2019/5/27

Motivation for new SI proposal on NR sidelink support for non-V2X

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Background for commercial NR Sidelink

- SA1 studied on "Network Controlled Interactive Service" (*FS_NCIS*) focusing *Commercial interactive services over local wireless link*
  - Existing smartphones or new forms of 5G portable devices (e.g. VR/AR devices, robot, etc.) for entertainment and education (e.g. interactive gaming or conferences) over PC5 interface ➔ power efficiency needs to be addressed for portable UEs
  - General requirements from TR22.842, interactive service with less than [10ms] End-to-End latency and at least [1 Gbps] data rate ➔ resource efficiency would be critical to achieve high data rate
  - TR 22.842 V1.2.0 2019-05 (final version)
  - SA1 Study item reported 100% completion in SA#84
  - SA1 work item approved in S1-191636
    - ✓ Target completion by 2019-11

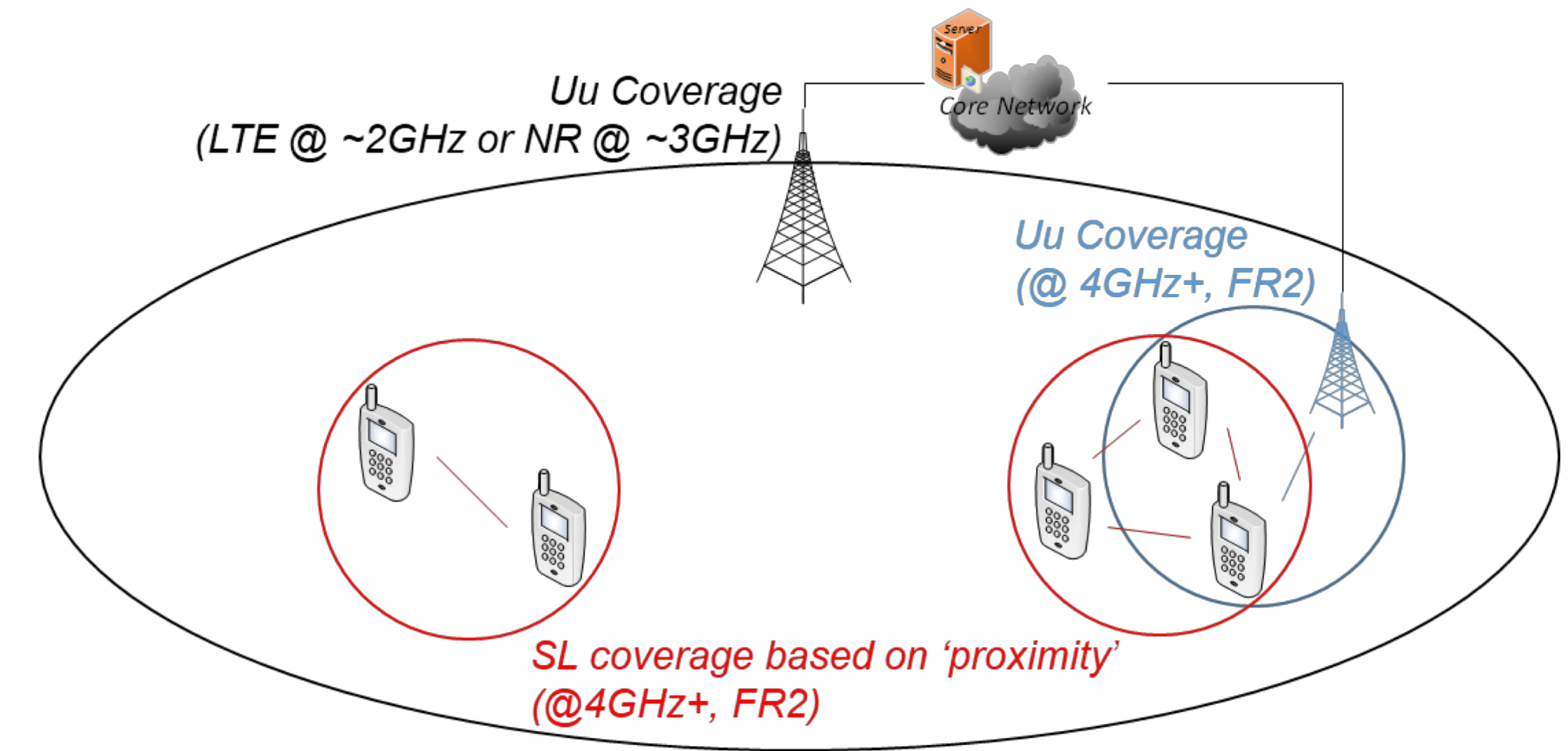Local Gaming

Local Conference

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SA2 kicked-off *Proximity based services in 5GS*

- Two sets of objectives are pursued pertaining to specifically commercial and public safety related services (S2-1906727)

    - Set-A objectives for Public Safety related ProSe;

    - Set-B objectives for commercial related ProSe, where set-B is stage-2 continuation of FS_NCIS (SA1 requirements);

- Based on a common framework, NR sidelink design should additionally support commercial (TR22.842 for NCIS) and Public Safety (TS22.278) use cases and requirements.

- Further stage-3 work is expected to follow in RAN and SA

Background of sidelink and applications

- In Rel-12/13, ProSe was introduced and mainly optimized for voice type traffic (MCPTT), i.e., lower data rate, relaxed delay requirement
- In Rel-14/15/16, V2X was introduced for ITS operation, mainly target at low latency and high reliability in high-speed scenarios,
  - Vehicle UEs assumed to have "unlimited power supply", i.e., UE power efficiency is not considered
    - ✓ Constant resource sensing and data reception operation are essential for safety and reliability, but not battery friendly
  - Low data rate typically required for V2X (e.g.10-90 Mbps), i.e., resource efficiency is not critical

Deployment scenarios

Uu Coverage
(LTE @ ~2GHz or NR @ ~3GHz)

Core Network

Uu Coverage
(@ 4GHz+, FR2)

SL coverage based on 'proximity'
(@4GHz+, FR2)

- NR sidelink is always under network Uu control
  - For network:
    - ✓ **Efficient spectrum utilization and cost reduction:** Massive deployment of FR2 cells to support high data rate applications everywhere **VS** adopting FR1 Uu to provide control over FR2 SL
    - ✓ **Effective traffic offloading between Uu and SL:** Whenever possible, comm between nearby UEs offload to SL to free-up UL/DL resources and capacity for other eMBB and URLLC services
  - For UE:
    - ✓ **More utilization of high-frequency band module:** Further explore costly high-frequency band module for more scenarios, and not limited by the hot-spot coverage via Uu interface
    - ✓ **Minimize UE battery consumption:** Reduction of Tx power for direct data transfer over SL compared to propagation distance to BS over Uu

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New features and enhancement for ProSe in 5GS

- Energy and resource efficiency operations
    - Dynamic CL power control for close proximity transmissions
    - Sidelink DRX for energy efficient reception
    - Higher order modulation and multi-layer transmissions for high data rate
- Coverage enhancement and service continuation
    - UE-to-Network relay
    - UE-to-UE relay
- UE discovery and group management
    - Sidelink transmission and reception managed by group header UE

Expected studies in RAN (objectives)

For commercial services:

- Study / evaluation of NR sidelink Rel-16 design to support NCIS use cases and identify necessary enhancements (RAN1)
- Study mechanism(s) to improve **energy-efficiency** for sidelink
  - Enhancements of [PSCCH/PSSCH multiplexing] and power setting procedure to enable **closed-loop power control** (RAN1)
  - Support of **sidelink DRX** (RAN2/1)
  - Support of **UE-to-UE relay** (RAN2/RAN1)
  - Support of SL Tx and Rx of member UEs **managed by group header UE** (RAN1/RAN2)
- Study mechanism(s) to improve **resource-efficiency** for sidelink
  - [Support of **256QAM** on sidelink assisted with channel feedback (RAN1/4)]
  - Feasibility to enhance **MIMO (up to [4] layers) / beamforming** assisted with channel feedback in low mobility (RAN1)
- Study interference from sidelink transmission to UL reception in adjacent channel environment (if any), and identify mitigation solution(s) (RAN4, RAN1)

For Public Safety services [RAN2/RAN1]:

- Study mechanism(s) to support **UE discovery** (RAN1/RAN2)
- Study mechanism(s) to support **UE-to-Network relay** (RAN2/RAN1)

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Timeline for enhance SL study for non-V2X in RAN

- The work targets for Release 17

- Main working group: RAN1 (primary), RAN2 (secondary)

- Study item phase

  - RAN plenary approval in December 2019

  - *Duration 6~9 months*

  - *TUs per meeting: 1.5*

- Work item phase

  - After SI completion (e.g. from September 2020)

  - *Duration: 6~9 months*

  - *TUs per meeting: 1.5*

Thank you

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