**3GPP TSG-CT WG4 Meeting #110-eC4-223037**

**E-Meeting, 12th – 20th May 2022**

**Source: Huawei**

**Title: Discussion paper on MB-SMF discovering AMF(s)**

**Spec: 3GPP TS 29.510 v17.5.0**

**Agenda item: 6.1.16 (5MBS)**

**Document for: Decision**

**1. Introduction**

Clause 7.3.1 MBS Session Start for Broadcast in 3GPP TS 23.247 v17.2.0 reads:

2. The MB-SMF may use NRF to discover the AMF(s) supporting MBS based on the MBS service area and select the appropriate one(s). Then the MB-SMF sends the Namf\_MBSBroadcast\_ContextCreate (TMGI, N2 SM information ([LL SSM], 5G QoS Profile), MBS service area, [MBS FSA ID(s)]) messages to the selected AMF(s) in parallel if the service type is broadcast service. The MB-SMF may include a maximum response time in the request.

**2. Open issue**

During the discovery of the AMF for a given MBS service area, it is not clear what should MB-SMF do if the MBS service area contains a list of the TAIs. In such case, MB-SMF will need to somehow map each TAI from the list to the serving AMF. There could be many to many relationships between TAIs and AMF-IDs, i.e. the same TAI may be served by more than one AMFs.

Let's look at the current state of matters.

MbsServiceArea type is defined in Table 5.9.4.4-1 of 3GPP TS 29.571 v17.5.0, quote:

Table 5.9.4.4-1: Definition of type MbsServiceArea

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| ncgiList | array(NcgiTai) | O | 1..N | List of NR cell ids with their pertaining TAIs. |
| taiList | array(Tai) | O | 1..N | List of tracking area Ids. |
| NOTE: The MBS Service Area consists of the union of the cells in the tracking areas listed in the taiList IE and the cells listed in the ncgiList IE. |

Therefore, an MbsServiceArea may contain one or more TAIs. If an MB-SMF wishes to discover the AMF(s) for a specific MBS service area, the MB-SMF needs to query an NRF by sending a parameter of type MbsServiceArea.

3GPP TS 29.510 v17.5.0 specifies that MbsServiceArea type is used by the MbsAreaSession data type, quote:

Table 6.1.6.2.90-1: Definition of type MbsAreaSession

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| areaSessionId | AreaSessionId | M | 1 | Area Session Identifier used for MBS session with location dependent content. When present, the Area Session ID together with the mbsSessionId (TMGI) uniquely identifies the MBS session in a specific MBS service area |
| mbsServiceArea | MbsServiceArea | M | 1 | MBS Service Area for MBS session with location dependent content |

Where, AreaSessionId is defined in Table 5.9.2-1 of 3GPP TS 29.571 v17.5.0, quote:

Table 5.9.2-1: Simple Data Types

|  |  |  |
| --- | --- | --- |
| Type Name | Type Definition | Description |
| AreaSessionId | Uint16 | Area Session Identifier used for MBS session with location dependent content.When present, the Area Session ID together with the TMGI uniquely identifies the MBS session in a specific MBS service area.  |

Currently, Table 6.2.3.2.3.1-1 for the Nnrf\_NFDiscovery Service API definition in 3GPP TS 29.510 v17.5.0 does not support queries with MbsAreaSession, but only with AreaSessionId, quote:

Table 6.2.3.2.3.1-1: URI query parameters supported by the GET method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| area-session-id | AreaSessionId | O | 0..1 | This IE may be present if the target NF type is "MB-SMF", the mbs-session-id-list IE is present and contains only one MBS Session ID. When present, the IE shall contain the Area Session ID, for the MBS session indicated in the mbs-session-id-list IE, for which an MB-SMF is to be discovered. When this IE is present, the NRF shall return an MB-SMF profile that currently serves the MBS Session ID and Area Session ID (see mbsSessionList attribute in clause 6.1.6.2.85).If no MB-SMF supports the MBS Session ID and Area Session ID, the NRF shall return an empty response.See clause 7.1.2 of 3GPP TS 23.247 [43]. | Query-MBS |

Query with AreaSessionId could be resolved to discovering MbsAreaSession, which in turn could help discovering MbsServiceArea and ultimately the TAI list. The above quote however makes it clear that **currently such query cannot** be used for an AMF discovery.

**3. Discussion**

It looks necessary to specify a new query parameter for the Nnrf\_NFDiscovery Service API definition in 3GPP TS 29.510 v17.5.0, in Table 6.2.3.2.3.1-1 "URI query parameters supported by the GET method on this resource".

If there are more than one TAIs in a given MBS service area, there could be many to may relationships between TAIs and AMF-IDs, i.e. the same TAI may be served by more than one AMFs. In principle, there are two ways to resolve the problem. Note, that currently Table 6.2.3.2.3.1-1 in TS 29.510 contaisn 'tai-list' attribue, which (a) is used for the eDGE-5GC feature and (b) NRF NRF shall return NFs which support all the TAIs in the list.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| tai-list | array(Tai) | O | 1..N | If included, this IE shall contain the Tracking Area Identities requested to be supported by the NFs being discovered. The NRF shall return NFs which support all the TAIs in the list. It may be included if the target NF type is "NEF". | Query-eEDGE-5GC |

1. MB-SMF queries the NRF multiple times. Each query contains a single TAI. The NRF returns one or more AMF IDs. It is important to highlight, that the returned AMF profile will contain the list of all supported TAIs
2. MB-SMF sends a list of TAIs to the NRF. The NRF returns either one AMF, which serves all TAIs (a jackpot), or an error.

Let's use an example scenarion, where:

* AMF-A serves e.g. TAI-1 … TAI-4.
* AMF-B serves e.g. TAI-4 … TAI-10. Note, TAI-4 is an overlap.

Let's take a closer look into these solution options.

Alternative 1. MB-SMF queries the NRF multiple times

For this there is already a 'tai' query parameter in Table 6.2.3.2.3.1-1. By setting "target-nf-type"="AMF" and "service-name" = "namf-mbs-bc", NRF will find candidate AMF(s) supporting Namf\_MBBroadcast service.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| tai | Tai | O | 0..1 | Tracking Area Identity. |  |

With the above example, the following queries will be performed.

1.a The MB-SMF queries NRF with 'TAI-1'.

1.b The NRF returns AMF-A, which serves TAI-1 … TAI-4.

1.c The MB-SMF queries NRF with 'TAI-5'.

1.d The NRF returns AMF-B, which serves TAI-4 … TAI-10.

1.e With two queries, the MB-SMF determines AMF-A and AMF-B cover all TAIs.

**Pro**: Trivial NRF internal logic.

**Con**: Multiple NRF queries are necessary.

Alternative 2. MB-SMF sends a list of TAIs to the NRF

This can be achieved by querying the NRF with 'tai-list' parameter. With the above example, "TAI-1, .. TAI-10":

2.a NRF will need to send back a data structure that maps each TAI to each AMF.

2.b NRF sends back the AMF ID that serve all TAIs, if the NRF finds such AMF ('Bingo' use case. In principle, there may be multiple such AMFs).

2.c Otherwise, NRF sends back an error message explaining the reason.

**Pro**: A single query is sufficient.

**Con**: New and more complex NRF internal logic:

* With the above Alternative 2.a, the NRF will need to send back a data structure that maps each TAI to each AMF. This looks too complex. Otherwise, the NRF shall return an error message.
* Alternative 2.b, the 'Bingo' scenario is unlikely to happen often enough.

Summary

Sending an 'tai-list' query parameter in hope the NRF finds at least one AMF that serves all TAIs, may be an overkill, because it can be successful only in 'Bingo' scenario, which has pretty low probability.

**4. Proposal**

CT4 should reuse the 'tai' query parameter, as specified in Alternative 1.

The proposed solution is captured in the CR0717-TS29510 in C4-223038.