



Group Specification

## **Open Radio equipment Interface (ORI); Requirements for Open Radio equipment Interface (ORI) (Release 1)**

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Reference

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## Foreword

This Group Specification (GS) has been produced by ETSI Industry Specification (ISG) Open Radio equipment Interface (ORI).

The contents of the present document are subject to continuing work within the ISG. Should the ISG modify the contents of the present document, it will be re-released by the ISG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit indicates the release number of ORI specification group starting from Release 1.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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## Introduction

Mobile communication networks have evolved from 1st generation to 3rd, and now, many operators are preparing to introduce LTE. Economical and efficient deployment of base stations is one of key issues for the success of mobile services. Operators also consider ecological aspects when renewing a system.

In general mobile radio base stations consist of a BaseBandUnit (BBU) and a Radio Frequency Unit (RFU), which usually is a RemoteRadioHead (RRH) in a distributed base station architecture.

Current interfaces between BBU and RRH are provided in a "semi proprietary" nature, although based on industry standards like CPRI or OBSAI. In order to gain flexibility operators are looking for distributed base station architectures with separate BBUs and RRHs. In order to gain interoperability, BBU and RRH are interconnected via an open BBU-RRH Interface (ORI) for flexible combination from different vendors.

ORI is about a digitized radio base station interface that establishes a connection between 'Radio Equipment Control' (REC) and 'Radio Equipment' (RE) enabling single-hop and multi-hop topologies. Different information flows (User Plane data, Control and Management Plane data, and Synchronization Plane data) are multiplexed over the interface. ORI covers OSI protocol layer 1, Layer 2 up to Layer 7.

The present document aims to define a set of system and link requirements that apply to the Open Radio equipment Interface (ORI).

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# 1 Scope

ETSI Group Specifications (GS) are deliverables produced by Industry Specification Groups (ISG). GSs are written with the style of a Technical Specification (TS), and represent the sole view of the ISG members.

The present document describes system-level requirements that apply to the Open Radio equipment Interface (ORI) and ORI nodes for Release 1.

NOTE: Requirements comply with CPRI specification of CPRI forum [1] and focuses on the following 3GPP radio access technologies namely UTRA-FDD [3], [4] and [5], E-UTRA-FDD [6] and E-UTRA-TDD [6]. Multiplexing between UTRA-FDD and E-UTRA-FDD is also considered.

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# 2 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.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://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.

## 2.1 Normative references

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

[1] "Common Public Radio Interface (CPRI); Interface Specification" V 4.1.

NOTE: Available at <http://www.cpri.info/spec.html>.

[2] ETSI GS ORI 002-1: "Open Radio equipment Interface (ORI); ORI Interface Specification; Part 1: Low Layers (Release 1)".

[3] ETSI TS 125 104: "Universal Mobile Telecommunications System (UMTS); Base Station (BS) radio transmission and reception (FDD) (3GPP TS 25.104)".

[4] ETSI TS 125 215: "Universal Mobile Telecommunications System (UMTS); Physical layer; Measurements (FDD) (3GPP TS 25.215)".

[5] ETSI TS 125 133: "Universal Mobile Telecommunications System (UMTS); Requirements for support of radio resource management (FDD) (3GPP TS 25.133)".

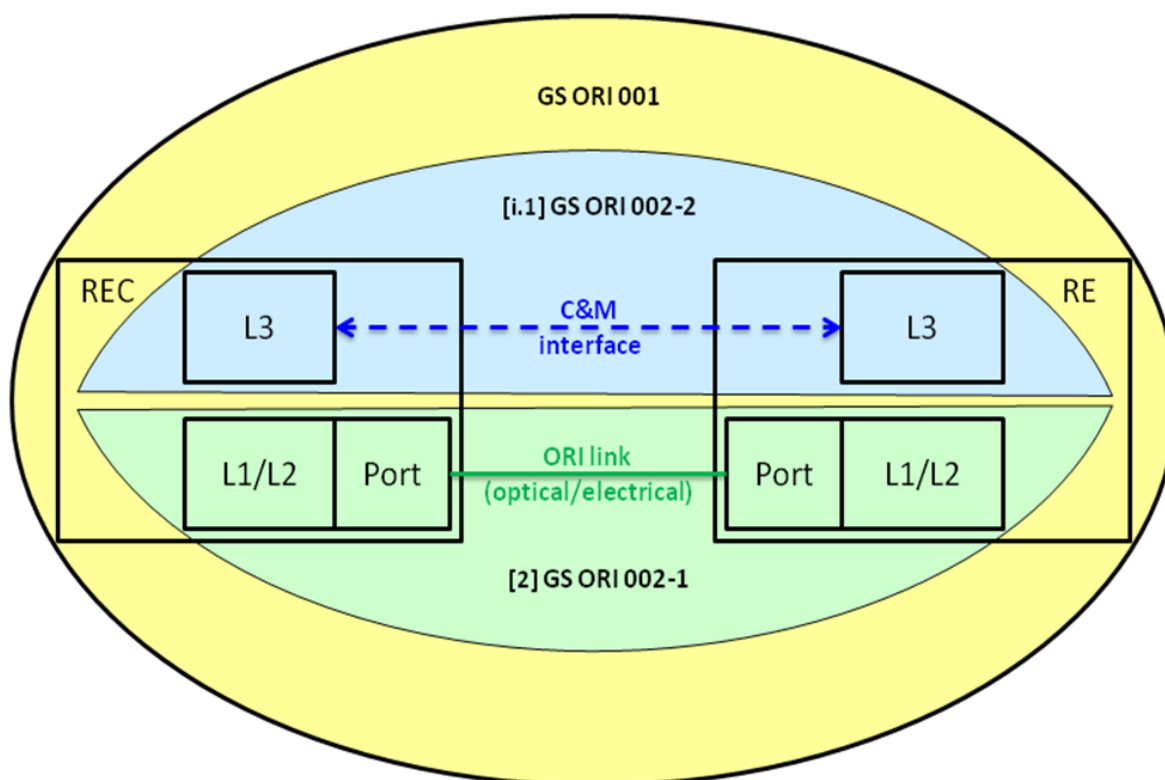
[6] ETSI TS 136 104: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (3GPP TS 36.104)".

## 2.2 Informative references

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 GS ORI 002-2: "Open Radio equipment Interface (ORI); ORI Interface Specification; Part 2: Control and Management (Release 1)".

## 2.3 Document structure of the ORI specifications



**Figure 2.3.1: Document structure of the ORI specifications**

NOTE: The Low Layers specification [2] covers a single ORI link. The C&M specification [i.1] covers multiple ORI links between one REC and one RE. The present requirements specification covers multiple ORI links between one REC and one or multiple REs.

## 3 Definitions and abbreviations

### 3.1 Definitions

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

**active link:** ORI link that supports at least one C&M signalling channel

**downlink:** direction from REC to RE for a logical connection

**hop:** aggregation of all ORI links directly connecting two ORI nodes

**logical connection:** interconnection between a particular SAP belonging to a port of the REC and the corresponding peer SAP belonging to a port of one particular RE and builds upon a single hop, or a multi-hop connection, between the REC and that particular RE

NOTE: Logical connections for C&M data, user plane data and synchronization can be distinguished.

**master port and slave port:** See section 2.1 in [1].

**multi-hop connection:** set of continuously connected hops starting from the REC and ending at a particular RE including REs in between

**ORI link:** bidirectional interface in between two directly-connected ORI ports, on two ORI nodes

NOTE: A working link consists of a master port and a slave port.

**ORI node:** subsystems REC and RE are also called ORI nodes, when either an REC or an RE is meant

**ORI port:** master port or slave port on an REC or an RE

**passive link:** ORI link that does not support any C&M channel

**protocol data planes:** the following data flows are discerned:

- **Control and Management (C&M) Plane:** Control data flow used for call processing while the management data flow is for the operation, administration and maintenance of the ORI link and the nodes. The control plane and management plane are mapped to a Service Access Point SAP.
- **User Plane:** Data that has to be transferred from the radio base station to the mobile station and vice versa. These data are transferred in the form of IQ data. Several IQ data flows are sent via one physical ORI link. Each IQ data flow reflects the data of one antenna for one carrier.
- **Synchronization:** Data flow which transfers synchronization and timing information between nodes.

**Service Access Points (SAP):** See section 2.1 in [1].

**subsystems:** radio base station system is composed of two basic subsystems, the radio equipment control and the radio equipment

**uplink:** direction from RE to REC for a logical connection

NOTE: For any terms used in the present document that are not defined either here or directly in the section in which they are used, refer to [1].

## 3.2 Abbreviations

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

3GPP	3 <sup>rd</sup> Generation Partnership Project
C&M	Control and Management
CPRI	Common Public Radio Interface
E-UTRA	Evolved UMTS Terrestrial Radio Access
FDD	Frequency Division Duplex
IQ	In-phase data and Quadrature data
O&M	Operation and Maintenance
OBSAI	Open Base Station Architecture Initiative
ORI	Open Radio equipment Interface
OSI	Open Systems Interconnection
RE	Radio Equipment
REC	Radio Equipment Control
SAP	Service Access Point
TDD	Time Division Duplex
UTRA	UMTS Terrestrial Radio Access

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## 4 ORI system requirements

### 4.1 Reference configurations

#### 4.1.1 Topology

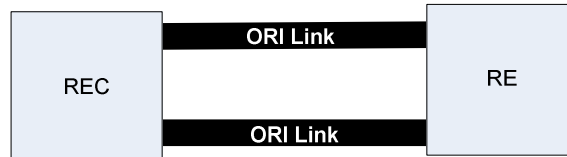
The following networking topologies shall be supported by the present release of the ORI interface:

- Single point-to-point link between one REC and one RE (figure 4.1.1)
- Multiple point-to-point links between one REC and one RE (figure 4.1.2)

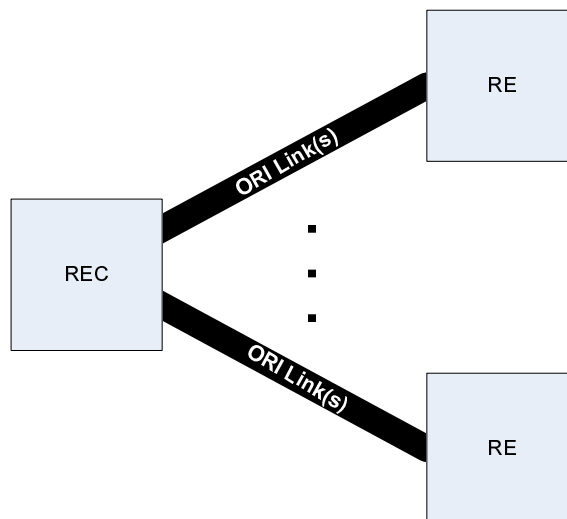
- Multiple point-to-point links between one REC and several REs (Star topology) (figure 4.1.3)



**Figure 4.1.1: Single point-to-point link between one REC and one RE**



**Figure 4.1.2: Multiple point-to-point links between one REC and one RE**



**Figure 4.1.3: Multiple point-to-point links between one REC and several REs (star topology)**

## 4.1.2 Specific ORI node requirements on ORI links and ORI ports

In support of the topology options as specified for the present release of ORI, the following is required of the RE and REC:

A hop shall support at least one active link.

**NOTE:** Multi-hop connection is not supported in the present release of the ORI interface.

As per the topologies defined in clause 4.1.1 it is assumed REC ports are only master ports and RE ports are only slave ports.

The RE shall support 1 to 255 ORI ports.

The REC shall support 1 to 255 ORI ports.



## 4.2 Supported radio standards

### 4.2.1 System requirements

The following technologies shall be supported by the present release of the ORI interface:

- UTRA-FDD [3], [4] and [5];
- E-UTRA-FDD [6];
- E-UTRA-TDD [6].

3GPP releases and versions relevant to the above radio standards are specified in [1], section 3.1.

Multiplexing between UTRA-FDD and E-UTRA-FDD on a link shall also be supported.

### 4.2.2 Specific ORI node requirements

In support of the technology options as specified for the present release of ORI, the following is required of the RE and REC:

- The RE/REC shall support at least one of UTRA-FDD, E-UTRA-FDD, or E-UTRA-TDD, and may optionally support multiplexing between UTRA-FDD and E-UTRA-FDD.

## 4.3 Protocol Requirements

### 4.3.1 Compliance with CPRI

#### 4.3.1.1 System requirements

The CPRI specification as specified in [1] shall be the baseline for the ORI Low Layers specification [2]. Inline with that, the ORI shall be compliant with all of the requirements in [1] for the applicable topologies and radio standards as specified for the present release of ORI. Furthermore, in order to make the ORI specification fully inter-operable, it may be necessary to restrict the number of options defined in [1] for usage within ORI. Such restrictions shall be described in the ORI specifications.

#### 4.3.1.2 Specific ORI node requirements

The RE/REC compliant to the ORI specifications shall:

- be fully compliant to CPRI, as defined in section 5.2 of [1]; and
- support mandatory requirements defined within ORI that are defined as options within CPRI; and
- support mandatory requirements defined within ORI that do not refer to functionality in CPRI specifications.

### 4.3.2 C&M functionality

Requirements will be added in this clause in a later version of the present document.

### 4.3.3 C&M signalling and transport

#### 4.3.3.1 System requirements

Any necessary additions to [1] shall be made in the ORI specification to provide transport for any C&M signalling required to fulfil the C&M functionality requirements.

CPRI defined "Fast C&M signalling channel based on Ethernet" shall be supported by the present release of the ORI interface.

#### 4.3.3.2 Specific ORI node requirements

Requirements on RE/REC for signalling transport are defined in [2].

### 4.4 Redundancy

#### 4.4.1 General

Redundancy-switching is deferred to future releases.

### 4.5 Interoperability

#### 4.5.1 General

The interface shall enable interoperability between products of different vendors. Any restrictions to the requirements in [1] or any other existing protocols used by ORI to enable interoperability shall be described in the ORI specifications.

Any knowledge of ORI support in the RE (and any subsequent RE connected to the RE connected directly to the REC) prior to C&M link establishment needs to be provisioned in the REC via O&M.

NOTE: The concurrent operation of compliant and non-compliant ORI nodes is not specified in the ORI specifications.

### 4.6 Forwards compatibility

#### 4.6.1 General

The release 1 of the ORI specification targets basic deployment and related interoperability. It shall also attempt to enable hardware-compatibility towards future Releases of the ORI specification, for such functionality where extensions are foreseen as needed.

Foreseen topologies include chaining, rings, trees, and multi-REC topologies. In order to support those topologies and to be able to discover them, the RE is expected to forward all the SAPs defined in [1] through the unit.

Foreseen functionalities include hot redundancy.

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## History

<b>Document history</b>		
V1.1.1	October 2011	Publication