ETSI TS 129 222 V16.3.0 (2020-08)

TECHNICAL SPECIFICATION

5G;
LTE;
Common API Framework for 3GPP Northbound APIs
(3GPP TS 29.222 version 16.3.0 Release 16)

Reference
RTS/TSGC-0329222vg30

Keywords
5G,LTE

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 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:
http://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/CommiteeSupportStaff.aspx

Copyright Notification

ETSI

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is 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 IPR Policy, no investigation, 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.

Legal Notice

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

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.

Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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

Version x.y.z

where:

x   the first digit:

1   presented to TSG for information;

2   presented to TSG for approval;

3   or greater indicates TSG approved document under change control.

y   the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z   the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present specification describes the protocol for the Common API Framework (CAPIF) for 3GPP Northbound APIs. The CAPIF and the related stage 2 architecture and functional requirements are defined in 3GPP TS 23.222 [2].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1]   3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2]   3GPP TS 23.222: "Functional architecture and information flows to support Common API Framework for 3GPP Northbound APIs; Stage 2".

[3]   Open API Initiative, "OpenAPI 3.0.0 Specification", https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md.

[4]   IETF RFC 7230: "Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing".

[5]   IETF RFC 7231: "Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content".

[6]   IETF RFC 7232: "Hypertext Transfer Protocol (HTTP/1.1): Conditional Requests".

[7]   IETF RFC 7233: "Hypertext Transfer Protocol (HTTP/1.1): Range Requests".

[8]   IETF RFC 7234: "Hypertext Transfer Protocol (HTTP/1.1): Caching".

[9]   IETF RFC 7235: "Hypertext Transfer Protocol (HTTP/1.1): Authentication".

[10]   IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".

[11]   IETF RFC 5246: "The Transport Layer Security (TLS) Protocol Version 1.2".

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

[13]   IETF RFC 6455: "The Websocket Protocol".

[14]   3GPP TS 29.122: "T8 reference point for northbound Application Programming Interfaces (APIs)".

[15]   3GPP TS 29.522: "5G System; Network Exposure Function Northbound APIs; Stage 3".

[16]   3GPP TS 33.122: "Security Aspects of Common API Framework for 3GPP Northbound APIs".

[17]   IETF RFC 2617: "HTTP Authentication: Basic and Digest Access Authentication".

[18]   3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[19]   3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces Stage 3".

[20]   IETF RFC 7239: "Forwarded HTTP Extension".

[21]   3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".[22] W3C HTML 4.01 Specification, https://www.w3.org/TR/2018/SPSD-html401-20180327/.

[23]   IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

[24]   IETF RFC 7519: "JSON Web Token (JWT)".

[25]   IETF RFC 7515: "JSON Web Signature (JWS)".

[26]   3GPP TS 29.523: "5G System; Policy Control Event Exposure Service; Stage 3".

[27]   3GPP TR 21.900: "Technical Specification Group working methods".

[28]   3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3"

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

API registry: API registry is a registry maintained by the CAPIF core function to store information about the service APIs based on the data models defined in this specification. The structure of the API registry is out of scope of this specification.

CAPIF administrator: An authorized user with special permissions for CAPIF operations.

PLMN trust domain: The entities protected by adequate security and controlled by the PLMN operator or a trusted 3rd party of the PLMN.

Service API: The interface through which a component of the system exposes its services to API invokers by abstracting the services from the underlying mechanisms.

Subscriber: A functional entity that subscribes to another functional entity for notifications.

3.2   Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AEF	API Exposing Function
AMF	API Management Function
APF	API Publishing Function
AS	Application Server
CAPIF	Common API Framework
CCF	CAPIF Core Function
JSON	JavaScript Object Notation
REST	Representational State Transfer
SCEF	Service Capability Exposure Function
SCS	Service Capability Server

4   Overview

4.1   Introduction

In 3GPP, there are multiple northbound API-related specifications. To avoid duplication and inconsistency of approaches between different API specifications and to specify common services (e.g. authorization), 3GPP has

considered in 3GPP TS 23.222 [2] the development of a common API framework (CAPIF) that includes common aspects applicable to any northbound service APIs.

The present document specifies the APIs needed to support CAPIF.

4.2 Service Architecture

3GPP TS 23.222 [2], clause 6 specifies the functional entities and domains of the functional model, which is depicted in Figure 4.2-1, in detail.
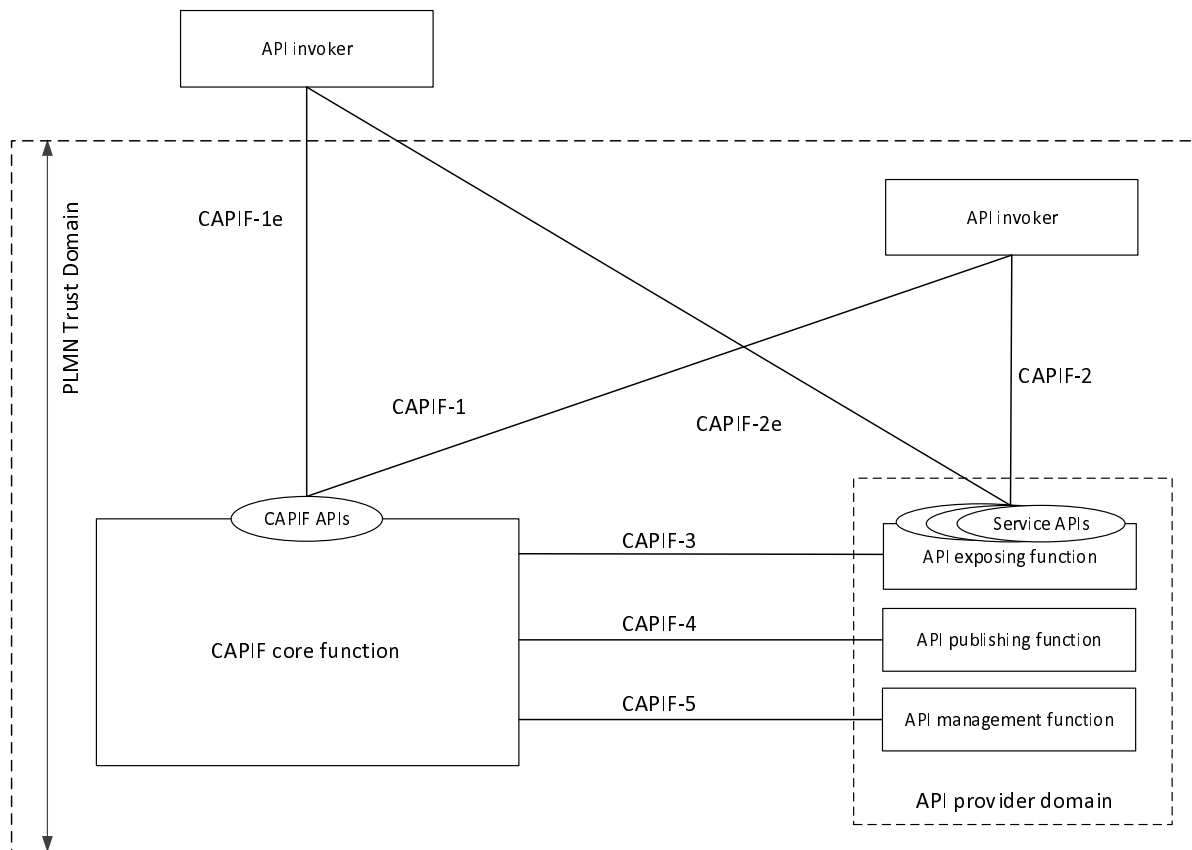
Figure 4.2-1: CAPIF Functional Model

CAPIF-1 and CAPIF-1e reference points connect an API invoker inside the PLMN Trust Domain and an API invoker outside the PLMN Trust Domain respectively, with the CAPIF core function.

CAPIF-2 and CAPIF-2e reference points connect an API invoker inside the PLMN Trust Domain and an API invoker outside the PLMN Trust Domain respectively, with the API exposing function.

CAPIF-3 reference point connects an API exposing function inside the PLMN Trust Domain with the CAPIF core function.

CAPIF-4 reference point connects an API publishing function inside the PLMN Trust Domain with the CAPIF core function.

CAPIF-5 reference point connects an API management function inside the PLMN Trust Domain with the CAPIF core function.

NOTE: The API exposing function, API publishing function and API management function are part the API provider domain which can be implemented by the Service Capability Exposure Function (SCEF) and/or the Network Exposure Function (NEF).

3GPP TS 23.222 [2], clause 6 specifies functional model for the CAPIF to support 3rd party API providers, which is depicted in Figure 4.2-2 in detail
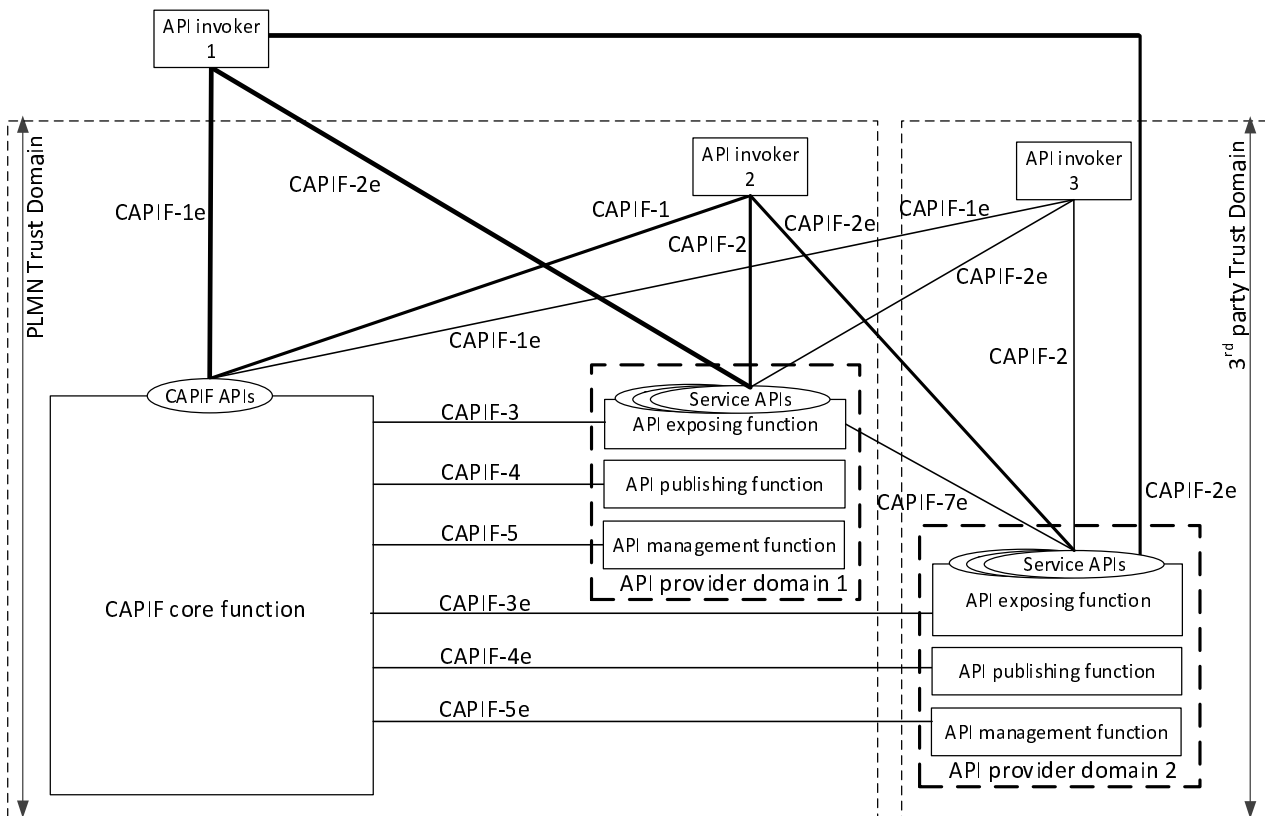
Figure 4.2-2: Functional model for the CAPIF to support 3rd party API providers

The CAPIF core function in the PLMN trust domain supports service APIs from both the PLMN trust domain and the 3rd party trust domain having business relationship with PLMN Trust Domain. The API invokers may exist within the PLMN trust domain, or within the 3rd party trust domain or outside of both the PLMN trust domain and the 3rd party trust domain.

CAPIF-3e reference point connects an API exposing function outside PLMN Trust Domain with the CAPIF core function.

CAPIF-4e reference point connects an API publishing function outside PLMN Trust Domain with the CAPIF core function.

CAPIF-5e reference point connects an API management function outside PLMN Trust Domain with the CAPIF core function.

CAPIF-7 and CAPIF-7e reference points connect API exposing functions within PLMN Trust Domain and outside PLMN Trust Domains respectively. 3GPP TS 23.222 [2] specifies functional model for interactions between API exposing functions.

NOTE: CAPIF-7 reference point is not represented in the Figure 4.2-2 which is aligning to TS 23.222 [2].

3GPP TS 23.222 [2], clause 6 specifies functional model to support CAPIF interconnection, which is depicted in Figure 4.2-3 in detail.
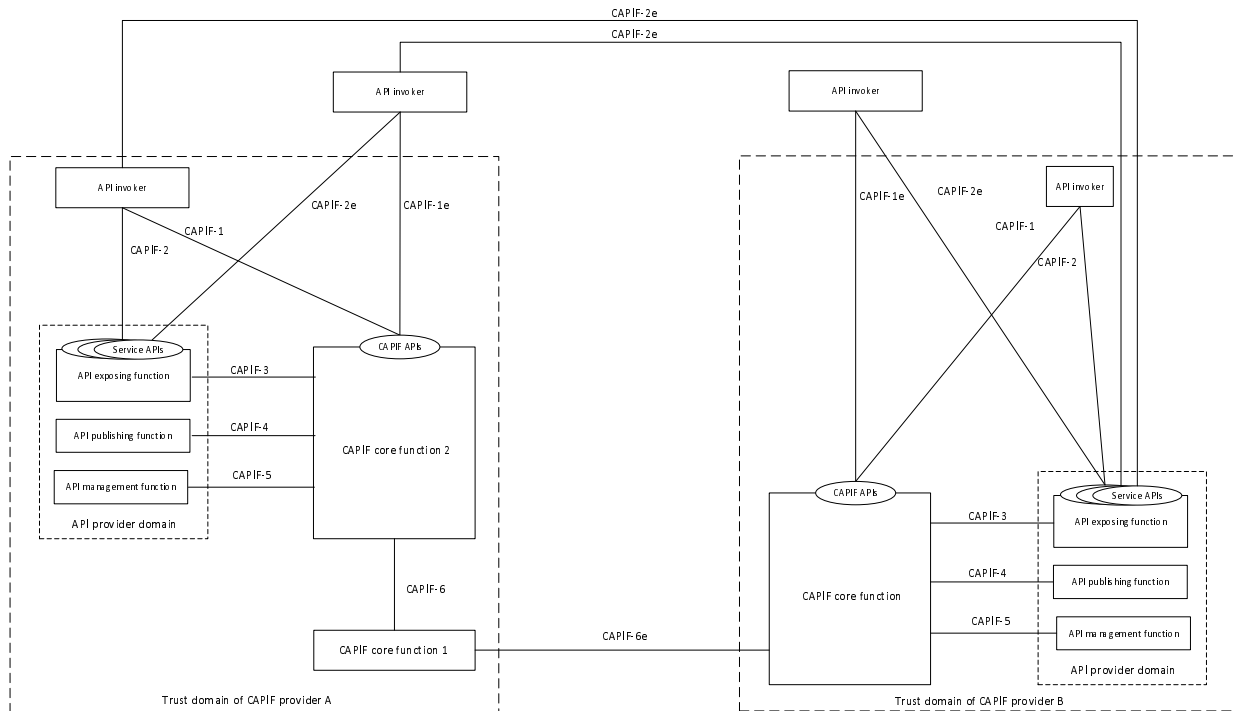
Figure 4.2-3: CAPIF interconnection functional model

CAPIF-6 and CAPIF-6e reference points connect two CAPIF core functions located in the same or different PLMN trust domains, respectively. The reference points allows API invokers of a CAPIF provider to utilize the service APIs from the 3rd party CAPIF provider or another CAPIF provider within trust domain.

4.3 Functional Entities

4.3.1 API invoker

The API invoker is typically provided by a 3rd party application provider who has service agreement with PLMN operator. The API invoker may reside within the same trust domain as the PLMN operator network.

The API invoker supports several capabilities such as supporting

- the authentication and obtaining authorization and discovering using CAPIF-1/CAPIF-1e reference point as defined in 3GPP TS 23.222 [2]; and

- invoking the Service APIs using CAPIF-2/CAPIF-2e referenced point as defined in 3GPP TS 23.222 [2], e.g. the T8 interface as defined in 3GPP TS 29.122 [14] or the NEF Northbound interface as defined in 3GPP TS 29.522 [15].

4.3.2 CAPIF core function

The CAPIF core function (CCF) supports the following capabilities over CAPIF-1/CAPIF-1e reference point as defined in 3GPP TS 23.222 [2]:

- authenticating the API invoker;

- providing the authorization information; and

- service API discovery.

The CAPIF core function supports the following capabilities over CAPIF-3 and CAPIF-3e reference points as defined in 3GPP TS 23.222 [2]:

- providing the service API access policy;

- providing the authentication and authorization information of API invoker for validation;

- providing API routing information;

- providing API topology hiding information;

- logging of service API invocations; and

- charging of service API invocations.

The CAPIF core function supports the following capabilities over CAPIF-4 and CAPIF-4e reference points as defined in 3GPP TS 23.222 [2]:

- publishing and storing the service APIs information.

The CAPIF core function supports the following capabilities over CAPIF-5 and CAPIF-5e reference points as defined in 3GPP TS 23.222 [2]:

- providing the service API invocation log for auditing;

- providing monitoring information the status of service APIs and

- storing configurations of the API provider policies.

- registering of API provider domain functions.

- update registration information of API provider domain functions.

The CAPIF core function supports the following capabilities over CAPIF-6 and CAPIF-6e reference point as defined in 3GPP TS 23.222 [2]:

- publishing of service APIs information with another CAPIF core function; and

- discovery of service APIs information with another CAPIF core function.

4.3.3 API exposing function

The API exposing function (AEF) is the provider of the Service APIs and is also the service communication entry point of the Service API to the API invokers using CAPIF-2/CAPIF-2e reference point as defined in 3GPP TS 23.222 [2]. The API exposing function consists of capabilities such as authenticating the API invoker, validating the authorization provided by the CAPIF core function and logging the Service API invocations at the CAPIF core function using CAPIF-3 and CAPIF-3e reference points as defined in 3GPP TS 23.222 [2].

According to the distributed deployment scenarios specified in 3GPP TS 23.222 [2], it is possible that the CAPIF can be deployed by splitting the functionality of the API exposing function among multiple API exposing function entities, of which one acts as the entry point. The source API exposing function communicates with the destination API exposing function over CAPIF-7/7e reference points.

4.3.4 API publishing function

The API publishing function (APF) enables the API provider to publish the Service APIs information using CAPIF-4 and CAPIF-4e reference points as defined in 3GPP TS 23.222 [2] in order to enable the discovery of Service APIs by the API invoker.

4.3.5 API management function

The API management function (AMF) enables the API provider to perform administration of the Service APIs. The API management function supports several capabilities such as querying the Service API invocation log for auditing, monitoring the events, configuring the API provider policies and monitoring the status of the Service APIs, register and maintain registration information of the API provider domain functions on the CAPIF core function, using CAPIF-5 and CAPIF-5e reference points as defined in 3GPP TS 23.222 [2].

5 Services offered by the CAPIF Core Function

5.1 Introduction of Services

The table 5.1-1 lists the CAPIF Core Function APIs below the service name. A service description subclause for each API gives a general description of the related API.

Table 5.1-1: List of CAPIF Services

Service Name	Service Operations	Operation Semantics	Consumer(s)
CAPIF_Discover_Service_API	Discover_Service_API	Request/ Response	API Invoker, CAPIF core function
	Event operations (NOTE)	(NOTE)	API Invoker
CAPIF_Publish_Service_API	Publish_Service_API	Request/ Response	API Publishing Function, CAPIF core function
	Unpublish_Service_API	Request/ Response	API Publishing Function, CAPIF core function
	Update_Service_API	Request/ Response	API Publishing Function, CAPIF core function
	Get_Service_API	Request/ Response	API Publishing Function, CAPIF core function
CAPIF_Events_API	Subscribe_Event	Subscribe/Notify	API Invoker, API Publishing Function, API Management Function, API Exposing Function
	Notify_Event	Subscribe/Notify	API Invoker, API Publishing Function, API Management Function, API Exposing Function
	Unsubscribe_Event	Subscribe/Notify	API Invoker, API Publishing Function, API Management Function, API Exposing Function
CAPIF_API_Invoker_Management_API	Onboard_API_Invoker	Request/ Response	API Invoker
	Offboard_API_Invoker	Request/ Response	API Invoker
	Notify_Onboarding_Completion	Subscribe/Notify	API Invoker
	Update_API_Invoker_Details	Request/Response	API Invoker
	Notify_Update_Completion	Subscribe/Notify	API Invoker
CAPIF_Security_API	Obtain_Security_Method	Request/ Response	API Invoker
	Obtain_Authorization	Request/ Response	API Invoker
	Obtain_API_Invoker_Info	Request/ Response	API exposing function
	Revoke_Authorization	Request/ Response	API exposing function
CAPIF_Monitoring_API	Event operations (NOTE)	(NOTE)	API Management Function
CAPIF_Logging_API_Invocation_API	Log_API_Invocation	Request/ Response	API exposing function
CAPIF_Auditing_API	Query_API_Invocation_Log	Request/ Response	API management function
CAPIF_Access_Control_Policy_API	Obtain_Access_Control_Policy	Request/Response	API Exposing Function
CAPIF_API_Provider_Management_API	Register_API_Provider	Request/Response	API Management Function
	Update_API_Provider	Request/Response	API Management Function
	Deregister_API_Provider	Request/Response	API Management Function
CAPIF_Routing_Info_API	Obtain_ Routing_Info	Request/Response	API exposing function
NOTE: The service operations of CAPIF Events API are reused by the CAPIF_Discover_Service_API, CAPIF_Publish_Service_API and CAPIF_Monitoring_API for events related services.			

Table 5.1-2 summarizes the corresponding APIs defined in this specification.

Table 5.1-2: API Descriptions

Service Name	Subclause	Description	OpenAPI Specification File	apiName	Annex
CAPIF_Discover_Service_API	8.1	CAPIF API discovery service	TS29222_CAPIF_Discover_Service_API.yaml	service-apis	A.2
CAPIF_Publish_Service_API	8.2	CAPIF API Publish Service	TS29222_CAPIF_Publish_Service_API.yaml	published-apis	A.3
CAPIF_Events_API	8.3	CAPIF event service	TS29222_CAPIF_Events_API.yaml	capif-events	A.4
CAPIF_API_Invoker_Management_API	8.4	CAPIF API Invoker Management Service	TS29222_CAPIF_API_Invoker_Management_API.yaml	api-invoker-management	A.5
CAPIF_Security_API	8.5	CAPIF Security Service	TS29222_CAPIF_Security_API.yaml	capif-security	A.6
CAPIF_Access_Control_Policy_API	8.6	CAPIF Access Control Policy API Service	TS29222_CAPIF_Access_Control_Policy_API.yaml	access-control-policy	A.7
CAPIF_Logging_API_Invocation_API	8.7	CAPIF Logging API Invocation Service	TS29222_CAPIF_Logging_API_Invocation_API.yaml	api-invocation-logs	A.8
CAPIF_Auditing_API	8.8	CAPIF Auditing API Service	TS29222_CAPIF_Auditing_API.yaml	logs	A.9
CAPIF_API_Provider_Management_API	8.9	CAPIF API Provider Management API Service	TS29222_CAPIF_API_Provider_Management_API.yaml	api-provider-management	A.11

5.2 CAPIF_Discover_Service_API

5.2.1 Service Description

5.2.1.1 Overview

The CAPIF discover service APIs, as defined in 3GPP TS 23.222 [2], allow API invokers via CAPIF-1/1e reference points to discover service API available at the CAPIF core function, and allow CAPIF core function via CAPIF-6 and CAPIF-6e reference points to discover service API available at other CAPIF core function.

5.2.2 Service Operations

5.2.2.1 Introduction

The service operation defined for CAPIF_Discover_Service_API is shown in table 5.2.2.1-1.

Table 5.2.2.1-1: Operations of the CAPIF_Discover_Service_API

Service operation name	Description	Initiated by
Discover_Service_API	This service operation is used by an API invoker to discover service API available at the CAPIF core function. This service operation is also used by CAPIF core function to discover service APIs available at other CAPIF core function.	API invoker, CAPIF core function

5.2.2.2 Discover_Service_API

5.2.2.2.1 General

This service operation is used by:

- an API invoker to discover service API available at the CAPIF core function; or

- a CAPIF core function to discover service API available at other CAPIF core function in interconnection scenario.

5.2.2.2.2 Consumer discovering service API using Discover_Service_API service operation

To discover service APIs available at the CAPIF core function, the consumer (e.g. API invoker) shall send an HTTP GET message with the API invoker Identifier or CAPIF core function Identifier and query parameters to the CAPIF core function as specified in subclause 8.1.2.2.3.1.

Upon receiving the above described HTTP GET message, the CAPIF core function shall:

1. verify the identity of the consumer (e.g. API invoker) and check if the consumer is authorized to discover the service APIs;

2. if the consumer is authorized to discover the service APIs, the CAPIF core function shall:

   a. search the CAPIF core function (API registry) for APIs matching the query criteria;

   b. apply the discovery policy, if any, on the search results and filter the search results to obtain the list of service API description or the information of the CAPIF core function which is required to be contacted further for discovering the service APIs;

   c. return the filtered search results or the information of the CAPIF core function in the response message. The shareableInformation for each of serviceAPIDescription is not provided in the filtered search results.

5.3 CAPIF_Publish_Service_API

5.3.1 Service Description

5.3.1.1 Overview

The CAPIF publish service APIs, as defined in 3GPP TS 23.222 [2], allow API publishing function via CAPIF-4 and CAPIF-4e reference points to publish and manage published service APIs at the CAPIF core function, and allow CAPIF core function via CAPIF-6 and CAPIF-6e reference points to publish and manage published service APIs at other CAPIF core function.

   NOTE: Functions from 3rd party API provider domain can also access this API with sufficient permissions.

5.3.2 Service Operations

5.3.2.1 Introduction

The service operations defined for the CAPIF_Publish_Service API are shown in table 5.3.2.1-1.

Table 5.3.2.1-1: Operations of the CAPIF_Publish_Service_API

Service operation name	Description	Initiated by
Publish_Service_API	This service operation is used by an API publishing function to publish service APIs on the CAPIF core function. This service operation is also used by CAPIF core function to publish service APIs on other CAPIF core function.	API publishing function, CAPIF core function
Unpublish_Service_API	This service operation is used by an API publishing function to un-publish service APIs from the CAPIF core function. This service operation is also used by CAPIF core function to un-publish service APIs on other CAPIF core function.	API publishing function, CAPIF core function
Get_Service_API	This service operation is used by an API publishing function to retrieve service APIs from the CAPIF core function. This service operation is also used by CAPIF core function to retrieve service APIs on other CAPIF core function.	API publishing function, CAPIF core function
Update_Service_API	This service operation is used by an API publishing function to update published service APIs on the CAPIF core function. This service operation is also used by CAPIF core function to update published service APIs on other CAPIF core function.	API publishing function, CAPIF core function

5.3.2.2 Publish_Service_API

5.3.2.2.1 General

This service operation is used by:

- an API publishing function to publish service APIs on the CAPIF core function: or

- a CAPIF core function to publish service APIs on other CAPIF core function in interconnection scenario.

5.3.2.2.2 API publishing function publishing service APIs on CAPIF core function using Publish_Service_API service operation

To publish service APIs at the CAPIF core function, the API publishing function shall send an HTTP POST message to the CAPIF core function. The body of the HTTP POST message shall include API Information as specified in subclause 8.2.2.2.3.1.

Upon receiving the above described HTTP POST message, the CAPIF core function shall:

1. verify the identity of the API publishing function and check if the API publishing function is authorized to publish service APIs;

2. if the API publishing function is authorized to publish service APIs, the CAPIF core function shall:

   a. verify the API Information present in the HTTP POST message and add the service APIs in the CAPIF core function (API registry);

   b. If topology hiding is enabled as per policy, the CAPIF core function shall

      i. determine the service APIs which require topology hiding as per policy;

      ii. determine the API exposing function(s) responsible for the topology hiding for each service API which requires topology hiding;

      iii. create a API topology hiding information for each service API which requires topology hiding by extracting the API identification information and the API exposing function(s) information from the service API information added to the CAPIF core function (API registry);

      iv. replace the API exposing function(s) information in the service API information added to the CAPIF core function (API registry) with the corresponding API exposing function(s) information responsible for the topology hiding for service API;

      v. send a notification message with the API topology hiding information to the API exposing function(s) which is responsible for the topology hiding for a service API and that has subscribed to the API_TOPOLOGY_HIDING_CREATED event;

      vi. store the API topology hiding information in the CAPIF core function;

   c. create a new resource using the service API information in the CAPIF core function (API registry) as specified in subclause 8.2.2.1;

   d. send a notification message with the updated service API, to all API Invokers that subscribed to the Service API Update event; and

   e. return the CAPIF Resource URI in the response message.

5.3.2.2.3 CAPIF core function publishing service APIs on other CAPIF core function using Publish_Service_API service operation

To publish service APIs at other CAPIF core function, the CAPIF core function shall send an HTTP POST message to the peer CAPIF core function. The body of the HTTP POST message shall include API Information as specified in subclause 8.2.2.2.3.1. For service API publishing on CAPIF-6 reference point, The CAPIF core function shall also include the published API path "pubApiPath" as specified in subclause 8.2.4.2.2. The "pubApiPath" includes a list of CAPIF core function Identifiers within the same CAPIF provider domain, such list includes own CAPIF core function identifier and received CAPIF core function identifier(s) from other CAPIF core function.

If the CAPIF core function knows the peer CAPIF core function identifier, it shall not send the HTTP POST message to the peer CAPIF core function if the peer CAPIF core function identifier is included in the published API path.

Upon receiving the above described HTTP POST message, the CAPIF core function shall:

   1. verify the identity of the requesting CAPIF core function in the URI and check if the CAPIF core function is authorized to publish service APIs;

   2. if the requesting CAPIF core function is authorized to publish service APIs, the CAPIF core function shall check if own CAPIF core function identifier is within the published API path (if received). If it is not within the path, the CAPIF core function shall add its own identifier in the path; otherwise reject the HTTP POST request.

   3. Then the CAPIF core function shall:

      a. verify the rest API Information present in the HTTP POST message and add the service APIs in the CAPIF core function (API registry);

      b. create a new resource as specified in subclause 8.2.2.1;

      c. send a notification message with the updated service API, to all API Invokers that subscribed to the Service API Update event; and

      d. return the CAPIF Resource URI in the response message.

5.3.2.3 Unpublish_Service_API

5.3.2.3.1 General

This service operation is used by:

- an API publishing function to un-publish service APIs from the CAPIF core function; or

- a CAPIF core function to un-publish service APIs on other CAPIF core function in interconnection scenario.

5.3.2.3.2 Consumer un-publishing service APIs from CAPIF core function using Unpublish_Service_API service operation

To un-publish service APIs from the CAPIF core function, the consumer (e.g. API publishing function) shall send an HTTP DELETE message using the CAPIF Resource URI received during the publish operation to the CAPIF core function as specified in subclause 8.2.2.3.3.3.

Upon receiving the above described HTTP DELETE message, the CAPIF core function shall

1. verify the identity of the consumer (e.g. API publishing function) and check if the consumer is authorized to un-publish service APIs;

2. if the consumer is authorized to un-publish service APIs, the CAPIF core function shall:

    a. delete the resource pointed by the CAPIF Resource URI;

    b. delete the relevant service APIs from the CAPIF core function (API registry);

    c. If topology hiding is enabled as per policy, the CAPIF core function shall

       i. determine the API topology hiding information associated with the service API and delete the corresponding API topology hiding information in the CAPIF core function;

       ii. send a notification message with the deleted API topology hiding information to the corresponding API exposing function(s) which were responsible for the topology hiding of the service API and that subscribed to the API_TOPOLOGY_HIDING_REVOKED event; and

    d. send a notification message with the deleted service API, to all API Invokers that subscribed to the Service API Update event.

5.3.2.4 Get_Service_API

5.3.2.4.1 General

This service operation is used by:

- an API publishing function to retrieve service APIs from the CAPIF core function; or

- a CAPIF core function to retrieve service APIs from other CAPIF core function in interconnection scenario.

5.3.2.4.2 Consumer retrieving service APIs from CAPIF core function using Get_Service_API service operation

To retrieve information about the published service APIs from the CAPIF core function, the consumer (e.g. API publishing function) shall send an HTTP GET message to the CAPIF core function. For retrieving the entire list of service APIs, the HTTP GET message shall be sent to the collection of service APIs resource representation URI as specified in subclause 8.2.2.2.3.2. For retrieving a specific service API, the HTTP GET message shall be sent to that service API's resource representation URI as described in subclause 8.2.2.3.3.1.

Upon receiving the above described HTTP GET message, the CAPIF core function shall

1. verify the identity of the consumer (e.g. API publishing function) and check if the consumer is authorized to retrieve information about the published service APIs;

2. if the consumer is authorized to retrieve information about the published service APIs, the CAPIF core function shall:

    a. respond with the requested API Information.

5.3.2.5 Update_Service_API

5.3.2.5.1 General

This service operation is used by:

- an API publishing function to update published service APIs on the CAPIF core function; or

- a CAPIF core function to update published service APIs on other CAPIF core function in interconnection scenario.

5.3.2.5.2 Consumer updating published service APIs on CAPIF core function using Update_Service_API service operation

To update information of published service APIs, the consumer (e.g. API publishing function) shall send an HTTP PUT message to that service API's resource representation URI in the CAPIF core function. The body of the HTTP PUT message shall include updated API Information as specified in subclause 8.2.2.3.3.2.

Upon receiving the above described HTTP PUT message, the CAPIF core function shall

1. verify the identity of the consumer (e.g. API publishing function) and check if the consumer is authorized to update information of published service APIs;

2. if the consumer is authorized to update information of published service APIs, the CAPIF core function shall:

    a. verify the API Information present in the HTTP PUT message and replace the service APIs in the CAPIF core function (API registry);

    b. If topology hiding is enabled as per policy, the CAPIF core function shall

        i. if the service API being updated has a corresponding API topology hiding information in the CAPIF core function, then update the API topology hiding information with any updated API exposing function(s) information from the service API information replaced at the CAPIF core function (API registry);

        ii. replace the API exposing function(s) information in the service API information added to the CAPIF core function (API registry) with the corresponding API exposing function(s) information responsible for the topology hiding for service API;

        iii. send a notification message with the API topology hiding information to the API exposing function(s) which is responsible for the topology hiding for a service API and that has subscribed to the API_TOPOLOGY_HIDING_CREATED event;

        iv. update the API topology hiding information in the CAPIF core function;

    c. replace the existing resource accordingly using the updated service API information in the CAPIF core function (API registry); and

    d. send a notification message with the updated service API, to all API Invokers that subscribed to the Service API Update event.

5.4 CAPIF_Events_API

5.4.1 Service Description

5.4.1.1 Overview

The CAPIF events APIs, as defined in 3GPP TS 23.222 [2], allow an API invoker via CAPIF-1/1e reference points, API exposure function via CAPIF-3/3e reference points, API publishing function via CAPIF-4/4e reference points and API management function via CAPIF-5/5e reference points to subscribe to and unsubscribe from CAPIF events and to receive notifications from CAPIF core function.

NOTE: The functional elements listed above are referred to as Subscriber in the service operations described in the subclauses below.

5.4.2 Service Operations

5.4.2.1 Introduction

The service operations defined for the CAPIF_Events_API are shown in table 5.4.2.1-1.

Table 5.4.2.1-1: Operations of the CAPIF_Events_API

Service operation name	Description	Initiated by
Subscribe_Event	This service operation is used by a Subscriber to subscribe to CAPIF events.	Subscriber
Unsubscribe_Event	This service operation is used by a Subscriber to unsubscribe from CAPIF events	Subscriber
Notify_Event	This service operation is used by CAPIF core function to send a notification to a Subscriber	CAPIF core function

5.4.2.2 Subscribe_Event

5.4.2.2.1 General

This service operation is used by a Subscriber to subscribe to CAPIF events.

5.4.2.2.2 Subscribing to CAPIF events using Subscribe_Event service operation

To subscribe to CAPIF events, the Subscriber shall send an HTTP POST message to the CAPIF core function. The body of the HTTP POST message shall include Subscriber's Identifier, Event Type and a Notification Destination URI as specified in subclause 8.3.2.2.3.1.

For all events included in the HTTP POST message, if the Enhanced_event_report feature is supported, the Subscriber may include an event report requirement in the "eventReq" attribute including:

- event notification method (periodic, one time, on event detection) in the "notifMethod" attribute;

- maximum Number of Reports in the "maxReportNbr" attribute;

- monitoring duration in the "monDur" attribute;

- repetition period for periodic reporting in the "repPeriod" attribute; and/or

- immediate reporting indication in the "immRep" attribute.

If the Enhanced_event_report feature is supported, the Subscriber may also include an event filter in the "eventFilters" attribute. The "eventFilters" attribute shall include:

- if the event is SERVICE_API_AVAILABLE, SERVICE_API_UNAVAILABLE or SERVICE_API_UPDATE, the API IDs in the "apiIds" attribute;

- if the event is API_INVOKER_ONBOARDED or API_INVOKER_OFFBOARDED or API_INVOKER_UPDATED, the API invoker IDs in the "apiInvokerIds" attribute;

- if the event is ACCESS_CONTROL_POLICY_UPDATE, the API invoker IDs in the "apiInvokerIds" attribute and/or API identifications in the "apiIds" attribute; and/or

- if the event is SERVICE_API_INVOCATION_SUCCESS or SERVICE_API_INVOCATION_FAILURE, the API invoker IDs in the "apiInvokerIds" attribute, AEF identifiers in the "aefIds" attribute and/or API IDs in the "apiIds" attribute.

Upon receiving the above described HTTP POST message, the CAPIF core function shall:

1. verify the identity of the Subscriber and check if the Subscriber is authorized to subscribe to the CAPIF events mentioned in the HTTP POST message;

2. if the Subscriber is authorized to subscribe to the CAPIF events, the CAPIF core function shall:

   a. create a new resource as specified in subclause 8.3.2.1; and

   b. return the CAPIF Resource URI in the response message.

5.4.2.3   Unsubscribe_Event

5.4.2.3.1   General

This service operation is used by a Subscriber to un-subscribe from CAPIF events.

5.4.2.3.2   Unsubscribing from CAPIF events using Unsubscribe_Event service operation

To unsubscribe from CAPIF events, the Subscriber shall send an HTTP DELETE message to the resource representing the event in the CAPIF core function as specified in subclause 8.3.2.3.3.1.

Upon receiving the HTTP DELETE message, the CAPIF core function shall:

1. verify the identity of the Unsubscribing functional entity and check if the Unsubscribing functional entity is authorized to Unsubscribe from the CAPIF event associated with the CAPIF Resource URI; and

2. if the Unsubscribing functional entity is authorized to unsubscribe from the CAPIF events, the CAPIF core function shall delete the resource pointed by the CAPIF Resource URI.

5.4.2.4   Notify_Event

5.4.2.4.1   General

This service operation is used by CAPIF core function to send a notification to a Subscriber.

5.4.2.4.2   Notifying CAPIF events using Notify_Event service operation

To notify CAPIF events, the CAPIF core function shall send an HTTP POST message using the Notification Destination URI received in the subscription request. The body of the HTTP POST message shall include an Event Notification and CAPIF Resource URI.

If the Enhanced_event_report feature is supported, the CAPIF core function may include an event detail in the "eventDetail" attribute. The "eventDetail" attribute shall include:

- if the event is SERVICE_API_AVAILABLE or SERVICE_API_UNAVAILABLE, the API IDs in the "apiIds" attribute;

- if the event is SERVICE_API_UPDATE, the API descriptions in the "serviceAPIDescriptions" attribute;

- if the event is API_INVOKER_ONBOARDED or API_INVOKER_OFFBOARDED or API_INVOKER_UPDATED, the API invoker IDs in the "apiInvokerIds" attribute;

- if the event is ACCESS_CONTROL_POLICY_UPDATE, the access control policy information in the "accCtrlPolList" attribute;

- if the event is SERVICE_API_INVOCATION_SUCCESS or SERVICE_API_INVOCATION_FAILURE, the API invocation logs in the "invocationLogs" attribute; or

- if the event is API_TOPOLOGY_HIDING_CREATED or API_TOPOLOGY_HIDING_REVOKED, the API topology hiding information in the "apiTopoHide" attribute.

Upon receiving the HTTP POST message, the Subscriber shall process the Event Notification.

5.5 CAPIF_API_Invoker_Management_API

5.5.1 Service Description

5.5.1.1 Overview

The CAPIF API invoker management APIs, as defined in 3GPP TS 23.222 [2], allow API invokers via CAPIF-1/1e reference points to on-board and off-board itself as a recognized user of the CAPIF or update the API invoker's details on the CAPIF core function.

5.5.2 Service Operations

5.5.2.1 Introduction

The service operations defined for the CAPIF API Invoker Management API are shown in table 5.5.2.1-1.

Table 5.5.2.1-1: Operations of the CAPIF_API_Invoker_Management_API

Service operation name	Description	Initiated by
Onboard_API_Invoker	This service operation is used by an API invoker to on-board itself as a recognized user of CAPIF	API invoker
Offboard_API_Invoker	This service operation is used by an API invoker to off-board itself as a recognized user of CAPIF	API invoker
Notify_Onboarding_Completion	This service operation is used by CAPIF core function to send an on-boarding notification to the API invoker.	CAPIF core function
Update_API_Invoker_Details	This service operation is used by an API invoker to update API invoker's details in the CAPIF core function.	API Invoker
Notify_Update_Completion	This service operation is used by CAPIF core function to send an update notification to the API invoker	CAPIF core function

5.5.2.2 Onboard_API_Invoker

5.5.2.2.1 General

This service operation is used by an API invoker to on-board itself as a recognized user of CAPIF

5.5.2.2.2 API invoker on-boarding itself as a recognized user of CAPIF using Onboard_API_Invoker service operation

To on-board itself as a recognized user of the CAPIF, the API invoker shall send an HTTP POST message to the CAPIF core function. The body of the HTTP POST message shall include API invoker Enrolment Details, API List and a Notification Destination URI for on-boarding notification as specified in subclause 8.4.2.2.3.1.

Upon receiving the above described HTTP POST message, the CAPIF core function shall check if it can determine authorization of the request and on-board the API invoker automatically. If the CAPIF core function:

1. can determine authorization of the request and on-board the API invoker automatically, the CAPIF core function:

   a. shall process the API invoker Enrolment Details and the API List received in the HTTP POST message and determine if the request sent by the API invoker is authorized or not;

   b. if the API invoker's request is authorized, the CAPIF core function shall:

      i. create the API invoker Profile consisting of an API invoker Identifier, Authentication Information, Authorization Information and CAPIF Identity Information;

    ii. verify the API List present in the HTTP POST message and create a API List of APIs the API invoker is allowed to access;

    iii. create a new resource as defined in subclause 8.4.2.1;

    iv. return the API invoker Profile, API List of APIs the API invoker is allowed to access and the CAPIF Resource URI in the response message.

2. cannot determine authorization of the request to on-board the API invoker automatically, the CAPIF core function:

    a. shall acknowledge the receipt of the on-boarding request to the API invoker.

    b. shall request the CAPIF administrator to validate the on-boarding request or the API management to validate the on-boarding request by sharing the API invoker Enrolment Details and the API List received in the HTTP POST message;

    c. on receiving confirmation of successful validation of the on-boarding request from the CAPIF administrator or the API management, the CAPIF core function shall:

      i. create the API invoker Profile consisting of an API invoker Identifier, Authentication Information, Authorization Information and CAPIF Identity Information;

      ii. create a new resource as defined in subclause 8.4.3;

      iii. deliver the API invoker Profile, API List of APIs the API invoker is allowed to access and the CAPIF Resource URI to the API invoker in a notification.

NOTE 1: How the CAPIF core function determines that the CAPIF core function can process the request and on-board the API invoker automatically is out-of-scope of this specification.

NOTE 2: How the CAPIF core function determines that the API invoker's request to on-board is authorized is specified in 3GPP TS 33.122 [16].

NOTE 3: Interactions between the CAPIF core function and the CAPIF administrator or the API management is out-of-scope of this specification.

NOTE 4: The onboarding credential received by the API invoker from the service provider as specified in 3GPP TS 33.122 [16] is included in the Authorization header field of the HTTP request message as described in IETF RFC 2617 [17].

NOTE 5: After the onboarding operation is completed the API Invoker no longer needs to maintain the Notification Destination URI and may delete it.

5.5.2.3 Offboard_API_Invoker

5.5.2.3.1 General

This service operation is used by an API invoker to stop being as a recognized user of CAPIF

5.5.2.3.2 API invoker off-boarding itself as a recognized user of CAPIF using Offboard_API_Invoker service operation

To off-board itself as a recognized user of the CAPIF, the API invoker shall send an HTTP DELETE message to its resource representation in the CAPIF core function as specified in subclause 8.4.2.3.3.1.

Upon receiving the HTTP DELETE message, the CAPIF core function shall:

1. determine if the request sent by the API invoker is authorized or not;

2. if the API invoker's request is authorized, the CAPIF core function shall:

    a. delete the resource representation pointed by the CAPIF Resource Identifier; and

    b. delete the related API invoker profile.

5.5.2.4 Notify_Onboarding_Completion

5.5.2.4.1 General

This service operation is used by the CAPIF core function to send a notification about the completion of the Onboarding operation to the API Invoker.

5.5.2.4.2 Notifying Onboarding completion using Notify_Onboarding_Completion service operation

When the CAPIF core function cannot immediately authorize the API invoker that issued an Onboarding request (see subclause 5.5.2.2.2) it will send a response acknowledging the request and begin processing it. After completion, the CAPIF core function shall send an HTTP POST message using the Notification Destination URI received in the Onboarding request. The body of the HTTP POST message shall include the API Invoker Profile, API List of the APIs the API invoker is allowed to access and the CAPIF Resource URI.

Upon receiving the HTTP POST message, the API invoker shall process the message in the same manner it would have processed an immediate response to the Onboarding request, and respond to the HTTP POST message with an acknowledgement and no body.

5.5.2.5 Update_API_Invoker_Details

5.5.2.5.1 General

This service operation is used by an API invoker to update the API invoker's profile details on the CAPIF core function.

5.5.2.5.2 API invoker updating its details on CAPIF using Update_API_Invoker_Details service operation

To update the API invoker's profile details on the CAPIF core function, the API invoker shall send a HTTP PUT message to the CAPIF core function to its resource representation, requesting to replace all properties in the existing resource, addressed by the URI received in the response to the request that has created the API invoker profile resource. The properties "apiInvokerId" and "onboardingInformation" shall remain unchanged from the previously provided values. The body of the HTTP PUT message shall include API invoker identity information, API invoker details that need to be updated and a Notification Destination URI for update notification as specified in clause 8.4.2.3.3.2. API invoker details may include API invoker information and API List. Upon receiving the above described HTTP PUT message:

1. if the CAPIF core function decides to update the API list of the API invoker without validation by CAPIF administrator, then the CAPIF core function:

   a. shall determine if the request in the HTTP PUT message by the API invoker is authorized or not.

   b. verify that the "apiInvokerId" and "onboardingInformation" properties are same as in API invoker resource on CAPIF core function.

   c. if the API invoker's request is authorized and the properties "apiInvokerId" and "onboardingInformation" match, the CAPIF core function shall:

      i. if the request contains an API list:

         - create a list of APIs the API invoker is allowed to access; and

         - update the resource identified by the CAPIF Resource URI of the API invoker's HTTP PUT request with the updated information in the request and the API list created in step A;

      ii. if the request does not contain an API list, update the resource identified by the CAPIF Resource URI of the API invoker's HTTP PUT request with the updated information in the request; and

      iii. return the updated API invoker details;

2. otherwise, the CAPIF core function:

    a.   shall acknowledge the receipt of the update API invoker details request to the API invoker.

    b.   verify that the "apiInvokerId" and "onboardingInformation" properties are same as in API invoker resource on CAPIF core function;

    c.   if the properties "apiInvokerId" and "onboardingInformation" match, then shall request the CAPIF administrator to validate the request or the API management to validate the request by sharing the API invoker identity information and the updated information received in the HTTP PUT message;

    d.   on receiving confirmation of successful validation of the request from the CAPIF administrator or the API management, the CAPIF core function shall:

        i.   update the resource identified by the CAPIF Resource URI of the API invoker's HTTP PUT request, with validated information; and

        ii.   return the updated API invoker details.

NOTE 1:   How the CAPIF core function determines that the CAPIF core function can process the request and update the API list of the API invoker automatically is out-of-scope of this specification.

NOTE 2:   Interactions between the CAPIF core function and the CAPIF administrator or the API management is out-of-scope of this specification.

NOTE 3:   After the operation is completed the API Invoker no longer needs to maintain the Notification Destination URI and may delete it.

5.5.2.6 Notify_Update_Completion

5.5.2.6.1 General

This service operation is used by the CAPIF core function to send a notification about the completion of the update of API invoker's details.

5.5.2.6.2 Notifying API invoker update completion using Notify_Update_Completion service operation

When the CAPIF core function cannot immediately grant the update request (see subclause 5.5.2.5.2) it will send a response acknowledging the request and begin processing it. After completion, the CAPIF core function shall send an HTTP POST message using the Notification Destination URI received in the update details request. The body of the HTTP POST message shall include the updated API Invoker details.

Upon receiving the HTTP POST message, the API invoker shall process the message in the same manner it would have processed an immediate response to the update the details of the API invoker request, and respond to the HTTP POST message with HTTP response 204 No content.

5.6 CAPIF_Security_API

5.6.1 Service Description

5.6.1.1 Overview

The CAPIF security APIs, as defined in 3GPP TS 23.222 [2], allow:

-   API invokers via CAPIF-1/1e reference points to (re-)negotiate the service security method and obtain authorization for invoking service APIs; and

-   API exposing function via CAPIF-3/3e reference points to obtain authentication information of the API invoker for authentication of the API invoker and revoke the authorization for service APIs.

5.6.2 Service Operations

5.6.2.1 Introduction

The service operations defined for CAPIF_Security_API are shown in table 5.6.2.1-1.

Table 5.6.2.1-1: Operations of the CAPIF_Security_API

Service operation name	Description	Initiated by
Obtain_Security_Method	This service operation is used by an API invoker to negotiate and obtain information about service API security method for itself with CAPIF core function. This information is used by API invoker for service API invocations.	API invoker
Obtain_Authorization	This service operation is used by an API invoker to obtain authorization to access service APIs.	API invoker
Obtain_API_Invoker_Info	This service operation is used by an API exposing function to obtain the authentication or authorization information related to an API invoker.	API exposing function
Revoke_Authorization	This service operation is used by an API exposing function to invalidate the authorization of an API invoker.	API exposing function

Security information is generated when requested by an API invoker, and is stored in the CAPIF Core function. The information can be accessed via a resource representation URI using the API invoker ID as described in subclause 8.5.2.3. The URI is provided to the API invoker in the HTTP response to the creation request (via the Obtain_Security_Method service operation name).

Refer to subclause 9.1.2a.2 for details about verifying that the API Exposing function has the ability to authorize API invokers prior to invoking service APIs.

5.6.2.2 Obtain_Security_Method

5.6.2.2.1 General

This service operation is used by an API invoker to negotiate and obtain service API security method from the CAPIF core function. The information received by API invoker shall be used for authentication with the API exposing function.

5.6.2.2.2 Request service API security method from CAPIF using Obtain_Security_Method service operation

To negotiate and obtain service API security method information from the CAPIF core function, the API invoker shall send an HTTP PUT message to the CAPIF core function. The body of the HTTP PUT message shall include Security Method Request and a Notification Destination URI for security related notifications. The Security Method Request from the API invoker contains the unique interface details of the service APIs and may contain a preferred method for each unique service API interface as specified in subclause 8.5.2.3.3.3.

Upon receiving the above described HTTP PUT message, the CAPIF core function shall:

1. determine the security method for each service API interface as specified in 3GPP TS 33.122 [16];

2. store the Notification Destination URI for security related notification;

3. create a new resource as defined in subclause 8.5.2.1; and

4. return the security method information and the CAPIF Resource URI in the response message.

5.6.2.3 Obtain_Authorization

5.6.2.3.1 General

This service operation is used by an API invoker to negotiate and obtain authorization information from the CAPIF core function. The information received by API invoker shall be used for authorization to invoke service APIs exposed by the API exposing function.

5.6.2.3.2 Obtain authorization using Obtain_Authorization service operation

To obtain authorization information from the CAPIF core function to invoke service APIs, the API invoker shall perform the functions of the resource owner, client and redirection endpoints as described in subclause 6.5.2.3 of 3GPP TS 33.122 [16].

The API invoker shall send a POST request to the "Token Endpoint", as described in IETF RFC 6749 [23], subclause 3.2. The "Token Endpoint" URI shall be:

{apiRoot}/capif-security/v1/securities/{securityId}/token

where {securityId} represents the individual security instance resource created by the API invoker during obtain security method, as described in subclause 5.6.2.2.

The body of the HTTP POST request shall indicate that the required OAuth2 grant must be of type "client_credentials". The "scope" parameter (if present) shall include a list of AEF identifiers and its associated API names the API invoker is trying to access (i.e., the API invoker expected scope).

The API invoker may use HTTP Basic authentication towards this endpoint, using the API invoker identifier as "username" and the onboarding secret as "password". Such username and password may be included in the header or body of the HTTP POST request.

On success, "200 OK" shall be returned. The payload body of the POST response shall contain the requested access token, the token type and the expiration time for the token. The access token shall be a JSON Web Token (JWT) as specified in IETF RFC 7519 [24]. The access token returned by the CAPIF core function shall include the claims encoded as a JSON object as specified in subclause 8.5.4.2.8 and then digitally signed using JWS as specified in IETF RFC 7515 [25] and in Annex C.1 of 3GPP TS 33.122 [16].

The digitally signed access token shall be converted to the JWS Compact Serialization encoding as a string as specified in subclause 7.1 of IETF RFC 7515 [25].

If the access token request fails at the CAPIF core function, the CAPIF core function shall return "400 Bad Request" status code, including a JSON object in the response payload, that includes details about the specific error that occurred.

5.6.2.4 Obtain_API_Invoker_Info

5.6.2.4.1 General

This service operation is used by an API exposing function to obtain the security information of API Invokers to be able to authenticate them and authorize each service API invocation by them.

5.6.2.4.2 Obtain API invoker's security information using Obtain_API_Invoker_Info service operation

To obtain authentication or authorization information from the CAPIF core function to authenticate or authorize an API invoker, the API exposing function shall send an HTTP GET message to that API invoker's resource representation URI in the CAPIF core function with an indication to request authentication and/or authorization information, as specified in subclause 8.5.2.3.3.1.

Upon receiving the above described HTTP GET message, the CAPIF core function shall:

1. determine the security information of API invoker for all the service API interfaces of the API exposing function; and

2. return the security information in the response message.

NOTE: Functions from 3rd party API provider domain can also access this service operation with sufficient permissions.

5.6.2.5 Revoke_Authentication

5.6.2.5.1 General

This service operation is used by an API exposing function to invalidate the authorization of a specified API Invoker to invoke service APIs exposed by the calling API exposing function.

5.6.2.5.2 Invalidate authorization using Revoke_Authorization service operation

To invalidate authorization of an API invoker for all service APIs, the API exposing function shall send an HTTP DELETE message to that API invoker's resource representation URI in the CAPIF core function using the API invoker ID as specified in subclause 8.5.2.3.3.2.

Upon receiving the HTTP DELETE message, the CAPIF core function shall delete the resource representation and shall notify the API invoker of the authorization invalidation using the Notification Destination URI received in the Obtain_Security_Method message.

The CAPIF core function shall also invalidate the previously assigned access token when the authorization of all service APIs are revoked for the API invoker.

To invalidate authorization of an API invoker for some service APIs, the API exposing function shall send an HTTP POST message to that API invoker's "delete" custom resource representation URI in the CAPIF core function with a list of the service APIs that should be revoked.

Upon receiving the HTTP POST message, the CAPIF core function shall revoke the authorization of the API invoker for the indicated service APIs (e.g. it may update the list of unauthorized APIs locally); and shall notify the API invoker of the authorization invalidation using the Notification Destination URI received in the Obtain_Security_Method message.

In both alternatives, the CAPIF core function shall acknowledge the HTTP request from the API exposing function.

NOTE: Functions from 3rd party API provider domain can also access this service operation with sufficient permissions.

5.7 CAPIF_Monitoring_API

The CAPIF monitoring API as defined in 3GPP TS 23.222 [2], allow the API management function via CAPIF-5/5e reference points to monitor service API invocations and receive such monitoring events from the CAPIF core function.

The CAPIF_Monitoring_API shall use the CAPIF_Events_API as described in subclause 8.3 by setting the CAPIFEvent to one of the events as described in subclause 8.3.4.3.3.

5.8 CAPIF_Logging_API_Invocation_API

5.8.1 Service Description

5.8.1.1 Overview

The Logging API invocations APIs, as defined in 3GPP TS 23.222 [2], allow API exposing functions via CAPIF-3/3e reference points to log the information related to service API invocations on the CAPIF core function.

NOTE: Functions from 3rd party API provider domain can also access this API with sufficient permissions.

5.8.2 Service Operations

5.8.2.1 Introduction

Table 5.8.2.1-1: Operations of the CAPIF_Logging_API_Invocation_API

Service operation name	Description	Initiated by
Log_API_Invocation	This service operation is used by an API exposing function to log API invocation information on CAPIF core function.	API exposing function

5.8.2.2 Log_API_Invocation_API

5.8.2.2.1 General

This service operation is used by an API exposing function to log API invocation information on CAPIF core function.

5.8.2.2.2 Logging service API invocations using Log_API_Invocation service operation

To log service API invocations at the CAPIF core function, the API exposing function shall send an HTTP POST message to the CAPIF core function. The body of the HTTP POST message shall include API exposing function identity information and API invocation log information as specified in subclause 8.7.2.2.3.1.

Upon receiving the above described HTTP POST message, the CAPIF core function shall:

1. verify the identity of the API exposing function and check if the API exposing function is authorized to create service API invocation logs;

2. if the API exposing function is authorized to create service API invocation logs, the CAPIF core function shall:

   a. process the API invocation log information received in the HTTP POST message and store the API invocation log information in the API repository;

   b. create a new resource as defined in subclause 8.7.2.1; and

   c. return the CAPIF Resource Identifier in the response message.

5.9 CAPIF_Auditing_API

5.9.1 Service Description

5.9.1.1 Overview

The Auditing API, as defined in 3GPP TS 23.222 [2], allows API management functions via CAPIF-5/5e reference points to query the log information stored on the CAPIF core function.

NOTE: Functions from 3rd party API provider domain can also access this API with sufficient permissions.

5.9.2   Service Operations

5.9.2.1   Introduction

Table 5.9.2.1-1: Operations of the CAPIF_Auditing_API

Service operation name	Description	Initiated by
Query_Invocation_Logs	This service operation is used by an API management function to query API invocation information logs stored on CAPIF core function.	API management function

5.9.2.2   Query_Invocation_Logs_API

5.9.2.2.1   General

This service operation is used by an API management function to query API invocation information logs stored on CAPIF core function.

5.9.2.2.2   Query API invocation information logs using Query_Invocation_Logs service operation

To query service API invocation logs at the CAPIF core function, the API management function shall send an HTTP GET message with the API management function identity information and the log query to the CAPIF core function as specified in subclause 8.8.2.2.3.1.

Upon receiving the above described HTTP GET message, the CAPIF core function shall:

1. verify the identity of the API management function and check if the API management function is authorized to query the service API invocation logs;

2. if the API management function is authorized to query the service API invocation logs, the CAPIF core function shall:

   a. search the API invocation logs for logs matching the Log Query criteria; and

   b. return the search results in the response message.

5.10   CAPIF_Access_Control_Policy_API

5.10.1   Service Description

5.10.1.1   Overview

The CAPIF access control policy APIs allow API exposing function via CAPIF-3/3e reference points to obtain the service API access policy from the CAPIF core function.

   NOTE: Functions from 3rd party API provider domain can also access this API with sufficient permissions.

5.10.2   Service Operations

5.10.2.1   Introduction

Table 5.3.2.1-1: Operations of the CAPIF_Access_Control_Policy_API

Service operation name	Description	Initiated by
Obtain_Access_Control_Policy	This service operation is used by an API exposing function to obtain the access control policy from the CAPIF core function.	API exposing function

5.10.2.2   Obtain_Access_Control_Policy

5.10.2.2.1   General

This service operation is used by an API exposing function to obtain the access control policy from the CAPIF core function.

5.10.2.2.2   API exposing function obtaining access control policy from the CAPIF core function using Obtain_Access_Control_Policy service operation

To obtain the access control policy from the CAPIF core function, the API exposing function shall send an HTTP GET message to the CAPIF core function with the API exposing function Identifier and API identification. The GET message may include API invoker ID for retrieving access control policy of the requested API invoker as specified in subclause 8.6.2.2.3.1.

Upon receiving the above described HTTP GET message, the CAPIF core function shall

1. verify the identity of the API exposing function and check if the API exposing function is authorized to obtain the access control policy corresponding to the API identification;

2. if the API exposing function is authorized to obtain the access control policy, the CAPIF core function shall respond with the access control policy information corresponding to the API identification and API invoker ID (if present) in the HTTP GET message.

5.10.3   Related Events

The CAPIF_Access_Control_Policy_API supports the subscription and notification of the status of access control information via the CAPIF_Events_API. The related events are specified in subclause 8.3.4.3.3.

5.11   CAPIF_API_Provider_Management_API

5.11.1   Service Description

5.11.1.1   Overview

The CAPIF API provider management APIs, as defined in 3GPP TS 23.222 [2], allow API management functions via CAPIF-5 and CAPIF-5e reference points to register, deregister and update registration information of API provider domain functions (API Exposing Function, API Publishing Function, API management Function) as a recognized API provider domain of the CAPIF domain.

5.11.2   Service Operations

5.11.2.1   Introduction

The service operations defined for the CAPIF API Provider Management API are shown in table 5.11.2.1-1.

Table 5.11.2.1-1: Operations of the CAPIF_API_Provider_Management_API

Service operation name	Description	Initiated by
Register_API_Provider	This service operation is used by an API management function to register API provider domain functions as a recognized API provider domain of the CAPIF domain.	API Management Function
Update_API_Provider	This service operation is used by an API management function to update the API provider domain functions details in the CAPIF domain.	API Management Function
Deregister_API_Provider	This service operation is used by an API management function to deregister API provider domain functions as a recognized API provider domain of the CAPIF domain.	API Management Function

5.11.2.2 Register_API_Provider

5.11.2.2.1 General

This service operation is used by an API management function to register API provider domain functions as a recognized API provider of CAPIF domain.

5.11.2.2.2 API provider domain functions registering as a recognized API provider domain function of CAPIF using Register_API_Provider service operation

To register API provider domain as a recognized API provider of the CAPIF, the API management function shall send a HTTP POST message to the CAPIF core function. The body of the HTTP POST message shall include API provider Enrolment Details, consisting of details of all API provider domain functions and security information for CAPIF core function to validate the registration request.

Upon receiving the above described HTTP POST message, the CAPIF core function validates the security information and determine if the request sent by API management function is authorized or not. If the API management function is authorized, CAPIF core function shall:

a. create the API provider domain profile consisting of API provider domain ID, API provider domain functions profiles as per the request. CAPIF core function shall assign the identities for the API provider domain functions.;

b. create a new resource as defined in clause 8.9.2.2.3.1; and

c. return the API provider domain profile, the CAPIF Resource URI in the response message and registration failure information specific to individual API provider domain functions.

5.11.2.3 Update_API_Provider

5.11.2.3.1 General

This service operation is used by an API management function to update API provider domain function details on the CAPIF domain.

5.11.2.3.2 API management function updating API provider domain function details on CAPIF using Update_API_Provider service operation

To update the API provider domain profile and its individual functions details on CAPIF domain, the API management function shall send a HTTP PUT message to its resource representation in the CAPIF core function as specified in clause 8.9.2.3.3.1, requesting to replace all properties in the existing resource, addressed by the URI received in the response to the request that has created the API provider domain profile resource. The property "apiProviderDomainId", shall remain unchanged from the previously provided values. The body of the HTTP PUT message shall include the API provider domain profile that need to be updated. Upon receiving the described HTTP PUT message:

1. the CAPIF core function shall process the updates received in the HTTP PUT message and determine if the request sent by API management function is authorized or not;

2. verify that the "apiProviderDomainId" property is same as in the API provider domain resource on CAPIF Core Function.

3. if the API management function is authorized and the property "apiProviderDomainId" matches, then the CAPIF core function shall

   a. replace the representation of the resource identified by the CAPIF Resource URI of the API management function's HTTP PUT request with updated information in the request.

   b. update the individual API provider domain function profiles as per the request. CAPIF core function shall create new API provider domain function profiles along with assignment of identities, if the API provider domain functions profiles in the request do not exist in CAPIF.

   c. return the updated API provider domain profile resource and update failure information specific to individual API provider domain functions.

5.11.2.4 Deregister_API_Provider

5.11.2.4.1 General

This service operation is used by an API management function to deregister the API provider domain function as a recognized API provider of the CAPIF domain.

5.11.2.4.2 API provider domain functions deregistering as a recognized API provider domain function of CAPIF using Deregister_API_Provider service operation

To deregister API provider domain as a recognized API provider of the CAPIF domain, the API management function shall send an HTTP DELETE message to its resource representation in the CAPIF core function as specified in clause 8.9.2.3.3.2.

Upon receiving the HTTP DELETE message, the CAPIF core function shall:

1. determine if the request sent by the API management functions is authorized or not;

2. if the API management function's request is authorized, the CAPIF core function shall:

   a. delete the resource representation pointed by the CAPIF Resource Identifier; and

   b. delete the related API provider domain profile.

5.12 CAPIF_Routing_Info_API

5.12.1 Service Description

5.12.1.1 Overview

The CAPIF routing info API allows an API exposing function via CAPIF-3 reference point to obtain the API routing information from the CAPIF core function.

NOTE: Functions from 3rd party API provider domain can also access this API routing information with sufficient permissions.

5.12.2 Service Operations

5.12.2.1 Introduction

Table 5.12.2.1-1: Operations of the CAPIF_Routing_Info_API

Service operation name	Description	Initiated by
Obtain_Routing_Info	This service operation is used by an API exposing function to obtain the API routing information from the CAPIF core function.	API exposing function

5.12.2.2 Obtain_Routing_Info

5.12.2.2.1 General

This service operation is used by an API exposing function to obtain the API routing information from the CAPIF core function.

5.12.2.2.2 API exposing function obtaining API routing information from the CAPIF core function using Obtain_Routing_Info service operation

To obtain the API routing information from the CAPIF core function, the API exposing function shall send an HTTP GET request message to the CAPIF core function with the API exposing function Identifier and API identification as specified in subclause 8.10.2.2.3.1.

Upon receiving the above described HTTP GET message, the CAPIF core function shall

1. verify the identity of the API exposing function and check if the API exposing function is authorized to obtain the API routing information corresponding to the API identification;

2. if the API exposing function is authorized to obtain the API routing information, the CAPIF core function shall respond with the API routing information corresponding to the API identification in the HTTP GET response message.

6 Services offered by the API exposing function

6.1 Introduction of Services

The table 6.1-1 lists the API exposing function APIs below the service name. A service description subclause for each API gives a general description of the related API.

Table 6.1-1: List of AEF Services

Service Name	Service Operations	Operation Semantics	Consumer(s)
AEF_Security_API	Initiate_Authentication	Request/ Response	API Invoker
	Revoke_Authorization	Request/ Response	CAPIF core function

Table 6.1-2 summarizes the corresponding APIs defined in this specification.

Table 6.1-2: API Descriptions

Service Name	Subclause	Description	OpenAPI Specification File	apiName	Annex

AEF_Security_API	9.1	AEF Security API Service	TS29222_AEF_Security_API.yaml	aef-security	A.10

6.2 AEF_Security_API

6.2.1 Service Description

6.2.1.1 Overview

The AEF securityAPI, allows an API invokers via CAPIF-2/2e reference points to request API exposing function to ensure that authentication parameters necessary for authentication of the API invoker are available with the API exposing function. If the necessary authentication parameters are not available, the API exposing function fetches necessary authentication parameters from CAPIF core function to authenticate the API invoker.

The AEF security API, also allows the CAPIF core function via CAPIF-3/3e reference points to request API exposing function to revoke the authorization of service APIs for an API invoker.

6.2.2 Service Operations

6.2.2.1 Introduction

The service operation defined for AEF_Security_API is shown in table 6.2.2.1-1.

Table 6.2.2.1-1: Operations of the AEF_Security_API

Service operation name	Description	Initiated by
Initiate_Authentication	This service operation is used by an API invoker to request API exposing function to confirm necessary authentication data is available to authenticate the API invoker	API invoker
Revoke_Authorization	This service operation is used by the CAPIF core function to request the API exposing function to revoke the authorization of service APIs for an API invoker.	CAPIF core function

6.2.2.2 Initiate_Authentication

6.2.2.2.1 General

This service operation is used by an API invoker to initiate authentication with the API exposing function. On receiving the Initiate_Authentication the API exposing function fetches the authentication information of the API invoker from the CAPIF core function, if required.

6.2.2.2.2 API invoker initiating authentication using Initiate_Authentication service operation

To initiate authentication with the API exposing function, the API invoker shall send an HTTP POST message to the API exposing function with the API invoker ID to the URI "{apiRoot}/aef-security/v1/check-authentication".

Upon receiving the above described HTTP POST message, the API exposing function shall check if the credentials of the API invoker for authentication are available with the API exposing function. If the credentials of the API invoker for authentication are not available, the API exposing function shall use the service defined in subclause 5.6.2.4.2 to fetch the credentials from the CAPIF core function.

The API exposing function shall store the received credentials and respond to the API invoker with 200 OK status code.

6.2.2.3 Revoke_Authorization

6.2.2.3.1 General

This service operation is used by CAPIF core function to revoke authorization of service APIs (e.g. due to policy change in the CAPIF core function). On receiving the Revoke_Authorization the API exposing function revokes authorization of the API invoker for the service APIs indicated in the request.

6.2.2.3.2 CAPIF core function initiating revocation using Revoke_Authorization service operation

To revoke authorization, the CAPIF core function shall send an HTTP POST message to the API exposing function with the API invoker ID and a list of service API IDs on the URI "{apiRoot}/aef-security/v1/revoke-authorization".

Upon receiving the HTTP POST message, the API exposing function shall revoke the authorization of the API invoker for the indicated service APIs (e.g. it may update the list of unauthorized APIs locally), and then respond to the CAPIF core function with 200 OK status code.

The CAPIF core function shall also notify the API invoker of the authorization invalidation using the Notification Destination URI received in the Obtain_Security_Method message.

7 CAPIF Design Aspects Common for All APIs

7.1 General

CAPIF APIs are RESTful APIs that allow secure access to the capabilities provided by CAPIF.

This document specifies the procedures triggered at different functional entities as a result of API invocation requests and event notifications. The stage-2 level requirements and signalling flows are defined in 3GPP TS 23.222 [2].

Several design aspects, as mentioned in the following subclauses, are specified in 3GPP TS 29.122 [14] and referenced by this specification.

7.2 Data Types

7.2.1 General

This clause defines structured data types, simple data types and enumerations that are applicable to several APIs defined in the present specification and can be referenced from data structures defined in the subsequent clauses.

In addition, data types that are defined in OpenAPI 3.0.0 Specification [3] can also be referenced from data structures defined in the subsequent clauses.

NOTE: As a convention, data types in the present specification are written with an upper-case letter in the beginning. Parameters are written with a lower-case letter in the beginning. As an exception, data types that are also defined in OpenAPI 3.0.0 Specification [3] can use a lower-case case letter in the beginning for consistency.

Table 7.2.1-1 specifies data types re-used by the CAPIF from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the CAPIF.

Table 7.2.1-1: Re-used Data Types

Data type	Reference	Comments
Uri	3GPP TS 29.122 [14]	
TestNotification	3GPP TS 29.122 [14]	Following clarifications apply: - The SCEF is the CAPIF core function; and - The SCS/AS is the Subscriber.
WebsockNotifConfig	3GPP TS 29.122 [14]	Following clarifications apply: - The SCEF is the CAPIF core function; and - The SCS/AS is the Subscriber.

7.2.2 Referenced structured data types

Table 7.2.2-1 lists structured data types defined in this specification referenced by multiple services:

Table 7.2.2-1: Referenced Structured Data Types

Data type	Reference	Description
Log	Subclause 8.7.4.2.3	Individual log entries
InterfaceDescription	Subclause 8.2.4.2.3	Description of the API interface
ServiceAPIDescription	Subclause 8.2.4.2.2	Description of the service API

7.2.3 Referenced Simple data types and enumerations

Following simple data types defined in Table 7.2.3.1-1 are applicable to several APIs in this document:

Table 7.2.3.1-1: Simple data types applicable to several APIs

Type name	Reference	Description
CAPIFResourceId	n/a	string chosen by the CAPIF core function to serve as identifier in a resource URI.
DataFormat	Subclause 8.2.4.3.4	Data format used by the API
Protocol	Subclause 8.2.4.3.3	Protocol used by the API

7.3 Usage of HTTP

For CAPIF APIs, support of HTTP/1.1 (IETF RFC 7230 [4], IETF RFC 7231 [5], IETF RFC 7232 [6], IETF RFC 7233 [7], IETF RFC 7234 [8] and IETF RFC 7235 [9]) over TLS (IETF RFC 5246 [11]) is mandatory and support of HTTP/2 (IETF RFC 7540 [10]) over TLS (IETF RFC 5246 [11]) is recommended.

A functional entity desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 7540 [10].

7.4 Content type

The bodies of HTTP request and successful HTTP responses shall be encoded in JSON format (see IETF RFC 8259 [12]).

The MIME media type that shall be used within the related Content-Type header field is "application/json", as defined in IETF RFC 8259 [12].

NOTE: This release only supports the content type JSON.

7.5 URI structure

7.5.1 Resource URI structure

All API URIs of CAPIF APIs shall be:

{apiRoot}/<apiName>/<apiVersion>/

"apiRoot" is configured by means outside the scope of the present document. It includes the scheme ("https"), host and optional port, and an optional prefix string. "apiName" and "apiVersion" shall be set dependent on the API, as defined in the corresponding subclauses below.

All resource URIs in the subclauses below are defined relative to the above root API URI.

NOTE 1: The "apiVersion" will only be increased if the new API version contains backward incompatible changes. Otherwise, the supported feature mechanism defined in subclause 7.8 can be used to negotiate extensions.

NOTE 2: A different root structure can be used when the resource URI is preconfigured in the API invoking entity.

The root structure may be followed by "apiSpecificSuffixes" that are dependent on the API and are defined separately for each API as resource URI where they apply:

{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>

7.5.2 Custom operations URI structure

The custom operation definition is in Annex C of 3GPP TS 29.501 [18].

The URI of a custom operation which is associated with a resource shall have the following structure:

{apiRoot}/<apiName>/<apiVersion>/<apiSpecificResourceUriPart>/<custOpName>

Custom operations can also be associated with the service instead of a resource. The URI of a custom operation which is not associated with a resource shall have the following structure:

{apiRoot}/<apiName>/<apiVersion>/<custOpName>

In the above URI structures, "apiRoot", "apiName", "apiVersion" and "apiSpecificResourceUriPart" are as defined in subclause 7.5.1 and "custOpName" represents the name of the custom operation as defined in subclause 5.1.3.2 of 3GPP TS 29.501 [18].

7.6 Notifications

The functional entities

- shall support the delivery of notifications using a separate HTTP connection towards an address;

- may support testing delivery of notifications; and

- may support the delivery of notification using WebSocket protocol (see IETF RFC 6455 [13]),

as described in 3GPP TS 29.122 [14], with the following clarifications:

- the SCEF is the CAPIF core function; and

- the SCS/AS is the Subscriber.

7.7 Error handling

Response bodies for error handling, as described in 3GPP TS 29.122 [14], are applicable to all APIs in the present specification unless specified otherwise, with the following clarifications:

- the SCEF is the CAPIF core function; and

- the SCS/AS is the functional entity invoking an API.

7.8   Feature negotiation

The functional entity invoking an API (i.e. the API invoker, the API exposing function, the API publishing function or the API management function) and the CAPIF core function use feature negotiation procedures defined in 3GPP TS 29.122 [14] to negotiate the supported features, with the following clarifications:

- description of the SCEF applies to the CAPIF core function;

- description of the SCS/AS applies to the functional entity invoking an API;

- the CAPIF Core Function should not register any feature in the NRF; and

- the AEF should not register any feature for AEF_Security_API in the NRF.

7.9   HTTP headers

The HTTP headers described in 3GPP TS 29.122 [14] are applicable to all APIs in this document.

7.10   Conventions for Open API specification files

The conventions for Open API specification files as specified in subclause 5.2.9 of 3GPP TS 29.122 [14] shall be applicable for all APIs in this document.

8   CAPIF API Definition

8.1   CAPIF_Discover_Service_API

8.1.1   API URI

The CAPIF_Discover_Service_API service shall use the CAPIF_Discover_Service_API.

The request URIs used in HTTP requests from the API invoker towards the CAPIF core function shall have the Resource URI structure as defined in subclause 7.5 with the following clarifications:

- The <apiName> shall be "service-apis".

- The <apiVersion> shall be "v1".

- The <apiSpecificSuffixes> shall be set as described in subclause 8.1.2.

8.1.2 Resources

8.1.2.1 Overview

{apiRoot}/service-apis/{apiVersion}
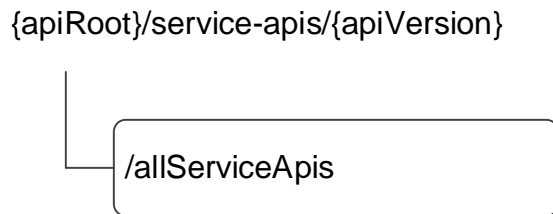
/allServiceApis

Figure 8.1.2.1-1: Resource URI structure of the CAPIF_Discover_Service_API

Table 8.1.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 8.1.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
All published service APIs (Store)	{apiRoot} /service-apis/{apiVersion} /allServiceApis	GET	Discover published service APIs and retrieve a collection of APIs according to certain filter criteria.

8.1.2.2 Resource: All published service APIs

8.1.2.2.1 Description

The All published service APIs resource represents a collection of published service APIs on a CAPIF core function. The resource is modelled as a Store resource archetype (see Annex C.3 of 3GPP TS 29.501 [18])

8.1.2.2.2 Resource Definition

Resource URI: **{apiRoot}/service-apis/{apiVersion}/allServiceApis**

This resource shall support the resource URI variables defined in table 8.1.2.2.2-1.

Table 8.1.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.1.1

8.1.2.2.3 Resource Standard Methods

8.1.2.2.3.1 GET

This operation retrieves a list of APIs currently registered in the CAPIF core function, satisfying a number of filter criteria.

Table 8.1.2.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description	Applicability
api-invoker-id	string	M	1	String identifying the API invoker assigned by the CAPIF core function. It also represents the CCF identifier in the CAPIF-6/6e reference point.	
api-name	string	O	0..1	API name, it is set as {apiName} part of the URI structure as defined in subclause 4.4 of 3GPP TS 29.501 [18].	
api-version	string	O	0..1	API major version in the URI (e.g. v1)	
comm-type	CommunicationType	O	0..1	Communication type used by the API (e.g.REQUEST_RESPONSE).	
protocol	Protocol	O	0..1	Protocol used by the API.	
aef-id	string	O	0..1	AEF identifier.	
data-format	DataFormat	O	0..1	Data format used by the API (e.g. serialization protocol JSON used).	
api-cat	string	O	0..1	The service API category to which the service API belongs to.	
supported-features	SupportedFeatures	O	0..1	To filter irrelevant responses related to unsupported features.	
api-supported-features	SupportedFeatures	C	0..1	Features supported by the discovered service API indicated by api-name parameter. This may only be present if api-name query parameter is present.	ApiSupportedFeatureQuery

This method shall support the request data structures specified in table 8.1.2.2.3.1-2 and the response data structures and response codes specified in table 8.1.2.2.3.1-3.

Table 8.1.2.2.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.1.2.2.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
DiscoveredAPIs	M	1	200 OK	The response body contains the result of the search over the list of registered APIs.
ProblemDetails	O	0..1	414 URI Too Long	Indicates that the server is refusing to service the request because the request-target is too long.

8.1.2.2.4 Resource Custom Operations

None.

8.1.3 Notifications

None.

8.1.4 Data Model

8.1.4.1 General

This subclause specifies the application data model supported by the API.

Table 8.1.4.1-1 specifies the data types defined for the CAPIF service based interface protocol.

Table 8.1.4.1-1: Specific Data Types

Data type	Section defined	Description	Applicability
DiscoveredAPIs	8.1.4.2.2	Definition of the service API	

Table 8.1.4.1-2 specifies data types re-used by the CAPIF_Discover_Service_API service:

Table 8.1.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
CommunicationType	Subclause 8.2.4.3.5	Communication type used by the API	
DataFormat	Subclause 8.2.4.3.4	Data format	
ProblemDetails	3GPP TS 29.122 [14]		
Protocol	Subclause 8.2.4.3.3	Protocol	
ServiceAPIDescription	Subclause 8.2.4.2.2	Description of the service API	

8.1.4.2 Structured data types

8.1.4.2.1 Introduction

8.1.4.2.2 Type: DiscoveredAPIs

Table 8.1.4.2.2-1: Definition of type DiscoveredAPIs

Attribute name	Data type	P	Cardinality	Description	Applicability
serviceAPIDescriptions	array(ServiceAPIDescription)	O	1..N	Description of the service API as published by the service. (NOTE)	
NOTE: For CAPIF_Discover_Service_API, the supportedFeatures attribute in ServiceAPIDescription data type shall be provided in the HTTP GET response of successful query. In addition, the supportedFeatures attribute may include one or more the supported features as defined in subclause 8.1.6.					

8.1.4.2.3 Void

8.1.4.3 Simple data types and enumerations

None.

8.1.5 Error Handling

General error responses are defined in subclause 7.7.

8.1.6 Feature negotiation

General feature negotiation procedures are defined in subclause 7.8.

Table 8.1.6-1: Supported Features

Feature number	Feature Name	Description
1	ApiSupportedFeatureQuery	Indicates the support of query with supported feature for a service API.

8.2   CAPIF_Publish_Service_API

8.2.1   API URI

The CAPIF_Publish_Service_API service shall use the CAPIF_Publish_Service_API.

The request URIs used in HTTP requests from the API publishing function towards the CAPIF core function shall have the Resource URI structure as defined in subclause 7.5 with the following clarifications:

-    The <apiName> shall be "published-apis".

-    The <apiVersion> shall be "v1".

-    The <apiSpecificSuffixes> shall be set as described in subclause 8.2.2.

8.2.2   Resources

8.2.2.1   Overview

Figure 8.2.2.1-1: Resource URI structure of the CAPIF_Publish_Service_API

Table 8.2.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 8.2.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
APF published APIs	{apiRoot} /published-apis/{apiVersion} /{apfId}/service-apis	POST	Publish a new API
		GET	Retrieve all published service APIs
Individual APF published API	{apiRoot} /published-apis /{apiVersion} /{apfId}/service-apis/{serviceApiId}	GET	Retrieve a published service API
		PUT	Update a published service API
		DELETE	Unpublish a published service API

8.2.2.2 Resource: APF published APIs

8.2.2.2.1 Description

The APF published APIs resource represents all published service APIs of a API publishing function.

8.2.2.2.2 Resource Definition

Resource URI: **{apiRoot}/published-apis/{apiVersion}/{apfId}/service-apis**

This resource shall support the resource URI variables defined in table 8.2.2.2.2-1.

Table 8.2.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.2.1
apfId	string	Identifies the API publishing function; for CAPIF interconnection case, this string also identifies the CCF which is publishing the service API.

8.2.2.2.3 Resource Standard Methods

8.2.2.2.3.1 POST

This method shall support the URI query parameters specified in table 8.2.2.2.3.1-1.

Table 8.2.2.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.2.2.2.3.1-2 and the response data structures and response codes specified in table 8.2.2.2.3.1-3.

Table 8.2.2.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
ServiceAPIDescription	M	1	Definition of the service API being published

Table 8.2.2.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServiceAPIDescription	M	1	201 Created	Service API published successfully. The URI of the created resource shall be returned in the "Location" HTTP header

Table 8.2.2.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/published-apis/v1/{apfId}/service-apis/{serviceApiId}

8.2.2.2.3.2 GET

This method shall support the URI query parameters specified in table 8.2.2.2.3.2-1.

Table 8.2.2.2.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.2.2.2.3.2-2 and the response data structures and response codes specified in table 8.2.2.2.3.2-3.

Table 8.2.2.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.2.2.2.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(ServiceAPIDescription)	O	0..N	200 OK	Definition of all service API(s) published by the API publishing function.

8.2.2.2.4 Resource Custom Operations

None.

8.2.2.3 Resource: Individual APF published API

8.2.2.3.1 Description

The Individual APF published API resource represents an individual published service API.

8.2.2.3.2 Resource Definition

Resource URI: **{apiRoot}/published-apis/{apiVersion}/{apfId}/service-apis/{serviceApiId}**

This resource shall support the resource URI variables defined in table 8.2.2.3.2-1.

Table 8.2.2.3.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.2.1
apfId	string	Identifies the API publishing function
serviceApiId	string	Identifies an individual published service API

8.2.2.3.3 Resource Standard Methods

8.2.2.3.3.1 GET

This method shall support the URI query parameters specified in table 8.2.2.3.3.1-1.

Table 8.2.2.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.2.2.3.3.1-2 and the response data structures and response codes specified in table 8.2.2.3.3.1-3.

Table 8.2.2.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.2.2.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(ServiceAPIDescription)	O	0..N	200 OK	Definition of all service API published by the API publishing function.

8.2.2.3.3.2 PUT

This method shall support the URI query parameters specified in table 8.2.2.3.3.2-1.

Table 8.2.2.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.2.2.3.3.2-2 and the response data structures and response codes specified in table 8.2.2.3.3.2-3.

Table 8.2.2.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
ServiceAPIDescription	M	1	Updated definition of the service API.

Table 8.2.2.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServiceAPIDescription	M	1	200 OK	Definition of the service API updated successfully.

8.2.2.3.3.3 DELETE

This method shall support the URI query parameters specified in table 8.2.2.3.3.3-1.

Table 8.2.2.3.3.3-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.2.2.3.3.3-2 and the response data structures and response codes specified in table 8.2.2.3.3.3-3.

Table 8.2.2.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.2.2.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The individual published service API matching the serviceApiId is deleted.

8.2.2.3.4 Resource Custom Operations

None.

8.2.3 Notifications

None.

8.2.4 Data Model

8.2.4.1 General

This subclause specifies the application data model supported by the API.

Table 8.2.4.1-1 specifies the data types defined for the CAPIF service based interface protocol.

Table 8.2.4.1-1: Specific Data Types

Data type	Section defined	Description	Applicability
AefProfile	8.2.4.2.4	AEF profile	
CommunicationType	8.2.4.3.5	Communication type of the resource	
CustomOperation	8.2.4.2.7	Custom operation	
DataFormat	8.2.4.3.4	Data format	
InterfaceDescription	8.2.4.2.3	Description of the API interface	
Operation	8.2.4.3.7	HTTP method (e.g. PUT)	
Protocol	8.2.4.3.3	Protocol used by the API	
Resource	8.2.4.2.6	API resource	
SecurityMethod	8.2.4.3.6	Security method (e.g. PKI)	
Version	8.2.4.2.5	API version information	

Table 8.2.4.1-2 specifies data types re-used by the CAPIF_Publish_Service_API service:

Table 8.2.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
Ipv4Addr	3GPP TS 29.122 [14]		
Ipv6Addr	3GPP TS 29.122 [14]		
Port	3GPP TS 29.122 [14]		
SupportedFeatures	3GPP TS 29.571 [19]	Used to negotiate the applicability of optional features defined in table 8.2.6-1.	

8.2.4.2 Structured data types

8.2.4.2.1 Introduction

8.2.4.2.2 Type: ServiceAPIDescription

Table 8.2.4.2.2-1: Definition of type ServiceAPIDescription

Attribute name	Data type	P	Cardinality	Description	Applicability
apiName	string	M	1	API name, it is set as {apiName} part of the URI structure as defined in subclause 4.4 of 3GPP TS 29.501 [18].	
apiId	string	O	0..1	API identifier assigned by the CAPIF core function to the published service API. Shall not be present in the HTTP POST request from the API publishing function to the CAPIF core function. Shall be present in the HTTP POST response from the CAPIF core function to the API publishing function and in the HTTP GET response from the CAPIF core function to the API invoker (discovery API).	
aefProfiles	array(AefProfile)	C	1..N	AEF profile information, which includes the exposed API details (e.g. protocol). For CAPIF-4/4e interface, API publishing function shall provide this attribute to the CAPIF core function in service API publishing. For CAPIF-1/1e interface, the CAPIF core function shall provide this attribute to the API Invoker during service API discovery. (NOTE 2)	
description	string	O	0..1	Text description of the API	
supportedFeatures	Supported Features	O	0..1	The supported optional features of the CAPIF API. (NOTE 1)	
shareableInfo	Shareable Information	O	0..1	Represents whether the service API and/or the service API category can be published to other CCFs.	
serviceAPICategory	string	C	0..1	The service API category to which the service API belongs to. This attribute is only applicable for CAPIF-6/6e interface. (NOTE 2)	
ccfId	string	C	0..1	CAPIF core function identifier which can be contacted further for discovering the details of service API information. This attribute is only applicable for CAPIF-6/6e interface and shall be provided with serviceAPICategory. (NOTE 2)	
apiSuppFeats	Supported Features	O	0..1	Provided by the consumer to indicate the features supported by the service API.	ApiSupportedFeaturePublishing
pubApiPath	Published ApiPath	C	0..1	It contains the published API path within the same CAPIF provider domain. it shall be provided by the CCF when publishing the service API to other CCF via the CAPIF-6 reference point.	
NOTE 1: For CAPIF_Publish_Service_API, the supported features attribute shall be provided in the HTTP POST request and in the response of successful resource creation. In addition, the supportedFeatures attribute may include one or more the supported features as defined in subclause 8.2.6.					
NOTE 2: For CAPIF-6/6e interface, at least one of aefProfiles or serviceAPICategory and the corresponding ccfId shall be provided.					

8.2.4.2.3   Type: InterfaceDescription

Table 8.2.4.2.3-1: Definition of type InterfaceDescription

Attribute name	Data type	P	Cardinality	Description	Applicability
ipv4Addr	Ipv4Addr	O	0..1	String identifying an IPv4 address (NOTE)	
ipv6Addr	Ipv6Addr	O	0..1	String identifying an IPv6 address (NOTE)	
port	Port	O	0..1	Port	
securityMethods	array(SecurityMethods)	M	1..N	Security methods supported by the interface. It takes precedence over the security methods provided in AefProfile, for this specific interface	
NOTE: Only one of the attributes "ipv4Addr" or "ipv6Addr" shall be included.					

8.2.4.2.4   Type: AefProfile

Table 8.2.4.2.4-1: Definition of type AefProfile

Attribute name	Data type	P	Cardinality	Description	Applicability
aefId	string	M	1	AEF identifier	
versions	array(Version)	M	1..N	API version	
protocol	Protocol	O	0..1	Protocol used by the API.	
dataFormat	DataFormat	O	0..1	Data format used by the API	
securityMethods	array(SecurityMethods)	O	1..N	Security methods supported by the AEF for all interfaces. Certain interfaces may have different security methods supported in the attribute interfaceDescriptions.	
domainName	string	O	0..1	Domain to which API belongs to (NOTE 1)	
interfaceDescriptions	array(InterfaceDescription)	O	1..N	Interface details (NOTE 1)	
NOTE 1: Only one of the attributes "domainName" or "interfaceDescriptions" shall be included.					
NOTE 2: Notification or callback type of resource is not included.					

8.2.4.2.5   Type: Version

Table 8.2.4.2.5-1: Definition of type Version

Attribute name	Data type	P	Cardinality	Description	Applicability
apiVersion	string	M	1	API major version in URI (e.g. v1)	
expiry	DateTime	O	0..1	Expiry date and time of the AEF service. This represents the planned retirement date as specified in subclause 4.3.1.5 of 3GPP TS 29.501 [18].	
resources	array(Resource)	O	1..N	Resources supported by the API. It may include the custom operations with resource association.	
custOperations	array(CustomOperation)	O	1..N	Custom operations without resource association.	

8.2.4.2.6   Type: Resource

Table 8.2.4.2.6-1: Definition of type Resource

Attribute name	Data type	P	Cardinality	Description	Applicability
resourceName	string	M	1	Resource name	
commType	Communic ationType	M	1	Communication type used by the API resource	
uri	string	M	1	Relative URI of the API resource, it is set as {apiSpecificResourceUriPart} part of the URI structure as defined in subclause 4.4 of 3GPP TS 29.501 [18].	
custOpName	string	O	0..1	it is set as {custOpName} part of the URI structure for a custom operation associated with a resource as defined in subclause 4.4 of 3GPP TS 29.501 [18].	
operations	array(Ope ration)	C	1..N	Supported HTTP methods for the API resource. Only applicable when the protocol in AefProfile indicates HTTP.	
description	string	O	0..1	Text description of the API resource.	

8.2.4.2.7   Type: CustomOperation

Table 8.2.4.2.7-1: Definition of type CustomOperation

Attribute name	Data type	P	Cardinality	Description	Applicability
commType	Communic ationType	M	1	Communication type used by the API resource	
custOpName	string	M	1	it is set as {custOpName} part of the URI structure for a custom operation without resource association as defined in subclause 4.4 of 3GPP TS 29.501 [18].	
operations	array(Ope ration)	C	1..N	Supported HTTP methods for the API resource. Only applicable when the protocol in AefProfile indicates HTTP.	
description	string	O	0..1	Text description of the custom operation.	

8.2.4.2.8   Type: ShareableInformation

Table 8.2.4.2.8-1: Definition of type ShareableInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
isShareable	boolean	M	1	Set to "true" indicates that the service API and/or the service API category can be shared to the list of CAPIF provider domain information. Otherwise set to "false".	
capifProvDoms	array(strin g)	O	1..N	List of CAPIF provider domains to which the service API information to be shared. (NOTE)	
NOTE: Only one CAPIF provider domain information shall be provided via the CAPIF-6e interface.					

8.2.4.2.9   Type: PublishedApiPath

Table 8.2.4.2.9-1: Definition of type PublishedApiPath

Attribute name	Data type	P	Cardinality	Description	Applicability
ccfIds	array(strin g)	O	1..N	A list of CCF identifiers where the service API is already published.	

ETSI

8.2.4.3 Simple data types and enumerations

8.2.4.3.1 Introduction

This subclause defines simple data types and enumerations that can be referenced from data structures defined in the previous subclauses.

8.2.4.3.2 Simple data types

The simple data types defined in table 8.2.4.3.2-1 shall be supported.

Table 8.2.4.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
n/a			

8.2.4.3.3 Enumeration: Protocol

Table 8.2.4.3.3-1: Enumeration Protocol

Enumeration value	Description	Applicability
HTTP_1_1	HTTP version 1.1	
HTTP2	HTTP version 2	

8.2.4.3.4 Enumeration: DataFormat

Table 8.2.4.3.4-1: Enumeration DataFormat

Enumeration value	Description	Applicability
JSON	Serialization protocol: JavaScript Object Notation	

8.2.4.3.5 Enumeration: CommunicationType

Table 8.2.4.3.5-1: Enumeration CommunicationType

Enumeration value	Description	Applicability
REQUEST_RESPONSE	The communication is of the type request-response.	
SUBSCRIBE_NOTIFY	The communication is of the type subscribe-notify	

8.2.4.3.6 Enumeration: SecurityMethod

Table 8.2.4.3.6-1: Enumeration SecurityMethod

Enumeration value	Description	Applicability
PSK	Security method 1 (Using TLS-PSK) as described in 3GPP TS 33.122 [16].	
PKI	Security method 2 (Using PKI) as described in 3GPP TS 33.122 [16].	
OAUTH	Security method 3 (TLS with OAuth token) as described in 3GPP TS 33.122 [16].	

8.2.4.3.7   Enumeration: Operation

Table 8.2.4.3.7-1: Enumeration Operation

Enumeration value	Description	Applicability
GET	HTTP GET method	
POST	HTTP POST method	
PUT	HTTP PUT method	
PATCH	HTTP PATCH method	
DELETE	HTTP DELETE method	

8.2.5   Error Handling

General error responses are defined in subclause 7.7.

8.2.6   Feature negotiation

General feature negotiation procedures are defined in subclause 7.8.

Table 8.2.6-1: Supported Features

Feature number	Feature Name	Description
1	ApiSupportedFeaturePublishing	Indicates the support of publishing with supported feature for a service API.

8.3   CAPIF_Events_API

8.3.1   API URI

The CAPIF_Events_API service shall use the CAPIF_Events_API.

The request URIs used in HTTP requests from the Subscriber towards the CAPIF core function shall have the Resource URI structure as defined in subclause 7.5 with the following clarifications:

-    The <apiName> shall be "capif-events".

-    The <apiVersion> shall be "v1".

-    The <apiSpecificSuffixes> shall be set as described in subclause 8.3.2.
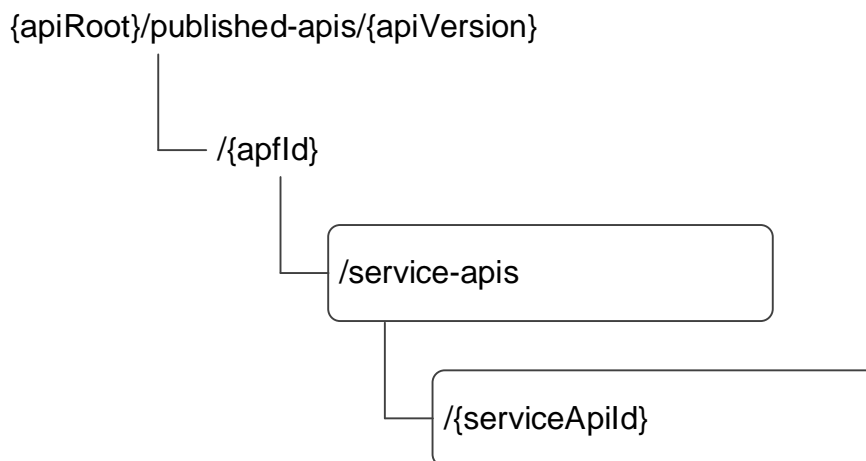
8.3.2   Resources

8.3.2.1   Overview
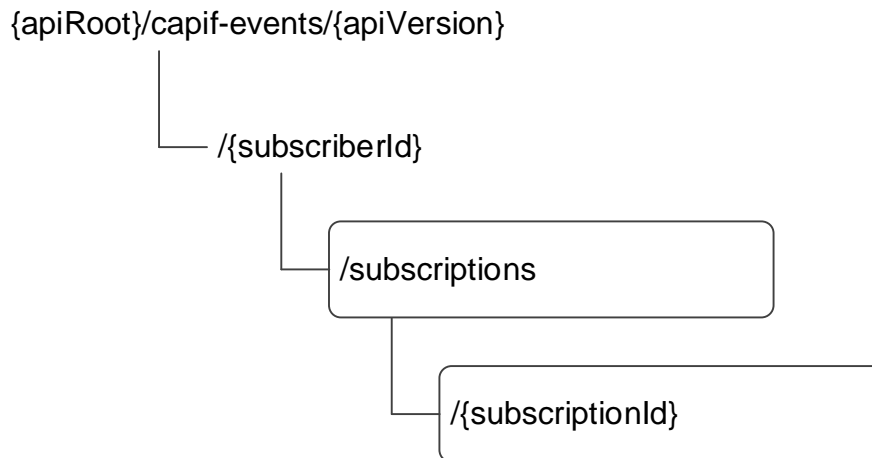
Figure 8.3.2.1-1: Resource URI structure of the CAPIF_Events_API

Table 8.3.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 8.3.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
CAPIF Events Subscriptions	{apiRoot}/capif-events/{apiVersion}/ {subscriberId}/subscriptions	POST	Creates a new individual CAPIF Event Subscription
Individual CAPIF Events Subscription	{apiRoot}/capif-events/{apiVersion}/ {subscriberId}/subscriptions/ {subscriptionId}	DELETE	Deletes an individual CAPIF Event Subscription identified by the subscriptionId

8.3.2.2   Resource: CAPIF Events Subscriptions

8.3.2.2.1   Description

The CAPIF Events Subscriptions resource represents all subscriptions of aSubscriber.

8.3.2.2.2   Resource Definition

Resource URI: **{apiRoot}/capif-events/{apiVersion}/{subscriberId}/subscriptions**

This resource shall support the resource URI variables defined in table 8.3.2.2.2-1.

Table 8.3.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.3.1
subscriberId	string	ID of the Subscriber

8.3.2.2.3 Resource Standard Methods

8.3.2.2.3.1 POST

This method shall support the URI query parameters specified in table 8.3.2.2.3.1-1.

Table 8.3.2.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.3.2.2.3.1-2 and the response data structures and response codes specified in table 8.3.2.2.3.1-3.

Table 8.3.2.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
EventSubscription	M	1	Create a new individual CAPIF Events Subscription resource.

Table 8.3.2.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
EventSubscription	M	1	201 Created	CAPIF Events Subscription resource created successfully. The URI of the created resource shall be returned in the "Location" HTTP header

Table 8.3.2.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/capif-events/v1/{subscriberId}/subscriptions/{subscriptionId}

8.3.2.2.4 Resource Custom Operations

None.

8.3.2.3 Resource: Individual CAPIF Events Subscription

8.3.2.3.1 Description

The Individual CAPIF Events Subscription resource represents an individual event subscription of aSubscriber.

8.3.2.3.2 Resource Definition

Resource URI: **{apiRoot}/capif-events/{apiVersion}/{subscriberId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 8.3.2.3.2-1.

Table 8.3.2.3.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.3.1
subscriberId	string	ID of the Subscriber
subscriptionId	string	Identifies an individual Events Subscription

8.3.2.3.3 Resource Standard Methods

8.3.2.3.3.1 DELETE

This method shall support the URI query parameters specified in table 8.3.2.3.3.1-1.

Table 8.3.2.3.3.1-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.3.2.3.3.1-2 and the response data structures and response codes specified in table 8.3.2.3.3.1-3.

Table 8.3.2.3.3.1-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.3.2.3.3.1-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The individual CAPIF Events Subscription matching the subscriptionId is deleted.

8.3.2.3.4 Resource Custom Operations

None.

8.3.3 Notifications

8.3.3.1 General

The delivery of notifications shall conform to subclause 7.6.

Table 8.3.3.1-1: Notifications overview

Notification	Resource URI	HTTP method or custom operation	Description (service operation)
Event notification	{notificationDestination}	POST	Notifies Subscriber of a CAPIF Event

8.3.3.2 Event Notification

8.3.3.2.1 Description

Event Notification is used by the CAPIF core function to notify a Subscriber of an Event. The Subscriber shall be subscribed to such Event Notification via the Individual CAPIF Events Subscription Resource.

8.3.3.2.2 Notification definition

The POST method shall be used for Event notification and the URI shall be the one provided by the Subscriber during the subscription to the event.

Resource URI: **{notificationDestination}**

This method shall support the URI query parameters specified in table 8.3.3.2.2.1-1.

Table 8.3.3.2.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.3.3.2.2-2 and the response data structures and response codes specified in table 8.3.3.2.2-3.

Table 8.3.3.2.2-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
EventNotification	M	1	Notification information of a CAPIF Event

Table 8.3.3.2.2-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.

8.3.4 Data Model

8.3.4.1 General

This subclause specifies the application data model supported by the API. Data types listed in subclause 7.2 apply to this API.

Table 8.3.4.1-1 specifies the data types defined specifically for the CAPIF_Events_API service.

Table 8.3.4.1-1: CAPIF_Events_API specific Data Types

Data type	Section defined	Description	Applicability
AccessControlPolicyListExt	8.3.4.2.6	Represents the extension for access control policies	
CAPIFEvent	8.3.4.3.2	Describes CAPIF events	
CAPIFEventDetail	8.3.4.2.5	Represents the CAPIF event detail	
CAPIFEventFilter	8.3.4.2.4	Represents the CAPIF event filter	
EventNotification	8.3.4.2.3	Represents an individual CAPIF Event Subscription Notification	
EventSubscription	8.3.4.2.2	Represents an individual CAPIF Event Subscription resource	

Table 8.3.4.1-2 specifies data types re-used by the CAPIF_Events_API service:

Table 8.3.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
ReportingInformation	3GPP TS 29.523 [26]	Used to indicate the reporting requirement, only the following information are applicable for CAPIF: - immRep - notifMethod - maxReportNbr - monDur - repPeriod	Enhanced_event_report
SupportedFeatures	3GPP TS 29.571 [19]	Used to negotiate the applicability of optional features defined in table 8.3.6-1.	
TestNotification	3GPP TS 29.122 [14]	Following differences apply: - The SCEF is the CAPIF core function; and - The SCS/AS is the Subscribing functional entity.	
Uri	3GPP TS 29.122 [14]		
WebsockNotifConfig	3GPP TS 29.122 [14]	Following differences apply: - The SCEF is the CAPIF core function; and - The SCS/AS is the Subscribing functional entity.	

8.3.4.2   Structured data types

8.3.4.2.1   Introduction

This subclause defines the structures to be used in resource representations.

8.3.4.2.2   Type: EventSubscription

Table 8.3.4.2.2-1: Definition of type EventSubscription

Attribute name	Data type	P	Cardinality	Description	Applicability
events	array(CAPIFEvent)	M	1..N	Subscribed events	
eventFilters	array(CAPIFEventFilter)	O	1..N	Subscribed event filters. The nth entry in the "eventFilters" attribute shall correspond to the nth entry in the "events" attribute. For event not having event filter, an empty event filter entry without any sub-attribute shall be provided.	Enhanced_event_report
eventReq	ReportingInformation	O	0..1	Represents the reporting requirements of the event subscription.	Enhanced_event_report
notificationDestination	Uri	M	1	URI where the notification should be delivered to.	
requestTestNotification	boolean	O	0..1	Set to true by Subscriber to request the CAPIF core function to send a test notification as defined in subclause 7.6. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 7.6.	Notification_websocket
supportedFeatures	SupportedFeatures	O	0..1	Used to negotiate the supported optional features of the API as described in subclause 7.8. This attribute shall be provided in the HTTP POST request and in the response of successful resource creation.	

8.3.4.2.3   Type: EventNotification

Table 8.3.4.2.3-1: Definition of type EventNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
subscriptionId	string	M	1	Identifier of the subscription resource to which the notification is related – CAPIF resource identifier	
events	CAPIFEvent	M	1	Notifications of individual events	
eventDetail	CAPIFEventDetail	O	0..1	Detailed information for the event.	Enhanced_event_report

8.3.4.2.4   Type: CAPIFEventFilter

Table 8.3.4.2.4-1: Definition of type CAPIFEventFilter

Attribute name	Data type	P	Cardinality	Description	Applicability
apiIds	array(string)	O	1..N	API identifiers that the event subscriber wants to know in the interested event.	
apiInvokerIds	array(string)	O	1..N	API invokers that the event subscriber wants to know in the interested event.	
aefIds	array(string)	O	1..N	String identifying the AEF.	

8.3.4.2.5   Type: CAPIFEventDetail

Table 8.3.4.2.5-1: Definition of type CAPIFEventDetail

Attribute name	Data type	P	Cardinality	Description	Applicability
serviceAPIDescriptions	array(ServiceAPIDescription)	O	1..N	Description of the service API as published by the APF.	
apiIds	array(string)	O	1..N	API identifiers.	
apiInvokerIds	array(string)	O	1..N	API invokers that are onboarded/offboarded.	
accCtrlPolList	AccessControlPolicyListExt	O	0..1	Access control policy updated list.	
invocationLogs	array(InvocationLog)	O	1..N	Invocation logs	
apiTopoHide	TopologyHiding	O	0..1	Topology hiding information for a service API	

8.3.4.2.6   Type: AccessControlPolicyListExt

Table 8.3.4.2.6-1: Definition of type AccessControlPolicyListExt

Attribute name	Data type	P	Cardinality	Description	Applicability
apiId	string	M	1	Identifier of the service API	
NOTE: This data type also contains all the properties defined for AccessControlPolicyList data type.					

8.3.4.2.7   Type: TopologyHiding

Table 8.3.4.2.7-1: Definition of type TopologyHiding

Attribute name	Data type	P	Cardinality	Description	Applicability
apiId	string	M	1	Identifier of the service API	
routingRules	array(RoutingRule)	M	1..N	Routing rules	

8.3.4.3   Simple data types and enumerations

8.3.4.3.1   Introduction

This subclause defines simple data types and enumerations that can be referenced from data structures defined in the previous subclauses.

8.3.4.3.2   Simple data types

None.

The simple data types defined in table 8.3.4.3.2-1 shall be supported.

Table 8.3.4.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
n/a			

8.3.4.3.3 Enumeration: CAPIFEvent

Table 8.3.4.3.3-1: Enumeration CAPIFEvent

Enumeration value	Description	Applicability
SERVICE_API_AVAILABLE	Events related to the availability of service APIs after the service APIs are published.	
SERVICE_API_UNAVAILABLE	Events related to the unavailability of service APIs after the service APIs are unpublished.	
SERVICE_API_UPDATE	Events related to change in service API information	
API_INVOKER_ONBOARDED	Events related to API invoker onboarded to CAPIF	
API_INVOKER_OFFBOARDED	Events related to API invoker offboarded from CAPIF	
SERVICE_API_INVOCATION_SUCCESS	Events related to the successful invocation of service APIs	
SERVICE_API_INVOCATION_FAILURE	Events related to the failed invocation of service APIs	
ACCESS_CONTROL_POLICY_UPDATE	Events related to the update for the access control policy related to the service APIs	
ACCESS_CONTROL_POLICY_UNAVAILABLE	Events related to the unavailability of the access control policy related to the service APIs (NOTE)	
API_INVOKER_AUTHORIZATION_REVOKED	Events related to the revocation of the authorization of API invokers to access the service APIs. (NOTE)	
API_INVOKER_UPDATED	Events related to API invoker profile updated to CAPIF.	
API_TOPOLOGY_HIDING_CREATED	Events related to the creation or update of the API topology hiding information of the service API after the service APIs are published	
API_TOPOLOGY_HIDING_REVOKED	Events related to the revocation of the API topology information of the service API after the service APIs are unpublished	
NOTE: The present release does not specify further details (e.g. event filters) for this event.		

8.3.5 Error Handling

General error responses are defined in subclause 7.7.

8.3.6 Feature negotiation

General feature negotiation procedures are defined in subclause 7.8. Table 8.3.6-1 lists the supported features for CAPIF_Events_API.

Table 8.3.6-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	Testing of notification connection is supported according to subclause 7.6.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 7.6. This feature requires that the Notification_test_event feature is also supported.
3	Enhanced_event_report	This feature supports the enhanced event report including event reporting requirement and event reporting details as defined in subclause 5.4.2.2.2.

8.4 CAPIF_API_Invoker_Management_API

8.4.1 API URI

The CAPIF_API_Invoker_Management_API service shall use the CAPIF_API_Invoker_Management_API.

The request URIs used in HTTP requests from the API invoker towards the CAPIF core function shall have the Resource URI structure as defined in subclause 7.5 with the following clarifications:

- The <apiName> shall be "api-invoker-management".

- The <apiVersion> shall be "v1".

- The <apiSpecificSuffixes> shall be set as described in subclause 8.4.2.

8.4.2 Resources

8.4.2.1 Overview

{apiRoot}/api-invoker-management/{apiVersion}

/onboardedInvokers

/{onboardingId}

Figure 8.4.2.1-1: Resource URI structure of the CAPIF_API_Invoker_Management_API

Table 8.4.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 8.4.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
On-boarded API Invokers	{apiRoot} /api-invoker-management/{apiVersion} /onboardedInvokers	POST	On-boards a new API invoker by creating a API invoker profile
Individual On-boarded API Invoker	{apiRoot} /api-invoker-management/{apiVersion} /onboardedInvokers/{onboardingId}	DELETE	Off-boards an individual API invoker by deleting the API invoker profile identified by {onboardingId}
		PUT	Updates the API invoker details of an individual API invoker identified by the {onboardingId}

8.4.2.2   Resource: On-boarded API invokers

8.4.2.2.1   Description

The On-boarded API Invokers resource represents all the API invokers that are on-boarded at a given CAPIF core function.

8.4.2.2.2   Resource Definition

Resource URI: **{apiRoot}/api-invoker-management/{apiVersion}/onboardedInvokers**

This resource shall support the resource URI variables defined in table 8.4.2.2.2-1.

Table 8.4.2.2.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	See clause 7.5
apiVersion	See clause 8.4.1

8.4.2.2.3   Resource Standard Methods

8.4.2.2.3.1   POST

This method shall support the URI query parameters specified in table 8.4.2.2.3.1-1.

Table 8.4.2.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.4.2.2.3.1-2 and the response data structures and response codes specified in table 8.4.2.2.3.1-3.

Table 8.4.2.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
APIInvokerEnrolmentDetails	M	1	Enrolment details of the API invoker including notification destination URI for any on-boarding related notifications and an optional list of APIs the API invoker intends to invoke while on-board.

Table 8.4.2.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
APIInvokerEnrolmentDetails	M	1	201 Created	API invoker on-boarded successfully The URI of the created resource shall be returned in the "Location" HTTP header. A list of APIs the API invoker is allowed to invoke while on-board may also be included as part of the APIInvokerEnrolmentDetails which is provided in the response body, if requested in the POST request.
n/a			202 Accepted	The CAPIF core has accepted the Onboarding request and is processing it. When processing is completed, the CAPIF core function will send a Notify_Onboarding_Completion notification to the requesting API invoker. See subclause 8.4.3.2.

8.4.2.3.3.2 PUT

The PUT method allows updating the API invoker details of the onboarded API invoker. This method shall support the URI query parameters specified in table 8.4.2.3.3.2-1.

Table 8.4.2.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in the table 8.4.2.3.3.2-2 and the response data structures and response codes specified in the table 8.4.2.3.3.2-3.

Table 8.4.2.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
APIInvokerEnrolmentDetails	M	1	Updated details of the API invoker and a notification destination URI for any update request related notifications.

Table 8.4.2.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
APIInvokerEnrolmentDetails	M	1	200 OK	API invoker's information updated successfully. Updated details of the API invoker as part of the APIInvokerEnrolmentDetails, which is provided in the response body.
n/a			202 Accepted	The CAPIF core has accepted the Update details request and is processing it. When processing is completed, the CAPIF core function will send a Notify_Update_Completion notification to the requesting API invoker. See sub clause 8.4.3.3.

8.4.2.2.4 Resource Custom Operations

None.

8.4.2.3 Resource: Individual On-boarded API Invoker

8.4.2.3.1 Description

The Individual On-boarded API Invokers resource represents an individual API invoker that is on-boarded at a given CAPIF core function.

8.4.2.3.2 Resource Definition

Resource URI: **{apiRoot}/api-invoker-management/{apiVersion}/onboardedInvokers/{onboardingId}**

This resource shall support the resource URI variables defined in table 8.4.2.3.2-1.

Table 8.4.2.3.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	See clause 7.5
apiVersion	See clause 8.4.1
onboardingId	String identifying an individual on-boarded API invoker resource

8.4.2.3.3 Resource Standard Methods

8.4.2.3.3.1 DELETE

This method shall support the URI query parameters specified in table 8.4.2.3.3.1-1.

Table 8.4.2.3.3.1-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the response codes specified in table 8.4.2.3.3.1-2 and the response data structures and response codes specified in table 8.4.2.3.3.1-3.

Table 8.4.2.3.3.1-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.4.2.3.3.1-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The individual on-boarded API invoker matching the onboardingId is deleted

8.3.2.3.4 Resource Custom Operations

None.

8.4.3 Notifications

8.4.3.1 General

The delivery of notifications shall conform to subclause 7.6.

Table 8.4.3.1-1: Notifications overview

Notification	Resource URI	HTTP method or custom operation	Description (service operation)
Notify_Onboarding_Completion	{notificationDestination}	POST	Notify API invoker of on-boarding result
Notify_Update_Completion	{notificationDestination}	POST	Notify API invoker details update result.

8.4.3.2 Notify_Onboarding_Completion

8.4.3.2.1 Description

Notify_Onboarding_Completion is used by the CAPIF core function to notify an API invoker of the on-boarding result.

8.4.3.2.2   Notification definition

The POST method shall be used for Notify_Onboarding_Completion and the URI shall be the one provided by the API invoker during the on-boarding request.

Resource URI: **{notificationDestination}**

This method shall support the URI query parameters specified in table 8.4.3.2.2-1.

Table 8.4.3.2.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.4.3.2.2-2 and the response data structures and response codes specified in table 8.4.3.2.2-3.

Table 8.4.3.2.2-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
OnboardingNotification	M	1	Notification with on-boarding result

Table 8.4.3.2.2-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.

8.4.3.3   Notify_Update_Completion

8.4.3.3.1   Description

Notify_Update_Completion is used by the CAPIF core function to notify of the update of API Invoker's details result.

8.4.3.3.2   Notification definition

The POST method shall be used for Notify_Update_Completion and the URI shall be the one provided by the API invoker during the API invoker details update request.

Resource URI: **{notificationDestination}**

This method shall support the URI query parameters specified in table 8.4.3.3.2-1.

Table 8.4.3.3.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.4.3.3.2-2 and the response data structures and response codes specified in table 8.4.3.3.2-3.

Table 8.4.3.3.2-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
OnboardingNotification	M	1	Notification with API Invoker's details update result.

Table 8.4.3.3.2-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.

8.4.4 Data Model

8.4.4.1 General

This subclause specifies the application data model supported by the API. Data types listed in subclause 7.2 apply to this API.

Table 8.4.4.1-1 specifies the data types defined specifically for the CAPIF_API_Invoker_Management_API service.

Table 8.4.4.1-1: CAPIF_API_Invoker_Management_API specific Data Types

Data type	Section defined	Description	Applicability
APIInvokerEnrolmentDetails	8.4.4.2.2	API invoker's enrolment details	
APIList	8.4.4.2.4	List of APIs	
OnboardingInformation	8.4.4.2.5	On-boarding information of the API invoker	
OnboardingNotification	8.4.4.2.7	Notification with on-boarding or update result	

Table 8.4.4.1-2 specifies data types re-used by the CAPIF_API_Invoker_Management_API service.

Table 8.4.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
ServiceAPIDescription	Subclause 8.1.4.2.2		
Uri	3GPP TS 29.122 [14]		
TestNotification	3GPP TS 29.122 [14]		
WebsockNotifConfig	3GPP TS 29.122 [14]		
SupportedFeatures	3GPP TS 29.571 [19]	Used to negotiate the applicability of optional features defined in table 8.4.6-1.	

8.4.4.2 Structured data types

8.4.4.2.1 Introduction

8.4.4.2.2 Type: APIInvokerEnrolmentDetails

Table 8.4.4.2.2-1: Definition of type APIInvokerEnrolmentDetails

Attribute name	Data type	P	Cardinality	Description	Applicability
apiInvokerId	string	O	0..1	API invoker ID assigned by the CAPIF core function to the API invoker while on-boarding the API invoker. Shall not be present in the HTTP POST request from the API invoker to the CAPIF core function, to on-board itself. Shall be present in all other HTTP requests and responses.	
onboardingInformation	OnboardingInformation	M	1	On-boarding information about the API invoker necessary for the CAPIF core function to on-board the API invoker.	
notificationDestination	Uri	M	1	URI where the notification should be delivered to.	
requestTestNotification	boolean	O	0..1	Set to true by Subscriber to request the CAPIF core function to send a test notification as defined in in subclause 7.6. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 7.6.	Notification_websocket
apiList	APIList	O	0..1	A list of APIs. When included by the API invoker in the HTTP request message, it lists the APIs that the API invoker intends to invoke while onboard or API invoker update. When included by the CAPIF core function in the HTTP response message, it lists the APIs that the API invoker is allowed to invoke while onboard or API invoker update.	
apiInvokerInformation	string	O	0..1	Generic information related to the API invoker such as details of the device or the application.	
supportedFeatures	SupportedFeatures	O	0..1	Used to negotiate the supported optional features of the API as described in subclause 7.8. This attribute shall be provided in the HTTP POST request and in the response of successful resource creation.	

8.4.4.2.3 Type: Void

8.4.4.2.4 Type: APIList

Table 8.4.4.2.4-1: Definition of type APIList

Attribute name	Data type	P	Cardinality	Description	Applicability
serviceAPIDescriptions	array(ServiceAPIDescription)	M	1..N	Definition of the service API	

8.4.4.2.5   Type: OnboardingInformation

Table 8.4.4.2.5-1: Definition of type OnboardingInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
apiInvokerPubli cKey	string	M	1	Public Key of API Invoker	
apiInvokerCertif icate	string	O	0..1	API invoker's generic client certificate	
onboardingSecr et	string	O	0..1	API invoker's onboarding secret, provided by the CAPIF core function.	

8.4.4.2.6   Type: Void

8.4.4.2.7   Type: OnboardingNotification

Table 8.4.4.2.7-1: Definition of type OnboardingNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
result	boolean	M	1	Set to "true" indicate successful on-boarding. Otherwise set to "false"	
resourceLocatio n	Uri	C	1	URI pointing to the new CAPIF resource created as a result of successful on-boarding. This attribute shall be present if 'result' attribute is set to "true". Otherwise it shall not be present.	
apiInvokerEnrol mentDetails	APIInvoke rEnrolmen tDetails	C	1	Enrolment details of the API invoker which are verified by the CAPIF administrator or API management. This attribute shall be present if 'result' attribute is set to "true". Otherwise it shall not be present.	
apiList	APIList	O	0..1	List of APIs API invoker is allowed to access. This attribute may be present if 'result' attribute is set to "true". Otherwise it shall not be present.	

8.4.4.3   Simple data types and enumerations

None.

8.4.5   Error Handling

General error responses are defined in subclause 7.7.

8.4.6   Feature negotiation

General feature negotiation procedures are defined in subclause 7.8. Table 8.4.6-1 lists the supported features for CAPIF_API_Invoker_Management_API.

Table 8.4.6-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	Testing of notification connection is supported according to subclause 7.6.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 7.6. This feature requires that the Notification_test_event feature is also supported.

8.5 CAPIF_Security_API

8.5.1 API URI

The CAPIF_Security_API service shall use the CAPIF_Security_API.

The request URIs used in HTTP requests from the API invoker or the API exposing function towards the CAPIF core function shall have the Resource URI structure as defined in subclause 7.5 with the following clarifications:

- The <apiName> shall be "capif-security".

- The <apiVersion> shall be "v1".

- The <apiSpecificSuffixes> shall be set as described in subclause 8.5.2.

8.5.2 Resources

8.5.2.1 Overview

{apiRoot}/capif-security/{apiVersion}

└── /trustedInvokers

    └── /{apiInvokerId}

        ├── /update

        ├── /delete

        └── /token

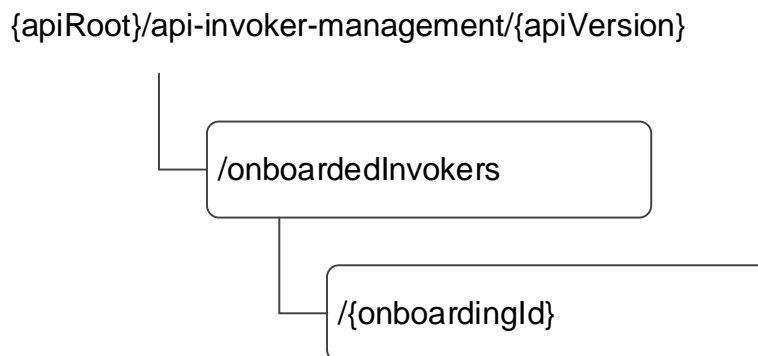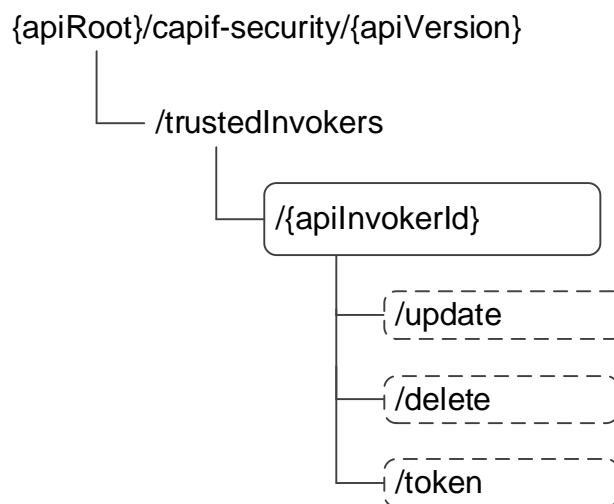**Figure 8.5.2.1-1: Resource URI structure of the CAPIF_Security_API**

Table 8.5.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 8.5.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Trusted API invokers	{apiRoot} /capif-security/{apiVersion} /trustedInvokers	n/a	
Individual trusted API invoker	{apiRoot} /capif-security/{apiVersion} /trustedInvokers/{apiInvokerId}	GET	Retrieve authentication information of an API invoker
		PUT	Create a security context for individual API invoker
		DELETE	Revoke the authorization of the API invoker
	{apiRoot} /trustedInvokers/{apiVersion}/{apiInvokerId}/update	update (POST)	Update the security context (e.g. re-negotiate the security methods).
	{apiRoot} /trustedInvokers/{apiVersion}/{apiInvokerId}/delete	delete (POST)	Revoke the authorization of the API invoker for some APIs
	{apiRoot} /capif-security/{apiVersion}/ securities/{securityId}/token	token (POST)	Obtain the OAuth 2.0 authorization information

8.5.2.2 Resource: Trusted API invokers

8.5.2.2.1 Description

The Trusted API Invokers resource represents all the API invokers that are trusted by the CAPIF core function and have received authentication information from the CAPIF core function.

8.5.2.2.2 Resource Definition

Resource URI: **{apiRoot}/capif-security/{apiVersion}/trustedInvokers**

This resource shall support the resource URI variables defined in table 8.5.2.2.2-1.

Table 8.5.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.5.1

8.5.2.2.3 Resource Standard Methods

8.5.2.2.3.1 Void

8.5.2.2.4 Resource Custom Operations

None.

8.5.2.3 Resource: Individual trusted API invokers

8.5.2.3.1 Description

The Individual trusted API Invokers resource represents an individual API invokers that is trusted by the CAPIF core function and have received security related information from the CAPIF core function.

8.5.2.3.2   Resource Definition

Resource URI: **{apiRoot}/capif-security/{apiVersion}/trustedInvokers/{apiInvokerId}**

This resource shall support the resource URI variables defined in table 8.5.2.3.2-1.

Table 8.5.2.3.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.5.1
apiInvokerId	string	Identifies an individual API invoker

8.5.2.3.3   Resource Standard Methods

8.5.2.3.3.1   GET

This method shall support the URI query parameters specified in table 8.5.2.3.3.1-1.

Table 8.5.2.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
authentication	boolean	O	0..1	When set to 'true', it indicates the CAPIF core function to send the authentication information of the API invoker. Set to false or omitted otherwise.
authorization	boolean	O	0..1	When set to 'true', it indicates the CAPIF core function to send the authorization information of the API invoker. Set to false or omitted otherwise.

This method shall support the request data structures specified in table 8.5.2.3.3.1-2 and the response data structures and response codes specified in table 8.5.2.3.3.1-3.

Table 8.5.2.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.5.2.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServiceSecurity	M	1	200 OK	The security related information of the API Invoker based on the request from the API exposing function.

8.5.2.3.3.2   DELETE

This method shall support the URI query parameters specified in table 8.5.2.3.3.2-1.

Table 8.5.2.3.3.2-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.5.2.3.3.2-2 and the response data structures and response codes specified in table 8.5.2.3.3.2-3.

Table 8.5.2.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.5.2.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Authorization of the API invoker revoked, and a notification is sent to the API invoker as specified in subclause 8.5.3.2

8.5.2.3.3.3   PUT

This method shall support the URI query parameters specified in table 8.5.2.3.3.3-1.

Table 8.5.2.3.3.3-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.5.2.3.3.3-2 and the response data structures and response codes specified in table 8.5.2.3.3.3-3.

Table 8.5.2.3.3.3-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
ServiceSecurity	M	1	Security method request from the API invoker to the CAPIF core function. The request indicates a list of service APIs and a preferred method of security for the service APIs. The request also includes a notification destination URI for security related notifications.

Table 8.5.2.3.3.3-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServiceSecurity	M	1	201 Created	Security method from the CAPIF core function to the API invoker is based on the received request. The response indicates the security method to be used for the service APIs The URI of the created resource shall be returned in the "Location" HTTP header.

Table 8.5.2.3.3.3-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/capif-security/v1/trustedInvokers/{apiInvokerId}

8.5.2.3.4 Resource Custom Operations

8.5.2.3.4.1 Overview

Table 8.5.2.3.4.1-1: Custom operations

Operation name	Custom operation URI	Mapped HTTP method	Description
update	{apiRoot} /capif-security/{apiVersion}/securities/{securityId}/update	POST	Update the security instance (e.g. re-negotiate the security methods).
delete	{apiRoot} /capif-security/{apiVersion}/securities/{securityId}/delete	POST	Revoke the authorization of the API invoker for some APIs

8.5.2.3.4.2 Operation: update

8.5.2.3.4.2.1 Description

This custom operation updates an existing Individual security instance resource in the CAPIF core function.

8.5.2.3.4.2.2 Operation Definition

This method shall support the URI query parameters specified in table 8.5.2.3.4.2.2-1.

Table 8.5.2.3.4.2.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This operation shall support the request data structures specified in table 8.5.2.3.4.2.2-2 and the response data structure and response codes specified in table 8.5.2.3.4.2.2-3.

Table 8.5.2.3.4.2.2-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
ServiceSecurity	M	1	Security method request from the API invoker to the CAPIF core function. The request indicates a list of service APIs and a preferred method of security for the service APIs. The request also includes a notification destination URI for security related notifications.

Table 8.5.2.3.4.2.2-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServiceSecurity	M	1	200 OK	Security method from the CAPIF core function to the API invoker is based on the received request. The response indicates the security method to be used for the service APIs

8.5.2.3.4.3   Operation: delete

8.5.2.3.4.3.1   Description

This custom operation revokes authorization for some service APIs of an existing Individual security instance resource in the CAPIF core function.

8.5.2.3.4.3.2   Operation Definition

This method shall support the URI query parameters specified in table 8.5.2.3.4.3.2-1.

Table 8.5.2.3.4.3.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This operation shall support the request data structures specified in table 8.5.2.3.4.3.2-2 and the response data structure and response codes specified in table 8.5.2.3.4.3.2-3.

Table 8.5.2.3.4.3.2-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
SecurityNotification	M	1	It includes a list of API identifiers for which authorization needs to be revoked for an API invoker.

Table 8.5.2.3.4.3.2-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The CAPIF core function revoked the authorization of the API invoker for the requested APIs.

8.5.2.3.4.4   Operation: token

8.5.2.3.4.4.1   Description

This custom operation obtains OAuth 2.0 authorization information from an existing Individual security instance resource in the CAPIF core function.

8.5.2.3.4.4.2   Operation Definition

This method shall support the URI query parameters specified in table 8.5.2.3.4.4.2-1.

Table 8.5.2.3.4.4.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This operation shall support the request data structures specified in table 8.5.2.3.4.4.2-2 and the response data structure and response codes specified in table 8.5.2.3.4.4.2-3.

Table 8.5.2.3.4.4.2-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
AccessTokenReq	M	1	This IE shall contain the request information for the access token request.

Table 8.5.2.3.4.4.2-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AccessTokenRsp	M	1	200 OK	This IE shall contain the access token response information.
AccessTokenErr	M	1	400 Bad Request	See IETF RFC 6749 [23] subclause 5.2.

8.5.3 Notifications

8.5.3.1 General

The delivery of notifications shall conform to subclause 7.6.

Table 8.5.3.1-1: Notifications overview

Notification	Resource URI	HTTP method or custom operation	Description (service operation)
Authorization revoked notification	{notificationDestination}	POST	Notify API invoker that the authorization rights are revoked by the API exposing function.

8.5.3.2 Authorization revoked notification

8.5.3.2.1 Description

Authorization revoked notification is used by the CAPIF core function to notify an API invoker that the authorization rights are revoked by the API exposing function.

8.5.3.2.2 Notification definition

The POST method shall be used for Authorization revoked notification and the URI shall be the one provided by the API invoker during the Obtain_Security_Method service operation.

Resource URI: **{notificationDestination}**

This method shall support the URI query parameters specified in table 8.5.3.2.2-1.

Table 8.5.3.2.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.5.3.2.2-2 and the response data structures and response codes specified in table 8.5.3.2.2-3.

Table 8.5.3.2.2-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
SecurityNotification	M	1	Notification with information related to revoked authorization.

Table 8.5.3.2.2-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.

8.5.4　Data Model

8.5.4.1　General

This subclause specifies the application data model supported by the API.

Table 8.5.4.1-1 specifies the data types defined for the CAPIF service based interface protocol.

Table 8.5.4.1-1: Specific Data Types

Data type	Section defined	Description	Applicability
AccessTokenClaims	8.5.4.2.6	The claims data structure for the access token.	
AccessTokenReq	8.5.4.2.7	Data type for carrying information related to access token request.	
AccessTokenRsp	8.5.4.2.8	Data type for carrying information related to access token response.	
SecurityInformation	8.5.4.2.3	Interface details and the security method	
SecurityNotification	8.5.4.2.5	Revoked authorization notification details	
ServiceSecurity	8.5.4.2.2	Details of the security method for each service API interface. When included by the API invoker, it shall indicate the preferred method of security. When included by the CAPIF core function, it shall indicate the security method to be used for the service API interface.	

Table 8.5.4.1-2 specifies data types re-used by the CAPIF_Security_API service based interface:

Table 8.5.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
DurationSec	3GPP TS 29.122 [14]	Duration in seconds	
SecurityMethod	Subclause 8.2.4.3.6	Security method (e.g. PKI)	
TestNotification	3GPP TS 29.122 [14]	Following differences apply: - The SCEF is the CAPIF core function; and - The SCS/AS is the Subscribing functional entity.	
Uri	3GPP TS 29.122 [14]		
WebsockNotifConfig	3GPP TS 29.122 [14]	Following differences apply: - The SCEF is the CAPIF core function; and - The SCS/AS is the Subscribing functional entity.	
SupportedFeatures	3GPP TS 29.571 [19]	Used to negotiate the applicability of optional features defined in table 8.5.6-1.	

8.5.4.2 Structured data types

8.5.4.2.1 Introduction

8.5.4.2.2 Type: ServiceSecurity

Table 8.5.4.2.2-1: Definition of type ServiceSecurity

Attribute name	Data type	P	Cardinality	Description	Applicability
securityInfo	array(SecurityInformation)	M	1..N	Security information for each API interface.	
notificationDestination	Uri	M	1	URI where the notification should be delivered to.	
requestTestNotification	boolean	O	0..1	Set to true by API invoker to request the CAPIF core function to send a test notification as defined in in subclause 7.6. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 7.6.	Notification_websocket
supportedFeatures	SupportedFeatures	O	0..1	Used to negotiate the supported optional features of the API as described in subclause 7.8. This attribute shall be provided in the HTTP POST request and in the response of successful resource creation.	

8.5.4.2.3 Type: SecurityInformation

Table 8.5.4.2.3-1: Definition of type SecurityInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
interfaceDetails	InterfaceDescription	O	1	Details of the interface (NOTE)	
aefId	string	O	0..1	AEF identifier (NOTE)	
prefSecurityMethods	array(SecurityMethod)	M	1..N	Security methods preferred by the API invoker for the API interface	
selSecurityMethod	SecurityMethod	O	0..1	Supplied by the CAPIF core function, it indicates the selected security method for the API interface. If it is not provided, it means no common supported security method by the API invoker and the AEF, or the selected security method is not allowed by the local policy in the CAPIF core function.	
authenticationInfo	string	O	0..1	Authentication related information	
authorizationInfo	string	O	0..1	Authorization related information	
NOTE: Only one of the attributes "aefId" or "interfaceDetails" shall be included.					

8.5.4.2.4   Void

8.5.4.2.5   Type: SecurityNotification

Table 8.5.4.2.5-1: Definition of type SecurityNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
apiInvokerId	string	M	1	String identifying the API invoker assigned by the CAPIF core function	
aefId	string	M	1	String identifying the AEF.	
apiId	string	M	1	Identifier of the service API	
cause	Cause	M	1	The cause for revoking the API invoker authorization to the service API	

8.5.4.2.6   Type: AccessTokenReq

Table 8.5.4.2.6-1: Definition of type AccessTokenReq

Attribute name	Data type	P	Cardinality	Description
grant_type	string	M	1	This IE shall contain the grant type as "client_credentials"
client_id	string	M	1	This IE shall contain the API invoker Identifier.
client_secret	string	O	0..1	This IE when present shall contain the onboarding secret which is got during API invoker onboarding.
scope	string	O	0..1	This IE when present shall contain a list of AEF identifiers and its associated API names for which the access_token is authorized for use. It takes the format of 3gpp#aefId1:apiName1,apiName2,…apiNameX;aefId2:apiName1,apiName2,…apiNameY;…aefIdN:apiName1,apiName2,…apiNameZ Using delimeter "#" after the discriminator "3gpp", ":" after AEF identifier, "," between API names and ";" between the last API name of the previous AEF identifier and the next AEF identifier. (NOTE 2) Example: '3gpp#aef-jiangsu-nanjing:3gpp-monitoring-event,3gpp-as-session-with-qos;aef-zhejiang-hangzhou:3gpp-cp-parameter-provisioning,3gpp-pfd-management'
NOTE 1: This data structure shall not be treated as a JSON object. It shall be treated as a key, value pair data structure to be encoded using x-www-urlencoded format as specified in subclause 17.13.4.1 of W3C HTML 4.01 Specification [22].				
NOTE 2: The scope may contain more space-delimited strings which further add additional access ranges to the scope, the definition of those additional strings is out of the scope of the present document.				

8.5.4.2.7 Type: AccessTokenRsp

Table 8.5.4.2.7-1: Definition of type AccessTokenRsp

Attribute name	Data type	P	Cardinality	Description
access_token	string	M	1	This IE shall contain JWS Compact Serialized representation of the JWS signed JSON object containing AccessTokenClaims (see subclause 8.5.4.2.c).
token_type	string	M	1	This IE shall contain the token type (i.e. "Bearer").
expires_in	DurationSec	M	1	This IE when present shall contain the number of seconds after which the access_token is considered to be expired.
scope	string	O	0..1	This IE when present shall contain a list of AEF identifiers and its associated API names for which the access_token is authorized for use. It takes the format of 3gpp#aefId1:apiName1,apiName2,…apiNameX;aefId2:apiName1,apiName2,…apiNameY;…aefIdN:apiName1,apiName2,…apiNameZ Using delimeter "#" after the discriminator "3gpp", ":" after AEF identifier, "," between API names and ";" between the last API name of the previous AEF identifier and the next AEF identifier. (NOTE) Example: '3gpp#aef-jiangsu-nanjing:3gpp-monitoring-event,3gpp-as-session-with-qos;aef-zhejiang-hangzhou:3gpp-cp-parameter-provisioning,3gpp-pfd-management'
NOTE: The scope may contain more space-delimited strings which further add additional access ranges to the scope, the definition of those additional strings is out of the scope of the present document.				

8.5.4.2.8 Type: AccessTokenClaims

Table 8.5.4.2.8-1: Definition of type AccessTokenClaims

Attribute name	Data type	P	Cardinality	Description
iss	string	M	1	This IE shall contain the API invoker Identifier.
scope	string	M	1	This IE shall contain a list of AEF identifiers and its associated API names for which the access_token is authorized for use. It takes the format of 3gpp#aefId1:apiName1,apiName2,…apiNameX;aefId2:apiName1,apiName2,…apiNameY;…aefIdN:apiName1,apiName2,…apiNameZ Using delimeter "#" after the discriminator "3gpp", ":" after AEF identifier, "," between API names and ";" between the last API name of the previous AEF identifier and the next AEF identifier. (NOTE) Example: '3gpp#aef-jiangsu-nanjing:3gpp-monitoring-event,3gpp-as-session-with-qos;aef-zhejiang-hangzhou:3gpp-cp-parameter-provisioning,3gpp-pfd-management'
exp	DurationSec	M	1	This IE shall contain the number of seconds after which the access_token is considered to be expired.
NOTE: The scope may contain more space-delimited strings which further add additional access ranges to the scope, the definition of those additional strings is out of the scope of the present document.				

8.5.4.3 Simple data types and enumerations

8.5.4.3.1 Introduction

This subclause defines simple data types and enumerations that can be referenced from data structures defined in the previous subclauses.

8.5.4.3.2 Simple data types

The simple data types defined in table 8.5.4.3.2-1 shall be supported.

Table 8.5.4.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
n/a			

8.5.4.3.3 Enumeration: Cause

Table 8.5.4.3.3-1: Enumeration Cause

Enumeration value	Description	Applicability
OVERLIMIT_USAGE	The revocation of the authorization of the API invoker is due to the overlimit usage of the service API	
UNEXPECTED_REASON	The revocation of the authorization of the API invoker is due to unexpected reason.	

8.5.5 Error Handling

General error responses are defined in subclause 7.7.

8.5.6 Feature negotiation

General feature negotiation procedures are defined in subclause 7.8. Table 8.5.6-1 lists the supported features for CAPIF_Security_API.

Table 8.5.6-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	Testing of notification connection is supported according to subclause 7.6.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 7.6. This feature requires that the Notification_test_event feature is also supported.

8.6 CAPIF_Access_Control_Policy_API

8.6.1 API URI

The CAPIF_Access_Control_Policy_API service shall use the CAPIF_Access_Control_Policy_API.

The request URIs used in HTTP requests from the API exposing function towards the CAPIF core function shall have the Resource URI structure as defined in subclause 7.5 with the following clarifications:

- The <apiName> shall be "access-control-policy".

- The <apiVersion> shall be "v1".

- The <apiSpecificSuffixes> shall be set as described in subclause 8.6.2.

8.6.2 Resources

8.6.2.1 Overview

This resource is created by the CAPIF administrator on the CAPIF core function.

NOTE: The details of the mechanisms used to create the Access Control Policy List resource on the CAPIF core function is out of the scope of the present document.

{apiRoot}/access-control-policy/{apiVersion}

/accessControlPolicyList

/{serviceApiId}
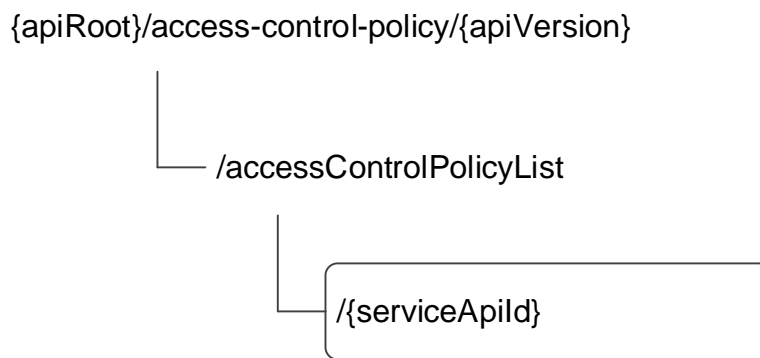
Figure 8.6.2.1-1: Resource URI structure of the CAPIF_Access_Control_Policy_API

Table 8.6.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 8.6.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Access Control Policy List	{apiRoot} /access-control-policy/{apiVersion} /accessControlPolicyList/{serviceApiId}	GET	Retrieves the access control policy list for a published service API.

8.6.2.2 Resource: Access Control Policy List

8.6.2.2.1 Description

The Access Control Policy List resource represents the access control information for all the service APIs per API invoker.

8.6.2.2.2 Resource Definition

Resource URI: **{apiRoot}/access-control-policy/{apiVersion}/accessControlPolicyList/{serviceApiId}**

This resource shall support the resource URI variables defined in table 8.6.2.2.2-1.

Table 8.6.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.6.1
serviceApiId	string	Identifies an individual published service API

8.6.2.2.3 Resource Standard Methods

8.6.2.2.3.1 GET

This method shall support the URI query parameters specified in table 8.6.2.2.3.1-1.

Table 8.6.2.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
aef-id	string	M	1	AEF identifier
api-invoker-id	string	O	1	String identifying the API invoker
supported-features	SupportedFeatures	O	0..1	To filter irrelevant responses related to unsupported features.

This method shall support the request data structures specified in table 8.6.2.2.3.1-2 and the response data structures and response codes specified in table 8.6.2.2.3.1-3.

Table 8.6.2.2.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.6.2.2.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AccessControlPolicyList	M	1	200 OK	List of the access control policy applicable for the service API requested.

8.6.2.2.4 Resource Custom Operations

None.

8.6.3 Notifications

None.

8.6.4 Data Model

8.6.4.1 General

This subclause specifies the application data model supported by the API. Data types listed in subclause 7.2 apply to this API.

Table 8.6.4.1-1 specifies the data types defined specifically for the CAPIF_Access_Control_Policy_API service.

ETSI

Table 8.6.4.1-1: CAPIF_Access_Control_Policy_API specific Data Types

Data type	Section defined	Description	Applicability
AccessControlPolicyList	8.6.4.2.2	Access control policy list	

Table 8.6.4.1-2 specifies data types re-used by the CAPIF_Access_Control_Policy_API service.

Table 8.6.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
n/a			

8.6.4.2 Structured data types

8.6.4.2.1 Introduction

This subclause defines data structures to be used in resource representations.

8.6.4.2.2 Type: AccessControlPolicyList

Table 8.6.4.2.2-1: Definition of type AccessControlPolicyList

Attribute name	Data type	P	Cardinality	Description	Applicability
apiInvokerPolicies	array(ApiInvokerPolicy)	O	0..N	Policy of each API invoker.	

8.6.4.2.3 Type: ApiInvokerPolicy

Table 8.6.4.2.3-1: Definition of type ApiInvokerPolicy

Attribute name	Data type	P	Cardinality	Description	Applicability
apiInvokerId	string	M	1	API invoker ID assigned by the CAPIF core function	
allowedTotalInvocations	integer	O	0..1	Total number of invocations allowed on the service API by the API invoker.	
allowedInvocationsPerSecond	integer	O	0..1	Invocations per second allowed on the service API by the API invoker.	
allowedInvocationTimeRangeList	array(TimeRangeList)	O	1..N	The time ranges during which the invocations are allowed on the service API by the API invoker.	

8.6.4.2.4 Type: TimeRangeList

Table 8.6.4.2.4-1: Definition of type TimeRangeList

Attribute name	Data type	P	Cardinality	Description	Applicability
startTime	DateTime	M	1	The start time for the invocations to be allowed on the service API by the API invoker.	
endTime	DateTime	M	1	The end time for the invocations to be allowed on the service API by the API invoker.	

8.6.4.3 Simple data types and enumerations

None.

8.6.5 Error Handling

General error responses are defined in subclause 7.7.

8.6.6 Feature negotiation

General feature negotiation procedures are defined in subclause 7.8.

Table 8.6.8-1: Supported Features

Feature number	Feature Name	Description
n/a		

8.7 CAPIF_Logging_API_Invocation_API

8.7.1 API URI

The CAPIF_Logging_API_Invocation_API service shall use the CAPIF_Logging_API_Invocation_API.

The request URIs used in HTTP requests from the API exposing function towards the CAPIF core function shall have the Resource URI structure as defined in subclause 7.5 with the following clarifications:

- The <apiName> shall be "api-invocation-logs".

- The <apiVersion> shall be "v1".

- The <apiSpecificSuffixes> shall be set as described in subclause 8.7.2

8.7.2   Resources

8.7.2.1   Overview
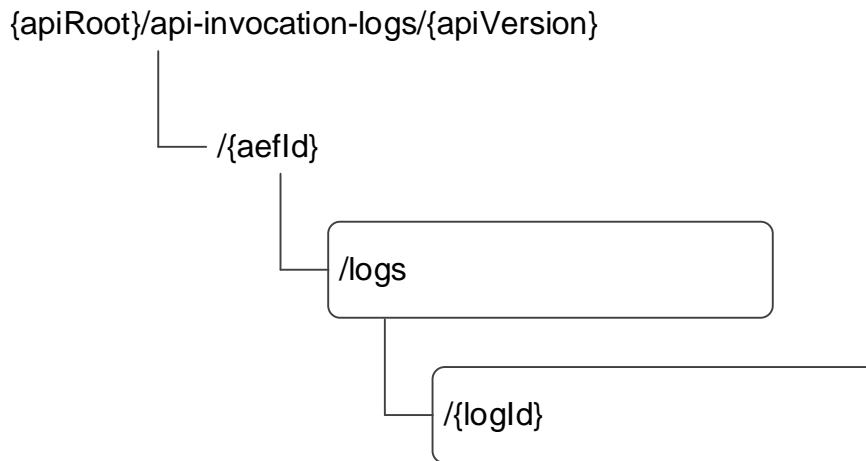
Figure 8.7.2.1-1: Resource URI structure of the CAPIF_Logging_API_Invocation_API

Table 8.7.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 8.7.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Logs	{apiRoot} /api-invocation-logs/{apiVersion} /{aefId}/logs	POST	Creates a new log entry for service API invocations
Individual log	{apiRoot} /api-invocation-logs/{apiVersion} /{aefId}/logs/{logId}	n/a	Individual log entry

8.7.2.2   Resource: Logs

8.7.2.2.1   Description

The Logs resource represents all the log entries created by a API exposing function at CAPIF core function.

8.7.2.2.2   Resource Definition

Resource URI: **{apiRoot}/api-invocation-logs/{apiVersion}/{aefId}/logs**

This resource shall support the resource URI variables defined in table 8.7.2.2.2-1.

Table 8.7.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.7.1
aefId	string	Identifies of the API exposing function

8.7.2.2.3 Resource Standard Methods

8.7.2.2.3.1 POST

This method shall support the URI query parameters specified in table 8.7.2.2.3.1-1.

Table 8.7.2.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.7.2.2.3.1-2 and the response data structures and response codes specified in table 8.7.2.2.3.1-3.

Table 8.7.2.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
InvocationLogs	M	201 Created	Log of service API invocations provided by API exposing function to store on the CAPIF core function.

Table 8.7.2.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
InvocationLogs	M	1	201 Created	Log of service API invocations provided by API exposing function successfully stored on the CAPIF core function. The URI of the created resource shall be returned in the "Location" HTTP header.

Table 8.7.2.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/api-invocation-logs/v1/{aefId}/logs/{logId}

8.7.2.2.4 Resource Custom Operations

None.

8.7.3 Notifications

None.

8.7.4 Data Model

8.7.4.1 General

This subclause specifies the application data model supported by the API.

Table 8.7.4.1-1 specifies the data types defined for the CAPIF service based interface protocol.

Table 8.7.4.1-1: Specific Data Types

Data type	Section defined	Description	Applicability
InvocationLog	8.7.4.2.2	Set of Service API invocation logs to be stored on CAPIF core function	
Log	8.7.4.2.3	Individual log entries	

Table 8.7.4.1-2 specifies data types re-used by the CAPIF_Logging_API_Invocation_API service:

Table 8.7.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
DateTime	3GPP TS 29.122 [14]		
InterfaceDescription	Subclause 8.2.4.2.3	Details of the interface	
SupportedFeatures	3GPP TS 29.571 [19]	Used to negotiate the applicability of optional features defined in table 8.7.6-1.	
Operation	Subclause 8.2.4.3.7	HTTP operation	
Protocol	Subclause 8.2.4.3.3	API protocol	
Uri	3GPP TS 29.122 [14]		

8.7.4.2 Structured data types

8.7.4.2.1 Introduction

8.7.4.2.2 Type: InvocationLog

Table 8.7.4.2.2-1: Definition of type InvocationLog

Attribute name	Data type	P	Cardinality	Description	Applicability
aefId	string	M	1	Identity information of the API exposing function requesting logging of service API invocations	
apiInvokerId	string	M	1	Identity of the API invoker which invoked the service API	
logs	array(Log)	M	1..N	Service API invocation log	
supportedFeatures	SupportedFeatures	O	0..1	Used to negotiate the supported optional features of the API as described in subclause 7.8. This attribute shall be provided in the HTTP POST request and in the response of successful resource creation.	

8.7.4.2.3 Type: Log

Table 8.7.4.2.3-1: Definition of type Log

Attribute name	Data type	P	Cardinality	Description	Applicability
apiId	string	M	1	String identifying the API invoked.	
apiName	string	M	1	Name of the API which was invoked, it is set as {apiName} part of the URI structure as defined in subclause 4.4 of 3GPP TS 29.501 [18].	
apiVersion	string	M	1	Version of the API which was invoked	
resourceName	String	M	1	Name of the specific resource invoked	
uri	Uri	M	1	Full URI of the API resource as defined in subclause 4.4 of 3GPP TS 29.501 [18].	
protocol	Protocol	M	1	Protocol invoked.	
operation	Operation	C	0..1	Operation that was invoked on the API, only applicable for HTTP protocol.	
result	string	M	1	For HTTP protocol, it contains HTTP status code of the invocation	
invocationTime	DateTime	O	0..1	Date on which it was invoked	
invocationLatency	DurationMs	O	0..1	Latency for the API invocation.	
inputParameters	ANY TYPE (NOTE)	O	0..1	List of input parameters	
OutputParameters	ANY TYPE (NOTE)	O	0..1	List of output parameters	
srcInterface	InterfaceDescription	O	0..1	Interface description of the API invoker.	
destInterface	InterfaceDescription	O	0..1	Interface description of the API invoked.	
fwdInterface	string	O	0..1	It includes the node identifier (as defined in IETF RFC 7239 [20] of all forwarding entities between the API invoker and the AEF, concatenated with comma and space, e.g. 192.0.2.43:80, unknown:_OBFport, 203.0.113.60	
NOTE: Any basic data type defined in OpenAPI 3.0.0 Specification [3] may be used.					

8.7.4.3 Simple data types and enumerations

8.7.4.3.1 Introduction

This subclause defines simple data types and enumerations that can be referenced from data structures defined in the previous subclauses.

8.7.4.3.2 Simple data types

The simple data types defined in table 8.7.4.3.2-1 shall be supported.

Table 8.7.4.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
DurationMs	integer	Unsigned integer identifying a period of time in units of milliseconds.	

8.7.5 Error Handling

General error responses are defined in subclause 7.7.

8.7.6 Feature negotiation

Table 8.7.8-1: Supported Features

Feature number	Feature Name	Description
n/a		

8.8 CAPIF_Auditing_API

8.8.1 API URI

The CAPIF_Auditing_API service shall use the CAPIF_Auditing_API.

The request URIs used in HTTP requests from the API management function towards the CAPIF core function shall have the Resource URI structure as defined in subclause 7.5 with the following clarifications:

- The <apiName> shall be "logs".

- The <apiVersion> shall be "v1".

- The <apiSpecificSuffixes> shall be set as described in subclause 8.8.2.

8.8.2 Resources

8.8.2.1 Overview

{apiRoot}/logs/{apiVersion}

/apiInvocationLogs
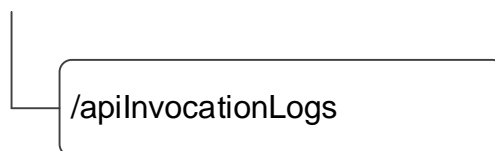
Figure 8.8.2.1-1: Resource URI structure of the CAPIF_Auditing_API

Table 8.8.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 8.8.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
All service API invocation logs (Store)	{apiRoot} /logs/{apiVersion}/apiInvocationLogs	GET	Query and retrieve service API invocation logs stored on the CAPIF core function

8.8.2.2 Resource: All service API invocation logs

8.8.2.2.1 Description

The All service API invocation logs resource represents a collection of service API invocation logs stored on the CAPIF core function. The resource is modelled as a Store resource archetype (see annex C.3 of 3GPP TS 29.501 [18])

8.8.2.2.2 Resource Definition

Resource URI: **{apiRoot}/logs/{apiVersion}/apiInvocationLogs**

This resource shall support the resource URI variables defined in table 8.8.2.2.2-1.

Table 8.8.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.8.1

8.8.2.2.3 Resource Standard Methods

8.8.2.2.3.1 GET

This method shall support the URI query parameters specified in table 8.8.2.2.3.1-1.

Table 8.8.2.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
aef-id	string	O	0..1	String identifying the API exposing function
api-invoker-id	string	O	0..1	String identifying the API invoker which invoked the service API
time-range-start	DateTime	O	0..1	Start time of the invocation time range
time-range-end	DateTime	O	0..1	End time of the invocation time range
apiid	string	O	0..1	String identifying the API invoked.
api-name	string	O	0..1	API name, it is set as {apiName} part of the URI structure as defined in subclause 4.4 of 3GPP TS 29.501 [18].
api-version	string	O	0..1	Version of the API which was invoked
protocol	Protocol	O	0..1	Protocol invoked
operation	Operation	O	0..1	Operation that was invoked on the API
result	string	O	0..1	HTTP status code of the invocation
resource-name	string	O	0..1	Name of the specific resource invoked
src-interface	InterfaceDescription	O	0..1	Interface description of the API invoker.
dest-interface	InterfaceDescription	O	0..1	Interface description of the API invoked.
supported-features	SupportedFeatures	O	0..1	To filter irrelevant responses related to unsupported features.

This method shall support the request data structures specified in table 8.8.2.2.3.1-2 and the response data structures and response codes specified in table 8.8.2.2.3.1-3.

Table 8.8.2.2.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.8.2.2.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(InvocationLog)	O	1..N	200 OK	Result of the query operation along with fetched service API invocation log data.
ProblemDetails	O	0..1	414 URI Too Long	Indicates that the server is refusing to service the request because the request-target is too long.

8.8.2.2.4   Resource Custom Operations

None.

8.8.3   Notifications

None.

8.8.4   Data Model

8.8.4.1   General

This subclause specifies the application data model supported by the API.

Table 8.8.4.1-1 specifies the data types defined for the CAPIF service based interface protocol.

Table 8.8.4.1-1: Specific Data Types

Data type	Section defined	Description	Applicability
n/a			

Table 8.8.4.1-2 specifies data types re-used by the CAPIF_Auditing_API service:

Table 8.8.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
DateTime	3GPP TS 29.122 [14]		
InterfaceDescription	Subclause 8.2.4.2.3	Interface description	
InvocationLog	Subclause 8.7.4.2.2	Logs of service API invocations stored on the CAPIF core function.	
Operation	Subclause 8.2.4.3.7	HTTP operation	
ProblemDetails	3GPP TS 29.122 [14]		
Protocol	Subclause 8.2.4.3.3	API protocol	

8.8.4.2   Structured data types

None.

8.8.4.3   Simple data types and enumerations

None.

8.8.5 Error Handling

General error responses are defined in subclause 7.7.

8.8.6 Feature negotiation

General feature negotiation procedures are defined in subclause 7.8.

Table 8.8.6-1: Supported Features

Feature number	Feature Name	Description
n/a		

8.9 CAPIF_API_Provider_Management_API

8.9.1 API URI

The CAPIF_API_Provider_Management_API service shall use the CAPIF_API_Provider_Management_API.

The request URIs used in HTTP requests from the API management function towards the CAPIF core function shall have the Resource URI structure as defined in subclause 7.5 with the following clarifications:

- The <apiName> shall be "api-provider-management".

- The <apiVersion> shall be "v1".

- The <apiSpecificSuffixes> shall be set as described in clause 8.9.2.

8.9.2 Resources

8.9.2.1 Overview

{apiRoot}/api-provider-management/{apiVersion}

/registrations

/{registrationId}
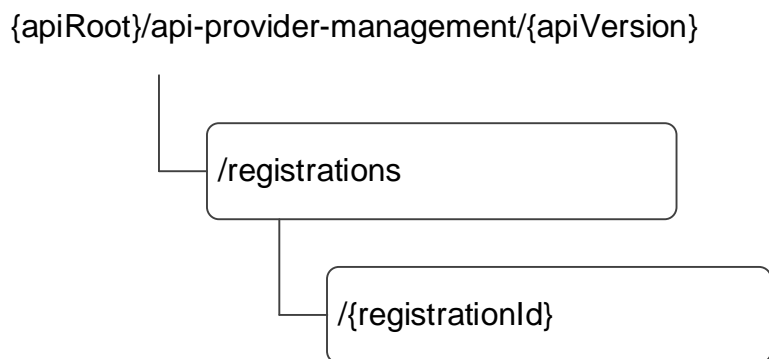
Figure 8.9.2.1-1: Resource URI structure of the CAPIF_API_Provider_Management_API

Table 8.9.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 8.9.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
All API Provider Domains Registrations	{apiRoot} /api-provider-management/{apiVersion} /registrations	POST	Registers new API provider domain by creating API provider domain with API provider domain functions profiles.
Individual API Provider Domain Registration	{apiRoot} /api-provider-management/{apiVersion} /registrations/{registrationId}	PUT	Updates an individual API provider domain identified by {registrationId}
		DELETE	Deregisters API provider domain by deleting API provider domain and functions, identified by {registrationId}.

8.9.2.2 Resource: All API Provider Domains Registrations

8.9.2.2.1 Description

The All API provider domains registrations resource represents all the API provider domains that are registered at a given CAPIF core function.

8.9.2.2.2 Resource Definition

Resource URI: **{apiRoot}/api-provider-management/{apiVersion}/registrations**

This resource shall support the resource URI variables defined in table 8.9.2.2.2-1.

Table 8.9.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.9.1

8.9.2.2.3 Resource Standard Methods

8.9.2.2.3.1 POST

This method shall support the URI query parameters specified in table 8.9.2.2.3.1-1.

Table 8.9.2.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 8.9.2.2.3.1-2 and the response data structures and response codes specified in table 8.9.2.2.3.1-3.

Table 8.9.2.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
APIProviderEnrolmentDetails	M	1	Enrolment details of the API provider domain including individual API provider domain function details.

Table 8.9.2.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
APIProviderEnrolmentDetails	M	1	201 Created	API provider domain registered successfully The URI of the created resource shall be returned in the "Location" HTTP header. The list of successfully registered individual API provider domain functions, registration specific failure information of failed API provider domain function registrations, are included in APIProviderEnrolmentDetails which is provided in the response body.

Table 8.9.2.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/api-provider-management/v1/registrations/{registrationId}

8.9.2.2.4   Resource Custom Operations

None.

8.9.2.3   Resource: Individual API Provider Domain Registration

8.9.2.3.1   Description

The Individual API Provide Domain Registration resource represents an individual API provider domain that is registered at a given CAPIF core function.

8.9.2.3.2   Resource Definition

Resource URI: **{apiRoot}/api-provider-management/{apiVersion}/registrations/{registrationId}**

This resource shall support the resource URI variables defined in table 8.9.2.3.2-1.

Table 8.9.2.3.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.5
apiVersion		See clause 8.9.1
registrationId	string	Identifies an individual registered API Provider domain resource

8.9.2.3.3   Resource Standard Methods

8.9.2.3.3.1   PUT

The PUT method allows updating the registered API provider domain's detail. The properties "apiProviderDomainId", and "supportedFeatures" shall remain unchanged from previously provided values. This method shall support the URI query parameters specified in table 8.9.2.3.3.1-1.

Table 8.9.2.3.3.1-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in the table 8.9.2.3.3.1-2 and the response data structures and response codes specified in the table 8.9.2.3.3.1-3.

Table 8.9.2.3.3.1-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
APIProviderEnrolmentDetails	M	1	Updated details of the API provider domain.

Table 8.9.2.3.3.1-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
APIProviderEnrolmentDetails	M	1	200 OK	API provider domain's information updated successfully. Updated details of the API provider domain is part of the APIProviderEnrolmentDetails, which is provided in the response body. The list of successfully updated individual API provider domain functions, registration update specific failure information of failed API provider domain function registration updates, are included in APIProviderEnrolmentDetails which is provided in the response body.

8.9.2.3.3.2 DELETE

This method shall support the URI query parameters specified in table 8.9.2.3.3.2-1.

Table 8.9.2.3.3.2-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the response codes specified in table 8.9.2.3.3.2-2 and the response data structures and response codes specified in table 8.9.2.3.3.2-3.

Table 8.9.2.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.9.2.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The individual registered API provider domain matching the registrationId is deleted. All the individual API provider domain functions of the API provider domain are deleted.

8.9.2.3.4 Resource Custom Operations

None.

8.9.3 Notifications

None.

8.9.4 Data Model

8.9.4.1 General

This clause specifies the application data model supported by the API. Data types listed in clause 7.2 apply to this API.

Table 8.9.4.1-1 specifies the data types defined specifically for the CAPIF_API_Provider_Management_API service.

Table 8.9.4.1-1: CAPIF_API_Provider_Management_API specific Data Types

Data type	Section defined	Description	Applicability
APIProviderEnrolmentDetails	8.9.4.2.2	API provider domain's enrolment details.	
APIProviderFunctionDetails	8.9.4.2.3	API Provider domain function's details.	
RegistrationInformation	8.9.4.2.4	Registration information of the individual API provider domain function.	

Table 8.9.4.1-2 specifies data types re-used by the CAPIF_API_Provider_Management_API service.

Table 8.9.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
SupportedFeatures	3GPP TS 29.571 [19]	Used to negotiate the applicability of optional features defined in table 8.4.6-1.	

8.9.4.2 Structured data types

8.9.4.2.1 Introduction

8.9.4.2.2 Type: APIProviderEnrolmentDetails

Table 8.9.4.2.2-1: Definition of type APIProviderEnrolmentDetails

Attribute name	Data type	P	Cardinality	Description	Applicability
apiProvDomId	string	O	0..1	API provider domain ID assigned by the CAPIF core function to the API management function while registering the API provider domain. Shall not be present in the HTTP POST request from the API management function to the CAPIF core function, to on-board itself. Shall be present in all other HTTP requests and responses.	
regSec	string	M	1	Security information necessary for the CAPIF core function to validate the registration of the API provider domain. Shall be present in HTTP POST request from API management function to CAPIF core function for API provider domain registration.	
apiProvFuncs	array(APIProviderFunctionDetails)	O	1..N	A list of individual API provider domain functions details. When included by the API management function in the HTTP request message, it lists the API provider domain functions that the API management function intends to register/update in registration or update registration procedure. When included by the CAPIF core function in the HTTP response message, it lists the API domain functions details that are registered or updated successfully.	
apiProvDomInfo	string	O	0..1	Generic information related to the API provider domain such as details of the API provider applications.	
suppFeat	Supported Features	O	0..1	Used to negotiate the supported optional features of the API as described in subclause 7.8. This attribute shall be provided in the HTTP POST request and in the response of successful resource creation.	
failReason	string	O	0..1	Registration or update specific failure information of failed API provider domain function registrations. Shall be present in the HTTP response body if atleast one of the API provider domain function registration or update registration fails.	

8.9.4.2.3 Type: APIProviderFunctionDetails

Table 8.9.4.2.3-1: Definition of type APIProviderFunctionDetails

Attribute name	Data type	P	Cardinality	Description	Applicability
apiProvFuncId	string	O	0..1	API provider domain functionID assigned by the CAPIF core function to the API provider domain function while registering/updating the API provider domain. Shall not be present in the HTTP POST request from the API management function to the CAPIF core function, to register itself. Shall be present in all other HTTP requests and responses.	
regInfo	Registration Information	M	1	Information necessary for the CAPIF core function to register the API provider domain function. This information shall be present in HTTP POST/PUT request from API management function to CAPIF core function for API provider domain registration. In the HTTP response message from CAPIF core function, shall include the updated registration information for API provider domain function.	
apiProvFuncRole	ApiProviderFuncRole	M	1	Role of API provider domain function. The role shall be present in the HTTP POST/PUT request that the API management function intends to register/update the API provider domain function as. CAPIF core function shall register the role of API provider domain function as per the request.	
apiProvFuncInfo	string	O	0..1	Generic information related to the API provider domain function such as details of the API provider applications.	

8.9.4.2.4 Type: RegistrationInformation

Table 8.9.4.2.4-1: Definition of type RegistrationInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
apiProvPubKey	string	M	1	Public Key of API Provider domain function.	
apiProvCert	string	O	0..1	API provider domain function's generic client certificate	

8.9.4.3 Simple data types and enumerations

8.9.4.3.1 Introduction

This subclause defines simple data types and enumerations that will be referenced from data structures defined in the previous subclauses.

8.9.4.3.2 Simple data types

The simple data types defined in table 8.9.4.3.2-1 shall be supported.

Table 8.9.4.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
n/a			

8.9.4.3.3 Enumeration: ApiProviderFuncRole

Table 8.9.4.3.3-1: Enumeration ApiProviderFuncRole

Enumeration value	Description	Applicability
AEF	API provider function is API Exposing Function.	
APF	API provider function is API Publishing Function.	
AMF	API provider function is API Management Function.	

8.9.5 Error Handling

General error responses are defined in clause 7.7 of this specification.

8.9.6 Feature negotiation

General feature negotiation procedures are defined in clause 7.8 of this specification.

8.10 CAPIF_Routing_Info_API

8.10.1 API URI

The CAPIF_Routing_Info_API service shall use the CAPIF_Routing_Info_API.

The request URIs used in HTTP requests from the API exposing function towards the CAPIF core function shall have the Resource URI structure as defined in subclause 7.5 with the following clarifications:

- The <apiName> shall be "capif-routing-info".

- The <apiVersion> shall be "v1".

- The <apiSpecificSuffixes> shall be set as described in subclause 8.x.2.

8.10.2 Resources

8.10.2.1 Overview

{apiRoot}/capif-routing-info/<apiVersion>

    /service-apis

       /{serviceApiId}
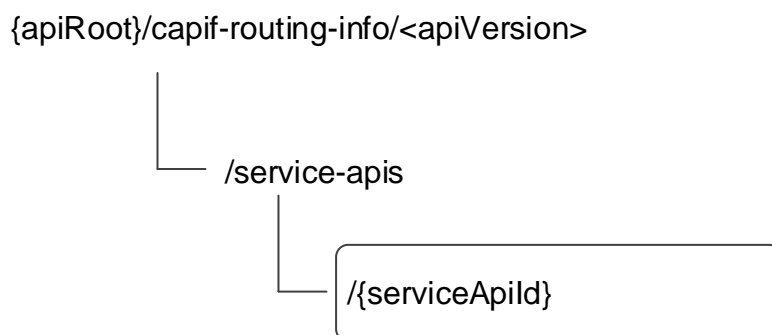
Figure 8.10.2.1-1: Resource URI structure of the CAPIF_Routing_Info_API

Table 8.10.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 8.10.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Individual Service API routing info	{apiRoot} /routing-info/<apiVersion> /service-apis/{serviceApiId}	GET	Retrieves the API routing information for a published service API and API exposing function which applies the topology hiding.

8.10.2.2 Resource: Individual Service API routing info

8.10.2.2.1 Description

The API Routing Information resource represents the API routing information for the service API per API Exposing Function.

8.10.2.2.2 Resource Definition

Resource URI: **{apiRoot}/routing-info/<apiVersion>/service-apis/{serviceApiId}**

This resource shall support the resource URI variables defined in table 8.10.2.2.2-1.

Table 8.10.2.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See subclause 7.5
apiVersion	string	See subclause 8.10.1
serviceApiId	string	Identifies an individual published service API

8.10.2.2.3 Resource Standard Methods

8.10.2.2.3.1 GET

This method shall support the URI query parameters specified in table 8.10.2.2.3.1-1.

Table 8.10.2.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
aef-id	string	M	1	AEF identifier
supp-feat	SupportedFeatures	O	0..1	To filter irrelevant responses related to unsupported features.

This method shall support the request data structures specified in table 8.10.2.2.3.1-2 and the response data structures and response codes specified in table 8.10.2.2.3.1-3.

Table 8.10.2.2.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 8.10.2.2.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response Codes	Description
RoutingInfo	M	1	200 OK	The Routing information applicable for the service API requested.

8.10.2.2.4 Resource Custom Operations

None.

8.10.3 Notifications

None.

8.10.4 Data Model

8.10.4.1 General

This subclause specifies the application data model supported by the API. Data types listed in subclause 7.2 apply to this API.

Table 8.10.4.1-1 specifies the data types defined specifically for the CAPIF_Routing_Info_API service.

Table 8.10.4.1-1: CAPIF_Routing_Info_API specific Data Types

Data type	Section defined	Description	Applicability
RoutingInfo	8.10.4.2.2	API routing information	
RoutingRule	8.10.4.2.3	API routing rule	
Ipv6AddressRange	8.10.4.2.4	IP address range	

Table 8.10.4.1-2 specifies data types re-used by the CAPIF_Routing_Info_API service.

Table 8.10.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
Ipv4AddressRange	3GPP TS 29.510 [28]		
Ipv6Addr	3GPP TS 29.122 [14]		
SupportedFeatures	3GPP TS 29.571 [19]		

8.10.4.2 Structured data types

8.10.4.2.1 Introduction

This subclause defines data structures to be used in resource representations.

8.10.4.2.2 Type: RoutingInfo

Table 8.10.4.2.2-1: Definition of type RoutingInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
routingRules	array(RoutingRule)	M	1..N	Routing rules	

8.10.4.2.3   Type: RoutingRule

Table 8.10.4.2.3-1: Definition of type RoutingRule

Attribute name	Data type	P	Cardinality	Description	Applicability
ipv4AddrRanges	array(Ipv4AddressRange)	O	1..N	The IPv4 address range for the API invocation source IP address. (NOTE)	
ipv6AddrRanges	array(Ipv6AddressRange)	O	1..N	The IPv6 address range for the API invocation source IP address. (NOTE)	
aefProfile	AefProfile	M	1	The target AEF profile	
NOTE:	If no IP address range is provided, it means the service API invocation from any source IP address can be routed to the target AEF.				

8.10.4.2.4   Type: Ipv6AddressRange

Table 8.10.4.2.4-1: Definition of type Ipv6AddressRange

Attribute name	Data type	P	Cardinality	Description	Applicability
start	Ipv6Addr	M	1	First value identifying the start of an IPv6 address range	
end	Ipv6Addr	M	1	Last value identifying the end of an IPv6 address range	

8.10.4.3   Simple data types and enumerations

None.

8.10.5   Error Handling

General error responses are defined in subclause 7.7.

8.10.6   Feature negotiation

General feature negotiation procedures are defined in subclause 7.8.

Table 8.10.6-1: Supported Features

Feature number	Feature Name	Description
n/a		

9   AEF API Definition

9.1   AEF_Security_API

9.1.1   API URI

The AEF_Security_API service shall use the AEF_Security_API.

The request URIs used in HTTP requests from the API invoker towards the API exposing function shall have the Resource URI structure as defined in subclause 7.5 with the following clarifications:

-    The <apiName> shall be "aef-security".

-    The <apiVersion> shall be "v1".

- The <custOpName> shall be set as described in subclause 9.1.2a.

9.1.2 Resources

There is no resource defined for this API.

9.1.2.2.4 Resource Custom Operations

None.

9.1.2a Custom Operations without associated resources

9.1.2a.1 Overview

Custom operations used for this API are summarized in table 9.1.2a.1-1. "{apiRoot}" and "{apiVersion}" are set as described in clause 7.5 and clause 9.1.1 respectively.

Table 9.1.2a.1-1: Custom operations without associated resources

Operation name	Custom operation URI	Mapped HTTP method	Description
check-authentication	{apiRoot}/aef-security/{apiVersion}/check-authentication	POST	Check authentication request.
revoke-authentication	{apiRoot}/aef-security/{apiVersion}/revoke-authorization	POST	Revoke authorization for service APIs.

9.1.2a.2 Operation: check-authentication

9.1.2a.2.1 Description

This custom operation allows the API invoker to confirm from the API exposing function, that necessary authentication data is available to authenticate the API invoker on API invocation.

9.1.2a.2.2 Operation Definition

This method shall support the URI query parameters specified in table 9.1.2a.2.2-1.

Table 9.1.2a.2.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This operation shall support the request and response data structures, and response codes specified in tables 9.1.2a.2.2-2 and 9.1.2a.2.2-3.

Table 9.1.2a.2.2-2: Data structures supported by the POST Request Body on this operation

Data type	P	Cardinality	Description
CheckAuthenticationReq	M	1	Authentication check request data

Table 9.1.2a.2.2-3: Data structures supported by the POST Response Body on this operation

Data type	P	Cardinality	Response codes	Description
CheckAuthenticationRsp	M	1	200 OK	The request was successful.

9.1.2a.3   Operation: revoke-authorization

9.1.2a.3.1   Description

This custom operation allows the CAPIF core function to request the API exposing function to revoke the authorization of the API invoker for the indicated service APIs.

9.1.2a.3.2   Operation Definition

This method shall support the URI query parameters specified in table 9.1.2a.3.2-1.

Table 9.1.2a.3.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This operation shall support the request and response data structures, and response codes specified in tables 9.1.2a.2.3-2 and 9.1.2a.2.3-3.

Table 9.1.2a.2.3-2: Data structures supported by the POST Request Body on this operation

Data type	P	Cardinality	Description
RevokeAuthorizationReq	M	1	Authorization revocation request data

Table 9.1.2a.2.3-3: Data structures supported by the POST Response Body on this operation

Data type	P	Cardinality	Response codes	Description
RevokeAuthorizationRsp	M	1	200 OK	The request was successful.

9.1.3   Notifications

None.

9.1.4   Data Model

9.1.4.1   General

This subclause specifies the application data model supported by the API. Data types listed in subclause 7.2 apply to this API.

Table 9.1.4.1-1 specifies the data types defined specifically for the AEF_Security_API service.

Table 9.1.4.1-1: AEF_Security_API specific Data Types

Data type	Section defined	Description	Applicability
CheckAuthenticationReq	Subclause 9.1.4.2.2	Authentication check request data	
CheckAuthenticationRsp	Subclause 9.1.4.2.3	Authentication check response data	
RevokeAuthorizationReq	Subclause 9.1.4.2.4	Authorization revocation request data	
RevokeAuthorizationRsp	Subclause 9.1.4.2.5	Authorization revocation response data	

Table 9.1.4.1-2 specifies data types re-used by the AEF_Security_API service.

Table 9.1.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
SecurityNotification	Subclause 8.5.4.2.5	Information about the revoked APIs	
SupportedFeatures	3GPP TS 29.571 [19]	Used to negotiate the applicability of optional features defined in table 9.1.6-1.	

9.1.4.2 Structured data types

9.1.4.2.1 Introduction

This subclause defines the structures to be used in resource representations.

9.1.4.2.2 Type: CheckAuthenticationReq

Table 9.1.4.2.2-1: Definition of type CheckAuthenticationReq

Attribute name	Data type	P	Cardinality	Description	Applicability
apiInvokerId	string	M	1	API invoker ID assigned by the CAPIF core function to the API invoker while on-boarding the API invoker.	
supportedFeatures	Supported Features	M	1	Used to negotiate the supported optional features of the API as described in subclause 7.8.	

9.1.4.2.3 Type: CheckAuthenticationRsp

Table 9.1.4.2.3-1: Definition of type CheckAuthenticationRsp

Attribute name	Data type	P	Cardinality	Description	Applicability
supportedFeatures	Supported Features	M	1	Used to negotiate the supported optional features of the API as described in subclause 7.8.	

9.1.4.2.4   Type: RevokeAuthorizationReq

Table 9.1.4.2.4-1: Definition of type RevokeAuthorizationReq

Attribute name	Data type	P	Cardinality	Description	Applicability
revokeInfo	SecurityNotification	M	1	It contains detailed revocation information.	
supportedFeatures	SupportedFeatures	M	1	Used to negotiate the supported optional features of the API as described in subclause 7.8.	

9.1.4.2.5   Type: RevokeAuthorizationRsp

Table 9.1.4.2.5-1: Definition of type RevokeAuthorizationRsp

Attribute name	Data type	P	Cardinality	Description	Applicability
supportedFeatures	SupportedFeatures	M	1	Used to negotiate the supported optional features of the API as described in subclause 7.8.	

9.1.4.3   Simple data types and enumerations

None.

9.1.5   Error Handling

General error responses are defined in the service API specification using CAPIF.

9.1.6   Feature negotiation

General feature negotiation procedures are defined in the service API specification using CAPIF.

Table 9.1.6-1: Supported Features

Feature number	Feature Name	Description
n/a		

10   Security

10.1   General

Security methods for CAPIF are specified in 3GPP TS 33.122 [16].

10.2   CAPIF-1/1e security

Secure communication between API invoker and CAPIF core function over CAPIF-1/1e reference points, using a TLS protocol based connection is defined in 3GPP TS 33.122 [16].

For Onboard_API_Invoker service operation of the CAPIF_API_Invoker_Management_API, the TLS protocol based connection shall be established using server certificate as defined in 3GPP TS 33.122 [16].

For rest of the CAPIF APIs, the TLS protocol based connection shall be established with certificate based mutual authentication as defined in 3GPP TS 33.122 [16].

10.3 CAPIF-2/2e security and securely invoking service APIs

For secure communication between API invoker and API exposing function and ensuring secure invocations of service APIs, the API invoker:

- shall negotiate the security method with the CAPIF core function using the Obtain_Security_Method service operation of the CAPIF_Security_API;

- shall initiate the authentication with the API exposing function using the Initiate_Authentication service operation of the AEF_Security_API; and

- shall establish a secure connection with the API exposing function as defined in 3GPP TS 33.122 [16], using the method negotiated with the CAPIF core function.

Annex A (normative): OpenAPI specification

A.1   General

This Annex is based on the OpenAPI 3.0.0 specification [3] and provides corresponding representations of all APIs defined in the present specification, in YAML format.

This Annex shall take precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API.

NOTE: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification file contained in this 3GPP Technical Specification are available on a Git-based repository hosted in ETSI Forge, that uses the GitLab software version control system (see clause 5B of the 3GPP TR 21.900 [27] and clause 5.3.1 of the 3GPP TS 29.501 [18] for further information).

A.2   CAPIF_Discover_Service_API

```
openapi: 3.0.0
info:
  title: CAPIF_Discover_Service_API
  description: |
    API for discovering service APIs.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.1.0"
externalDocs:
  description: 3GPP TS 29.222 V16.3.0 Common API Framework for 3GPP Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.222/
servers:
  - url: '{apiRoot}/service-apis/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 7.5 of 3GPP TS 29.222.
paths:
  /allServiceAPIs:
    get:
      description: Discover published service APIs and retrieve a collection of APIs according to
certain filter criteria.
      parameters:
        - name: api-invoker-id
          in: query
          description: String identifying the API invoker assigned by the CAPIF core function. It
also represents the CCF identifier in the CAPIF-6/6e interface.
          required: true
          schema:
            type: string
        - name: api-name
          in: query
          description: API name, it is set as {apiName} part of the URI structure as defined in
subclause 4.4 of 3GPP TS 29.501 [18].
          schema:
            type: string
        - name: api-version
          in: query
          description: API major version the URI (e.g. v1).
          schema:
            type: string
        - name: comm-type
          in: query
          description: Communication type used by the API (e.g. REQUEST_RESPONSE).
          schema:
            $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/CommunicationType'
        - name: protocol
          in: query
          description: Protocol used by the API.
          schema:
```

```
                  $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/Protocol'
            - name: aef-id
              in: query
              description: AEF identifer.
              schema:
                type: string
            - name: data-format
              in: query
              description: Data formats used by the API (e.g. serialization protocol JSON used).
              schema:
                $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/DataFormat'
            - name: api-cat
              in: query
              description: The service API category to which the service API belongs to.
              schema:
                type: string
            - name: supported-features
              in: query
              description: Features supported by the NF consumer for the CAPIF Discover Service API.
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
            - name: api-supported-features
              in: query
              description: Features supported by the discovered service API indicated by api-name
parameter. This may only be present if api-name query parameter is present.
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
          responses:
            '200':
              description: The response body contains the result of the search over the list of
registered APIs.
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/DiscoveredAPIs'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '406':
              $ref: 'TS29122_CommonData.yaml#/components/responses/406'
            '414':
              $ref: 'TS29122_CommonData.yaml#/components/responses/414'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  schemas:
    DiscoveredAPIs:
      type: object
      properties:
        serviceAPIDescriptions:
          type: array
          items:
            $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/ServiceAPIDescription'
          minItems: 1
          description: Description of the service API as published by the service. Each service API
description shall include AEF profiles matching the filter criteria.
```

A.3 CAPIF_Publish_Service_API

```
openapi: 3.0.0
info:
  title: CAPIF_Publish_Service_API
  description: |
    API for publishing service APIs.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
```

```
  version: "1.1.0"
externalDocs:
  description: 3GPP TS 29.222 V16.3.0 Common API Framework for 3GPP Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.222/
servers:
  - url: '{apiRoot}/published-apis/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 7.5 of 3GPP TS 29.222.
paths:

# APF published API

  /{apfId}/service-apis:
    post:
      description: Publish a new API.
      parameters:
        - name: apfId
          in: path
          required: true
          schema:
            $ref: '#/components/schemas/apfId'
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ServiceAPIDescription'
      responses:
        '201':
          description: Service API published successfully The URI of the created resource shall be
returned in the "Location" HTTP header.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ServiceAPIDescription'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/published-apis/v1/{apfId}/service-apis/{serviceApiId}'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    get:
      description: Retrieve all published APIs.
      parameters:
        - name: apfId
          in: path
          required: true
          schema:
            $ref: '#/components/schemas/apfId'
      responses:
        '200':
          description: Definition of all service API(s) published by the API publishing function.
```

```
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/ServiceAPIDescription'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '406':
              $ref: 'TS29122_CommonData.yaml#/components/responses/406'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

# Individual APF published API

  /{apfId}/service-apis/{serviceApiId}:
    get:
      description: Retrieve a published service API.
      parameters:
        - name: serviceApiId
          in: path
          required: true
          schema:
            $ref: '#/components/schemas/serviceApiId'
        - name: apfId
          in: path
          required: true
          schema:
            $ref: '#/components/schemas/apfId'
      responses:
        '200':
          description: Definition of all service API published by the API publishing function.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ServiceAPIDescription'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    put:
      description: Update a published service API.
      parameters:
        - name: serviceApiId
          in: path
          required: true
          schema:
            $ref: '#/components/schemas/serviceApiId'
        - name: apfId
          in: path
          required: true
          schema:
            $ref: '#/components/schemas/apfId'
      requestBody:
```

```
                  required: true
                  content:
                    application/json:
                      schema:
                        $ref: '#/components/schemas/ServiceAPIDescription'
              responses:
                '200':
                  description: Definition of service API updated successfully.
                  content:
                    application/json:
                      schema:
                        $ref: '#/components/schemas/ServiceAPIDescription'
                '400':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'
            delete:
              description: Unpublish a published service API.
              parameters:
                - name: serviceApiId
                  in: path
                  required: true
                  schema:
                    $ref: '#/components/schemas/serviceApiId'
                - name: apfId
                  in: path
                  required: true
                  schema:
                    $ref: '#/components/schemas/apfId'
              responses:
                '204':
                  description: The individual published service API matching the serviceAPiId is deleted.
                '400':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'

# Components

components:
  schemas:
# Data types uses as path variables
    apfId:
      type: string
      description: Identification of the API publishing function.
    serviceApiId:
      type: string
      description: String identifying an individual published service API.
```

```
# Data Type for representations
    ServiceAPIDescription:
      type: object
      properties:
        apiName:
          type: string
          description: API name, it is set as {apiName} part of the URI structure as defined in
subclause 4.4 of 3GPP TS 29.501.
        apiId:
          type: string
          description: API identifier assigned by the CAPIF core function to the published service
API. Shall not be present in the HTTP POST request from the API publishing function to the CAPIF
core function. Shall be present in the HTTP POST response from the CAPIF core function to the API
publishing function and in the HTTP GET response from the CAPIF core function to the API invoker
(discovery API).
        aefProfiles:
          type: array
          items:
            $ref: '#/components/schemas/AefProfile'
          minItems: 1
          description: AEF profile information, which includes the exposed API details (e.g.
protocol).
        description:
          type: string
          description: Text description of the API
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        shareableInfo:
          $ref: '#/components/schemas/ShareableInformation'
        serviceAPICategory:
          type: string
        apiSuppFeats:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        pubApiPath:
          $ref: '#/components/schemas/PublishedApiPath'
        ccfId:
          type: string
          description: CAPIF core function identifier.
      required:
        - apiName
    InterfaceDescription:
      type: object
      properties:
        ipv4Addr:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv4Addr'
        ipv6Addr:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv6Addr'
        port:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Port'
        securityMethods:
          type: array
          items:
            $ref: '#/components/schemas/SecurityMethod'
          minItems: 1
          description: Security methods supported by the interface, it take precedence over the
security methods provided in AefProfile, for this specific interface.
      oneOf:
        - required: [ipv4Addr]
        - required: [ipv6Addr]
    AefProfile:
      type: object
      properties:
        aefId:
          type: string
          description: Identifier of the API exposing function
        versions:
          type: array
          items:
            $ref: '#/components/schemas/Version'
          minItems: 1
          description: API version
        protocol:
          $ref: '#/components/schemas/Protocol'
        dataFormat:
          $ref: '#/components/schemas/DataFormat'
        securityMethods:
          type: array
          items:
```

```
                $ref: '#/components/schemas/SecurityMethod'
              minItems: 1
              description: Security methods supported by the AEF
            domainName:
              type: string
              description: Domain to which API belongs to
            interfaceDescriptions:
              type: array
              items:
                $ref: '#/components/schemas/InterfaceDescription'
              minItems: 1
              description: Interface details
          required:
            - aefId
            - versions
          oneOf:
            - required: [domainName]
            - required: [interfaceDescriptions]
      Resource:
        type: object
        properties:
          resourceName:
            type: string
            description: Resource name
          commType:
            $ref: '#/components/schemas/CommunicationType'
          uri:
            type: string
            description: Relative URI of the API resource, it is set as {apiSpecificResourceUriPart}
part of the URI structure as defined in subclause 4.4 of 3GPP TS 29.501.
          custOpName:
            type: string
            description: it is set as {custOpName} part of the URI structure for a custom operation
associated with a resource as defined in subclause 4.4 of 3GPP TS 29.501.
          operations:
            type: array
            items:
              $ref: '#/components/schemas/Operation'
            minItems: 1
            description: Supported HTTP methods for the API resource. Only applicable when the
protocol in AefProfile indicates HTTP.
          description:
            type: string
            description: Text description of the API resource
        required:
          - resourceName
          - commType
          - uri
      CustomOperation:
        type: object
        properties:
          commType:
            $ref: '#/components/schemas/CommunicationType'
          custOpName:
            type: string
            description: it is set as {custOpName} part of the URI structure for a custom operation
without resource association as defined in subclause 4.4 of 3GPP TS 29.501.
          operations:
            type: array
            items:
              $ref: '#/components/schemas/Operation'
            minItems: 1
            description: Supported HTTP methods for the API resource. Only applicable when the
protocol in AefProfile indicates HTTP.
          description:
            type: string
            description: Text description of the custom operation
        required:
          - commType
          - custOpName
      Version:
        type: object
        properties:
          apiVersion:
            type: string
            description: API major version in URI (e.g. v1)
          expiry:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
```

```
      resources:
        type: array
        items:
          $ref: '#/components/schemas/Resource'
        minItems: 1
        description: Resources supported by the API.
      custOperations:
        type: array
        items:
          $ref: '#/components/schemas/CustomOperation'
        minItems: 1
        description: Custom operations without resource association.
    required:
      - apiVersion
  ShareableInformation:
    type: object
    properties:
      isShareable:
        type: boolean
        description: Set to "true" indicates that the service API and/or the service API category
can be shared to the list of CAPIF provider domain information. Otherwise set to "false".
      capifProvDoms:
        type: array
        items:
          type: string
        minItems: 1
        description: List of CAPIF provider domains to which the service API information to be
shared.
    required:
      - isShareable
  PublishedApiPath:
    type: object
    properties:
      ccfIds:
        type: array
        items:
          type: string
        minItems: 1
        description: A list of CCF identifiers where the service API is already published.
  Protocol:
    anyOf:
    - type: string
      enum:
        - HTTP_1_1
        - HTTP_2
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
    description: >
      Possible values are
      - HTTP_1_1: HTTP version 1.1
      - HTTP_2: HTTP version 2
  CommunicationType:
    anyOf:
    - type: string
      enum:
        - REQUEST_RESPONSE
        - SUBSCRIBE_NOTIFY
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
    description: >
      Possible values are
      - REQUEST_RESPONSE: The communication is of the type request-response
      - SUBSCRIBE_NOTIFY: The communication is of the type subscribe-notify
  DataFormat:
    anyOf:
    - type: string
      enum:
        - JSON
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
```

```
                content defined in the present version of this API.
            description: >
              Possible values are
              - JSON: JavaScript Object Notation
      SecurityMethod:
        anyOf:
        - type: string
          enum:
             - PSK
             - PKI
             - OAUTH
        - type: string
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
        description: >
          Possible values are
          - PSK: Security method 1 (Using TLS-PSK) as described in 3GPP TS 33.122
          - PKI: Security method 2 (Using PKI) as described in 3GPP TS 33.122
          - OAUTH: Security method 3 (TLS with OAuth token) as described in 3GPP TS 33.122
      Operation:
        anyOf:
        - type: string
          enum:
             - GET
             - POST
             - PUT
             - PATCH
             - DELETE
        - type: string
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
        description: >
          Possible values are
          - GET: HTTP GET method
          - POST: HTTP POST method
          - PUT: HTTP PUT method
          - PATCH: HTTP PATCH method
          - DELETE: HTTP DELETE method
```

A.4 CAPIF_Events_API

```
openapi: 3.0.0
info:
  title: CAPIF_Events_API
  description: |
    API for event subscription management.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.1.0"
externalDocs:
  description: 3GPP TS 29.222 V16.3.0 Common API Framework for 3GPP Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.222/
servers:
  - url: '{apiRoot}/capif-events/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 7.5 of 3GPP TS 29.222

paths:
  /{subscriberId}/subscriptions:
    post:
      description: Creates a new individual CAPIF Event Subscription.
      parameters:
        - name: subscriberId
          in: path
          description: Identifier of the Subscriber
          required: true
          schema:
            type: string
      requestBody:
        required: true
        content:
```

```
              application/json:
                schema:
                  $ref: '#/components/schemas/EventSubscription'
      callbacks:
        notificationDestination:
          '{request.body#/notificationDestination}':
            post:
              requestBody:  # contents of the callback message
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/EventNotification'
              responses:
                '204':
                  description: No Content (successful notification)
                '400':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      responses:
        '201':
          description: Created (Successful creation of subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/EventSubscription'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/capif-events/v1/{subscriberId}/subscriptions/{subscriptionId}'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{subscriberId}/subscriptions/{subscriptionId}:
    delete:
      description: Deletes an individual CAPIF Event Subscription.
```

```
      parameters:
        - name: subscriberId
          in: path
          description: Identifier of the Subscriber
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of an individual Events Subscription
          required: true
          schema:
            type: string
      responses:
        '204':
          description: The individual CAPIF Events Subscription matching the subscriptionId is
deleted.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  schemas:
    EventSubscription:
      type: object
      properties:
        events:
          type: array
          items:
            $ref: '#/components/schemas/CAPIFEvent'
          minItems: 1
          description: Subscribed events
        eventFilters:
          type: array
          items:
            $ref: '#/components/schemas/CAPIFEventFilter'
          minItems: 1
          description: Subscribed event filters
        eventReq:
          $ref: 'TS29523_Npcf_EventExposure.yaml#/components/schemas/ReportingInformation'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
        requestTestNotification:
          type: boolean
          description: Set to true by Subscriber to request the CAPIF core function to send a test
notification as defined in in subclause 7.6. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - events
        - notificationDestination
    EventNotification:
      type: object
      properties:
        subscriptionId:
          type: string
          description: Identifier of the subscription resource to which the notification is related
- CAPIF resource identifier
        events:
          $ref: '#/components/schemas/CAPIFEvent'
        eventDetail:
          $ref: '#/components/schemas/CAPIFEventDetail'
      required:
```

```
              - subscriptionId
              - events
      CAPIFEventFilter:
        type: object
        properties:
          apiIds:
            type: array
            items:
              type: string
            minItems: 1
            description: Identifier of the service API
          apiInvokerIds:
            type: array
            items:
              type: string
            minItems: 1
            description: Identity of the API invoker
          aefIds:
            type: array
            items:
              type: string
            minItems: 1
            description: Identifier of the API exposing function
      CAPIFEventDetail:
        type: object
        properties:
          serviceAPIDescriptions:
            type: array
            items:
              $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/ServiceAPIDescription'
            minItems: 1
            description: Description of the service API as published by the APF.
          apiIds:
            type: array
            items:
              type: string
            minItems: 1
            description: Identifier of the service API
          apiInvokerIds:
            type: array
            items:
              type: string
            minItems: 1
            description: Identity of the API invoker
          accCtrlPolList:
            $ref: '#/components/schemas/AccessControlPolicyListExt'
          invocationLogs:
            type: array
            items:
              $ref: 'TS29222_CAPIF_Logging_API_Invocation_API.yaml#/components/schemas/InvocationLog'
            minItems: 1
            description: Invocation logs.
          apiTopoHide:
            $ref: '#/components/schemas/TopologyHiding'
      AccessControlPolicyListExt:
        allOf:
        - $ref:
'TS29222_CAPIF_Access_Control_Policy_API.yaml#/components/schemas/AccessControlPolicyList'
        - type: object
          properties:
            apiId:
              type: string
        required:
        - apiId
      TopologyHiding:
        type: object
        properties:
          apiId:
            type: string
          routingRules:
            type: array
            items:
              $ref: 'TS29222_CAPIF_Routing_Info_API.yaml#/components/schemas/RoutingRule'
            minItems: 1
        required:
        - apiId
        - routingRules
      CAPIFEvent:
```

```
      anyOf:
      - type: string
        enum:
           - SERVICE_API_AVAILABLE
           - SERVICE_API_UNAVAILABLE
           - SERVICE_API_UPDATE
           - API_INVOKER_ONBOARDED
           - API_INVOKER_OFFBOARDED
           - SERVICE_API_INVOCATION_SUCCESS
           - SERVICE_API_INVOCATION_FAILURE
           - ACCESS_CONTROL_POLICY_UPDATE
           - ACCESS_CONTROL_POLICY_UNAVAILABLE
           - API_INVOKER_AUTHORIZATION_REVOKED
           - API_INVOKER_UPDATED
           - API_TOPOLOGY_HIDING_CREATED
           - API_TOPOLOGY_HIDING_REVOKED
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      description: >
        Possible values are
        - SERVICE_API_AVAILABLE: Events related to the availability of service APIs after the
service APIs are published.
        - SERVICE_API_UNAVAILABLE: Events related to the unavailability of service APIs after the
service APIs are unpublished.
        - SERVICE_API_UPDATE: Events related to change in service API information.
        - API_INVOKER_ONBOARDED: Events related to API invoker onboarded to CAPIF.
        - API_INVOKER_OFFBOARDED: Events related to API invoker offboarded from CAPIF.
        - SERVICE_API_INVOCATION_SUCCESS: Events related to the successful invocation of service
APIs.
        - SERVICE_API_INVOCATION_FAILURE: Events related to the failed invocation of service APIs.
        - ACCESS_CONTROL_POLICY_UPDATE: Events related to the update for the access control policy
related to the service APIs.
        - ACCESS_CONTROL_POLICY_UNAVAILABLE: Events related to the unavailability of the access
control policy related to the service APIs.
        - API_INVOKER_AUTHORIZATION_REVOKED: Events related to the revocation of the authorization
of API invokers to access the service APIs.
        - API_INVOKER_UPDATED: Events related to API invoker profile updated to CAPIF.
        - API_TOPOLOGY_HIDING_CREATED: Events related to the creation or update of the API topology
hiding information of the service APIs after the service APIs are published.
        - API_TOPOLOGY_HIDING_REVOKED: Events related to the revocation of the API topology hiding
information of the service APIs after the service APIs are unpublished.
```

A.5 CAPIF_API_Invoker_Management_API

```
openapi: 3.0.0
info:
  title: CAPIF_API_Invoker_Management_API
  description: |
    API for API invoker management.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.1.0"
externalDocs:
  description: 3GPP TS 29.222 V16.3.0 Common API Framework for 3GPP Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.222/
servers:
  - url: '{apiRoot}/api-invoker-management/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 7.5 of 3GPP TS 29.222

paths:
  /onboardedInvokers:
    post:
      description: Creates a new individual API Invoker profile.
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/APIInvokerEnrolmentDetails'
      callbacks:
```

```
              notificationDestination:
                '{request.body#/notificationDestination}':
                  post:
                    description: Notify the API Invoker about the onboarding completion
                    requestBody:  # contents of the callback message
                      required: true
                      content:
                        application/json:
                          schema:
                            $ref: '#/components/schemas/OnboardingNotification'
                    responses:
                      '204':
                        description: No Content (successful onboarding notification)
                      '400':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                      '401':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                      '403':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                      '404':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                      '411':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                      '413':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                      '415':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                      '429':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                      '500':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                      '503':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                      default:
                        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
        responses:
          '201':
            description: API invoker on-boarded successfully
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/APIInvokerEnrolmentDetails'
            headers:
              Location:
                description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/api-invoker-management/v1/onboardedInvokers/{onboardingId}'
                required: true
                schema:
                  type: string
          '202':
            description: The CAPIF core has accepted the Onboarding request and is processing it.
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /onboardedInvokers/{onboardingId}:
    delete:
      description: Deletes an individual API Invoker.
      parameters:
```

```
            - name: onboardingId
              in: path
              description: String identifying an individual on-boarded API invoker resource
              required: true
              schema:
                type: string
          responses:
            '204':
              description: The individual API Invoker matching onboardingId was offboarded.
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      put:
        description: Updates an individual API invoker details.
        parameters:
          - name: onboardingId
            in: path
            description: String identifying an individual on-boarded API invoker resource
            required: true
            schema:
              type: string
        requestBody:
          description: representation of the API invoker details to be updated in CAPIF core function
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/APIInvokerEnrolmentDetails'
        callbacks:
          notificationDestination:
            '{request.body#/notificationDestination}':
              post:
                description: Notify the API Invoker about the API invoker update completion
                requestBody:  # contents of the callback message
                  required: true
                  content:
                    application/json:
                      schema:
                        $ref: '#/components/schemas/OnboardingNotification'
                responses:
                  '204':
                    description: No Content (successful API invoker update notification)
                  '400':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                  '401':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                  '403':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                  '404':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                  '411':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                  '413':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                  '415':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                  '429':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                  '500':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                  '503':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                  default:
                    $ref: 'TS29122_CommonData.yaml#/components/responses/default'
        responses:
```

```
          '200':
            description: API invoker details updated successfully
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/APIInvokerEnrolmentDetails'
          '202':
            description: The CAPIF core has accepted the API invoker update details request and is
processing it.
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  schemas:
    OnboardingInformation:
      type: object
      properties:
        apiInvokerPublicKey:
          type: string
          description: The API Invoker's public key
        apiInvokerCertificate:
          type: string
          description: The API Invoker's generic client certificate, provided by the CAPIF core
function.
        onboardingSecret:
          type: string
          description: The API Invoker's onboarding secret, provided by the CAPIF core function.
      required:
        - apiInvokerPublicKey
    APIList:
      type: array
      items:
        $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/ServiceAPIDescription'
      minItems: 1
      description: The list of service APIs that the API Invoker is allowed to invoke
    APIInvokerEnrolmentDetails:
      type: object
      properties:
        apiInvokerId:
          type: string
          description: API invoker ID assigned by the CAPIF core function to the API invoker while
on-boarding the API invoker. Shall not be present in the HTTP POST request from the API invoker to
the CAPIF core function, to on-board itself. Shall be present in all other HTTP requests and
responses.
          readOnly: true
        onboardingInformation:
          $ref: '#/components/schemas/OnboardingInformation'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
        requestTestNotification:
          type: boolean
          description: Set to true by Subscriber to request the CAPIF core function to send a test
notification as defined in in subclause 7.6. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        apiList:
          $ref: '#/components/schemas/APIList'
        apiInvokerInformation:
          type: string
```

```
        description: Generic information related to the API invoker such as details of the device
or the application.
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - onboardingInformation
        - notificationDestination
      description: Information about the API Invoker that requested to onboard
    OnboardingNotification:
      type: object
      properties:
        result:
          type: boolean
          description: Set to "true" indicate successful on-boarding. Otherwise set to "false"
        resourceLocation:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
        apiInvokerEnrolmentDetails:
          $ref: '#/components/schemas/APIInvokerEnrolmentDetails'
        apiList:
          $ref: '#/components/schemas/APIList'
      required:
        - result
```

A.6 CAPIF_Security_API

```
openapi: 3.0.0
info:
  title: CAPIF_Security_API
  description: |
    API for CAPIF security management.
    © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.2"
externalDocs:
  description: 3GPP TS 29.222 V16.1.0 Common API Framework for 3GPP Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.222/
servers:
  - url: '{apiRoot}/capif-security/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 7.5 of 3GPP TS 29.222.
paths:

  /trustedInvokers/{apiInvokerId}:
    get:
      parameters:
        - name: apiInvokerId
          in: path
          description: Identifier of an individual API invoker
          required: true
          schema:
            type: string
        - name: authenticationInfo
          in: query
          description: When set to 'true', it indicates the CAPIF core function to send the
authentication information of the API invoker. Set to false or omitted otherwise.
          schema:
            type: boolean
        - name: authorizationInfo
          in: query
          description: When set to 'true', it indicates the CAPIF core function to send the
authorization information of the API invoker. Set to false or omitted otherwise.
          schema:
            type: boolean
      responses:
        '200':
          description: The security related information of the API Invoker based on the request from
the API exposing function.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ServiceSecurity'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '406':
              $ref: 'TS29122_CommonData.yaml#/components/responses/406'
            '414':
              $ref: 'TS29122_CommonData.yaml#/components/responses/414'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      put:
        parameters:
          - name: apiInvokerId
            in: path
            description: Identifier of an individual API invoker
            required: true
            schema:
              type: string
        requestBody:
          description: create a security context for an API invoker
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ServiceSecurity'
        callbacks:
          notificationDestination:
            '{request.body#/notificationDestination}':
              post:
                requestBody:
                  required: true
                  content:
                    application/json:
                      schema:
                        $ref: '#/components/schemas/SecurityNotification'
                responses:
                  '204':
                    description: No Content (successful notification)
                  '400':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                  '401':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                  '403':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                  '404':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                  '411':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                  '413':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                  '415':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                  '429':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                  '500':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                  '503':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                  default:
                    $ref: 'TS29122_CommonData.yaml#/components/responses/default'
        responses:
          '201':
            description: Successful created.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/ServiceSecurity'
            headers:
              Location:
                description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/capif-security/v1/trustedInvokers/{apiInvokerId}'
                required: true
```

ETSI

```
              schema:
                type: string
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '414':
            $ref: 'TS29122_CommonData.yaml#/components/responses/414'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      parameters:
        - name: apiInvokerId
          in: path
          description: Identifier of an individual API invoker
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content (Successful deletion of the existing subscription)
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /trustedInvokers/{apiInvokerId}/update:
    post:
      parameters:
        - name: apiInvokerId
          in: path
          description: Identifier of an individual API invoker
          required: true
          schema:
            type: string
      requestBody:
        description: Update the security context (e.g. re-negotiate the security methods).
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ServiceSecurity'
      responses:
        '200':
          description: Successful updated.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ServiceSecurity'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /trustedInvokers/{apiInvokerId}/delete:
    post:
      parameters:
        - name: apiInvokerId
          in: path
          description: Identifier of an individual API invoker
          required: true
          schema:
            type: string
      requestBody:
        description: Revoke the authorization of the API invoker for APIs.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SecurityNotification'
      responses:
        '204':
          description: Successful revoked.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /securities/{securityId}/token:
    post:
      parameters:
        - name: securityId
          in: path
          description: Identifier of an individual security instance
          required: true
          schema:
            type: string
      requestBody:
        required: true
        content:
          application/x-www-form-urlencoded:
            schema:
              $ref: '#/components/schemas/AccessTokenReq'
      responses:
        '200':
```

```
                description: Successful Access Token Request
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/AccessTokenRsp'
              '400':
                description: Error in the Access Token Request
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/AccessTokenErr'

components:
  schemas:
    ServiceSecurity:
      type: object
      properties:
        securityInfo:
          type: array
          items:
            $ref: '#/components/schemas/SecurityInformation'
          minimum: 1
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
        requestTestNotification:
          type: boolean
          description: Set to true by API invoker to request the CAPIF core function to send a test
notification as defined in in subclause 7.6. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - securityInfo
        - notificationDestination
    SecurityInformation:
      type: object
      properties:
        interfaceDetails:
          $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/InterfaceDescription'
        aefId:
          type: string
          description: Identifier of the API exposing function
        prefSecurityMethods:
          type: array
          items:
            $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/SecurityMethod'
          minItems: 1
          description: Security methods preferred by the API invoker for the API interface.
        selSecurityMethod:
          $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/SecurityMethod'
        authenticationInfo:
          type: string
          description: Authentication related information
        authorizationInfo:
          type: string
          description: Authorization related information
      required:
        - prefSecurityMethods
      oneOf:
        - required: [interfaceDetails]
        - required: [aefId]
    SecurityNotification:
      type: object
      properties:
        apiInvokerId:
          type: string
          description: String identifying the API invoker assigned by the CAPIF core function
        aefId:
          type: string
          description: String identifying the AEF.
        apiIds:
          type: array
          items:
            type: string
          minItems: 1
          description: Identifier of the service API
        cause:
```

```
              $ref: '#/components/schemas/Cause'
            required:
              - apiInvokerId
              - apiIds
              - cause
      AccessTokenReq:
        format: x-www-form-urlencoded
        properties:
          grant_type:
            type: string
            enum:
              - client_credentials
          client_id:
            type: string
          client_secret:
            type: string
          scope:
            type: string
        required:
          - grant_type
          - client_id
      AccessTokenRsp:
        type: object
        properties:
          access_token:
            type: string
            description: JWS Compact Serialized representation of JWS signed JSON object
(AccessTokenClaims)
          token_type:
            type: string
            enum:
              - Bearer
          expires_in:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
          scope:
            type: string
        required:
          - access_token
          - token_type
          - expires_in
      AccessTokenClaims:
        type: object
        properties:
          iss:
            type: string
          scope:
            type: string
          exp:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        required:
          - iss
          - scope
          - exp
      AccessTokenErr:
        type: object
        properties:
          error:
            type: string
            enum:
              - invalid_request
              - invalid_client
              - invalid_grant
              - unauthorized_client
              - unsupported_grant_type
              - invalid_scope
          error_description:
            type: string
          error_uri:
            type: string
        required:
          - error
      Cause:
        anyOf:
        - type: string
          enum:
            - OVERLIMIT_USAGE
            - UNEXPECTED_REASON
        - type: string
```

```
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
        description: >
          Possible values are
          - OVERLIMIT_USAGE: The revocation of the authorization of the API invoker is due to the
overlimit usage of the service API
          - UNEXPECTED_REASON: The revocation of the authorization of the API invoker is due to
unexpected reason.
```

A.7 CAPIF_Access_Control_Policy_API

```
openapi: 3.0.0
info:
  title: CAPIF_Access_Control_Policy_API
  description: |
    API for access control policy.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.3"
externalDocs:
  description: 3GPP TS 29.222 V15.6.0 Common API Framework for 3GPP Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.222/
servers:
  - url: '{apiRoot}/access-control-policy/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 7.5 of 3GPP TS 29.222

paths:
  /accessControlPolicyList/{serviceApiId}:
    get:
      description: Retrieves the access control policy list.
      parameters:
        - name: serviceApiId
          in: path
          description: Identifier of a published service API
          required: true
          schema:
            type: string
        - name: aef-id
          in: query
          required: true
          description: Identifier of the AEF
          schema:
            type: string
        - name: api-invoker-id
          in: query
          description: Identifier of the API invoker
          schema:
            type: string
        - name: supported-features
          in: query
          description: To filter irrelevant responses related to unsupported features
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      responses:
        '200':
          description: OK.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AccessControlPolicyList'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '414':
```

```
                  $ref: 'TS29122_CommonData.yaml#/components/responses/414'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  schemas:
    AccessControlPolicyList:
      type: object
      properties:
        apiInvokerPolicies:
          type: array
          items:
            $ref: '#/components/schemas/ApiInvokerPolicy'
          minItems: 0
          description: Policy of each API invoker.
    ApiInvokerPolicy:
      type: object
      properties:
        apiInvokerId:
          type: string
          description: API invoker ID assigned by the CAPIF core function
        allowedTotalInvocations:
          type: integer
          description: Total number of invocations allowed on the service API by the API invoker.
        allowedInvocationsPerSecond:
          type: integer
          description: Invocations per second allowed on the service API by the API invoker.
        allowedInvocationTimeRangeList:
          type: array
          items:
            $ref: '#/components/schemas/TimeRangeList'
          minItems: 0
          description: The time ranges during which the invocations are allowed on the service API
by the API invoker.
      required:
        - apiInvokerId
    TimeRangeList:
      type: object
      properties:
        startTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        stopTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
```

A.8   CAPIF_Logging_API_Invocation_API

```
openapi: 3.0.0
info:
  title: CAPIF_Logging_API_Invocation_API
  description: |
    API for invocation logs.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.2"
externalDocs:
  description: 3GPP TS 29.222 V15.6.0 Common API Framework for 3GPP Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.222/
servers:
  - url: '{apiRoot}/api-invocation-logs/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 7.5 of 3GPP TS 29.222
paths:
  /{aefId}/logs:
    post:
      description: Creates a new log entry for service API invocations.
      parameters:
        - name: aefId
          in: path
          description: Identifier of the API exposing function
```

```
              required: true
              schema:
                type: string
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/InvocationLog'
        responses:
          '201':
            description: Log of service API invocations provided by API exposing function successfully
stored on the CAPIF core function.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/InvocationLog'
            headers:
              Location:
                description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/api-invocation-logs/v1/{aefId}/logs/{logId}'
                required: true
                schema:
                  type: string
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /{aefId}/logs/{logId}:
    description: Creates a new log entry for service API invocations.
    parameters:
      - name: aefId
        in: path
        description: Identifier of the API exposing function
        required: true
        schema:
          type: string
      - name: logId
        in: path
        description: Identifier of individual log entry
        required: true
        schema:
          type: string
components:
  schemas:
    InvocationLog:
      type: object
      properties:
        aefId:
          type: string
          description: Identity information of the API exposing function requesting logging of
service API invocations
        apiInvokerId:
          type: string
          description: Identity of the API invoker which invoked the service API
        logs:
          type: array
          items:
            $ref: '#/components/schemas/Log'
          minItems: 1
```

```
              description: Service API invocation log
          supportedFeatures:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        required:
          - aefId
          - apiInvokerId
          - logs
    Log:
      type: object
      properties:
        apiId:
          type: string
          description: String identifying the API invoked.
        apiName:
          type: string
          description: Name of the API which was invoked, it is set as {apiName} part of the URI
structure as defined in subclause 4.4 of 3GPP TS 29.501.
        apiVersion:
          type: string
          description: Version of the API which was invoked
        resourceName:
          type: string
          description: Name of the specific resource invoked
        uri:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
        protocol:
          $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/Protocol'
        operation:
          $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/Operation'
        result:
          type: string
          description: For HTTP protocol, it contains HTTP status code of the invocation
        invocationTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        invocationLatency:
          $ref: '#/components/schemas/DurationMs'
        inputParameters:
          description: List of input parameters. Can be any value - string, number, boolean, array
or object.
        outputParameters:
          description: List of output parameters. Can be any value - string, number, boolean, array
or object.
        srcInterface:
          $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/InterfaceDescription'
        destInterface:
          $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/InterfaceDescription'
        fwdInterface:
          type: string
          description: It includes the node identifier (as defined in IETF RFC 7239 of all
forwarding entities between the API invoker and the AEF, concatenated with comma and space, e.g.
192.0.2.43:80, unknown:_OBFport, 203.0.113.60
      required:
        - apiId
        - apiName
        - apiVersion
        - resourceName
        - protocol
        - result
    DurationMs:
      type: integer
      description: Unsigned integer identifying a period of time in units of milliseconds.
      minimum: 0
```

A.9 CAPIF_Auditing_API

```
openapi: 3.0.0
info:
  title: CAPIF_Auditing_API
  description: |
    API for auditing.
    © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.1"
externalDocs:
  description: 3GPP TS 29.222 V15.4.0 Common API Framework for 3GPP Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.222/
servers:
```

```
    - url: '{apiRoot}/logs/v1'
      variables:
        apiRoot:
          default: https://example.com
          description: apiRoot as defined in subclause 7.5 of 3GPP TS 29.222.
paths:
  /apiInvocationLogs:
    get:
      description: Query and retrieve service API invocation logs stored on the CAPIF core function.
      parameters:
        - name: aef-id
          in: query
          description: String identifying the API exposing function.
          schema:
            type: string
        - name: api-invoker-id
          in: query
          description: String identifying the API invoker which invoked the service API.
          schema:
            type: string
        - name: time-range-start
          in: query
          description: Start time of the invocation time range.
          schema:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        - name: time-range-end
          in: query
          description: End time of the invocation time range.
          schema:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        - name: api-id
          in: query
          description: String identifying the API invoked.
          schema:
            type: string
        - name: api-name
          in: query
          description: API name, it is set as {apiName} part of the URI structure as defined in
subclause 4.4 of 3GPP TS 29.501.
          schema:
            type: string
        - name: api-version
          in: query
          description: Version of the API which was invoked.
          schema:
            type: string
        - name: protocol
          in: query
          description: Protocol invoked.
          schema:
            $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/Protocol'
        - name: operation
          in: query
          description: Operation that was invoked on the API.
          schema:
            $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/Operation'
        - name: result
          in: query
          description: Result or output of the invocation.
          schema:
            type: string
        - name: resource-name
          in: query
          description: Name of the specific resource invoked.
          schema:
            type: string
        - name: src-interface
          in: query
          description: Interface description of the API invoker.
          content:
            application/json:
              schema:
                $ref:
'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/InterfaceDescription'
        - name: dest-interface
          in: query
          description: Interface description of the API invoked.
          content:
```

```
              application/json:
                schema:
                  $ref:
'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/InterfaceDescription'
        - name: supported-features
          in: query
          description: To filter irrelevant responses related to unsupported features
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      responses:
        '200':
          description: Result of the query operation along with fetched service API invocation log
data.
          content:
            application/json:
              schema:
                $ref:
'TS29222_CAPIF_Logging_API_Invocation_API.yaml#/components/schemas/InvocationLog'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '414':
          $ref: 'TS29122_CommonData.yaml#/components/responses/414'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
```

A.10 AEF_Security_API

```
openapi: 3.0.0
info:
  title: AEF_Security_API
  description: |
    API for AEF security management.
    © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.1"
externalDocs:
  description: 3GPP TS 29.222 V15.4.0 Common API Framework for 3GPP Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.222/
servers:
  - url: '{apiRoot}/aef-security/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 7.5 of 3GPP TS 29.222.
paths:
  /check-authentication:
    post:
      summary: Check authentication.
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/CheckAuthenticationReq'
      responses:
        '200':
          description: The request was successful.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/CheckAuthenticationRsp'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
```

```
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /revoke-authorization:
    post:
      summary: Revoke authorization.
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/RevokeAuthorizationReq'
      responses:
        '200':
          description: The request was successful.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/RevokeAuthorizationRsp'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  schemas:
    CheckAuthenticationReq:
      type: object
      properties:
        apiInvokerId:
          type: string
          description: API invoker ID assigned by the CAPIF core function to the API invoker while
on-boarding the API invoker.
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - apiInvokerId
        - supportedFeatures
    CheckAuthenticationRsp:
      type: object
      properties:
        supportedFeatures:
```

```
              $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
          required:
            - supportedFeatures
        RevokeAuthorizationReq:
          type: object
          properties:
            revokeInfo:
              $ref: 'TS29222_CAPIF_Security_API.yaml#/components/schemas/SecurityNotification'
            supportedFeatures:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
          required:
            - revokeInfo
            - supportedFeatures
        RevokeAuthorizationRsp:
          type: object
          properties:
            supportedFeatures:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
          required:
            - supportedFeatures
```

A.11 CAPIF_API_Provider_Management_API

```
openapi: 3.0.0
info:
  title: CAPIF_API_Provider_Management_API
  description: |
    API for API provider domain functions management.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.0"
externalDocs:
  description: 3GPP TS 29.222 V16.3.0 Common API Framework for 3GPP Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.222/
servers:
  - url: '{apiRoot}/api-provider-management/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 7.5 of 3GPP TS 29.222

paths:
  /registrations:
    post:
      description: Registers a new API Provider domain with API provider domain functions profiles.
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/APIProviderEnrolmentDetails'
      responses:
        '201':
          description: API provider domain registered successfully
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/APIProviderEnrolmentDetails'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/api-provider-management/v1/registrations/{registrationId}'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
```

```
                '415':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /registrations/{registrationId}:
    delete:
      description: Deregisters API provider domain by deleting API provider domain and functions.
      parameters:
        - name: registrationId
          in: path
          description: String identifying an registered API provider domain resource
          required: true
          schema:
            type: string
      responses:
        '204':
          description: The API provider domain matching registrationId is deleted.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    put:
      description: Updates an API provider domain's registration details.
      parameters:
        - name: registrationId
          in: path
          description: String identifying an registered API provider domain resource
          required: true
          schema:
            type: string
      requestBody:
        description: representation of the API provider domain registration details to be updated in
CAPIF core function
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/APIProviderEnrolmentDetails'
      responses:
        '200':
          description: API provider domain registration details updated successfully
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/APIProviderEnrolmentDetails'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
```

```
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  schemas:
    APIProviderEnrolmentDetails:
      type: object
      properties:
        apiProvDomId:
          type: string
          description: API provider domain ID assigned by the CAPIF core function to the API
management function while registering the API provider domain. Shall not be present in the HTTP POST
request from the API Management function to the CAPIF core function, to on-board itself. Shall be
present in all other HTTP requests and responses.
          readOnly: true
        regSec:
          type: string
          description: Security information necessary for the CAPIF core function to validate the
registration of the API provider domain. Shall be present in HTTP POST request from API management
function to CAPIF core function for API provider domain registration.
        apiProvFuncs:
          type: array
          items:
            $ref: '#/components/schemas/APIProviderFunctionDetails'
          minItems: 1
          description: A list of individual API provider domain functions details. When included by
the API management function in the HTTP request message, it lists the API provider domain functions
that the API management function intends to register/update in registration or update registration
procedure. When included by the CAPIF core function in the HTTP response message, it lists the API
domain functions details that are registered or updated successfully.
        apiProvDomInfo:
          type: string
          description: Generic information related to the API provider domain such as details of the
API provider applications.
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        failReason:
          type: string
          description: Registration or update specific failure information of failed API provider
domain function registrations.Shall be present in the HTTP response body if atleast one of the API
provider domain function registration or update registration fails.
      required:
        - regSec
    APIProviderFunctionDetails:
      type: object
      properties:
        apiProvFuncId:
          type: string
          description: API provider domain functionID assigned by the CAPIF core function to the API
provider domain function while registering/updating the API provider domain. Shall not be present in
the HTTP POST request from the API management function to the CAPIF core function, to register
itself. Shall be present in all other HTTP requests and responses.
        regInfo:
          $ref: '#/components/schemas/RegistrationInformation'
        apiProvFuncRole:
          $ref: '#/components/schemas/ApiProviderFuncRole'
        apiProvFuncInfo:
          type: string
          description: Generic information related to the API provider domain function such as
details of the API provider applications.
      required:
        - regInfo
        - apiProvFuncRole
    RegistrationInformation:
      type: object
      properties:
        apiProvPubKey:
          type: string
          description: Public Key of API Provider domain function.
        apiProvCert:
          type: string
          description: API provider domain function's client certificate
      required:
```

ETSI

```
            - apiProvPubKey
        ApiProviderFuncRole:
          anyOf:
          - type: string
            enum:
              - AEF
              - APF
              - AMF
          - type: string
            description: >
              This string provides forward-compatiblity with future extensions to the enumeration but is
    not used to encode content defined in the present version of this API.
          description: >
            Possible values are
            - AEF: API provider function is API Exposing Function.
            - APF: API provider function is API Publishing Function.
            - AMF: API Provider function is API Management Function.
```

A.12   CAPIF_Routing_Info_API

```
openapi: 3.0.0
info:
  title: CAPIF_Routing_Info_API
  description: |
    API for Routing information.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.0"
externalDocs:
  description: 3GPP TS 29.222 V16.3.0 Common API Framework for 3GPP Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.222/
servers:
  - url: '{apiRoot}/capif-routing-info/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 7.5 of 3GPP TS 29.222

paths:
  /service-apis/{serviceApiId}:
    get:
      description: Retrieves the API routing information.
      parameters:
        - name: serviceApiId
          in: path
          description: Identifier of a published service API
          required: true
          schema:
            type: string
        - name: aef-id
          in: query
          required: true
          description: Identifier of the AEF
          schema:
            type: string
        - name: supp-feat
          in: query
          required: false
          description: To filter irrelevant responses related to unsupported features
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      responses:
        '200':
          description: OK.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/RoutingInfo'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
```

```
                '406':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/406'
                '414':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/414'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  schemas:
    RoutingInfo:
      type: object
      properties:
        routingRules:
          type: array
          items:
            $ref: '#/components/schemas/RoutingRule'
          minItems: 1
      required:
        - routingRules
    RoutingRule:
      type: object
      properties:
        ipv4AddrRanges:
          type: array
          items:
            $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/Ipv4AddressRange'
          minItems: 1
        ipv6AddrRanges:
          type: array
          items:
            $ref: '#/components/schemas/Ipv6AddressRange'
          minItems: 1
        aefProfile:
          $ref: 'TS29222_CAPIF_Publish_Service_API.yaml#/components/schemas/AefProfile'
      required:
        - aefProfile
    Ipv6AddressRange:
      type: object
      properties:
        start:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv6Addr'
        end:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv6Addr'
      required:
        - start
        - end
```

Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2018-03	CT3#95	C3-181278				TS skeleton of Common API Framework for 3GPP Northbound APIs	0.0.0
2018-03	CT3#95	C3-181378				Inclusion of documents agreed in CT3#95: C3-181281, C3-181282, C3-181283, C3-181284, C3-181285, C3-181286, C3-181287, C3-181321, C3-181322, Rapporteur changes	0.1.0
2018-04	CT3#96	C3-182527				Inclusion of documents agreed in CT3#96: C3-182204, C3-182387, C3-182393, C3-182395, C3-182468, C3-182469, C3-182470, C3-182483, C3-182484, C3-182485	0.2.0
2018-05	CT3#97					Inclusion of documents agreed in CT3#97: C3-183271, C3-183274, C3-183275, C3-183372, C3-183376, C3-183377, C3-183378, C3-183379, C3-183598, C3-183599, C3-183602, C3-183603, C3-183604, C3-183798, C3-183799, C3-183809, C3-183841, C3-183842	0.3.0
2018-06	CT#80	CP-181037				TS sent to plenary for approval	1.0.0
2018-06	CT#80	CP-181037				TS approved by plenary	15.0.0
2018-09	CT#81	CP-182016	0001	1	F	Changes to clause 4 – Overview	15.1.0
2018-09	CT#81	CP-182016	0003	2	F	Changes to CAPIF Publish Service API subclause	15.1.0
2018-09	CT#81	CP-182016	0004	2	F	Changes to CAPIF Events API subclause	15.1.0
2018-09	CT#81	CP-182016	0005	4	F	Changes to CAPIF API Invoker Management API subclause	15.1.0
2018-09	CT#81	CP-182016	0006	4	F	Changes to CAPIF Authentication Authorization API subclause	15.1.0
2018-09	CT#81	CP-182016	0007	3	F	Update to data types for ServiceAPIDescription and APIQuery	15.1.0
2018-09	CT#81	CP-182016	0008	5	F	Definition of CAPIF_Access_Control_Policy_API, and OpenAPI schema	15.1.0
2018-09	CT#81	CP-182016	0009	4	F	CAPIF_Events_API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182016	0010	4	F	AEF_Authentication_API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182016	0011	1	F	CAPIF_Discover_Service API - Corrections	15.1.0
2018-09	CT#81	CP-182016	0012	3	F	CAPIF_discovery_service API OpenAPI file	15.1.0
2018-09	CT#81	CP-182016	0013	4	F	CAPIF_Publish_Service API - Corrections and OpenAPI file	15.1.0
2018-09	CT#81	CP-182016	0014	4	F	AEF_Authentication API - Editor's notes	15.1.0
2018-09	CT#81	CP-182016	0015	4	F	Corrections to data type	15.1.0
2018-09	CT#81	CP-182016	0016	1	F	API Invoker's Information in APIInvokerEnrolmentDetails	15.1.0
2018-09	CT#81	CP-182016	0017	1	F	Corrections to OnboardingInformation data type	15.1.0
2018-09	CT#81	CP-182016	0018	2	F	Security method preference	15.1.0
2018-09	CT#81	CP-182016	0019	1	F	Clarifications to Obtain_API_Invoker_Info service operation	15.1.0
2018-09	CT#81	CP-182016	0020	1	F	Subscribed and Subscribing functional entity	15.1.0
2018-09	CT#81	CP-182016	0021	1	F	Miscellaneous corrections	15.1.0
2018-09	CT#81	CP-182016	0023	1	F	Definitions and abbreviations	15.1.0
2018-09	CT#81	CP-182016	0024	1	F	Referenced data types and enumerations	15.1.0
2018-09	CT#81	CP-182016	0025	2	F	CAPIF_Security_API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182016	0026	1	F	CAPIF discovery service API – API invoker retrieves API information using GET	15.1.0
2018-09	CT#81	CP-182016	0028	2	F	CAPIF_Auditing_API – API management function retrieves API information logs using GET – OpenAPI document	15.1.0
2018-09	CT#81	CP-182016	0029	3	F	API Names changes in clause 5	15.1.0
2018-09	CT#81	CP-182016	0030	-	F	Change security-related API names in clause 8 and 10	15.1.0
2018-09	CT#81	CP-182016	0031	2	F	Describe response code 202 for Onboard_API_Invoker POST method	15.1.0
2018-09	CT#81	CP-182016	0032	-	F	Correct cardinality for onboardingNotificationDestination	15.1.0
2018-09	CT#81	CP-182016	0033	-	F	Correct cardinality for securityNotificationDestination	15.1.0
2018-09	CT#81	CP-182016	0034	1	F	Correct protocol type in Interface Description	15.1.0
2018-09	CT#81	CP-182016	0036	1	F	Query parameter in retrieving access control	15.1.0
2018-09	CT#81	CP-182037	0037	1	F	Authorization endpoint and token request	15.1.0
2018-09	CT#81	CP-182016	0038	1	F	CAPIF Events	15.1.0
2018-09	CT#81	CP-182016	0040	1	F	Corrections to resource figures	15.1.0
2018-09	CT#81	CP-182016	0041	1	F	CAPIF_Auditing_API - 'query' custom operation	15.1.0
2018-09	CT#81	CP-182016	0042	2	F	OpenAPI - CAPIF_API_Invoker_Management API	15.1.0
2018-09	CT#81	CP-182016	0043	2	F	OpenAPI - CAPIF_Logging_API_Invocation API	15.1.0
2018-12	CT#82	CP-183109	0047		F	Correct server definition	15.2.0

ETSI

2018-12	CT#82	CP-183109	0027	2	F	Security adaptation for Nnef northbound APIs with CAPIF	15.2.0
2018-12	CT#82	CP-183109	0045	1	F	Correct security API name in subclause 5.6.2.1	15.2.0
2018-12	CT#82	CP-183109	0046	1	F	Remove Event operations from CAPIF_Publish_API	15.2.0
2018-12	CT#82	CP-183109	0048		F	Correct CAPIF services	15.2.0
2018-12	CT#82	CP-183109	0049	2	F	Correct api name and service name for CAPIF_Publish_Service_API	15.2.0
2018-12	CT#82	CP-183109	0050	2	F	Correct api name and service name for CAPIF_Discover_Service_API	15.2.0
2018-12	CT#82	CP-183109	0051	4	F	Correct CAPIF_Publish_Service_API	15.2.0
2018-12	CT#82	CP-183109	0052	1	F	Correct CAPIF_Discover_Service_API	15.2.0
2018-12	CT#82	CP-183109	0053	4	F	Correct CAPIF_Logging_API_Invocation_API	15.2.0
2018-12	CT#82	CP-183109	0054	3	F	Correct CAPIF_Auditing_API	15.2.0
2018-12	CT#82	CP-183109	0055	2	F	Correct CAPIF_Security_API	15.2.0
2018-12	CT#82	CP-183109	0055	3	F	Correct CAPIF_Security_API	15.2.0
2018-12	CT#82	CP-183109	0057		F	Correct CAPIF_Access_Control_Policy_API	15.2.0
2018-12	CT#82	CP-183109	0058	2	F	supportedFeatures - CAPIF_Discover_Service_API	15.2.0
2018-12	CT#82	CP-183109	0059		F	supportedFeatures 002 - CAPIF_Publish_Service_API	15.2.0
2018-12	CT#82	CP-183109	0060	1	F	supportedFeatures 003 - CAPIF_Events_API	15.2.0
2018-12	CT#82	CP-183109	0061		F	supportedFeatures 004 - CAPIF_API_Invoker_Management_API	15.2.0
2018-12	CT#82	CP-183109	0062		F	supportedFeatures 005 - CAPIF_Security_API	15.2.0
2018-12	CT#82	CP-183109	0063	2	F	supportedFeatures - CAPIF_Access_Control_Policy_API	15.2.0
2018-12	CT#82	CP-183109	0064		F	supportedFeatures 007 - CAPIF_Logging_API_Invocation_API	15.2.0
2018-12	CT#82	CP-183109	0065	2	F	supportedFeatures - CAPIF_Auditing_API	15.2.0
2018-12	CT#82	CP-183109	0067		F	Redundant Editor's note	15.2.0
2018-12	CT#82	CP-183109	0068	1	F	Correct CAPIF_API_Invoker_Management_API	15.2.0
2018-12	CT#82	CP-183109	0070		F	Missing general description in A.1	15.2.0
2018-12	CT#82	CP-183109	0071	1	F	Update mandatory error status code	15.2.0
2018-12	CT#82	CP-183109	0072	3	F	Correct resource model and add missing functions in CAPIF_Security_API	15.2.0
2018-12	CT#82	CP-183109	0074	2	F	Correct resource model and add missing function in AEF_Authentication_API	15.2.0
2018-12	CT#82	CP-183109	0075	1	F	externalDocs field in OpenAPI documents	15.2.0
2018-12	CT#82	CP-183109	0076	3	F	location header in OpenAPI documents	15.2.0
2018-12	CT#82	CP-183109	0077	1	F	version number in OpenAPI documents	15.2.0
2018-12	CT#82	CP-183109	0078	2	F	corrections to CAPIF_Access_Control_Policy_API	15.2.0
2018-12	CT#82	CP-183109	0079	1	F	corrections to CAPIF_Logging_API_Invocation_API	15.2.0
2018-12	CT#82	CP-183109	0079	2	F	Security adaptation for T8 APIs with CAPIF	15.2.0
2018-12	CT#82	CP-183109	0080		F	corrections to EventNotification	15.2.0
2018-12	CT#82	CP-183109	0081		F	corrections to theSubscriber	15.2.0
2018-12	CT#82	CP-183109	0082		F	remove 'OnboardingRequestAck' data type	15.2.0
2019-03	CT#83	CP-190119	0083	1	F	Correct GET description for retrieving service API information	15.3.0
2019-03	CT#83	CP-190119	0084	1	F	Correct PUT message for updating service APIs	15.3.0
2019-03	CT#83	CP-190119	0085	2	F	Correct AEF operations related to obtaining security info or revoking API invokers	15.3.0
2019-03	CT#83	CP-190119	0086	1	F	Correction of definition of obtaining the correct resource in Security APIs	15.3.0
2019-03	CT#83	CP-190119	0089	1	F	Correct several descriptions in clause 8 tables	15.3.0
2019-06	CT#84	CP-191088	0090	1	F	Correct CAPIF_Logging_API yaml file	15.4.0
2019-06	CT#84	CP-191221	0091	1	F	Copyright notice in the YAML files	15.4.0
2019-06	CT#84	CP-191222	0092	1	F	API version update	15.4.0
2019-09	CT#85	CP-192158	0093	3	F	Northbound API registeration and discovery	16.0.0
2019-12	CT#86	CP-193194	0095	1	A	Correct cardinality in event API	16.1.0
2019-12	CT#86	CP-193199	0096	4	B	Reference update: RFC 8259	16.1.0
2019-12	CT#86	CP-193199	0097		F	Detailed information in CAPIF event notification	16.1.0
2019-12	CT#86	CP-193195	0101	4	B	Updates to Service Architecture and functional entities	16.1.0
2019-12	CT#86	CP-193194	0103	1	A	Clause reference corrections	16.1.0
2019-12	CT#86	CP-193194	0105	1	A	Conventions for Open API specification files	16.1.0
2019-12	CT#86	CP-193195	0106	1	B	Update-to-Service-Architecture	16.1.0
2019-12	CT#86	CP-193195	0107	2	B	Update-to-Service-API-Publish	16.1.0
2019-12	CT#86	CP-193195	0108	1	B	Interconnection-Service-API-Publish	16.1.0
2019-12	CT#86	CP-193195	0109	2	B	Update-to-Discover-Service-API	16.1.0
2019-12	CT#86	CP-193199	0111	1	B	Supported feature in API publish service	16.1.0
2019-12	CT#86	CP-193195	0112	1	B	API invoker details update – Service Definition	16.1.0
2019-12	CT#86	CP-193195	0113	1	B	API invoker details update – API Definition	16.1.0
2019-12	CT#86	CP-193195	0114	1	B	API Provider Registration and Update – Service Definition	16.1.0
2019-12	CT#86	CP-193195	0115	3	B	API Provider Registration and Update – API Definition	16.1.0

2019-12	CT#86	CP-193195	0116	1	B	Support for 3rd party API provider domain	16.1.0
2019-12	CT#86	CP-193194	0118	1	A	Correct the notificationDestination of ServiceSecurity object in yaml file	16.1.0
2019-12	CT#86	CP-193194	0120	1	A	Align the API name of Initiate_Authentication	16.1.0
2019-12	CT#86	CP-193212	0121		F	Update of API version and TS version in OpenAPI file	16.1.0
2020-03	CT#87e	CP-200205	0123	1	B	Published API path	16.2.0
2020-03	CT#87e	CP-200205	0124		B	API Invoker Udpate – Event Updates	16.2.0
2020-03	CT#87e	CP-200205	0125	2	B	API Provider Management – Open API	16.2.0
2020-03	CT#87e	CP-200216	0126		F	29.222 Rel-16 Update of OpenAPI version and TS version in externalDocs field	16.2.0
2020-06	CT#88e	CP-201277	0128	3	B	Service description and operations for CAPIF_API_Routing_Policy_API	16.3.0
2020-06	CT#88e	CP-201277	0129	3	B	API definition for CAPIF_API_Routing_Policy_API	16.3.0
2020-06	CT#88e	CP-201278	0130	3	B	API Topology hiding	16.3.0
2020-06	CT#88e	CP-201230	0133		A	Correct API publish procedure	16.3.0
2020-06	CT#88e	CP-201231	0131	1	F	API Provider management API attribute name optimization	16.3.0
2020-06	CT#88e	CP-201231	0135	1	F	Correct ServiceAPIDescription	16.3.0
2020-06	CT#88e	CP-201231	0136	2	F	Correct service API discovery in interconnection	16.3.0
2020-06	CT#88e	CP-201231	0137	1	F	Correct shareable information	16.3.0
2020-06	CT#88e	CP-201235	0138	1	F	Correct the supported features in the published API	16.3.0
2020-06	CT#88e	CP-201235	0139	1	F	Update general subclause for OpenAPI specification	16.3.0
2020-06	CT#88e	CP-201256	0140	1	F	URI of the CAPIF APIs	16.3.0
2020-06	CT#88e	CP-201231	0141	1	B	Add API category in discovery	16.3.0
2020-06	CT#88e	CP-201235	0142		F	Optionality of ProblemDetails	16.3.0
2020-06	CT#88e	CP-201230	0144	1	A	Clause and reference point correction	16.3.0
2020-06	CT#88e	CP-201231	0145	1	F	Align interface names	16.3.0
2020-06	CT#88e	CP-201235	0146	1	F	Supported headers, Resource Data type, Operation Name and yaml mapping	16.3.0
2020-06	CT#88e	CP-201255	0147		F	Update of OpenAPI version and TS version in externalDocs field	16.3.0
2020-06	CT#88e	CP-201319	0149		A	Required attribute corrections to CAPIF Open APIs	16.3.0

History

Document history		
V16.3.0	August 2020	Publication