

3GPP TSG-SA WG1 Meeting #92e S1-204171  
Electronic Meeting, 11 November - 20 November 2020



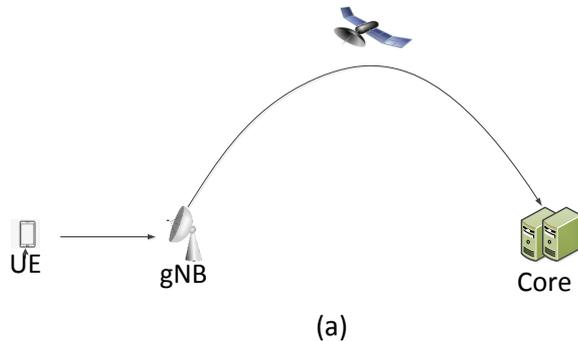
# Discussion on Enhancing 5G System with NTN

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- **Public users want to always access the mobile networks without changing equipment or Subscriber Identity**
  - 4.59 billion civil aviation passengers in the world in 2019
  - 1.2 million seafarers and 65 thousands ships onboard every day
  - At least 1.22 billion Adventure tourists in the world in 2019
  - In the extreme rural areas, it is hard or expensive to deploy a whole terrestrial 5G system
- **Vertical business hope an integrated private network services provided by one single operator to achieve the worldwide business management, especially for the business in coverage hole**
- **Ability enhancement in satellite & HAPS are needed to provide more services, for example, coverage expansion (rural & islands) , disaster recovery/ prevention, remote sensing and ecological monitoring**

# Potential scenarios

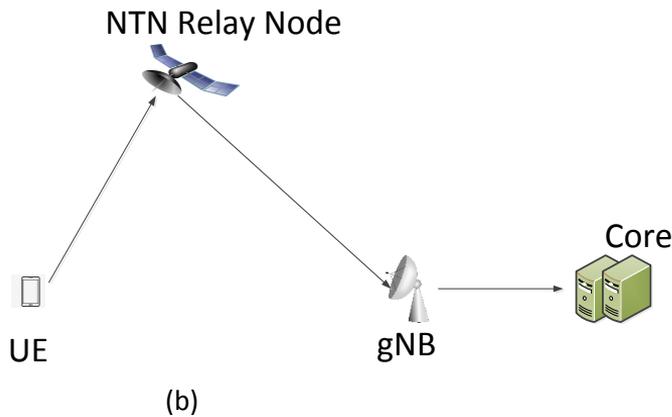
- Transparent relay for UE, relay or gNB, where (a) is proposed



- Potential requirements:

- The 5G system shall support mobility management of UEs accessed in the gNB with high speed.

- Regenerative relay for UE and relay, where (f) is proposed



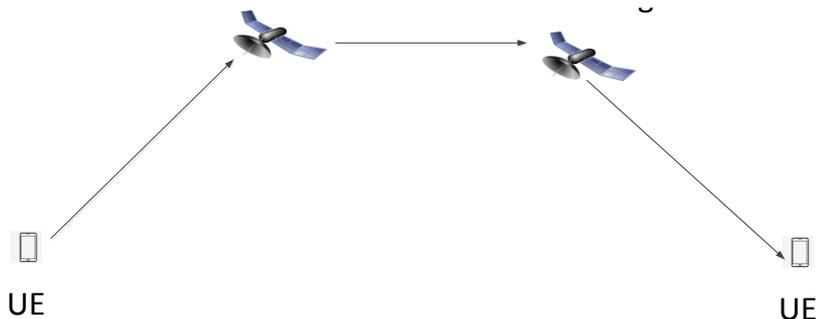
- Potential requirements:

- The 5G system shall support wireless backhaul of mobile NTN relay nodes which may be in motion related to both UEs and remote gNB.
- The 5G network shall support topologically redundant connectivity on the wireless self-backhaul of NTN relay nodes.

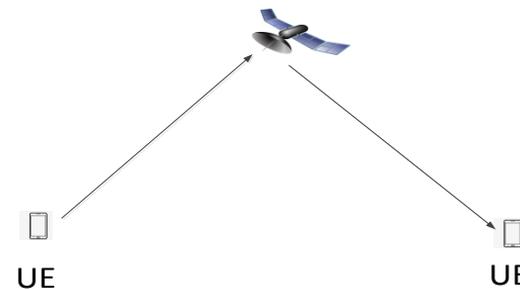
# Potential scenarios

- **Low delay scenarios**

- We propose scenarios (c) and (d) to reduce the E2E delay



(c)



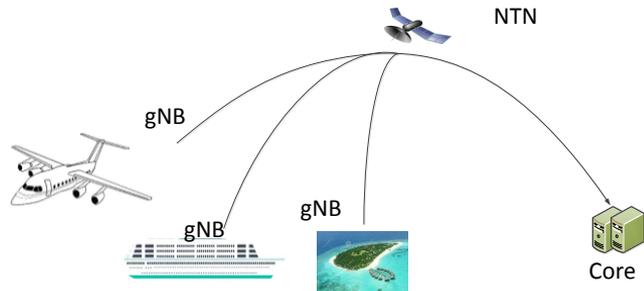
(d)

- **Potential requirements:**

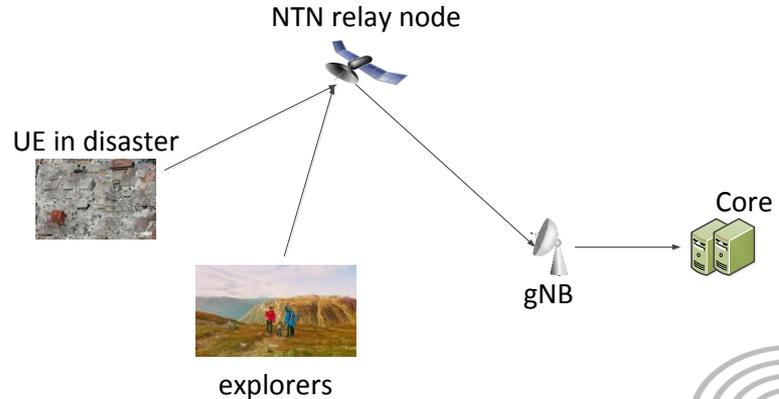
- The 5G UE can directly communicate with another UE via NTN access network.
- Enhance the KPI for 5G NTN systems, for example delay.

# Example Use Cases

- **Scenario (a): Transparent backhaul for gNBs**
  - Backhaul for gNBs in mobile platforms, such as aircraft, cruise ship or high-speed trains.
  - Backhaul for gNBs in a coverage island.



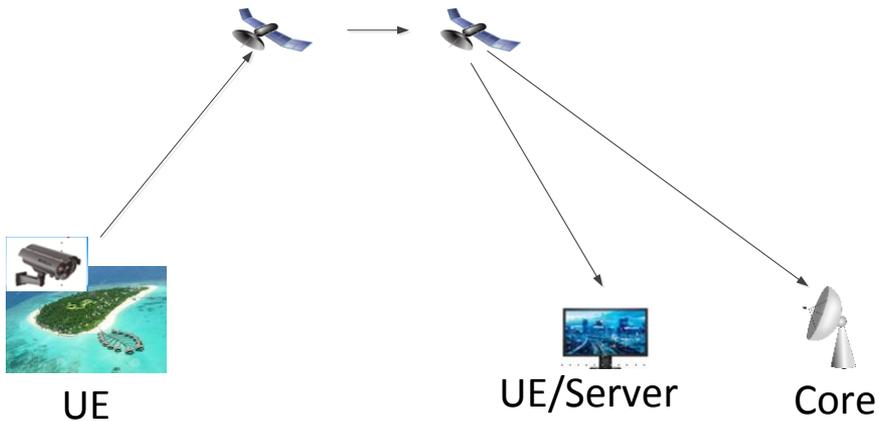
- **Scenario (b): generative NTN relay to ground gNB**
  - Communication recovery in regions after disaster
  - Flexible access when the user is leaving the terrestrial NR coverage



# Example Use case

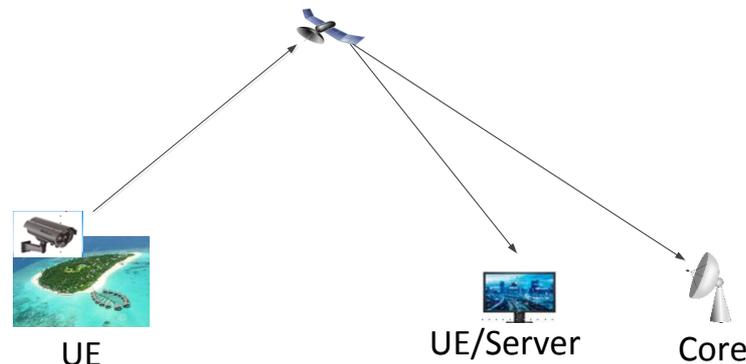
- **Scenario (c): low delay scenarios in coverage of different NTN nodes**

- Users/ users and servers in the coverage of different NTN nodes are allowed to communicate with each other with the direct ISL without backhaul to the ground



- **Scenario (d): low delay scenarios in the coverage in one NTN nodes**

- Users/ users and servers in the coverage in one platform are allowed to communicate with each other via the NTN nodes without backhaul to the ground



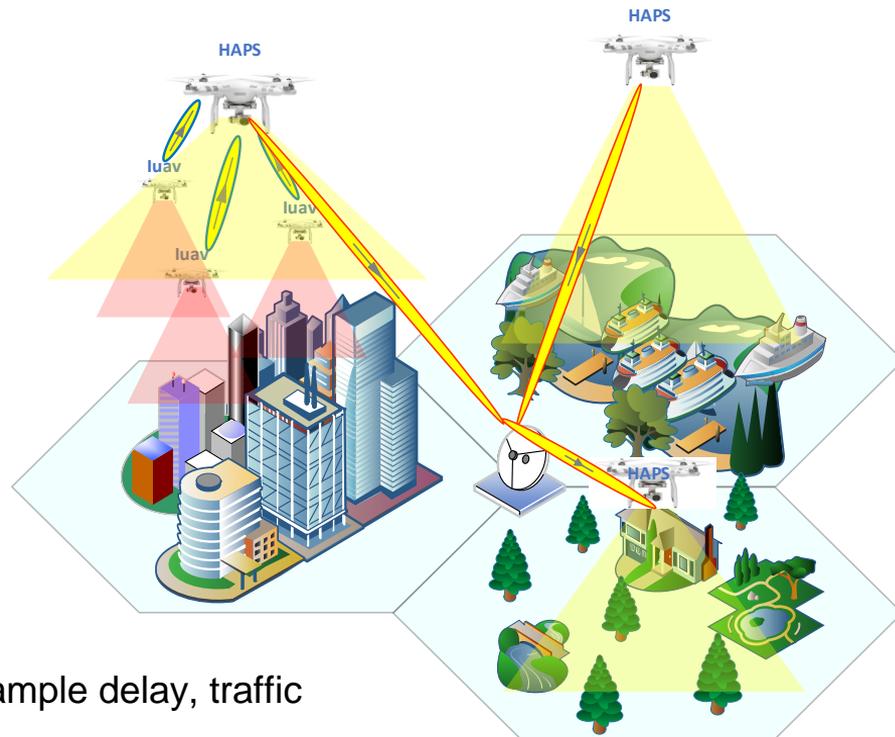
# Example Use Cases

- **HAPS is very likely to be used for MNOs**

- Coverage Expansion ( Rural & Islands )
- Disaster Recovery/Prevention
- 3D Coverage ( Drone IOTs )

- **Potential requirements:**

- KPI for a 5G system with HAPS access, for example delay, traffic capacity and so on.



- **There is a need to study the proposed scenarios to meet the requirements of more access flexibility.**
  - Backhauling and relaying by NTN might provide a solution for the lacking backhaul to the core network or lacking a terrestrial connection between UE and network.
  - The different backhaul technologies provide different performance concerning data rate, delay, availability, resilience, etc.
  - The different relay solutions also influence the performance because of the propagation distance and the mobility of the non-terrestrial nodes.
  - To reduce the E2E delay introduced by the long propagation distance, UE can directly deliver data to another UE via NTN access network.
- **There is a need to study the support for 5G HAPS, for example KPI.**

- **The aim of this work is to identify and to study new use cases and KPI to support 5G enhanced with NTN components (e.g. satellite GEO, LEO, with or without inter satellite links, HAPS, etc.) be used:**
  - as transport / backhaul in a 5G system.
  - as relay node from UE to ground gNB in a 5G system.
  - to reduce E2E delay.
  - to investigate gap analysis for QoS Control , management , charging and etc.



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**Thank you!**