MENOG 5

Beirut, October 25th-29th 2009

Euro-Asian Submarine Cables
An overview

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Agenda

- The growth of demand in the mid term scenario
- Types of submarine cables
- Building blocks of multi-owner systems: The C&MA
- Restoration and Protection of submarine Cables
- A real case: cable cut emergency on Jan 30, 2008
- The upgrades
- Submarine Cable Systems in the Med Basin
- Telecom Italia Sparkle network assets
- New Cable projects in the Euro-Asia-East Africa region

The growth of demand in the mid term scenario

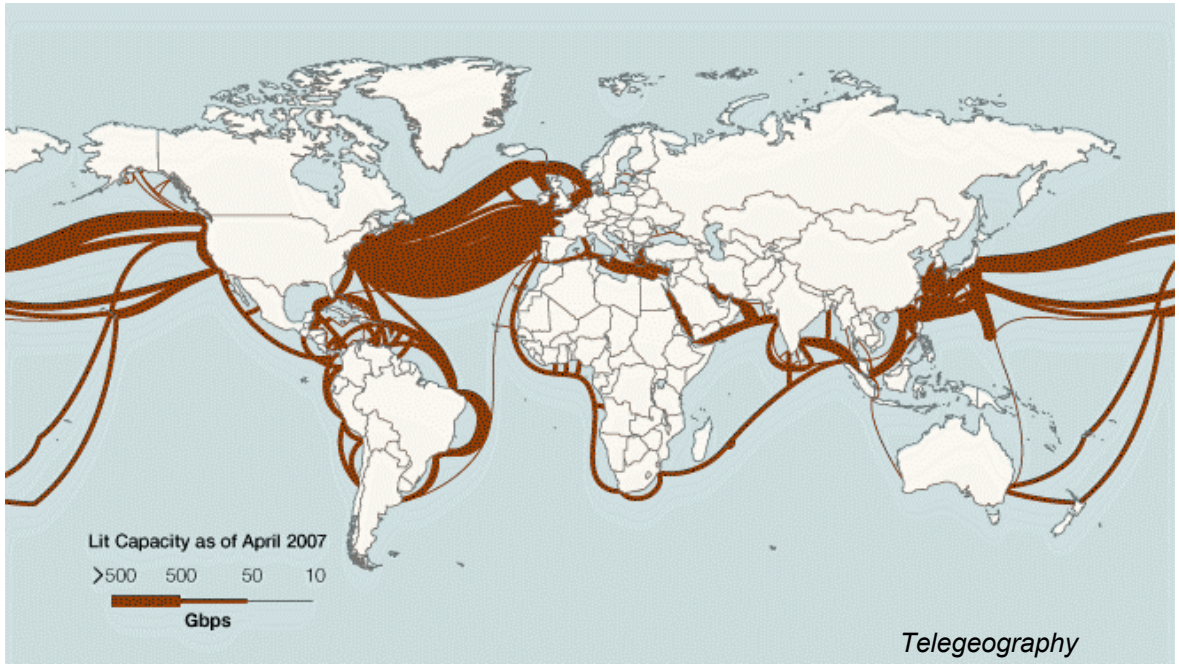
- **Several new systems are lining up**

  In the next 2 years, a number of new submarine systems is expected to come to life: interested routes are primarily India to Europe and Trans Pacific. All the main regional players and most of European and US carriers are involved in these projects.


THE WALL STREET JOURNAL EUROPE

A new boom in fiber cable sweeps world

By Christopher Rhoads



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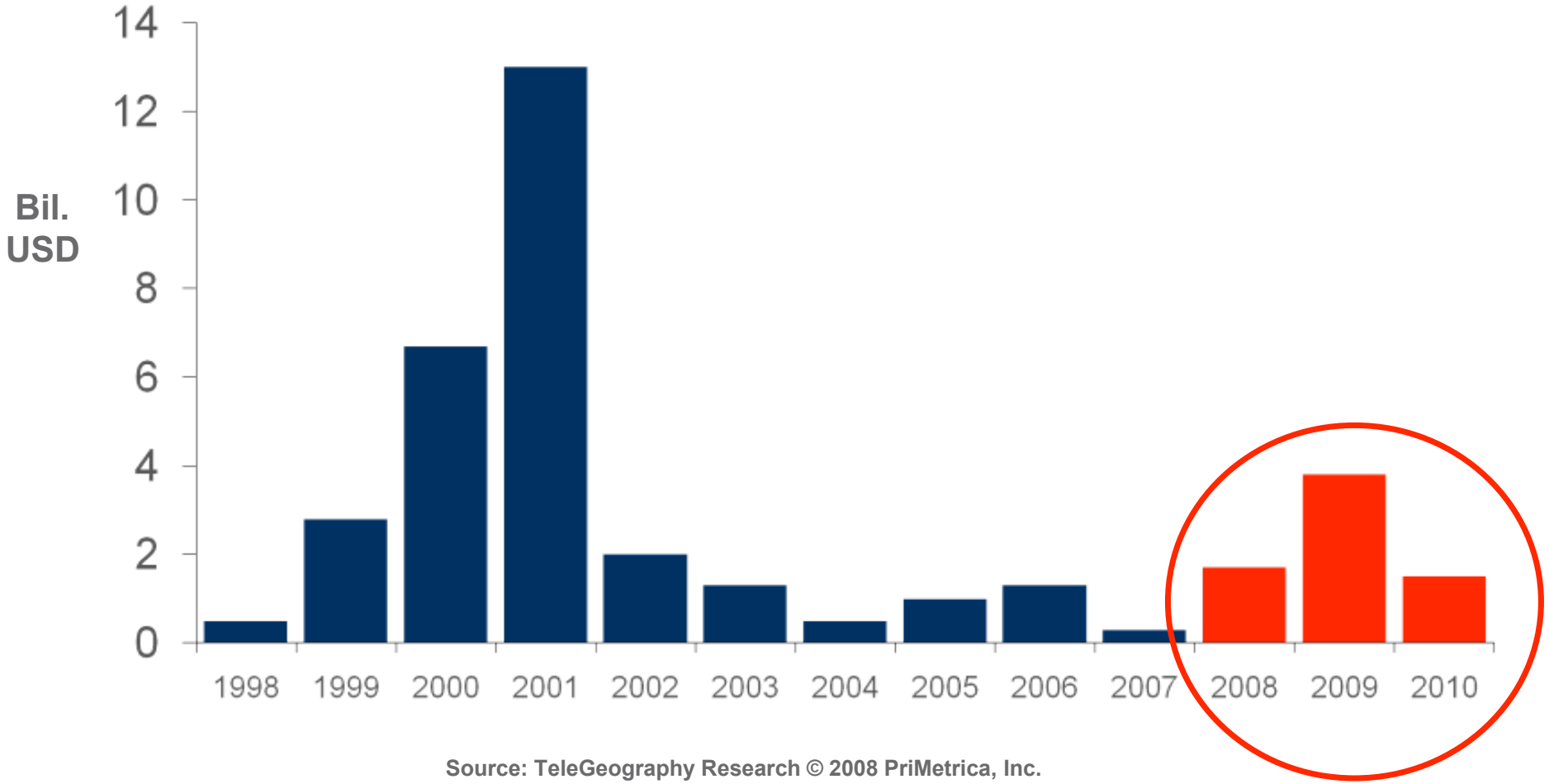
Investments in Submarine Cable Systems



Source: TeleGeography Research © 2008 PriMetrica, Inc.

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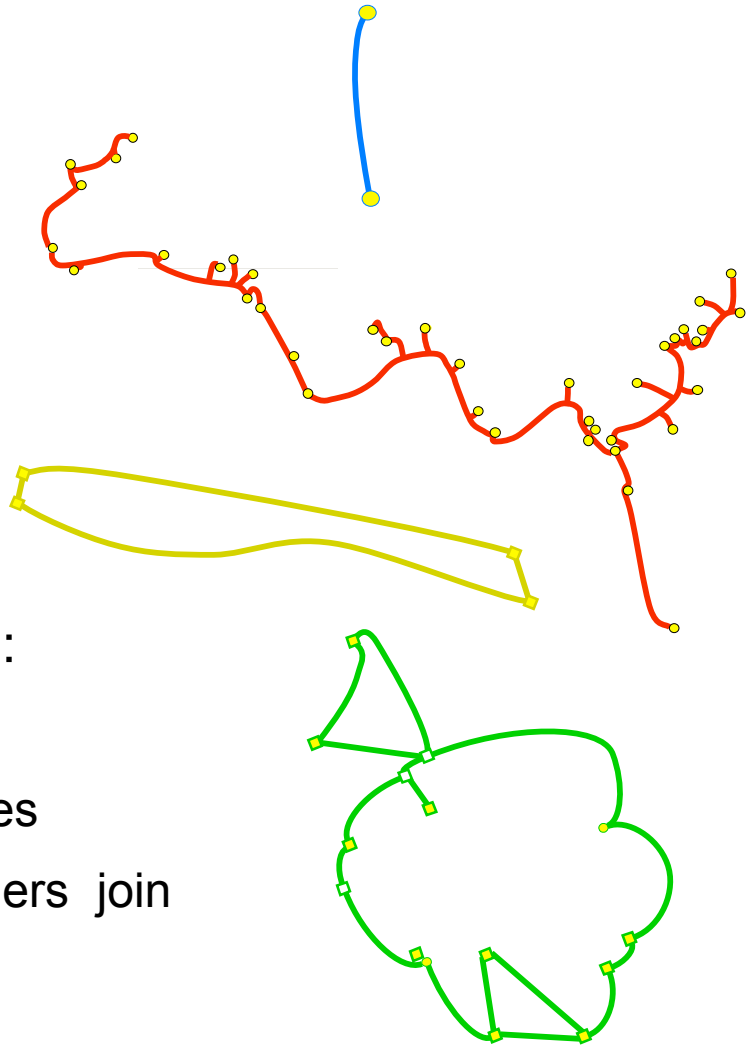
Submarine cable types (1)

- Submarine cables have different shapes:
  - simple, little, point-to-point segments
  - long, multi-legged and spurred complexes
  - simple rings
  - Clouds of festoons
- Submarine cables have different parenthoods:
  - Private cables, owned by one single company
  - Bilateral cables, owned by the two landing parties
  - Consortium cables, where a number of carriers join forces in the project



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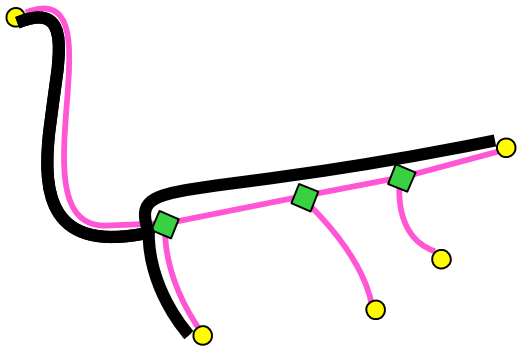
Submarine cable types (2)

- Consortium cables: one system, several owners
  - The optical layer is common and undivided between Parties
  - Ownership is proportional to investment in the system
  - The SDH layer is individually used by Parties



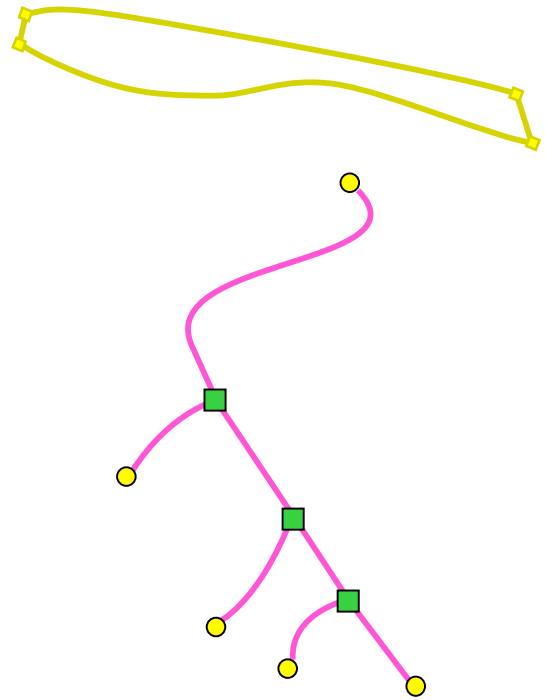
- Complexity means flexibility means complexity!
  - Capacity usage can vary:
    - in size
    - in topology
    - from time to time

Building blocks of multi-owner systems: the Construction and Maintenance Agreement (C&MA)

- Cable System Configuration & Description.
- System Ready For Service Date and Duration of the C&MA.
- Ownership of Segments.
- Cable Management Structure.
- Acquisition and Use of Capacity.
- Increase of Capacity – Upgrades.
- Allocation of Operation and Maintenance Costs.
- Ownership & Capacity Activation Schedules.

Restoration of Submarine Cables

- Only few systems have a ring based architecture and are therefore self-protected
- Most systems have “fishbone” architecture!
- The strategy: join forces with other cables with similar path
  - Restoration is between Landing Stations
- The MARA (Mutual Aid Restoration Agreement)
  - This service is not for free!



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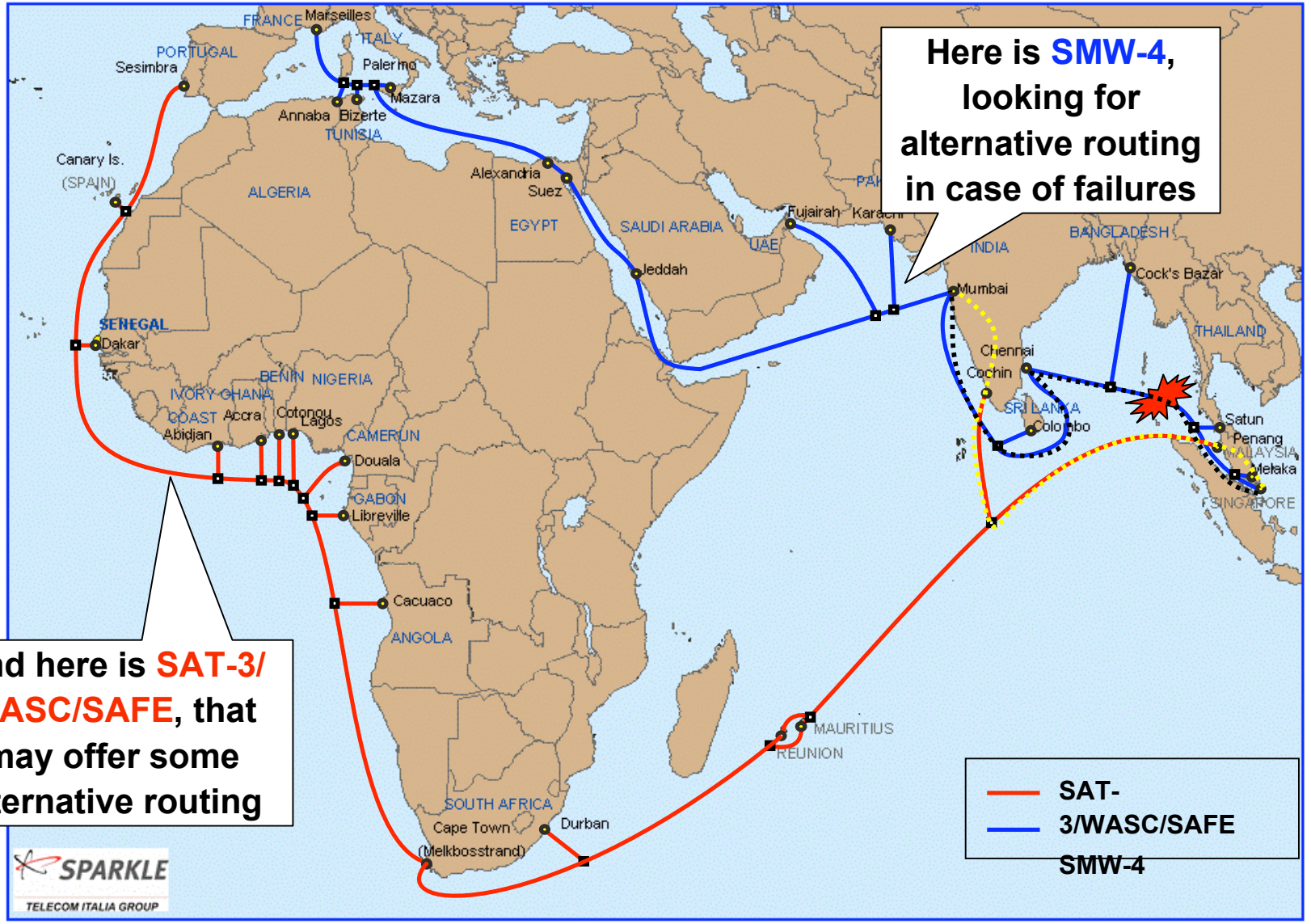
Restoration: An example



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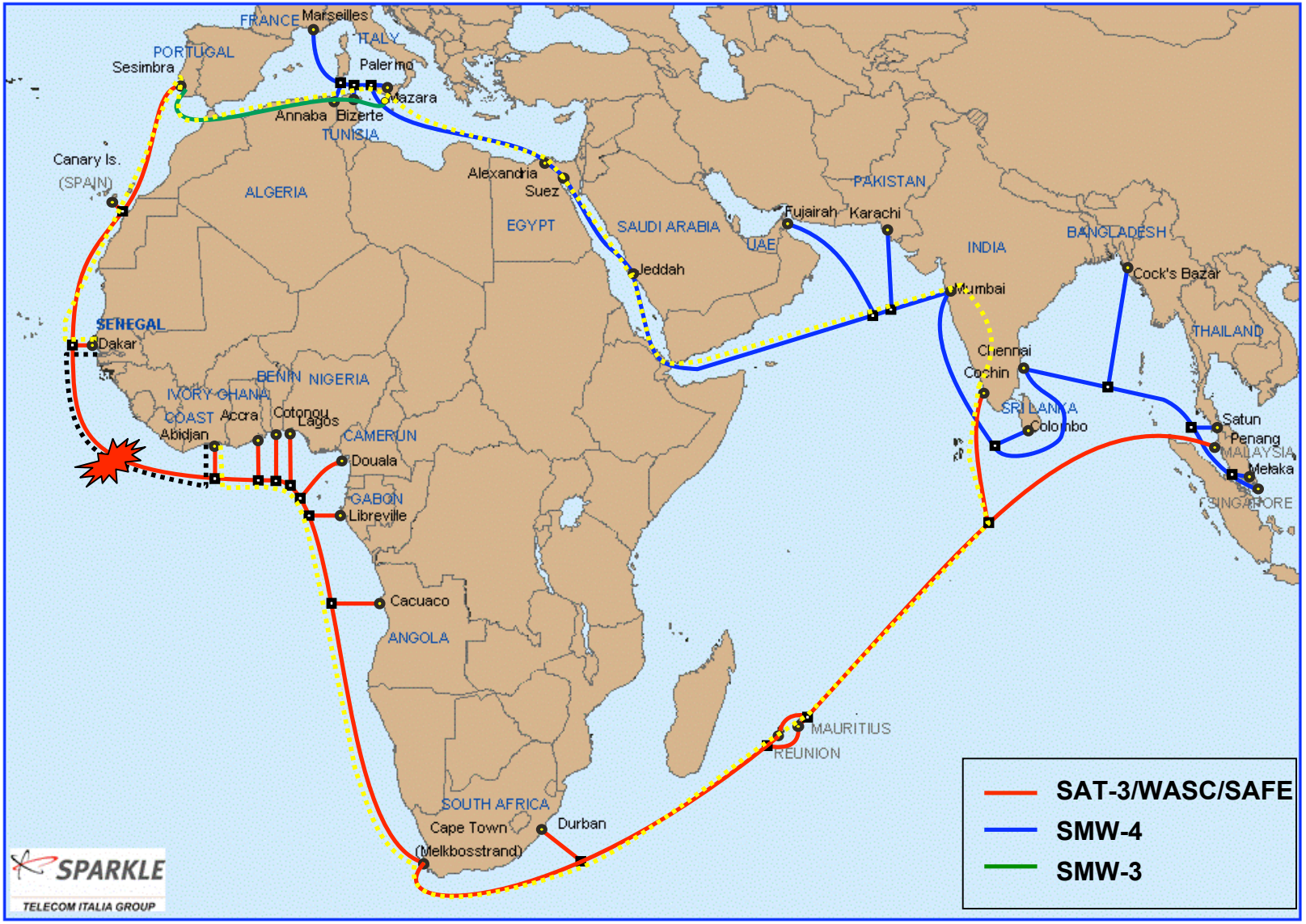
Restoration: Another example



Protection: Automatic Restoration

- Restoration traditionally means manual activation, on event, of pre-planned routing plans
- Optimization of spare resources, combination of multiple restoration plans for multiple cable systems
- Automatic Restoration (equivalent to Protection on terrestrial networks) has been introduced
  - SMW-3 and SMW-4 have implemented some SNCP protection between any pair on corresponding Landing Station
  - Terrestrial interlinks, whenever necessary, have been provisioned and fully dedicated to complete the infrastructure
- Service continuity is becoming a must also in submarine cables!

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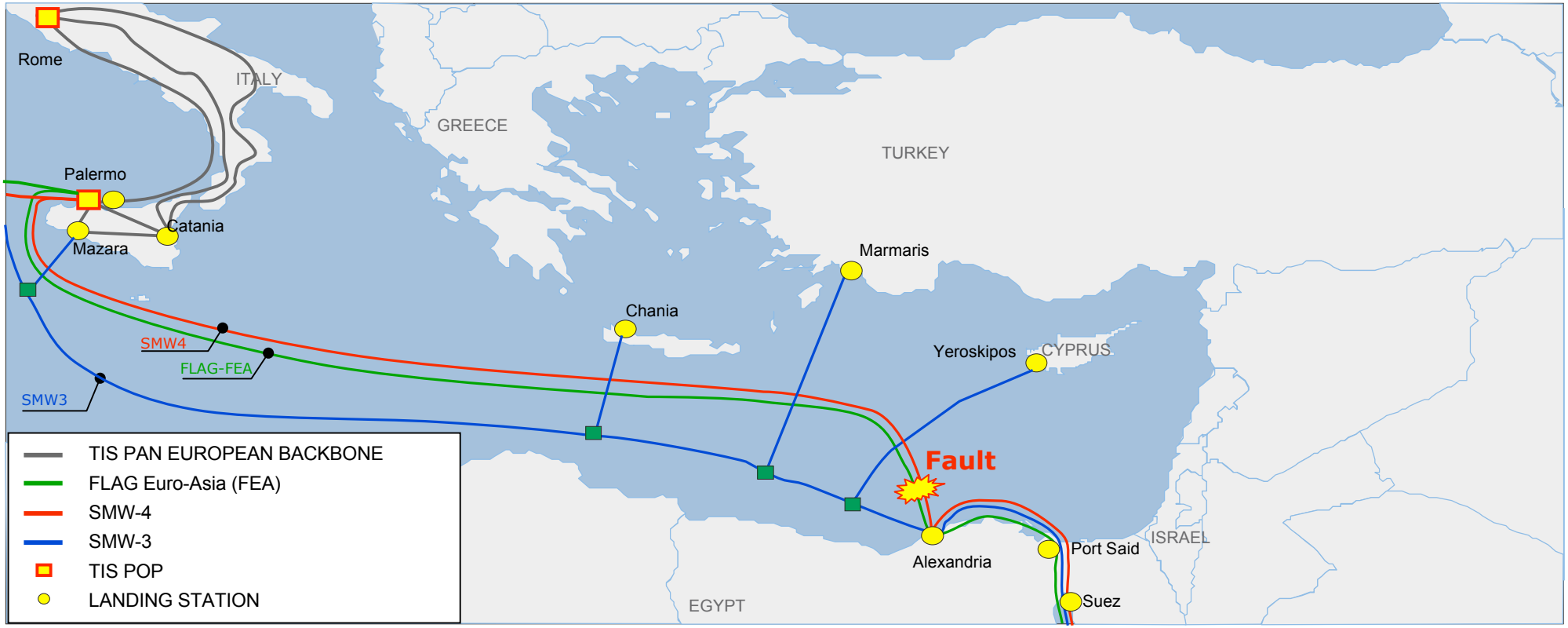
A real case: cable cut emergency on Jan 30, 2008

- Two cable cuts occurred about 10 Km out of Alexandria, Egypt coast, causing severe service disruption to Carriers and Service Providers relying upon either FLAG-FEA and SMW-4



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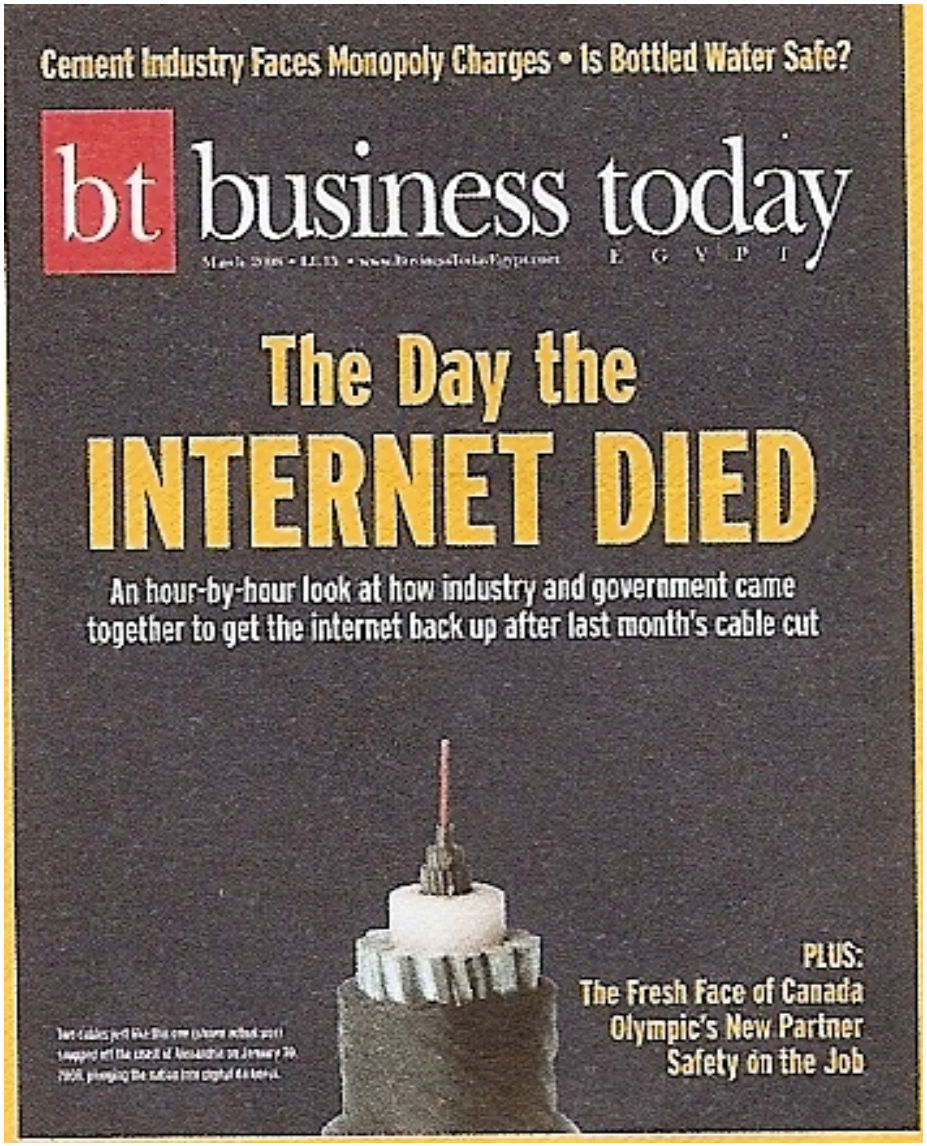

Analysts and media report Internet connectivity is impacted as severely as:

- 75% in Egypt and Pakistan
- 50% in Emirates
- 50% in Saudi Arabia
- 10% in India

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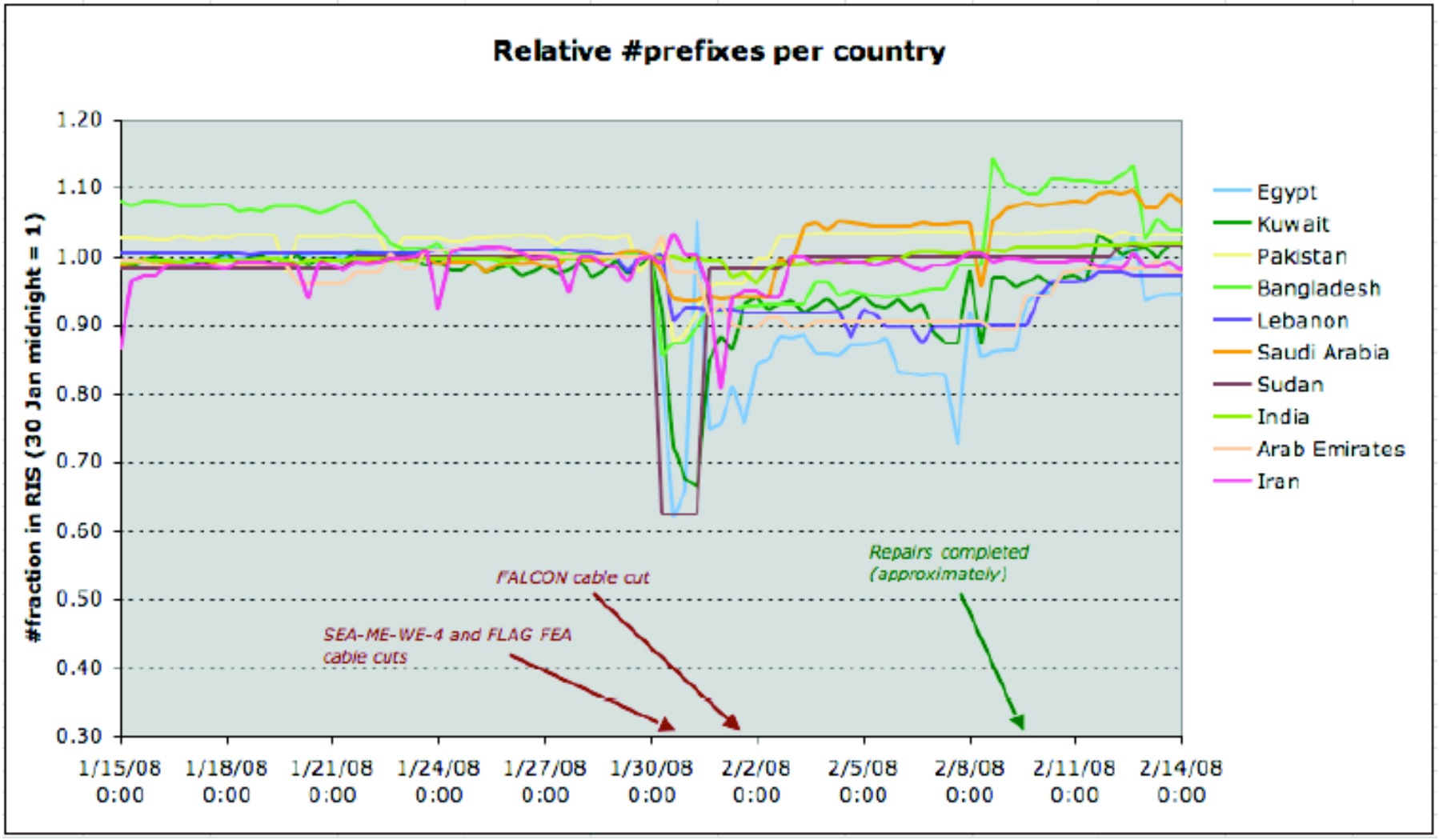
IP impacts of cable cut Jan ‘08: lost of Prefixes



Università di Roma 3, RIPE NCC: Fiber Cut Jan 08, Analysis of Network Dynamics - March 2008

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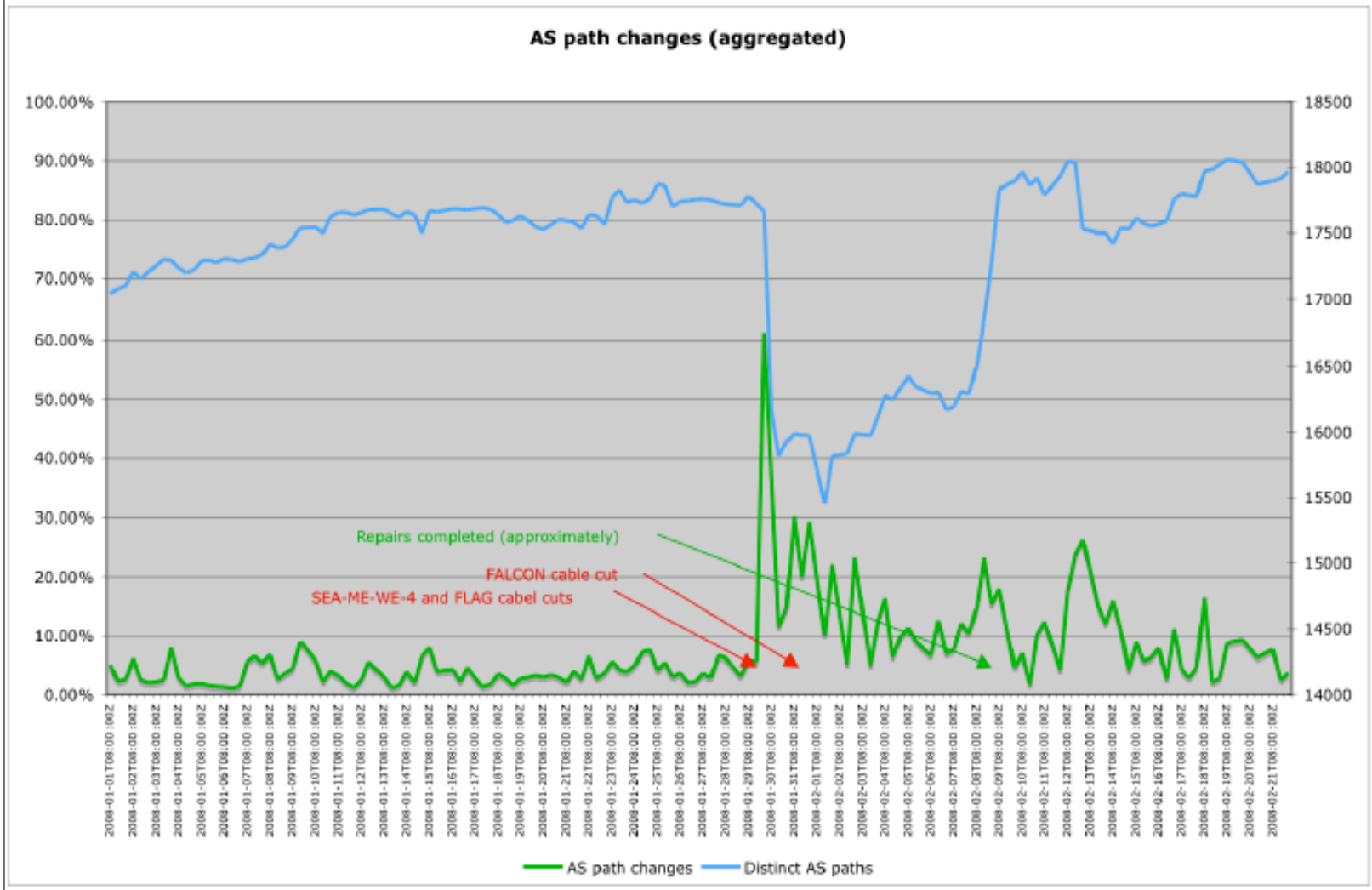
IP impacts of cable cut Jan '08: AS Paths turbulence



On Jan 30th:

- pick of AS Path Changes (green)
- drop of Distinct AS Paths (blu)

Regional AS Paths turbulence until repairs are completed

Università di Roma 3, RIPE NCC: Analysis of Network Dynamics-March 2008

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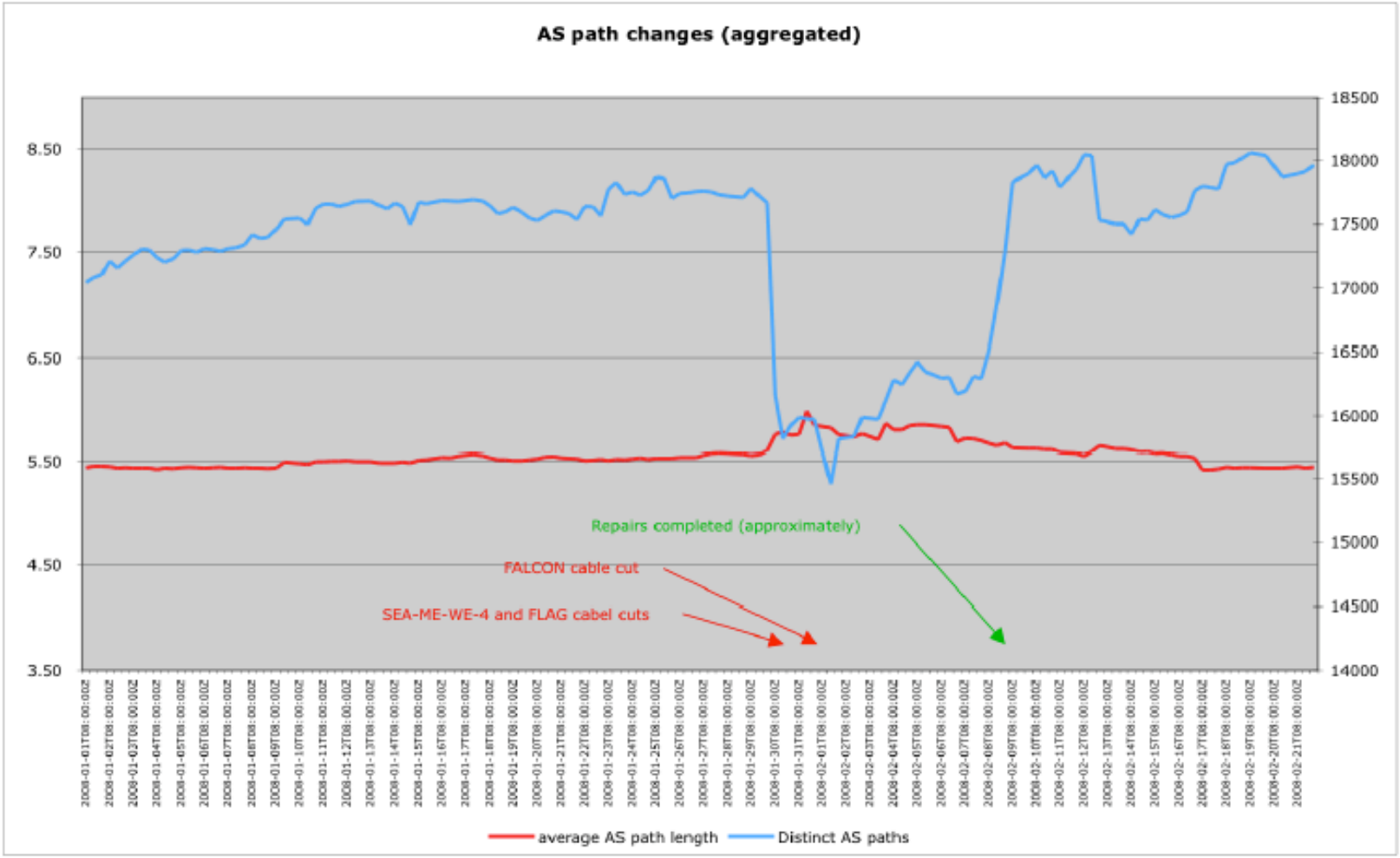
IP impacts of cable cut Jan '08: AS Paths Length (red)



Conclusions:

- Unreachable networks
- Increased latency and congestion
- Routing topology entropy
- BGP instability

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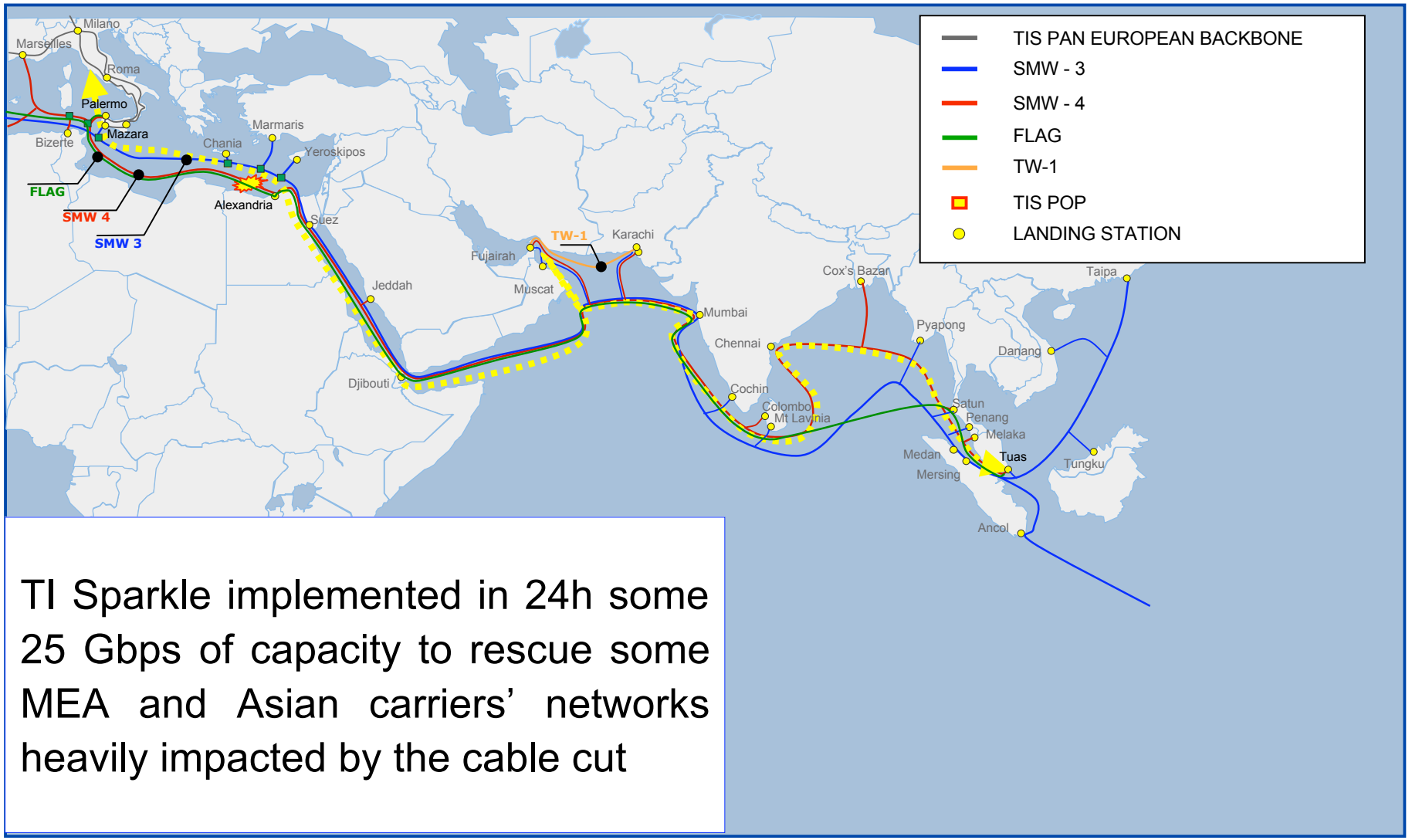
Cable cut Jan 30, 2008: Sparkle rescue plan to Europe and Singapore



TI Sparkle implemented in 24h some 25 Gbps of capacity to rescue some MEA and Asian carriers' networks heavily impacted by the cable cut

The Upgrades (1)

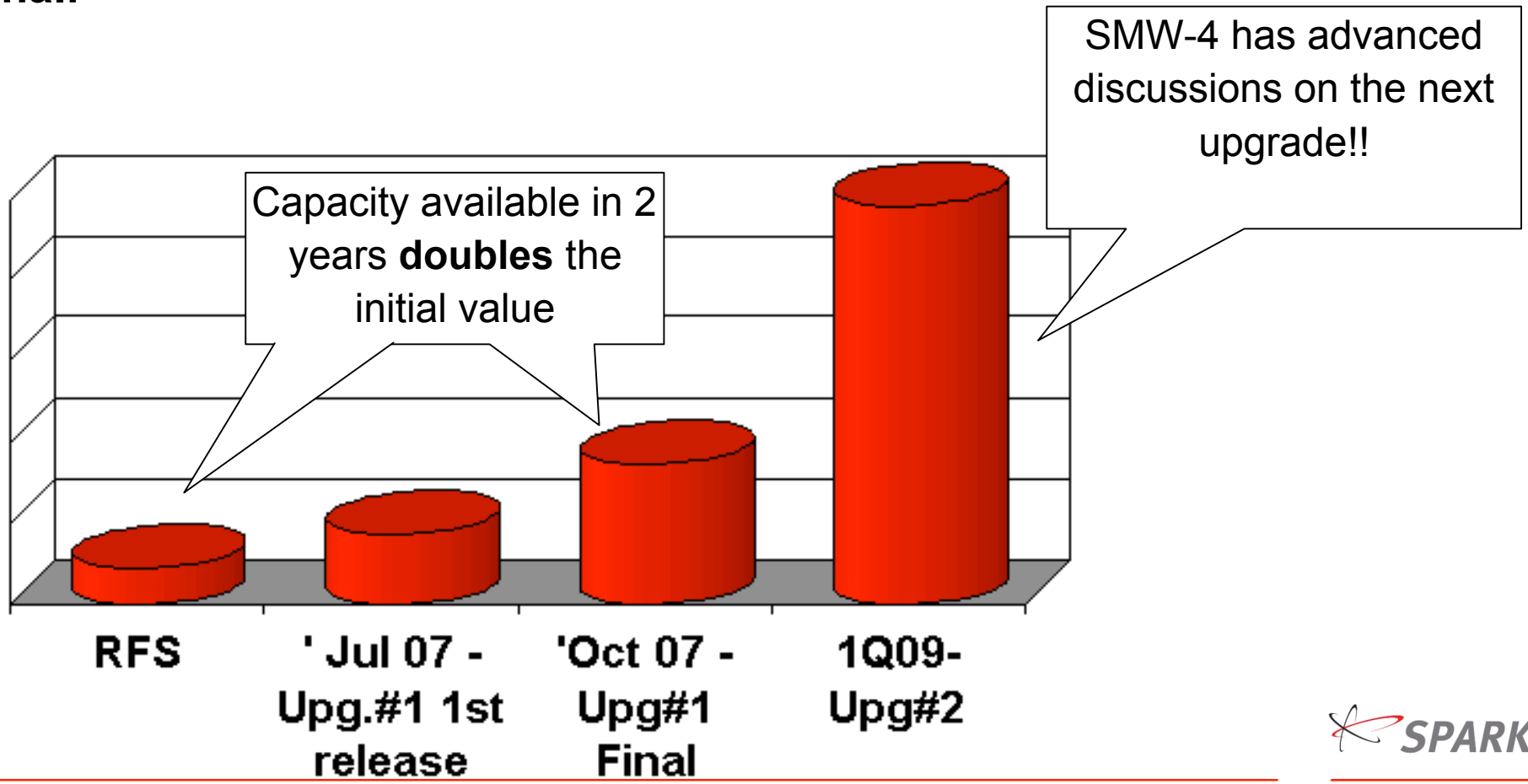
- Submarine cable systems lifetime is today 15/20 years
- In this period the system is subject to several “development” activities:
  - Increase in capacity
  - Technical enhancements
- Upgrading a multi-owner system cable requires many decisions, to be agreed between all Parties
  - Participation /Funding
  - Technical design
  - Planning
  - Capacity distribution

The Upgrades (2)

- Not a “potential” development, but a significant part of the life of a submarine cable system
  - Upgrades in today systems take place in the first 4 to 5 years from RFS
- Upgrades costs are clearly lower than initial investment
  - Not an off-shore activity!
  - Only specific parts of a system are normally involved
- This impacts on Parties Business Plans
  - any co-owner must preserve its cost efficiency and market competitiveness

An example: History of upgrades on SMW-4

Demand of connectivity from South East Asia, India and the Gulf is strong: since its RFS in Nov. 2005, **SMW-4 increases in capacity every year and half**



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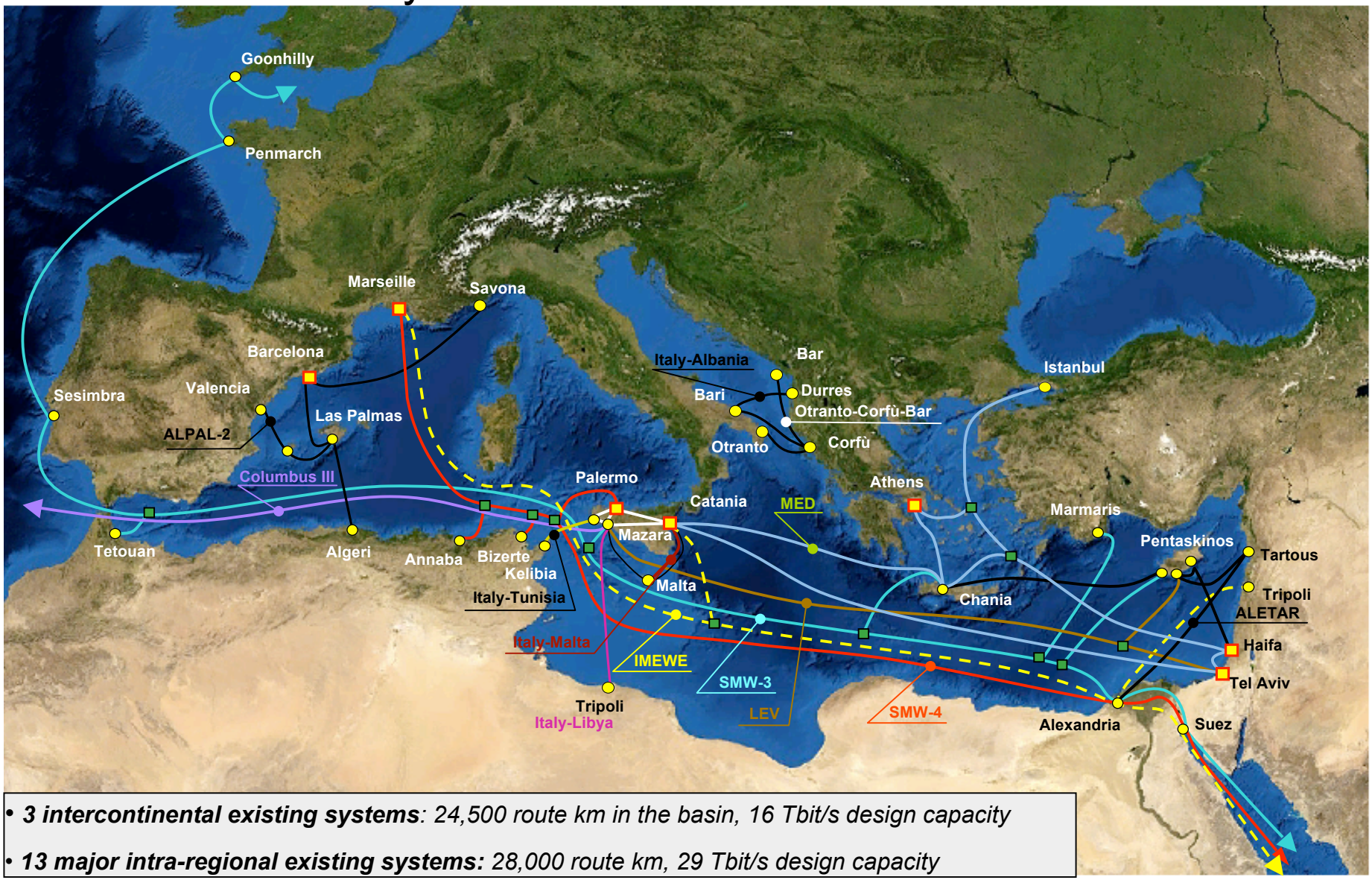
Submarine Cable Systems in the Med Basin



- ***3 intercontinental existing systems**: 24,500 route km in the basin, 16 Tbit/s design capacity*
- ***13 major intra-regional existing systems:** 28,000 route km, 29 Tbit/s design capacity*

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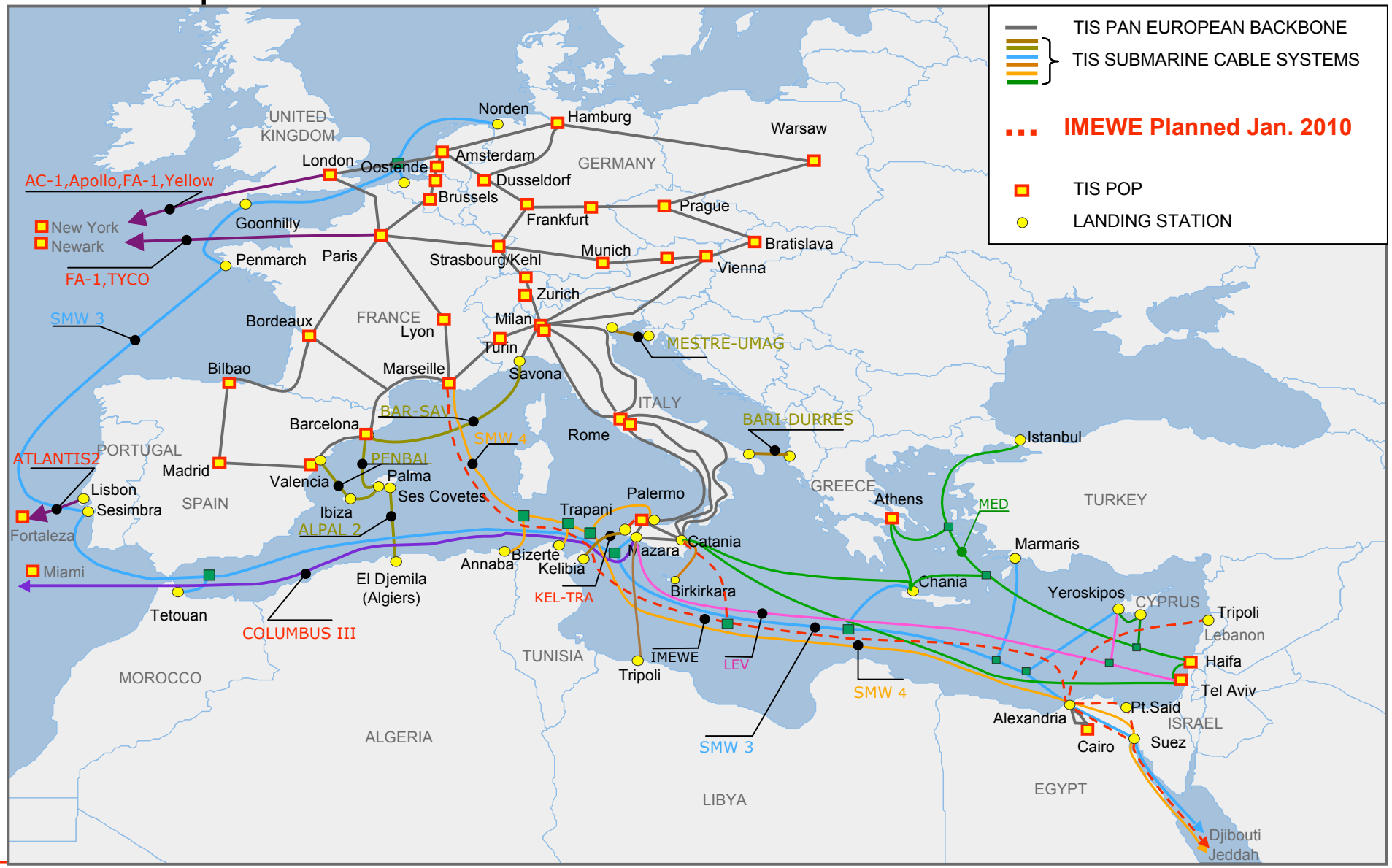
TIS European and Mediterranean Backbone



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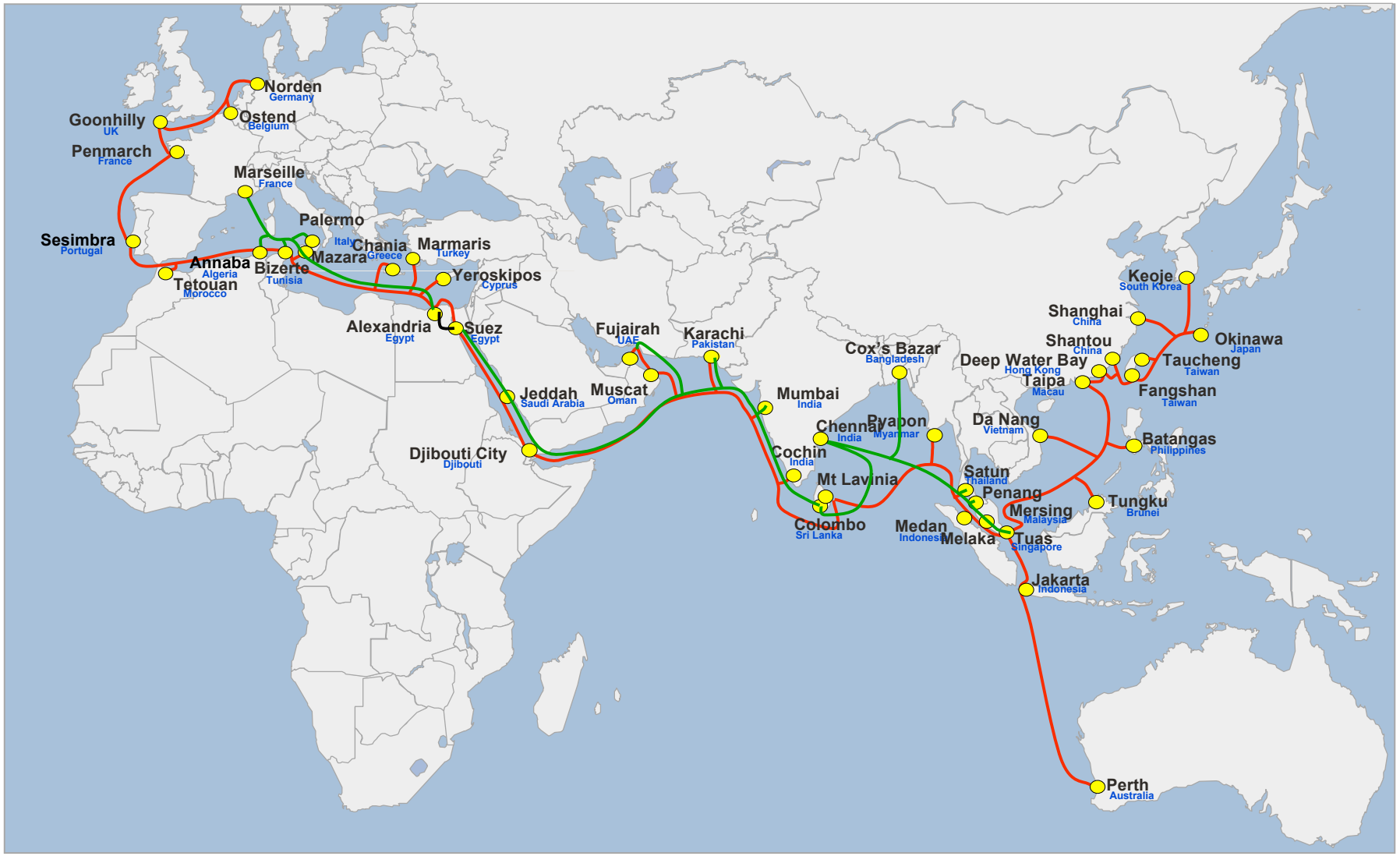
Middle East & South East Asia Backbone (SMW3 & SMW4)



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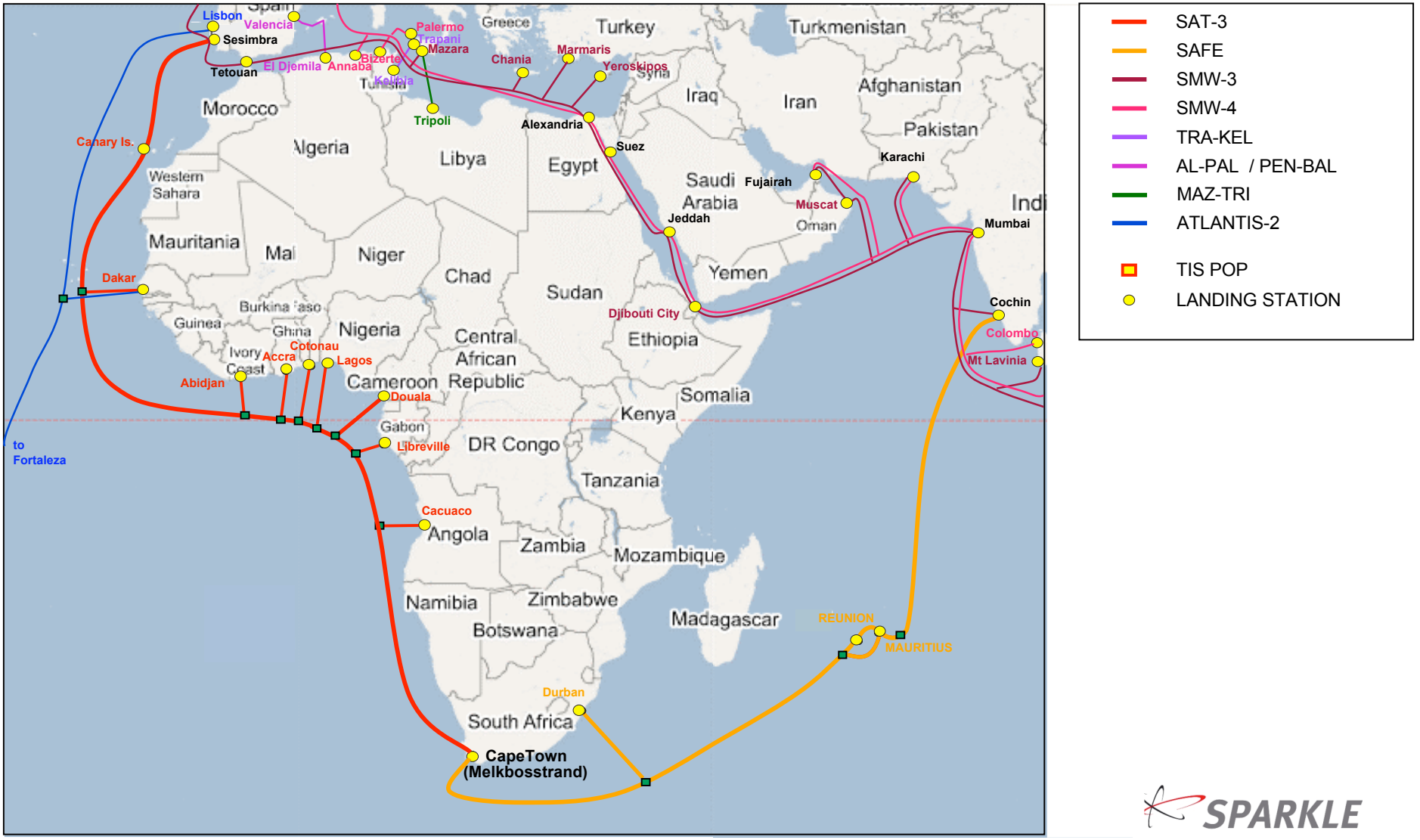

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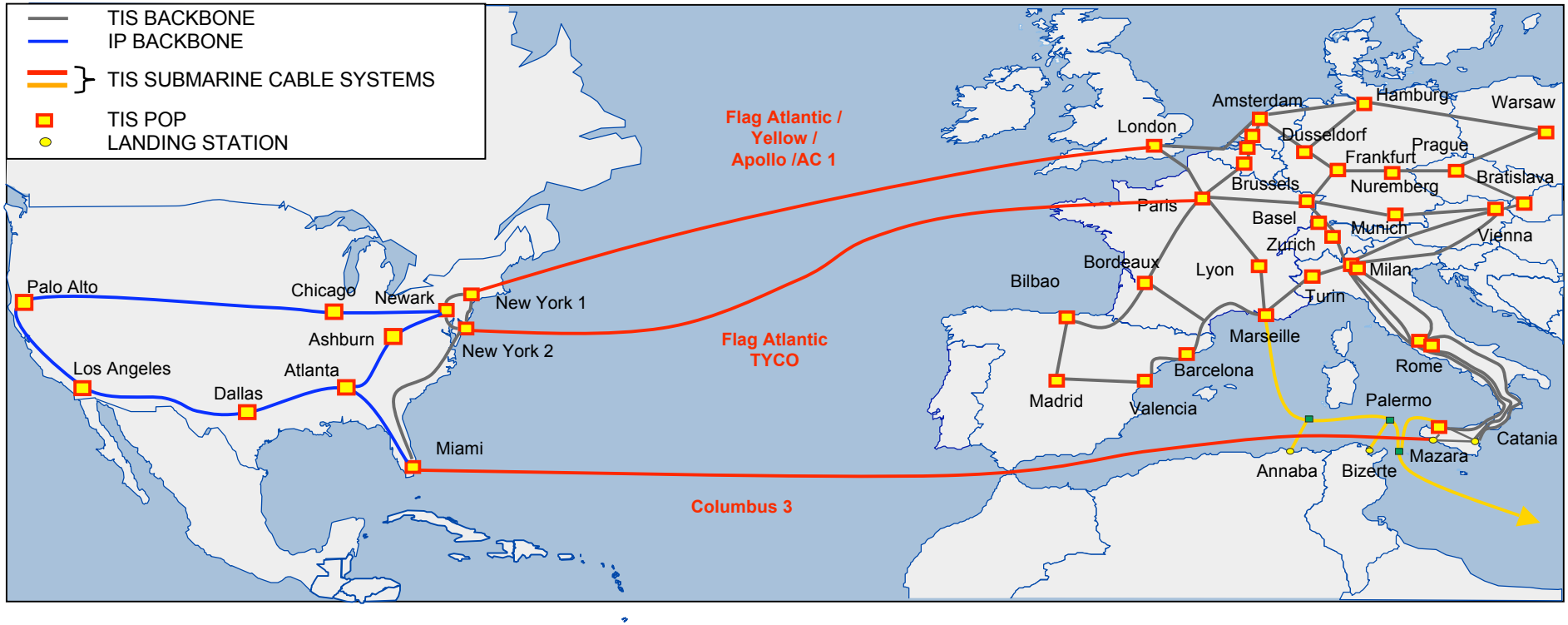
Transatlantic Backbone



- Multiple protected rings on a combination of Flag Atlantic, Yellow, Apollo and TYCO
- Additional connectivity to Miami on Columbus III at STM-1 level

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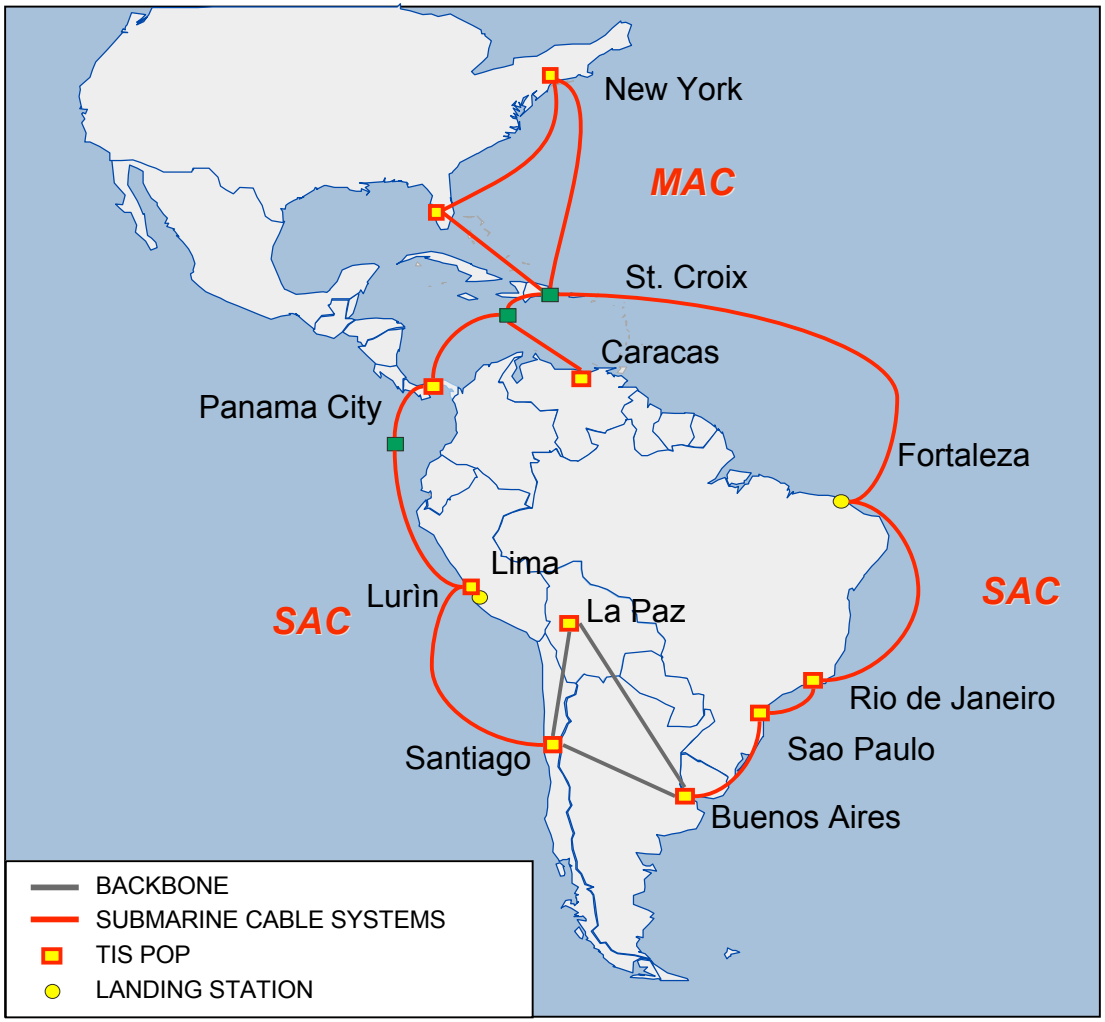
Latam Backbone



Data Center in Miami, NAP of the Americas

POP:

- Rio de Janeiro
- S. Paulo (2)
- Buenos Aires (2)
- La Paz
- Santiago de Chile
- Lima
- Panama City
- Caracas

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TI Sparkle next move

- TI Sparkle promoted IMEWE, **I**ndia, **M**iddle **E**ast, **W**estern **E**urope, a system launched on Feb.5, 2008, with an official signature ceremony in Rome, by the 9 carriers joining the project:

  TIS (Italy), FT (France),
  TE (Egypt), Ogero (Lebanon),
  STC (Saudi Arabia), Etisalat (UAE),
  PTCL (Pakistan), VSNL/TATA Telecom
  Bharti Airtel (India)

  RFS of the system is expected in **January 2010**.

- In 2010 IMEWE will be one of the very few cable of new generation (most likely two) serving the route India-Europe.
- IMEWE will not simply upgrade or compete with systems that already exist; it will **extend capacity to under-served and developing markets** as well as to **complement existing infrastructure with physically diverse paths**.

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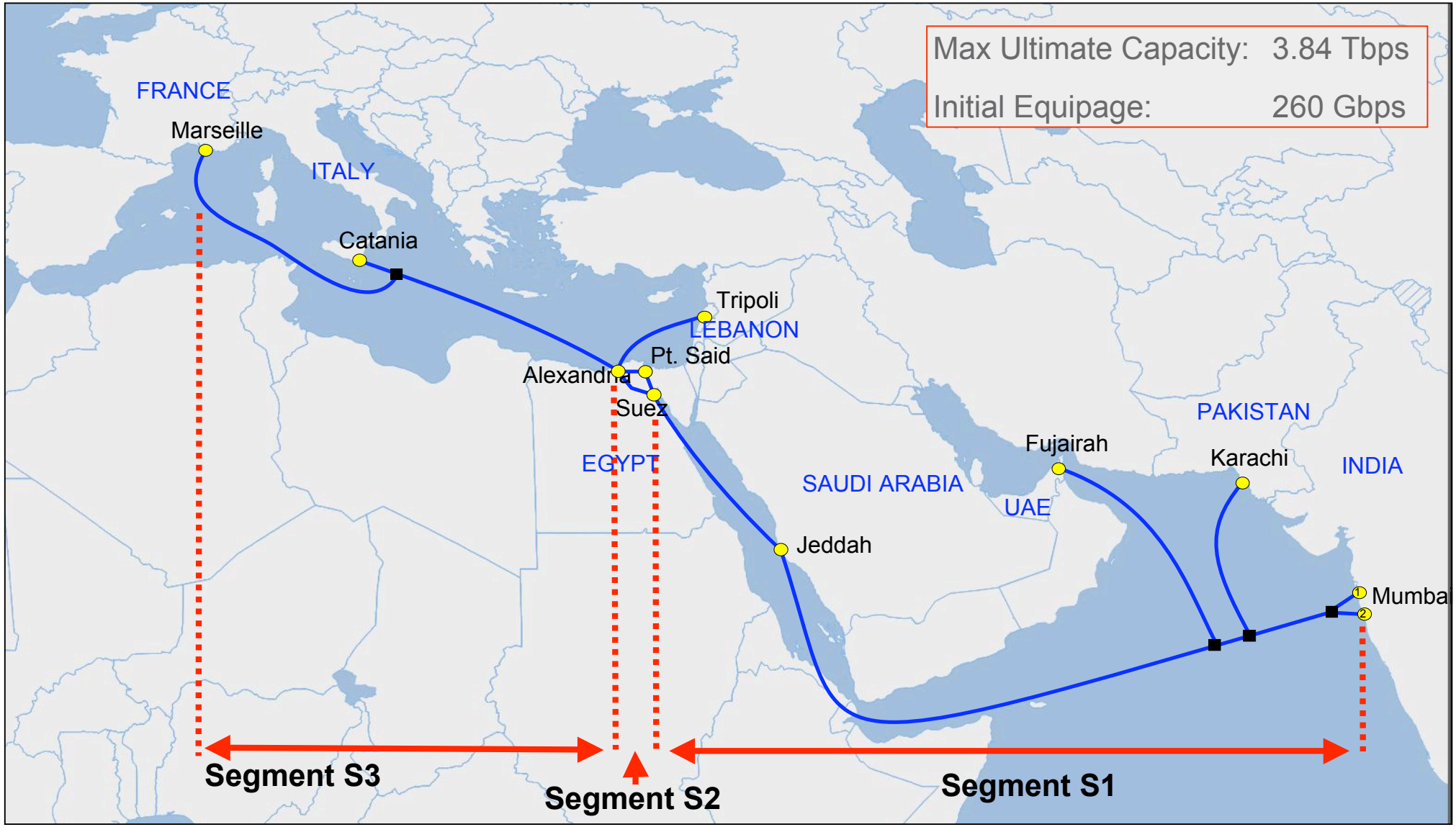
IMEWE - Configuration



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New Cable projects in the Euro-Asia-East Africa region

REGION	COUNTRY	IMEWE	MENA	SEACOM TE NORTH	EIG	HAWK	EASSy
ASIA	Pakistan	▲					
	India	▲		▲	▲		
GULF	UAE	▲			▲		
	Oman		▲		▲		
	Saudi Arabia	▲	▲	▲	▲		
MED BASIN	Lebanon	▲					
	Syria					Δ	
	Egypt	▲	▲	▲	▲	▲	
	Turkey					Δ	
	Greece		Δ				
	Cyprus			▲		▲	
	Libya				▲	Δ	
	Malta					Δ	
	Italy	▲	▲			▲	
	France	▲		▲		▲	
	Monaco				▲		
	Gibraltar				▲		
	Portugal				▲		
	UK				▲		
EAST AFRICA	Sudan						▲
	Djibouti			▲	▲		▲
	Somalia						▲
	Kenya			▲			▲
	Tanzania			▲			▲
	Mozambique			▲			▲
	Madagascar			▲			▲
	South Africa			▲			▲
Estimated RFS		Q1'10	Q2 '10	Q2'10	Q2'10	Q3'10	Q3'10

Source: TIS

Shùkran!

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