**3GPP TSG-WG SA2 Meeting #148E e-meeting  *S2-2108574r04***

**Elbonia, November 15 – 22, 2021 (revision of S2-2108163)**

Source: Huawei, HiSilicon, Samsung, CATT, China Mobile, China Telecom, China Unicom, ZTE, Juniper, SK Telecom, KT Corp, LG Uplus, KPN, Siemens, Robert Bosch GmbH, LGE, Spreadtrum Communications, ETRI, CAICT, China Southern Power Grid, CEPRI, CBN, SIA, DISH Network

Title: New SID on generic group management, exposure and communication enhancements

Document for: Approval

Agenda Item: 9.1.3

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 generic group management, exposure and communication enhancements

Acronym: FS\_GMEC

Unique identifier: ?

Potential target Release: Rel-18

# 1 Impacts

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

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a Study Item

|  |  |
| --- | --- |
|  | 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) |
| FS\_5GLAN\_enh | SA2 | 840025 | Study on enhancement of support for 5G LAN-type service |
| Vertical\_LAN | SA2 | 830042 | 5GS Enhanced support of Vertical and LAN Services |
| SEI | SA1 | 920039 | Smart Energy and Infrastructure |
| [QoS\_MON](https://www.3gpp.org/DynaReport/WiSpec--790004.htm) | SA1 | 790004 | QoS Monitoring |
| cyberCAV | SA1 | 800007 | Service requirements for cyber-physical control applications in vertical domains |
| eCAV | SA1 | 840050 | Enhancements for cyber-physical control applications in vertical domains |
| FS\_Resident | SA1 | 880040 | Study of Enhancements for Residential 5G |
| PIRates | SA1 | 930029 | Personal IoT and Residential networks Service Requirements |

### 2.3 Other related Work Items and dependencies

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

Dependency on non-3GPP (draft) specification:

# 3 Justification

3GPP has specified many enablers for vertical use, for example the features defined by IIOT, NPN and URLLC. Among them, R16 5G LAN-type service offers private communication using IP and/or non-IP type communications for UE and devices behind UE, using an optimized communication path controlled by a single SMF. However, the cardinality of SMF per 5G VN is limited to one in Rel-16, even if the 5G VN is very large. Multiple SMFs should be supported, for instance for administrative domains or a large multi-site company or a large scale industrial setting that spans multiple countries. And at the same time, the SMFs need to support single/common 5G VN wide area.

In Rel-18 SA1 study on 5G Smart Energy and Infrastructure “5SEI” has concluded new requirement (clause 6.13.2, 6.28 of TS 22.261 and clause 5.2, 5.6 and 9 of TS 22.104) including that the 5G system shall allow a UE to request a communication service to send data to different groups of UEs at the same time and the 5G system shall allow different QoS policy for each group the UE communicates with.

Currently, BUM (Broadcast, Unknown Unicast, Multicast) traffic for 5G VN are delivered via individual delivery (e.g. individual copies are delivered via individual PDU sessions) to all UEs in a VN (even if a UE is not interested in the traffic), and there are some open issues or restrictions on BUM traffic forwarding that needs to be addressed or removed, for example, "No support of forwarding packets with destination MAC address not known by SMF/UPF", " No support for forwarding a broadcast/multicast packet with source address not known to SMF/UPF", " Multicast group formation of selected members of a 5G VN for Ethernet type data communication is not described ", " Signalling scalability issues for large VN groups with lots of devices (MAC addresses) served by PDU sessions related with this VN group", "No support of loop-free due to topology changes", "restriction for maximum of 16 VLAN tags or maximum of allowed MAC addresses" etc.

An example vertical is future factories. When the member UEs of the 5G VN subscribed to different PLMNs (See clause 6.26.2.2 of TS 22.261) or even SNPNs, this 5G VN may span multiple PLMNs or SNPNs or serving networks, if there are SLAs between the serving network and member UE’s home SNPN or PLMN. Meanwhile, the UE member may move between the networks offering this 5G VN. The 5G VN parts offered respectively by those networks need to be integrated, e.g., addressing scheme, traffic forwarding, user plane path, DNN/S-NSSAI mapping, consistant QoS handling, authentication, and service continuity due to UE mobility. Since the current specification only supports the 5G VN within one network (i.e., the home network of the 5G VN group members is same and the PDU Sessions accessing to a certain 5G VN group should all anchor at the common home network of 5G VN group members) and the group management is loosely linked with the requirements applicable for group communication, e.g., QoS so these aspects need to be enhanced.

Recently, the 5G Alliance for Connected Industries and Automation (5G-ACIA) has provided to 3GPP a whitepaper (S2-2102128) including a set of functional requirements that the 5GS has to satisfy in terms of supporting certain information exchange between 5GC and industrial application domain, and exposure of 5G capabilities. The main goal is to enable the management, operation, monitoring and use of such networks and network services from an enterprise perspective easily without having to rely on sophisticated, heavy-weight tools and in-depth knowledge on the underlying 5G technology. Some requirements regarding device management, e.g. connectivity management, connectivity monitoring, group management etc. have not yet been fulfilled and need further studies.

# 4 Objective

**Work Task 1:** Study possible enhancements of generic group management and 5G capabilities exposure for industrial and automation applications:

- **Work Task 1.1:** Enhance dynamic group management by re-using and generalizing existing solutions to enable the following:

- set/modify the group attributes: provisioning of service area or QoS applicable to each UE of a given group

- subscribe to group status event reporting for the event "newly registered or (de)-registered group member"

- **Work Task 1.2:** Study whether and how to enhance NEF exposure framework to enable capability exposure for provisioning of traffic characteristics and monitoring of performance characteristics applicable to each UE of a given group

NOTE: It is assumed that the above sub-WT#1.2 focuses on the exposure enhancements and no new enforcement mechanisms will be specified for this sub-WT. The traffic characteristics include e.g., transfer interval, data volume per cycle time, average and peak date rates, silence time interval, and PDU Session Type. The performance characteristics include communication service availability, communication service reliability, end-to-end latency, service bit rate and packet error rate. Which traffic characteristics are relevant for 5GS and which performance characteristics need to be monitored will also be studied as part of this WT.

**Work Task 2:** enhancements of 5G VN group communication:

- **Work Task 2.1:** Support group communication for a 5G VN which supports multiple SMFs, including support of SMF redundancy for reliability of the 5G VN group communication

 - **Work Task 2.2:** Support group communication for a 5G VN which spans across multiple PLMNs

NOTE: It is assumed that the above sub-WT also studies whether it can be applied for a 5G VN which spans across SNPNs, if related requirements are agreed in SA1.

- **Work Task 2.3:** Enforcement of group communication for a group with group attribute service area or QoS that are applicable to all UEs within the group

- **Work Task 2.4:** Specific to SMF configuring N4 rules with the reported MAC addresses mechanism, study N4 signalling scalability issues for large VN groups with lots of devices (MAC addresses) and support of forwarding unknown packets

**Work Task 3:** Whether additional mechanism or enhancement is needed and how to support group communication allowing UE to simultaneously send data to different groups, where each group has a different QoS policy (requirement regarding 5SEI as indicated in clause 6.13.2 of TS 22.261)

**Work Task 4:** Whether and how to support loop-free 5G VN topology in the case of 5G VN connected to LAN

NOTE: It is assumed that the above WT#4 will consider how to adapt 5GS to existing protocols to support loop-free.

**Work Task 5:** Whether and how to optimize BUM (Broadcast, Unknown Unicast, Multicast) traffic forwarding considering the open issues and restrictions in Rel-16 (clause 5.8.2.13.3 of TS 23.501)

Work Task 7: Support more than 16 MAC/VIDs from DN-AAA for Ethernet PDU Session

## TU estimates and dependencies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Work Task ID | TU Estimate(Study) | TU Estimate(Normative) | RAN Dependency(Yes/No/Maybe)  | Inter Work Tasks Dependency Editor’s Note: This column should highlight if WT#x is self-contained, or is depended on completion of other WTs |
| WT#1 | 3.5 | 1.75 |  |  |
| WT#1.1 | 2  | 1 | No | self-contained |
| WT#1.2 | 1.5 | 0.75 | Maybe | self-contained |
| WT#2 | 3.75 | 1.25 |  |  |
| WT#2.1 | 0.75 | 0.25 | No | self-contained |
| WT#2.2 | 1.5 | 0.5 | No | depends on WT#2.1 |
| WT#2.3 | 0.5 | 0.25 | No | self-contained |
| WT#2.4 | 0.5 | 0.25 | No | self-contained |
|  |  |  |  |  |
|  |  |  |  |  |
| WT#3 | 0.75 | 0.25 | No | self-contained |
| WT#4 | 1 | 0.5 | No | self-contained |
| WT#5 | 0.5 | 0.25 | No | self-contained |
| WT#6 | 1 | 0.5 | No | self-contained |
| WT#7 | 0.5 | 0.25 | No | self-contained |

Total TU estimates for the study phase: 10.25

Total TU estimates for the normative phase: 5

Total TU estimates: 10.25 + 5 = 15.25

# 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 | 23.xyz | Study on generic group management, exposure and communication enhancements | SA#96 (June. 2022) | SA#97 (Sept. 2022) | Zhu Qianghua, Huawei, zhuqianghua@huawei.comSang-Jun Moon, Samsung, moonst@samsung.com |

# 6 Work item Rapporteur(s)

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Primary Rapporteur, Responsible for Work Task 1

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Secondary Rapporteur, Responsible for Work Task 2, 3, 4, 5, 6, 7

# 7 Work item leadership

SA2

# 8 Aspects that involve other WGs

SA3 for security aspects. SA5 for management and charging aspects. SA6 for application layer aspects.

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| Huawei |
| HiSilicon |
| Samsung |
| CATT |
| China Mobile |
| China Telecom |
| China Unicom |
| ZTE |
| Juniper |
| SK Telecom |
| KT Corp |
| LG Uplus |
| KPN |
| Siemens |
| Robert Bosch GmbH |
| LGE |
| Spreadtrum Communications |
| ETRI |
| CAICT |
| China Southern Power Grid |
| CEPRI |
| CBN |
| SIA |
| DISH Network |
|  |