**SA WG2 Meeting #153E e-meetingS2-220xxxx**

10 - 17 October 2022, Elbonia (was S2-220xxxx)

**Source: Qualcomm Incorporated**

**Title: New WID on** **Architecture Enhancements for Vehicle Mounted Relays**

**Document for: Approval**

**Agenda Item: 10.3**

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: Architecture Enhancements for Vehicle Mounted Relays

Acronym: VMR\_ARCH

Unique identifier:

{A number to be provided by MCC at the plenary}

Potential target Release: *Rel-18*

# 1 Impacts

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

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
| x | Feature |
|  | Building Block |
|  | *Work Task* |
|  | 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) |
| VMR | SA1 | 930021 | Stage 1 of Vehicle-Mounted Relays |

### 2.3 Other related Work Items and dependencies

{List here other Work Items which relate to the proposed one, such as a Work Item in an earlier Release if further enhancing the feature from the previous Release)}

|  |  |  |
| --- | --- | --- |
| Other related Work /Study Items (if any) | | |
| Unique ID | Title | Nature of relationship |
| 850009 | Architecture enhancements for the support of Integrated access and backhaul (IAB) | Baseline IAB architecture support. |
| 941009 | Mobile IAB (Integrated Access and Backhaul) for NR | RAN aspects of the VMR feature. |

# 3 Justification

Following the introduction and evolution of 5G, demand for improved cellular coverage and connectivity continues to increase, which may be challenging in many outdoor and mobility scenarios.

In certain urban environments, installing additional base stations on buildings or other infrastructure sites may face typical deployment challenges and burdens, such as real estate availability and costs, or constraining regulations. In the same urban environments, in conjunction with the high density of users, one can also expect the presence and availability of many vehicles around, e.g. for public/private passengers transportation, goods delivery, food trucks etc, typically moving at low/pedestrian speed (or temporarily stationary). Some of the vehicles can follow a certain known/predictable itinerary (e.g. buses or trams, etc), or be situated in specific locations (e.g. outside stadiums), through or around areas where extra cellular coverage and capacity would be needed. Those vehicles would indeed offer a convenient and efficient place in which to install on board base stations (or base station elements) acting as relays, for providing 5G coverage and connectivity to neighbouring UEs outside the vehicle. The relay will use 5G wireless backhaul toward the macro network (stationary donor base stations) connected to the 5G core.

Vehicle relays are obviously very suitable and optimal for connecting users or devices inside the vehicle itself, not only in urban areas but also other environments (and vehicle speeds), e.g. for passengers in buses, car/taxi, or trains.

In other scenarios, e.g. during an outdoor sport race or pedestrian events, vehicles equipped with relays could conveniently move along with users or devices that are outside the vehicle and provide service to them. In some cases, e.g. during medical emergencies or when an area lacks sufficient coverage, vehicle relays can enable improved connectivity and data delivery.

The technical benefits of using vehicle relays include, among others, the ability of the vehicle relay to get better macro coverage than the nearby UE, thanks to better RF/antenna capabilities, thus providing the UE with a better link to the macro network. Additionally, a vehicle relay is expected to have less stringent power or battery constraints than UEs.

Along with advantages for network operators and end users, incentives can also be put into place to encourage vehicles manufacturers or owners to install and operate relays in their vehicles (e.g. based on agreements between the operator and automakers, transport companies, fleet owner/enterprise, etc.).

SA1 had a study item (FS\_VMR, SP-200798) that identified new use cases and service requirements related to vehicle mounted relays (VMRs) documented in TR 22.839. The consolidated normative requirements were captured in stage 1 specifications, e.g. TS 22.261.

SA2 carried out the corresponding architecture enhancement studies (FS\_VMR), focusing on the following areas:

* efficient mobility and service continuity for UE or a group of UEs to efficiently deliver data during different mobility scenarios (including mobility of the mobile base station relays);
* provisioning, policies and mechanisms to e.g. manage relay configuration, geographic restrictions, QoS, authorize and control of UEs' access via the mobile base station relay, etc.;
* support for roaming of mobile base station relay (including the roaming of MT and DU components), support for regulatory requirements (e.g. emergency, priority services, public safety), and support for location services for UEs accessing mobile base station relay.

Solutions, evaluations and conclusions were documented in TR 23.700-05. Based on the evaluation and conclusions, it is proposed to create the necessary normative specifications for the agreed architecture enhancements.

# 4 Objective

The objective of this work items is to specify the architecture enhancements, functionalities and procedures based on conclusions of TR 23.700-05 (clause 8).

Specifically, the detailed objectives include:

1) configuration of the mobile base setation relay for its interaction with serving PLMN OAM;

2) authorization of the mobile base station relay by 5GC, including in the roaming case;

3) enhancements to location service procedures for accurate UEs’ location estimation when they are served by mobile base station relays;

4) enhancements to provide additional ULI information to 5GC for UEs served by mobile base station relays;

5) enhancements to mobility procedures for UEs moving together with mobile base stations relays;

6) enhancements to support control of UEs’ access to mobile base station relays using CAG mechanism.

Editor's note: objective 5 and 6 depends on the conclusions to be agreed in SA2#153e.

NOTE: For objective 3, coordination with 5G\_eLCS\_Ph3 is needed.

# 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 |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} | | | |
| TS/TR No. | Description of change | Target completion plenary# | Remarks |
| 23.501 | System architecture for support of VMR feature. | TSG#99 (Mar, 2023) |  |
| *23.502* | *Procedures for support of VMR features.* | *TSG#99 (Mar, 2023)* |  |
| *23.503* | *Policy control for support of VMR features.* | *TSG#99(Mar, 2023)* |  |
| *23.273* | *eLCS procedure enhancements to support the VMR features.* | *TSG#99(Mar, 2023)* |  |

# 6 Work item Rapporteur(s)

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# 7 Work item leadership

SA2

# 8 Aspects that involve other WGs

The following aspects involving other WGs may arise related to this WID:

- Security aspects

- Charging aspects

- RAN aspects

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| Qualcomm Incorporated |
| Sony ? |
| InterDigital Inc. ? |
| AT&T ? |
| Verizon UK Ltd ? |
| ZTE Corporation ? |
| Telstra ? |
| vivo Mobile Communications Ltd ? |
| Volkswagen AG ? |
| Philips International B.V. ? |
| Xiaomi ? |
| SyncTechno Inc. ? |
| FirstNet ? |
| Lenovo/Motorola Mobility ? |
| LG Electronics ? |
| Rakuten Mobile Inc. ? |
| Thales ? |
| TNO ? |
| Apple ? |
| NOKIA ? |
| NOKIA SHANGHAI BELL ? |
| Intel ? |
| Deutsche Telekom ? |