



**TATA** COMMUNICATIONS

## Cable breaks:

Ultimate test of network robustness

CORPORATE

**MENOG3**

Kuwait, April 15-17th 2008

Yves Poppe,  
Director Business Development  
IP Services

## Member of the Tata Group

125-year old largest private sector group

\$29 billion in revenues

### Acquired VSNL in February 2002

- VSNL acquired Tyco in Nov 2004
- VSNL acquired Teleglobe in Feb 2006

Teleglobe, Tyco, VSNL and VSNL International become Tata Communications on February 13<sup>th</sup> 2008

Tata Consultancy Services (TCS)



TATA CONSULTANCY SERVICES



TATA STEEL



## Ultimate tests for network robustness

### May 2003

- Algeria earthquake cuts FLAG and Seamewe-3

### December 2006

- Taiwan earthquake cuts most cables in the region

### January 30<sup>th</sup> 2008

- FLAG and Seamewe-4 are cut off Alexandria



Once upon a time



Mess Quarters, Aden  
Cable Station circa 1905



Suez - The Eastern  
Telegraph Company Ltd

<http://www.atlantic-cable.com/>

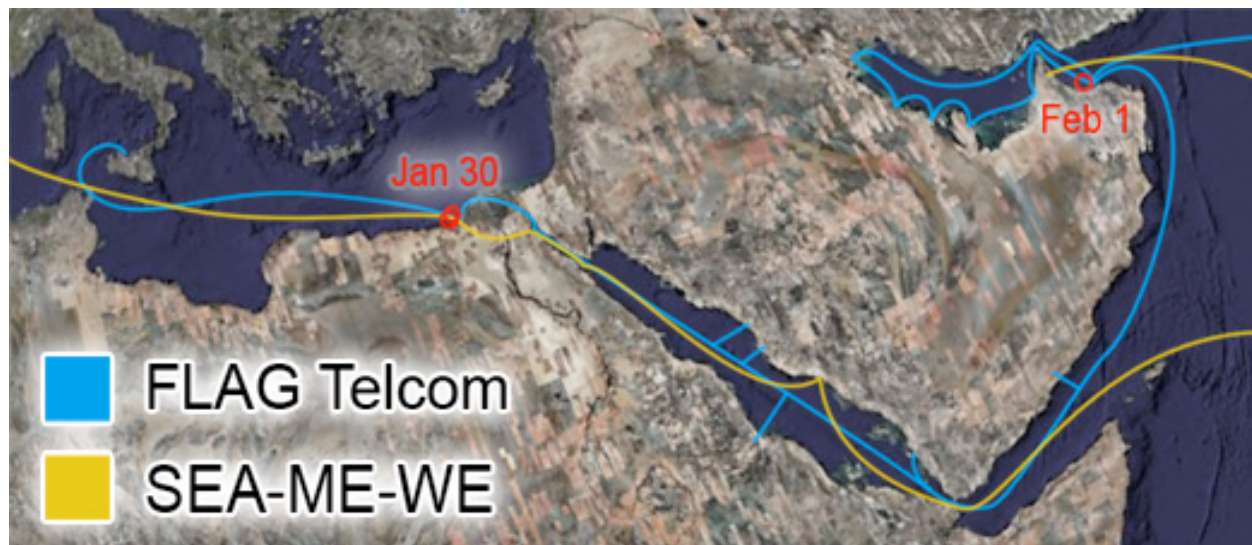


## January 30th 2008

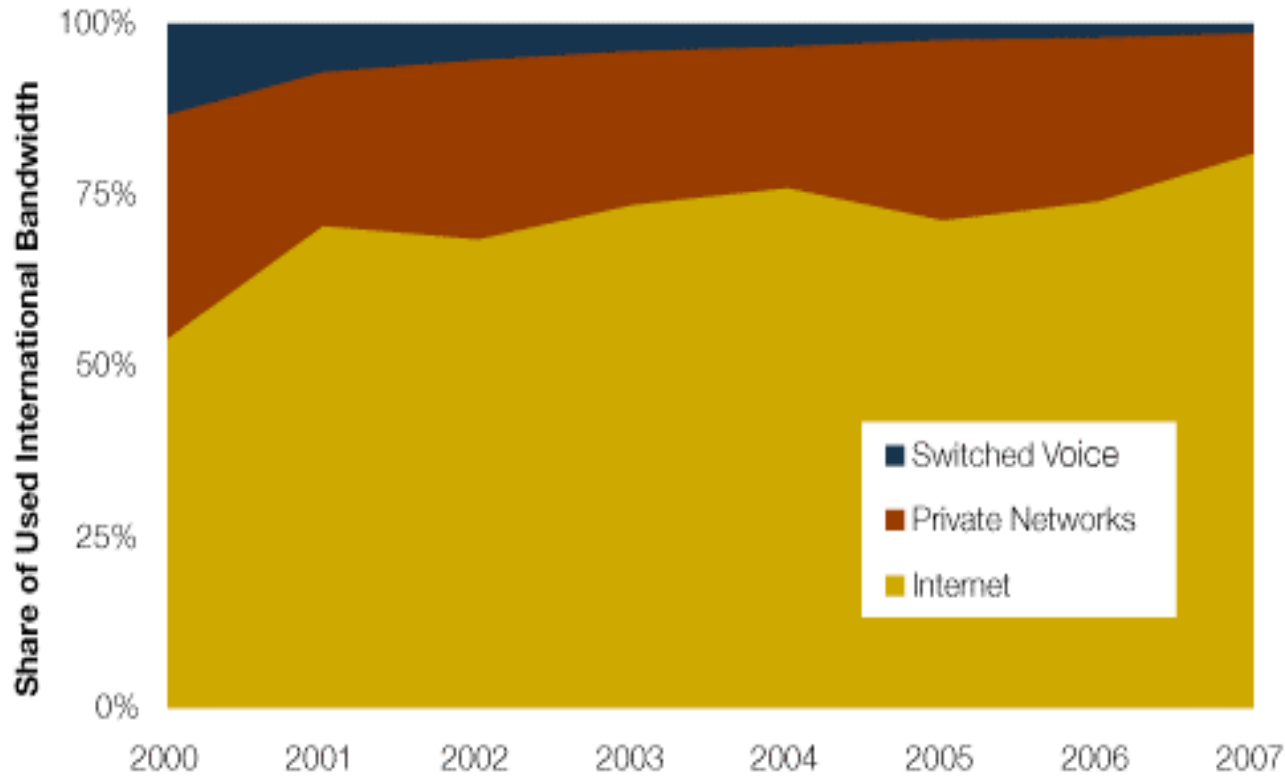
4:30 am Flag cable cut 8.3 km off Alexandria

8:00 am Seamewe-4 cable cut 12 km off Alexandria

Then on February 1st 5:59 GMT cable break 56km of Dubai

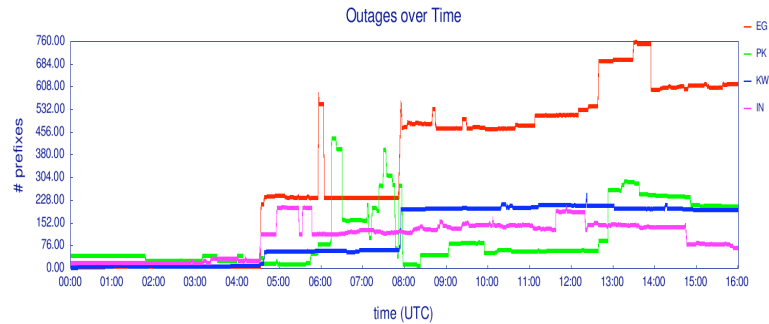


Close to 80% of international bandwidth is for internet!

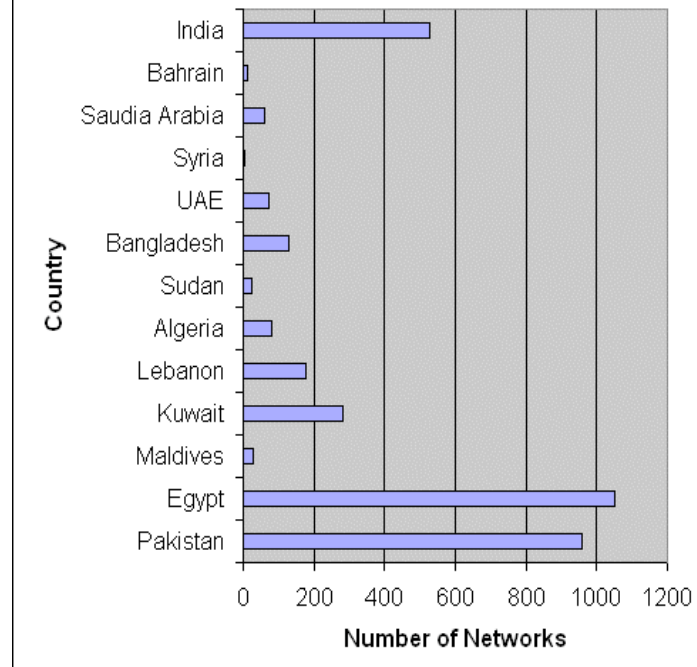


Source: Telegeography

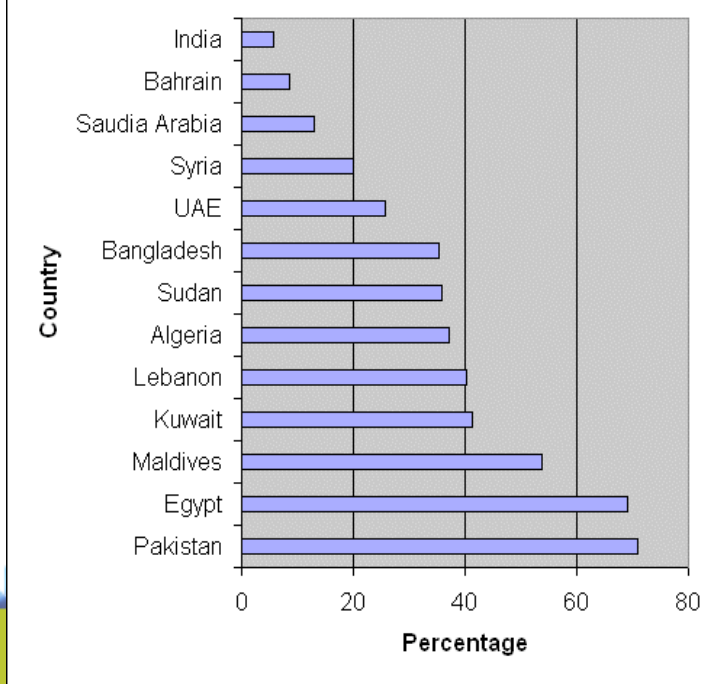




Outaged Networks by Country

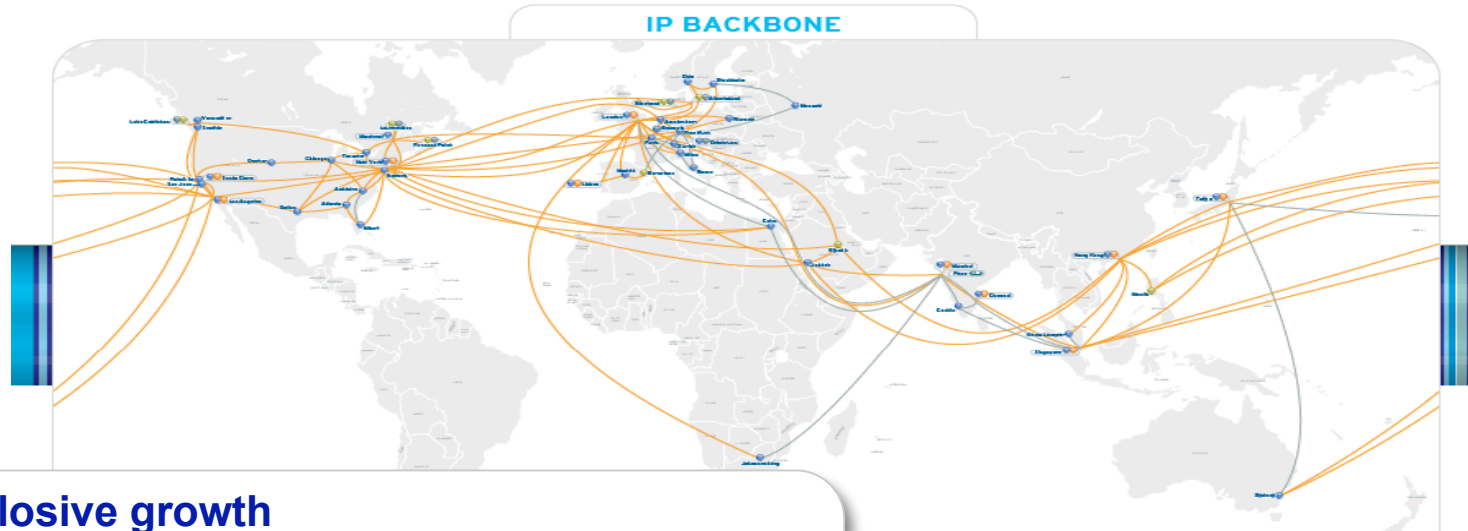


Percentage of Outaged Networks



Cables and global Internet :  
Alexandria cable cut impact as per  
Renesys

## Globe Circling Global IP network



### Explosive growth

- OC48/192 MPLS backbone
- 70% year over year traffic growth
- Courtesy of User generated Content and p2p Youtube, Myspace etc

### IP Network at a glance

- 700+Gbps of Backbone Capacity
- Carries around 400 Petabits globally per month;
- 500+Gbps of customer connectivity

### In response to the cable breaks:

- More than two additional STM16's worth of capacity activated within 24 hours on SMW-3, SMW4 and TIC to route Middle-East and Indian Internet traffic eastward.



# From Alexandria to the Luzon Strait

**December 26<sup>th</sup> 2006**

**12:26:21 UTC**

**6.2 miles under the sea**

**Taiwan Region**



# Earthquake Magnitude 7.1 – Dec 26th 2006 12:26:21 UTC - TAIWAN REGION

## Earthquake Details

Magnitude	7.1 ( <a href="#">Major</a> )
Date-Time	<b>Tuesday, December 26, 2006 at 12:26:21 (UTC)</b> = Coordinated Universal Time <b>Tuesday, December 26, 2006 at 8:26:21 PM</b> = local time at epicenter <u>Time of Earthquake in other Time Zones</u>
Location	21.825°N, 120.538°E
Depth	10 km (6.2 miles) set by location program
Region	TAIWAN REGION
Distances	90 km (55 miles) SSE of <b>Kao-hsiung, Taiwan</b> 120 km (75 miles) SSW of <b>T'ai-tung, Taiwan</b> 375 km (235 miles) SSW of <b>T'AI-PEI, Taiwan</b> 800 km (495 miles) N of <b>MANILA, Philippines</b>
Location Uncertainty	horizontal +/- 4.8 km (3.0 miles); depth fixed by location program
Parameters	Nst=222, Nph=222, Dmin=282.4 km, Rmss=0.93 sec, Gp= 32°, M-type=teleseismic moment magnitude (Mw), Version=Q
Source	USGS NEIC (WDCS-D)
Event ID	uswtai

This event has been reviewed by a seismologist.

- First aftershock – 8 min later – 6.9
- Second aftershock – 4 min later - 5.2
- Third aftershock - 3 hours later - 5.5

Source: [earthquake.usgs.gov](http://earthquake.usgs.gov)

# Luzon Strait

# North to South Asia Favoured Passage



© TeleGeography, Inc. 2001

**APCN-2**



© TeleGeography, Inc. 2001

**C2C**



© TeleGeography, Inc. 2001

**EAC**



Source: Flag 2006

**FNAL**



## Why the Luzon Strait ?

Three routes are available to link South East & Northern Asia (Japan-Korea):

### Luzon Strait between Taiwan & Philippines

- 320 km width; 2600m sill depth in Bashi Channel (north)

### Route south of the Philippines

- adds lots of mileage & hence **latency**

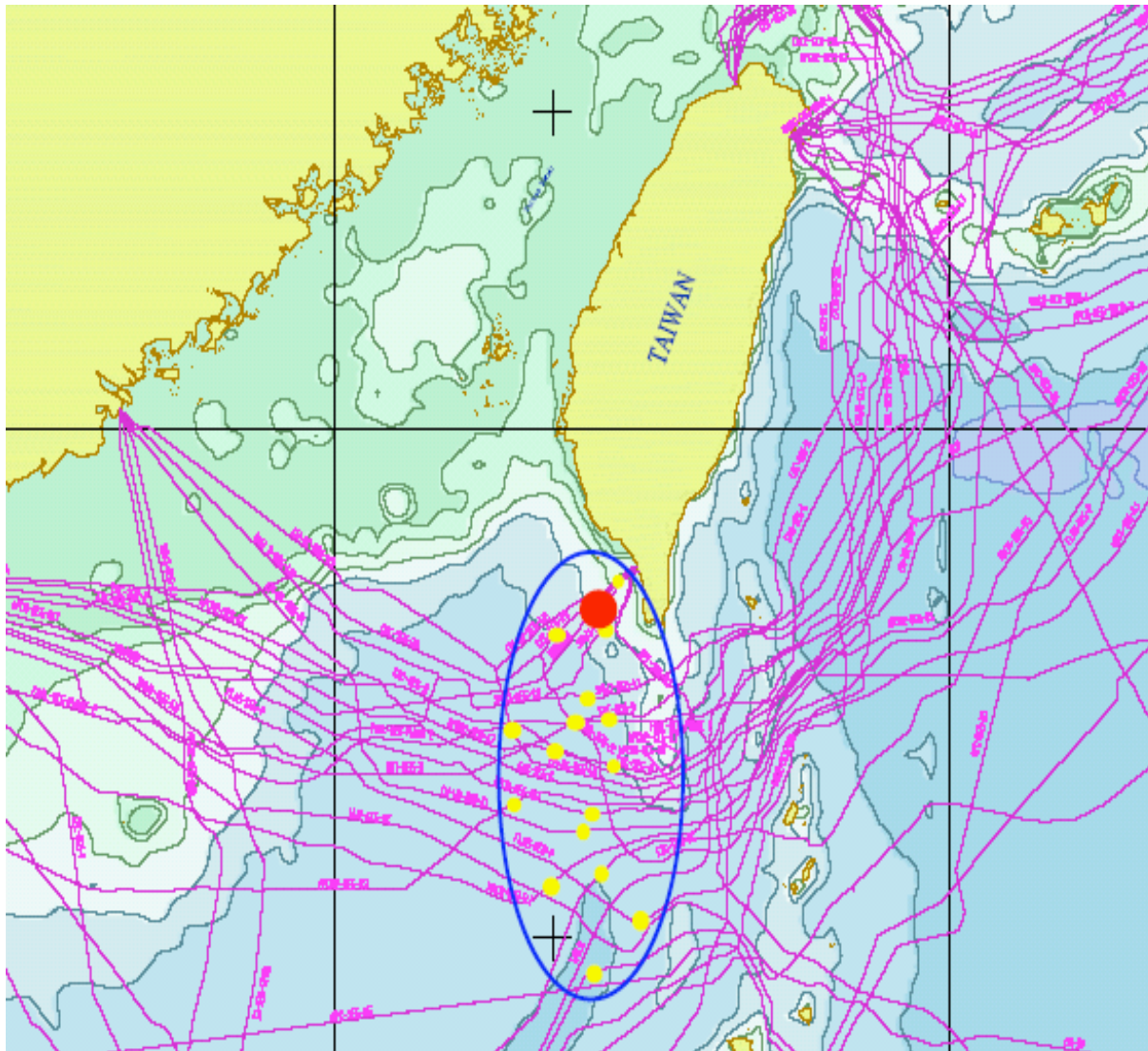
### Formosa Strait

- Narrowest part is 130 km width
- 70 m depth (too close to fishermen)

the Luzon Strait is the best subsea cable route alternative.



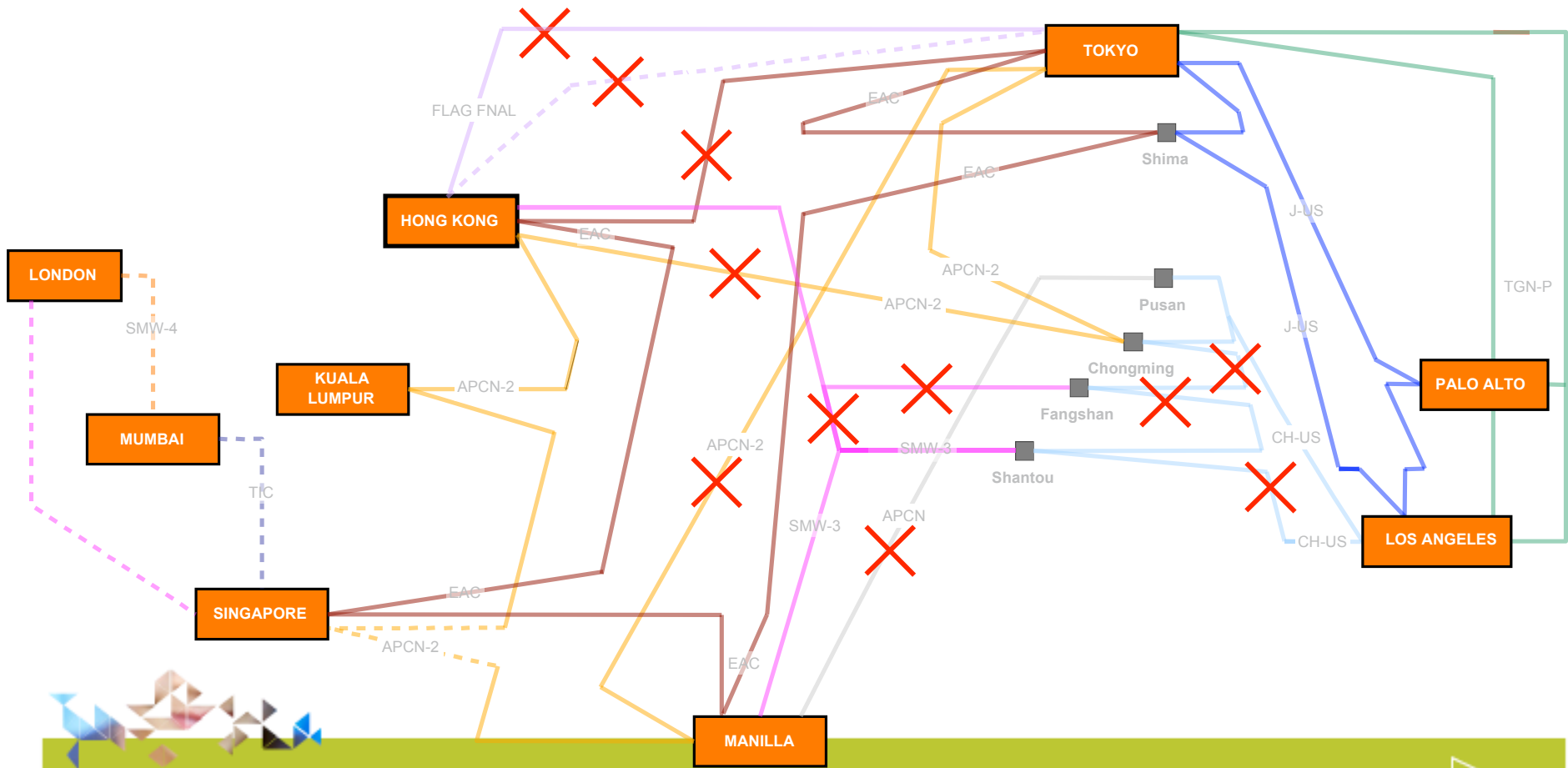
## Impacted Cable Systems



- 6 major cable systems are being affected including resilience path/cable
- Impacted area is around 300km by 150km
- Traffic connecting to Southern Taiwan is severely affected, communication in/out HK, Southeast Asia are severely affected
- Traffic going thru North Taiwan to Japan is not being affected

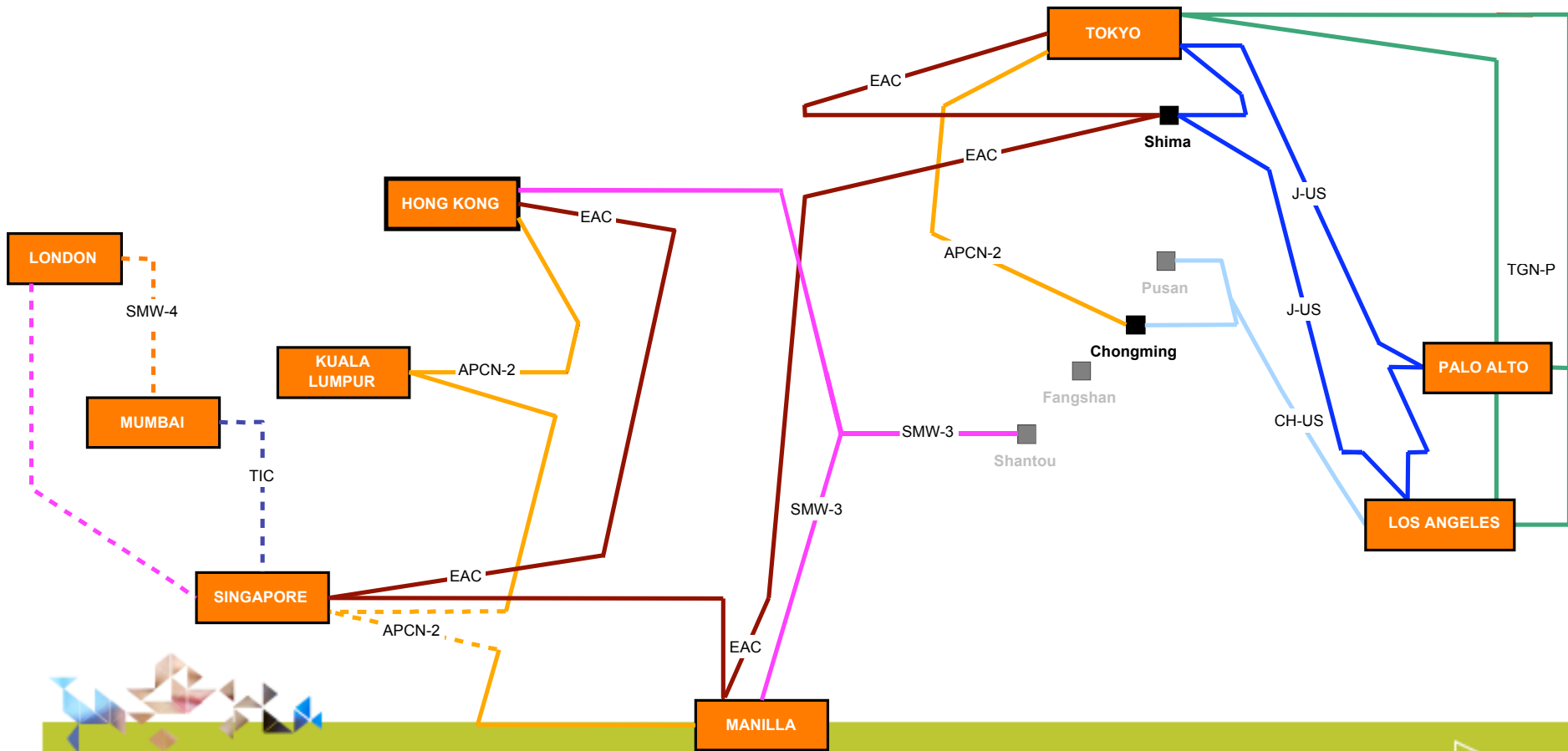
**Map courtesy of PCCW**

# Taiwan Earthquake December 26, 2006 | Cable Faults



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# Taiwan Earthquake December 26, 2006 | Remaining Cable Routes



## Repairing subsea cable systems

Subsea optical fibers are 21 millimeters in diameter and the cables lay on the ocean floor.

Quakes displace cables from their original location, cause landslides, stir sediment layers and displace and even sometimes bury cables

The Bashi Channel is 2500-4000m deep and a remotely operated underwater robot cannot be operated below a depth of 2000 m, so grapnels had to be used in this case to repair 18 faults. It took 49 days to complete all repairs.

In the case of the Alexandria cable breaks, robots can be used and repairs should take on average ten days allowing for the cable ships to arrive on site





## What do these undersea cables look like?

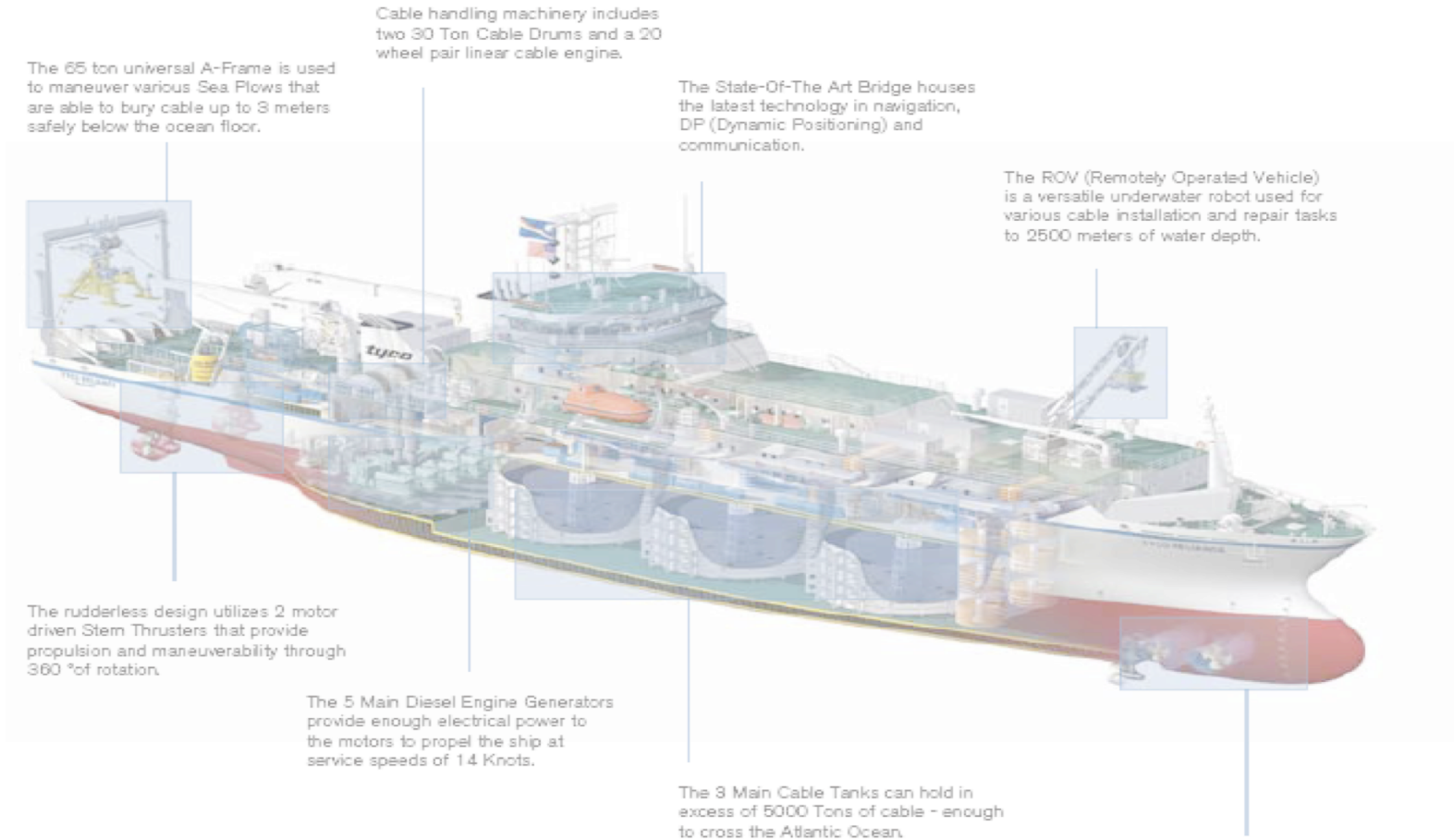


### Alcatel OALC4

- Up to 12 fibres
- Maximum deployment depth: 8000m
- Double barrier against hydrogen
- High density polyethylene
- Adaptable ohmic resistance
- Highly reliable over 25 years
- Highly resistant to cable breaks
- Complete range of armouring



# Anatomy of a cable ship



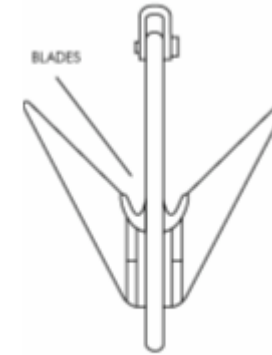
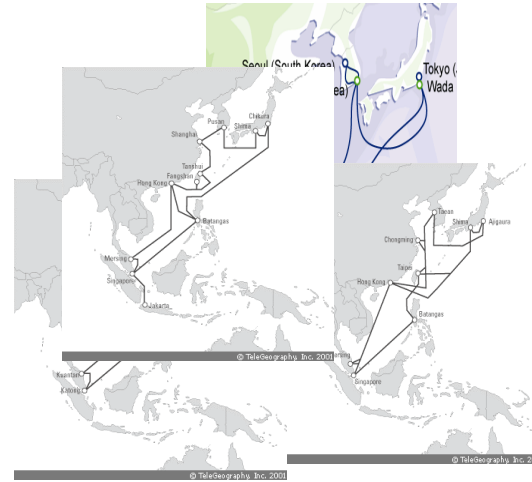
**Our Reliance Class Fleet**

CS Tyco Reliance	CS Tyco Dependable
CS Tyco Responder	CS Tyco Decisive
CS Tyco Resolute	CS Tyco Durable

CORPORATE

One of the 2 Bow Thrusters actually swings down and rotates 360° to provide maneuverability and station keeping during critical operations.

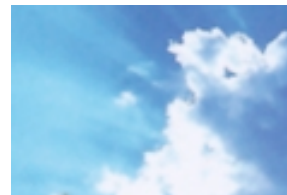
## Repairing a deep subsea cable system



### Cable repair ship

C.S. Charles Brown

Powerful vessel equipped to maintain station and perform cable repair in rough weather conditions.



Not so rough weather

A grapnel fitted with a cutter and a grabbing tool.

45 by 60 cm (18 by 24 in)

**Dropping grapnel + dragging oceanfloor + recover cable = 16 hours**

**Average repair duration = 7 days**



## Repairing a shallow subsea cable system



Tyco owned Dependable, 2003

the *Dependable's* cable laying and repair equipment includes stern linear and drum engines; dynamometers; traction winches; after deck cranes; buoy handling davits and much more

The ship's navigation aids include Furuno GPS and ECDIS systems, along with a magnetic compass, gyrocompass, track pilot, echo sounders, speed log and X- and S-band radar.



SCARAB IV ROV



## Lessons learned: Circle the globe

The deadly earthquake close to the Algerian coast on may 21<sup>st</sup> 2003 measuring 6.8 cut both the Seamewe-3 and Flag cables forcing most Asia –Europe traffic to go east via North-America.

This Taiwan earthquake forced a lot of Asia–North-America traffic to go west via Europe

The january 30<sup>th</sup> 2008 Alexandria cable breaks forced traffic east

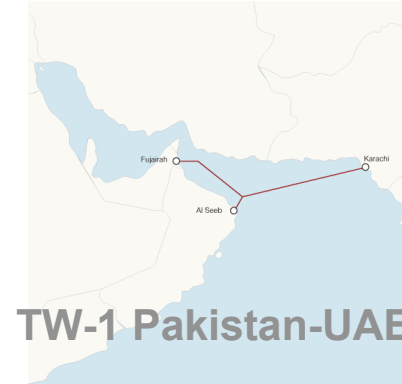
*"A little more towards the West"*



Pr. Cuthbert Calculus  
Copyright © Casterman, Hergé, Moulinsart]

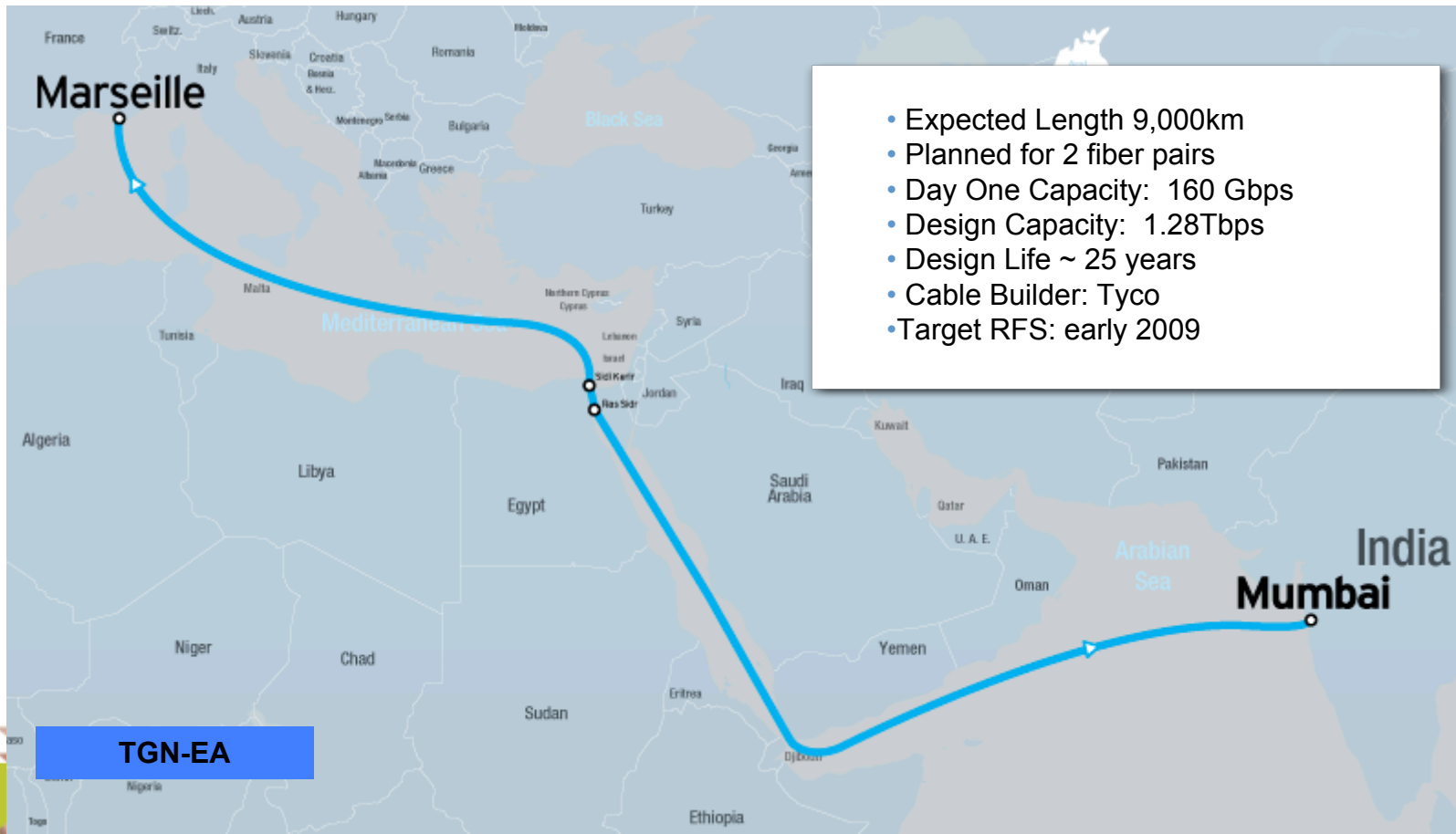


## Current Cable Connectivity in the Gulf



## Added diversity: EurAsia Express (TGN-EA)

Tata Communications Joint Build with Telecom Egypt for an express route cable



## IMEWE design as announced in February 2008



Expected Length ~ 13,000km  
 3.84 Tb capacity on 3 fiber pairs  
 Target RFS: 2H2009

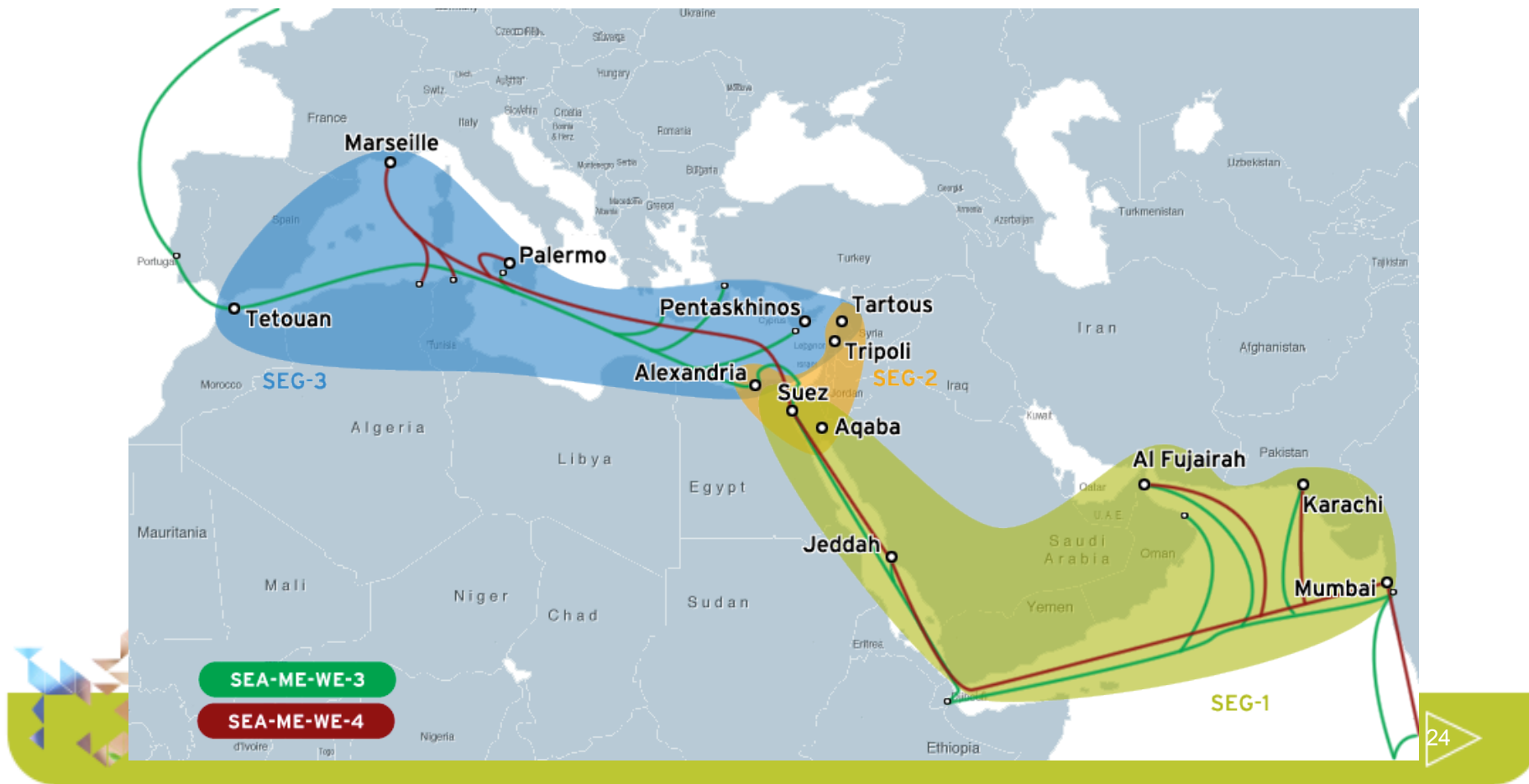
9 parties connecting 8 countries and 10 landing points

- India - Mumbai (Bharti and Tata Telecom)
- Pakistan - Karachi (PTCL)
- UAE - Fujairah (Etisalat)
- Saudi Arabia - Jeddah (STC)
- Egypt - Suez and Alexandria (Ogero Telecom, Telecom Egypt)
- Lebanon - Tripoli
- Italy - Catania (Sparkle)
- France - Marseille (France Telecom)

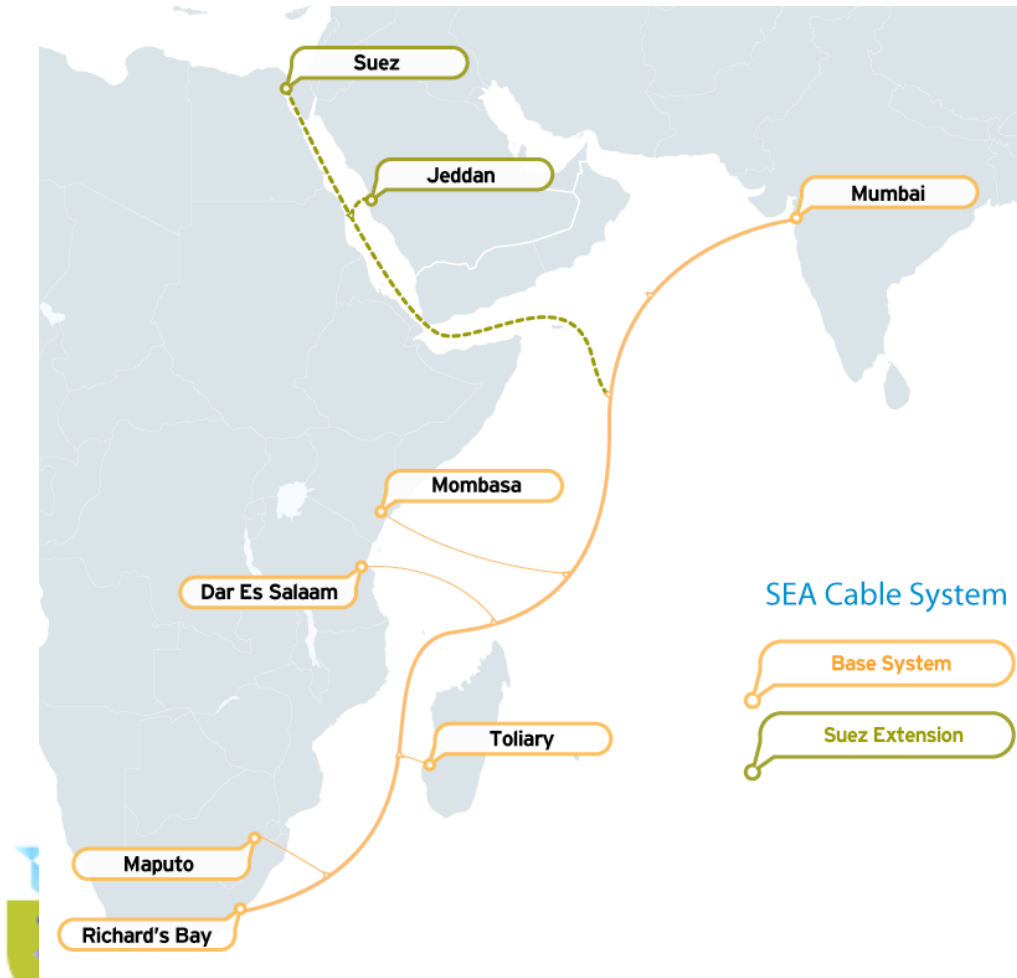


## South Asia - Gulf States/Middle-East- Europe Network Diversity

In addition to FLAG, SMW-3 and SMW4, the upcoming IMEWE, TGN-EA, Orascom s MENA and the planned new FLAG cable will provide the region vastly increased South Asia – Middle East – Europe capacity and diversity



## SEACom Cable



Announced March 2007

Financing closed in November

Length: 13,000km

Locations:

- South Africa, Mozambique, Madagascar, Tanzania, Kenya, India, Saudi Arabia, Egypt

Design Capacity: 1.28Tbps

Expected RFS: 2H2009

Tata Communications handles Mumbai cable stations, Neotel the Mtunzini cable station and backhaul, VGSL manages cable.

Farther  
is the place  
where value  
is born.



**“The internet is rapidly becoming a key ingredient in our economic infrastructure – akin to electricity and roads – as well as our social structures »**

**OECD Forum  
Conference Paris, 2006**

BUSINESS

[www.tatacommunications.com](http://www.tatacommunications.com)