

5G AND NON-TERRESTRIAL NETWORKS (NTN) – STATUS, OPPORTUNITIES AND CHALLENGES

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- As part of 3GPP releases 15 and 16, connectivity architectures, use case descriptions, and initial link budget models for NTN have been defined
- Other organizations have also done a lot of work, established testbeds, and contributed on the subject (SAT5G, SATis5, etc.)
- Release 17 (estimated freeze September 22) and 18 will complete and dive into the technological implementation details of NTN communications.
- IMT-2030 (6G) will push forward toward a fully integrated 3D network
- But the industry is not necessarily waiting, and early players are appearing on the horizon (e.g., AST, Lynk, Omnispace, etc.)
- As well, many architectural constructs that characterize the 4G and 5G world are making their way into the satellite communications world (SDN, NFV, MANO, etc.)

WHAT BRINGS RELEASE 17?



		Release 16	Release 17
Ecosystem Growth Fritter Growth	Industrial IoT	 NR in unlicensed spectrum Private networks Ultra-reliable low-latency Communication (URLCC) Time-Sensitive Networking (TSN) 	 NR in unlicensed spectrum Private networks Ultra-reliable low-latency Communication (URLCC) Time-Sensitive Networking (TSN)
	Other verticals	• Vehicular communication (Cellular V2X)	 Sidelink enhancement for Public safety and pedestrians Multi-cast Non-terrestrial networks (satellite and HAPS) Railway (application layer)
5G Release 15 Extreme Mobile Broadband	Network deployment & automation	 Full 5G system resilience Wireless-wireline convergence Network slicing Phase 2 Network automation Phase 2 Integrated Access and Backhaul 	 Network slicing Phase 3 Network automation Phase 3 Extension to 71 GHz
Broadband Enhancen	Device enhancement	 Device power saving Enhanced MIMO Mobility enhancement 	 Further device power saving Further enhanced MIMO Multiple USIMs Cloud gaming QoS "NR-Light" for Consumer IoT

Source: https://blog.3g4g.co.uk/2020/07/anritsu-webinar-on-evolution-of-5g-from.html

R.17 - TIMELINE





Estimated 'freeze' of release 17 - Sept 2022

ARTES FP INSTINCT

3GPP AIMS TO SEAMLESSLY INTEGRATE NTN WITH TERRESTRIAL

Practically prove the 5G satellite advantages



6G VISION – 3D NETWORKS



Control view: Intelligent connection



Network view: Enhanced Stratification

Infrastructure view: Ubiquitous 3D coverage

TWO PLACES WHERE SATELLITE CAN CONNECT





DIRECT 'UE' ACCESS THROUGH 5G SATELLITE





Source: 3GPP TR 38.811 V15.4.0 (2020-09)

- Direct connection for IOT, broadcast, entertainment for cars, public safety, etc.
- Transmission of NR through the satellite (bent pipe or regenerative)

3GPP BASED INDIRECT RELAY 5G CONNECTION THROUGH 5G SATELLITE





Source: 3GPP TR 38.811 V15.4.0 (2020-09)

- Relay Node is composed of gNB and relay UE
- Relay node can connect to multiple UEs

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RELAY BH IN DETAIL (TAKEN FROM TERRESTRIAL IAB CONCEPT)





Source: https://www.mpirical.com/blog/integrated-access-and-backhaul-for-5g

SG SATELLITE CONNECTIVITY WITH MEC – CONNECTION TO MEC AND DISTRIBUTED CORE ELEMENTS



Source: 3GPP TR 23.737 V17.2.0 (2021-03)

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MULTI-RAT SCENARIOS – NEED FOR E2E MANAGEMENT AND ORCHESTRATION



gNB-F1 gNB-CU DU NG NR-Uu ᆂ NTN SRI Gateway N6 Data 5G-CN UE Network gNB NR-Uu NG * 44 \mathbb{A}

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Multi connectivity involving transparent NTN-based NG-RAN and cellular NG-RAN

Multi connectivity involving regenerative NTN-based NG-RAN (gNB-DU) and cellular NG-RAN



Multi connectivity between two transparent NTN-based NG-RAN



Multi connectivity between two regenerative NTN-based NG-RAN (gNB on board)

Source: 3GPP TR 38.821 V16.0.0 (2019-12)

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GILAT IS READY FOR 5G TODAY!





GILAT PATENTED TECHNOLOGY SUPPORT ACCELERATED 5G TODAY!

GILAT CONTINUE AND ENHANCE THE PLATFORM TOWARD 5G

HIGH SPEED

LOW LATENCY

FLEXIBLE NETWORK ARCHITECTURE



THANK YOU

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