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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Vehicular gateways and intelligent transportation systems
(ITS) – Vehicular gateway interfaces

Communications interface between external applications and a vehicle gateway platform

Recommendation ITU-T H.560



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Recommendation ITU-T H.560

Communications interface between external applications and a vehicle gateway platform

Summary

Recommendation ITU-T H.560 specifies functional requirements for vehicle gateway platform (VGP) services, services functionalities and management, including vehicle gateway platform, application and communication network requirements. In particular, it defines the requirements for services running over the vehicle gateway platform and the communication interfaces between those services and some applications running over external devices such as cloud servers, nomadic devices or other in-vehicle devices.

History

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FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Introduction

The primary goal of the vehicle gateway platform (VGP) is to provide an integrated runtime environment for delivering the communications services of a vehicle gateway. The VGP also provides higher layer communications services in order to support intelligent transportation systems (ITS) and infotainment applications and services for the driver and passengers. Therefore, the VGP provides and controls the access to the driver-vehicle interface (DVI) devices such as displays, speakers and buttons installed inside the car.

In particular, the communication services allow external applications to enhance the user interface of the vehicle. Communication services will also enable the VGP to control the timing and format of all application outputs transmitted to the driver via the DVI, even for applications that are not integrated at the time of vehicle manufacturing. They shall also provide enough capabilities and flexibility to support any kind of application while respecting safety constraints specific to the vehicle environment.

Indeed, there are some safety concerns with drivers interacting with information and communications technology (ICT) applications "brought in" to the vehicle on a nomadic device or "beamed in" via network connectivity. Firstly, interactions with these applications are often performed through a nomadic device's user interface instead of the vehicle's user interface. Nomadic device user interfaces are usually not adapted for in-vehicle usage because of their small size, manual interface and unsecured/uncontrolled/arbitrary position within the vehicle. On the other hand, vehicle user interfaces are usually optimized for safe interaction with drivers by careful placement and design of the user interface.

Secondly, interaction with these devices/applications typically operates independently of the driving situation and other applications the driver may be interacting with. This can result in driver distraction that is not compatible with safe driving. For instance, a social media status update message from an unpaired nomadic device may interfere with a collision avoidance warning.

Consequently, an important aim of this Recommendation is to define services requirements that will address all of these safety concerns, based on a standardized communications interface between the vehicle and all external applications – regardless of where they are physically located. Such an interface will enable drivers to safely interact with external ICT applications through the vehicle's user interface and also allow all interaction with the driver to be managed by a centralized point of control.

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Recommendation ITU-T H.560

Communications interface between external applications and a vehicle gateway platform

1 Scope

This Recommendation defines the requirements for vehicle gateway platform (VGP) services, VGP service functionalities and VGP management. The VGP service functions support service capabilities for applications running and data/message processing. The VGP service functionalities support core capabilities used by VGP services such as session management or in-vehicle resource access management. Finally, the VGP management supports functions for VGP configuration and monitoring such as security management.

This Recommendation also defines the network requirements for communication interfaces used between the defined VGP services and external applications. These external applications could be running over nomadic devices brought into the vehicle, roadside infrastructure, or cloud-based servers. Applications downloaded to one of the in-vehicle devices after the time of manufacture are also considered external applications since they may not be fully integrated into the driver-vehicle interface (DVI) and require a communications interface. Advanced driver assistance systems (ADAS) are considered as out of scope of this Recommendation.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T F.749.1] Recommendation ITU-T F.749.1 (2015), *Functional requirements for vehicle gateways*.
- [ITU-T H.550] Recommendation ITU-T H.550 (2017), *Architecture and functional entities of vehicle gateway platforms*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 vehicle gateway platform (VGP) [ITU-T F.749.1]: A VGP is the collection of ICT hardware and software in a vehicle operating as an open platform to provide an integrated runtime environment for delivering the communications services of a VG. A VGP may also provide higher layer communications services such as interaction with the driver through the driver-vehicle access services and so on. Subsystems dedicated solely to vehicle operation are not considered part of the VGP. Supported applications/services include ITS and infotainment.

3.1.2 vehicle gateway (VG) [ITU-T F.749.1]: A VG is a device in a vehicle that enables communications between a device in the vehicle and another device which may be physically located either inside the vehicle or outside the vehicle (e.g. roadside station, cloud-based server, etc.). A VG provides standardized interfaces and protocols, communications across heterogeneous

networks, optimized network selection based on application needs and network QoS, arbitration and integration of network communications, security and switching network connections to maintain service continuity.

3.1.3 nomadic devices [ITU-T F.749.1]: Nomadic devices include all types of information and communication devices as well as entertainment devices that can be brought into the vehicle by the driver and/or passengers to be used while driving. Examples include mobile phones, portable computers, tablets, mobile navigation devices, portable media players and multi-functional smart phones.

3.1.4 driver-vehicle interface (DVI) [b-ITU-T F.749.2]: The integrated user interface for the vehicle. It includes visual displays, loudspeakers, microphones, manual input controls, etc.

3.1.5 quality of service (QoS) [b-ITU-T E.800]: Totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 advanced driver assistance systems (ADAS): Vehicle systems that have a primary function of helping the driver safely control the vehicle. Examples of such systems include lane departure warning systems and adaptive cruise control (ACC).

3.2.2 external applications/services: Applications/services that were not integrated into the vehicle at the time of manufacture. Such applications/services include those that reside on a nomadic device brought into the vehicle, on the roadside infrastructure, or on a cloud-based server. Applications/services that do reside on the vehicle platform, but that were not integrated at the time of manufacture (e.g., downloaded applications), are also considered "external applications/services" as they might not be fully integrated into the DVI.

3.2.3 service functionalities: The service functionalities entities provide a set of basic control functions such as session management and in-vehicle resource access management that are used by other services.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

3G	Third Generation of cellular phone technologies
ACC	Adaptive Cruise Control
ADAS	Advanced Driver Assistance Systems
API	Application Programming Interface
CAN	Controller Area Network
DVA	Driver Vehicle Access
DVI	Driver Vehicle Interface
ECU	Electronic Control Unit
GRE	Generic Route Encapsulation
ICT	Information and Communications Technology
IP	Internet Protocol
IPsec	Internet Protocol Security

ITS	Intelligent Transportation Systems
L2TP	Layer 2 Tunnelling Protocol
LDM	Local Dynamic Map
LTE	Long Term Evolution
MIB	Management Information Base
OID	Object Identifier
PPTP	Point-to-Point Tunnelling Protocol
QoS	Quality of Service
RSU	Roadside Unit
SAM	Situational Awareness Management
SMSA	Security Management for Services and Applications
SSL	Secure Sockets Layer
TLS	Transport Layer Security
USB	Universal Serial Bus
VG	Vehicle Gateway
VGP	Vehicle Gateway Platform
VPN	Virtual Private Network
WLAN	Wireless Local Area Network

5 Conventions

None.

6 System description

The VGP framework includes several components such as access networks and devices (known as vehicle gateways or VGs), services, service functionalities and management. Figure 2 in [ITU-T H.550] illustrates the high level architecture of the VGP and presents the VGP services and management within the overall VGP framework. This figure is used as a basis for many of the figures included in this Recommendation.

This Recommendation focuses on VGP services and management.

6.1 Overview of VGP services

6.1.1 VGP services

6.1.1.1 Driver-vehicle access service

This clause introduces the supported services that have interaction with DVI. These services are part of driver vehicle access (DVA) service. DVA service has components for managing input devices, providing an I/O interface for the application to control input and to access the on-board display. The main components and roles related to DVA are as follows:

- Display management service
 - Announcing the list of on-board displays
 - Providing schemes to share access to each display