

I cavi sottomarini e la rilevanza strategica delle infrastrutture critiche di connettività

MIMIT - Scuola Superiore di Specializzazione in TLC

12 Marzo 2025

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Introduzione di Sparkle

Internet: mercato, infrastrutture, traffici e attori chiave

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E a cosa altro possono servire...?



Sparkle at a glance

Operations Commerciali in **32 Countries**

Headcount **682**

600,000 km fibra ottica

171 PoPs Network coverage ⁽¹⁾

PoPs via partners **>1,000**

100% TIM Group

1st Service Provider Internazionale in Italia

Tra i **Top-10** Global Operators

#4 per Seabone, Sparkle Global IP Transit Backbone ⁽²⁾

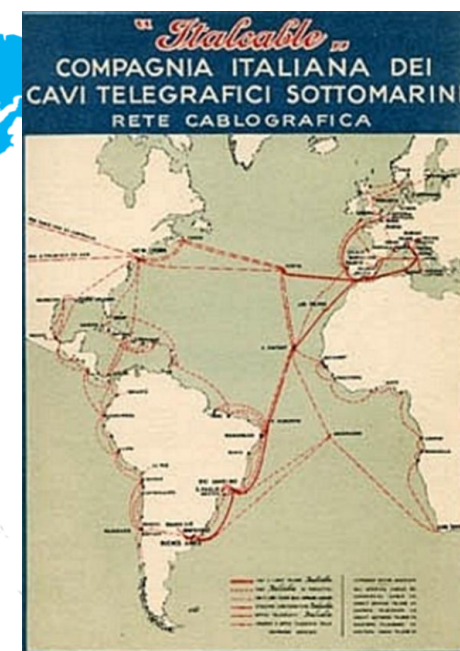
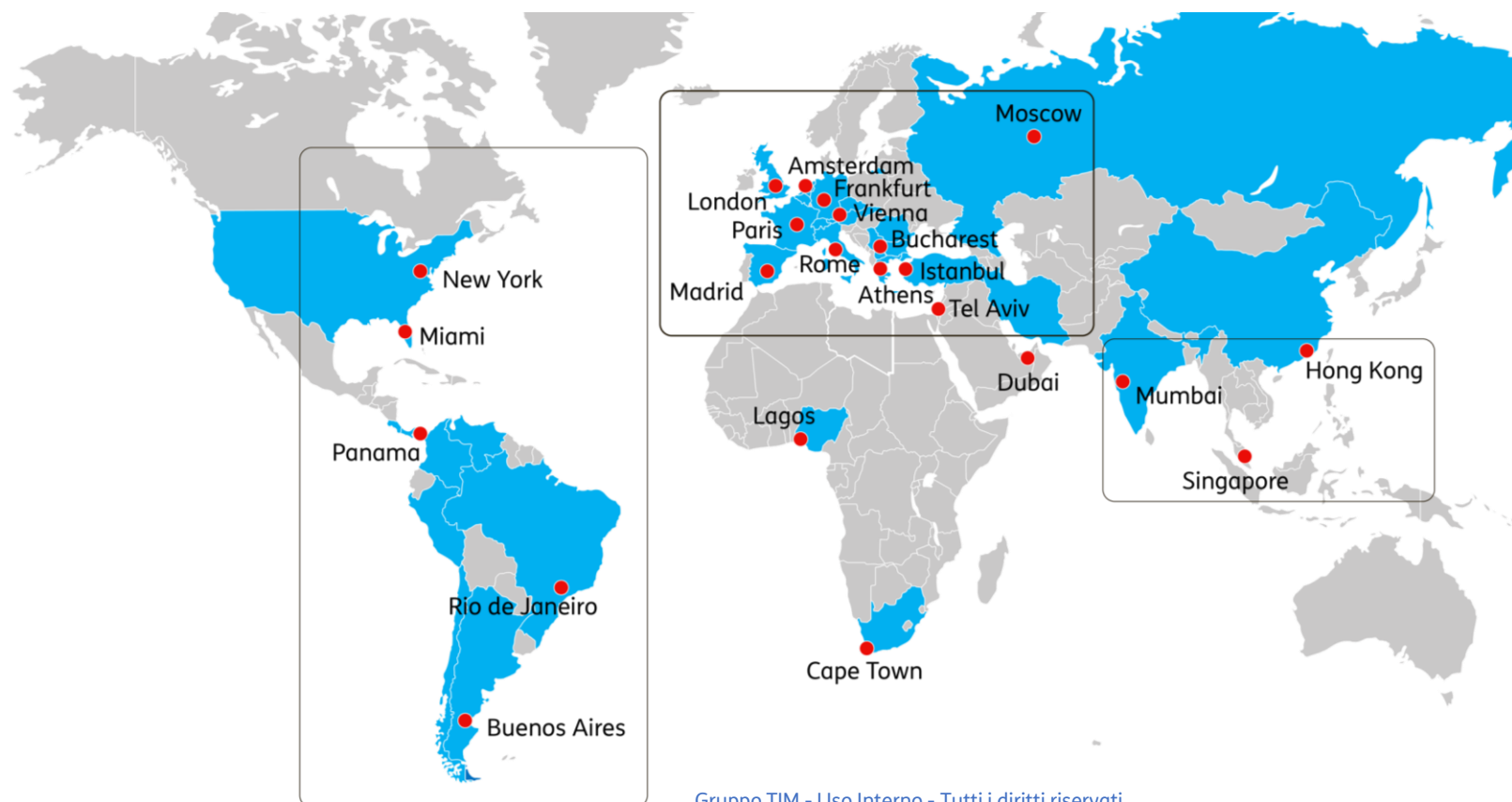
1,518 Clienti

Traffico Voce **6.4B minutes**

Traffico Dati **133 Tbps**

1020 MEUR Ricavi

Accordi Roaming **>600** in **190+** Paesi

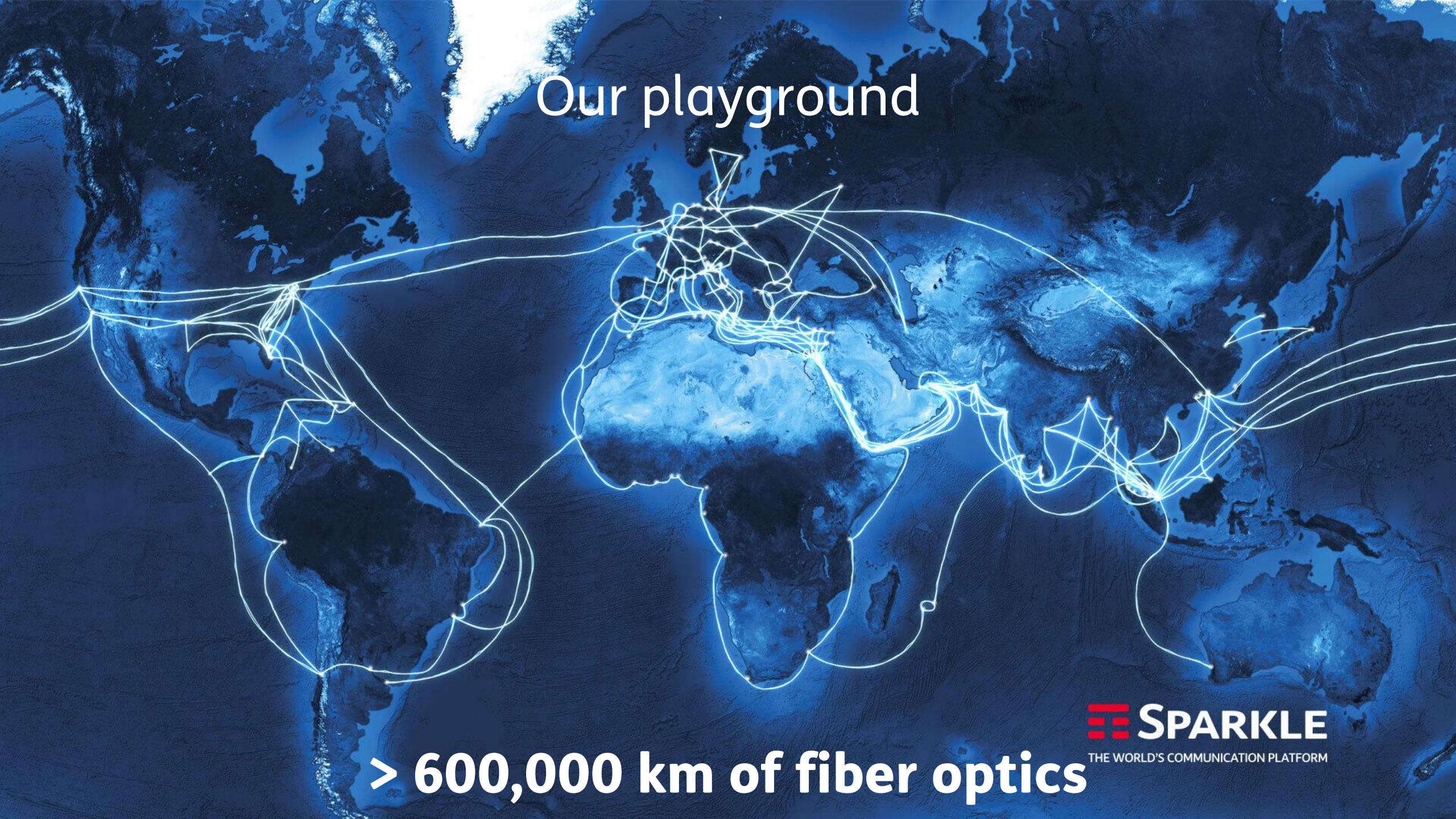


● Offices

December 2023

(1) March 2023

(2) Source Caida - October 2023



Our playground

> 600,000 km of fiber optics

 **SPARKLE**
THE WORLD'S COMMUNICATION PLATFORM

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World Economic Outlook

Source: IMF (Apr'24)

North America

	2024	2027	CAGR
GDP	B\$ 31.023	B\$ 34.851	3,0%
GDP PC	\$ 82.075	\$ 90.351	2,4%
Pop.	378 mln	386 mln	0,5%
Infl. rate	2,4%	2,4%	

MENA

	2024	2027	CAGR
GDP	B\$ 4.433	B\$ 5.133	3,7%
GDP PC	\$ 8.677	\$ 9.547	2,4%
Pop.	511 mln	538 mln	1,3%
Infl. rate	9,3%	5,5%	

Europe

	2024	2027	CAGR
GDP	B\$ 25.521	B\$ 28.627	2,9%
GDP PC	\$ 37.642	\$ 41.750	2,6%
Pop.	678 mln	686 mln	0,3%
Infl. rate	4,4%	2,7%	

Central Asia

	2024	2027	CAGR
GDP	B\$ 2.697	B\$ 2.937	2,2%
GDP PC	\$ 11.209	\$ 12.038	1,8%
Pop.	241 mln	244 mln	0,3%
Infl. rate	5,9%	4,3%	

Far East Asia

	2024	2027	CAGR
GDP	B\$ 25.636	B\$ 30.373	4,3%
GDP PC	\$ 15.817	\$ 18.805	4,4%
Pop.	1.621 mln	1.615 mln	-0,1%
Infl. rate	2,0%	2,0%	

Central America

	2024	2027	CAGR
GDP	B\$ 3.051	B\$ 3.544	3,8%
GDP PC	\$ 11.355	\$ 12.810	3,1%
Pop.	269 mln	277 mln	0,7%
Infl. rate	3,8%	3,1%	

South America

	2024	2027	CAGR
GDP	B\$ 3.851	B\$ 4.459	3,7%
GDP PC	\$ 11.043	\$ 12.511	3,2%
Pop.	349 mln	356 mln	0,5%
Infl. rate	26,5%	4,2%	

South East Asia

	2024	2027	CAGR
GDP	B\$ 8.565	B\$ 11.062	6,6%
GDP PC	\$ 3.334	\$ 4.183	5,8%
Pop.	2.569 mln	2.644 mln	0,7%
Infl. rate	3,8%	3,4%	

Oceania

	2024	2027	CAGR
GDP	B\$ 2.091	B\$ 2.353	3,0%
GDP PC	\$ 44.354	\$ 47.950	2,0%
Pop.	47 mln	49 mln	1,0%
Infl. rate	3,3%	2,7%	

West Africa

	2024	2027	CAGR
GDP	B\$ 586	B\$ 675	3,6%
GDP PC	\$ 1.312	\$ 1.398	1,6%
Pop.	447 mln	483 mln	2,0%
Infl. rate	14,5%	7,7%	

Central Africa

	2024	2027	CAGR
GDP	B\$ 196	B\$ 246	5,8%
GDP PC	\$ 1.179	\$ 1.351	3,5%
Pop.	167 mln	182 mln	2,2%
Infl. rate	7,1%	4,3%	

Southern Africa

	2024	2027	CAGR
GDP	B\$ 617	B\$ 701	3,3%
GDP PC	\$ 3.008	\$ 3.194	1,5%
Pop.	205 mln	220 mln	1,7%
Infl. rate	40,4%	30,1%	

East Africa

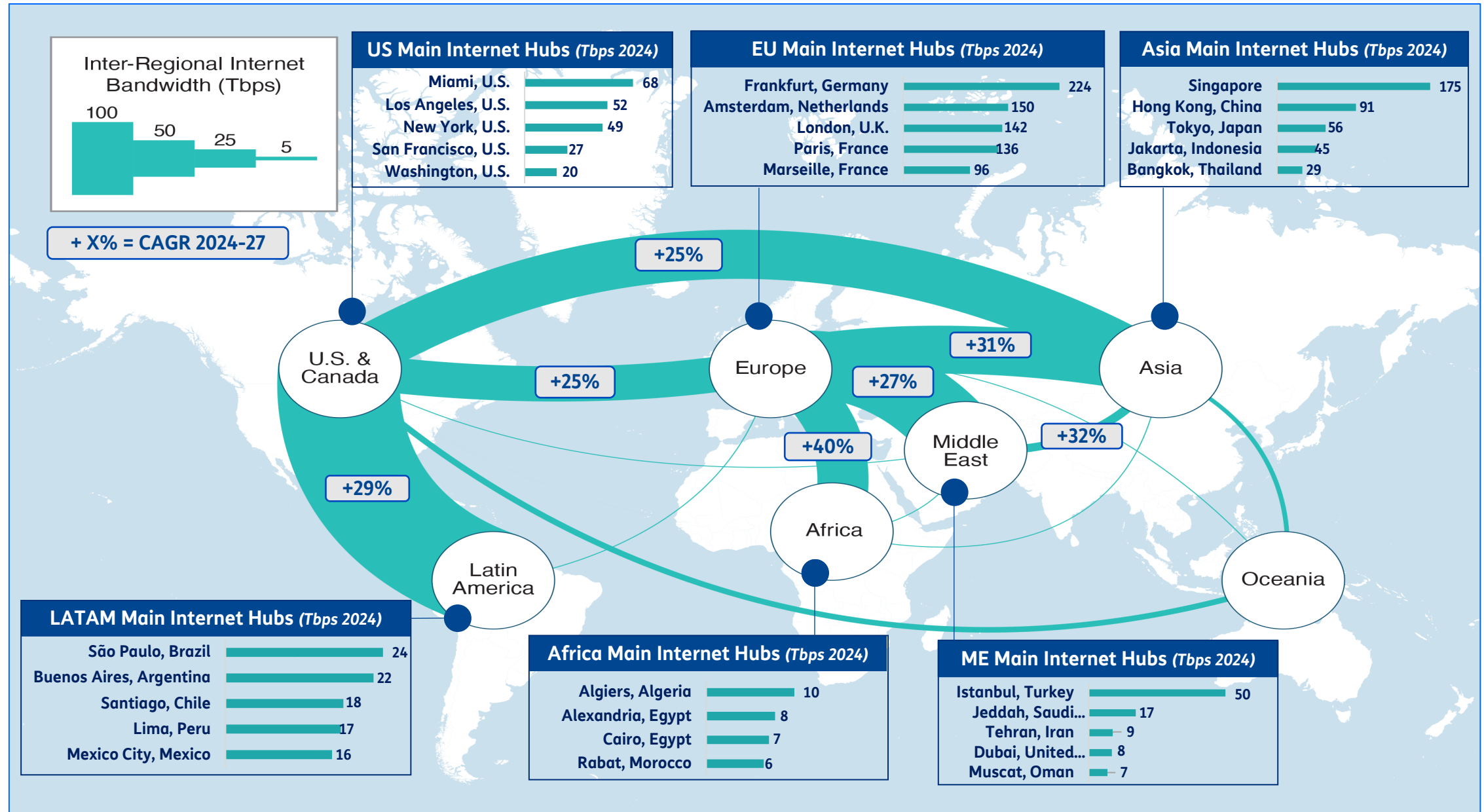
	2024	2027	CAGR
GDP	B\$ 506	B\$ 674	7,5%
GDP PC	\$ 1.390	\$ 1.724	5,5%
Pop.	364 mln	391 mln	1,8%
Infl. rate	12,6%	8,4%	

GDP PC – per capita

GDP and GDP PC are in PPP – purchasing power parity – terms

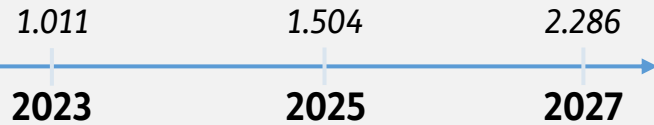
Inflation rate is on the ACP – average consumer prices – index (also known as CPI)

International Internet Bandwidth by Regional Route



Market Trends/Geographic Mix – IP Volumes

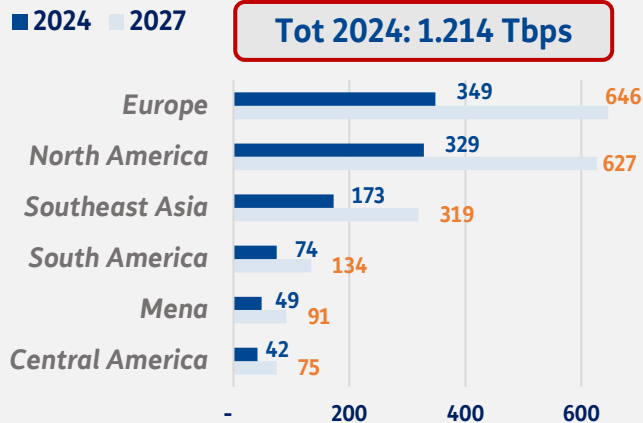
TOTAL IP TRANSIT TRAFFIC (Tbps)



CAGR 24-27

23,5%

IP TRANSIT TRAFFIC - MAIN REGIONS (Tbps)



Tot 2024: 1.214 Tbps

CAGR 24-27

22,8%

24,0%

22,7%

21,8%

23,2%

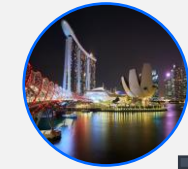
23,5%

Source: IP Networks Forecast H2'23 Telegeography, Sparkle elaborations

2024 MAIN GLOBAL INTERNET HUBS



1 223,5 Tbps
FRANKFURT



2 175,5 Tbps
SINGAPORE



3 150,0 Tbps
AMSTERDAM



4 141,6 Tbps
LONDON



5 135,7 Tbps
PARIS



6 95,5 Tbps
MARSEILLE



7 90,7 Tbps
HONG KONG



8 68,5 Tbps
MIAMI



9 62,5 Tbps
VIENNA



10 61,4 Tbps
STOCKHOLM

TOP 10

1.205 Tbps (45% of the TOP 100 cities per internet traffic)

TOP 20

1.651 Tbps (62% of the TOP 100 cities per internet traffic)



16 42,7 Tbps
MILAN

vs 15 in 2023
39.5 Tbps

→ ↑ ↓ comparison with the 2023 ranking

Players in the value chain



Main actors of the Internet value chain (source: Arthur D. Little)

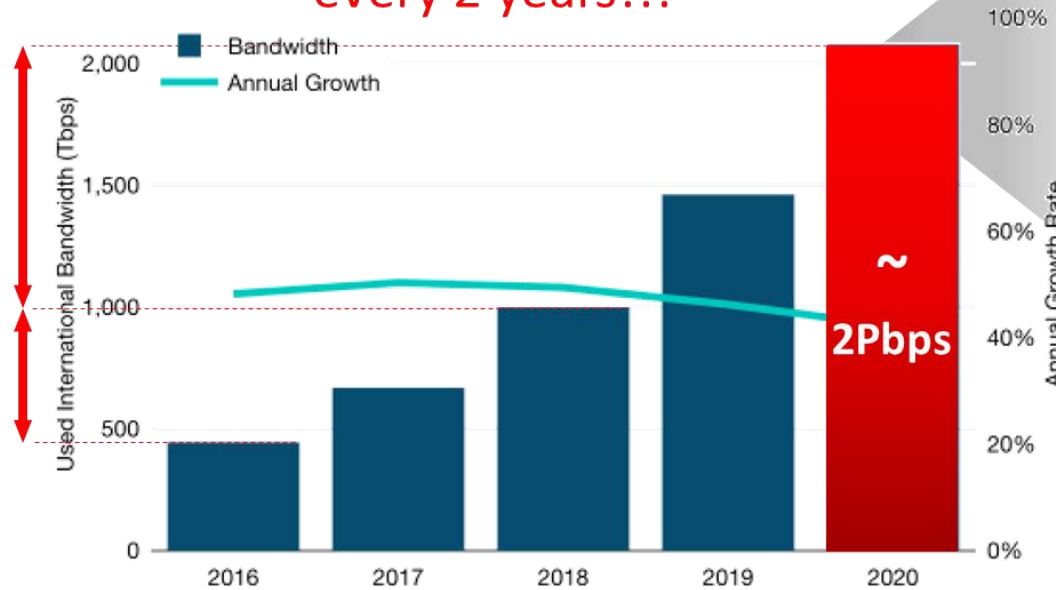
From Content and Application producers to Providers and End Customers



Digital transformation consumes a lot of connectivity...global!

Worldwide International Bandwidth Growth

more than **doubling**
every 2 years!!!



similarities with 1st Moore's Law ('80s/'90s)

Source: Telegeography



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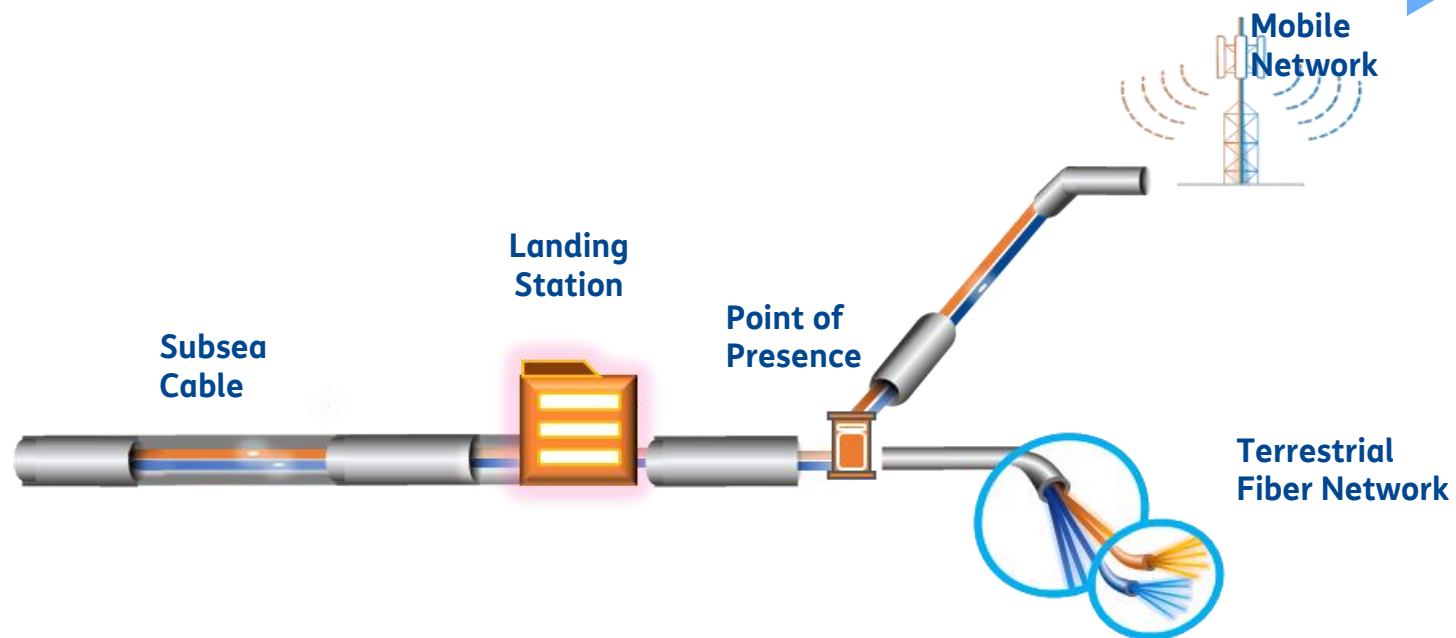
Critical Infrastructures: Backbones

International
Backbones
(Terrestrial & Submarine)

+ Data Centers

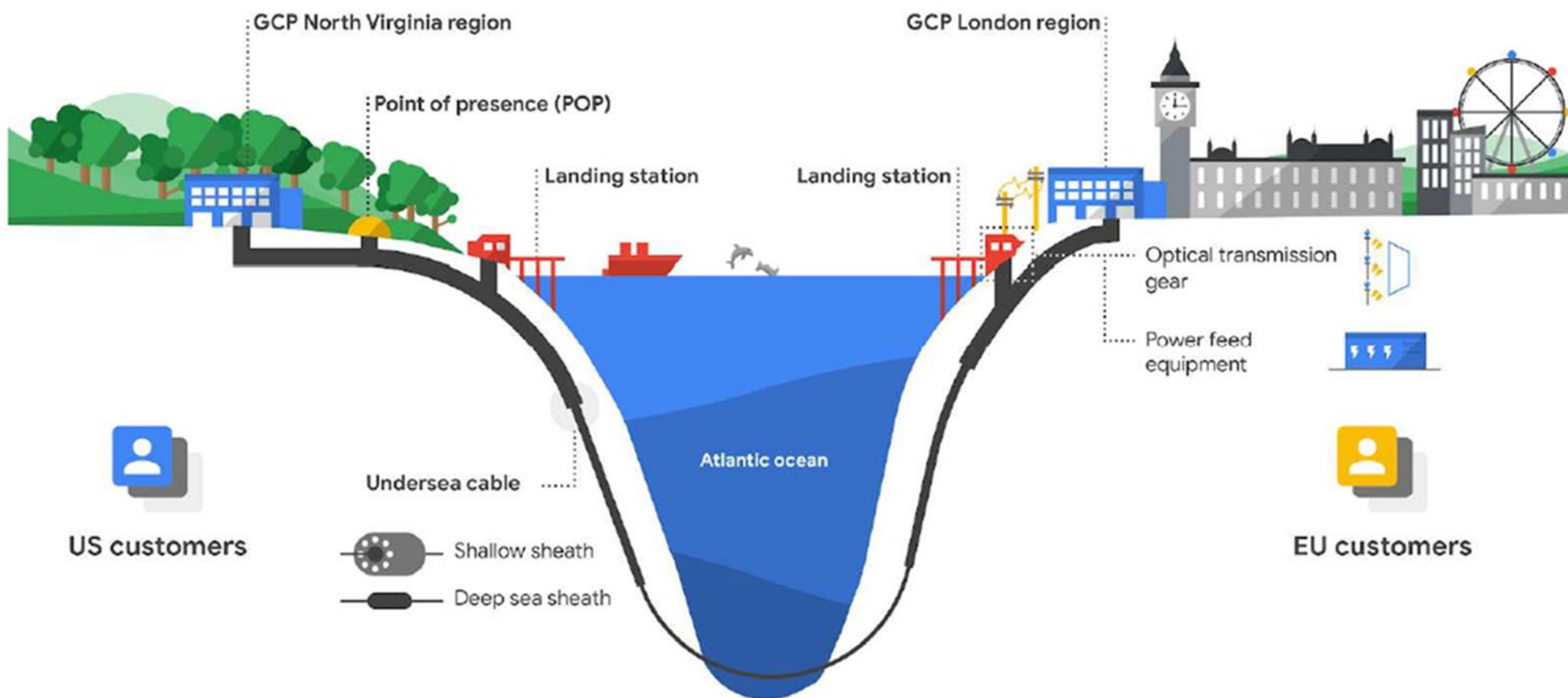


National
Fixed and Mobile
Broadband Networks



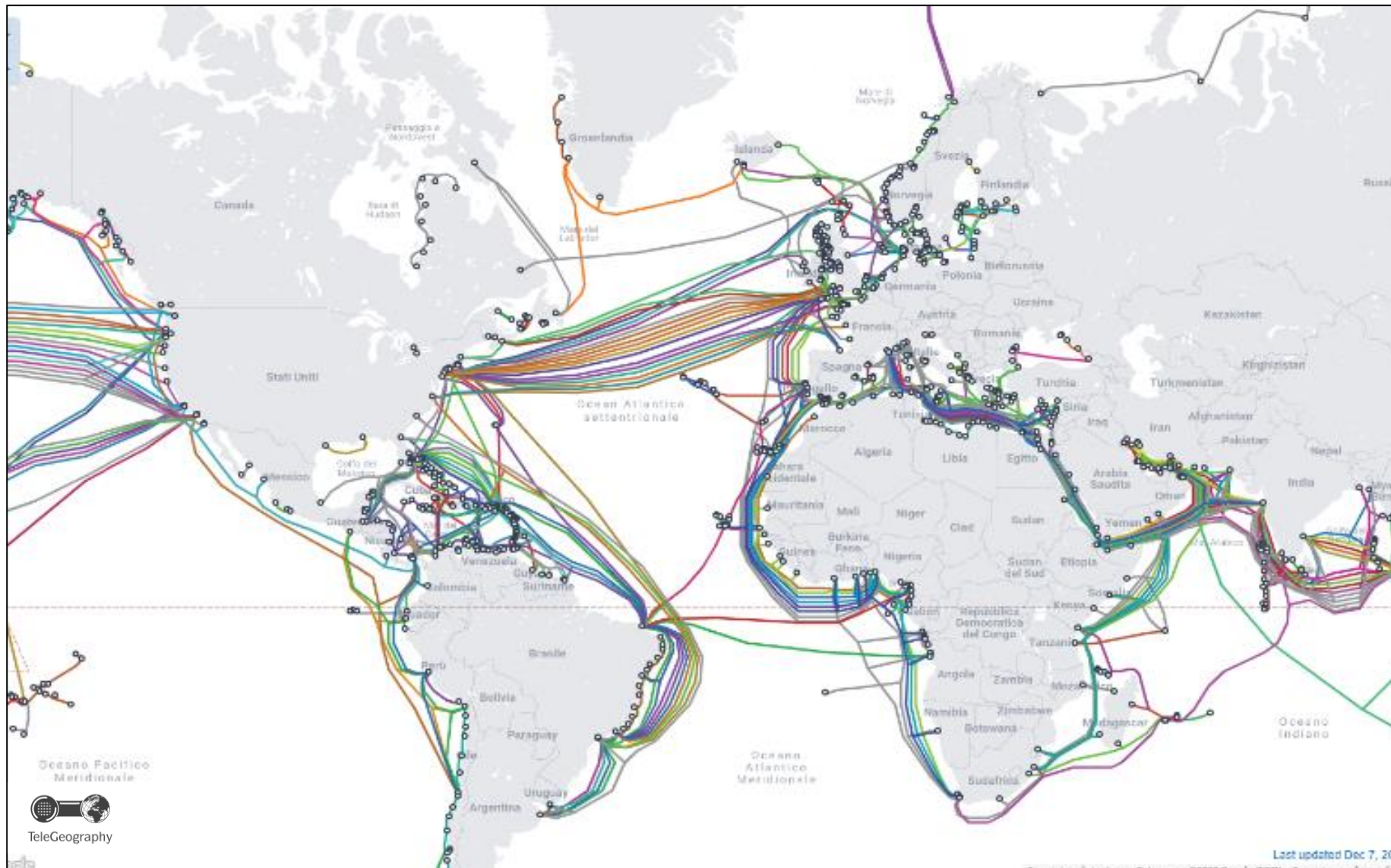
Submarine hidden infrastructure

Submarine Cable Components

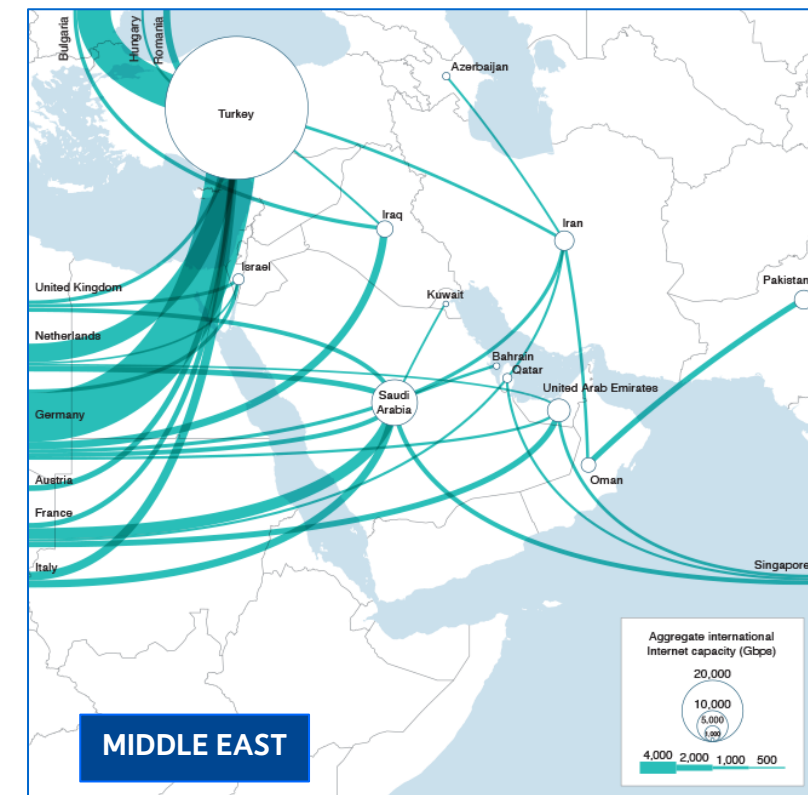
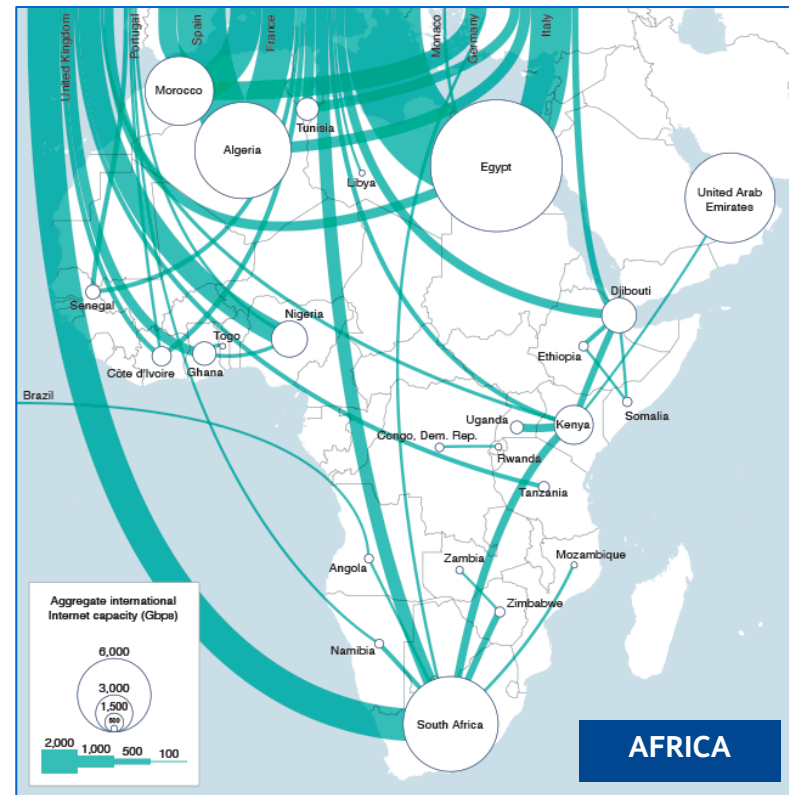
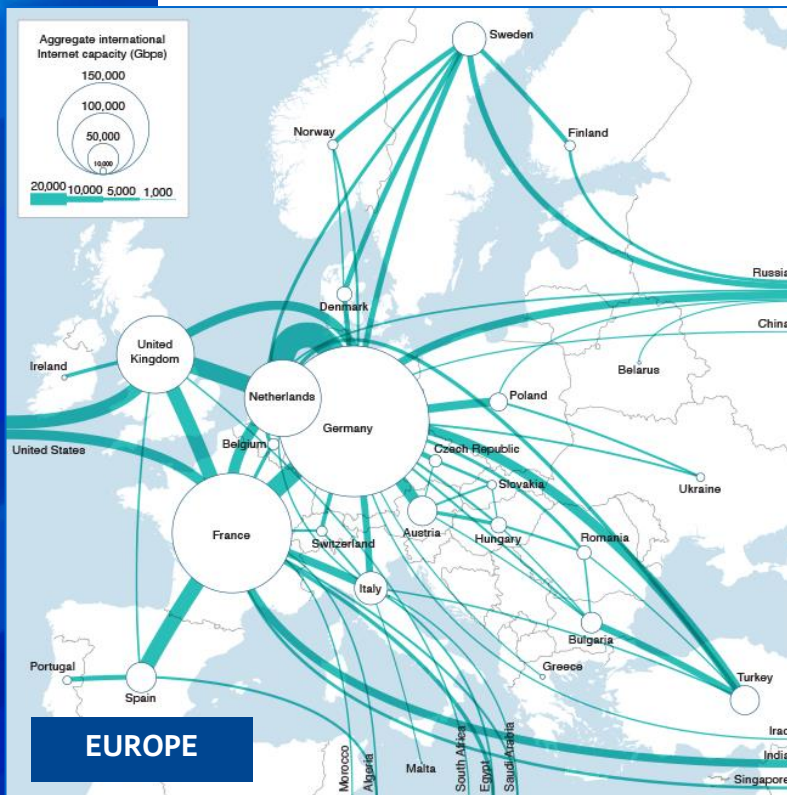


Global Network of submarine fiber optical cables

According to Analysts, the current global network of 450 submarine cables supports 99% of global Internet and communications traffic carrying \$10 trillion/day of financial transactions.



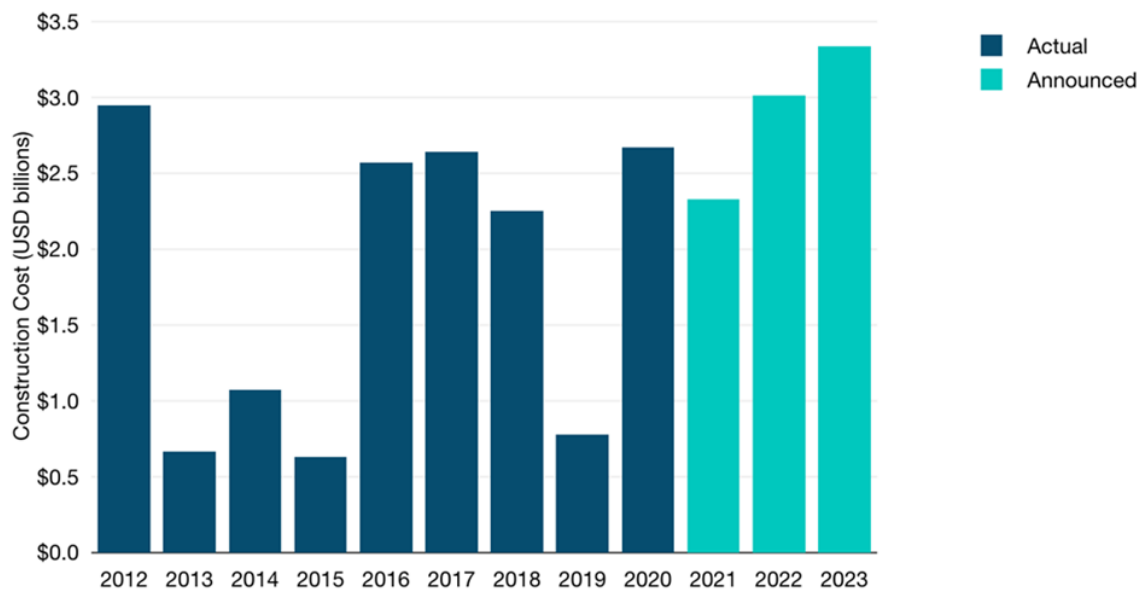
IP Data market by routes: Europe – Middle East - Africa



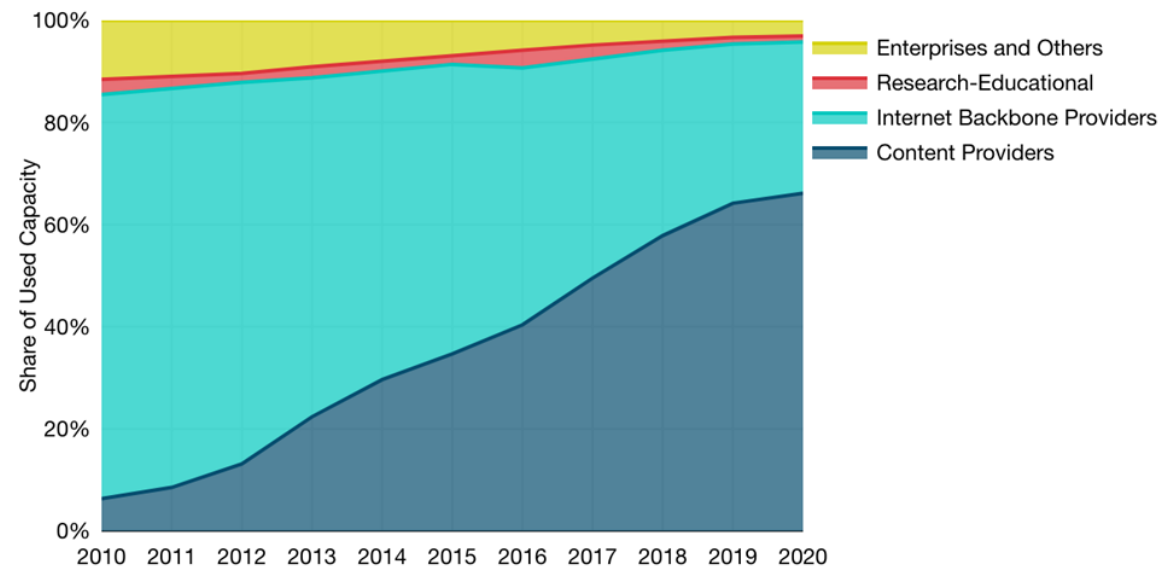
	Gbps	2020	2021	2022	2023	2024	2025	2026	2027	CAGR
Europe-Middle East		35,791	46,773	61,957	76,339	98,953	127,201	161,074	203,310	28%
Europe-Africa		14,843	20,932	29,549	41,974	58,912	82,289	115,108	160,354	40%
Africa-Middle East		459	504	583	467	742	1,052	1,480	2,077	24%

Who is investing on new sumarine cables

Investment in new systems is soaring



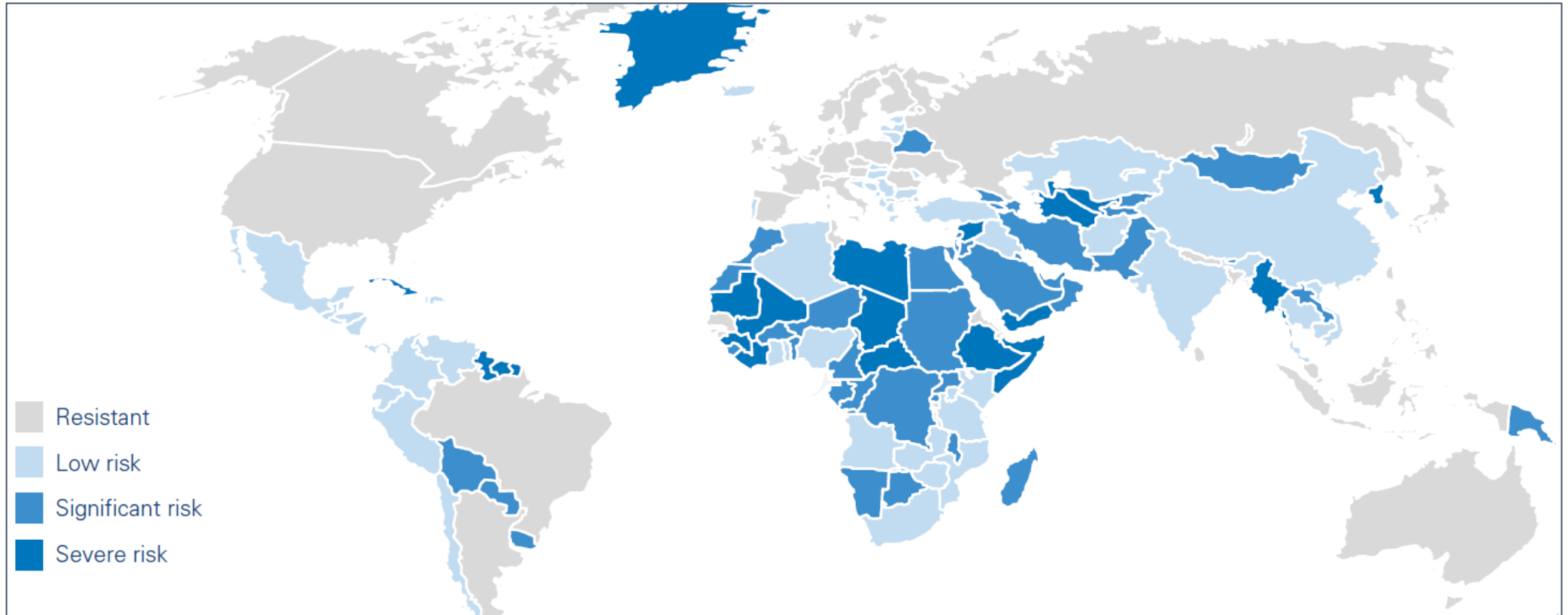
Who is using this bandwidth?



Big Tech (Google, Meta/Facebook, Amazon, Microsoft) are currently main investors in submarine cables!

Where Internet is at risk?

The absence or scarcity of redundancy and diversification of backbones - primarily Submarine - makes this large part of the world still at high risk of Internet disconnection

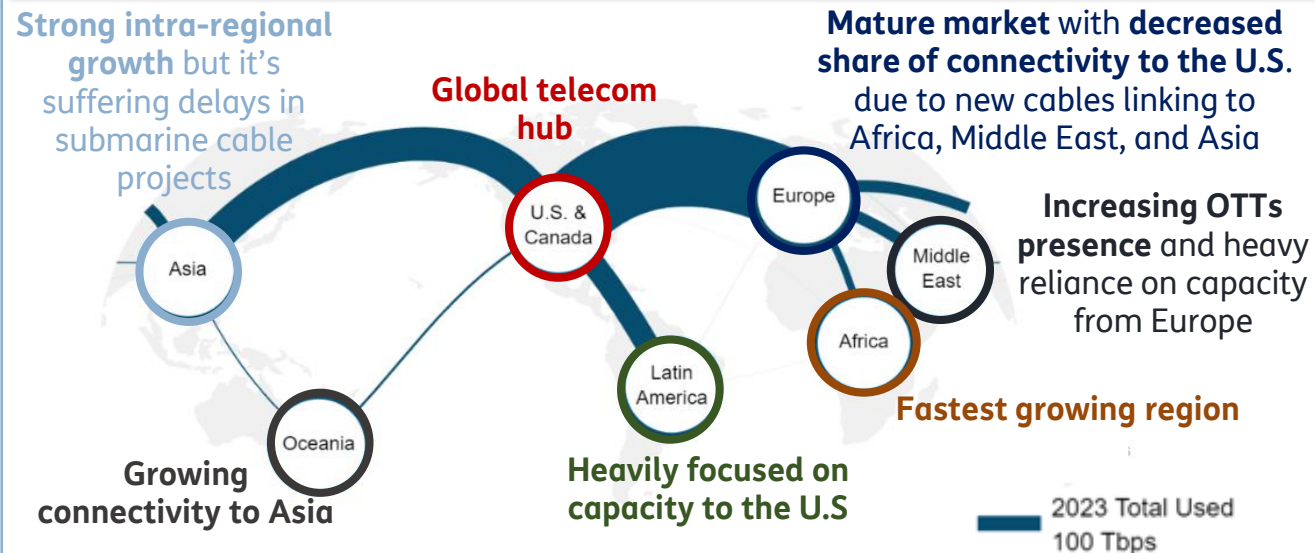


Risk of Internet disconnection (source: Renesys/Oracle)

Market Trends - Mediterranean back to the center for global digital traffic

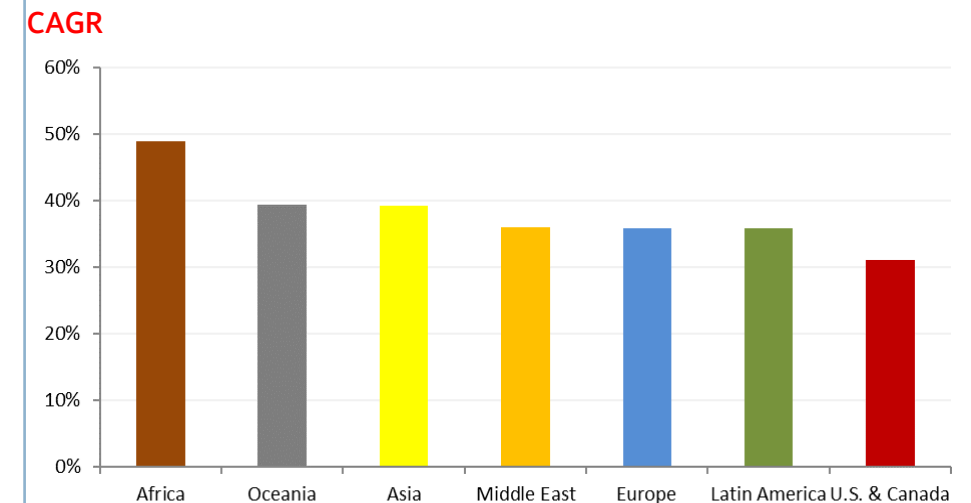
- ❑ International bandwidth demand has more than **tripled from 2019 to 2023, reaching 5 Pbps**
- ❑ Comparable growth in all the regions with **fastest growth in Africa** (~50% CAGR 19-23) and **slowest in North America** (~30% CAGR 19-23)
- ❑ **Europe** is the region with most used international bandwidth (3776 Tbps)
- ❑ **OTTs** are the dominant users (more than 70% of total used capacity in 2023)
- ❑ Recent **price trends** vary by region: price erosion has started to accelerate again on routes with new high-capacity cables in service but remains stalled on routes with continued delays in new supply

2023 used inter-regional Bandwidth

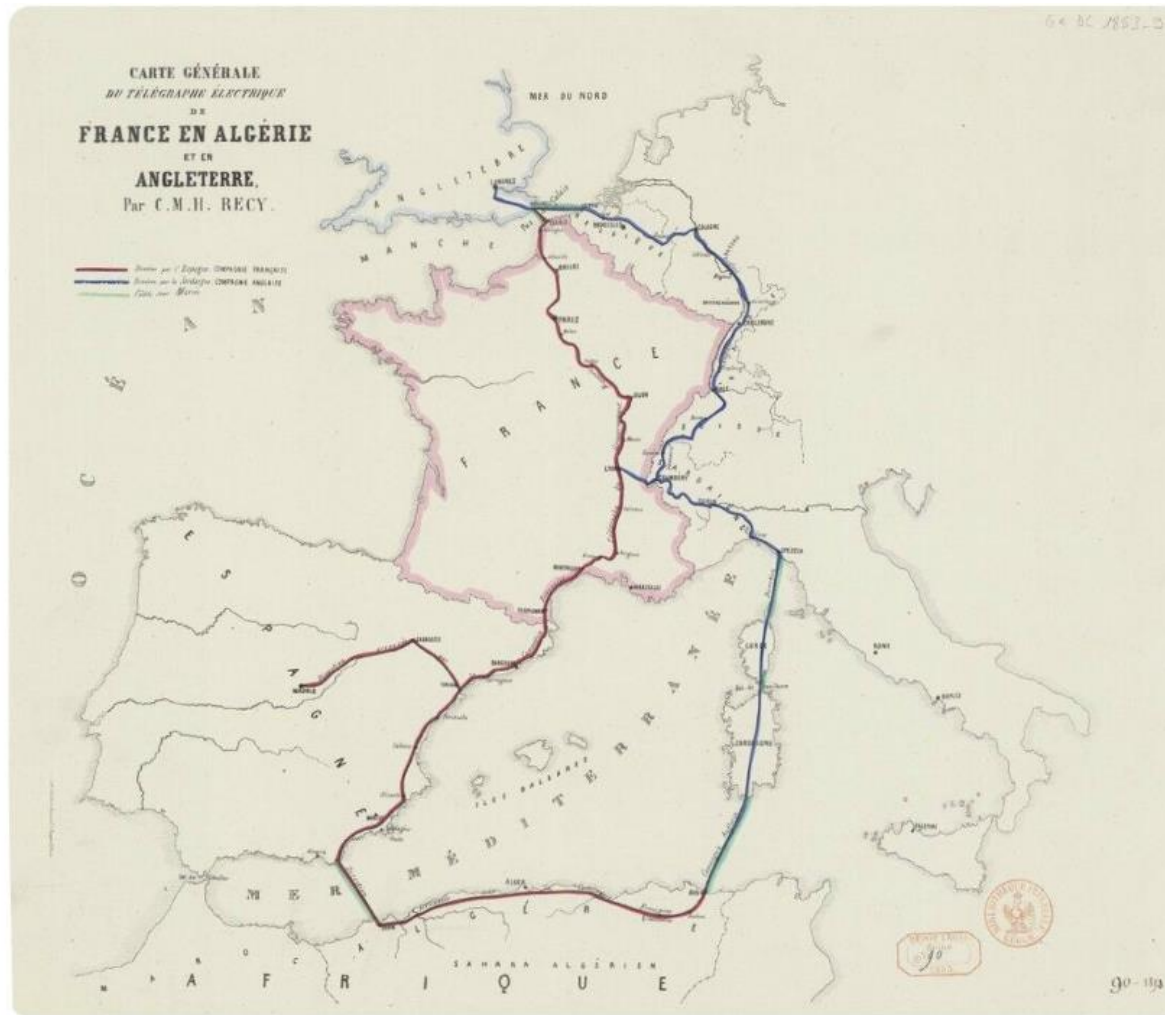


Source: Telegeography

Used Int. Bandwidth Growth by Region (CAGR 19-23)



Italy and Mediterranean have always been considered strategic

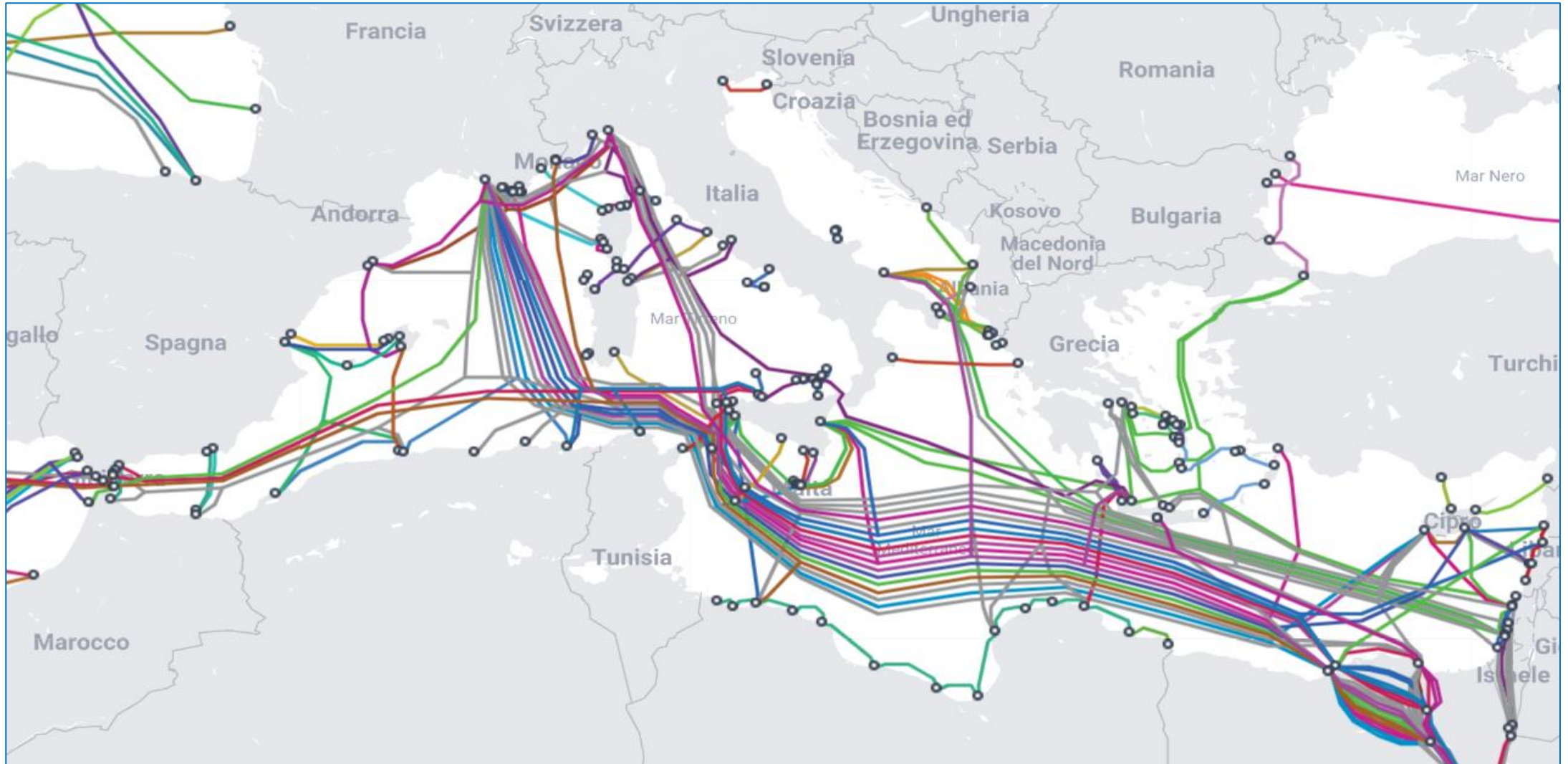


Carte générale du télégraphe électrique de France en Algérie et en Angleterre / Par C. M. H. Récy, fonte: gallica.bnf.fr / Bibliothèque nationale de France. Tracciato delle linee telegrafiche La Spezia - Corsica - Algeria. Dalla città di Bona, punto di arrivo della linea sottomarina proveniente da Cagliari, la rete telegrafica coloniale francese si sviluppò verso Ovest per collegare i principali centri dell'Algeria prossimi alla costa mediterranea. Gli inglesi avrebbero voluto sviluppare proprie linee da Bona verso Sud-Est, attraverso la Tunisia, la Tripolitania sino al Cairo e poi a Suez. Un'altra linea sottomarina fu prevista da Cagliari per Malta e Corfù ove il collegamento sarebbe passato alla rete continentale. Nella mappa in rosso sono indicate le linee telegrafiche gestite dalla rete francese ed in blu quelle gestite dagli inglesi (Brett).

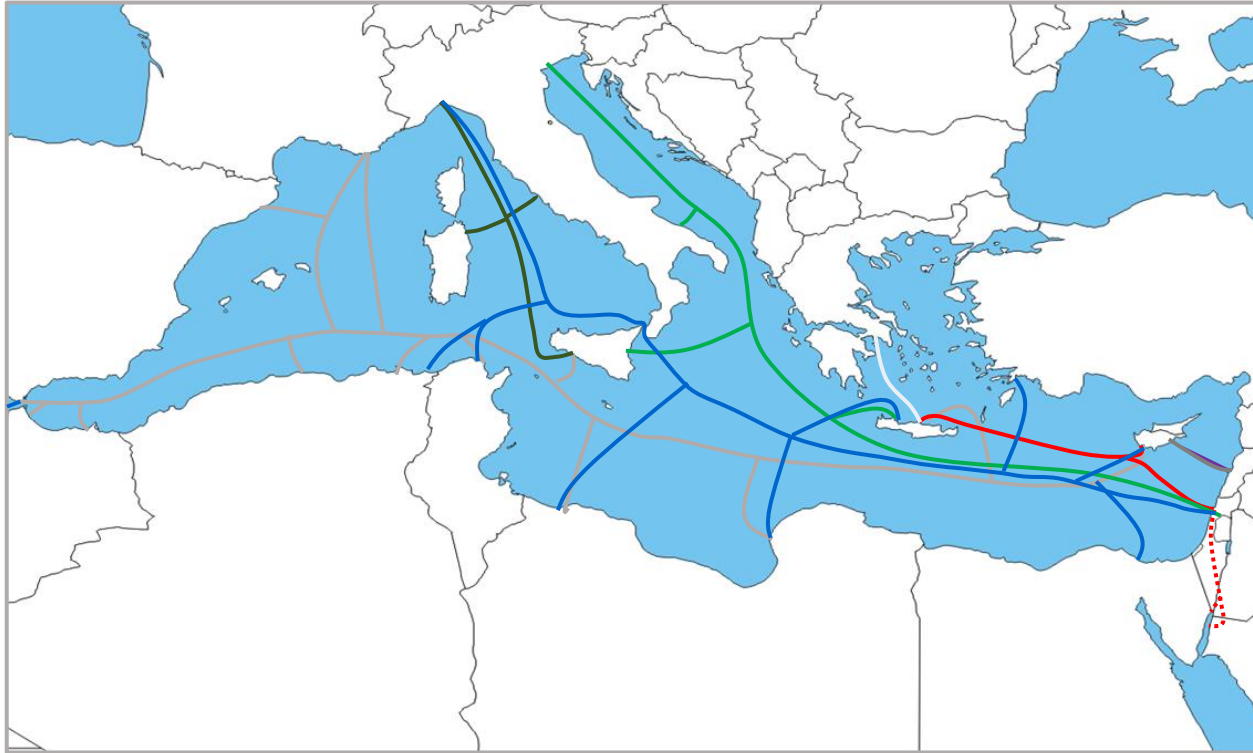
- In 1853 Cavour signed an agreement with France and England to lay a cable that would connect Italy with Africa through a mixed underwater and land route (La Spezia-Sardinia, through Corsica, and then towards Algeria).
- This convention allowed the Kingdom of Sardinia to improve international relations, becoming a hub of communications to Africa, the Middle East and the Indies. Thanks to Cavour, this line became the Mediterranean platform for international telecommunications.

Submarine cables in the Mediterranean Sea

The Mediterranean Sea serves as a **critical crossroads for international data traffic**, hosting numerous submarine cables that connect Europe, Asia, and Africa while also ensuring regional connectivity



TRENDS: MEDITERRANEAN, DIVERSIFICATION IS THE KEY



The strong concentration on Marseille (SPOF risk - Single Point Of Failure) is directing many of the new projects to diversify with a main landing place in Italy, with the rise of the Ligurian border (Genoa and Savona) and North East of Italy as the main alternative, but Spain with Barcelona is also a candidate to become a basin hub.

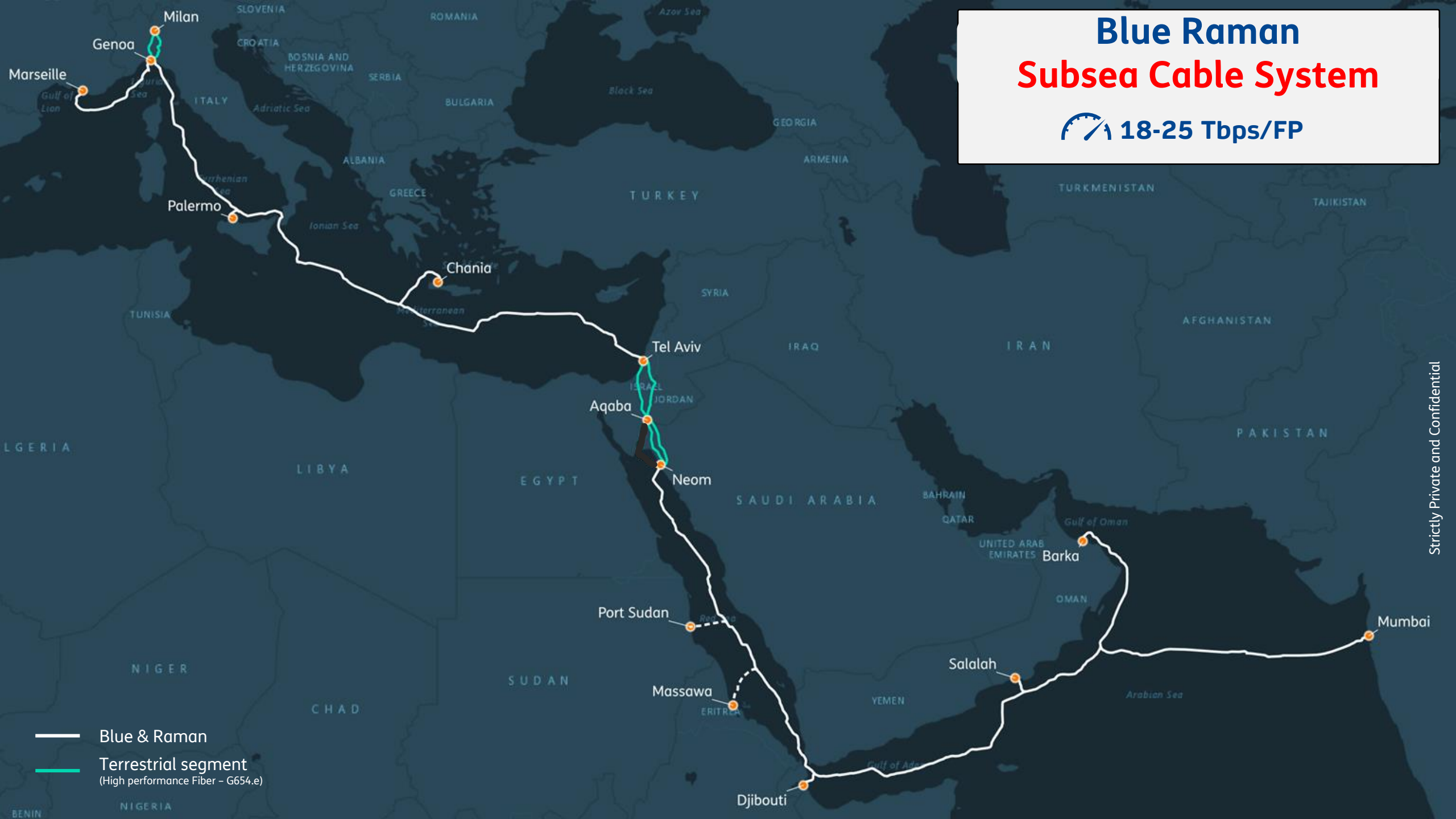
ONGOING SUBMARINE CABLE MAIN SYSTEMS

- **APOLLO EAST-WEST** by Grid Telecom is connecting Athens to Crete (RFS 2024)
- **ANDROMEDA** by Grid Telecom and Tamares will connect Crete to Cyprus and Israel (RFS 2025) with a further terrestrial link to Aqaba and Haql in Saudi Arabia
- **BLUEMED** by Sparkle to connect the Mediterranean countries. The segment from Genova/Marseille to Greece (Chania) is active, branches in Algeria, Tunisia, Libya, Turkey and Cyprus are planned
- **GREEN MED** by Sparkle will connect Italy to Greece and Israel, with possible branches to the countries in the Adriatic Sea (RFS 2027)
- **UNITIRRENO** by Unidata and Azimut will cross the Tyrrhenian Sea connecting Genoa to Sicily, Sardinia and Rome (RFS 2025 Q3)
- **MEDUSA** by AFRIX Telecom will span the Mediterranean Sea connecting Greece and Cyprus to all the North-African countries and to Sicily, France, Spain and the Atlantic (RFS 2026)
- **CADMOS-2** by Cyta and the Lebanese MoT will connect Cyprus to Lebanon (RFS 2026)



Blue Raman Subsea Cable System

 18-25 Tbps/FP



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Why subsea cables are considered strategic

Global Connectivity & Economic Growth

-  Carries 98%+ of international data traffic
-  Supports employment, e-commerce, finance, entrepreneurship
-  Enables real-time global business & financial transactions

Geopolitical Influence

-  Enhances geopolitical leverage through secure communication
-  Critical for military & intelligence operations

Strategic Redundancy & Digital Sovereignty

-  Diversification of routes avoids global internet disruptions
-  Reduces dependence on third party's digital infrastructure
-  Protects national interests in data transmission

Resilience & Future Technologies (5G, AI, Cloud)

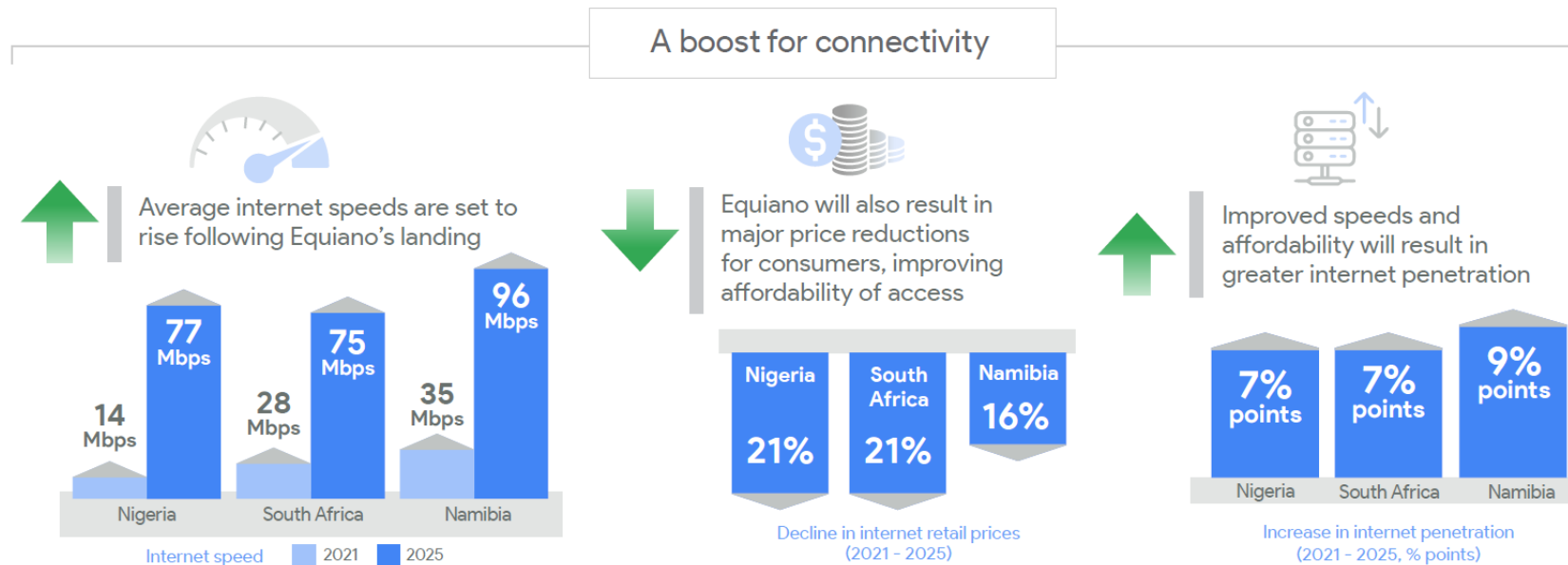
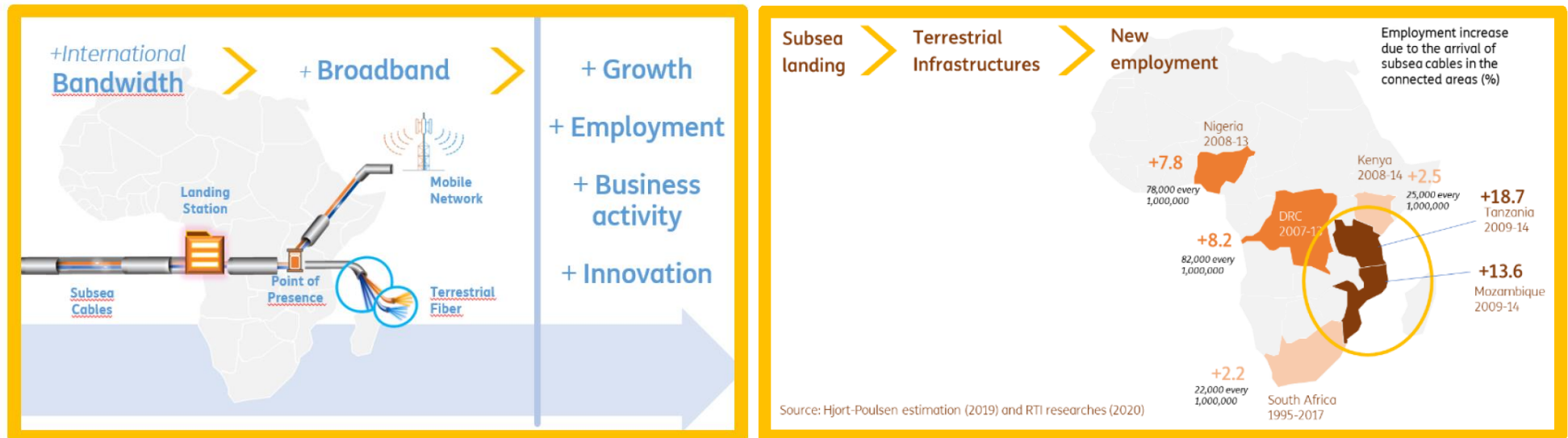
-  Low-latency, high-speed backbone for 5G & AI
-  Supports cloud computing & smart infrastructure
-  Drives digital transformation & industrial automation

Investment & Infrastructure Diplomacy

-  Major investments shape global digital dominance
-  Geostrategic projects like EU's Global Gateway & U.S. Indo-Pacific initiatives
-  Strengthens international partnerships & economic influence

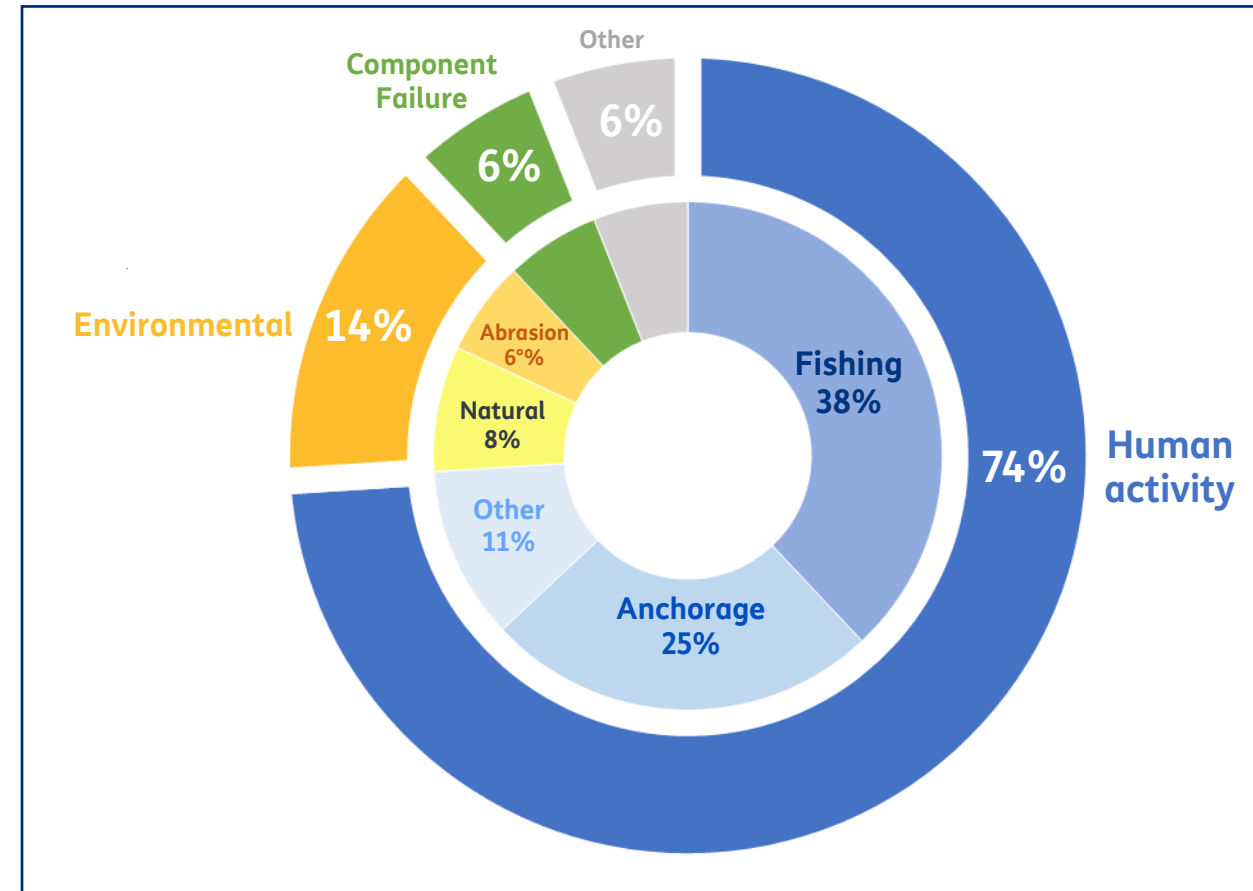


Arrival of Subsea cables – Benefits (Africa case)



Resiliency of Internet Backbone

- Cable faults happen. On average, there are over 100 each year.
- Rarely the cable fault is perceived because most companies follow a “safety” approach to usage, spreading their networks' capacity over multiple cables so that if one breaks, their network will run smoothly over other cables while service is restored on the damaged one.
- The most of the damage to submarine cables is caused by human activity, especially fishing and anchoring
- Earthquakes are one of the possible causes of breakage



Fonte:  TeleGeography

<https://blog.telegeography.com/what-happens-when-submarine-cables-break>

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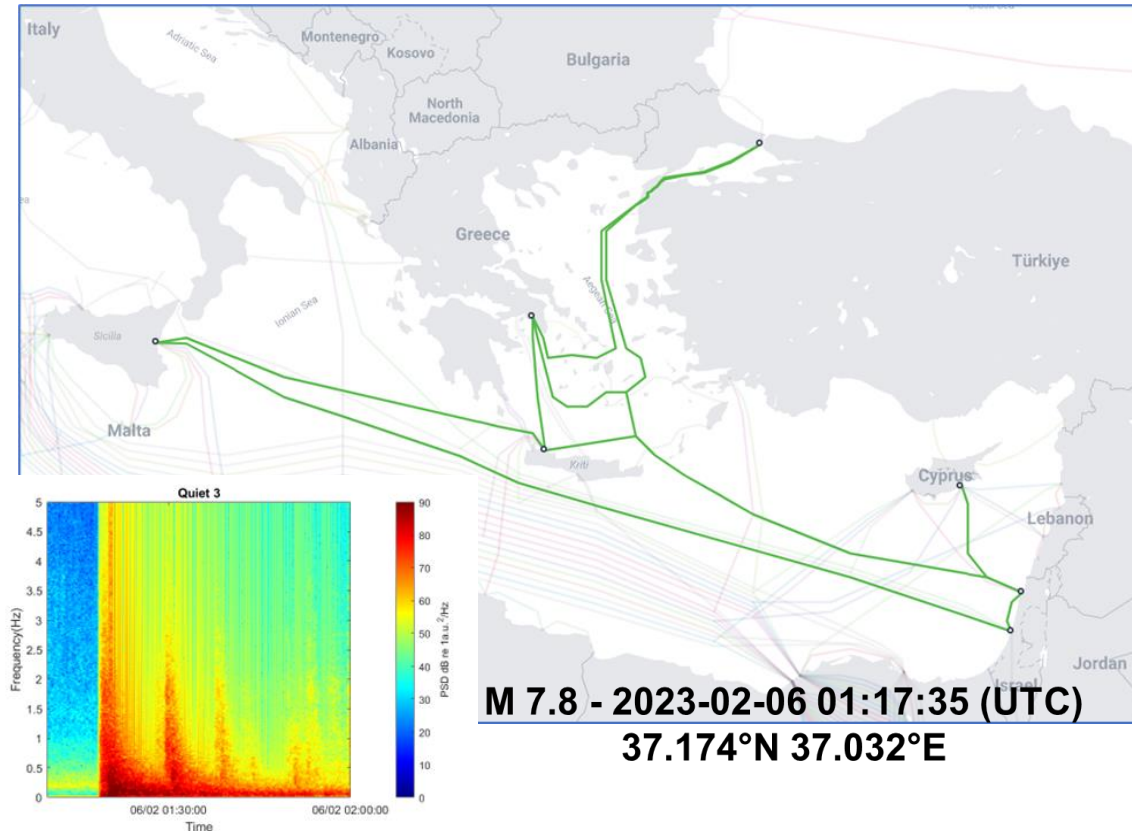
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Cable sensing, not only Internet traffic



First SOP (State of Polarization) experiment on a ring cable (MedNautilus), which improves the ability to identify the epicenter of phenomena originating at sea.



Istituto Nazionale di
Geofisica e Vulcanologia



Submarine cables and analytics will support monitoring and alerting of seismic phenomena that can generate tsunamis and earthquakes!