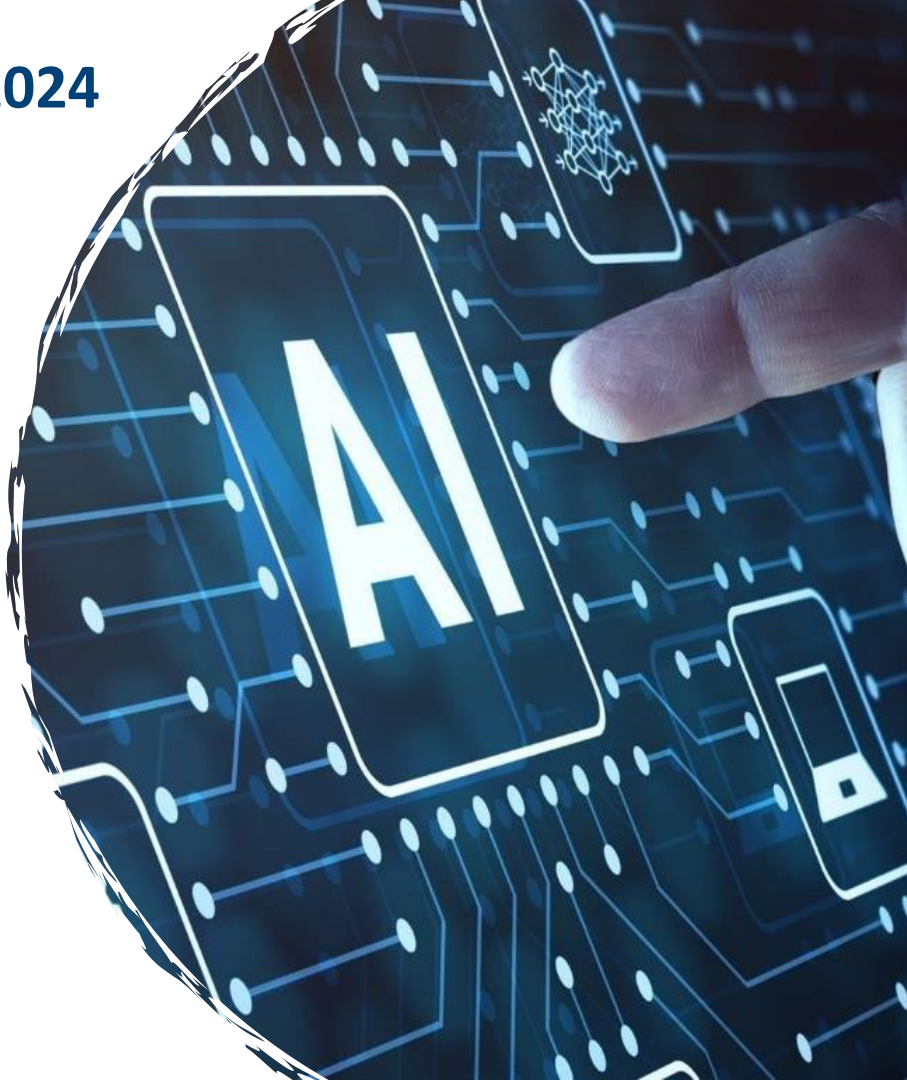
ETSI AI Conference 2024



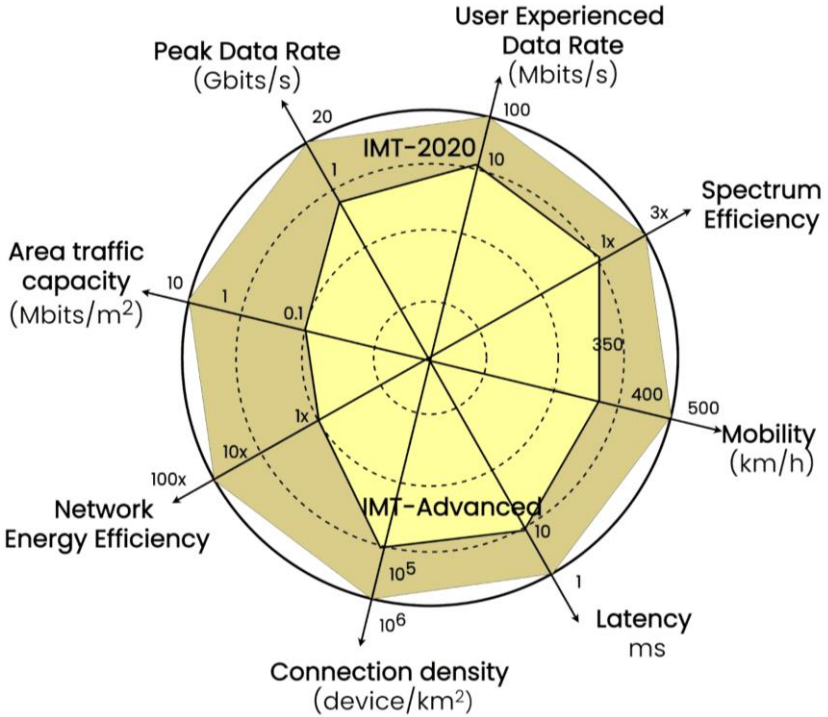
Empowering MNOs: Navigating the Future with AI Applications and Perspectives

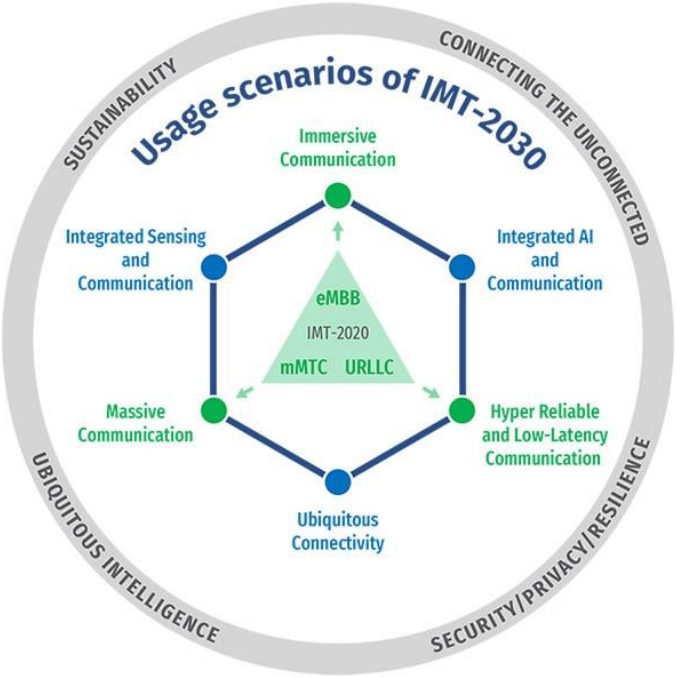
Presented by: Ahmet Faruk COSKUN

TURKCELL

06/02/2024

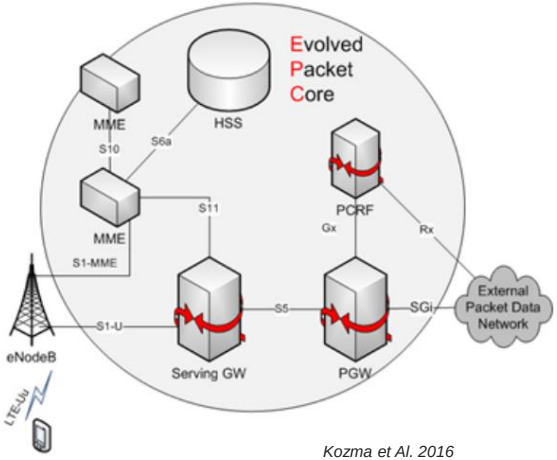
MNOs' survival strategy within the spider web of KPIs





The utilization of AI through Telco generations

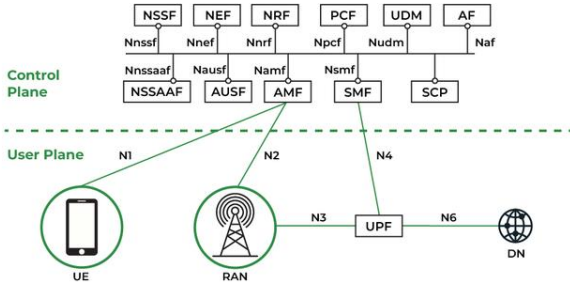
4G LTE Architecture



Kozma et Al. 2016

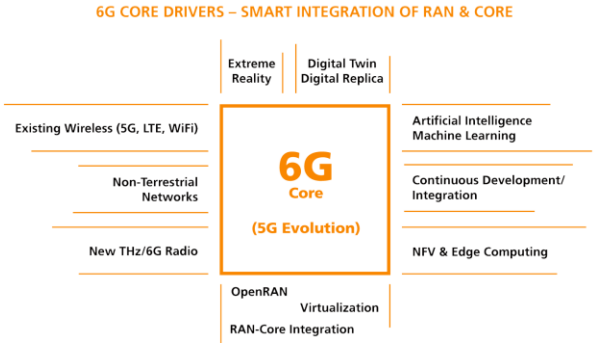
Hardware Based Units
- Dedicated hardware components
- Proprietary systems with vendor lock-in
- Physical installation and manual scaling

5G Architecture



Softwarization:
- Network Function Virtualization (NFV)
- Cloud-native architecture and services
- Scalable and flexible service deployment
- Reduced reliance on physical hardware

6G Core Drivers



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AI Integrated:
- Smart network operations using AI and ML algorithms
- Autonomous network healing, optimization, and scaling
- Predictive maintenance and anomaly detection
- Energy-efficient network management
- Self-organizing networks with minimal human intervention
- Intelligent resource allocation and traffic prediction

Transforming hardware to software:
- Mobility Management **Entitiy** (MME) to Access and Mobility Mangement **Function** (AMF)
- Serving/Packet Data Network **Gateway** (SGW, PGW) to Session Management **Function** (SMF)
- Home Subscriber **Server** (HSS) to Unified Data **Management** (UDM)
- **PCF, NSSF, NWDAF…**

Future's Communication Technology: 6G!

- Faster Data transfer
- More connections
- More flexible architecture
- More efficient Resource allocation
- More diverse Use cases
- More sustainable networks
- Ubiquitous coverage (Air, Land, Sea)

Autonomous networks, but how?

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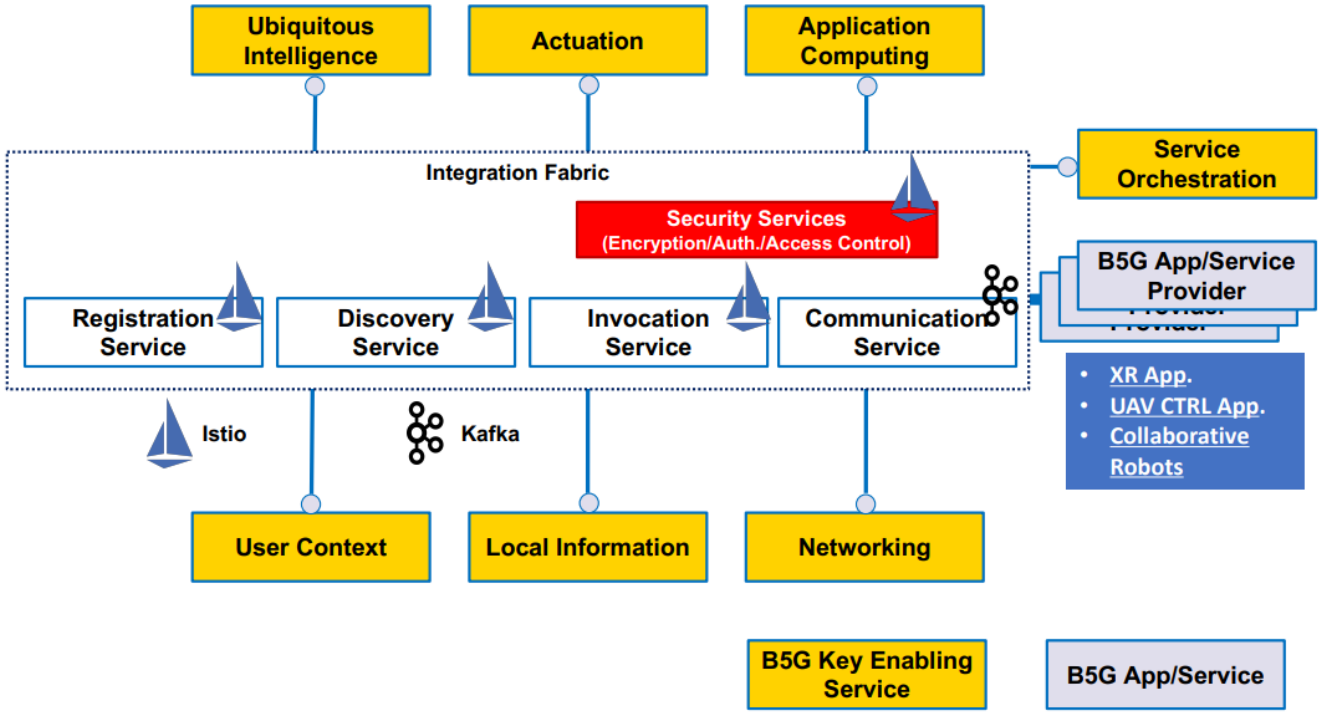
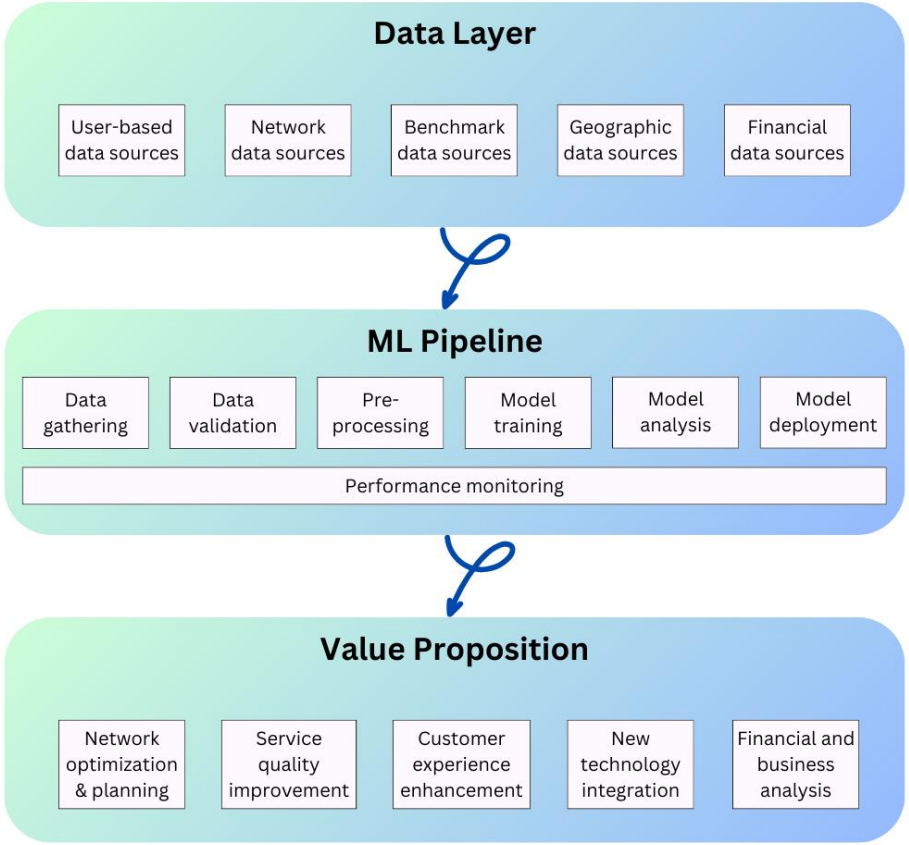
Next Generation Mobile Network World



6G system architecture envisioned as a “Service of Services”, interoperable through an integration fabric.

Taleb, Tarik & Benzaid, Chafika & Bordallo Lopez, Miguel & Mikhaylov, Konstantin & Tarkoma, Sasu & Kostakos, Panos & Mahmood, Nurul & Pirinen, Pekka & Matinmikko-Blue, Marja & Latva-aho, Matti & Pouttu, A.. (2022). 6G System architecture: A service of services vision. ITU Journal on Future and Evolving Technologies. 3. 710-743.

Value Proposition by Utilizing ML



Proactive Cell Sleeping

Customer Experience Prediction

Service Quality Forecast

Autonomous networks, but future?

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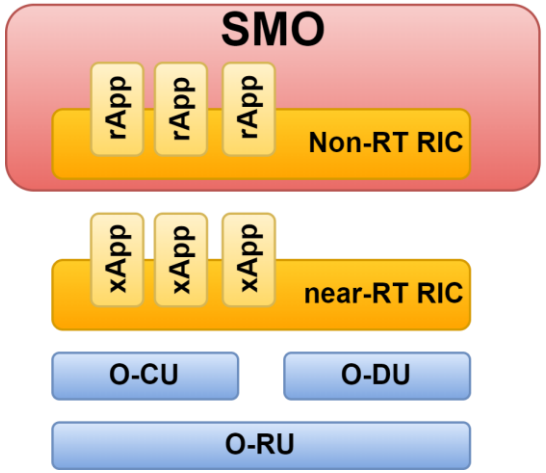
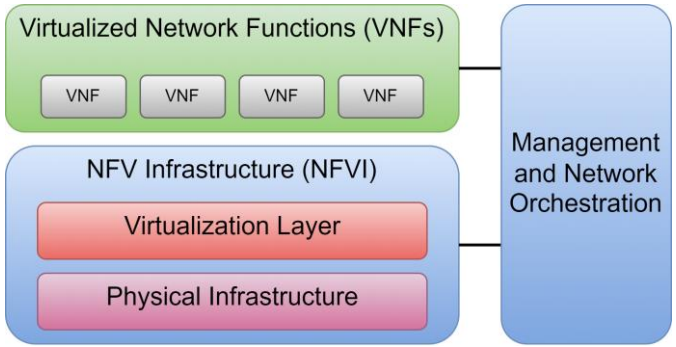
Next Generation Mobile – Autonomous Network

O-RAN



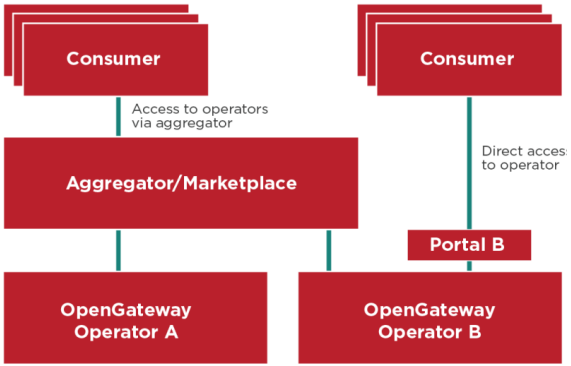
- Advanced Automated Operations
- Enhanced Network Optimization and Efficiency

NFV



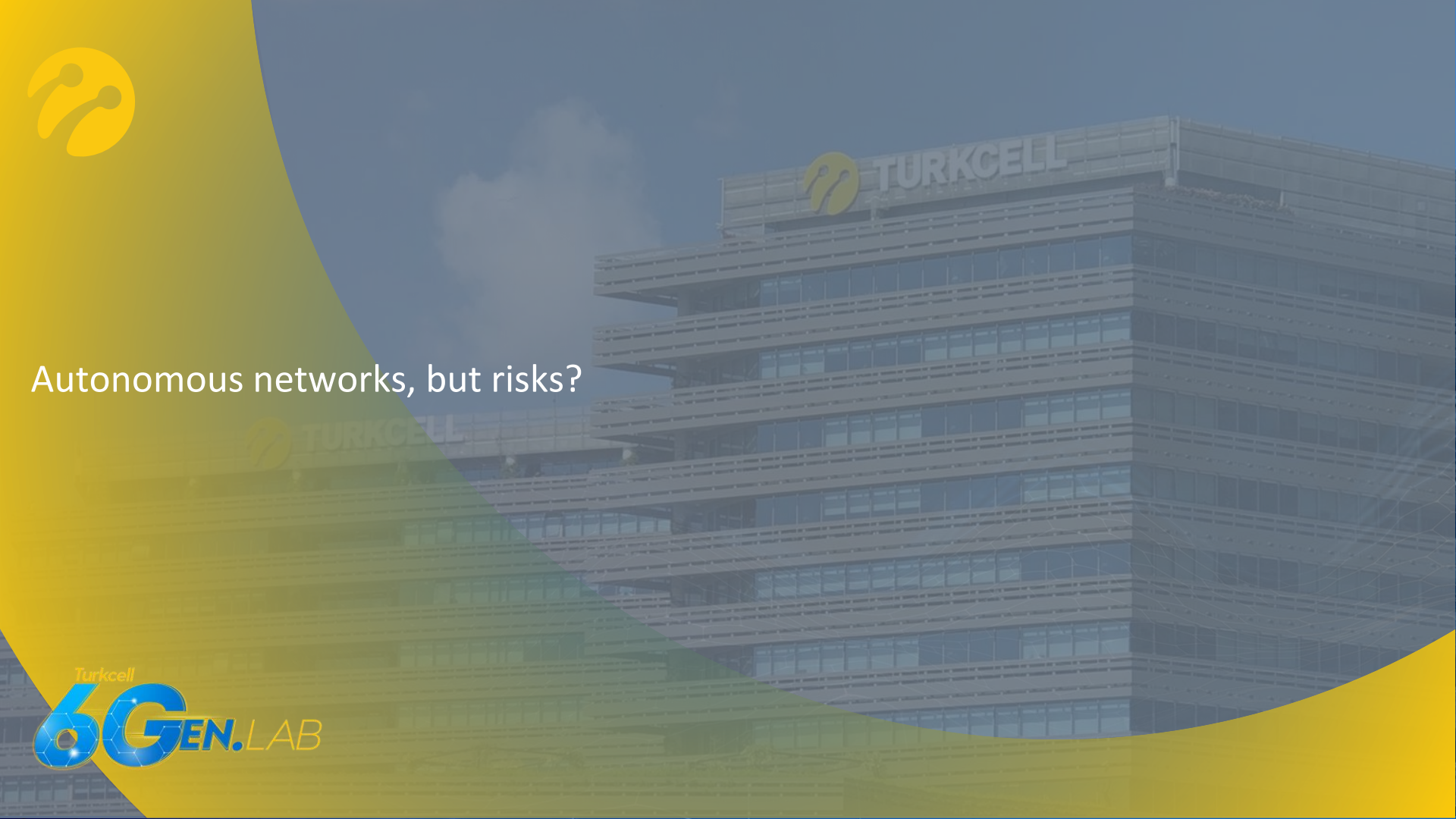
- Scalability and Flexibility
- Rapid Deployment and Innovation
- Network Data Analytic Function (NWDAF)

Open-Gateway



- Enhanced Interoperability
- Increased Innovation and Customization

https://www.gsma.com/futurenetworks/wp-content/uploads/2023/05/The-Ecosystem-for-Open-Gateway-NaaS-API-development.pdf



Autonomous networks, but risks?

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AI/ML Spesific Risks!

- Resource Intensiveness
- Bias and Discrimination
- Trustworthiness and Transparency
- Data Privacy and Security
- Reliability
- Regulatory and Compliance Risks

ReCap on AI/ML Usage in Turkcell's Activities

In which ways and readiness levels AI/ML is utilized?

- **Research&Development Projects such as Horizon Europe/6G-SNS/CELTIC NEXT**
  - Academic researches on AI-native network design and autonomous networks
  - Development of xApps and rApps for tailored applications

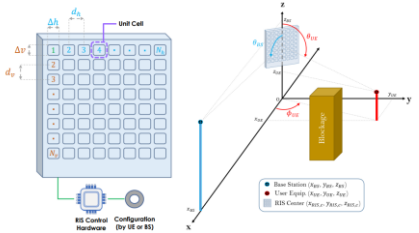
- **Laboratory Test and PoC Studies for AI-aided procedures**
  - Physical-layer processing including sensing and comm., and energy efficiency
  - Network slicing and resource management applications addressing different use-cases (eMBB, URLLC)

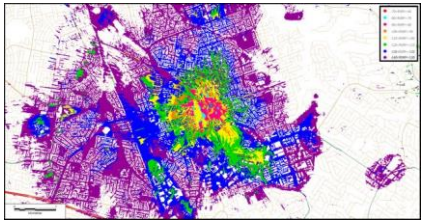
- **Network Planning for 4G/5G**
  - Non real-time site configuration addressing QoE and energy efficiency
  - Smart CAPEX

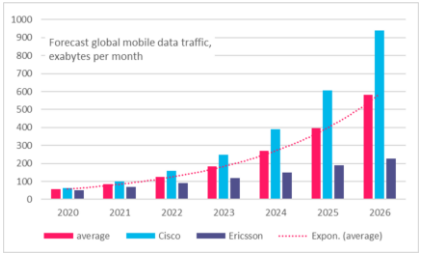
- **Forecasting applications on users' demands and overall data traffic**
  - The earthquake and other natural disaster use cases are being considered with the help of high TRL level system integrations
  - Benchmarking financial studies for ARPU (Av. Revenue Per User) including the other MNOs

- **Integration within end-point customer applications and services**
  - Service-based planning for mobile gaming

- **Transformation of rule-based existing management and orchecstration modules to their AI/ML equivalents**







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In 1926, genius scientist Nikola Tesla stated:

"*When wireless is perfectly applied, the whole Earth will be converted into a huge brain*"