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UAS Connectivity over NR

RAN Rel-18 Workshop

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Nokia, Nokia Shanghai Bell

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UAS Connectivity over NR: Motivation

- The number drone use cases is large and cellular networks with their ubiquitous coverage are the best candidate for serving them and therefor a great opportunity for mobile operators.
- In LTE rel 15 a number of aerial features were introduced, which were targeting interference mitigation, improved reliability and lowering overhead from measurements.
- Issues to open the full potential of cellular networks to serving drones is reliability for the C2 link along the flight path and co existence with terrestrial users (especially in the uplink due to drones often requiring large uplink throughputs.
- This work item aims to enhance Aerial UE support for NR in Rel-18. Besides some of the same features as introduced in rel 15, the following should be studied:
  - Measurements/mobility enhancements to control the choice and amount of measurements
  - Enhancements for co-existence for high uplink aerial throughputs
  - Support of mechanisms of ensuring reliability guarantees along the flight path
  - Further enhancements for increased reliability
- Furthermore FAA has issued a requirement to broadcast the ID, which should be supported by NR, which can be done through broadcast solutions.

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UAS Connectivity over NR : Objectives

- Aerial UE specific reporting, like height, location and flight path [RAN2]
- Subscription based identification [RAN2/RAN3/SA2]
- Measurements/mobility enhancements to control the choice and amount of measurements [RAN2]
- Enhancements for co-existence for high uplink aerial throughputs [RAN2]
- Support of mechanisms of ensuring reliability guarantees along the flight path [RAN1/RAN2]
- Enhancements for increased reliability [RAN1/RAN2]
- Support for UAV to ground identification through broadcast [RAN2]

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UAS Connectivity over NR : Objectives in more detail

- Aerial UE specific reporting, like height, location and flight path [RAN2]
  - Required for UAV specific RRM, reliability guarantees.
  - The signaling overhead should be kept small
- Subscription based identification [RAN2/RAN3/SA2]
  - Enabling similar functionality as in rel 15 LTE.
- Measurements/mobility enhancements to control the choice and amount of measurements [RAN2]
  - Ensuring the overload from measurements can be avoided while the required information is achieved by RAN for mobility decisions.
- Enhancements for increased reliability [RAN1/RAN2]
  - Avoiding in the uplink Tx power splitting is decreasing the reliability in the uplink.

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UAS Connectivity over NR : Objectives in more detail

- Support of mechanisms of ensuring reliability guarantees along the flight path [RAN1/RAN2]
  - It expected that the UTM/USS/Uspace will base its decision flight permissions on the availability and reliability of cellular connectivity along the flight path.
  - Network planning methods by themselves are not accurate enough to predict this, as load changes and different UEs may have different behaviour.
  - There the network together with the aerial UE can provide information which enables more accurate estimation of the availability and reliability along the flight path.
  - It is different from MDT/SON in the sense that this may have an active7online component which can be used to inform the UTM/USS/Uspace of changes in availability and/or reliability.

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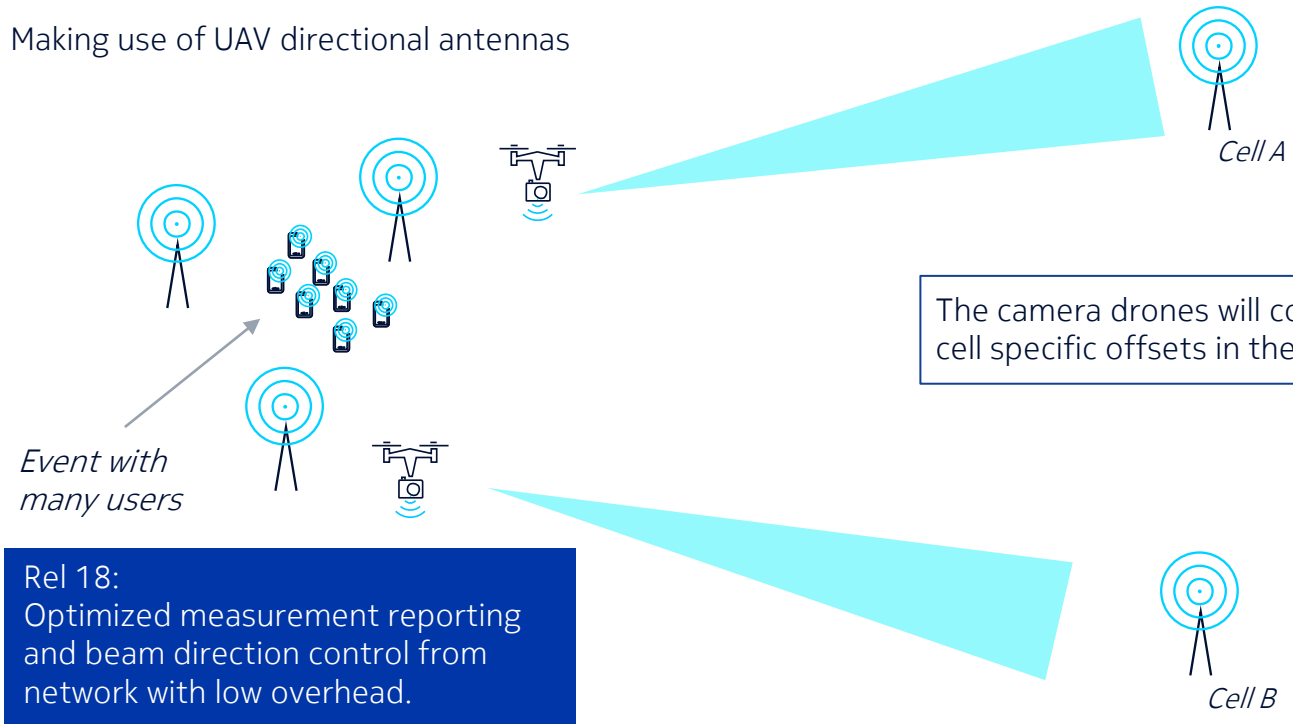
UAS Connectivity over NR : Objectives in more detail

Enhancements for co-existence for high uplink aerial throughputs [RAN2]

Making use of UAV directional antennas



The camera drones will connect to cell A and B through cell specific offsets in the handover algorithms

Rel 18:
Optimized measurement reporting and beam direction control from network with low overhead.

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