

3GPP TSG-RAN Meeting #84
Newport Beach, California, USA, June 3rd – 6th 2019

Tdoc RP-191051



Agenda Item: 8
Source: Ericsson

On Rel-17 NTN work scope

Overall directions



- Follow up Rel-16 NTN SI to introduce a basic set of features to enable NR technology to support satellite communications (NR NTN)
- Aim to maximize synergies with existing NR features for terrestrial mobile networks → minimize changes
- Relevant enhancements can be used in other scenarios such as HAPS or very large cells

Architecture (1)



- From the Rel-16 SI conclusions:
 - "No showstoppers to support **transparent** and **regenerative** satellite based NG-RAN architecture
 - "The regenerative option based on relay-like architecture was not studied (IAB WI ongoing)
 - "For a potential normative phase, it is proposed to focus on:
 - GEO-based satellite access with transparent payloads
 - LEO-based satellite access with regenerative payloads
 - "No specific issues have been identified to support the split regenerative option (gNB-DU on board)
 - Some protocol adaptation may be needed in a potential normative phase
 - "If the relay-like architecture (IAB) needs to be supported, further study will be needed"
- Many SI topics (e.g. paging, etc.) were mostly agnostic to the architecture option
 - Some specific optimizations were discussed

Architecture (2) - observations



- Transparent satellite based NG-RAN architecture should be prioritized

- Reasons

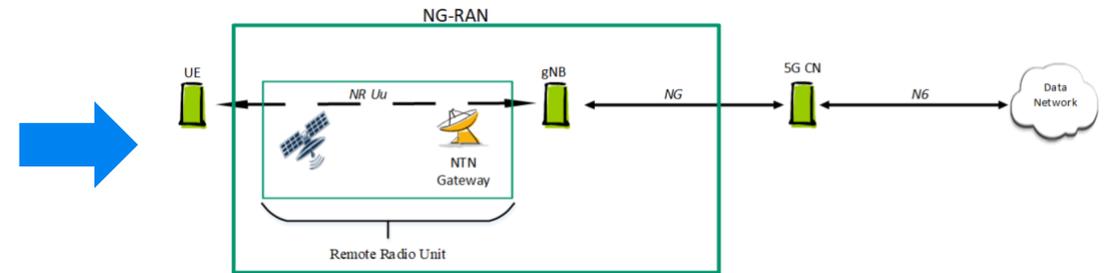
- It is most desirable from the point of view of:

- NG-RAN impacts
- Mobility support
- Dual-connectivity support

- When considering how to support feeder link switchover for a satellite, the transparent option does not seem to pose constraints on transport network design, unlike the regenerative options

- With respect to OAM requirements, the transparent architecture option poses less OAM requirements than the regenerative options

- No apparent show-stopper to use it also for LEO, besides GEO



Architecture (3) - further observations



- We still believe **Regenerative** satellite based NG-RAN architecture with gNB-DU on board should have **lower** priority than the other options
- **Reasons**
 - Out of all the regenerative options, it is the only one which impacts *both* RRC *and* F1 design
 - With this option it is not possible to support a standardized ISL
 - No standardized inter-gNB-DU interface in NR
 - e.g. HO, DC, traffic offload typically involve interactions between gNB-CU (on ground) and gNB-DU (on satellite) via F1
 - Potential performance limitations for satellite case are unknown

Key design topics



- Key design considerations include long propagation delay, large Doppler, and moving cells
- Doppler pre-compensation/post-compensation should be assumed for forward/return link to reduce impact on PHY layer design
- **The main technical areas are**
 - PRACH and random access procedure adaptations for uplink timing and frequency control
 - Retransmission mechanisms, e.g. deactivate HARQ
 - Connected/idle mode mobility enhancements
 - MAC/RLC/PDCP timer adaptation

RAN4 aspects



- It is important to have a clear understanding on spectrum and regulatory aspects of satellite spectrum, and thus a study phase of RAN4 aspects should be considered first so that related issues can be thoroughly studied

