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Radijski sistemi z možnostjo preoblikovanja (RRS) - Informacijski modeli in protokoli za radijsko opremo (RE) za splošno arhitekturo preoblikovanja programske opreme - 1. del: Splošni večradijski vmesnik (gMURI)

Reconfigurable Radio Systems (RRS) - Radio Equipment (RE) information models and protocols for generalized software reconfiguration architecture - Part 1: generalized Multiradio Interface (gMURI)

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Part 1: generalized Multiradio Interface (gMURI)

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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.

The present document is part 1 of a multi-part deliverable covering the Radio Equipment (RE) information models and protocols, as identified below:

Part 1: "generalized Multiradio Interface (gMURI)";

Part 2: "generalized Reconfigurable Radio Frequency Interface (gRRFI)";

Part 3: "generalized Unified Radio Application Interface (gURAI)";

Part 4: "generalized Radio Programming Interface (gRPI)".

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

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).

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1 Scope

The present document defines an information model and protocol for multiradio interface for reconfigurable RE except for reconfigurable mobile devices which are covered in [i.6] to [i.11]. The work is based on the Use Cases defined in ETSI TR 103 585 [i.1], on the system requirements defined in ETSI EN 303 641 [1] and on the radio reconfiguration related architecture for reconfigurable RE defined in ETSI EN 303 648 [i.2].

The present document is based on ETSI EN 303 146-1 [i.8] and provide a generalized interface definition for the generalized Software Reconfiguration Architecture.

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 referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference.

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

[1] ETSI EN 303 641: "Reconfigurable Radio Systems (RRS); Radio Equipment (RE) reconfiguration requirements".

2.2 Informative 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 referenced document (including any amendments) applies.

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 TR 103 585: "Reconfigurable Radio Systems (RRS); Radio Equipment (RE) reconfiguration use cases ".

[i.2] ETSI EN 303 648: "Reconfigurable Radio Systems (RRS); Radio Equipment (RE) reconfiguration architecture".

[i.3] IEEE 1900.4™-2009: "IEEE Standard for Architectural Building Blocks Enabling Network-Device Distributed Decision Making for Optimized Radio Resource Usage in Heterogeneous Wireless Access Networks".

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

[i.5] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of Radio Equipment and repealing Directive 1999/5/EC.

[i.6] ETSI EN 302 969: "Reconfigurable Radio Systems (RRS); Radio Reconfiguration related Requirements for Mobile Devices".

[i.7] ETSI EN 303 095: "Reconfigurable Radio Systems (RRS); Radio reconfiguration related architecture for Mobile Devices (MD)".

[i.8] ETSI EN 303 146-1: "Reconfigurable Radio Systems (RRS); Mobile Device (MD) information models and protocols; Part 1: Multiradio Interface (MURI)".

[i.9] ETSI EN 303 146-2: "Reconfigurable Radio Systems (RRS); Mobile Device (MD) information models and protocols; Part 2: Reconfigurable Radio Frequency Interface (RRFI)".

[i.10] ETSI EN 303 146-3: "Reconfigurable Radio Systems (RRS); Mobile Device (MD) information models and protocols; Part 3: Unified Radio Application Interface (URAI)".

[i.11] ETSI EN 303 146-4: "Reconfigurable Radio Systems (RRS); Mobile Device (MD) information models and protocols; Part 4: Radio Programming Interface (RPI)".

[i.12] ETSI EN 303 681-2: "Reconfigurable Radio Systems (RRS); Radio Equipment (RE) information models and protocols for generalized software reconfiguration architecture; Part 2: generalized Reconfigurable Radio Frequency Interface (gRRFI)".

[i.13] ETSI EN 303 681-3: "Reconfigurable Radio Systems (RRS); Radio Equipment (RE) information models and protocols for generalized software reconfiguration architecture; Part 3: generalized Unified Radio Application Interface (gURAI)".

[i.14] ETSI EN 303 681-4: "Reconfigurable Radio Systems (RRS); adio Equipment (RE) information models and protocols for generalized software reconfiguration architecture; Part 4: generalized Radio Programming Interface (gRPI)".

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

association: logical communication link to a Radio Access Network or a peer equipment

NOTE 1: Typically, some control signalling is necessary to maintain the association. No user data transfer may occur with only an association present, but a data flow may be established into an association for this purpose.

NOTE 2: Peer equipment is any communication counterpart of a reconfigurable Radio Equipment. It can be reached by establishing a logical communication link (i.e. an association) between the reconfigurable Radio Equipment and peer equipment.

channel: designated part of the information transfer capability having specified characteristics, provided at the user network interface

NOTE: It is the over-the-air wireless propagation channel which is used to convey an information signal from transmitter to receiver. This definition is specified in ETSI EN 303 648 [i.2].

Communication Services Layer (CSL): layer related to communication services supporting generic applications

NOTE: A communication services layer supports generic applications like Internet access. In the present document, it consists of Administrator, Mobility Policy Manager (MPM), Networking stack and Monitor.

link: connecting one location to another through a given Radio Access Technology for the purpose of transmitting and receiving digital information

NOTE: Each link is conveyed over a given Channel.

Radio Application (RA): software which enforces the generation of the transmit RF signals or the decoding of the receive RF signals

NOTE 1: The Software is executed on a particular radio platform or an RVM as part of the radio platform.

NOTE 2: RAs might have different forms of representation. They are represented as:

- source codes including Radio Library calls of Radio Library native implementation and Radio HAL calls;
- IRs including Radio Library calls of Radio Library native implementation and radio HAL calls;
- executable codes for a particular radio platform.

radio computer: part of Radio Equipment working under ROS control and on which RAs are executed

NOTE: A radio computer typically includes programmable processors, hardware accelerators, peripherals, software, etc. RF part is considered to be part of peripherals.

Radio Control Framework (RCF): control framework which, as a part of the OS, extends OS capabilities in terms of radio resource management

NOTE: RCF is a control framework which consists of Configuration Manager (CM), Radio Connection Manager (RCM), Flow Controller (FC) and Multiradio Controller (MRC). The Resource Manager (RM) is typically part of OS.

Radio Equipment (RE): *"an electrical or electronic product, which intentionally emits and/or receives radio waves for the purpose of radio communication and/or radiodetermination, or an electrical or electronic product which must be completed with an accessory, such as antenna, so as to intentionally emit and/or receive radio waves for the purpose of radio communication and/or radiodetermination"*.

NOTE: The definition above is as defined in the Radio Equipment Directive, Article 2(1)(1) [i.5].

reconfigurable mobile device: mobile device with radio communication capabilities providing support for radio reconfiguration

NOTE: Reconfigurable mobile devices include but are not limited to: smartphones, feature phones, tablets, and laptops.

reconfigurable Radio Equipment: Radio Equipment with radio communication capabilities providing support for radio reconfiguration

NOTE: Reconfigurable Radio Equipment includes Smartphones, Feature phones, Tablets, Laptops, Connected Vehicle communication platform, Network platform, IoT device, etc.

routing entity: entity which directs network packets from their source toward their destination through intermediate network nodes by specific packet forwarding mechanisms

NOTE 1: In the present document, source and destination relate either to CSL or radio computers.

NOTE 2: Note that the directing of packets may include decision making and physical routing.

Unified Radio Application (URA): Radio Application which complies with the reconfigurable RE framework defined in the present document

3.2 Symbols

Void.

3.3 Abbreviations

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

ASN.1	Abstract Syntax Notation One
BLER	BLock Error Rate
CM	Configuration Manager
CSL	Communication Services Layer
FC	Flow Controller
gMURI	generalized Multiradio Interface

gRPI	generalized Radio Programming Interface
gRRFI	generalized Reconfigurable Radio Frequency Interface
gURAI	generalized Unified Radio Applications Interface
ID	IDentification
IR	Intermediate Representation
ITU-T	International Telecommunication Uniton Telecommunication Standardization Sector
MPM	Mobility Policy Manager
MRC	MultiRadio Controller
MURI	Multiradio Interface
OS	Operating System
RA	Radio Application
RAN	Radio Access Network
RAP	Radio Application Package
RAT	Radio Access Technology
RCF	Radio Control Framework
RCID	Radio Computer Identification
RCM	Radio Connection Manager
RE	Radio Equipment
RERC	Radio Equipment Reconfiguration Class
RF	Radio Frequency
RM	Resource Manager
ROS	Radio Operating System
SINR	Signal to Interference plus Noise Ratio
SW	SoftWare
TCP/IP	Transmission Control Protocol/Internet Protocol
UML	Unified Modeling Language
URA	Unified Radio Applications

4 Introduction

A reconfigurable RE is capable of running multiple radios simultaneously, changing the set of radios by loading new Radio Application Packages (RAP) and setting their parameters. All Radio Applications (RAs) are called Unified Radio Applications (URAs) when they exhibit a common behaviour from the reconfigurable RE's point of view in ETSI EN 303 648 [i.2]. In order to run multiple URAs, the reconfigurable RE will include Communication Services Layer (CSL), Radio Control Frameworks (RCFs), Radio Platforms and 4 sets of interfaces for their interconnection.

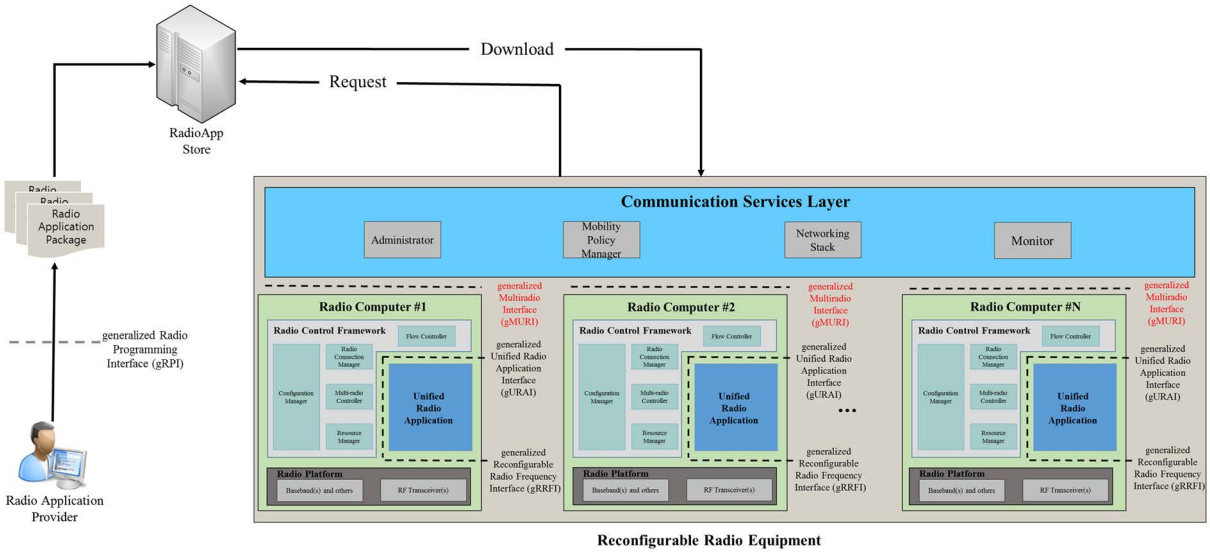

Figure 4.1: Four sets of interfaces for Reconfigurable RE

Figure 4.1 illustrates the Reconfigurable RE architecture with the 4 sets of interfaces, i.e.:

- gMURI for interfacing CSL and RCF which is the scope of the present document.
- gRRFI for interfacing URA and RF Transceiver (in ETSI EN 303 681-2 [i.12]).
- gURAI for interfacing URA and RCF (in ETSI EN 303 681-3 [i.13]).
- gRPI for allowing an independent and uniform production of RAs (in ETSI EN 303 681-4 [i.14]).

The present document defines gMURI.

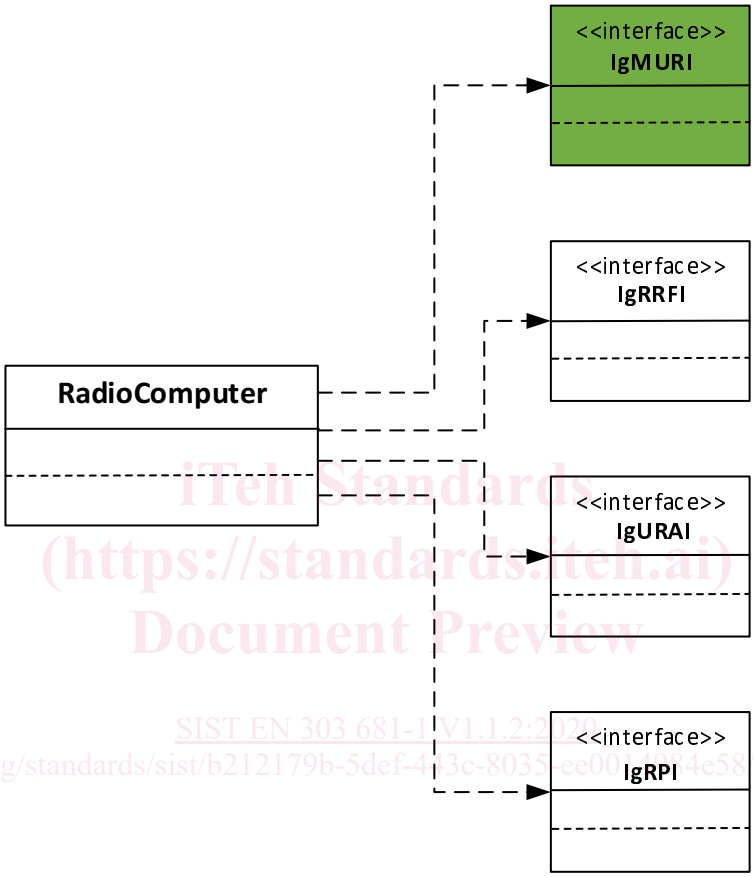

Figure 4.2: UML class diagram for Radio Computer interfaces

Figure 4.2 illustrates UML class diagram for Radio Computer interfaces. The reconfigurable RE may be seen as a set of multiple Radio Computers where individual URAs are engineered as software entities in ETSI EN 303 648 [i.2].

The present document is organized as follows:

- clause 5 describes the system identification;
- clause 6 describes the notational tool for defining both information model classes and interface classes;
- clause 7 describes the information model for radio computer; and
- clause 8 describes the interface definition.

While UML is used for defining the information model and protocol related to gMURI, other modeling languages could be used as well.