3GPP TSG RAN#83
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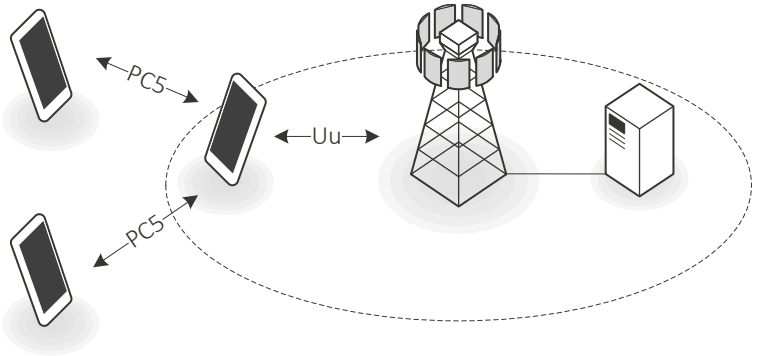
Agenda Item 15

UE-based Coverage Extension

MediaTek Inc.



Addressing the coverage gap in new NR bands

- Challenging indoor penetration for new NR bands
  - Majority of additional NR spectrum in C band (3-6GHz) and mmW.
  - Over 10dB propagation difference between 1.8GHz and 3.5GHz, even larger for higher C band frequencies.
  - Extremely challenging outdoor->indoor penetration for mmW.

- Small cell deployments provide NR indoor high data rate experience
  - Small-cell footprint primarily in densely populated areas and private premises
  - Small cells less likely deployed in suburban residential and rural areas

- LTE/NR Dynamic Spectrum Sharing only mitigates NR coverage issue
  - Legacy LTE FDD low bands re-used for NR indoor coverage
  - NR data rates in low bands (without C-band and mmW) remain similar to LTE.

UEs to Complement NR network coverage

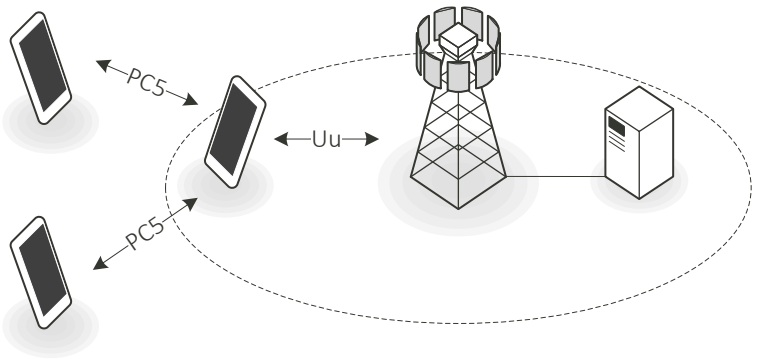
- UE-based Coverage Extension complements and NR network coverage
  - Better indoor NR data rates beyond network coverage edge in e.g. residential suburban areas, rural areas, specific difficult coverage gaps.

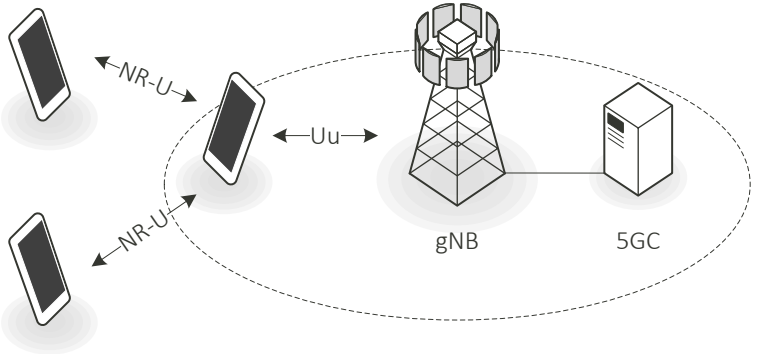
- Key Target: agile user-driven deployment
  - Low deployment friction essential
  - Seamless, easy ‘out-of-the-box’ operation with very limited user intervention
  - End-users to decide and install on a need-basis

- Fast roll-out: rely on scale of existing retail network for UE ecosystem

Some Possible Use Cases

- Battery-powered Smartphone in good coverage provides NR extended NR coverage for other UEs further inside one apartment
  - Possible restriction: only while smartphone charging
  - Alternatively, a purpose-built plugged-in UE achieves the same purpose
- UE as a coverage gap filler
  - Used until denser network deployment finalised
- Single-hop or Multi-hop
- Synergy with NR-U deployments
- PC5: In-band, out-of-band or unlicensed





Frequency bands

- The following frequency bands are to be considered for use in coverage extension:
  - Sub-6 licensed frequency bands
  - FR2 licensed frequency bands
  - Unlicensed spectrum

Proposal

- TSG RAN1/RAN2 to study benefits and necessary enhancements to existing
  - UE relay approaches
    - NR Sidelink (PC5) UE-network relay
    - Smart UE-based store-and-forward
    - UP-only relay (CP via gNB)
  - UE as an IAB node
  - NR-U Access Point
- Evaluate
  - Licensed and Unlicensed spectrum
  - Single-hop and Multi-hop
  - Energy efficiency aspects relevant to battery-powered UEs
- Timeframe: R17
  - Followed by relevant normative work after RAN plenary decision