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Contents

Foreword

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

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Should indicates a recommendation to do something

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need not indicates permission not to do something

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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 stage 3 protocol and data model for the Neasdf Service Based Interface. It provides stage 3 protocol definitions and message flows, and specifies the API for each service offered by the EASDF.

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.548 [14].

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 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".

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

[13] IETF RFC 7807: "Problem Details for HTTP APIs".

[14] 3GPP TS 23.548: "5G System Enhancements for Edge Computing; Stage 2".

[15] IETF RFC 6902: "JavaScript Object Notation (JSON) Patch".

[16] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[17] Void.

[18] IETF RFC 7871: "Client Subnet in DNS Queries".

[19] 3GPP TS 23.003: "Numbering, addressing and identification".

3 Definitions, symbols 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].

One-Time DNS Rule: A DNS Rule that applies only once to a specific DNS message earlier buffered in the EASDF and reported to the SMF (see clause 5.2.3.2.4).

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].

BD AIT	Baseline DNS Action Information Template
BD MDT	Baseline DNS Message Detection Template
EASDF	Edge Application Server Discovery Function
ECS	EDNS Client Subnet
EDNS	Extension mechanisms for DNS
MDT	(DNS Query or DNS Response) Message Detection Template

4 Overview

4.1 Introduction

Within the 5GC, the EASDF offers services to the SMF via the Neasdf service based interface (see 3GPP TS 23.548 [14], 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3]).

Figure 4.1-1 provides the reference model (in service based interface representation and in reference point representation), with focus on the EASDF and the scope of the present specification.

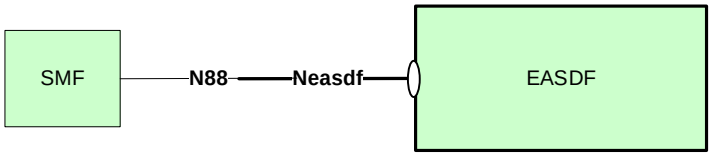

Figure 4.1-1: Reference model – EASDF

The functionalities supported by the EASDF are listed in clause 5.1.1 of 3GPP TS 23.548 [14].

5 Services offered by the EASDF

5.1 Introduction

The EASDF offers to other NFs the following service:

Table 5.1-1: NF Service provided by EASDF

Service Name	Description	Example Consumer
Neasdf_DNSContext	This service enables the consumer to create, update and delete DNS context in EASDF, or subscribe to DNS message reporting from EASDF.	SMF
Neasdf_BaselineDNSPattern	This service enables the consumer to create, update and delete Baseline DNS pattern in EASDF.	SMF

The Neasdf_DNSContext service and Neasdf_BaselineDNSPattern service are specified in 3GPP TS 23.548 [14].

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

Table 5.1-2: API Descriptions

Service Name	Clause	Description	OpenAPI Specification File	apiName	Annex
Neasdf_DNSContext	6.1	EASDF DNSContext Service	TS29556_Neasdf_DNSContext.yaml	neasdf-dnscontext	A.2
Neasdf_BaselineDNSPattern	6.2	EASDF BaselineDNSPattern Service	TS29556_Neasdf_BaselineDNSPattern.yaml	neasdf-baselinednspattern	A.3

5.2 Neasdf_DNSContext Service

5.2.1 Service Description

The Neasdf_DNSContext service operates on the DNS contexts. The EASDF is acting as NF Service Producer, while the SMF is the NF Service Consumer.

Following functionalities are provided by the Neasdf_DNSContext service:

- Create a DNS context in EASDF;
- Update a DNS context in EASDF;
- Delete a DNS context in EASDF;
- Enable the EASDF to report DNS signalling related information to the NF service consumer when receiving DNS Query or DNS Response.

The Neasdf_DNSContext service supports the following service operations.

Table 5.2.1-1: Service operations supported by the Neasdf_DNSContext service

Service Operations	Description	Operation Semantics	Example Consumer(s)
Create	Create a DNS context in EASDF.	Request/Response	SMF
Update	Update a DNS context in EASDF.	Request/Response	SMF
Delete	Delete a DNS context in EASDF.	Request/Response	SMF
Notify	EASDF reports DNS signalling related information to the NF service consumer when receiving DNS Query or DNS Response.	Subscribe/Notify	SMF

5.2.2 Service Operations

5.2.2.1 Introduction

See Table 5.2.1-1 for an overview of the service operations supported by the Neasdf_DNSContext service.

5.2.2.2 Create

5.2.2.2.1 General

The Create service operation shall be used to create an individual DNS context for a given PDU Session in the EASDF.

It is used in the following procedures:

- EAS Discovery Procedure with EASDF (see clause 6.2.3.2.2 of 3GPP TS 23.548 [14]).

There shall be only one individual DNS context created in an EASDF per PDU session.

The NF Service Consumer (e.g. SMF) shall create a DNS context by using the HTTP POST method as shown in Figure 5.2.2.2.1-1.

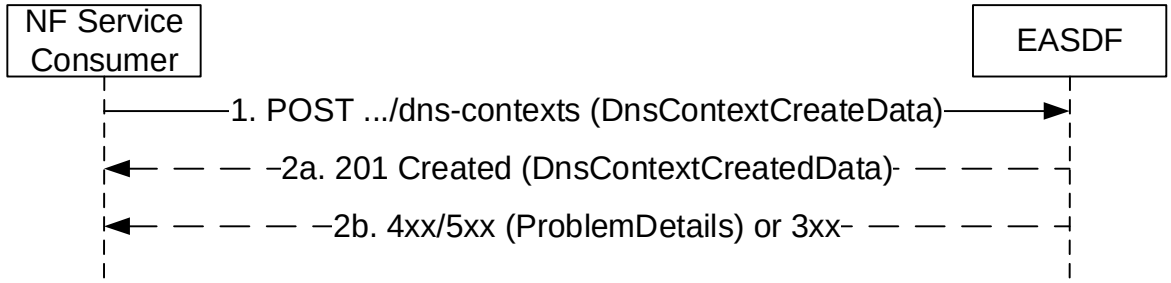

Figure 5.2.2.2.1-1: DNS context creation

1. The NF Service Consumer shall send a POST request to the resource representing the DNS contexts collection resource of the EASDF. The payload body of the POST request shall contain:

   - the UE IP address, S-NSSAI and the DNN of the related PDU session;
   - a notification URI for receiving DNS context related event notifications, if notifications are requested;
   - one or more DNS rules.

2a. On success, a "201 Created" response shall be returned with the "Location" header containing the URI of the created resource.

The POST response body shall include:

- the IP address of the EASDF (to be sent by the SMF to the UE).

2b. On failure, or redirection, one of the HTTP status code listed in Table 6.1.3.2.3.1-3 shall be returned.

5.2.2.3 Update

5.2.2.3.1 General

The Update service operation shall be used to update an individual DNS context previously created in the EASDF. The update operation may apply to the whole DNS context (complete replacement of the data of the existing DNS context by new data), or it may apply to modify a subset of the parameters of the DNS context.

It is used in the following procedures:

- EAS Discovery Procedure with EASDF (see clause 6.2.3.2.2 of 3GPP TS 23.548 [14]).

To perform a partial update of the DNS context of a given DNS context Id, the NF Service Consumer shall issue an HTTP PATCH request, as shown in Figure 5.2.2.3.1-1. This partial update shall be used to add, delete and/or replace individual parameters of the DNS context.

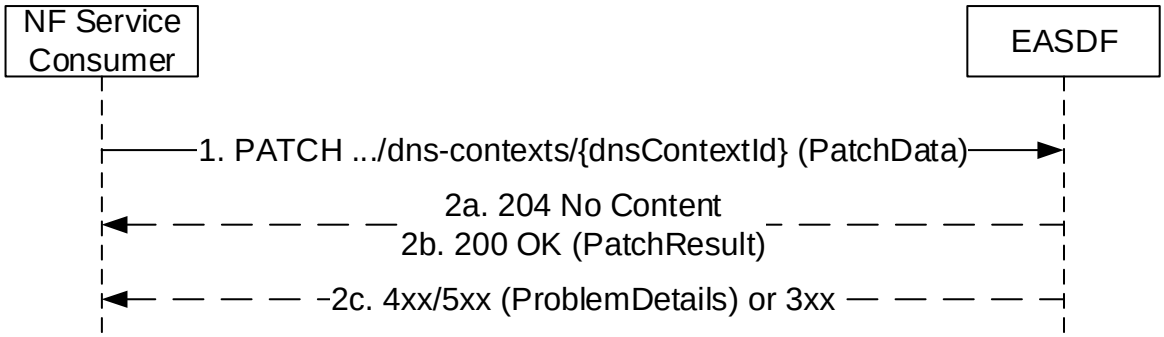

Figure 5.2.2.3.1-1: DNS context Partial Update

1. The NF Service Consumer (e.g. SMF) shall send a PATCH request to the resource URI representing the individual DNS context, identified by the {dnsContextId}. The payload body of the PATCH request shall contain the list of operations (add/delete/replace) to be applied to parameters in the individual DNS context.

2a. On success, if all the modification instructions in the PATCH request have been implemented, "204 No Content" shall be returned.

2b. If some of the modification instructions for unknown attribute(s) in the PATCH request have been ignored, the EASDF shall respond with "200 OK" with the response body containing PatchResult, as specified in clause 5.2.7.2 of 3GPP TS 29.500 [4].

2c. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.3.3.2-3 shall be returned.

To perform a complete replacement of the data of the DNS context of a given DNS context Id, the NF Service Consumer shall issue an HTTP PUT request, as shown in Figure 5.2.2.3.1-2:

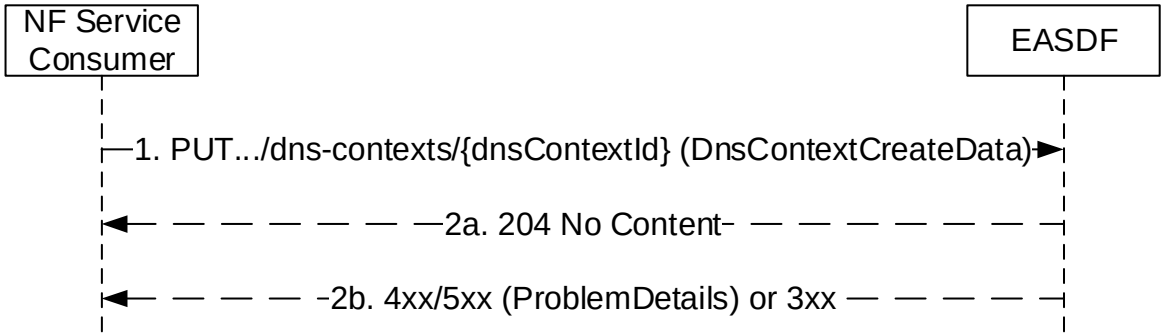

Figure 5.2.2.3.1-2: DNS context Complete Replacement

1. The NF service consumer (e.g. SMF) shall send a PUT request to the resource URI representing the individual DNS context, identified by the {dnsContextId}. The payload body of the PUT request shall contain a representation of the individual DNS context to be completely replaced in the EASDF.

2a. On success, "204 No Content" shall be returned.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.3.3.3-3 shall be returned.

5.2.2.4 Delete

5.2.2.4.1 General

The Delete Service operation shall be used by the NF service consumer (e.g. SMF) to delete the individual DNS context in the EASDF.

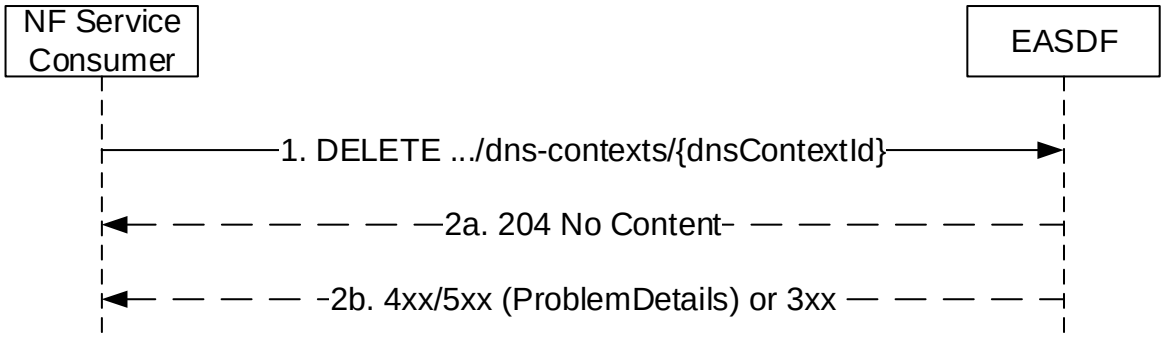

Figure 5.2.2.4.1-1: DNS context deletion

1. The NF Service Consumer (e.g. SMF) shall send a DELETE request to delete the individual DNS context represented by the {dnsContextId}. The request body shall be empty.

2a. On success, "204 No Content" shall be returned. The response body shall be empty.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.3.3.1-3 shall be returned.

5.2.2.5 Notify

5.2.2.5.1 General

The Notify service operation shall be used to notify the NF Service Consumer (e.g. SMF) about a DNS context related event, e.g. if a received DNS Query message or DNS response message matches a DNS detection template of an DNS rule and the associated action requires to report the message to the NF service producer.

It is used in the following procedures:

- EAS Discovery Procedure with EASDF (see clause 6.2.3.2.2 of 3GPP TS 23.548 [14]).

The EASDF shall send an HTTP POST request targeting the DNS context notification URI provided by the NF Service Consumer in the Create or Update service operation (see clause 5.2.2.2.1). See also Figure 5.2.2.5.1-1.

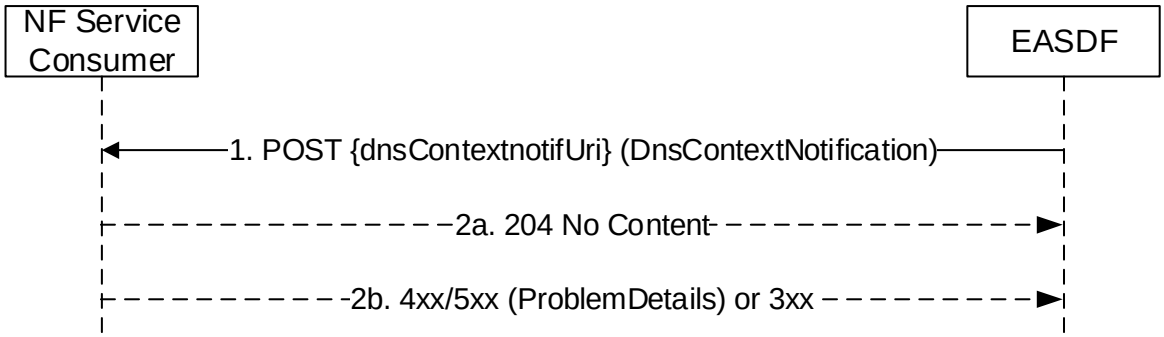

Figure 5.2.2.5.1-1: DNS Context Notify

1. The EASDF shall send a HTTP POST request to the DNS context notification URI, and the payload body of the POST request shall contain a DnsContextNotification data structure, with the DNS message report that was subscribed by the NF Service Consumer.

2a. On success, "204 No Content" shall be returned and the payload body of the POST response shall be empty.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.5.2.3.1-3 shall be returned.

5.2.3 DNS messages processing by EASDF

5.2.3.1 Introduction

This clause specifies how the EASDF shall process DNS messages according to the instructions received from the SMF.

5.2.3.2 DNS message processing model

5.2.3.2.1 DNS Context

The SMF shall control how the EASDF processes DNS messages received for a particular UE's PDU session by creating one single DNS context per PDU session including the following information:

- the UE IP address, S-NSSAI and DNN of the PDU session; and
- one or more DNS rules.

There shall be at most one DNS context created in the EASDF with the same UE IP address, S-NSSAI and DNN. If the EASDF receives a request to create a DNS context for which another DNS context already exists with the same UE IP address, S-NSSAI and DNN, the EASDF shall proceed with creating the DNS context and shall delete the earlier existing DNS context with the same UE IP address, S-NSSAI and DNN.

5.2.3.2.2 DNS Rule

A DNS rule shall apply either to DNS Query messages or DNS Response messages. A DNS rule shall contain:

- the DNS Rule ID uniquely identifying the DNS rule within the DNS context, for a DNS rule other than a One-Time DNS rule;
- precedence information, indicating the order in which the EASDF shall attempt to match DNS messages against all the DNS rules provisioned in the DNS context, for a DNS rule other than a One-Time DNS rule;
- for a DNS rule provisioned for DNS Query messages:
  - for a DNS rule other than a One-Time DNS rule:
    - at least one DNS Query Message Detection Template (MDT) or Baseline DNS Query Message Detection Template (BD MDT) ID referring to a BD MDT provisioned in a baseline DNS pattern; such a DNS rule may contain one or more DNS Query MDTs and/or BD MDT IDs referring to BD MDTs provisioned in one or more baseline DNS patterns; or
  - for a One-Time DNS rule:
    - the DNS message identifier uniquely identifying the DNS message buffered in the EASDF;
- for a DNS rule provisioned for DNS Response messages:
  - for a DNS rule other than a One-Time DNS rule:
    - at least one DNS Response MDT or Baseline DNS Response MDT ID referring to a BD MDT provisioned in a baseline DNS pattern; a DNS rule may contain one or more DNS Response MDTs and/or BD MDT IDs referring to BD MDTs provisioned in one or more baseline DNS patterns;
  - for a One-Time DNS rule:
    - the DNS message identifier uniquely identifying the DNS message buffered in the EASDF;
- a list of actions to apply to all DNS messages matching at least one DNS MDT of the DNS rule or one BD MDT referred by the DNS rule.

See clauses 5.2.3.5 and 5.2.3.2.4 for the description of baseline DNS patterns and One-Time DNS rules respectively.

Figure 5.2.3.2-1 provides an overview of DNS contexts, DNS rules (other than One-Time DNS rules) and baseline DNS patterns, depicting one DNS context created with N DNS rules, some of them referring to baseline DNS patterns.

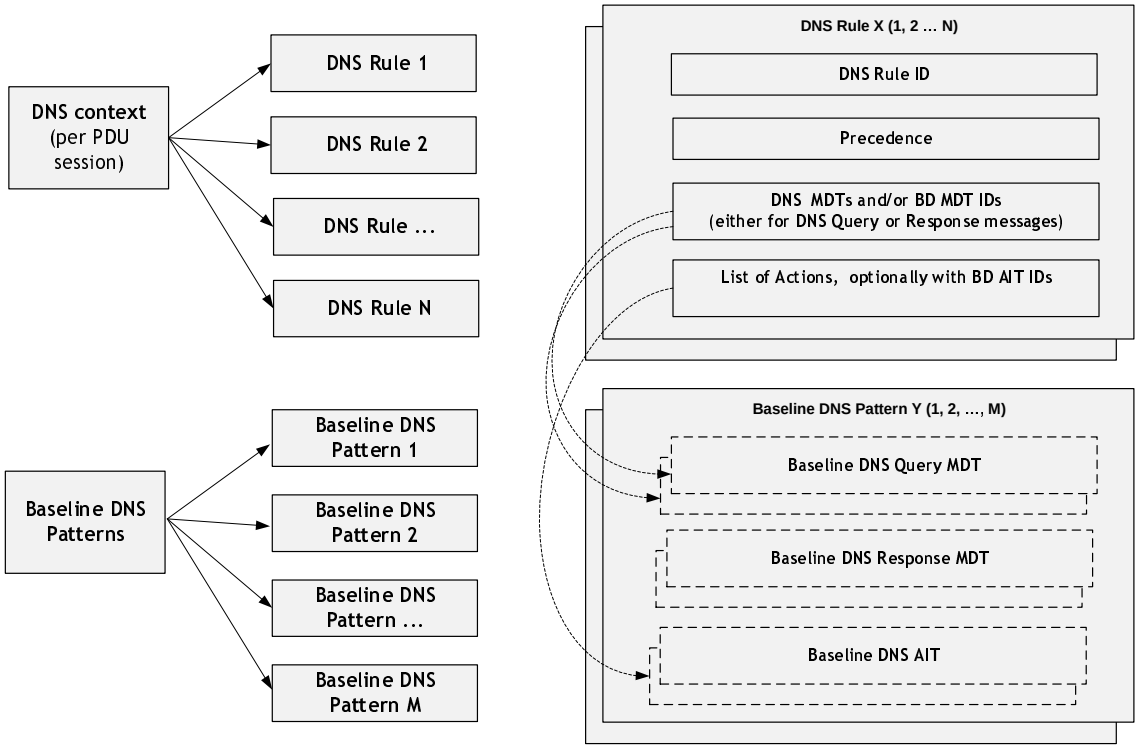

Figure 5.2.3.2-1: Overview of DNS contexts, DNS rules and Baseline DNS Patterns

5.2.3.2.3 Processing flow for incoming DNS messages

Upon receipt of a DNS message, the EASDF shall first identify the DNS context corresponding to the DNS message as follows:

- for DNS Query message: by using the source IP address of the DNS Query message and by matching it with the UE IP address provisioned in the DNS Query MDTs if any or with the UE IP address provisioned in the DNS context; and

- for a DNS Response message: by matching the DNS response with the DNS Query (either by the EASDF assigning a specific Transaction ID when forwarding the DNS Query message and by matching the Transaction ID in the DNS Query and DNS Response, or by the EASDF using a unique couple of source IP address and UDP port per DNS context when forwarding the DNS Query message and by matching the DNS Response message using the destination IP address and UDP port) and by retrieving the DNS context that is associated with the DNS query.

NOTE 1: The EASDF has direct user plane connectivity (i.e., without any NAT) with the PSA UPF over N6 for the transmission of DNS signalling exchanged with the UE. The deployment of a NAT between EASDF and PSA UPF is not supported.

If there is no DNS context matching a DNS Query or Response message, the EASDF should forward the DNS Query message towards a preconfigured DNS server and the DNS response towards the UE.

After finding the DNS context, the EASDF shall look up for a DNS rule matching the DNS message, among all DNS rules provisioned in the DNS Context, starting with the DNS rules with the highest precedence and continuing then with DNS rules with a lower precedence, in decreasing order of precedence. If there is no DNS rule matching the DNS message, the EASDF should forward the DNS Query message towards a preconfigured DNS server/resolver for resolution.

NOTE 2: The SMF can provision in the DNS context a DNS rule with the lowest precedence and with a DNS Query MDT or a DNS Response MDT containing a wildcard FQDN, such as to associate a default behavior to all DNS messages not matching any other DNS rule, e.g. forward DNS Query messages to a specific DNS Server.

After having found a matching DNS rule, the EASDF shall stop looking up for other DNS rules and shall apply the list of actions provisioned in the matching DNS rule.

A DNS message matches a DNS rule if it matches at least one MDT of the DNS Rule or one BD MDT referred by the DNS rule.

The DNS message processing models for DNS Query and DNS Response are depicted in Figure 5.2.3.2-2 and 5.2.3.2-3 respectively.

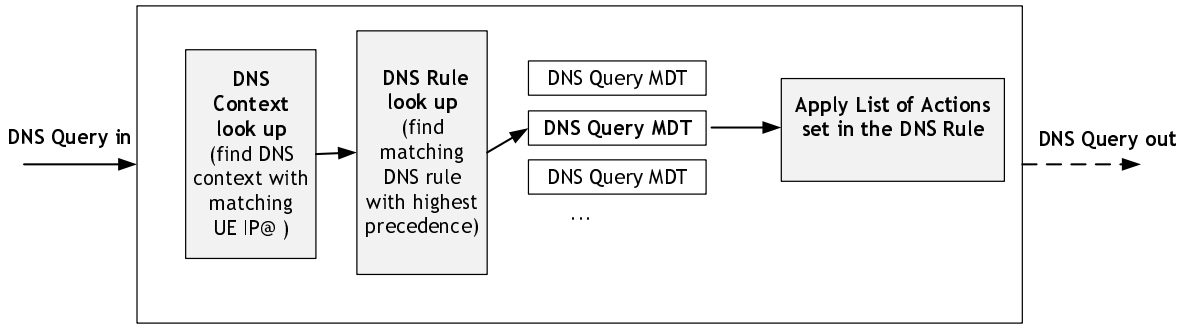

Figure 5.2.3.2-2: DNS Query processing flow in the EASDF

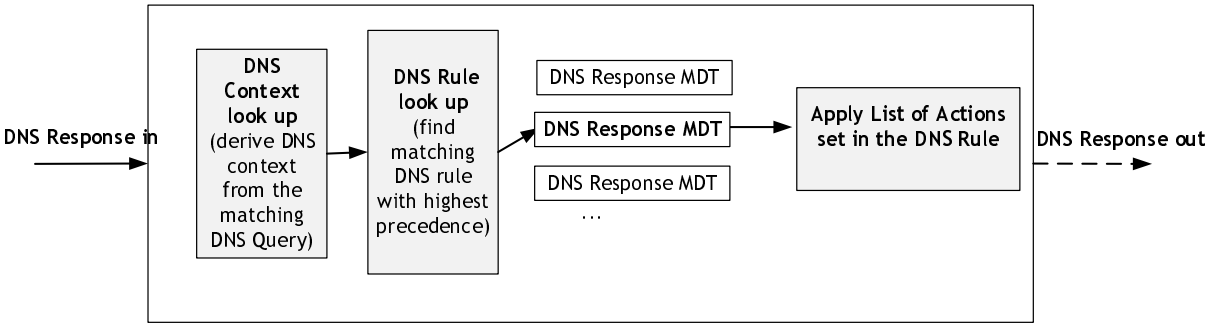

Figure 5.2.3.2-3: DNS Response processing flow in the EASDF

5.2.3.2.4 Processing of a One-Time DNS Rule applicable to a specific DNS message earlier buffered in the EASDF

The SMF may instruct the EASDF to apply certain actions (e.g. forward or drop a DNS message) to a specific DNS message, that has been earlier buffered in the EASDF and reported to the SMF, by creating a new DNS rule in the DNS context that includes:

- the DNS message identifier uniquely identifying the DNS message within the DNS context, as reported earlier by the EASDF in the DNSContext Notify request; and
- the requested actions to apply to the DNS message.

Such a DNS rule shall not contain any DNS Rule ID, precedence, MBT nor BD MDT.

Upon receipt of an DNSContext Update request that creates such a DNS rule, the EASDF shall apply the requested actions to the specific DNS message identified by the DNS message identifier and then delete the DNS Rule. If there is no buffered DNS message corresponding to the DNS message identifier received in the DNS rule, the EASDF shall reject the request with an error.

NOTE: A DNS rule that includes a DNS message identifier is referred as a "One-Time" DNS rule throughout this specification since the DNS rule is applied only once for the indicated DNS message and the DNS rule is not further stored by the EASDF.

5.2.3.3 DNS Message Detection Template

5.2.3.3.1 General

The contents of a DNS Query MDT or a DNS Response MDT may be provisioned directly in a DNS rule itself or in a BD MDT provisioned in a baseline DNS pattern. In the latter case, a DNS rule may refer to one or more BD MDTs (that are all either DNS Query MDTs or DNS Response MDTs) of one or more baseline DNS patterns by referencing the BD MDT IDs of the BD MDTs of the baseline DNS patterns.

The following clauses define the contents of DNS Query MDTs and DNS Response MDTs, provisioned in a DNS rule or in a BD MDT.

5.2.3.3.2 DNS Query MDT

A DNS Query Message Detection Template may include:

- a UE IP address;
- a list of FQDN ranges or a wildcard FQDN representing "any FQDN" (see clauses 6.1.6.2.5 and 6.1.6.2.6).

A UE IP address may only be provisioned in a DNS Query MDT, i.e. it cannot be provisioned in a Baseline DNS MDT. However, a DNS rule may be provisioned with a reference to one or more Baseline DNS Query MDTs together with a UE IP address (see clause 6.1.6.2.20), in which case the referenced Baseline DNS Query MDTs shall be matched for the specific UE IP address.

When present in a DNS Query MDT, or together with the reference to a Baseline DNS Query MDT, the UE IP address shall be used for matching the DNS Query message with the related DNS rule (see clause 5.2.3.2). Otherwise, the UE IP address provisioned in the DNS context shall be used.

FQDNs shall be matched against the Query Domain Name of DNS Query messages.

5.2.3.3.3 DNS Response MDT

A DNS Response Message Detection Template may include:

- a list of FQDN ranges or a wildcard FQDN representing "any FQDN"; and/or
- a list of EAS IP addresses ranges.

FQDNs shall be matched against the Domain Names in the Answers of DNS Response messages.

EAS IP addresses ranges shall be matched against the IP addresses returned in the Answers of DNS Response messages.

5.2.3.4 Actions applicable to DNS message

5.2.3.4.1 General

Each DNS rule shall be provisioned with the list of actions to apply to all DNS messages matching the DNS rule.

The SMF may request the EASDF to apply one or more of the following actions:

1) REPORT DNS message content to the SMF.

   The SMF may further request the EASDF to send a report only once to the SMF, i.e. only when a first DNS message matches any MDT of the DNS rule. If so, the EASDF shall skip this action (i.e. report to SMF) for any subsequent DNS message matching the DNS rule.

The SMF may further request the EASDF to reset the reporting-once indication, in which case the EASDF shall send (only) one more report at the next DNS message that matches the DNS rule.

2) BUFFER DNS message.

3) FORWARD DNS message.

   The SMF may further request the EASDF to set the destination IP address of the DNS Query message to a specific DNS Server address. The DNS Server address may either be included in the DNS rule or in a Baseline DNS Action Information Template (BD AIT); in the latter case, the DNS rule shall refer to the corresponding BD AIT ID. If no DNS Server address is provided by the SMF, the EASDF shall forward the DNS message to a locally pre-configured DNS server/resolver.

   The SMF may request the EASDF to build an EDNS Client Subnet (ECS) option to be included in the DNS Query message as defined in IETF RFC 7871 [18], or to be used for replacing the ECS option if an ECS option is received in the DNS Query message from the UE. The information for the EASDF to build the ECS option may either be included in the DNS rule or in a Baseline DNS Action Information Template (BD AIT); in the latter case, the DNS rule shall refer to the corresponding BD AIT ID.

   When forwarding a DNS Query message, if the SMF did not request the EASDF to build an ECS option, the EASDF shall remove the ECS option received from the UE in the DNS Query, if any.

   When forwarding a DNS Response message to the UE, based on configuration, the EASDF shall either remove any received ECS option or, if an ECS option was received in the DNS Query from the UE, replace it with the latter ECS option.

4) DISCARD DNS message.

The SMF may change the list of actions associated to a DNS rule (other than a One-Time DNS rule), e.g. to replace the actions to REPORT and BUFFER DNS Query messages to the SMF by the action to FORWARD the DNS messages. In such a case, any earlier buffered DNS message (matching the DNS rule) and any further incoming DNS message shall be processed according to the new instructions received from the SMF, e.g. they shall all be forwarded. The SMF may alternatively request the EASDF to apply certain actions to a specific DNS message by creating a One-Time DNS rule as defined in clause 5.2.3.2.4.

5.2.3.4.2 Event reporting by EASDF

The EASDF shall send a report to the SMF:

- to report the contents of DNS (Query or Response) messages matching a DNS rule provisioned with the action to report the DNS message contents.

The EASDF shall send reports to the SMF as defined in clause 5.2.2.5. The notification request sent to the SMF may contain one or more reports, for DNS Query and/or DNS Response messages matching one or more DNS rules provisioned in the DNS context. For each report, the EASDF may provide a DNS message identifier uniquely identifying the DNS message reported to the SMF within the DNS context (see clause 5.2.3.2.4).

5.2.3.5 Baseline DNS Patterns

5.2.3.5.1 General

The SMF may create, modify or delete baseline DNS patterns in the EASDF using the Neasdf_BaselineDnsPattern service (see clause 5.3).

A baseline DNS pattern contains baseline DNS information that may apply to multiple PDU sessions, e.g. to all PDU sessions with a certain DNN and S-NSSAI.

A baseline DNS pattern may contain:

- one or several BD MDTs; and/or

- one or several BD AITs.

A baseline DNS pattern may contain BD MDTs for DNS Query messages and BD MDTs for DNS Response messages. One BD MDT shall be either a DNS Query MDT or a DNS Response MDT (see clause 5.2.3.3).

A BD AIT may include:

- one or more local DNS Server IP address(es); and/or
- ECS option information.

NOTE 1: Multiple DNS Server IP addresses can be provided for resiliency.

A BD MDT and a BD AIT shall be uniquely identified in the EASDF by the combination of the following information:

- the URI of the baseline DNS pattern in which the BD MDT or BD AIT is defined; the URI shall be chosen by the SMF when creating the baseline DNS pattern (see clause 6.2.3); and
- an MDT or AIT identifier (string) uniquely identifying the MDT or AIT within the baseline DNS pattern; this identifier shall be chosen by the SMF when creating the BD MDT or BD AIT.

The URI of a baseline DNS pattern shall be unique per SMF set, if an SMF set controls the EASDF, or unique per SMF otherwise.

NOTE 2: The URI of a baseline DNS pattern includes an identifier of the SMF or SMF set (see clause 6.2.3.1) and SMF implementation specific information. This ensures the uniqueness of the URI in the EASDF when several SMFs or SMF sets control the same EASDF. As an example, an SMF can encode the URI of the baseline DNS pattern and the MDT or AIT identifier to include the DNAI or a sequence number. The EASDF is not meant to understand the structure of this information.

When a BD MDT or BD AIT of a baseline DNS pattern is modified by the SMF, the modified BD MDT or BD AIT shall apply to all DNS rules of all DNS contexts referring to that BD MDT or BD AIT.

5.3 Neasdf_BaselineDNSPattern Service

5.3.1 Service Description

The Neasdf_BaselineDNSPattern service operates on the Baseline DNS patterns in EASDF, which contains the DNS base information that may apply to multiple PDU sessions, e.g. DNS Query and Response MDTs applicable to all PDU sessions with a certain DNN and S-NSSAI. The EASDF is acting as NF Service Producer, while the SMF is the NF Service Consumer.

Following functionalities are provided by the Neasdf_BaselineDNSPattern service:

- Create a Baseline DNS Pattern in EASDF;
- Update the Baseline DNS Pattern in EASDF;
- Delete the Baseline DNS Pattern in EASDF.

The Neasdf_BaselineDNSPattern service supports the following service operations.

Table 5.3.1-1: Service operations supported by the Neasdf_BaselineDNSPattern service

Service Operations	Description	Operation Semantics	Example Consumer(s)
Create	Create a Baseline DNS Pattern in EASDF.	Request/Response	SMF
Update	Update the Baseline DNS Pattern in EASDF.	Request/Response	SMF
Delete	Delete the Baseline DNS Pattern in EASDF.	Request/Response	SMF

5.3.2 Service Operations

5.3.2.1 Introduction

See Table 5.3.1-1 for an overview of the service operations supported by the Neasdf_BaselineDNSPattern service.

5.3.2.2 Create

5.3.2.2.1 General

The Create service operation shall be used to create the Baseline DNS Pattern in the EASDF.

It is used in the following procedures:

- BaselineDNSPattern management in the EASDF procedure (see clause 6.2.3.4.4 of 3GPP TS 23.548 [14]).

The NF Service Consumer (e.g. SMF) shall create the Baseline DNS Pattern by using the HTTP PUT method as shown in Figure 5.3.2.2.1-1.

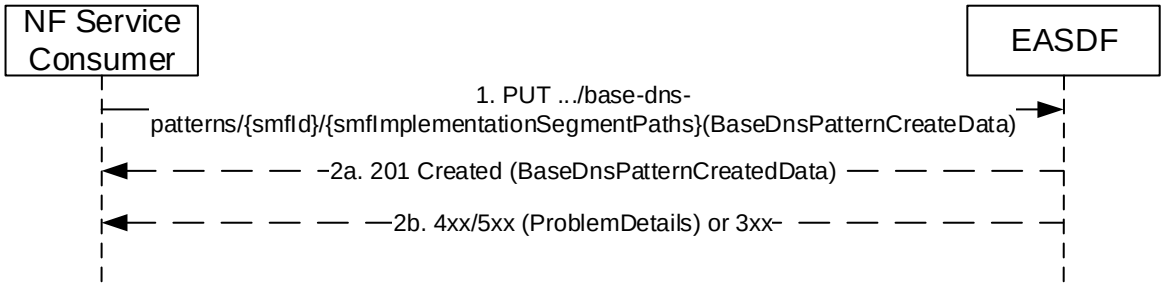

Figure 5.3.2.2.1-1: Baseline DNS Pattern creation

1. The NF Service Consumer shall send a PUT request to create the Baseline DNS Pattern in the EASDF. The payload body of the PUT request may contain:

   - one or more Baseline DNS message detection templates (MDTs);

   - one or more Baseline DNS action information templates (AITs).

2a. On success, a "201 Created" response shall be returned with the "Location" header containing the URI of the created resource.

2b. On failure, or redirection, one of the HTTP status code listed in Table 6.2.3.2.3.2-3 shall be returned.

5.3.2.3 Update

5.3.2.3.1 General

The Update service operation shall be used to update an individual Baseline DNS Pattern previously created in the EASDF. The update operation may apply to the whole Baseline DNS Pattern (complete replacement of the data of the existing Baseline DNS Pattern by new data), or it may apply to modify a subset of the parameters of the Baseline DNS Pattern.

It is used in the following procedures:

- BaselineDNSPattern management in the EASDF procedure (see clause 6.2.3.4.4 of 3GPP TS 23.548 [14]).

To perform a partial update of the Baseline DNS Pattern, the NF Service Consumer shall issue an HTTP PATCH request, as shown in Figure 5.3.2.3.1-1. This partial update shall be used to add, delete and/or replace individual parameters of the Baseline DNS Pattern.

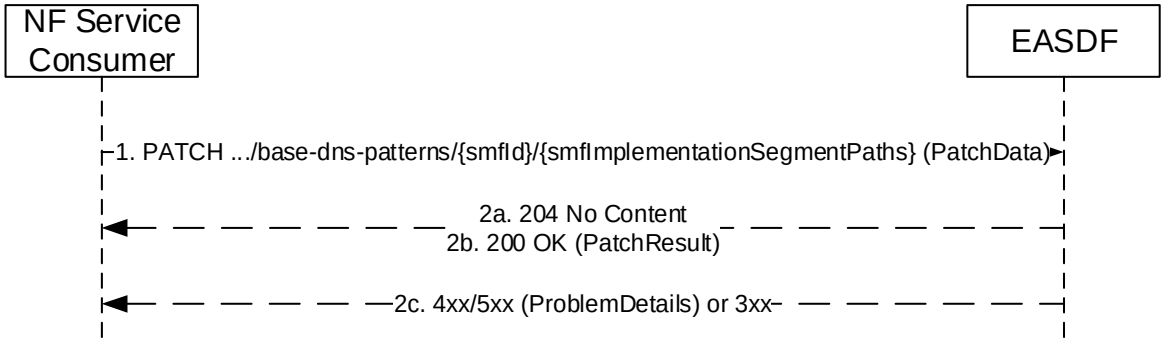

Figure 5.3.2.3.1-1: Baseline DNS Pattern Partial Update

1. The NF Service Consumer (e.g. SMF) shall send a PATCH request to the resource URI representing the individual Baseline DNS Pattern. The payload body of the PATCH request shall contain the list of operations (add/delete/replace) to be applied to parameters in the individual Baseline DNS Pattern.

2a. On success, if all the modification instructions in the PATCH request have been implemented, "204 No Content" shall be returned.

2b. If some of the modification instructions for unknown attribute(s) in the PATCH request have been ignored, the EASDF shall respond with "200 OK" with the response body containing PatchResult, as specified in clause 5.2.7.2 of 3GPP TS 29.500 [4].

2c. On failure or redirection, one of the HTTP status code listed in Table 6.2.3.2.3.1-3 shall be returned.

To perform a complete replacement of the data of the Baseline DNS Pattern, the NF Service Consumer shall issue an HTTP PUT request, as shown in Figure 5.3.2.3.1-2:

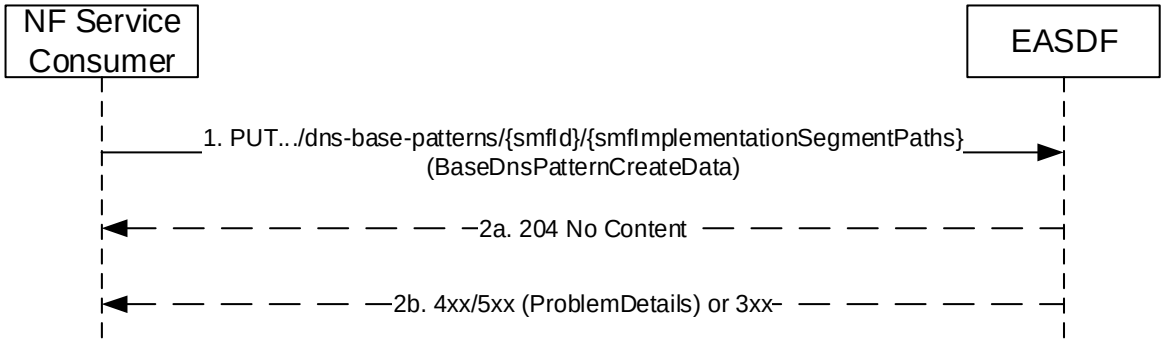

Figure 5.3.2.3.1-2: Baseline DNS Pattern Complete Replacement

1. The NF service consumer (e.g. SMF) shall send a PUT request to the resource URI representing the individual Baseline DNS Pattern. The payload body of the PUT request shall contain a representation of the individual Baseline DNS Pattern to be completely replaced in the EASDF.

2a. On success, "204 No Content" shall be returned.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.2.3.2.3.2-3 shall be returned.

5.3.2.4 Delete

5.3.2.4.1 General

The Delete service operation shall be used to delete an individual Baseline DNS Pattern previously created in the EASDF.

It is used in the following procedures:

- BaselineDNSPattern management in the EASDF procedure (see clause 6.2.3.4.4 of 3GPP TS 23.548 [14]).

To perform a deletion of the Baseline DNS Pattern, the NF Service Consumer shall issue an HTTP DELETE request, as shown in Figure 5.3.2.4.1-1.

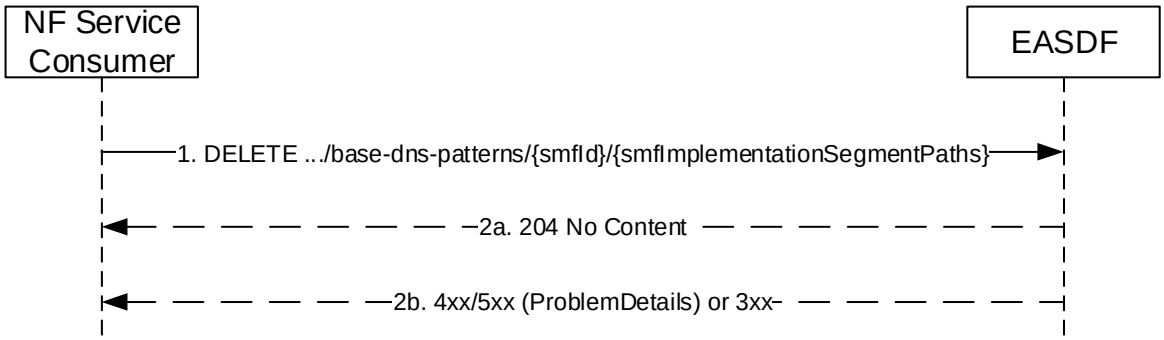

Figure 5.3.2.4.1-1: Baseline DNS Pattern Deletion

1. The NF Service Consumer (e.g. SMF) shall send a DELETE request to delete the individual Baseline DNS Pattern. The request body shall be empty.

2a. On success, "204 No Content" shall be returned. The response body shall be empty.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.2.3.2.3.3-3 shall be returned.

6 API Definitions

6.1 Neasdf_DNSContext Service API

6.1.1 Introduction

The Neasdf_DNSContext shall use the Neasdf_DNSContext API.

The API URI of the Neasdf_DNSContext API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "neasdf-dnscontext".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.1.3.

6.1.2 Usage of HTTP

6.1.2.1 General

HTTP/2, IETF RFC 7540 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

The OpenAPI [6] specification of HTTP messages and content bodies for the Neasdf_DNSContext API is contained in Annex A.

6.1.2.2 HTTP standard headers

6.1.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

6.1.2.2.2 Content type

The following content types shall be supported:

- JSON, as defined in IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".
- "Problem Details" JSON Object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [13];
- JSON Patch (IETF RFC 6902 [15]). The use of the JSON Patch format in a HTTP request body shall be signalled by the content type "application/json-patch+json".

6.1.2.3 HTTP custom headers

The mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] shall be supported, and the optional HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4] may be supported. In this release of this specification, no custom headers specific to the Neasdf_DNSContext service are defined.

6.1.3 Resources

6.1.3.1 Overview

Figure 6.1.3.1-1 describes the resource URI structure of the Neasdf_DNSContext API.

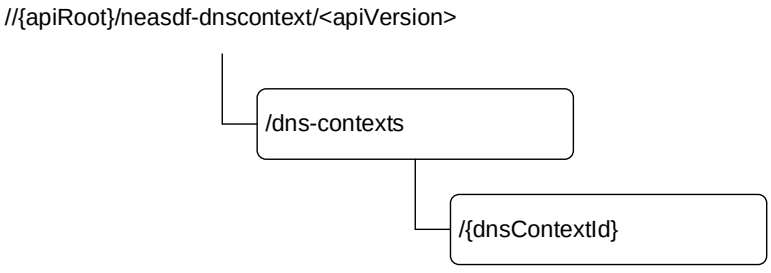

Figure 6.1.3.1-1: Resource URI structure of the Neasdf_DNSContext API

Table 6.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.1.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Description (service operation)
DNS contexts collection	/dns-contexts	POST	Create
Individual DNS context	/dns-contexts/{dnsContextId}	PATCH	Update (partial update)
		PUT	Update (complete replacement)
		DELETE	Delete

6.1.3.2 Resource: DNS contexts collection

6.1.3.2.1 Description

This resource represents the collection of the individual DNS contexts created in the EASDF.

This resource is modelled with the Collection resource archetype (see clause C.2 of 3GPP TS 29.501 [5]).

6.1.3.2.2 Resource Definition

Resource URI: **{apiRoot}/neasdf-dnscontext/<apiVersion>/dns-contexts**

This resource shall support the resource URI variables defined in table 6.1.3.2.2-1.

Table 6.1.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1
apiVersion	string	See clause 6.1.1

6.1.3.2.3 Resource Standard Methods

6.1.3.2.3.1 POST

This method creates an individual DNS context resource in the EASDF.

This method shall support the URI query parameters specified in table 6.1.3.2.3.1-1.

Table 6.1.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.1.3.2.3.1-2 and the response data structures and response codes specified in table 6.1.3.2.3.1-3.

Table 6.1.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
DnsContextCreateData	M	1	Representation of the DNS context to be created in the EASDF

Table 6.1.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
DnsContextCreatedData	M	1	201 Created	Successful creation of a DNS context
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
ProblemDetails	O	0..1	400 Bad Request	The "cause" attribute may be set to one of the following application errors: - BASELINE_DNS_PATTERN_UNKNOWN - BASELINE_DNS_MDT_UNKNOWN - BASELINE_DNS_AIT_UNKNOWN
NOTE 1: The mandatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4].				

Table 6.1.3.2.3.1-4: Headers supported by the 201 response code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/neasdf-dnscontext/<apiVersion>/dns-contexts/{dnsContextId}

Table 6.1.3.2.3.1-5: Headers supported by the 307 response code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

Table 6.1.3.2.3.1-6: Headers supported by the 308 response code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

6.1.3.2.4 Resource Custom Operations

None.

6.1.3.3 Resource: Individual DNS context

6.1.3.3.1 Description

This resource represents an individual DNS context created in the EASDF.

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

6.1.3.3.2 Resource Definition

Resource URI: **{apiRoot}/neasdf-dnscontext/<apiVersion>/dns-contexts/{dnsContextId}**

This resource shall support the resource URI variables defined in table 6.1.3.3.2-1.

Table 6.1.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1.
apiVersion	string	See clause 6.1.1.
dnsContextId	string	DNS context Identifier assigned by the EASDF during the Create service operation.

6.1.3.3.3 Resource Standard Methods

6.1.3.3.3.1 DELETE

This method deletes an individual DNS context resource in the EASDF.

This method shall support the URI query parameters specified in table 6.1.3.3.3.1-1.

Table 6.1.3.3.3.1-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.1.3.3.3.1-2 and the response data structures and response codes specified in table 6.1.3.3.3.1-3.

Table 6.1.3.3.3.1-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.1.3.3.3.1-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful deletion of the DNS context.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4].				

Table 6.1.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

Table 6.1.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

6.1.3.3.3.2 PATCH

This method updates (partial update) an individual DNS context resource in the EASDF.

This method shall support the URI query parameters specified in table 6.1.3.3.3.2-1.

Table 6.1.3.3.3.2-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.1.3.3.3.2-2 and the response data structures and response codes specified in table 6.1.3.3.3.2-3.

Table 6.1.3.3.3.2-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
array(PatchItem)	M	1..N	It contains the list of changes to be made to the DNS context, according to the JSON PATCH format specified in IETF RFC 6902 [15].

Table 6.1.3.3.3.2-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
PatchResult	M	1	200 OK	Upon partial success, e.g. some of the requested modifications for unknown attribute(s) are discarded while the rest of the modification instructions are fully accepted, the EASDF shall return the execution report.
n/a			204 No Content	Successful update of the DNS context.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the PATCH method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4].				

Table 6.1.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

Table 6.1.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

6.1.3.3.3 PUT

This method updates (complete replacement) an individual DNS context resource in the EASDF.

This method shall support the URI query parameters specified in table 6.1.3.3.3.3-1.

Table 6.1.3.3.3.3-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.1.3.3.3.3-2 and the response data structures and response codes specified in table 6.1.3.3.3.3-3.

Table 6.1.3.3.3.3-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
DnsContextCreateData	M	1	DNS Context Data to replace the existing DNS context data

Table 6.1.3.3.3.3-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful update of the DNS context.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the PATCH method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4].				

Table 6.1.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

Table 6.1.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

6.1.3.3.4 Resource Custom Operations

There are no resource custom operations for the Neasdf_DNSContext service in this release of the specification.

6.1.4 Custom Operations without associated resources

There are no custom operations defined without any associated resources for the Neasdf_DNSContext service in this release of this specification.

6.1.5 Notifications

6.1.5.1 General

This clause specifies the notifications supported by the Neasdf_DNSContext service.

Notifications shall comply to clause 6.2 of 3GPP TS 29.500 [4] and clause 4.6.2.3 of 3GPP TS 29.501 [5].

Table 6.1.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
DNS Context Notification	{notifyUri} (Notification URI provided by NF Service Consumer)	POST	DNS Context Notify

6.1.5.2 DNS Context Notify

6.1.5.2.1 Description

The Event Notification is used by the EASDF to report one or several observed Events to a NF service consumer(e.g. SMF) that has subscribed to such Notifications.

6.1.5.2.2 Target URI

The Callback URI **"{notifyUri}"** shall be used with the callback URI variables defined in table 6.1.5.2.2-1.

Table 6.1.5.2.2-1: Callback URI variables

Name	Definition
notifyUri	String formatted as URI with the Callback Uri

6.1.5.2.3 Standard Methods

6.1.5.2.3.1 POST

This method shall support the request data structures specified in table 6.1.5.2.3.1-1 and the response data structures and response codes specified in table 6.1.5.2.3.1-1.

Table 6.1.5.2.3.1-2: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
DnsContextNotification	M	1	Representation of the DNS context notification

Table 6.1.5.2.3.1-3: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful notification of the DNS context change
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an URI pointing to the endpoint of another NF service consumer to which the notification should be sent. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an URI pointing to the endpoint of another NF service consumer to which the notification should be sent. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4].				

Table 6.1.5.2.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	A URI pointing to the endpoint of another NF service consumer to which the notification should be sent or pointing to the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance ID towards which the notification is redirected

Table 6.1.5.2.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	A URI pointing to the endpoint of another NF service consumer to which the notification should be sent or pointing to the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance ID towards which the notification is redirected

6.1.6 Data Model

6.1.6.1 General

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

Table 6.1.6.1-1 specifies the data types defined for the Neasdf_DNSContext service based interface protocol.

Table 6.1.6.1-1: Neasdf_DNSContext specific Data Types

Data type	Clause defined	Description	Applicability
DnsContextCreateData	6.1.6.2.2	Data in DNS Context Create request	
DnsContextCreatedData	6.1.6.2.3	Data in DNS Context Create response	
DnsRule	6.1.6.2.4	DNS handling rule	
DnsQueryMdt	6.1.6.2.5	DNS Query Message Detection Template	
DnsRspMdt	6.1.6.2.6	DNS Response Message Detection Template	
Ipv4AddressRange	6.1.6.2.7	IPv4 addresses range	
Ipv6PrefixRange	6.1.6.2.8	IPv6 addresses range	
Action	6.1.6.2.9	Action to apply to DNS messages matching a message detection template	
DnsContextNotification	6.1.6.2.10	DNS context notification	
ForwardingParameters	6.1.6.2.11	Forwarding instructions	
EcsOption	6.1.6.2.12	ECS Option information	
DnsContextEventReport	6.1.6.2.13	DNS context Event report	
DnsQueryReport	6.1.6.2.14	DNS Query Event Report	
DnsRspReport	6.1.6.2.15	DNS Response Event Report	
EcsOptionInfo	6.1.6.2.16	ECS option information	
DnsServerAddressInfo	6.1.6.2.17	DNS Server address information	
BaselineDnsMdtId	6.1.6.2.18	Baseline DNS Message Detection Template Identifier	
BaselineDnsAitId	6.1.6.2.19	Baseline DNS Action Information Template Identifier	
BaselineDnsQueryMdtInfo	6.1.6.2.20	Baseline DNS Query MDT ID and optionally associated information	
BaselineDnsRspMdtInfo	6.1.6.2.21	Baseline DNS Response MDT ID and optionally associated information	
ApplyAction	6.1.6.3.3	Action to apply to the DNS packet	

Table 6.1.6.1-2 specifies data types re-used by the Neasdf 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 Neasdf_DNSContext service based interface.

Table 6.1.6.1-2: Neasdf_DNSContext re-used Data Types

Data type	Reference	Comments	Applicability
IPv4Addr	3GPP TS 29.571 [16]	IPv4 address	
IPv6Prefix	3GPP TS 29.571 [16]	IPv6 prefix	
Dnn	3GPP TS 29.571 [16]	DNN	
Uri	3GPP TS 29.571 [16]	URI	
Uint32	3GPP TS 29.571 [16]	Unsigned 32-bit integer	
IpAddr	3GPP TS 29.571 [16]	IP address	
IPv6Addr	3GPP TS 29.571 [16]	IPv6 address	
SupportedFeatures	3GPP TS 29.571 [16]	Supported features	
DateTime	3GPP TS 29.571 [16]	Date and time	
PatchResult	3GPP TS 29.571 [16]		
FqdnPatternMatchingRule	3GPP TS 29.571 [16]	FQDN Pattern Matching Rule	
Fqdn	3GPP TS 29.571 [16]		
Snssai	3GPP TS 29.571 [16]		

6.1.6.2 Structured data types

6.1.6.2.1 Introduction

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

6.1.6.2.2 Type: DnsContextCreateData

Table 6.1.6.2.2-1: Definition of type DnsContextCreateData

Attribute name	Data type	P	Cardinality	Description	Applicability
ueIpv4Addr	Ipv4Addr	C	0..1	UE IPv4 address (NOTE 1)	
ueIpv6Prefix	Ipv6Prefix	C	0..1	UE IPv6 prefix (NOTE 1)	
dnn	Dnn	M	1	DNN of the PDU session (NOTE 2)	
sNssai	Snssai	M	1	S-NSSAI of the PDU session (NOTE 2)	
dnsRules	map(DnsRule)	M	1..N	Map of DNS message handling rules. The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [12], with a maximum of 32 characters.	
notifyUri	Uri	C	0..1	Callback URI to receive notifications. This IE shall be present if the NF service consumer subscribes to receive DNS context notifications.	
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.	
NOTE 1: At least one of the ueIpv4Addr and ueIpv6Prefix attributes shall be present. NOTE 2: The UE IP address shall be used together with the DNN and S-NSSAI to uniquely identify the DNS context associated with a PDU session (e.g. in deployments where the same EASDF is used for PDU sessions to DNs with overlapping IP address spaces) and to associate the DNS context with a specific DN (and e.g. related tunnels connecting to the DN).					

6.1.6.2.3 Type: DnsContextCreatedData

Table 6.1.6.2.3-1: Definition of type DNSContextCreatedData

Attribute name	Data type	P	Cardinality	Description	Applicability
easdfIpv4Addr	IPv4Addr	C	0..1	EASDF IPv4 address	
easdfIpv6Addr	IPv6Addr	C	0..1	EASDF IPv6 address	
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.	
NOTE: At least one of the easdfIpv4Addr and easdfIpv6Addr attributes shall be present.					

6.1.6.2.4 Type: DnsRule

Table 6.1.6.2.4-1: Definition of type DnsRule

Attribute name	Data type	P	Cardinality	Description	Applicability
dnsRuleId	string	C	0..1	Unique Identifier of the DNS rule within the DNS context This IE shall be present for a DNS rule other than a One-Time DNS rule.	
label	string	O	0..1	DNS rule's label (NOTE 5)	
precedence	Uint32	C	0..1	Precedence of the DNS message handling rule. This IE shall be present for a DNS rule other than a One-Time DNS rule. The lower precedence values indicate higher precedence of the DNS rule, and the higher precedence values indicate lower precedence of the DNS rule when matching a DNS message.	
dnsQueryMdtList	map(DnsQueryMdt)	C	1..N	Map of DNS Query message detection templates. The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [12], with a maximum of 32 characters. (NOTE 3)	
baseDnsQueryMdtList	array(BaselineDnsQueryMdtInfo)	C	1..N	List of Baseline DNS Query Message Detection Template IDs and optionally associated information. (NOTE 3)	
dnsRspMdtList	map(DnsRspMdt)	C	1..N	Map of DNS Response message detection templates. The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [12], with a maximum of 32 characters. (NOTE 4)	
baseDnsRspMdtList	array(BaselineDnsRspMdtInfo)	C	1..N	List of Baseline DNS Response Message Detection Template IDs and optionally associated information. (NOTE 4)	
dnsMsgId	string	C	0..1	DNS message identifier This IE shall be present for a One-Time DNS Rule and it shall be set to the identifier of the DNS message buffered in the EASDF for which the DNS rule shall apply (see clause 5.2.3.2.4). (NOTE 6)	
actionList	map(Action)	M	1..N	Map of Actions to apply to DNS messages matching the DNS message detection templates. The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [12], with a maximum of 32 characters.	

NOTE 1: A DNS rule shall be provisioned either for DNS Query messages or for DNS Response messages.
NOTE 2: A DNS rule including the dnsMsgId IE shall be considered as a One-Time DNS Rule (see clause 5.2.3.2.4).
NOTE 3: For a DNS rule other than a One-Time DNS rule provisioned for DNS Query messages, at least one of the dnsQueryMdtList and baseDnsQueryMdtList IEs shall be present.
NOTE 4: For a DNS Rule other than a One-Time DNS rule provisioned for DNS Response messages, at least one of the dnsRspMdtList and baseDnsRspMdtList IEs shall be present.
NOTE 5: This attribute may contain free information describing the scope of the DNS rule. It may be used e.g. for trouble-shooting.
NOTE 6: An EASDF can encode the DNS message identifier as the ID field in the header of the DNS message, or as any other string uniquely identifying the DNS message within the DNS context.

6.1.6.2.5 Type: DnsQueryMdt

Table 6.1.6.2.5-1: Definition of type DnsQueryMdt

Attribute name	Data type	P	Cardinality	Description	Applicability
mdtId	string	M	1	Identifier of the DNS Query message detection template, with a maximum of 32 characters.	
label	string	O	0..1	DNS Query MDT's label (NOTE 2)	
sourceIpv4Addr	Ipv4Addr	O	0..1	UE IPv4 address (NOTE 1)	
sourceIpv6Prefix	Ipv6Prefix	O	0..1	UE IPv6 prefix (NOTE 1)	
fqdnPatternList	array(FqdnPatternMatchingRule)	O	1..N	List of FQDN patterns, where each FQDN pattern is described by a FQDN Pattern Matching Rule. An FQDN value is considered part of the template if and only if the FQDN in the Queries field in the DNS Query message fully matches at least one FQDN pattern. (NOTE 3)	

NOTE 1: If neither the sourceIpv4Addr IE nor the sourceIpv6Prefix IE is present, the UE IP address in the DNS Context Data shall be assumed.
NOTE 2: This attribute may contain free information describing the scope of the DNS Query MDT. It may be used e.g. for trouble-shooting.
NOTE 3: The list of FQDN patterns may encode some FQDN patterns with a string matching rule and others with a regular expression (when the FQDN patterns cannot be described by a string matching rule).

6.1.6.2.6 Type: DnsRspMdt

Table 6.1.6.2.6-1: Definition of type DnsRspMdt

Attribute name	Data type	P	Cardinality	Description	Applicability
mdtId	string	M	1	Identifier of the DNS Response message detection template, with a maximum of 32 characters.	
label	string	O	0..1	DNS Response MDT's label (NOTE 1)	
fqdnPatternList	array(FqdnPatternMatchingRule)	O	1..N	List of FQDN patterns, where each FQDN pattern is described by a FQDN Pattern Matching Rule. An FQDN value is considered part of the template if and only if the FQDN in the Queries field in the DNS Response message fully matches at least one FQDN pattern. (NOTE 2)	
easIpv4AddrRanges	array(Ipv4AddressRange)	O	1..N	List of EAS IPv4 addresses ranges	
easIpv6PrefixRanges	array(Ipv6PrefixRange)	O	1..N	List of EAS IPv6 prefixes ranges	

NOTE 1: This attribute may contain free information describing the scope of the DNS Response MDT. It may be used e.g. for trouble-shooting.
NOTE 2: The list of FQDN patterns may encode some FQDN patterns with a string matching rule and others with a regular expression (when the FQDN patterns cannot be described by a string matching rule).

6.1.6.2.7 Type: Ipv4AddressRange

Table 6.1.6.2.7-1: Definition of type IPv4AddressRange

Attribute name	Data type	P	Cardinality	Description
start	Ipv4Addr	M	1	First value identifying the start of an IPv4 address range
end	Ipv4Addr	M	1	Last value identifying the end of an IPv4 address range

6.1.6.2.8 Type: Ipv6PrefixRange

Table 6.1.6.2.8-1: Definition of type IPv6PrefixRange

Attribute name	Data type	P	Cardinality	Description
start	Ipv6Prefix	M	1	First value identifying the start of an IPv6 prefix range
end	Ipv6Prefix	M	1	Last value identifying the end of an IPv6 prefix range

6.1.6.2.9 Type: Action

Table 6.1.6.2.9-1: Definition of type Action

Attribute name	Data type	P	Cardinality	Description
applyAction	ApplyAction	M	1	Action to apply to the DNS message
forwardingParameters	ForwardingParameters	O	0..1	This IE may be present if applyAction IE is set to " FORWARD". When present, it shall contain forward instructions to apply to the DNS message before forwarding it.
reportingOnceInd	boolean	O	0..1	Reporting-once Indication This IE may be present if the applyAction is set to "REPORT". When present, it shall be set as follows: - true: only one report shall be sent to the SMF, i.e. one report shall only be sent when a first DNS message matches any Message Detection Template of the DNS rule. - false (default): a report shall be sent to the SMF for any DNS message matching any Message Detection Template of the DNS rule.
resetReportingOnceInd	boolean	O	0..1	Reset the Reporting-once Indication This IE may be present in a request modifying a DNS rule, if the applyAction is set to "REPORT" and the reportingOnceInd is set to "true". When present, it shall be set as follows: - true: reset the Reporting-once Indication, i.e. send (only) one more report to the SMF when a next first DNS message matches any Message Detection Template of the DNS rule. - false (default): do not reset the Reporting-once Indication

6.1.6.2.10 Type: DnsContextNotification

Table 6.1.6.2.10-1: Definition of type DnsContextNotification

Attribute name	Data type	P	Cardinality	Description
eventReportList	array(DnsContextEventReport)	O	1..N	List of event reports

6.1.6.2.11 Type: ForwardingParameters

Table 6.1.6.2.11-1: Definition of type ForwardingParameters

Attribute name	Data type	P	Cardinality	Description
ecsOptionInfo	EcsOptionInfo	O	0..1	Information to build optional EDNS Client Subnet (ECS) option to be included in the DNS Query as defined in IETF RFC 7871 [18], or to be used for replacing the ECS option received in the DNS Query message from the UE.
dnsServerAddressInfo	DnsServerAddressInfo	O	0..1	DNS Server Address Information to be used as destination address of the outgoing DNS Query

6.1.6.2.12 Type: EcsOption

Table 6.1.6.2.12-1: Definition of type EcsOption

Attribute name	Data type	P	Cardinality	Description
sourcePrefixLength	integer	M	1	Leftmost number of significant bits of the IP address as defined for the SOURCE PREFIX-LENGTH in clause 6 of IETF RFC 7871 [18]. Minimum=0. Maximum=128
scopePrefixLength	integer	O	0..1	Leftmost number of bits of the IP address that the DNS response covers as defined for the SCOPE PREFIX-LENGTH in clause 6 of IETF RFC 7871 [18]. This attribute shall only be sent in EASDF notification to the SMF. Minimum=0. Maximum=128
ipAddr	IpAddr	M	1	IP address as defined for the ADDRESS in clause 6 of IETF RFC 7871 [18]

6.1.6.2.13 Type: DnsContextEventReport

Table 6.1.6.2.13-1: Definition of type DnsContextEventReport

Attribute name	Data type	P	Cardinality	Description
timestamp	DateTime	M	1	Time of detection of the event
dnsRuleId	Uint32	C	0..1	Identifies the DNS rule that triggered the report. This IE shall be present if the report is triggered by an event matching a DNS rule.
dnsQueryReport	DnsQueryReport	O	0..1	DNS Query Report
dnsRspReport	DnsRspReport	O	0..1	DNS Response Report
dnsMsgId	string	O	0..1	DNS message identifier When present, this IE shall be set to a unique identifier of the DNS message for which the event is reported (see clause 5.2.3.2.4)

6.1.6.2.14 Type: DnsQueryReport

Table 6.1.6.2.14-1: Definition of type DnsQueryReport

Attribute name	Data type	P	Cardinality	Description
fqdn	Fqdn	O	0..1	FQDN received in the DNS Query

6.1.6.2.15 Type: DnsRspReport

Table 6.1.6.2.15-1: Definition of type DnsRspReport

Attribute name	Data type	P	Cardinality	Description
fqdn	Fqdn	O	0..1	FQDN received in the DNS Response
easIpv4Addresses	array(IPv4Addr)	O	1..N	EAS IPv4 address(es) received in the DNS Response
easIpv6Addresses	array(IPv6Addr)	O	1..N	EAS IPv6 address(es) received in the DNS Response
ecsOption	EcsOption	O	0..1	EDNS Client Subnet (ECS) option received in the DNS Response (as defined in IETF RFC 7871 [18])

6.1.6.2.16 Type: EcsOptionInfo

Table 6.1.6.2.16-1: Definition of type EcsOptionInfo

Attribute name	Data type	P	Cardinality	Description
ecsOption	EcsOption	C	0..1	Information to build optional EDNS Client Subnet (ECS) option to be included in the DNS Query as defined in IETF RFC 7871 [18], or to be used for replacing the ECS option received in the DNS Query message from the UE. (NOTE 1)
baseDnsAitId	BaselineDnsAitId	C	0..1	Identifier of the Baseline DNS Action Information Template that contains information to build optional EDNS Client Subnet (ECS) option to be included in the DNS Query as defined in IETF RFC 7871 [18], or to be used for replacing the ECS option received in the DNS Query message from the UE. (NOTE 1, NOTE 2)
NOTE 1: Either the ecsOption IE or the baseDnsAitId IE shall be present. NOTE 2: The referenced baseline DNS Action Information Template may contain other information beyond the information to build the ECS option, in which case the EADSF shall only apply the information to build the ECS option.				

6.1.6.2.17 Type: DnsServerAddressInfo

Table 6.1.6.2.17-1: Definition of type DnsServerAddressInfo

Attribute name	Data type	P	Cardinality	Description
dnsServerAddressList	array(IpAddr)	C	1..N	DNS Server Address to be used as destination address of the outgoing DNS Query. More than one IP address may be provided for resiliency. (NOTE 1)
baseDnsAitId	BaselineDnsAitId	C	0..1	Identifier of the Baseline DNS Action Information Template that contains DNS Server Address to be used as destination address of the outgoing DNS Query. (NOTE 1, NOTE 2)
NOTE 1: Either the dnsServerAddressList IE or the baseDnsAitId IE shall be present. NOTE 2: The referenced baseline DNS Action Information Template may contain other information beyond the DNS Server Address information, in which case the EADSF shall only apply the DNS Server Address information.				

6.1.6.2.18 Type: BaselineDnsMdtId

Table 6.1.6.2.18-1: Definition of type BaselineDnsMdtId

Attribute name	Data type	P	Cardinality	Description	Applicability
baseDnsPatternUri	Uri	M	1	URI of the baseline DNS pattern returned in the Location header in the baseline DNS pattern creation response	
mdtId	string	M	1	Identifier of the baseline DNS Message Detection Template ID within the baseline DNS pattern	

6.1.6.2.19 Type: BaselineDnsAitId

Table 6.1.6.2.19-1: Definition of type BaselineDnsAitId

Attribute name	Data type	P	Cardinality	Description	Applicability
baseDnsPatternUri	Uri	M	1	URI of the baseline DNS pattern returned in the Location header in the baseline DNS pattern creation response	
aitId	string	M	1	Identifier of the baseline DNS Action Information Template ID within the baseline DNS pattern	

6.1.6.2.20 Type: BaselineDnsQueryMdtInfo

Table 6.1.6.2.20-1: Definition of type BaselineDnsQueryMdtInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
sourceIpv4Addr	Ipv4Addr	O	0..1	UE IPv4 address (NOTE)	
sourceIpv6Prefix	Ipv6Prefix	O	0..1	UE IPv6 prefix (NOTE)	
baseDnsMdtList	array(BaselineDnsMdtId)	M	1..N	List of Baseline DNS Query Message Detection Template IDs.	

NOTE: If neither the sourceIpv4Addr IE nor the sourceIpv6Prefix IE is present, the UE IP address in the DNS Context Data shall be assumed.

6.1.6.2.21 Type: BaselineDnsRspMdtInfo

Table 6.1.6.2.21-1: Definition of type BaselineDnsRspMdtInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
baseDnsMdtList	array(BaselineDnsMdtId)	M	1..N	List of Baseline DNS Response Message Detection Template IDs.	

6.1.6.3 Simple data types and enumerations

6.1.6.3.1 Introduction

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

6.1.6.3.2 Simple data types

The simple data types defined in table 6.1.6.3.2-1 shall be supported.

Table 6.1.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
	<one simple data type, i.e. boolean, integer, number, or string>		

6.1.6.3.3 Enumeration: ApplyAction

The enumeration ApplyAction represents an action to apply to the DNS packet. It shall comply with the provisions defined in table 6.1.6.3.3-1.

Table 6.1.6.3.3-1: Enumeration ApplyAction

Enumeration value	Description	Applicability
"BUFFER"	Buffer the DNS Query or Response message	
"REPORT"	Report the DNS Query or Response message content to the SMF	
"FORWARD"	Forward the DNS Query or Response message, after applying the instructions indicated in the forwarding parameters if any	
"DISCARD"	Discard DNS messages	

6.1.6.4 Data types describing alternative data types or combinations of data types

There is no alternative data types or combinations of data types used for the Neasdf_DNSContext service in this version of the API.

6.1.6.5 Binary data

There is no binary data used for the Neasdf_DNSContext service in this version of the API.

6.1.7 Error Handling

6.1.7.1 General

For the Neasdf_DNSContext API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [4].

In addition, the requirements in the following clauses are applicable for the Neasdf_DNSContext API.

6.1.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4]. No further specific procedures for the Neasdf_DNSContext service are specified.

6.1.7.3 Application Errors

The application errors defined for the Neasdf_DNSContext service are listed in Table 6.1.7.3-1.

Table 6.1.7.3-1: Application errors

Application Error	HTTP status code	Description
BASELINE_DNS_PATTERN_UNKNOWN	400 Bad Request	The request to create or modify a DNS context is rejected due to a baseline DNS pattern being unknown to the EASDF (i.e the URI of the baseline DNS pattern is unknown).
BASELINE_DNS_MDT_UNKNOWN	400 Bad Request	The request to create or modify a DNS context is rejected due to a baseline DNS Message Detection Template being unknown to the EASDF (the baseline DNS pattern is known).
BASELINE_DNS_AIT_UNKNOWN	400 Bad Request	The request to create or modify a DNS context is rejected due to a baseline DNS Action Information Template being unknown to the EASDF (the baseline DNS pattern is known).

6.1.8 Feature negotiation

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

Table 6.1.8-1: Supported Features

Feature number	Feature Name	Description

NOTE: No optional feature is defined for the Neasdf_DNSContext API in this release of the specification.

6.1.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Neasdf_DNSContext API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Neasdf_DNSContext API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Neasdf_DNSContext service.

The Neasdf_DNSContext API defines a single scope "neasdf-dnscontext" for the entire service, and it does not define any additional scopes at resource or operation level.

6.2 Neasdf_BaselineDNSPattern Service API

6.2.1 Introduction

The Neasdf_BaselineDNSPattern service shall use the Neasdf_BaselineDNSPattern API.

The API URI of the Neasdf_BaselineDNSPattern API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "neasdf-baselinednspattern".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.2.3.

6.2.2 Usage of HTTP

6.2.2.1 General

HTTP/2, IETF RFC 7540 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

The OpenAPI [6] specification of HTTP messages and content bodies for the Neasdf_BaselineDNSPattern API is contained in Annex A.

6.2.2.2 HTTP standard headers

6.2.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

6.2.2.2.2 Content type

The following content types shall be supported:

- JSON, as defined in IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".
- "Problem Details" JSON Object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [13].
- JSON Patch (IETF RFC 6902 [15]). The use of the JSON Patch format in a HTTP request body shall be signalled by the content type "application/json-patch+json".

6.2.2.3 HTTP custom headers

The mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] shall be supported, and the optional HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4] may be supported.

6.2.3 Resources

6.2.3.1 Overview

Figure 6.2.3.1-1 describes the resource URI structure of the Neasdf_BaselineDNSPattern API.

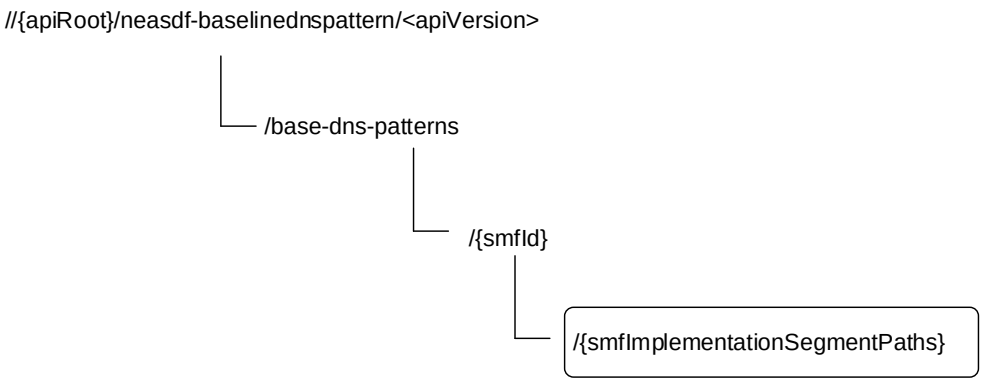

Figure 6.2.3.1-1: Resource URI structure of the Neasdf_BaselineDNSPattern API

Table 6.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.2.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Description (service operation)
Individual Baseline DNS Pattern	/base-dns-patterns/{smfId}/{smfImplementationSegmentPaths}	PUT	Create a new Baseline DNS pattern, or replace the existing Baseline DNS pattern, by providing an Baseline DNS pattern
		PATCH	Update (partial update)
		DELETE	Delete

6.2.3.2 Resource: Individual Baseline DNS Pattern

6.2.3.2.1 Description

This resource represents an individual Baseline DNS Pattern created in the EASDF.

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

6.2.3.2.2 Resource Definition

Resource URI: **{apiRoot}/neasdf-baselinednspattern/<apiVersion>/base-dns-patterns/{smfId}/{smfImplementationSegmentPaths}**

This resource shall support the resource URI variables defined in table 6.2.3.2.2-1.

Table 6.2.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.2.1.
apiVersion	string	See clause 6.2.1.
smfId	VarNfId	Represents the SMF Set Identifier (see NF Set Identifier in clause 28.12 of 3GPP TS 23.003 [19]) or the Set ID part within the SMF Set Identifier (see <Set Id> within the NF Set Identifier in clause 28.12 of 3GPP TS 23.003 [19]) or NF Instance Id of the SMF. The SMF Set Identifier or the Set ID part within the SMF Set ID shall be included if the EASDF is controlled by the SMF set, or the NF Instance Id of the SMF shall be included if the EASDF is controlled by a SMF.

EXAMPLE 1: .../base-dns-patterns/smfInstanceId=4947a69a-f61b-4bc1-b9da-47c9c5d14b64/{smfImplementationSegmentPaths}

EXAMPLE 2: .../base-dns-patterns/smfSetId=set1.smfset.5gc.mnc012.mcc345/{smfImplementationSegmentPaths}

EXAMPLE 3: .../base-dns-patterns/setId=set1/{smfImplementationSegmentPaths}

6.2.3.2.3 Resource Standard Methods

6.2.3.2.3.1 PATCH

This method updates (partial update) an individual Baseline DNS Pattern resource in the EASDF.

This method shall support the URI query parameters specified in table 6.2.3.2.3.1-1.

Table 6.2.3.3.3.1-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.2.3.2.3.1-2 and the response data structures and response codes specified in table 6.2.3.2.3.1-3.

Table 6.2.3.2.3.1-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
array(PatchItem)	M	1..N	It contains the list of changes to be made to the Baseline DNS pattern, according to the JSON PATCH format specified in IETF RFC 6902 [15].

Table 6.2.3.2.3.1-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
PatchResult	M	1	200 OK	Upon partial success, e.g. some of the requested modifications for unknown attribute(s) are discarded while the rest of the modification instructions are fully accepted, the EASDF shall return the execution report.
n/a			204 No Content	Successful update of the Baseline DNS Pattern.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the PATCH method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4].				

Table 6.2.3.2.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

Table 6.2.3.2.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

6.2.3.2.3.2 PUT

This method creates or updates (complete replacement) an individual Baseline DNS Pattern resource in the EASDF.

This method shall support the URI query parameters specified in table 6.2.3.2.3.2-1.

Table 6.2.3.2.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.2.3.2.3.2-2 and the response data structures and response codes specified in table 6.2.3.2.3.2-3.

Table 6.2.3.2.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
BaseDnsPatternCreateData	M	1	Baseline DNS Pattern Data to be created or to replace the existing Baseline DNS Pattern data

Table 6.2.3.2.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
DnsBasePatternCreatedData	M	1	201 Created	Successful creation of a Baseline DNS Pattern
n/a			204 No Content	Successful update of the Baseline DNS Pattern.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the PUT method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4].				

Table 6.2.3.2.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

Table 6.2.3.2.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

6.2.3.2.3.3 DELETE

This method deletes an individual Baseline DNS Pattern resource in the EASDF.

This method shall support the URI query parameters specified in table 6.2.3.2.3.3-1.

Table 6.2.3.2.3.3-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.2.3.3.3.3-2 and the response data structures and response codes specified in table 6.2.3.2.3.3-3.

Table 6.2.3.2.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.2.3.2.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful deletion of the Baseline DNS Pattern.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing a different URI, or the same URI if this is a redirection triggered by an SCP to the same target resource via another SCP. In the former case, the URI shall be an alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the Successful deletion of method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4].				

Table 6.2.3.2.3.3-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

Table 6.2.3.2.3.3-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located on an alternative service instance within the same EASDF or EASDF (service) set, or same URI if this is a redirection triggered by an SCP towards the same target resource via another SCP.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target EASDF (service) instance ID towards which the request is redirected

6.2.3.3.4 Resource Custom Operations

6.2.3.3.4.1 Overview

Table 6.2.3.3.4.1-1: Custom operations

Operation Name	Custom operation URI	Mapped HTTP method	Description (Service operation)

6.2.4 Custom Operations without associated resources

There are no custom operations defined without any associated resources for the Neasdf_BaselineDNSPattern service in this release of this specification.

6.2.5 Notifications

There are no notifications defined for the Neasdf_BaselineDNSPattern service in this release of the specification.

6.2.6 Data Model

6.2.6.1 General

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

Table 6.2.6.1-1 specifies the data types defined for the Neasdf_BaselineDNSPattern service based interface protocol.

Table 6.2.6.1-1: Neasdf_BaselineDNSPattern specific Data Types

Data type	Clause defined	Description	Applicability
BaseDnsPatternCreateData	6.2.6.2.2	Data in Baseline DNS Pattern Create request	
BaseDnsPatternCreatedData	6.2.6.2.3	Data in Baseline DNS Pattern Create response	
BaselineDnsMdt	6.2.6.2.4	Baseline DNS message detection template	
BaselineDnsAit	6.2.6.2.5	Baseline DNS action information Template	
VarNfId	6.2.6.2.6	SMF or SMF Set Id or Set Id part in SMF set identifier	

Table 6.2.6.1-2 specifies data types re-used by the Neasdf 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 Neasdf_BaselineDNSPattern service based interface.

Table 6.2.6.1-2: Neasdf_BaselineDNSPattern re-used Data Types

Data type	Reference	Comments	Applicability
DnsQueryMdt	6.1.6.2.5	DNS Query Message Detection Template	
DnsRspMdt	6.1.6.2.6	DNS Response Message Detection Template	
EcsOption	6.1.6.2.12	ECS Option information	
IpAddr	3GPP TS 29.571 [16]	IP address	
NfSetId	3GPP TS 29.571 [16]	NF Set Id	
NfInstanceId	3GPP TS 29.571 [16]	NF Instance Id	
PatchResult	3GPP TS 29.571 [16]		

6.2.6.2 Structured data types

6.2.6.2.1 Introduction

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

6.2.6.2.2 Type: BaseDnsPatternCreateData

Table 6.2.6.2.2-1: Definition of type BaseDnsPatternCreateData

Attribute name	Data type	P	Cardinality	Description	Applicability
label	string	O	0..1	Baseline DNS pattern's label (NOTE)	
baseDnsMdtList	map(BaselineDnsMdt)	O	1..N	When present, this IE contains the map of DNS message detection templates. The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [12], carrying the identifier of the baseline DNS Message Detection Template, with a maximum of 32 characters.	
baseDnsAitList	map(BaselineDnsAit)	O	1..N	When present, this IE contains the map of Baseline DNS action information Templates. The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [12], carrying the identifier of the baseline DNS Message Detection Template, with a maximum of 32 characters.	
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.2.8 is supported.	
NOTE: This attribute may contain free information describing the scope of the baseline DNS pattern. It may be used e.g. for trouble-shooting.					

6.2.6.2.3 Type: BaseDnsPatternCreatedData

Table 6.2.6.2.3-1: Definition of type BaseDnsPatternCreatedData

Attribute name	Data type	P	Cardinality	Description	Applicability
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.2.8 is supported.	

6.2.6.2.4 Type: BaselineDnsMdt

Table 6.2.6.2.4-1: Definition of type BaselineDnsMdt

Attribute name	Data type	P	Cardinality	Description	Applicability
mdtId	string	M	1	Identifier of the DNS message detection template within the baseline DNS pattern, with a maximum of 32 characters.	
label	string	O	0..1	Baseline DNS MDT's label (NOTE 2)	
dnsQueryMdtList	map(DnsQueryMdt)	C	1..N	Map of DNS Query message detection templates. The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [12], carrying the identifier of the DNS Query message detection template, with a maximum of 32 characters. If present, only fqdnList attribute shall be included in the DNS Query message detection template. (NOTE 1)	
dnsRspMdtList	map(DnsRspMdt)	C	1..N	Map of DNS Response message detection templates. The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [12], carrying the identifier of the DNS Response message detection template, with a maximum of 32 characters. (NOTE 1)	
NOTE 1: Either the dnsQueryMdtList IE or the dnsRspMdtList IE shall be present. NOTE 2: This attribute may contain free information describing the scope of the baseline DNS MDT. It may be used e.g. for trouble-shooting.					

6.2.6.2.5 Type: BaselineDnsAit

Table 6.2.6.2.5-1: Definition of type BaselineDnsAit

Attribute name	Data type	P	Cardinality	Description	Applicability
aitId	string	M	1	Identifier of the DNS message handling action within the baseline DNS pattern	
label	string	O	0..1	Baseline DNS AIT's label (NOTE)	
ecsOption	EcsOption	C	0..1	Information to build optional EDNS Client Subnet (ECS) option to be included in the DNS Query as defined in IETF RFC 7871 [18], or to be used for replacing the ECS option received in the DNS Query message from the UE.	
dnsServerAddressList	array(IpAddr)	C	1..N	DNS Server Address to be used as destination address of the outgoing DNS Query More than one IP address may be provided for resiliency.	
NOTE: This attribute may contain free information describing the scope of the baseline DNS AIT. It may be used e.g. for trouble-shooting.					

6.2.6.2.6 Type: VarNfId

Table 6.2.6.2.6-1: Definition of type VarNfId

Attribute name	Data type	P	Cardinality	Description	Applicability
smfSetId	NfSetId	C	0..1	This IE shall be present if available. When present, this IE includes the SMF Set Id (NOTE)	
setId	string	C	0..1	This IE shall be present if available. When present, this IE includes Set Id part in NF Set Identifier (see clause 28.12 of 3GPP TS 23.003 [7]), formatted as the following string: "set<Set ID>" with <Set ID> encoded as a string of characters consisting of alphabetic characters (A-Z and a-z), digits (0-9) and/or the hyphen (-) and that shall end with either an alphabetic character or a digit. Pattern: '^([A-Za-z0-9\-]*[A-Za-z0-9])$' Examples: "setxyz" "set12" (NOTE)	
smfInstanceId	NfInstanceId	C	0..1	This IE shall be present if available. When present, this IE includes SMF Instance Id (NOTE)	
NOTE: Either smfSetId attribute or setId or smfInstanceId attribute shall be included.					

6.2.7 Error Handling

6.2.7.1 General

For the Neasdf_BaselineDNSPattern API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [4].

In addition, the requirements in the following clauses are applicable for the Neasdf_BaselineDNSPattern API.

6.2.7.2 Protocol Errors

No specific procedures for the Neasdf_BaselineDNSPattern API service are specified.

6.2.7.3 Application Errors

The application errors defined for the Neasdf_BaselineDNSPattern service are listed in Table 6.2.7.3-1.

Table 6.2.7.3-1: Application errors

Application Error	HTTP status code	Description

6.2.8 Feature negotiation

The optional features in table 6.2.8-1 are defined for the Neasdf_BaselineDNSPattern API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 6.2.8-1: Supported Features

Feature number	Feature Name	Description

6.2.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Neasdf_BaselineDNSPattern API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Neasdf_BaselineDNSPattern API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Neasdf_BaselineDNSPattern service.

The Neasdf_BaselineDNSPattern API defines a single scope "neasdf-baselinednspattern" for the entire service, and it does not define any additional scopes at resource or operation level.

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 3GPP TS 29.501 [5] clause 5.3.1 and 3GPP TR 21.900 [7] clause 5B).

A.2 Neasdf_DNSContext API

```
openapi: 3.0.0

info:
  version: '1.0.0'
  title: 'Neasdf_DNSContext'
  description: |
    EASDF DNS Context Service.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.556 V17.1.0; 5G System; Edge Application Server Discovery Services; Stage3
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.556/

servers:
  - url: '{apiRoot}/neasdf-dnscontext/v1'
    variables:
      apiRoot:
        default: https://example.com
        description:  apiRoot as defined in clause 4.4 of 3GPP TS 29.501.

security:
  - {}
  - oAuth2ClientCredentials:
    - neasdf-dnscontext

paths:

  /dns-contexts:
    post:
      summary:  Create
      tags:
        - DNS contexts collection
      operationId: CreateDnsContext
      requestBody:
        description: representation of the DNS context to be created in the EASDF
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/DnsContextCreateData'
      callbacks:
        dnsContextNotification:
          '{$request.body#/notifyUri}':
            post:
              requestBody:  # contents of the DNS context Notify request
```

```
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/DnsContextNotification'
              responses:
                '204':
                  description: successful notification
                '307':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/307'
                '308':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/308'
                '400':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
                '403':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
                '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'
                '503':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29571_CommonData.yaml#/components/responses/default'

      responses:
        '201':
          description: successful creation of a DNS context
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/DnsContextCreatedData'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/neasdf-dnscontext/<apiVersion>/dns-contexts/{dnsContextId}'
              required: true
              schema:
                type: string
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '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'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  /dns-contexts/{dnsContextId}:
    delete:
      summary:  Delete the DNS Context
      tags:
        - Individual DNS context
      operationId: DeleteDnsContext
```

```
    parameters:
      - name: dnsContextId
        in: path
        description:  DNS context Identifier
        required: true
        schema:
          type: string
    responses:
      '204':
        description: successful deletion of an SM context
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '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'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  patch:
    summary: Updates the DNS context
    operationId: UpdateDnsContext
    tags:
      - Individual DNS context
    parameters:
      - name: dnsContextId
        in: path
        description:  DNS context Identifier
        required: true
        schema:
          type: string
      - name: Content-Encoding
        in: header
        description: Content-Encoding, described in IETF RFC 7231
        schema:
          type: string
    requestBody:
      content:
        application/json-patch+json:
          schema:
            type: array
            items:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/PatchItem'
      required: true
    responses:
      '200':
        description: Partial update of the DNS context
        content:
          application/json:
            schema:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/PatchResult'
      '204':
        description: Successful update of the DNS context
        headers:
          Accept-Encoding:
            description: Accept-Encoding, described in IETF RFC 7694
            schema:
              type: string
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
```

```
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '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'
      '501':
        $ref: 'TS29571_CommonData.yaml#/components/responses/501'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  put:
    summary: Updates the DNS context (complete replacement)
    operationId: ReplaceDnsContext
    tags:
      - Individual DNS context
    parameters:
      - name: dnsContextId
        in: path
        description:  DNS context Identifier
        required: true
        schema:
          type: string
      - name: Content-Encoding
        in: header
        description: Content-Encoding, described in IETF RFC 7231
        schema:
          type: string
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/DnsContextCreateData'
    responses:
      '204':
        description: Successful update of the DNS context
        headers:
          Accept-Encoding:
            description: Accept-Encoding, described in IETF RFC 7694
            schema:
              type: string
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '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'
      '501':
        $ref: 'TS29571_CommonData.yaml#/components/responses/501'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
```

```
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'


components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            neasdf-dnscontext: Access to the neasdf-dnscontext API


  schemas:
#
# STRUCTURED DATA TYPES
#
    DnsContextCreateData:
      description: Data within Create request
      type: object
      properties:
        ueIpv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        ueIpv6Prefix:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
        dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        sNssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        dnsRules:
          description: map of DNS message handling rules where a valid JSON string serves as key
          type: object
          additionalProperties:
            $ref: '#/components/schemas/DnsRule'
          minProperties: 1
        notifyUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - dnn
        - sNssai
        - dnsRules
      anyOf:
        - required: [ ueIpv4Addr ]
        - required: [ ueIpv6Prefix ]

    DnsContextCreatedData:
      description: Data within Create response
      type: object
      properties:
        easdfIpv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        easdfIpv6Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      anyOf:
        - required: [ easdfIpv4Addr ]
        - required: [ easdfIpv6Addr ]

    DnsRule:
      description: DNS message handling rule
      type: object
      properties:
        dnsRuleId:
          type: string
        label:
          type: string
        precedence:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint32'
        dnsQueryMdtList:
          description: map of DNS query message detection templates where a valid JSON string serves
as key
          type: object
          additionalProperties:
```

```
            $ref: '#/components/schemas/DnsQueryMdt'
          minProperties: 1
        baseDnsQueryMdtList:
          type: array
          items:
            $ref: '#/components/schemas/BaselineDnsQueryMdtInfo'
          minItems: 1
        dnsRspMdtList:
          description: map of DNS response message detection templates where a valid JSON string
serves as key
          type: object
          additionalProperties:
            $ref: '#/components/schemas/DnsRspMdt'
          minProperties: 1
        baseDnsRspMdtList:
          type: array
          items:
            $ref: '#/components/schemas/BaselineDnsRspMdtInfo'
          minItems: 1
        dnsMsgId:
          type: string
        actionList:
          description: map of actions where a valid JSON string serves as key
          type: object
          additionalProperties:
            $ref: '#/components/schemas/Action'
          minProperties: 1
      required:
        - actionList
      allOf:
        - not:
            required: [ dnsQueryMdtList, dnsRspMdtList ]
        - not:
            required: [ dnsQueryMdtList, baseDnsRspMdtList ]
        - not:
            required: [ baseDnsQueryMdtList, dnsRspMdtList ]
        - not:
            required: [ baseDnsQueryMdtList, baseDnsRspMdtList ]

    DnsQueryMdt:
      description: DNS Query message detection template
      type: object
      properties:
        mdtId:
          type: string
        label:
          type: string
        sourceIpv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        sourceIpv6Prefix:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
        fqdnPatternList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/FqdnPatternMatchingRule'
          minItems: 1
      required:
        - mdtId

    DnsRspMdt:
      description: DNS Response message detection template
      type: object
      properties:
        mdtId:
          type: string
        label:
          type: string
        fqdnPatternList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/FqdnPatternMatchingRule'
          minItems: 1
        easIpv4AddrRanges:
          type: array
          items:
            $ref: '#/components/schemas/Ipv4AddressRange'
          minItems: 1
        easIpv6PrefixRanges:
```

```
      type: array
      items:
        $ref: '#/components/schemas/Ipv6PrefixRange'
      minItems: 1
  required:
    - mdtId

Ipv4AddressRange:
  description: Range of IPv4 addresses
  type: object
  properties:
    start:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
    end:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
  required:
    - start
    - end

Ipv6PrefixRange:
  description: Range of IPv6 prefixes
  type: object
  properties:
    start:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
    end:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
  required:
    - start
    - end

Action:
  description: Action to apply to DNS messages matching a message detection template
  type: object
  properties:
    applyAction:
      $ref: '#/components/schemas/ApplyAction'
    fwdParas:
      $ref: '#/components/schemas/ForwardingParameters'
    reportingOnceInd:
      type: boolean
      default: false
    resetReportingOnceInd:
      type: boolean
      default: false
  required:
    - applyAction

DnsContextNotification:
  description: Data within DNS Context Notify
  type: object
  properties:
    eventreportList:
      type: array
      items:
        $ref: '#/components/schemas/DnsContextEventReport'
      minItems: 1

ForwardingParameters:
  description: Forwarding instructions
  type: object
  properties:
    ecsOptionInfo:
      $ref: '#/components/schemas/EcsOptionInfo'
    dnsServerAddressInfo:
      $ref: '#/components/schemas/DnsServerAddressInfo'

EcsOptionInfo:
  description: ECS Option Information
  type: object
  properties:
    ecsOption:
      $ref: '#/components/schemas/EcsOption'
    baseDnsAitId:
      $ref: '#/components/schemas/BaselineDnsAitId'
  anyOf:
    - required: [ ecsOption ]
    - required: [ baseDnsAitId ]
```

```
    DnsServerAddressInfo:
      description: DNS Server Address Information
      type: object
      properties:
        dnsServerAddressList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/IpAddr'
          minItems: 1
        baseDnsAitId:
          $ref: '#/components/schemas/BaselineDnsAitId'
      anyOf:
        - required: [ dnsServerAddressList ]
        - required: [ baseDnsAitId ]

    BaselineDnsMdtId:
      description: Baseline DNS Message Detection Template Identifier
      type: object
      properties:
        baseDnsPatternUri:
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        mdtId:
          type: string
      required:
        - baseDnsPatternUri
        - mdtId

    BaselineDnsAitId:
      description: Baseline DNS Action Information Template Identifier
      type: object
      properties:
        baseDnsPatternUri:
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        aitId:
          type: string
      required:
        - baseDnsPatternUri
        - aitId

    EcsOption:
      description: ECS Option Information
      type: object
      properties:
        sourcePrefixLength:
          type: integer
          minimum: 0
          maximum: 128
        scopePrefixLength:
          type: integer
          minimum: 0
          maximum: 128
        ipAddr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/IpAddr'
      required:
        - sourcePrefixLength
        - ipAddr

    DnsContextEventReport:
      description: DNS context event report
      type: object
      properties:
        timestamp:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        dnsRuleId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint32'
        dnsQueryReport:
          $ref: '#/components/schemas/DnsQueryReport'
        dnsRspReport:
          $ref: '#/components/schemas/DnsRspReport'
        dnsMsgId:
          type: string


    DnsQueryReport:
      description: DNS Query Event Report
```

```
      type: object
      properties:
        fqdn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Fqdn'

    DnsRspReport:
      description: DNS Response Event Report
      type: object
      properties:
        fqdn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Fqdn'
        easIpv4Addresses:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
          minItems: 1
        easIpv6Addresses:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
          minItems: 1
        ecsOption:
          $ref: '#/components/schemas/EcsOption'

    BaselineDnsQueryMdtInfo:
      description: Baseline DNS Query MDT Information
      type: object
      properties:
        sourceIpv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        sourceIpv6Prefix:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
        baseDnsMdtList:
          type: array
          items:
            $ref: '#/components/schemas/BaselineDnsMdtId'
          minItems: 1
      required:
        - baseDnsMdtList

    BaselineDnsRspMdtInfo:
      description: Baseline DNS Response MDT Information
      type: object
      properties:
        baseDnsMdtList:
          type: array
          items:
            $ref: '#/components/schemas/BaselineDnsMdtId'
          minItems: 1
      required:
        - baseDnsMdtList

#
# SIMPLE DATA TYPES
#



#
# ENUMERATIONS
#

    ApplyAction:
      anyOf:
      - type: string
        enum:
          - BUFFER
          - REPORT
          - FORWARD
          - DISCARD
      - 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: >
        Action to apply to the DNS packet
```

A.3 Neasdf_BaselineDNSPattern API

```
openapi: 3.0.0

info:
  version: '1.0.0'
  title: 'Neasdf_BaselineDNSPattern'
  description: |
    EASDF Baseline DNS Pattern Service.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.556 V17.1.0; 5G System; Edge Application Server Discovery Services; Stage
3
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.556/'

servers:
  - url: '{apiRoot}/neasdf-baselinednspattern/v1'
    variables:
      apiRoot:
        default: https://example.com
        description:  apiRoot as defined in clause 4.4 of 3GPP TS 29.501.

security:
  - {}
  - oAuth2ClientCredentials:
    - neasdf-baselinednspattern

paths:

  /base-dns-patterns/{smfId}/{smfImplementationSegmentPaths}:
    patch:
      summary: Updates the Baseline DNS Pattern
      operationId: UpdateBaseDNSPattern
      tags:
        - Individual Baseline DNS Pattern
      parameters:
        - name: smfId
          in: path
          description: SMF or SMF set identifier or Set Id part in SMF set identifier
          required: true
          schema:
            $ref: '#/components/schemas/VarNfId'
          style: simple
          explode: true
        - name: smfImplementationSegmentPaths
          in: path
          description: SMF Implementation Dependent Segment Paths
          required: true
          schema:
            type: string
        - name: Content-Encoding
          in: header
          description: Content-Encoding, described in IETF RFC 7231
          schema:
            type: string
      requestBody:
        content:
          application/json-patch+json:
            schema:
              type: array
              items:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/PatchItem'
        required: true
      responses:
        '200':
          description: Partial update of the Baseline DNS Pattern
          content:
            application/json:
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/PatchResult'
        '204':
```

```
          description: Successful update of the Baseline DNS Pattern
          headers:
            Accept-Encoding:
              description: Accept-Encoding, described in IETF RFC 7694
              schema:
                type: string
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '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'
        '501':
          $ref: 'TS29571_CommonData.yaml#/components/responses/501'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

    put:
      summary: Creates or Updates the Baseline DNS Pattern (complete replacement)
      operationId: CreateOrReplaceBaseDnsPattern
      tags:
        - Individual Baseline DNS Pattern
      parameters:
        - name: smfId
          in: path
          description: SMF or SMF set identifier or Set Id part in SMF set identifier
          required: true
          schema:
            $ref: '#/components/schemas/VarNfId'
          style: simple
          explode: true
        - name: smfImplementationSegmentPaths
          in: path
          description: SMF Implementation Dependent Segment Paths
          required: true
          schema:
            type: string
        - name: Content-Encoding
          in: header
          description: Content-Encoding, described in IETF RFC 7231
          schema:
            type: string
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/BaseDnsPatternCreateData'
      responses:
        '201':
          description: successful creation of a Baseline DNS pattern
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/BaseDnsPatternCreatedData'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/neasdf-baselinednspattern/<apiVersion>/base-dns-
patterns/{smfId}/{smfImplementationSegmentPaths}'
              required: true
              schema:
```

```
            type: string
      '204':
        description: Successful update of the Baseline DNS Pattern
        headers:
          Accept-Encoding:
            description: Accept-Encoding, described in IETF RFC 7694
            schema:
              type: string
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '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'
      '501':
        $ref: 'TS29571_CommonData.yaml#/components/responses/501'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  delete:
    summary:  Deletes a Baseline DNS Pattern
    tags:
      - Individual Baseline DNS Pattern
    operationId: DeleteBaseDnsPattern
    parameters:
      - name: smfId
        in: path
        description: SMF or SMF set identifier or Set Id part in SMF set identifier
        required: true
        schema:
          $ref: '#/components/schemas/VarNfId'
        style: simple
        explode: true
      - name: smfImplementationSegmentPaths
        in: path
        description: SMF Implementation Dependent Segment Paths
        required: true
        schema:
          type: string
    responses:
      '204':
        description: successful deletion of a Baseline DNS Pattern
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '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'
```

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

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            neasdf-baselinednspattern: Access to the neasdf-baselinednspattern API

  schemas:
#
# STRUCTURED DATA TYPES
#
    BaseDnsPatternCreateData:
      description: Data in Baseline DNS Pattern Create request
      type: object
      properties:
        label:
          type: string
        baseDnsMdtList:
          description: map of baseline DNS message detection templates where a valid JSON string
serves as key
          type: object
          additionalProperties:
            $ref: '#/components/schemas/BaselineDnsMdt'
          minProperties: 1
        baseDnsAitList:
          description: map of Baseline DNS action information Template where a valid JSON string
serves as key
          type: object
          additionalProperties:
            $ref: '#/components/schemas/BaselineDnsAit'
          minProperties: 1
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'

    BaseDnsPatternCreatedData:
      description: Data in Baseline DNS Pattern Create response
      type: object
      properties:
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'

    BaselineDnsMdt:
      description: Baseline DNS message detection template
      type: object
      properties:
        mdtId:
          type: string
        label:
          type: string
        dnsQueryMdtList:
          description: map of DNS query message detection templates where a valid JSON string serves
as key
          type: object
          additionalProperties:
            $ref: 'TS29556_Neasdf_DNSContext.yaml#/components/schemas/DnsQueryMdt'
          minProperties: 1
        dnsRspMdtList:
          description: map of DNS response message detection templates where a valid JSON string
serves as key
          type: object
          additionalProperties:
            $ref: 'TS29556_Neasdf_DNSContext.yaml#/components/schemas/DnsRspMdt'
          minProperties: 1
      required:
        - mdtId
      not:
        required: [ dnsQueryMdtList, dnsRspMdtList ]

    BaselineDnsAit:
      description: Baseline DNS action information Template
```

```
      type: object
      properties:
        aitId:
          type: string
        label:
          type: string
        ecsOption:
          $ref: 'TS29556_Neasdf_DNSContext.yaml#/components/schemas/EcsOption'
        dnsServerAddressList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/IpAddr'
          minItems: 1
      required:
        - aitId

    VarNfId:
      description: SMF or SMF Set Id or Set Id part in NF Set Id
      type: object
      properties:
        smfSetId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NfSetId'
        setId:
          type: string
          pattern: '^([A-Za-z0-9\-]*[A-Za-z0-9])$'
        smfInstanceId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'


#
# SIMPLE DATA TYPES
#



#
# ENUMERATIONS
#
```

Annex B (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2021-04	CT4#103e	C4-212440				TS skeleton	0.0.0
2021-04	CT4#103e	C4-212441 C4-212442				Implementation of pCRs agreed in CT4#103E	0.1.0
2021-06	CT4#104e	C4-213092 C4-213093 C4-213094 C4-213095 C4-213096 C4-213182 C4-213184 C4-213185 C4-213429 C4-213430 C4-213479				Implementation of pCRs agreed in CT4#104E	0.2.0
2021-09	CT4#105e	C4-214676				Implementation of pCRs agreed in CT4#105E	0.3.0
2021-10	CT4#106e	C4-215049 C4-215365 C4-215366 C4-215488 C4-215489 C4-215246 C4-215429 C4-215430 C4-215431 C4-215432 C4-215433 C4-215434				Implementation of pCRs agreed in CT4#106E	0.4.0
2021-11	CT4#107e	C4-216189 C4-216551 C4-216303 C4-216304 C4-216305 C4-216306 C4-216307				Implementation of pCRs agreed in CT4#107E	0.5.0
2021-12	CT#94	CP-213156				V1.0.0 presented for information	1.0.0
2022-01	CT4#107bise	C4-220101 C4-220103 C4-220239 C4-220399 C4-220419 C4-220452				Implementation of pCRs agreed in CT4#107bisE	1.1.0
2022-03	CT4#108e	C4-221136 C4-221296 C4-221482				Implementation of pCRs agreed in CT4#108E	1.2.0
2022-03	CT#95e	CP-220105				TS send for approval	2.0.0
2022-03	CT#95e					TS approved	17.0.0
2022-06	CT#96	CP-221034	0001	2	F	Key of Map in Data Structure for Baseline DNS Pattern	17.1.0
2022-06	CT#96	CP-221034	0002		F	Reference point between SMF and EASDF	17.1.0
2022-06	CT#96	CP-221034	0003	1	B	Using FQDN Pattern Matching Rule for fqdnPatternList	17.1.0
2022-06	CT#96	CP-221034	0004		F	Reuse of type Fqdn from 29.571	17.1.0
2022-06	CT#96	CP-221034	0005		F	S-NSSAI in Create DNS context	17.1.0
2022-06	CT#96	CP-221051	0006		F	29.556 Rel-17 API version and External doc update	17.1.0
2022-12	CT#98e	CP-223045	0009	1	F	Handling of EDNS Client Subnet option by EASDF	17.2.0
2022-12	CT#98e	CP-223045	0010		F	Corrections on DnsServerAddressInfo	17.2.0

History

Document history		
V17.0.0	May 2022	Publication
V17.1.0	July 2022	Publication
V17.2.0	January 2023	Publication