
Radijski sistemi z možnostjo preoblikovanja (RRS) - Informacijski modeli in protokoli za radijsko opremo (RE) za splošno arhitekturo preoblikovanja programske opreme - 3. del: Splošni enotni radijski aplikacijski vmesnik (gURAI)

Reconfigurable Radio Systems (RRS) - Radio Equipment (RE) information models and protocols for generalized software reconfiguration architecture - Part 3: generalized Unified Radio Application Interface (gURAI)

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Contents

Intellectual Property Rights	4
Foreword.....	4
Modal verbs terminology.....	4
1 Scope	5
2 References	5
2.1 Normative references	5
2.2 Informative references.....	5
3 Definition of terms, symbols and abbreviations.....	6
3.1 Terms.....	6
3.2 Symbols.....	7
3.3 Abbreviations	7
4 Introduction	8
5 System Identification.....	9
5.1 Radio Computer Structure	9
5.2 gURAI System Requirement Mapping.....	10
6 Notational Tools	11
6.1 Notational Tool for Information Model Classes.....	11
6.2 Notational Tool for Interface Classes.....	11
7 Information Model for Radio Computer	12
7.1 Radio Computer	12
7.2 Class Definitions for Information Model.....	15
8 Interface Definition	21
8.1 Interface Overview	21
8.2 Radio Application Management Services	22
8.2.1 Overview on Radio Application Management Services	22
8.2.2 Messages for Radio Application Management Services.....	23
8.3 User Data Flow Services	23
8.3.1 Overview on User Data Flow Services	23
8.3.2 Messages for User Data Flow Services.....	24
8.4 Multiradio Control Services	24
8.4.1 Overview on Multiradio Control Services	24
8.4.2 Messages for Multiradio Control Services.....	25
8.5 Class Definitions for Interface.....	25
Annex A (informative): Abstract Data Definitions.....	27
Annex B (informative): gURAI Qualification Methods for Validation.....	31
History	32

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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 3 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
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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).

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1 Scope

The scope of the present document is to define an information model and protocol for unified radio application interface for radio equipment reconfiguration 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 will be based on ETSI EN 303 146-3 [i.10] and provide a generalized interface definition for the generalized Unified Radio Application Interface.

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.

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

2.2 Informative references

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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 1900.4TM-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 303 681-1: "Reconfigurable Radio Systems (RRS); Radio Equipment (RE) information models and protocols for generalized software reconfiguration architecture; Part 1: generalized Multiradio Interface (gMURI)".
- [i.13] ETSI EN 303 681-2: "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); Radio 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: connection from one location to another through a given Radio Access Technology for the purpose of transmitting and receiving digital information

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 hardware 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.

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 Application Interface
ID	IDentification
IR	Intermediate Representation
ITU-T	International Telecommunication Union Telecommunication Standardization Sector
MPM	Mobility Policy Manager
MRC	MultiRadio Controller
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
RF	Radio Frequency
RM	Resource Manager
ROS	Radio Operating System
RX	Receiver
SINR	Signal to Interference plus Noise Ratio
TX	Transmitter
UML	Unified Modelling 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.

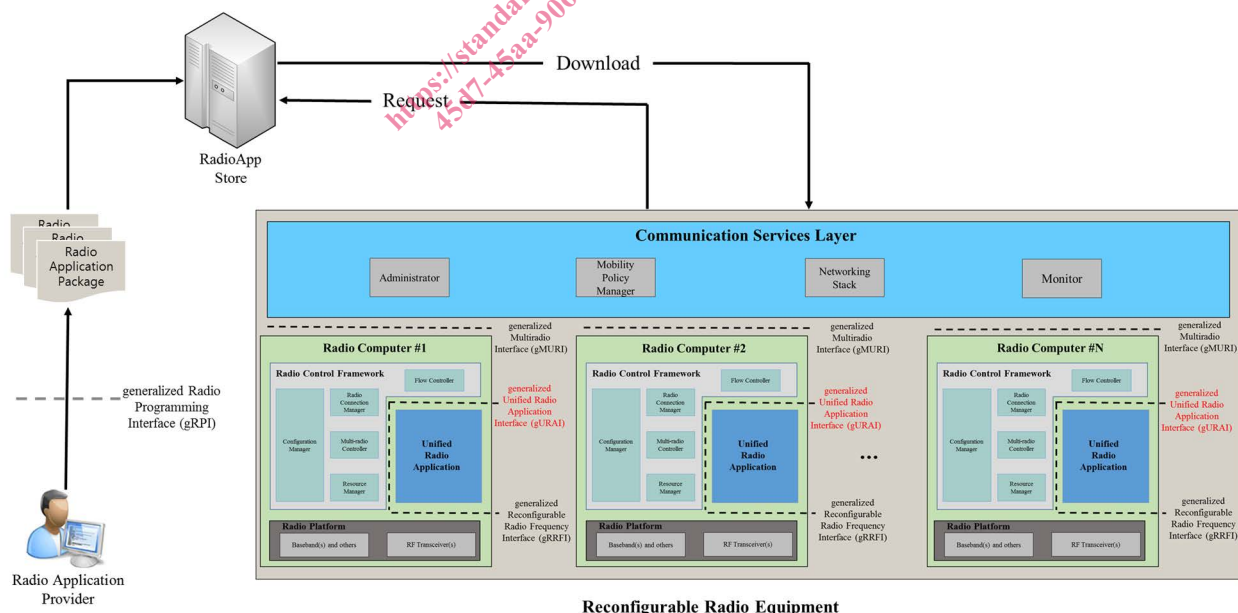


Figure 4.1: Four sets of interfaces for Reconfigurable RE

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

- gMURI for interfacing CSL and RCF (in ETSI EN 303 681-1 [i.12]).

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

The present document defines gURAI.

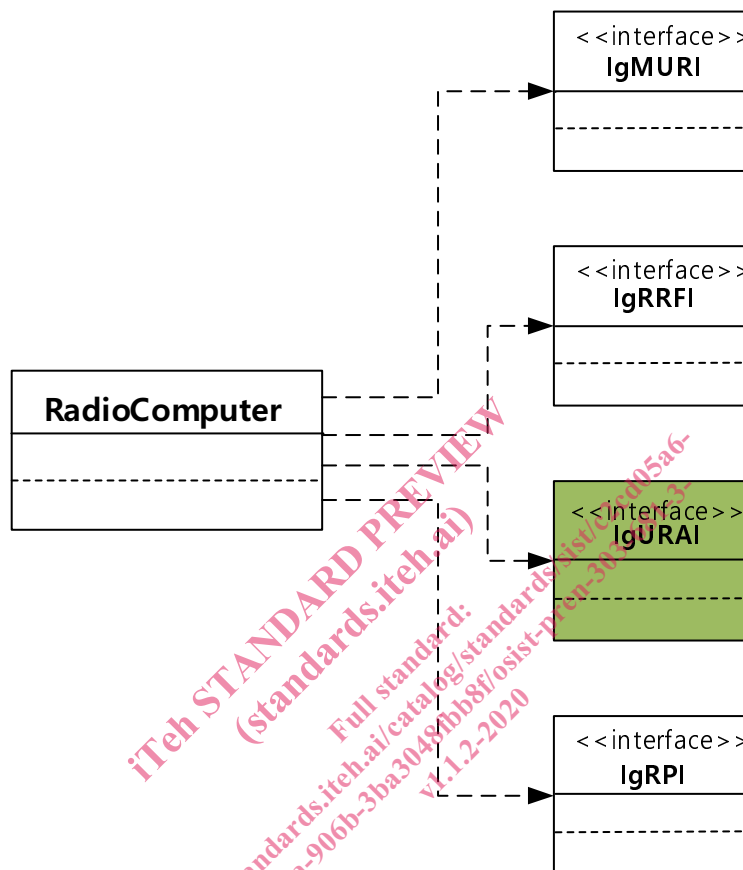


Figure 4.2: UML class diagram for Radio Computer interfaces

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 gURAI, other modelling languages could be used as well.

5 System Identification

5.1 Radio Computer Structure

Figure 5.1 illustrates how RCF and URA interact with each other using gURAI.