RP-182488

ON NR-UNLICENSED WORK ITEM

3GPP TSG RAN Meeting #82

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Document for: Discussion, Decision

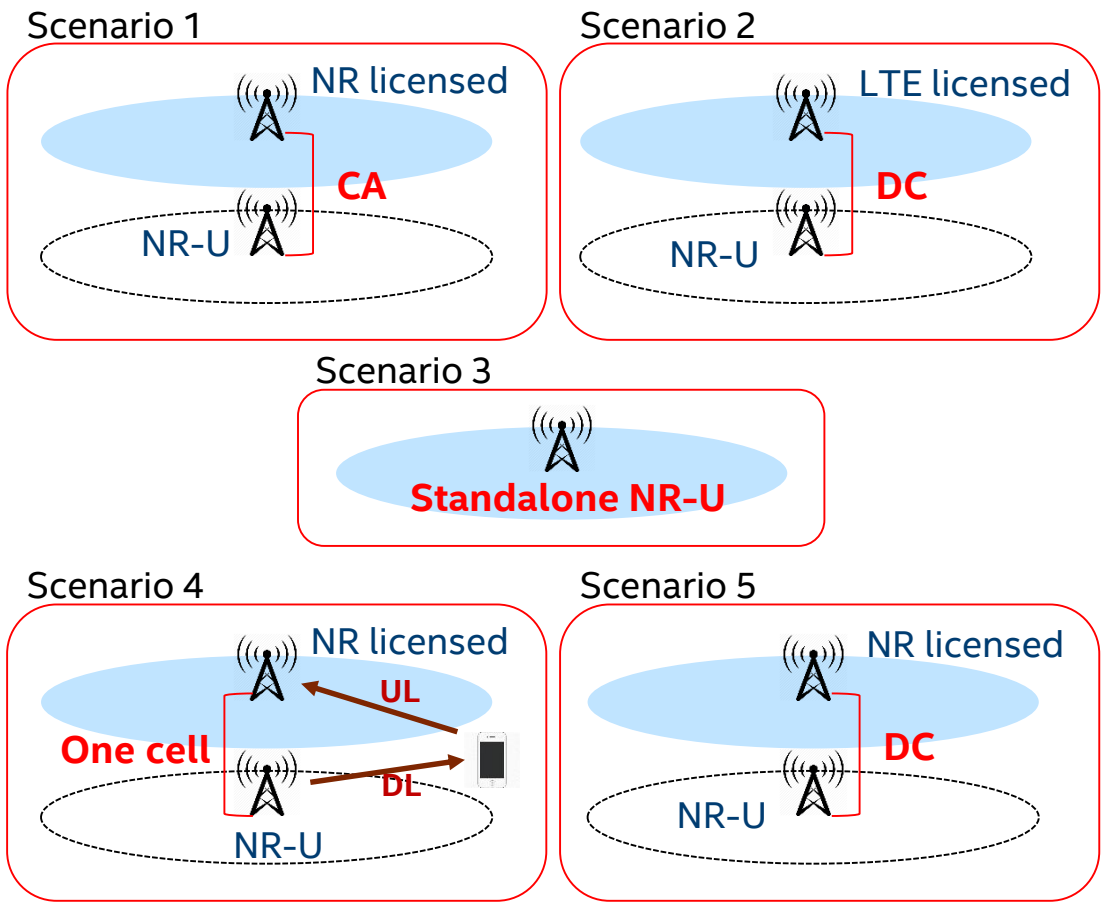
NR-U SI HAS BEEN SUCCESSFULLY COMPLETED

The NR-U study concludes that it is feasible to modify NR to operate in unlicensed spectrum in CA, DC, and stand-alone modes. What have been studied during the SI is summarized as follows.

- What have been discussed by RAN1
  - Frame structure (COT structure, BWP operation, CA operation, wideband operation, partial slot support)
  - DL signal/channel (DRS structure, initial signal, PDCCH monitoring enhancements)
  - UL signal/channel (Block interlaced structure for PUSCH/PUCCH, enhancements on PUCCH, PRACH, and SRS)
  - Channel access schemes (Basic LBT schemes according to the channel/signals, LBE/FBE channel access)
  - Initial access (SS/PBCH position & frame timing, RACH procedure, Paging, RRM/RLM procedure)
  - HARQ (Feedback mechanism, HARQ-ACK codebook enhancements)
  - Configured grant (Resource allocation mechanism, AUL UCI, DFI)
- What have been discussed by RAN2
  - Inactive and Idle mode operation
  - L2 aspects (4-step/2-step RACH, MAC)
  - Control plane aspects (RLM/RLF and mobility)

REL-16 NR-U WI : ON DEPLOYMENT SCENARIOS

- **Scenario 4** should not be necessarily limited to NR-U DL + NR-Lic UL. Rather, it can be generalized to Standalone NR-U (i.e., DL+UL) + NR-Lic UL (i.e., supplemental UL to Standalone NR-U)
  - No/little additional specification impact is expected.
- Work on **Scenario 5** will be dependent on outcome/progress of the parallel WI on "Multi-RAT DC and CA enhancements". The work on this scenario should not hinder the WI completion.



REL-16 NR-U WI : SCOPE

Aspects to be included in Rel-16 NR-U WI scope

- Frame structure: COT structure, BWP operation, CA operation, partial slot support
- DL signal/channel: DRS structure, PDCCH monitoring enhancements
- UL signal/channel: Block interlaced structure for PUSCH/PUCCH, enhancements on PUCCH, PRACH, and SRS
- Channel access schemes: Basic LBT schemes according to the channel/signals, LBE/FBE channel access
- Initial access: SS/PBCH position & frame timing, enhancements on random access, paging, RRM/RLM procedure
- HARQ: Feedback mechanism, HARQ-ACK codebook enhancements
- Inactive and Idle mode procedure
- **2-step RACH**
  - If NOMA becomes the primary WI for 2-step RACH, then NR-U WI is expected to focus on only necessary modifications/enhancements.
  - If NR-U becomes the primary WI for 2-step RACH, a nontrivial burden can be imposed given the large work scope including e.g., linkage between PRACH preamble and DMRS and/or scrambling sequences of data channel, multiplexing of 2-step RACH and 4-step RACH, and details on Msg-B (Msg-2+Msg-4), fallback of 4-step to 2-step RACH, etc.
- Control plane aspects (RLM/RLF and mobility)

REL-16 NR-U WI: DOWN-SCOPING OR DEPRIORITIZATION

The work scope seems to be too broad to be completed by Dec 2019, even bigger than the aggregated work scope of Rel-13 LAA + Rel-14 eLAA + Rel-15 feLAA. The following aspects can be removed or deprioritized in Rel-16 NR-U WI.

- Frame structure
  - Wideband operation (>20MHz) other than 20MHz based CA
    - ✓ Not sufficiently studied. Impact/benefit is unclear
  - Additional subcarrier spacings, e.g., 60KHz SCS for SSB/PBCH
    - ✓ As captured in TR, nontrivial spec impact (new design of SSB/PBCH, PRACH configuration, potentially sub-PRB block interlace).
- DL signal/channel: Initial signal
  - Controversial and no conclusion during the SI.
- Configured grant:
  - Not essential feature. Deprioritize it if TU is concerned.
- PCI collision/confusion issues
  - PCI collision can be already mitigated via network listening and existing ANR. PCI confusion can be resolved via existing ANR mechanism.
- DRX enhancements
  - DRX enhancement has never been studied during the SI. DRX enhancement can be studied in Power Saving SI

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