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Reconfigurable Radio Systems (RRS); Enabling the operation of Cognitive Radio System (CRS) dependent for their use of radio spectrum on information obtained from Geo-location Databases (GLDBs); Parameters and procedures for information exchange between different GLDBs

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Foreword

This draft European Standard (EN) has been produced by ETSI Technical Committee Reconfigurable Radio Systems (RRS), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document covers the parameters and procedures for information exchange between different Geolocation Databases (GLDB) the operation of Cognitive Radio System (CRS). The work is based on the system architecture for WSD GLDBs as defined in ETSI EN 303 145 [i.1] and ETSI EN 303 143 [i.2].

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

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NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI EN 303 145: "Reconfigurable Radio Systems (RRS); System Architecture and High Level Procedures for Coordinated and Uncoordinated Use of TV White Spaces".

[i.2] ETSI EN 303 143: "Reconfigurable Radio Systems (RRS); System architecture for information exchange between different Geo-location Databases (GLDBs) enabling the operation of White Space Devices (WSDs)".

[i.3] ISO/IEC 10731 (1994): "Information Technology - Open Systems Interconnection - Basic Reference Model: Conventions for the Definition of OSI Services".

[i.4] Recommendation ITU-T X.680: "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[i.5] ETSI EN 301 598: "White Space Devices (WSD); Wireless Access Systems operating in the 470 MHz to 790 MHz TV broadcast band; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".

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3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

communication function: hardware/software module that provides communication services required by the interfaces between logical entities based on communications protocol stack

database function: software/hardware that stores necessary information provided by regulators for calculating available spectrum that a WSD in a CRS can operate on with protection to incumbent services as well as registration of the WSDs under regulatory requirements and for protecting incumbent services purposes

G-G Interface function: abstraction of the totality of those functional blocks inside a geo-location database realizing the G-G logical interface between GLDBs

G-G Logical interface: conceptual boundary between GLDBs for information exchange to enable the operation of a CRS with protection of the incumbent service

geo-location function: software/hardware that calculates location specific EIRP of a frequency band and that a WSD in a CRS can use based on the information on incumbents stored in database function

victim GLDB: GLDB whose incumbents can suffer interference from CRSs that are under the management of another GLDB (the querying GLDB)

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACLR	Adjacent Channel Leakage Ratio
ACS	Adjacent Channel Selectivity
ASN	Abstract Syntax Notation
CRS	Cognitive Radio System
DB-SAP	DataBase Service Access Point
EIRP	Effective Isotropic Radiated Power
GLDB	Geo-Location DataBase
GL-SAP	Geolocation service access point
ID	IDentifier
IP	Internet Protocol
SAP	Service Access Point
SC	Spectrum Coordinator
WSD	White Space Device

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4 Service access points

4.1 General

The following clauses describe the primitives related to the Service Access Points as identified in ETSI EN 303 143 [i.2] and also shown in figure 4.1.

Clause 4.2 describes the primitives associated to the geolocation function (GL-SAP in figure 4.1).

Clause 4.3 describes the primitives associated to the database function (DB-SAP in figure 4.1).

Clause 4.4 describes the primitives associated to the communication function (Com-SAP in figure 4.1).

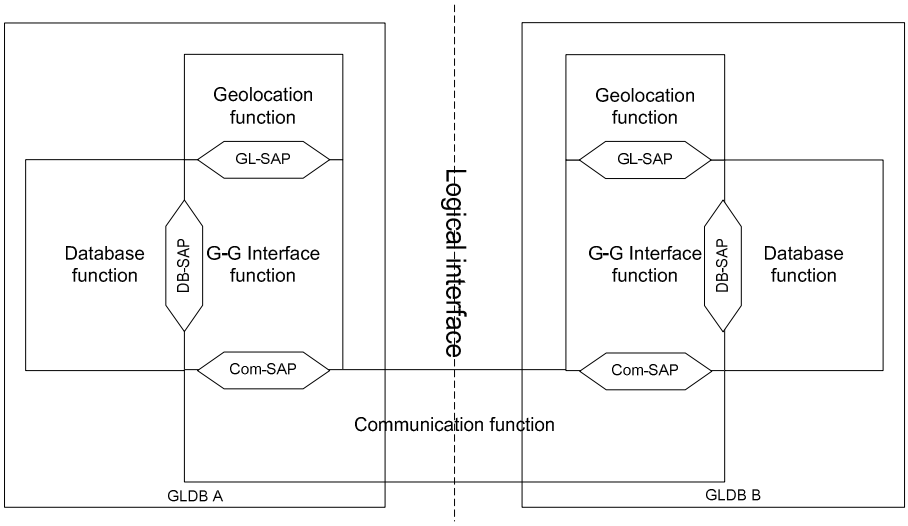

Figure 4.1: reference model for the information exchange between GLDBs using the G-G logical interface [i.2]

The terminology used for describing primitives at service access points for peer OSI-service-users follows the model described in ISO/IEC 10731 [i.3] and is shown in figure 4.2.

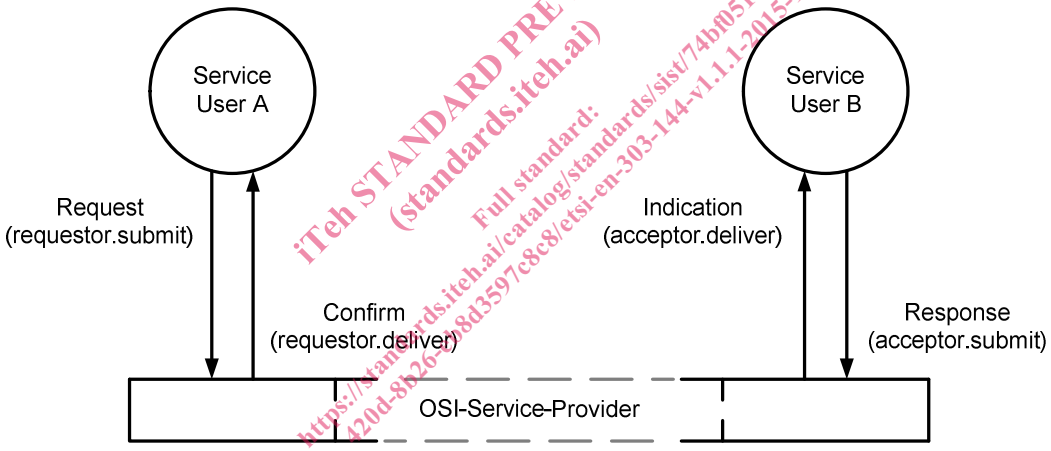

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Figure 4.2: Example of a peer-to-peer connection-mode service

4.2 Geo-location function SAP

4.2.1 CRS operational parameter generation

The CRS operational parameter generation service provides a set of primitives or method through which the G-G interface function provides the device parameters of a CRS and obtains operational parameters of a CRS generated by the geo-location function. The service is used in the second variant of the procedure in clause 6.1.3 "CRS Spectrum Usage Modification Procedure" in ETSI EN 303 143 [i.2] where victim GLDB update the list of available channels and powers to protect incumbents in victim GLDB.

Get_CRS_Operation_Parameter.request

Function

This primitive is used by the G-G interface function to request operational parameters of a CRS.

Semantics of the service primitive

Get_CRS_Operational_Parameter.request (
operationalParameterRequestID,
deviceDescriptor,locationInfo
)

Parameters

Name	Type	Description
OperationalParameterRequestID	TransactionID	OperationalParameterRequestID uniquely identifies one transaction of requesting operational parameters for a CRS.
DeviceDescriptor	DeviceDescriptor	Device descriptor describes the physical profile of a CRS.
LocationInfo	LocationInfo	Geo-location information of CRS.

When used

This primitive shall be used by the G-G interface function when it needs to obtain the operational parameters of a CRS as described by the CRS device parameters.

Effect of receipt

The geo-location database function subsequently determines the operational parameters of the CRS based on the submitted device parameters and use the *Get_Operational_Parameter.response* primitive to reflect the result of the request.

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Get_CRS_Operational_Parameter.response

Function

This primitive is used by the geo-location function to provide the operational parameters to the G-G interface function as a response to the Get_CRS_Operational_Parameter.request primitive.

Semantics of the service primitive

Get_CRS_Operational_Parameter.response(
operationalParameterRequestID,
status,
operationalParameters
)

Parameters

Name	Type	Description
OperationalParameterRequestID	TransactionID	OperationalParameterRequestID uniquely identifies one transaction of requesting operational parameters for a CRS.
Status	Status	Status of operation.
OperationalParameters	OperationalParameters	OperationalParameters is produced by the GLDB for the requesting CRS to configure its transmissions.

When used

This primitive shall be used by the geo-location function to generate a response to the operational parameter request.

Effect of receipt

The G-G interface function receives the result of the request for operational parameters of a CRS.

4.2.2 CRS operational parameter check

The CRS operational parameter check service provides a set of primitives or method through which the G-G interface function checks whether the usage of the provided operational parameters will cause interference to the incumbent. The service is used in clause 6.1.2 "Victim GLDB Discovery Procedure" in ETSI EN 303 143 [i.2].

CRS_Operational_Parameter_check.request

Function

This primitive is used by the G-G interface function to request the GLDB function to check whether the CRS using the provided operational parameters will cause interference to the incumbent.

Semantics of the service primitive

Check_CRS_Operational_Parameter.request(
operationalParameterCheckID,
operationalParameters,
checkMode,
replyMode
)

Parameters

Name	Type	Description
OperationalParameterCheckID	TransactionID	OperationalParameterCheckID uniquely identifies one transaction of requesting operational parameters check for a CRS.
OperationalParameters	OperationalParameters	operationalParameters is produced by the GLDB for the requesting CRS to configure its transmissions.
CheckMode	CheckMode	CheckMode parameter specifies the mode of operational parameters check.
ReplyMode	ReplyMode	ReplyMode parameter specifies the mode of replying the result of operational parameters check request.

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When used

This primitive shall be used by the G-G interface function when it needs to check whether a CRS using the provided operational parameters will cause interference to the incumbent.

Effect of receipt

The geo-location database function subsequently checks whether the CRS described by the submitted device parameters will cause interference to the incumbent when using the provided operational parameters. Subsequently, the geo-location function uses the *CRS_Operational_Parameter_Check.response* primitive to reflect the result of the request in a format specified by the mode of reply.

CRS_Operational_Parameter_Check.response

Function

This primitive is used by the geo-location function to provide the operational parameters check result to the G-G interface function as a response to the CRS_Operational_Parameter_Check.request primitive.

Semantics of the service primitive

CRS_Operational_Parameter_Check.response(
operationalParameterCheckID,
status,
checkResult
)

Parameters

Name	Type	Description
OperationalParameterCheckID	TransactionID	OperationalParameterCheckID uniquely identifies one transaction of requesting operational parameters check for a CRS.
Status	Status	Status of operation.
CheckResult	CheckResult	Results of the operational parameters check. The format of the result depends on the reply mode as specified in the checkMode parameter given in the CRS_Operational_Parameter_Check.request primitive.

When used

This primitive shall be used by the geo-location function to generate a response to *CRS_Operational_Parameter_check.request*.

Effect of receipt

The G-G interface function receives the result of the request for operational parameter check for a CRS.

4.3 Database SAP

4.3.1 Incumbent information read

The incumbent information read service provides a set of primitives or method through which the G-G interface function read information of incumbents stored at the database function via the DB-SAP. The service is used in clause 6.1.1 "Incumbents Information Sharing Procedure" in ETSI EN 303 143 [i.2].

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Incumbent_Info_Read.request

Function

This primitive is used by the G-G interface function to read the information of incumbent stored at the database function.

Semantics of the service primitive

```
Incumbent_Info_Read.request(
                            incumbentInfoReadID
                            )
```

Parameters

Name	Type	Description
IncumbentInfoReadID	TransactionID	IncumbentInfoReadID uniquely identifies one transaction of incumbent information read request.

When used

This primitive shall be used by the G-G interface function of a GLDB when it needs to read the incumbent information stored at the database function.

Effect of receipt

The database function uses the Incumbent_Info_Read.response to reflect the result.

Incumbent_Info_Read.response

Function

This primitive is used by the database function to provide the result to the G-G interface function as a response to the Incumbent_Info_Read.request primitive.

Semantics of the service primitive

Incumbent_Info_Sharing.response(
incumbentInfoSharingID,
status,
incumbentInfo
)

Parameters

Name	Type	Description
IncumbentInfoSharingID	TransactionID	IncumbentInfoSharingID uniquely identifies one transaction of incumbent information sharing request.
Status	Status	Status of operation.
IncumbentInfo	IncumbentInfo	Information of the incumbent.

When used

This primitive shall be used by the database function to generate a response to the *Incumbent_Info_Read.Request*.

Effect of receipt

The G-G interface function receives the result of the request for reading information of incumbent stored at the database function.

4.3.2 Incumbent information write

The incumbent information write service provides a set of primitives or method through which the G-G interface function write information of incumbents to the database function via the DB-SAP. The service is used in clause 6.1.1 "Incumbents Information Sharing Procedure" in ETSI EN 303 143 [i.2].

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Incumbent_Info_Write.request

Function

This primitive is used by the G-G interface function to write the incumbent information to the database function.

Semantics of the service primitive

Incumbent_Info_Write.request(
incumbentInfoWriteID,
incumbentInfo
)

Parameters

Name	Type	Description
IncumbentInfoWriteID	TransactionID	IncumbentInfoWriteID uniquely identifies one transaction of incumbent information write request.
IncumbentInfo	IncumbentInfo	incumbent information.

When used

This primitive shall be used by the G-G interface function when it needs to write the incumbent information to the database function.

Effect of receipt

The database function uses the *Incumbent_Info_Write.response* to reflect the result.

Incumbent_Info_Write.response

Function

This primitive is used by the database function to provide the result to the G-G interface function as a response to the Incumbent_Info_Write.request primitive.

Semantics of the service primitive

Incumbent_Info_Write.response(
incumbentInfoWriteID,
status
)

Parameters

Name	Type	Description
IncumbentInfoSharingID	TransactionID	IncumbentInfoSharingID uniquely identifies one transaction of incumbent information sharing request.
Status	Status	Status of operation.

When used

This primitive shall be used by the database function to generate a response to the Incumbent_Info_Write.Request.

Effect of receipt

The G-G interface function receives the result of the request for writing incumbent information to the database function.

4.3.3 CRS channel usage information read

The CRS channel usage information read service provides a set of primitives or method through which the G-G interface function read information of CRS channel usage stored at the database function via the DB-SAP. The service is used in clause 6.1.4 "CRS Operating Parameters Checking Procedure" in ETSI EN 303 143 [i.2].

CRS_ChUsage_Info_Read.request

Function

This primitive is used by the G-G interface function to read information of CRS channel usage stored at the database function.

Semantics of the service primitive

CRS_ChUsage_Info_Read.request(
cRSChUsageReadID,
deviceID
)

Parameters

Name	Type	Description
cRSChUsageReadID	TransactionID	cRSChUsageReadID uniquely identifies one transaction of CRS channel usage information read request.
deviceID	DeviceID	deviceID defines the CRS that the channel usage information is to be read.

When used

This primitive shall be used by the G-G interface function of a GLDB when it needs to read the CRS channel usage information stored at the database function.

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