

3GPP TSG RAN Meeting #80
La Jolla, US, June 11-14, 2018
Agenda item: 10.1.3
Source: Ericsson

RP-181189



THOUGHTS ON IOT RELAYS

BACKGROUND



- › Following the Release 15 Study item on relaying a discussion have started on a Release 16 relaying work item.
 - The Release 15 study item focused on wearables relaying, e.g. a smart watch connected to a network via a smart phone.
 - The discussion have now shifted towards IoT relaying, e.g. a smart meter connected to a network via a gateway or other smart meter.
- › In this document we share our view on aspects related to relaying in the scope of 3GPP Release 16. In this context we also address the topic of repeaters which cover a similar use case as relays.

RELAYS SPECTRUM



- › The relay discussion have focused on NW and UE based relays, which both operate in licensed spectrum:
 - The NW based relay operates in both UL and DL.
 - The UE based relay using the sidelink Pc5 interface makes only use of UL spectrum.
 - Both these options are dependent on Operators approval.
 - Besides the 3GPP based options, unlicensed offering exists in terms of NR-U, MFA etc.
- › LTE inband relaying requires coordination and partitioning of resources.
 - The frequency resources are time multiplexed between donor and access links.
 - › In case or Release 10 NW based relays, MBMS subframes are used to facilitate the donor link transmissions.
 - › For UE based relays a separate pool of Uu resources are reserved for the sidelink PC5.
- › Outband relaying does not require coordination.
 - Donor and access links do not share the same spectrum.
 - Less relevant due to the requirement of dedicated spectrum for relaying.

RELAYS

CATEGORIES



- › A NW based relay is dedicated to provide the relaying functionality.
 - It requires extra deployment effort but is deployed with the single purpose to facilitate improved radio network spectral efficiency.
 - It is backwards compatible with deployed UEs and have no impact on UE implementation complexity.
 - Its under operators control and benefits all the operators customers.
- › A UE based relay may both serve as a UE and a relay.
 - The operator gives permission to deploy a relay, but the actual deployment is not under operator control.
 - Its location may in best case be optimized locally, and in worst case not at all.
 - The required sidelink support impacts the relay cost/complexity and its power consumption. Its assumed that the UE based relay requires access to a mains power supply.
 - The primarily benefit is for 3rd party devices.



- › Sidelink based relaying negatively impacts the UE complexity
 - PC5 makes use of UL spectrum in a TDD fashion. A sidelink capable UE must hence support receivers for both the Uu DL and PC5. This impacts the UE hardware complexity.
 - › To overcome this impact it has been proposed to support unidirectional relaying.
 - This eliminates the need to implement a separate PC5 receiver.
 - It has a limited use case as the coverage extension provided by the relay only applies to the UL.
 - PC5 is based on the LTE UL and does not support NB-IoT physical channels/signals. Support for PC5 will impact the UE software complexity.
- › Sidelink based relaying is not supported by already deployed UEs, and do not improve their coverage.

RELAYS

3GPP SIDELINK TRACK RECORD



- › Rel-12/13
 - PS sidelink → struggling
 - Commercial D2D → failed
- › Rel-14
 - LTE-based V2V → struggling/under discussion
- › Rel-15
 - Wearables D2D → lost interest

RELAYS

NETWORK BASED RELAYING



› Needed enhancements

- Enhance relay architecture with CIOT enhancements (RAN2/RAN3)
 - › UP based: Suspend/resume (optional)
 - › CP based: DoNAS
- For inband relaying only
 - › R-PDCCH like control for LTE-M (RAN1)
- Very low Tx power BS class for LTE-M/NB-IoT (RAN4)?

SUMMARY

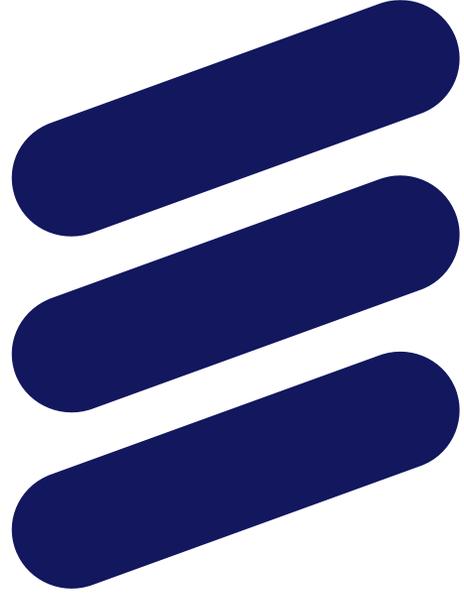


- › 3GPP Release 16 should if anything focus on adding support for NB-IoT repeaters in TS 36.106 and TS 36.143.
- › If Release 16 work on relays are needed the focus should be on network based relays that provide backwards compatible services over the Uu interface.
 - A short study may be motivated to identify the impact on the NW Relay specifications TS 36.116/36.117.
 - Work on sidelink based relays for IoT should be down prioritized due to the impact on UE complexity and the lack of backwards compatibility.

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