INTERNATIONAL STANDARD

ISO 29281-2

Second edition
2019-01

Intelligent transport systems — Localized communications —

Part 2: Legacy system support

Systèmes intelligents de transport — Communications localisées —

Partie 2: Support pour systèmes hérités

Reference number
ISO 29281-2:2019(E)

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Published in Switzerland

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

This second edition cancels and replaces the first edition (ISO 29281-2:2013), which has been technically revised. It also incorporates the Amendment ISO 29281-2:2013/Amd 1:2014.

A list of all parts of the ISO 29281 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is part of a family of International Standards for communications in Intelligent Transport Systems (ITS) based on the ITS station and communication architecture specified in ISO 21217:2014.

This document is Part 2 of a multipart series of International Standards which determines functionalities of ITS localized communications related to the legacy communications application layer specified in ISO 15628. These functionalities are protocols and procedures located in the various layers and entities of the ITS station.

Intelligent transport systems — Localized communications —

Part 2: Legacy system support

1 Scope

This document specifies elements of communications for localized communications in ITS.

In particular, the following architectures, procedures and protocols are specified:

— support of communication interfaces (DSRC-CI) using the DSRC application layer specified in ISO 15628;

— support of ISO 15628 DSRC applications via an ITS access technology suited for localized communications.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 8825-2, *Information technology — ASN.1 encoding rules: Specification of Packed Encoding Rules (PER) — Part 2*

ISO 15628, *Intelligent transport systems — Dedicated short range communication (DSRC) — DSRC application layer*

ISO 17419, *Intelligent transport systems — Cooperative systems — Globally unique identification*

ISO 17423, *Intelligent transport systems — Cooperative systems — Application requirements and objectives*

ISO 21217, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

ISO 21218, *Intelligent transport systems — Hybrid communications — Access technology support*

ISO 22418, *Intelligent transport systems — Fast service announcement protocol (FSAP)*

ISO 24102-1, *Intelligent transport systems — ITS station management — Part 1: Local management*

ISO 24102-3, *Intelligent transport systems — ITS station management — Part 3: Service access points*

ISO 24102-4, *Intelligent transport systems — ITS station management — Part 4: Station-internal management communications*

ISO 24103, *Intelligent transport systems — Communications access for land mobiles (CALM) — Media adapted interface layer (MAIL)*

ISO 29281-1, *Intelligent transport systems — Localized communications — Part 1: Fast networking & transport layer protocol (FNTP)*

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:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
15628 legacy CI
communication interface design in support of the ISO 15628 application layer

3.2
15628 legacy service
application layer service specified in ISO 15628

3.3
DSRC application layer
application layer specified in ISO 15628

3.4
15628 legacy application
ITS application using the ISO 15628 application layer

4 Symbols and abbreviated terms

DSRC Dedicated short range communication

NOTE The term DSRC has two meanings. One indicates IEEE 802.11 OCB communications at 5,9 GHz, standardized for ITS in ISO 21215. The other one indicates communications at 5,8 GHz such as the European DSRC backscatter technology standardized in EN 12253[3], and the Japanese active transceiver technology standardized in ARIB STD-T75[9] and ARIB STD-T110[10]. The latter meaning of DSRC applies in this document.

5 Requirements

Communication functionality, which is different to the functionality of networked communications, e.g. functionality out of the set of Internet protocols (IP), is referred to as localized communications functionality in this document.

The functionality to support legacy systems, especially those related to ISO 15628 "DSRC application layer" shall be as specified in this document.

Detailed requirements are specified in the following clauses of this document.

— Clause 6 specifies architectural elements.

— Clause 7 specifies facility layer protocols

— Clause 8 specifies conformance declaration.

— Clause 9 specifies test methods.

— Annexes A and B provide further mandatory requirements.

— The informative Annex C provides 15628 legacy service guidelines.

6 Architecture

6.1 ITS station

The specifications given in this document shall comply with the ITS station architecture and with the concept of an ITS station communication unit (ITS-SCU) as specified in ISO 21217 and ISO 24102-4.

6.2 Communication scenarios

General ITS communication scenarios are illustrated in ISO 21217. Specific communication scenarios for service advertisement are specified in ISO 22418.

6.3 Implementation scenarios

The protocols specified in this document may support the implementation architectures introduced in ISO 21217 and illustrated in Figures 1 and 2 with an ITS station unit and a peer DSRC station unit.

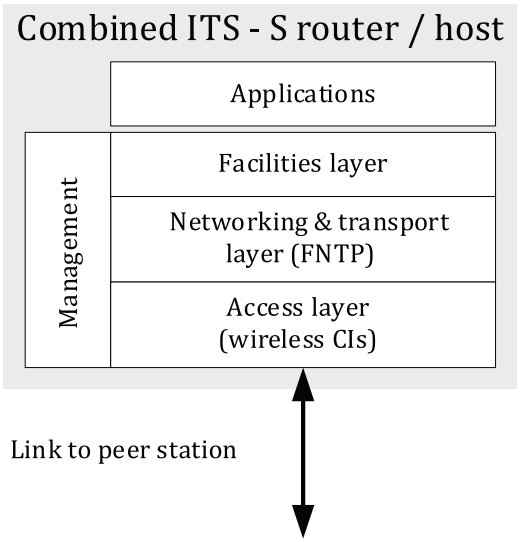

Figure 1 — Combined ITS-S host / router

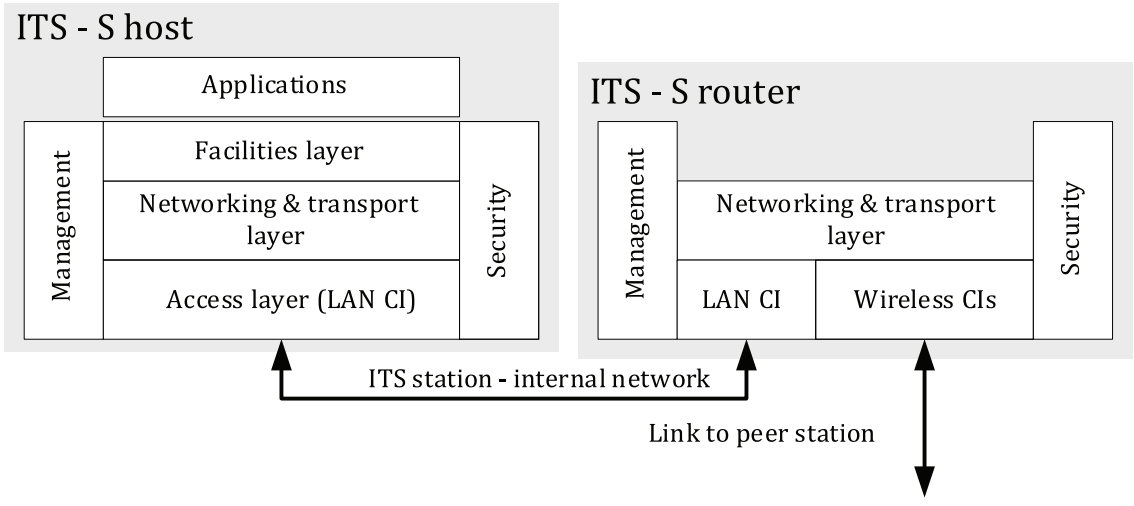

Figure 2 — ITS-S host and ITS-S router separated in different ITS-SCUs

6.4 15628 legacy CIs

An existing ITS-S access layer technology may be implemented in an ITS station as a "15628 legacy CI", as presented in Figure 3, such that it can communicate with peer stations that are not necessarily aware of any ITS-S context, and where none of the networking protocols specified for ITS-S are used in the wireless link.

EXAMPLE Examples of legacy CIs are the passive 5,8 GHz backscatter technology specified in EN 12253[3] and referred to as "CEN DSRC", and the active 5,8 GHz technology specified ARIB STD-T75[9].

Types of CIs are specified in the ISO 21218 I-parameter "MedType". "MedType" presents values of the ITS-ATT globally unique identifier of access technologies specified in ISO 17419. A legacy CI medium identified as an ITS access technology in ISO 17419 is "DSRC" with an application layer specified in ISO 15628. Further types may be added.

NOTE The presentation of ITS-ATT in ISO 17419 refers to the CEN DSRC at 5,8 GHz specified in EN 12253[3], and inconsistently to ISO 15628, which is the DSRC application layer that can be used in combination with the EN 12253 access technology, but also in combination with other access technologies, e.g. the Japanese active DSRC technology. In order to resolve this ambiguity, this document specifies a new value of ITS-ATT in support of the Japanese DSRC access technology. The proposed value of ITS-ATT is 129; it is to be registered in the ITS-ATT registry introduced in ISO 17419. Further on, this inconsistency is to be resolved in the already started revision of ISO 17419 into a two-part document.

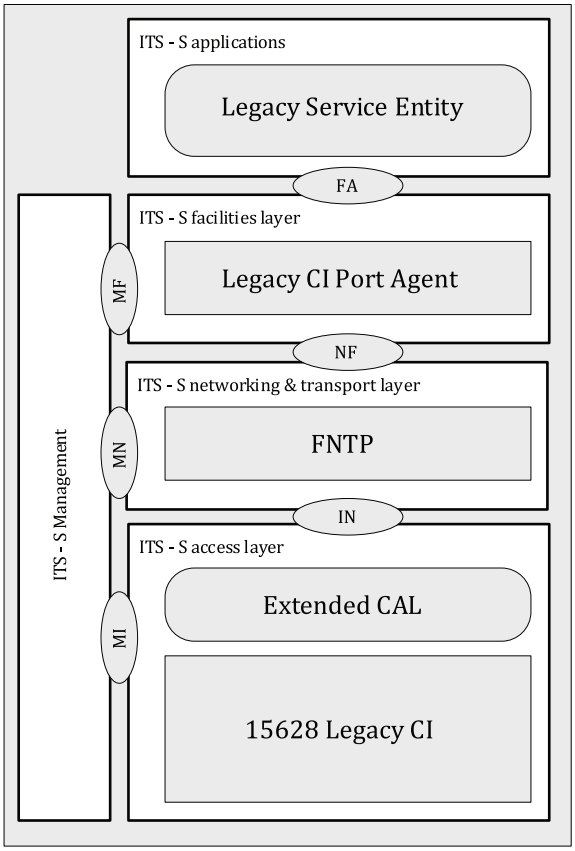

Figure 3 — General architecture for ISO 15628 legacy CIs

Inside the ITS station, the "Fast networking & transport layer protocol" (FNTP) specified in ISO 29281-1 shall be used for the forwarding of packets between the ITS-S access layer and the ITS-S facilities layer.

This requires

— implementing a communication adaptation layer (CAL) as specified in ISO 21218, extended with the additional functionality for FNTP support as specified in this document, which optionally may also include parts of the service processing functionality;

— making use of the "Legacy CI Port Agent" as specified in this document.

This document specifies new I-Parameters, in addition to those already specified in ISO 21218. These new I-Parameters are presented in Table 1.

Table 1 — I-Parameters dedicated to ISO 15628 legacy CIs

I-Param no[a]	I-Parameter name	ASN.1 type	Description
57	LegacyOption	`LegacyOption15628`	Classification of different operational options specified in this document.
58	PortPA	`PortPA15628`	Port number of the "Legacy CI Port Agent" connecting to the applicable "Legacy Service Entity"
a Numbers are assigned by the I-Parameter registry, see ISO 17419, and published in a future version of ISO 21218			

The "Legacy Service Entity", i.e. the 15628 legacy application, shall register at the "Legacy CI Port Agent" indicating the CI class and legacy option of the required legacy CI.

Further details depend on the existing CI technology. Normative examples for legacy systems in accordance with ISO 15628 are provided in Annex B.

6.5 15628 legacy applications

Applications built on top of the ISO 15628 application layer may be operated over an ITS CI of CI class CIC-l1 specified in ISO 21218. The services shall interface with the FNTP via the "15628 Kernel Emulator", see Figure 4.

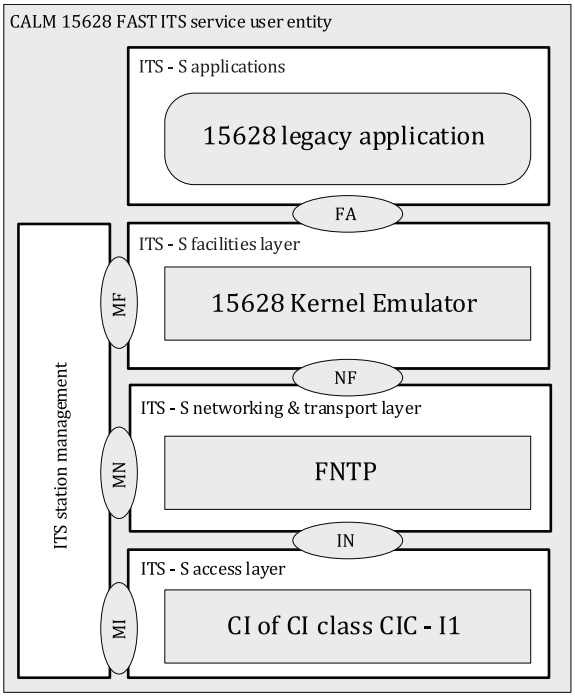

Figure 4 — 15628 legacy service operated over a CI of CI class CIC-l1 specified in ISO 21218

The 15628 initialization phase, i.e. exchange of BST and VST, shall be implemented with the FSAP service initialization phase functionality, i.e. exchange of FSAM and FSRM, specified in ISO 22418.

The "15628 Kernel Emulator" shall perform the following tasks:

— Register at server FSAP manager for periodic transmission of BST, if applicable.

— Register at client FSAP manager for reception of BSTs, if applicable.

— Emulate the 15628 T-Kernel interface for usage by applications.

— Map the 15628 "FlowControl" on BC-VCI and UC-VCI.

The purpose of the 15628 link identifier (LID) shall be served by Link-ID specified in ISO 21218.

Detailed procedures are specified in Clause 7.

7 Facilities layer protocols

7.1 General

The ITS-S facilities layer shall use functionality of the MF-SAP for management purposes as specified in ISO 24102-3.

NOTE 1 This document does not specify details of MF-SAP service primitive functions, allowing for private implementations as enabled in ISO 24102-3.

The ITS-S facilities layer shall be connected to ITS-S applications via an API. The API introduced in ISO 21217 basically provides the functionality of the MA-SAP, the FA-SAP, and the SA-SAP. Details of the API are outside the scope of this document.

NOTE 2 The design of service primitive functions in ISO 22418 assumes that ITS-S application processes always register via the MA-SAP. In the case of 15628 legacy applications and the architecture given in this document, the registration is made via the MF-SAP. Thus the respective MA-SAP service primitive functions specified in ISO 22418 also apply for the MF-SAP. Alternatively the registration is done by the 15628 legacy application via the MA-SAP, i.e. the API.

The ITS-S facilities layer shall use functionality of the NF-SAP for connecting to the ITS-S networking & transport layer.

7.2 FSAP communication handler

The FSAP communication handler specified in ISO 22418 and located in the ITS-S facilities layer is responsible for reception of FSAMs and FSRMs and for repetitive transmission of FSAMs.

7.3 Legacy CI Port Agent

Upon registration of a 15628 legacy CI at the ITS station management entity as specified in ISO 24102-1 and optionally registered as specified in ISO 17423, the ITS station management entity notifies the "Legacy CI Port Agent" about the presence of this 15628 legacy CI, indicating the Link-ID and the type of legacy CI as specified in ISO 21218.

The "Legacy CI Port Agent" shall

— use the NF-SAP service NF-FNTP-PORT of the FNTP to get a host port number assigned as specified in ISO 29281-1;

— notify the port number to the ITS station management entity, indicating also the Link-ID of the related 15628 legacy CI.

The "Legacy CI Port Agent" shall maintain a separate host port number for each legacy CI registered in the ITS station.

Details on ISO 15628 legacy CIs are provided in B.1.

7.4 15628 kernel emulator

7.4.1 15628 legacy applications

15628 legacy applications used with the operational mode LegacyOption15628 = 3 shall be treated in the same way as ITS-S applications designed for FNTP.

NOTE The functionality of ACn commands specified in EN 12795[8] is not supported.

7.4.2 CI classes

The 15628 kernel emulator enables ITS applications built on ISO 15628 to be operated over a wireless CI of CI class CIC-l1 specified in ISO 21218, based on the FNTP. Usage of CIs of CI class CIC-l5 specified in ISO 21218 in combination with the 15628 kernel emulator is prohibited.

7.4.3 Registration of 15628 legacy applications

In a server station the 15628 kernel emulator shall register available 15628 legacy applications at the FSAP manager using the service primitive function of ASN.1 type "FsapProviderRegistration" specified in ISO 22418 with at least the parameters specified in Table 2.

Table 2 — Registration of 15628 server application at groupcast manager

Parameter	Value
`FsapProviderRegistration. applicationID`	ITS-SAPIID of ASN.1 type ITSsapiid specified in ISO 17419, containing ITS-AID = "aid" as contained in "ApplicationList" specified in ISO 15628; e.g. ITS-AID = 1 for electronic fee collection.
`FsapProviderRegistration. flowID`	As specified in ISO 22418
`FsapProviderRegistration. priority`	As specified in ISO 22418
`FsapProviderRegistration. fsamDissem`	As specified in ISO 22418
`FsapProviderRegistration. serviceDataReg`	As specified in ISO 22418
`ServiceDataReg. fsamExtensions`	The value of "BeaconID" specified in ISO 15628 shall be provided in the extension element of ASN.1 type AdvertiserIdentifier. This may require creating an FSAM dedicated to this purpose, i.e. not shared with other ITS applications
`ServiceDataReg. providerPort`	Present, as specified in ISO 22418

In a client station the 15628 kernel emulator shall register available 15628 applications at the at the FSAP manager using the service primitive function of ASN.1 type "FsapUserRegistration" specified in ISO 22418 with at least the parameters specified in Table 3.

Table 3 — Registration of 15628 server application at groupcast manager

Parameter	Value
`FsapUserRegistration.applicationID`	ITS-SAPIID of ASN.1 type ITSsapiid specified in ISO 17419, containing also ITS-AID = "aid" as contained in "ApplicationList" specified in ISO 15628; e.g. ITS-AID = 1 for electronic fee collection.
`FsapUserRegistration.serviceID`	ITS-AID ="aid" as contained in "ApplicationList" specified in ISO 15628
`FsapUserRegistration.contextData`	SamContext.itsaidCtxRef.ctx="eid". SamContext.context={"parameter", "obeConfiguration"}, with "parameter"as contained in "ApplicationList" and "obeConfiguration" as contained in "VST" "eid", "parameter" and "VST" as specified in ISO 15628.

7.4.4 Service operation phase

In the service operation phase the PDUs of the 15628 services GET, SET, ACTION and EVENT-REPORT as specified in ISO 15628 are exchanged.

For the purpose of this document, the ITS-FPDU contained in an FNTP NPDU as specified in ISO 29281-1 shall contain the T-APDU as specified in ISO 15628.

The "15628 Kernel Emulator" shall support concatenation and chaining as specified in ISO 15628.

The 15628 parameters "FlowControl" and "LID" are not supported explicitly. "FlowControl" and "LID" shall be considered in the operation phase as specified in Table 4.

Table 4 — 15628 "FlowControl" and "LID" versus VCI type

15628				ITS
FlowControl	**LID**	**Mode**	**Purpose**	**VCI**
1	broadcast	0	Broadcast transmission	TX via BC-VCI
1, 4	private	0	Data transmission	TX via UC-VCI
7	private	1	Data exchange - Request	TX via UC-VCI
10	private	—	Data exchange - Response	TX via UC-VCI
2, 3, 5, 6, 8, 9, 11	—	—	—	—

The purpose of 15628 "LID" shall be served by Link-ID.

7.5 Basic primitive application functions

Basic primitive application functions are an essential element of 15628 legacy CIs according to option 2 specified in Annex B. They are related to on-board unit's resources, e.g. human-machine interface, IC card interface. Each basic primitive application function is uniquely addressed by a port number. A roadside station selects and combines basic primitive application functions (see Figure B.2) in order to realize a specific service.

Examples of the basic primitive application functions are shown in Annex C.

NOTE Basic primitive application functions are executed on LPP.

8 Conformance

A "Protocol Implementation Conformance Statements" (PICS) proforma is specified in ETSI/TS 102 985-1[5] for the predecessor of this document. However this needs to be revised now.

9 Test methods

A "Test Suite Structure & Test Purposes" (TSS&TP) specification for conformance testing is provided in ETSI/TS 102 985-2[6] for the predecessor of this document. However this needs to be revised now.

An "Abstract Test Suite" (ATS) specification for conformance testing is provided in in ETSI/TS 102 985-3[7] for the predecessor of this document. However this needs to be revised now.

Annex A
(normative)

ASN.1

A.1 Use of modules

The following ASN.1 module is specified in this annex:

— **ITSlegacySupport** { iso (1) standard (0) calm-nonip(29281) legacy (2) asnm-1 (1) version1 (1)}

A.2 Module ITSlegacySupport

Unaligned packed encoding rules (PER) as specified in ISO/IEC 8825-2 shall be applied for this ASN.1 module.

```
ITSlegacySupport { iso (1) standard (0) calm-nonip(29281) legacy (2) asnm-1 (1) version1
(1)}

DEFINITIONS AUTOMATIC TAGS::=BEGIN

IMPORTS
PortNumber FROM CITSdataDictionary1 {iso(1) standard(0) cits-applMgmt (17419)
dataDictionary (1) version1 (1)}

ITSatt FROM CITSapplMgmtApplReg2 {iso(1) standard(0) cits-applMgmt (17419) applRegistry
(2) version2 (2)}
;
-- End of IMPORTS
-- Operational mode
LegacyOption15628::=INTEGER{
   notALegacyCi   (0), -- this value should never be used
   nonIpDsrc   (1), -- default DSRC (ISO 15628) communications
   ipDsrc   (2), -- support of ISO 24103
   noDsrcCI   (3), -- not yet standardized
   }(0..255)

-- Port number of the "Legacy CI Port Agent"
PortPA15628::=PortNumber

-- LPP payload in FNTP
FNTPlpp::=OCTET STRING (SIZE(0..65535))

-- ITS-ATT value selecting the Japanese DSRC access technology
c-ITSatt-JapaneseDSRC ITSatt::=129 -- Japanese DSRC

/*
   The ASN.1 specification has been checked for conformance to the ASN.1
   standards by OSS ASN-1STEP
*/

END
```

Annex B
(normative)

15628 legacy CI

B.1 15628 legacy CIs

This annex presents normative details for legacy CIs explicitly supporting the ISO 15628 application layer.

Two options of handling 15628 legacy CIs are specified. Distinction is made by the way in which the 15628 legacy services are implemented.

Option 1: Restricted to CI class CIC-l5 specified in ISO 21218. Adaptation to the ISO 21217 ITS station architecture performed by means of a "15628 Agent Application" below the IN-SAP being responsible for the quick parts of the service, a "15628 Principal Application" above the NF-SAP being responsible for the slow parts of the service and for global control of the service, and the "15628 Port Manager", see Figure 3 and Figure B.1.

Option 2: Restricted to CI class CIC-l5 specified in ISO 21218. Adaptation to the ISO 21217 ITS station architecture performed by means of the LPCP below the IN-SAP, the FNTP LPP support, and the "15628 Port Manager", see Figure 3 and Figure B.2.

The "Agent Application" and the LPCP shall provide the functionality of the communication adaptation layer (CAL) specified in ISO 21218.

The purpose of LID specified in ISO 15628 shall be achieved by means of the CI-ID of a UC-VCI.

B.2 Option 1

Figure B.1 shows the architecture for option 1. Two communication entities are distinguished in Figure B.1:

a) 15628 FNTP ITS service provider entity (communication master) typically implemented as 15628 DSRC roadside unit (RSU), and not being aware of the ISO 21217 ITS station architecture.

b) 15628 FNTP ITS service user entity (communication slave) with a functionality normally available in a 15628 DSRC on-board unit (OBU), implemented in an ITS mobile unit.

NOTE 1 The communication master also can be implemented as presented for the communication slave.

NOTE 2 The term "DSRC" used above does not refer to IEEE DSRC, but to ISO 15628.

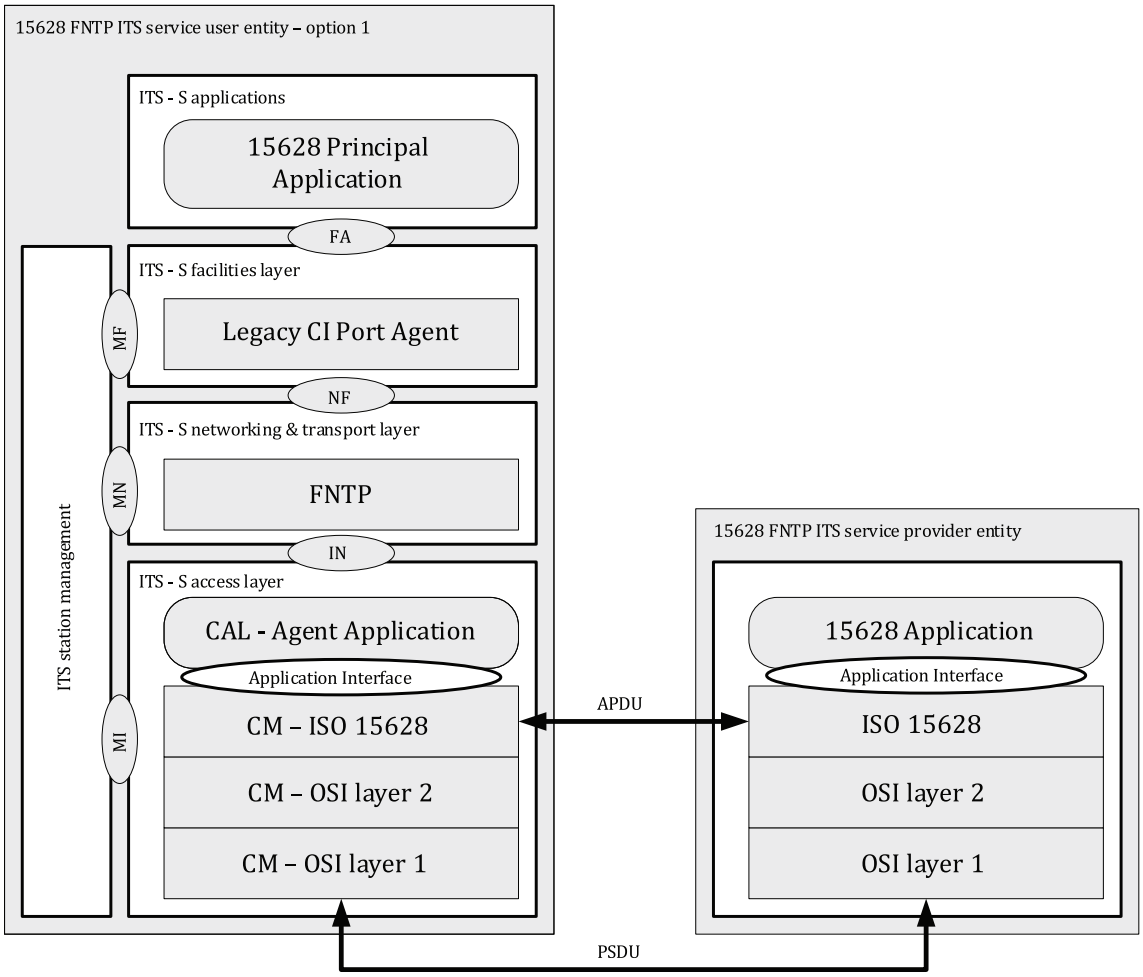

Figure B.1 — 15628 architecture with "Agent Application"

The complete 15628 legacy ITS service is arranged in a "CAL - Agent Application" and a "15628 Principal Application". The "Agent Application" shall autonomously handle time-critical packets received via the "Application Interface", i.e. packets received from the 15628 FNTP ITS service provider application in the RSU. Other packets may be forwarded to the "15628 Principal Application" without execution by the "Agent Application", e.g. packets addressed to the HMI interface or to an OBU component.

The 15628 FNTP ITS service user entity contains a DSRC communication module (CM), the "Application Interface", the communications adaptation layer (CAL) contained in the "Agent Application", the "Legacy CI Port Agent" interfacing to the MF-SAP, the NF-SAP and to the API, and the "15628 Principal Application".

The "Agent Application" shall interface the communication stack of the CM in accordance with ISO 15628 via the "Application Interface". Examples of an "Application Interface" are given in [1],[2].

The "Agent Application" shall interface the ITS-S networking & transport layer via the IN-SAP, providing the functionality of the communications adaptation layer (CAL) specified in ISO 21218. The networking protocol used to connect the "Agent Application" to the "15628 Port Manager" shall be FNTP specified in ISO 29281-1. The FNTP port number selecting the "Legacy CI Port Agent" shall be assigned upon activation of the "15628 legacy CI".

In case service data units (SDUs) are simultaneously received via the "Application Interface" and via the IN-SAP, priority shall be given to the SDUs received via the "Application Interface".

The 15628 legacy CI shall provide the functionality of an MI-SAP in accordance with ISO 24102-3 and ISO 21218 with restrictions and amendments as specified in this document. The 15628 legacy CI shall be of CI class "CIC-l5" and of CI access class "CIAC-1" according to ISO 21218.

In order to register the CI, the MI-REQUEST "RegisterCI" specified in ISO 21218 shall be used with

— parameter "medType" set to "iso15628",

— parameter "linkID" corresponding to a MAC address set to the all-zero locally administered individual address 02-00-00-00-00-00 to indicate a CI without MAC address as specified in ISO 21218.

A 15628 legacy CI shall always provide only a single UC-VCI. A 15628 legacy CI shall not provide a BC-VCI or MC-VCI, which does not preclude reception of groupcast frames.

Every BST received shall be forwarded to the "Legacy CI Port Agent".

B.3 Option 2

Figure B.2 shows the architecture for option 2 which consists of equal peer stations.

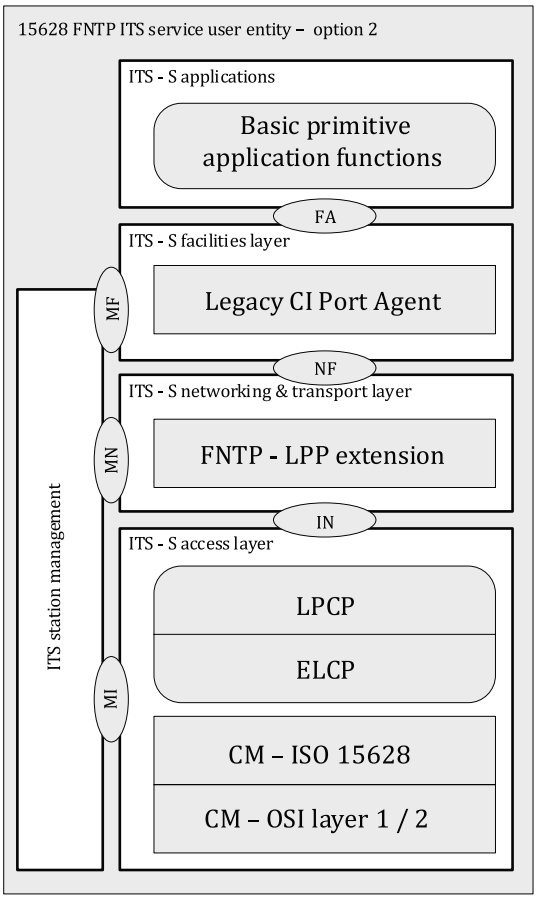

Figure B.2 — Option 2

The "Local Port Control Protocol" (LPCP) performs as an adaptation layer for ISO 15628 type DSRC. It shall be built on top of the "Extended Link Control Protocol" (ELCP) specified in ISO 24103. The ELCP shall be addressed in the BST and VST with the application Id "aid" = 18 specified in ISO 15628.

NOTE The ELCP is designed to support IP communications and non-IP communications.

The complete 15628 legacy service is implemented above the ITS-S facilities layer by means of "Basic primitive application functions".

The networking protocol used to connect the "Basic primitive application functions" to the LPCP shall be FNTP, specified in ISO 29281-1, with TPID-FS set to two (LPP support mode). The FNTP port number selecting the "Basic primitive application functions" via the "Legacy CI Port Agent" may be assigned dynamically upon activation of the "15628 legacy CI" or may be set by implementation.

B.4 Common procedures

B.4.1 Link management

Upon reception of a BST which shall result in creation of a new LID in a DSRC OBU as specified in ISO 15628, the "15628 legacy CI" shall

— delete the existing UC-VCI;

— create a new UC-VCI;

— associate the Link-ID of this new UC-VCI with the BeaconID contained in the BST;

— acknowledge the BST by transmission of a VST, if appropriate according to the rules specified in ISO 15628.

Upon reception of a RELEASE command specified in ISO 15628, the "15628 legacy CI" shall

— forward the RELEASE command to the "Legacy CI Port Agent";

— delete the related UC-VCI.

Upon timeout of the validity of a BeaconID specified in ISO 15628, the "15628 Legacy CI" shall delete the related UC-VCI.

B.4.2 CI states

Possible states of a CI are specified in ISO 21218.

The states "suspended" and "inactive" shall not apply for "15628 Legacy CIs" implemented as back-scatter devices specified in [3].

All state changes are notified to the "Legacy CI Port Agent" as specified in ISO 21218.

B.5 15628 I-parameters

B.5.1 Applicable parameters

Table B.1 specifies the details of I-parameters specific to a 15628 "Legacy CI".

Table B.1 — 15628 I-parameters

I-Param No	I-Parameter name	Range / values	Description	Owner
3	ManufacturerDeviceID	specified in ISO 21218	Concatenation of ObeConfiguration.equipmentClass and ObeConfiguration.manufacturerID	See ISO 21218
14	MedType	128	Indicating ISO 15628 / DSRC at 5,8 GHz	See ISO 21218
57	LegacyOption	0, 1, 2, 3 4-255	Sequential option number 0: The CI is not a legacy CI 1: Specified in B.2 2: Specified in B.3 3: to be specified in a future version of this document 4 - 255: reserved	
58	PortPA	0 - 255	Port number of FNTP pointing to the "Legacy CI Port Agent".	

B.5.2 Description

B.5.2.1 ManufacturerDeviceID

Table B.2 specifies details of I-Parameter "ManufacturerDeviceID".

Table B.2 — 15628-parameter Type

ASN.1 Type	Valid Range	Description
`UTF8String`	Text string "eeeemmmm", where eeee presents the hexadecimal equivalent of the equipment class, and mmmm presents the hexadecimal equivalent of the manufacturer ID	Length of 8 characters. Equipment class and manufacturer ID used in VST as specified in ISO 15628.

B.5.2.2 MedType

Table B.5 specifies details of I-Parameter "MedType".

Table B.3 — Parameter MedType

ASN.1 Type	Valid Range	Description
ITSatt	129	New value identifying the Japanese DSRC access technology specified in ARIB STD T-75[9].

B.5.2.3 LegacyOption

Table B.5 specifies details of I-Parameter "LegacyOption".

Table B.4 — Parameter LegacyOption

ASN.1 Type	Valid Range	Description
`LegacyOption15628`	0, 1, 2	Identifying options specified in this document. Further values are reserved.

B.5.2.4 PortPA

Table B.5 specifies details of I-Parameter "PortPA".

Table B.5 — Parameter PortPA

ASN.1 Type	Valid Range	Description
`PortNumber`	As specified inISO 17419	Port number of FNTP pointing to the "15628 Port Manager" as specified in this document.

Annex C
(informative)

15628 legacy service guidelines

C.1 Option 1

The "Agent Application" can be implemented as a smart cache memory which provides specific real-time functionality, e.g. security related functionality. The "Agent Application" mainly responds to the APDUs with time-critical constraints from the 15628 ITS service provider application as specified in ISO 15628. Other APDUs, i.e. without time-critical constraints, mainly the ACTION APDU may be directly handled in the "15628 Principal Application" without involvement of the "Agent Application". Details on how to use the ACTION ADPU by an application are specified in the "Application Interface" standards [1] and [2]. A time-critical example to be handled in the "Agent Application" is the GET_STAMPED command carried in the ACTION APDU, which retrieves information with an authenticator appended to it. An example for handling in the "15628 Principal Application" is the TRANSFER_CHANNEL command carried in the ACTION APDU, which connects to any OBU component, e.g. smart-card.

The required setting of CI access class in no way indicates the type of security applied in the 15628 service.

C.2 Option 2

C.2.1 Introduction

ITS communication media that have the application layer standardized in ISO 15628 (DSRC application layer) have been used by many ITS applications such as EFC. ISO 24103 (MAIL) enables usage of ISO 15628 media for IP communication. On the other hand, for non-IP communication type application, various applications will be executed without requesting the large over-head for communication between roadside equipment-vehicle and vehicle-vehicle.

In this mechanism, vehicle on-board equipment has the basic primitive application functions that are considered to be needed for vehicle on-board equipment as general function.

Road-side applications operate those basic primitive application functions via media which have an application layer in accordance with ISO 15628, the extended link control protocol (ELCP) defined in ISO 24103 and the local port control protocol (LPCP). Those basic primitive application functions will be used by various services commonly.

C.2.2 Application ID

At first, VST-BST will be exchanged between RSU and OBU, identifying "aid" specified in ISO 15628. The value "aid" = 18 (multi purpose application) is used to point to the implementation option 2.

C.2.3 Architecture

Figure C.1 presents the OSI structure for using 15628 legacy CIs according to option 2.

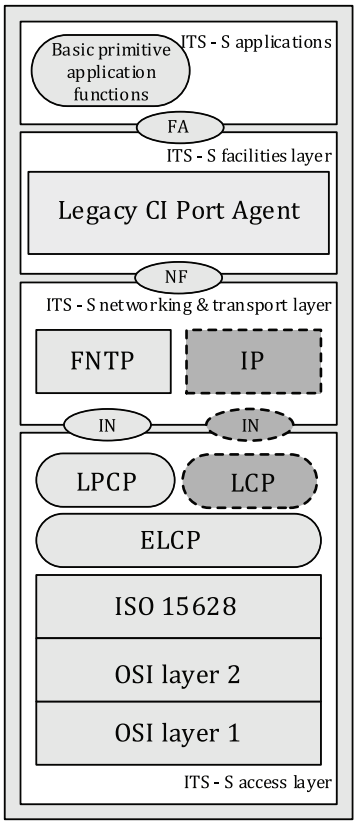

Figure C.1 — Protocol structure of layer 1 and layer 2 for option 2

NOTE Table C.2 shows examples of the basic primitive applications functions and usage.

The "Extended Link Control Protocol" (ELCP) and the "LAN Control Protocol" (LCP) are specified in ISO 24103. ELCP and LCP connect the 15628 legacy CI to the IPv6 networking protocol. ELCP and the "Local Port Control Protocol" (LPCP) connect the 15628 legacy CI to the FNTP.

C.2.4 Extended link control protocol

ELCP is needed for FNTP and for IP networking via a 15628 CI according to option 2.

ELCP has the following functions in order to complement the communication facility of the ISO 15628 type DSRC and provides the communication services for data transmission and the management service to control the network control protocol.

a) multi-protocol correspondence;

b) client/server type communication control;

c) bulk transmission control;

d) broadcast transmission mode control;

e) access control;

f) communication connection management.

ELCP can provide various transmission modes like bulk transmission and broadcast transmission; however some of the functions above are used for IP communication and not used for non-IP communication.

C.2.5 Local port control protocol

C.2.5.1 Functionality

LPCP is the adaptation layer to connect ELCP to IN-SAP for FNTP. LPCP is in charge to insert / remove the FNTP header. These headers will not be used in the wireless legacy link, but only inside the ITS station for local processing.

LPCP will provide the data transfer service for non-network type applications.

The LPCP that works as an adaptation layer for ISO 15628 is not a network or transport protocol, but it provides IN-SAP to the FNTP (especially to the local port protocol) located upper layer. It is a control protocol for data transfer service and communication control and management service for upper layer protocol. It provides communication session based on not only client/server model but also peer to peer model.

C.2.5.2 Procedure

The LPCP shall be selected with IN-SAP address as specified in ISO 21218.

In order to execute multiple non-network type applications, the LPCP defines the identification information (local port) to identify connection for the upper layer protocol.

In order to send data correctly from a sending source application to a destination application, the LPCP identifies connection of each application using local ports that identify the sending destination application and sending source application and a link address that identifies the counterpart station.

C.2.5.3 Header

The DL-SAP source_address and destination_address as used in the LLC services shall be concatenation of a CI-ID and IN-SAP address.

In case of using a particular media and upper protocols are known in priori, source_address and destination_address may be indicated by other methods on implementation.

NOTE LinkAdress and PortNo can indicate the address.

C.2.5.4 Data transfer service interface

The LPCP provides the following data transfer service primitives to the LPP:

— TransferData.request (linkAddress, sourcePort, destinationPort, userData);

— TransferData.indication (linkAddress, sourcePort, destinationPort, userData).

The "TransferData.request" service primitive is passed from the upper layer protocol to the LPCP to request to transfer the NCP-SDU passed from the upper layer protocol to the remote station.

The "TransferData.indication" service primitive is passed from the LPCP to the upper layer protocol to indicate arrival of the NCP-SDU.

The parameter "linkAddress" indicates the link address used in the DSRC.

The parameter "sourcePort" indicates the local port number (application) that is the data sending source. When a response from the sending destination is required, it is used as the default access point for giving the response.

The parameter "destinationPort" indicates the local port number (application), which is the data sending destination, and together with the parameter "linkAddress" identifies the access point of the local port control protocol.

The parameter "userData" is provided by the actual NCP-SDU itself or by passing a pointer to the NCP-SDU or by other means.

The logical relationship between data transfer service primitives the LPCP to the LPP is shown in Figure C.2.

NOTE Service primitive type "request" is abbreviated to "req" and "indication" to "ind".

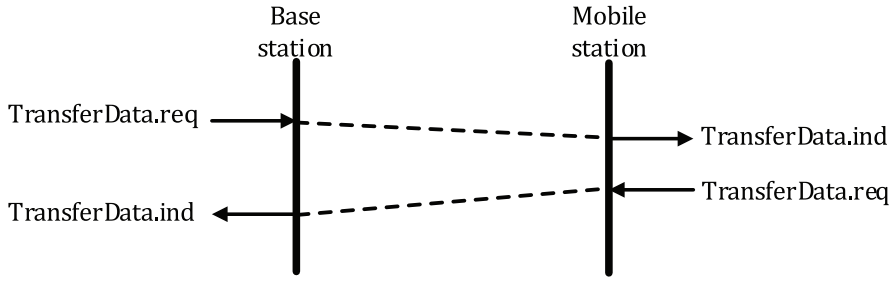

Figure C.2 — Logical relationship between data transfer service primitives

C.2.5.5 Management service interface

The LPCP provides the following management services to the LPP:

a) Event notification service

The LPCP provides the following service primitive as the event notification service to the LPP.

— EventReport.indication (linkAddress, destinationPort, eventCode, [extensionParameter])

The "EventReport.indication" primitive is passed from the LPCP to the upper layer protocol in the local station to notify of an event notified by the event notification service of the ELCP, or passed from the LPCP to the upper layer protocol in the remote station or local station to provide notification that an event such as error occurred in the LPCP.

The parameter "linkAddress" indicates the link address used in the DSRC.

The parameter "destinationPort" indicates the local port number (application) that is the data sending destination, and identifies the access point of the LPCP together with the parameter "linkAddress".

The parameter "eventCode" indicates the type of event that occurred.

The parameter "extensionParameter" indicates the additional event information corresponding to each event code, and may be provided by the actual data itself or by passing pointer to the data or by other means.

b) Local port management service

The LPCP provides the following primitives as the local port management service to the LPP.

— OpenPort.request ([openPort], [primitiveType], [recvEventCode])

— OpenPort.confirm ([openPort])

— ClosePort.request (closePort)

The "OpenPort.request" primitive is passed from the upper layer protocol to the LPCP to request the opening of a local port.

The "OpenPort.confirm" primitive is passed from the LPCP to the upper layer protocol to provide notification of the opened local port number.

The "ClosePort.request" primitive is passed from the upper layer protocol to the LPCP to request the closing of a local port.

The parameter "openPort" indicates the number of an opened local port.

The parameter "primitiveType" indicates the type of the indication primitive received by the opened local port.

The parameter "recvEventCode" indicates the type of event received by the opened local port.

The parameter "closePort" sets the local port number to be closed.

The logical relationship between management service primitives the LPCP to the LPP is shown in Figure C.3.

NOTE Service primitive type "request" is abbreviated to "req", "indication" to "ind" and "confirm" to "conf".

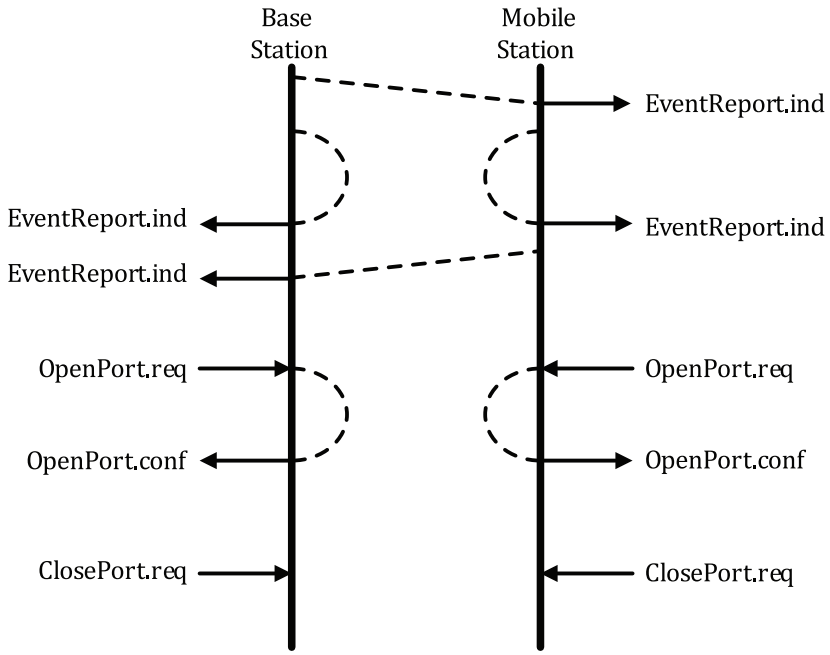

Figure C.3 — Logical relationship between management service primitives

C.2.5.6 Local port management procedure

C.2.5.6.1 Local port open process

When the "OpenPort.request" primitive in which the "openPort" parameter is specified is received from the LPP, the LPCP shall register the local port number (openPort), notification primitive type (primitiveType) and notification event type (recvEventCode) in the acceptable local port list. Then it notifies the upper layer protocol of the opened local port number through the "OpenPort.confirm" primitive.

If the specified local port (openPort) does overlap an existing port, the LPCP does not register the contents above, and notifies the upper layer protocol that opening of the local port has failed through the "OpenPort.confirm" primitive without the "openPort" parameter.

When receiving the "OpenPort.request" primitive without the "openPort" parameter, the LPCP shall assign a local port number to the requested process and register the assignment result, notification primitive type (primitiveType) and notification event type (recvEventCode) in the acceptable local port list. Then it notifies the upper layer protocol of the opened local port number through the "OpenPort. confirm" primitive.

C.2.5.6.2 Local port close process

When receiving the "ClosePort.request" primitive from the upper layer protocol, the LPCP shall delete the information on the requested local port number from the acceptable local port list, and will not perform the notification of the received message after that for the deleted local port.

C.2.5.7 Connection processing procedure

C.2.5.7.1 Communication connection process

When receiving the "connection notice" through the "EventInformation.indication" primitive in the management service of the ELCP, the LPCP shall register the received link address and extension parameter in the communication control information list.

Then the LPCP may notify the local port of a "connection notice" through the "EventReport.indication" primitive.

After that, the LPCP shall refer to the acceptable local port list, generate the event notification message whose event code is "acceptable port list" and whose additional event information is the acceptable local port list in the local station, and then send the message to the remote station.

When receiving the event notification message ("acceptable port list") sent from the remote station, the LPCP notifies the local port of the event "acceptable port list" through the "EventReport.indication" primitive.

C.2.5.7.2 Communication disconnection process

When receiving "disconnection notice" through the "EventInformation.indication" primitive in the management service of the ELCP, the LPCP shall delete the information on the received link address from the communication control information list.

Then the LPCP may notify the local port of a "disconnection notice" through the "EventReport. indication" primitive.

C.2.5.8 Data transfer procedure

C.2.5.8.1 Data transmission process

When receiving the "TransferData.request" primitive from the LPP, the LPCP shall refer to the communication control information list, then send the NCP-SDU passed from the primitive through the data transfer message.

If the DSRC is not connected or the remote station notifies that the sending destination local port is invalid, the LPCP may notify the source local port through the "EventReport.indication" primitive.

C.2.5.8.2 Data reception process

When receiving a data transfer message, the LPCP extracts the protocol identifier, destination local port number, source local port number and NCP-SDU from the message.

The LPCP shall refer to the acceptable local port list, and then notify the LPP specified by the destination local port number that the NCP-SDU is received from the remote station through the "TransferData. indication" primitive.

When the link address is a private one and the destination local port number specified in the received data transfer message is invalid, the LPCP shall send back and notify that the sending destination local port is invalid.

C.2.6 Basic primitive application function

C.2.6.1 Overview

The basic primitive application functions are required to correspond to the diversified services.

This clause shows the basically-required functions and the specifications based on the philosophy, combining the several applications to correspond to the diversified services. Under this concept, what types of basic primitive application functions are defined as "basic" is important. This clause specifies the structure which is required to realize the higher service, the same as to support the minimum amount of the human machine Interfaces (HMI) and to include the DSRC-specific application.

C.2.6.2 Human Machine Interface (HMI) functions of OBE

Because of OBE's resources, HMI functions loaded on OBE are limited.

Table C.1 shows examples of the configuration of HMI of OBE in view of the indication system (display of numbers and characters, voice, and sound) and display system (buttons).

Table C.1 — Examples of OBE configuration

	Example 1	Example 2	Example 3	Example 4
No HMI	X			
Display		X		X
Button			X	X
Required functions	none	Instruction	Indication	Instruction and response

Example 1 is the simple OBE without an HMI.

Example 2 uses resources known from existing ETC OBEs. It can provide number/character information, simple sound data, and alarm messages to the users. The application to realize these functions is defined as "OBE basic instruction application".

Examples 3 and 4 enable to transmit a message from mobile users to the road. This allows the users to transmit their decision such as "OK". The application to realize this function is defined as "OBE instruction response application".

C.2.6.3 Examples of basic primitive application functions

— OBE instruction response application

  OBE instruction response application notifies the OBE of the specific instruction information from the external server connected to the road side system and returns the response from the users by using the input mechanism (such as buttons) of OBE.

— OBE memory access application

  OBE memory access application is the application of the system on the roadside. The memory on OBE of the application stores variable length data in free form with search tag. This application also enables to write data to the mentioned memory of OBE and read from the application of the system on the roadside. In this case, the search tag needs to be preliminarily specified by application.

— IC card access application

  IC card access application provides the function to access the IC card on request from the system on the roadside by the method prescribed by ISO/IEC 7816 (all parts). The function of the IC card access application is exclusively applicable to the ISO/IEC 7816-compliant IC card.

— Push-type information delivery application

Push-type information delivery application sends the contents or the position of the contents to the client on the OBE from the server of the system on the roadside. This application on the client side automatically executes the processing corresponding to each receive contents. The method in which the contents are distributed is called "contents push," and the method that the position of contents (URL, etc.) is distributed, and the acquisition of the contents is separately executed with HTTP, etc. is called "pseudo-push."

— OBE ID communications application

OBE ID communications application notifies the roadside of the ID of the OBE to identify the OBE on the roadside. To communicate the OBE ID with road-to-vehicle communication, the system on the roadside notifies the OBE of the acquirer ID, and the OBE returns the OBE ID corresponding to the acquirer ID.

— OBE basic indication application

OBE basic indication application is used to provide the minimum HMI function. The specific instruction data is notified to OBE from the external server connected to the system on the roadside.

C.2.6.4 Examples of basic primitive application functions

Table C.2 shows the example of the combination of the basic primitive application functions and correspondence to DSRC services.

Table C.2 — Functions required for the DSRC services and correspondence to the basic primitive application functions

			OBE instruction response	OBE memory access	IC card access	Push-type information dielivery	OBE ID communication	OBE basic instruction
Fare settlement	Link settlement system	Function to give the instructions to OBE (as well as ETC system or expanded function)	X				X	X
		Function to access the OBE-specific information (ID)		X			X	
		Function to access the memory of OBE (accumulation of information for use)		X			X	
	Card transaction system	Function to give the instructions to OBE (as well as ETC system or expanded function)	X					X
		Function to give the instructions to OBE (as well as ETC system or expanded function)	X					

Table C.2 *(continued)*

			OBE instruction response	OBE memory access	IC card access	Push-type information dielivery	OBE ID communication	OBE basic instruction
		Function to access the IC card loaded into OBE			X			
		Function to access the memory of OBE (accumulation of information for use)		X				
Transmitting/receiving data	Vehicle-specific information control system	Function to give the instructions to OBE (as well as ETC system or expanded function)	X				X	X
		Function to access the OBE-specific information (ID)		X			X	
		Function to access the memory of OBE (accumulation of information for use)		X			X	
	Information service system with picture display unit	Function to distribute the URL of the start page by the information providing service and other information from the information providing server to OBE (providing of push-type information)				X		

C.2.6.5 Example of port number for identify the basic primitive application functions

For the local port number of each primitive function, the area 0x0C00 to 0x0C1F is used. The area is classified into four types after focusing the flow of information. Table C.3 lists example of local port number for basic primitive application functions.

Table C.3 — Local port number of basic primitive application functions (example)

Port number	Basic primitive application functions	Data flow
0x0C00	OBE ID communication	Road to vehicle
0x0C01 - 0x0C07	For future use	
0x0C08	OBE basic instruction	
0x0C09	OBE instruction response	
0x0C0A	Push-type information delivery	
0x0C0B - 0x0C0F	For future use	
0x0C10	IC card access	Road to vehicle /Vehicle to road, Use of card
0x0C11 - 0x0C17	For future use	
0x0C18	OBE memory access	Road to vehicle /Vehicle to road, Use of memory
0x0C19 - 0x0C1F	For future use	

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ICS 35.240.60; 03.220.01

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