3GPP TSG RAN Rel-19 workshop
Taipei, June 15 - 16, 2023

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Agenda Item: 5

Views on Ambient IoT for Rel-19

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Overview | Ambient IoT

- In RAN study item for ambient IoT, following key aspects considered including:
  - Representative use-cases and corresponding deployment scenario characteristics
    - Indoor/outdoor inventory, indoor/outdoor sensors, indoor/outdoor positioning, indoor/outdoor command
  - Connectivity topologies for ambient IoT device
    - BS <-> Ambient IoT
    - BS <-> Intermediate Node <-> ambient IoT
    - BS -> Assisting Node -> Ambient IoT -> BS; BS <- Assisting Node <- Ambient IoT <- BS
    - UE <-> Ambient IoT
  - Device categorization and design targets
    - Device A with no energy storage, no harvesting ambient sources, no independent signal generation, device B with energy storage (ambient energy), no independent signal generation and device C with energy storage (ambient energy), independent signal generation

Justification | Ambient IoT

- New category of use-cases: There is a wide variety of use-cases including inventory/logistic management, indoor/outdoor sensors with positioning/ranging, etc. for which the current NR devices may not fulfill all the requirements
- Ultra-low power/complexity devices: In addition to supporting the required functionalities for the different use-cases, key requirements for ultra-low power devices without the need of even a power source may not be possible with existing LPWA devices
- RF energy harvesting: RF-based ambient energy harvesting can potentially be a promising technology to make big stride towards green communication

Study Considerations | Ambient IoT

- Prioritization considerations
  - Use-cases prioritization: Prioritization from the wide set of use-cases under considered in SA and RAN should be considered
  - Topology prioritization: For more focused study and based on use-cases prioritization, 3GPP shall consider only the most essential topologies in Rel-19
  - Device type prioritization: If possible, based on use-case prioritization and required KPIs, study may focus on only a subset of device types
- Timeline considerations
  - 3GPP needs to consider one of the two alternatives for Rel-19 item on ambient IoT (if approved)
    - Alt. 1: Only study item in Rel-19
    - Alt. 2: Study phase followed by normative work in Rel-19

Study Proposals (1/2) | Ambient IoT

- Study evaluation methodology for different device types and applicable deployment scenarios, based on the outcome of RAN study on ambient IoT
  - Further prioritization can be considered for a more focused study item at RAN WG level
  - Only a subset of the representative use-cases based on market needs may be considered
  - Based on prioritization of use-cases, prioritization of device categories could be possible
- Study the requirements and identify PHY enhancements to enable RF-based energy harvesting and communication with different ambient IoT devices types for different topologies including at least
  - Waveform enhancements, if needed
    - Depending on device types considered in RAN, waveform requirements may vary
    - For device A and device B with no active transmission, only backscattering waveform needed

Study Proposals (2/2) | Ambient IoT

- (Cont…) Study the requirements and identify PHY enhancements to enable RF-based energy harvesting and communication with different ambient IoT devices types for different topologies including at least
  - Dedicated/new signals and feasibility of existing signals for energy harvesting
    - Depending on design targets in terms on power consumption and energy storage capacity, new signals for harvesting energy might be needed
  - Signaling framework including
    - control channel design
    - uplink/downlink/sidelink control information
- Study and identify higher layer impacts to support ambient IoT device types

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