RP-170219

MOTIVATION FOR WI - HIGH ACCURACY POSITIONING

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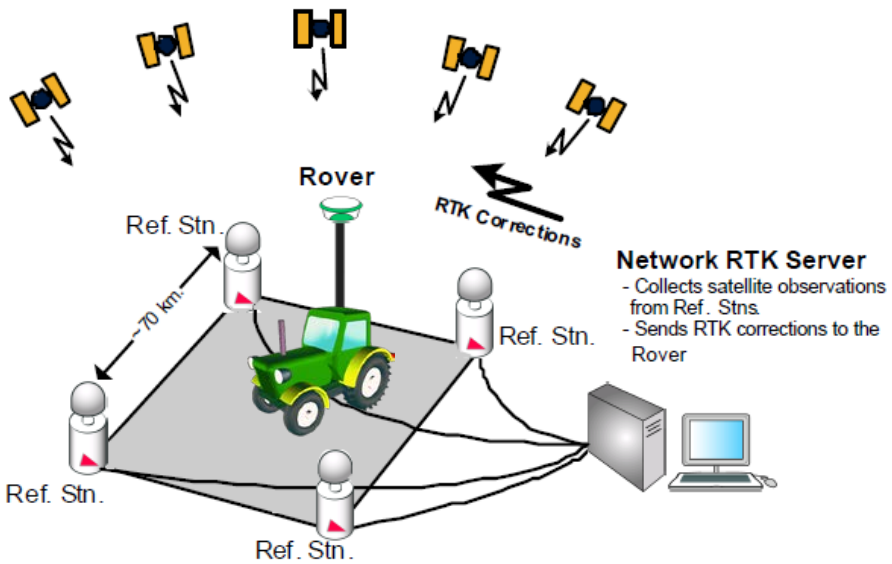
GENERAL MOTIVATION

- RTK (Real Time Kinematic) is an established technology bringing GNSS-based positioning down to cm accuracy.
- Network RTK applications make use of legacy GSM/UMTS/LTE or mobile internet connectivity in order to feed GNSS receivers with appropriate correction data.
- Although initially applied by specialized services, e.g. surveying, Network RTK nowadays is applied in various specialized business applications like precision farming, road construction..
- Anticipated developments of RTK receiver technologies and ubiquitous availability of mobile connectivity will enable further use cases for high precision positioning opening the potential for volume services.
- Efficient support of high precision volume service requires alignment to mobile network and radio resources by applying broadcast transmission of correction data on radio cell basis when the penetration of correction data receivers is sufficient.
- A transparent broadcast channel is needed for conveying continuously correction data at low data rates. By this existing and evolving correction data standards shall be supported.

FROM POINT-2-POINT TO POINT-2-MULTIPOINT SERVICE

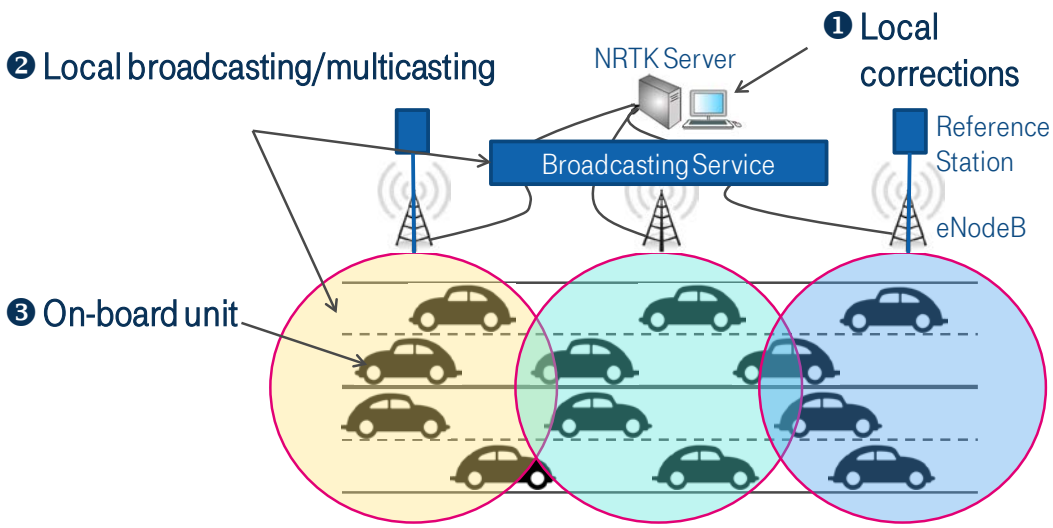
Status quo

- Corrections data transmitted via individual internet connections (uni-cast) to RTK receivers
- Correction service and mobile network service mainly decoupled



Volume Service

- Broadcasting of correction data with regional validity
- Supports service integration
- Allows alignment of RTK infrastructure with mobile network



LIGHTWEIGHT BROADCAST CHANNEL

Correction data

- RTK corrections (or raw observation of reference stations) follow standardized format defined by Radio Technical Commission for Maritime Services organization (RTCM), also other exist
- Different versions of RTCM standard exist, latest: RTCM3.2; future versions can be expected
- RTCM copes with the various GNSS systems in use, e.g. GPS, GLONASS, BeiDou, Galileo
- Rough characteristics of data stream: chunks of correction data provided with 1Hz, summing up to an average data rate below 10kbps (to be revisited).

Capabilities and requirements on the broadcast/multi-cast/uni-cast channel

- Transparent channel on radio cell basis serving the relative low data rate requirements of correction data (see above); channel may be re-used for other data streams of similar characteristics
- Shall provide sufficient service in the entire radio cell coverage area, also reliable at cell edge
- Shall be encrypted in order to support subscription service
- A uni-cast mode shall be considered in case of insufficient penetration of correction data receivers
- Special emphasis shall be given to the efficient correction data distribution and the lean adaption of the system architecture where necessary

OBJECTIVES OF WI: DEFINING THE RIGHT APPROACH

- Definition of functionality in Rel-14 to enable efficient distribution of RTK correction information based on LTE SIB broadcast (considering similar distribution via 5G-NR BCCH in a future WI); principles of the current LTE Positioning framework, e.g. LPPe, should be reused as much as possible [RAN2, RAN3, SA2]
  - Support different versions of RTCM standard exist, latest: RTCM3.2; forward compatible with future versions
  - RTCM copes with the various GNSS systems in use, e.g. GPS, GLONASS, BeiDou, Galileo, QZSS
  - Shall provide sufficient service in the entire radio cell coverage area, also reliable at cell edge
  - A uni-cast mode shall be considered in case of insufficient penetration of correction data receivers
- Definition of related performance requirements for RTK positioning [RAN4]
- Support RTK correction service subscription [RAN2, RAN3, SA3, SA2]
  - RTK data shall be encrypted in order to support subscription service
  - The encryption key is delivered to UE by unicast using a separate procedure

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