several categories, as stated below.

– Metadata to represent the enclosing relationship between content and a content collection in the content directory: ObjectId and ParentId. ObjectId describes the identifier of item object, ParentId describes the identifier of its parent container object, see B.1.2 and B.1.3 for details. ObjectId and ParentId gives a logical representation of the enclosing relationship between content and content collection.

– Metadata to represent the content storage device attribute: DeviceId and DeviceName, see B.1.4 and B.1.5 for details.

– Metadata of general content related attributes:

  - ObjectType describes the content type; see B.1.6 for details;
  - ObjectName describes the content name; see B.1.7 for details;
  - ObjectExtension describes the content extension; see B.1.8 for details;
  - MediaFormat describes the content format; see B.1.9 for details;
  - ObjectURI describes the content access method in content index service; see B.1.10 for details;
  - ObjectPath describes the content path in the content directory; see B.1.11 for details;
  - ParentPath describes the content parent path in the content directory; see B.1.12 for details;
  - Size describes the content storage size; see B.1.13 for details;
  - ObjectStoreAttribute describes the content storage medium information; see B.1.14 for details;
  - CreateTime describes the creation time of the item object in IGRS content index service; see B.1.15 for details;
  - LastAccessTime describes the last access time of the item object in IGRS content index service; see B.1.16 for details;
  - LastWriteTime describes the last write time of the item object in IGRS content index service; see B.1.17 for details;
  - HashId describes the hash value of the content; see B.1.18 for details;

- Tspec describes the quality of service requirement when transferring the content; see B.1.19 for details;
- Rank describes the priority order of the content used in personalisation and recommendation mode; see B.1.20 for details;
- AVMCastGroupName describes the name of the audio/video multicast group setup for multicasting; see B.1.21 for details.

– Interface for vendor defined metadata: VendorMeta, vendor can use this XML Schema struct to use self-defined or third party metadata; see A.2.4 for details.

– Extension point for the extension of metadata in the next version of this standard: extension point defined for the item object in the next version of this standard; see A.2.5.2 for details.

A.2.2.3 Metadata of specific item object

A.2.2.3.1 General

Besides the basic metadata defined in A.2.2.2, this clause defines the metadata of a specific item object, i.e. Audio, Video, LiveVideo, EPG, Photo, Doc, Camera, Screen and Bookmark.

A.2.2.3.2 Metadata of audio item object

The Audio item object represents the audio content in the content directory, such as music, recording of a conference, etc.

Besides the basic metadata of the item object, the audio item object also defines the following metadata.

- Duration describes playing duration of the music; see B.2.2.2 for details.
- AudioSamplesPerSec describes the sampling rate of the music; see B.2.2.3 for details.
- ObjectTitle describes the music title; see B.2.2.4 for details.
- Singer describes the performing artist of the music; see B.2.2.5 for details.
- Genre describes the music genre; see B.2.2.6 for details.
- MusicDisc describes the album name of the music; see B.2.2.7 for details.
- Author describes the music author; see B.2.2.8 for details.
- Summary describes the highlight summary of the music; see B.2.2.9 for details.
- Description describes other information of the music such as background of the singer, publication date of the album or the number of the selling copies etc.; see B.2.2.10 for details.

A.2.2.3.3 Metadata of video item object

The Video item object represents video content in the content directory such as a movie, PVR recorded TV series, personal video clips created by the user, etc.

Besides the basic metadata of an item object, the video item object also defines the following metadata.

- Duration describes the playing duration of the video; see B.2.3.2 for details.
- FrameRate describes the video frame rate; see B.2.3.3 for details.
- AudioSamplesPerSec describes the sampling rate of the audio contained in the video; see B.2.3.4 for details.
- Width describes the width of the resolution of the video; see B.2.3.5 for details.
- Height describes the height of the resolution of the video; see B.2.3.6 for details.
- Genre describes the video genre; see B.2.3.7 for details.

- Author describes the video author; see B.2.3.8 for details.
- Roles describes the artist roles in the video such as actor, actress, director, producer, writer, etc.; see B.2.3.9 for details.
- Summary describes the highlight summary of the video; see B.2.3.10 for details.
- ToC describes the table of content structure of the video; see B.2.3.11 for details.
- Subtitles describes the subtitles supported by the video; see B.2.3.12 for details.
- AudioTracks describes the mutiple audio tracks supported by the video; see B.2.3.13 for details.
- Description describes the other information of the video such as the production date of the movie, box office information etc.; it can also be a user-added annotation about the personal video clip; see B.2.3.14 for details.

A.2.2.3.4 Metadata of LiveVideo item object

The LiveVideo item object represents a broadcast or other live video broadcast program such as a TV broadcast program or Internet livecast video program, which can be imported to the content directory and presented to the user by the IGRS media server.

Besides the basic metadata of item object, LiveVideo item object also defines the following metadata.

- Channel describes the channel information of the broadcast or livecast program; see B.2.4.2 for details.
- FrameRate describes the video frame rate of the broadcast or livecast program; see B.2.4.3 for details.
- AduioSamplesPerSec describes the sampling rate of the audio contained in the broadcast or livecast program; see 0 for details.
- Width describes the width of the resolution of the broadcast or livecast program; see B.2.4.5 for details.
- Height describes the height of the resolution of the broadcast or livecast program; see B.2.4.6 for details.
- Subtitles describes the subtitles supported by the broadcast or livecast program; see B.2.4.7 for details.
- AudioTracks describes the multiple audio tracks supported by the broadcast or livecast program; see B.2.4.8 for details.
- Description describes the other information of the broadcast or livecast program; see B.2.4.9 for details.

A.2.2.3.5 Metadata of EPG item object

The EPG item object represents the broadcast or livecast electronic program guide or Internet video program guide in the content directory, which is exposed by the IGRS media server to the user. Besides the basic metadata of the item object, the EPG item object also defines the following metadata.

- Channel describes the channel information of the broadcast or livecast program; see B.2.5.2 for details.
- EPGProvider describes the information of the EPG provider; see B.2.5.3 for details.
- StartTime describes the starting time of the broadcast or livecast program; see B.2.5.4 for details.
- EndTime describes the ending time of the broadcast or livecast program; see B.2.5.5 for details.
- Duration describes the duration of the broadcast or livecast program; see B.2.5.6 for details.

- Description describes the other information of the broadcast or livecast program; see B.2.5.7 for details.

This standard does not pose any restrictions on the specific EPG format used in a broadcast or livecast program. The original content of the EPG can be exported to the VendorMeta metadata of the content (see A.2.4).

A.2.2.3.6 Metadata of photo item object

The Photo item object represents the photo content in the content directory, which can be photos exported from the user's digital camera or photos with location information taken by a smartphone equipped with GPS and transferred via the Bluetooth protocol (IEEE 802.15.1).

Besides the basic metadata of the item object, the Photo item object also defines the following metadata.

- Width describes the width of the resolution of the photo; see B.2.6.2 for details.
- Height describes the height of the resolution of the photo; see B.2.6.3 for details.
- Detail describes the content related information of the photo, including time, location, task, activity and scene; see B.2.6.4 for details.
- Description describes the other information of the photo, which can be user-added annotation about the background of the photo; see B.2.6.5 for details.

A.2.2.3.7 Metadata of doc item object

The Doc item object represents the plain document in the content directory, such as a word processor document or a presentation slide stored in the media server. The document item is then decoded on the media server to generate a picture and subsequently sent to the media client device for rendering.

Besides the basic metadata of the item object, the Doc item object also defines the following metadata.

- Width describes the width of the resolution of the picture generated by the media server when decoding the document; see B.2.7.2 for details.
- Height describes the height of the resolution of the picture generated by the media server when decoding the document; see B.2.7.3 for details.
- Description describes the other information of the picture generated by the media server when decoding the document, which can be the annotation on each slide of the presentation document or annotation of each page of the work processor document; see B.2.7.4 for details.

A.2.2.3.8 Metadata of camera item object

The Camera item object represents the camera in the network. The associated real time video stream can be transferred to a rendering device or storage device.

Besides the basic metadata of an item object, thet Camera item object also defines the following metadata.

- CameraName describes the name of the camera in the network; see B.2.8.2 for details.
- FrameRate describes the frame rate of the video stream used by the camera; see B.2.8.3 for details.
- AudioSamplesPerSec describes the sampling rate of the audio from the built-in microphone of the camera; see B.2.8.4 for details.
- Width describes the width of the resolution of the video stream used by the camera; see B.2.8.5 for details.

- Height describes the height of the resolution of the video stream used by the camera; see B.2.8.6 for details.
- Description describes the information of the camera, such as verdor's model number; see B.2.8.7 for details.

A.2.2.3.9 Metadata of screen item object

The Screen item object represents the projector in the network, which can send a projected picture to a rendering device in real-time.

Besides the basic metadata of item object, the Screen item object also defines the following metadata.

- BitCount describes the bit count of the projected picture from the projector; see B.2.9.2 for details.
- Wtype describes the projection type of the projector; see B.2.9.3 for details.
- FrameRate describes the frame rate of the projector; see B.2.9.4 for details.
- Width describes the width of the resolution of the projector; see B.2.9.5 for details.
- Height describes the height of the resolution of the projector; see B.2.9.6 for details.
- Description describes the other information of the projected picture from the projector; see B.2.9.7 for details.

A.2.2.3.10 Metadata of bookmark item object

The Bookmark item object represents the bookmark record of video content. The IGRS AV application supports bookmarking the position of the video being played and allows the same content to resume from the stopped position from the last playback in a new playback session.

Besides the basic metadata of item object, the Bookmark item object also defines the following metadata.

- RefObjectId describes the identifier of the bookmarked video content; see B.2.10.2 for details.
- Bookmark describes the bookmark information; see B.2.10.3 for details.
- Description describes the other information of the bookmark; see B.2.10.4 for details.

A.2.3 Metadata of container object

A.2.3.1 General

The Container object has two kinds of metadata.

- Basic metadata: this kind of metadata shall apply to all container objects (see A.2.3.2).
- Metadata related with specific container objects: this specification defines ten types of specific container objects. They are FileFolder, AudioAlbum, VideoAlbum, LiveVideoContainer, EPGContainer, PhotoAlbum, ToCContainer, SummaryContainer, BookmarkContainer and PersonalizedContainer respectively (see A.2.3.3).

A.2.3.2 Basic metadata of container objects

The Basic metadata of container objects can be classified into several categories, see below.

- Metadata to represent the enclosing relationship between content collections in the content directory: ObjectId and ParentId. ObjectId describes the identifier of container object. ParentId describes the identifier of its parent container object (see B.3.2 and B.3.3 for details). ObjectId and ParentId give a logical representation of the enclosing relationship between content collections.

- Metadata to represent the content storage device's attribute: DeviceId and DeviceName (see B.3.4 and B.3.5 for details).
- Metadata of general content collection related attribute are the following.
  - ObjectType describes the content collection type; see B.3.6 for details.
  - ObjectName describes the content collection name; see B.3.7 for details.
  - ObjectPath describes the path of the content collection in the content directory; see B.3.8 for details.
  - ParentPath describes the parent path of the content collection in the content directory; see B.3.9 for details.
  - ObjectStoreAttribute describes storage medium information of the content collection; see B.3.10 for details.
  - CreateTime describes the creation time of the container object in IGRS content index service; see B.3.11 for details.
  - LastAccessTime describes the last access time of the container object in IGRS content index service; see B.3.12 for details.
  - LastWriteTime describes the last write time of the container object in IGRS content index service; see B.3.13 for details.
- Interface for vendor defined metadata: VendorMeta, vendor can use this XML Schema struct to use self-defined or third party metadata; see A.2.4 for details.
- Extension point for the extension of metadata in the next version of this standard: extension point defined for the container object in the next version of this standard; see A.2.5.3 for details.

A.2.3.3 Metadata of specific container object

A.2.3.3.1 General

Besides the basic metadata defined in A.2.3.2, this clause defines the metadata of a specific container object, i.e. FileFolder, AudioAlbum, VideoAlbum, LiveVideoContainer, EPGContainer, PhotoAlbum, ToCContainer, SummaryContainer, BookmarkContainer and PersonalizedContainer.

A.2.3.3.2 Metadata of FileFolder container object

The FileFolder container object represents the content collection of plain file folder in the content directory.

Besides the basic metadata of container object, the FileFolder container object also defines the following metadata:

- Description describes the other information of the file folder; see B.4.2.2 for details.

A.2.3.3.3 Metadata of AudioAlbum container object

The AudioAlbum container object represents the content collection of one or more audio files in the content directory.

Besides the basic metadata of container object, the AudioAlbum container object also defines the following metadata.

- Singer describes the performing artist of the audio album; see B.4.3.2 for details;
- Genre describes the audio album genre; see B.4.3.3 for details;
- MusicDisc describes the album name; see B.4.3.4 for details;
- Author describes the author of the audio album; see B.4.3.5 for details;

- Description describes other information of the audio album, such as background of the singer, publication date of the album or the number of the selling copies, etc.; see B.4.3.6 for details.

A.2.3.3.4 Metadata of VideoAlbum container object

The VideoAlbum container object represents the content collection of one or more video files in the content directory.

Besides the basic metadata of container object, the VideoAlbum container object also defines the following metadata.

- ToC describes the table of content highlight structure of the video album; see B.4.4.2 for details.
- Description describes the other information of the video album; see B.4.4.3 for details.

A.2.3.3.5 Metadata of LiveVideoContainer container object

The LiveVideoContainer container object represents the content collection of one or more LiveVideo content in the content directory. Generally, all LiveVideo content within one LiveVideoContainer object should be the broadcast or livecast programs from one service provider.

Besides the basic metadata of container object, the LiveVideoContainer container object also defines the following metadata.

- Provider describes the service provider information of the contained broadcast or livecast programs; see B.4.5.2 for details.
- Description describes the other information of the contained broadcast or livecast programs; see B.4.5.3 for details.

A.2.3.3.6 Metadata of EPGContainer container object

The EPGContainer container object represents the content collection of one or more EPG content in the content directory.

Besides the basic metadata of container object, the EPGContainer container object also defines the following metadata.

- EPGProvider describes the information of EPG provider; see B.4.6.2 for details.
- Description describes the other information of the EPG content collection; see B.4.6.3 for details.

A.2.3.3.7 Metadata of PhotoAlbum container object

The PhotoAlbum container object represents the content collection of one or more photo files in the content directory.

Besides the basic metadata of container object, the PhotoAlbum container object also defines the following metadata.

- Summary describes the collaged photo information of highlights of all photos in the photo album; see B.4.7.2 for details.
- Description describes the other information of the photo album; see B.4.7.3 for details.

A.2.3.3.8 Metadata of ToCContainer container object

The ToCContainer container object represents the content collection of table of contents (which is represented by a Video item object or Photo item object) of one or more video contents).

The ToCContainer may not be required to be rendered on the user interface of the user interface. The IGRS dynamic service invocation module shall determine whether to render this kind of container object based on the requirement of the application.

It is recommended that the table of contents (which is represented by a Video item object or Photo item object) of all video content should be contained in one ToCContainer so that the IGRS dynamic service invocation module can retrieve all table of content structures of the present content directory in a convenient way.

The ToCContainer container object does not define other metadata.

A.2.3.3.9 Metadata of SummaryContainer container object

The SummaryContainer container object represents the content collection of the highlighted summary of one or multiple video contents or the content collection of collaged photos of the highlighted summary of all photos contained in a PhotoAlbum.

The SummaryContainer may not be required to be rendered on the user interface of the device. The IGRS dynamic service invocation module shall determine whether to render this kind of container object based on the requirement of the application.

It is recommended that the highlighted summary (which is represented by a Video item object) of video content or collaged photo (which is represented by a Photo item object) of all photo albums should be contained in one SummaryContainer so that the IGRS dynamic service invocation module can retrieve all highlighted summaries or collaged photos of the present content directory in a convenient way.

The SummaryContainer container object does not define other metadata.

A.2.3.3.10 Metadata of BookmarkContainer container objects

The BookmarkContainer container object represents the content collection of one or more Bookmark item objects in the content directory.

The BookmarkContainer may not be required to be rendered on the user interface of the device. The IGRS dynamic service invocation module shall determine whether to render this kind of container object based on the requirement of the application.

It is recommended that all Bookmark item objects in the content directory should be contained in one BookmarkContainer so that the IGRS dynamic service invocation module can retrieve all the video bookmarks of the present content directory in a convenient way.

The BookmarkContainer container object does not define other metadata.

A.2.3.3.11 Metadata of PersonalizedContainer container objects

The PersonalizedContainer container object represents the content collection of one or more recommended personalised contents, based on the user's preference. User preference can be obtained explicitly from the user's input or can be derived implicitly from the user's behavior of the content viewing history by means of an intelligent algorithm.

The IGRS dynamic service invocation module shall determine how to render this kind of container object and the contained content based on the requirement of the application. For instance, if such a container contains Video item objects, the user interface can render it as "Most favorite videos recommended". If such a container contains EPG item objects and the genre of the broadcast or a livecast program is "Comedy", the user interface can render it as "Most favorite comedy tonight". If such a container contains LiveVideo item objects and the

livecast programs are from the Internet, the user interface can render it as “Most popular Internet video livecast”, etc.

Content in the content directory shall be analysed and categorised into different PersonalizedContainer types of content collection. When the PersonalizedContainer type of content collection is generated by the content directory, all content within it shall be of the same item object type.

Besides the basic metadata of container object, the PersonalizedContainer container object also defines the following metadata.

- ContentType describes the item object type of the personalised content; see B.4.11.2 for details.
- UserInfo describes the user information related with the personalised content; see B.4.11.3 for details.
- Genre describes the genre of the personalised content collection; see B.4.11.4 for details.
- Description describes the other information of the personalised content collection; see B.4.11.5 for details.

A.2.4 Interface for vendor defined metadata

Besides the basic metadata and metadata for a specific type of object defined for the item and container object in A.2.2 and A.2.3, this specification encourages a vendor to use self-defined or third party metadata to realise enhanced metadata application and therefore defines the interface for the vendor’s metadata.

In addition to the VendorMeta defined in one basic metadata for both item and container, the vendor can also use any XML element from the XML namespace other than “igrs” as its sub-element. Type of VendorMeta is defined as a VendorMetaType and its XML Schema definition is as follows:

```
<xs:complexType name="VendorMetaType">
    <xs:sequence>
        <!-- allow metadata from any other namespace to be used here -->
        <xs:any namespace="##other" minOccurs="0" maxOccurs="unbounded" />
    </xs:sequence>
    <xs:attribute name="VendorId" type="xs:string" />
    <xs:attribute name="MetaId" type="xs:string" />
</xs:complexType>
```

VendorMetaType has two attributes, where

- VendorId attribute describes the identifier of the vendor, its value can be the vendor’s domain name on the Internet, such as “igrs.org”,
- MetaId attribute describes the identifer of the used metadata, which can be a URI, such as “urn:igrs-org:metadata:annotation”.

A.2.5 Extension point for the next version’s metadata definition

A.2.5.1 General

With regard to the requirement for extension of a metadata definition in the next version of this standard and to accommodate advanced audio/video applications, this standard defines the extension point for the metadata. The extension point for the metadata of the item object is defined in A.2.5.2 and the extension point for the metadata of container object is defined in A.2.5.3.

A.2.5.2 Extension point for the metadata of item object

In addition to the two XML Schemata any element defined in ItemProperty of the item object, the next version of this specification can also use any XML element from local XML namespace or XML namespace other than “igrs” within ItemProperty. The extension point is defined as:

```
<xs:any namespace="##other" processContents="lax" />
<xs:any namespace="##local" processContents="lax" />
```

A.2.5.3 Extension point for the metadata of container objects

In addition to the two XML Schema elements defined in the ContainerProperty of the container object, the next version of this specification can also use any XML element from the local XML namespace or XML namespace other than “igrs” within ContainerProperty. The extension point is defined as:

```
<xs:any namespace="##other" processContents="lax" />
<xs:any namespace="##local" processContents="lax" />
```

Annex B
(normative)

Specific description of metadata definitions

B.1 Basic metadata of item objects

B.1.1 General

This clause provides the definition and usage description of the basic metadata of item objects.

B.1.2 ObjectId

ObjectId is mandatory, string type, and describes the identifier of the item object. The ABNF definition is

<ItemObjectIdType>::=“urn:IGRS:Item:”<IGRSItemObjectIdVal><IGRSItemObjectIdVal>::=8<URNChars>“-”4<URNChars>“-”4<URNChars>“-”4<URNChars>“-”12<URNChars>
<URNChars>::=<trans>
<trans>::=<upper> | <lower> | <number>
<upper>::=“A” | “B” | “C” | “D” | “E” | “F”
<lower>::=“a” | “b” | “c” | “d” | “e” | “f”
<number>::=“0” | “1” | “2” | “3” | “4” | “5” | “6” | “7” | “8” | “9”

A well-formed ObjectId example of an item object is

urn:IGRS:Item:540A64F4-431D-4FB1-A79D-1C9FBDAE3DD0.

B.1.3 ParentId

ParentId is mandatory, string type, and describes the identifier of the parent container object of the item object. The ABNF definition is

<ContainerObjectIdType>::=“urn:IGRS:Container:”<IGRSContainerObjectIdVal>
<IGRSContainerObjectIdVal>::=8<URNChars>“-”4<URNChars>“-”4<URNChars>“-”4<URNChars>“-”12<URNChars>
<URNChars>::=<trans>
<trans>::=<upper> | <lower> | <number>
<upper>::=“A” | “B” | “C” | “D” | “E” | “F”
<lower>::=“a” | “b” | “c” | “d” | “e” | “f”
<number>::=“0” | “1” | “2” | “3” | “4” | “5” | “6” | “7” | “8” | “9”

A well-formed ObjectId example of an container object is

urn:IGRS:Container:D532285C-AE5C-CCAC-7444-752F68B06C6C.

B.1.4 DeviceId

DeviceId is optional, string type, and describes the identifier of the device where the content represented by the present item object is located. The ABNF definition is

<DeviceIdType>::=“urn:IGRS:Device:DeviceId:”8<URNChars>“-”4<URNChars>“-”4<URNChars>“-”4<URNChars>“-”12<URNChars>
<URNChars>::=<trans>
<trans>::=<upper> | <lower> | <number>
<upper>::=“A” | “B” | “C” | “D” | “E” | “F”
<lower>::=“a” | “b” | “c” | “d” | “e” | “f”
<number>::=“0” | “1” | “2” | “3” | “4” | “5” | “6” | “7” | “8” | “9”

A well-formed device identifier example is

urn:IGRS:Device:DeviceId:D532285C-AE5C-CCAC-7444-752F68B06C6C.

B.1.5 DeviceName

DeviceName is optional, string type, and describes the name of the device where the content represented by the present item object is located.

B.1.6 ObjectType

ObjectType is mandatory, string type, and the values allowed for this metadata is “Audio”, “Video”, “LiveVideo”, “EPG”, “Photo”, “Doc”, “Camera”, “Screen” and “Bookmark”, which corresponds to audio, video, broadcast or livecast program, electronic program guide, photo, document, camera, projector and bookmark respectively.

B.1.7 ObjectName

ObjectName is mandatory, string type, and describes the name of the content represetend by the present item object.

B.1.8 ObjectExtension

ObjectExtension is optional, string type, and describes the extension name of the content represented by the present item object. The values allowed for this metadata shall conform to the MIME type of the multimedia object defined by IANA (see Reference: http://www.iana.org/assignments/media-types/) (refer also to IETF RFC 2046).

B.1.9 MediaFormat

MediaFormat is mandatory, XML Schema struct type of Type_MediaFormat, and describes the media format of the content represented by the present item object. The XML Schema definition is

```
<xs:complexType name="Type_MediaFormat">
    <xs:choice>
        <xs:group ref="MediaFormatGroup" minOccurs="0" maxOccurs="unbounded" />
    </xs:choice>
    <xs:attribute name="Name" type="xs:string" />
    <xs:attribute name="Type" type="xs:string" />
</xs:complexType>

<xs:group id="MediaFormatGroup">
    <xs:choice>
        <xs:element name="ContainerFormat" type="xs:string" />
        <xs:element name="AudioFormat" type="xs:string" />
        <xs:element name="VideoFormat" type="xs:string" />
        <xs:element name="PhotoFormat" type="xs:string" />
    </xs:choice>
</xs:group>
```

where

1) ContainerFormat is string type, which describes the container format of the multimedia content, its allowed values are “3GP”, “3G2”, “AIFF”, “ASF”, “AU”, “AVI”, “DMF”, “EVO”, “F4V”, “FLV”, “M2TS”, “MKA”, “MKS”, “MKV”, “MOV”, “MP4”, “MPEG”, “MPEG_PS”, “MPEG_TS”, “OGG”, “RIFF”, “RM”, “RMVB”, “VOB”, “WAV”, “UNKNOWN”;

2) AudioFormat is string type, which describes the audio encoding format of the multimedia content, its allowed values are “AUDIO_AAC”, “AUDIO_AC3”, “AUDIO_ALS”, “AUDIO_DTS”, “AUDIO_FLAC”, “AUDIO_HEAAC”, “AUDIO_HEAACv2”, “AUDIO_LPCM”,

"AUDIO_MP1", "AUDIO_MP2", "AUDIO_MP3", "AUDIO_REALAUDIO", "AUDIO_VORBIS", "AUDIO_WMA", "AUDIO_UNKNOWN";

3) VideoFormat is string type, which describes the video encoding format of the multimedia content, its allowed values are "VIDEO_MPEG1", "VIDEO_MPEG2", "VIDEO_MPEG4", "VIDEO_MPEG4AVC", "VIDEO_REALVIDEO", "VIDEO_WMV""VIDEO_UNKNOWN";

4) PhotoFormat is string type, which describes the photo encoding format of the multimedia content, its allowed values are "PHOTO_BMP", "PHOTO_GIF", "PHOTO_JPEG", "PHOTO_PNG", "PHOTO_TIFF", "PHOTO_UNKNOWN";

5) Name attribute is string type:

a. For the multimedia content of the audio type, the allowed values expressed in regular expression are: "AUDIO_(AAC|AC3|ALS|DTS|FLAC|HEAAC|HEAACv2|LPCM|MP1|MP2|MP3|REAL AUDIO|VORBIS|WMA|UNKNOWN)";

b. For the multimedia content of the video type, the allowed values expressed in regular expression are: "VIDEO_(AAC|AC3|ALS|DTS|FLAC|HEAAC|HEAACv2|LPCM|MP1|MP2|MP3|REAL AUDIO|VORBIS|WMA|UNKNOWN)_(MPEG1|MPEG2|MPEG4|MPEG4AVC|REALVI DEO|WMV|UNKNOWN)";

c. For the multimedia content of the photo type, the allowed value expressed in regular expression is "PHOTO_(BMP|GIF|JPEG|PNG|TIFF|UNKNOWN)".

6) Type attribute is string type and its allowed values are "Audio", "Video", "Photo" to represent the type of the multimedia content.

B.1.10 ObjectURI

ObjectURI is mandatory, string type, and describes out-of-band transport access method of the content represented by the present item object in the IGRS content index service.

For HTTP based out-of-band transport, the format of ObjectURI is defined as:

ObjectURI=http://ServerIP:ServerPort/ItemId

where

1) "http" represents media server supports HTTP based out-of-band transport;
2) ServerIP and ServerPort describe the IP address and port of the out-of-band HTTP server on the media server;
3) ItemId describes the identifier of the item object in the UUID format.

For RTSP/RTP based out-of-band transport, format of ObjectURI is defined as:

ObjectURI=(rtsp|rtspu|rtspmu)://ServerIP:ServerPort/ItemId

where

1) "rtsp" represents media server supports RTP over TCP based out-of-band transport, "rtspu" represents media server supports RTP over UDP based out-of-band transport and "rtspmu" represents media server supports RTP over UDP multicast based out-of-band transport;
2) ServerIP and ServerPort describe the IP address and port of the out-of-band RTSP server on the media server;
3) ItemId describes the identifier of the item object in the UUID format.

B.1.11 ObjectPath

ObjectPath is optional, string type, and describes the path of the content represented by the present item object in the IGRS content directory.

B.1.12 ParentPath

ParentPath is optional, string type, and describes the parent path of the content represented by the present item object in the IGRS content directory.

B.1.13 Size

Size is optional, string type, and describes the storage size of the content represented by the present item object in the IGRS content index service.

B.1.14 ObjectStoreAttribute

ObjectStoreAttribute is optional, XML Schema struct type of ObjectStoreAttributeType, and describes the storage related information of the content represented by the present item object. The XML Schema definition is

```
<xs:complexType name="ObjectStoreAttributeType">
    <xs:sequence>
        <xs:element name="ReadOnly" type="xs:boolean" minOccurs="0" />
        <xs:element name="Hide" type="xs:boolean" minOccurs="0" />
        <xs:element name="Medium" type="xs:string" minOccurs="0" />
            </xs:sequence>
</xs:complexType>
```

where

- ReadOnly: boolean type, and allowed values are “true” or “false”, which states whether the item object is read-only;
- Hide: boolean type, and allowed values are “true” or “false”, which states whether the item object is hidden;
- Medium: string type, and allowed values are "BD", "CD-DA", "CD-R", "CD-ROM", "CD-RW", "CF", "DV", "DVD+R", "DVD+RW", "DVD-AUDIO", "DVD-R", "DVD-RAM", "DVD-RW", "DVD-ROM", "HDD", "MD", "MMC", "MS", "NETWORK", "NONE", "NOT_IMPLEMENTED", "SD", "VHS", "VIDEO-CD" and "UNKNOWN", which gives the storage medium of the item object.

B.1.15 CreateTime

CreateTIme is optional, datetime type, and describes the creation time of the present item object in the IGRS content directory.

B.1.16 LastAccessTime

LastAccessTime is optional, datetime type, and describes the last access time of the present item object in the IGRS content directory.

B.1.17 LastWriteTime

LastWriteTime is optional, datetime type, and describes the last write time of the present time object in the IGRS content directory.

B.1.18 HashId

HashID is optional, XML Schema struct type of HashIdType, and describes the hash value of the content represented by the present item object. The XML Schema definition is

```
<xs:complexType name="HashIdType">
    <xs:sequence>
        <xs:element name="Type">
            <xs:simpleType>
                <xs:restriction base="xs:string">
                    <xs:enumeration value="TITLE" />
                    <xs:enumeration value="CONTENT" />
                </xs:restriction>
            </xs:simpleType>
        <xs:element>
```

```
            <xs:element name="Algorithm">
                <xs:simpleType>
                    <xs:restriction base="xs:string">
                        <xs:enumeration value="SCMCMAC" />
                        <xs:enumeration value="SHA-1" />
                        <xs:enumeration value="SHA-256" />
                        <xs:enumeration value="FINGERPRINT" />
                    </xs:restriction>
            </xs:simpleType>
            </xs:element>
            <xs:element name="Value" type="xs:string" />
        </xs:sequence>
    </xs:complexType>
```

where

- Type: string type; it gives the hash value is computed on the title or the content itself;
- Algorithm: string type; it gives the type of hash algorithm;, allowed values are “SCMCMAC”, “SHA-1”, “SHA-256” and “FINGERPRINT”, where the first three use traditional cryptographical hash algorithm, while the fourth uses multimedia content’s intrinsic robustness features (e.g. energy of the specific spectrum of the audio) to compute the hash value;
- Value: string type; gives the hash value.

A well-formed XML string example of this struct is

```
<HashId>
    <Type>CONTENT</Type>
    <Algorithm>SHA-256</Algorithm>
    <Value>6a09e667bb67ae853c6ef372a54ff53a510e527f9b05688c1f83d9ab5be0cd19</Value
>
</HashId>
```

The IGRS dynamic service invocation module can distribute the content to different storage servers in the home network based on the various hash values to achieve load balancing. It can also use the hash value to retrieve the content distributed on different storage servers in the home network in an efficient way.

B.1.19 Tspec

Tspec is optional, XML Schema struct type of TspecType, and describes the QoS requirement of the out-of-band transport of the content represented by the present item object. The XML Schema definition is

```
<xs:complexType name="TspecType">
    <xs:sequence>
        <xs:element name="TspecEntry" minOccurs="1" maxOccurs="unbounded">
            <xs:complexType>
                <xs:sequence>
                    <xs:element name="Name" type="xs:string" minOccurs="1" />
                    <xs:element name="Value" type="xs:string" minOccurs="1" />
                </xs:sequence>
            </xs:complexType>
        <xs:element>
    </xs:sequence>
</xs:complexType>
```

This XML Schema struct consists of multiple TspecEntry structs and each TspecEntry contains a Name and Value pair, where Name is the parameter name of TSPEC such as DataRate, PeakDataRate, MaxPacketSize and Value is the parameter’s value.

B.1.20 Rank

Rank is mandatory for the item object within PersonalizedContainer container object and optional for the item object within other container object type, string type, and describes the playback priority of the content in a personalised content collection.

B.1.21 AVMCastGroupName

AVMCastGroupName is optional, string type, and describes an audio/video multicast group name setup for multicasting.

B.2 Metadata of a specific item object

B.2.1 General

This clause provides the definition and usage description of the metadata of a specific item object.

B.2.2 Metadata of the Audio item object

B.2.2.1 General

This subclause provides the definition and usage description of the metadata of Audio item object.

B.2.2.2 Duration

Duration is mandatory for the Audio item object and optional for other item objects, string type, and describes the playback duration of the music. The string shall have the form of the regular expression “H+:MM:SS[.F+]”, where “H+” is one or more digits to represent the number of hours, “MM” are two digits in the range between “00” and “59” to represent minutes, “SS” are two digits in the range between “00” and “59” to represent seconds, “[.F+]” is one digit at least to represent milliseconds. This item is optional.

B.2.2.3 AudioSamplesPerSec

AudioSamplesPerSec is mandatory for the Audio item object and optional for other item objects, string type, and describes the sampling rate of the audio, in units hertz (Hz).

B.2.2.4 ObjectTitle

ObjectTitle is mandatory for the Audio item object and optional for other item objects, string type, and describes the title of the music.

B.2.2.5 Singer

Singer is mandatory for the Audio item object and optional for other item objects, string type, and describes the performing artist of the music.

B.2.2.6 Genre

Genre is mandatory for the Audio item object and optional for other item objects, string type, and describes the genre of the music. Allowed values are “Baroque”, “Classical”, “Romantic”, “Opera”, “Folk”, “Rock”, “Pop”, “Blues”, “Electronica” and “Unknown”.

B.2.2.7 MusicDisc

MusicDisc is mandatory for the Audio item object and optional for other item objects, string type, and describes the name of music album.

B.2.2.8 Author

Author is mandatory for the Audio item object and optional for other item objects, string type, and describes the publisher of the music. For user generated music in the Internet community, the user can be the author of the music.

B.2.2.9 Summary

Summary is mandatory for the Audio item object and optional for other item objects, string type, and describes the identifier of an Audio item object in the same content directory, which represents the highlight summary of the present audio. If the present audio does not have a highlight summary audio or the present audio is a highlight summary audio of some other audio, the value of this metadata shall be an empty ItemID, i.e. “00000000-0000-0000-0000-000000000000”. The highlight summary shall be stored in the content collection of the SummaryContainer type.

NOTE Empty ItemID is reserved for this purpose. Other item objects should not use empty ItemID.

The IGRS content index service can provide a highlighted summary of audio to the IGRS dynamic service invocation module by this metadata. The IGRS dynamic service invocation module can use this metadata to provide the music preview functionality to the user.

B.2.2.10 Description

Description is optional, string type, and describes other information about the music, such as the background of the singer, the publication date of the album or the number of the copies sold, etc.

B.2.3 Metadata of the Video item object

B.2.3.1 General

This subclause provides the definition and usage description of the metadata of Video item object.

B.2.3.2 Duration

Duration is mandatory for the Video item object and optional for other item objects, string type, and describes the playback duration of the video. The string format shall be the same as the Duration metadata defined for the Audio item object in B.2.2.2.

B.2.3.3 FrameRate

FrameRate is mandatory for the Video item object and optional for other item objects, string type, and describes the frame rate of the video, in units hertz (Hz).

B.2.3.4 AudioSamplesPerSec

AudioSamplesPerSec is mandatory for the Video item object and optional for other item objects, string type, and describes the sampling rate of the video, in units hertz (Hz).

B.2.3.5 Width

Width is mandatory for the Video item object and optional for other item objects, string type, and describes the width of the resolution of the video.

B.2.3.6 Height

Height is mandatory for the Video item object and optional for other item objects, string type, and describes the height of the resolution of the video.

B.2.3.7 Genre

Genre is mandatory for the Video item object and optional for other item objects, string type, and describes the genre of the video. The allowed values are “Action”, “Adult”, “Adventure”, “Animation”, “Biography”, “Comedy”, “Children”, “Crime”, “Disaster”, “Drama”, “Fantasy”, “Horror”, “Musical”, “Sci-Fi”, “Short”, “Sport”, “Thriller”, “War”, “Western”, and “Unknown”.

B.2.3.8 Author

Author is mandatory for the Video item object and optional for other item objects, string type, and describes the publisher of the video. For user generated video in the Internet community, the user can be the author of the video.

B.2.3.9 Roles

Roles is mandatory for the Video item object and optional for other item objects, XML Schema struct type of RolesType, and describes the role information in a video, such as the actor, actress, director, producer, writer etc. The XML Schema definition is

```
<xs:complexType name="RolesType">
    <xs:sequence>
        <xs:element name="Role" minOccurs="0" maxOccurs="unbounded">
            <xs:complexType>
                <xs:simpleContent>
                    <xs:extension base="xs:string">
                        <xs:attribute name="Name" type="xs:string" />
                    </xs:extension>
                </xs:simpleContent>
            </xs:complexType>
        </xs:element>
    </xs:sequence>
</xs:complexType>
```

where permissible values for Name attributes of a Role element include “Actor”, “Actress”, “Director”, “Producer” and “Writer”.

B.2.3.10 Summary

Summary is mandatory for the Video item object and optional for other item objects, string type, and describes the identifier of a Video item object in the same content directory, which represents the highlight summary of the present video. If the present video does not have a highlight summary video or the present video is a highlight summary video of some other video, the value of this metadata shall be an empty ItemID, i.e. “00000000-0000-0000-0000-000000000000”. The highlight summary shall be stored in the content collection of the SummaryContainer type.

NOTE Empty ItemID is reserved for this purpose and other item objects should not use empty ItemID.

The IGRS content index service can provide a highlighted summary of video to the IGRS dynamic service invocation module by this metadata. The IGRS dynamic service invocation module can use this metadata to provide the video preview functionality to the user.

B.2.3.11 ToC

ToC is mandatory for the Video item object and optional for other item objects, XML Schema struct type of ToCType, and describes the table of content structure of the video. The Video table of content provides the structured information for a complex video. Based on this metadata, the IGRS dynamic service invocation module can provide a user interface to empower the user to retrieve and preview the content and highlight segments efficiently. This metadata shall be obtained by the content index service using the content analysis method to analyze the video content and identify the topic, then link the video segment with the identified topic. The XML Schema definition is

```
<xs:complexType name="ToCType">
    <xs:sequence>
        <xs:element name="Segment" minOccurs="0">
            <xs:complexType>
                <xs:sequence>
                    <xs:element name="Topic" type="xs:string" />
                    <xs:element name="Offset" type="xs:string" minOccurs="0" />
                    <xs:element name="Dura" type="xs:string" minOccurs="0" />
                    <xs:element name="Ref" type="ItemIdType" minOccurs="0" />
                    <xs:element name="Desc" type="xs:string" />
                </xs:sequence>
            </xs:complexType>
        </xs:element>
    </xs:sequence>
</xs:complexType>
```

This struct consists of a series of Segment elements and each Segment struct contains five fields, as follows.

- Topic: string type; it describes the identified topic of the video segment.
- Offset: string type; it describes the position offset of the video segment relative to the beginning of the original video file.
- Dura: string type; it describes the duration of the video segment relative to the position of Offset.
- Ref: string type, it describes the identifier of a Video or Photo item object in the same content directory, which describes the scene of the video segment and the video segment content shall store in the content collection of the ToCContainer type.
- Desc: string type, it describes the other information of the video segment.

NOTE For the video content that does not have a table of content structure, for instance, a video is a ToC video segment of some other video, the ToC should be an empty XML element, i.e. the ToC does not contain any Segment struct.

Offset/Dura uses an excerpted video clip of the original content as the scene of the video segment, while Ref uses another Video or Photo item object in the content directory as the scene of the video segment. For each video segment, either Offset/Dura or Ref shall be provided.

B.2.3.12 Subtitles

Subtitles is optional, XML Schema struct type of SubtitlesType, and describes the supported subtitle information of the video content represented by the present item object. The XML Schema definition is

```
<xs:complexType name="SubtitlesType">
    <xs:sequence>
        <xs:element name="Subtitle" minOccurs="0" maxOccurs="unbounded">
            <xs:complexType name="SubtitleType">
                <xs:sequence>
                    <xs:element name="Id" type="xs:string" />
                    <xs:element name="Name" type="xs:string" />
                    <xs:element name="URI" type="xs:string" />
                    <xs:element name="Desc" type="xs:string" />
                </xs:sequence>
            </xs:complexType>
        </xs:element>
        <xs:attribute name="Default" type="xs:string" />
    </xs:sequence>
</xs:complexType>
```

where the Default attribute describes the identifier of the default subtitle; Id field of the SubtitleType describes the identifier of the subtitle, Name field describes the name of the

subtitle, URI field describes the access address of the subtitle and Desc field describes the descriptive information of the subtitle.

In the case of a media client decoding the subtitle, the media client shall use HTTP GET or HTTP POST protocol to access the address denoted by the URI field, obtain the subtitle, then load the subtitle to decode; for the case of a media server decoding the subtitle, the SelectSubtitle() interface of MSTMS shall be invoked to set the subtitle of the current playing video.

B.2.3.13 AudioTracks

AudioTracks is optional, XML Schema struct type of AudioTracksType, and describes the supported audio track information of the video content represented by the present item object. The XML Schema definition is

```
<xs:complexType name="AudioTracksType">
    <xs:sequence>
        <xs:element name="AudioTrack" minOccurs="0" maxOccurs="unbounded">
            <xs:complexType name="AudioTrackType">
                <xs:sequence>
                    <xs:element name="Id" type="xs:string" />
                    <xs:element name="Name" type="xs:string" />
                    <xs:element name="Desc" type="xs:string" />
                </xs:sequence>
            </xs:complexType>
        </xs:element>
        <xs:attribute name="Default" type="xs:string" />
    </xs:sequence>
</xs:complexType>
```

where the Default attribute describes the identifier of the default audio track; Id field of the AudioTrackType describes the identifier of the audio track, Name field describes the name of the audio track and Desc field describes the descriptive information of the audio track.

In the case of a media client decoding the audio track, the SelectAudioTrack() interface of MCTMS shall be invoked to set the audio track of the current playing video; in the case of a media server decoding the subtitle, the SelectAudioTrack() interface of MSTMS shall be invoked to set the audio track of the current playing video.

B.2.3.14 Description

Description is optional, string type, and describes other information about the video, such as the production date of the movie, box office information, etc. It can also be user-added annotation on a personal video clip.

B.2.4 Metadata of the LiveVideo item object

B.2.4.1 General

This subclause provides the definition and usage description of the metadata of LiveVideo item object.

B.2.4.2 Channel

Channel is mandatory for the LiveVideo item object and optional for other item objects, XML Schema struct type of ChannelType, and describes the channel information of the broadcast or livecast program. The XML Schema definition is

```
<xs:complexType name="ChannelType">
    <xs:sequence>
        <xs:element name="Title" type="xs:string" minOccurs="0" />
        <xs:element name="Provider" type="xs:string" minOccurs="0" />
```

```
            <xs:element name="Type" type="xs:string" minOccurs="0" />
            <xs:element name="Id" type="xs:string" minOccurs="0" />
        </xs:sequence>
    </xs:complexType>
```

where

- Title: string type, it describes the name of the channel;
- Provider: string type, it describes the provider of the channel;
- Type: string type, it describes the access type of the channel;
- Id: string type, it describes the access number of the channel.

B.2.4.3 FrameRate

FrameRate is mandatory for the LiveVideo item object and optional for other item objects, string type, and describes the video frame rate of a broadcast or livecast program, in units hertz (Hz).

B.2.4.4 AudioSamplesPerSec

AudioSamplesPerSec is mandatory for the LiveVideo item object and optional for other item objects, string type, and describes the audio sampling rate of a broadcast or livecast program, in units hertz (Hz).

B.2.4.5 Width

Width is mandatory for the LiveVideo item object and optional for other item objects, string type, and describes the width of the resolution of a broadcast or livecast program.

B.2.4.6 Height

Height is mandatory for the LiveVideo item object and optional for other item objects, string type, and describes the height of the resolution of a broadcast or livecast program.

B.2.4.7 Subtitles

Subtitles are optional; see B.2.3.12 for details.

B.2.4.8 AudioTracks

AudioTracks are optional; see B.2.3.13 for details.

B.2.4.9 Description

Description is optional, string type, and describes other information about a broadcast or livecast program.

B.2.5 Metadata of the EPG item object

B.2.5.1 General

This subclause provides the definition and usage description of the metadata of an EPG item object.

B.2.5.2 Channel

Channel is mandatory for the EPG item object and optional for other item objects, XML Schema struct type of ChannelType, and describes the channel information of a broadcast or livecast program. See B.2.4.2 for details.

B.2.5.3 EPGProvider

EPGProvider is mandatory for the EPG item object and optional for other item objects, string type, and describes the information about an EPG provider.

B.2.5.4 StartTime

StartTime is mandatory for the EPG item object and optional for other item objects, datetime type, and describes the start time of a broadcast or livecast program.

B.2.5.5 EndTime

EndTime is mandatory for the EPG item object and optional for other item objects, datetime type, and describes the ending time of a broadcast or livecast program.

B.2.5.6 Duration

Duration is mandatory for the EPG item object and optional for other item objects, string type, and describes the duration of a broadcast or livecast program. The format shall be the same as the Duration metadata definition in B.2.2.2.

B.2.5.7 Description

Description is optional, string type, and describes other information about a broadcast or livecast program.

B.2.6 Metadata of the Photo item object

B.2.6.1 General

This subclause provides the definition and usage description of the metadata of a Photo item object.

B.2.6.2 Width

Width is mandatory for the Photo item object and optional for other item objects, string type, and describes the width of the resolution of the photo.

B.2.6.3 Height

Height is mandatory for the Photo item object and optional for other item objects, string type, and describes the height of the resolution of the photo.

B.2.6.4 Detail

Detail is optional, XML Schema struct type of ContentDetailType, and describes information about the photo including time, location, person, activity and scene. The XML Schema definition is

```
<xs:complexType name="ContentDetailType">
    <xs:sequence>
        <xs:element name="Time" type="dt:dateTime" />
        <xs:element name="Location" type="xs:string" />
        <xs:element name="Person" minOccurs="0" maxOccurs="unbounded" type="xs:string"
/>
        <xs:element name="Activity" type="xs:string" />
        <xs:element name="Sceen" type="xs:string" />
    </xs:sequence>
</xs:complexType>
```

where

- Time: datetime type; it describes the photography time of the photo;
- Location: string type; it describes the photography location of the photo; it can be the location description such as “Shanghai China” or it can also be the longitudinal and latitudinal information, such as “31°12′0″N 121°30′0″E”;
- Person: string type; it describes the name of the person in the photo; this field is allowed to appear zero or multiple times, where zero means no person information is provided and multiple means multiple persons’ information are provided;
- Activity: string type; it describes the photo related activity such as “party”, “travel”, “meeting” etc.;
- Scene: string type; it describes the scene in the photo, such as “sky”, “sea”, “beach”, “indoor”, “outdoor”, etc.

B.2.6.5 Description

Description is optional, string type, and describes other information about the photo, which can be user-added annotation describing the background of the photo.

B.2.7 Metadata of a Doc item object

B.2.7.1 General

This subclause provides the definition and usage description of the metadata of the Doc item object.

B.2.7.2 Width

Width is mandatory for the Doc item object and optional for other item objects, string type, and describes the width of the resolution of the picture generated by the media server when decoding the document.

B.2.7.3 Height

Height is mandatory for the Doc item object and optional for other item objects, string type, and describes the height of the resolution of the picture generated by the media server when decoding the document.

B.2.7.4 Description

Description is optional, string type, and describes other information about the picture generated by a media server when decoding the document. This may be the annotation on each slide in a presentation document or the annotation on each page in a word processor document.

B.2.8 Metadata of Camera item object

B.2.8.1 General

This subclause provides the definition and usage description of the metadata of the Camera item object.

B.2.8.2 CameraName

CameraName is mandatory for the Camera item object and optional for other item objects, string type, and describes the name of the camera in the network.

B.2.8.3 FrameRate

FrameRate is mandatory for the Camera item object and optional for other item objects, string type, and describes the frame rate of the video stream from the camera, in units hertz (Hz).

B.2.8.4 AudioSamplesPerSec

Optional, string type, it describes the audio sampling rate of built-in microphone of the camera, in units hertz (Hz).

B.2.8.5 Width

Mandatory for the Camera item object and optional for other item objects, string type, it describes the width of the resolution of the video stream from the camera.

B.2.8.6 Height

Mandatory for the Camera item object and optional for other item objects, string type, it describes the height of the resolution of the video stream from the camera.

B.2.8.7 Description

Description is optional, string type, and describes the information of the camera, such as the verdor's model number.

B.2.9 Metadata of Screen item object

B.2.9.1 General

This subclause provides the definition and usage description of the metadata of the Screen item object.

B.2.9.2 BitCount

BitCount is mandatory for the Screen item object and optional for other item objects, string type, and describes the bit count of the projected picture from the projector. Allowed values are "8", "16", "24" and "32".

B.2.9.3 Wtype

Wtype is mandatory for the Screen item object and optional for other item objects, string type, and describes the projection type of the projector. Allowed values are "FullScreen" (full screen display) and "Dialog" (dialog display).

B.2.9.4 FrameRate

FrameRate is mandatory for the Screen item object and optional for other item objects, string type, and describes the frame rate of the projector, in units hertz (Hz).

B.2.9.5 Width

Width is mandatory for the Screen item object and optional for other item objects, string type, and describes the width of the resolution of the projector.

B.2.9.6 Height

Height is mandatory for the Screen item object and optional for other item objects, string type, and describes the height of the resolution of the projector.

B.2.9.7 Description

Description is optional, string type, and describes the other information of the projected picture from the projector.

B.2.10 Metadata of Bookmark item object

B.2.10.1 General

This subclause provides the definition and usage description of the metadata of the Bookmark item object.

B.2.10.2 RefObjectId

RefObjectId is mandatory for the Bookmark item object and optional for other item objects, string type, and describes the identifier of the bookmarked video content in the content directory.

B.2.10.3 Bookmark

Bookmark is mandatory for the Bookmark item object and optional for other item objects, XML Schema type of BookmarkType, and describes the bookmark information. The XML Schema definition is

```
<xs:complexType name="BookmarkType">
    <xs:sequence>
        <xs:element name="Position" type="BookmarkPosType" />
        <xs:element name="Seg" type="ItemObjectIdType" />
    </xs:sequence>
</xs:complexType>

<xs:complexType name="BookmarkPosType">
    <xs:simpleContent>
        <xs:extension base="xs:string">
            <xs:attribute name="Type" type="xs:string" />
        </xs:extension>
    </xs:simpleContent>
</xs:complexType>
```

where

- Position: value is string; it describes the playing position of the video content indicated by the bookmark; the Type attribute allows two values “Time” and “Range”, which indicate the type of the recorded playing position: when the value of Type is “Time”, it means the recorded playing position is the time the content was played and the unit is seconds; when the value of Type is “Range”, it means the recorded playing position is the bytes count of the content that was played;
- Seg: string type; it describes the identifier of a Video or Photo item object in the content directory, which represents a video segment or key frame picture near the recorded playing position indicated by the bookmark; this object shall be stored in the content collection of the SummaryContainer type.

When the user is playing video content and wishes to record the current playing position before ending playback, the user can use the video bookmark functionality. The Media player shall determine a key frame (which can be used for fast retrieval) based on the decoding status of the audio video decoder in the player and the feature of the currently selected video frame. The Media player shall make the key frame position the current playing position and extract a video segment or a key frame picture near the current playing position and store the video segment or picture in the content directory. The IGRS dynamic service invocation module can invoke CIS::CreateObject() interface to create a Bookmark item object in the content directory. The RefObjectId of this object saves the value of the identifier of the bookmarked video content in the content directory, while Bookmark struct saves the bookmark related information.

The IGRS dynamic service invocation module can retrieve the related bookmark information of the video content for browsing, and it can display the play position of the last playback as well as the video segment or picture at this position on the user interface.

B.2.10.4 Description

Description is optional, string type, and describes the other information of the bookmark.

B.3 Basic metadata of the container object

B.3.1 General

This clause provides the definition and usage description of the basic metadata of a container object.

B.3.2 ObjectId

ObjectId is mandatory, string type, and describes the identifier of the container object. The ABNF definition is

<ContainerObjectIdType>::=“urn:IGRS:Container:”<IGRSContainerObjectIdVal>
<IGRSContainerObjectIdVal>::=8<URNChars>“-”4<URNChars>“-”4<URNChars>“-”4<URNChars>“-”12<URNChars>
<URNChars>::=<trans>
<trans>::=<upper> | <lower> | <number>
<upper>::=“A” | “B” | “C” | “D” | “E” | “F”
<lower>::=“a” | “b” | “c” | “d” | “e” | “f”
<number>::=“0” | “1” | “2” | “3” | “4” | “5” | “6” | “7” | “8” | “9”

A well-formed ObjectId example of a container object is

urn:IGRS:Container:D532285C-AE5C-CCAC-7444-752F68B06C6C.

B.3.3 ParentId

ParentId is mandatory, string type, and describes the identifier of the parent container object of the present container object. The ABNF definition shall be the same as the definition in B.1.3.

B.3.4 DeviceId

DeviceId is optional, string type, and describes the identifier of the device where the content collection represented by the present container object is located. The ABNF definition shall be the same as the definition in B.1.4.

B.3.5 DeviceName

DeviceName is optional, string type, and describes the name of the device where the content collection represented by the present container object is located.

B.3.6 ObjectType

ObjectType is mandatory, string type, and the values allowed for this metadata are “FileFolder”, “AudioAlbum”, “VideoAlbum”, “LiveVideoContainer”, “EPGContainer”, “PhotoAlbum”, “ToCContainer”, “SummaryContainer”, “BookmarkContainer” and “PersonalizedContainer”.

B.3.7 ObjectName

ObjectName is mandatory, string type, and describes the name of the content collection represented by the present container object.

B.3.8 ObjectPath

ObjectPath is optional, string type, and describes the path of the content collection represented by the present container object in the IGRS content directory.

B.3.9 ParentPath

ParentPath is optional, string type, and describes the parent path of the content collection represented by the present container object in the IGRS content directory.

B.3.10 ObjectStoreAttribute

ObjectStoreAttribute is optional, XML Schema struct type of ObjectStoreAttributeType, and describes the storage related information of the content collection represented by the present container object. The XML Schema definition shall be the same as the definition in B.1.14.

B.3.11 CreateTime

CreateTime is optional, datetime type, and describes the creation time of the present container object in the IGRS content directory.

B.3.12 LastAccessTime

LastAccessTime is optional, datetime type, and describes the last access time of the present container object in the IGRS content directory.

B.3.13 LastWriteTime

LastWriteTime is optional, datetime type, and describes the last write time of the present container object in the IGRS content directory.

B.4 Metadata of specific container object

B.4.1 General

This subclause provides the definition and usage description of the metadata of specific container objects.

B.4.2 Metadata of the FileFolder container object

B.4.2.1 General

This subclause provides the definition and usage description of the metadata of the FileFolder container object.

B.4.2.2 Description

Description is optional, string type, and describes other information of the file folder.

B.4.3 Metadata of the AudioAlbum container object

B.4.3.1 General

This subclause gives the definition of the metadata of the AudioAlbum container object and usage description.

B.4.3.2 Singer

Singer is mandatory for the AudioAlbum container object and optional for other container objects, string type, and describes the performing artist of the music album.

B.4.3.3 Genre

Genre is mandatory for the AudioAlbum container object and optional for other container objects, string type, and describes the genre of the music album. The values allowed for this metadata shall be the same as defined in B.2.2.6.

B.4.3.4 MusicDisc

MusicDisc is mandatory for the AudioAlbum container object and optional for other container objects, string type, and describes the name of the music album.

B.4.3.5 Author

Author is mandatory for the AudioAlbum container object and optional for other container objects, string type, and describes the publisher of the music album. For user generated music in the Internet community, the user can be the author of the music album.

B.4.3.6 Description

Description is optional, string type, and describes the other information of the music album, such as background of the singer, publication date of the album or the number of copies sold, etc.

B.4.4 Metadata of VideoAlbum container object

B.4.4.1 General

This subclause provides the definition and usage description of the metadata of VideoAlbum container object.

B.4.4.2 ToC

ToC is optional, XML Schema struct type of the ContainerToCType, and describes the highlight video segment of the video album. The IGRS dynamic service invocation module can render a structured content collection on a user interface based on this metadata and ToC metadata of each video contained in the video album. The XML Schema definition is

```
<xs:complexType name="ContainerToCType">
    <xs:sequence>
        <xs:element name="Video" minOccurs="0">
            <xs:complexType>
                <xs:sequence>
                    <xs:element name="Title" type="xs:string" />
                    <xs:element name="Id" type="ItemIdType" />
                    <xs:element name="Offset" type="xs:string" minOccurs="0" />
                    <xs:element name="Dura" type="xs:string" minOccurs="0" />
                    <xs:element name="Ref" type="ItemIdType" minOccurs="0" />
                    <xs:element name="Desc" type="xs:string" minOccurs="0" />
                </xs:sequence>
            </xs:complexType>
        </xs:element>
    </xs:sequence>
</xs:complexType>
```

ToC struct consists of a series of Video structs, and each Video struct contains the following fields:

- Title: string type; it describes the title of the video content in the album;
- Id: string type; it describes the identifier of the video content in the album;
- Offset: string type; it describes the position offset of a video segment relative to the beginning of the original video file in the album;

- Dura: string type; it describes the duration of the video segment relative to the position of the Offset value of a video in the album;
- Ref: string type; it describes the identifier of a Video or Photo item object in the same content directory, which describes the highlight segment of a video in the album, and the video segment content shall be stored in the content collection of the ToCContainer type;
- Desc: string type; it describes the other information of the highlight segment.

NOTE Offset/Dura uses an excerpted video clip of the original content as the highlight scene of a video content, while Ref uses another Video or Photo item object in the content directory as the highlight scene of a video content. For each video content, either Offset/Dura or Ref should be provided.

B.4.4.3 Description

Optional, string type, it describes the other information of the video album.

B.4.5 Metadata of the LiveVideoContainer container object

B.4.5.1 General

This subclause provides the definition and usage description of the metadata of the LiveVideoContainer container object.

B.4.5.2 Provider

Provider is mandatory for the LiveVideoContainer container object and optional for other container objects, string type, and describes the service provider information of broadcast or livecast programs in the present content collection.

B.4.5.3 Description

Description is optional, string type, and describes other information of the broadcast or livecast programs in the present content collection.

B.4.6 Metadata of the EPGContainer container object

B.4.6.1 General

This subclause provides the definition and usage description of the metadata of an EPGContainer container object.

B.4.6.2 EPGProvider

EPGProvider is mandatory for the EPGContainer container object and optional for other container objects, string type, and describes the EPG provider information.

B.4.6.3 Description

Description is optional, string type, and describes other information of an EPG content collection.

B.4.7 Metadata of PhotoAlbum container object

B.4.7.1 General

This subclause provides the definition and usage description of the metadata of the PhotoAlbum container object.

B.4.7.2 Summary

Optional, string type, it describes the identifier of a collaged photo which consists of highlights of all photos in the photo album,and the collaged photo shall be in the content collection of the SummaryContainer type.

B.4.7.3 Description

Description is optional, string type, and describes other information about the photo album.

B.4.8 Metadata of the ToCContainer container object

This subclause provides the definition and usage description of the metadata of the ToCContainer container object.

B.4.9 Metadata of the SummaryContainer container object

This subclause provides the definition and usage description of the metadata of the SummaryContainer container object.

B.4.10 Metadata of the BookmarkContainer container object

This subclause provides the definition and usage description of the metadata of the BookmarkContainer container object.

B.4.11 Metadata of the PersonalizedContainer container object

B.4.11.1 General

This subclause provides the definition and usage description of the metadata of the PersonalizedContainer container object.

B.4.11.2 ContentType

ContentType is mandatory for the PersonalizedContainer container object and optional for other container objects, string type. The allowed values shall be the same as those defined in B.1.6 (i.e. ObjectType of item object), which describes the object type of the personalised content.

B.4.11.3 UserInfo

UserInfo is optional, string type, and describes the user information related to the personalised content. If the personalised content collection is not related to any specific user, the metadata should not appear.

B.4.11.4 Genre

Genre is mandatory for the PersonalizedContainer container object and optional for other container objects, string type, and the allowed values shall be the same as those defined either in B.2.2.6 or B.2.3.7, which describes the genre of the personalised content collection.

B.4.11.5 Description

Description is optional, string type, and describes the other information of the personalised content collection.

Annex C
(normative)

Specific description of data type generation rules

C.1 Type_ObjectId

For an item object on the Content Index Service, the definition shall be the same as in Clause B.1.

For a container object on the Content Index Service, the definition shall be the same as in Clause B.3.

C.2 Type_ContentList

The XML Schema struct describes a list of items and/or container objects on the Content Index Service.

The XML Schema definition of the ContentListType is as follows:

```
    <xs:complexType name="Type_ContentList">
        <xs:sequence>
            <xs:element name="Container" type="igrs:Type_Container" minOccurs="0"
maxOccurs="unbounded" />
            <xs:element name="Item" type="igrs:Type_Item" minOccurs="0"
maxOccurs="unbounded" />
    </xs:sequence>
</xs:complexType>where Type_Container and Type_Item are also XML Schema types, the
definitions are as follows:
    <xs:complexType name="Type_Container">
        <xs:sequence>
            <xs:element name="ContainerProperty" type="ContainerPropertyType" />

            <!-- allow any element except from target namespace -->
            <xs:choice minOccurs="0" maxOccurs="unbounded">
                <xs:any namespace="##other" processContents="lax" />
                <xs:any namespace="##local" processContents="lax" />
            </xs:choice>
        </xs:sequence>

        <xs:attribute name="Num_containers" type="xs:unsignedInt" />
        <xs:attribute name="Num_items" type="xs:unsignedInt" />

        <xs:anyAttribute namespace="##any" processContents="lax" />
</xs:complexType>

    <xs:complexType name="Type_Item">
        <xs:sequence>
            <xs:element name="ItemProperty" type="ItemPropertyType" />

            <!-- allow any element except from target namespace -->
            <xs:choice minOccurs="0" maxOccurs="unbounded">
                <xs:any namespace="##other" processContents="lax" />
                <xs:any namespace="##local" processContents="lax" />
            </xs:choice>
        </xs:sequence>
```

```
        <xs:anyAttribute namespace="##any" processContents="lax" />
</xs:complexType>
```

The ContainerProperty can contain all allowed metadata elements and attributes defined in Clause B.3 for the specific container object type.

The ItemProperty can contain all allowed metadata elements and attributes defined in Clause B.2 for the specific item object type.

C.3 Type_FilterRule

C.3.1 Syntax definition

<FilterRule>::=<NILSTRING> | <LogicalExpression>
<LogicalExpression>::=<RelationExpression> | ‘not’ ‘(‘ <LogicalExpression> ‘)’ |
<LogicalExpression> <BinaryLogicalOperator> <LogicalExpression>
<BinaryLogicalOperator>::=‘and’ | ‘or’
<RelationExpression>::=<ATTRIBUTENAME> <RelationOperator> <CONSTANTVALUE>
<RelationOperator>::=‘=’ | ‘<’ | ‘>’ | ‘<=’ | ‘>=’ | ‘<>’ | ‘like’ | ‘not like’

C.3.2 Semantic explanation

a) <NILSTRING> denotes a null string. Any item shall satisfy the search condition indicated by <NILSTRING>.
b) <ATTRIBUTENAME> is the name of attribute that is contained in the return result of GetSearchCapabilityList().
c) <CONSTANTVALUE> is a constant. Its type shall match the type of <ATTRIBUTENAME>.
d) ‘like’|’not like’ is a relation operator of pattern matching. It denotes " matching" and "not matching" respectively.
e) The wild card that appears in a matching pattern is ‘%’. For example, ‘abc%’ means a string started with ‘abc’. ‘%abc’ means a string ended with ‘abc’. ‘%abc%’ means a string contained ‘abc’. ‘abc%def’ means a string started with ‘abc’ and ended with ‘def’, etc.
f) ‘=’|’<’|’>’|’<=’|’>=’|’<>’ are comparison operators. They denote "equal", "less than", "greater than", "less than or equal", "greater than or equal" and "not equal" respectively.
g) ‘and’|’or’ are binary logic operators.
h) ‘not’ is a unitary logic operator.

C.4 Type_SortRule

C.4.1 Syntax defintion

<SortRule>::=<NILSTRING> | <SortExpression>
<SortExpression>::=<ATTRIBUTENAME> <SortSwitch> | <ATTRIBUTENAME>
<SortSwitch> ‘,’ <SortExpression>
<SortSwitch>::=‘ASC’ | ‘DESC’

C.4.2 Semantic explanation

a) <NILSTRING> denotes a null string. It indicates that the result can be processed without sorting.
b) <ATTRIBUTENAME> is the name of attribute that is contained in the return result of GetSortCapabilityList().
c) ‘ASC’|’DESC’ are sorting options. They mean "ascending sort" and "descending sort" respectively.
d) The priority of a sorting indicator separated by ‘,’ is from left to right.

C.5 Type_URI

C.5.1 Syntax definition

<URI>::=<Protocol> '://' <IPAddress> ':' <IPPort> '/' <ResourceInfo>

<ResourceInfo>::=<RelativePath> | <ItemId>

C.5.2 Semantic explanation

a) <Protocol> denotes a string of protocol name. It could be "http" or "rtp" or "rtp-u".
b) <IPAddress> and <IPPort> denote IP address and port of the server where resource is located.
c) <ResourceInfo> denotes two ways to interpret the location of the resource, either by the relative storage path of the resource on the server or or by the corresponding item object Id of the resource managed by the CIS.

C.6 Type_MediaFormat

The XML Schema struct is defined as in B.1.9.

C.7 Type_UserList

The XML Schema struct is defined as:

```
        <complexType name="Type_UserList">

            <sequence>

                <element name="User" type="string" minOccurs="0"
maxOccurs="unbounded" />

            </sequence>

    </complexType>
```

C.8 Type_ProtocolInfo

C.8.1 Syntax defnition

```
        <complexType name="Type_ProtocolInfo">
            <sequence>
                <element name="TransportProtocol">
                    <complexType>
                        <sequence>
                            <element name="Port" type="string" minOccurs="0"
  maxOccurs="unbounded" />
                        </sequence>
                        <attribute name="Name" type="string" />
                    </complexType>
                </element>
                <element name="ControlProtocol" minOccurs="0">
                    <complexType>
                        <sequence>
                            <element name="Port" type="string" minOccurs="0"
  maxOccurs="unbounded" />
                        </sequence>
```

```
                    <attribute name="Name" type="string" />
                </complexType>
            </element>
        </sequence>
    </complexType>
```

C.8.2 Semantic explanation

a) Transport protocol type is: "HTTP", "RTP" etc. Control protocol type is "BCM".
b) Address ports are the ports corresponding to transport protocol and to control protocol.

C.9 Type_MediaFormatList

The XML Schema struct describes a list of media format supported by the device. The XML Schema definition of Type_MediaFormatList is as follows:

```
<complexType name="Type_MediaFormatList">

    <sequence>

        <element name="MediaFormat" type="Type_MediaFormat"
maxOccurs="unbounded" />

    </sequence>

</complexType>
```

C.10 Type_StorageMediumName

The Media content storage medium is used to play media by MSTMS instance. The legal values are: "BD", "CD-DA", "CD-R", "CD-ROM", "CD-RW", "CF", "DV", "DVD+R", "DVD+RW", "DVD-AUDIO", "DVD-R", "DVD-RAM", "DVD-RW", "DVD-ROM", "HDD", "MD", "MMC", "MS", "NETWORK", "NONE", "NOT_IMPLEMENTED", "SD", "VHS", "VIDEO-CD" and "UNKNOWN".

C.11 Type_TransportURI

C.11.1 Syntax definition

The URI used for the transport of the media content object has a Type of String. The Description format of transport protocol is

```
    <TransportURI>:=
TransportProtocol://ServerIP:ServerPort/IGRS/ItemId?ParamName1=ParamValue1&Para
mName2=ParamValue2&...&ParamNameN=ParamValueN
```

C.11.2 Semantic explanation

- TransportProtocol means the protocol of the out-of-band transport and the values could be “http”, “rtsp”, “rtspu” and “rtspmu”;
- ServerIP and ServerPort means the IP address and server port of out-of-band transport server on the Media Server device respectively;
- ItemId means the identifier of the selected media object;
- Multiple parameters are allowed for the transcoding of media content in content index service in the form of “ParamName=ParamValue” pair:
  - BitRate means the requested bit rate of the content;
  - Width and Height means the video resolution setting;
  - Width-Ratio and Height-Ratio gives the resolution limit;

- AspectRatio means the display aspect ratio of target. The options are: PAR_SQUARE (1:1), PAR_43 (4:3), PAR_169 (16:9);
- VideoFormat has two values: PAL and NSTC. The default definition of Width and Height for PAL is 720*576 and for NSTC is 720*480;
- BitCount means the color digit. It can be 8, 16, 24, 32;
- Wtype is the type of projection. The options are: FullScreen (full screen), Dialog (dialog box).

C.12 Type_ItemList

The XML Schema struct describes a list of item objects on the Content Index Service.

The XML Schema definition of Type_ItemList is as follows:

```
<complexType name="Type_ItemList">

    <sequence>

        <element name="Item" type="cis:Type_Item" minOccurs="0"
maxOccurs="unbounded" />

    </sequence>

</complexType>
```

where Type_Item is defined as in Clause C.2.

C.13 Type_DisplayWindowInfo

C.13.1 Syntax definition

```
<complexType name="Type_DisplayWindowInfoList" type="DisplayWindowInfoListType">
    <sequence>
        <element name="DisplayWindowInfo" type="igrs:Type_DisplayWindowInfo"
minOccurs="0" maxOccurs="unbounded" />
    </sequence>
</complexType>
<complexType name="Type_DisplayWindowInfo">
    <sequence>
        <element name="DisplayWindowId" type="igrs:Type_DisplayWindowId" />
        <element name="DisplayWindowPosition"
type="igrs:Type_DisplayWindowPosition" />
        <element name="DisplayWindowSize" type="igrs:Type_DisplayWindowSize" />
        <element name="DisplayURI" type="string" />
        <element name="DisplayMode" type="string" />
    </sequence>
</complexType>

<complexType name="Type_DisplayWindowSize">
    <sequence>
        <element name="Width" type="int" minOccurs="0" />
        <element name="Height" type="int" minOccurs="0" />
    </sequence>
</complexType>

<complexType name="Type_DisplayWindowPosition">
```

```
        <sequence>
            <element name="CenterX" type="int" minOccurs="0" />
            <element name="CenterY" type="int" minOccurs="0" />
            <element name="CenterZ" type="int" minOccurs="0" />
        </sequence>
    </complexType>
```

C.13.2 Semantic explanation

a) DisplayURI is the unique ID for playing. It is the same as the playing attribute TransportURI of MSTMS (or MCTMS) without Width, Height setting, etc.;
b) There are two choices for DisplayMode: FullScreen | Window;
c) "−1"is the default value for Width, Height, CenterX, CenterY and CenterZ ("−1" denotes setting is disabled).

C.14 Type_ObjectId in FAMS

C.14.1 Overview

The File/directory object identifier Type_ObjectId is a global unique ID. Each file/directory object identifier may uniquely correspond to a directory or file.

C.14.2 IGRS file/directory object identifier format

<IGRSObjectIdURN> ::="urn:"<IGRSDeviceNS>":"<IGRSObjectNS>":"<IGRSObjectIdVAL>

NOTES:

<IGRSDeviceNS>::=Device ID (GUID)

<IGRSObjectNS>::=<"Directory">|<"File">

<IGRSObjectIdVAL>::=Object path name, such as"/a/b/c" and is case sensitive

C.15 ObjectType

Identifies Object Type. The legal values: FILE|DIRECTORY

NOTES:

If the object is file, the value of ObjectType should be FILE.

If the object is directory, the value of ObjectType should be DIRECTORY.

Annex D
(normative)

Service type message format

D.1 Universal message format for IGRS service invocation

D.1.1 Overview

The IGRS Application Profile messages adopt a XML Schema description. The Service invocation message format of the IGRS Application Profile shall conform to the service invocation message format specified in ISO/IEC 14543-5-1.

D.1.2 Service invocation request message

The Client can initiate a "request/response" service invocation based on the session with the target service. The definition of the service invocation request message is shown in Table D.1.

Table D.1 – IGRS service invocation request message

Message	Field explanation
M-POST /IGRS HTTP/1.1	HTTP EXTENDED COMMAND LINE
Host: Target Host IP address:Port	Required field
01-IGRSVersion: IGRS/1.0	Required field, IGRS version number
01-IGRSMessageType:InvokeServiceRequest	Required field, content shall be this
01-SourceDeviceId: requesting device identifier	Required field and type is URI, defined in 8.1.2 of ISO/IEC 14543-5-1
01-TargetDeviceId: target device identifier	Required field, type is URI, defined in 8.1.2 of ISO/IEC 14543-5-1
Content-Length: Message body length	Required field
Content-type:text/xml; charset=utf-8	Required field
MAN:"http://www.igrs.org/spec1.0";ns=01	Required field
MAN:"http://schemas.xmlsoap.org/soap/envelope/";ns=02	Required field
02-SoapAction:"IGRS-InvokeService-Request"	Required field
	Shall be empty
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">	Required field
<SOAP-ENV:Body>	Required field
<Session xmlns="http://www.igrs.org/spec1.0"request="NeedResponse">	Required field, request attribute indicates that the invocation message needs a response
<SourceClientId> *Source client identifier* </SourceClientId>	Required field, type is 32-bit unsignedInt
<TargetServiceId> *Target service identifier* </TargetServiceId>	Required field, type is 32-bit unsignedInt
<SequenceId> *Invocation request sequence Id* </SequenceId>	Required field, type is 32-bit unsignedInt
<!--Here is the start of the specific invocation request message-->	
<Invocation interface name>	Required field

Message	Field explanation
<Input parameter name>*Input parameter value*</Input parameter name>	The service invocation interface that meets the requirements of the IGRS specification ISO/IEC 14543-5-21 or ISO/IEC 14543-5-22
……	
<Input parameter name>*Input parameter value*</Input parameter name>	The service invocation interface that meets the requirements of the IGRS specification ISO/IEC 14543-5-21 or ISO/IEC 14543-5-22
</Invocation interface name>	Required field
<!--Here is the end of the specific invocation request message-->	
</Session>	Required field
</SOAP-ENV:Body>	Required field
</SOAP-ENV:Envelope>	Required field
NOTE Italics indicate where content is to be inserted; all other text in message definitions is fixed.	

D.1.3 Service invocation response message

When an IGRS service receives an invocation request with a response requirement, it should return an invocation response message. A Service invocation response message is sent to the client that is invoking the service based on the same session. The message definition is shown in Table D.2:

Table D.2 – Service invocation response message

Message	Field explanation
HTTP/1.1 200 OK	HTTP Command line
Ext:	Required field
Cache-control:no-cache="Ext"	Required field
MAN:"http://www.igrs.org/spec1.0";ns=01	Required field
01-IGRSVersion: IGRS/1.0	Required field, IGRS version number
01-IGRSMessageType:InvokeServiceResponse	Required field, content shall be this
01-TargetDeviceId: target device identifier	Required field, type is URI
01-SourceDeviceId: requesting device identifier	Required field, type is URI
01-AcknowledgeId: Service pipe message response sequence Id	Required field, Type is 32 bit unsignedInt
Content-Length: Message body length	Required field
Content-type:text/xml; charset=utf-8	Required field
MAN:"http://schemas.xmlsoap.org/soap/envelope/";ns=02	Required field
02-SoapAction:"IGRS-InvokeService-Response"	Required field
	Shall be empty
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">	Required field
<SOAP-ENV:Body>	Required field
<Session xmlns="http://www.igrs.org/spec1.0">	Required field
<SourceServiceId>*Source service identifier* </SourceServiceId>	Required field, Type is 32 bit unsignedInt

Message	Field explanation
<TargetClientId>*Target client identifier* </TargetClientId>	Required field, Type is 32 bit unsignedInt
<AcknowledgeId>*Invocation response message sequence Id* </AcknowledgeId>	Required field, Type is 32 bit unsignedInt, It is the same as the invocation request SequenceId of the request message
<ReturnCode>*Invocation response status code*</ReturnCode>	Required field, defined in Clause 11 of ISO/IEC 14543-5-1
<!—Here is the specific invocation response message-->	
<FileReturnCode>*File universal error return code* </FileReturnCode>	Optional field: Indicates the error response message independent of the service invocation, such as the service invocation is not supported. There shall be one and only one return code returned between FileReturnCode and ReturnCode
<Invocation interface name>	Required field
<ReturnCode>*Service invocation response status code* </ReturnCode>	Optional field. Conform to service invocation return code definition. There shall be one and only one return code returned between FileReturnCode and ReturnCode
< Output parameter>*Output parameter value* </ Output parameter>	Shall meet service interface definition requirement
……	
< Output parameter>*Output parameter value* </ Output parameter>	Shall meet service interface definition requirement.
</ Invocation interface name>	Required field
<!—Here is the specific invocation response message-->	
</Session>	Required field
</SOAP-ENV:Body>	Required field
</SOAP-ENV:Envelope>	Required field
NOTE Italics indicate where content is to be inserted; all other text in message definitions is fixed.	

D.1.4 Content directory/file directory object update notification message

The CIS can notify a client based on session setup with the client (IGRS dynamic service invocation module) when the content directory object changes. This message does not require any response. If the content directory object update event is subscribed to a multi-directory structure, the update message should be sent only to the lowest directory object. The message definition is shown in Table D.3.

The FAMS can notify a client based on the session setup with the client when the file/directory object changes. This message does not require any response. If the file/directory object update event is subscribed to a multi-directory structure, the update message should be sent only to the lowest directory object. The message definition is shown in Table D.4.

Table D.3 – Content directory object update notification message

Message	Field explanation
M-NOTIFY /IGRS HTTP/1.1	Extended HTTP command line
Host: target host IP address: port	Required field
MAN:"http://www.igrs.org/spec1.0";ns=01	Required field
01-IGRSVersion: IGRS/1.0	Required field, IGRS version

Message	Field explanation
	no
01-IGRSMessageType: CisServiceNotifyClient	Required field, content shall be this
01-SourceDeviceId: source device identifier	Required field. Type is URI
01-TargetDeviceId: target device identifier	Required field. Type is URI
01-SequenceId: Device pipe acknowledgement message sequence ID	Required field and type is 32 bit unsignedInt (0 is reserved)
Content-Length: message body length	Required field
Content-Type:text/xml; charset=utf-8	Required field
MAN:"http://schemas.xmlsoap.org/soap/envelope/";ns=02	Required field
02-SoapAction:"IGRS-CisServiceToClient-Notify"	Required field
	Shall be empty
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">	Required field
<SOAP-ENV:Body>	Required field
<Session xmlns="http://www.igrs.org/spec1.0" request="NoResponse">	Required field, "request" attribute indicates that no response is needed
<SourceServiceId> *Source service ID* </SourceServiceId >	Required field and type is 32 bit unsignedInt (0 is reserved)
<TargetClientId> *Target client ID*</TargetClientId>	Required field and type is 32 bit unsignedInt (0 is reserved)
<SequenceId> *Invocation request sequence ID* </SequenceId>	Required field and type is 32 bit unsignedInt (0 is reserved)
<!--Here is specific invocation notification message-->	
<CisUpdateNotification>	Required field
<ContentUpdateId> *Content update ID* </ContentUpdateId>	Required field. See the definition of service data type ContentUpdateId in media CIS
<SubscribeObjectId> *Subscribed media object ID* </SubscribeObjectId>	Required field. See the definition of service data type Type_ObjectId in media CIS
<ParentContainerId> *ID of parent container in which the update event occurred* </ParentContainerId>	Required field. See the definition of service data type Type_ObjectId (Container type) in media CIS
<EventObjectIds> *Media object ID list in which update event occurred*</EventObjectIds>	Optional field. Media object ID list that update event happened
<EventType> *Media object update event type* </EventType>	Required field. Type is string. The options are"ObjectInsert", "ObjectUpdate", "ObjectDelete"
<EventInfo> *Media object update event description* </EventInfo>	Optional field. Type is string
</CisUpdateNotification>	Required field
</Session>	Required field
</SOAP-ENV:Body>	Required field
</SOAP-ENV:Envelope>	Required field
NOTE Italics indicate where content is to be inserted; all other text in message definitions is fixed.	

Example:

The XML Schema of the specific notification message of content object update notification message is defined as:

```
<element name="CisUpdateNotification">
    <complexType>
        <sequence>
            <element name="ContentUpdateId" type="xsd:string"/>
            <element name="SubscribeObjectId" type="xsd:string"/>
            <element name="ParentContainerId"t ype="xsd:string"/>
            <element name="EventObjectIds" minOccurs="0">
                <complexType>
                    <sequence>
                        <element name="EventObjectId" type="xsd:string"
maxOccurs="unbounded"/>
                    </sequence>
                </complexType>
            </element>
            <element name="EventType">
                <complexType>
                    <choice>
                        <element name="ObjectInsert"/>
                        <element name="ObjectUpdate"/>
                        <element name="ObjectDelete"/>
                    </choice>
                </complexType>
            </element>
            <element name="EventInfo"type="xsd:string"minOccurs="0"/>
        </sequence>
    </complexType>
</element>
```

Table D.4 – File/directory object update notification message

Message	Field explanation
M-NOTIFY IGRS HTTP/1.1	HTTP EXTENDED COMMAND LINE
Host:Target host IP address:Port	Required field
MAN:"http://www.igrs.org/spec1.0";ns=01	Required field
01-IGRSVersion: IGRS/1.0	Required field, IGRS version number
01-IGRSMessageType: FamsServiceNotifyClient	Required field, content shall be this
01-SourceDeviceId: Source device identifier	Required field, type is URI
01-TargetDeviceId: Target device identifier	Required field, type is URI
01-SequenceId: Device pipe message sequence Id	Required field, type is 32 bit unsignedInt (0 is reserved)
Content-Length:message body length	Required field
Content-type:text/xml; charset=utf-8	Required field
MAN:"http://schemas.xmlsoap.org/soap/envelope/";ns=02	Required field
02-SoapAction:"IGRS-FamsServiceToClient-Notify"	Required field

Message	Field explanation
	Shall be empty
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">	Required field
<SOAP-ENV:Body>	Required field
<Session xmlns="http://www.igrs.org/spec1.0" request="NoResponse">	Required field, "request" attribute indicates that no response is needed.
<SourceServiceId> *Source Service identifier* </SourceServiceId>	Required field, type is 32 bit unsignedInt (0 is reserved)
<TargetClientId>*Target client identifier*</TargetClientId>	Required field, type is 32 bit UnsignedInt (0 is reserved)
<SequenceId>*Invocation request sequence Id* </SequenceId>	Required field, type is 32 bit unsignedInt (0 is reserved)
<!--Here is the specific notification message-->	
<FamsUpdateNotification>	Required field
<SubscribeObjectId>The subscribed file/directory object identifier </SubscribeObjectId>	Required field, refer to the Type_ObjectId data type definition in Annex C
<ParentDirectoryId> *ID of parent directory in which the update event occurred* </ParentDirectoryId>	Required field, refer to Type_ObjectId data type definition in Annex C
<EventObjectIdList> *File/Directory object ID list in which update event occurred* </EventObjectIdList>	Optional field, refer to Type_ObjectIdList data type definition in Annex C. The updated object identifier list.
<EventType>*File/directory object update event type* </EventType>	Required field, type is string, The options are: "ChildrenAdded", "ChildrenDeleted", "NameChanged", "AccessRightChanged", "ContentChanged", "SelfDeleted"
</FamsUpdateNotification>	Required field
</Session>	Required field
</SOAP-ENV:Body>	Required field
</SOAP-ENV:Envelope>	Required field
NOTE Italics indicate where content is to be inserted; all other text in message definitions is fixed.	

NOTE

The XML Schema of a specific notification message in the file/directory object update notification message is defined as:

```
<element name="FamsUpdateNotification">
    <complexType>
        <sequence>
            <element name="SubscribeObjectId" type="xsd:string"/>
            <element name="ParentDirectoryId" type="xsd:string"/>
            <element name="EventObjectIdList" minOccurs="0">
                <complexType>
                    <sequence>
                        <element name="EventObjectId" type="xsd:string"
minOccurs="1" maxOccurs="unbounded"/>
                    </sequence>
                </complexType>
            </element>
            <element name="EventType">
```

```
                    <complexType>
                        <choice>
                            <element name="ChildrenAdded/>
                            <element name="ChildrenDeleted"/>
                            <element name="NameChanged"/>
                            <element name="AccessRightChanged"/>
                <element name="ContentChanged"/>
                            <element name="SelfDeleted"/>
                        </choice>
                    </complexType>
                </element>
            </sequence>
        </complexType>
    </element>
```

D.1.5 Service attribute update notification message

The Service can notify the Client (IGRS dynamic service invocation module) based on the session setup with the Client (IGRS dynamic service invocation module) when a service attribute changes. This message does not require a response. The message definition is shown in Table D.5.

Table D.5 – Service attribute update notification message

Message	Field explanation
M-NOTIFY /IGRS HTTP/1.1	HTTP EXTENDED COMMAND LINE
Host:Target host IP address:Port	Required field
MAN:"http://www.igrs.org/spec1.0";ns=01	Required field
01-IGRSVersion: IGRS/1.0	Required field, IGRS version number
01-IGRSMessageType:ServiceNotifyClient	Required field, content shall be this
01-SourceDeviceId: Source Device identifier	Required field, type is URI
01-TargetDeviceId: Target Device Identifier	Required field, type is URI
01-SequenceId: Device pipe message sequence Id	Required field, type is 32 bit unsignedInt (0 is reserved)
Content-Length:message body length	Required field
Content-type:text/xml; charset=utf-8	Required field
MAN:"http://schemas.xmlsoap.org/soap/envelope/";ns=02	Required field
02-SoapAction:"IGRS-ServiceToClient-Notify"	Required field
	Shall be empty
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">	Required field
<SOAP-ENV:Body>	Required field
<Session xmlns="http://www.igrs.org/spec1.0" request="NoResponse">	Required field, "request" attribute indicates that no response is needed
<SourceServiceId> *Source Service Identifier*</SourceServiceId>	Required field, type is 32 bit unsignedInt (0 is reserved)
<TargetClientId> *Target Client Identifier* </TargetClientId>	Required field, type is 32 bit unsignedInt (0 is reserved)
<SequenceId> *Invocation request sequence Id* </SequenceId>	Required field, type is 32 bit unsignedInt (0 is reserved)
<!--Here is the specific notification message-->	
<ServiceAttributeUpdateNotification>	Required field

Message	Field explanation
<SubscriptionId> *Subscription Identifier*</SubscriptionId>	Required field, string, Subscription Identifier
<ServiceAttributeName>*The updating Service attribute name* </ServiceAttributeName>	Required field, type is string, the updating service attribute name
<ServiceAttributeValue > *Value of service attribute in which update event occurred* </ ServiceAttributeValue >	Required field, type is string
</ServiceAttributeUpdateNotification>	Required field
</Session>	Required field
</SOAP-ENV:Body>	Required field
</SOAP-ENV:Envelope>	Required field
NOTE Italics indicate where content is to be inserted; all other text in message definitions is fixed.	

NOTE

XML Schema of a specific notification message in the service attribute update notification message is defined as:

```
<element name="ServiceAttributeUpdateNotification">
    <complexType>
        <sequence>
            <element name="SubscriptionId" type="xsd:string"/>
            <element name="ServiceAttributeName" type="xsd:string"/>
            <element name="ServiceAttributeValue" type="xsd:string"/>
        </sequence>
    </complexType>
</element>
```

D.2 Content index service

D.2.1 Service data type

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">

        <include
schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-metadata-item.xsd">
            <annotation>
                <documentation xml:lang="en">
                    Item metadata definition of IGRS Content Index Service is included
here.
                </documentation>
            </annotation>
        </include>

        <include
schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-metadata-container.xsd">
            <annotation>
                <documentation xml:lang="en">
                    Container metadata definition of IGRS Content Index Service is
included here.
                </documentation>
            </annotation>
        </include>

        <include
schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-framework.xsd ">
            <annotation>
                <documentation xml:lang="en">
                    Content representational framework definition of IGRS Content Index
Service is included here.
                </documentation>
```

```
            </annotation>
        </include>

        <simpleType name="Type_ObjectId">
            <restriction base="string" />
        </simpleType>

        <complexType name="Type_AttributeList">
            <sequence>
                <element name="Attribute" type="string" minOccurs="1"
maxOccurs="unbounded" />
            </sequence>
        </complexType>

        <complexType name="Type_ContentList">
            <sequence>
                <element name="Container" type="igrs:Type_Container" minOccurs="0"
maxOccurs="unbounded" />
                <element name="Item" type="igrs:Type_Item" minOccurs="0"
maxOccurs="unbounded" />
            </sequence>
        </complexType>

        <simpleType name="Type_FilterRule">
            <restriction base="string" />
        </simpleType>

        <simpleType name="Type_BrowseFlag">
            <restriction base="string">
                <enumeration value="CONSTANT_CONTAINERSELFINFO" />
                <enumeration value="CONSTANT_CONTAINERCHILDRENINFO" />
            </restriction>
        </simpleType>

        <simpleType name="Type_SortRule">
            <restriction base="string" />
        </simpleType>

        <simpleType name="Type_Count">
            <restriction base="int" />
        </simpleType>

        <simpleType name="Type_TransferInstanceId">
            <restriction base="unsignedInt" />
        </simpleType>

        <simpleType name="Type_TransferInstanceIds">
            <list itemType="igrs:Type_TransferInstanceId" />
        </simpleType>

        <simpleType name="Type_TransferState">
            <restriction base="string">
                <enumeration value="IN_PROGRESS" />
                <enumeration value="STOPPED" />
                <enumeration value="COMPLETED" />
                <enumeration value="ERROR" />
            </restriction>
        </simpleType>

        <simpleType name="Type_Length">
            <restriction base="string" />
```

```
        </simpleType>

        <complexType name="Type_TagList">
            <sequence>
                <choice minOccurs="0" maxOccurs="unbounded">
                    <any namespace="##other" processContents="lax" />
                    <any namespace="##local" processContents="lax" />
                </choice>
            </sequence>
        </complexType>

        <simpleType name="Type_URI">
            <restriction base="string" />
        </simpleType>

        <simpleType name="Type_SearchCapabilityList">
            <list itemType="string" />
        </simpleType>

        <simpleType name="Type_SortCapabilityList">
            <list itemType="string" />
        </simpleType>

        <simpleType name="Type_AttributeValueSearchCapabilityList">
            <list itemType="string" />
        </simpleType>

        <simpleType name="Type_ContentUpdateId">
            <restriction base="unsignedInt" />
        </simpleType>

        <simpleType name="Type_SearchAttributeName">
            <restriction base="string" />
        </simpleType>

        <complexType name="Type_AttributeValueList">
            <sequence>
                <element name="AttributeValue" type="string" minOccurs="0"
maxOccurs="unbounded" />
            </sequence>
        </complexType>

        <complexType name="Type_UserList">
            <sequence>
                <element name="User" type="string" minOccurs="0"
maxOccurs="unbounded" />
            </sequence>
        </complexType>
</schema>
```

D.2.2 Content index service invocation message format

D.2.2.1 GetSearchCapabilityList

D.2.2.1.1 GetSearchCapabilityListRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService "
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetSearchCapabilityListRequest">
        <complexType />
    </element>
</schema>
```

D.2.2.1.2 GetSearchCapabilityListResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetSearchCapabilityListResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="SearchCaps" type="igrs:Type_SearchCapabilityList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.2 GetSortCapabilityList

D.2.2.2.1 GetSortCapabilityListRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetSortCapabilityListRequest">
        <complexType />
    </element>
</schema>
```

D.2.2.2.2 GetSortCapabilityListResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetSortCapabilityListResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="SortCaps" type="igrs:Type_SortCapabilityList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.3 GetAttributeValueSearchCapabilityList

D.2.2.3.1 GetAttributeValueSearchCapabilityListRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetAttributeValueSearchCapabilityListRequest">
        <complexType />
    </element>
</schema>
```

D.2.2.3.2 GetAttributeValueSearchCapabilityListResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetAttributeValueSearchCapabilityListResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element  name="SearchAttributeValueCaps"  type="igrs:Type_AttributeList"
/>
            </sequence>
```

```
        </complexType>
    </element>
</schema>
```

D.2.2.4 GetContentUpdateId

D.2.2.4.1 GetContentUpdateIdRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetContentUpdateIdRequest">
        <complexType />
    </element>
</schema>
```

D.2.2.4.2 GetContentUpdateIdResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetContentUpdateIdResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="ContentUpdateId" type="igrs:Type_ContentUpdateId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.5 Browse

D.2.2.5.1 BrowseRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="BrowseRequest">
        <complexType>
            <sequence>
                <element name="ObjectId" type="igrs:Type_ObjectId" />
                <element name="BrowseFlag" type="igrs:Type_BrowseFlag" />
                <element name="BrowseRule" type="igrs:Type_FilterRule" />
                <element name="Offset" type="igrs:Type_Offset" />
                <element name="RequestCount" type="igrs:Type_Count" />
                <element name="SortRule" type="igrs:Type_SortRule" />
                <element name="ResultScale" type="igrs:Type_AttributeList" minOccurs="0"
/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.5.2 BrowseResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="BrowseResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="Result" type="igrs:Type_ContentList" />
                <element name="NumberReturned" type="igrs:Type_Count" />
```

```
                <element name="ContainerNumberTotal" type="igrs:Type_Count"
    minOccurs="0" />
                <element name="ItemNumberTotal" type="igrs:Type_Count" minOccurs="0"
    />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.6 Search

D.2.2.6.1 SearchRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="SearchRequest">
        <complexType>
            <sequence>
                <element name="ObjectId" type="igrs:Type_ObjectId" />
                <element name="SearchRule" type="igrs:Type_FilterRule" />
                <element name="Offset" type="igrs:Type_Offset" />
                <element name="RequestCount" type="igrs:Type_Count" />
                <element name="SortRule" type="igrs:Type_SortRule" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.6.2 SearchResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="SearchResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="Result" type="igrs:Type_ContentList" />
                <element name="NumberReturned" type="igrs:Type_Count" />
                <element name="NumberTotalMatched" type="igrs:Type_Count"
minOccurs="0" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.7 GetAttributeList

D.2.2.7.1 GetAttributeListRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetAttributeListRequest">
        <complexType>
            <sequence>
                <element name="ObjectId" type="igrs:Type_ObjectId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.7.2 GetAttributeListResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
```

```
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetAttributeListResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="AttributeList" type="igrs:Type_AttributeList" />
                <element name="NumberReturned" type="igrs:Type_Count" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.8 SearchAttributeValue

D.2.2.8.1 SearchAttributeValueRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="SearchAttributeValueRequest">
        <complexType>
            <sequence>
                <element name="ObjectId" type="igrs:Type_ObjectId" />
                <element name="SearchAttributeName"
    type="igrs:Type_SearchAttributeName" />
                <element name="Offset" type="igrs:Type_Count" />
                <element name="RequestCount" type="igrs:Type_Count" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.8.2 SearchAttributeValueResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="SearchAttributeValueResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="AttributeValueList" type="igrs:Type_AttributeValueList" />
                <element name="NumberReturned" type="igrs:Type_Count" />
                <element name="NumberTotalMatched" type="igrs:Type_Count"
minOccurs="0" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.9 ConvertMediaFormat

D.2.2.9.1 ConvertMediaFormatRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="ConvertMediaFormatRequest">
        <complexType>
            <sequence>
                <element name="ObjectId" type="igrs:Type_ObjectId" />
                <element name="CurrentMediaFormat" type="igrs:Type_MediaFormat" />
                <element name="TargetMediaFormat" type="igrs:Type_MediaFormat" />
            </sequence>
```

```
        </complexType>
    </element>
</schema>
```

D.2.2.9.2 ConvertMediaFormatResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="ConvertMediaFormatResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.10 CreateObject

D.2.2.10.1 CreateObjectRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="CreateObjectRequest">
        <complexType>
            <sequence>
                <element name="ContainerId" type="igrs:Type_ObjectId" />
                <element name="Elements" type="igrs:Type_ContentList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.10.2 CreateObjectResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="CreateObjectResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="ObjectId" type="igrs:Type_ObjectId" />
                <element name="Result" type="igrs:Type_ContentList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.11 DestroyObject

D.2.2.11.1 DestroyObjectRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="DestroyObjectRequest">
        <complexType>
            <sequence>
                <element name="ObjectId" type="igrs:Type_ObjectId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.11.2 DestroyObjectResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="DestroyObjectResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.12 UpdateObject

D.2.2.12.1 UpdateObjectRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="UpdateObjectRequest">
        <complexType>
            <sequence>
                <element name="ObjectId" type="igrs:Type_ObjectId" />
                <element name="CurrentTag" type="igrs:Type_TagList" />
                <element name="NewTag" type="igrs:Type_TagList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.12.2 UpdateObjectResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="UpdateObjectResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.13 ImportResource

D.2.2.13.1 ImportResourceRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="ImportResourceRequest">
        <complexType>
            <sequence>
                <element name="SourceURI" type="igrs:Type_URI" />
                <element name="DestinationURI" type="igrs:Type_URI" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.13.2 ImportResourceResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
```

```
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="ImportResourceResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="TransferInstanceId" type="igrs:Type_TransferInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.14 ExportResource

D.2.2.14.1 ExportResourceRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="ExportResourceRequest">
        <complexType>
            <sequence>
                <element name="SourceURI" type="igrs:Type_URI" />
                <element name="DestinationURI" type="igrs:Type_URI" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.14.2 ExportResourceResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="ExportResourceResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="TransferInstanceId" type="igrs:Type_TransferInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.15 StopTransferResource

D.2.2.15.1 StopTransferResourceRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="StopTransferResourceRequest">
        <complexType>
            <sequence>
                <element name="TransferInstanceId" type="igrs:Type_TransferInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.15.2 StopTransferResourceResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="StopTransferResourceResponse">
```

```
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.16 GetTransferInstanceIds

D.2.2.16.1 GetTransferInstanceIdsRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetTransferInstanceIdsRequest">
        <complexType />
    </element>
</schema>
```

D.2.2.16.2 GetTransferInstanceIdsResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
        <element name="GetTransferInstanceIdsResponse">
            <complexType>
                <sequence>
                    <element name="ReturnCode" type="unsignedInt" />
                    <element name="TransferIntanceIds"
type="igrs:Type_TransferInstanceIds" />
                </sequence>
            </complexType>
        </element>
</schema>
```

D.2.2.17 GetTransferState

D.2.2.17.1 GetTransferStateRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetTransferStateRequest">
        <complexType>
            <sequence>
                <element name="TransferInstanceId" type="igrs:Type_TransferInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.17.2 GetTransferStateResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="GetTransferStateResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="TransferState" type="igrs:Type_TransferState" />
                <element name="TransferLength" type="igrs:Type_Length" />
                <element name="TransferTotal" type="igrs:Type_Length" />
            </sequence>
        </complexType>
```

```
    </element>
</schema>
```

D.2.2.18 DeleteResource

D.2.2.18.1 DeleteResourceRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="DeleteResourceRequest">
        <complexType>
            <sequence>
                <element name="ResourceURI" type="igrs:Type_URI" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.18.2 DeleteResourceResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="DeleteResourceResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.19 PersonalizedSearch

D.2.2.19.1 PersonalizedSearchRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="PersonalizedSearchRequest">
        <complexType>
            <sequence>
                <element name="ObjectId" type="igrs:Type_ObjectId" />
                <element name="Users" type="igrs:Type_UserList" minOccurs="0" />
                <element name="SearchRule" type="igrs:Type_FilterRule" />
                <element name="Offset" type="igrs:Type_Count" />
                <element name="RequestCount" type="igrs:Type_Count" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.19.2 PersonalizedSearchResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="PersonalizedSearchResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="Result" type="igrs:Type_ContentList" />
```

```
                <element name="NumberReturned" type="igrs:Type_Count" />
                <element name="NumberTotalMatched" type="igrs:Type_Count"
minOccurs="0" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.20 PersonalizedRecommend

D.2.2.20.1 PersonalizedRecommendRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="PersonalizedRecommendRequest">
        <complexType>
            <sequence>
                <element name="ObjectId" type="igrs:Type_ObjectId" />
                <element name="Users" type="igrs:Type_UserList" minOccurs="0" />
                <element name="Offset" type="igrs:Type_Count" />
                <element name="RequestCount" type="igrs:Type_Count" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.2.2.20.2 PersonalizedRecommendResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">
    <element name="PersonalizedRecommendResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="Result" type="igrs:Type_ContentList" />
                <element name="NumberReturned" type="igrs:Type_Count" />
                <element name="NumberTotalMatched" type="igrs:Type_Count"
minOccurs="0" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.3 Connection management service

D.3.1 Service data type

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService"
            xmlns:cis="http://www.igrs.org/igrs/ContentIndexService">

            <complexType name="Type_ProtocolInfoList">
                <sequence>
                    <element name="ProtocolInfo" type="igrs:Type_ProtocolInfo"
maxOccurs="unbounded" />
                </sequence>
            </complexType>

            <complexType name="Type_ProtocolInfo">
                <sequence>
                    <element name="TransportProtocol">
```

```
                        <complexType>
                            <sequence>
                                <element name="Port" type="string" minOccurs="0"
maxOccurs="unbounded" />
                            </sequence>
                            <attribute name="Name" type="string" />
                        </complexType>
                    </element>
                    <element name="ControlProtocol" minOccurs="0">
                        <complexType>
                            <sequence>
                                <element name="Port" type="string" minOccurs="0"
maxOccurs="unbounded" />
                            </sequence>
                            <attribute name="Name" type="string" />
                        </complexType>
                    </element>
                </sequence>
            </complexType>

            <simpleType name="Type_ConnectionManagementServiceId">
                <restriction base="string" />
            </simpleType>

            <simpleType name="Type_ConnectionId">
                <restriction base="int" />
            </simpleType>

            <simpleType name="Type_TransportInstanceId">
                <restriction base="int" />
            </simpleType>

            <simpleType name="Type_ConnectionIdList">
                <list itemType="string" />
            </simpleType>

            <simpleType name="ConnectionStateType">
                <restriction base="string">
                    <enumeration value="OK" />
                    <enumeration value="DISCONNECTED" />
                    <enumeration value="CONTENTFORMATMISMATCH" />
                    <enumeration value="INSUFFICIENTBANDWIDTH" />
                    <enumeration value="INSUFFICIENTBANDWIDTH" />
                    <enumeration value="UNRELIABLECHANNEL" />
                    <enumeration value="UNKNOWN" />
                </restriction>
            </simpleType>

            <complexType name="Type_MediaFormatList">
                <sequence>
                    <element name="MediaFormat" type="cis:Type_MediaFormat"
maxOccurs="unbounded" />
                </sequence>
            </complexType>

            <complexType name="Type_IPList">
                <sequence>
                    <element name="IP" type="string" maxOccurs="unbounded" />
                </sequence>
            </complexType>
```

```
            <simpleType name="Type_RenderingManagementInstanceID">
                <restriction base="int" />
            </simpleType>

            <simpleType name="Type_ConnectionRoleFlag">
                <restriction base="string">
                    <enumeration value="ASSERVER" />
                    <enumeration value="ASCLIENT" />
                </restriction>
            </simpleType>

</schema>
```

D.3.2 Service invocation message format

D.3.2.1 GetProtocolInfo

D.3.2.1.1 GetProtocolInfoRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ConnectionManagementService"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService">
    <element name="GetProtocolInfoRequest">
        <complexType />
    </element>
</schema>
```

D.3.2.1.2 GetProtocolInfoResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ConnectionManagementService"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService">
    <element name="GetProtocolInfoResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="ProtocolInfoList" type="igrs:Type_ProtocolInfoList" />
                <element name="MediaFormatList" type="igrs:Type_MediaFormatList" />
                <element name="IPList" type="igrs:Type_IPList" minOccurs="0" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.3.2.2 PrepareForConnection

D.3.2.2.1 PrepareForConnectionRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ConnectionManagementService"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService">
    <element name="PrepareForConnectionRequest">
        <complexType>
            <sequence>
                <element name="RemoteProtocolInfo" type="igrs:Type_ProtocolInfo" />
                <element name="PeerCMSId"
type="igrs:Type_ConnectionManagementServiceId" miniOccurs="0" />
                <element name="PeerConnectionId" type="igrs:Type_ConnectionId"
miniOccurs="0" />
                <element name="ConnectionRoleFlag"
type="igrs:Type_ConnectionRoleFlag" />
                <element name="PeerIPList" type="igrs:Type_IPList" minOccurs="0" />
            </sequence>
        </complexType>
```

```
    </element>
</schema>
```

D.3.2.2.2 PrepareForConnectionResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ConnectionManagementService"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService">
    <element name="PrepareForConnectionResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="ConnectionId" type="igrs:Type_ConnectionId" />
                <element name="TransportInstanceId" type="igrs:Type_TransportInstanceId"
miniOccurs="0" />
                <element name="RmsId" type="igrs:Type_RenderingManagementInstanceId"
minOccurs="0" />
                <element name="UsableIPList" type="igrs:Type_IPList" miniOccurs="0" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.3.2.3 ReleaseConnection

D.3.2.3.1 ReleaseConnectionRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ConnectionManagementService"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService">
    <element name="ReleaseConnectionRequest">
        <complexType>
            <sequence>
                <element name="ConnectionId" type="igrs:Type_ConnectionId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.3.2.3.2 ReleaseConnectionResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ConnectionManagementService"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService">
    <element name="ReleaseConnectionResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.3.2.4 GetActiveConnectionIdList

D.3.2.4.1 GetActiveConnectionIdListRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ConnectionManagementService"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService">
    <element name="GetActiveConnectionIdListRequest">
        <complexType />
</element></schema>
```

D.3.2.4.2 GetActiveConnectionIdListResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ConnectionManagementService"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService">
    <element name="GetActiveConnectionIdlistResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="ConnectionIdList" type="igrs:Type_ConnectionIdList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.3.2.5 GetCurrentConnectionInfo

D.3.2.5.1 GetCurrentConnectionInfoRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ConnectionManagementService"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService">
    <element name="GetCurrentConnectionInfoRequest">
        <complexType>
            <sequence>
                <element name="ConnectionId" type="igrs:Type_ConnectionId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.3.2.5.2 GetCurrentConnectionInfoResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/ConnectionManagementService"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService">
    <element name="GetCurrentConnectionInfoResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="TransportInstanceId" type="igrs:Type_TransportInstanceId"
minOccurs="0" />
                <element name="ProtocolInfo" type="igrs:Type_ ProtocolInfo" />
                <element name="PeerCMSId"
type="igrs:Type_ConnectionManagementServiceId" />
                <element name="PeerConnectionId" type="igrs:Type_ConnectionId" />
                <element name="ConnectionState" type="igrs:Type_ConnectionState" />
                <element name="RmsId" type="igrs:Type_RenderingManagementInstanceId"
miniOccurs="0" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4 Media server transport management service

D.4.1 Service data type

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService"
            xmlns:cis="http://www.igrs.org/igrs/ContentIndexService">

            <simpleType name="Type_TransportState">
                <restriction base="string">
```

```
            <enumeration value="PLAYING" />
            <enumeration value="PAUSED_PLAYBACK" />
            <enumeration value="PAUSED_RECORDING" />
            <enumeration value="STOPPED" />
            <enumeration value="RECORDING" />
            <enumeration value="TRANSITIONING" />
            <enumeration value="NO_MEDIA_PRESENT" />
            <enumeration value="COMPLETE" />
            <enumeration value="ERROR_OCCURRED" />
        </restriction>
    </simpleType>

    <simpleType name="Type_StorageMediaName">
        <restriction base="string">
            <enumeration value="BD" />
            <enumeration value="CD-DA" />
            <enumeration value="CD-R" />
            <enumeration value="CD-ROM" />
            <enumeration value="CD-RW" />
            <enumeration value="CF" />
            <enumeration value="DV" />
            <enumeration value="DVD+R" />
            <enumeration value="DVD+RW" />
            <enumeration value="DVD-AUDIO" />
            <enumeration value="DVD-R" />
            <enumeration value="DVD-RAM" />
            <enumeration value="DVD-RW" />
            <enumeration value="DVD-ROM" />
            <enumeration value="HDD" />
            <enumeration value="MD" />
            <enumeration value="MMC" />
            <enumeration value="MS" />
            <enumeration value="NETWORK" />
            <enumeration value="NONE" />
            <enumeration value="NOT_IMPLEMENTED" />
            <enumeration value="SD" />
            <enumeration value="VHS" />
            <enumeration value="VIDEO-CD" />
            <enumeration value="UNKNOWN" />
        </restriction>
    </simpleType>

    <simpleType name="Type_PlayMode">
        <restriction base="string">
            <enumeration value="NORMAL" />
            <enumeration value="SHUFFLE" />
            <enumeration value="REPEAT_ONE" />
            <enumeration value="REPEAT_ALL" />
            <enumeration value="RANDOM" />
            <enumeration value="DIRECT_1" />
            <enumeration value="INTRO" />
        </restriction>
    </simpleType>

    <simpleType name="Type_PlaySpeed">
        <restriction base="string">
            <enumeration value="NORMAL" />
            <enumeration value="FASTFORWARD" />
            <enumeration value="SLOWFORWARD" />
            <enumeration value="FASTBACKWARD" />
            <enumeration value="SLOWBACKWARD" />
```

```
            </restriction>
        </simpleType>

        <simpleType name="Type_MediaTimeLength">
            <restriction base="string" />
        </simpleType>

        <complexType name="Type_TransportURIList">
            <sequence>
                <element name="TransportURI" type="igrs:Type_TransportURI"
minOccurs="1" maxOccurs="unbounded" />
            </sequence>
        </complexType>

        <simpleType name="Type_TransportURI">
            <restriction base="string" />
        </simpleType>

        <complexType name="Type_ItemList">
            <sequence>
                <element name="Item" type="cis:Type_Item" minOccurs="0"
maxOccurs="unbounded" />
            </sequence>
        </complexType>

        <simpleType name="Type_SeekMode">
            <restriction base="string">
                <enumeration value="TRACK_NR" />
                <enumeration value="TAPE_INDEX" />
                <enumeration value="ABS_COUNT" />
                <enumeration value="REL_COUNT" />
                <enumeration value="ABS_TIME" />
                <enumeration value="REL_TIME" />
                <enumeration value="FRAME" />
            </restriction>
        </simpleType>

        <simpleType name="Type_SeekTargetPosition">
            <restriction base="string" />
        </simpleType>

        <simpleType name="Type_TransportInstanceId">
            <restriction base="int" />
        </simpleType>

        <simpleType name="Type_Count">
            <restriction base="int" />
        </simpleType>

        <simpleType name="Type_TimeLength">
            <restriction base="unsignedInt" />
        </simpleType>

        <simpleType name="Type_TimeShiftSwitch">
            <restriction base="string">
                <enumeration value="OPEN" />
                <enumeration value="CLOSE" />
            </restriction>
        </simpleType>

        <simpleType name="Type_SelectionId">
            <restriction base="string" />
```

```
            </simpleType>
</schema>
```

D.4.2 Service invocation message format

D.4.2.1 SetTransportURIList

D.4.2.1.1 SetTransportURIListRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="SetTransportURIListRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="TransportURIList" type="igrs:Type_TransportURIList" />
                <element name="ItemList" type="igrs:Type_ItemList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.1.2 SetTransportURIListResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="SetTransportURIListResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.2 GetTransportInfo

D.4.2.2.1 GetTransportInfoRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="GetTransportInfoRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.2.2 GetTransportInfoResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="GetTransportInfoResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentTransportState" type="igrs:Type_TransportState" />
                <element name="CurrentSpeed" type="igrs:Type_PlaySpeed" />
            </sequence>
```

```
        </complexType>
    </element>
</schema>
```

D.4.2.3 Play

D.4.2.3.1 PlayRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="PlayRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="Offset" type="igrs:Type_Count" />
                <element name="Speed" type="igrs:Type_PlaySpeed" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.3.2 PlayResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="PlayResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
</element></schema>
```

D.4.2.4 Next

D.4.2.4.1 NextRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="NextRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.4.2 NextResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="NextResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.5 Previous

D.4.2.5.1 PreviousRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="PreviousRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.5.2 PreviousResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="PreviousResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.6 Stop

D.4.2.6.1 StopRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="StopRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.6.2 StopResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService "
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="StopResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.7 Pause

D.4.2.7.1 PauseRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService "
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="PauseRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.7.2 PauseResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="PauseResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.8 Resume

D.4.2.8.1 ResumeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="ResumeRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.8.2 ResumeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="ResumeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.9 Seek

D.4.2.9.1 SeekRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
```

```
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="SeekRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="Unit" type="igrs:Type_SeekMode" />
                <element name="Target" type="igrs:Type_SeekTargetPosition" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.9.2 SeekResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="SeekResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.10 TimeShift

D.4.2.10.1 TimeShiftRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="TimeShiftRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="ShiftTime" type="igrs:Type_TimeLength" />
                <element name="TimeShiftSwitch" type="igrs:Type_TimeShiftSwitch" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.10.2 TimeShiftResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="TimeShiftResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.11 GetPlayURIList

D.4.2.11.1 GetPlayURIListRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
```

```
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="GetPlayURIListRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.11.2 GetPlayURIListResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="GetPlayURIListResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="TransportURIList" type="igrs:Type_TransportURIList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.12 GetAllMediaInfo

D.4.2.12.1 GetAllMediaInfoRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="GetAllMediaInfoRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.12.2 GetAllMediaInfoResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="GetAllMediaInfoResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="ItemList" type="igrs:Type_ItemList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.13 GetCurrentMediaInfo

D.4.2.13.1 GetCurrentMediaInfoRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
```

```
    <element name="GetCurrentMediaInfoRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.13.2 GetCurrentMediaInfoResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="GetCurrentMediaInfoResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="ElapsedDuration" type="igrs:Type_MediaTimeLength" />
                <element name="CurrentURI" type="igrs:Type_TransportURI" />
                <element name="Item" type="igrs:Type_Item" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.14 GetPlayMode

D.4.2.14.1 GetPlayModeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="GetPlayModeRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.14.2 GetPlayModeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="GetPlayModeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="PlayMode" type="igrs:Type_PlayMode" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.15 SetPlayMode

D.4.2.15.1 SetPlayModeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
```

```
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="SetPlayModeRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="NewPlayMode" type="igrs:Type_PlayMode" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.15.2 SetPlayModeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="SetPlayModeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.16 SelectSubtitle

D.4.2.16.1 SelectSubtitleRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name=" ">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="SelectionId" type="igrs:Type_SelectionId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.16.2 SelectSubtitleResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="SelectSubtitleResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.17 SelectAudioTrack

D.4.2.17.1 SelectAudioTrackRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="SelectAudioTrackRequest">
```

```
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="SelectionId" type="igrs:Type_SelectionId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.4.2.17.2 SelectAudioTrackResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaServerTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaServerTransportManagementService">
    <element name="SelectAudioTrackResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5 Media client transport management service

D.5.1 Service data type

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService"
            xmlns:cis="http://www.igrs.org/igrs/ContentIndexService">

            <simpleType name="Type_TransportState">
                <restriction base="string">
                    <enumeration value="PLAYING" />
                    <enumeration value="PAUSED_PLAYBACK" />
                    <enumeration value="PAUSED_RECORDING" />
                    <enumeration value="STOPPED" />
                    <enumeration value="RECORDING" />
                    <enumeration value="TRANSITIONING" />
                    <enumeration value="NO_MEDIA_PRESENT" />
                    <enumeration value="COMPLETE" />
                    <enumeration value="ERROR_OCCURRED" />
                </restriction>
            </simpleType>

            <simpleType name="Type_StorageMediaName">
                <restriction base="string">
                    <enumeration value="BD" />
                    <enumeration value="CD-DA" />
                    <enumeration value="CD-R" />
                    <enumeration value="CD-ROM" />
                    <enumeration value="CD-RW" />
                    <enumeration value="CF" />
                    <enumeration value="DV" />
                    <enumeration value="DVD+R" />
                    <enumeration value="DVD+RW" />
                    <enumeration value="DVD-AUDIO" />
                    <enumeration value="DVD-R" />
                    <enumeration value="DVD-RAM" />
                    <enumeration value="DVD-RW" />
                    <enumeration value="DVD-ROM" />
                    <enumeration value="HDD" />
```

```
                    <enumeration value="MD" />
                    <enumeration value="MMC" />
                    <enumeration value="MS" />
                    <enumeration value="NETWORK" />
                    <enumeration value="NONE" />
                    <enumeration value="NOT_IMPLEMENTED" />
                    <enumeration value="SD" />
                    <enumeration value="VHS" />
                    <enumeration value="VIDEO-CD" />
                    <enumeration value="UNKNOWN" />
                </restriction>
            </simpleType>

            <simpleType name="Type_PlayMode">
                <restriction base="string">
                    <enumeration value="NORMAL" />
                    <enumeration value="SHUFFLE" />
                    <enumeration value="REPEAT_ONE" />
                    <enumeration value="REPEAT_ALL" />
                    <enumeration value="RANDOM" />
                    <enumeration value="DIRECT_1" />
                    <enumeration value="INTRO" />
                </restriction>
            </simpleType>

            <simpleType name="Type_PlaySpeed">
                <restriction base="string">
                    <enumeration value="NORMAL" />
                    <enumeration value="FASTFORWARD" />
                    <enumeration value="SLOWFORWARD" />
                    <enumeration value="FASTBACKWARD" />
                    <enumeration value="SLOWBACKWARD" />
                </restriction>
            </simpleType>

            <simpleType name="Type_MediaTimeLength">
                <restriction base="string" />
            </simpleType>

            <complexType name="Type_TransportURIList">
                <sequence>
                    <element name="TransportURI" type="igrs:Type_TransportURI"
minOccurs="1" maxOccurs="unbounded" />
                </sequence>
            </complexType>

            <simpleType name="Type_TransportURI">
                <restriction base="string" />
            </simpleType>

            <complexType name="Type_ItemList">
                <sequence>
                    <element name="Item" type="cis:Type_Item" minOccurs="0"
maxOccurs="unbounded" />
                </sequence>
            </complexType>

            <simpleType name="Type_SeekMode">
                <restriction base="string">
                    <enumeration value="TRACK_NR" />
                    <enumeration value="TAPE_INDEX" />
                    <enumeration value="ABS_COUNT" />
```

```
            <enumeration value="REL_COUNT" />
            <enumeration value="ABS_TIME" />
            <enumeration value="REL_TIME" />
            <enumeration value="FRAME" />
        </restriction>
    </simpleType>

    <simpleType name="Type_SeekTargetPosition">
        <restriction base="string" />
    </simpleType>

    <simpleType name="Type_TransportInstanceId">
        <restriction base="int" />
    </simpleType>

    <simpleType name="Type_Count">
        <restriction base="int" />
    </simpleType>

    <simpleType name="Type_RecordInput">
        <restriction base="string">
            <enumeration value="ANALOG" />
            <enumeration value="DIGITAL" />
        </restriction>
    </simpleType>

    <simpleType name="Type_RecordBitRateType">
        <restriction base="string">
            <enumeration value="FIXED" />
            <enumeration value="VARIABLE" />
        </restriction>
    </simpleType>

    <simpleType name="Type_RecordBitRate">
        <restriction base="unsignedInt" />
    </simpleType>

    <simpleType name="Type_RecordAudioSampleRate">
        <restriction base="unsignedInt" />
    </simpleType>

    <simpleType name="Type_RecordAudioBitRate">
        <restriction base="unsignedInt" />
    </simpleType>

    <simpleType name="Type_RecordVideoFormat">
        <restriction base="string" />
    </simpleType>

    <simpleType name="Type_TimeLength">
        <restriction base="unsignedInt" />
    </simpleType>

    <simpleType name="Type_TimeShiftSwitch">
        <restriction base="string">
            <enumeration value="OPEN" />
            <enumeration value="CLOSE" />
        </restriction>
    </simpleType>

    <simpleType name="Type_SelectionId">
```

```
            <restriction base="string" />
        </simpleType>
</schema>
```

D.5.2 Service invocation message format

D.5.2.1 SetTransportURIList

D.5.2.1.1 SetTransportURIListRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="SetTransportURIListRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="TransportURIList" type="igrs:Type_TransportURIList" />
                <element name="ItemList" type="igrs:Type_ItemList" minOccurs="0" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.1.2 SetTransportURIListResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="SetTransportURIListResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.2 GetTransportInfo

D.5.2.2.1 GetTransportInfoRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="GetTransportInfoRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.2.2 GetTransportInfoResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="GetTransportInfoResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentTransportState" type="igrs:Type_TransportState" />
                <element name="CurrentSpeed" type="igrs:Type_PlaySpeed" />
```

```
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.3 Play

D.5.2.3.1 PlayRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="PlayRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="Speed" type="igrs:Type_PlaySpeed" />
                <element name="Offset" type="igrs:Type_Count" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.3.2 PlayResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="PlayResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.4 Next

D.5.2.4.1 NextRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="NextRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.4.2 NextResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="NextResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
```

```
    </element>
</schema>
```

D.5.2.5 Previous

D.5.2.5.1 PreviousRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="PreviousRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.5.2 PreviousResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="PreviousResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.6 Stop

D.5.2.6.1 StopRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="StopRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.6.2 StopResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="StopResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.7 Pause

D.5.2.7.1 PauseRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="PauseRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.7.2 PauseResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="PauseResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.8 Resume

D.5.2.8.1 ResumeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="ResumeRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.8.2 ResumeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="ResumeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.9 Seek

D.5.2.9.1 SeekRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
```

```
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="SeekRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="Unit" type="igrs:Type_SeekMode" />
                <element name="Target" type="igrs:Type_SeekTargetPosition" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.9.2 SeekResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="SeekResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.10 TimeShift

D.5.2.10.1 TimeShiftRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="TimeShiftRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="ShiftTime" type="igrs:Type_TimeLength" />
                <element name="TimeShiftSwitch" type="igrs:Type_TimeShiftSwitch" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.10.2 TimeShiftResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="TimeShiftResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.11 GetPlayURIList

D.5.2.11.1 GetPlayURIListRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
```

```
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="GetPlayURIListRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.11.2 GetPlayURIListResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="GetPlayURIListResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="TransportURIList" type="igrs:Type_TransportURIList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.12 GetAllMediaInfo

D.5.2.12.1 GetAllMediaInfoRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="GetAllMediaInfoRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.12.2 GetAllMediaInfoResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="GetAllMediaInfoResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="ItemList" type="igrs:Type_ItemList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.13 GetCurrentMediaInfo

D.5.2.13.1 GetCurrentMediaInfoRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
```

```
    <element name="GetCurrentMediaInfoRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.13.2 GetCurrentMediaInfoResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="GetCurrentMediaInfoResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="ElapsedDuration" type="igrs:Type_MediaTimeLength" />
                <element name="CurrentURI" type="igrs:Type_TransportURI" />
                <element name="Item" type="igrs:Type_Item" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.14 GetPlayMode

D.5.2.14.1 GetPlayModeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="GetPlayModeRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.14.2 GetPlayModeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="GetPlayModeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="PlayMode" type="igrs:Type_PlayMode" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.15 SetPlayMode

D.5.2.15.1 SetPlayModeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
```

```
    <element name="SetPlayModeRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="NewPlayMode" type="igrs:Type_PlayMode" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.15.2 SetPlayModeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="SetPlayModeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.16 Record

D.5.2.16.1 RecordRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="RecordRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="RecordInput" type="igrs:Type_RecordInput" />
                <element name="RecordBitRateType" type="igrs:Type_RecordBitRateType"
/>
                <element name="RecordBitRate" type="igrs:Type_RecordBitRate"
minOccurs="0" />
                <element name="RecordAudioSampleRate"
type="igrs:Type_RecordAudioSampleRate" minOccurs="0" />
                <element name="RecordAudioBitRate"
type="igrs:Type_RecordAudioBitRate" minOccurs="0" />
                <element name="RecordVideoFormat" type="igrs:Type_RecordVideoFormat"
miniOccur="0" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.16.2 RecordResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="RecordResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
```

```
</schema>
```

D.5.2.17 PauseRecord

D.5.2.17.1 PauseRecordRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService0"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="PauseRecordRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.17.2 PauseRecordResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="PauseRecordResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.18 ResumeRecord

D.5.2.18.1 ResumeRecordRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="ResumeRecordRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.18.2 ResumeRecordResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="ResumeRecordResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.19 StopRecord

D.5.2.19.1 StopRecordRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="StopRecordRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
            </sequence>
        </complexType>
    </element></schema>
```

D.5.2.19.2 StopRecordResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="StopRecordResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.20 SelectSubtitle

D.5.2.20.1 SelectSubtitleRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="SelectSubtitleRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="SelectionId" type="igrs:Type_SelectionId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.20.2 SelectSubtitleResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="SelectSubtitleResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.21 SelectAudioTrack

D.5.2.21.1 SelectAudioTrackRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="SelectAudioTrackRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="igrs:Type_TransportInstanceId" />
                <element name="SelectionId" type="igrs:Type_SelectionId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.5.2.21.2 SelectAudioTrackResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/MediaClientTransportManagementService"
targetNamespace="http://www.igrs.org/igrs/MediaClientTransportManagementService">
    <element name="SelectAudioTrackResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6 Rendering management service

D.6.1 Service data type

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">

            <simpleType name="Type_PresetProfileList">
                <restriction base="string" />
            </simpleType>

            <simpleType name="Type_PresetProfile">
                <restriction base="string" />
            </simpleType>

            <simpleType name="Type_Brightness">
                <restriction base="unsignedInt" />
            </simpleType>

            <simpleType name="Type_Contrast">
                <restriction base="unsignedInt" />
            </simpleType>

            <simpleType name="Type_Sharpness">
                <restriction base="unsignedInt" />
            </simpleType>

            <simpleType name="Type_VideoGain">
                <restriction base="unsignedInt" />
            </simpleType>

            <simpleType name="Type_VideoGreyLevel">
```

```
    <restriction base="unsignedInt" />
</simpleType>

<simpleType name="Type_ColorTemperature">
    <restriction base="unsignedInt" />
</simpleType>

<simpleType name="Type_MuteState">
    <restriction base="boolean" />
</simpleType>

<simpleType name="Type_Volume">
    <restriction base="unsignedInt" />
</simpleType>

<simpleType name="Type_LoudnessSwitch">
    <restriction base="boolean" />
</simpleType>

<simpleType name="Type_PlayChannel">
    <restriction base="string">
        <enumeration value="MASTER" />
        <enumeration value="LF" />
        <enumeration value="RF" />
        <enumeration value="CF" />
        <enumeration value="LFE" />
        <enumeration value="LS" />
        <enumeration value="RS" />
        <enumeration value="LFC" />
        <enumeration value="RFC" />
        <enumeration value="SB" />
        <enumeration value="SL" />
        <enumeration value="SR" />
        <enumeration value="T" />
        <enumeration value="B" />
    </restriction>
</simpleType>

<simpleType name="Type_RenderingManagementInstanceId">
    <restriction base="int" />
</simpleType>

<simpleType name="Type_DisplayWindowId">
    <restriction base="unsignedInt" />
</simpleType>

<complexType name="Type_DisplayWindowSize">
    <sequence>
        <element name="Width" type="int" minOccurs="0" />
        <element name="Height" type="int" minOccurs="0" />
    </sequence>
</complexType>

<complexType name="Type_DisplayWindowPosition">
    <sequence>
        <element name="CenterX" type="int" minOccurs="0" />
        <element name="CenterY" type="int" minOccurs="0" />
        <element name="CenterZ" type="int" minOccurs="0" />
    </sequence>
</complexType>
```

```
            <complexType name="Type_DisplayWindowInfo">
                <sequence>
                    <element name="DisplayWindowId" type="igrs:Type_DisplayWindowId"
/>
                    <element name="DisplayWindowPosition"
type="igrs:Type_DisplayWindowPosition" />
                    <element name="DisplayWindowSize"
type="igrs:Type_DisplayWindowSize" />
                    <element name="DisplayURI" type="string" />
                    <element name="DisplayMode" type="string" />
                </sequence>
            </complexType>

            <complexType name="Type_DisplayWindowInfoList"
type="DisplayWindowInfoListType">
                <sequence>
                    <element name="DisplayWindowInfo"
type="igrs:Type_DisplayWindowInfo" minOccurs="0" maxOccurs="unbounded" />
                </sequence>
            </complexType>
</schema>
```

D.6.2 Service invocation message format

D.6.2.1 ListPresets

D.6.2.1.1 ListPresetsRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="ListPresetsRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.1.2 ListPresetsResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="ListPresetsResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentPresetProfile" type="igrs:Type_PresetProfileList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.2 SelectPresets

D.6.2.2.1 SelectPresetsRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SelectPresetsRequest">
        <complexType>
```

```
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="PresetProfileList" type="igrs:Type_PresetProfileList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.2.2 SelectPresetsResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SelectPresetsResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.3 GetBrightness

D.6.2.3.1 GetBrightnessRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetBrightnessRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.3.2 GetBrightnessResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetBrightnessResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentBrightness" type="igrs:Type_Brightness" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.4 SetBrightness

D.6.2.4.1 SetBrightnessRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetBrightnessRequest">
        <complexType>
```

```
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="DesiredBrightness" type="igrs:Type_Brightness" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.4.2 SetBrightnessResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetBrightnessResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.5 GetContrast

D.6.2.5.1 GetContrastRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetContrastRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.5.2 GetContrastResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetContrastResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentContrast" type="igrs:Type_Contrast" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.6 SetContrast

D.6.2.6.1 SetContrastRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetContrastRequest">
        <complexType>
            <sequence>
```

```
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="DesiredContrast" type="igrs:Type_Contrast" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.6.2 SetContrastResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetContrastResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.7 GetSharpness

D.6.2.7.1 GetSharpnessRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetSharpnessRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.7.2 GetSharpnessResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">   <element
name="GetSharpnessResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentSharpness" type="igrs:Type_Sharpness" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.8 SetSharpness

D.6.2.8.1 SetSharpnessRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetSharpnessRequest">
        <complexType>
            <sequence>
```

```
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="DesiredSharpness" type="igrs:Type_Sharpness" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.8.2 SetSharpnessResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetSharpnessResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.9 GetVideoGain

D.6.2.9.1 GetVideoGainRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetVideoGainRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.9.2 GetVideoGainResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetVideoGainResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentVideoGain" type="igrs:Type_VideoGain" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.10 SetVideoGain

D.6.2.10.1 SetVideoGainRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetVideoGainRequest">
        <complexType>
            <sequence>
```

```
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="DesiredVideoGain" type="igrs:Type_VideoGain" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.10.2 SetVideoGainResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetVideoGainResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.11 GetVideoGreyLevel

D.6.2.11.1 GetVideoGreyLevelRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetVideoGreyLevelRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.11.2 GetVideoGreyLevelResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetVideoGreyLevelResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentVideoGreyLevel" type="igrs:Type_VideoGreyLevel"
/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.12 SetVideoGreyLevel

D.6.2.12.1 SetVideoGreyLevelRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetVideoGreyLevelRequest">
        <complexType>
```

```
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="DesiredVideoGreyLevel" type="igrs:Type_VideoGreyLevel"
/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.12.2 SetVideoGreyLevelResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetVideoGreyLevelResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.13 GetColorTemperature

D.6.2.13.1 GetColorTemperatureRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetColorTemperatureRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.13.2 GetColorTemperatureResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetColorTemperatureResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentColorTemperature"
type="igrs:Type_ColorTemperature" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.14 SetColorTemperature

D.6.2.14.1 SetColorTemperatureRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
```

```
    <element name="SetColorTemperatureRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="DesiredColorTemperature"
type="igrs:Type_ColorTemperature" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.14.2 SetColorTemperatureResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetColorTemperatureResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.15 GetMute

D.6.2.15.1 GetMuteRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetMuteRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="Channel" type="igrs:Type_PlayChannel" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.15.2 GetMuteResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetMuteResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentMute" type="igrs:Type_MuteState" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.16 SetMute

D.6.2.16.1 SetMuteRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetMuteRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="Channel" type="igrs:Type_PlayChannel" />
                <element name="DesiredMute" type="igrs:Type_MuteState" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.16.2 SetMuteResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetMuteResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.17 GetVolume

D.6.2.17.1 GetVolumeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService0">
    <element name="GetVolumeRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="Channel" type="igrs:Type_PlayChannel" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.17.2 GetVolumeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetVolumeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentVolume" type="igrs:Type_Volume" />
            </sequence>
        </complexType>
    </element>
```

```
</schema>
```

D.6.2.18 SetVolume

D.6.2.18.1 SetVolumeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetVolumeRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="Channel" type="igrs:Type_PlayChannel" />
                <element name="DesiredVolume" type="igrs:Type_Volume" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.18.2 SetVolumeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetVolumeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.19 GetLoudness

D.6.2.19.1 GetLoudnessRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetLoudnessRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="Channel" type="igrs:Type_PlayChannel" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.19.2 GetLoudnessResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetLoudnessResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="CurrentLoudness" type="igrs:Type_LoudnessSwitch" />
```

```
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.20 SetLoudness

D.6.2.20.1 SetLoudnessRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetLoudnessRequest">
        <complexType>
            <sequence>
                <element name="InstanceId"
type="igrs:Type_RenderingManagementInstanceId" />
                <element name="Channel" type="igrs:Type_PlayChannel" />
                <element name="DesiredLoudness" type="igrs:Type_Loudness" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.20.2 SetLoudnessResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetLoudnessResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.21 GetPlayerDisplayAttribute

D.6.2.21.1 GetPlayerDisplayAttributeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetPlayerDisplayAttributeRequest">
        <complexType />
    </element>
</schema>
```

D.6.2.21.2 GetPlayerDisplayAttributeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetPlayerDisplayAttributeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="PlayerDisplayAttribute"
type="igrs:Type_DisplayWindowInfo" />
            </sequence>
        </complexType>
    </element>
```

```
</schema>
```

D.6.2.22 GetAllDisplayWindowInfo

D.6.2.22.1 GetAllDisplayWindowInfoRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetAllDisplayWindowInfoRequest">
        <complexType />
    </element>
</schema>
```

D.6.2.22.2 GetAllDisplayWindowInfoResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetAllDisplayWindowInfoResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="DisplayWindowInfoList"
type="igrs:Type_DisplayWindowInfoList" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.23 GetDisplayWindowSize

D.6.2.23.1 GetDisplayWindowSizeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetDisplayWindowSizeRequest">
        <complexType>
            <sequence>
                <element name="WindowId" type="igrs:Type_DisplayWindowId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.23.2 GetDisplayWindowSizeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetDisplayWindowSizeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="DisplayWindowSize" type="igrs:Type_DisplayWindowSize"
/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.24 SetDisplayWindowSize

D.6.2.24.1 SetDisplayWindowSizeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetDisplayWindowSizeRequest">
        <complexType>
            <sequence>
                <element name="WindowId" type="igrs:Type_DisplayWindowId" />
                <element name="DesiredDisplayWindowSize"
type="igrs:Type_DisplayWindowSize" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.24.2 SetDisplayWindowSizeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetDisplayWindowSizeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
</element></schema>
```

D.6.2.25 GetDisplayWindowPosition

D.6.2.25.1 GetDisplayWindowPositionRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetDisplayWindowPositionRequest">
        <complexType>
            <sequence>
                <element name="WindowId" type="igrs:Type_DisplayWindowId" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.25.2 GetDisplayWindowPositionResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="GetDisplayWindowPositionResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
                <element name="DisplayWindowSize"
type="igrs:Type_DisplayWindowPosition" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.26 SetDisplayWindowPosition

D.6.2.26.1 SetDisplayWindowPositionRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetDisplayWindowPositionRequest">
        <complexType>
            <sequence>
                <element name="WindowId" type="igrs:Type_DisplayWindowId" />
                <element name="DesiredDisplayWindowPosition"
type="igrs:Type_DisplayWindowPosition" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.6.2.26.2 SetDisplayWindowPosition Response

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/igrs/RenderingManagementService"
targetNamespace="http://www.igrs.org/igrs/RenderingManagementService">
    <element name="SetDisplayWindowPositionResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt" />
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7 File access management service

D.7.1 Service data type

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
        <element name="Type_AuthenticationKey" type="xsd:string"/>
        <element name="Type_InstanceId" type="xsd:string"/>
        <element name="Type_ObjectId" type="xsd:string"/>
        <element name="Type_SubscriptionId" type="xsd:string"/>
        <element name="Type_FilterRule" type="xsd:string"/>
        <element name="Type_SortRule" type="xsd:string"/>
        <element name="Type_ServiceAttributeName" type="xsd:string"/>
        <element name="Type_Count" type="xsd:int"/>
        <element name="Type_SortCapability" type="xsd:string"/>
        <element name="Type_SearchCapability" type="xsd:string"/>
        <element name="Type_DeleteMode" type="xsd:string"/>
        <element name="Type_UserAuthenticationInfo" type="UserAuthenticationInfoType"/>
        <element name="Type_ObjectAttribute" type="ObjectAttributeType"/>
        <element name="Type_ObjectURI" type="xsd:string"/>
        <element name="Type_ObjectIdList">
            <complexType>
                <sequence>
                    <element name="ObjectId"type="xsd:string"
                        minOccurs="1"maxOccurs="unbounded"/>
                </sequence>
            </complexType>
        </element>
        <element name="Type_ObjectList">
            <complexType>
```

```
            <sequence>
                <element name="Object" type="ObjectAttributeType" minOccurs="0"/>
            </sequence>
        </complexType>
    </element>
    <element name="Type_ObjectURITreeList">
        <complexType>
            <sequence>
                <element name="ObjectURITree" type="ObjectURITreeType"
                  minOccurs="1" maxOccurs="unbounded"/>
            </sequence>
        </complexType>
    </element>
    <complexType name="ObjectURITreeType">
        <attribute name="ObjectAttribute" type="ObjectAttributeType"/>
        <attribute name="ObjectURI" type ="xsd:string"/>
            <sequence>
                <element name="ObjectURITree" type="ObjectURITreeType"
                  minOccurs="0" maxOccurs="unbounded"/>
            </sequence>
    </complexType>
    <complexType name="UserAuthenticationInfoType">
        <sequence>
            <element name="UserInfo"minOccurs="0">
                <complexType>
                    <sequence>
                        <element name="UserName" type="xsd:string"/>
                        <element name="UserPassword" type="xsd:string"/>
                    </sequence>
                </complexType>
            </element>
            <element name="DeviceInfo" minOccurs="0">
                <complexType>
                    <sequence>
                        <element name="DeviceId" type="xsd:string"/>
                        <element name="DeviceName" type="xsd:string"/>
                    </sequence>
                </complexType>
            </element>
            <element name="3rdPartyAuthen" minOccurs="0">
                <complexType>
                    <sequence>
                        <element name="3rdPartyAuthenType" type="string"/>
                    </sequence>
                </complexType>
            </element>
        </sequence>
    </complexType>
    <complexType name="ObjectAttributeType">
        <sequence>
            <element name="ObjectType" type="xsd:string"/>
            <element name="ObjectId" type="xsd:string"/>
            <element name="ObjectName" type="xsd:string"/>
            <element name="ParentId" type="xsd:string" minOccurs="0"/>
            <element name="DeviceId" type="xsd:string" minOccurs="0"/>
            <element name="DeviceName" type="xsd:string" minOccurs="0"/>
            <element name="AccessRight">
                <complexType>
                    <sequence>
                        <element name="Read" type="xsd:string" minOccurs="0"/>
                        <element name="Write" type="xsd:string" minOccurs="0"/>
                        <element name="Hide" type="xsd:string" minOccurs="0"/>
```

```
                                        </sequence>
                    </complexType>
                </element>
                <element name="CreateTime" type="xsd:string" minOccurs="0"/>
                <element name="LastAccessTime" type="xsd:string" minOccurs="0"/>
                <element name="LastWriteTime" type="xsd:string" minOccurs="0"/>
                <element name="Size" type="xsd:string" minOccurs="0"/>
                <element name="Num_SubDirectories" type="unsignedInt" minOccurs="0"/>
                <element name="Num_SubFiles" type="unsignedInt" minOccurs="0"/>
            </sequence>
        </complexType>
</schema>
```

D.7.2 Service invocation message format

D.7.2.1 GetAuthenticationKey

D.7.2.1.1 GetAuthenticationKeyRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetAuthenticationKeyRequest">
        <complexType>
            <sequence>
                <element name="InstanceId" type="string"/>
                <element name="UserAuthenticationInfo"
            type="Type_UserAuthenticationInfo"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.1.2 GetAuthenticationKeyResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetAuthenticationKeyResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="AuthenticationKey" type="string"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.2 GetSortCapability

D.7.2.2.1 GetSortCapabilityRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetSortCapabilityRequest"/>
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.2.2 GetSortCapabilityResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetSortCapabilityResponse>
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="SortCaps" ref="igrs:Type_SortCapability"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.3 GetSearchCapability

D.7.2.3.1 GetSearchCapabilityRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetSearchCapabilityRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.3.2 GetSearchCapabilityResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetType_SearchCapabilityResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="SearchCaps" ref="igrs:Type_SearchCapability"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.4 Browse

D.7.2.4.1 BrowseRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="BrowseRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="ObjectId" type="Type_ObjectId"/>
                <element name="BrowseFilter" type="Type_FilterRule"/>
                <element name="StartOffset" type="Type_Count"/>
                <element name="RequestedCount" type="Type_Count"/>
                <element name="SortRule" type="Type_SortRule"/>
            </sequence>
        </complexType>
```

```
    </element>
</schema>
```

D.7.2.4.2 BrowseResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="BrowseResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                 <element name="Result" type="Type_ObjectList"/>
                 <element name="NumberReturned" type="Type_Count"/>
                <element name="NumberTotalMatched" type="Type_Count"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.5 GetAttribute

D.7.2.5.1 GetAttributeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetAttributeRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="ObjectId" type="Type_ObjectId"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.5.2 GetAttributeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetFileAttributeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="ObjectAttribute" type="Type_ObjectAttribute"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.6 SetAttribute

D.7.2.6.1 SetAttribute Request

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SetAttributeRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
```

```
                <element name="ObjectId" type="Type_ObjectId"/>
                <element name="ObjectAttribute" type="Type_ObjectAttribute"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.6.2 SetAttributeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SetAttributeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.7 Search

D.7.2.7.1 SearchRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SearchRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="ObjectIdList" type="Type_ObjectIdList"/>
                <element name="SearchRule" type="Type_FilterRule"/>
                <element name="StartOffset" type="Type_Count"/>
                <element name="RequestedCount" type="Type_Count"/>
                <element name="SortRule" type="Type_SortRule"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.7.2 SearchResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SearchResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="Result" type="Type_ObjectList"/>
                <element name="NumberReturned" type="Type_Count"/>
                <element name="NumberTotalMatched" type="Type_Count"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.8 GetBrowseFilter

D.7.2.8.1 GetBrowseFilterRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
```

```
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetBrowseFilterRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.8.2 GetBrowseFilterResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetBrowseFilterResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="BrowseFilter" type="Type_FilterRule"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.9 SetBrowseFilter

D.7.2.9.1 SetBrowseFilterRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SetBrowseFilterRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="BrowseFilter" type="Type_FilterRule"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.9.2 SetBrowseFilterResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SetBrowseFilterResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.10 New

D.7.2.10.1 NewRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="NewRequest">
        <complexType>
```

```
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="ParentId" type="Type_ObjectId"/>
                <element name="ObjectAttribute" type="Type_ObjectAttribute"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.10.2 NewResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="NewResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="ObjectId" type="Type_ObjectId"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.11 Copy

D.7.2.11.1 CopyRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="CopyRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="SourceObjectId" type="Type_ObjectId"/>
                <element name="DestParentId" type="Type_ObjectId"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.11.2 CopyResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="CopyResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="DestObjectId" type="Type_ObjectId"/>
                <element name="DestObjectAttribute" type="Type_ObjectAttribute"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.12 Move

D.7.2.12.1 MoveRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
```

```
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="MoveRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="SourceObjectId" type="Type_ObjectId"/>
                <element name="DestParentId" type="Type_ObjectId"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.12.2 MoveResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="MoveResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="DestObjectId" type="Type_ObjectId"/>
                <element name="DestObjectAttribute" type="Type_ObjectAttribute"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.13 Delete

D.7.2.13.1 DeleteRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="DeleteRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                    <element name="ObjectId" type="Type_ObjectId"/>
                    <element name="DeleteMode" type="Type_DeleteMode"/>
                </sequence>
            </complexType>
    </element>
</schema>
```

D.7.2.13.2 DeleteResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="DeleteResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.14 PrepareforDownload

D.7.2.14.1 PrepareforDownload Request

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="PrepareforDownloadRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string">
                <element name="SourceObjectIdList" type="Type_ObjectIdList"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.14.2 PrepareforDownloadResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="PrepareforDownloadResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                    <element name="SourceObjectURITreeList"
            type="Type_ObjectURITreeList"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.15 PrepareforUpload

D.7.2.15.1 PrepareforUploadRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="PrepareforUploadRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="ObjectAttribute" type="Type_ObjectAttribute"/>
                <element name="DestParentId" type="Type_ObjectId"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.15.2 PrepareforUploadResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="PrepareforUploadResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="DestParentURI" type="Type_ObjectURI"/>
            </sequence>
        </complexType>
    </element>
```

```
</schema>
```

D.7.2.16 SubscribeObjectChange

D.7.2.16.1 SubscribeObjectChangeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SubscribeObjectChangeRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="ObjectId" type="Type_ObjectId"/>
            </sequecne>
        </complextType>
    </element>
</schema>
```

D.7.2.16.2 SubscribeObjectChangeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SubscribeObjectChangeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.17 UnSubscribeServiceAttribute

D.7.2.17.1 UnSubscribeServiceAttributeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="UnSubscribeServiceAttributeRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="ObjectId" type="Type_ObjectId"/>
            </sequecne>
        </complextType>
    </element>
</schema>
```

D.7.2.17.2 UnSubscribeServiceAttributeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="UnSubscribeServiceAttributeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.18 SubscribeServiceAttribute

D.7.2.18.1 SubscribeServiceAttributeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SubscribeServiceAttributeRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="ServiceAttributeName" type="string"/>
            </sequecne>
        </complextType>
    </element>
</schema>
```

D.7.2.18.2 SubscribeServiceAttributeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SubscribeServiceAttributeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="SubscriptionId"type="string"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.7.2.19 UnsubscribeServiceAttribute

D.7.2.19.1 UnsubscribeServiceAttributeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="UnsubscribeServiceAttributeRequest">
        <complexType>
            <sequence>
                <element name="AuthenticationKey" type="string"/>
                <element name="SubscriptionId" type="string"/>
            </sequecne>
        </complextType>
    </element>
</schema>
```

D.7.2.19.2 UnsubscribeServiceAttributeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="UnsubscribeServiceAttributeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.8 File connection management service

D.8.1 Service data type

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
        <element name="Type_ProtocolInfoList" type="PortocolInfoListType"/>
    <element name="Type_ProtocolInfo" type="ProtocolInfoType"/>
    <element name="Type_ConnectionId" type="xsd:unsignedInt"/>
    <element name="Type_ServiceAttributeName" type="xsd:string"minOccurs="0"/>
    <element name="Type_SubscriptionId" type="xsd:string"minOccurs="0"/>
    <element name="Type_IPList"minOccurs="0">
        <complexType>
            <sequence>
                <element name="IP" type="xsd:string" maxOccurs="unbounded"/>
            </sequence>
        </complexType>
    </element>
    <complexType name="PortocolInfoListType">
        <sequence>
            <element name="ProtocolInfo" type="ProtocolInfoType"
                minOccurs="0" maxOccurs="unbounded"/>
        </sequence>
    </complexType>
    <complexType name="ProtocolInfoType">
        <sequence>
            <element name="TransportProtocol">
                <complexType>
                    <sequence>
                        <element name="Port" type="xsd: string"
                            minOccurs="0" maxOccurs="unbounded"/>
                    </sequence>
                    <attribute name="Name" type="xsd: string"/>
                </complexType>
            </element>
            <element name="ParameterList" type="xsd: string" minOccurs="0"/>
            <element name="AdditionalInfo" type="xsd: string" minOccurs="0"/>
        </sequence>
    </complexType>
```

D.8.2 Service invocation message format

D.8.2.1 GetProtocolInfo

D.8.2.1.1 GetProtocolInfoRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetProtocolInfoRequest"/>
</schema>
```

D.8.2.1.2 GetProtocolInfoResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="GetProtocolInfoResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="ProtocolInfoList" ref="igrs:Type_ProtocolInfoList"/>
```

```
            <element name="IPList" ref="igrs:Type_IPList"/>
        </sequence>
    </complexType>
</element>
</schema>
```

D.8.2.2 PrepareforConnection

D.8.2.2.1 PrepareforConnectionRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="PrepareforConnectionRequest">
        <complexType>
            <sequence>
                <element name="RemoteProtocolInfo" type="Type_ProtocolInfo"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.8.2.2.2 PrepareforConnectionResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="PrepareforConnectionResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="ConnectionId" type="Type_ConnectionId"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.8.2.3 ReleaseConnection

D.8.2.3.1 ReleaseConnectionRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="ReleaseConnectionRequest".
        <complexType>
            <sequence>
                <element name="ConnectionId" type="Type_ConnectionId"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.8.2.3.2 ReleaseConnectionResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="ReleaseConnectionResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
            </sequence>
        </complexType>
```

```
    </element>
</schema>
```

D.8.2.4 SubscribeServiceAttribute

D.8.2.4.1 SubscribeServiceAttributeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SubscribeServiceAttributeRequest">
        <complexType>
            <sequence>
                <element name="ServiceAttributeName" type="string"/>
            </sequecne>
        </complextType>
    </element>
</schema>
```

D.8.2.4.2 SubscribeServiceAttributeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="SubscribeServiceAttributeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
                <element name="SubscriptionId" type="string"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

D.8.2.5 UnsubscribeServiceAttribute

D.8.2.5.1 UnsubscribeServiceAttributeRequest

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="UnsubscribeServiceAttributeRequest">
        <complexType>
            <sequence>
                <element name="SubscriptionId" type="string"/>
            </sequecne>
        </complextType>
    </element>
</schema>
```

D.8.2.5.2 UnsubscribeServiceAttributeResponse

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:igrs="http://www.igrs.org/spec1.0"
targetNamespace="http://www.igrs.org/spec1.0">
    <element name="UnsubscribeServiceAttributeResponse">
        <complexType>
            <sequence>
                <element name="ReturnCode" type="unsignedInt"/>
            </sequence>
        </complexType>
    </element>
</schema>
```

Annex E
(normative)

IGRS XML schema files

E.1 igrs-cis-dt.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema xmlns="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    elementFormDefault="qualified" attributeFormDefault="unqualified">

    <xs:annotation>
        <xs:documentation xml:lang="en">
            Definition of basic types used in IGRS Content Index Service.
        </xs:documentation>
    </xs:annotation>

    <xs:simpleType name="dateTime">
        <xs:annotation>
            <xs:documentation>Definition of IGRS CIS dateTime type.</xs:documentation>
        </xs:annotation>
        <xs:restriction base="xs:dateTime" />
    </xs:simpleType>

    <xs:simpleType name="stringListType">
        <xs:list itemType="xs:string" />
    </xs:simpleType>

</xs:schema>
```

E.2 igrs-cis-framework.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema xmlns="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
    xmlns:dt="http://www.igrs.org/igrs/ContentIndexService"
    elementFormDefault="qualified" attributeFormDefault="unqualified">

    <xs:annotation>
        <xs:documentation xml:lang="en">
            Content representational framework definition of IGRS Content Index Service is
defined in this schema file.
        </xs:documentation>
    </xs:annotation>

    <xs:include
schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-metadata-item.xsd">
        <xs:annotation>
            <xs:documentation xml:lang="en">
                Item metadata definition of IGRS Content Index Service is included here.
            </xs:documentation>
        </xs:annotation>
    </xs:include>
```

```
    <xs:include
schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-metadata-container.xsd">
        <xs:annotation>
            <xs:documentation xml:lang="en">
                Container metadata definition of IGRS Content Index Service is included here.
            </xs:documentation>
        </xs:annotation>
    </xs:include>

    <xs:import namespace="http://www.igrs.org/igrs/ContentIndexService"
        schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-dt.xsd" />

    <!-- item definition -->
    <xs:complexType name="Type_Item">
        <xs:sequence>
            <xs:element name="ItemProperty" type="ItemPropertyType" />

            <!-- allow any element except from target namespace -->
            <xs:choice minOccurs="0" maxOccurs="unbounded">
                <xs:any namespace="##other" processContents="lax" />
                <xs:any namespace="##local" processContents="lax" />
            </xs:choice>
        </xs:sequence>

        <xs:anyAttribute namespace="##any" processContents="lax" />
    </xs:complexType>

    <!-- container definition -->
    <xs:complexType name="Type_Container">
        <xs:sequence>
            <xs:element name="ContainerProperty" type="ContainerPropertyType" />

            <!-- allow any element except from target namespace -->
            <xs:choice minOccurs="0" maxOccurs="unbounded">
                <xs:any namespace="##other" processContents="lax" />
                <xs:any namespace="##local" processContents="lax" />
            </xs:choice>
        </xs:sequence>

        <xs:attribute name="Num_containers" type="xs:unsignedInt" />
        <xs:attribute name="Num_items" type="xs:unsignedInt" />

        <xs:anyAttribute namespace="##any" processContents="lax" />
    </xs:complexType>

</xs:schema>
```

E.3 igrs-cis-metadata-base.xsd

```
<?xml version="1.0" encoding="utf-8" ?>
<xs:schema namespace="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
    xmlns:dt="http://www.igrs.org/igrs/ContentIndexService"
    elementFormDefault="qualified" attributeFormDefault="unqualified">

    <xs:annotation>
        <xs:documentation xml:lang="en">
            Content representational framework and base metadata definition of IGRS Content
Index Service.
```

```
            </xs:documentation>
        </xs:annotation>

        <xs:import namespace="http://www.igrs.org/igrs/ContentIndexService"
            schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-dt.xsd" />

        <xs:simpleType name="ItemObjectIdType">
            <xs:restriction base="xs:string">
                <xs:pattern
value="urn:[0-9a-fA-F]{8}(-[0-9a-fA-F]{4}){3}-[0-9a-fA-F]{12}:Item:[0-9a-fA-F]{8}(-[0-9a-fA-F]{4}
){3}-[0-9a-fA-F]{12}" />
            </xs:restriction>
        </xs:simpleType>

        <xs:simpleType name="ContainerObjectIdType">
            <xs:restriction base="xs:string">
                <xs:pattern
value="urn:[0-9a-fA-F]{8}(-[0-9a-fA-F]{4}){3}-[0-9a-fA-F]{12}:Container:^/([0-9a-zA-Z]+/?)*" />
            </xs:restriction>
        </xs:simpleType>

        <xs:complexType name="ObjectStoreAttributeType">
            <xs:sequence>
                <xs:element name="ReadOnly" type="xs:boolean" minOccurs="0" />
                <xs:element name="Hide" type="xs:boolean" minOccurs="0" />
                <xs:element name="Medium" minOccurs="0">
                    <xs:simpleType>
                        <xs:restriction base="xs:string">
                            <xs:enumeration value="BD" />
                            <xs:enumeration value="CD-DA" />
                            <xs:enumeration value="CD-R" />
                            <xs:enumeration value="CD-ROM" />
                            <xs:enumeration value="CD-RW" />
                            <xs:enumeration value="CF" />
                            <xs:enumeration value="DV" />
                            <xs:enumeration value="DVD+R" />
                            <xs:enumeration value="DVD+RW" />
                            <xs:enumeration value="DVD-AUDIO" />
                            <xs:enumeration value="DVD-R" />
                            <xs:enumeration value="DVD-RAM" />
                            <xs:enumeration value="DVD-RW" />
                            <xs:enumeration value="DVD-ROM" />
                            <xs:enumeration value="HDD" />
                            <xs:enumeration value="MD" />
                            <xs:enumeration value="MMC" />
                            <xs:enumeration value="MS" />
                            <xs:enumeration value="NETWORK" />
                            <xs:enumeration value="NONE" />
                            <xs:enumeration value="NOT_IMPLEMENTED" />
                            <xs:enumeration value="SD" />
                            <xs:enumeration value="VHS" />
                            <xs:enumeration value="VIDEO-CD" />
                            <xs:enumeration value="UNKNOWN" />
                        </xs:restriction>
                    </xs:simpleType>
                </xs:element>
            </xs:sequence>
        </xs:complexType>

        <xs:simpleType name="DeviceIdType">
            <xs:restriction base="xs:string">
```

```
            <xs:pattern
value="urn:IGRS:Device:DeviceId:[0-9a-fA-F]{8}(-[0-9a-fA-F]{4}){3}-[0-9a-fA-F]{12}" />
        </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="ItemIdType">
        <xs:restriction base="xs:string">
            <xs:pattern value="[0-9a-fA-F]{8}(-[0-9a-fA-F]{4}){3}-[0-9a-fA-F]{12}" />
        </xs:restriction>
    </xs:simpleType>

    <xs:complexType name="VendorMetaType">
        <xs:sequence>
            <!-- allow metadata from any other namespace to be used here -->
            <xs:any namespace="##other" minOccurs="0" maxOccurs="unbounded" />
        </xs:sequence>
        <xs:attribute name="VendorId" type="xs:string" />
        <xs:attribute name="MetaId" type="xs:string" />
    </xs:complexType>

</xs:schema>
```

E.4 igrs-cis-metadata-container.xsd

```
<?xml version="1.0" encoding="utf-8" ?>
<xs:schema xmlns="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
    xmlns:dt="http://www.igrs.org/igrs/ContentIndexService"
    elementFormDefault="qualified" attributeFormDefault="unqualified">

    <xs:annotation>
        <xs:documentation xml:lang="en">
            Container metadata definition of IGRS Content Index Service.
        </xs:documentation>
    </xs:annotation>

    <xs:include
schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-metadata-base.xsd" />

    <xs:import namespace="http://www.igrs.org/igrs/ContentIndexService"
        schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-dt.xsd" />

    <xs:complexType name="ContainerPropertyType">
        <xs:group ref="ContainerPropGroup" minOccurs="0" maxOccurs="unbounded" />
    </xs:complexType>

    <xs:group id="ContainerPropGroup">
        <xs:choice>
            <!-- ObjectId/ParentId to track the physical enclosing relationship between
containers -->
            <xs:element name="ObjectId" type="ContainerObjectIdType" />

            <xs:element name="ParentId" type="ContainerObjectIdType" />

            <!-- device properties -->
            <xs:element name="DeviceId" type="DeviceIdType" />

            <xs:element name="DeviceName" type="xs:string" />
```

```
                <!-- generic properties -->
                <xs:element name="ObjectType" type="xs:string" />

                <xs:element name="ObjectName" type="xs:string" />

                <xs:element name="ObjectPath" type="xs:string" />

                <xs:element name="ParentPath" type="xs:string" />

                <xs:element name="ObjectStoreAttribute" type="ObjectStoreAttributeType" />

                <xs:element name="CreateTime" type="dt:dateTime" />

                <xs:element name="LastAccessTime" type="dt:dateTime" />

                <xs:element name="LastWriteTime" type="dt:dateTime" />

                <xs:group ref="SpecificContainerTypeGroup" />

                <!-- extension point for vendor specific metadata -->
                <xs:element name="VendorMeta" type="VendorMetaType" />

                <xs:any namespace="##other" processContents="lax" />

                <xs:any namespace="##local" processContents="lax" />
            </xs:choice>
        </xs:group>

        <xs:group id="SpecificContainerTypeGroup">
            <xs:choice>
                <xs:group ref="FileFolderGroup" minOccurs="0" maxOccurs="unbounded" />
                <xs:group ref="AudioAlbumGroup" minOccurs="0" maxOccurs="unbounded" />
                <xs:group ref="VideoAlbumGroup" minOccurs="0" maxOccurs="unbounded" />
                <xs:group ref="LiveVideoContainerGroup" minOccurs="0"
maxOccurs="unbounded" />
                <xs:group ref="PhotoAlbumGroup" minOccurs="0" maxOccurs="unbounded" />
                <xs:group ref="ToCContainerGroup" minOccurs="0" maxOccurs="unbounded" />
                <xs:group ref="SummaryContainerGroup" minOccurs="0"
maxOccurs="unbounded" />
                <xs:group ref="BookmarkContainerGroup" minOccurs="0"
maxOccurs="unbounded" />
                <xs:group ref="PersonalizedContainerGroup" minOccurs="0"
maxOccurs="unbounded" />
            </xs:choice>
        </xs:group>

        <!-- FileFolder container type -->
        <xs:group id="FileFolderGroup">
            <xs:choice>
                <xs:element name="Description" type="xs:string" />
            </xs:choice>
        </xs:group>

        <!-- AudioAlbum container type -->
        <xs:group id="AudioAlbumGroup">
            <xs:choice>
                <xs:element name="Singer" type="xs:string" />
                <xs:element name="Genre" type="xs:string" />
                <xs:element name="MusicDisc" type="xs:string" />
                <xs:element name="Author" type="xs:string" />
                <xs:element name="Description" type="xs:string" />
            </xs:choice>
```

```
</xs:group>

<!-- VideoAlbum container type -->
<xs:group id="VideoAlbumGroup">
    <xs:choice>
        <xs:element name="ToC" type="ContainerToCType" />
        <xs:element name="Description" type="xs:string" />
    </xs:choice>
</xs:group>

<!-- LiveVideoContainer container type -->
<xs:group id="LiveVideoContainerGroup">
    <xs:choice>
        <xs:element name="Provider" type="xs:string" />
        <xs:element name="Description" type="xs:string" />
    </xs:choice>
</xs:group>

<!-- EPGContainer container type -->
<xs:group id="EPGContainerGroup">
    <xs:choice>
        <xs:element name="EPGProvider" type="xs:string" />
        <xs:element name="Description" type="xs:string" />
    </xs:choice>
</xs:group>

<!-- PhotoAlbum container type -->
<xs:group id="PhotoAlbumGroup">
    <xs:choice>
        <xs:element name="Summary" type="ItemIdType" />
        <xs:element name="Description" type="xs:string" />
    </xs:choice>
</xs:group>

<!-- ToCContainer container type -->
<xs:group id="ToCContainerGroup">
    <xs:choice>
    </xs:choice>
</xs:group>

<!-- SummaryContainer container type -->
<xs:group id="SummaryContainerGroup">
    <xs:choice>
    </xs:choice>
</xs:group>

<!-- BookmarkContainer container type -->
<xs:group id="BookmarkContainerGroup">
    <xs:choice>
    </xs:choice>
</xs:group>

<!-- PersonalizedContainer container type -->
<xs:group id="PersonalizedContainerGroup">
    <xs:choice>
        <xs:element name="ContentType" type="xs:string" />
        <xs:element name="UserInfo" type="xs:string" />
        <xs:element name="Genre" type="xs:string" />
        <xs:element name="Description" type="xs:string" />
    </xs:choice>
</xs:group>
```

```
    <xs:complexType name="ContainerToCType">
        <xs:sequence>
            <xs:element name="Video" minOccurs="0">
                <xs:complexType>
                    <xs:sequence>
                        <xs:element name="Title" type="xs:string" />
                        <xs:element name="Id" type="ItemIdType" />
                        <xs:element name="Offset" type="xs:string" minOccurs="0" />
                        <xs:element name="Dura" type="xs:string" minOccurs="0" />
                        <xs:element name="Ref" type="ItemIdType" minOccurs="0" />
                        <xs:element name="Desc" type="xs:string" minOccurs="0" />
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
        </xs:sequence>
    </xs:complexType>

</xs:schema>
```

E.5 igrs-cis-metadata-item.xsd

```
<?xml version="1.0" encoding="utf-8" ?>
<xs:schema xmlns="http://www.igrs.org/igrs/ContentIndexService"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
    xmlns:dt="http://www.igrs.org/igrs/ContentIndexService"
    elementFormDefault="qualified" attributeFormDefault="unqualified">

    <xs:annotation>
        <xs:documentation xml:lang="en">
            Item metadata definition of IGRS Content Index Service.
        </xs:documentation>
    </xs:annotation>

    <xs:include
schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-metadata-base.xsd" />

    <xs:import namespace="http://www.igrs.org/igrs/ContentIndexService"
        schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-dt.xsd" />

    <xs:complexType name="ItemPropertyType">
        <xs:group ref="ItemPropGroup" minOccurs="0" maxOccurs="unbounded" />
    </xs:complexType>

    <xs:group id="ItemPropGroup">
        <xs:choice>
            <!-- ObjectId/ParentId to track the physical enclosing relationship between item
and container -->
            <xs:element name="ObjectId" type="ItemObjectIdType" />

            <xs:element name="ParentId" type="ContainerObjectIdType" />

            <!-- device properties -->
            <xs:element name="DeviceId" type="DeviceIdType" />

            <xs:element name="DeviceName" type="xs:string" />

            <!-- generic properties -->
            <xs:element name="ObjectType" type="xs:string" />
```

```
            <xs:element name="ObjectName" type="xs:string" />
            <xs:element name="ObjectExtension" type="xs:string" />
            <xs:element name="MediaFormat" type="Type_MediaFormat" />
            <xs:element name="ObjectURI" type="xs:string" />
            <xs:element name="ObjectPath" type="xs:string" />
            <xs:element name="ParentPath" type="xs:string" />
            <xs:element name="Size" type="xs:string" />
            <xs:element name="ObjectStoreAttribute" type="ObjectStoreAttributeType" />
            <xs:element name="CreateTime" type="dt:dateTime" />
            <xs:element name="LastAccessTime" type="dt:dateTime" />
            <xs:element name="LastWriteTime" type="dt:dateTime" />
            <xs:element name="Encrypted" type="xs:string" />
            <xs:element name="DRMContentId" type="xs:string" />
            <xs:element name="HashId" type="HashIdType" />
            <xs:element name="Tspec" type="TspecType" />
            <xs:element name="Rank" type="xs:string" />
            <xs:element name="AVMCastGroupName" type="xs:string" />
            <!-- metadata of specific item type goes here -->
            <xs:group ref="SpecificItemTypeGroup" />
            <!-- extension point for vendor specific metadata -->
            <xs:element name="VendorMeta" type="VendorMetaType" />
            <xs:any namespace="##other" processContents="lax" />
            <xs:any namespace="##local" processContents="lax" />
        </xs:choice>
    </xs:group>

    <xs:complexType name="Type_MediaFormat">
        <xs:choice>
            <xs:group ref="MediaFormatGroup" minOccurs="0" maxOccurs="unbounded" />
        </xs:choice>
        <xs:attribute name="Name" type="xs:string" />
        <xs:attribute name="Type" type="xs:string" />
    </xs:complexType>

    <xs:group id="MediaFormatGroup">
        <xs:choice>
            <xs:element name="ContainerFormat" type="xs:string" />
            <xs:element name="AudioFormat" type="xs:string" />
            <xs:element name="VideoFormat" type="xs:string" />
            <xs:element name="PhotoFormat" type="xs:string" />
        </xs:choice>
```

```
    </xs:group>

    <xs:complexType name="HashIdType">
        <xs:sequence>
            <xs:element name="Type">
                <xs:simpleType>
                    <xs:restriction base="xs:string">
                        <xs:enumeration value="TITLE" />
                        <xs:enumeration value="CONTENT" />
                    </xs:restriction>
                </xs:simpleType>
            </xs:element>
            <xs:element name="Algorithm">
                <xs:simpleType>
                    <xs:restriction base="xs:string">
                        <xs:enumeration value="SCMCMAC" />
                        <xs:enumeration value="SHA-1" />
                        <xs:enumeration value="SHA-256" />
                    </xs:restriction>
                </xs:simpleType>
            </xs:element>
            <xs:element name="Value" type="xs:string" />
        </xs:sequence>
    </xs:complexType>

    <xs:complexType name="TspecType">
        <xs:sequence>
            <xs:element name="TspecEntry" minOccurs="1" maxOccurs="unbounded">
                <xs:complexType>
                    <xs:sequence>
                        <xs:element name="Name" type="xs:string" minOccurs="1" />
                        <xs:element name="Value" type="xs:string" minOccurs="1" />
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
        </xs:sequence>
    </xs:complexType>

    <xs:group id="SpecificItemTypeGroup">
        <xs:choice>
            <xs:group ref="AudioItemGroup" minOccurs="0" maxOccurs="unbounded" />
            <xs:group ref="VideoItemGroup" minOccurs="0" maxOccurs="unbounded" />
            <xs:group ref="LiveVideoItemGroup" minOccurs="0" maxOccurs="unbounded" />
            <xs:group ref="EPGItemGroup" minOccurs="0" maxOccurs="unbounded" />
            <xs:group ref="PhotoItemGroup" minOccurs="0" maxOccurs="unbounded" />
            <xs:group ref="DocItemGroup" minOccurs="0" maxOccurs="unbounded" />
            <xs:group ref="CameraItemGroup" minOccurs="0" maxOccurs="unbounded" />
            <xs:group ref="ScreenItemGroup" minOccurs="0" maxOccurs="unbounded" />
            <xs:group ref="BookmarkItemGroup" minOccurs="0" maxOccurs="unbounded" />
        </xs:choice>
    </xs:group>

    <!-- Audio item type -->
    <xs:group id="AudioItemGroup">
        <xs:choice>
            <xs:element name="Duration" type="xs:string" />
            <xs:element name="AudioSamplesPerSec" type="xs:string" />
            <xs:element name="ObjectTitle" type="xs:string" />
            <xs:element name="Singer" type="xs:string" />
            <xs:element name="Genre">
                <xs:simpleType>
                    <xs:restriction base="xs:string">
```

```
                        <xs:enumeration value="Baroque" />
                        <xs:enumeration value="Classical" />
                        <xs:enumeration value="Romantic" />
                        <xs:enumeration value="Opera" />
                        <xs:enumeration value="Folk" />
                        <xs:enumeration value="Rock" />
                        <xs:enumeration value="Pop" />
                        <xs:enumeration value="Blues" />
                        <xs:enumeration value="Electronica" />
                        <xs:enumeration value="Unknown" />
                    </xs:restriction>
                </xs:simpleType>
            </xs:element>
            <xs:element name="MusicDisc" type="xs:string" />
            <xs:element name="Author" type="xs:string" />
            <xs:element name="Summary" type="ItemIdType" />
            <xs:element name="Description" type="xs:string" />
        </xs:choice>
    </xs:group>

    <!-- Video item type -->
    <xs:group id="VideoItemGroup">
        <xs:choice>
            <xs:element name="Duration" type="xs:string" />
            <xs:element name="FrameRate" type="xs:string" />
            <xs:element name="AudioSamplesPerSec" type="xs:string" />
            <xs:element name="Width" type="xs:string" />
            <xs:element name="Height" type="xs:string" />
            <xs:element name="Genre">
                <xs:simpleType>
                    <xs:restriction base="xs:string">
                        <xs:enumeration value="Action" />
                        <xs:enumeration value="Adult" />
                        <xs:enumeration value="Adventure" />
                        <xs:enumeration value="Animation" />
                        <xs:enumeration value="Biography" />
                        <xs:enumeration value="Comedy" />
                        <xs:enumeration value="Children" />
                        <xs:enumeration value="Crime" />
                        <xs:enumeration value="Disaster" />
                        <xs:enumeration value="Drama" />
                        <xs:enumeration value="Fantasy" />
                        <xs:enumeration value="Horror" />
                        <xs:enumeration value="Musical" />
                        <xs:enumeration value="Sci-Fi" />
                        <xs:enumeration value="Short" />
                        <xs:enumeration value="Sport" />
                        <xs:enumeration value="Thriller" />
                        <xs:enumeration value="War" />
                        <xs:enumeration value="Western" />
                        <xs:enumeration value="Unknown" />
                    </xs:restriction>
                </xs:simpleType>
            </xs:element>
            <xs:element name="Author" type="xs:string" />
            <xs:element name="Roles">
                <xs:complexType>
                    <xs:sequence>
                        <xs:element name="Role" minOccurs="0"
maxOccurs="unbounded">
                            <xs:complexType>
```

```
                                    <xs:simpleContent>
                                        <xs:extension base="xs:string">
                                            <xs:attribute name="Name">
                                                <xs:simpleType>
                                                    <xs:simpleContent>
                                                        <xs:restriction base="xs:string">
                                                            <xs:enumeration value="Actor"
/>
                                                            <xs:enumeration value="Actress"
/>
                                                            <xs:enumeration
value="Director" />
                                                            <xs:enumeration
value="Producer" />
                                                            <xs:enumeration value="Writer"
/>
                                                        </xs:restriction>
                                                    </xs:simpleContent>
                                                </xs:simpleType>
                                            </xs:attribute>
                                        </xs:extension>
                                    </xs:simpleContent>
                                </xs:complexType>
                            </xs:element>
                        </xs:sequence>
                    </xs:complexType>
                </xs:element>
                <xs:element name="Summary" type="ItemIdType" />
                <xs:element name="ToC" type="ToCType" />
                <xs:element name="Subtitles" type="SubtitlesType" />
                <xs:element name="AudioTracks" type="AudioTracksType" />
                <xs:element name="Description" type="xs:string" />
            </xs:choice>
        </xs:group>

        <!-- LiveVideo item type -->
        <xs:group id="LiveVideoItemGroup">
            <xs:choice>
                <xs:element name="Channel" type="ChannelType" />
                <xs:element name="FrameRate" type="xs:string" />
                <xs:element name="AudioSamplesPerSec" type="xs:string" />
                <xs:element name="Width" type="xs:string" />
                <xs:element name="Height" type="xs:string" />
                <xs:element name="Subtitles" type="SubtitlesType" />
                <xs:element name="AudioTracks" type="AudioTracksType" />
                <xs:element name="Description" type="xs:string" />
            </xs:choice>
        </xs:group>

        <!-- EPG item type -->
        <xs:group id="EPGItemGroup">
            <xs:choice>
                <xs:element name="Channel" type="ChannelType" />
                <xs:element name="EPGProvider" type="xs:string" />
                <xs:element name="StartTime" type="dt:dateTime" />
                <xs:element name="EndTime" type="dt:dateTime" />
                <xs:element name="Duration" type="xs:string" />
                <xs:element name="Description" type="xs:string" />
            </xs:choice>
        </xs:group>

        <!-- Photo item type -->
```

```
<xs:group id="PhotoItemGroup">
    <xs:choice>
        <xs:element name="Width" type="xs:string" />
        <xs:element name="Height" type="xs:string" />
        <xs:element name="Detail" type="ContentDetailType" />
        <xs:element name="Description" type="xs:string" />
    </xs:choice>
</xs:group>

<!-- Doc item type -->
<xs:group id="DocItemGroup">
    <xs:choice>
        <xs:element name="Width" type="xs:string" />
        <xs:element name="Height" type="xs:string" />
        <xs:element name="Description" type="xs:string" />
    </xs:choice>
</xs:group>

<!-- Camera item type -->
<xs:group id="CameraItemGroup">
    <xs:sequence>
        <xs:element name="CameraName" type="xs:string" />
        <xs:element name="FrameRate" type="xs:string" />
        <xs:element name="AudioSamplesPerSec" type="xs:string" />
        <xs:element name="Width" type="xs:string" />
        <xs:element name="Height" type="xs:string" />
        <xs:element name="Description" type="xs:string" />
    </xs:sequence>
</xs:group>

<!-- Screen item type -->
<xs:group id="ScreenItemGroup">
    <xs:choice>
        <xs:element name="BitCount" type="xs:string" />
        <xs:element name="Wtype" type="xs:string" />
        <xs:element name="FrameRate" type="xs:string" />
        <xs:element name="Width" type="xs:string" />
        <xs:element name="Height" type="xs:string" />
        <xs:element name="Description" type="xs:string" />
    </xs:choice>
</xs:group>

<!-- Bookmark item type -->
<xs:group id="BookmarkItemGroup">
    <xs:choice>
        <xs:element name="RefObjectId" type="ItemObjectIdType" />
        <xs:element name="Bookmark" type="BookmarkType" />
    </xs:choice>
</xs:group>

<xs:complexType name="ToCType">
    <xs:sequence>
        <xs:element name="Segment" minOccurs="0">
            <xs:complexType>
                <xs:sequence>
                    <xs:element name="Topic" type="xs:string" />
                    <xs:element name="Offset" type="xs:string" minOccurs="0" />
                    <xs:element name="Dura" type="xs:string" minOccurs="0" />
                    <xs:element name="Ref" type="ItemIdType" minOccurs="0" />
                    <xs:element name="Desc" type="xs:string" minOccurs="0" />
                </xs:sequence>
```

```
                </xs:complexType>
            </xs:element>
        </xs:sequence>
    </xs:complexType>

    <xs:complexType name="SubtitlesType">
        <xs:sequence>
            <xs:element name="Subtitle" minOccurs="0" maxOccurs="unbounded">
                <xs:complexType name="SubtitleType">
                    <xs:sequence>
                        <xs:element name="Id" type="xs:string" />
                        <xs:element name="Name" type="xs:string" />
                        <xs:element name="URI" type="xs:string" />
                        <xs:element name="Desc" type="xs:string" />
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
            <xs:attribute name="Default" type="xs:string" />
        </xs:sequence>
    </xs:complexType>

    <xs:complexType name="AudioTracksType">
        <xs:sequence>
            <xs:element name="AudioTrack" minOccurs="0" maxOccurs="unbounded">
                <xs:complexType name="AudioTrackType">
                    <xs:sequence>
                        <xs:element name="Id" type="xs:string" />
                        <xs:element name="Name" type="xs:string" />
                        <xs:element name="Desc" type="xs:string" />
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
            <xs:attribute name="Default" type="xs:string" />
        </xs:sequence>
    </xs:complexType>

    <xs:complexType name="ChannelType">
        <xs:sequence>
            <xs:element name="Title" type="xs:string" minOccurs="0" />
            <xs:element name="Provider" type="xs:string" minOccurs="0" />
            <xs:element name="Type" type="xs:string" minOccurs="0" />
            <xs:element name="Id" type="xs:string" minOccurs="0" />
        </xs:sequence>
    </xs:complexType>

    <xs:complexType name="ContentDetailType">
        <xs:sequence>
            <xs:element name="Time" type="dt:dateTime" />
            <xs:element name="Location" type="xs:string" />
            <xs:element name="Person" minOccurs="0" maxOccurs="unbounded"
type="xs:string" />
            <xs:element name="Activity" type="xs:string" />
            <xs:element name="Scene" type="xs:string" />
        </xs:sequence>
    </xs:complexType>

    <xs:complexType name="BookmarkType">
        <xs:sequence>
            <xs:element name="Position">
                <xs:complexType name="BookmarkPosType">
                    <xs:simpleContent>
                        <xs:extension base="xs:string">
```

```
                        <xs:attribute name="Type" type="xs:string" />
                    </xs:extension>
                </xs:simpleContent>
            </xs:complexType>
        </xs:element>
        <xs:element name="Seg" type="ItemObjectIdType" />
    </xs:sequence>
</xs:complexType>

</xs:schema>
```

Annex F
(normative)

Connection management service description.wsdl

```
<?xml version="1.0" encoding="utf-8"?>
<definitions xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:igrsExt="http://www.igrs.org/igrs/ServiceDescription"
xmlns:igrs="http://www.igrs.org/igrs/ConnectionManagementService"
    targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService"
name="ConnectionManagementService">
    <types>
        <schema xmlns="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.igrs.org/igrs/ConnectionManagementService"
            xmlns:cis="http://www.igrs.org/igrs/ContentIndexService">

            <complexType name="Type_ProtocolInfoList">
                <sequence>
                    <element name="ProtocolInfo" type="igrs:Type_ProtocolInfo"
maxOccurs="unbounded" />
                </sequence>
            </complexType>

            <complexType name="Type_ProtocolInfo">
                <sequence>
                    <element name="TransportProtocol">
                        <complexType>
                            <sequence>
                                <element name="Port" type="string" minOccurs="0"
maxOccurs="unbounded" />
                            </sequence>
                            <attribute name="Name" type="string" />
                        </complexType>
                    </element>
                    <element name="ControlProtocol" minOccurs="0">
                        <complexType>
                            <sequence>
                                <element name="Port" type="string" minOccurs="0"
maxOccurs="unbounded" />
                            </sequence>
                            <attribute name="Name" type="string" />
                        </complexType>
                    </element>
                </sequence>
            </complexType>

            <simpleType name="Type_ConnectionManagementServiceId">
                <restriction base="string" />
            </simpleType>

            <simpleType name="Type_ConnectionId">
                <restriction base="int" />
            </simpleType>

            <simpleType name="Type_TransportInstanceId">
                <restriction base="int" />
            </simpleType>
```

```
            <simpleType name="Type_ConnectionIdList">
                <list itemType="string" />
            </simpleType>

            <simpleType name="ConnectionStateType">
                <restriction base="string">
                    <enumeration value="OK" />
                    <enumeration value="DISCONNECTED" />
                    <enumeration value="CONTENTFORMATMISMATCH" />
                    <enumeration value="INSUFFICIENTBANDWIDTH" />
                    <enumeration value="INSUFFICIENTBANDWIDTH" />
                    <enumeration value="UNRELIABLECHANNEL" />
                    <enumeration value="UNKNOWN" />
                </restriction>
            </simpleType>

            <complexType name="Type_MediaFormatList">
                <sequence>
                    <element name="MediaFormat" type="cis:Type_MediaFormat"
maxOccurs="unbounded" />
                </sequence>
            </complexType>

            <complexType name="Type_IPList">
                <sequence>
                    <element name="IP" type="string" maxOccurs="unbounded" />
                </sequence>
            </complexType>

            <simpleType name="Type_RenderingManagementInstanceID">
                <restriction base="int" />
            </simpleType>

            <simpleType name="Type_ConnectionRoleFlag">
                <restriction base="string">
                    <enumeration value="ASSERVER" />
                    <enumeration value="ASCLIENT" />
                </restriction>
            </simpleType>

            <element name="GetProtocolInfoRequest">
                <complexType />
            </element>

            <element name="GetProtocolInfoResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="ProtocolInfoList" type="igrs:Type_ProtocolInfoList"
/>
                        <element name="MediaFormatList"
type="igrs:Type_MediaFormatList" />
                        <element name="IPList" type="igrs:Type_IPList" minOccurs="0" />
                    </sequence>
                </complexType>
            </element>

            <element name="PrepareForConnectionRequest">
                <complexType>
                    <sequence>
                        <element name="RemoteProtocolInfo"
```

```
type="igrs:Type_ProtocolInfo" />
                        <element name="PeerCMSId"
type="igrs:Type_ConnectionManagementServiceId" miniOccurs="0" />
                        <element name="PeerConnectionId" type="igrs:Type_ConnectionId"
miniOccurs="0" />
                        <element name="ConnectionRoleFlag"
type="igrs:Type_ConnectionRoleFlag" />
                        <element name="PeerIPList" type="igrs:Type_IPList" minOccurs="0"
/>
                    </sequence>
                </complexType>
            </element>

            <element name="PrepareForConnectionResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="ConnectionId" type="igrs:Type_ConnectionId" />
                        <element name="TransportInstanceId"
type="igrs:Type_TransportInstanceId" miniOccurs="0" />
                        <element name="RmsId"
type="igrs:Type_RenderingManagementInstanceId" minOccurs="0" />
                        <element name="UsableIPList" type="igrs:Type_IPList"
miniOccurs="0" />
                    </sequence>
                </complexType>
            </element>

            <element name="ReleaseConnectionRequest">
                <complexType>
                    <sequence>
                        <element name="ConnectionId" type="igrs:Type_ConnectionId" />
                    </sequence>
                </complexType>
            </element>

            <element name="ReleaseConnectionResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                    </sequence>
                </complexType>
            </element>

            <element name="GetActiveConnectionIdListRequest">
                <complexType />
            </element>

            <element name="GetActiveConnectionIdlistResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="ConnectionIdList"
type="igrs:Type_ConnectionIdList" />
                    </sequence>
                </complexType>
            </element>

            <element name="GetCurrentConnectionInfoRequest">
                <complexType>
                    <sequence>
                        <element name="ConnectionId" type="igrs:Type_ConnectionId" />
```

```
                    </sequence>
                </complexType>
            </element>

            <element name="GetCurrentConnectionInfoResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="TransportInstanceId"
type="igrs:Type_TransportInstanceId" minOccurs="0" />
                        <element name="ProtocolInfo" type="igrs:Type_ ProtocolInfo" />
                        <element name="PeerCMSId"
type="igrs:Type_ConnectionManagementServiceId" />
                        <element name="PeerConnectionId" type="igrs:Type_ConnectionId"
/>
                        <element name="ConnectionState"
type="igrs:Type_ConnectionState" />
                        <element name="RmsId"
type="igrs:Type_RenderingManagementInstanceId" miniOccurs="0" />
                    </sequence>
                </complexType>
            </element>

        </schema>
    </types>

    <message name="GetProtocolInfoInput">
        <part name="parameter" element="igrs:GetProtocolInfoRequest" />
    </message>
    <message name="GetProtocolInfoResponse">
        <part name="parameter" element="igrs:GetProtocolInfoResponse" />
    </message>

    <message name="PrepareForConnectionInput">
        <part name="parameter" element="igrs:PrepareForConnectionRequest" />
    </message>
    <message name="PrepareForConnectionOutput">
        <part name="parameter" element="igrs:PrepareForConnectionResponse" />
    </message>

    <message name="ReleaseConnectionInput">
        <part name="parameter" element="igrs:ReleaseConnectionRequest" />
    </message>
    <message name="ReleaseConnectionOutput">
        <part name="parameter" element="igrs:ReleaseConnectionResponse" />
    </message>

    <message name="GetActiveConnectionIdListInput">
        <part name="parameter" element="igrs:GetActiveConnectionIdListRequest" />
    </message>
    <message name="GetActiveConnectionIdlistOutput">
        <part name="parameter" element="igrs:GetActiveConnectionIdlistResponse"/>
    </message>

    <message name="GetCurrentConnectionInfoInput">
        <part name="parameter" element="igrs:GetCurrentConnectionInfoRequest" />
    </message>
    <message name="GetCurrentConnectionInfoOutput">
        <part name="parameter" element="igrs:GetCurrentConnectionInfoResponse" />
    </message>
```

```
    <igrsExt:IGRSportType name="ConnectionManagementPortType">
        <operation name="GetProtocolInfo">
            <input message="igrs:GetProtocolInfoInput" />
            <output message="igrs:GetProtocolInfoOutput" />
        </operation>
        <operation name="PrepareForConnection">
            <input message="igrs:PrepareForConnectionInput" />
            <output message="igrs:PrepareForConnectionOutput" />
        </operation>
        <operation name="ReleaseConnection">
            <input message="igrs:ReleaseConnectionInput" />
            <output message="igrs:ReleaseConnectionOutput" />
        </operation>
        <operation name="GetActiveConnectionIdList">
            <input message="igrs:GetActiveConnectionIdListInput" />
            <output message="igrs:GetActiveConnectionIdListOutput" />
        </operation>
        <operation name="GetCurrentConnectionInfo">
            <input message="igrs:GetCurrentConnectionInfoInput" />
            <output message="igrs:GetCurrentConnectionInfoOutput" />
        </operation>

        <igrsExt:serviceAttribute name="ConnectionIdList" type="igrs:Type_ConnectionIdList"
notifiable="true" />
        <igrsExt:serviceAttribute name="ProtocolInfoList" type="igrs:Type_ProtocolInfoList"
notifiable="true" />
        <igrsExt:serviceAttribute name="MediaFormatList" type="igrs:Type_MediaFormatList"
notifiable="true" />
        <igrsExt:serviceAttribute name="IPList" type="igrs:Type_IPList" notifiable="true" />
    </igrsExt:IGRSportType>

    <binding name="ConnectionManagementServiceIGRSPipe"
type="igrs:ConnectionManagementPortType">
        <igrsExt:binding transport="http://www.igrs.org/igrs/igrspipe" style="document" />
        <operation name="GetProtocolInfo">
            <input>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
        <operation name="PrepareForConnection">
            <input>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
        <operation name="ReleaseConnection">
            <input>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
```

```
            </output>
        </operation>
        <operation name="GetActiveConnectionIdList">
            <input>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
        <operation name="GetCurrentConnectionInfo">
            <input>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
    </binding>

    <service name="ConnectionManagementService">
        <port name="ConnectionManagementService"
binding="igrs:ConnectionManagementServiceIGRSPipe">
            <igrsExt:address
location="http://www.igrs.org/igrs/ConnectionManagementService" />
        </port>
    </service>

</definitions>
```

Annex G
(normative)

Content index service description.wsdl

```
<?xml version="1.0" encoding="utf-8"?>
<definitions xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:igrsExt="http://www.igrs.org/igrs/ServiceDescription"
xmlns:igrs="http://www.igrs.org/igrs/ContentIndexService"
    targetNamespace="http://www.igrs.org/igrs/ContentIndexService"
name="ContentIndexService">
    <types>
        <schema xmlns="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.igrs.org/igrs/ContentIndexService">

            <include
schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-metadata-item.xsd">
                <annotation>
                    <documentation xml:lang="en">
                        Item metadata definition of IGRS Content Index Service is included
here.
                    </documentation>
                </annotation>
            </include>

            <include
schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-metadata-container.xsd">
                <annotation>
                    <documentation xml:lang="en">
                        Container metadata definition of IGRS Content Index Service is
included here.
                    </documentation>
                </annotation>
            </include>

            <include
schemaLocation="http://www.igrs.org/schemas/cis/igrs-cis-framework.xsd ">
                <annotation>
                    <documentation xml:lang="en">
                        Content representational framework definition of IGRS Content Index
Service is included here.
                    </documentation>
                </annotation>
            </include>

            <simpleType name="Type_ObjectId">
                <restriction base="string" />
            </simpleType>

            <complexType name="Type_AttributeList">
                <sequence>
                    <element name="Attribute" type="string" minOccurs="1"
maxOccurs="unbounded" />
                </sequence>
            </complexType>

            <complexType name="Type_ContentList">
                <sequence>
```

```
                    <element name="Container" type="igrs:Type_Container" minOccurs="0"
maxOccurs="unbounded" />
                    <element name="Item" type="igrs:Type_Item" minOccurs="0"
maxOccurs="unbounded" />
                </sequence>
            </complexType>

            <simpleType name="Type_FilterRule">
                <restriction base="string" />
            </simpleType>

            <simpleType name="Type_BrowseFlag">
                <restriction base="string">
                    <enumeration value="CONSTANT_CONTAINERSELFINFO" />
                    <enumeration value="CONSTANT_CONTAINERCHILDRENINFO" />
                </restriction>
            </simpleType>

            <simpleType name="Type_SortRule">
                <restriction base="string" />
            </simpleType>

            <simpleType name="Type_Count">
                <restriction base="int" />
            </simpleType>

            <simpleType name="Type_TransferInstanceId">
                <restriction base="unsignedInt" />
            </simpleType>

            <simpleType name="Type_TransferInstanceIds">
                <list itemType="igrs:Type_TransferInstanceId" />
            </simpleType>

            <simpleType name="Type_TransferState">
                <restriction base="string">
                    <enumeration value="IN_PROGRESS" />
                    <enumeration value="STOPPED" />
                    <enumeration value="COMPLETED" />
                    <enumeration value="ERROR" />
                </restriction>
            </simpleType>

            <simpleType name="Type_Length">
                <restriction base="string" />
            </simpleType>

            <complexType name="Type_TagList">
                <sequence>
                    <choice minOccurs="0" maxOccurs="unbounded">
                        <any namespace="##other" processContents="lax" />
                        <any namespace="##local" processContents="lax" />
                    </choice>
                </sequence>
            </complexType>

            <simpleType name="Type_URI">
                <restriction base="string" />
            </simpleType>

            <simpleType name="Type_SearchCapabilityList">
```

```
            <list itemType="string" />
        </simpleType>

        <simpleType name="Type_SortCapabilityList">
            <list itemType="string" />
        </simpleType>

        <simpleType name="Type_AttributeValueSearchCapabilityList">
            <list itemType="string" />
        </simpleType>

        <simpleType name="Type_ContentUpdateId">
            <restriction base="unsignedInt" />
        </simpleType>

        <simpleType name="Type_SearchAttributeName">
            <restriction base="string" />
        </simpleType>

        <complexType name="Type_AttributeValueList">
            <sequence>
                <element name="AttributeValue" type="string" minOccurs="0"
maxOccurs="unbounded" />
            </sequence>
        </complexType>

        <complexType name="Type_UserList">
            <sequence>
                <element name="User" type="string" minOccurs="0"
maxOccurs="unbounded" />
            </sequence>
        </complexType>

        <element name="GetSearchCapabilityListRequest">
            <complexType />
        </element>

        <element name="GetSearchCapabilityListResponse">
            <complexType>
                <sequence>
                    <element name="ReturnCode" type="unsignedInt" />
                    <element name="SearchCaps"
type="igrs:Type_SearchCapabilityList" />
                </sequence>
            </complexType>
        </element>

        <element name="GetSortCapabilityListRequest">
            <complexType />
        </element>

        <element name="GetSortCapabilityListResponse">
            <complexType>
                <sequence>
                    <element name="ReturnCode" type="unsignedInt" />
                    <element name="SortCaps" type="igrs:Type_SortCapabilityList" />
                </sequence>
            </complexType>
        </element>

        <element name="GetAttributeValueSearchCapabilityListRequest">
            <complexType />
```

```
            </element>

            <element name="GetAttributeValueSearchCapabilityListResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="SearchAttributeValueCaps"
type="igrs:Type_AttributeList" />
                    </sequence>
                </complexType>
            </element>

            <element name="GetContentUpdateIdRequest">
                <complexType />
            </element>

            <element name="GetContentUpdateIdResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="ContentUpdateId"
type="igrs:Type_ContentUpdateId" />
                    </sequence>
                </complexType>
            </element>

            <element name="BrowseRequest">
                <complexType>
                    <sequence>
                        <element name="ObjectId" type="igrs:Type_ObjectId" />
                        <element name="BrowseFlag" type="igrs:Type_BrowseFlag" />
                        <element name="BrowseRule" type="igrs:Type_FilterRule" />
                        <element name="Offset" type="igrs:Type_Offset" />
                        <element name="RequestCount" type="igrs:Type_Count" />
                        <element name="SortRule" type="igrs:Type_SortRule" />
                        <element name="ResultScale" type="igrs:Type_AttributeList"
minOccurs="0" />
                    </sequence>
                </complexType>
            </element>

            <element name="BrowseResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="Result" type="igrs:Type_ContentList" />
                        <element name="NumberReturned" type="igrs:Type_Count" />
                        <element name="ContainerNumberTotal" type="igrs:Type_Count"
minOccurs="0" />
                        <element name="ItemNumberTotal" type="igrs:Type_Count"
minOccurs="0" />
                    </sequence>
                </complexType>
            </element>

            <element name="SearchRequest">
                <complexType>
                    <sequence>
                        <element name="ObjectId" type="igrs:Type_ObjectId" />
                        <element name="SearchRule" type="igrs:Type_FilterRule" />
                        <element name="Offset" type="igrs:Type_Offset" />
```

```
                    <element name="RequestCount" type="igrs:Type_Count" />
                    <element name="SortRule" type="igrs:Type_SortRule" />
                </sequence>
            </complexType>
        </element>

        <element name="SearchResponse">
            <complexType>
                <sequence>
                    <element name="ReturnCode" type="unsignedInt" />
                    <element name="Result" type="igrs:Type_ContentList" />
                    <element name="NumberReturned" type="igrs:Type_Count" />
                    <element name="NumberTotalMatched" type="igrs:Type_Count"
minOccurs="0" />
                </sequence>
            </complexType>
        </element>

        <element name="GetAttributeListRequest">
            <complexType>
                <sequence>
                    <element name="ObjectId" type="igrs:Type_ObjectId" />
                </sequence>
            </complexType>
        </element>

        <element name="GetAttributeListResponse">
            <complexType>
                <sequence>
                    <element name="ReturnCode" type="unsignedInt" />
                    <element name="AttributeList" type="igrs:Type_AttributeList" />
                    <element name="NumberReturned" type="igrs:Type_Count" />
                </sequence>
            </complexType>
        </element>

        <element name="SearchAttributeValueRequest">
            <complexType>
                <sequence>
                    <element name="ObjectId" type="igrs:Type_ObjectId" />
                    <element name="SearchAttributeName"
type="igrs:Type_SearchAttributeName" />
                    <element name="Offset" type="igrs:Type_Count" />
                    <element name="RequestCount" type="igrs:Type_Count" />
                </sequence>
            </complexType>
        </element>

        <element name="SearchAttributeValueResponse">
            <complexType>
                <sequence>
                    <element name="ReturnCode" type="unsignedInt" />
                    <element name="AttributeValueList"
type="igrs:Type_AttributeValueList" />
                    <element name="NumberReturned" type="igrs:Type_Count" />
                    <element name="NumberTotalMatched" type="igrs:Type_Count"
minOccurs="0" />
                </sequence>
            </complexType>
        </element>

        <element name="ConvertMediaFormatRequest">
```

```
                <complexType>
                    <sequence>
                        <element name="ObjectId" type="igrs:Type_ObjectId" />
                        <element name="CurrentMediaFormat"
type="igrs:Type_MediaFormat" />
                        <element name="TargetMediaFormat"
type="igrs:Type_MediaFormat" />
                    </sequence>
                </complexType>
            </element>

            <element name="ConvertMediaFormatResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                    </sequence>
                </complexType>
            </element>

            <element name="CreateObjectRequest">
                <complexType>
                    <sequence>
                        <element name="ContainerId" type="igrs:Type_ObjectId" />
                        <element name="Elements" type="igrs:Type_ContentList" />
                    </sequence>
                </complexType>
            </element>

            <element name="CreateObjectResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="ObjectId" type="igrs:Type_ObjectId" />
                        <element name="Result" type="igrs:Type_ContentList" />
                    </sequence>
                </complexType>
            </element>

            <element name="DestroyObjectRequest">
                <complexType>
                    <sequence>
                        <element name="ObjectId" type="igrs:Type_ObjectId" />
                    </sequence>
                </complexType>
            </element>

            <element name="DestroyObjectResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                    </sequence>
                </complexType>
            </element>

            <element name="UpdateObjectRequest">
                <complexType>
                    <sequence>
                        <element name="ObjectId" type="igrs:Type_ObjectId" />
                        <element name="CurrentTag" type="igrs:Type_TagList" />
                        <element name="NewTag" type="igrs:Type_TagList" />
                    </sequence>
```

```
            </complexType>
        </element>

        <element name="UpdateObjectResponse">
            <complexType>
                <sequence>
                    <element name="ReturnCode" type="unsignedInt" />
                </sequence>
            </complexType>
        </element>

        <element name="ImportResourceRequest">
            <complexType>
                <sequence>
                    <element name="SourceURI" type="igrs:Type_URI" />
                    <element name="DestinationURI" type="igrs:Type_URI" />
                </sequence>
            </complexType>
        </element>

        <element name="ImportResourceResponse">
            <complexType>
                <sequence>
                    <element name="ReturnCode" type="unsignedInt" />
                    <element name="TransferInstanceId"
type="igrs:Type_TransferInstanceId" />
                </sequence>
            </complexType>
        </element>

        <element name="ExportResourceRequest">
            <complexType>
                <sequence>
                    <element name="SourceURI" type="igrs:Type_URI" />
                    <element name="DestinationURI" type="igrs:Type_URI" />
                </sequence>
            </complexType>
        </element>

        <element name="ExportResourceResponse">
            <complexType>
                <sequence>
                    <element name="ReturnCode" type="unsignedInt" />
                    <element name="TransferInstanceId"
type="igrs:Type_TransferInstanceId" />
                </sequence>
            </complexType>
        </element>

        <element name="StopTransferResourceRequest">
            <complexType>
                <sequence>
                    <element name="TransferInstanceId"
type="igrs:Type_TransferInstanceId" />
                </sequence>
            </complexType>
        </element>

        <element name="StopTransferResourceResponse">
            <complexType>
                <sequence>
                    <element name="ReturnCode" type="unsignedInt" />
```

```
                    </sequence>
                </complexType>
            </element>

            <element name="GetTransferInstanceIdsRequest">
                <complexType />
            </element>

            <element name="GetTransferInstanceIdsResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="TransferIntanceIds"
type="igrs:Type_TransferInstanceIds" />
                    </sequence>
                </complexType>
            </element>

            <element name="GetTransferStateRequest">
                <complexType>
                    <sequence>
                        <element name="TransferInstanceId"
type="igrs:Type_TransferInstanceId" />
                    </sequence>
                </complexType>
            </element>

            <element name="GetTransferStateResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="TransferState" type="igrs:Type_TransferState" />
                        <element name="TransferLength" type="igrs:Type_Length" />
                        <element name="TransferTotal" type="igrs:Type_Length" />
                    </sequence>
                </complexType>
            </element>

            <element name="DeleteResourceRequest">
                <complexType>
                    <sequence>
                        <element name="ResourceURI" type="igrs:Type_URI" />
                    </sequence>
                </complexType>
            </element>

            <element name="DeleteResourceResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                    </sequence>
                </complexType>
            </element>

            <element name="PersonalizedSearchRequest">
                <complexType>
                    <sequence>
                        <element name="ObjectId" type="igrs:Type_ObjectId" />
                        <element name="Users" type="igrs:Type_UserList" minOccurs="0"
/>
                        <element name="SearchRule" type="igrs:Type_FilterRule" />
```

```
                        <element name="Offset" type="igrs:Type_Count" />
                        <element name="RequestCount" type="igrs:Type_Count" />
                    </sequence>
                </complexType>
            </element>

            <element name="PersonalizedSearchResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="Result" type="igrs:Type_ContentList" />
                        <element name="NumberReturned" type="igrs:Type_Count" />
                        <element name="NumberTotalMatched" type="igrs:Type_Count"
minOccurs="0" />
                    </sequence>
                </complexType>
            </element>

            <element name="PersonalizedRecommendRequest">
                <complexType>
                    <sequence>
                        <element name="ObjectId" type="igrs:Type_ObjectId" />
                        <element name="Users" type="igrs:Type_UserList" minOccurs="0"
/>
                        <element name="Offset" type="igrs:Type_Count" />
                        <element name="RequestCount" type="igrs:Type_Count" />
                    </sequence>
                </complexType>
            </element>

            <element name="PersonalizedRecommendResponse">
                <complexType>
                    <sequence>
                        <element name="ReturnCode" type="unsignedInt" />
                        <element name="Result" type="igrs:Type_ContentList" />
                        <element name="NumberReturned" type="igrs:Type_Count" />
                        <element name="NumberTotalMatched" type="igrs:Type_Count"
minOccurs="0" />
                    </sequence>
                </complexType>
            </element>

        </schema>
    </types>

    <message name="GetSearchCapabilityListInput">
        <part name="parameter" element="igrs:GetSearchCapabilityListRequest" />
    </message>
    <message name="GetSearchCapabilityListOutput">
        <part name="parameter" element="igrs:GetSearchCapabilityListResponse" />
    </message>

    <message name="GetSortCapabilityListInput">
        <part name="parameter" element="igrs:GetSortCapabilityListRequest" />
    </message>
    <message name="GetSortCapabilityListOutput">
        <part name="parameter" element="igrs:GetSortCapabilityListResponse" />
    </message>

    <message name="GetAttributeValueSearchCapabilityListInput">
        <part name="parameter"
element="igrs:GetAttributeValueSearchCapabilityListRequest" />
```

```
    </message>
    <message name="GetAttributeValueSearchCapabilityListOutput">
        <part name="parameter"
element="igrs:GetAttributeValueSearchCapabilityListResponse" />
    </message>

    <message name="GetContentUpdateIdInput">
        <part name="parameter" element="igrs:GetContentUpdateIdRequest" />
    </message>
    <message name="GetContentUpdateIdOutput">
        <part name="parameter" element="igrs:GetContentUpdateIdResponse"/>
    </message>

    <message name="BrowseInput">
        <part name="parameter" element="igrs:BrowseRequest" />
    </message>
    <message name="BrowseOutput">
        <part name="parameter" element="igrs:BrowseResponse" />
    </message>

    <message name="SearchInput">
        <part name="parameter" element="igrs:SearchRequest" />
    </message>
    <message name="SearchOutput">
        <part name="parameter" element="igrs:SearchResponse" />
    </message>

    <message name="GetAttributeListInput">
        <part name="parameter" element="igrs:GetAttributeListRequest" />
    </message>

    <message name="GetAttributeListOutput">
        <part name="parameter" element="igrs:GetAttributeListResponse" />
    </message>

    <message name="SearchAttributeValueInput">
        <part name="parameter" element="igrs:SearchAttributeValueRequest" />
    </message>
    <message name="SearchAttributeValueOutput">
        <part name="parameter" element="igrs:SearchAttributeValueResponse" />
    </message>

    <message name="ConvertMediaFormatInput">
     <part name="parameter" element="igrs:ConvertMediaFormatRequest" />
    </message>
    <message name="ConvertMediaFormatOutput">
        <part name="parameter" element="igrs:ConvertMediaFormatResponse" />
    </message>

    <message name="CreateObjectInput">
        <part name="parameter" element="igrs:CreateObjectRequest" />
    </message>
    <message name="CreateObjectOutput">
        <part name="parameter" element="igrs:CreateObjectResponse" />
    </message>

    <message name="DestroyObjectInput">
        <part name="parameter" element="igrs:DestroyObjectRequest" />
    </message>
    <message name="DestroyObjectOutput">
        <part name="parameter" element="igrs:DestroyObjectResponse" />
```

```
</message>

<message name="UpdateObjectInput">
    <part name="parameter" element="igrs:UpdateObjectRequest" />
</message>
<message name="UpdateObjectOutput">
    <part name="parameter" element="igrs:UpdateObjectResponse" />
</message>

<message name="ImportResourceInput">
    <part name="parameter" element="igrs:ImportResourceRequest" />
</message>
<message name="ImportResourceOutput">
    <part name="parameter" element="igrs:ImportResourceResponse" />
</message>

<message name="ExportResourceInput">
    <part name="parameter" element="igrs:ExportResourceRequest" />
</message>
<message name="ExportResourceOutput">
    <part name="parameter" element="igrs:ExportResourceResponse" />
</message>

<message name="StopTransferResourceInput">
    <part name="parameter" element="igrs:StopTransferResourceRequest" />
</message>
<message name="StopTransferResourceOutput">
    <part name="parameter" element="igrs:StopTransferResourceResponse" />
</message>

<message name="GetTransferInstanceIdsInput">
    <part name="parameter" element="igrs:GetTransferInstanceIdsRequest" />
</message>
<message name="GetTransferInstanceIdsOutput">
    <part name="parameter" element="igrs:GetTransferInstanceIdsResponse" />
</message>

<message name="GetTransferStateInput">
    <part name="parameter" element="igrs:GetTransferStateRequest" />
</message>
<message name="GetTransferStateOutput">
    <part name="parameter" element="igrs:GetTransferStateResponse" />
</message>

<message name="DeleteResourceInput">
    <part name="parameter" element="igrs:DeleteResourceRequest" />
</message>
<message name="DeleteResourceOutput">
    <part name="parameter" element="igrs:DeleteResourceResponse" />
</message>

<message name="PersonalizedSearchInput">
    <part name="parameter" element="igrs:PersonalizedSearchRequest" />
</message>
<message name="PersonalizedSearchOutput">
    <part name="parameter" element="igrs:PersonalizedSearchResponse" />
</message>

<message name="PersonalizedRecommendInput">
    <part name="parameter" element="igrs:PersonalizedRecommendRequest" />
</message>
<message name="PersonalizedRecommendOutput">
```

```
    <part name="parameter" element="igrs:PersonalizedRecommendResponse" />
</message>

<igrsExt:IGRSportType name="ContentIndexPortType">
    <operation name="GetSearchCapabilityList">
        <input message="igrs:GetSearchCapabilityListInput" />
        <output message="igrs:GetSearchCapabilityListOutput" />
    </operation>
    <operation name="GetSearchAttributeCapabilityList">
        <input message="igrs:GetSearchAttributeCapabilityListRequest"/>
        <output message="igrs:GetSearchAttributeCapabilityListResponse"/>
    </operation>
    <operation name="GetSortCapabilityList">
        <input message="igrs:GetSortCapabilityListInput" />
        <output message="igrs:GetSortCapabilityListOutput" />
    </operation>
    <operation name="GetAttributeValueSearchCapabilityList">
        <input message="igrs:GetAttributeValueSearchCapabilityListInput" />
        <output message="igrs:GetAttributeValueSearchCapabilityListOutput" />
    </operation>
    <operation name="GetContentUpdateId">
        <input message="igrs:GetContentUpdateIdInput" />
        <output message="igrs:GetContentUpdateIdOutput" />
    </operation>
    <operation name="Browse">
        <input message="igrs:BrowseInput" />
        <output message="igrs:BrowseOutput" />
    </operation>
    <operation name="Search">
        <input message="igrs:SearchInput" />
        <output message="igrs:SearchOutput" />
    </operation>
    <operation name="GetAttributeList">
        <input message="igrs:GetAttributeListInput" />
        <input message="igrs:GetAttributeListOutput" />
    </operation>
    <operation name="SearchAttributeValue">
        <input message="igrs:SearchAttributeValueInput" />
        <output message="igrs:SearchAttributeValueOutput" />
    </operation>
    <operation name="ConvertMediaFormat">
        <input message="igrs:ConvertMediaFormatInput" />
        <output message="igrs:ConvertMediaFormatOutput" />
    </operation>
    <operation name="CreateObject">
        <input message="igrs:CreateObjectInput" />
        <output message="igrs:CreateObjectOutput" />
    </operation>
    <operation name="DestroyObject">
        <input message="igrs:DestroyObjectInput" />
        <output message="igrs:DestroyObjectOutput" />
    </operation>
    <operation name="UpdateObject">
        <input message="igrs:UpdateObjectInput" />
        <output message="igrs:UpdateObjectOutput" />
    </operation>
    <operation name="ImportResource">
        <input message="igrs:ImportResourceInput" />
        <output message="igrs:ImportResourceOutput" />
    </operation>
    <operation name="ExportResource">
```

```
            <input message="igrs:ExportResourceInput" />
            <output message="igrs:ExportResourceOutput" />
        </operation>
        <operation name="StopTransferResource">
            <input message="igrs:StopTransferResourceInput" />
            <output message="igrs:StopTransferResourceOutput" />
        </operation>
        <operation name="GetTransferInstanceIds">
            <input message="igrs:GetTransferInstanceIdsInput" />
            <output message="igrs:GetTransferInstanceIdsOutput" />
        </operation>
        <operation name="GetTransferState">
            <input message="igrs:GetTransferStateInput" />
            <output message="igrs:GetTransferStateOutput" />
        </operation>
        <operation name="DeleteResource">
            <input message="igrs:DeleteResourceInput" />
            <output message="igrs:DeleteResourceOutput" />
        </operation>
        <operation name="PersonalizedSearch">
            <input message="igrs:PersonalizedSearchInput" />
            <output message="igrs:PersonalizedSearchOutput" />
        </operation>
        <operation name="PersonalizedRecommend">
            <input message="igrs:PersonalizedRecommendInput" />
            <output message="igrs:PersonalizedRecommendOutput" />
        </operation>

        <igrsExt:serviceAttribute name="ContentUpdateId"
type="igrs:Type_ContentUpdateId" notifiable="true" />
        <igrsExt:serviceAttribute name="SortCaps" type="igrs:Type_SortCapabilityList"
notifiable="true" />
        <igrsExt:serviceAttribute name="ObjectId" type="igrs:Type_ObjectId" notifiable="true"
/>
        <igrsExt:serviceAttribute name="TransferInstanceIds"
type="igrs:Type_TransferInstanceIds" minOccurs="0" notifiable="true" />
    </igrsExt:IGRSportType>

    <binding name="ContentIndexServiceIGRSPipe" type="igrs:ContentIndexPortType">
        <igrsExt:binding transport="http://www.igrs.org/igrs/igrspipe" style="document" />
        <operation name="GetSearchCapabilityList">
            <input>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
        <operation name="GetSortCapabilityList">
            <input>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
        <operation name="GetAttributeValueSearchCapabilityList">
            <input>
```

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                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
        <operation name="GetContentUpdateId">
            <input>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
        <operation name="Browse">
            <input>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
        <operation name="Search">
            <input>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
        <operation name="GetAttributeList">
            <input>
                <soap:body user="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
        <operation name="SearchAttributeValue">
            <input>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </input>
            <output>
                <soap:body use="literal"
encodingStyle="http://www.igrs.org/igrs/igrspipe/encoding" />
            </output>
        </operation>
        <operation name="ConvertMediaFormat">
            <input>
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