Qualcomm

SA2#145E: May 17-28, 2021

S2-2104762

# Rel-18 new SID:
## Motivation for Study of Architecture Enhancements for Vehicle Mounted Relays (FS_VMR_ARC)

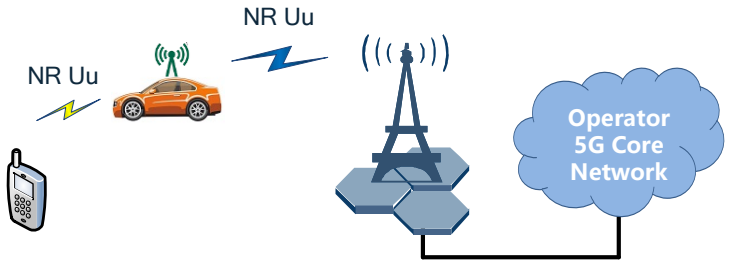
Qualcomm

5G

# Motivation

## Why Vehicle-mounted Relays?

*A convenient & efficient way to extend 5G outdoor coverage & capacity*




- No real estate costs or constraints unlike with fixed relays
- High density of UEs and vehicles is expected in urban environments
- Certain vehicles have a known itinerary (e.g. buses, trams)
- Vehicle relays can have better Tx/Rx capabilities and macro coverage than UEs
- Vehicle relays can have much less stringent power and battery constraints than UEs
- Incentives can be given to vehicle makers/owners to install/operate relays on their vehicles

# Use cases

## Providing service to users in the vehicle

**Users in a taxi/shared vehicle**

**Users in a bus or subway car**

**Users in a high speed train**

# Use cases (cont.)

## Providing service to users outside the vehicle

### Pedestrians around low-speed or parked vehicles

- *E.g. buses or taxi/cars moving in downtown streets, or vehicles (temporarily) parked outside stadiums or other popular locations*

### Mobile camera feeding video via nearby vehicle

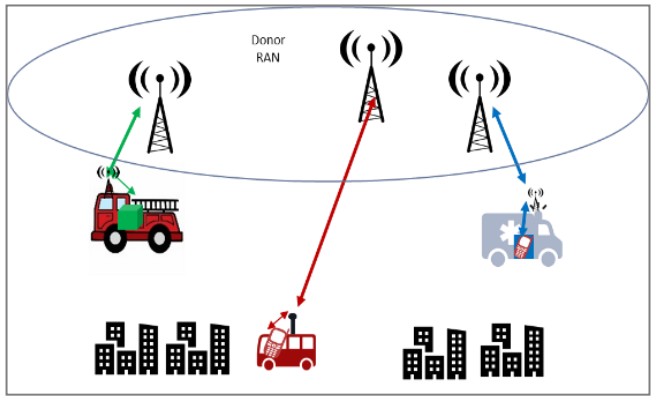
- *E.g. camera from motorbike(s) following sporting race use relay from alongside vehicle*

# Use cases (cont.)

## Providing service for Public Safety

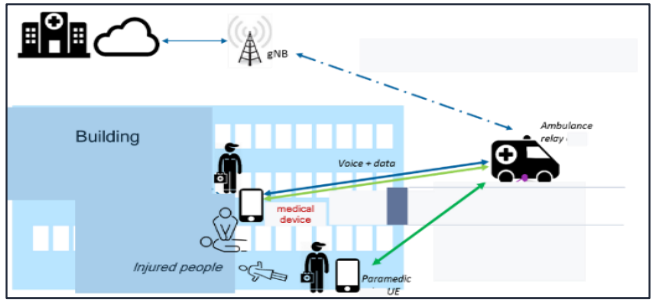
### Coverage extension scenarios

- *E.g ad-hoc connectivity in/around PS vehicles, or extended coverage for first-responders indoor.*




### Multiple provider connectivity for the Relay backhaul

- *E.g. To support mission critical services*
- *E.g. Possible support of load-balancing*



# Status of Stage 1 work

SA1 (FS_VMR, VMR)

- SA1 has studied in Rel-18 (FS_VMR) new use cases and potential requirements related to vehicle-mounted relays, in the following areas (documented in TR 22.839):
  - Vehicle (base station) relays providing service to UEs inside the vehicle or in the vicinity of the vehicle;
  - End-to-end service continuity during mobility scenarios (including mobility of the relays);
  - Provisioning, policies and control mechanisms, e.g.
    - Provisioning of spectrum used by the relays, geographic area restrictions for relays;
    - Control of relay operation, UEs access and connectivity via relays.
  - Aspects related to roaming of relays, security, regulatory requirements (e.g. for emergency services), incentives, charging, handling of spectrum interference.
  - Simultaneous connectivity of UE to relay and macro network

- SA1 expects to finish 80% of normative work by September 2021, to incorporate the corresponding service requirements into TS 22.261.

# Objectives for SA2 study

- The aim of this study work is to investigate and identify potential architecture and system level enhancements for 5G system to support the operation of base station relays mounted on vehicles, using NR self-backhauling to connect with donor gNB and 5GC. Specifically, the objectives include:
  - Gap analysis of the existing 5GS features and functionalities for the support of service requirements identified by SA1 (VMR).
  - Study system architecture enhancements required to support new service requirements, including:
    - operation of vehicle mounted (base station) relays providing service to UEs inside the vehicle or in the vicinity of the vehicle;
    - efficient mobility and end-to-end service continuity during different mobility scenarios (including mobility of the relays);
    - provisioning, policies and mechanisms to e.g. manage relay configuration, geographic restrictions, QoS, authorize and control of UEs' access via the relay, etc.;
    - roaming of relays, security, regulatory requirements (e.g. emergency, priority services, public safety), location services;
    - charging and incentive schemes for MNOs, fleet owners and end users;
    - simultaneous connectivity of the UE to the relay and the macro network, or via multiple relays;
    - multi-PLMN sharing, and different access/backhauling topologies.

NOTE 1: potential conflicts with other studies/work on UE relays (e.g. 5G ProSe Relays) should be avoided.

NOTE 2: the study should investigate potential enhancements for both UEs and Network, including support of legacy UEs.

NOTE 3: single-hop relay should be the main/baseline scenario.

NOTE 4: focus should be on NR Uu for the UE connectivity to the Relay; combination with other functionalities is not precluded, e.g. using PC5 for assistance/control, ranging etc.

# Timeline of the study

- Expect to start with other Rel-18 study items (e.g. depending on TSG/SA2 timelines)
  - 8 TUs for study phase are estimated
- Sent to TSG for information in Mar 2022.
- Sent to TSG for approval in Jun 2022 (and start corresponding normative work)

Qualcomm

# Thank you!

Follow us on:

For more information, visit us at:

www.qualcomm.com & www.qualcomm.com/blog

Nothing in these materials is an offer to sell any of the components or devices referenced herein.

©2019-2020 Qualcomm Technologies, Inc. and/or its affiliated companies. All Rights Reserved.

Qualcomm and Snapdragon are trademarks of Qualcomm Incorporated, registered in the United States and other countries. Other products and brand names may be trademarks or registered trademarks of their respective owners.

References in this presentation to “Qualcomm” may mean Qualcomm Incorporated, Qualcomm Technologies, Inc., and/or other subsidiaries or business units within the Qualcomm corporate structure, as applicable. Qualcomm Incorporated includes Qualcomm’s licensing business, QTL, and the vast majority of its patent portfolio. Qualcomm Technologies, Inc., a wholly-owned subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of Qualcomm’s engineering, research and development functions, and substantially all of its product and services businesses, including its semiconductor business, QCT.