

Progress of NetShare phase 2

China Unicom

weiqun5@chinaunicom.cn



Summary of Progress



- 📶 Previous work: SA1#104 meeting clarified project motivation and background clarification.
- 📶 SA1#105 meeting provided typical use cases, completed the analysis including gap with existing technologies, impact on UE and impact on RAN as follows:
 - Point 1: NetShare phase2 lies in extending indirect network sharing scenarios considering the fundamental design of R17 and R18 satellites. NetShare phase1 as baseline.
 - Point 2: Disaster scenarios do not bring a repetitive review of scenarios already presented by MINT, but extend the necessary cases when UE does not support MINT.
 - Point 3: Clarified the difference between R20 “Satellite access - Phase 4”(agreed on SA1 #105) and NetShare phase 2, the latter focusing on terrestrial enhancement of the sharing of satellite access of terrestrial MNOs.
 - Point 4: Further introduced the SID motivation and business model.
- 📶 Pre SA1 #106 meeting, we focused on resolving the remaining wording issues in SA1 #105 NetShare phase2 objective, for example:
 - For point 3 in SA1 #105 meeting, specifically, selecting word matching point 3 in potential options " Sharing satellite network", " satellite access network" or "satellite access" to qualify the correct scope for the SID.
 - The new Objective was updated on the basis of suggestions and comments collected from the preparation meetings.

Issues and Way Forward

Unresolved issues:

- Should the NetShare phase2 satellite stabilised wording be updated to the satellite SID?

We did:

- Seeking input from satellite key supporters and interest companies to provide satellite SID updates, before SA1 #106 meeting.
- Prepared NetShare phase2 SID updates to gather input at Jeju Island meeting.

Way forward:

- Option1: NetShare phase2 SID with satellite and disaster aspects.
- Option2: NetShare phase2 WID with satellite and disaster aspects.
- Option3: NetShare phase2 WID with only disaster aspect.

Target for this meeting:

- Looking for guidance from SA1 on way forward and to check the stability of the scope of NetShare phase2 SID updates.

Thank you



Last meeting use cases

Scenario I: Sharing satellite network

Analyses and Motivation

- Indirect Network Sharing (INS) has been studied and specified in R19 NetShare item. The use case of "satellite network sharing" has been introduced, described in clause 5.7 of TR 22.851.
- However, there are still aspects regarding the sharing of satellite network via indirect network sharing that have not been fully investigated in R19 item.
- **Problems:** For satellite sharing, one of the challenges for the partners' network operators is related with the compatibility and maintenance generated by the interconnection between the shared satellite and two or more core networks via MOCN.
- **Motivation of INS: It can avoid revisiting N2 work between satellites and new participating operators. (Figure 4)**

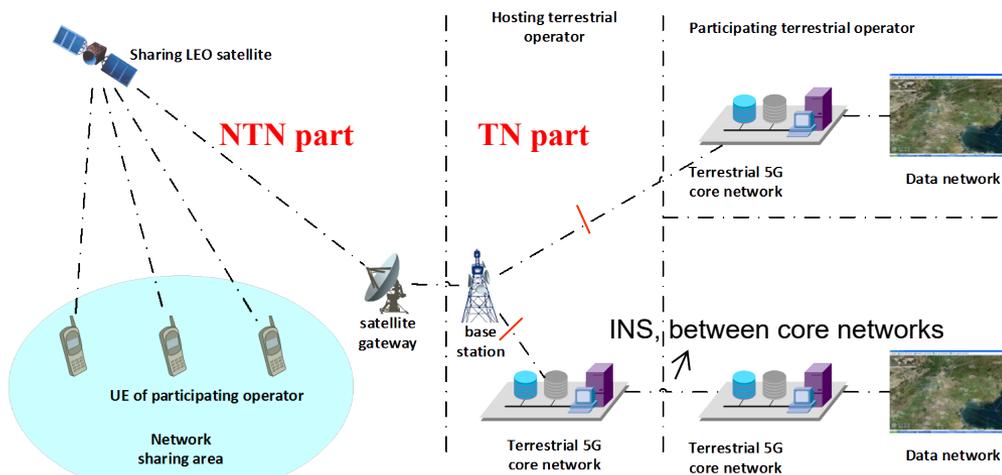


Figure 4: Motivation of INS on sharing Satellite

Problem for R19 INS

- R19 Hosting Operator may operate core network and Shared NG-RAN(**TN part**), while satellite network sharing involves **TN and NTN parts**.
- New business model, **agreements related with OP1,OP2 and satellite**.

proposal for SA1 R20

- The concept of INS R20 may introduce the possibility to support additional new business role models, including:
 - **Sharing satellites**
 - **Hosting terrestrial operator**
 - **and participating terrestrial operator.**

Legend: -- The N2 work between the satellites and the new participants was the red line.

Business Model Use Case

Two sharing model applicable to satellite.

- Assuming that LEO satellite are willing to share network as hosting operator. It may have used MCC 9xx broadcast signals. In order to improve efficiency and simplify operation process, the satellite prefer to connect one TN operator (OP1) for satellite resource sharing.
- OP2 and OP3 both as participatings. There are two sharing method for OP2 and OP3 depend on agreements.
- For OP2, OP1 and satellite operator serve as Hosting (as indirect network sharing);
- For OP3, satellite operator play the role of Hosting (as MOCN);

business models

- There are at least three distinct stakeholder relations:

1) **The hosting terrestrial operator (OP1)** owned shared satellites;

2) Third party company own and manage **shared satellites**, which are connected to the 5G core network;

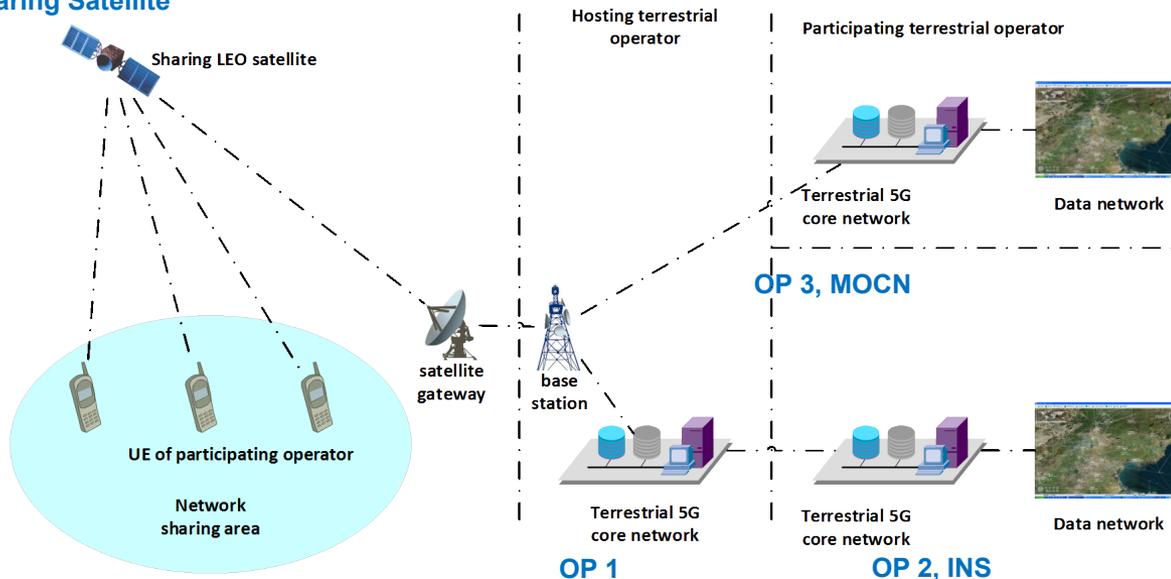
3) **Participating operators (OP3)** can use satellite resources through the terrestrial operator's core network hosting or connecting sharing satellites mentioned above.

- Other potential use cases.

- **R20 Satellite network sharing assumes INS R19 as baseline.**

- **High compatibility with TR 22.851 FS_NetShare.**

Sharing Satellite



Other 2 Use Cases



Alignment of Sharing Information

- When working with satellite, participating operators hope to specific signal coverage area of the shared satellite on the ground.
- GA1 (Geographical Area 1) is a TN shared area and GA2 is an NTN shared area. Reasonable division of coverage will help reduce signal overlap, but this also depends on the accuracy and reliability of the satellite operation in terms of geographic location and signal transmission. The requirements for the satellite itself are outside the scope of the SID. (Figure ①)
- OP2 as one participant of satellite sharing, synchronises the sharing information with the satellite in accordance through OP1's core network. (Figure ②)
 - For the INS network, this involves OP1's network;
 - For the MOCN network, this involves only NTN satellite and participant.

Satellite OP

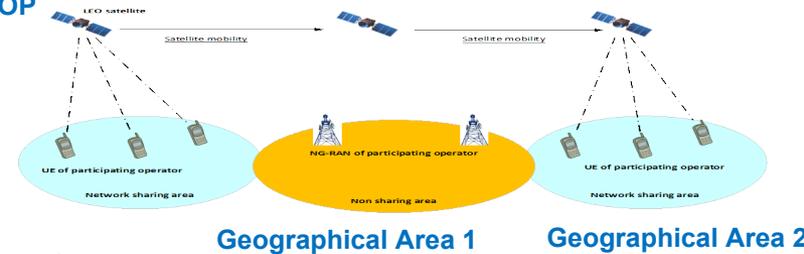


Figure ①

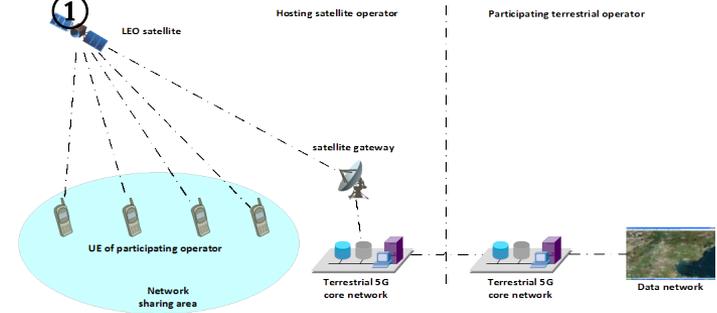


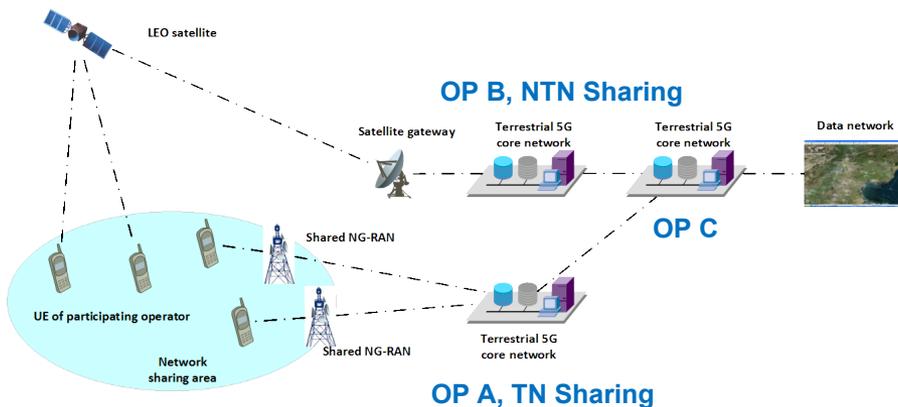
Figure ②

OP 1 OP 2

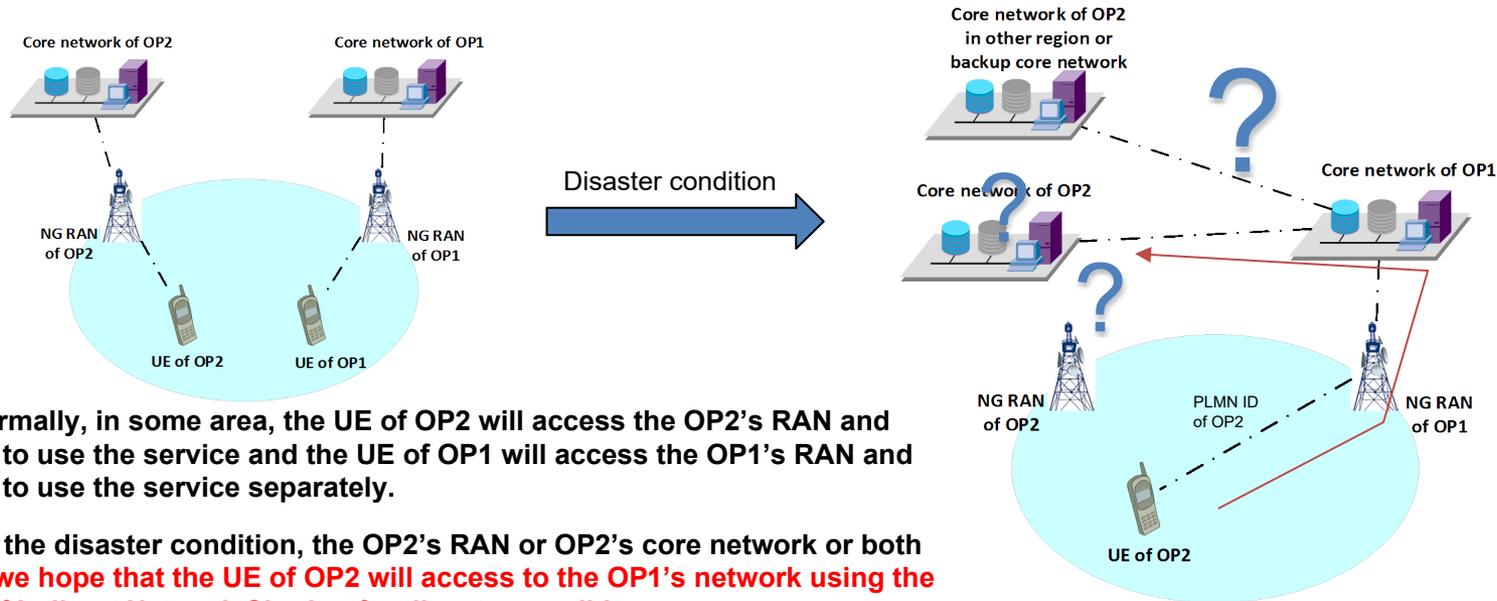
Overlap of Shared TN and NTN

- OP C, as participant of OP A's shared NG-RAN;
- OP C, as participant of NTN shared satellite via OP B's network, while the shared TN and NTN have a high probability of overlapping coverage;
- OP C will provide network selection prioritisation based on the agreements and the policy of the OP C's network;
- This part of the requirements need to be re-visited when sharing happens via multiple access.

Sharing Satellite



Scenario 2: Network sharing for disaster condition



Use case: Normally, in some area, the UE of OP2 will access the OP2's RAN and core network to use the service and the UE of OP1 will access the OP1's RAN and core network to use the service separately.

When arising the disaster condition, the OP2's RAN or OP2's core network or both broke down, **we hope that the UE of OP2 will access to the OP1's network using the mechanism of Indirect Network Sharing for disaster condition.**

Motivation

- Since Indirect Network Sharing (INS) has been studied and specified in R19 NetShare item. it is very natural to export INS to support disaster condition. It can effectively reduce the impact on legacy UE.

Problems:

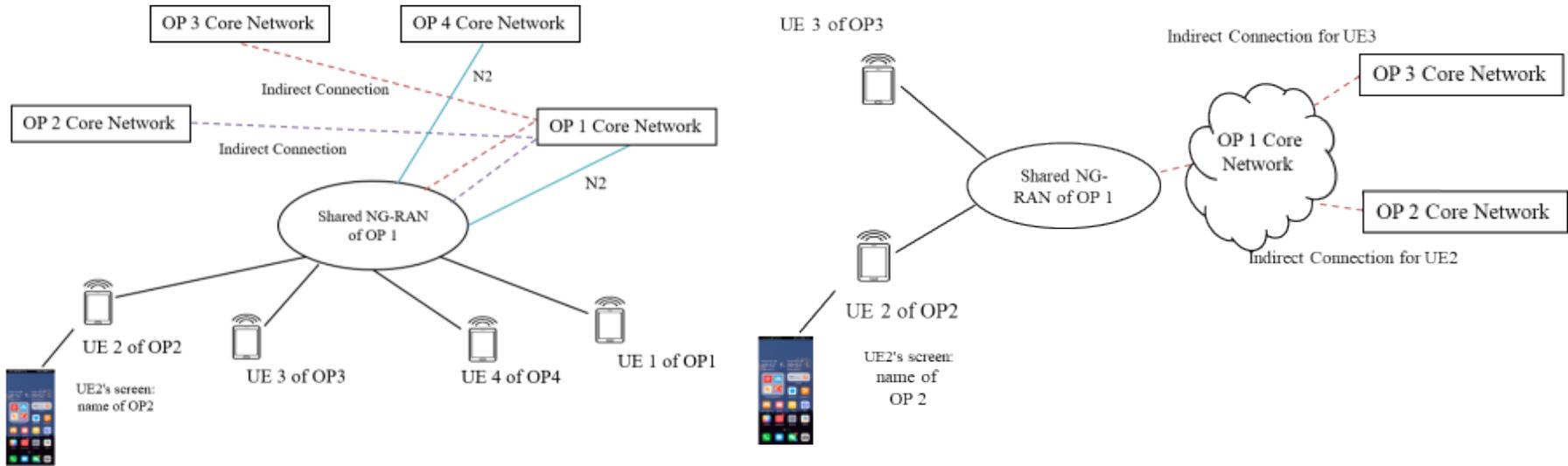
- NG-RAN outside the sharing area provide no OP2's information normally.
- There maybe OP2's core network elements in the disaster condition connected OP1's core network.

Gaps:

- 3GPP TS 22.261 indentified MINT requirements for disaster condition, which has a clear definition in TS 22.261 clause 6.31 of using network of **other/another PLMNs**, rather than INS.

Propose: R20 Network sharing for disaster condition assumes INS R19 as baseline.

The existing requirements in R19



The requirements on Indirect Network Sharing have been specified in clause 6.21 of TS 22.261 under the following aspects:

- General
- Mobility
- Network access control
- Regulatory services
- Charging

NOTE : Requirements of Indirect Network Sharing assume no impact on UE.

Potential Scenario in R20: shared satellite network

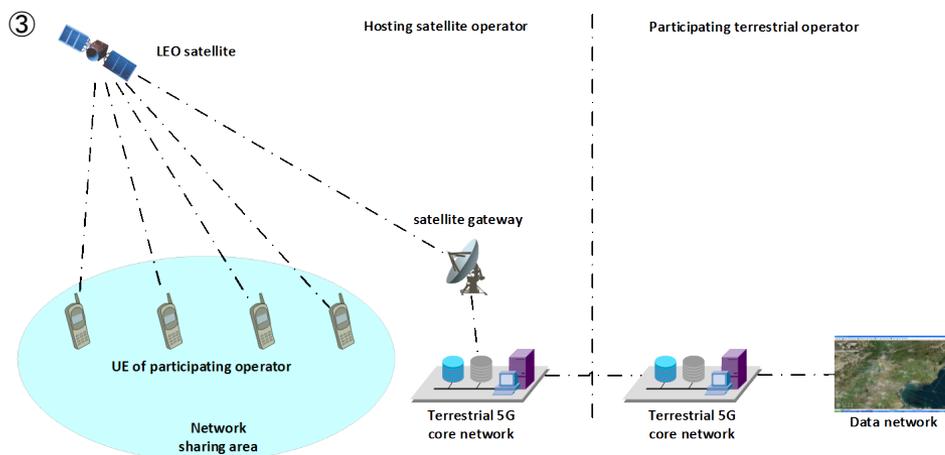
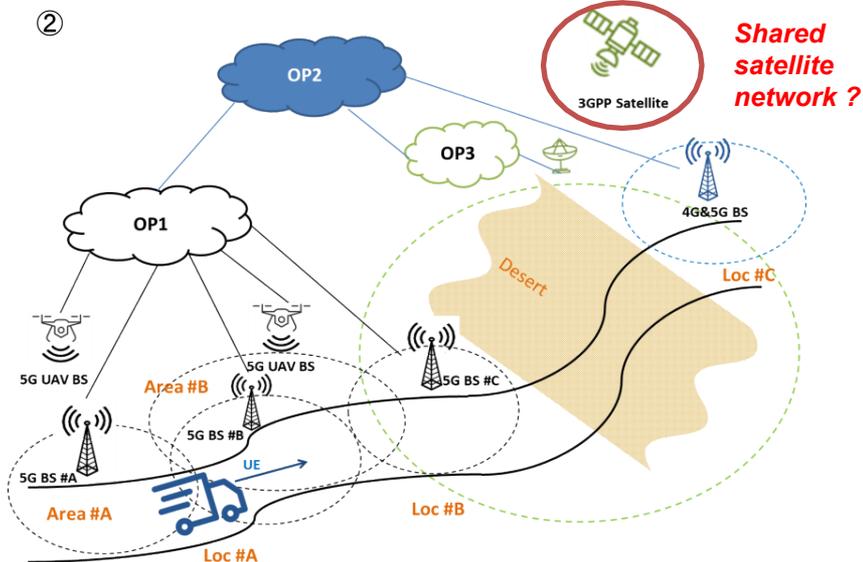
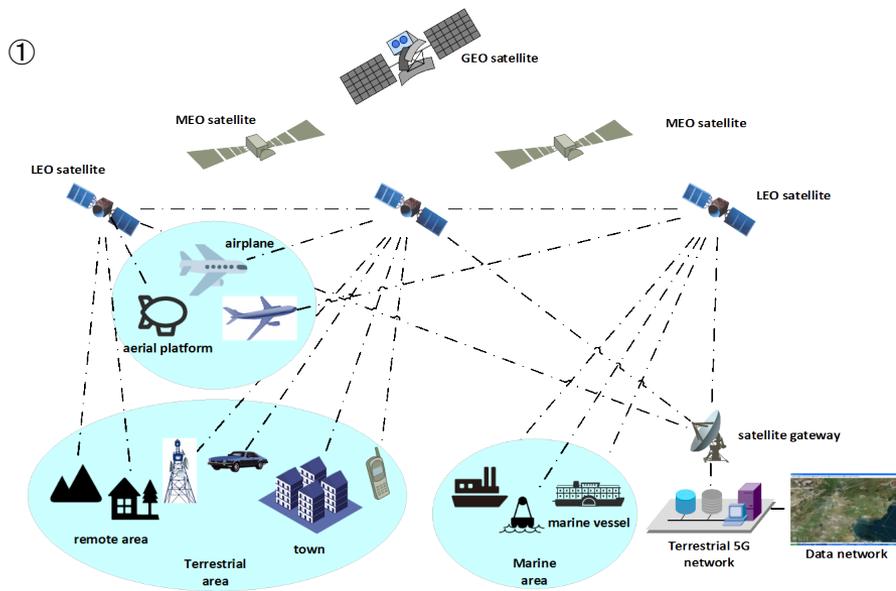
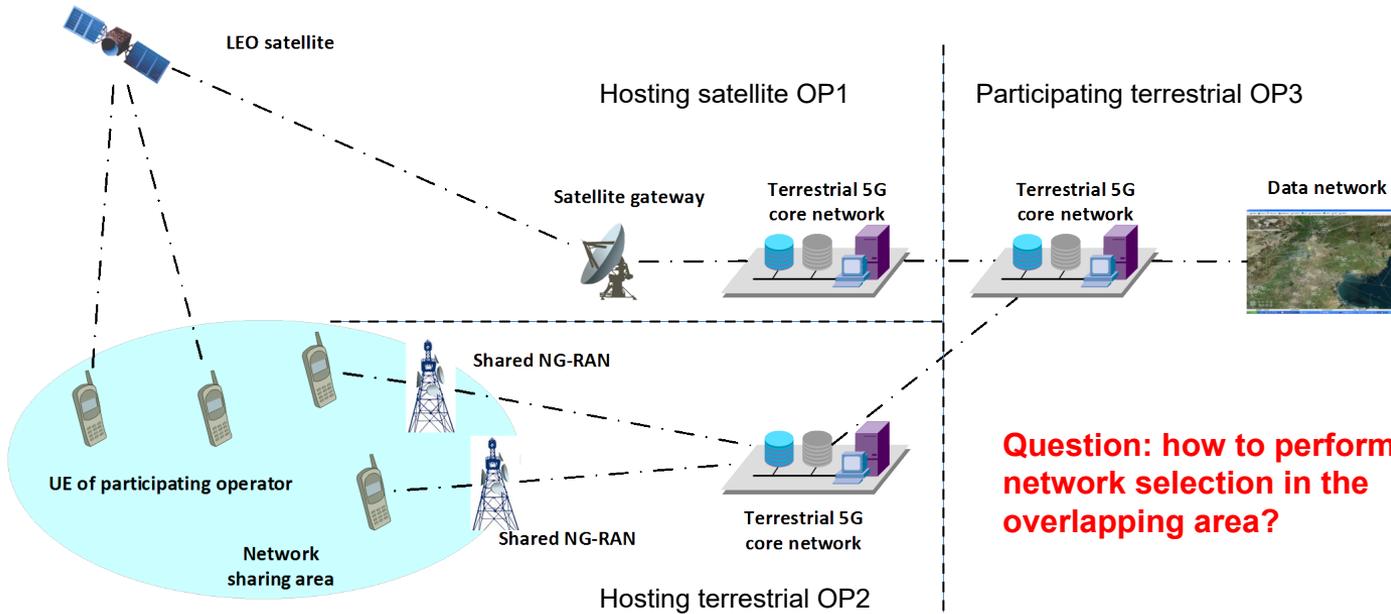


Figure ① : Satellite network is not only an effective complement to terrestrial networks, but can also play an important role in network access in areas or scenarios that are inaccessible to terrestrial networks.

Figure ② : The use case described in clause 5.7 of TR 22.851 has involved the “satellite network sharing” in some special scenarios, e.g. desert, islands, forests, and etc. However, the Indirect Network Sharing considering to share satellite network has not been investigated fully in R19 item.

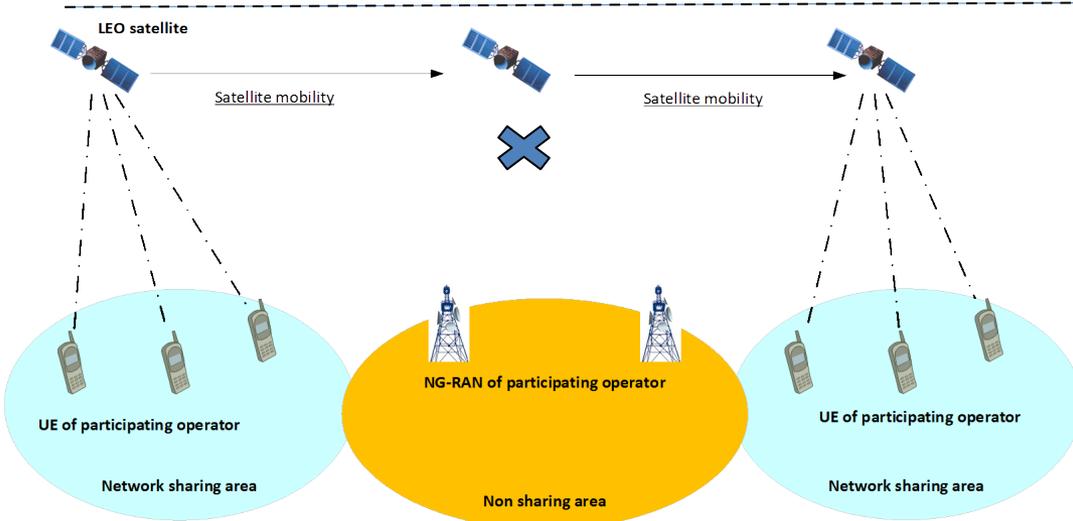
Figure ③ : illustrates the example to share the satellite network using the mechanism of Indirect Network Sharing.

Gaps compared with the existing requirements



Potential scenario: The coverage of OP1's shared satellite network may overlap with OP2's shared 5G network.
 If the UE of participating operator moves into this shared area, the network selection needs to be performed considering lots of factors, e.g., charging, regulation, service.

Question: how to perform network selection in the overlapping area?



Potential scenario: Currently, LEO satellites are being used more widely. And 3GPP SA2 R19 also began to study the satellite network of regenerative payload generic architecture.
 Since the LEO satellite is always moving relative to the ground, if the LEO satellite network is used as a hosting operator network in Indirect Network Sharing scenario, when the LEO satellite moves to a shared area, it can broadcast the information of the corresponding participating operator to provide access service, but if the LEO satellite moves to other non-shared areas, **in order to reduce interference and consider other factors**, it should not broadcast the information of the corresponding participating operator temporarily.

The existing requirement as specified in clause 6.21 of TS 22.261 "A 5G satellite access network shall support NG-RAN sharing" is too general and not enough.