**3GPP TSG-CT WG4 Meeting #111-eC4-224315**

**E-Meeting, 18th – 26th August 2022**

**Source: China Mobile, CATT, ZTE, China Telecom, Huawei, NTT DOCOMO, Vodafone**

**Title: New WID on 5GC Restoration Improvements**

**Document for: Approval**

**Agenda Item: 5**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>   
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: Study on 5GC Restoration Improvements

Acronym: FS\_5RI

Unique identifier:

Potential target Release: Rel-18

# 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Affects: | UICC apps | ME | AN | CN | Others (specify) |
| Yes |  |  |  | X |  |
| No | X | X | X |  |  |
| Don't know |  |  |  |  | X |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a

|  |  |
| --- | --- |
|  | Feature |
|  | Building Block |
|  | *Work Task* |
| X | Study Item |

## 2.2 Parent Work Item

For a brand-new topic, use “N/A” in the table below. Otherwise indicate the parent Work Item.

|  |  |  |  |
| --- | --- | --- | --- |
| Parent Work / Study Items | | | |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| N/A | N/A | N/A | N/A |

### 2.3 Other related Work Items and dependencies

|  |  |  |
| --- | --- | --- |
| Other related Work /Study Items (if any) | | |
| Unique ID | Title | Nature of relationship |
|  |  |  |

# 3 Justification

Restoration solutions for 5GC entities have been continuously studied and standardized since Rel-15. 3GPP TS 23.527 provides a set of generic restoration solutions for Service-Based entities, however during the deployment of 5G, several restoration issues have been identified regarding specific NFs/scenarios, which are not yet standardized by 3GPP:

**Issue-1: NRF restoration**

NRF is one of the key NFs in 5GC, it mainly provides the following functionalities:

- NF/service discovery. This is the essential functionality since all the signalling routing in SBA is based on NF/service discovery.

- NF information retrieval. NFs register its profile to the NRF, and in principle NF can include all kind of information in its profile. Thus NRF provides a way for an NF to retrieve the information of other NFs.

- NF restoration. NRF may maintain heartbeat with other NFs, thus NRF can be aware of the availability of other NFs. One NF can get notification on the failure of NF which is of interest from NRF and then trigger the restoration procedure.

To improve the availability of NRF services, it is common to deploy NRF in manners like NRF pool, primary-secondary backup, etc. 3GPP has not specified detailed NRF restoration procedures for different deployment manners. At least the following aspects have been identified:

- NF profile synchronization. There are two kinds of information, one is relatively static information e.g. NF address, services provided by the NF, the other is dynamic information e.g. the load status of NF. It has not been specified how to keep the NRF’s knowledge up to date during restoration.

- Subscription and notification. NF may subscribe to event notification from NRF, NRF may subscribe to event notification from another NRF. During the restoration procedure the subscription and notification should keep available.

- Failback after recovery. In the primary-secondary deployment mode, after the failure and recovery of the primary NRF, the service load should be switched back to the primary NRF. It should be ensured that during the failback the information is synchronized and there is no signalling storm during the failback.

It is very common that NFs (e.g. AMF, SMF, UDM) communicate with NRF from a different vendor or different PLMN, therefore the NRF restoration procedure should be well defined to reduce the interoperability risks during restoration.

**Issue-2: Combined PCF/PCRF restoration**

To support interoperability and service continuity between 4G and 5G, operators may deploy combined PCRF/PCF. Depending on the RAT and CN the UE is camping on, AF may use Rx (Diameter) or N5 (HTTP) to contact with PCRF/PCF. When it comes to restoration of PCRF/PCF, the following issues are raised:

- PCRF/PCF reselection. Generic NF reselection mechanism based on SCP has been specified in 5G. If there is an incoming N5 message to the SCP and the target PCF is on failure, the SCP may reselect the backup PCF. However if later on the UE handover to 4G, it is unclear how the Diameter message over Rx interface is routed to the PCRF collocated with the backup PCF.

- Binding information update. If the PCRF/PCF restoration procedure happens when the UE is camping on 4G, which means the PCRF/PCF reselection is done in 4G network by e.g. DRA, it is unclear then how does the PCF update the binding information in the BSF.

**Issue-3: NF one-to-one backup**

It is very common to deploy the network entities in one-to-one backup manner, which means one NF instance has a determined NF instance as backup. This is supported for AMF, where one AMF may explicitly register a backup AMF in the NRF. However the similar mechanism is not yet defined for other kinds of NFs. It is needed to study whether the similar mechanism is beneficial for other NFs, and if yes, how.

# 4 Objective

The study item includes the following tasks:

- To study the need and potential solutions of NRF restoration

- To study the need and potential solutions of combined PCRF/PCF restoration

- To study the need and potential solutions of generic one-to-one backup for all 5GC NFs

# 5 Expected Output and Time scale

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| New specifications {One line per specification. Create/delete lines as needed} | | | | | |
| Type | TS/TR number | Title | For info  at TSG# | For approval at TSG# | Rapporteur |
| Internal TR | 29.8ab | Study on 5GC Restoration Improvements | TSG#99  (March, 2023) | TSG#100  (June, 2023) | Song Yue,  China Mobile,  songyue@chinamobile.com |

|  |  |  |  |
| --- | --- | --- | --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} | | | |
| TS/TR No. | Description of change | Target completion plenary# | Remarks |
|  |  |  |  |

# 6 Work item Rapporteur(s)

Song Yue, China Mobile, songyue@chinamobile.com

# 7 Work item leadership

CT4

# 8 Aspects that involve other WGs

Security aspects will be covered by SA3.

# 9 Supporting Individual Members

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| --- |
| Supporting IM name |
| China Mobile |
| CATT |
| ZTE |
| China Telecom |
| Huawei |
| NTT DOCOMO |
| Vodafone |