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When the Sky is not the Limit:

See How AI/ML Help Satellite Business and Operations Systems

Azam Beyk

Senior Consultant

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AGENDA

1. The Telecom Evolution Towards 6G
2. 5G Satellite Growth and Revenues
3. The Role of SatCom in Future Communication Networks
4. The Need for AI/ML-enabled SatCom
5. AI/ML Enabled SatCom Business and Operations Systems (Use Cases)

01

The Telecom Evolution Towards 6G

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Where are We? And Where are We Heading?

Mobile Broadband Service

1986 1992 2004 2012 2020 2030 SMART AND GREEN WORLD

Intelligent Networks

1G > 2G > 3G > 4G > 5G > 6G and Beyond

- Advanced Mobile Phone Service (AMPS)
- Total Access Communication System (TACS)
- Foundation of land mobile radio Communications

- Global System for Mobile (GSM)
- Digital-AMPS
- IS-95

- Wideband-Code Division Multiple Access (W-CDMA)
- High Speed Packet Access (HSPA)
- CDMA 2000

- Long-Term Evolution (LTE)
- LTE-Advanced

- 5G NR
- IMT-2020

TODAY

TESTBEDS PROTOTYPES TRIALS COMMERCIALISATION

3GPP: RELEASE 14 > RELEASE 15 > RELEASE 16

Massive Machine Type Communication
~200.200/km^2

ITU

Enhanced Mobile Broadband
~20 Gbps

Ultra-Reliable Low-Latency Communications
~1 ms

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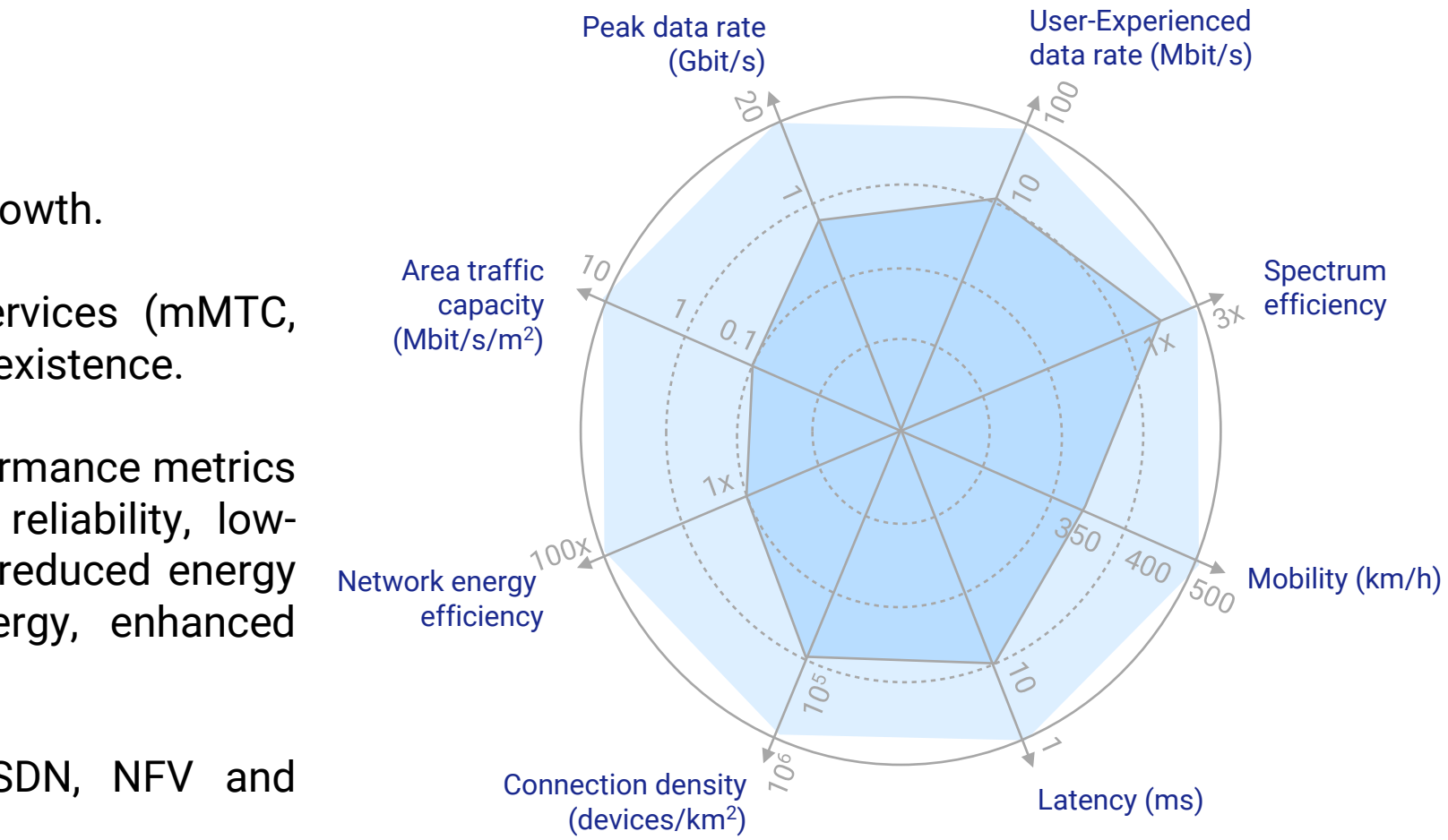
5G Key Objectives and Key Requirements

Key Objectives of 5G Networks:

- To support the expected mobile growth.
- To support various emerging services (mMTC, URLLC, IoT) and to enable their coexistence.
- To enhance various network performance metrics (massive connectivity, ultra-high reliability, low-latency, high resource efficiency, reduced energy consumption/high efficiency energy, enhanced security).
- To bring agility to networks (SDN, NFV and network slicing).



ITU -R (IMT 2020) 5G Requirements

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5G Seems Small Compared to 6G

FeMBB
· Full-Sensory Digital Sensing and Reality
· UHD/SHD/EHD Videos
· Holographic Verticals and Society
· Tactile/Haptic Internet

Peak Data Rate (≥ 1Tb/s)

User-Experienced Data Rate (1 Gb/s)

Spectrum Efficiency 5-10x

ERLLC (eURLLC)
· Industrial Internet
· Fully Automated Driving

Latency 10-100 µs (OTA)

ELPC
Internet of Bio-Nano-Things

Network Energy Efficiency 100x

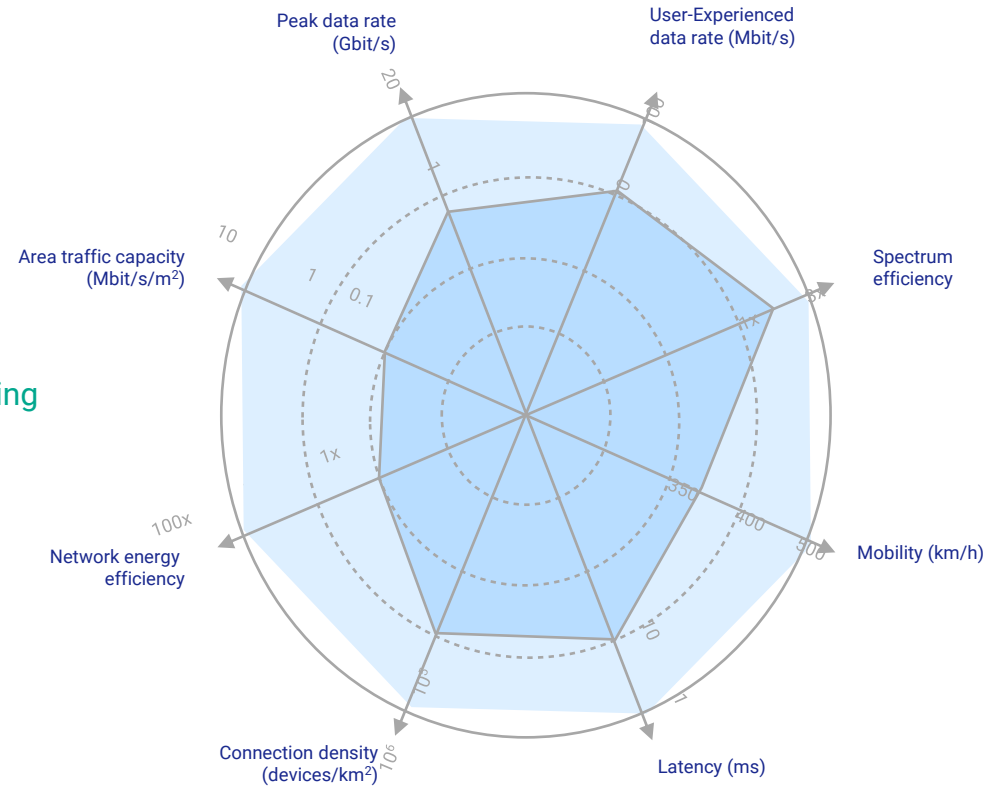
Connectivity Density (10^7 Devices/km^2)

Area Traffic Capacity (1Gb/s/m^2)

Mobility ≥ 1.000 km/h

LDHMC
· Space Travel
· Deep-Sea Sightseeing
· Hyper-HSR

umMTC
IoE



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5G Satellite Growth and Revenues

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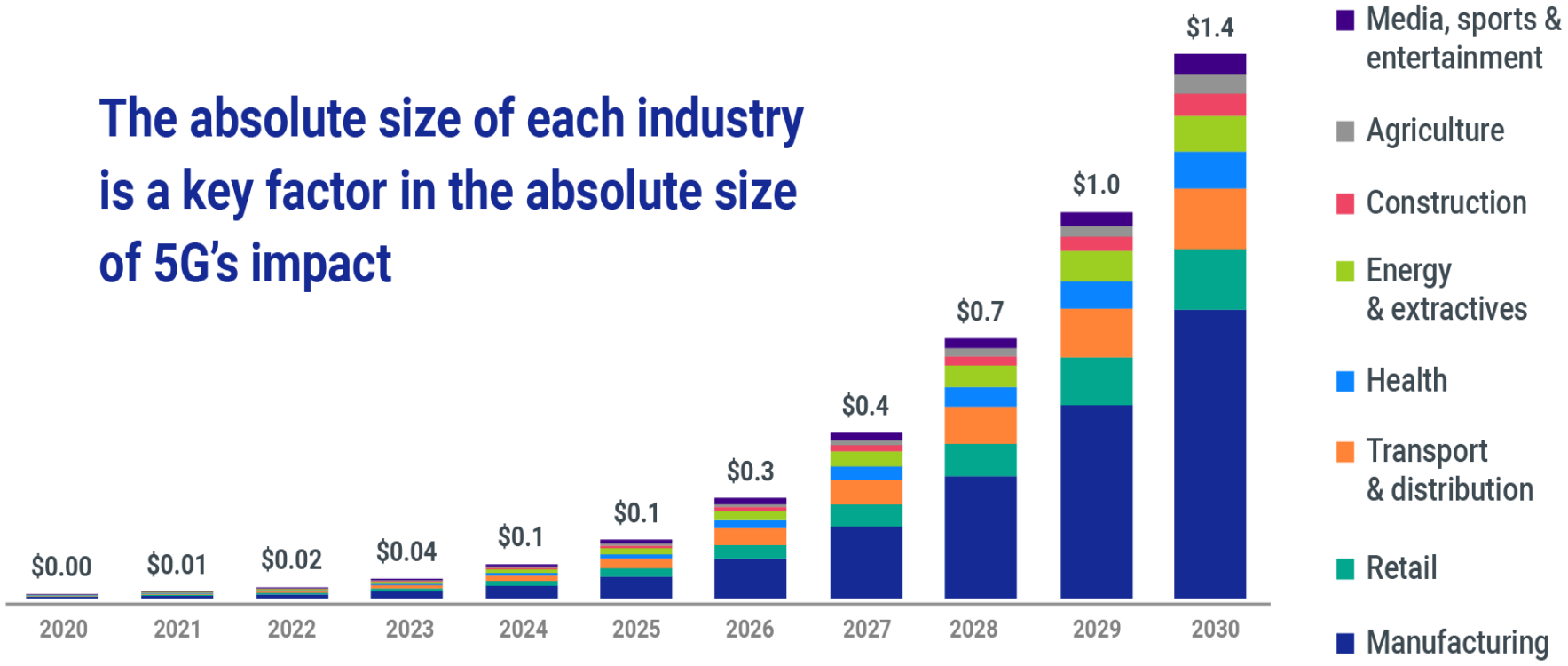
“Beyond the obvious use cases, such as cellular backhaul and trunking, a wide spectrum of applications will experience accelerated demand on SatCom, including IoT, private 5G for corporate networks, mobility or even more conservative users such as government/military”

5G Benefits to Verticals in Trillions of USD

The introduction of 5G will have a deep impact on the satellite ecosystem, with close to 10 million active revenue sources by 2030.

These mostly new businesses will help provide $32.5 billion of extra revenue by 2030.



* stl partners report

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The Role of SatCom in Future Communication Networks

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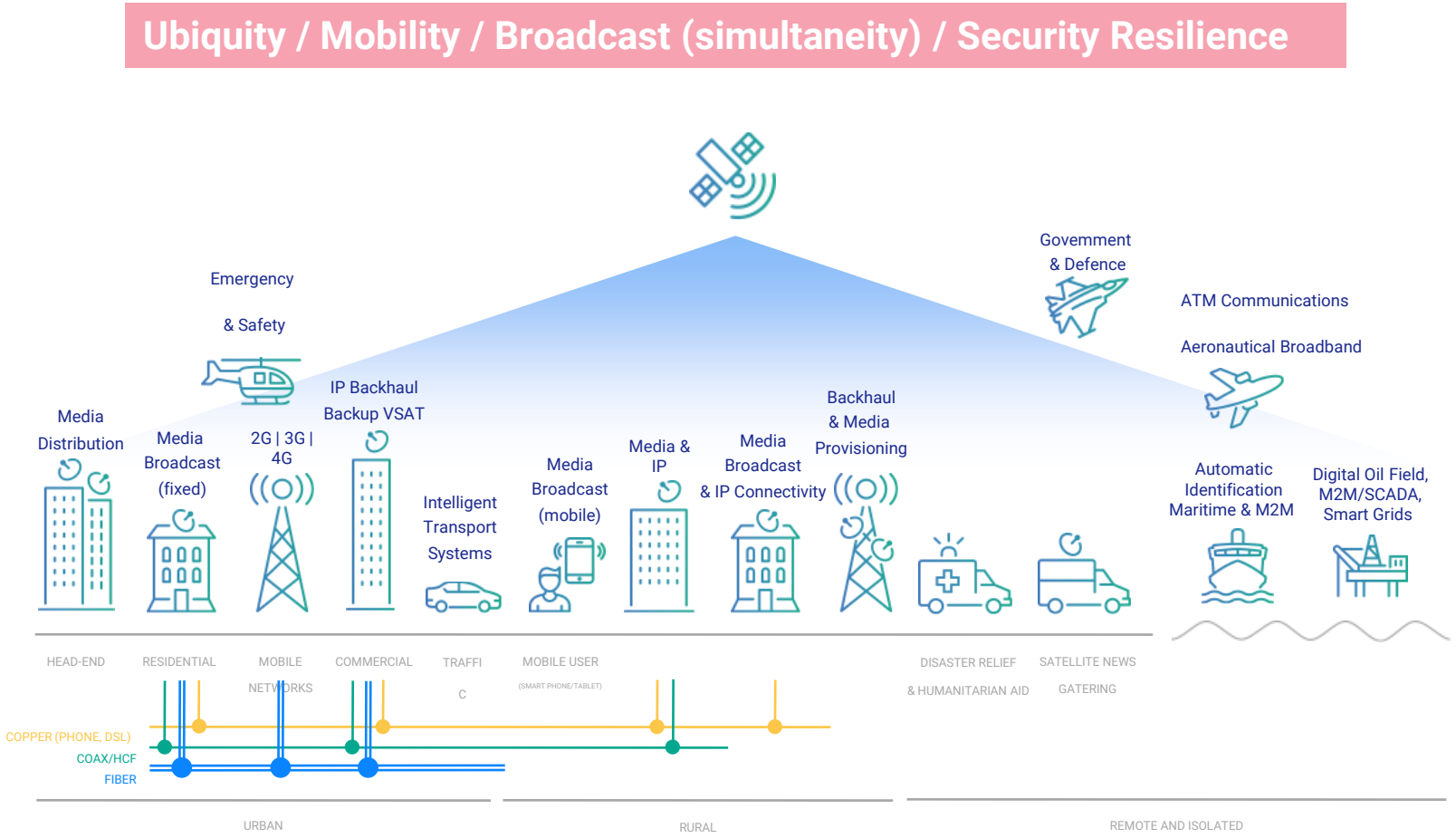
Key Features Critical to the Successful Deployment and Operation of 5G and 6G

- Complementing connectivity for mobile nodes (ships, aircraft, vehicles and trains).
- Offloading a temporarily congested network.
- Providing backhauling services to fixed or moving base stations.
- Providing emergency response/disaster recovery communications.



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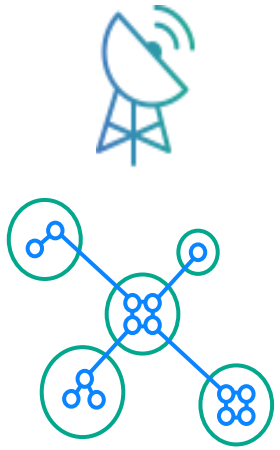
Satellite Use Case Categories in 5G



TRUNKING & HEAD-END FEED

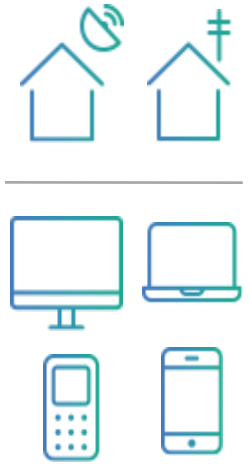
Satellites provide a very high speed direct connectivity option to remote/hard-to-reach locations

BACKHAULING & TOWER FEED

Satellites provide a high speed connectivity (incl. multicast content) to wireless towers, access points and the cloud

COMMS ON THE MOVE

Satellites provide a direct and/or complementary connection for users on the move (e.g. on planes, trains, automobiles and ships)



HYBRID MULTIPLAY

Satellites deliver content complementing terrestrial broadband (as well as direct broadband connectivity in some cases)

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The Need for AI/ML-enabled SatCom

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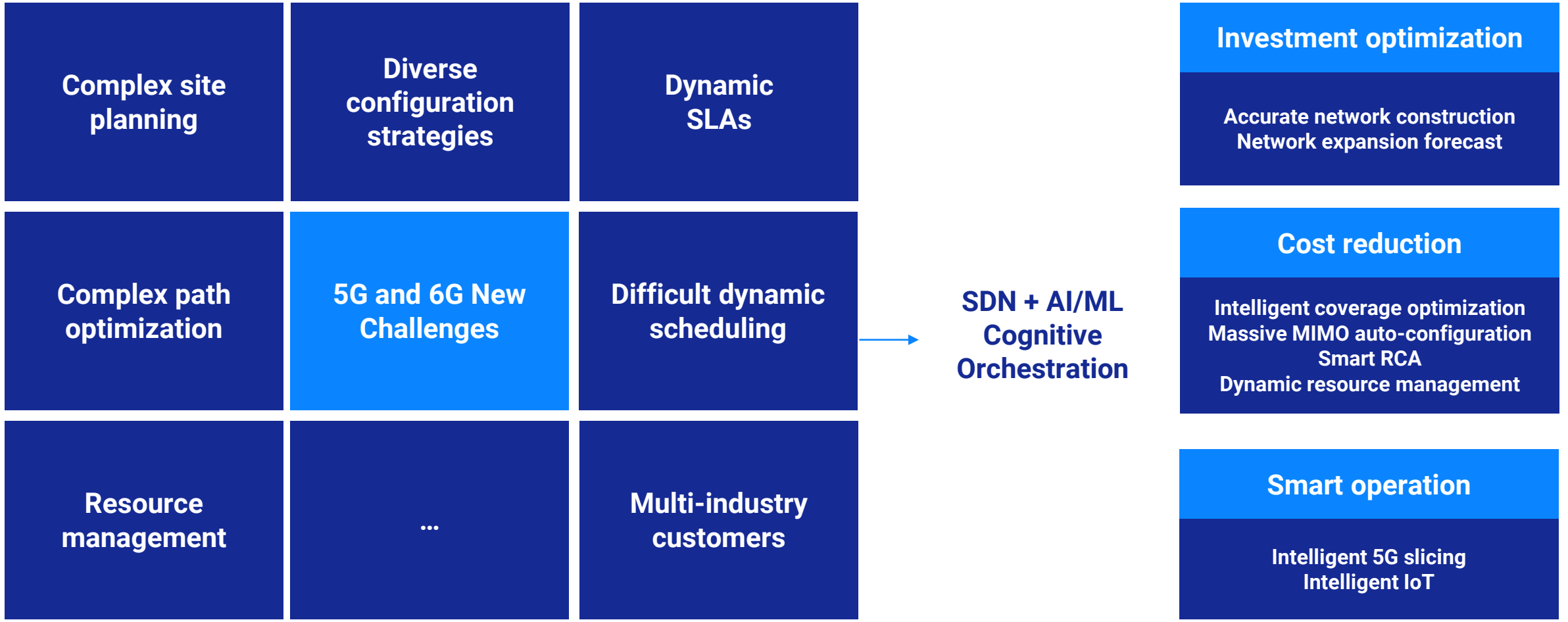
“One must not underestimate the transformative power of 5G in how satellite networks are designed. By incorporating technologies such as SDN and AI, the future satellite networks will offer the scale to operate VHTS constellations under standardized service orchestration”

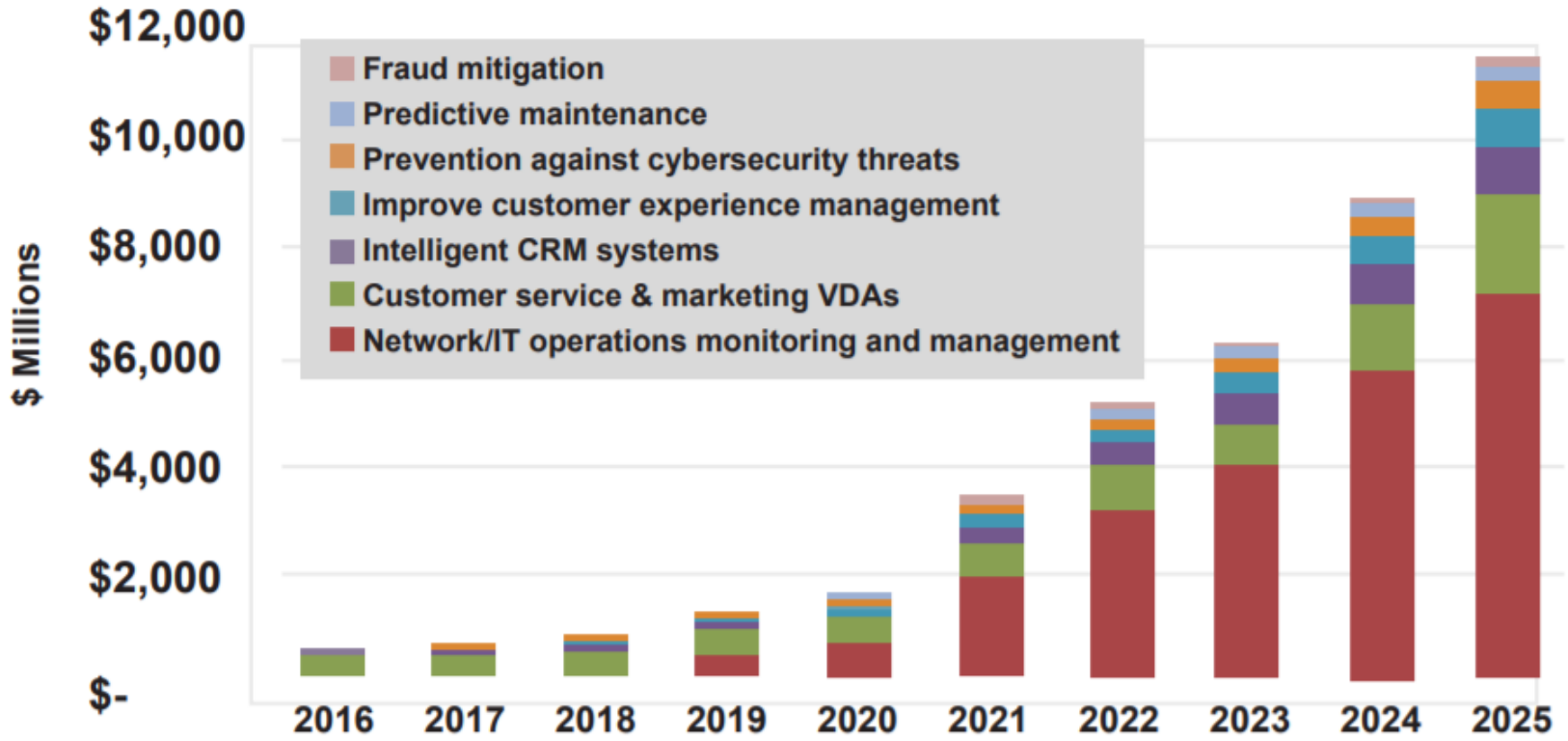
Drivers for Cognitive Orchestration Implementation in SatCom



Telecom AI Software Revenue by Use Case and World Markets

AI investments in the sector are predicted to reach $36.7 billion annually by 2025.

The largest area of investment is network/IT operations monitoring and management, but resources are also being poured into customer service, cybersecurity, predictive maintenance and fraud mitigation.



* Tractica

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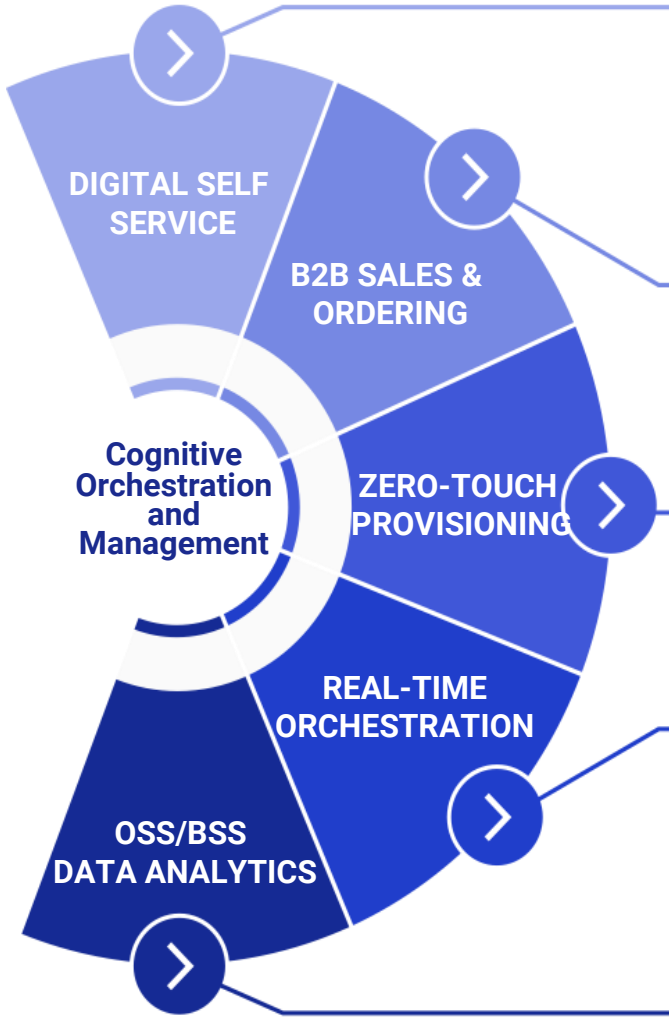
Applications of Cognitive Orchestration and Management



DIGITAL SELF SERVICE: Enhance marketing efforts, thanks to a non-intrusive direct marketing platform for advertising new services and promotions. Increase the number of new sales orders, thanks to the ability to reach your customers with well-targeted, personalized offers directly to their mobile device or desktop.

B2B SALES & ORDERING: Provides end to end, lead to cash experience with a single, unified platform. Accurate quotes are always delivered automatically, in a matter of minutes

ZERO-TOUCH PROVISIONING: Satcom can deliver the configuration needed for each newly deployed virtual function. With the further introduction of AI/ML into NFV, the lifecycle length of functionality gets even shorter.

REAL-TIME ORCHESTRATION: The ability to manage and orchestrate virtual and physical network functions in one system reduces the complexity of adopting new technology and enables support for innovative satcom service offers for customers.

OSS/BSS DATA ANALYTICS: Performing big data analysis, an AI module using ML algorithms to implement predictive maintenance, and knowledge accumulation for automated gathering of best practices in preventing and solving network and service incidents and problems.

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AI/ML Enabled SatCom Business and Operations Systems (Use Cases)

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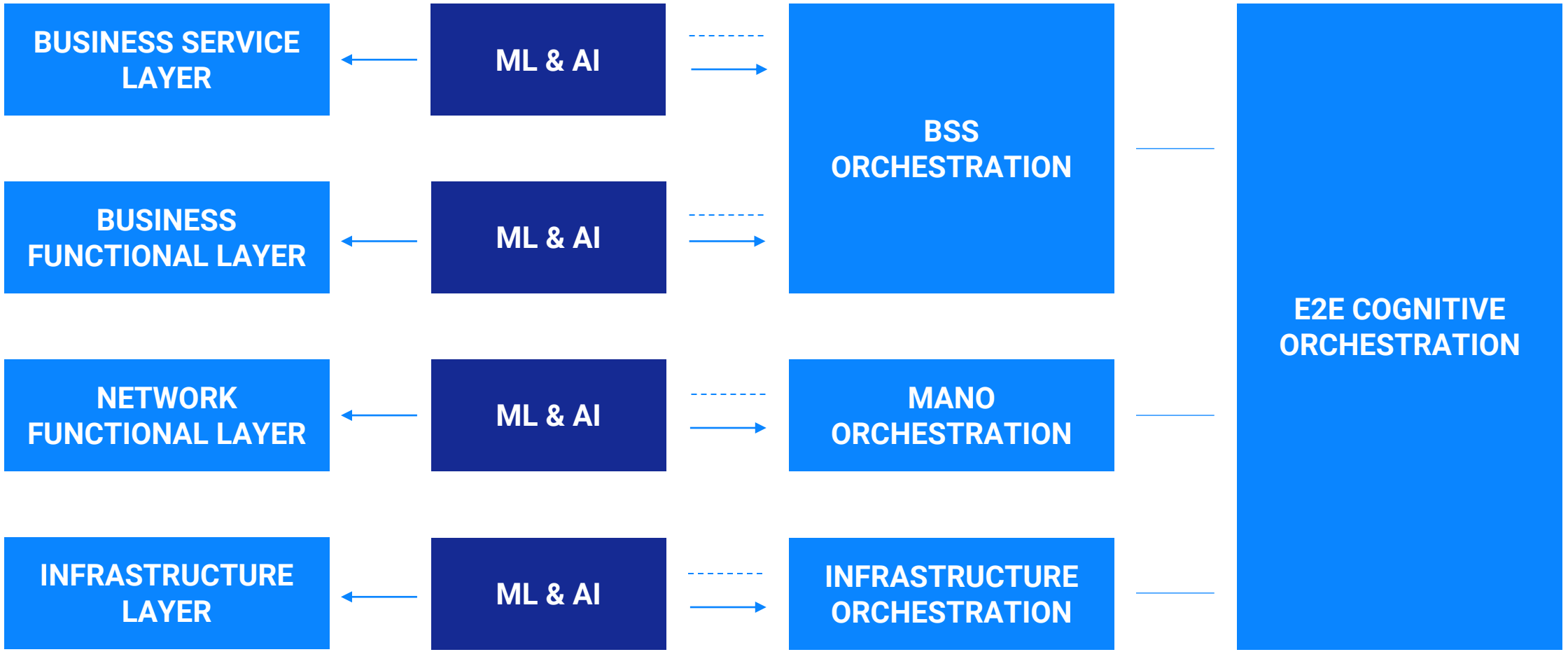
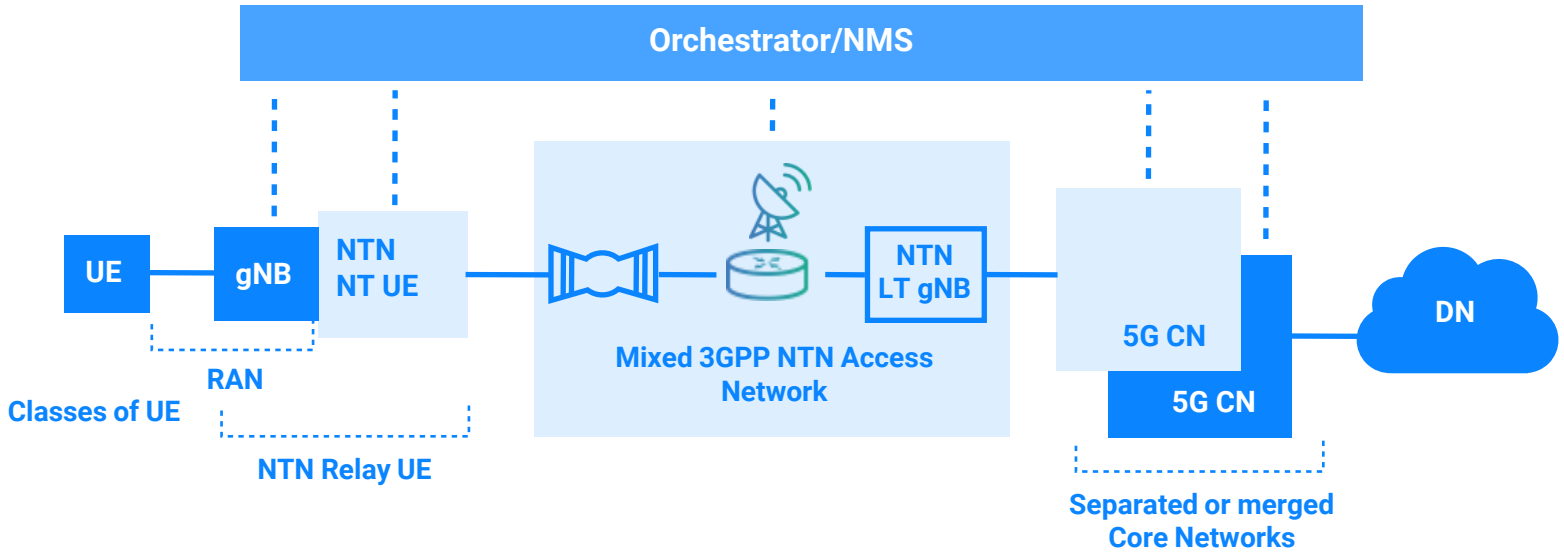
What is Cognitive Orchestration and Management?



Cognitive Orchestrator Interfacing to the Integrated Satellite/Terrestrial System

Cognitive OSS assurance brings pro-activeness and significant reduction of mean time to repair (MTTR) due to automation enabled by close integration of traditionally stand-alone applications such as fault management, service problem management, resource and service test management, resource and service performance management, service quality management, and service assurance control.

The embedded utilization of AI/ML is the key differentiator, enabling the system to take into account the different requirements that services may have of the underlying network, and to calculate and predict the customer service impact accurately.



AI/ML-driven Automation System for SatCom

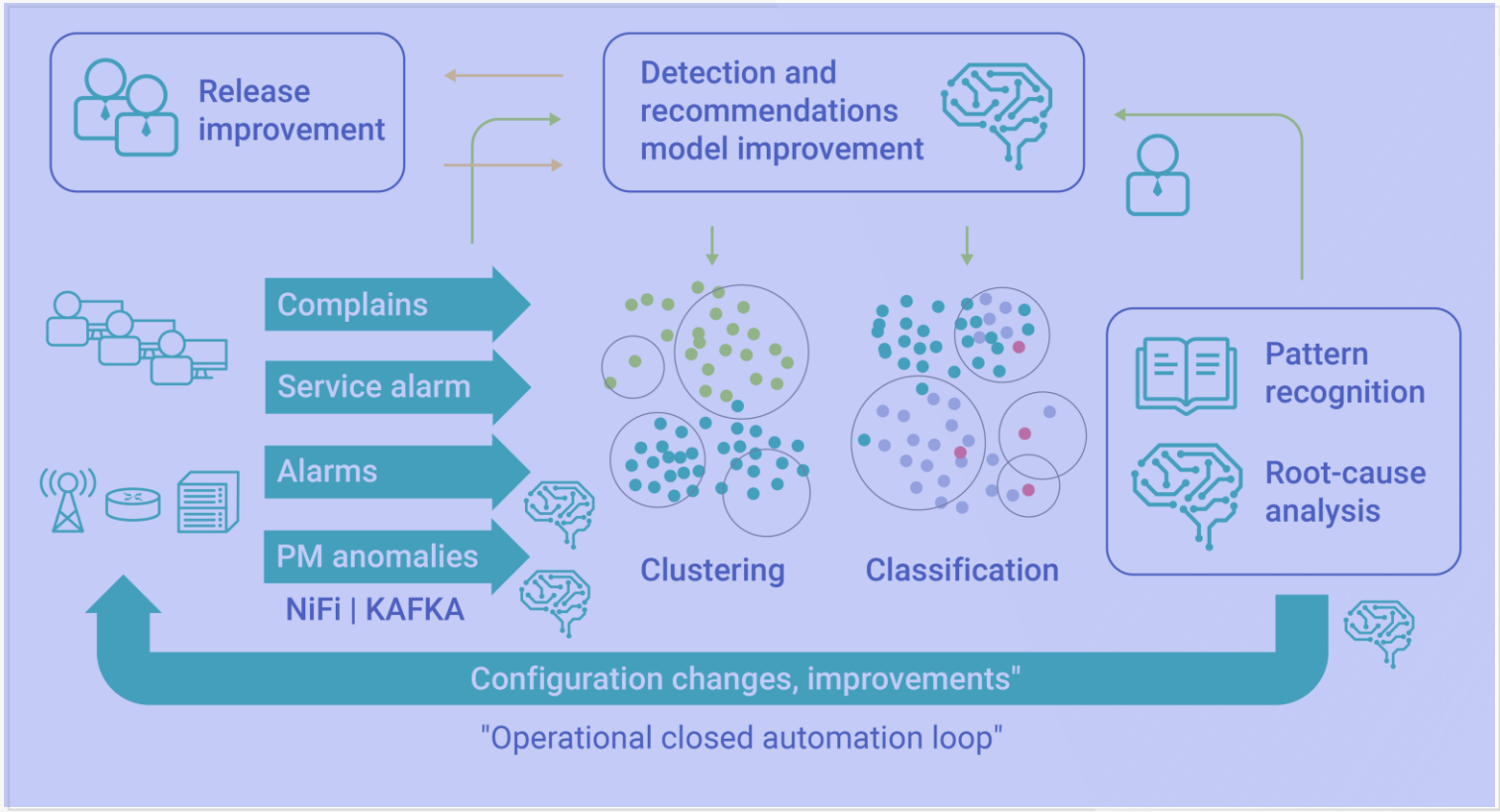
AI Control Desk is a dedicated part of Intelligent Service Desk, focused on the supervision of results of machine learning. AI Control Desk supports the following use cases: **automated situation detection, automated problem detection, automated baseline generation and anomaly detection, and knowledge accumulation.**

Business Requirements

Cost savings by reducing unnecessary field work

Improving customer NW quality experience over major service issues

Saving time taken for root-cause analysis of poor service quality



Business Benefits

Duplicate task reduction **10%**

t-NPS improvement **10%**

NW administrator productivity gain **5%**

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Azam Beyk, MSc

Azam Beyk has served as a Senior OSS Consultant at Comarch UK since 2017. As a technical leader of the OSS presales segment in the UK, Azam is responsible for providing pioneering consultancy and he is a key to steering the future of 5G OSS systems to the top telecom operators in the UK, USA, Canada and Italy. During his time in Vodafone, he was accountable for introducing the 5G technology into a functional tower of 1400 employees. As a fellow member of the Institution of Engineering and Technology he now focuses on future OSS, 6G, AI, machine learning and techno-economic analysis.

https://www.linkedin.com/in/azambeyk/

Azam.Beyk@comarch.com

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