IEC TR 63122-1

Edition 1.0 2019-12

TECHNICAL REPORT

colour inside

Smart television –
Part 1: Conceptual model for smart television

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

IEC TR 63122-1:2019-12(en)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2019 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

IEC TR 63122-1

Edition 1.0 2019-12

TECHNICAL REPORT

colour inside

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

Smart television –
Part 1: Conceptual model for smart television

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.160.25

ISBN 978-2-8322-7694-5

Warning! Make sure that you obtained this publication from an authorized distributor.

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms and definitions 7
4 General features 8
4.1 Framework of smart television system 8
4.2 Smart television terminal 10
4.2.1 Hardware 10
4.2.2 Software 10
4.3 Characteristics 11
4.3.1 Human-machine interaction 11
4.3.2 Multi-screen interaction 12
4.3.3 Security mechanism 12
5 Application scenarios of smart television 14
5.1 Digital TV broadcast 14
5.1.1 Digital TV 14
5.1.2 EPG 14
5.1.3 HbbTV 14
5.2 Internet-based application 14
5.2.1 General 14
5.2.2 Daily life information 14
5.2.3 Online audio/video service 15
5.2.4 E-commerce 15
5.2.5 Social application 15
5.2.6 Video communications service 15
5.2.7 Online information search 15
5.2.8 Online education 15
5.2.9 Cloud storage 15
5.2.10 Community living service 15
5.2.11 Health service 15
5.2.12 Smart home service 16
5.2.13 Games 16
5.3 Local application 16
5.4 Application store 16
5.4.1 Function description 16
5.4.2 Cloud application-management system 16
5.4.3 Terminal application management software 17
Annex A (informative) Comparative study on existing smart television technologies 18
Annex B (informative) Essential features 20
B.1 General 20
B.2 Connection 20
B.3 N-screen technology 20
B.3.1 Wi-Fi Direct™ 20
B.3.2 DLNA 21
B.4 Human-machine interaction technology 21

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

Annex C (informative) Smart television platforms and solutions 22
C.1 HbbTV 22
C.2 Android TV 23
C.3 tvOS 23
C.4 Open webOS 24
C.5 Tizen 24
C.6 Linux (embedded operation system) 24
C.7 Apple TV 25
Annex D (informative) Media profile 26
Bibliography 27

Figure 1 – Block diagram of smart television system 9
Figure 2 – Block diagram of smart television terminal 11

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

SMART TELEVISION –

Part 1: Conceptual model for smart television

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 63122-1, which is a technical report, has been prepared by subcommittee TA 1: terminals for audio, video and data services and contents, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
100/2903/DTR	100/3053/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

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

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

A list of all parts in the IEC 63122 series, published under the general title *Smart television*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

INTRODUCTION

This part of IEC 63122 discusses the background of cloud computing, the Internet, the mobile Internet industry, the principle of open innovation, the vertical integration of the industry chain, technology and encourages the digital TV (television) industry to seize the opportunity to upgrade and strengthen innovation in smart television technology. The innovations of business models and institutional mechanisms will be explored, and we will explain how acceleration is needed to broaden the application market and put forward the concept of smart television models and standardization needs.

The reception of digital TV and high-definition broadcasting in the home has recently been well established for various areas. Internet TV and delivery of multimedia content to the user at home, via the Internet, are also becoming increasingly common.

Smart television systems are intended to extend the reach of multimedia content to the TV set in a seamless, viewer-friendly manner. The viewer can more conveniently access both broadcast digital content and Internet multimedia content on a TV set using a single user-interface device and a single on-screen interface.

There are three major key factors leading smart television development. Lifestyle changes from the user side, the building of network infrastructure according to the rapid development of wired and wireless networks, and the emergence of TV alternatives.

An individualized lifestyle accelerates personalization and customization of contents, and the experience from other smart electronic devices drives the user to long for the smart television as the core of entertainment at home.

The rapid development of high-speed Internet access and the emergence of home network techniques assigning an IP address to electronic devices will make TV smarter.

In addition, the market requires a change from TV to smart television because of the emergence of TV alternatives, such as the tablet, the smartphone and the media player.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

SMART TELEVISION –

Part 1: Conceptual model for smart television

1 Scope

The focus of this part of IEC 63122 is the conceptual definition of smart television, basic features, use cases and current technologies based on applications and requirements. They make it clear where further existing standards can be used and highlight where work on standards is needed.

In addition, this document was developed taking into account ISO/IEC Guide 71. The objective of this document is to highlight potential areas for standardisation for smart televisions.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
smart television system
television system consisting of a smart television service platform, transmission network and smart television terminal

3.2
smart television service platform
service platform that is capable of providing smart television terminal with such applications or services as digital TV broadcast or Internet service

Note 1 to entry: The services could be VOD, catch-up, games, web searches, interactive advertising, personalization, voting, social networking, etc.

3.3
transmission network
network for interactive data transmission in smart television systems, which includes the home network (family local network), radio and television broadcasting network, the Internet, and other networks (i.e. accident or secure private network)

3.4
smart television terminal
digital television set (TV set and set-top box) with integrated Internet capability and an operating system, which can use a variety of contents through services by using a convenient user interface/experience

Note 1 to entry: Usually, smart televisions allow the user to install and run more advanced applications or plug-ins/add-ons based on a specific platform.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

3.5
smart television set
TV set that supports smart television terminal function, capability and audio/video presentation function

3.6
smart television set top box
set top box that supports smart television terminal function, capability and without audio/video presentation function

3.7
application store
online store for purchasing and downloading software applications for smart televisions and other smart devices

3.8
health service
diagnosis, treatment and prevention of disease, illness, injury and other physical and mental impairments in human beings though smart television system

3.9
application programming interface
API
set of routines, protocols, and tools for building software applications

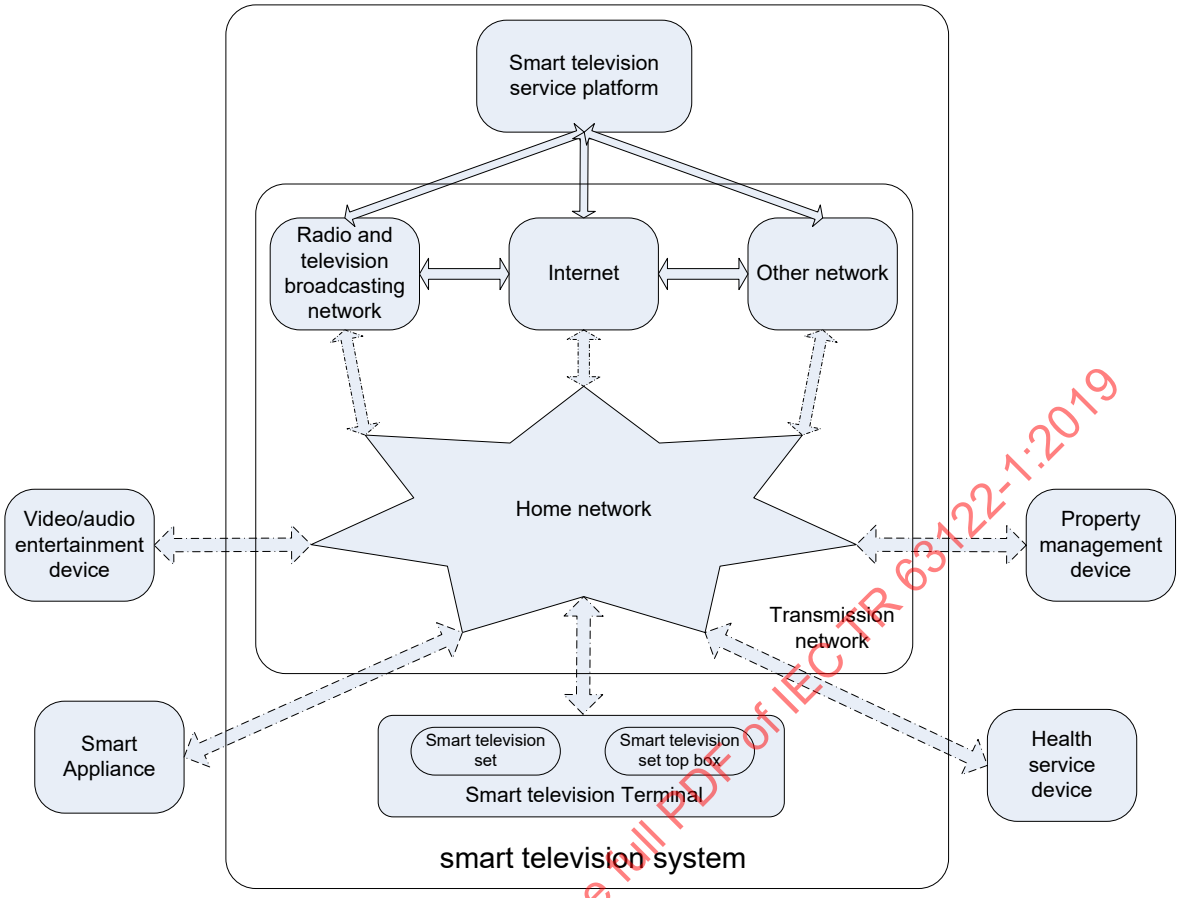
3.10
NGB
next generation broadcasting network
network constructed on the basis of achievements of cable television digitalization and mobile multimedia broadcasting and with support of its innovative core technology of "high-performance broadband information network", integrated "triple-play", combining wired with wireless modes and a network

4 General features

4.1 Framework of smart television system

The framework of the smart television system is shown in Figure 1, based on the study of existing smart television technologies, described in Annex A.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019



Key

Smart television service platform:	radio and television broadcasting stations, Internet or other network sites, application stores, etc.
Transmission network:	radio and television broadcasting networks, Internet and other networks, etc.
Smart television terminal:	smart television set, smart television set top box, video game console with TV tuner and video recorder with TV tuner, etc.
Smart appliance:	refrigerator, washer, etc.
Video/audio entertainment device:	sound system, MP3, MP4, personal tablet, laptop, etc.
Health service device:	blood glucose meter, pulse monitor, blood pressure monitor, etc;
Property management device:	remote meter reading, access control and video camera, etc.

Figure 1 – Block diagram of smart television system

The smart television service platform incorporates various application links of TV programmes and network service into the TV programme stream, EPG or network information stream and transmits them to the smart television terminal through the transmission network channel via a home network or other network. The smart television service platform also pushes various application links and network services relating to TV programmes through different channels synchronously.

In addition to the conventional watching of live digital TV programming and Internet TV programmes, the smart television terminal also realizes a seamless connection between TV media and social media, thereby allowing user interaction in a convenient and quick manner.

With such means as application stores, a smart television terminal offers search, news, weather, music, video, games, photos, video calls, shopping, chatting, multi-screen interaction and advertising information relating to current live content.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

By interconnection with other smart devices, smart television terminals may realize extended application in such fields as smart appliance, audio/video entertainment, health service and property management.

4.2 Smart television terminal

4.2.1 Hardware

Smart television hardware configurations have been greatly improved in order to meet rising consumer entertainment enjoyment expectations and the demand of smoothly operating smart televisions. Expected specifications include a dual-core CPU processor 1,5 GHz or higher, more than 2 GB of memory, a peripheral SD card slot supporting memory expansion in the form of an SD card of 2 GB to 32 GB, soft codecs and hard codecs providing a variety of codecs such as MPEG.x and H.26x, and support for multiple resolutions from QVGA to 8Kx4K (UHDTV).

A smart television terminal shall be provided with a supported hardware capacity.

Generally, smart television terminal hardware consists of a central computing unit, a storage unit, a signal input interface unit, a signal output interface unit and a display:

- central computing unit: includes CPU and GPU, video decoder supporting formats such as HEVC, MPEG2, MPEG4, H.264, AVS, and audio decoder supporting formats such as MP3, AAC, AC-3, WMA9, DRA;
- storage unit: includes RAM, ROM, HDD, SSD, etc.;
- signal input interface unit: used to receive digital TV and radio signals, or receive IP signals through the Internet, LAN or other network;
- signal output interface unit: used to output audio/video signals through a digital interface or an audio interface;
- display: used to present video content.

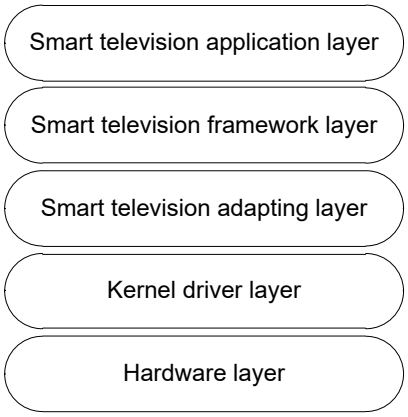
4.2.2 Software

4.2.2.1 Software block diagram

Smart television terminal software consists of a hardware layer, a kernel driver layer, a smart television adapting layer, a smart television framework layer and a smart television application layer, as shown in Figure 2.

Generally, a smart television terminal operation system consists of a kernel driver layer, a smart television adapting layer and a smart television framework layer.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019



Key

Hardware layer:	consists of central processing unit, storage unit, signal input interface unit and signal output interface unit
Kernel driver layer:	adopts the Linux kernel applicable to TV Framework. Core system services of smart television operation system, such as memory management, process management, network protocol framework, system security, file system and other infrastructure, come from a Linux kernel. In addition, relevant device drivers also come from a Linux kernel.
Smart television adapting layer:	located between the smart television framework layer and the kernel driver layer, the adapting layer is capable of supporting different hardware platforms, including I/O devices, sensors, cameras, A/V modules, displays, networs and multimedia and other interfaces, facilitating the migration of the operating system to different hardware platforms
Smart television framework layer:	offers a system library for applications running in the application layer framework
Smart television application layer:	offers a scalable application interface for use by third-party developers

Figure 2 – Block diagram of smart television terminal

4.2.2.2 Smart television operation system

A smart television operation system is a software system set running in the TV hardware environment, controlling the operation of other programs and offering an interactive operating interface for users in the upper side, and providing an interactive standard for bottom hardware and supporting different devices in the lower side. It is mainly responsible for basic tasks, such as managing and configuring memory, determining the priority for the supply and demand of system resources, controlling I/O devices, and operating the network and management file systems.

4.2.2.3 Application layer software

The application layer of smart television contains user-oriented application software with different functions. Most application layer software is developed and realized based on application interfaces provided in the framework layer. Application layer software may be installed, upgraded and uninstalled by the user.

4.3 Characteristics

4.3.1 Human-machine interaction

Human-machine interaction refers to a process during which the user completes a smart television terminal operation and information exchange through operating an interactive device or recognition technology incidental to a smart television terminal.

Smart television terminal operation and information exchange includes two categories, i.e. conventional television function and smart application.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

Conventional television functions include receiving and operating digital TV/radio, such as auto/manual channel search, signal selection, channel switching, sound control. Human-machine interaction incidental to smart television terminal includes facial recognition, voice recognition, gesture recognition and somatosensory recognition, etc. More essential features of smart televisions are shown in Annex B.

Interactive devices include, but are not limited to, the following categories: remote controls, keyboards, mice, joysticks and wearable devices.

Interaction techniques include, but are not limited to, the following categories:

- facial: also known as face recognition, a biometric identification technology; refers to a technology that uses an external device, such as a camera, to acquire visual feature information of faces for identification;
- gesture recognition: refers to a technique that uses mathematical algorithms to analyze movements of various parts of a human (generally face and hands) captured by an external camera and, in combination with the current software environment, determine the intent of a user and execute the corresponding operations;
- voice recognition: refers to a technique that allows the machine to convert the voice signal into corresponding text or command through a recognition and understanding process;
- somatosensory interaction: a technique that conducts interaction through capturing and identifying human movements and expressions;
- touch interaction: touch control for smart television refers to the interactive application that allows the user to touch, click and slide directly on the TV screen to complete the control of smart television.

4.3.2 Multi-screen interaction

Multi-screen interaction refers to a series of operations including transmission, sharing, resolution, display and control of multimedia (video, audio, picture and text, etc.) content between different multimedia terminal devices, such as mobile phone, tablet, smart television terminal and computers through interconnection protocols for cable or wireless network.

Multi-screen interaction technology may allow the user to share the contents between multiple devices. For instance, a film on a mobile phone may be played on a smart television terminal and controlled through the mobile phone; a picture on a tablet may be displayed synchronously on a smart television terminal or other smart devices; the content being presented on a smart television terminal may be synchronized to a mobile phone, a tablet or other smart devices for playing and to control switching; a simulated remote control such as a mobile phone or a tablet may be used to realize such functions as controlling and inputting text on a smart television terminal.

4.3.3 Security mechanism

4.3.3.1 Overview

Security mechanisms involved in smart television mainly include system security, application security, payment security and content security.

4.3.3.2 System security

System security refers to the security mechanism used in smart television terminal hardware, firmware and system software for safeguarding normal operation of the terminal system and offering the necessary security support for application software.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

Typical system security mechanisms include: software encryption/decryption engine, safe storage of information, trusted execution environment, safe starting, root of trust for storage, root of trust for authentication, application source authentication, application installation management and control, authority management, system log, security service, security service application interface and system security upgrade.

4.3.3.3 Application security

Application security involves two levels, i.e. behaviour security and transaction security. For the former, the application cannot, during execution, cause any damage to a smart television terminal system, other applications on the terminal and other devices in the network by utilizing its own error or malicious code. Malicious codes contained in the application, such as viruses, trojans and worms, as well as misuse of terminal authority by the application, are the main causes for behaviour security vulnerabilities. Conducting security testing before an application is released to the application store for user download is an important means for the prevention of such security issues.

Application transaction security refers to security protection measures adopted by application developers for protecting specific transactions contained in the application as developed. Such security measures are used to satisfy the requirements of transaction flows and transaction data for confidentiality and integrity, such as the username password mechanism, data encryption transmission and storage mechanism. The security of the application transaction largely depends upon the system security mechanism of the terminal.

4.3.3.4 Payment security

In a narrow sense, payment security refers to the security of various types of payment application software, affiliated with application security. Various types of application software with payment functions (mainly including third-party payment, e-commerce, group buying, wealth planning, banking, etc.) often adopt multiple security measures to safeguard the payment transaction flow and data security and prevent consumers' personal payment information from being embezzled. Common security measures include username, password, real-time SMS verification code, USB token, digital certificate and running environment testing. In a broad sense, payment security requires that any unnecessary loss cannot be caused to personal financial information and assets before, during and after the payment process.

4.3.3.5 Content security

The content security mechanism is mainly used to prevent unauthorized use of digital audio/video content on smart television terminals. At present, the content security mechanism adopted for smart television terminals mainly consists of conditional receiving of digital TV, DRM and digital interface content protection.

The conditional receiving technique is used in the digital TV broadcast system. Once the service platform of broadcast system encrypts the MPEG transmission flow, conditional receiving system will safely transmit the encryption key to the terminal, which, following the obtainment of the encryption key, will then conduct decryption and decoding. The conditional receiving technique for the terminal may be realized through a smart card solution, a card-free solution or a machine-card separation solution.

The DRM technique is mainly used in a two-way network. The DRM system often consists of a front-end content encryption module, a front-end licence issue module and a terminal decryption module. Compared with the conditional receiving technique, the DRM technique may allow a much finer authorization of content use (i.e. playing times and playing timeline).

The digital interface content protection technique is used to prevent the attacker from intercepting the audio/video content at the terminal digital interface, often using data encryption.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

5 Application scenarios of smart television

5.1 Digital TV broadcast

5.1.1 Digital TV

Smart television allows the user to watch the TV programmes through the broadcast system. The broadcast system can transmit live programme broadcasts, time-shifted broadcasts, on-demand broadcasts and play back programmes, etc.

Live broadcast refers to a technique to receive audio/video streams broadcast by the smart television platform in a real-time manner for watching. According to the resolution of the video source, live broadcasts may be divided into standard resolution, high resolution and ultra-high resolution, etc.

Time-shifted broadcast combines storage and real-time streams cache to realize seamless integration of recording broadcasts and live broadcasts. In the current channel, a user may choose bitrate and time-point to watch the programme right before the current timing and switch to a live broadcast state at any time in a time-shifted broadcast mode.

An on-demand broadcast refers to a video interaction transaction that allows the front-end of smart television to broadcast and push a programme at a designated time-point. It adopts a real-time stream transmission protocol/real-time transmission protocol to realize such controls as play, pause and forward/back of the video programme.

Playback is an on-demand broadcast transaction of a live programme source. Using the play on-demand principle, it records the live program in the service platform of smart television to allow the user to control the broadcast.

5.1.2 EPG

The EPG provides a simple and convenient operation interface for the use of a smart television application. With the EPG, the user can see the information on the programme, including programme name, channel, broadcast time, programme details, etc.

5.1.3 HbbTV

HbbTV can show digital television content from a number of different sources including traditional broadcast TV, the Internet, and connected devices in the home. Services delivered through HbbTV include enhanced teletext, catch-up services, video-on-demand, EPGs, interactive advertising, personalisation, voting, games, social networking, and other multimedia applications.

5.2 Internet-based application

5.2.1 General

Internet-based application refers to an information resource that the smart television terminal needs to acquire through the Internet or other network when the user uses the application. Typical Internet-based applications for smart televisions cover such information as news, on-demand broadcast of audio/video, e-commerce, social media, visualized communications, search, online education, cloud storage, community business services, health services, smart applications and games. See Annex C for more information. Considerations concerning the media profile are introduced in Annex D.

5.2.2 Daily life information

Digital information provided by the media, once subject to display adaptation through image processing technology, may be acquired by the user on a smart television terminal. Such information includes digital newspapers, real-time news, weather information and advertising.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

5.2.3 Online audio/video service

Online audio/video service providers transmit the audio/video data chosen by the user to the smart television terminal via the Internet or other network according to the command of the user. Such applications include live broadcasts, on-demand broadcasts, searches and previews.

5.2.4 E-commerce

E-commerce applications allow the user to complete the procurement of commodities or services online through a smart television terminal. E-commerce applications often include commodity classification, commodity display, commodity comparison, shopping cart, orders, delivery address, etc.

5.2.5 Social application

Social applications migrate social tools such as instant messaging software and microblogs to a smart television terminal, and adapt smart television terminals, thereby extending the interaction functions of smart television terminals and other smart terminals.

5.2.6 Video communications service

The video communications service allows video calls between smart television terminals or between smart television terminals and other terminals.

5.2.7 Online information search

Search functions includes text, picture, voice and video search, allowing the user to rapidly search local or remote information that needs to be acquired.

5.2.8 Online education

Smart television online education refers to remote education that is offered by access to the Internet or other networks through smart television terminals. Online education can be realized in the following forms: online classroom, courseware browsing, online reading, exam trends, employment guidance and online textbooks, etc.

5.2.9 Cloud storage

With cloud service applications offered by smart television terminals, a user may acquire cloud storage and cloud albums from cloud service providers. The user may search or play on cloud and carry out such operations as backup, sharing and deletion.

5.2.10 Community living service

Smart television terminals may be connected to the property management centre of a residential area to offer, through the application platform provided by the property management centre, information on surrounding stores and promotional information of surrounding stores, and delivering such functions as online inquiries, payment of utilities and property management fees, shopping delivery services, catering bookings and making reservations.

5.2.11 Health service

A smart television terminal can be connected to a blood glucose meter, a pulse monitor and a blood pressure monitor via an external interface, and monitor or manage the health condition of a user through connection with the Internet or other network or health service centre. Health service applications may offer many services, such as regular reminders, health condition supervision, health worker communication, emergency response and emergency calls.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

5.2.12 Smart home service

Smart television terminals can connect to other smart appliances to form a home network with the television as the core. The user may control different home appliances, such as the washing machine, the refrigerator and the air conditioner through the smart television terminal, and deliver smart living services including log information storage, cloud data analysis and recommendation push through cloud storage and cloud computing technology.

5.2.13 Games

Smart television terminals may run sports, education, chess, fighting and social games through various human-machine interaction means.

5.3 Local application

Local applications refer to application programs that are installed and run on smart television terminals locally and may offer such functions as local media playing, standalone games, text processing, file management and local setting without access to external networks.

5.4 Application store

5.4.1 Function description

An application store is an application that runs on smart television terminals relying on a cloud application management system and offering a range of third-party software for smart televisions. The user can browse, purchase and download application programs in the application store and install such programs on the smart television terminal, thereby continuously extending various functions of the smart television terminal.

An application store generally includes two parts: a cloud application management system and smart television terminal application-management software.

5.4.2 Cloud application-management system

A cloud application-management system is mainly used for various functions for each application uploaded by every developer, including security scanning, legality review, adaptation and stability testing, application management, application arrangement, smart recommendation, smart search and account and payment management.

- Security scanning: once an application is uploaded by the developer, the system will automatically scan whether the application contains viruses or advertising, whether the application's name or description contains any sensitive word that is not allowed by the system.
- Legality review: it carries out a legality review over the application as uploaded, including: whether the application complies with laws and regulations or contains any pornographic or illegal content, whether the screenshot or icon of the application is clear and follows the format requirements.
- Adaptation and stability testing: considering the difference of various types of smart televisions in terms of operation system, screen resolution and chip platform, it consists of testing and reviewing whether the application as uploaded can run as normal on different types of smart television. Such testing is also known as reliability verification prior to application go-live.
- Application management: application management mainly includes application view, application on/off-line, application upload and multiple picture upload.
- Application arrangement: mainly re-arrangement of application within the cloud system based on different dimensions, such as hot ranking and selected recommendation based on downloading and ratings.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

- Smart recommendation: it uses a specific algorithm to calculate the application that a user or device is most interested in based on data regarding application browsing and downloading of such user or device within a certain period.
- Smart search: with a search engine developed by the cloud system, improves the convenience and accuracy of searches for users with a series of methods. Such searches may support various forms, such as pinyin, initials and ranking.
- Account and payment management: with a customized account management system, a user can realize such functions as application collection, comment, management and payment through such an account.

5.4.3 Terminal application management software

Terminal application management software can be installed and used on various types of smart television terminals. Through such software, various applications offered by the cloud application management system may be displayed on smart television terminals via a visualized screen, allowing the user to browse, search, download, install, update and uninstall an application and presenting various functions in a visualized manner, including hot recommendations, application classification and search screen.

- Downloading and installation of application software: application software is downloaded in the application store and installed on smart television terminal. Application software may be automatically installed or wait for installation.
- Update of application software: in view of version variation of application software in the cloud system, a new version of terminal application software may be adopted for the old one based on the user's choice. Personal data of the user following the update will be changed.
- Removal of application software: uninstalling may be conducted with an uninstall tool or other method for the purpose of deleting the program files or data information of such application software in the smart television terminal system.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

Annex A
(informative)

Comparative study on existing smart television technologies

IEC/TC100 collected survey results from participating member countries at the end of February 2013. According to the result, different countries have different definitions and descriptions for smart televisions.

"Smart TV" has been a marketing term already used by some companies in the market, so the term "smart television" could be confused with these products. Further, it is too vague a term for any technical discourse. Deutsches Electrotechnische Kommission (DKE) would like to suggest a better name – "connected television" or "connected TV".

While the definition of the smart television does not exist in Japan at this moment, the following functionalities can be generally recognized as a smart television: to have a capability to receive real-time broadcasting; to have a capability to utilize a variety of contents through services for the digital TV set with integrated Internet capabilities; to allow the user to download and run advanced applications.

Smart television comprises interactive applications and services that are accessed, wholly or partially, through a television and are delivered via IP networks. Applications and services will often, but not always, include audio and video content. Examples of common smart TV applications and services available today include catch-up TV, video on demand, EPG, information services, such as news and weather, and games. Applications and services are typically accessed via a manufacturer-provided portal. Smart televisions usually also include other traditional TV features, such as the reception of connections to external services. Hybrid services, integrating content from broadcast and IP networks, are also common.

There are several trademarks in the U.S. associated with "SMART TV". Using a different term is recommended. There are some online suggestions such as "connected TV" or "hybrid TV". Care should be taken when selecting a term as there are several related terms that may have different meanings, such as "WEB TV", "IPTV", and "INTERNET TV". The project team will have to decide which functions are integral to a "SMART TV".

There is no standardized definition for a "SMART TV", but the following are some definitions available in the U.S.

- PC MAG encyclopedia: An Internet-enabled TV set with advanced functions such as being able to update its own electronic program guide (EPG), record programs (DVR capability) and provide interactive access to the Web for movie content as well as Web surfing. The "SMART TV" could be also called a "connected TV," a smart television may be able to execute built-in and downloaded applications. For example, Samsung®'s Internet@TV[1] is a feature upgrade for certain TV and Blu-ray™ player models that lets viewers download and run apps. See Google TV[2] and smartphones.
- Toshiba® smart television description: Introducing Toshiba SmartTV™ [3], a suite of innovations available on premium L6200U and L7200U HDTVs. These sets transform your television experience by effortlessly tying into the Web, mobile devices, even other

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

---

1 Internet@TV is the trade name of a product supplied by Samsung. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

2 Google TV is the trade name of a product supplied by Google. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

3 SmartTV is the trademark of a product supplied by Toshiba. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

electronics in your home to expand what you can do and enjoy—and simply make life easier. Stream content with Netflix®[4] and other providers. Share videos and music across your home network and other devices. Get unchained Web access with an open browser. Find your favorites in a flash. Plan your entertainment with Toshiba MediaGuide™. Or set up your home theater in a heartbeat, and control it all with your universal remote, tablet PC or smartphone.

- Samsung® smart television[5]: Samsung smart television lets you find and control exciting content in new and unexpected ways. Accessing Apps, signature services and browsing are easy. Voice and gesture controls, face recognition, the smart Touch Remote Control and the Smart View Mobile App all provide unique ways to interact with your TV. Enjoy an exceptional picture and a TV experience like never before. Smart Interaction – Smart Content – Smart Evolution.
- Wikipedia®: A smart TV is a traditional television set with integrated Internet and interactive "Web 2.0" features which allows users to stream music and videos, browse the Internet, and view photos. Smart TV is a technological convergence of computers, television sets and set-top boxes. Besides the traditional functions of television sets and set-top boxes provided through traditional broadcasting media, these devices can also provide Internet TV, online interactive media, over-the-top content (OTT), as well as on-demand streaming media, and home networking access.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

---

4 Netflix is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC] of this product.

5 Samsung Smart Television is the trade name of a product supplied by Samsung. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Annex B
(informative)

Essential features

B.1 General

This should be investigated and recommendations be developed based upon consumer market research, which term appeals to consumers and conveys an appropriate technical message.

B.2 Connection

DKE comments the feature could include broadband Internet protocol connectivity, home network awareness and a standardized application environment. Network connection (wired or wireless) and browser/middleware enabling interactivity streaming depend on the form factor of the devices in question as well as customer infrastructure. For a hand-held device, obviously wired connectivity makes little sense.

N-screen interactive technology would increase values of the smart television. In this case, either wired or wireless connections should be fitted. The television equipped with features such as integration of broadcasting, broadband, and the Internet would be regarded as a smart television.

In addition to conventional TV features, a smart television will include:

- IP connectivity;
- interactive application environment;
- audio and video reception via IP: this should be able to deliver the best possible quality available to the user, taking into account network capabilities and conditions;
- content protection measures, enabling the delivery of premium content.

Assuming this question refers to communication between a TV and (a) mobile device(s), the link to the mobile device should clearly be wireless. A wired connection would be very inconvenient for users. Communication is likely to be via the user's home IP network, which may include both wired and wireless segments. The TV may access this network via a wired or wireless connection.

Interoperates with other Internet connected devices is an essential feature, including standards-based Internet connectivity, home networking capability, and access to cloud-based applications and entertainment services.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

B.3 N-screen technology

B.3.1 Wi-Fi Direct™

Wi-Fi Direct™ is a technology which is developed by Wi-Fi alliance©. Wi-Fi Direct enables Wi-Fi devices to connect directly, making it simple and convenient to do things like print, share, sync and display. Products bearing the Wi-Fi Direct™ certification mark can connect to one another without joining a traditional home, office or hotspot network.

Wi-Fi Direct™ can be used for all kinds of applications – to share content, synch data, socialize, play games, play audio and video, and more, only easier and without worrying about finding an Internet connection.

This information comes from the Wi-Fi alliance©. If you need more information, please refer to www.wi-fi.org.

B.3.2 DLNA

Home network media discovery and exchange is implemented using DLNA and UPnP standards. The DLNA specifications are already standardised in the IEC 62481 series.

B.4 Human-machine interaction technology

Subclause 4.3.1 has already given some introduction for human-machine interaction technology, such as facial, gesture, voice recognition, somatosensory and touch interaction.

The related International Standard development is conducted by IEC and ISO committees, such as JTC1 SC35, which is focused on gesture standardization.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

Annex C
(informative)

Smart television platforms and solutions

C.1 HbbTV

The only deployed industry standard solution so far is HbbTV (Hybrid Broadcast Broadband TV), published as ETSI TS 102796-V1.1.1 in June 2010, and V1.2.1 published in November 2012. Work is currently ongoing on further development of the HbbTV standard. HbbTV is based on standards and specifications developed by DVB, OIPF, W3C, CEA, and others. The OIPF specifications are currently being standardised in the IEC 62766 series.

HbbTV is based on CE-HTML, with extensions from DVB and the Open IPTV Forum for integration with broadcast services and delivery. HbbTV is present in TVs from many manufacturers. All platforms make extensive use of industry standards for some components.

The best solution depends on the requirements of an individual platform. However, fragmentation, meaning the requirement to port applications and services for each targeted platform, is a serious problem in the industry today. All members of the value chain will benefit from open-standard solutions allowing applications and services to be developed once and deployed on multiple platforms.

The industry is addressing this need through initiatives such as the Smart Television Alliance and HbbTV. Standard components such as a profile of HTML5, H.264 and MPEG-DASH help to some degree, but standardising how to integrate these components is also required. In addition, some proprietary components are also likely to be necessary, in particular for content protection.

If standards work is undertaken, it should cover only interfaces subject to undesirable fragmentation. As described above, one possible target would be the interface between the application or service provider and the smart television (meaning the customer premise equipment).

This would require the following technical aspects to be addressed:

- interactive application environment;
- audio and video codecs;
- application and content delivery;
- content protection;
- the Smart Television Alliance covers all these aspects and it is recommended that IEC investigates the Smart Television Alliance solution in any future technical work on Smart television;
- some interfaces, specifically relating to content protection, will be difficult to standardise, and typically rely today on some proprietary technology.

Other interfaces referred to in this survey are not subject to harmful fragmentation and do not require such a high level of standardisation. Specifically, it should be noted that smartphones, tablets and PCs do not directly need to support smart television features. Applications provided by, for example, the manufacturer can be downloaded to these devices to communicate with the smart television and can deal with specific features of the TV. Users are not inconvenienced by fragmentation in this area.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

Standards should not limit the ability for manufacturers to develop and improve their platforms, or for content and service providers to take advantage of new features. Smart television is a rapidly developing industry and standardisation needs to happen without limiting the potential for the industry to innovate.

C.2 Android TV

Android™[6] is an open source operating system based on the Linux™ kernel that is mainly used in mobile phones, tablets and other portable devices. Android has become the most widely used smart television operating system solution. Its characteristics are:

- very convenient to use (i.e. the camera, GPS, etc.);
- has its own runtime, and excellent virtual memory management;
- provides a rich interface of controls for developers to use, allows visual development, and ensures consistent application interface in the Android platform;
- lightweight inter-process communication mechanism;
- supports background service class applications;
- supports efficient and fast data access.

For more details, please refer to www.android.com.

C.3 tvOS

tvOS™[7] is a smart operating system standard for television operating systems. tvOS is designed and developed for smart television terminals such as set-top boxes, connected TV sets and home media gateways. tvOS has a layered architecture, consisting of the tvOS core layer, hardware abstraction layer, component layer, runtime environment layer and application framework layer.

The tvOS core uses an open source Linux with an added security module. tvOS can be tied to a secure chip with a security mechanism. It supports a two-way secure hand shaking mechanism for identifying the smart television terminal that uses tvOS. It also supports secure app downloading by using a trust chain mechanism.

tvOS is very friendly to DTV or video applications and has very good performance for video services. Many DTV functional modules have been optimized and embedded into the component layer. These modules can be used by video or DTV apps based on tvOS so that these video apps can be light and enjoy excellent performance.

TVOS can support both Chinese NGB video services apps and Android apps. A TV Virtual Machine (TVM) is embedded in the runtime environment layer. The TVM can support both Dalvik[8] and JVM. An HTML engine is also embedded in this layer. The application framework supports both NGB video service API and Android API.

IECNORM.COM : Click to view the full PDF of IEC TR 63122-1:2019

---

6 Android is the trademark of a product supplied by Google. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

7 tvOS is the trademark of a product supplied by Apple. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

8 Dalvik is the trade name of a product supplied by Google. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.