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# 5GC Enhancement for Satellite Access Phase Ⅲ

Xiaomi



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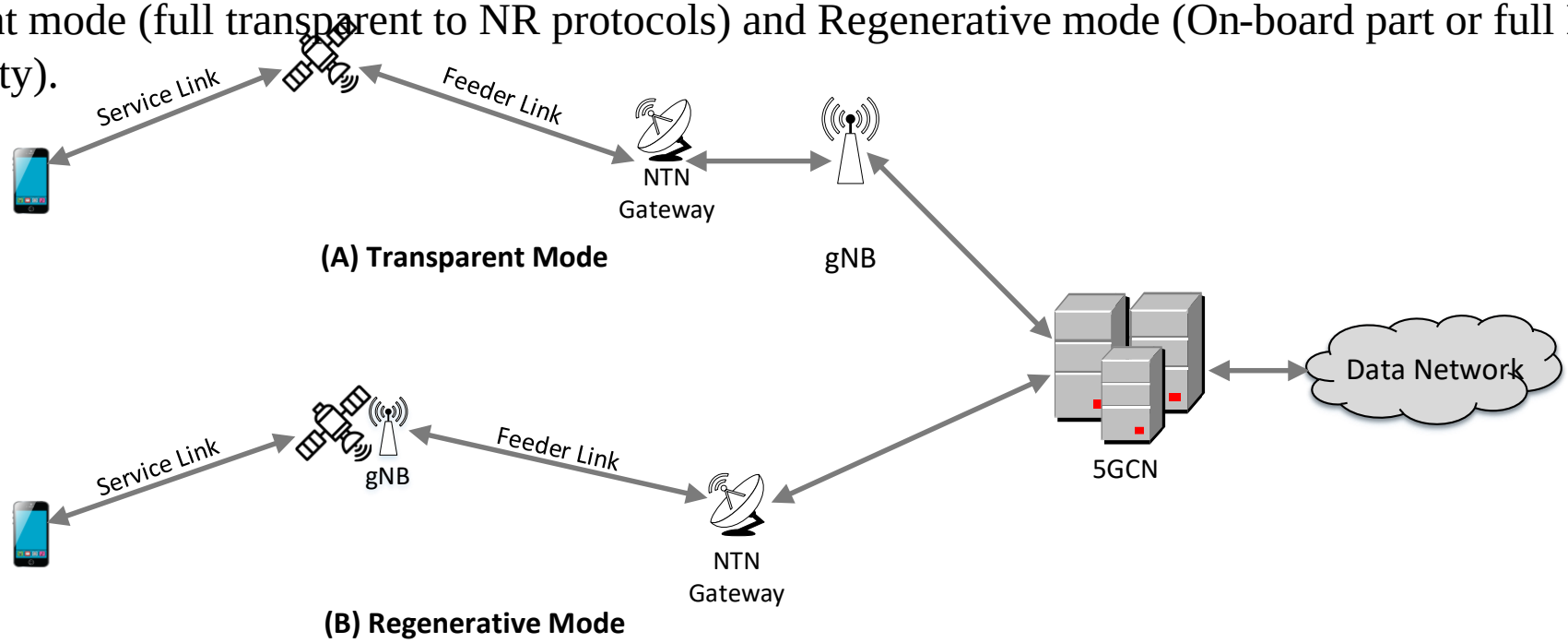
# 5GSAT ARCH Ph3

## Motivations

- Satellite access has gained more and more consensus which is playing a key part in extending cellular 5G networks to air, sea and other remote areas not covered by terrestrial cell networks.
- Transparent mode (full transparent to NR protocols) and Regenerative mode (On-board part or full NG-RAN functionality).




- Such two modes mentioned in TR 23.737(SA2 R-17 5GSAT_ARCH), but only transparent mode is targeted until R-18.
- Most use cases and requirements described in TR22.865 (SA1 R-19 FS_5GSAT_Ph3) are based on Regenerative mode.
- Supporting regenerative mode can further enrich satellite access deployment. In some cases, it can reduce latency and improve service experience, compared with transparent mode (e.g. on-board NR+UPF)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## Potential issue & Identified Gaps (1)

- Feeder link discontinuous connection
  - Descriptions
    - UE network connection may interrupt due to satellite coverage without active feeder link connection to the ground station
      - UE locates in the areas with few ground station, e.g. deep-sea maritime areas
    - Enable RAN on-board with:
      - Store and forward operation is proposed to support delay-tolerant/non-real-time services during discontinuous feeder link
      - Support real time services between UEs using the same satellite access or between UE and application server on board as well without going through the terrestrial network
  - Gaps
    - Support of store and forward operation for delay-tolerant service when feeder link is unavailable
    - Support of local data switch between UEs using the same satellite access
    - Support of time sensitive service by local communication between UE and application server on board


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## Potential issue & Identified Gaps (2)

- Handover due to RAN node mobility for Regenerative mode
  - Descriptions
    - Embarking RAN on-board NGSO satellites implies frequent handovers of RAN nodes for any given 5GC
    - A large number of UE under the same coverage will be simultaneously handed over from one RAN node to another one, which may cause overload in RAN and CN
  - Gaps
    - Conditions to trigger handover from a RAN node to another RAN node
    - Interface (X2/N2) and Functionality(RAN/5GC) enhancements to support RAN node mobility
    - Overload control due to the RAN node mobility


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## Potential issue & Identified Gaps (3)

- SCAI provision due to discontinuous coverage
  - Descriptions
    - In Rel-18, it was decided this release will not work on the standardization of Satellite Coverage Availability Information(SCAI) and can be handled in the future release
    - Without the standard SCAI, it would be difficult to derive accurate out of coverage period for a UE by the UE/network
  - Gaps
    - Support of satellite coverage availability information standardization provided to the UE/AMF

    NOTE: whether this objective is included or not will based on the progress of 5GSAT_Ph2 in SA2 R18.


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# 5GSAT ARCH Ph3

## Potential SA2 Objectives

- **Discontinuous Feeder link for regenerative mode:**
  - Support of store and forward operation for delay-tolerant service when feeder link is unavailable
  - Support of local data switch between UEs using the same satellite access
  - Support of time sensitive service by local communication between UE and application server on board
- **Handover optimization for regenerative mode**
  - Conditions to trigger handover enhancement
  - Interface(X2/N2) and Functionality (RAN/5GC) enhancements to support RAN node mobility
  - Overload control due to the RAN node mobility
- **SCAI provision for discontinuous coverage**
  - Satellite coverage availability information standardization provided to the UE/AMF

**NOTE: whether this objective is included or not will based on the progress of 5GSAT_Ph2 in SA2 R18**


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# Thank You!



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