



ENI PoC #17: Intelligent
Satellite-Terrestrial
Integration Network
Architecture Progress
Update

Rapporteur:

Tsinghua University, China Telecom, Asaiinfo, Huawei, CAICT,
CNIT, CNR ISTI

ENI PoC project #17: Intelligent Satellite-Terrestrial Integration Network Architecture



PoC Goals and PoC member task

Host/Team Leader:



Team members:

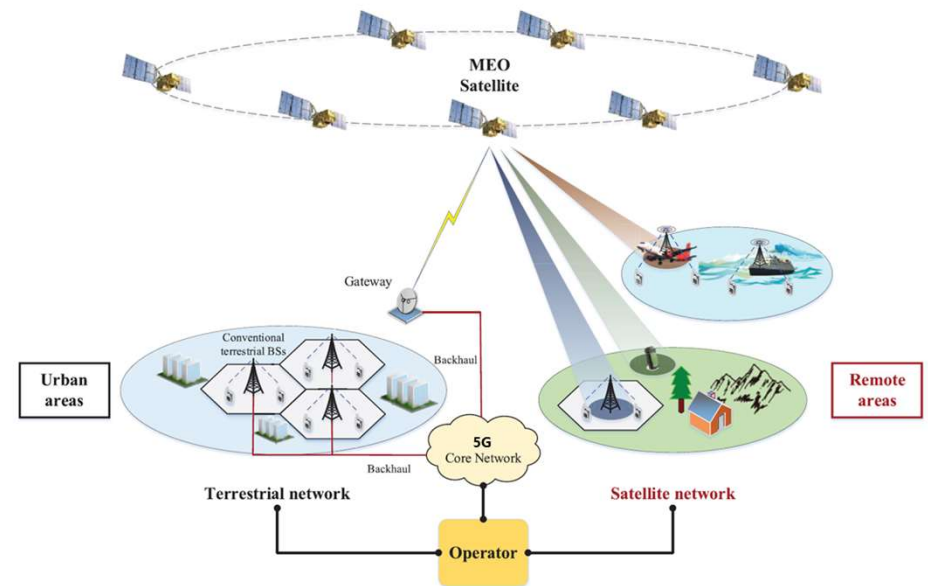


- ✓ PoC Project Goal #1: Hand-and-Arm based Architecture. Demonstrate the architecture design with inherent wide-area coverage capability and the unified management of user access with ubiquitous signaling coverage.
- ✓ PoC Project Goal #2: Intelligent On-demand Coverage. Demonstrate the intelligent on-demand coverage technology to provide dynamic resource allocation for traffic steering to meet diversified user demands.

ENI PoC project #17: Intelligent Satellite-Terrestrial Integration Network Architecture

The integrated satellite-terrestrial network architecture to achieve high effective network efficiency

The integration architecture is composed of the MEO satellite network and the terrestrial network, both of which are connected to the 5G core network of the operator. To provide unified and continuous communication service, the MEO satellite network and the terrestrial network are integrated at the air interface level. In this way, unified terminal devices can seamlessly access either the satellite network or the terrestrial cellular network according to different service scenarios. For users located in the coverage of terrestrial networks, generally in urban areas, the users will access the terrestrial network for broadband services. For users in areas without terrestrial networks, such as rural areas, sea areas, and airspace, the users will access the satellite network for communication.



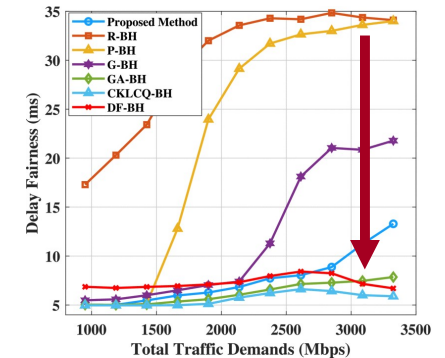
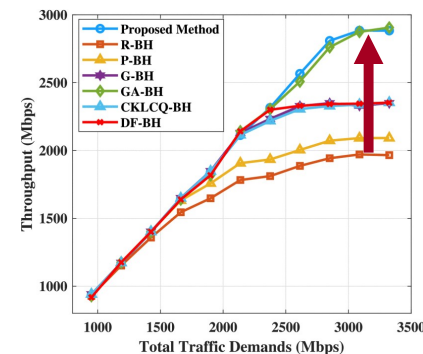
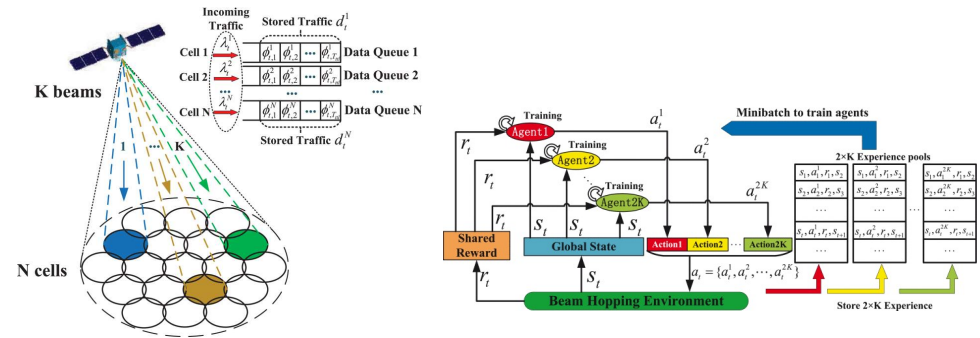
The integrated satellite-terrestrial network architecture

ENI PoC project #17: Intelligent Satellite-Terrestrial Integration Network Architecture



Intelligent On-demand Coverage

A dynamic beam pattern and bandwidth allocation scheme based on DRL is proposed, which flexibly uses three degrees of freedom of time, space and frequency. And a cooperative multi-agent deep reinforcement learning framework is proposed to solve the explosion of action space, where each agent is only responsible for the illumination allocation or bandwidth allocation of one beam. The agents can learn to collaborate by sharing the same reward to achieve the common goal, which refers to maximize the throughput and minimize the delay fairness between cells. Simulations have proven that the proposed method has better performance of data throughput and the delay fairness than existing beam hopping approaches.



Performance of the intelligent on-demand coverage

ENI PoC project #17: Intelligent Satellite-Terrestrial Integration Network Architecture



PoC Milestones and Current Progress



PoC Milestone	Stages/Milestone description	Target Date	Additional Info
P.S	PoC project submission	09/2023	Presentation during #ENI 27
P.TP.1	PoC Test Plan 1	12/2023	Initial testbed up and running
P.D1	PoC Demo 1	12/2023	Webinar demo at the ENI#28 plenary meeting
P.D2	PoC Demo 2	06/2024	Demo at shanghai MWC2024
P.D3	PoC Demo 3	TBD	Demo at Intel AI summit
P.C1	PoC Expected Contribution 1	05/2024	Contributions to ENI use case
P.C2	PoC Expected Contribution 2	07/2024	Contributions to ENI requirement
P.C3	PoC Expected Contribution 4	07/2024	Contributions to ENI terminology
P.C4	PoC Expected Contribution 5	09/2024	Contributions to ENI data mechanism
P.R	PoC Report	09/2024	PoC-Project-End Feedback
P.E	PoC Project End	12/2024	Presented to ISG ENI for information