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5G NTN Use Cases Summary of 3GPP TR 22.865 v19.2.0

3GPP Document Scope

1 Scope

The present document describes use cases and aspects related to enhancements of the 5G system over satellite, including:

- Store and Forward (S&F) Satellite operation for delay-tolerant communication service
- UE-Satellite-UE communication
- GNSS independent operation
- Positioning enhancements for satellite access



Our focus

Potential service requirements are derived for these use cases and are consolidated in a dedicated chapter.

The report ends with recommendations regarding the continuation of the work.

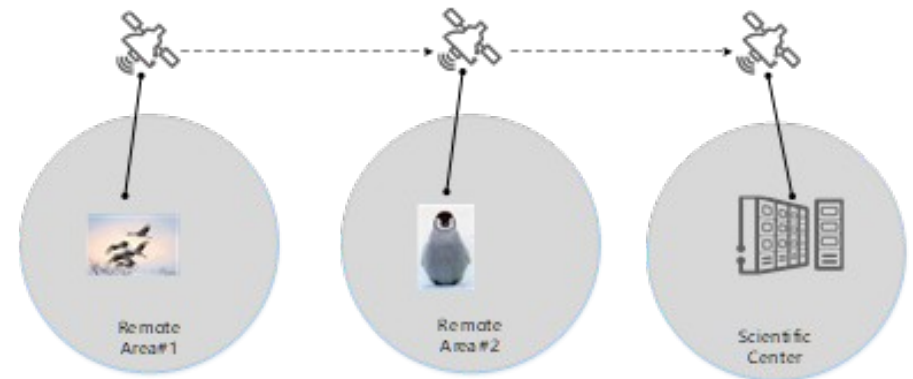
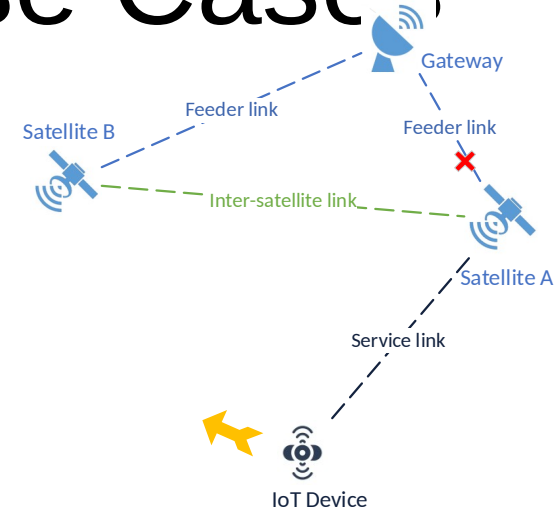
Overview

The present document captures a set of use cases and potential service requirements related to the 5G system with satellite access taking into account new capabilities such as:

- 1. S&F Satellite operation for delay-tolerant communication services:** S&F Satellite operation is an operation mode of a 5G system with satellite-access, where the 5G system can provide some level of service (in storing and forwarding the data) when satellite connectivity is intermittently/temporarily unavailable, e.g. to provide communication service for UEs under satellite coverage without a simultaneous active feeder link connection to the ground segment. **This is particularly relevant for delay-tolerant IoT services via NGSO space segment.**

List of Store-and-Forward Use Cases

- **Mobile originated/terminated messages**
 - S&F service between a UE with satellite access and an Application Server for a delay-tolerant/non-real-time IoT NTN service.
- **Inter-satellite**
 - To expand the market of delay-tolerant IoT devices, store and forward operations are necessary to be developed to sustain the user plane data during the feeder link disconnection between the satellite and the terrestrial gateway.
- **Data transfer for IoT devices in remote areas**
 - In remote areas, there is no terrestrial network for various reasons, e.g. it is difficult to build and maintain communication towers. As a result, this makes it challenging to collect information for environmental protection purposes in these areas.
- **Emergency report**
 - Store and forward emergency report and position with confirmation of receipt; no end-to-end connectivity



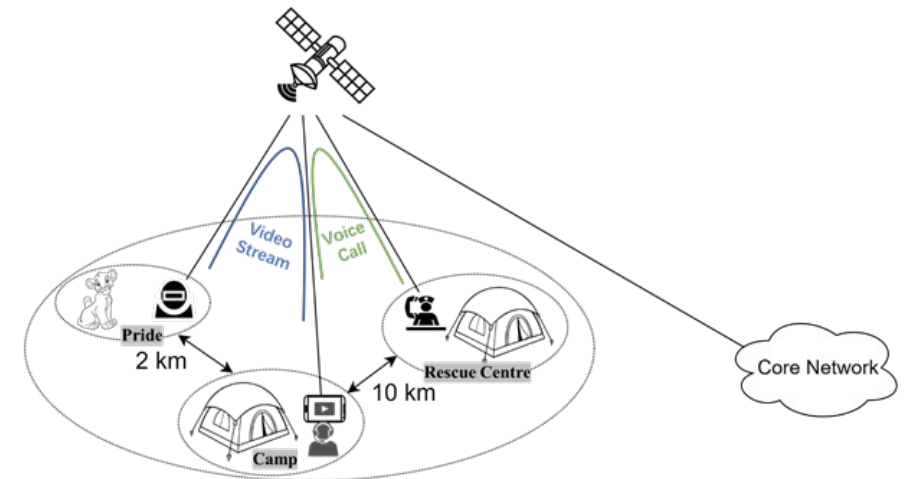
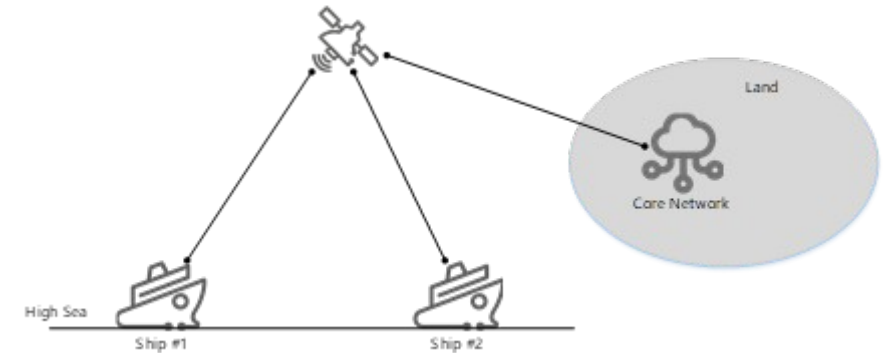
Figures 5.3.1-1 and 5.4.3-1 from TR 22.865

Selected Store-and-Forward Requirements from TR 22.865

- Subject to operator's policies, a 5G system with satellite access shall be able to **support S&F Satellite operation** for authorized UEs; e.g. store data on the satellite when the feeder link is unavailable, and forward the data once the feeder link between the satellite and the ground segment becomes available.
- Subject to operator's policies, a 5G system with satellite access supporting S&F Satellite operation shall be able to **support forwarding of the stored data from one satellite to another satellite** (e.g., which has an available feeder link to the ground network), through ISLs.
- Subject to operator's policies, a 5G system with satellite access supporting S&F Satellite operation shall be able to allow the operator or a trusted 3rd party to apply, on a per UE and/or satellite basis, an **S&F data retention period**.
- Subject to operator's policies, a 5G system with satellite access supporting S&F Satellite operation shall be able to allow the operator or a trusted 3rd party to apply, on a per UE and/or satellite basis, an **S&F data storage quota**.
- A 5G system with satellite access supporting S&F Satellite operation shall be able to support a mechanism to **configure and provision specific required QoS and policies** for UE's data subject to store and forward operation (e.g. forwarding priority, acknowledgment policy).

List of Other Use Cases

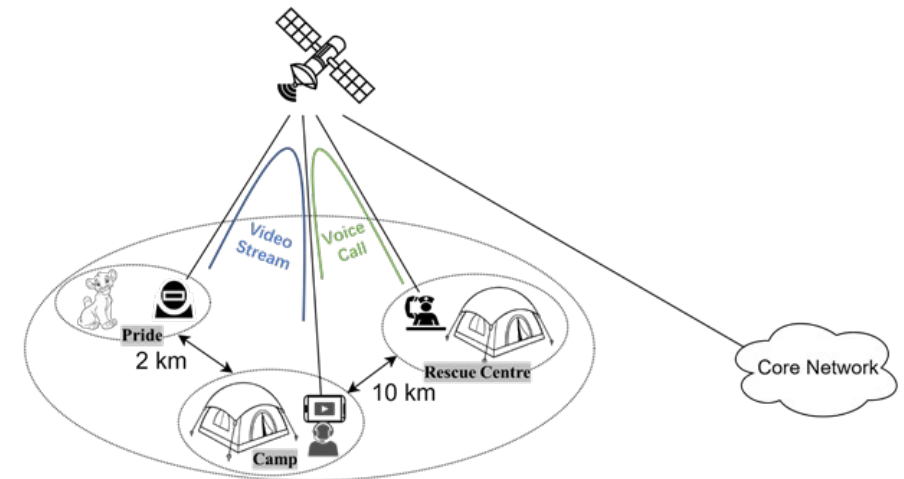
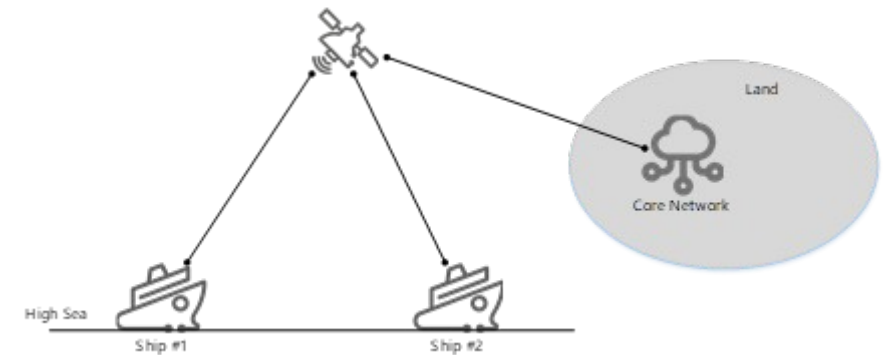
- **LAN using satellite access**
 - LAN access to users over 5G satellite network
- **Information exchange between ships at sea**
 - Maintain ship-to-ship communications even when feeder link to ground station becomes unavailable
- **Support of UE-satellite-UE phone call**
 - Phone call over a roaming 5G satellite network
- **Enabling multiple communication services between UEs**
 - Alerts/notifications, voice calls, and streaming video over 5G satellite network; maintaining quality of service
- **Usage of satellite connectivity for collection of information to aid terrestrial network planning**
 - Collect 5G satellite usage statistics to plan for a terrestrial network
- **Vehicle fleet management in the desert**
 - Status updates among trucks over 5G networks, switching from terrestrial to satellite and back to terrestrial



Figures 5.6.3-1 and 5.8.2-1 from TR 22.865

List of Other Use Cases

- **Service differentiation for UEs via satellite access**
 - Determine available services to users based on the positioning capability and mobility
- **UAVs using satellite access**
 - High-fidelity images and location from UAV to a fire monitoring center; commands to the UAV
- **Enhanced Positioning Service using satellite access**
 - Emergency phone calls and location services via 5G satellite after a natural disaster
- **Service continuity for UE-to-UE communication between satellites**
 - Maintain voice and data connectivity during handovers between satellites
- **Service continuity for UE-to-UE communication in case of mobility between satellite and terrestrial network**
 - Maintain connectivity among small aircraft as one or all of them move out of terrestrial network coverage



Figures 5.6.3-1 and 5.8.2-1 from TR 22.865