**3GPP TSG-CT WG1 Meeting #123-eC1-202093**

**Electronic meeting, 16-24 April 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **24.502** | **CR** | **0120** | **rev** | **-** | **Current version:** | **16.3.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **x** |

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| ***Title:*** | Correct N3AN node selection due to LI | | | | | | | | | |
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| ***Source to WG:*** | BlackBerry UK Ltd. | | | | | | | | | |
| ***Source to TSG:*** | C1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5GS\_Ph1-CT | | | | |  | ***Date:*** | | | 2020-04-06 |
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| ***Category:*** | **A** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | | **PROBLEM 1**  A visited country may not have deployed LI-enabled N3IWF.  This visited country could require usage of LI-enabled ePDG. At present, a compliant UE, supporting connectivity with N3IWF and with ePDG, cannot be configured to use ePDG in this visited country (via DNS).  **PROBLEM 2**  Observation 1  TS 24.526 shows that the ‘any\_PLMN’ entry is optional. From a protocol perspective, absence of the ‘any\_PLMN’ entry is ok: a UE needs to handle the case where ‘any\_PLMN’ entry is not provided.  TS 24.302 also has procedures that allow ‘any\_PLMN’ entry to be optionally present.  Observation 2  The single ‘any\_PLMN’ entry, if configured, applies in every visited country. This ‘any\_PLMN’ entry may not reflect every country’s Lawfull Intercept requirements. It means every country prefers either ePDG or N3IWF or the same FQDN format.  **PROBLEM 3**  Unlike subclause 7.2.4.4.2, subclause 7.2.4.4.3 omits UE behavior for when the UE has selected an ePDG IP address.  **BACKWARDS COMPATIBILITY**  There is no impact on the protocols. The proposed changes are backwards compatible. | | | | | | | | |
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| ***Summary of change:*** | | Correct the procedure determining if the visited country requires selection of an ePDG or N3IWF in this country.  Clarify what it means for N3AN node configuration information to be considered “provisioned”.  Clarify the procedure when the 'Any\_PLMN' N3AN node selection information entry in the N3AN node selection information is NOT available.  Add UE behavior for tunnel error and retry handling when the UE has selected an ePDG IP address because the N3AN node selected for Non-IMS service is an ePDG.  **NOTE**: Because there is no style “B6”, I ended up duplicating some conditions and e.g. introduce a bullet labelled C) with these duplications in 7.2.4.4.2 and 7.2.4.4.3. I ran out of styles … | | | | | | | | |
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| ***Consequences if not approved:*** | | A visited country that mandates usage of ePDG in the visited country cannot meet the LI requirements by its regulator.  Impossible for a HPLMN to allow a roaming UE to determine whether the N3AN node needs to be selected in a visited country, after the UE has registered with a VPLMN. Visited country’s regulations not met (The visited country cannot enforce LI requirements similarly as in TS 24.302).  Impossible for a UE, selecting a N3AN node selection for Non-IMS service, to be compliant to tunnel error and retry handling when the N3AN node selected for Non-IMS service is an ePDG. | | | | | | | | |
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| ***Clauses affected:*** | | 7.2.4.2, 7.2.4.3, 7.2.4.4.2, 7.2.4.4.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\*\*\* First change \*\*\*

#### 7.2.4.2 Determine if the visited country mandates the selection of N3IWF or ePDG in this country

In order to determine if the visited country mandates the selection of N3IWF in this country, the UE shall perform the DNS NAPTR query using Visited Country FQDN as specified in clause 28 of 3GPP TS 23.003 [8] via the non-3GPP access network.

If the result of this query is:

- a set of one or more records containing the service instance names of the form "*n3iwf.5gc.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org*", the UE shall determine that the visited country mandates the selection of the N3IWF in this country; and

NOTE: The (<MCC>, <MNC>) pair in each record represents PLMN Id (see 3GPP TS 23.003 [8]) in the visited country which can be used for N3IWF selection in subclause 7.2.4.3 and subclause 7.2.4.4.

- no records containing the service instance names of the form "*n3iwf.5gc.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org*", the UE shall determine that the visited country does not mandate the selection of the N3IWF in this country.

The UE shall determine if the visited country mandates the selection of ePDG in this country using the procedure specified in subclause 7.2.1.4 of 3GPP TS 24.302 [7].

\*\*\* Next change \*\*\*

#### 7.2.4.3 UE procedure when the UE only supports connectivity with N3IWF

If the UE only supports connectivity with N3IWF and does not support connectivity with ePDG, the UE shall ignore the following ePDG related configuration parameters if available in the N3AN node configuration information when selecting an N3IWF:

- the home ePDG identifier configuration; and

- the preference parameter in each N3AN node selection information entry in the N3AN node selection information.

The UE shall proceed as follows:

a) if the UE is located in its home country:

1) if the N3AN node configuration information is provisioned:

NOTE 1: The N3AN node configuration information is considered provisioned if it contains at least the HPLMN's N3AN node selection information entry in the N3AN node selection information.

i) if the home N3IWF identifier configuration is provisioned in the N3AN node configuration information and contains an IP address, the UE shall use the IP address of the home N3IWF identifier configuration as the IP address of the N3IWF;

ii) if the home N3IWF identifier configuration is provisioned in the N3AN node configuration information and does not contain an IP address, the UE shall use the FQDN of the home N3IWF identifier configuration as the N3IWF FQDN; and

iii) if the home N3IWF identifier configuration is not provisioned in the N3AN node configuration information, the UE shall construct an N3IWF FQDN based on the FQDN format of the HPLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the HPLMN stored on the USIM as specified in 3GPP TS 23.003 [8]; and

2) if the N3AN node configuration information is not provisioned on the UE, the UE shall construct the N3IWF FQDN based on the Operator Identifier FQDN format using the PLMN ID of the HPLMN stored on the USIM;

and for the above cases constructing or using an N3IWF FQDN, the UE shall use the DNS server function to resolve the N3IWF FQDN to the IP address(es) of the N3IWF(s). The UE shall select as the IP address of the N3IWF a resolved IP address of an N3IWF with the same IP version as its local IP address; and

b) if the UE is not located in its home country:

1) if the N3AN node configuration information is provisioned, the UE is registered to a VPLMN via 3GPP access and the PLMN ID of VPLMN is not included in the list of "forbidden PLMNs for non-3GPP access to 5GCN":

i) if an N3AN node selection information entry for the VPLMN is available in the N3AN node selection information of the N3AN node configuration information, the UE shall construct an N3IWF FQDN based on FQDN format of the VPLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the VPLMN as specified in 3GPP TS 23.003 [8]; and

ii) if an N3AN node selection information entry for the VPLMN is not available in the N3AN node selection information of the N3AN node configuration information and an 'Any\_PLMN' N3AN node selection information entry in the N3AN node selection information is available, the UE shall construct an N3IWF FQDN based on the FQDN format of the 'Any\_PLMN' N3AN node selection information entry using the PLMN ID of the VPLMN as specified in 3GPP TS 23.003 [8];

and for the above cases, the UE shall use the DNS server function to resolve the constructed N3IWF FQDN to the IP address(es) of the N3IWF(s). The UE shall select as the IP address of the N3IWF a resolved IP address of an N3IWF with the same IP version as its local IP address; and

2) if one of the following is true:

- the UE is not registered to a PLMN via 3GPP access and the UE uses WLAN;

- the N3AN node configuration information is not provisioned;

- the N3AN node configuration information is provisioned, the UE is registered to a VPLMN via 3GPP access and the PLMN ID of VPLMN is included in the list of "forbidden PLMNs for non-3GPP access to 5GCN"; or

- the UE is registered to a VPLMN via 3GPP access, the UE uses WLAN, and the N3AN node configuration information is provisioned but neither an N3AN node selection information entry for the VPLMN nor an 'Any\_PLMN' N3AN node selection information entry is available;

the UE shall perform a DNS query (see 3GPP TS 23.003 [8]) as specified in subclause 7.2.4.2.2 to determine if the visited country mandates the selection of N3IWF or ePDG in this country, and:

i) if selection of N3IWF in visited country is mandatory:

A) if the UE is registered to a VPLMN via 3GPP access, the PLMN ID of VPLMN is included in one of the returned DNS records and is not included in the list of "forbidden PLMNs for non-3GPP access to 5GCN", the UE shall construct an N3IWF FQDN based on the Operator Identifier FQDN format using the PLMN ID of the VPLMN in 3GPP access as described in 3GPP TS 23.003 [8]; and

B) if the UE is not registered to a PLMN via 3GPP access or the UE is registered to a VPLMN via 3GPP access and the PLMN ID of VPLMN is not included in any of the returned DNS records or is included in the list of "forbidden PLMNs for non-3GPP access to 5GCN":

- if the N3AN node configuration information is provisioned, the UE shall select a PLMN included in the DNS response that has highest PLMN priority (see 3GPP TS 24.526 [17]) in the N3AN node selection information of the N3AN node configuration information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" and the UE shall construct an N3IWF FQDN based on the FQDN format of the selected PLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the selected PLMN as specified in 3GPP TS 23.003 [8]; and

- if the N3AN node configuration information is not provisioned or the N3AN node selection information of the N3AN node configuration information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" does not contain any of the PLMNs in the DNS response, selection of the PLMN is UE implementation specific. The UE shall construct an N3IWF FQDN based on the Operator Identifier FQDN format using the PLMN ID of the selected PLMN as described in 3GPP TS 23.003 [8];

and for the above cases, the UE shall use the DNS server function to resolve the constructed N3IWF FQDN to the IP address(es) of the N3IWF(s). The UE shall select as the IP address of the N3IWF a resolved IP address of an N3IWF with the same IP version as its local IP address;

ii) if the UE determines that selection of N3IWF or ePDG in the visited country is not mandatory:

A) if the N3AN node configuration information is provisioned and the N3AN node selection information of the N3AN node configuration information contains one or more PLMNs in the visited country which are not in the list of "forbidden PLMNs for non-3GPP access to 5GCN", the UE shall select a PLMN that has highest PLMN priority (see 3GPP TS 24.526 [17]) in the N3AN node selection information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" and the UE shall construct an N3IWF FQDN based on the FQDN format of the selected PLMN's N3AN node selection information entry in the N3AN node selection information as specified in 3GPP TS 23.003 [8] using the PLMN ID of the selected PLMN; and

B) if the N3AN node configuration information is not provisioned or the N3AN node configuration information is provisioned and the N3AN node selection information of the N3AN node configuration information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" contains no PLMNs in the visited country:

- if the home N3IWF identifier configuration is provisioned in the N3AN node configuration information (see 3GPP TS 24.526 [17]) and contains an IP address, the UE shall use the IP address of the home N3IWF identifier configuration as the IP address of the N3IWF;

- if the home N3IWF identifier configuration is provisioned in the N3AN node configuration information (see 3GPP TS 24.526 [17]) and does not contain an IP address, the UE shall use the FQDN of the home N3IWF identifier configuration as the N3IWF FQDN; and

- if the home N3IWF identifier configuration is not provisioned in the N3AN node configuration information, the UE shall construct an N3IWF FQDN based on the Operator Identifier FQDN format using the PLMN ID of the HPLMN as described in 3GPP TS 23.003 [8];

and for the above cases constructing or using an N3IWF FQDN, the UE shall use the DNS server function to resolve the N3IWF FQDN to the IP address(es) of the N3IWF(s). The UE shall select as the IP address of the N3IWF a resolved IP address of an N3IWF with the same IP version as its local IP address; and

iii) if no DNS response is received or bullet i) and ii) do not apply, the UE shall terminate the N3AN node selection procedure.

Following bullet a) and b) above, once the UE selected the IP address of the N3IWF, the UE shall initiate the IKEv2 SA establishment procedure as specified in subclause 7.3.

If the IKEv2 SA establishment procedure towards an N3IWF in the HPLMN fails due to no response to an IKE\_SA\_INIT request message, and the selection of N3IWF in the HPLMN is performed using home N3IWF identifier configuration and there are more pre-configured N3IWFs in the HPLMN, the UE shall repeat the tunnel establishment attempt using the next FQDN or IP address(es) of the N3IWF in the HPLMN.

If the IKEv2 SA establishment procedure towards to any of the received IP addresses of the selected N3IWF fails due to no response to an IKE\_SA\_INIT request message, then the UE shall repeat the N3IWF selection as described in this subclause, excluding the N3IWFs for which the UE did not receive a response to the IKE\_SA\_INIT request message.

NOTE 2: The time the UE waits before reattempting access to another N3IWF or to an N3IWF that it previously did not receive a response to an IKE\_SA\_INIT request message, is implementation specific.

\*\*\* Next change \*\*\*

##### 7.2.4.4.2 N3AN node selection for IMS service

If the N3AN node selection is required for an IMS service, the UE shall use the preference parameter in the N3AN node selection information entries of the N3AN node selection information to determine whether selection of N3IWF or ePDG is preferred in a given PLMN.

The UE shall proceed as follows:

a) if the UE is located in its home country:

1) if the N3AN node configuration information is provisioned:

NOTE 1: The N3AN node configuration information is considered provisioned if it contains at least the HPLMN's N3AN node selection information entry in the N3AN node selection information.

i) if the preference parameter in the HPLMN's N3AN node selection information entry of the N3AN node selection information indicates that N3IWF is preferred:

A) if the home N3IWF identifier configuration is provisioned in the N3AN node configuration information and contains an IP address, the UE shall use the IP address of the home N3IWF identifier configuration as the IP address of the N3IWF;

B) if the home N3IWF identifier configuration is provisioned in the N3AN node configuration information and does not contain an IP address, the UE shall use the FQDN of the home N3IWF identifier configuration as the N3IWF FQDN; and

C) if the home N3IWF identifier configuration is not provisioned in the N3AN node configuration information, the UE shall construct an N3IWF FQDN based on the FQDN format of the HPLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the HPLMN stored on the USIM as specified in clause 28 of 3GPP TS 23.003 [8]; and

ii) if the preference parameter in the HPLMN's N3AN node selection information entry of the N3AN node selection information indicates that ePDG is preferred:

A) if the home ePDG identifier configuration is provisioned in the N3AN node configuration information and contains an IP address, the UE shall use the IP address of the home ePDG identifier configuration as the IP address of the ePDG;

B) if the home ePDG identifier configuration is provisioned in the N3AN node configuration information and does not contains an IP address, the UE shall use the FQDN of the home ePDG identifier configuration as the ePDG FQDN; and

C) if the home ePDG identifier configuration is not provisioned in the N3AN node configuration information, the UE shall construct an ePDG FQDN based on the FQDN format of HPLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the HPLMN stored on the USIM as specified in clause 19 of 3GPP TS 23.003 [8]; and

2) if the N3AN node configuration information is not provisioned on the UE, the UE shall construct the N3IWF FQDN based on the Operator Identifier FQDN format using the PLMN ID of the HPLMN stored on the USIM;

and for the above cases constructing or using an N3IWF FQDN or ePDG FQDN, the UE shall use the DNS server function to resolve the N3IWF FQDN or ePDG FQDN to the IP address(es) of the N3IWF(s) or ePDG(s). The UE shall select as the IP address of the N3IWF or of the ePDG a resolved IP address of an N3IWF or an ePDG with the same IP version as its local IP address; and

b) if the UE is not located in its home country:

1) if the N3AN node configuration information is provisioned, the UE is registered to a VPLMN via 3GPP access and the PLMN ID of VPLMN is not included in the list of "forbidden PLMNs for non-3GPP access to 5GCN":

i) if an N3AN node selection information entry for the VPLMN is available in the N3AN node selection information of the N3AN node configuration information:

A) if the preference parameter in the VPLMN's N3AN node selection information entry of the N3AN node configuration information indicates that N3IWF is preferred, the UE shall construct an N3IWF FQDN based on the FQDN format of the VPLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the VPLMN as specified in clause 28 of 3GPP TS 23.003 [8]; and

B) if the preference parameter in the VPLMN's N3AN node selection information entry of the N3AN node configuration information indicates that ePDG is preferred, the UE shall construct an ePDG FQDN based on the FQDN format of the VPLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the VPLMN as specified in clause 19 of 3GPP TS 23.003 [8]; and

ii) if an N3AN node selection information entry for the VPLMN is not available in the N3AN node selection information of the N3AN node configuration information and an 'Any\_PLMN' N3AN node selection information entry in the N3AN node selection information is available:

A) if the preference parameter in the 'Any\_PLMN' N3AN node selection information entry of the N3AN node configuration information indicates that N3IWF is preferred, the UE shall construct an N3IWF FQDN based on the FQDN format of the 'Any\_PLMN' N3AN node selection information entry using the PLMN ID of the VPLMN as specified in clause 28 of 3GPP TS 23.003 [8]; and

B) if the preference parameter in the 'Any\_PLMN' N3AN node selection information entry of the N3AN node configuration information indicates that ePDG is preferred, the UE shall construct an ePDG FQDN based on the FQDN format of the 'Any\_PLMN' N3AN node selection information entry using the PLMN ID of the VPLMN as specified in clause 19 of 3GPP TS 23.003 [8];

and for above case, the UE shall use the DNS server function to resolve the constructed N3IWF FQDN or ePDG FQDN to the IP address(es) of the N3IWF(s) or ePDG(s). The UE shall select as the IP address of the N3IWF or the ePDG a resolved IP address of an N3IWF or ePDG with the same IP version as its local IP address; and

2) if one of the following is true:

- the UE is not registered to a PLMN via 3GPP access and the UE uses WLAN;

- the N3AN node configuration information is not provisioned;

- the N3AN node configuration information is provisioned, the UE is registered to a VPLMN via 3GPP access and the PLMN ID of VPLMN is included in the list of "forbidden PLMNs for non-3GPP access to 5GCN"; or

- the UE is registered to a VPLMN via 3GPP access, the UE uses WLAN, and the N3AN node configuration information is provisioned but neither an N3AN node selection information entry for the VPLMN nor an 'Any\_PLMN' N3AN node selection information entry is available;

the UE shall perform a DNS query (see 3GPP TS 23.003 [8]) as specified in subclause 7.2.4.2 to determine if the visited country mandates the selection of N3IWF or ePDG in this country and:

i) if selection of N3IWF or ePDG in the visited country is mandatory:

A) if the UE is registered to a VPLMN via 3GPP access, the PLMN ID of VPLMN is included in one of the returned DNS records and is not included in the list of "forbidden PLMNs for non-3GPP access to 5GCN":

I) if selection of N3IWF in the visited country is mandatory, the UE shall construct an N3IWF FQDN based on the Operator Identifier FQDN format using the PLMN ID of the VPLMN as described in 3GPP TS 23.003 [8]; or

II) if selection of ePDG in the visited country is mandatory, the UE shall construct an ePDG FQDN based on the Operator Identifier FQDN format using the PLMN ID of the VPLMN as described in clause 19 of 3GPP TS 23.003 [8]; and

NOTE 2: If the conditions for item I) and item II) are met, the UE decision to construct either a N3IWF FQDN or an ePDG FQDN is implementation dependent.

B) if the UE is not registered to a PLMN via 3GPP access, or the UE is registered to a VPLMN via 3GPP access, the PLMN ID of VPLMN is not included in any of the returned DNS records or is included in the list of "forbidden PLMNs for non-3GPP access to 5GCN" and the N3AN node configuration information is provisioned, the UE shall select an a PLMN included in the DNS response that has highest PLMN priority (see 3GPP TS 24.526 [17]) in the N3AN node selection information of the N3AN node configuration information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" the UE shall:

I) if selection of N3IWF in the visited country is mandatory, construct an N3IWF FQDN based on the FQDN format of the selected PLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the selected PLMN as specified in clause 28 of 3GPP TS 23.003 [8]; or

II) if selection of ePDG in the visited country is mandatory, construct an ePDG FQDN based on the FQDN format of the selected PLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the selected PLMN as specified in clause 19 of 3GPP TS 23.003 [8]; and

C) if the UE is not registered to a PLMN via 3GPP access, or the UE is registered to a VPLMN via 3GPP access, the PLMN ID of VPLMN is not included in any of the returned DNS records or is included in the list of "forbidden PLMNs for non-3GPP access to 5GCN" and the N3AN node configuration information is not provisioned or the N3AN node selection information of the N3AN node configuration information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" does not contain any of the PLMNs in the DNS response, selection of the PLMN is UE implementation specific. The UE shall:

I) if selection of N3IWF in the visited country is mandatory, construct an N3IWF FQDN based on the Operator Identifier FQDN format using the PLMN ID of the selected PLMN as described in clause 28 of 3GPP TS 23.003 [8]; or

II) if selection of ePDG in the visited country is mandatory, construct an ePDG FQDN based on the Operator Identifier FQDN format using the PLMN ID of the selected PLMN as described in clause 19 of 3GPP TS 23.003 [8];

and for the above cases, the UE shall use the DNS server function to resolve the constructed N3IWF FQDN or the constructed ePDG FQDN to the IP address(es) of the N3IWF(s) or ePDG(s), respectivelly. The UE shall select as the IP address of the N3IWF or the ePDG a resolved IP address of an N3IWF or an ePDG with the same IP version as its local IP address;

ii) if the UE determines that selection of N3IWF and ePDG in the visited country is not mandatory:

A) if the N3AN node configuration information is provisioned and the N3AN node selection information of the N3AN node configuration information contains one or more PLMNs in the visited country which are not included in the list of "forbidden PLMNs for non-3GPP access to 5GCN", the UE shall select a PLMN that has highest PLMN priority (see 3GPP TS 24.526 [17]) in the N3AN node selection information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" and the UE shall construct an N3IWF FQDN or ePDG FQDN based on the FQDN format of the selected PLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the selected PLMN as specified in clause 28 or clause 19 of 3GPP TS 23.003 [8] , respectivelly; and

B) if the N3AN node configuration information is not provisioned or the N3AN node configuration information is provisioned and the N3AN node selection information of the N3AN node configuration information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" contains no PLMN in the visited country:

- if the home N3IWF identifier configuration or home ePDG identifier configuration is provisioned in the N3AN node configuration information (see 3GPP TS 24.526 [17]) and contains an IP address, the UE shall use the IP address of the configuration as the IP address of the N3IWF or ePDG;

- if the home N3IWF identifier configuration or home ePDG identifier configuration is provisioned in the N3AN node configuration information (see 3GPP TS 24.526 [17]) and does not contains an IP address, the UE shall use the FQDN of the configuration as N3IWF FQDN or ePDG FQDN; and

- if the home N3IWF identifier configuration and home ePDG identifier configuration are not provisioned in the N3AN node configuration information, the UE shall construct an N3IWF FQDN or ePDG FQDN based on the Operator Identifier FQDN format using the PLMN ID of the HPLMN as described in clause 28 or clause 19 of 3GPP TS 23.003 [8];

and for the above cases constructing or using an N3IWF FQDN or an ePDG FQDN, the UE shall use the DNS server function to resolve the FQDN to the IP address(es) of the N3IWF(s) or ePDG(s). The UE shall select as the IP address of the N3IWF or the ePDG a resolved IP address of an N3IWF or ePDG with the same IP version as its local IP address; and

iii) if no DNS response is received, the UE shall terminate the N3AN node selection procedure.

Following bullet a) and b) above, once the UE selected the IP address of the N3IWF or the ePDG,

a) if the IP address of N3IWF is selected, the UE shall:

i) initiate the IKEv2 SA establishment procedure as specified in subclause 7.3;

ii) if the IKEv2 SA establishment procedure towards an N3IWF in the HPLMN fails due to no response to an IKE\_SA\_INIT request message or the UE is informed during registration over non-3GPP access that the IMS voice over PS session is not supported over non-3GPP access, and the selection of N3IWF in the HPLMN is performed using home N3IWF identifier configuration and there are more pre-configured N3IWFs in the HPLMN, repeat the tunnel establishment attempt using the next FQDN or IP address(es) of the N3IWF in the HPLMN;

iii) if the IKEv2 SA establishment procedure towards any of the received IP addresses of the selected N3IWF fails due to no response to an IKE\_SA\_INIT request message or the UE is informed during registration over non-3GPP access that the IMS voice over PS session is not supported over non-3GPP access, attempt to select an ePDG in the same PLMN as specified in 3GPP TS 24.302 [7] instead; and

iv) if the UE fails to connect to either N3IWF or ePDG in the same PLMN, repeat the N3AN node selection as described in this subclause, excluding the N3IWFs for which the UE did not receive a response to the IKE\_SA\_INIT request message;

NOTE 3: The time the UE waits before reattempting access to another N3IWF or to an N3IWF that it previously did not receive a response to an IKE\_SA\_INIT request message, is implementation specific.

b) if the IP address of ePDG is selected, the UE shall:

i) initiate tunnel establishment as specified in 3GPP TS 24.302 [7];

ii) if tunnel establishment as specified in 3GPP TS 24.302 [7] towards an ePDG in the HPLMN fails due to no response to an IKE\_SA\_INIT request message, and the selection of ePDG in the HPLMN is performed using home ePDG identifier configuration and there are more pre-configured ePDG in the HPLMN, repeat the tunnel establishment attempt using the next FQDN or IP address(es) of the ePDG in the HPLMN;

iii) if tunnel establishment as specified in 3GPP TS 24.302 [7] towards any of the received IP addresses of the selected ePDG fails due to no response to an IKE\_SA\_INIT request message, attempt to select an N3IWF in the same PLMN instead; and

iv) if the UE fails to connect to either ePDG or N3IWF in the same PLMN, repeat the N3AN node selection as described in this subclause, excluding the ePDGs for which the UE did not receive a response to the IKE\_SA\_INIT request message.

NOTE 4: The time the UE waits before reattempting access to another ePDG or to an ePDG that it previously did not receive a response to an IKE\_SA\_INIT request message, is implementation specific.

\*\*\* Next change \*\*\*

##### 7.2.4.4.3 N3AN node selection for Non-IMS service

If the N3AN node selection is required for a non-IMS service, the UE shall ignore the preference parameter in the N3AN node selection information entries of the N3AN node selection information.

The UE shall proceed as follows:

a) if the UE is located in its home country:

1) if the N3AN node configuration information is provisioned:

NOTE 1: The N3AN node configuration information is considered provisioned if it contains at least the HPLMN's N3AN node selection information entry in the N3AN node selection information.

i) if the home N3IWF identifier configuration is provisioned in the N3AN node configuration information and contains an IP address, the UE shall use the IP address of the home N3IWF identifier configuration as the IP address of the N3IWF;

ii) if the home N3IWF identifier configuration is provisioned in the N3AN node configuration information and does not contain an IP address, the UE shall use the FQDN of the home N3IWF identifier configuration as the N3IWF FQDN; and

iii) if the home N3IWF identifier configuration is not provisioned in the N3AN node configuration information, the UE shall construct an N3IWF FQDN based on the FQDN format of the HPLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the HPLMN stored on the USIM as specified in clause 28 of 3GPP TS 23.003 [8]; and

2) if the N3AN node configuration information is not provisioned, the UE shall construct the N3IWF FQDN based on the Operator Identifier FQDN format using the PLMN ID of the HPLMN stored on the USIM;

and for the above cases constructing or using an N3IWF FQDN, the UE shall use the DNS server function to resolve the N3IWF FQDN to the IP address(es) of the N3IWF(s) or ePDG(s). The UE shall select as the IP address of the N3IWF a resolved IP address of an N3IWF with the same IP version as its local IP address; and

b) if the UE is not located in its home country:

1) if the N3AN node configuration information is provisioned, the UE is registered to a VPLMN via 3GPP access and the PLMN ID of VPLMN is not included in the list of "forbidden PLMNs for non-3GPP access to 5GCN":

i) if an N3AN node selection information entry for the VPLMN is available in the N3AN node selection information of the N3AN node configuration information, the UE shall construct an N3IWF FQDN based on the FQDN format of the VPLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the VPLMN as specified in clause 28 of 3GPP TS 23.003 [8]; and

ii) if an N3AN node selection information entry for the VPLMN is not available in the N3AN node selection information of the N3AN node configuration information and an 'Any\_PLMN' N3AN node selection information entry in the N3AN node selection information is available, the UE shall construct an N3IWF FQDN based on the FQDN format of the 'Any\_PLMN' N3AN node selection information entry using the PLMN ID of the VPLMN as specified in clause 28 of 3GPP TS 23.003 [8]; and

and for above case, the UE shall use the DNS server function to resolve the constructed N3IWF FQDN to the IP address(es) of the N3IWF(s). The UE shall select as the IP address of the N3IWF a resolved IP address of an N3IWF with the same IP version as its local IP address; and

2) if one of the following is true:

- the UE is not registered to a PLMN via 3GPP access and the UE uses WLAN;

- the N3AN node configuration information is not provisioned;

- the N3AN node configuration information is provisioned, the UE is registered to a VPLMN via 3GPP access and the PLMN ID of VPLMN is included in the list of "forbidden PLMNs for non-3GPP access to 5GCN"; or

- the UE is registered to a VPLMN via 3GPP access, the UE uses WLAN, and the N3AN node configuration information is provisioned but neither an N3AN node selection information entry for the VPLMN nor an 'Any\_PLMN' N3AN node selection information entry is available;

the UE shall perform a DNS query (see 3GPP TS 23.003 [8]) as specified in subclause 7.2.4.2 to determine if the visited country mandates the selection of N3IWF or ePDG in this country, and:

i) if selection of N3IWF or ePDG in the visited country is mandatory:

A) if the UE is registered to a VPLMN via 3GPP access, the PLMN ID of VPLMN is included in one of the returned DNS records and is not included in the list of "forbidden PLMNs for non-3GPP access to 5GCN":

I) if selection of N3IWF in the visited country is mandatory, the UE shall construct an N3IWF FQDN based on the Operator Identifier FQDN format using the PLMN ID of the VPLMN as described in clasue 28 of 3GPP TS 23.003 [8]; and

II) if selection of ePDG in the visited country is mandatory, the UE shall construct an ePDG FQDN based on the Operator Identifier FQDN format using the PLMN ID of the VPLMN as described in clause 19 of 3GPP TS 23.003 [8]; and

NOTE 2: If the conditions for item I) and item II) are met, the UE decision to construct either a N3IWF FQDN or an ePDG FQDN is implementation dependent.

B) if the UE is not registered to a PLMN via 3GPP access or the UE is registered to a VPLMN via 3GPP access, the PLMN ID of VPLMN is not included in any of the returned DNS records or is included in the list of "forbidden PLMNs for non-3GPP access to 5GCN" and the N3AN node configuration information is provisioned, the UE shall select an a PLMN included in the DNS response that has highest PLMN priority (see 3GPP TS 24.526 [17]) in the N3AN node selection information of the N3AN node configuration information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" and the UE shall:

I) if selection of N3IWF in the visited country is mandatory, construct an N3IWF FQDN based on the FQDN format of the selected PLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the selected PLMN as specified in clause 28 of 3GPP TS 23.003 [8]; or

II) if selection of ePDG in the visited country is mandatory, construct an ePDG FQDN based on the FQDN format of the selected PLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the selected PLMN as specified in clause 19 of 3GPP TS 23.003 [8]; and

C) if the UE is not registered to a PLMN via 3GPP access or the UE is registered to a VPLMN via 3GPP access, the PLMN ID of VPLMN is not included in any of the returned DNS records or is included in the list of "forbidden PLMNs for non-3GPP access to 5GCN" and the N3AN node configuration information is not provisioned or the N3AN node selection information of the N3AN node configuration information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" does not contain any of the PLMNs in the DNS response, selection of the PLMN is UE implementation specific. The UE shall:

I) if selection of N3IWF in the visited country is mandatory, construct an N3IWF FQDN based on the Operator Identifier FQDN format using the PLMN ID of the selected PLMN as described in 3GPP TS 23.003 [8]; or

II) if selection of ePDG in the visited country is mandatory, construct an ePDG FQDN based on the Operator Identifier FQDN format using the PLMN ID of the selected PLMN as described in clause 19 of 3GPP TS 23.003 [8];

and for the above cases, the UE shall use the DNS server function to resolve the constructed N3IWF FQDN or ePDG FQDN to the IP address(es) of the N3IWF(s) or the ePDG(s). The UE shall select as the IP address of the N3IWF or the ePDG a resolved IP address of an N3IWF or an ePDG with the same IP version as its local IP address;

ii) if the UE determines that selection of N3IWF and ePDG in the visited country is not mandatory:

A) if the N3AN node configuration information is provisioned and the N3AN node selection information of the N3AN node configuration information contains one or more PLMNs in the visited country which are not in the list of "forbidden PLMNs for non-3GPP access to 5GCN", the UE shall select a PLMN that has highest PLMN priority (see 3GPP TS 24.526 [17]) in the N3AN node selection information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" and the UE shall construct an N3IWF FQDN or ePDG FQDN based on the FQDN format of the selected PLMN's N3AN node selection information entry in the N3AN node selection information using the PLMN ID of the selected PLMN as specified in clause 28 or clause 19 3GPP TS 23.003 [8], respectivelly; and

B) if the N3AN node configuration information is not provisioned or the N3AN node configuration information is provisioned and the N3AN node selection information of the N3AN node configuration information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" contains no PLMN in the visited country:

- if the home N3IWF identifier configuration or home ePDG identifier configuration is provisioned in the N3AN node configuration information (see 3GPP TS 24.526 [17]) and contains an IP address, the UE shall use the IP address of the configuration as the IP address of the N3IWF or ePDG;

- if the home N3IWF identifier configuration or home ePDG identifier configuration is provisioned in the N3AN node configuration information (see 3GPP TS 24.526 [17]) and does not contains an IP address, the UE shall use the FQDN of the configuration as N3IWF FQDN or ePDG FQDN; and

- if the home N3IWF identifier configuration and home ePDG identifier configuration are not provisioned in the N3AN node configuration information, the UE shall construct an N3IWF FQDN or ePDG FQDN based on the Operator Identifier FQDN format using the PLMN ID of the HPLMN as described in clause 28 or clause 19 of 3GPP TS 23.003 [8], respectivelly;

and for the above cases constructing or using an N3IWF FQDN or an ePDG FQDN, the UE shall use the DNS server function to resolve the FQDN to the IP address(es) of the N3IWF(s) or ePDG(s). The UE shall select as the IP address of the N3IWF or the ePDG a resolved IP address of an N3IWF or ePDG with the same IP version as its local IP address; and

iii) if no DNS response is received, the UE shall terminate the N3AN node selection procedure.

Following bullet a) and b) above, once the UE selected the IP address of the N3IWF or the ePDG,

a) if the IP address of N3IWF is selected, the UE shall:

1) initiate the IKEv2 SA establishment procedure as specified in subclause 7.3;

2) if the IKEv2 SA establishment procedure towards an N3IWF in the HPLMN fails due to no response to an IKE\_SA\_INIT request message, and the selection of N3IWF in the HPLMN is performed using home N3IWF identifier configuration and there are more pre-configured N3IWFs in the HPLMN, repeat the tunnel establishment attempt using the next FQDN or IP address(es) of the N3IWF in the HPLMN;

3) if the IKEv2 SA establishment procedure towards any of the IP addresses of the N3IWF of the selected PLMN fails due to no response to an IKE\_SA\_INIT request message, repeat the N3AN node selection as described in this subclause with N3IWF of another PLMN; and

4) if the IKEv2 SA establishment procedure towards any of the received IP addresses of the N3IWF of any fails due to no response to an IKE\_SA\_INIT request message, attempt to select an ePDG as specified in 3GPP TS 24.302 [7] and use tunnel establishment as specified in 3GPP TS 24.302 [7];

NOTE 3: The time the UE waits before reattempting access to another N3IWF or to an N3IWF that it previously did not receive a response to an IKE\_SA\_INIT request message, is implementation specific.

b) if the IP address of ePDG is selected, the UE shall:

i) initiate tunnel establishment as specified in 3GPP TS 24.302 [7];

ii) if tunnel establishment as specified in 3GPP TS 24.302 [7] towards an ePDG in the HPLMN fails due to no response to an IKE\_SA\_INIT request message, and the selection of ePDG in the HPLMN is performed using home ePDG identifier configuration and there are more pre-configured ePDG in the HPLMN, repeat the tunnel establishment attempt using the next FQDN or IP address(es) of the ePDG in the HPLMN;

iii) if tunnel establishment as specified in 3GPP TS 24.302 [7] towards any of the received IP addresses of the selected ePDG fails due to no response to an IKE\_SA\_INIT request message, attempt to select an N3IWF in the same PLMN instead; and

iv) if the UE fails to connect to either ePDG or N3IWF in the same PLMN, repeat the N3AN node selection as described in this subclause, excluding the ePDGs for which the UE did not receive a response to the IKE\_SA\_INIT request message.

NOTE 4: The time the UE waits before reattempting access to another ePDG or to an ePDG that it previously did not receive a response to an IKE\_SA\_INIT request message, is implementation specific.

\*\*\* No more changes \*\*\*