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Contents

Foreword

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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 7159: "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] IETF RFC 5280: "Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile".

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.

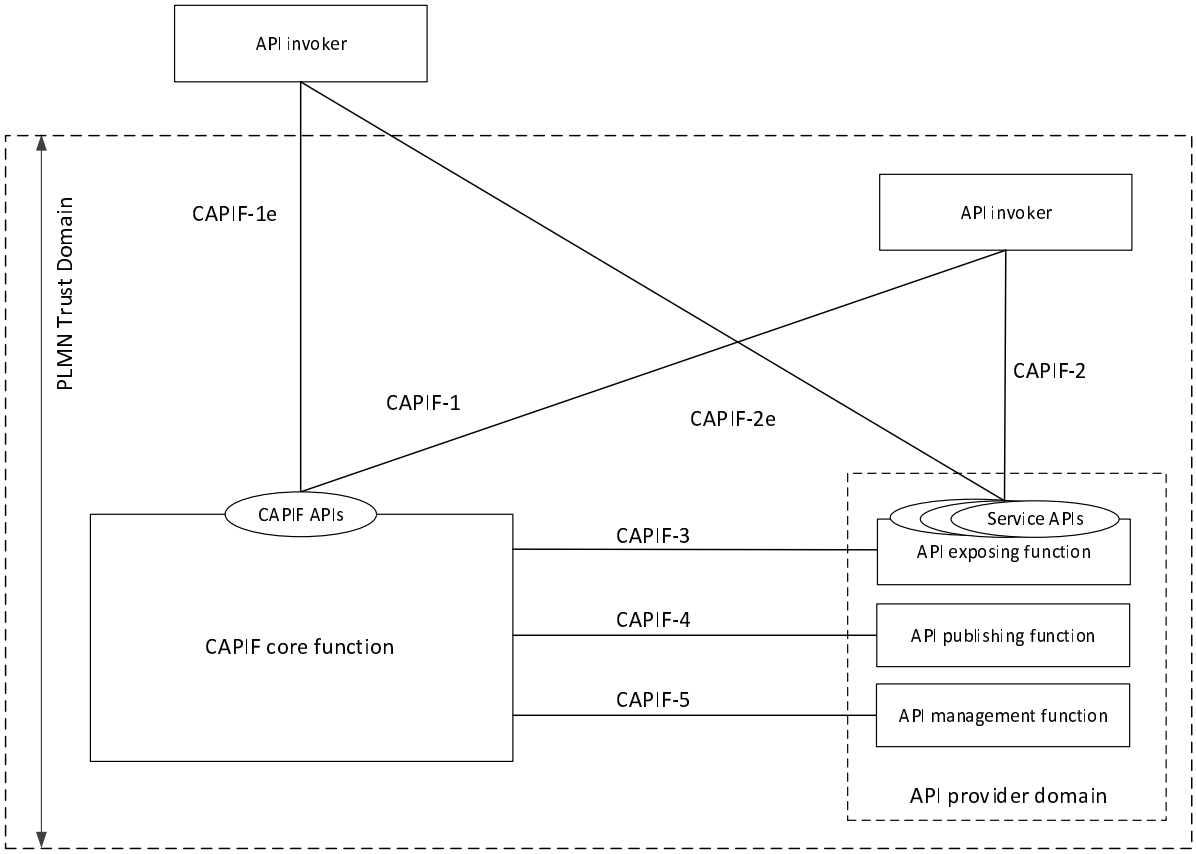

Figure 4.2-1: CAPIF Functional Model

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).

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 reference point 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;
- logging of service API invocations and
- charging of service API invocations.

The CAPIF core function supports the following capabilities over CAPIF-4 reference point 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 reference point 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.

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 reference point 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 takes the role of API invoker and communicates with the destination API exposing function over CAPIF-2.

4.3.4 API publishing function

The API publishing function (APF) enables the API provider to publish the Service APIs information using CAPIF-4 reference point 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 using CAPIF-5 reference point as defined in 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	AP Invoker
	Event operations (NOTE)	(NOTE)	API Invoker
CAPIF_Publish_Service_API	Publish_Service_API	Request/ Response	API Publishing Function
	Unpublish_Service_API	Request/ Response	API Publishing Function
	Update_Service_API	Request/ Response	API Publishing Function
	Get_Service_API	Request/ Response	API Publishing 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
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
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.			

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.

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.	API invoker

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.

5.2.2.2.2 API invoker discovering service API using Discover_Service_API service operation

To discover service APIs available at the CAPIF core function, the API invoker shall send an HTTP GET message with the API invoker 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 API invoker and check if the API invoker is authorized to discover the service APIs;
2. if the API invoker 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;
   c. return the filtered search results in the response message.

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 reference point to publish and manage published service APIs at the CAPIF core function.

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.	API publishing function
Unpublish_Service_API	This service operation is used by an API publishing function to un-publish service APIs from the CAPIF core function.	API publishing function
Get_Service_API	This service operation is used by an API publishing function to retrieve service APIs from the CAPIF core function.	API publishing function
Update_Service_API	This service operation is used by an API publishing function to update published service APIs on the CAPIF core function.	API publishing 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.

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. 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.

5.3.2.3.2 API publishing function 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 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 API publishing function and check if the API publishing function is authorized to un-publish service APIs;
2. if the API publishing function 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); and
   c. 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.

5.3.2.4.2 API publishing function 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 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 API publishing function and check if the API publishing function is authorized to retrieve information about the published service APIs;
2. if the API publishing function 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.

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

To update information of published service APIs, the 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 API publishing function and check if the API publishing function is authorized to update information of published service APIs;
2. if the API publishing function 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. replace the existing resource accordingly; and
   c. 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 reference point, API publishing function via CAPIF-4 reference point and API management function via CAPIF-5 reference point 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.

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.

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.

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

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.

5.6 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 reference point 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} is the API invoker identifier and represents the "Individual trusted API invoker" resource created 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.

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.

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 reference point 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 reference point to log the information related to service API invocations on the CAPIF core function.

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 reference point to query the log information stored on the CAPIF core function.

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 reference point to obtain the service API access policy from the CAPIF core function.

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.

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

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 reference point 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 7159 [12]).

The MIME media type that shall be used within the related Content-Type header field is "application/json", as defined in IETF RFC 7159 [12].

NOTE: This release only supports the content type JSON.

7.5 URI structure

7.5.1 Resource URI structure

All resource URIs of CAPIF APIs should have the following root structure:

{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 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 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:

- The SCEF is the CAPIF core function; and
- The SCS/AS is the functional entity invoking an API.

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 request URI used in each HTTP request from the API invoker towards the CAPIF core function shall have the 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

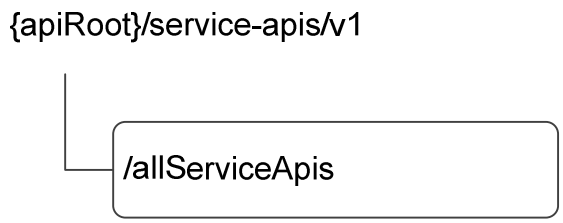

Figure 8.1.2.1-1: Resource URI structure of the CAPIF_Discover_Service_API

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/v1 /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/v1/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	Definition
apiRoot	See subclause 7.5

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
api-invoker-id	string	M	1	String identifying the API invoker assigned by the CAPIF core function.
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).
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 8.1.2.2.3.1-2 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	M	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. . Each service API description shall include AEF profiles matching the filter criteria.	

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
n/a		

8.2 CAPIF_Publish_Service_API

8.2.1 API URI

The request URI used in each HTTP request from the API publishing function towards the CAPIF core function shall have the 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

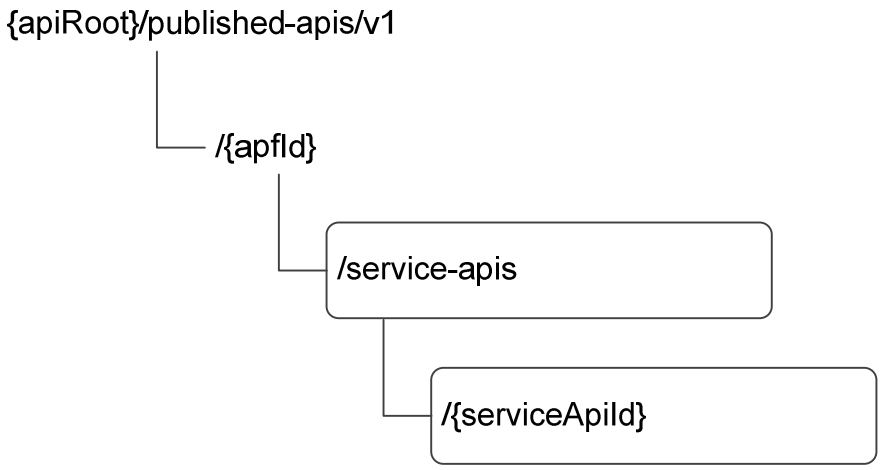

Figure 8.2.2.1-1: Resource URI structure of the CAPIF_Publish_Service_API

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/v1 /{apfId}/service-apis	POST	Publish a new API
		GET	Retrieve all published service APIs
Individual APF published API	{apiRoot} /published-apis /v1 /{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/v1/{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	Definition
apiRoot	See subclause 7.5
apfId	String identifying the API publishing function

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

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/v1/{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	Definition
apiRoot	See subclause 7.5
apfId	String identifying the API publishing function
serviceApiId	String identifying 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 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.	
description	string	O	0..1	Text description of the API	
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.	

8.2.4.2.3 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	CommunicationType	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(Operation)	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	CommunicationType	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(Operation)	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.	

8.2.4.3 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
n/a		

8.3 CAPIF_Events_API

8.3.1 API URI

The request URI used in each HTTP request from the Subscriber towards the CAPIF core function shall have the 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

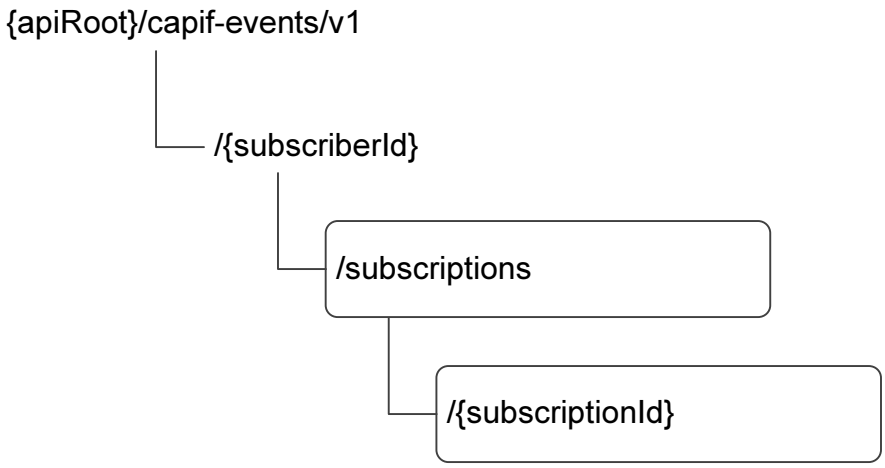

Figure 8.3.2.1-1: Resource URI structure of the CAPIF_Events_API

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/v1/{subscriberId}/subscriptions	POST	Creates a new individual CAPIF Event Subscription
Individual CAPIF Events Subscription	{apiRoot}/capif-events/v1/{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/v1/{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	Definition
apiRoot	See subclause 7.5
subscriberId	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

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/v1/{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	Definition
apiRoot	See subclause 7.5
subscriberId	ID of the Subscriber
subscriptionId	String identifying 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
EventSubscription	8.3.4.2.2	Represents an individual CAPIF Event Subscription resource	
EventNotification	8.3.4.2.3	Represents an individual CAPIF Event Subscription Notification	
CAPIFEvent	8.3.4.3.2	Describes CAPIF events	

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
Uri	3GPP TS 29.122 [14]		
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.	
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 8.3.6-1.	

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	
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	

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	
API_INVOKER_AUTHORIZATION_REVOKED	Events related to the revocation of the authorization of API invokers to access the service APIs.	

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.

Editor's Note: Supporting features specific to Subscriber is for further study.

8.4 CAPIF_API_Invoker_Management_API

8.4.1 API URI

The request URI used in each HTTP request from the API invoker towards the CAPIF core function shall have the 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

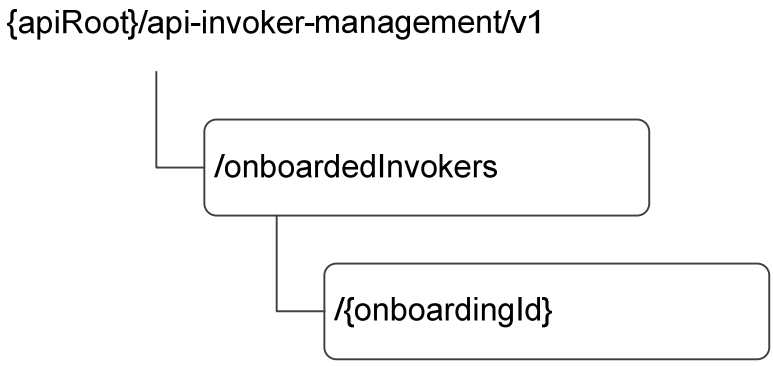

Figure 8.4.2.1-1: Resource URI structure of the CAPIF_API_Invoker_Management_API

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/v1 /onboardedInvokers	POST	On-boards a new API invoker by creating a API invoker profile
Individual On-boarded API Invoker	{apiRoot} /api-invoker-management/v1 /onboardedInvokers/{onboardingId}	DELETE	Off-boards an individual API invoker by deleting the API invoker profile identified by {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/v1/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 subclause 7.5

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.

8.4.2.2.4 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/v1/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 subclause 7.5
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

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.

8.4.4 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 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. 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.	
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
apiInvokerPublicKey	string	M	1	Public Key of API Invoker	
apiInvokerCertificate	string	O	0..1	API invoker's generic client certificate. The subject field in the certificate shall be encoded with API invoker ID as Common Name as specified in IETF RFC 5280 [26].	
onboardingSecret	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"	
resourceLocation	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.	
apiInvokerEnrolmentDetails	APIInvokerEnrolmentDetails	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 request URI used in each HTTP request from the API invoker or the API exposing function towards the CAPIF core function shall have the 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

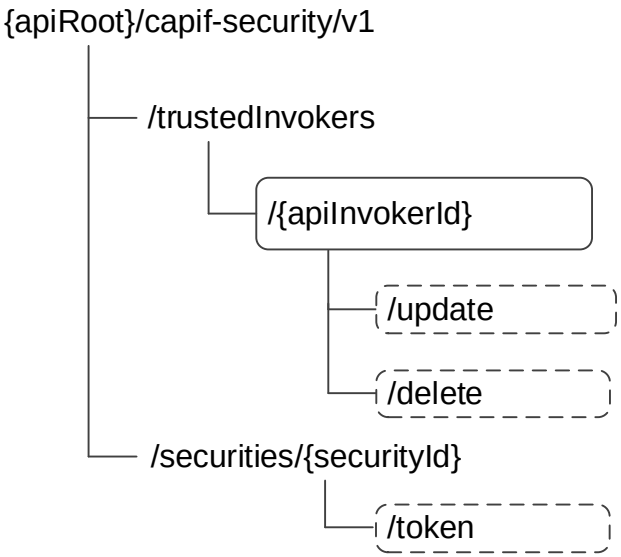

Figure 8.5.2.1-1: Resource URI structure of the CAPIF_Security_API

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/v1 /trustedInvokers	n/a	
Individual trusted API invoker	{apiRoot} /capif-security/v1 /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}/capif-security/v1 /trustedInvokers/{apiInvokerId}/update	update (POST)	Update the security context (e.g. re-negotiate the security methods).
	{apiRoot}/capif-security/v1 /trustedInvokers/{apiInvokerId}/delete	delete (POST)	Revoke the authorization of the API invoker for some APIs
	{apiRoot} /capif-security/v1/ 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/v1/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	Definition
apiRoot	See subclause 7.5

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/v1/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	Definition
apiRoot	See subclause 7.5
apiInvokerId	String identifying 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.

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

Custom operation URI	Mapped HTTP method	Description
{apiRoot} /capif-security/v1/trustedInvokers/{apiInvokerId}/update	POST	Update the security instance (e.g. re-negotiate the security methods).
{apiRoot} /capif-security/v1/trustedInvokers/{apiInvokerId}/delete	POST	Revoke the authorization of the API invoker for some APIs
{apiRoot} /capif-security/v1/securities/{securityId}/token	POST	Obtain the OAuth 2.0 authorization information

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 Operation: token

8.5.2.3.4.1 Description

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

8.5.2.3.4.2 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 request URI used in each HTTP request from the API exposing function towards the CAPIF core function shall have the 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.

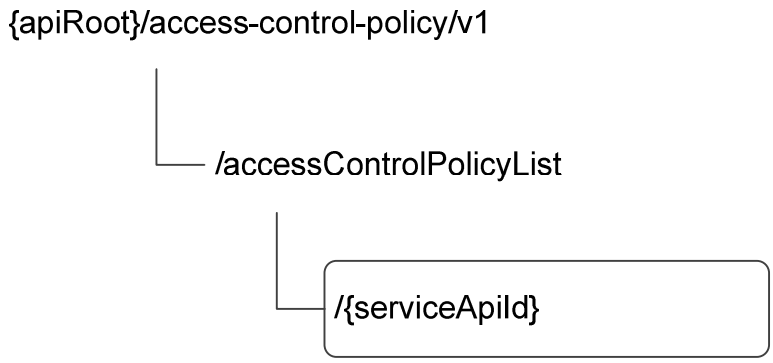

Figure 8.6.2.1-1: Resource URI structure of the CAPIF_Access_Control_Policy_API

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/v1 /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/v1/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	Definition
apiRoot	See subclause 7.5
serviceApiId	String identifying 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.

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 request URI used in each HTTP request from the API exposing function towards the CAPIF core function shall have the 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

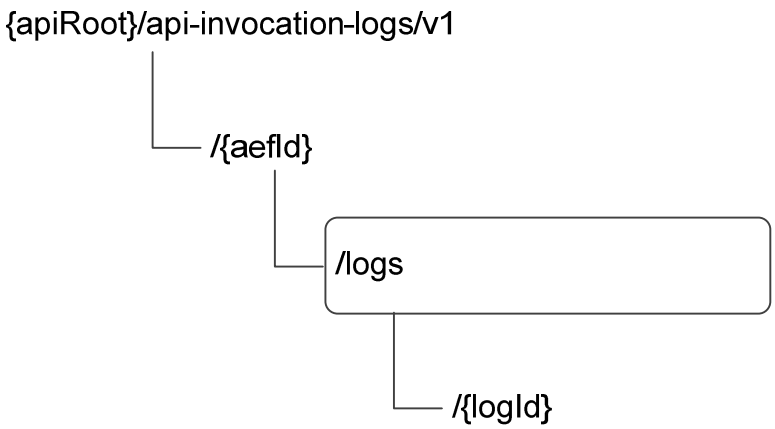

Figure 8.7.2.1-1: Resource URI structure of the CAPIF_Logging_API_Invocation_API

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/v1 /{aefId}/logs	POST	Creates a new log entry for service API invocations
Individual log	{apiRoot} /api-invocation-logs/v1 /{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/v1/{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	Definition
apiRoot	See subclause 7.5
aefId	Identity 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.

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	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.	

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 request URI used in each HTTP request from the API management function towards the CAPIF core function shall have the 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

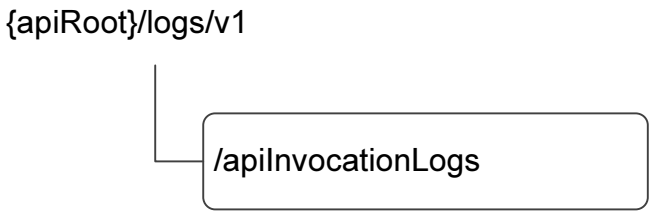

Figure 8.8.2.1-1: Resource URI structure of the CAPIF_Auditing_API

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/v1/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/v1/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	Definition
apiRoot	See subclause 7.5

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	M	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		

9 AEF API Definition

9.1 AEF_Security_API

9.1.1 API URI

The request URI used in each HTTP request from the API invoker towards the API exposing function shall have the following structure:

- The {apiRoot} shall be as defined in the service API specification using CAPIF.
- 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" is set as described in subclause 7.5.

Table 9.1.2a.1-1: Custom operations without associated resources

Custom operation URI	Mapped HTTP method	Description
{apiRoot}/aef-security/v1/check-authentication	POST	Check authentication request.
{apiRoot}/aef-security/v1/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	Supported Features	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	Supported Features	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.

A.2 CAPIF_Discover_Service_API

```
openapi: 3.0.0
info:
  title: CAPIF_Discover_Service_API
  description: |
    API for discovering service APIs.
    © 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}/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.
          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: supported-features
          in: query
          description: To filter irrelevant responses related to unsupported features
```

```
          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.
    © 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}/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'
      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
    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.
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    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}/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
        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'
      required:
        - subscriptionId
        - events
    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
      - 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.
```

A.5 CAPIF_API_Invoker_Management_API

```
openapi: 3.0.0
info:
  title: CAPIF_API_Invoker_Management_API
  description: |
    API for API invoker management.
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    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}/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'

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.
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    All rights reserved.
  version: "1.0.3"
externalDocs:
  description: 3GPP TS 29.222 V15.7.0 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
              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 API invoker
        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
```

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
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2018-12	CT#82	CP-183109	0067		F	Redundant Editor's note	15.2.0
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2018-12	CT#82	CP-183109	0070		F	Missing general description in A.1	15.2.0
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2018-12	CT#82	CP-183109	0075	1	F	externalDocs field in OpenAPI documents	15.2.0
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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
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2019-12	CT#86	CP-193194	0094	1	F	Correct cardinality in event API	15.5.0
2019-12	CT#86	CP-193194	0102	1	F	Clause reference corrections	15.5.0
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2019-12	CT#86	CP-193194	0117	1	F	Correct the notificationDestination of ServiceSecurity object in yaml file	15.5.0
2019-12	CT#86	CP-193194	0119	1	F	Align the API name of Initiate_Authentication	15.5.0
2019-12	CT#86	CP-193194	0122		F	Update of OpenAPI version and TS version in externalDocs field	15.5.0
2020-06	CT#88e	CP-201230	0132		F	Correct API publish procedure	15.6.0
2020-06	CT#88e	CP-201230	0134	1	F	Correct ServiceAPIDescription	15.6.0
2020-06	CT#88e	CP-201230	0143	1	F	Clause and reference point correction	15.6.0
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2020-09	CT#89e	CP-202063	0154	1	F	Correct CAPIF security API	15.7.0
2020-09	CT#89e	CP-202063	0156	1	F	Correct api invoker certificate in onboarding	15.7.0

2020-09	CT#89e	CP-202083	0159		F	Update of OpenAPI version and TS version in externalDocs field	15.7.0

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