**3GPP TSG-CT WG1 Meeting #141eC1-23xxxx**

**Online 17– 21 April 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** | **1** | **Current version:** |  |  |
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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 |  |

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|  |
| ***Title:***  | Clarifications for slice-based N3IWF selection |
|  |  |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | 5WWC\_Ph2 |  | ***Date:*** | 2023-04-06 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** |  |
|  | *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 canbe 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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | Multiple corrections are needed, related to N3IWF selection (correcting wrong bulleted list, correcting typos, adding missing terms…etc.). |
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| ***Summary of change:*** | The needed corrections are done in this CR (correcting wrong bulleted list, correcting typos, adding missing terms…etc.). |
|  |  |
| ***Consequences if not approved:*** | Missing terms and wrong bulleted lists remain in the spec. |
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| ***Clauses affected:*** | 7.2.2, 7.2.4.3 |
|  |  |
|  | **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 \*\*\*\*\*

### 7.2.2 N3AN node configuration information

The N3AN node configuration information is provisioned to the UE either by the H-PCF, V-PCF or via implementation specific means. The UE shall apply the N3AN node configuration information provisioned via implementation specific means only if the N3AN node configuration information provisioned by the H-PCF is not present in the UE.

The N3AN node configuration information shall consist of the following:

- N3AN node selection information;

- optionally, home N3IWF identifier configuration;

- optionally, home ePDG identifier configuration;

- optionally, extended home N3IWF identifier configuration; and

- optionally, slice-specific N3IWF prefix configuration.

NOTE 1: N3AN node configuration information provisioned by a VPLMN includes only slice-specific N3IWF prefix configuration.

The N3AN node selection information consists of N3AN node selection information entries. Each N3AN node selection information entry contains a PLMN ID and information for the PLMN ID. The N3AN node selection information contains at least an N3AN node selection information entry with information for the HPLMN and an N3AN node selection information entry for "any\_PLMN".

The extended home N3IWF identifier configuration contains one or more tuples of a FQDN/IP address of the N3IWF in the HPLMN and S-NSSAIs supported by this N3IWF and subscribed by the UE.

The Slice-specific N3IWF prefix configuration consists of Slice-specific N3IWF prefix entries. Each Slice-specific N3IWF prefix entry contains a slice-specific N3IWF prefix and an S-NSSAI list. Slice-specific N3IWF prefix configuration is valid only in the PLMN that provisioned it.

NOTE 2: As an implementation option, the UE can store slice-specific N3IWF prefix configuration provisioned by a PLMN for later use.

The N3AN node configuration information provisioned by the H-PCF or the V-PCF is as specified in 3GPP TS 24.501 [4] annex D and 3GPP TS 24.526 [17].

The UE shall support the implementation of standard DNS mechanisms in order to retrieve the IP address(es) of the N3IWF or ePDG. The input to the DNS query is an N3IWF FQDN or ePDG FQDN as specified in 3GPP TS 23.003 [8].

\*\*\*\*\* 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:

i) if the extended home N3IWF identifier configuration is provisioned in the N3AN node configuration information, the UE shall use the IP address or the FQDN from the extended home N3IWF identifier entry whose S-NSSAI list has the best match with the Requested S-NSSAI(s) that the UE is going to use in the registration procedure over the untrusted non-3GPP access;

ii) if the extended home N3IWF identifier configuration is not provisioned in the N3AN node configuration information and the Slice-specific N3IWF prefix configuration is provisioned, the UE shall construct a Prefixed N3IWF FQDN (see 3GPP TS 23.003 [8]) using the prefix of the Slice-specific N3IWF prefix entry for the HPLMN whose S-NSSAI list has the best match with the Requested S-NSSAI(s) that the UE is going to use in the registration procedure over the untrusted non-3GPP access. The FQDN format (operator identifier or tracking area identity based) is determined from the FQDN format of the HPLMN's N3AN node selection information entry in the N3AN node selection information; and

iii) if neither the extended home N3IWF identifier configuration nor the Slice-specific N3IWF prefix configuration is provisioned in the N3AN node configuration information and:

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. The UE shall consider that the HPLMN is selected;

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. The UE shall consider that the HPLMN is selected; 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 3GPP TS 23.003 [8]. The UE shall consider that the HPLMN is selected; 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. The UE shall consider that the HPLMN is selected;

 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. If the DNS response contains no records and the UE used an FQDN determined by following step a)-1)-i), the UE shall follow the procedure in bullet a)-1)-ii) assuming that the extended home N3IWF identifier configuration is not provisioned. If the DNS response contains no records and the UE used an FQDN determined by following step a)-1)-ii), the UE shall follow the procedure in bullet a)-1)-iii) assuming that neither the extended home N3IWF identifier configuration nor the Slice-specific N3IWF prefix configuration is provisioned; and

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

1) if the Slice-specific N3IWF prefix configuration is provisioned for the VPLMN, the UE is registered to a VPLMN via 3GPP access, the PLMN ID of VPLMN is not included in the list of "forbidden PLMNs for non-3GPP access to 5GCN", and at least one Slice-specific N3IWF prefix entry is available in the Slice-specific N3IWF prefix configuration, the UE shall construct a Prefixed N3IWF FQDN (see 3GPP TS 23.003 [8]) using the prefix of the Slice-specific N3IWF prefix entry whose S-NSSAI list has the best match with the Requested S-NSSAI(s) that the UE is going to use in the registration procedure over the untrusted non-3GPP access in the VPLMN. The FQDN format (operator identifier or tracking area identity based) is determined from the FQDN format of the VPLMN's N3AN node selection information entry in the N3AN node selection information;

2) if the Slice-specific N3IWF prefix configuration is not provisioned for the VPLMN and the N3AN node configuration information is provisioned, the UE is registered to a VPLMN via 3GPP access, the PLMN ID of VPLMN is not included in the list of "forbidden PLMNs for non-3GPP access to 5GCN", and 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].The UE shall consider that the VPLMN is selected;

 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

3) if one of the following is true:

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

- neither the N3AN node configuration information nor the Slice-specific N3IWF prefix configuration are provisioned; or

- the N3AN node configuration information or the Slice-specific N3IWF prefix configuration is provisioned, the UE is registered to a VPLMN via 3GPP access and:

A) the PLMN ID of VPLMN is included in the list of "forbidden PLMNs for non-3GPP access to 5GCN"; or

B) the N3AN node selection information entry for the VPLMN is not present in the N3AN node selection information or the Slice-specific N3IWF prefix configuration for the VPLMN is not present;

 the UE shall perform a DNS query (see 3GPP TS 23.003 [8]) as specified in clause 7.2.4.2 to determine if the visited country mandates the selection of N3IWF 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].The UE shall consider that the VPLMN in 3GPP access is selected; 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 UE has Slice-specific N3IWF prefix configuration for one or more PLMNs included in the DNS response excluding any VPLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN", the UE shall construct a Prefixed N3IWF FQDN (see 3GPP TS 23.003 [8]) using the prefix of the Slice-specific N3IWF prefix entry whose S-NSSAI list has the best match with the Requested S-NSSAI(s) that the UE is going to use in the registration procedure over the untrusted non-3GPP access. The FQDN format (operator identifier or tracking area identity based) is determined from the FQDN format of the selected VPLMN's N3AN node selection information entry in the N3AN node selection information;

- if the Slice-specific N3IWF prefix configuration is not provisioned and 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 a) neither the Slice-specific N3IWF prefix configuration nor the N3AN node configuration information are provisioned or b) neither the Slice-specific N3IWF prefix configuration nor 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" contain any of the PLMNs in the DNS response, then the selection of a PLMN of the visited country is UE implementation specific. If the UE does not select a PLMN, the UE shall terminate the N3AN node selection procedure. If the UE selects a PLMN, 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 DNS response contains no records and the UE used Prefixed N3IWF FQDN in the DNS query, the UE shall repeat the DNS query using the same FQDN without the prefix label;

iii) if the DNS response contains no records and the UE did not use the Prefixed N3IWF FQDN in the DNS query, the UE shall further determine if the visited country mandates the selection of ePDG in the visited country using the procedure specified in clause 7.2.1.4 of 3GPP TS 24.302 [7].

 If the UE determines that the visited country mandates the selection of ePDG in the visited country, the UE shall assume that the selection of N3IWF in the visited country is mandatory and shall terminate the N3AN node selection procedure.

- If the UE determines that the visited country does not mandate the selection of ePDG in the visited country, the UE shall assume that the selection of N3IWF in the visited country is not mandatory, then the UE shall proceed as below:

A) if the UE has Slice-specific N3IWF prefix configuration the UE shall construct a Prefixed N3IWF FQDN (see 3GPP TS 23.003 [8]) using the prefix of the Slice-specific N3IWF prefix entry whose S-NSSAI list has the best match with the Requested S-NSSAI(s) that the UE is going to use in the registration procedure over the untrusted non-3GPP access. The FQDN format (operator identifier or tracking area identity based) is determined from the FQDN format of the selected VPLMN's N3AN node selection information entry in the N3AN node selection information;

B) if the Slice-specific N3IWF prefix configuration is not provisioned and 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

C) if a) neither the Slice-specific N3IWF prefix configuration nor the N3AN node configuration information is provisioned or b) the Slice-specific N3IWF prefix configuration is not provisioned and 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 extended home N3IWF identifier configuration is provisioned in the N3AN node configuration information, the UE shall use the IP address or the FQDN from the extended home N3IWF identifier entry whose S-NSSAI list has the best match with the Requested S-NSSAI(s) that the UE is going to use in the registration procedure over the untrusted non-3GPP access; and

- if the extended home N3IWF identifier configuration is not provisioned in the N3AN node configuration information and:

- 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. The UE shall consider that the HPLMN is selected;

- 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. The UE shall consider that the HPLMN is selected; 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]. The UE shall consider that the HPLMN is selected;

 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

iv) 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, the UE shall initiate the IKEv2 SA establishment procedure as specified in clause 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 Extended home N3IWF identifier configuration or Home 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 clause, excluding the N3IWFs for which the UE did not receive a response to the IKE\_SA\_INIT request message.

If the UE constructed an N3IWF FQDN based on FQDN format of the VPLMN's N3AN node selection information entry (see item b).1)), and the IKEv2 SA establishment procedure towards to each of the received IP addresses of the selected N3IWF failed due to no response to an IKE\_SA\_INIT request message, the UE considers Slice-specific N3IWF prefix entry and the N3AN node selection information entry for the VPLMN as not present and the UE shall repeat the N3IWF selection as described in this clause.

NOTE: 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.

\*\*\*\*\* End of changes \*\*\*\*\*