

ETSI TS 129 506 V19.0.0 (2026-01)



TECHNICAL SPECIFICATION

**5G;
5G System;
Usage of the Unified Data Repository services
for Ambient IoT Data;
Stage 3
(3GPP TS 29.506 version 19.0.0 Release 19)**



ReferenceDTS/TSGC-0429506vj00

Keywords5G

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Foreword

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

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In the present document, modal verbs have the following meanings:

- shall** indicates a mandatory requirement to do something
- shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

- should** indicates a recommendation to do something
- should not** indicates a recommendation not to do something
- may** indicates permission to do something
- need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

- can** indicates that something is possible
- cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

- will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document specifies the usage of the Unified Data Repository services for Ambient IoT Data. It provides the resource definition and data model for Ambient IoT data used over the Nudr Service Based Interface. The protocol definition for Nudr Service Based Interface which is specific to Ambient IoT data is also specified in the present document.

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.369 [14].

The stage 3 protocol definition for Nudr Service Based Interface which is common for subscription data, policy data, structure data for exposure, application data and Ambient IoT data is specified in 3GPP TS 29.504 [15].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [4] and 3GPP TS 29.501 [5].

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 23.501: "System Architecture for the 5G System; Stage 2".
- [3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".
- [4] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".
- [5] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".
- [6] OpenAPI: "OpenAPI Specification Version 3.0.0", <https://spec.openapis.org/oas/v3.0.0>.
- [7] 3GPP TR 21.900: "Technical Specification Group working methods".
- [8] 3GPP TS 33.501: "Security architecture and procedures for 5G system".
- [9] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".
- [10] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".
- [11] IETF RFC 9113: "HTTP/2".
- [12] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".
- [13] IETF RFC 9457: "Problem Details for HTTP APIs".
- [14] 3GPP TS 23.369: "Architecture support for Ambient power-enabled Internet of Things; Stage 2".
- [15] 3GPP TS 29.504: "5G System; Unified Data Repository Services; Stage 3".
- [16] IETF RFC 9110: "http Semantics".
- [17] IETF RFC 9111: "HTTP Caching".

- [18] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces Stage 3".
- [19] 3GPP TS 29.369: "Ambient IoT Data Management Services".

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].

AIoT Device: An Ambient IoT device is an IoT device powered by energy harvesting, with limited energy storage capability.

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].

AIoT	Ambient IoT
------	-------------

4 Overview

The resources, data model and usage defined in the present document are used by the 5GC NFs (e.g., UDM) to access the Ambient IoT data via the Unified Data Repository services specified in 3GPP TS 29.504 [15].

5 Usage of Nudr_DataRepository Service API for Ambient IoT data

5.1 Introduction

The following clauses specify the usage of Nudr_DataRepository service for Ambient IoT data. The principles specified in 3GPP TS 29.504 [15] are followed unless explicitly specified otherwise in the following clauses.

5.2 Resources

5.2.1 Overview

This clause specifies the resources for the usage of the Unified Data Repository service for Ambient IoT data.

5.2.2 Resource Structure

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 5.2.2-1 depicts the resource URIs structure for the Nudr_DataRepository API for Ambient IoT data.

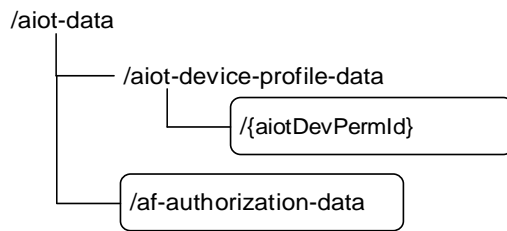


Figure 5.2.2-1: Resource URI structure of the Nudr_DataRepository API for Ambient IoT data

Table 5.2.2-1 provides an overview of the resources and applicable HTTP methods.

Table 5.2.2-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
AiotDeviceProfileData	/aiot-data/aiot-device-profile-data/{aiotDevPermId}	GET	Retrieve the AIoT device profile data for an AIoT device permanent identifier.
		PATCH	Modify the AIoT device profile data for an AIoT device permanent identifier.
AfAuthorizationData	/af-authorization-data	GET	Retrieve AF Authorization Data

5.2.3 Resource: AiotDeviceProfileData

5.2.3.1 Description

The resource represents all AIoT device profile data attributes in the UDR for a given "aiotDevPermId".

5.2.3.2 Resource definition

Resource URI: {apiRoot}/nudr-dr/<apiVersion>/aiot-data/aiot-device-profile-data/{aiotDevPermId}

This resource shall support the resource URI variables defined in table 5.2.3.2-1.

Table 5.2.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See 3GPP TS 29.504 [15] clause 6.1.1
aiotDevPermId	AiotDevPermId	Represents the AIoT device permanent id. Data type AiotDevPermId is defined in 3GPP TS 29.571 [18].

5.2.3.3 Resource Standard Methods

5.2.3.3.1 GET

This method shall support the URI query parameters specified in table 5.2.3.3.1-1.

Table 5.2.3.3.1-1: 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 5.2.3.3.1-2 and the response data structures and response codes specified in table 5.2.3.3.1-3.

Table 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 5.2.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AiotDeviceProfileData	M	1	200 OK	Upon success, a response body containing AIoT Device Profile Data shall be returned.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - DATA_NOT_FOUND
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

5.2.3.3.2 PATCH

This method shall support the URI query parameters specified in table 5.2.3.3.2-1.

Table 5.2.3.3.2-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description
supported-features	SupportedFeatures	O	0..1	The features supported by the NF service consumer.

This method shall support the request data structures specified in table 5.2.3.3.2-2 and the response data structures and response codes specified in table 5.2.3.3.2-3.

Table 5.2.3.3.2-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
AiotDeviceProfileDataPatch	M	1	Modify the aiot device profile data resource for a given AIoT device permanent identifier.

Table 5.2.3.3.2-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Upon successful modification there is no body in the response message. (NOTE 2)
PatchResult	M	1	200 OK	Upon success, the execution report is returned. (NOTE 2)
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - DATA_NOT_FOUND
NOTE 1: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				
NOTE 2: If all the modification instructions in the PATCH request have been implemented, the UDR shall respond with 204 No Content response; if some of the modification instructions in the PATCH request have been discarded, and the NF service consumer has included in the supported-feature query parameter the "PatchReport" feature number, the UDR shall respond with PatchResult.				

5.2.4 Resource: AfAuthorizationData

5.2.4.1 Description

This resource represents the AF Authorization data.

This resource is modelled as the Document resource archetype (see clause C.1 of 3GPP TS 29.501 [5]).

5.2.4.2 Resource Definition

Resource URI: {apiRoot}/nudr-dr/<apiVersion>/aiot-data/af-authorization-data

This resource shall support the resource URI variables defined in table 5.2.4.2-1.

Table 5.2.4.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See 3GPP TS 29.504 [15] clause 6.1.1

5.2.4.3 Resource Standard Methods

5.2.4.3.1 GET

This method shall support the URI query parameters specified in table 5.2.4.3.1-1.

Table 5.2.4.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description	Applicability
af-id	Afid	O	0..1	When present, this parameter indicates the AF for whom the Authorization data is to be retrieved. When this IE is absent, it shall indicate that the Authorization Data for all the AFs are to be retrieved.	

This method shall support the request data structures specified in table 5.2.4.3.1-2 and the response data structures and response codes specified in table 5.2.4.3.1-3.

Table 5.2.4.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.2.4.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AfAuthorizationData	M	1	200 OK	Upon success, a response body containing the AfAuthorizationData shall be returned.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - DATA_NOT_FOUND
NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

5.2.4.4 Resource Custom Operations

None.

5.3 Custom Operations without associated resources

None in this release of the specification.

5.4 Notifications

None in this release of the specification.

5.5 Data Model

5.5.1 General

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

Table 5.5.1-1 specifies the data types defined for the Nudr_DataRepository for AIoT data service-based interface protocol.

Table 5.5.1-1: Nudr_DataRepository specific Data Types for AIoT data

Data type	Section defined	Description	Applicability
AiotDeviceProfileData	5.5.2.2	AIoT Device Profile Data	
AiotDeviceProfileDataPatch	5.5.2.3	AIoT Device Profile Data for patch operation	

Table 5.5.1-2 specifies data types re-used by the Nudr_DataRepository for AIoT Data service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nudr_DataRepository service based interface for Ambient IoT data.

Table 5.5.1-2: Nudr_DataRepository re-used Data Types for AIoT data

Data type	Reference	Comments	Applicability
AiotDevPermlId	3GPP TS 29.571 [18]	AIoT device permanent identifier	
LastKnownAiotfInfo	3GPP TS 29.369 [19]	Last Known AIoT Information	
PatchResult	3GPP TS 29.571 [18]		
ProblemDetails	3GPP TS 29.571 [18]	Used in error responses to provide more detailed information about an error.	
SupportedFeatures	3GPP TS 29.571 [18]	see 3GPP TS 29.500 [4] clause 6.6	
AfAuthorizationData	3GPP TS 29.369 [19]	AF Authorization Data	
AfId	3GPP TS 29.369 [19]	AF ID	

5.5.2 Structured data types

5.5.2.1 Introduction

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

5.5.2.2 Type AiotDeviceProfileData

Table 5.5.2.2-1: Definition of type AiotDeviceProfileData

Attribute name	Data type	P	Cardinality	Description	Applicability
aiotDevPerMId	AiotDevPerMId	M	1	Globally unique AIoT device permanent identifier	
lastKnownAiotfInfo	LastKnownAiotfInfo	M	1	Last known AIO TF that serves the AIoT device, or unknown. true: the last known AIO TF that serves the AIoT device; false: Unknown	

5.5.2.3 Type AiotDeviceProfileDataPatch

Table 5.5.2.3-1: Definition of type AiotDeviceProfileDataPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
lastKnownAiotfInfo	LastKnownAiotfInfo	M	1	Last known AIO TF that serves the AIoT device, or unknown. true: the last known AIO TF that serves the AIoT device; false: Unknown	

5.5.3 Simple data types and enumerations

5.5.3.1 Introduction

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

5.6 Error handling

Table 5.6-1 lists common response body data structures used within the nudr-dr (Nudr_DataRepository) API.

Table 5.6-1: Common Response Body Data Structures

Data type	P	Cardinality	Response codes	Description
ProblemDetails	O	0..1	4xx, 5xx responses	For unsuccessful status codes, the UDR may provide detailed information.

NOTE: In addition common data structures as defined in 3GPP TS 29.500 [4] are supported.

The application layer error handling shall follow 3GPP TS 29.504 [15] clause 6.1.6 unless explicitly specified in this document.

5.7 Feature negotiation

The optional features in table 6.1.8-1 of 3GPP TS 29.504 [15] are defined for the Nudr_DataRepository API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Annex A (normative): OpenAPI specification

A.1 General

This Annex specifies the formal definition of the API(s) defined in the present specification. It consists of OpenAPI specifications in YAML format.

This Annex takes precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API(s).

NOTE 1: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification files contained in this 3GPP Technical Specification are available on a Git-based repository that uses the GitLab software version control system (see clause 5.3.1 of 3GPP TS 29.501 [5] and clause 5B of 3GPP TR 21.900 [7]).

A.2 Nudr_DataRepository API for AIoT data API

For the purpose of referencing entities in the Open API file defined in this Annex, it shall be assumed that this Open API file is contained in a physical file named "TS29506_Aiot_Device_Profile_Data.yaml".

```

openapi: 3.0.0

info:
  version: '1.0.0-alpha.1'
  title: Unified Data Repository Service API file for Ambient IoT data
  description: |
    The API version is defined in 3GPP TS 29.504
    © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: >
    3GPP TS 29.506 V19.0.0; 5G System; Usage of the Unified Data Repository Service for AIoT Data
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.506/'

paths:
  /aiot-data/aiot-device-profile-data/{aiotDevPermId}:
    parameters:
      - name: aiotDevPermId
        in: path
        required: true
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AiotDevPermId'
    get:
      summary: Retrieves the AIoT device profile data for an AIoT device permanent identifier
      operationId: ReadAiotDeviceProfileData
      tags:
        - AiotDeviceProfileData (Document)
      security:
        - {}
        - oAuth2ClientCredentials:
            - nudr-dr
            - nudr-dr:aiot-data:aiot-device-profile-data
            - nudr-dr:aiot-data:aiot-device-profile-data:aiotDevPermId:read
      responses:
        '200':
          description: >
            Upon success, a response body containing AIoT device profile data shall be returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AiotDeviceProfileData'

```

```

'400':
  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
'401':
  $ref: 'TS29571_CommonData.yaml#/components/responses/401'
'403':
  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
'404':
  description: Not Found
  content:
    application/problem+json:
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
'406':
  $ref: 'TS29571_CommonData.yaml#/components/responses/406'
'429':
  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
'500':
  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
'502':
  $ref: 'TS29571_CommonData.yaml#/components/responses/502'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
patch:
  summary: Modify the AIoT device profile data for an AIoT device permanent identifier.
  operationId: UpdateAiotDeviceProfileData
  tags:
    - AiotDeviceProfileData (Document)
  security:
    - {}
    - oAuth2ClientCredentials:
      - nudr-dr
      - nudr-dr:aiot-data:aiot-device-profile-data
      - nudr-dr:aiot-data:aiot-device-profile-data:aiotDevPermId:modify
  parameters:
    - name: supported-features
      in: query
      description: Supported Features
      required: false
      schema:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
  requestBody:
    required: true
    content:
      application/merge-patch+json:
        schema:
          $ref: '#/components/schemas/AiotDeviceProfileDataPatch'
  responses:
    '200':
      description: Expected response to a valid request.
      content:
        application/json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/PatchResult'
    '204':
      description: No content. Response to successful modification.
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '401':
      $ref: 'TS29571_CommonData.yaml#/components/responses/401'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':
      description: Not Found
      content:
        application/problem+json:
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
    '411':
      $ref: 'TS29571_CommonData.yaml#/components/responses/411'
    '413':
      $ref: 'TS29571_CommonData.yaml#/components/responses/413'
    '415':
      $ref: 'TS29571_CommonData.yaml#/components/responses/415'
    '429':
      $ref: 'TS29571_CommonData.yaml#/components/responses/429'
    '500':

```

```

    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '502':
    $ref: 'TS29571_CommonData.yaml#/components/responses/502'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'

/aiot-data/af-authorization-data:
  get:
    summary: get AF Authorization Data
    operationId: Get AF Authorization Data
    tags:
      - AF Authorization Data Retrieval
    security:
      - {}
      - oAuth2ClientCredentials:
          - nudr-dr:aiot-data:af-authorization-data
          - nudr-dr:aiot-data:af-authorization-data:AfId
    parameters:
      - name: af-id
        in: query
        description: AF ID
        required: false
        schema:
          $ref: 'TS29369_Nadm_DM.yaml#/components/schemas/AfId'
    responses:
      '200':
        description: Expected response to a valid request
        content:
          application/json:
            schema:
              $ref: 'TS29369_Nadm_DM.yaml#/components/schemas/AfAuthorizationData'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29571_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error

components:
  schemas:

# STRUCTURED TYPES

AiotDeviceProfileData:
  description: Contains the AIoT device profile data for a given AIoT device permanent id.
  type: object
  properties:
    aiotDevPermId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/AiotDevPermId'
      description: >
        Contains an AIoT device permanent identifier.
    lastKnownAiotfInfo:
      $ref: 'TS29369_Nadm_DM.yaml#/components/schemas/LastKnownAiotfInfo'
      description: >
        Contains Last known AIOTF that serves the AIoT device, or unknown.
  required:
    - aiotDevPermId
    - lastKnownAiotfInfo

AiotDeviceProfileDataPatch:

```

```
description: Contains the modifiable AIoT device profile data for a given AIoT device
permanent Id.
type: object
properties:
  lastKnownAiotfInfo:
    $ref: 'TS29369_Nadm_DM.yaml#/components/schemas/LastKnownAiotfInfo'
    description: >
      Contains Last known AIOTF that serves the AIoT device, or unknown.
```

```
# ENUMS:
```

Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2025-05	CT4#129	C4-252334				TS skeleton	0.0.0
2025-08	CT4#130	C4-253541				Inclusion of pCRs agreed at CT4#130, including C4-253414, C4-253528, C4-253562, C4-253574.	0.1.0
2025-09	CT#109	CP-252183				Presented for information and approval	1.0.0
2025-09	CT#109					Approved in TSG CT#109	19.0.0

History

Document history		
V19.0.0	January 2026	Publication