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# ETSI Conference on Non-Terrestrial Networks, a Native Component of 6G.

3-4 April 2024

Summary of Sessions (1 to 7)  
Source: Session Moderators.

[#etsiNTNevent](#)

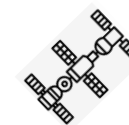
[ETSI - Conference on "Non-Terrestrial Networks, a Native Component of 6G"](#)



# Session#01: Moderated by David Boswarthick, Director NET, ETSI SETTING THE SCENE & DESCRIBING THE OPPORTUNITIES



Very Full Agenda, make the most of breaks / lunches for networking,  
Presentations available for download after the event



(14) Posters in reception area, visit and ask questions

Live art summary of all sessions



Remember to post your thoughts on social media  
[#etsiNTNevent](https://twitter.com/etsiNTNevent)



Quick surveys during each session,  
Overall event survey at end of day 2



Thanks to our event partners



## Session#01: Moderated by David Boswarthick, Director NET, ETSI

# SETTING THE SCENE & DESCRIBING THE OPPORTUNITIES

### Main Messages from the Session:

- Space enables global seamless connectivity for industry and society
- ESA provides significant funding for TN/NTN B5G and 6G projects
- 6G In-Orbit-Laboratory satellite (ESA funded) will be launched in two years.
- ESA 5G/6G Hub is available for 5G/6G TN/NTN testing
- Europe is investing significantly in B5G and 6G R&D with the SNS-JU programme that lasts almost a decade
- There are several technology challenges (currently in R&D) which will enable the full NTN integration in 6G (unified architecture)
- NTN needs to be considered early in 6G development with research in the areas of protocols and architecture
- NTN is already included in 5G and there are plans / roadmaps for further development of NTN integration in 6G
- 5G-NTN in 3GPP includes NR (New Radio) and also NTN-IoT. 6G-NTN should be an evolution of 5G-NTN enabling new use cases not well supported by 5G-NTN. Native component refers to unified waveform from Rel-21 onwards

### Main Findings from the Session:

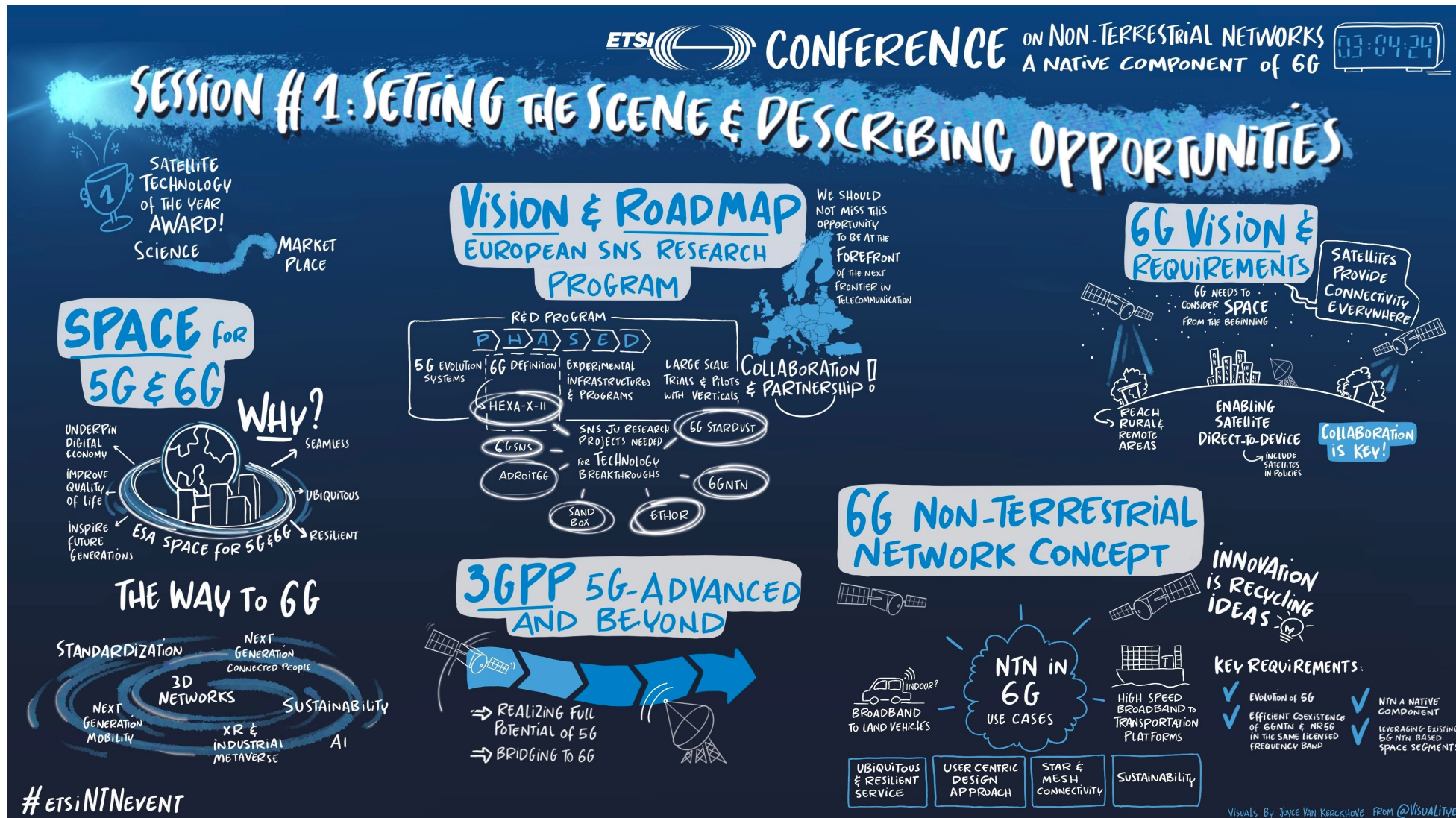
- NTN has been recognized as a 'pivotal' element of 6G
- Extensive collaboration is essential between terrestrial, satellite and space communities
- Successful NTN integration requires:-
  - flexible regulatory frameworks
  - access to globally harmonized spectrum
  - transparent / rational licensing schemes
  - open – global standards

### Suggested Actions / Way-forward from the Session:

- Important to create strong links between NTN research projects and (pre)-standardization activities in ETSI / 3GPP / others
- Consider further enablers / agreements to ensure good cooperation between the NTN and TN communities

# Session#01: (Graphical Summary)

## SETTING THE SCENE & DESCRIBING THE OPPORTUNITIES



Visuals By JOYCE VAN KERCKHOVE FROM @VISUALITYEU

## Session#02: *Moderated by Javier Albares Bueno, SNS-JU Office* **FUTURE NTN ENABLED USE CASES**

### Main Messages from the Session:

- [EBU] THE M.A.R.S. STRATEGY (Multilayer, Anywhere, Resilient and Sustainable)
- [EBU] Broadcast is key for media and can also be a solution for emergency alerts on a global basis
- [Siemens] Satellite will not only transform safety and security but also railway operations and transport experience.
- [Airbus] 6G NTN is the standard of the future for the aviation industry but a global standard is needed.
- [Airbus] QoS is key, however different approach to cockpit operations, air traffic management and passenger experience.
- [Airbus] Likely impact of high sat capacity buildup will be lower price/Mb and a sharp increase in demand.
- [TCCA] PPDR is transitioning from 2G directly to 5G and beyond. Greater added value of 3GPP defined NTN solutions vs proprietary alternatives.
- [ESA] 10 cm positioning should be the objective of 6G-NTN. Important to find alternative to GNSS.

### Main Findings from the Session:

- Only Satellite can provide truly global and ubiquitous coverage, but SatNets will still require terrestrial networks in the future
- Important role of AI technologies and Flexible satellite performance
- Next evolution will be about moving compute to space
- Broadband direct to mobile VSAT enabled by GEO/LEO constellations as an opportunity
- Main challenge is interoperability due to proprietary solutions and complex/fragmented ecosystem (both are related)
- 6G NTN adoption by the global telecom industry will pave the way towards universal modem based on a standard chipset
- Emergencies represent 0.1% of demand but 99.9% of relevance when there is a situation.
- Many future use cases are probably unknown today, lots of opportunities ahead.
- Automotive/Aviation/High Speed trains, Public safety and Agriculture voted as most promising by audience.

### Suggested Actions / Way-forward from the Session:

- Incentivise maturity on Electronically Steerable Antennas and other key complementors of NTN connectivity
- Include new items (i.e. positioning) early in standardisation discussions
- Include regulators as an important stakeholder in standardisation discussions

# Session#02: (Graphical Summary) FUTURE NTN ENABLED USE CASES

**ETSI CONFERENCE ON NON-TERRESTRIAL NETWORKS** A NATIVE COMPONENT OF 6G 03:04:24

## SESSION #2: FUTURE NTN ENABLED USE CASES

### MEDIA & SATELLITE NTN

1 BILLION VIEWERS EVERY DAY...

**MEDIA**  
BROADCASTING IS NOT DEAD  
SATELLITES HAVE BEEN KEY

**M.A.R.S. STRATEGY**  
REACHING 100% OF THE POPULATION FOR FREE

**EMERGENCIES**  
5G-EMERGE PROJECT  
MULTI-LAYER EDGE CONNECTION 5G-0

**EARLY WARNING SYSTEMS**

### SATELLITE COMMS & COMPUTING SERVICES FOR RAILWAY USE CASES

TODAY... BENT-PIPE IS THE PREVAILING TOPOLOGY → FUTURE... MULTI-ORBITAL CONSTELLATION

**TRAINS** → **DATA CENTER**

BACKUP & EMERGENCY    TRAIN OPERATIONS    PASSENGER EXPERIENCE

### AVIATION USE CASES FOR 6G NTN

WIDEBAND & BROADBAND IS KEY!

**WE NEED STANDARDS [6G NTN]**

**AEROCONNECTIVITY**  
GEO, MEO, LEO  
FUTURE... FULLY CONNECTED ENTITIES

GLOBAL & UBIQUITOUS CONNECTIVITY CAN BE PROVIDED BY SATELLITES ONLY

AVIONICS WORLD

**PURPOSE: FOCUS ON PASSENGER EXPERIENCE**

**CHALLENGES:**

- FRAGMENTED CONNECTIVITY MARKET
- LACK OF INTEROPERABILITY AND STANDARD
- DUPLICATE OF AIRBORNE COMMUNICATION SYSTEM

### NTN & CRITICAL COMMUNICATIONS

SPECIFIC SCENARIO PARTICULAR NEED

UBIQUITOUS COVERAGE, RESILIENCE & BACKUP

**PUBLIC SAFETY WORKING ENVIRONMENT**

- COMMUNICATIONS
- WIRELESS DATA SERVICES
- ENABLING INTERNATIONAL OPERATIONS
- IOT DEVICES

### SYNERGIES BETWEEN DISRUPTIVE SATELLITE NAVIGATION SYSTEMS IN LEO & NTN

EMERGE AS A NEW SERVICE

- 1 NTN USE CASES: EXISTING & EMERGING
- 2 LOCALIZING FEATURES IN NTN SYSTEMS
- 3 ESA'S LEO-PNT IN ORBIT DEMONSTRATION

① 6G-NTN    ② NR-NTN D2D    ③ NR-NTN HOME BB & BACKHAUL

### PANEL DISCUSSION

**MULTI-LAYERED APPROACH**

**COMMON MOBILE BROADBAND STANDARDS & SOLUTIONS**

**WORK ON TERMINALS**

THINK OF GLOBAL ECOSYSTEMS

CHIPS    LABOUR    OPEN STANDARDS    LEGISLATION    TRANSPORT

INCLUDE REGULATORS

JOINED FORCES

#ETSiNTNevent

Visuals By JOYCE VAN KERCKHOVE FROM @VISUALITYELL

## Session#03: Moderated by Michael Short, SA Catapult TELCO & VENDOR VIEWS OF NTN-6G

### Main Messages from the Session:

- TN/ NTN Convergence brings 2 sectors together that don't know each other well or their respective strengths. This event shows high levels of enthusiasm for change and a more unified approach.
- The market growth to 2030 is not purely about Volume (of Subscriptions) but also about Value (Use Cases and some Sectors in particular) and Variety (Coverage, Data speeds, IoT, Transport and Emergency services)
- We need to make the most of Cellular + satellite strengths, as we did with separate Cellular and Wi-Fi modes in earlier years
- 6G needs PNT independence from GPS

### Main Findings from the Session:

- All IP networks & addressing need to be revisited by ETSI / IETF together but aiming for a single architecture. Full integration needs work
- Multisat and Multilink planning is needed, even if LEO may be an early priority
- Plan for the beginning of NTN and don't get distracted by `nice to haves` (boiling the ocean)
- Build on operator strengths in systems design and integration to meet user needs
- Recipe for change must include flexible spectrum policies and WRC 27 (the dessert to complete the main meal)
- ETSI is the place to do this TN/ NTN work
- Volume / spectrum consistency is vital for economies of scale. For user equipment at current volumes of 1Billion plus per annum .....standards are vital

### Suggested Actions / Way-forward from the Session:

- Annual event and ETSI processes which are globally inclusive are both needed to show real progress
- Spectrum and Standards need strong linkage – not just as an afterthought
- Plugfests and regular ETSI communications needed for TN / NTN convergence
- Ongoing ESA / SNS / Horizon Europe will be needed to 2030 in Europe for convergent standards work
- Global planning forum needed to help continents harmonise NTN requirements – 6G can no longer run off solo without this

# Session#03: (Graphical Summary) TELCO & VENDOR VIEWS OF NTN-6G

ETSI CONFERENCE ON NON-TERRESTRIAL NETWORKS A NATIVE COMPONENT OF 6G 03:04:24

## SESSION#3: TELCO & VENDOR VIEWS OF NTN-6G

**FROM UBIQUITOUS COVERAGE TO FULL INTEGRATION & BEYOND**

Different deployment models, different set of challenges

**STANDARDISATION**

- ✓ ADDRESSING, ROUTING & FORWARDING ARE FUNDAMENTAL (IP HAS ITS LIMITATIONS)
- ✓ NETWORKING ISSUES (NOT DESIGNED FOR LARGE SCALE NETWORKS)
- ✓ COVERAGE & CONNECTION STABILITY

**SOME OTHER TOPICS FOR CONSIDERATION**

- NEW CHALLENGES MOBILITY
- NTN CONFIGURATION & ARCHITECTURE
- HAPS OVER RURAL AREAS
- POWER CONSUMPTION AWARE ROUTING
- SCALABILITY

**MOBILE & SATELLITE**

ENRICHING THE LIFE OF PEOPLE ANYWHERE, ANYTIME, ANY PEOPLE

**3 KEY ENABLERS**

- 1 EVOLUTION OF DIRECT-TO-HANDSET TECHNOLOGY
- 2 HARMONIZATION OF SATELLITE FREQUENCIES ACROSS BORDERS
- 3 BUSINESS FRAMEWORK (LEASE FROM A SATELLITE OPERATOR)

**ACCESS IN REMOTE LOCATIONS**

- SATELLITE BROADBAND
- DISASTER RECOVERY
- IRIS
- RED PROJECTS

**UBIQUITOUS 6G SERVICE THROUGH NTN**

- BE PART OF 6G FROM DAY 1
- BASED ON PRINCIPLES OF NTN IN 5G-ADVANCED
- MAXIMIZE SIMILARITY WITH 6G-TN

TRANSPARENT OR REGENERATIVE

**SATELLITE COMPONENTS IN 6G NETWORKS**

THE TABLE IS DRESSED, INVITING BOTH TERRESTRIAL & SATELLITE ECOSYSTEMS

3GPP IS THE PLACE!

**MENU**

- MARKETS & USE CASES
- FROM 5G TO 6G
- NATIVE INCLUSION OF SATELLITE COMPONENTS IN 6G

VALUE VARIETY

## HOW WILL TELCO & VENDORS EVOLVE?

VOLUME

**SATELLITE & TERRESTRIAL NETWORK CONVERGENCE FROM 5G TOWARDS 6G**

NTN-TN SPECTRUM SHARING

THE INDUSTRY NEEDS TO BE BRAVE

SATELLITE INDUSTRY MOVES AT A DIFFERENT SPEED

GSMA 2023 GLOBAL MOBILE AWARD

3GPP-R17-NR-NTN 1<sup>st</sup> SMARTPHONE TESTED IN MWC'S

4<sup>th</sup> KU-BAND NR NTN TESTED IN MWC-24!

VISUALS BY JOYCE VAN KERCKHOVE FROM @VISUALITVEU



## Session#04: *Moderated by Maria Guta, ESA* **SATELLITE OPERATORS & VENDORS VIEWS**

### Main Messages from the Session:

- **[Viasat/Inmarsat]** Power/energy efficient –more scalability/flexibility/lean design – TN/NTN complementary network co-design, security/resiliency, better forward/backward compatibility, leverage AI, optimisation of IP/MQUC stack
- **[SES]** Support different SNO/MNO cooperation schemes/Seamless reliable roaming between SNO and MNO operations, Integrated unified 3D TN/NTN network with multi-orbit and multi-frequency connectivity management/6G Multi-link and multi-band access scheme with integrated RIC and Sat Resource management/rebalance NGSO/GSO in 3D-NTN design, benefit of unified 5GMBS solutions for cost/QoS support /terminal development
- **[EUTELSAT]** Group]Enabling technologies OBP/OISL/Flexible resources management/beam-shaping/hopping antennas, optimisation of air interface/terminals development/GNSS free operations
- **[ECHOSTAR]** Seamless integration TN/NTN/Cost driven TN/NTN co-design/ NTN 6G design to maximise 6G Benefits/dynamic instantly adjustment to traffic & operations conditions/optimize multi-orbit QoS support/maximise energy & spectral efficiency in 6G air interface /Fully seamless NTN/TN to enhance values for end-users
- **[THALES]** Proposed KPIs. Vertical terminals classes/proposed radio interface/RAN features (e.g. GNSS free operations, Low SNR operation/AI driven interference mitigation/), as well as SA features (e.g. /secure architectures/smooth migration/scalable system design/ SW regenerative payloads/smart orchestration -service chaining-routing/green design for space and e2e TN/NTN system/JSAC support/
- **[AIRBUS]** Graceful integration of 3GPP features in NTN design/prioritised RAN features/Satellite friendly design & implementation (reduced On-board complexity)/FR2FR2 VSAT support is primary/secure architectures/scalable system design/GNSS free operations/AI driven interference mitigation/Regenerative re-purposable multi-mission payloads/support of JSAC&JPAS missions/multi-tenant NTN/TN network topology management and resources orchestration incl. frequency spectrum management

## Session#04: *Moderated by Maria Guta, ESA* **SATELLITE OPERATORS & VENDORS VIEWS**

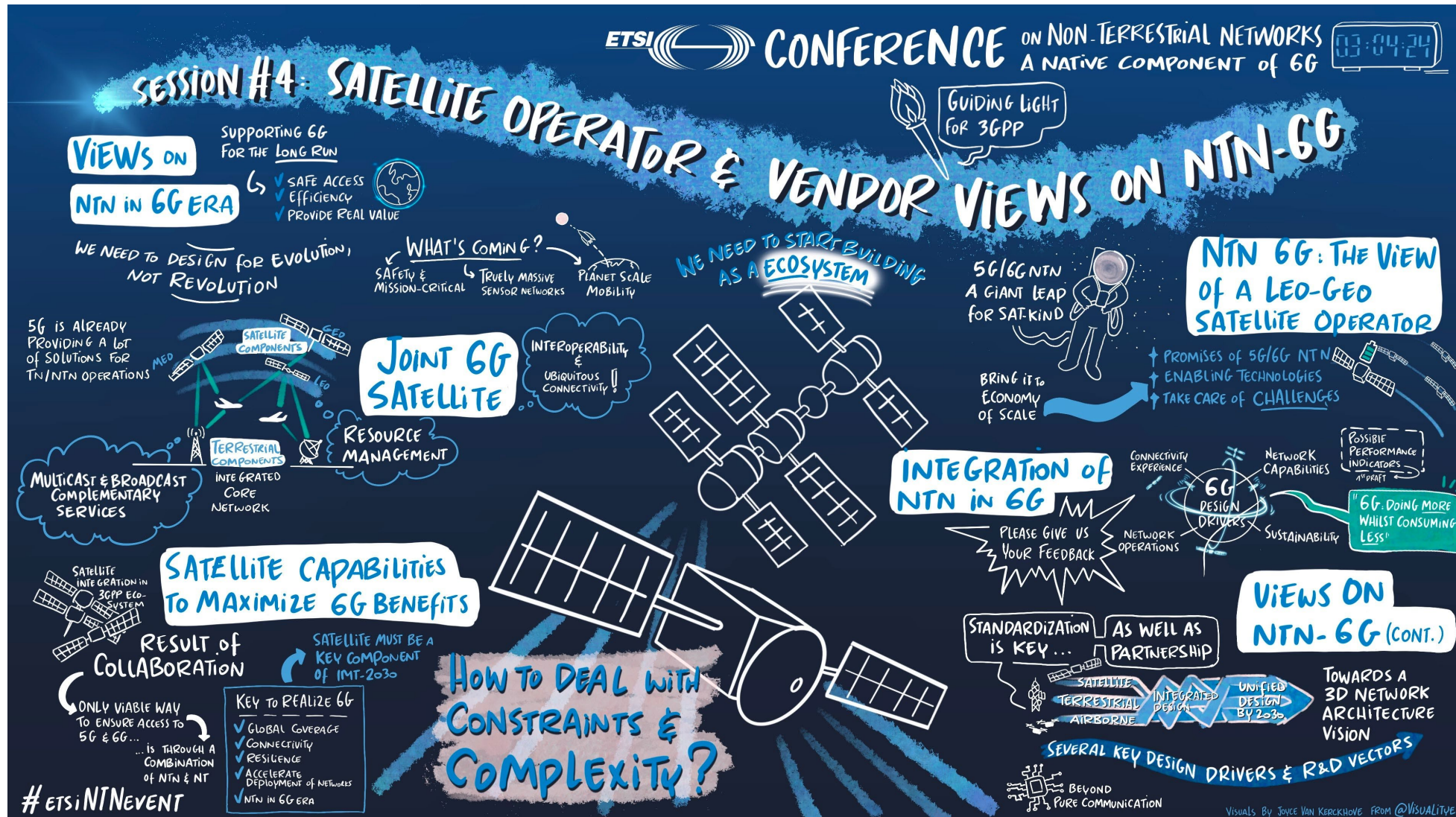
### Main Findings from the Session:

- NTN constraints in design, operations & services provision drive smooth migration of 3GPP 5G adv. to 6G technology in evolutionary steps
- Holistic e2e TN/NTN complementary networks co-design for infrastructure cost design, reduced carbon footprint, support of QoS, multipath/broadcast
- Multi-orbit multi-tenant TN/NTN networks topology and services orchestration and resources management/seamless TN/NTN roaming, multi orbit terminals/multi frequency operations and spectrum management/3GPP NTN specific and auxiliary technology co-design
- Optimised placement of RAN and Core/Edge functionalities in TN/NTN (regenerative) co-designed networks trading off complexity/performance/cost/operations ease
- Space Community needs to respond to elevated expectations with innovative, cost effective, sustainable solutions that permit ecosystem enforcement, open multi-tenant deployments for viable TN/NTN
- Importance of WRC 27 for NTN items

### Suggested Actions / Way-forward from the Session:

- Optimise of 3GPP process –use of automation where and as appropriate
- Consolidate vertical terminal classes and KPIs for 6G NTN use cases
- Voice coordinated approach to 6G NTN standardisation
- Reinforce public and private support & industry co-investment to development of TN/NTN solutions
- Support European technology autonomy and propose competitive NTN solutions
- Reinforce collaborative co-creation, co-design early co-experimentation (also in orbit) & co-operation of TN/NTN & introduce agility & reduce time to market
- Propose plausible service exploitation models & business interfaces between TN/NTN & verticals for multi-tenant network service provision
- Time to pass from intentions to actions – Bring solutions to market

# Session#04: (Graphical Summary) SATELLITE OPERATOR & VENDOR VIEWS OF NTN-6G



## Session#05: *Moderated by Bernard Barani, 6G-IA (1 of 2)* **EC FUNDED / CELTIC / SNS / OTHER RESEARCH PROJECTS**

### Main Messages from the Session:

- Multiple R&I projects, SNS, cluster 4 are working in the technologies that will shape 6G Standards
- Alignment with multi-layer satcom systems at architectural level is the way forward, part of 6G native (no add on)
- Challenging use cases (e.g. Direct com to HH device) to drive requirements. Coverage, rural as common factor.
- Reference architecture for both TN-NTN needed
- Overall network and service management to be designed E2E across multiple domains, MANO solution.
- Communication and computing continuum to be considered for TN-NTN integration with support of distributed processing, edge clouds and AI/ML
- R&D in time to contribute to standardisation work opening under Release 20. 3G PP RAN and ITU key but not necessarily the only ones.
- Complexity drives needs for PoC's, Demonstrators, and experimental facilities.
- The Open approach is useful.

## Session#05: Moderated by Bernard Barani, 6G-IA (2 of 2)

# EC FUNDED / CELTIC / SNS / OTHER RESEARCH PROJECTS

### Main Findings from the Session:

- Multiple architectural models for integration being considered, each with pro and cons:
- Significant on-going work at RAN level: waveforms, multi bands/connectivity; seamless HO; spectrum management and sharing, GNSS free positioning, adapted protocols (RACH..), impact of direct device connectivity
- Also, significant work at resource management level. Computing and storage resources adapted to account for NTN dynamicity requirements.
- Innovative technologies like AI/ML targeted for TN also part of 6G framework but end to end integration requires significant efforts (already in the TN case)
- Demonstrator/experimental environments are being put in place, will require further expansion for full E2E validation/demo capabilities.
- Work at chipset level may need further expansion
- Most of the contemplated technologies have a potential towards standardisation
- Sustainability issues

### Suggested Actions / Way-forward from the Session:

- Engage! Only through collaboration EU can become relevant in the 6G definition
- Consider standardisation as a systematic output, beyond project life-time;
- Actively prepare for upcoming milestones: 3G PP SAI use case workshop in May 2024, 3GPP kick off workshop for Release 20 in 2025, Starting NTN Framework under ITU-D
- Standardisation bodies beyond ITU / 3GPP to be considered

# Session#05: (Graphical Summary)

## EC FUNDED / CELTIC / SNS / OTHER RESEARCH PROJECTS

**ETSI CONFERENCE** ON NON-TERRESTRIAL NETWORKS A NATIVE COMPONENT OF 6G 04:04:24

**SESSION#5: EC FUNDS / CELTIC / SNS / OTHER RESEARCH PROJECTS**

### 5G STARDUST

SEAMLESS INTEGRATION of NTN WITH 5G-ADVANCED

KA-BAND  
REFERENCE SATELLITE SYSTEM  
LEO (HPP 55-821)  
1200 KM ALTITUDE  
415Ls FOR EACH SATELLITE  
OBP PAYLOAD  
5G INTEGRATION

### A SPLIT ARCHITECTURE

LEO FEEDER NODES  
LEO SERVICE NODES

6G-NTN STANDARDISATION  
• 3GPP  
• ITU  
• WRC-27

ARCHITECTURE DERIVED FROM USE CASES & REQUIREMENTS ANALYSIS

ADDRESS MULTI-LAYERED ARCHITECTURE

## 6G-NTN

### TRANTOR

PAVING THE PATH TO 6G NTN THROUGH MULTI-CONNECTIVITY

ARCHITECTURE FOR INTEGRATED & AUTOMATED MANAGEMENT:

- \* ENMS: EVOLUTION OF SATELLITE NMS TOWARDS CLOUD BASED ORCHESTRATOR
- \* IME
- \* DISTRIBUTED ANALYTICS EXTRACTED TO SUPPORT QoS & TRAFFIC MONITORING IN MID/BACK-HAUL

ACCESS DOMAIN    TRANSPORT DOMAIN    CORE DOMAIN

NTN MOBILITY CAN BE FURTHER IMPROVED: COVERAGE HOLE

FAST SWITCH DUAL CONNECTIVITY

SPECTRUM SHARING IN 2GHZ BAND

RURAL AREA IS A BIT SENSITIVE

6G

Holistic FLAGSHIP

GLOBAL SERVICE COVERAGE EVALUATED

## HEXA-X-II

### ETHER: A 6G

ARCHITECTURE FOR 3D MULTI-LAYERED NETWORKS

INFRASTRUCTURE LAYER  
E2E SERVICE LAYER  
BUSINESS LAYER

#ETSI NTNEVENT

### 6G-STERLING AI POWERED IN-ORBIT LABORATORY

TO STRENGTHEN EUROPEAN SPACE TECHNOLOGY

MOU WITH ESA FOR COLLABORATION

CUSTOM SATELLITE TOPOLOGY  
6G LIBRARY

## 6G-SANDBOX

ACTIVITIES TOWARDS NTN-6G

### COMMECT

INTEGRATING TN & NTN FOR RURAL & REMOTE AREAS

TOWARDS DIGITAL TRANSFORMATION

END USERS EXPERIENCE    END USER ADVISORS

- BUSINESS MODELS
- KPIs
- CONNECTIVITY

DECISION-MAKING SUPPORT TOOL

### ADROIT 6G

AI-ENABLED OPEN ARCHITECTURE

TRANSFORMATIONS	AI/ML POWERED OPTIMIZATION	CROWDSOURCING AI DISTRIBUTED AGENTS REGENERATIVE MODELS	TECHNOLOGIES
	CLOUD NATIVE NETWORK SOFTWARE	VIRTUAL BASE STATIONS (vBSS) EDGE-CLOUD FOR NTN	
	SOFTWARE-DRIVEN ZERO TOUCH AUTOMATION	AUTOMATED MEO OPEN PROGRAMMABILITY	

VISUALS BY JOYCE VAN KERCKHOVE FROM @VISUALITVEU

## Session#06: *Moderated by Stefano Cioni, ESA* **ESA ENABLED RESEARCH PROJECTS**

### Main Messages from the Session:

- SSIG have had a great impact on 3GPP NTN contributions. Collaboration is paramount
- 6G NTN shall be an evolution (not a revolution), since many proof of concepts are now available
- 5G NTN technical evidence is achieved, it is time to meet the market expectations

### Main Findings from the Session:

- OpenAirInterface™ upgraded for supporting GEO/LEO transparent architectures
- 5G architectural split Option-7 is very promising for NTN systems
- NTN key features (e.g., SIB-19, triggers for conditional HO) successful demonstration > O-RAN A1/E2 interfaces

### Suggested Actions / Way-forward from the Session:

- Promote Option-7 split in 3GPP NTN (e.g., Release 19 / Release 20)
- Propose a reference multi-layer satellite network for 6G-NTN
- Inclusion of 3GPP NTN features in the O-RAN framework
- Improve the information exchange among O-RAN and 3GPP SA5

# Session#06: (Graphical Summary) ESA ENABLED RESEARCH PROJECTS

ETSI CONFERENCE ON NON-TERRESTRIAL NETWORKS A NATIVE COMPONENT OF 6G 04:04:24

## SESSION#6: ESA ENABLED RESEARCH PROJECTS

### HELENA PROJECT STANDARDISATION

3 PILLARS:

- SSIG**: SATELLITE STANDARDISATION INTEREST GROUP (ALREADY A SUCCESS STORY OUTSIDE 3GPP)
- COLLABORATION + COORDINATION ARE PARAMOUNT**
- VERY ACTIVE IMPACT IN 3GPP**

SSIG HELENA  
UNIFIED ANSWER TO ALL 3GPP GROUPS

BE IMPACTFUL IN 3GPP AT ALL STAGES  
WITH A CLEAR, CONSISTENT APPROACH

### ESA PROJECT ON NTN

5G LEO SOFTWARE DEFINED RADIO FOR F4T PROTOTYPING

GOALS: CREATE EARLY PROTOTYPES, NTN COMPLIANT PROTOCOL STACK IMPLEMENTATION, OpenAirInterface™

UE SIDE | gNB SIDE

NOW WE HAVE A PERFECT 5G-NTN E2E OPEN SOURCE PROTOTYPE!

### INTELLIGENT SATELLITE PAYLOADS

DEEPLY 5G-INFRASTRUCTURE STUDY: RESULTS

- PORTFOLIO OF VERTICAL MARKETS: PUBLIC SERVICES, BUSINESS SERVICES
- GENERAL FRAMEWORK FOR MISSION E2E REQUIREMENTS
- CONCLUSIVE DEMONSTRATION ROADMAP
- T/N/NTN INTEGRATED E2E SYSTEM ARCHITECTURE

JPAC - EARTH OBSERVATION: CORE MISSION! USES 5G FOR COMMUNICATION, 5G NTN COMMS FOR SENSING

SERVER IN SPACE

CROSS-INDUSTRY CO-OPERATION IS KEY!

INTELLIGENT SATELLITE PAYLOADS ARE THE FUTURE!

### 6G SMARTSAT

DESIGN & VALIDATE ROUTING SOLUTION

SEMANTIC ROUTING

INTELLIGENT ROUTING

### AlcomS

AI FOR SATELLITE COMMUNICATION

WS0 USE CASES

WS1 5G NTN BASEBAND PROCESSING

WS2 5G AI PACKET ROUTER

WS3 FLIGHT CONTROL & SATELLITE ARCHITECTURE

ML-DRIVEN

REALLY HAVING PRODUCTS IN MIND

FOCUS ON SECURITY!

2 PLATFORMS: HPPDU (Psi) FUNCTIONAL SPLIT, LAYERSCAPE (NXP) COMPRESSING

### UNLOCKING THE CONNECTIVITY OF 5G/6G SATELLITE TELCO SYSTEMS

DEDICATED SIGNALLING VIA E2 INTERFACE

MAXIMUM CONNECTIVITY

REMOTE VEHICLE CONTROL

6G-NTN IS AN EVOLUTION NOT A REVOLUTION !!

#ETSiNTNevent

VISUALS BY JOYKE VAN KERCKHOVE FROM @VISUALITYELL



## **Session#07: Moderated by Alessandro Vanelli-Coralli, 6G-NTN Project Lead**

# **NATIONAL & GLOBAL INITIATIVES FOR NTN-6G**

### **Main Messages from the Session (Integration/synergies/etc):**

- [AB] 6G extends mobile networks to airspace and non-terrestrial networks.
- [UB] Alignment of spectrum bands and regulatory aspects (at least across Europe) is needed
- [VTT] Direct satellite-to-handheld connections will be a game changer for many use cases such as public safety
- [TNO/UniFi] Synergies between Free Space Optical (FSO) and radio (RF) communications a promising concept to meet 6G KPIs.
- [DT] TN/NTN differ wrt. service, capacity/performance, system architecture, component technologies, ecosystem integration is beneficial
- [UniS/UniFi] Open networking approach and network orchestration techniques is being performed in 3D ML architecture
- [AB/UniFi] Early technology demonstrations essential to support standardization process. Test should be open and shared no duplication.

### **Main Findings from the Session (Research):**

- [AB] Research needs to address the complexities especially in term of the non-terrestrial network element.
- [UB] Research needs to address gNb functionality handover, network service continuity across countries, functional split options, security
- [UniFi/UB] AI/ML management based on SDN/NFV to be tested evaluated; AI not necessarily a game-changer
- [VTT] Advanced machine-type connectivity and energy-efficient services require research on RedCap over satellite
- [TNO] Further development of FSO and RF, and relevant network architecture, to meet 6G
- [DT] TN/NTN (airborne as well) unification needed without losing unique advantages of each systems

### **Suggested Actions / Way-forward from the Session (Standardization)**

- [UB]/ UniFi] Input of NTN specific uses cases to SA1 – now.
- [UniS/ UniFi/TNO] Spectrum sharing and interference mitigation needs more emphasis
- [UniS] Evolutionary approach from 5G advanced.
- [TNO] Standardization (ETSI) of FSO communications to meet the X-hauling requirements identified by 3GPP.
- [VTT] RedCap over satellite in Rel. 19+ (link level protocols and mobility management)
- [DT] Solutions needed for seamless service continuity on the air interface and IP routing in the sky on the feeder link

# Session#07: (Graphical Summary) NATIONAL & GLOBAL INITIATIVES FOR NTN-6G

ETSI CONFERENCE ON NON-TERRESTRIAL NETWORKS A NATIVE COMPONENT OF 6G 04:04:24

**SESSION#7: NATIONAL & GLOBAL INITIATIVES FOR NTN-6G**

### 6G FOR CONNECTING SKY

FLYING TAXI CASE

MULTI-LAYER ARCHITECTURE ORCHESTRATION

DEMONSTRATIONS

LAB TESTS

FLIGHT TEST DRONE (6G SKY)

### LUXEMBOURGISH [SIGCOM] ACTIVITIES ON B5G-6G NTN

6G SPACE LAB

5G-NANOSATELLITE

INSTRUCT

MICRO5G

SMARTSPACE

ALGORITHM ACCELERATION

NETWORK STATUS PREDICTION

ENGAGE

JCAS

INTEGRATED SENSING & COMMUNICATIONS

LURCIA LAB

QUANTUM COMMUNICATIONS & KEY DISTRIBUTION

### FULLY INTEGRATED TN/NTN FOR COMMS

THE ITA NTN PROJECT

TRANSVERSAL & SUPPORTING ACTIONS

5G PILLARS

eMBB

URLLC

mMTC

CONTRIBUTION TO 6G

NTN STANDARDIZATION PROCESS

AIM: DESIGN & ANALYSE 3D MULTI-LAYER NETWORK INFRASTR.

PROOF OF CONCEPT

VECTOR SHARING

### GERMAN 6G-PLATFORM: 3D NETWORKS

RESILIENCE

DIRECT TRANSFER TO INDUSTRY PROJECTS

"CONNECT THE UNCONNECTED"

WE NEED ALREADY TO DISCUSS TODAY WITH SOCIETY

HARMONISATION of 3D CONCEPTS

3D NETWORKS CONTRIBUTION

### 5G REDCAP CONNECTIVITY OVER SATELLITES

EVOLUTION OF 5G NEW RADIO (NR)

ROLE OF STANDARDISATION

SUPPORT INDUSTRIAL USE CASES?

CONNECTION OF SMALL, NON-COMPLEX DEVICES

#ETSiNTNEVENT

### FREE SPACE OPTICS & RADIO COMMUNICATIONS

FUTURE NETWORK SERVICES

CREATING A STRATEGIC KNOWLEDGE POSITION

NXTGEN HIGHTECH PROGRAM

FSD LASER COMM

DOMINANCE OF RF COMMUNICATION + FSD LASER

SPACE

AIR

GROUND

### TUDOR: TOWARDS UBIQUITOUS 3D

GOAL: CAPACITY-ASSURED UNIVERSAL CONNECTIVITY (3D)

OPENNESS + RAN EFFICIENCY

BE ABLE TO SETUP OWN BUSINESS MODEL

CONTRIBUTION TO STANDARDISATION

SPACE

HAPS

3D OPEN RAN

3D OPEN TRAMPAS

3D OPEN CORE

CLOUD

TERRESTRIAL

### HOW ENSURE GOOD COOPERATIONS?

STANDARD EVAL FRAMEWORK

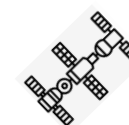
SHARED OPEN SOURCE TOOLS

INVEST & ACCELERATE

VISUALS BY JOYCE VAN KERCKHOVE FROM @VISUALITVEU

# Thanks to All

Thanks to our event partners



Thanks to our programme committee members & moderators



Thanks to the audience for their attention  
& excellent interactions



Thanks to all of our speakers



Thanks to Joyce of Visuality for the “Live art”



Thanks to the ETSI team for the amazing support

