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Technical Specification

O-RAN Working Group 2 (Non-RT RIC and A1 interface WG)

A1 interface: Transport Protocol

O-RAN ALLIANCE e.V., Buschkauler Weg 27, 53347 Alfter, Germany

Contents

Foreword

This Technical Specification (TS) has been produced by O-RAN Alliance Working Group 2 (Non-RT RIC and A1 interface WG). It 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 O-RAN Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in O-RAN deliverables except when used in direct citation.

1 Scope

The contents of the present document are 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.

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.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, O-RAN cannot guarantee their long-term validity.

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

[1] O-RAN TS: "A1 interface: General Aspects and Principles" ("A1GAP")

[2] O-RAN TS: "A1 interface: Application Protocol" ("A1AP")

[3] O-RAN TS: "A1 interface: Type Definitions" ("A1TD")

[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 7321: "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 (2017-07): "Internet Protocol, Version 6 (IPv6) Specification"

[13] IETF RFC 791 (1981-09): "Internet Protocol"

[14] IETF RFC 6749 (2012-10): "The OAuth 2.0 Authorization Framework"

[15] IETF RFC 7519 (2015-05): "JSON Web Token (JWT)"

[16] O-RAN TS: "O-RAN Security Requirements Specifications"

[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.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, O-RAN 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.

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.

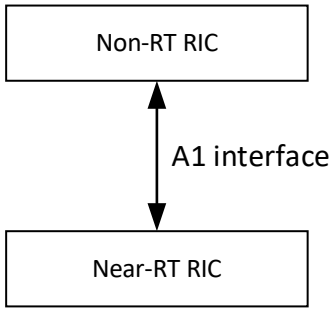

Figure 4.2-1: A1 interface reference model

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 7321 [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.

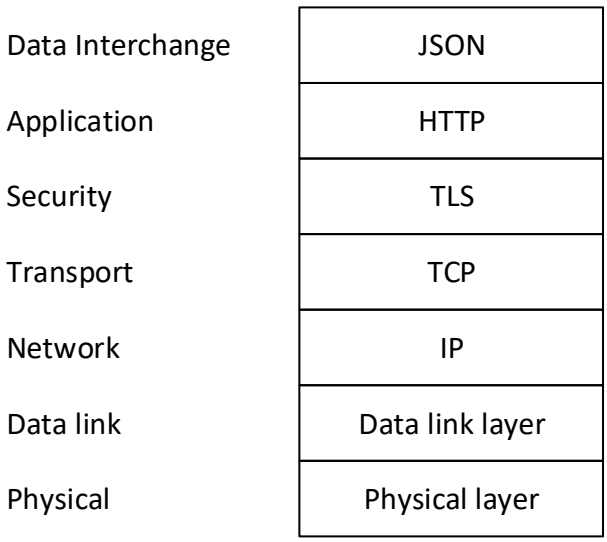

Figure 4.3-1: A1 protocol stack

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].

History

Date	Revision	Description
2022.11.17	02.01	Aligning to O-RAN drafting rules
2022.07.30	02.00	Adapting to ODR template and referring to O-RAN security specifications for mTLS and OAuth2.0
2021.03.13	01.01	Editorial corrections to apply latest template and update references. Clarification of HTTP port number.
2019.09.30	01.00	First version

