



Publicly Available Specification (PAS); A1 interface: Transport Protocol (O-RAN.WG2.A1TP-R003-v02.01)

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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).

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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 at <https://docbox.etsi.org/Reference>.

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

- [1] [ETSI TS 103 983 \(V3.1.0\)](#): "Publicly Available Specification (PAS); O-RAN Working Group 2 (Non-RT RIC and A1 interface WG) A1 interface: General Aspects and Principles (O-RAN.WG2.A1GAP-R003-v03.01)".
- [2] [ETSI TS 103 987 \(V4.0.0\)](#): "Publicly Available Specification (PAS); O-RAN Working Group 2 (Non-RT RIC and A1 interface WG) A1 interface: Application Protocol (O-RAN.WG2.A1AP-R003-v04.00)".
- [3] [ETSI TS 103 988 \(V5.0.0\)](#): "Publicly Available Specification (PAS); O-RAN Working Group 2 (Non-RT RIC and A1 interface WG) A1 interface: Type Definitions (O-RAN.WG2.A1TD-R003-v05.00)".
- [4] [IETF RFC 793](#): "Transmission Control Protocol".
- [5] [IETF RFC 5246](#): "The Transport Layer Security (TLS) Protocol Version 1.2".
- [6] [IETF RFC 8446](#): "The Transport Layer Security (TLS) Protocol Version 1.3".
- [7] [IETF RFC 2818](#): "HTTP over TLS".
- [8] [IETF RFC 7230](#): "Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing".
- [9] [IETF RFC 7231](#): "Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content".
- [10] [IETF RFC 7540](#): "Hypertext Transfer Protocol Version 2 (HTTP/2)".
- [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] [IETF RFC 6749 \(October 2012\)](#): "The OAuth 2.0 Authorization Framework".
- [15] [IETF RFC 7519 \(May 2015\)](#): "JSON Web Token (JWT)".
- [16] [O-RAN TS](#): "O-RAN Security Requirements and Controls Specification".
- [17] [O-RAN TS](#): "O-RAN Security Protocols Specifications".

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 are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

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.

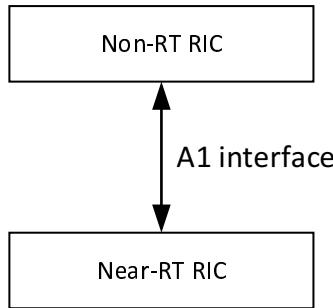


Figure 4.2-1: A1 interface reference model

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 5246 [5] and IETF RFC 8446 [6] is used to provide secure HTTP connections as specified in IETF RFC 2818 [7] and IETF RFC 7230 [8];
- HTTP as specified in IETF RFC 7231 [9] and IETF RFC 7540 [10] 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.

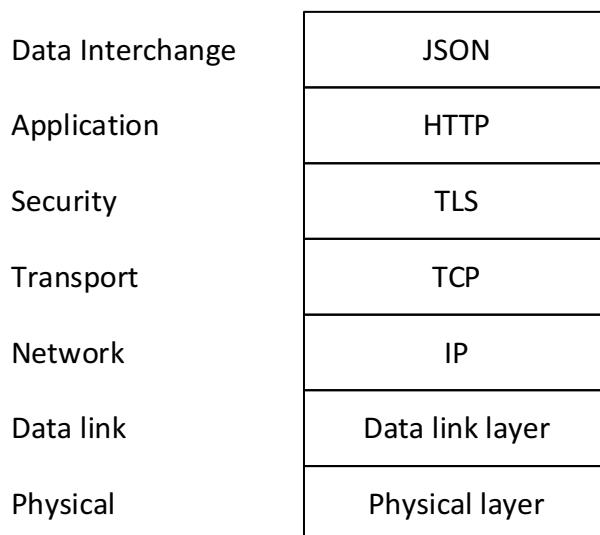


Figure 4.3-1: A1 protocol stack

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 v1.2 as specified in IETF RFC 5246 [5], TLS v1.3 as specified in IETF RFC 8446 [6], and OAuth2.0 as specified in IETF RFC 6749 [14] with JWT as specified in IETF RFC 7519 [15] shall be supported.

TLS shall be supported and used for the security protection at the transport and application layers, as specified in O-RAN Security Requirements Specifications [16] and O-RAN Security Protocols Specifications [17].

mTLS shall be supported and used for mutual authentication, as specified in O-RAN Security Requirements Specifications [16] and O-RAN Security Protocols Specifications [17].

OAuth 2.0 shall be supported and used for authorization at the application layer, as specified in O-RAN Security Requirements Specifications [16] and O-RAN Security Protocols Specifications [17].

JWT shall be supported for authorization as specified in O-RAN Security Requirements Specifications [16] and O-RAN Security Protocols Specifications [17].

8 Application

As application layer, HTTP/1.1 as specified in IETF RFC 7231 [9] shall be supported, and HTTP/2 as specified in IETF RFC 7540 [10] should be supported.

HTTP over TLS as specified in IETF RFC 2818 [7] and updated in IETF RFC 7230 [8] 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	Version	Information about changes
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

History

Document history		
V2.1.0	January 2024	Publication