CELTIC Proposers Day
- Keynote -

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CELTIC-NEXT

Eureka Cluster

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Harnessing AI in 6G: Adapting Autonomous Networks with 6G Enabling Technologies

6G and Autonomous Network

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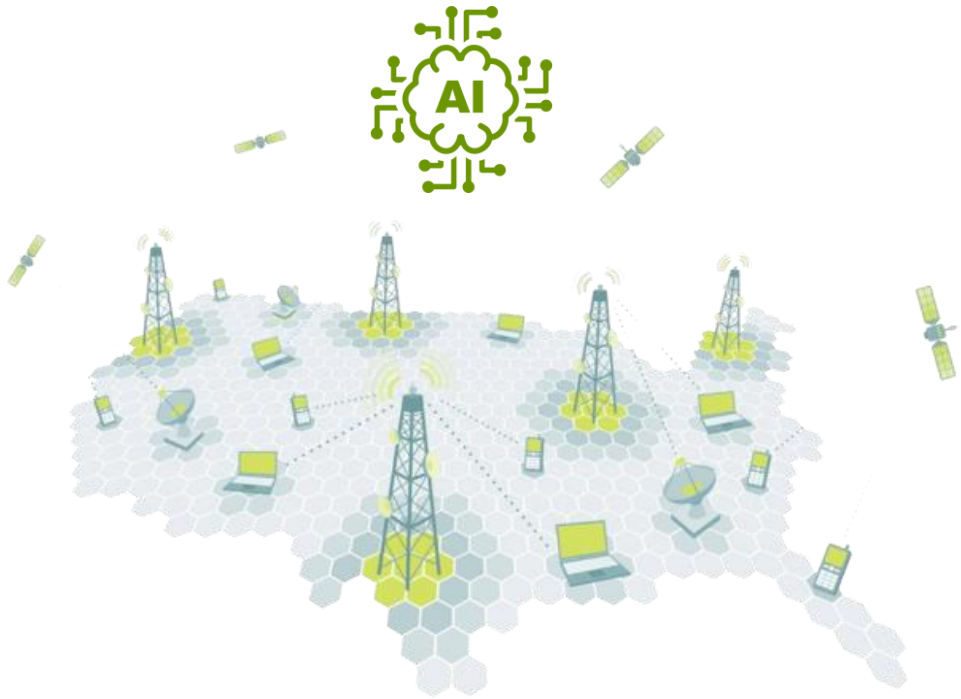
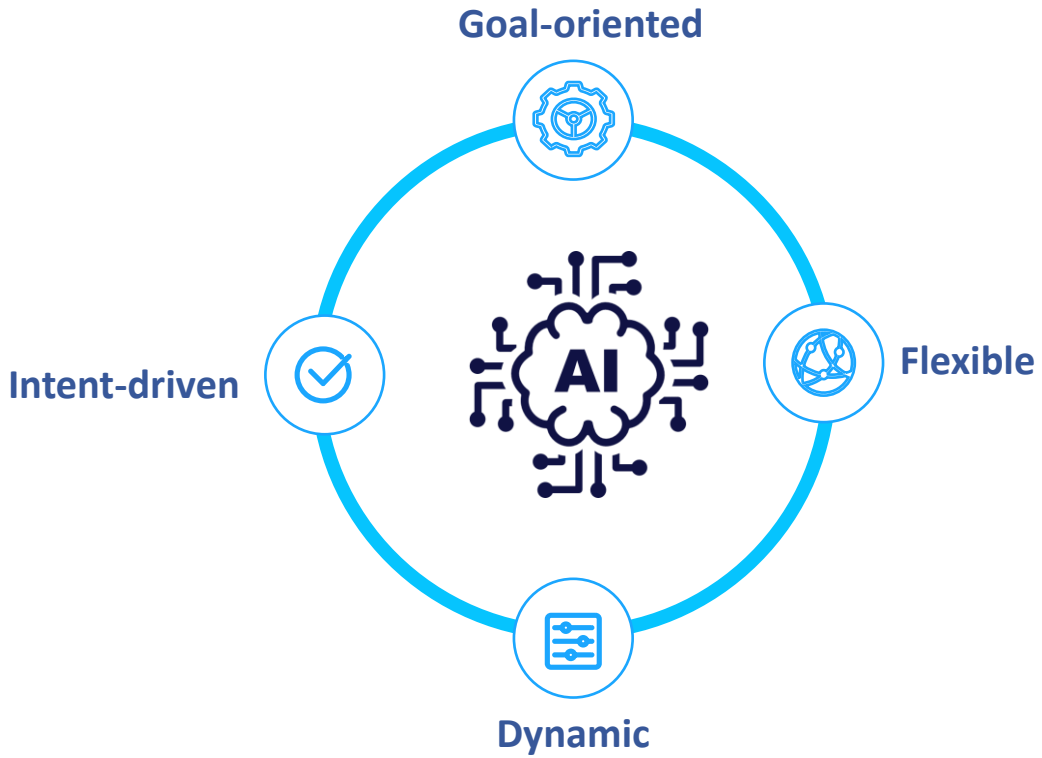
5G → 6G

AI for Networks



Networks for AI



Towards Fully Autonomous Networks

The ability to **perform** tasks or operations (e.g., provisioning, monitoring)

The capability to **gather** and **understand** the current state of the network, including context and external conditions

The ability to **process** collected data and **derive insights** for optimizing network performance or resolving issues.

The capability to **make decisions**, either manually or autonomously, based on analysis and predefined rules.

Refers to how the network **aligns** with user or business intentions and the **quality** of the delivered experience.

Indicates the **scope** or scenarios in which the specified level of autonomy is applied.

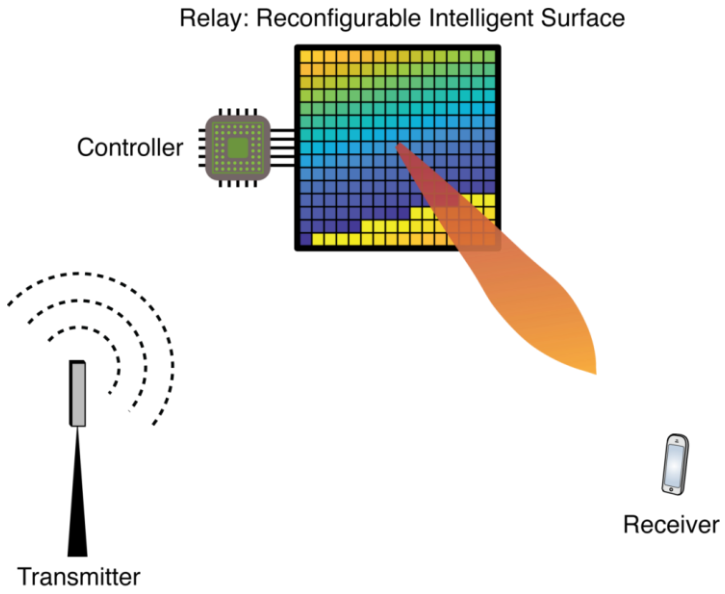
Autonomous Levels	L0: Manual Operation & Maintenance	L1: Assisted Operation & Maintenance	L2: Partial Autonomous Networks	L3: Conditional Autonomous Networks	L4: High Autonomous Networks	L5: Full Autonomous Networks
Execution	P	P/S	S	S	S	S
Awareness	P	P/S	P/S	S	S	S
Analysis	P	P	P/S	P/S	S	S
Decision	P	P	P	P/S	S	S
Intent/Experience	P	P	P	P	P/S	S
Applicability	N/A	Select scenarios				All scenarios

P People (manual) S System (autonomous)

Autonomy	The capability to make decisions free from human control.
Automatic	Able to operate independently of human control
Autonomous	Having autonomy.
Autonomic	Acting or occurring involuntarily.

https://www.zte.com.cn/global/about/magazine/zte-technologies/2022/6-en/2/perspective-of-autonomous-optical-transport-network.html

Autonomous Network – RIS for Execution



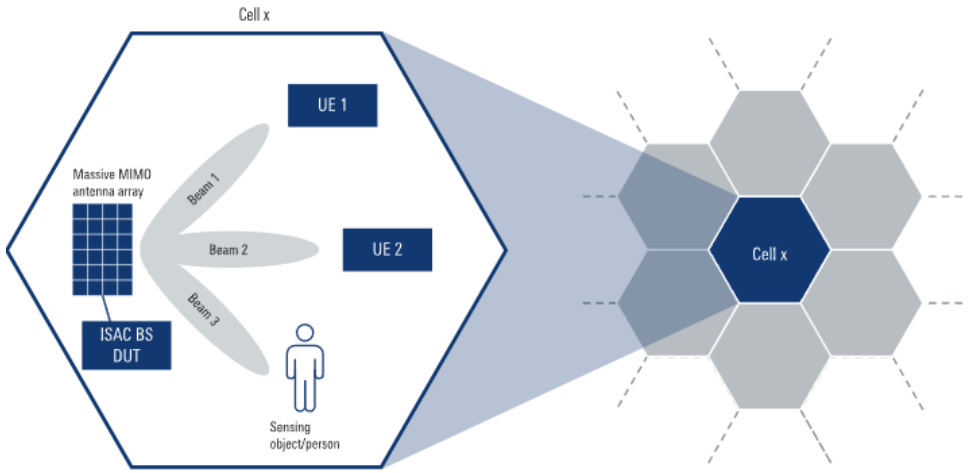
RIS = Road to Smart Radio Environments

- Manipulating EM waves via low-cost tunable electronic components (PIN diodes, varactors, liquid crystals)
- Reflection, amplification, refraction, absorption functionalities
- Control propagation environment

RIS enables **autonomous real-time optimization** of radio environments by controlling reflective surfaces dynamically.

https://ma-mimo.ellintech.se/2020/06/08/reconfigurable-intelligent-surfaces-the-resurrection-of-relaying/

Autonomous Network – ISAC for Awareness



ISAC is a next-generation wireless technology that enables networks to **simultaneously sense their environment and transmit data.** ISAC allows networks to **dynamically detect obstacles, user movements, and environmental conditions, optimizing operations in real time.**

ISAC integrates sensing and communication to provide real-time environmental awareness, allowing networks to autonomously perceive and adapt to changes.

https://www.rohde-schwarz.com/us/applications/integrated-sensing-and-communication-isac-brings-the-future-to-life-in-6g-application-card_56279-1476226.html#media-gallery-5

Autonomous Network – NTN for Awareness

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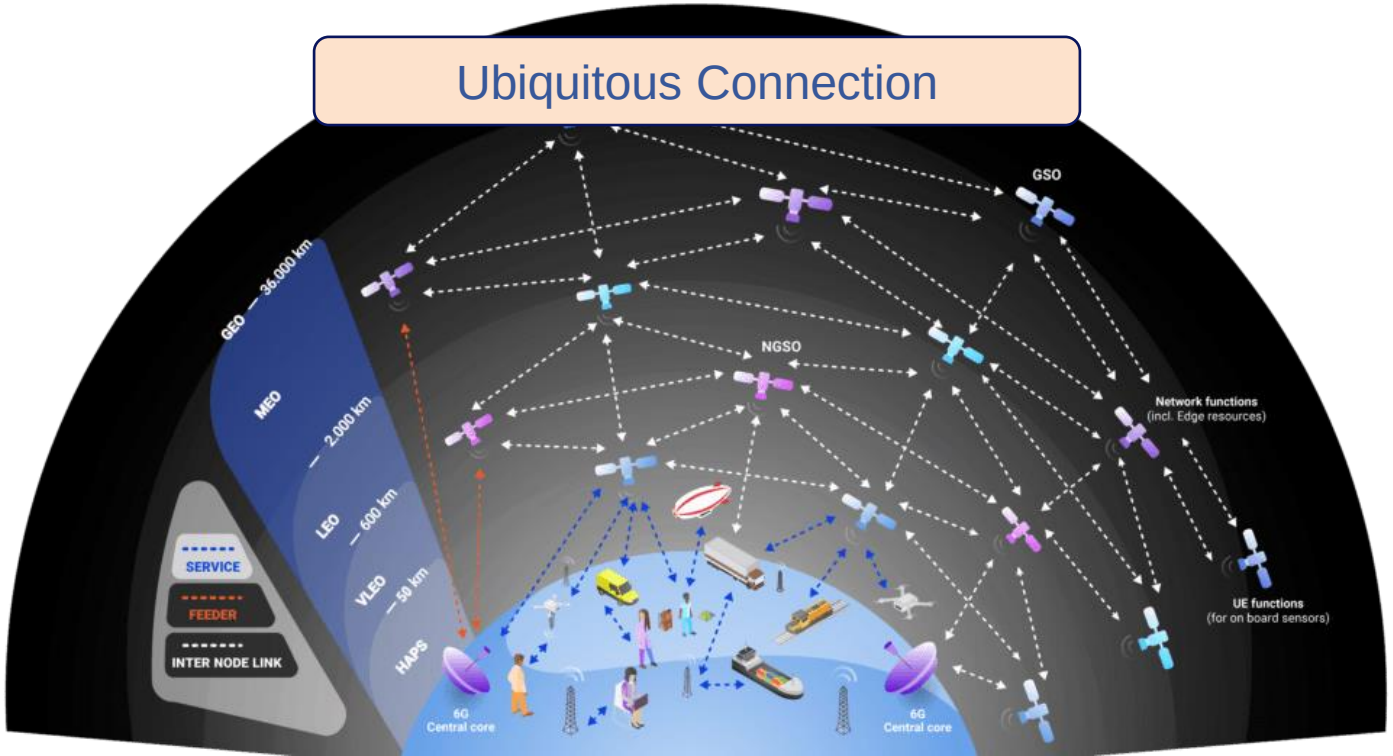
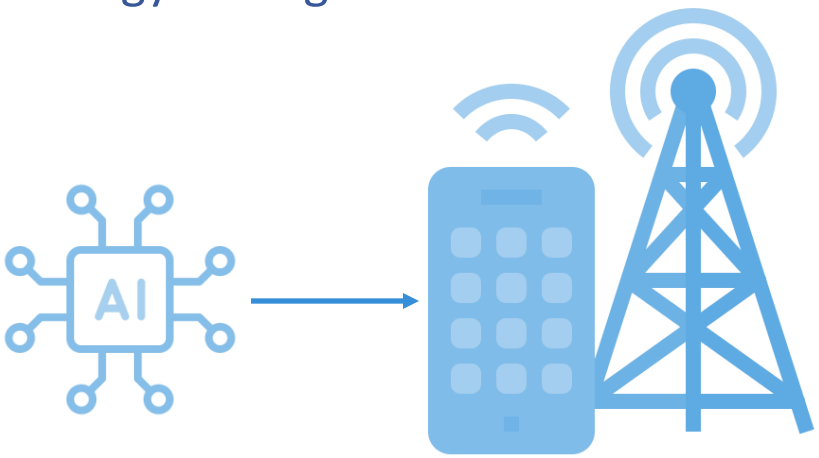
In autonomous networks, NTN enhances awareness by providing continuous, wide-area situational intelligence, ensuring connectivity in remote and disaster-prone regions, and enabling global monitoring of network conditions. By combining NTN with AI and ISAC, networks can dynamically adapt, predict connectivity issues, and optimize resources in real time, making them more resilient and intelligent.



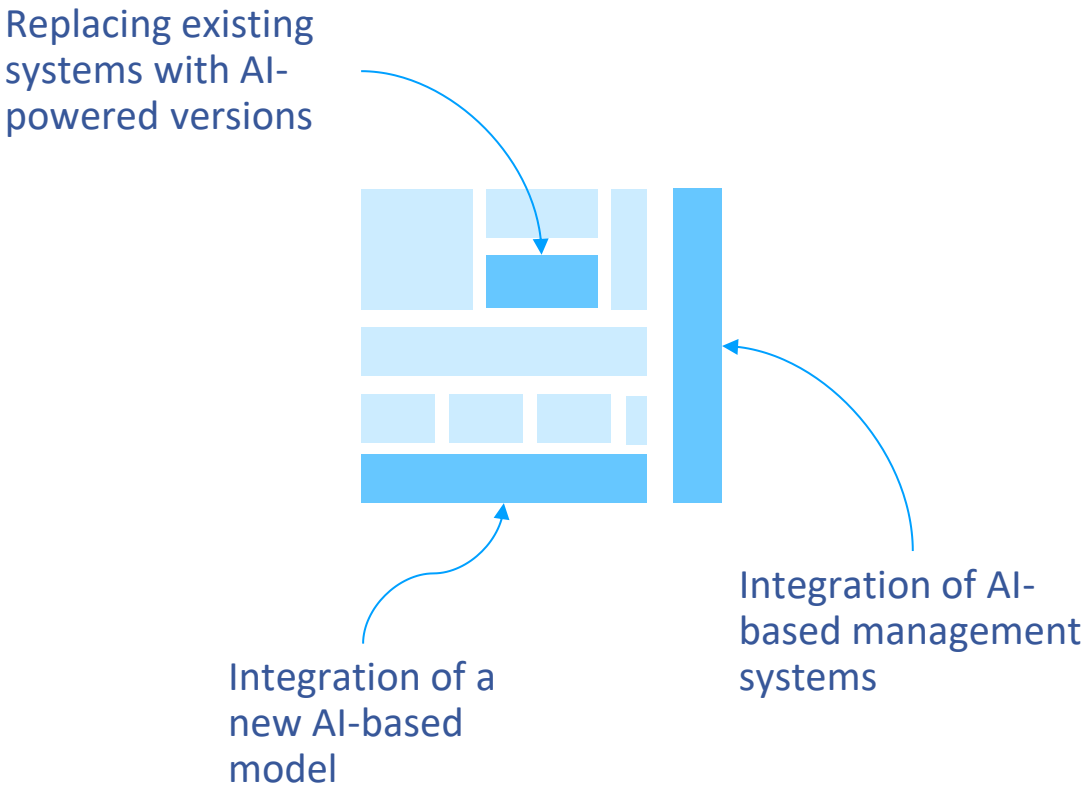
Autonomous Network – Decision & Analysis

AI for Networks:

- Predictive maintenance
- Intelligent decision making
- Energy management



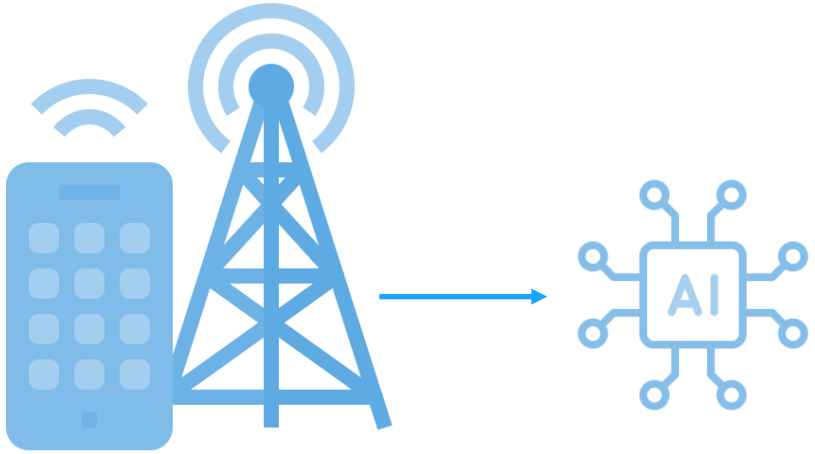
A.I. **Network**



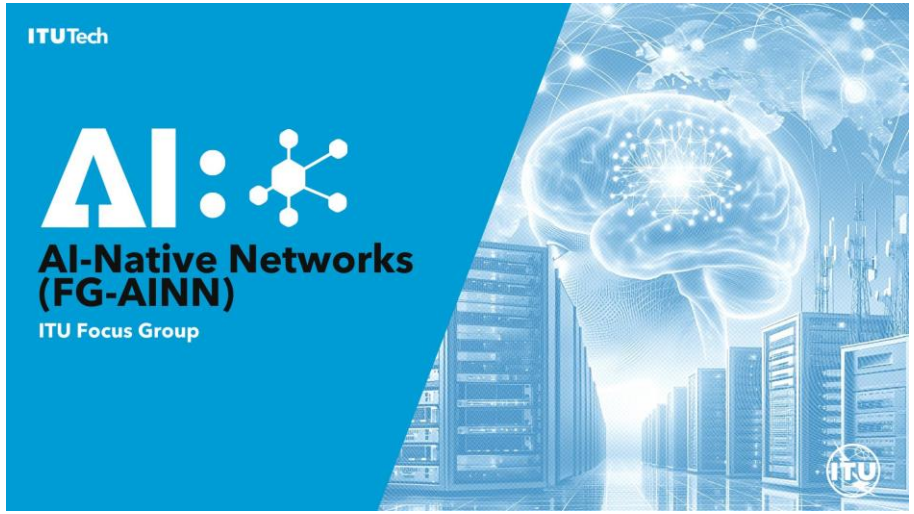
Autonomous Network – Decision & Analysis

Networks for AI:

- AI-native network design
- Provisioning High-Performance Connectivity
- Supporting Distributed AI Processing



Network **A.I.**



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AI for 6GEN.LAB

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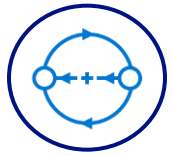
Graph Neural Networks

Graphs for dynamic customer segmentation

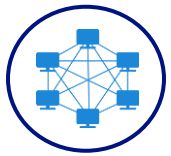
Resource planning for robust network architecture



Reinforcement Learning

StorAIge VERGE

Reinfocement learning-driven dynamic network slicing



Distributed Learning

Edge-to-cloud continuum

Decentralised networks

Generative A.I.

Synthetic data generation

GenAI as an interpreter

Reliable and Trustworthy A.I.

GSMA™

GSMA Realiable AI Maturity Roadmap early adopter

Let’s Collaborate and Innovate Together

We Are More Than a Telecommunications Provider

R&D Collaborations

6GEN.LAB

PoC and Live Demos

New Technologies Venture Capital Investment Fund

www.turkcell.com.tr/gsyf

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MANY THANKS FOR YOUR ATTENTION.

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