



Publicly Available Specification (PAS); O-RAN Architecture Description (O-RAN.WG1.OAD-R003-v08.00)

Document Preview

ETSI TS 103 982 V8.0.0 (2024-01)

<https://standards.iteh.ai/catalog/standards/etsi/4a4f059a-1011-4ac3-8c71-39e218ccda97/etsi-ts-103-982-v8-0-0-2024-01>

CAUTION

The present document has been submitted to ETSI as a PAS produced by O-RAN WG1 and approved by the ETSI Technical Committee MSG.

ETSI had been assigned all the relevant copyrights related to the document O-RAN.WG1.OAD-R003-v08.00 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.

ReferenceDTS/MSG-001134

Keywordsarchitecture, 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:

<https://www.etsi.org/standards-search>

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 at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

If you find a security vulnerability in the present document, please report it through our

Coordinated Vulnerability Disclosure Program:

<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

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 2024.
All rights reserved.

Contents

Intellectual Property Rights	5
Foreword.....	5
Modal verbs terminology.....	5
1 Scope	6
2 References	6
2.1 Normative references	6
2.2 Informative references.....	7
3 Definition of terms, symbols and abbreviations.....	8
3.1 Terms.....	8
3.2 Symbols.....	9
3.3 Abbreviations	9
4 O-RAN Overview	11
4.1 Scope and Objectives	11
5 General O-RAN Architecture Principles.....	11
6 O-RAN Architecture	12
6.1 Overall Architecture of O-RAN	12
6.2 O-RAN Control Loops	14
6.3 Description of O-RAN Functions.....	15
6.3.1 Service Management and Orchestration (SMO)	15
6.3.1.1 SMO Architecture Principles	15
6.3.1.2 SMO Functionality.....	15
6.3.1.2.1 Introduction to SMO Functionality	15
6.3.1.2.2 SMO support for FCAPS to O-RAN Network Functions	16
6.3.1.2.3 Non-RT RIC	17
6.3.1.2.4 O-Cloud Management, Orchestration and Workflow Management	17
6.3.2 Near-RT RIC	18
6.3.3 O-CU-CP	18
6.3.4 O-CU-UP	18
6.3.5 O-DU	19
6.3.6 O-RU	19
6.3.7 O-eNB.....	19
6.3.8 O-Cloud	19
6.4 Relevant Interfaces in O-RAN Architecture.....	20
6.4.1 Introduction to Relevant Interfaces in O-RAN Architecture	20
6.4.2 A1 Interface	20
6.4.3 O1 Interface	21
6.4.4 O2 Interface	21
6.4.5 E2 Interface.....	21
6.4.6 O-Cloud Notification Interface	21
6.4.7 Open Fronthaul Interface	21
6.4.8 E1 Interface.....	21
6.4.9 F1-c Interface.....	21
6.4.10 F1-u Interface.....	22
6.4.11 NG-c Interface	22
6.4.12 NG-u Interface	22
6.4.13 X2-c Interface	22
6.4.14 X2-u Interface	22
6.4.15 Xn-c Interface	22
6.4.16 Xn-u Interface	22
6.4.17 Uu Interface	22
6.4.18 CTI (Cooperative Transport Interface)	22
6.4.19 Y1 Interface	23
6.5 UE Associated Identifiers Used in O-RAN	23

6.6	O-RAN Security Architecture	24
6.6.1	Introduction to O-RAN Security Architecture	24
6.6.2	O-RAN Security Benefits	24
6.6.3	O-RAN Threat Analysis	24
6.6.3.1	Introduction to O-RAN Threat Analysis	24
6.6.3.2	O-RAN Threats	24
6.6.3.3	O-RAN Attack Surface	24
6.6.4	O-RAN Security Protocols	25
6.6.5	Considerations for a Zero-Trust Architecture	25
7	O-RAN Information Model (IM) Principles	25
Annex A (informative): Implementation Options of O-RAN Functions and Network Elements ...		26
A.1	Shared Cell	26
A.2	FHGW Function	27
A.3	Near-RT RIC	28
A.4	Near-RT RIC, O-CU-CP, O-CU-UP, O-DU and O-RU	28
A.5	Cooperative Transport	33
Annex B (informative): Change history		34
History		35

iTeh Standards
(https://standards.iteh.ai)
Document Preview

ETSI TS 103 982 V8.0.0 (2024-01)

http://standards.iteh.ai/catalog/standards/etSI/44a0f5-190a44c3-8-7c3-24cd89ac/etSI-ts-103-982-v8-0-2024-01

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 Web server (<https://ipr.etsi.org/>).

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™** and **LTE™** 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 Mobiles Standards Group (MSG).

The content of the present document is subject to continuing work within O-RAN and may change following formal O-RAN approval. Should the O-RAN ALLIANCE modify the contents of the present document, it will be re-released by O-RAN with an identifying change of version date and an increase in version number as follows:

version xx.yy.zz

where:

- xx: the first digit-group is incremented for all changes of substance, i.e., technical enhancements, corrections, updates, etc. (the initial approved document will have xx=01). Always 2 digits with leading zero if needed.
- yy: the second digit-group is incremented when editorial only changes have been incorporated in the document. Always 2 digits with leading zero if needed.
- zz: the third digit-group included only in working versions of the document indicating incremental changes during the editing process. External versions never include the third digit-group. Always 2 digits with leading zero if needed.

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 overall architecture of O-RAN.
- describes: the O-RAN architecture elements and relevant interfaces that connect them.

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.

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

- [1] [ETSI TS 123 501](#): "5G; System architecture for the 5G System (5GS) (3GPP TS 23.501)".
- [2] [ETSI TS 128 622](#): "Universal Mobile Telecommunications System (UMTS); LTE; 5G; Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS) (3GPP TS 28.622)".
- [3] [ETSI TS 132 101](#): "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Principles and high level requirements (3GPP TS 32.101)".
- [4] [ETSI TS 136 401](#): "LTE ; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Architecture description (3GPP TS 36.401)".
- [5] [ETSI TS 136 420](#): "LTE; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 general aspects and principles (3GPP TS 36.420)".
- [6] [ETSI TS 136 423](#): "LTE; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP) (3GPP TS 36.423)".
- [7] [ETSI TS 138 300](#): "5G; NR; NR and NG-RAN Overall description; Stage-2 (3GPP TS 38.300)".
- [8] [ETSI TS 138 331](#): "5G; NR; Radio Resource Control (RRC); Protocol specification (3GPP TS 38.331)".
- [9] [ETSI TS 138 401](#): "5G; NG-RAN; Architecture description (3GPP TS 38.401)".
- [10] [ETSI TS 138 413](#): "5G; NG-RAN; NG Application Protocol (NGAP) (3GPP TS 38.413)".
- [11] [ETSI TS 138 420](#): "5G; NG-RAN; Xn general aspects and principles (3GPP TS 38.420)".
- [12] [ETSI TS 138 423](#): "5G; NG-RAN; Xn Application Protocol (XnAP) (3GPP TS 38.423)".
- [13] [ETSI TS 138 460](#): "5G; NG-RAN; E1 general aspects and principles (3GPP TS 38.460)".
- [14] [ETSI TS 138 463](#): "5G; NG-RAN; E1 Application Protocol (E1AP) (3GPP TS 38.463)".
- [15] [ETSI TS 138 470](#): "5G; NG-RAN; F1 general aspects and principles (3GPP TS 38.470)".
- [16] [ETSI TS 138 473](#): "5G; NG-RAN; F1 Application Protocol (F1AP) (3GPP TS 38.473)".

- [17] [O-RAN TR](#): "Cloud Architecture and Deployment Scenarios for O-RAN Virtualized RAN".
- [18] [O-RAN TS](#): "A1 interface: General Aspects and Principles".
- [19] [O-RAN TS](#): "Control, User and Synchronization Plane Specification".
- [20] [O-RAN TS](#): "Cooperative Transport Interface; Transport Control Plane Specification".
- [21] [O-RAN TS](#): "Cooperative Transport Interface; Transport Management Plane Specification".
- [22] [O-RAN TS](#): "E2 General Aspects and Principles (E2GAP)".
- [23] [O-RAN TS](#): "Hardware Reference Design Specification for Indoor Picocell (FR1) with Split Architecture Option 8".
- [24] [O-RAN TS](#): "Management Plane Specification".
- [25] [O-RAN TS](#): "Non-RT RIC Architecture".
- [26] [O-RAN TS](#): "Near-Real-time RAN Intelligent Controller E2 Service Model (E2SM)".
- [27] [O-RAN TS](#): "O-Cloud Notification API Specification for Event Consumers".
- [28] [O-RAN TS](#): "Operations and Maintenance Architecture".
- [29] [O-RAN TS](#): "O-RAN Information Model and Data Models Specification".
- [30] [O-RAN TS](#): "O-RAN Operations and Maintenance Interface Specification".
- [31] [O-RAN TS](#): "Security Protocols Specifications".
- [32] [O-RAN TS](#): "Security Requirements and Controls Specifications".
- [33] [O-RAN TS](#): "Security Threat Modeling and Remediation Analysis".
- [34] [O-RAN TS](#): "Use Cases Analysis Report".
- [35] [O-RAN TS](#): "Use Cases Detailed Specification".

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] 3GPP TR 38.801: "Study on new radio access technology: Radio access architecture and interfaces (Release 14)".
- [i.2] [ETSI TR 121 905](#): "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; Vocabulary for 3GPP Specifications (3GPP TR 21.905)".
- [i.3] NIST SP 800-207 Rose, S., Borchert, O., Mitchell, S., and Connelly, S.: "[Zero-Trust Architecture](#)", U.S. NIST, August 2020.
- [i.4] O-RAN White Paper: "O-RAN: Towards an Open and Smart RAN", October 2018.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI TR 121 905 [i.2] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in ETSI TR 121 905 [i.2].

E2 Node: logical node terminating E2 interface

Managed Application: The definition of Managed Application is given in O-RAN Operations and Maintenance Architecture [28].

Managed Element: The definition of a Managed Element (ME) is given in ETSI TS 128 622 [2], Clause 4.3.3.

Managed Function: The definition of a Managed Function (MF) is given in ETSI TS 128 622 [2], Clause 4.3.4.

Near-RT RIC (O-RAN Near-Real-Time RAN Intelligent Controller): A logical function that enables near-real-time control and optimization of RAN elements and resources via fine-grained data collection and actions over E2 interface. It may include AI/ML (Artificial Intelligence / Machine Learning) workflow including model training, inference and updates.

NOTE: Refer to [22] for more information.

Non-RT RIC (O-RAN Non-Real-Time RAN Intelligent Controller): A logical function within SMO that drives the content carried across the A1 interface. It is comprised of the Non-RT RIC Framework and the Non-RT RIC Applications (rApps) whose functions are defined below.

NOTE: Refer to [18] for more information.

Non-RT RIC Applications (rApps): Modular applications that leverage the functionality exposed via the Non-RT RIC Framework's R1 interface to provide added value services relative to RAN operation, such as driving the A1 interface, recommending values and actions that may be subsequently applied over the O1/O2 interface and generating "enrichment information" for the use of other rApps. The rApp functionality within the Non-RT RIC enables non-real-time control and optimization of RAN elements and resources and policy-based guidance to the applications/features in Near-RT RIC.

NOTE: Refer to [25] for more information.

Non-RT RIC Framework: That functionality internal to the SMO that logically terminates the A1 interface to the Near-RT RIC and exposes to rApps, via its R1 interface, the set of internal SMO services needed for their runtime processing. The Non-RT RIC Framework functionality within the Non-RT RIC provides AI/ML workflow including model training, inference and updates needed for rApps.

NOTE: Refer to [25] for more information.

NMS: Network Management System for the O-RU as specified in O-RAN "Management Plane Specification" [24] to support legacy Open Fronthaul M-Plane deployments (prior to version 5 of O-RAN "Management Plane Specification" [24])

O1: interface between SMO framework as specified in Clause 6.3.1 and O-RAN managed elements, for operation and management, by which FCAPS management, PNF (Physical Network Function) software management, File management shall be achieved

O2: interface between SMO framework as specified in Clause 6.3.1 and the O-Cloud for supporting O-RAN virtual network functions

NOTE: Refer to [17] for more information.

O-Cloud: cloud computing platform comprising a collection of physical infrastructure nodes that meet O-RAN requirements to host the relevant O-RAN functions (such as Near-RT RIC, O-CU-CP, O-CU-UP, and O-DU), the supporting software components (such as Operating System, Virtual Machine Monitor, Container Runtime, etc.) and the appropriate management and orchestration functions

NOTE: Refer to [17] for more information.

O-CU-CP (O-RAN Central Unit - Control Plane): logical node hosting the RRC and the control plane part of the PDCP protocol

NOTE: Refer to Clause 6.3.3 for more information.

O-CU-UP (O-RAN Central Unit - User Plane): logical node hosting the user plane part of the PDCP protocol and the SDAP protocol

NOTE: Refer to Clause 6.3.4 for more information.

O-DU (O-RAN Distributed Unit): logical node hosting RLC/MAC/High-PHY layers based on a lower layer functional split

NOTE: Refer to Clause 6.3.5 for more information.

O-eNB: eNB ETSI TS 136 401 [4] or ng-eNB ETSI TS 138 300 [7] that supports E2 interface

NOTE: Refer to Clause 6.3.7 for more information.

O-RU (O-RAN Radio Unit): A logical node hosting Low-PHY layer and RF processing based on a lower layer functional split. This is similar to 3GPP's "TRP" or "RRH" but more specific in including the Low-PHY layer (FFT/iFFT, PRACH extraction). Refer to Clause 6.3.6 for more information.

Open FH M-Plane: management interface controlling the O-RU, generally driven from the O-DU but in the case of the hybrid topology also driven from the SMO

NOTE: Refer to [24] for more details.

SMO: Service Management and Orchestration system as described in Clause 6.3.1.

xApp: An application designed to run on the near-RT RIC. Such an application is likely to consist of one or more microservices and at the point of on-boarding will identify which data it consumes and which data it provides. The application is independent of the near-RT RIC and may be provided by any third party. The E2 enables a direct association between the xApp and the RAN functionality [22].

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TR 121 905 [i.2] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in ETSI TR 121 905 [i.2].

4G	4 th Generation of mobile communications
5G	5 th Generation of mobile communications
3GPP	3 rd Generation Partnership Project
5GC	5G Core
5GS	5G System
AAL	Accelerator Abstraction Layer
AF	Application Function
API	Application Programming Interface
AI	Artificial Intelligence
AMF	Access and Mobility Functions
C-RNTI	Cell Radio Network Temporary Identifier

CM	Configuration Management
CMTS	Cable Modem Termination System
CP	Control Plane
CSP	Communications Service Provider
CTI	Cooperative Transport Interface
CUS	Control User Synchronization
DC	Dual connectivity
DOCSIS	Data Over Cable Service Interface Specification
DM	Data Model
DTLS	Datagram Transport Layer Security
E-UTRA	Evolved Universal Terrestrial Radio Access
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
EN-DC	E-UTRAN New Radio - Dual Connectivity
EPC	Evolved Packet Core
eNB	evolved Node B
FCAPS	Fault, Configuration, Accounting, Performance, Security
FFT	Fast Fourier Transform
FHGW	Fronthaul Gateway
FHM	Fronthaul Multiplexer
FM	Fault Management
gNB	next generation Node B
gNB-CU	gNB Central Unit
gNB-DU	gNB Distributed Unit
GUAMI	Globally Unique AMF Identifier
GUMMEI	Globally Unique MME Identifier
HARQ	Hybrid Automatic Repeat Request
ID	Identifier
iFFT	inverse Fast Fourier Transform
IM	Information Model
IPSec	Internet Protocol Security
LLS	Lower Layer Split
LTE	Long Term Evolution
MAC	Media Access Control
ME	Managed Element
MeNB	Master eNB
MF	Managed Function
ML	Machine Learning
MME	Mobility Management Entity
Near-RT RIC	Near-Real-Time RAN Intelligent Controller
NETCONF	NETwork CONFiguration Protocol
NG	Next Generation
NG-RAN	Next Generation RAN
NGAP	Next Generation Application Protocol
NIST	National Institute of Standards and Technology
NMS	Network Management System
Non-RT RIC	Non-Real-Time RAN Intelligent Controller
NR	5G New Radio
O-Cloud	O-RAN Cloud
O-CU-CP	O-RAN Central Unit - Control Plane.
O-CU-UP	O-RAN Central Unit - User Plane
O-DU	O-RAN Distributed Unit
O-eNB	O-RAN eNB
O-RAN	Open RAN
O-RU	O-RAN Radio Unit
OAM	Operations, Administration and Maintenance
OLT	Optical Line Terminal
ONU	Optical Network Unit
Open FH	Open FrontHaul
PDCP	Packet Data Convergence Protocol
PHY	Physical layer
PKI	Public Key Infrastructure
PM	Performance Management

PNF	Physical Network Function
PON	Passive Optical Network
PRACH	Physical Random Access CHannel
PTP	Precision Time Protocol
RAN	Radio Access Network
rApp	Non-RT RIC Application
RAT	Radio Access Technology
RF	Radio Frequency
RIC	RAN Intelligent Controller
RLC	Radio Link Control
RRC	Radio Resource Control
RRH	Remote Radio Head
RRM	Radio Resource Management
RRU	Remote Radio Unit
RT	Real Time
RU	Radio Unit
SBA	Service Based Architecture
SBOM	Software Bill Of Materials
SDAP	Service Data Adaptation Protocol
SMO	Service Management and Orchestration
SRB	Signalling Radio Bearer
SSHv2	Secure SHell 2.0
TLS	Transport Layer Security
TN	Transport Node
TR	Technical Report
TRP	Transmission and Reception Point
TS	Technical Specification
TU	Transport Unit
UE	User Equipment
UL	Up Link
UP	User Plane
UPF	User Plane Function
VM	Virtual Machine
VNF	Virtualized Network Function
WG	Working Group
xApp	Near-RT RIC Application
X2AP	X2 Application Protocol
XnAP	Xn Application Protocol
ZTA	Zero Trust Architecture

4 O-RAN Overview

4.1 Scope and Objectives

O-RAN activities are guided by the following objectives [i.4]:

- Leading the industry towards open, interoperable interfaces, RAN virtualization, and big data and AI enabled RAN intelligence.
- Maximizing the use of common-off-the-shelf hardware and merchant silicon and minimizing proprietary hardware.
- Specifying APIs and interfaces, driving standards to adopt them as appropriate, and exploring open source where appropriate.
- The O-RAN Architecture identifies the key functions and interfaces adopted in O-RAN.