ETSI Conference on
Non-Terrestrial Networks,
A Native Component of 6G

5G-STARDUST: Seamless Integration of NTN with 5G-Advanced

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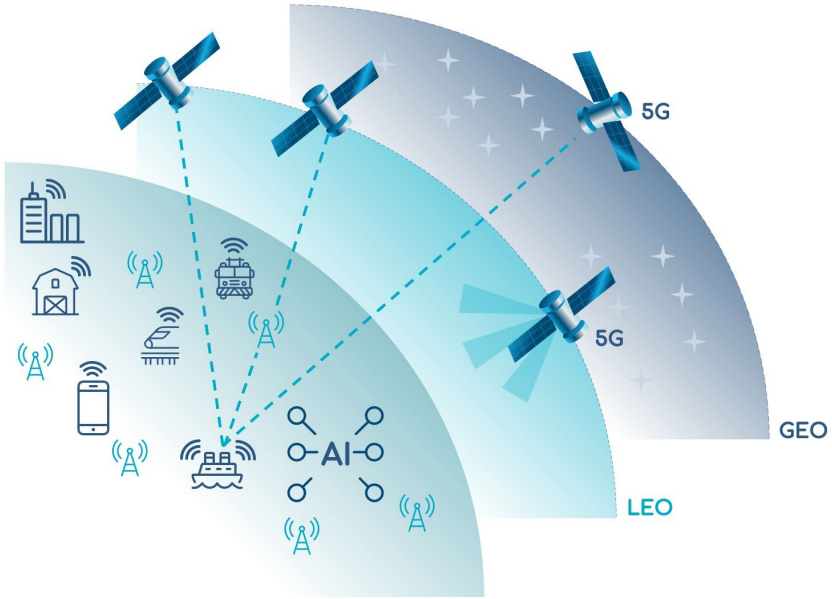
PROJECT AMBITION

Design, develop and demonstrate a deeper integration of TN and NTN: *Deliver a fully integrated 5G-NTN autonomous system with novel self-adapting end-to-end connectivity models for enabling ubiquitous radio access.*

Project Objectives

- Study, design, a 5G-based satellite network, implementing onboard processing and storage capabilities towards effective networking and mobile computing in the sky.
- Define, design data-driven management system components, building on AI/ML based solutions for resource allocation and service provision in highly dynamic integrated hybrid networks.
- Design, implement, and demonstrate E2E services over a fully integrated TN-NTN advanced network architecture with regenerative space nodes.
- Contribute to the development of a European Research and Technology roadmap to ensure strategic positioning and global competitiveness of Europe in integrated TN-NTN communications.

KEY TECHNOLOGIES



- *Regenerative payloads for GEO and NGSO systems*
- *Unified radio interface for cost-effective converged TN/NTN multi-tenant networks*
- *Softwarised self-organised network architecture*
- *E2E AI-Driven Network Design*

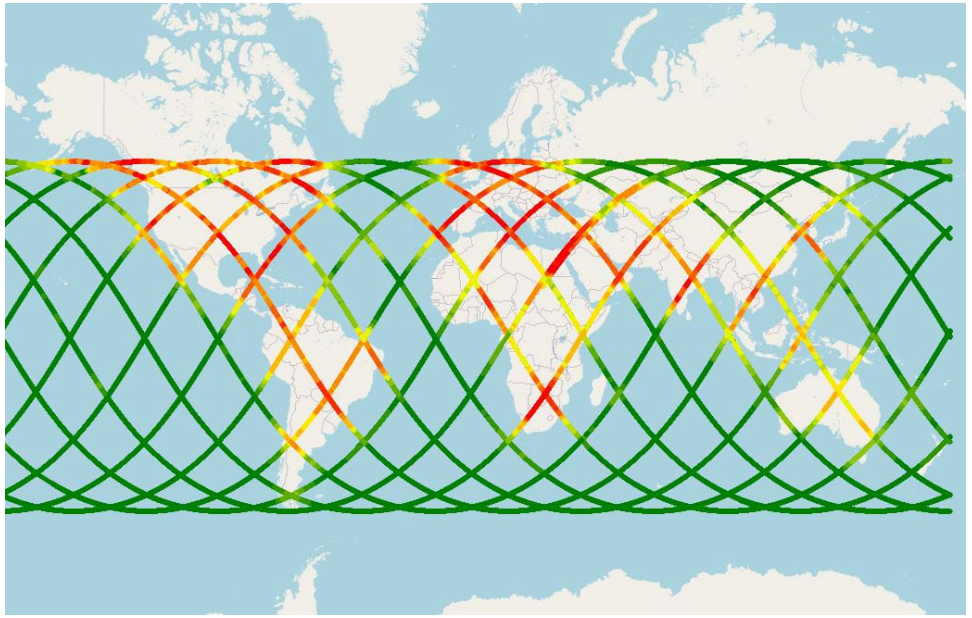
Reference Scenarios

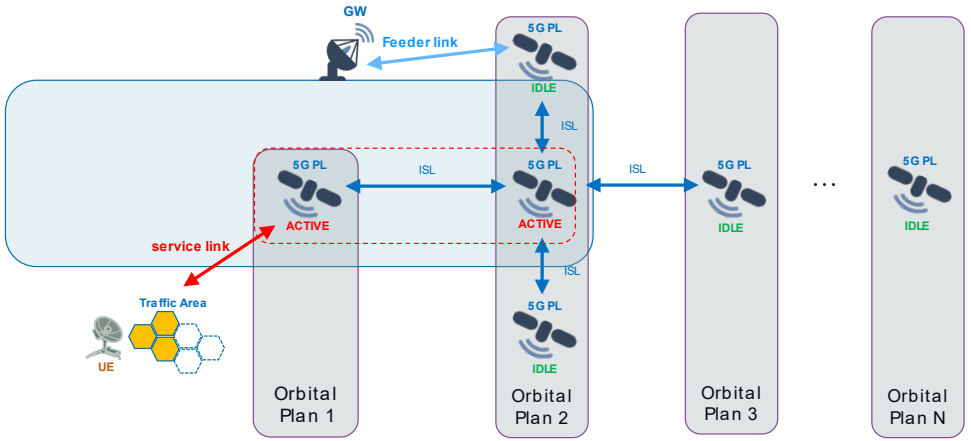
Topics	Scenario	Description
DUAL CONNECTIVITY	Scenario 1.1	Airway GEO and NGSO complementing terrestrial coverage when airplane leave the airport. 5G broadband services for passengers with terrestrial and satellite, providing a homogeneous and transparent experience for users.
	Scenario 1.2	Direct Access/LEO (IAB), helping to fast deploy networks to accelerate terrestrial 5G rural deployments or temporal gap filler. FWA from LEO/GEO with dual connectivity and common O&M with terrestrial and satellite, providing a homogeneous and transparent experience for users and a common management for the MNOs.
Architecture and Service Distribution	Scenario 2.1	V2N communications to enhance 3 different services like Software over the air updates, HD maps updates and NG eCall service to provide rapid assist in serious accident; using TN and LEO satellites to extent V2N coverage for underserved areas.
	Scenario 2.2	PPDR communication in case TN infrastructure is damaged during a disaster event. NTN will provide temporarily coverage for first responders. Also, extended coverage in case of uncovered areas for first responder agencies is considered. Direct and backhauled access of LEO satellites.
	Scenario 2.3	Distributed 5G Systems for private networks. LEO onboarded with UPF, ensuring shorter global data paths, data retention and potentially with ultra-secure and ultra-reliable signalling centralized in satellite environment.

Reference Architecture

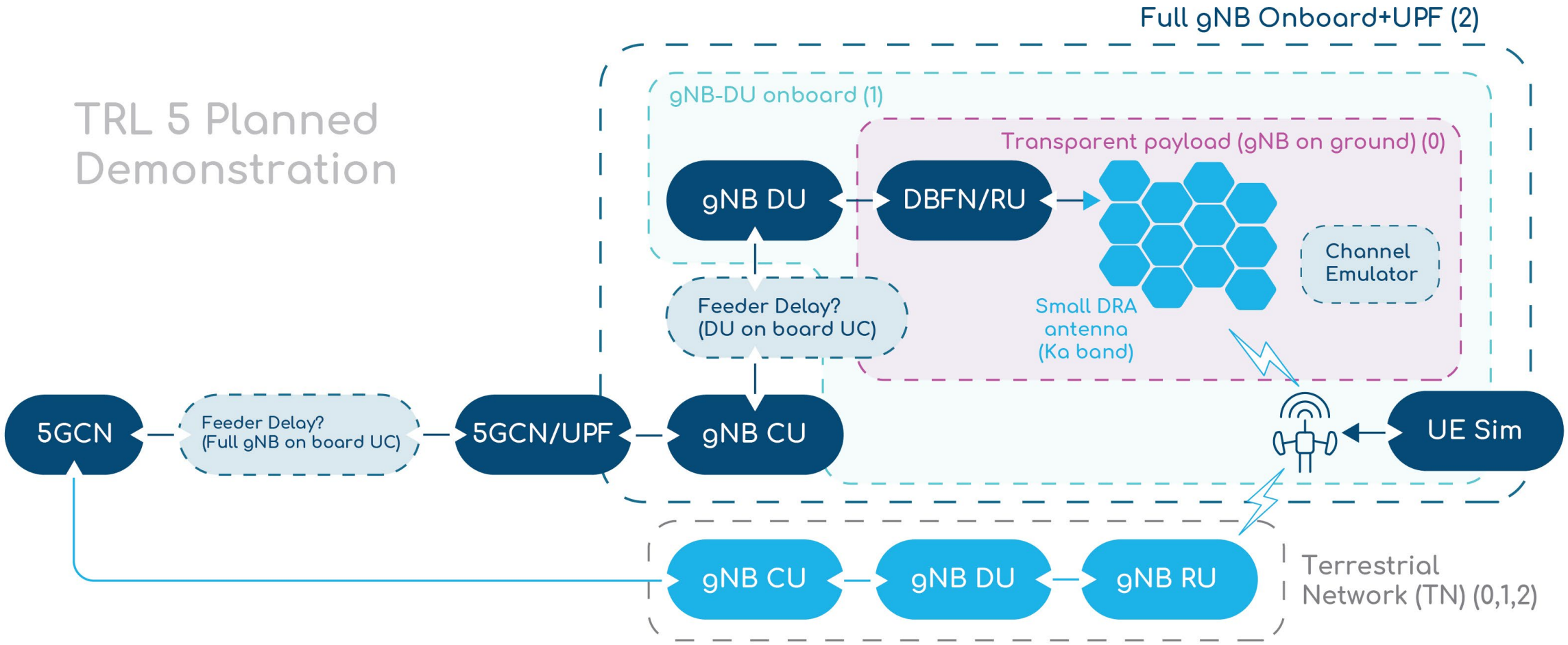
- Reference satellite system → LEO constellation according to 3GPP TR 38.821
  - 1200 km altitude
  - Ka-band
  - 4 ISLs for each satellite
  - OBP payload

- 5G Integration:
  - Each satellite implement a 5G-enabled payload, that can be active or idle depending on the coverage area and performed functions
  - Different functional splitting model considered (full gNB or CU/DU)

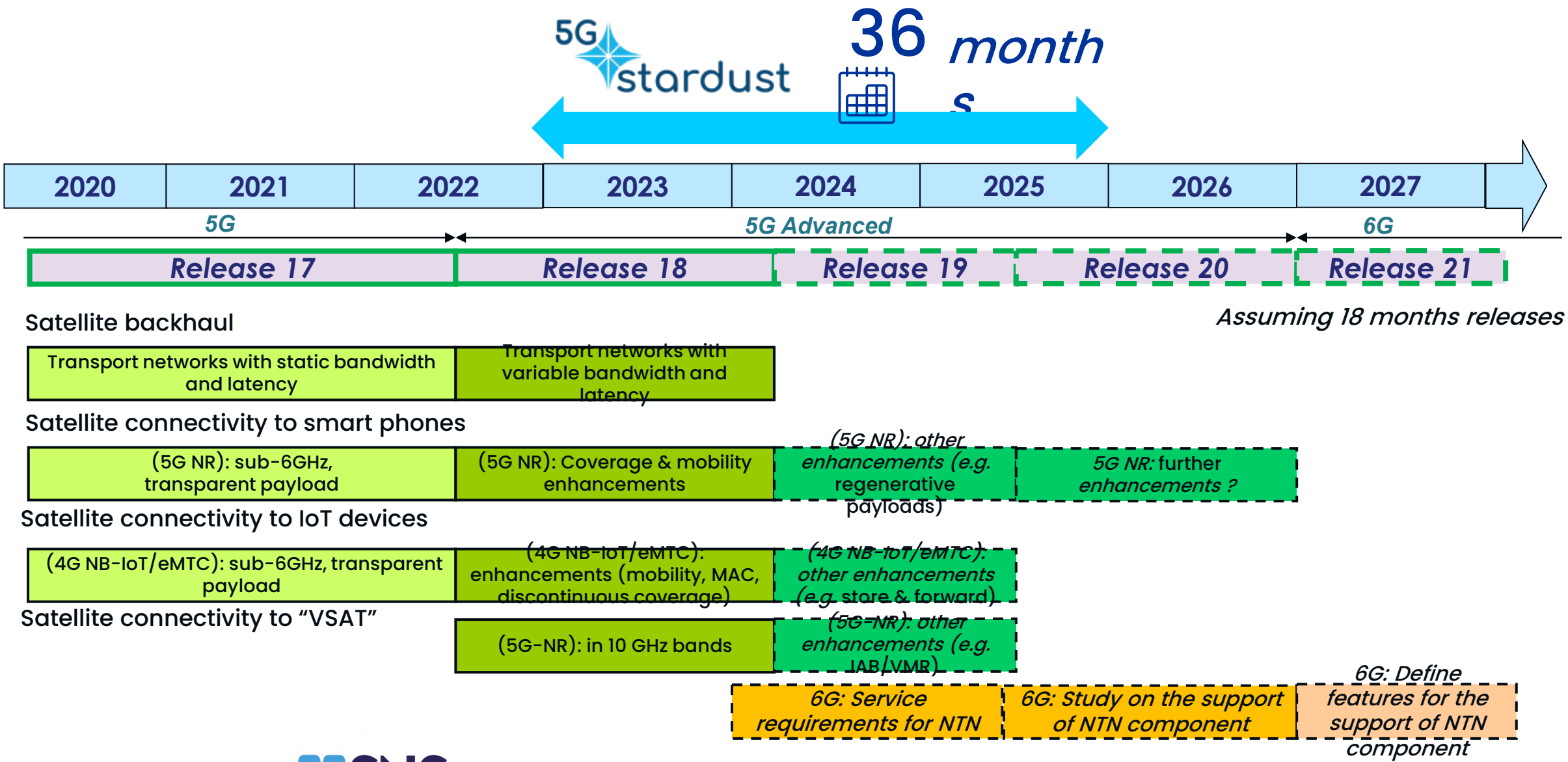




TRL 4/5 Planned Demonstration



Timeline



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