



Data Centers & Telco Cloud

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Data Center in Italia

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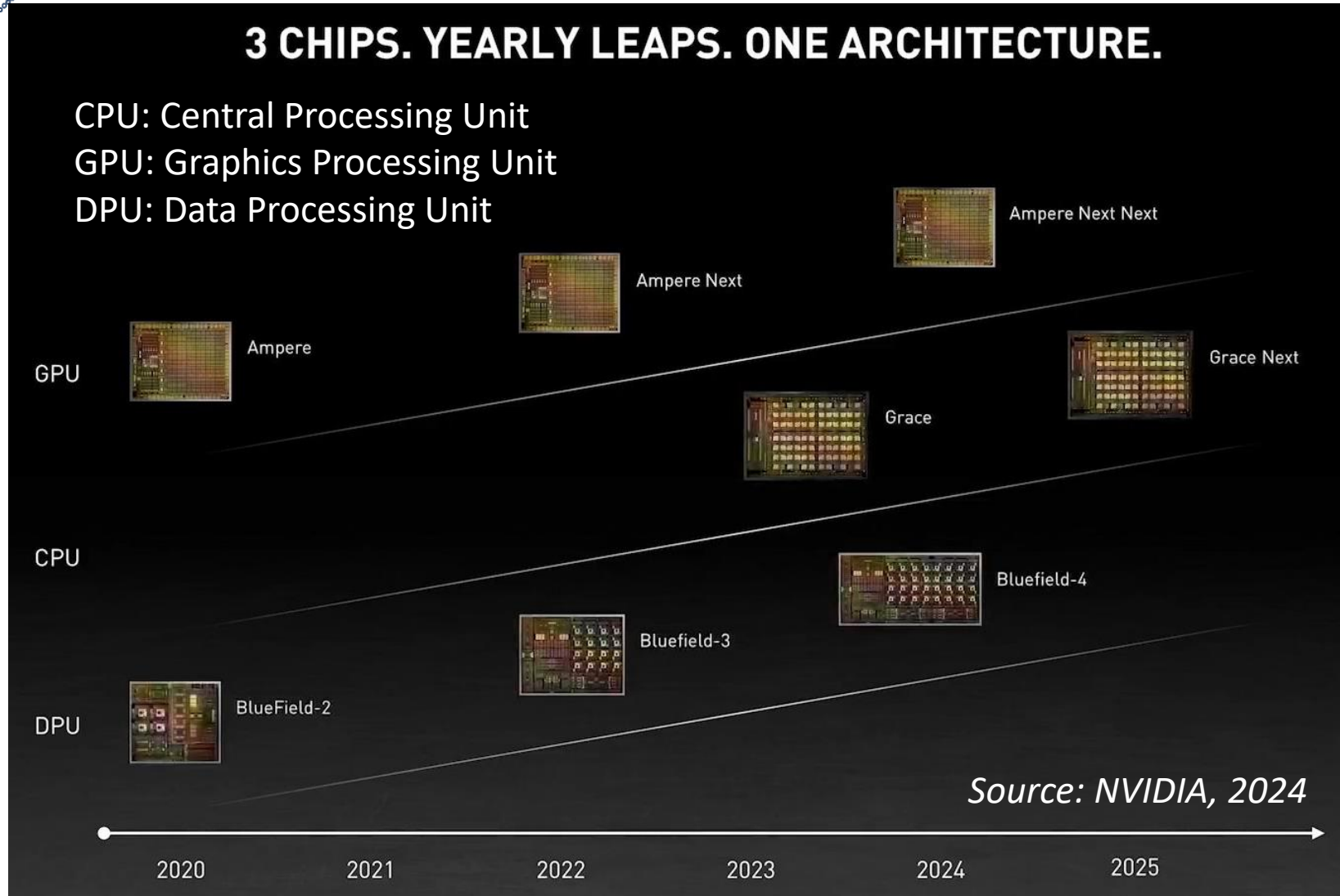


- **DATA CENTER BACKGROUND**
 - DATA CENTER ITALY
 - TELCO CLOUD





CPUs, GPUs, DPUs: 2020-2025



CPU: sequential tasks
GPU: parallel, graphical & AI tasks
DPU: data-centric tasks



HPC & General-Purpose GPUs

High Performance Computing (HPC)

HPC involves using supercomputers and computer clusters to solve advanced computation problems. **These systems utilize parallel processing to execute multiple tasks simultaneously.** Here are some key features:

- **Architecture:** HPC systems are composed of interconnected nodes, each consisting of one or more CPUs (Central Processing Units)
- **Applications:** Commonly used in **scientific research, weather modeling, simulations, financial modeling, and large-scale data analysis**
- **Performance:** HPC systems are designed to handle **extremely large datasets and perform trillions of calculations per second**

GPU-Based Computing

GPU-based computing, also known as **General-Purpose Computing on Graphics Processing Units (GPGPU)**, leverages the parallel processing power of GPUs originally designed for rendering graphics

- **Architecture:** GPUs consist of thousands of smaller, efficient cores designed for handling multiple tasks simultaneously
- **Applications:** Widely used in **machine learning, deep learning, data mining, image and video processing, and scientific simulations**
- **Performance:** **GPUs excel in tasks that require massive parallelism and can significantly speed up computations compared to traditional CPUs**



xAI's COLOSSUS Supercomputer clusters up to 200,000 NVIDIA Hopper GPUs

The COLOSSUS Ethernet Switching Fabric for up to 200,000 GPUs Strictly Non-blocking for its Remote Direct Memory Access

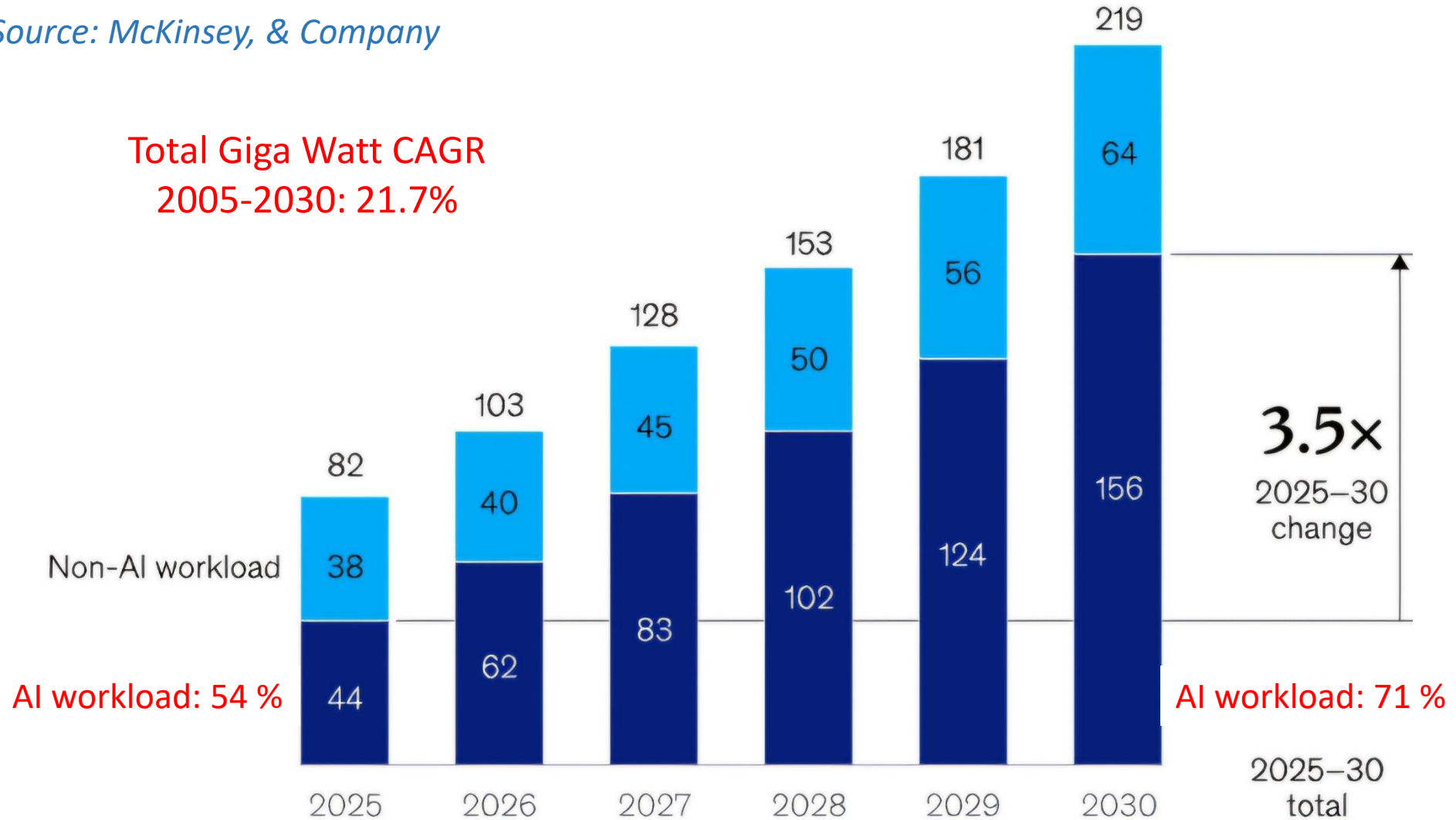
The **NVIDIA Spectrum SN5000** series switches are the fifth generation of Spectrum Ethernet switches, purpose-built to accelerate hyperscale generative AI fabrics. With **port speeds reaching up to 800 gigabits per second (Gb/s)**, SN5000 switches deliver accelerated Ethernet for every data center





AI & non-AI Data Center Workload in Giga Watt 2025-2030

Source: McKinsey, & Company





Supercomputer & Quantum Computer

	<i>SUPERCOMPUTER</i>	<i>QUANTUM COMPUTER</i>
Computing Model	Bits (switches) that can be 0 or 1.	Qubits that can be 0, 1, superposition of 0 and 1
Processing Method	Parallel classical processing	superposition & entanglement & interference
Strengths	Deterministic calculations, large-scale simulations	Solving specific problems exponentially faster
Weaknesses	Power-intensive, scales linearly	Fragile qubits, high error rates
Best For	AI, physics simulations, weather modeling	Cryptography, optimization, life simulations
Challenges	Power consumption, scalability, data bottlenecks	Qubit decoherence, noise, lack of fault tolerance
Current Research	Exascale computing, neuromorphic chips	Error correction, better qubits, hybrid quantum-classical approaches

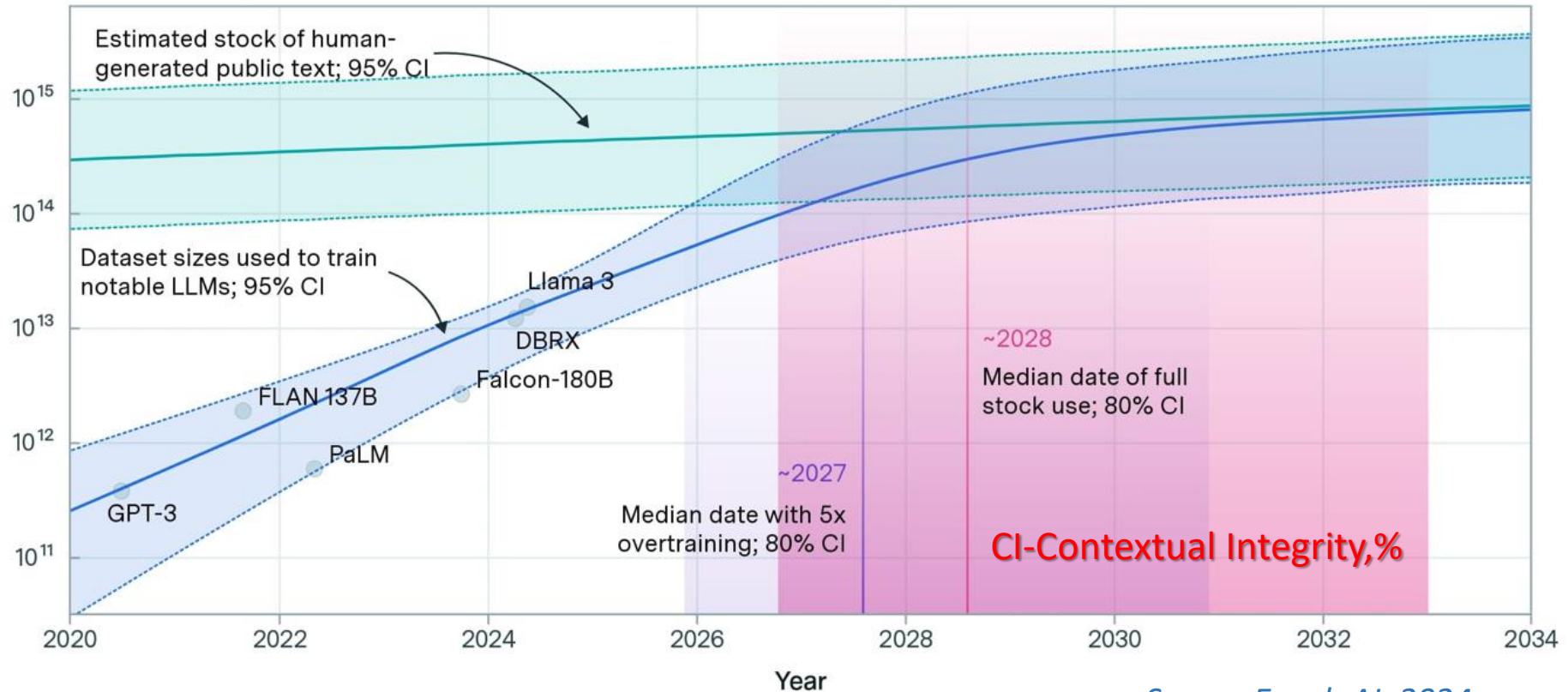


AI Data Training 2020 - 2034

Projections of the stock of public text and data usage

EPOCH AI

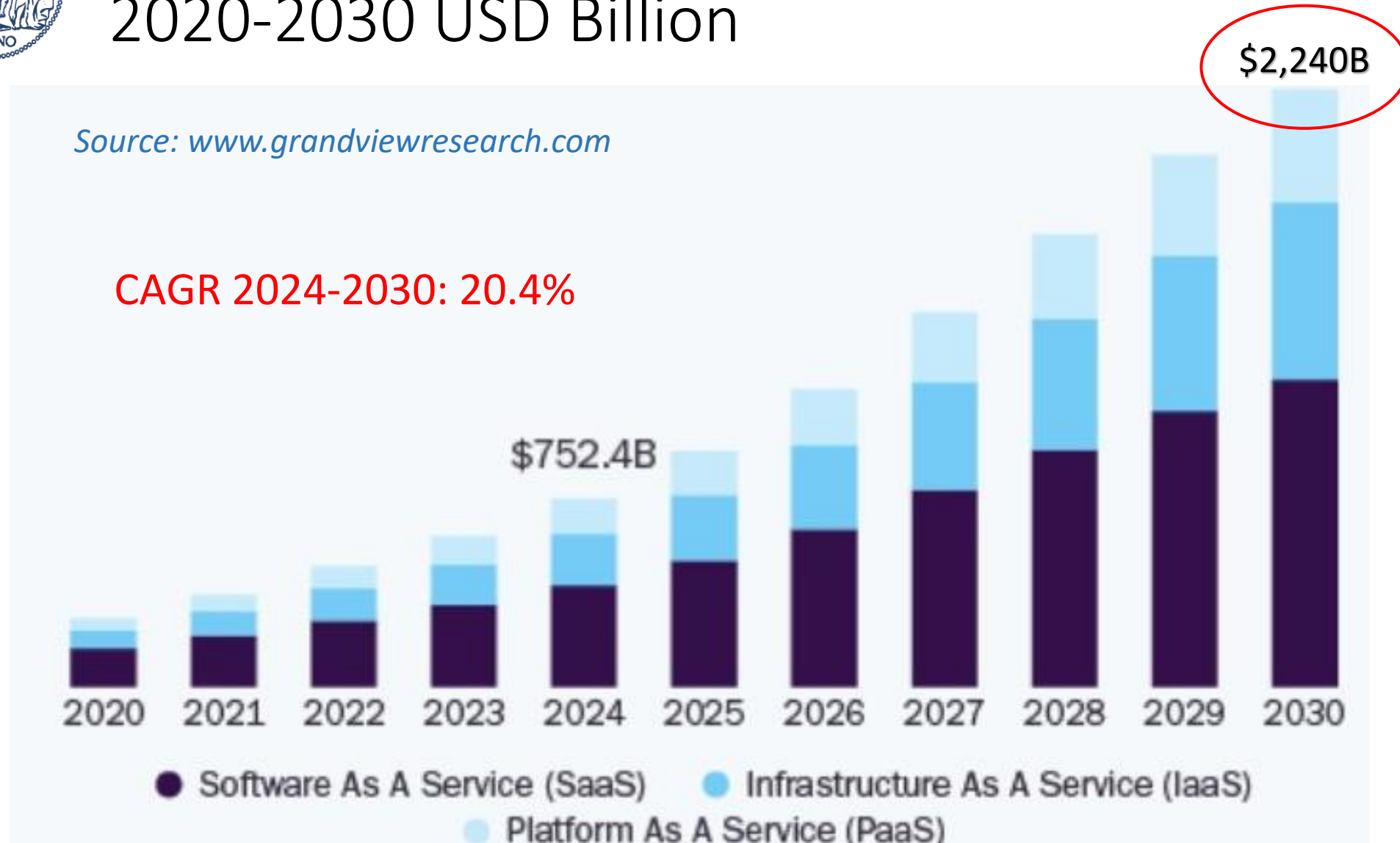
Effective stock (number of tokens)



Source Epoch AI, 2024



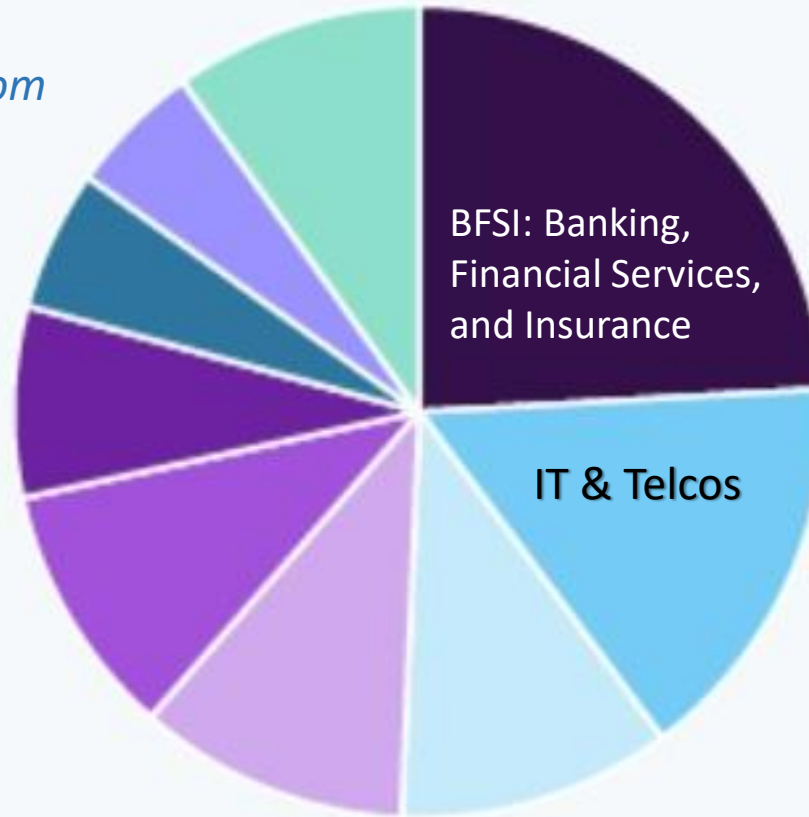
Cloud Computing Services Market Size 2020-2030 USD Billion





Cloud Computing Services Market Share, 2024 (%)

Source: www.grandviewresearch.com



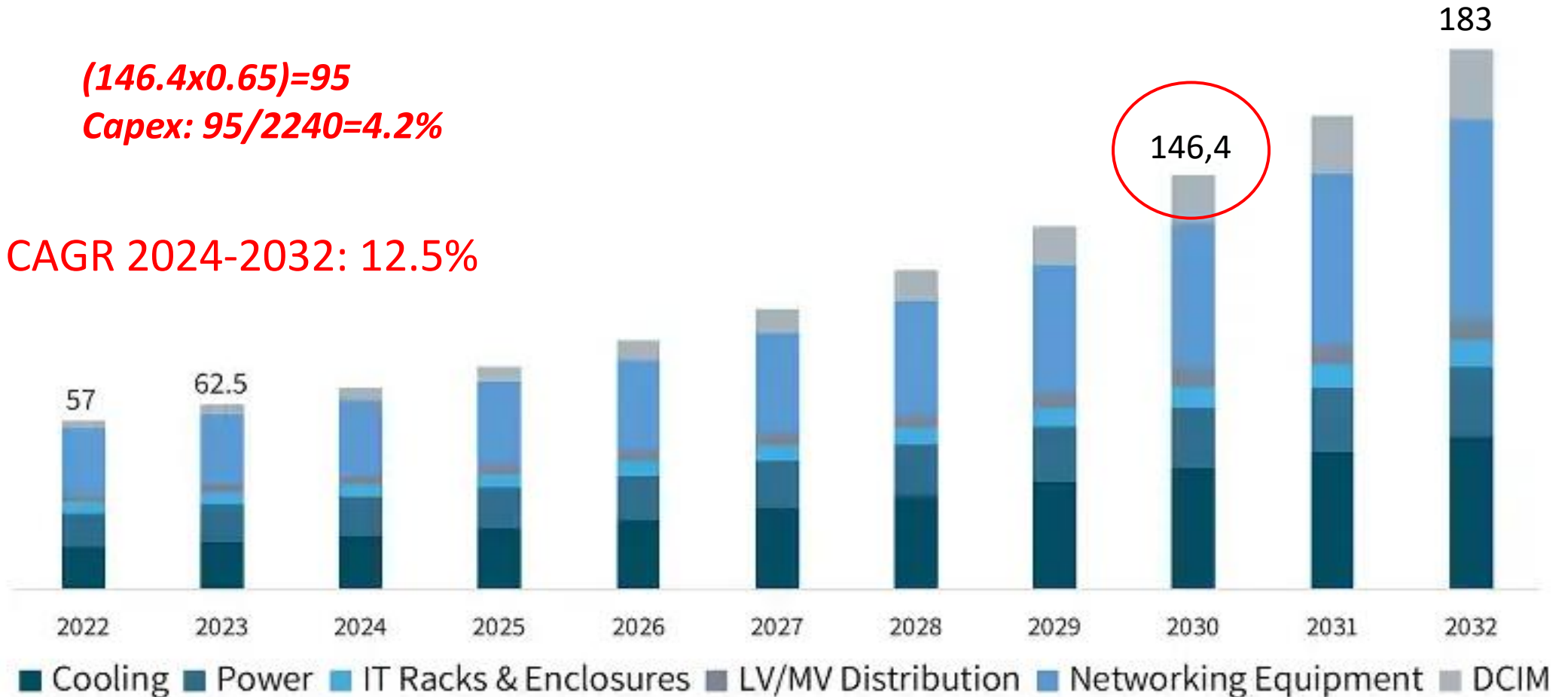
- BFSI
- IT & Telecom
- Retail & Consumer Goods
- Media & Entertainment
- Manufacturing
- Energy & Utilities
- Healthcare
- Government & Public Sector
- Others



Data Center Infrastructure Market Size 2022- 2032 USD Billion (65% for Cloud)

(146.4x0.65)=95
Capex: 95/2240=4.2%

CAGR 2024-2032: 12.5%

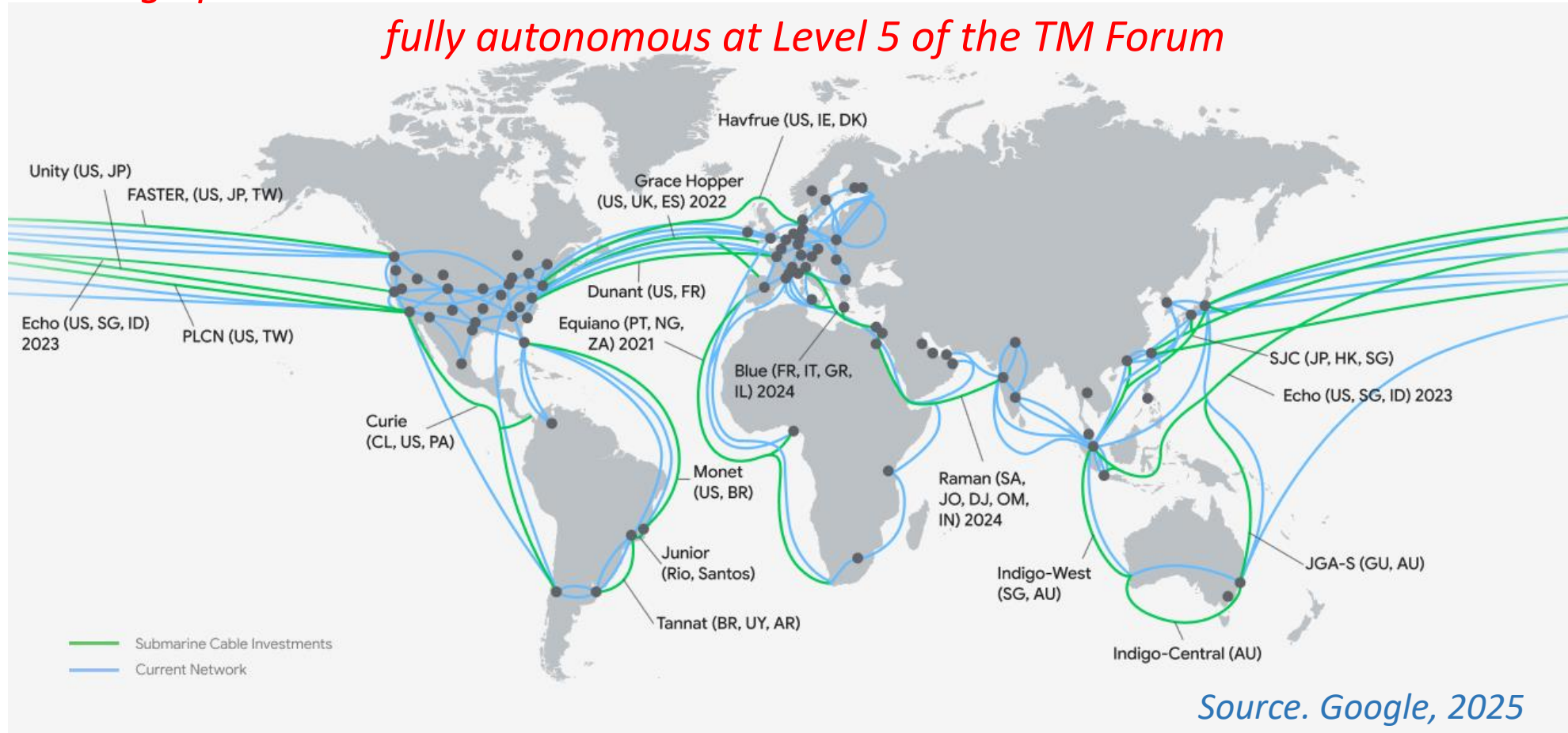


Source: gminsights.com, 2023



Google's up to 50 Data Centers by 2025

Google challenges Telcos with a world-wide terrestrial & submarine fiber infrastructure, connecting up to 50 Data Centers in 2025: its 3.2 million kilometer backbone will be made fully autonomous at Level 5 of the TM Forum





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 - TELCO CLOUD





Overview Data Center Offer/Demand

OFFER

Telco

Two types:

- Network POP
- DC for Customers (Wholesale and Enterprise)

DCs can be owned or subleased

Neutral DC

Operators specialized in data center construction with two business models:

- Sale of cages/dedicated rooms
- Colocation of individual racks

Individuals DC

Not open to housing/colocation services but dedicated to the provision of cloud services or private infrastructure

Cable Landing Station

Facilities located near the coast that transmit data arriving by sea to the terrestrial network

DEMAND

Telco

They buy or build DCs for POP use or for resale to third parties

Hyperscaler/CSP

They buy or build DCs to deliver their cloud services

Private companies

They buy DCs for their own use

Submarine cable operators

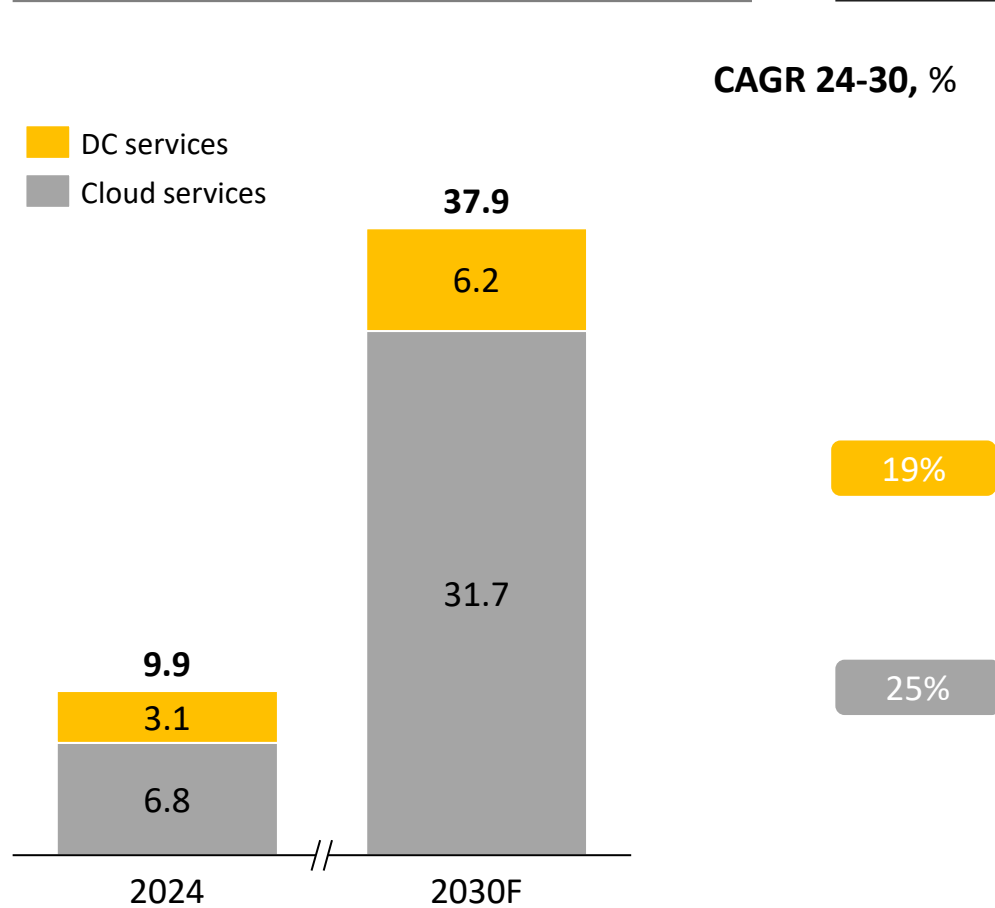
They buy or build specialized DCs (Cable Landing Station) to terminate and supply power to submaring cables

- **Uptime** (defined as four levels of which III and IV are commercially relevant): levels defined by the Uptime Institute ('tier'), ANSI TIA 942 ('rated') or EN 50600 ('class')
- **Energy efficiency:** measured through the PUE (Power Usage Effectiveness) parameter defined as the ratio of total energy . The most efficient data centers come in at 1.2 – 1.3. The Italian average is in the order of 1.8 - 2.0.



DC and Cloud Services Italy Market is worth 6.7 EUR Bn - in '24 the highest Growth over last 10 Years

Italian market value pool 2024-2030, EUR Bn



Underlying growth drivers in Italy



Enterprise migration trends

Expected increase (x2 in 4 years) in the client base, given migration of players from legacy own DCs



AI rise

Exponential increase in the demand for computing power and data storage driven by AI inferencing spread (from 15 KW/rack to 1MW/rack)



Government incentives

6 EUR Bn PNRR investments to enable the digitization process and 1.2 EUR Bn for Next Generation Cloud Infrastructure



B2B spend increase

47% of the companies surveyed declare intention to increase their spending in Data Center/ Cloud in the next 12 months

Source: Osservatorio del Politecnico di Milano; Gartner; Other analysis, 2025

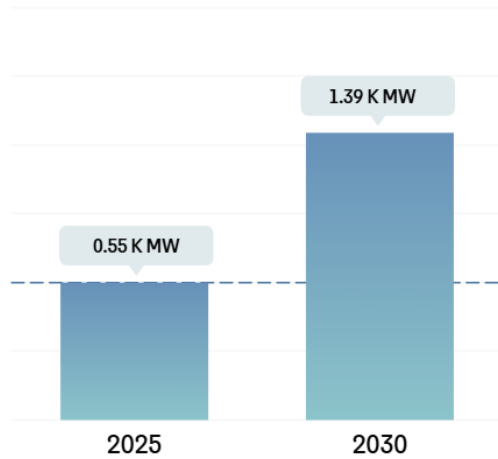


Italian Data Center Market: Power & Energy

Italy Data Center Market

Market Size in Thousand MW

CAGR 20.24%



Source : Mordor Intelligence



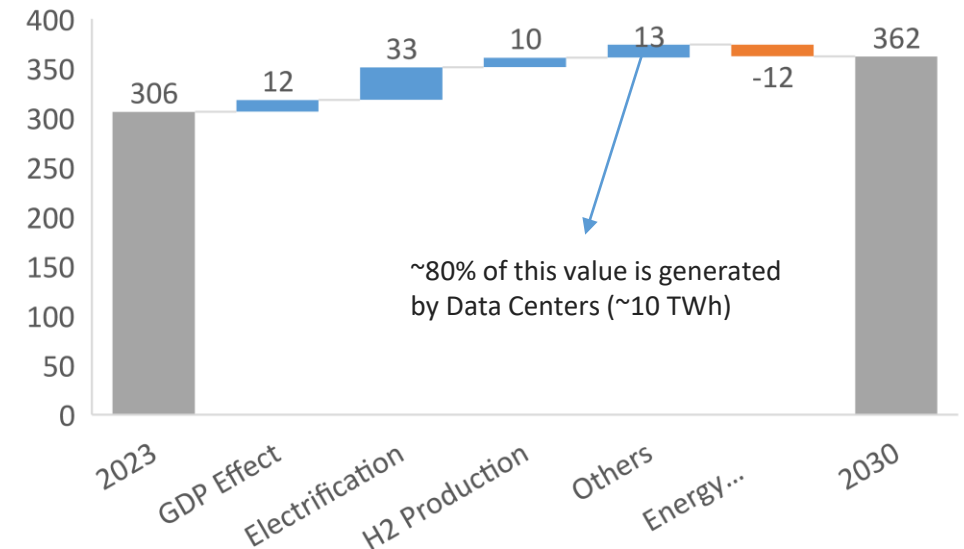
Study Period	2018 - 2030
Base Year For Estimation	2024
Forecast Data Period	2025 - 2030
Market Volume (2025)	0.55 Thousand MW
Market Volume (2030)	1.39 Thousand MW
CAGR	20.24 %
Market Concentration	High

Major Players



*Disclaimer: Major Players sorted in no particular order

Energy Demand, TWh, 2023-2030



IT Power Demand

Nominal installed IT power in Italy: 2024: ~0.5 GW → 2030: ~2 GW (~4x increase)


























Nominal installed IT power in Milan area: 2024: 238 MW → 2026: ~477 MW (~4x increase)

- Rack design target: **1 MW Rack with liquid cooling and 400 Volt Direct Current**
- Energy by **Small Modular Reactors, SMR**
- Renewable by **Hydrotreated Vegetable Oil, HVO**

Source: Mondor Intelligenece, Terna, McKinsey data Center demand model, Osservatorio Data Center, 2025



New Entrants in the Market: 40 DCs announced

Player	New DC announced, #	Location	Total space, Sqm '000	 New players
 EQUINIX	6	Milano	N/A	
 STACK INFRASTRUCTURE	6	Milano, Pavia	185	
 COMPASS datacenters	5	Milano	213	
 Data4 SMART & SUSTAINABLE DATA CENTERS	5	Milano	297	
 CloudHQ	4	Milano MPX	113	
 VANTAGE DATA CENTERS	4	Milano MPX	120	
 DATA for MED Mediterranean Digital HUB	3	Caserta	60	
 noovle	2	Milano	N/A	
 DATA LEIX	2	Bari, Caserta	N/A	
 GEOVEDA	1	Pisa	N/A	
 DEDAGROUP	1	Trento	80	
 VITALI designed for reliability	1	Bergamo	181	
 BBELL	1	Torino	N/A	
 DIGITAL REALTY	1	Roma	220	
 TIM	1	Roma	N/A	
 UNIDATA	1	Roma	20	
 AWS	1	Milano	N/A	

Source: Data Center Map, different websites, 2025



Data Centers Costs vary locally: Average Italian DC Capex is ~50 EUR Million for a Greenfield Project

Average Data Center in Italy

Size 40K sqm

UPS 6 MW

Density 50 kW / rack

CapEx ~50 EUR Mn

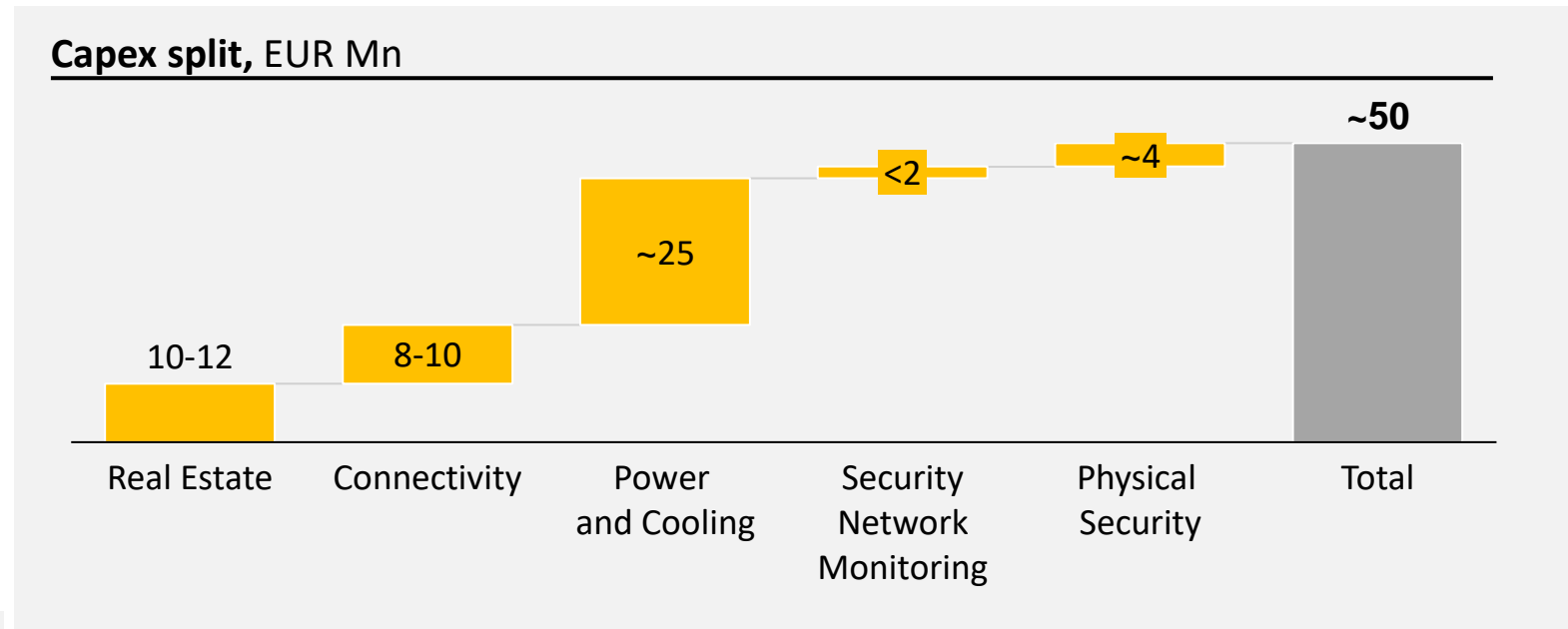
Assumption 20Y years depreciation

Time to market 2-3 years

Payback time 6-7 years



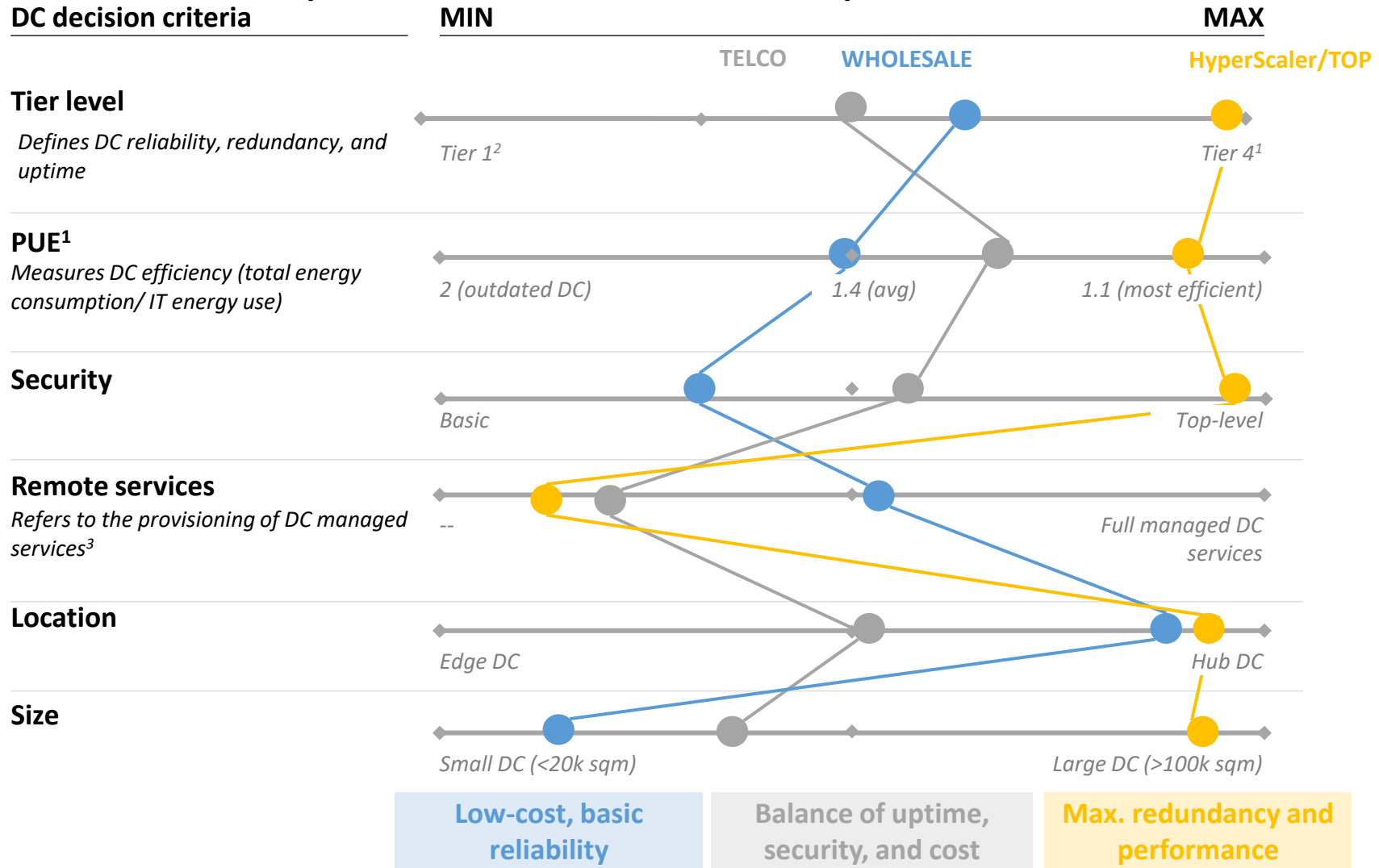
Capex split, EUR Mn



Source: McKinsey Analysis, 2025



Medium & Large Clients looking for Security, Reliability and Redundancy



Source: Osservatorio Data Center, McKinsey, PWC, Survey Market analysis, 2025



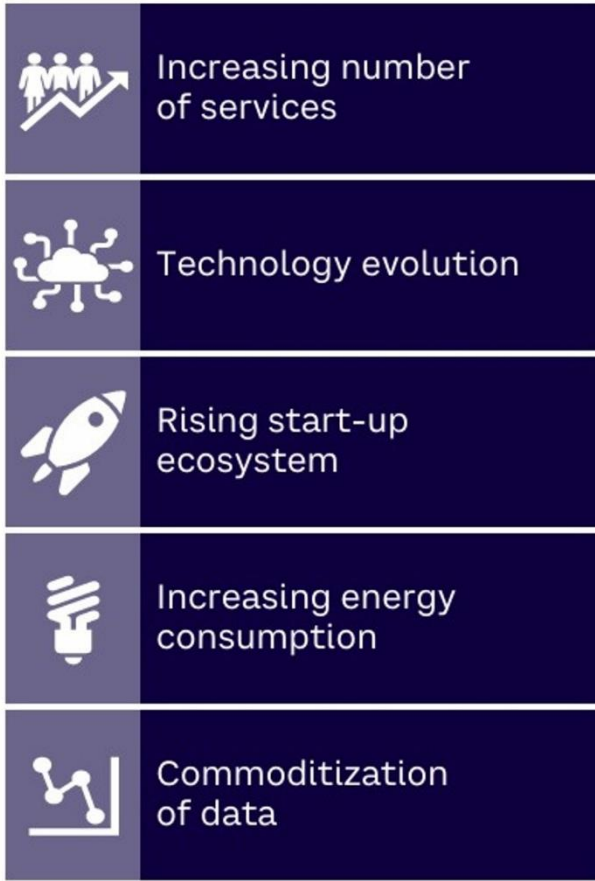
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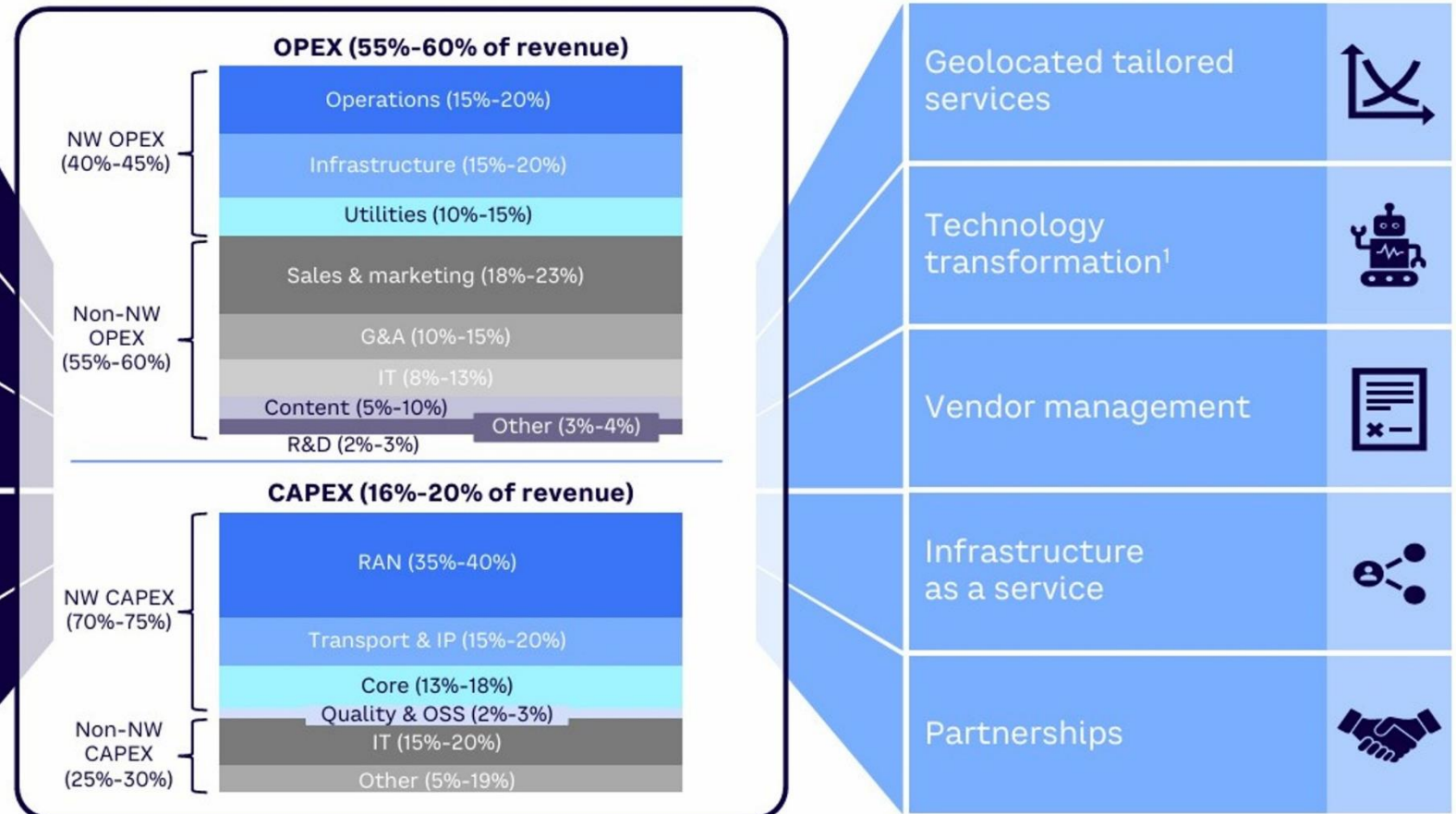
Telco's Evolution/Efficiency vs. OPEX/CAPEX

EVOLUTION DRIVERS



vs.

EFFICIENCY LEVELS



Source: Arthur D. Little, 2024



Key Challenges to Telco Cloud

Network softwarization promises open, flexible, and virtualized networks but progresses unevenly and slowly, with most cloud efforts limited to private infrastructures and specific functions (e.g. 5G core)

- **Benefits include:**

- Greater network **agility and flexibility**
- **Cost savings**
- Innovation via open collaboration (**NaaS**)

- **Key challenges:**

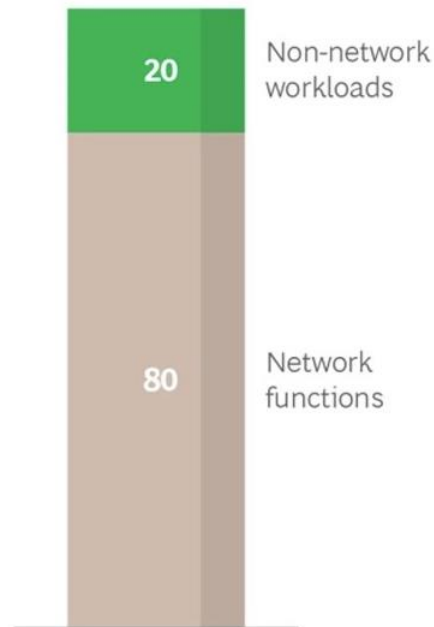
- Technical complexity: requires upskilling and tailored approaches based on traffic needs and feasibility
- **Operational risks:**
 - **Security and control** issues (especially with public clouds)
 - Interoperability gaps and **risk of vendor lock-in**
 - Economic uncertainty on **ROI and service demand**
- Market transformation: shift from vendor-owned hardware to cloud-leased infrastructure; impact on competition and regulation
- Edge computing investment:
 - Placement of edge nodes is critical for latency-sensitive services
 - Risk of digital divide in underserved areas
 - Potential need for public-private partnerships and regulatory support

The cloud computing continuum will require more significant efforts and progress in interoperability and orchestration

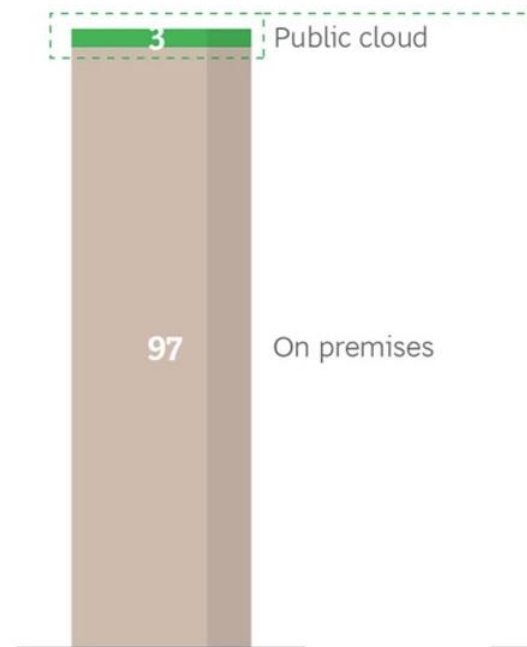


Telco's Use of the Public Cloud - 2023

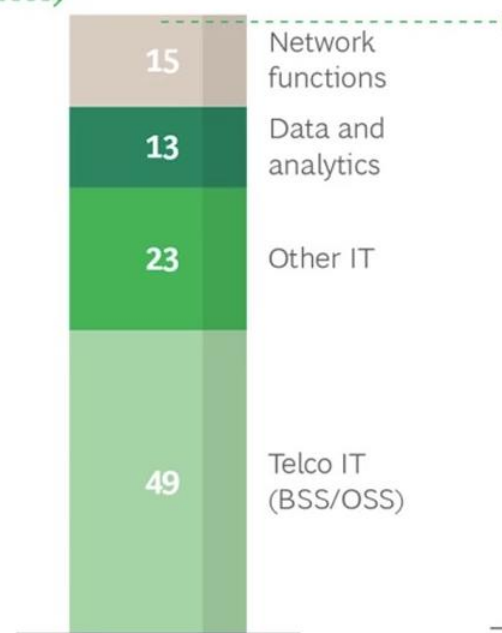
Distribution of total telco workload, by workload type (%)



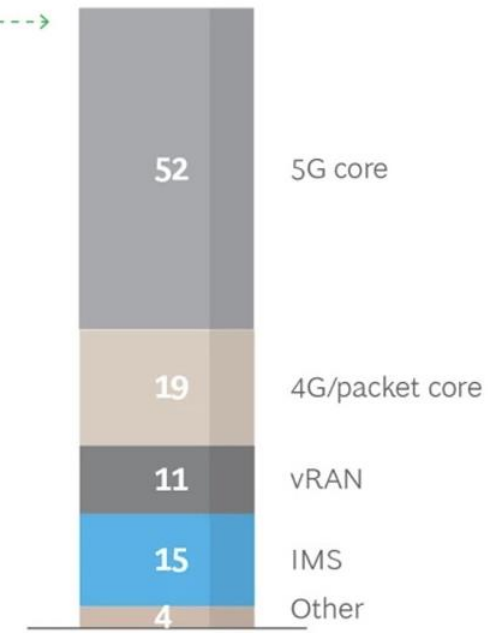
Distribution of total telco workload, by deployment method (%)



Distribution of public cloud telco workloads (%)



Distribution of public cloud network functions (%)

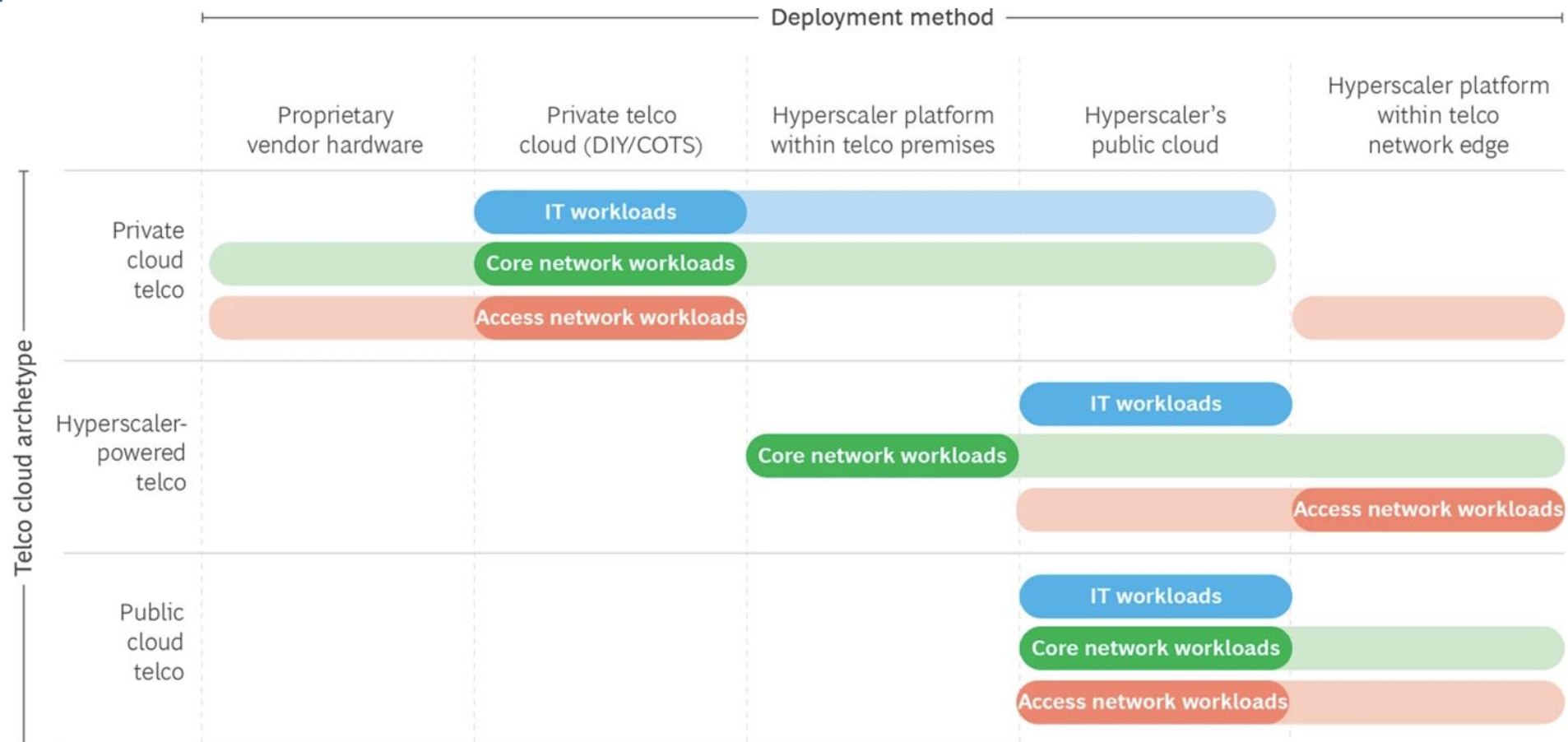


Sources: Omdia Public Cloud Provider – Telco Workload Tracker Report, 2023; BCG analysis.

Note: BSS = business support system; IMS = IP multimedia subsystem; OSS = operations support system; vRAN = virtualized radio access network. Because of rounding, not all percentages add up to 100.



Telco Cloud Deployment Methods



Source: BCG analysis.

Source: Boston Consulting Group, 2023

Note: This presentation focuses on evolving archetypes and does not reflect the “as-is” state. Solid bars represent the most common deployment method for each workload; shaded bars represent the range of deployment options. COTS = commercial off-the-shelf; DIY = do it yourself.

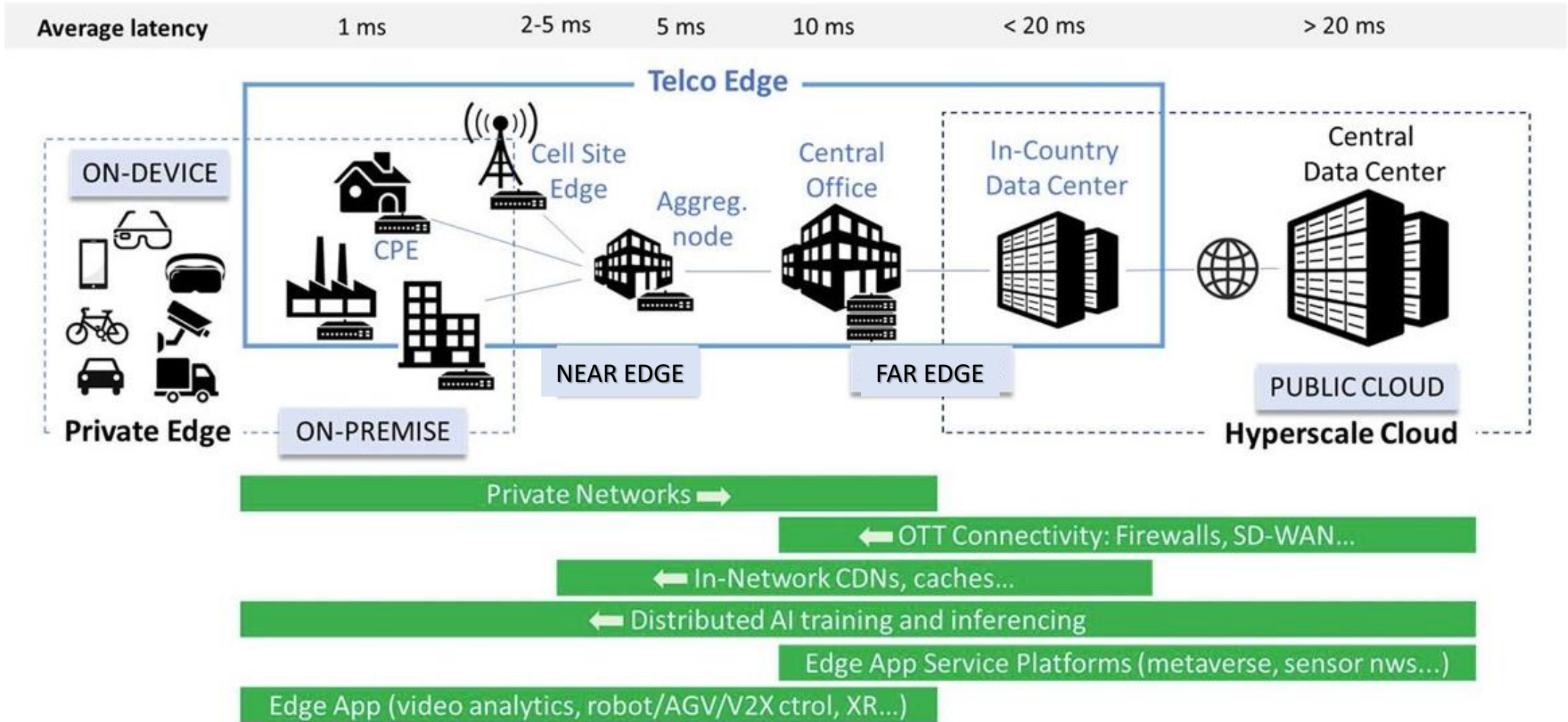


Benefits Summary: Hyperscale vs. On-Prem. Solutions

Value Driver	Quantifiable Benefit	5yr Cumulative Benefit over on prem
Infrastructure / Platform Savings	Network HW CapEx reduction/avoidance based on 5 year refresh of hardware assets	6%
	SW OS and cloud SW component, RedHat assumed	100%
	Hardware maintenance Hardware support cost for servers and switches	100%
	Software maintenance CapEx/OpEx reductions of OpenStack based on leveraging AWS ECS/EKS	100%
	HW Book Value Recovery Recovery of HW book value based on buyout of decommissioned assets	2%
	Data Center/MSOs Hidden upfront cost of enabling a data center to host the server, HVAC, battery backup + power, cooling, space	100%
Staff Productivity	Engineering/Operations Productivity OpEx optimization of Infrastructure admin and automation (CI/CD & AI/ML)	27%
<i>Source: Amazon, 2024</i>		45%



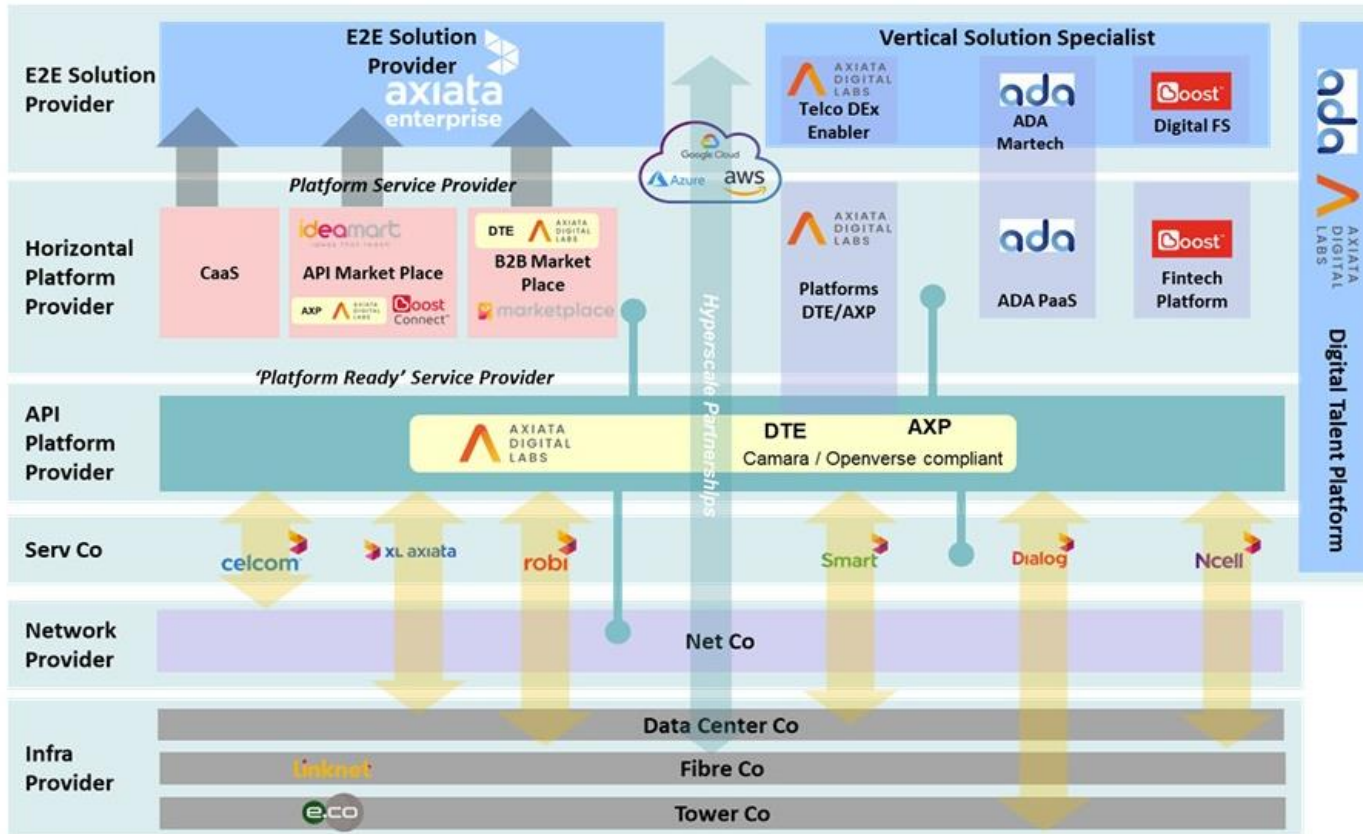
Edge Cloud Opportunities & Telco's Locations



Source: European Alliance for Industrial Data, Edge & Cloud, 2024



Axiata's Telco-TechCo Evolution



- Priority Drivers**
- TCO – CAPEX & OPEX
 - IT & SW Transformation @ Core
 - Partners & Ecosystems
 - Digital Talent
 - De-Layer X-Cos
 - Asset Light

Telco-TechCo is an Evolution of a Pure (Legacy) Telco which Retains the Fundamental Core Strength of "Connectivity", embracing TechCo Principles to deliver Higher Returns on Capital and spawn New Growth Frontiers.

Source: Axiata, 2024