ETSI TS 103 986 V3.3.0 (2025-05)

Publicly Available Specification (PAS); A1 interface: Transport Protocol (O-RAN.WG2.A1TP-R004-v03.03)

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).

Reference
RTS/MSG-001165

Keywords
interface, PAS, protocol, transport

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Foreword

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

The present document is part of a TS-family covering the A1 interface as identified below:

- "A1 interface: General Aspects and Principles";
- "A1 interface: Use Cases and Requirements";
- "A1 interface: Transport Protocol";
- "A1 interface: Application Protocol";
- "A1 interface: Type Definitions"; and
- "A1 interface: Test Specification".

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 transport protocol stack for the A1 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.

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] ETSI TS 103 983 (V4.0.0): "Publicly Available Specification (PAS); A1 interface: General Aspects and Principles (O-RAN.WG2.A1GAP-R004-v04.00)".

[2] ETSI TS 103 987 (V4.3.0): "Publicly Available Specification (PAS); A1 interface: Application Protocol (O-RAN.WG2.A1AP-R004-v04.03)".

[3] ETSI TS 103 988 (V9.0.0): "Publicly Available Specification (PAS); A1 interface: Type Definitions (O-RAN.WG2.A1TD-R004-v09.00)".

[4] IETF RFC 793: "Transmission Control Protocol".

[5] Void.

[6] IETF RFC 8446: "The Transport Layer Security (TLS) Protocol Version 1.3".

[7] Void.

[8] Void.

[9] Void.

[10] Void.

[11] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[12] IETF RFC 8200 (July 2017): "Internet Protocol, Version 6 (IPv6) Specification".

[13] IETF RFC 791 (September 1981): "Internet Protocol".

[14] Void.

[15] Void.

[16] O-RAN TS: "O-RAN Security Requirements and Controls Specification".

[17] O-RAN TS: "O-RAN Security Protocols Specifications".

[18] IETF RFC 9110: "HTTP Semantics".

[19] IETF RFC 9112: "HTTP/1.1".

[20] IETF RFC 9113: "HTTP/2".

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.

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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.

Not applicable.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in A1GAP [1] apply.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in A1GAP [1] and the following apply:

IETF	Internet Engineering Task Force
JWT	JSON Web Tokens
RFC	Request For Comments

4 A1 interface protocol stack

4.1 General

The architecture for the A1 interface is specified in A1GAP [1]. The protocol stack for the A1 interface supports application protocol and data models as specified in A1AP [2] and A1TD [3].

4.2 Reference model

The A1 interface is defined between the Non-RT RIC and the Near-RT RIC functions. The A1 architecture and principles are described in A1GAP [1]. Figure 4.2-1 illustrates the reference model for the A1 interface.

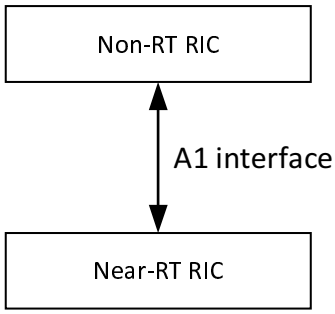

Figure 4.2-1: A1 interface reference model

4.3 Functions and protocol stack

The following layers of the protocol stack for the A1 interface are described in the following clauses:

- TCP as specified in IETF RFC 793 [4] provides the communication service at the transport layer;
- TLS as specified in IETF RFC 8446 [6] is used to provide secure HTTP connections;
- HTTP as specified in IETF RFC 9110 [18], IETF RFC 9112 [19] and IETF RFC 9113 [20] is used as application-level protocol;
- The data interchange layer constitutes the transport of documents in the JSON format as specified in IETF RFC 8259 [11].

Figure 4.3-1 illustrates the protocol stack of the A1 interface.

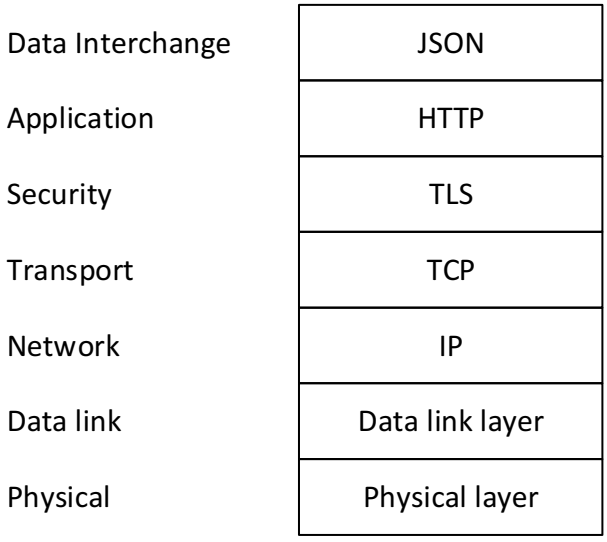

Figure 4.3-1: A1 protocol stack

5 Network layer

A1 may be transported over IPv6 as specified in IETF RFC 8200 [12] and/or IPv4 as specified in IETF RFC 791 [13].

6 Transport layer

TCP as specified in IETF RFC 793 [4] shall be used as transport protocol. An HTTP connection is mapped to a TCP connection.

Both Non-RT RIC and Near-RT RIC can act as HTTP client and HTTP server. As a result, Non-RT RIC and Near-RT RIC can establish a TCP connection for each direction.

7 Security

TLS, mTLS, and OAuth2.0 shall be supported as specified in clause 5.2.1 of SRS [16].

mTLS and OAuth 2.0 with JWT shall be supported as specified in clause 4.7 of SPS [17].

8 Application

As application layer, HTTP/1.1 as specified in IETF RFC 9112 [19] shall be supported, and HTTP/2 as specified in IETF RFC 9113 [20] should be supported.

HTTP over TLS as specified in IETF RFC 9110 [18] and IETF RFC 9112 [19] shall be supported. If HTTP/2 is supported, HTTP/2 over TLS as specified in IETF RFC 9113 [20] shall be supported.

HTTP details such as standard headers, custom headers, error codes, methods, URIs etc are specified in A1AP [2].

The default TCP port numbers should be used for HTTP operation.

9 Data interchange

As a data interchange format, JSON as specified in IETF RFC 8259 [11] shall be supported. The objects transported in HTTP messages, and the data types in JSON format, are specified in A1TD [3].

Annex A (informative): Change history

Date	Revision	Description
2019.09.30	01.00	First version
2021.03.13	01.01	Editorial corrections to apply latest template and update references. Clarification of HTTP port number
2022.07.30	02.00	Adapting to ODR template and referring to O-RAN security specifications for mTLS and OAuth2.0
2022.11.17	02.01	Aligning to O-RAN drafting rules
2023.07.31	03.00	Updating obsolete references and applying latest template
2023.11.30	03.01	ETSI PAS related editorial enhancements of references in clause 7
2024.03.31	03.02	Editorial enhancement of references
2024.07.31	03.03	Updated specification designator to R004

History

Document history		
V2.1.0	January 2024	Publication
V3.3.0	May 2025	Publication