



## TECHNICAL SPECIFICATION

### **Publicly Available Specification (PAS); O-RAN R1 interface General Aspects and Principles (O-RAN.WG2.TS.R1GAP-R004-v11.00)**

get full document from [standards.iteh.ai](https://standards.iteh.ai)

#### **CAUTION**

*The present document has been submitted to ETSI as a PAS produced by O-RAN Alliance and approved by the ETSI Technical Committee Mobile Standards Group (MSG).*

*ETSI had been assigned all the relevant copyrights related to the document O-RAN.WG2.TS.R1GAP-R004-v11.00 on an "as is basis". Consequently, to the fullest extent permitted by law, ETSI disclaims all warranties whether express, implied, statutory or otherwise including but not limited to merchantability, non-infringement of any intellectual property rights of third parties. No warranty is given about the accuracy and the completeness of the content of the present document.*

---

**Reference**DTS/MSG-001172

---

**Keywords**interface, PAS

---

**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

---

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° w061004871

---

**Important notice**

---

The present document can be downloaded from the  
[ETSI Search & Browse Standards](#) application.

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format on [ETSI deliver](#) repository.

Users should be aware that the present document may be revised or have its status changed, this information is available in the [Milestones listing](#).

If you find errors in the present document, please send your comments to the relevant service listed under [Committee Support Staff](#).

If you find a security vulnerability in the present document, please report it through our [Coordinated Vulnerability Disclosure \(CVD\)](#) program.

---

**Notice of disclaimer & limitation of liability**

---

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

---

**Copyright Notification**

---

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2026.  
All rights reserved.

# Contents

Intellectual Property Rights .....	6
Foreword.....	6
Modal verbs terminology.....	6
1 Scope .....	7
2 References .....	7
2.1 Normative references .....	7
2.2 Informative references.....	7
3 Definition of terms, symbols and abbreviations.....	8
3.1 Terms.....	8
3.2 Symbols.....	8
3.3 Abbreviations .....	8
4 General Aspects of R1 Interface and R1 Services.....	9
4.1 Introduction .....	9
4.2 General principles.....	9
4.3 Specification objectives.....	9
4.4 Capabilities.....	9
5 R1 Services.....	10
5.1 Service management and exposure services.....	10
5.1.1 General.....	10
5.1.2 Bootstrap service .....	10
5.1.2.1 Overview .....	10
5.1.2.2 Bootstrap .....	11
5.1.3 Service registration service .....	11
5.1.3.1 Overview .....	11
5.1.3.2 Registration of services .....	11
5.1.4 Service discovery service.....	11
5.1.4.1 Overview .....	11
5.1.4.2 Discovery of services .....	12
5.1.5 Void .....	12
5.1.6 Authentication and authorization .....	12
5.1.6.1 Overview .....	12
5.1.6.2 Authentication .....	12
5.1.6.3 Authorization .....	12
5.1.7 rApp registration service.....	13
5.1.7.1 Overview .....	13
5.1.7.2 rApp registration management .....	13
5.2 Data management and exposure services .....	13
5.2.1 General.....	13
5.2.2 Data registration service .....	15
5.2.2.1 Overview .....	15
5.2.2.2 Registration of DME types.....	15
5.2.3 Data discovery service .....	15
5.2.3.1 Overview .....	15
5.2.3.2 Discovery of DME types.....	15
5.2.4 Data request service .....	16
5.2.4.1 Overview .....	16
5.2.4.2 Requesting data .....	16
5.2.5 Data subscription service .....	16
5.2.5.1 Overview .....	16
5.2.5.2 Subscribing to data.....	17
5.2.6 Data delivery services .....	17
5.2.6.1 Overview.....	17
5.2.6.2 Pull data service .....	17
5.2.6.3 Push data service .....	18

5.2.6.4	Point to multipoint data streaming service .....	18
5.2.7	Data offer service .....	18
5.2.7.1	Overview .....	18
5.2.7.2	Managing a data offer .....	18
5.3	A1-related Services .....	19
5.3.1	General.....	19
5.3.2	A1 policy management services .....	19
5.3.2.1	Overview .....	19
5.3.2.2	A1 Policy management .....	20
5.3.3	A1 enrichment information related services .....	21
5.3.3.1	Overview .....	21
5.3.3.2	A1 enrichment information .....	21
5.3.4	A1 ML model management services .....	21
5.3.4.1	Overview .....	21
5.4	RAN OAM-related Services.....	21
5.4.1	General.....	21
5.4.2	Network Information service .....	22
5.4.2.1	Overview .....	22
5.4.2.2	Queries related to information about cells .....	22
5.4.3	Fault Management (FM) service.....	22
5.4.3.1	Overview .....	22
5.4.3.2	Querying alarm information.....	22
5.4.3.3	Changing the alarm acknowledgement state .....	22
5.4.4	Performance Management (PM) service.....	22
5.4.4.1	Overview .....	22
5.4.4.2	Querying performance information.....	23
5.4.5	Configuration Management (CM) service .....	23
5.4.5.1	Overview .....	23
5.4.5.2	Retrieving configuration schemas .....	23
5.4.5.3	Reading configuration data .....	23
5.4.5.4	Writing configuration changes .....	24
5.5	O2-related Services .....	24
5.5.1	General.....	24
5.5.2	O2 Infrastructure management service .....	24
5.5.2.1	Overview .....	24
5.5.2.2	Query O2-IMS Information .....	24
5.5.3	O2 Deployment management service .....	25
5.5.3.1	Overview.....	25
5.5.3.2	Query O2-DMS Information .....	25
5.6	AI/ML Workflow Services .....	25
5.6.1	General.....	25
5.6.2	AI/ML model registration service.....	26
5.6.2.1	Overview .....	26
5.6.2.2	Registration of AI/ML model.....	26
5.6.3	AI/ML model storage service .....	27
5.6.3.1	Overview.....	27
5.6.3.2	Storage of AI/ML model .....	27
5.6.4	AI/ML model discovery services.....	27
5.6.4.1	Overview .....	27
5.6.4.2	Discovery of AI/ML model.....	28
5.6.5	AI/ML model change subscription service .....	28
5.6.5.1	Overview .....	28
5.6.5.2	Subscribing to AI/ML model changes.....	28
5.6.6	AI/ML model training capability registration service.....	28
5.6.6.1	Overview .....	28
5.6.6.2	Registration of AI/ML training capability.....	28
5.6.7	AI/ML Model deployment request service .....	29
5.6.8	AI/ML model training services.....	29
5.6.8.1	Overview .....	29
5.6.8.2	AI/ML model training .....	29
5.6.9	AI/ML model performance monitoring service .....	30
5.6.9.1	Overview.....	30

5.6.9.2	Monitoring the performance of a deployed AI/ML model.....	30
5.6.10	AI/ML model inference service .....	30
5.6.10.1	Overview .....	30
5.6.10.2	Inference of AI/ML model.....	30
5.6.11	AI/ML model training capability query services .....	31
5.6.11.1	Overview .....	31
5.6.11.2	Query of AI/ML model training capability .....	31
6	R1 Interface Protocol Structure.....	31
<b>Annex A (informative):</b>	<b>Change history .....</b>	<b>32</b>
History .....		33

# Sample Document

get full document from [standards.iteh.ai](https://standards.iteh.ai)

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the [ETSI IPR online database](#).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

## Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™**, **LTE™** and **5G™** logo are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

---

## Foreword

This Technical Specification (TS) has been produced by O-RAN Alliance and approved by ETSI Technical Committee Mobile Standards Group (MSG).

---

## 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 specifies the general aspects and principles of the R1 interface. It is part of a TS-family covering the R1 interface specifications.

---

## 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 in the [ETSI docbox](#).

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 necessary for the application of the present document.

- [1] [O-RAN.WG2.TS.A1AP-R004](#): "O-RAN A1 interface: Application Protocol".
- [2] [O-RAN.WG2.TS.Use-Case-Requirements-R004](#): "O-RAN Non-RT RIC & A1/R1 Interface: Use Cases and Requirements".
- [3] [O-RAN.WG2.TS.Non-RT-RIC-ARCH-R004](#): "O-RAN Non-RT RIC: Architecture".
- [4] [O-RAN.WG11.TS.SecProtSpec.O-R003](#): "O-RAN Security Protocols Specifications".
- [5] [O-RAN.WG2.TS.R1TP-R004](#): "O-RAN Transport protocols for R1 Services".
- [6] [O-RAN.WG6.TS.O2IMS-INTERFACE-R004](#): "O-RAN O2IMS-Interface Specification".
- [7] [O-RAN.WG6.O2DMS-INTERFACE-ETSI-NFV-PROFILE-R004](#): "O-RAN O2dms Interface Specification: Profile based on ETSI NFV Protocol and Data Models".
- [8] [O-RAN.WG6.TS.O2-GA&P-R004](#): "O-RAN O2 Interface General Aspects and Principles".
- [9] [O-RAN.WG11.TS.SRCS.0-R004](#): "O-RAN Security Requirements and Controls Specification".
- [10] [O-RAN.WG1.OAM-Architecture](#): "O-RAN Operations and Maintenance Architecture".

### 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 may be useful in implementing an ETSI deliverable or add to the reader's understanding, but are not required for conformance to the present document.

- [i.1] ETSI TR 121 905: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Vocabulary for 3GPP Specifications (3GPP TR 21.905 version 9.4.0 Release 9)".

## 3 Definition of terms, symbols and abbreviations

### 3.1 Terms

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

**AI/ML model:** algorithm that applies AI/ML techniques to produce model output data based on model input data

**AI/ML model training:** process to train an AI/ML model by learning the input/output relationship in a data driven manner and obtain a trained AI/ML model that can be used for inference

**data instance:** set of data which resulted from a data job

**data job:** entity that provides data related to a DME type

**DME type:** data type managed and exposed by the DME services and identified by a DME type identifier

**O-RAN Non-real-time RAN Intelligent Controller (Non-RT RIC):** logical function in the SMO framework that enables non-real-time control and optimization of RAN elements and resources, AI/ML workflow including model training and updates, and policy-based guidance of applications/features in Near-RT RIC

NOTE: The Non-RT RIC is comprised of the Non-RT RIC framework and Non-RT RIC applications (rApps).

**Non-RT RIC framework:** functionality internal to the SMO framework that logically terminates the A1 interface and provides the R1 services to rApps through the R1 interface

**R1 interface:** interface between rApps and Non-RT RIC framework via which R1 Services can be produced and consumed

**R1 services:** collection of services including, but not limited to, service registration and discovery services, authentication and authorization services, AI/ML workflow services, RAN OAM-related services as well as A1 and O2 related services

**Non-RT RIC application rApp:** application designed to consume and/or produce R1 Services

NOTE: rApps can leverage the functionality provided by the SMO/Non-RT RIC framework to deliver value added services related to intelligent RAN optimization and operation.

**rApp instance:** individual occurrence of a Non-RT RIC application running in the Non-RT RIC runtime environment

**rApp instance identifier:** unique identifier for each rApp instance, assigned by the SMO/Non-RT RIC framework during rApp registration

### 3.2 Symbols

Void.

### 3.3 Abbreviations

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

AI	Artificial Intelligence
API	Application Programming Interface
CM	Configuration Management
DME	Data Management and Exposure
DMS	Deployment Management Service
EI	Enrichment Information
FM	Fault Management
FQDN	Fully Qualified Domain Name
ID	Identifier
IMS	Infrastructure Management Service

ML	Machine Learning
OAM	Operation And Maintenance
PM	Performance Management
RAN	Radio Access Network
rAppId	rApp Instance Identifier
RBAC	Role Based Access Control
RIC	RAN Intelligent Controller
RT	Real-Time
SME	Service Management and Exposure
SMO	Service Management and Orchestration
SPS	Security Protocols Specification
SRS	Security Requirements and controls Specification
TBAC	Target Based Access Control
UCR	Use Cases and Requirement
URI	Uniform Resource Identifier

---

## 4 General Aspects of R1 Interface and R1 Services

### 4.1 Introduction

The following clauses cover the general aspects for R1 interface.

### 4.2 General principles

The general principles for the specification of the R1 interface are as follows:

- The R1 interface is an open logical interface within the O-RAN architecture between the rApps and the Non-RT RIC framework.
- The R1 interface supports the exchange of control signalling information and the collection and delivery of data between endpoints.
- The R1 interface enables multi-vendor rApps to consume or produce the R1 services and is independent of specific implementations of the SMO and Non-RT RIC framework.
- The R1 interface is defined in an extensible way that enables new services and data types to be added without needing to change the protocols or the procedures.

### 4.3 Specification objectives

The R1 interface specifications shall:

- Facilitate inter-connection between rApps and Non-RT RIC framework supplied by different vendors.
- Provide a level of abstraction between rApps and SMO/Non-RT RIC framework that can be the consumers and or producers of R1 services.

### 4.4 Capabilities

As described in [2] the R1 interface shall support:

- Registration and Deregistration of R1 services.
- Authentication of rApps.
- Authorization of requests to access R1 services.