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Views on Ambient IoT in R19

Source: China Unicom

Motivation and Use Cases

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Motivation:

- The ambient IoT presents significant market potential and diverse applications, addressing critical needs in use cases, such as intelligent warehousing, logistics management, baggage tracking, personal asset management, electronic shelves, intelligent laundry, transportation ports, and medical equipment, among others.
- Currently, the batteries in the majority of communication devices require regular replacement or recharging. Ambient IoT utilizes backscatter communication technology to offer maintenance-free IoT solutions in response to the challenge of electricity scarcity.

Proposal 1: Considering the demands of the market and the advancements in commerce, it is suggested that R19 ambient IoT SI should be completed by December 2024 and start a six-month WI.

Device Categories of Ambient IoT

- **Considering the TU limit, it is recommended that the priority for R19 Ambient IoT devices should be focused on A/B over C with an expectable commercial prospect of WI.**

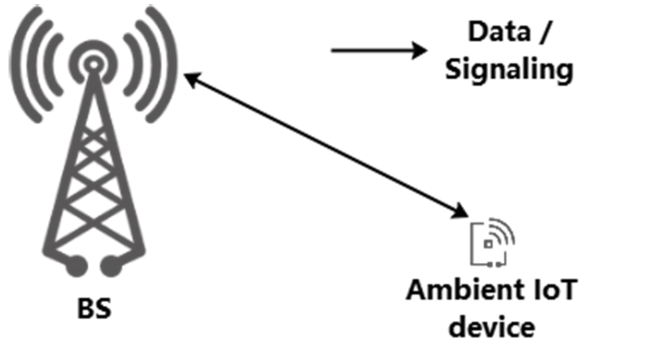
- Device A/B tags are primarily used in local area networks, and Device C tags are suitable for wide area networks. The initial commercial release should offer appropriate tags for the most urgent applications in local area networks.
- The complexity of Device C, which includes active RF components for transmission, is greater than that of Device A/B, resulting in a multiplied workload.

Proposal 2: Considering the constraints of TU and the urgency of WI, it is suggested that Devices A and B should be the scope of R19. Device C will be considered in the following release of Ambient IoT.

Deployment Scenarios

- **The deployment scenario 1 with Topology 1 should be prioritized as the baseline and the pioneering work of Ambient IoT.**

- In outdoor deployment scenarios, it may not be essential to provide continuous coverage for the entire network during the initial commercial phase. Instead, priority can be given to local and indoor deployment to meet specific outdoor requirements.



Topology (1): BS ↔ Ambient IoT device

Proposal 3: The initial consideration should be given to Deployment Scenario 1, utilizing Topology 1 as the foundational framework for the pioneering work of Ambient IoT.

Frequency Band

Frequency selection

- In Ambient IoT, it is essential to thoroughly evaluate the utilization of commercial frequency bands used by operators, including those at 900MHz and 2.1GHz, and to investigate the potential combination of 5G bands.

Downselection of the spectrum

- The potential options for spectrum allocation include in-band to NR, in guard-band to LTE/NR, and in standalone band(s).

Proposal 4: The ambient IoT working on FDD presents a promising opportunity for imminent commercialization. It is preferred that the ambient IoT for R19 is intended for deployments in the in-band and guard-band spectrum for NR.

Aspects for SI and WI

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☐ Need to consider carefully the amount of specification work and commercial relevance of R19 Ambient IoT features.

- While ambient IoT represents a new device category, the workload of passive device design can be minized by removing of active device design.

Proposal 5: Specific research objectives need to be further decided in the subsequent elements.

- For Physical layer, it is advisable to start with the general aspects in SI, such as frame structure and numerology, waveform and multiple access, modulation and channel coding, and the WI continues to work on signal, channel and procedure design, including random access procedure, power control, etc.
- For Higher layer, it is advisable to achieve conclusions in SI and continue discussing details in WI in follows.
  - Identify and specify control plane functionalities, including general RRC aspects, mobility, and paging.
  - Identify and specify user plane functionalities, including SDAP, RLC, MAC, data transmission.
- RAN3 aspects: enabling necessary CN-RAN signalling, RAN architecture aspects, if any.

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Thanks!