

Telecom Operators Perspective: Oil & Gas Connectivity

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SYNOPSIS

- **Telecom Technologies in Oil & Gas**
 - LEO and Direct to Cell
 - Private 5G and extended FWA
 - IIOT
 - Edge Computing
 - Cloudification
 - Software Defined Networks and Network Function Virtualization
- **Oil & Gas Segment: Connectivity Journeys**
 - Drivers
 - Opportunities for Telco
- **Concluding Remarks**

Telco: Emerging Trends

LEO & Direct to Cell

Private 5G & extended FWA

IIOT

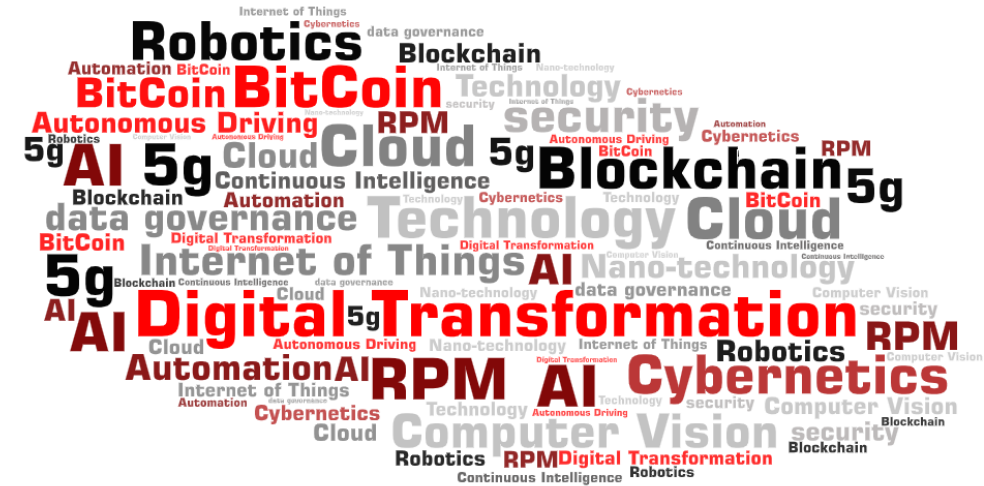
Edge Computing

Multi-Cloud

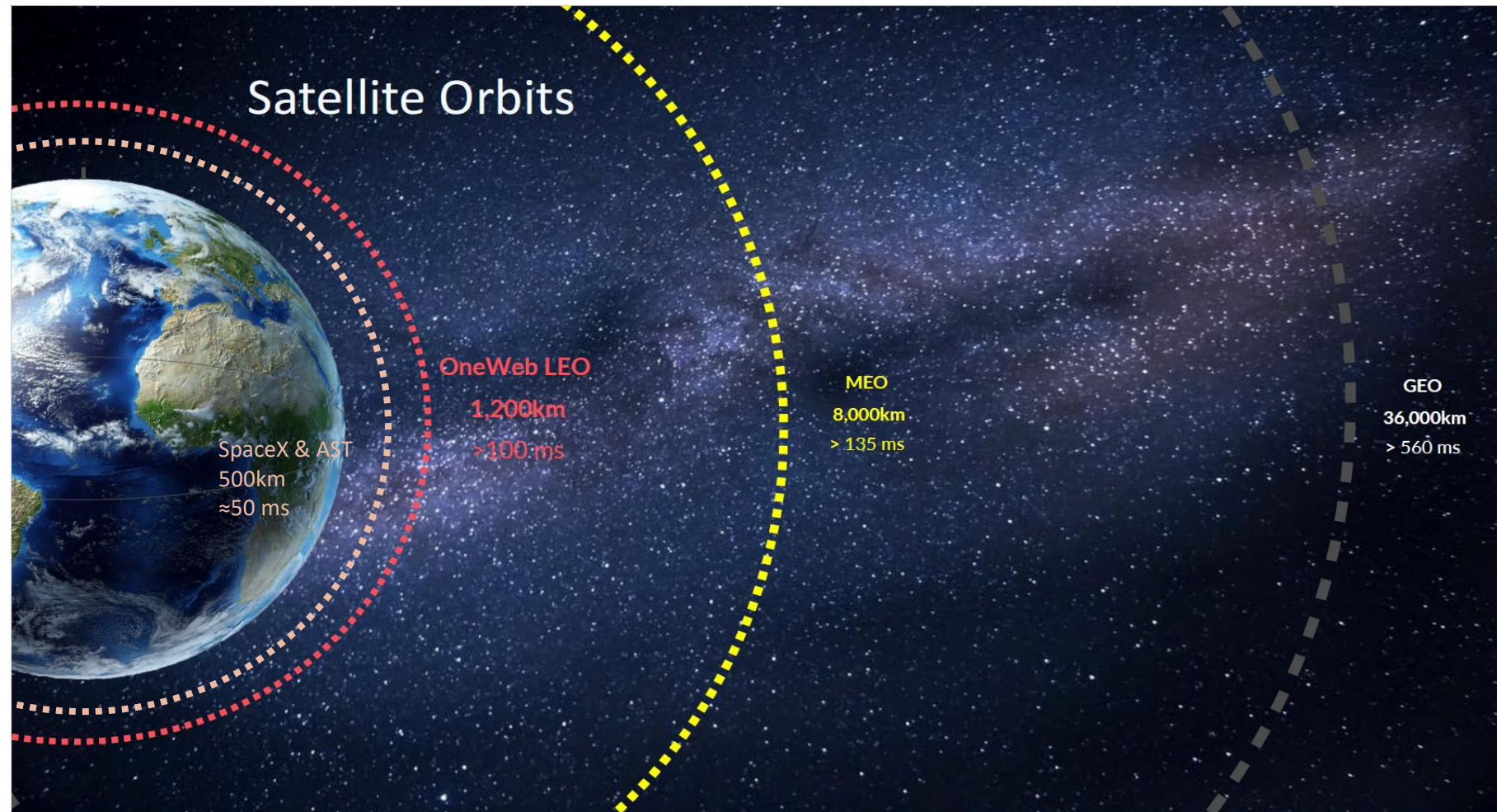
SDN & NFV

Artificial Intelligence

Cyber security



LEO, MEO, GEO



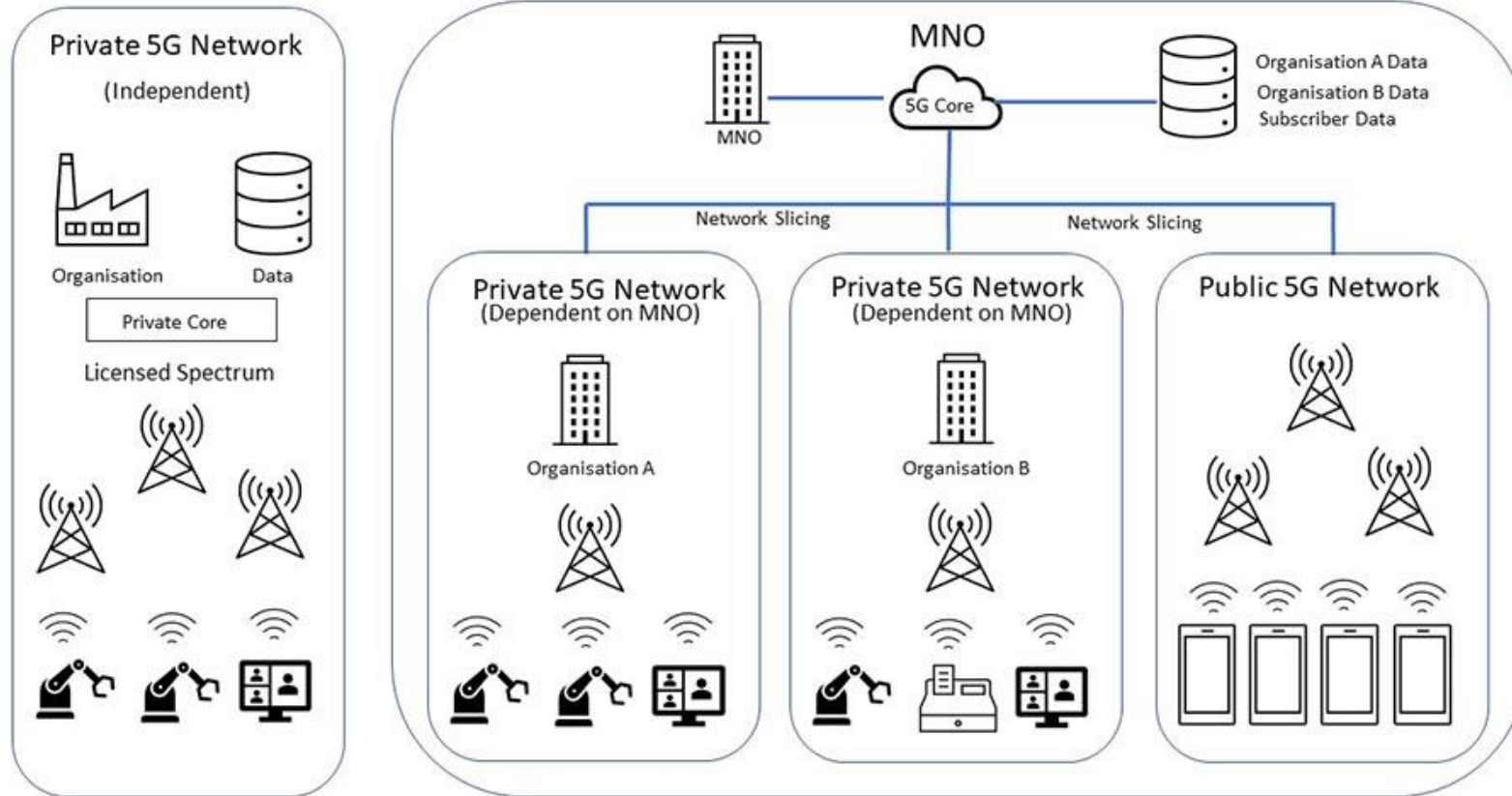
Comparison of LEO providers

Considerations	Starlink*	OneWeb	AST
Technology	LEO (500 km above ground) Available: 4500 LEOs Target: 30k LEOs	LEO (1200 km above ground) Available: 648 LEOs Target: 648	LEO (400-550 km above ground) 2 prototypes launched Target: 243
Coverage/satellite	379 square km	75,000 Square km	780,000 square km
Latency	Sub-50 msec	Sub-100 ms	< 50 ms
Hardware	<ul style="list-style-type: none"> Electronic phased array antenna, Router, & cables Direct to cell is also available 	<ul style="list-style-type: none"> Satellite antenna, a receiver and a customer network exchange unit. 	<ul style="list-style-type: none"> Service can be used in 4/5G mobiles without purchasing dedicated hardware
Target Customer	B2C & B2B <ul style="list-style-type: none"> Aviation Cruise ships and vessels (Maritime), Stationary and remote enterprises (Business) 	B2B <ul style="list-style-type: none"> Aviation Maritime Fixed and remote enterprises (Govt, defense) 	B2B (MNOs) AST Space Mobile utilizes the existing spectrum licenses its MNO partners already obtained to transmit signals between mobile phones, ground stations, and its satellites.
Speed	<ul style="list-style-type: none"> 40-220/8-25 Mbps 	<ul style="list-style-type: none"> Up to 150/20 Mbps 	<ul style="list-style-type: none"> Download (trials): 10.3 Mbps
Customer orientation	Deliver high-speed internet service directly to consumer households and businesses	Develop smaller scale, specialized internet services and industry partnerships.	Directly connect ordinary mobile phones to a space-based cellular broadband satellite network.

***Starlink intends to launch direct to cell service later in Q4 2024 through T-mobile in US market**

Private 5G

Type of Private 5G Networks

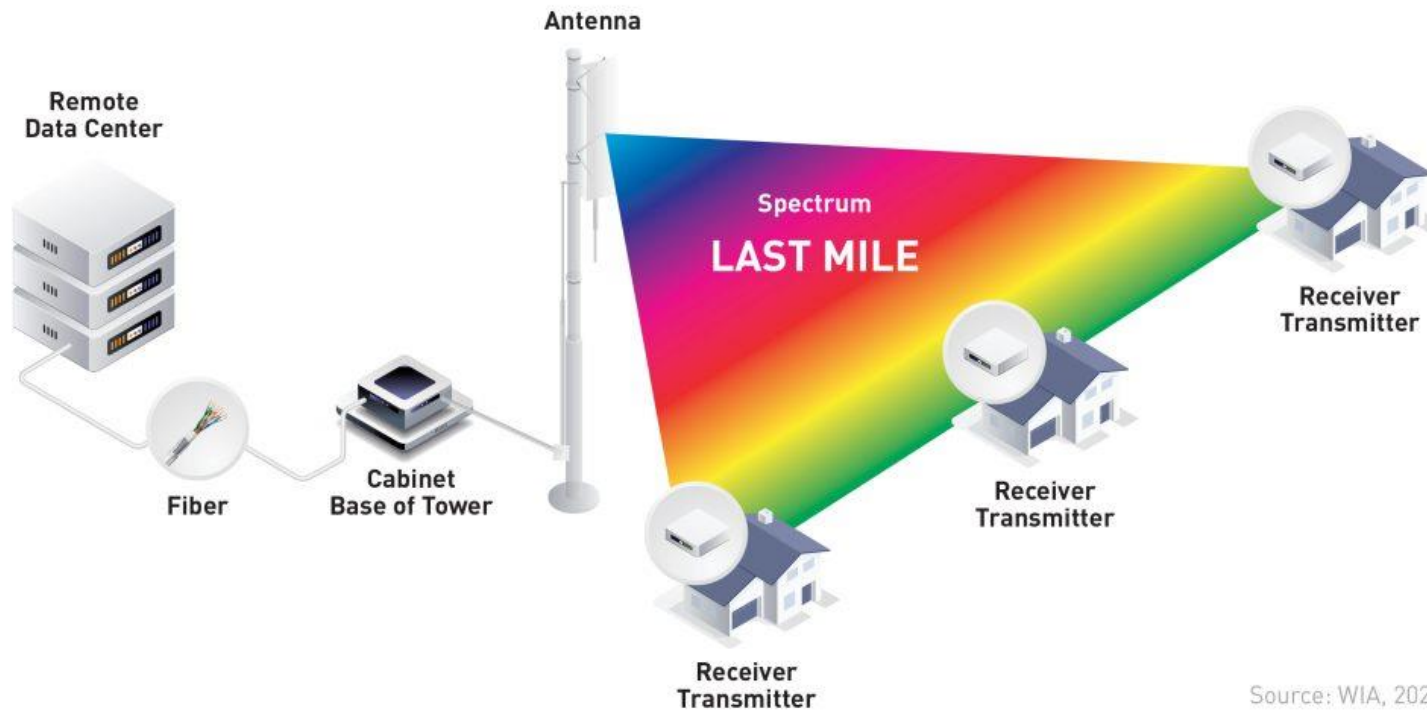


- A private 5G network is customized to offer network infrastructure only to authorized devices, providing security, privacy, and data isolation.
- A private 5G network carries all the key capabilities of 5G; isolated from the public 5G network provided by any Mobile Network Operator (MNO) or connected in a restricted manner.

Source: Fujitsu

Fixed Wireless Access

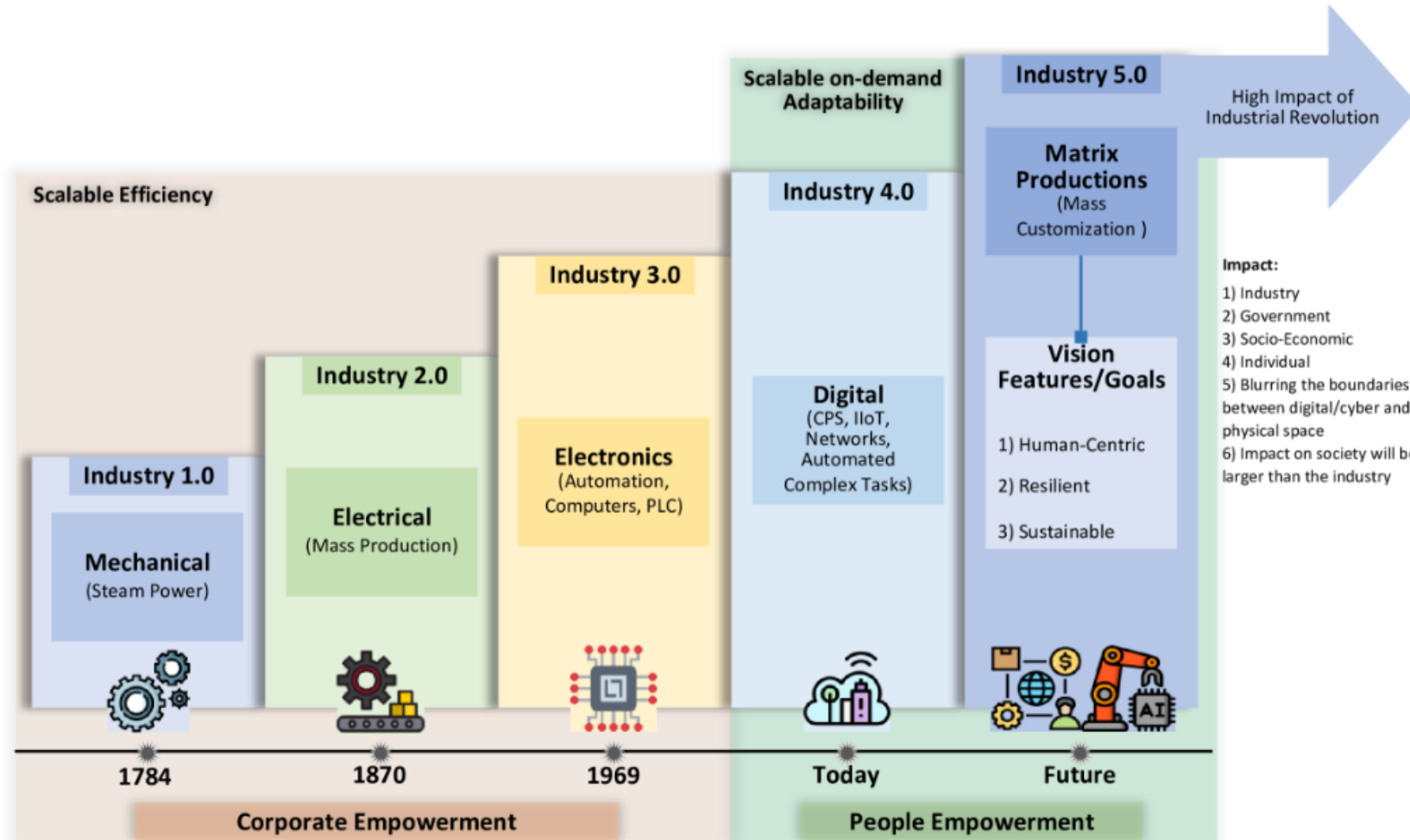
Basic Point to Multipoint (PtMP)



Source: WIA, 2022

- *FWA using 5G can be cost-effective alternative to both traditional wired access and satellite Internet.*
- *It can be deployed in rural areas or remote fixed offshore areas where the investment in buried cable or even aboveground wire or fiber can be expensive and time-consuming.*


IOT & Industry 4.0 & 5.0



Industry 5.0 core elements and their envisioned technical enablers: [Industry 5.0 is Coming](#)


IOT & Industry 4.0 & 5.0

Machine-to-Machine



A device that captures an event and transmit the event over the network to an application. The application translates event to meaningful information.

Internet of Things

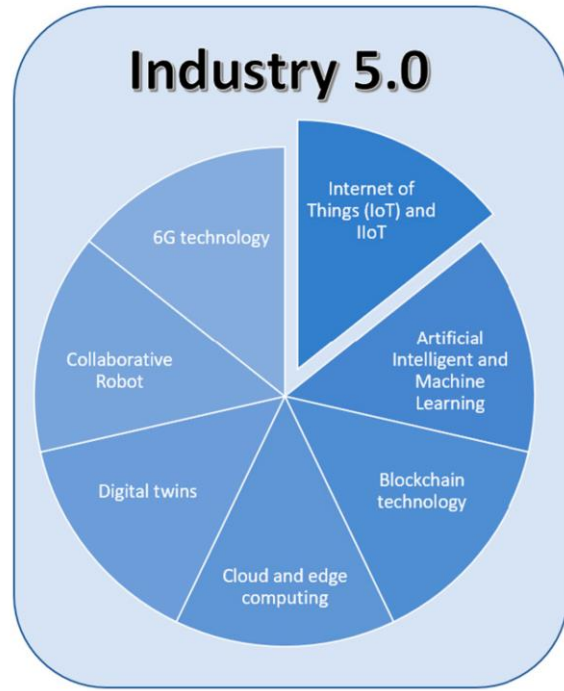


A network of uniquely identifiable things that communicate without human interaction using IP connectivity.

Internet of Everything



Bringing together the people, process, data, and things to make networked connections more meaningful by turning information into actions.

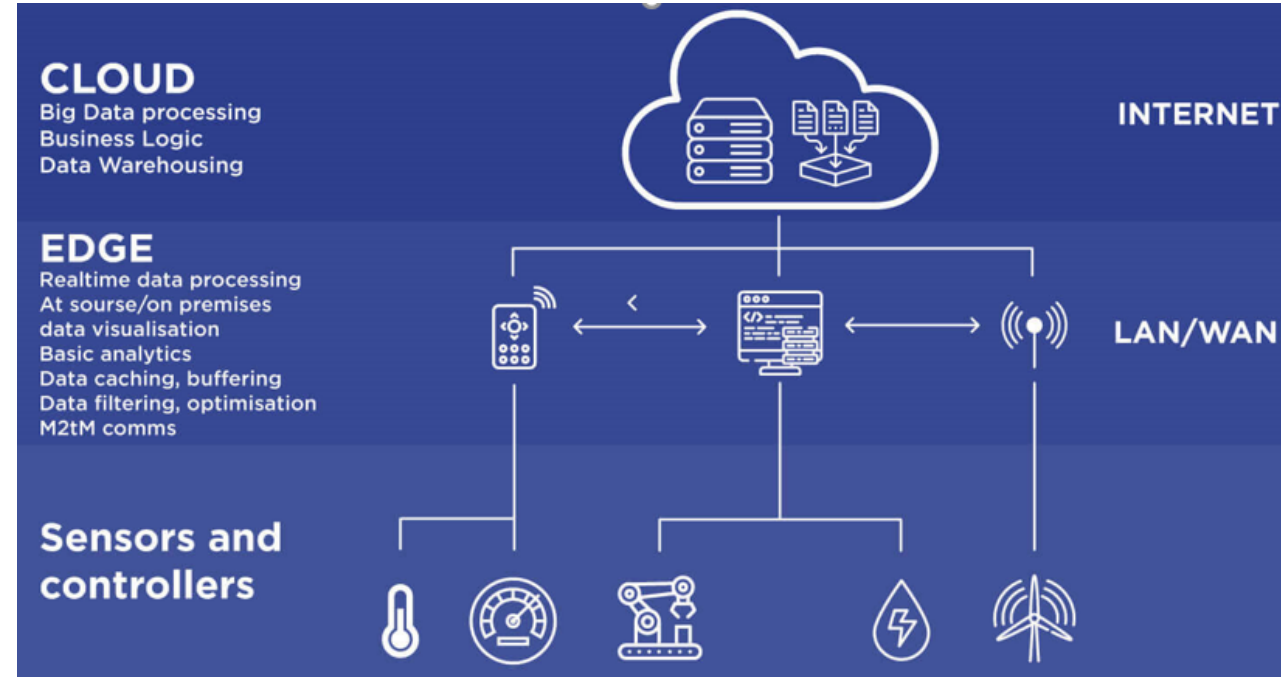
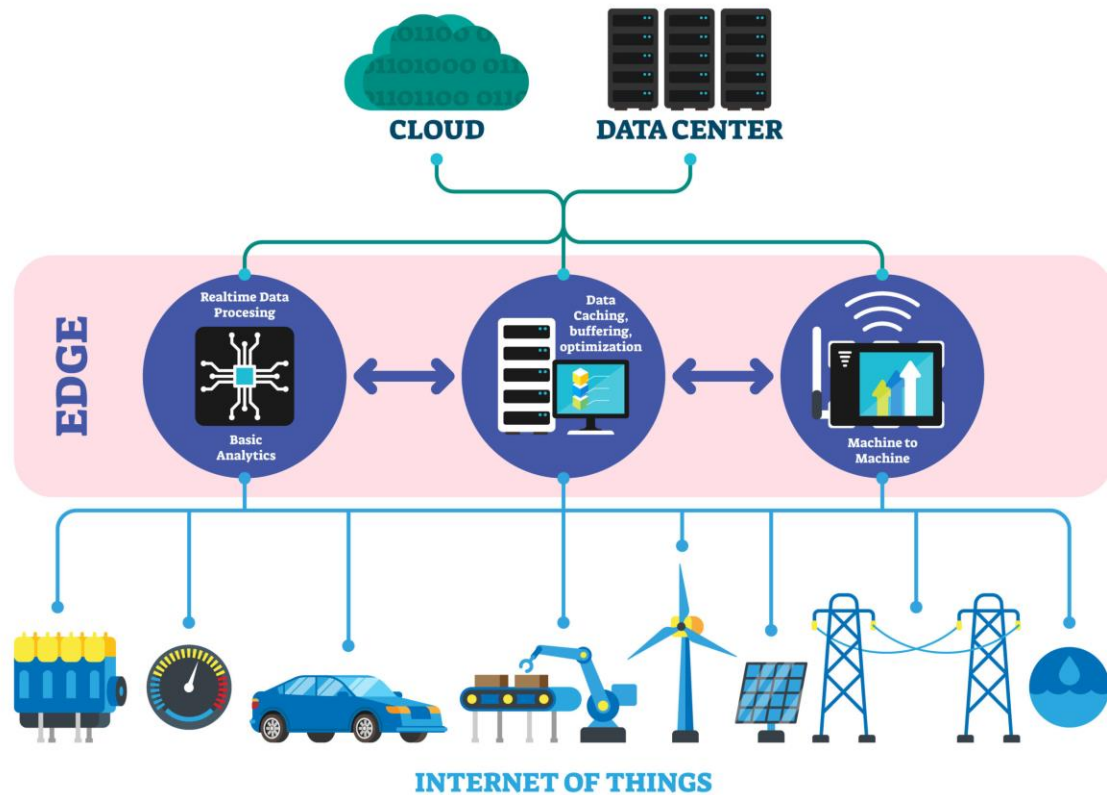


IoE is considered a superset of IoT while M2M communication is a subset of IoT.
-Could Credential Council

Pang, T.Y.; Lee, T.-K.; Murshed, M. Towards a New Paradigm for Digital Health Training and Education in Australia: Exploring the Implication of the Fifth Industrial Revolution. *Appl. Sci.* **2023**, *13*, 6854.

Edge Computing

Edge Computing



Edge computing places the intelligence in the connected devices themselves, whereas, fog computing puts it in the local area network.

Telco Cloudification

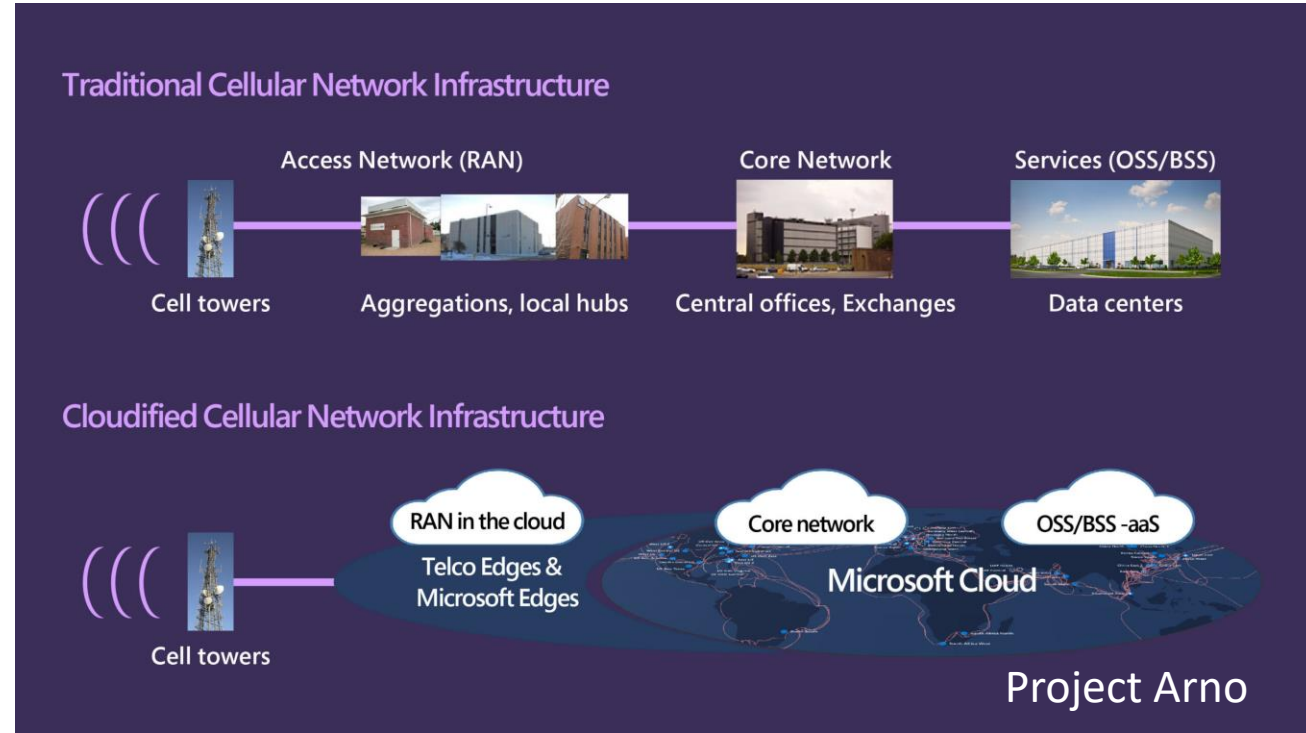
“Cloudifying” in telecom means reimagining infrastructure components as virtualized elements:

- **Cloud services that can auto-deploy and self-scale, on public cloud regions and customers’ on-premises locations.**

Switches and routers to be replaced by virtual machines or containers hosted in cloud and edge data centers.

Fibers and cables would become virtual links inside the cloud network.

Operation and business support systems, (OSS and BSS) would be replaced by software.



Specific telecom functions would be redesigned as cloud services. As a result, businesses could add new services without adding new hardware.

SDN and NFV

- The first step in cloudification is the virtualization and softwarization of networks.
 - Telcos achieve with a combination of network functions virtualization (NFV) and software defined networks (SDN)

NFV, with its multilayered architecture, virtualizes network functions into modular building blocks called virtualized network functions (VNFs).

NFV replaces traditional, custom-designed network equipment (black boxes or purpose-built hardware) with commercial off-the-shelf (COTS) hardware that use software to provide a host of different VNFs.

NFV

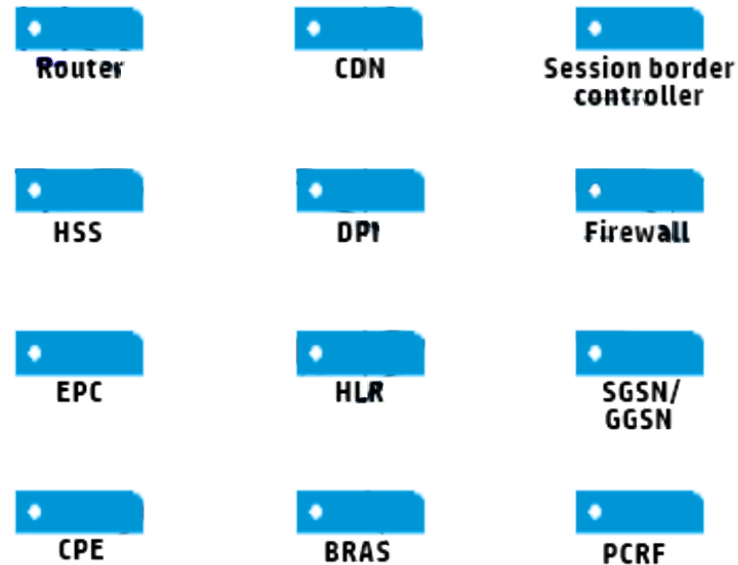
- SDN decouples the network's control plane from the underlying data plane.
- Move traditional architecture (hardware-dependent), to software \approx efficient, centralized routing.
- Connecting applications through APIs, SDN increase the performance/security of applications and create a flexible, dynamic network architecture.

SDN

SDN and NFV

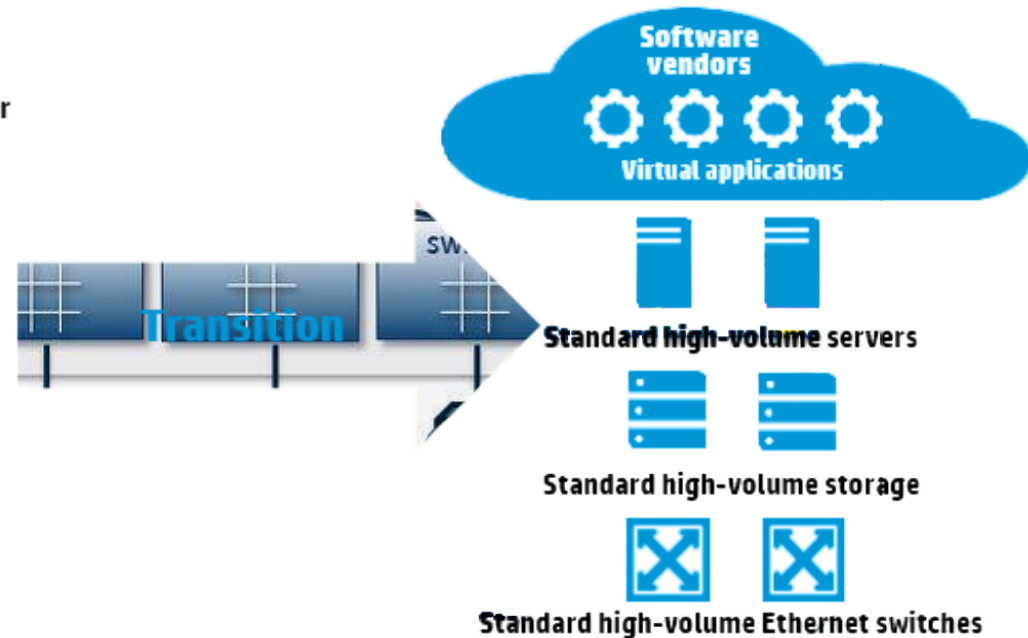
Classic network appliance approach:

- Cumbersome
- Proprietary
- Manual



Network virtualization approach:

- Agile
- Standard
- Automated



Edlund, J. 'The New Business of the Network for CSPs', April 2014

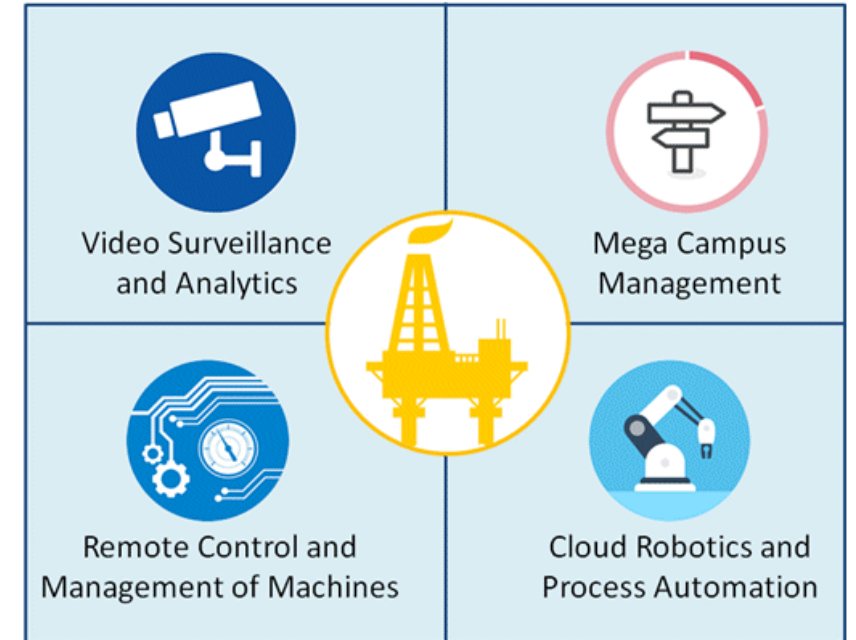
Divers of connectivity. Oil & Gas

Typical Applications	Onshore & Offshore Use cases
SCADA	<ul style="list-style-type: none">• Production and injection well monitoring, measurement,• Logging, and control;• Source and disposal water well monitoring;• Storage tank monitoring and control;• Emergency equipment shutdown and recovery
Real-time video feeds and surveillance	<ul style="list-style-type: none">• Provides operations with remote situational awareness and information that can facilitate decisions, improve safety, and deliver early visibility into critical situations unfolding
Security and surveillance systems	<ul style="list-style-type: none">• Enhance facility security with electronic access control at entry points or secure locations in the facility; video security at gates or around the site perimeter
Drill rig communications and diagnostics	<ul style="list-style-type: none">• Monitor drill bit depth and tilt, mud weight, temperatures and pressures; remotely run diagnostics and analyze results
Asset tracking	<ul style="list-style-type: none">• Track and update the location of fixed and mobile assets in the field improves operations and contributes to safety and security
Field workforce connectivity	<ul style="list-style-type: none">• Keep work crews in the field connected with access to SCADA data, instant messaging and email at remote sites even if they lack cell service
Voice	<ul style="list-style-type: none">• IP phones for mobile workers even in remote areas improves operational efficiency and worker safety

Private 5G use cases: Oil & Gas

Use cases in oil & gas that private networks can support:

- Advanced predictive maintenance
- Video ingest and analytics for:
 - Worker safety and monitoring
 - Incident detection
 - Security and surveillance
- Drone navigation for site inspection
- Push-to-X (talk, video, message)
- IoT use cases, including environmental sensing



Source: Frost & Sullivan

5G use cases in Oil & Gas

LTE and WiFi could meet some of these needs, but the ones falling under the category of URLLC (ultra-reliable low latency communication) could only be addressed through 5G networks.

Telco Opportunities: Oil & Gas

- Offer reliable backhaul & access connectivity through combination of fiber, 5G private/dedicated network and/or VSAT through LEO technologies
- Create SDN-NFV integrated edge networks to support URLLC applications using private cloud solutions (including AR, VR)
- Offer 5G integrated FWA extensions in areas where wired LAN implementations can be cost prohibitive
- Offer integrated IIOT solutions for specific application sensors, actuators and AI-powered controllers
- Advanced automation can be supported by high-speed data exchange and seamless integration of technologies such as IIOT, 5G, edge cloud, SDN-NFV, AI and Cyber Security



Thanks



Q&A