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On positioning support for Industrial IOT

Qualcomm, Daimler, Bosch, Fraunhofer, Sony

Current status of NR Positioning in Release 16

- The ongoing Study on NR Positioning Support [1] considers regulatory as well as commercial use cases

- Industrial IoT/automation is one prominent commercial use case with demanding indoor positioning requirements. This has been documented in SA1 [2]
  - There has been a need expressed from the Industrial IoT community that NR/5G shall support indoor positioning in industrial/automation scenarios.

- For performance evaluation of NR positioning solutions, a representative number of scenarios have been defined [3]:
  - Scenario 1: Indoor Office for FR1 and FR2 (Open office and Mixed Office);
  - Scenario 2: Urban Micro (UMi) street canyon for FR1 and FR2;
  - Scenario 3: Urban Macro (UMa) for FR1 only.

- Scenario 1 allows evaluation of indoor positioning performance, and could approximate positioning for indoor industrial use cases.

Current status of Channel Modeling for Indoor Industrial Scenarios in Release 16

- Indoor industrial scenarios have **different** characteristics from traditional mobile comms scenarios
  - E.g. they are different from “Indoor Office”, as indicated by 5G-ACIA to 3GPP [4]

- The Study on Channel Modeling for IIOT scenarios was approved exactly for this reason
  - To address industrial scenarios that exhibit more diverse and unique environmental features & to add them to the set of 3GPP channel models [5].

Consequences for NR IIOT positioning

- Currently, NR IIOT positioning is **not** explicitly in the scope of any ongoing Rel-16 project

- Technically speaking, NR IIOT positioning can already be evaluated, based on contributions, in the ongoing NR Positioning SI.
- However, since, as mentioned earlier, propagation conditions and deployment scenarios in a factory hall may differ from an Indoor Office (Scenario 1), the results may be misleading from a IIOT perspective

- There should be an agreement in principle that, once scenarios and channel models for indoor industrial use cases have been developed, the evaluation of NR positioning technologies be extended with these scenarios
  - There should be some understanding on how to do that to avoid that IIOT positioning “falls through the cracks”

Proposal on how to address the gap in 3GPP

- The NR Positioning Study Item [1] is supposed to be completed at RAN#83 (March 2019).
- The Study on Channel Modeling for Indoor Industrial Scenarios [5] is supposed to be completed at RAN#85 (September 2019).
- To address positioning requirements for IIoT, the following is proposed:

Proposal 1: Evaluation of indoor positioning performance (incl. industrial use cases) continues within the NR positioning study item using Scenario 1 [3].

Proposal 2: Once the scenarios and channel models tailored for industrial use cases have been completed, continue the evaluation of positioning solutions with these new scenarios (even if the NR positioning work could be in the WI phase by then). Edit the NR positioning SID accordingly (see next slide)

Proposal 3: The study on channel models currently being developed for indoor industrial scenarios [5] should also be edited to indicate support of studies on positioning performance.

Proposed edit to the NR positioning SID

- *Define a representative number of evaluation scenarios for indoor and outdoor*
  - *One use case representing indoor (e.g. Indoor Office as a baseline)*
  - *One use case representing outdoor (Umi-street canyon and Uma scenario as baseline)*
  - *One macro deployment from TR37.857 for FR1*
  - *Note: Any specific deployment scenarios are also studied including evaluation scenarios for FR2.*
  - *Note: IIoT specific scenarios will be studied once the channel modeling for Indoor Industrial Scenarios has been completed.*

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Proposed edit to the IIoT Channel Modeling SID

4.1 Objective of SI

The study item aims to develop a channel model to support studies on URLLC/IIOT enhancements and positioning for industrial scenarios and use cases.

Conclusions

- Industrial IOT positioning is an important element to enable the adoption of 5G NR on the part of the IIOT segment
- Due to the current arrangement of the various Rel-16 projects, IIOT positioning is not in the scope of any ongoing activity: we should avoid it falls through the cracks
- We propose edits to the NR Positioning SI and to the IIOT Channel Model SI accordingly
- These changes need not impact current RAN1 and RAN2 directions during the NR positioning SI phase

References

[1] RP-182155, "Revised SID: Study on NR positioning support", Intel Corporation, Ericsson.

[2] 3GPP TR 22.104: " Service requirements for cyber-physical control applications in vertical domains".

[3] 3GPP TR 38.855: "Study on NR positioning support".

[4] RP-181521, "LS on Channel Model for Indoor Industrial Scenarios", 5G Alliance for Connected Industries and Automation.

[5] RP-182138, "New SI proposal: Study on Channel Modeling for Indoor Industrial Scenarios", Ericsson.