TECHNICAL REPORT

ISO/TR 14813-1

First edition
1999-07-15

Transport information and control systems — Reference model architecture(s) for the TICS sector —

Part 1:
TICS fundamental services

Systèmes de commande et d'information des transports — Architecture(s) de modèle de référence pour le secteur TICS —

Partie 1: Services fondamentaux TICS

Reference number
ISO/TR 14813-1:1999(E)

Contents

Page

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

Printed in Switzerland

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The main task of technical committees is to prepare International Standards, but in exceptional circumstances, a technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 14813-1, which is a Technical Report of type 2, was prepared by Technical Committee ISO/TC 204, *Transport information and control systems.*

It is expected that there may well be more than one single TICS Architecture approach to be considered and documented and that existing architecture approaches will have previously-produced documentation developed according to disparate standards and conventions.

It is also implicit in the work to be undertaken by WG 1, that working group members will require a clear, well-structured understanding of the work of the following participant groups:

o Other TC 204 Working Groups

o CEN TC 278 Working Groups

o Japanese initiatives

o European RTTT programs

o US ITS program

o Australian initiatives

o Canadian Initiatives

Full documentation of all possible architectural approaches is obviously not feasible given the high level of resources required to carry this out. Indeed full documentation and description of all possible approaches is undesirable as an item for Standardization.

A defined and consistent approach is however required to facilitate the specification of architecture requirements to enable a clear view to be developed and presented of the work of each participant group.

By combining the work of major contributions such as the European Functions and sub Functions and the US ITS list of user services, the WG has used the basic hypothesis that it is possible to define a set of fundamental services which can be used in a variety of combinations and configurations, to provide an outline description of the different TICS Architecture approaches. It is assumed that the scope of the TICS sector will always have a definable boundary (which will change over time).

ISO/TR 14813 consists of the following parts, under the general title *Transport information and control systems — Reference model architecture(s) for the TICS sector*:

— *Part 1: TICS fundamental services*

— *Part 2: Core reference model*

— *Part 3: Example elaboration*

— *Part 4: Reference model tutorial*

— *Part 5: Requirements for architecture description in TICS standards*

— *Part 6: Data presentation in ASN.1*

— *Part 7: TICS data profiles*

Introduction

In order to develop a cohesive Reference Architecture, and in order to establish the relationship and interdependencies of the various Transport Information and Control Systems (TICS) services, it is beneficial to firstly determine the underlying fundamental services. The purpose of this part of ISO/TR 14813 is to identify the fundamental services within the current perception of the TICS sector. In response to requests this part of ISO/TR 14813 also categorises these TICS Fundamental Services into logical groups.

TICS Fundamental Services will also provide a common descriptive basis for comparing existing Japanese, European and North American taxonomies, or classification systems. For example, it should be possible to map the ATT Functions and Sub functions described by ERTICO CORD in "Recommended Definitions of ATT Subfunctions, Functions and Areas" (Deliverable D003 - part 6 Version 1) to the US User Services by relating both to the TICS fundamental services.

These described services are given the general appellation “TICS Fundamental Services”.

Transport information and control systems — Reference model architecture(s) for the TICS sector —

Part 1:
TICS fundamental services

1 Scope

This part of ISO/TR 14813 provides definitions of the fundamental informational products or services or applications areas provided to a TICS user. These are described as “TICS Fundamental Services”. This part of ISO/TR 14813 identifies 32 TICS fundamental services. If further fundamental services are subsequently identified as the sector develops, it is the intention that this part of ISO/TR 14813 shall be revised to include them.

This part of ISO/TR 14813 is applicable to the Working Groups of ISO/TC 204 and other TCs who are developing standards for the TICS sector and associated sectors whose boundaries cross into the TICS sector (such as urban light railways, intermodal freight and fleet. This part of ISO/TR 14813 is designed to provide information and explanation to those developing TICS Standards and to those developing specifications, implementations and deployments for Transport Information and Control Systems.

This part of ISO/TR 14813 is in itself, by its nature, advisory and informative. It is designed to assist the integration of services into a cohesive Reference Architecture, assist interoperability and common data definition.

2 Definitions

For the purposes of this part of ISO/TR 14813, the following terms and definitions apply.

2.1
TICS fundamental service
an informational product or service or application area provided to a TICS user

2.2
TICS user
one who directly receives and can act on TICS data or control products

2.3
External TICS user
one who receives a TICS fundamental service through interaction with the TICS system by way of a TICS External Interface

NOTE The external interfaces and the external users define the boundary of the TICS sector. These users of the fundamental services may be human or systems. They may simultaneously use the services of non-TICS systems.

2.4
Internal TICS user
one who receives a TICS fundamental service through interaction with the TICS system by way of an Internal-Internal Interface

3 Symbols and abbreviations

ITS Intelligent Transport System

TICS Transport Information and Control Systems

4 General Requirements

4.1 TICS Services

ISO/TC 204/WG 1 defines TICS fundamental services as follows:

"TICS fundamental services are informational products or services or applications areas provided to a TICS user".

If all the TICS Fundamental Services are specified, then a user viewpoint of the sector will be established, independent of internal sector functionality or technology.

By way of further elaboration, A TICS Fundamental Service is a separable application that is perceived by a TICS user as unique from other fundamental services.

A TICS Fundamental Service is not a technology or an internal functionality of a TICS system.

4.1.1 Characteristics of TICS Services

There are several characteristics of TICS Fundamental Services. They are:

a) A TICS fundamental service may be composed of subservices,

b) The name of a TICS fundamental service should reflect the application area supported,

c) A TICS fundamental service should be logically consistent and of manageable size,

d) If two TICS fundamental services are always provided together they should be combined into a single fundamental service.

Once the significant architecture approaches have been represented in this manner, it should be possible to define comparable end user views of each architecture approach.

4.2 TICS Users

ISO/TC 204/WG 1 defines a TICS user as follows:

"one who directly receives and can act on TICS data or control products."

There are two types of TICS Users:

External TICS Users: these are external users of TICS fundamental services who interact with the TICS system through TICS external interfaces. These are the external users of the TICS sector. The external interfaces and external users define the boundary of the TICS sector. These users of the fundamental services may be human or systems. They may simultaneously use the services of non-TICS systems.

Internal TICS Users: these are internal users of the TICS system. They interact with the system through TICS Internal-Internal Interfaces. They may be human, or TICS modules.

4.2.1 Examples of TICS Users

travellers	car drivers	bus drivers	truck drivers
elderly drivers	tourists	service providers	pedestrians
cyclists	motorcyclists	transportation providers	commuters
public officials	police agencie	commercial operators	public transport operators
haulier/truckers shippers	regulators	goods vehicle inspectors	fleet operators
toll road operators	airlines	shipping lines	travel consultants

5 TICS Fundamental Services

This clause lists and describes 32 TICS Fundamental Services.

5.1 Pre-trip Information

This service provides single mode, multi-modal and inter-modal transportation information at home, work, hotels, major public locations, such as shopping centres, and on portable terminals.

Pre-trip Information includes shared transport such as public transport by road, rail, air and sea, mass transit, car pooling and other sharing and matching services.

Pre-trip information includes current information on network status, traffic conditions, road and weather information, prevailing traffic regulations and tolls.

5.2 On-trip Driver Information

This service is provided as:

1. distributed collective information,
2. tailored subscribed information.

On-trip driver (user) Information includes:

a) incidents

b) park & ride options

c) parking

d) prevailing traffic conditions

e) public transport schedules (timetable and actual)

f) regulations

g) roadworks, both planned and emergency

h) tolls

i) weather

j) roadside phones (roadside services, including callboxes)

Service 2 (On-trip Driver Information) and service 3 (On-trip Public Transport Information) are separable but complementary and can both be used in one trip.

5.3 On-trip Public Transport Information

On-trip Public Transport Information is provided to the traveller once the trip has started. Examples of 'on-trip' public transport information include:

a) information terminals at bus stops

b) information terminals at bus stations, rail stations, car parks

c) information terminals in major public places

d) information terminals at transfer points

e) in-vehicle information displays

f) portable/personal terminals

The **type of information** provided may include:

a) boarding point information

b) fare information

c) interchange possibilities

d) route choice

e) time of next service

f) where to get off

This service is complementary to service 2 (On-trip Driver Information).

5.4 Personal Information Services

This service provides information either in a pre-trip, or on-trip context. This information is complementary to service 1 (Pre-trip Information) and service 2 (On-trip Driver Information), providing a 'yellow pages' type function. Examples of the type of information provided are as follows:

a) car repair/recovery facilities

b) filling station location and information

c) hospital locations and information

d) hotel locations and availability

e) restaurant locations and information

f) booking

g) general tourist information (e.g. points of interest, parks, hours of operation)

h) truck stops and maintenance facilities

5.5 Route Guidance & Navigation

This service provides information on community and/or individual user optimum route options for specified destinations. Examples include the following applications:

a) autonomous navigation, based on historic data regarding road network and public transport information

b) dynamic route guidance, based on real-time network status and public transport information

c) dual mode route guidance with the capability of either dynamic, or autonomous modes of operation

d) multi-modal trip making including interchange possibilities

e) route and facility guidance services through portable terminal units and roadside equipment (for safety and convenience)

Best route options may be calculated taking account of network and public transport information and may incorporate multi-modal options such as Park and Ride.

This service also includes the provision of route guidance to pedestrians, cyclists and motorcyclists.

5.6 Transportation Planning Support

This service covers the use of TICS systems to provide data regarding traffic flows and travel demand for transportation planning purposes. Examples of such applications based upon TICS data include the following:

a) current traffic flow data from traffic control systems

b) current utilisation levels from public transport information systems

c) origin and destination data from route guidance systems

d) route choice data from route guidance systems

e) travel demand data from pre-trip information systems

5.7 Traffic Control

This service covers the management and control of traffic flows through the use of TICS technologies. It includes the following:

a) adaptive traffic signal control

b) directional variable message signing

c) implementation of predefined traffic management strategies

d) integration of inter urban and urban control

e) ramp metering

f) route guidance integrated with traffic control

g) speed control

h) tidal flow (e.g. directional lane control)

5.8 Incident Management

This service provides the capability for detecting and responding to various incidents on the transport network. Examples of incident management functions include the following:

a) anticipation and prevention

b) detection and prediction

c) monitoring

d) disaster management; such disasters as earthquakes, landslides, inundation or major warfare

e) post incident management (including disaster/disruption)

f) response initiation

g) incident verification

NOTE Disaster management may become a full user service at a later date.

5.9 Demand Management

This service is the development and implementation of management and control strategies designed to influence the demand for travel.

These strategies influence the overall level of demand for travel at different times of the day and relative demand for different modes of transport, through the management of pricing structures, area access control or zone entry regulations. Demand management functions include:

a) access control

b) air quality based zone pricing

c) congestion pricing

d) high occupancy vehicle facility management

e) parking pricing

f) public transport fares management

5.10 Policing/Enforcing Traffic Regulations

This service covers the application of TICS technologies to the enforcement of traffic laws and regulations. Examples include the following:

a) access control

b) high occupancy vehicle facility usage

c) parking regulation enforcement

d) speed limit enforcement

e) signal enforcement (e.g. red light violation)

f) emissions monitoring

5.11 Infrastructure Maintenance Management

This service covers the application of TICS technologies to the management of road, communication and computer infrastructure. Included in this service are:

a) highway maintenance management

b) nature and location from utilities and authorities to TICS control centres

c) the provision of road works

d) the use of probe car data to guide timing and location of planned road works and road closures

e) highway sign maintenance management

5.12 Vision Enhancement

This service is the application of TICS technologies to the enhancement of driver perception through the use of in-vehicle equipment.

NOTE The lead on standardization for the onboard issues will be agreed between TC 204 and TC 22.

5.13 Automated Vehicle Operation

This service is the application of TICS technologies to completely automate the driving process, creating a 'hands off' driving environment. Examples include the following:

a) automatic lane keeping

b) automatic parking operation

c) vehicle platooning

d) very low speed cruise control (inching)

5.14 Longitudinal Collision Avoidance

Longitudinal collision avoidance includes the use of sensors and control systems to detect potential for collisions either prompting the driver to take action or automatically initiate avoiding action. This includes the application of obstacle detection systems.

5.15 Lateral Collision Avoidance

Lateral collision avoidance is the use of systems (such as sensors and control systems) to monitor the potential hazards involved in lane keeping, lane changing, entering and leaving high speed roads and overtaking. It can either prompt the driver to take action or automatically initiate collision avoidance manoeuvres.

5.16 Safety Readiness

Safety readiness is the use of monitoring and warning systems for both private car driver and vehicle. Examples include the following:

a) critical component monitoring

b) driver alertness monitoring

c) engine temperature

d) oil pressure

e) road condition monitoring

NOTE The lead on standardization for the onboard issues will be agreed between TC 204 and TC 22.

5.17 Pre-crash Restraint Deployment

This service uses TICS technologies to determine the velocity, mass and direction of vehicle and objects involved in a potential collision and the number, location and major physical characteristics of occupants. A system's use of this data to determine a response strategy may include the following elements:

a) arming and deploying air bags

b) deploying lateral protection systems

c) deploying rollbars

d) tightening seatbelts

NOTE The lead on standardization for the onboard issues will be agreed between TC 204 and TC 22.

5.18 Commercial Vehicle Pre-clearance

Commercial vehicle pre-clearance allows commercial vehicles, including trucks and buses to have credentials and other documents, safety status and weights checked automatically at normal road speeds. A principal objective being to effect pre-clearances with minimal disruption to the vehicle journey and the traffic flow.

5.19 Commercial Vehicle Administrative Processes

This is complementary to service 18 (Commercial Vehicle Pre-clearance). It enables hauliers and shippers to purchase annual and ad hoc credentials, using communications and computer technologies.

5.20 Automated Roadside Safety Inspection

Automated roadside safety inspection is the use of TICS systems to enable roadside access to safety performance records of hauliers, vehicles and drivers. This will enhance existing systems of spot checks by providing inspectors with easy access to current data relevant to the inspection.

5.21 Commercial Vehicle On-board Safety Monitoring

This service covers the use of on-board monitoring systems to oversee the safety status of commercial vehicles, commercial vehicle drivers and cargo during the entire course of the trip. This may include sensing and collecting data on the following:

a) brakes

b) driver alertness

c) driving time

d) lights

e) shifted cargo

f) tyres

Warning may be provided to both the driver and/or remote monitoring facilities.

5.22 Commercial Fleet Management

At a multi-modal level commercial fleet management includes logistics and freight management systems. It also covers the use of Automatic Vehicle Location (AVL) and vehicle-to-control centre communications to provide vehicle location and other status information to the fleet operators despatched. This facilitates the use of dynamic despatching systems to improve the efficiency of the fleet management process. This service includes:

a) pre-trip information

b) inter-modal terminal conditions

5.23 Public Transport Management

This service covers the application of TICS technologies to the operation, planning and management of public transport operations. It includes the provision of real-time information on vehicle location and status, enabling the identification of departures from schedules and dynamic rescheduling. This also includes the monitoring of public transport vehicle status such as passenger loadings, engine management system functions, tyre pressures. This service also includes the application of multi-modal or super-modal scheduling and planning systems.

5.24 Demand Responsive Public Transport

This service covers the provision of on-demand transport services to individual travellers. This will provide demand responsive transport services to the user, while enabling transport operators to dispatch and schedule vehicles.

Typically travellers may request service by specifying destination and any special needs such as pram conveyancing, wheel chair lifts, or other special services for the disabled. Vehicles, covering a corridor, or area, are then despatched to the traveller by a dispatching system. The public transport fleet deployed on this service may include buses, vans and taxis.

This service addresses the needs of commuters by providing a viable shared transport alternative to the single occupancy private car and also addresses the needs of specific groups such as elderly and disabled.

5.25 Shared Transport Management

Shared transport management provides real-time ride matching services to users at home, office, or other locations.

5.26 Emergency Notification and Personal Security

This service applies TICS technologies to provide both driver/personal security services and automatic incident notification for private car drivers and goods vehicle drivers. This may include:

a) automatic collision notification

b) automatic theft warning systems

c) user initiated distress calls

d) seat belt tightening

e) third party emergency notification

NOTE The lead on standardization for the onboard issues will be agreed between TC 204 and TC 22.

5.27 Emergency Vehicle Management

Emergency vehicle management includes the application of fleet management, route guidance and traffic signal priority techniques to the management of emergency vehicles such as fire, police and ambulance.

5.28 Hazardous Materials & Incident Notification

This service covers the use of TICS technologies to provide authorities with data on the nature, location and condition of hazardous goods cargoes. This facilitates the enforcement of routeing instructions and the effective response to any incident involving the load. Data to be provided may include:

a) Routeing Data

   1) route guidance

   2) route enforcement

b) Incident Data

   1) issuing post-incident instructions to driver

   2) location of vehicle

   3) nature of incident

   4) nature of cargo

5.29 Electronic Financial Transactions

This service includes the use of electronic, or 'cashless' payment systems for transportation. Examples include the following:

a) Fare collection (e.g. public transport)

b) Toll collection (e.g. parking)

c) Payment for services (e.g. yellow page access)

5.30 Public Travel Security

Public travel security includes the surveillance and monitoring systems for public transport facilities, car parks and on-board public transport vehicles. Systems may be automatic, sending a distress call when specified conditions are encountered or manually initiated. This also covers the use of security systems designed to protect public transport vehicle operators.

5.31 Safety Enhancements for Vulnerable Road Users

This service covers the application of TICS technologies to the enhancement of safety levels for vulnerable road user groups (particularly elderly or disabled and road maintenance workers). These groups include:

a) motor cyclists

b) pedal cyclists

c) pedestrians

Safety enhancement measures may include measures such as:

a) smart pedestrian crossings (e.g. prolonging crossing times for elderly and disabled users).

b) speed warning systems

c) vehicle presence detection

d) automatic advice to drivers by vulnerable road users (e.g. presence of wheel chair)