



Subsea cables: Jugular veins of Global Communications

CORPORATE

AFRINIC - 11

Dakar, Senegal, November 2009

Yves Poppe
Director Bus. Dev IP services



Member of the Tata Group

125-year old largest private sector group

\$62.5 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 became Tata Communications on February 13th 2008

Tata Consultancy Services (TCS)

Major shareholder in Neotel



International Lines of Business

Wholesale Voice

- 21bn minutes of voice traffic p.a
- VoIP and TDM transport

Mobile

- 400 wireless operators
- GSM to CDMA conversion
- First link with North America

Data

- Tier 1 global backbone
- Peering with all other major carriers
- Low Latency, Shortest-path global transit routing
- Content Data Network

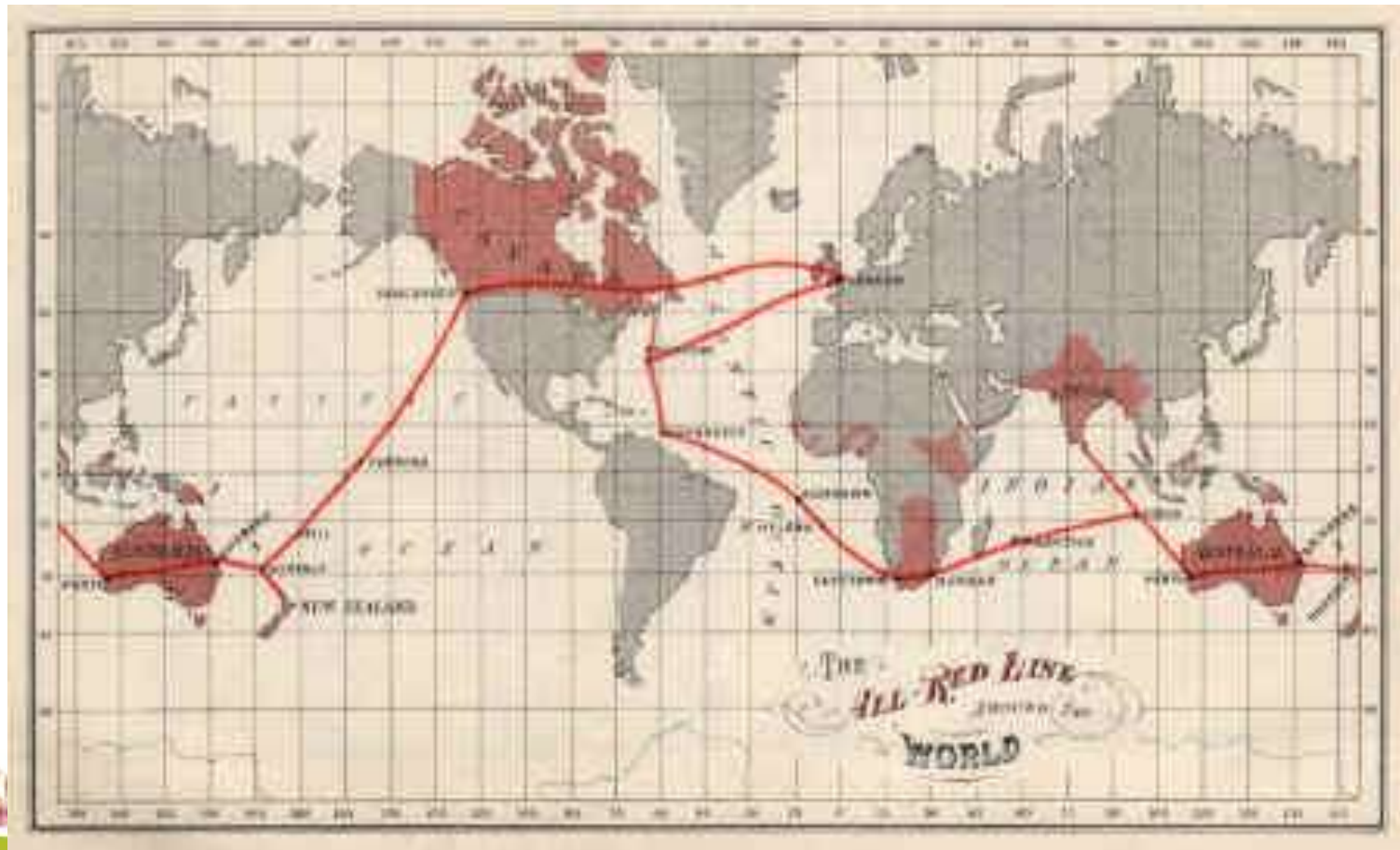
Enterprise Services

- IPL, IP, MPLS, Ethernet, VPN
- Managed services: VPN, VoIP VPN
- Enterprise Network
- Management Services
- Managed Hosting

Global transport services

- International capacity from DS3 to 10 gigabit wavelengths
- Major investor in undersea cable capacity

The Grandfather of Global Networks: All Red Line completed in October 1902



From undersea telegraph to undersea voice

In the 1950s new technology put cables ahead of radio. Small vacuum tubes that could operate under water for 20 years or more meant that amplifiers could be buried at sea with the cable. This boosted the cable's information capacity to the point that it could even carry telephone signals.

Small vacuum tubes like this could be buried at sea with the cable for years. They helped to increase a cable's information-carrying capacity by more than a thousandfold.



Borrowed from : The Underwater web, Smithsonian Institute

<http://www.sil.si.edu/Exhibitions/Underwater-Web/uw-credits.htm>

The first decade of subsea fiber optics

- 1986; First international subsea optical cable between U.K. and Belgium
- 1988: TAT-8 becomes the first transoceanic optical cable
- March 2nd 1992: TAT-9 with 565mb capacity
“NEW YORK, N.Y. -- AT&T today activated service on a new \$450-million undersea fiber optic cable system linking the United States and Canada with the United Kingdom, France and Spain, double the capacity of previous-generation submarine fiber optic cables.”
- Late 1992: TAT-10 activated.
Another 565mb capacity.
- 1993: TAT-11 (2x565mb),
the first gigabit level transoceanic cable!
- Oct 1994: Cantat-3 with 5gig!
- Who needs all that capacity ?



Followed by a decade of major surprises....

- The internet tsunami took everybody by surprise.
- Cantat-3 was full in less than 3 years (initial plan called for 17 years).
- The magic potion of DWDM : five years later cables of 1000 times the capacity of Cantat-3 were being installed.
- Cable capacity: from meg/s to gig/s to tera/sec in less than 12 years
- Deregulation, easy access to capital, advances in laser and fiber technology and spectacular internet growth created a new generation of global cable builders: Global Crossing, Level3, FLAG, 360networks and resulted in a cornucopia of transmission capacity.
- TAT-8 was retired in 2002, TAT-9, TAT-10 and TAT-11 in 2003! Ten to 15 years earlier than projected lifespan.

....and a Terabit level roller coaster of boom and bust

- Starting shots came with Atlantic Crossing (AC1) in May 1998 and with PC-1 on the Pacific side in Jan 2000.
- Tyco, Level3, Global Crossing, FLAG, 360 networks emerged as a new generation transoceanic cable builders and owners.
- The crowning achievements were the terabit level C&W transatlantic cable and the Tyco transpacific cable; both came on line early 2003.
- 3-4 years of spectacular growth peaked in early 2000 and were followed by the dotcom and telecom bust. The bottom was reached in 2003 with a slow recovery accelerating in 2006 especially in Asia and Africa.
- Smaller boom now in progress with Asia and Africa cables, expected to peak in 2010
- Impact of the 2008-2009 recession?
- Telegeography lists 205 subsea cables active and planned as of July 2009

Capacity resulting from the turn of the Century build-out

Under the Atlantic: 28.4 Terrabit per second (TBps)

Under the Pacific: 23 Tbps

Around South America : 13 Tbps

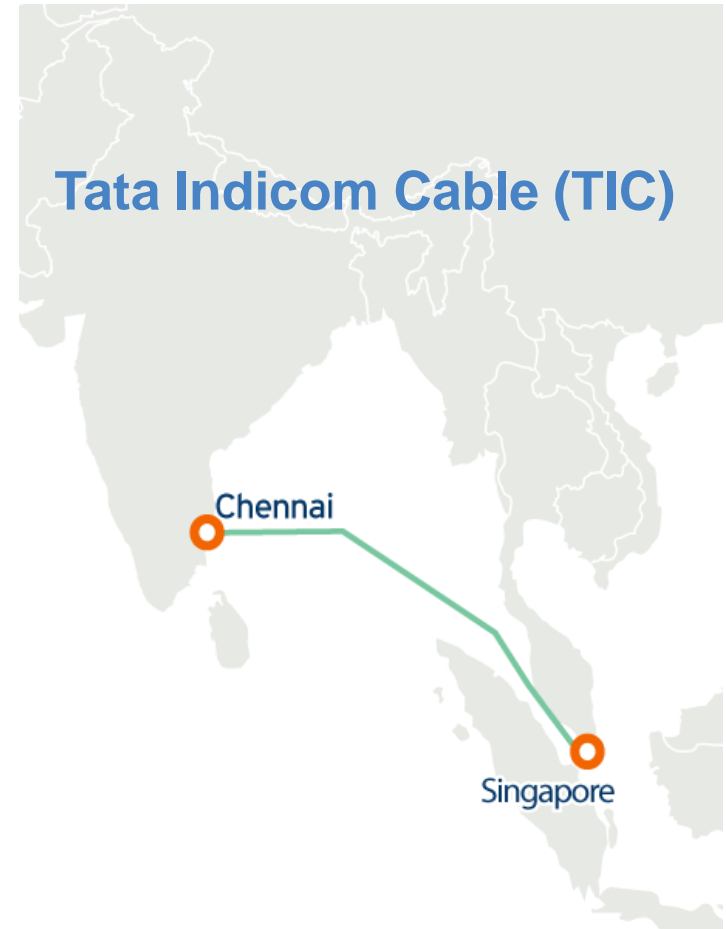
East and North East Asia : 33 Tbps

Two major pieces were missing: South Asia to Europe and circum Africa where the capacity was only 0.355Tbps (SAT/SAFE)

Around Africa : 0.355Tbps

Central Asian build-out

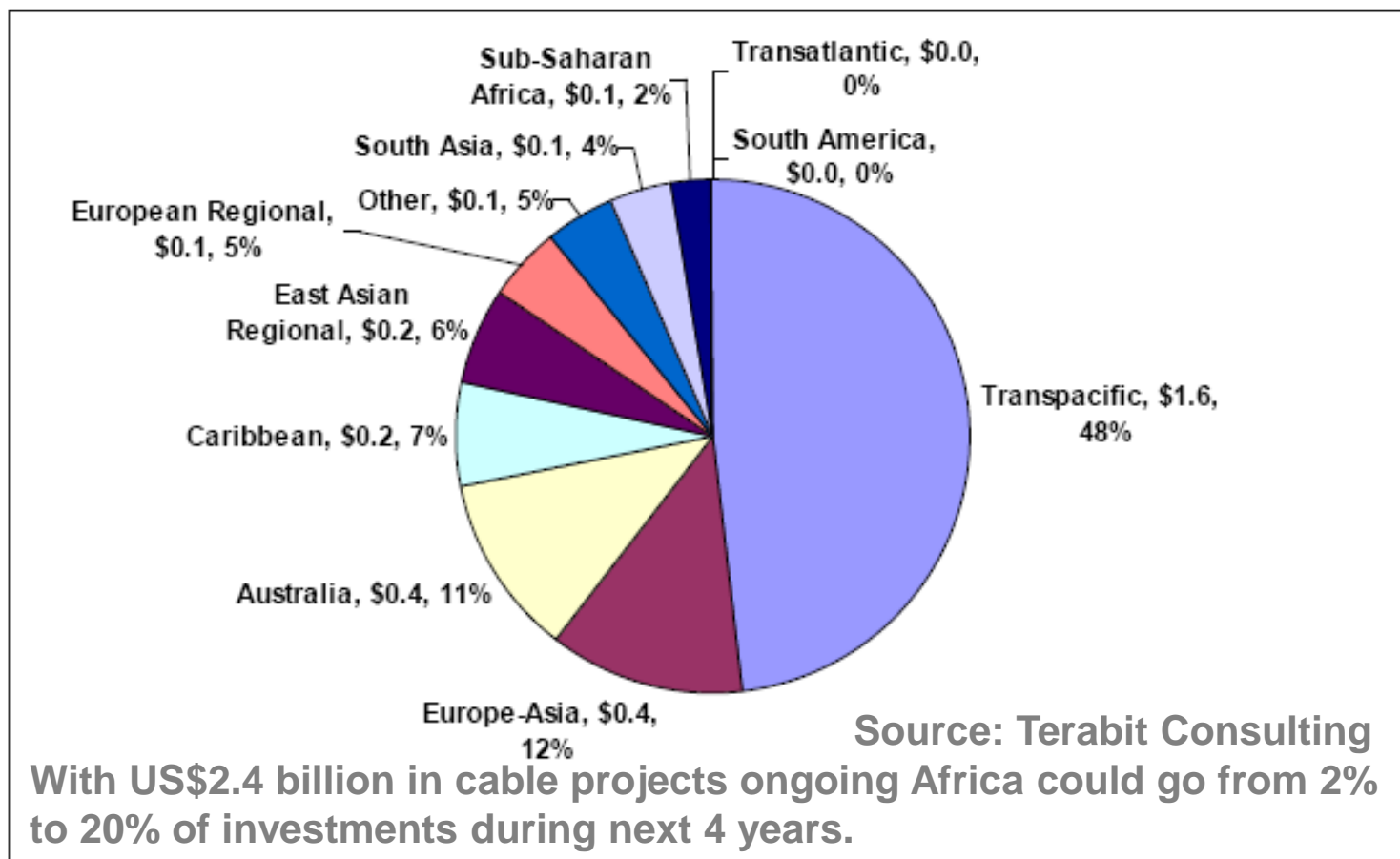
- April 2002: RFS for i2i; 8.12Tb capacity; 160Gb lit, 50% Bharti 50% Singtel owned
- Feb 2004: VSNL and Asia Netcom announce the Tata Indicom cable (TIC) between Chennai and Singapore cable ; RFS was nov 2004 with an initial lit capacity of 320gbps and a design capacity of 5.12Tbps; connects into EAC and on to North America.
- Oct 2005: BSNL announces India-Sri Lanka cable
- March 2006: BSNL and MSNL announce new India-Singapore cable. Built not started yet.



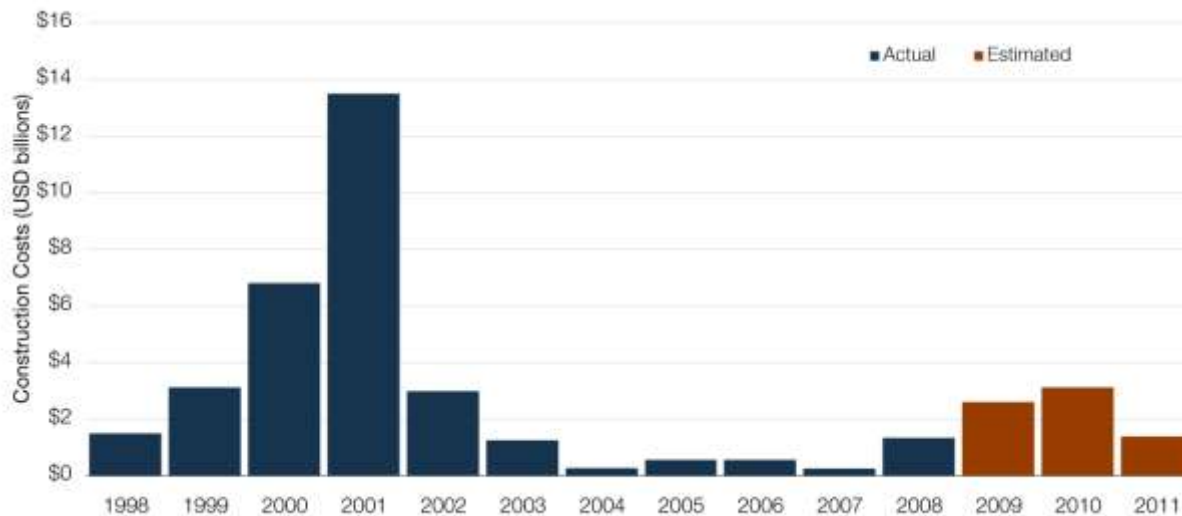
Building up stronger Europe-Asia capacity

- SEAMEWE-4 : went live dec 2005 with 160Gb lit capacity ;1.28Tb/s design capacity. Sixteen countries participate including Pakistan, India, Sri Lanka and Bangladesh; the UAE, Saudi, Egypt, Tunisia and Algeria.
- FLAG (now owned by Reliance Ind. of india) announced a similar project called Falcon in February 2004, including Oman, Kuwait, Qatar, Bahrein, Iran and Iraq, 1.28 Tbit design , chose Alcatel as supplier in feb 2005; RFS was september 2006
- August 2006: VSNL and partners announce India-France IMEWE cable, 3.8Tb, RFS 2H2009
- December 2007: VSNL announces Eurasia express in cooperation with Telecom Egypt; 1.28Tb capacity, RFS 2009
- I-ME-WE , TGN-Eurasia and EIG to add multi terabit India-ME-Europe capacity with RFS dates in 2009 and 2010. Flag NGN no longer on shorter term radar.

Global investments in subsea cables 2006-2008

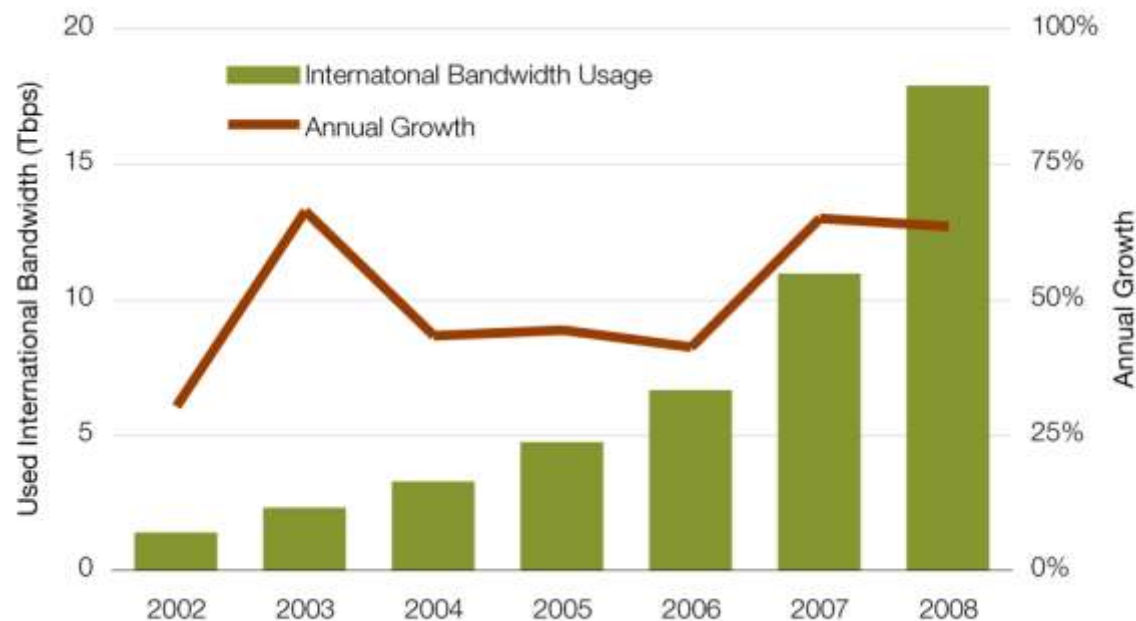


Investments in subsea cables: extrapolating to 2011



Telegeography sees the current wave peak in 2010. Reasonable assumption but any surprises in store as BB access continues to expand furiously?

Insatiable demand for more bandwidth seems to continue



Who dares to extrapolate?

A second wave of Trans-Pacific capacity

TransPacific Express (TPE)

5.12Tb design capacity;
1.28Tb lit initially
RFS was late 2008



Asia America Gateway (AAG)

1.92Tb design capacity
RFS was Q3 2009



Google gets into the act

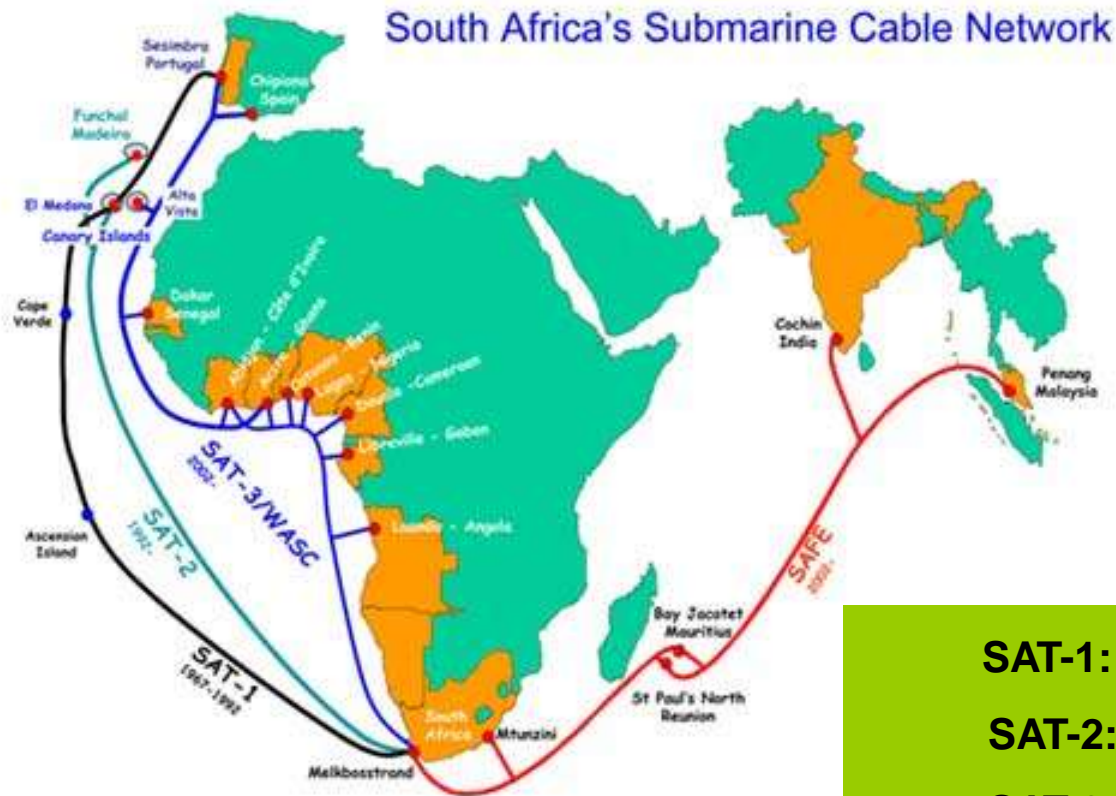
Sept 2007: Google announces Unity system

- Consortium includes Bharti, Global Transit Malaysia, KDDI, Google, Pacnet, Singtel
- US\$300 million project, contracts issued to NEC and Tyco in february 2008
- 7.68Tb design capacity
- Sheduled RFS mid 2010



Africa

the three SAT's



SAT-1: 1968

SAT-2: 1993

SAT-3: 2001

WASC/SAFE: 2002

See: <http://atlantic-cable.com/CableCos/SouthAfrica/index.htm>

CORPORATE

East Africa was the missing link

EASSY:

The original project consisted of two fibre pairs with a capacity of 640 Gigabit; estimated cost of \$200 million ; 8840 km

Unfortunately, disagreements nearly derailed and delayed the project by around four years.

RFS mid 2010?



East Africa : until recently the missing link going forward: 4 or 5 cables instead of just one?

FLAG NGN

Full capacity:
2.56Tbps
RFS: ??



EASSY

Full capacity:
320Gbps
RFS: mid 2010



TEAMS

Full capacity:
320 Gbps
RFS: Q4 2009



SEACom Cable System

First Cable system connecting E. Africa to S. Africa, India and Europe

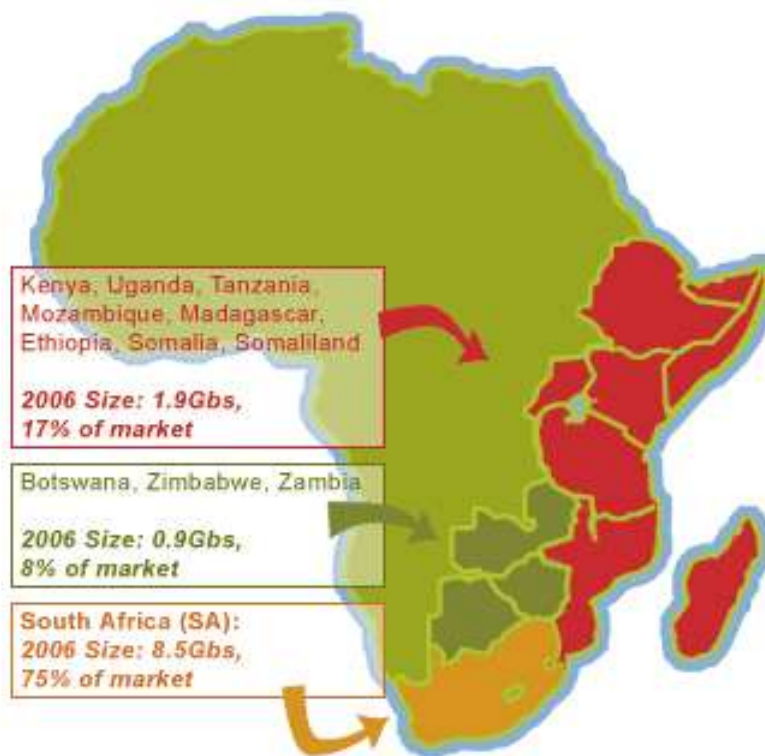


- Length: 13,000km Cable
- Locations:
 - **South Africa (Mtunzini)**
 - **Mozambique (Maputo)**
 - **Madagascar (Toliary),**
 - **Tanzania (Dar es Salaam)**
 - **Kenya (Mombasa)**
 - **India (Mumbai)**
 - **Djibouti (Djibouti)**
 - **France (Marseille)**
- Ultimate Capacity: 1,280 Gbps
- City-to-City Connectivity onto the Tata Communications Networks in Europe, India, & USA
- Full Range of Service Offerings including:
 - **E1, DS-3, STM-1 through STM-64**
- Lease and IRU Contracts available
- Expected RFS: 2H2009

SEACom final configuration

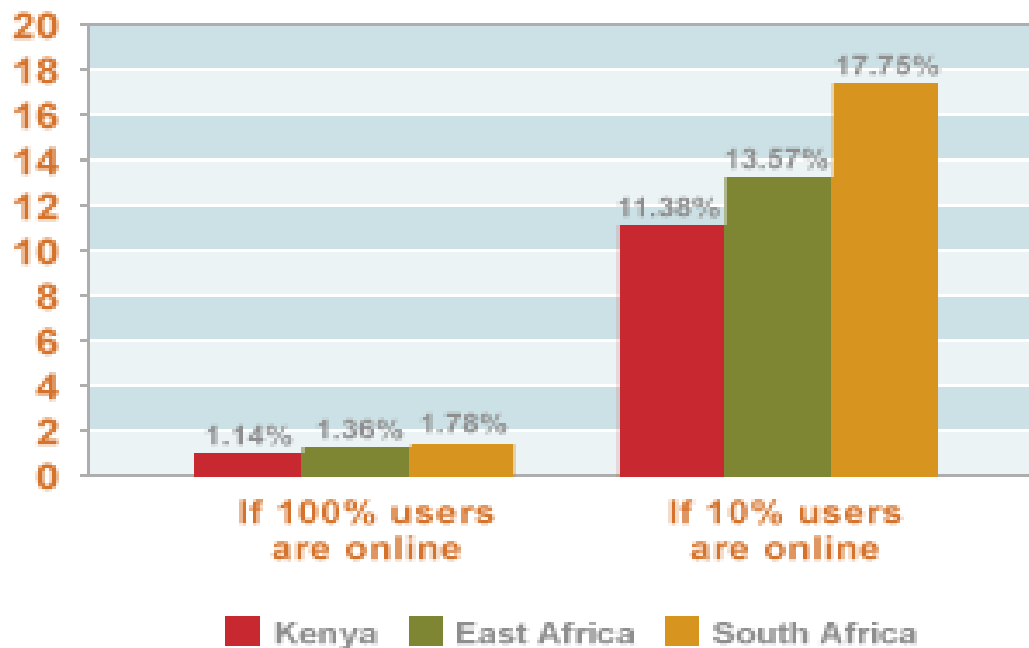


Eastern and South African Broadband Market



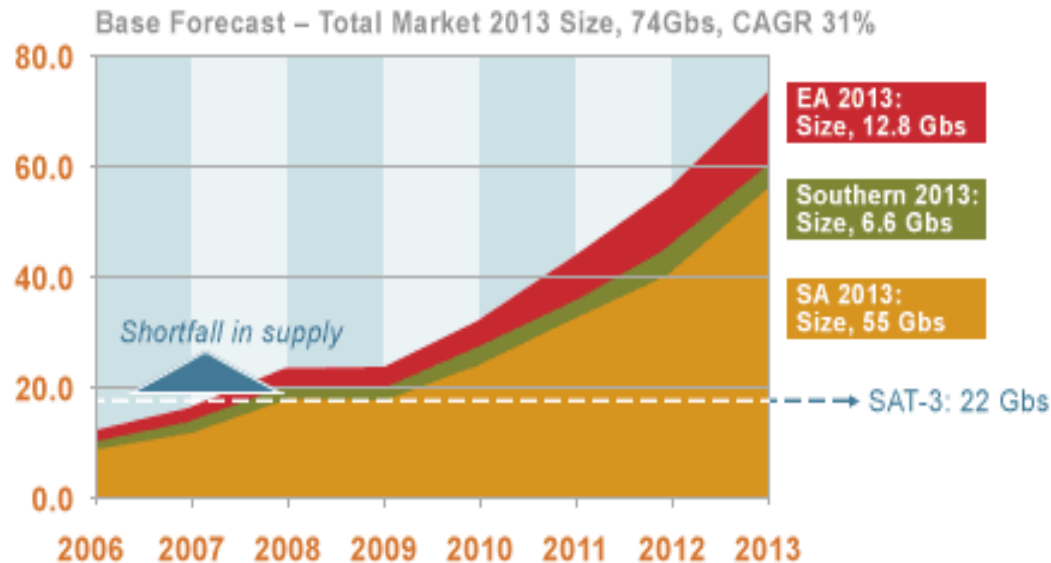
Source: Balancing Act

The desperate need for more bandwidth



Currently international bandwidth available to each current internet end user is limited to a few kilobits at the best of times

South and Eastern Africa market growth



If end users are able to access the internet at international broadband speeds, the African market for international bandwidth will grow from today's 10Gbs to over 800Gbs.

And on the African West Coast : WACS is going forward

The 14,000km submarine cable will run from Cape Town to the UK with landings in Namibia, Angola, the Democratic Republic of Congo, the Republic of Congo, Cameroon, Nigeria, Togo, Ghana, Cote d'Ivoire, Cape Verde, the Canary Islands and Portugal.

The WACS consortium comprises eleven companies that signed the WACS Construction and Maintenance Agreement: Angola Telecom, UK-based Cable & Wireless, Portugal Telecom, SOTELCO (Congo), Telecom Namibia, Togo Telecom, India's Tata Communications and four South African firms - Broadband Infraco, Telkom SA, MTN and Vodacom.

3.84Tb design capacity, RFS 2011

US\$600 million investment

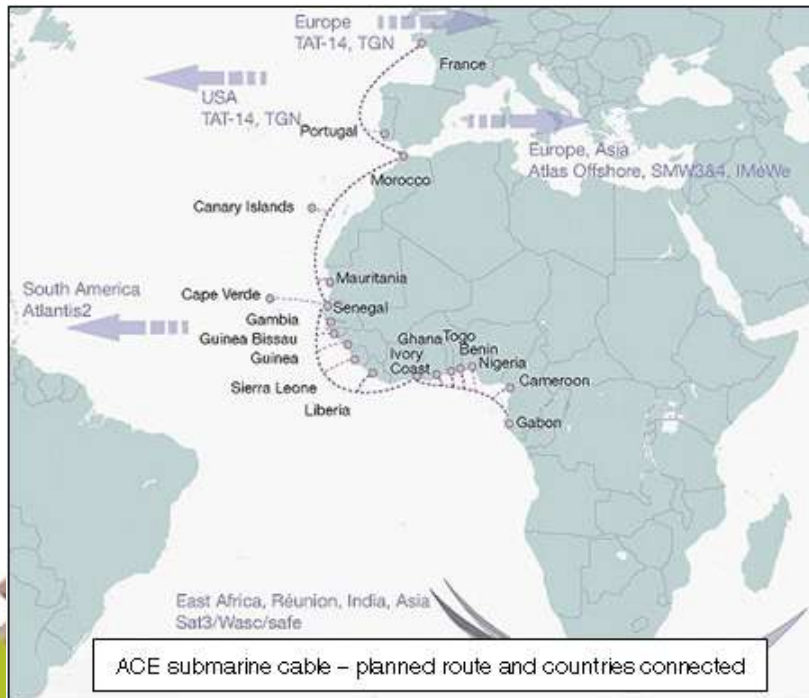
April 2009: contract awarded to Alcatel

Other West African projects: MainOne, Glo-1, ACE

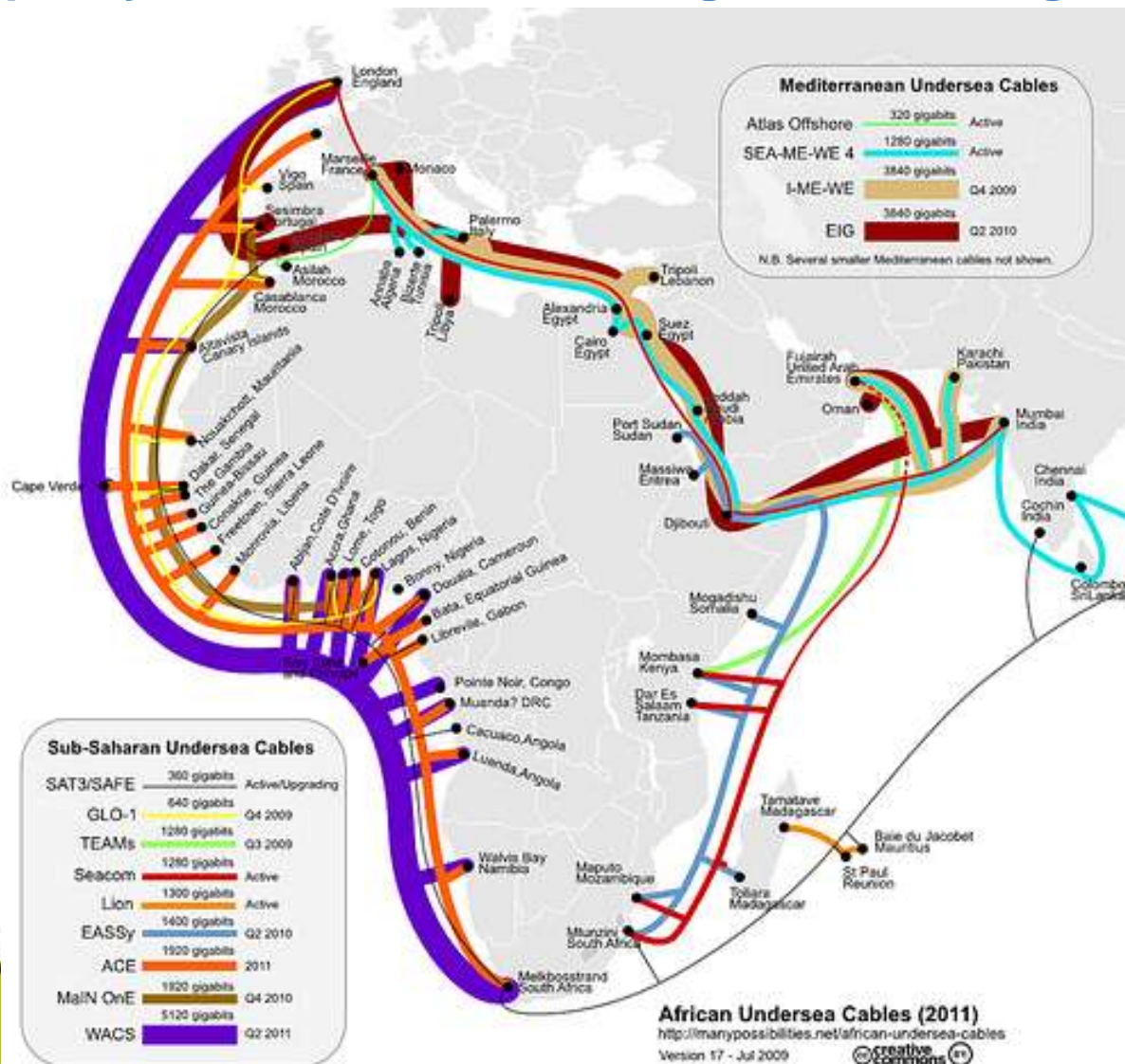
Main One: Nigerian initiative RFS end 2010
1.2Tb design capacity

Glo-1: Lagos –London expansion

ACE: France Telecom initiative RFS 2011



Subsea Capacity Situation in 2011 if all goes according to plan



Some final thoughts

Technological evolution of subsea cable capacity has been astounding

Ownership of subsea cable capacity and cable builds have shifted dramatically to emerging economies; the USA, Japan and France react.

Rapid shift from mature western markets to emerging economies.

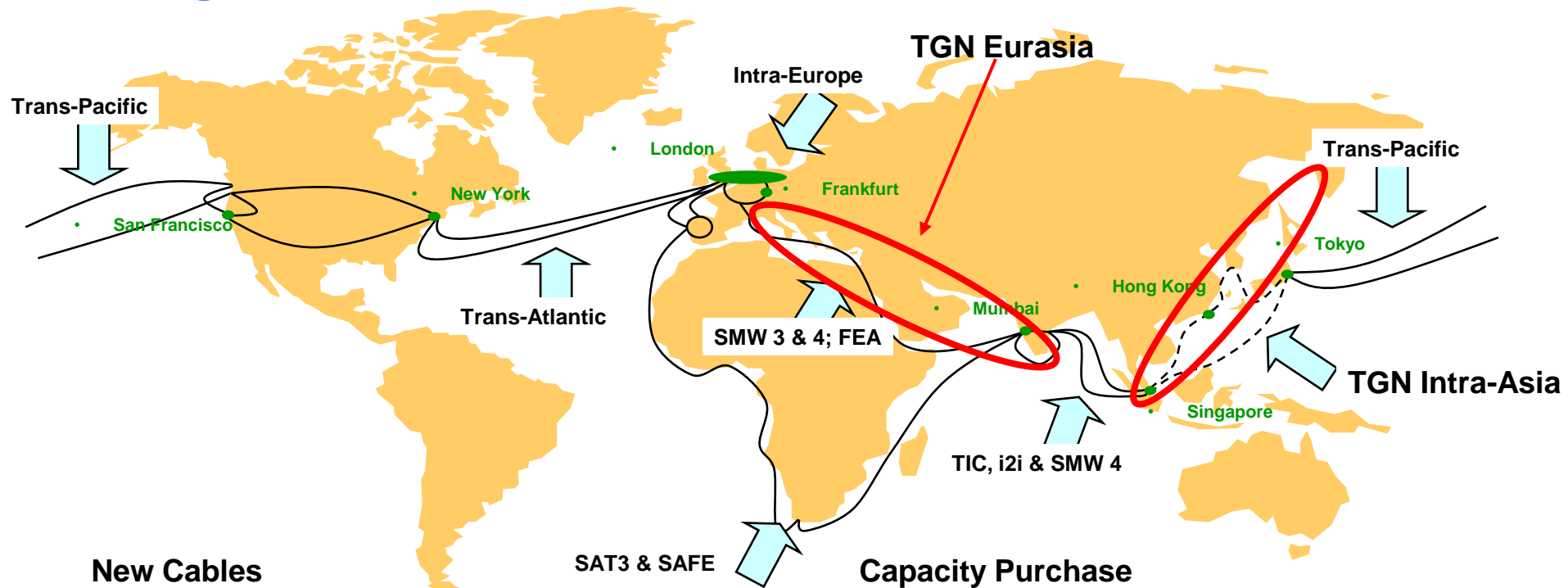
Ownership position in selected subsea cables and land cables key to sustained international expansion.

Satisfying customer needs in the 3G and beyond multimedia mobile world will necessitate considerable amounts of global bandwidth.

ANNEX

Tata Communications subsea and terrestrial cable world tour

Circling the world on Tata Communication owned Submarine Cable



New Cables

Cable Name	Connecting	Ownership
TGN-Intra Asia	Singapore Hong Kong, Japan, Vietnam, Philippines	Majority Owner
TGN-Eurasia	India to France via Egypt	Majority Owner

Capacity Purchase

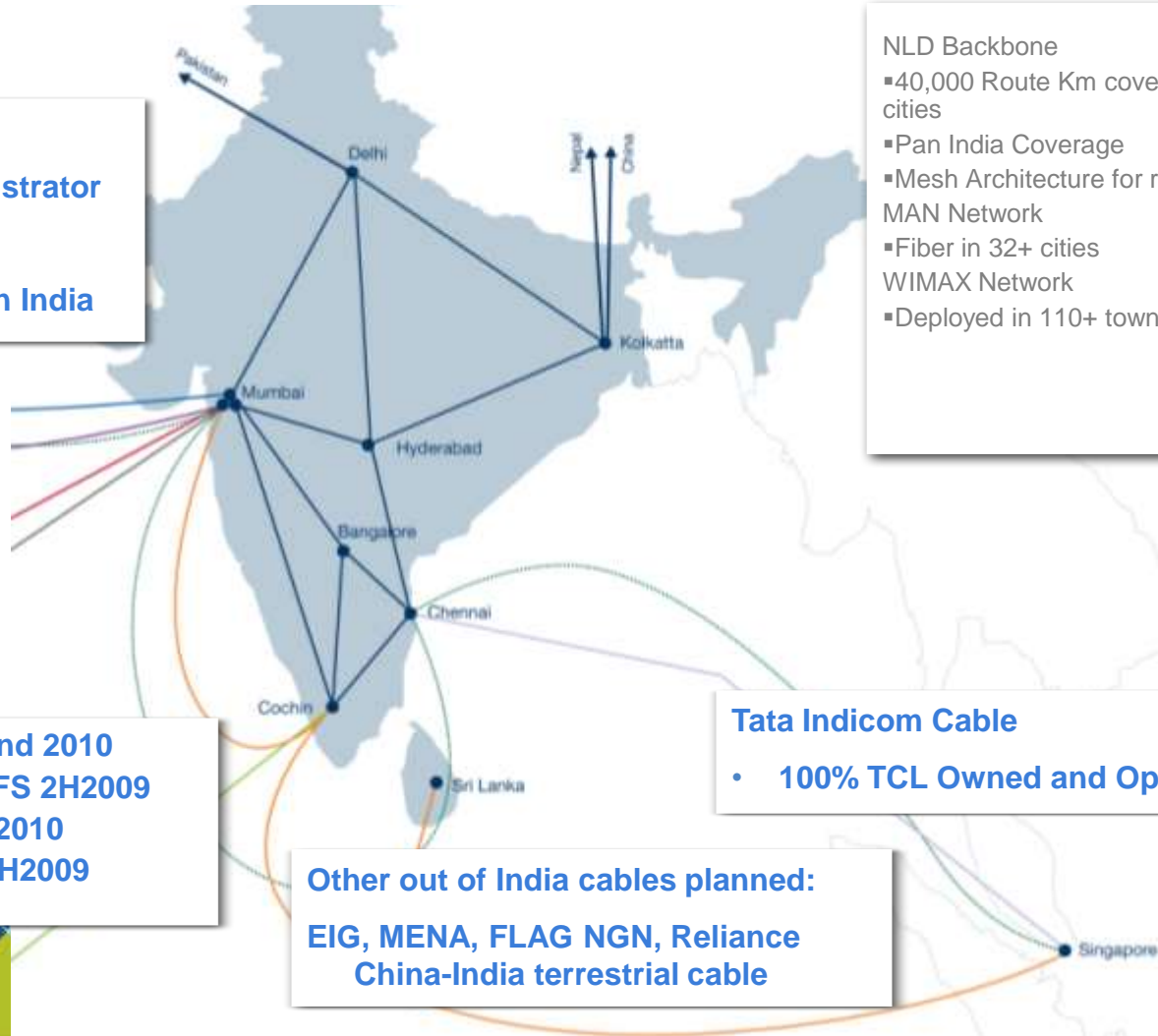
Cable Name	Connecting	Ownership
IMEWE	India, Middle East, Egypt, Italy, France	Consortium Member
SEACOM	India, Egypt, South Africa	Initial Capacity Owner

Diverse Connectivity to and from India

Comprehensive Cable Redundancy into India

SMW4

- Network Administrator
- SMW3 & SAFE
- Landing Party in India



NLD Backbone

- 40,000 Route Km covering 300 major cities
- Pan India Coverage
- Mesh Architecture for resilience
- MAN Network
- Fiber in 32+ cities
- WIMAX Network
- Deployed in 110+ towns

New cables in 2009 and 2010

- TGN-EurAsia: RFS 2H2009
- IMEWE: RFS 1Q2010
- SEACom: RFS 2H2009

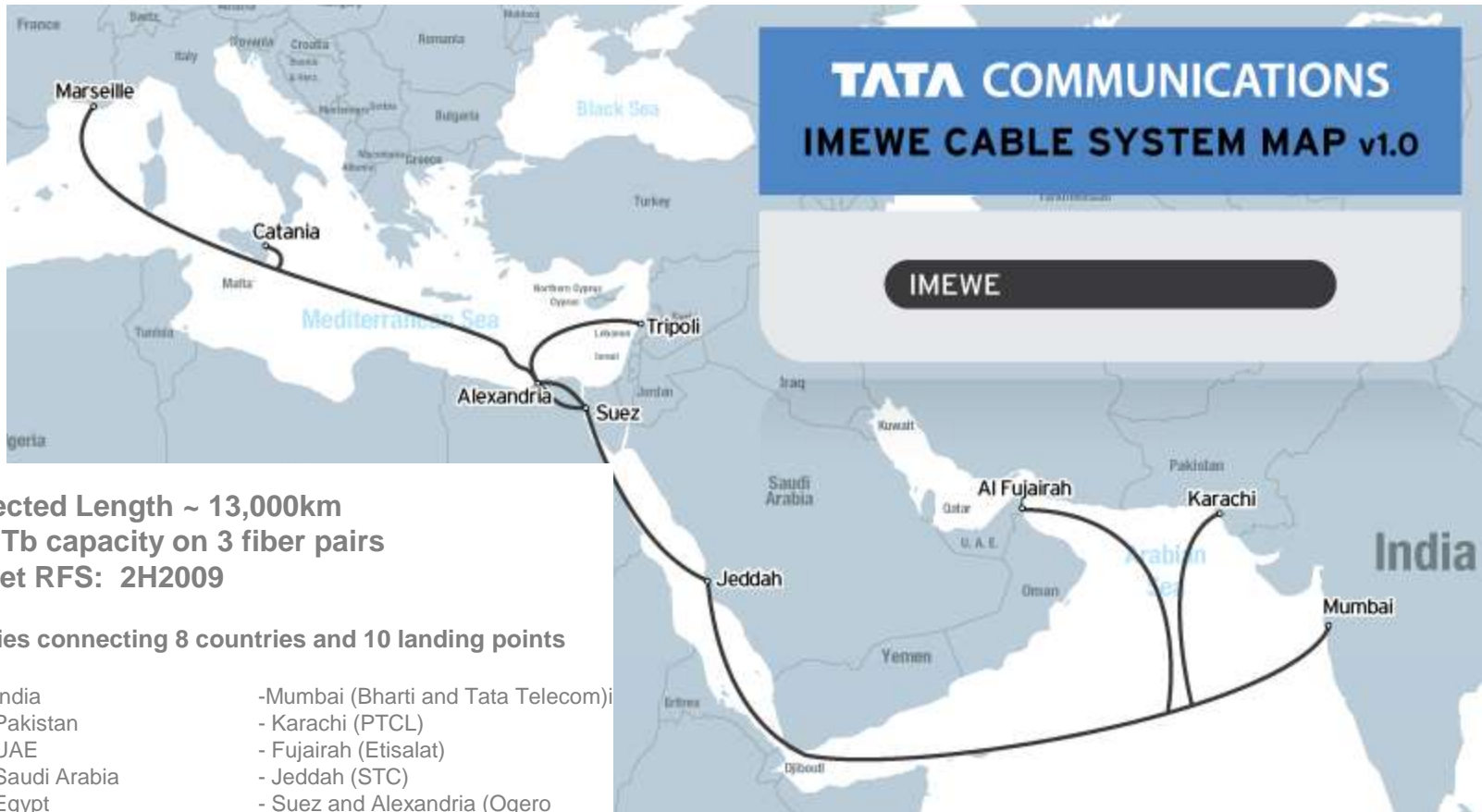
Tata Indicom Cable

- 100% TCL Owned and Operated

Other out of India cables planned:

EIG, MENA, FLAG NGN, Reliance
China-India terrestrial cable

I-ME-WE as currently under construction



SEACom Cable System

First Cable system connecting E. Africa to S. Africa, India and Europe



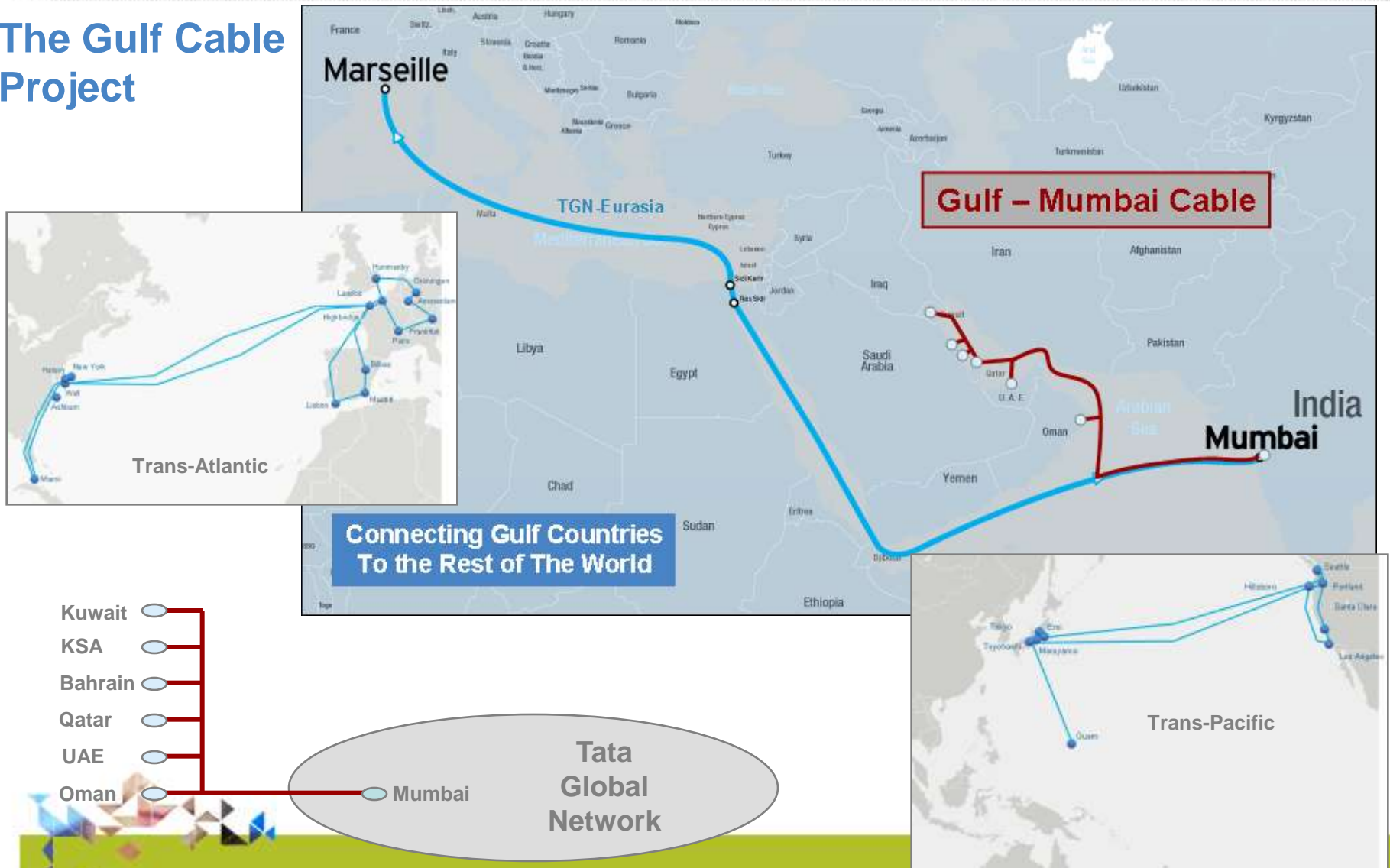
- Length: 13,000km Cable
- Locations:
 - **South Africa (Mtunzini)**
 - **Mozambique (Maputo)**
 - **Madagascar (Toliary),**
 - **Tanzania (Dar es Salaam)**
 - **Kenya (Mombasa)**
 - **India (Mumbai)**
 - **Djibouti (Djibouti)**
 - **France (Marseille)**
- Ultimate Capacity: 1,280 Gbps
- City-to-City Connectivity onto the Tata Communications Networks in Europe, India, & USA
- Full Range of Service Offerings including:
 - **E1, DS-3, STM-1 through STM-64**
- Lease and IRU Contracts available
- Expected RFS: 2H2009

TGN – EurAsia

Tata Communications Joint Build for an express route cable from India to Europe



The Gulf Cable Project

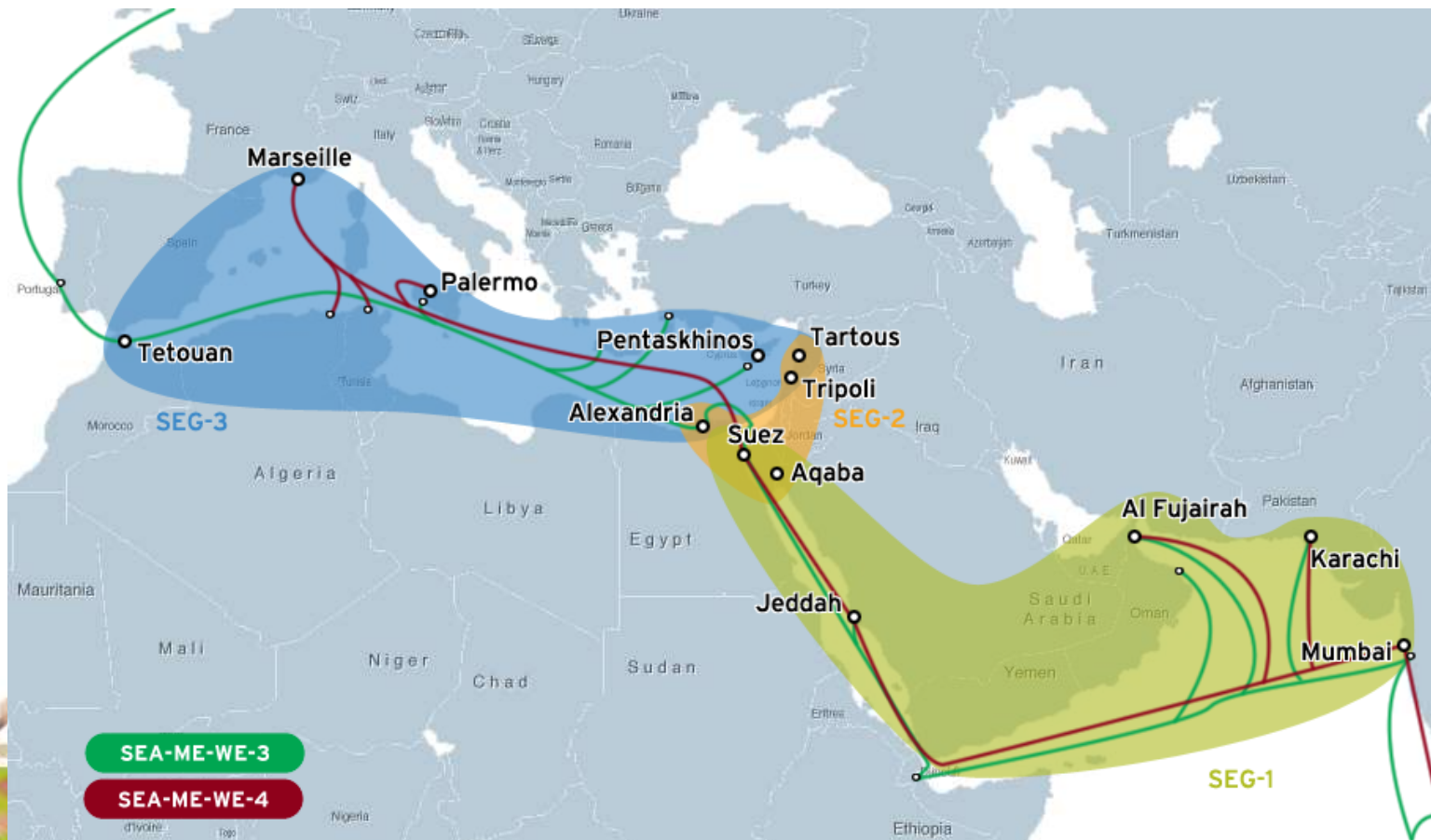


CORPORATE

for discussion purposes only

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



TGN - Europe



- European Ring
- City-to-City Connectivity to:
 - London, Paris, Amsterdam, Frankfurt
 - Lisbon, Madrid, Marseille
- Full Range of Service Offerings including:
 - DS-3, STM-1 through STM-64
 - Wavelength Services
 - Fiber Pairs
 - Ethernet Services
- New Connection to Marseille Landings
 - Provides access from Marseille to USA not touching London or Paris.

TGN - Atlantic

Connectivity across the Atlantic from Europe, Middle East, Africa, and India

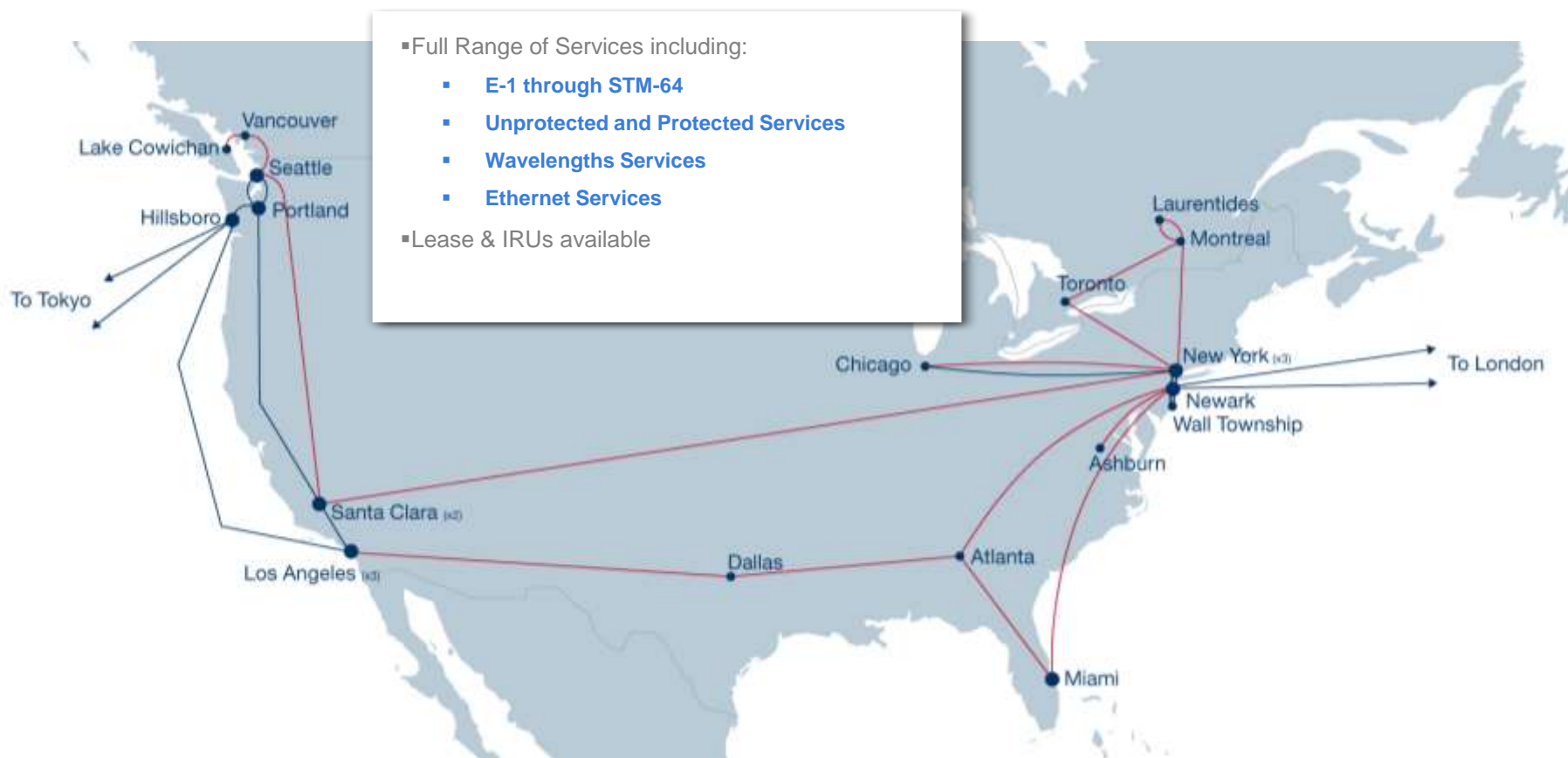
- Full range of Service Offerings including:
 - DS3, STM1 through STM-64
 - Wavelength Services
 - Fiber Pairs
 - Ethernet Services
- Lease and IRU Contracts available



- Ability to connect from Marseille to USA, avoiding NYC and London
- USA presence in 32 A of A, 60 Hudson, 111 8th, 165 Halsey, and Ashburn

Trans-America Connections

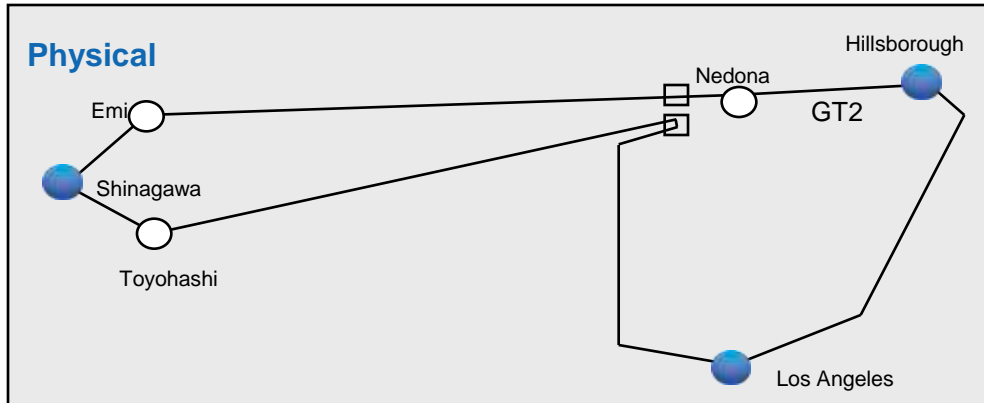
Connectivity from the Atlantic and Pacific Systems to all major business centers in USA and Canada



TGN - Pacific

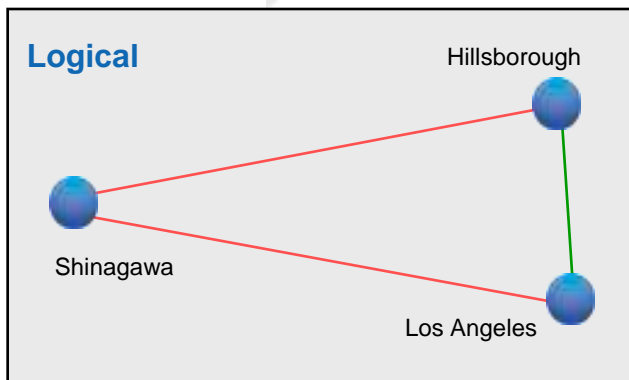
Connectivity across the Pacific between the USA, Japan, and the Asia Pacific

Physical

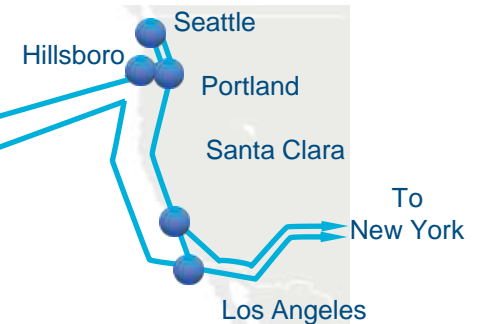


Tokyo, Emi & Maruyama
 Toyohashi
 Chikura
To APCN-2 & TGN-IA

Logical



- **City-to-City Connectivity in Japan and USA**
- **Full Range of Service Offerings including**
 - _ E-1, DS-3, STM-1 through STM-64
 - _ Protected and Unprotected
 - _ Wavelength Services
 - _ Fiber Pairs
 - _ Ethernet Services
- **Lease & IRU Contracts available**
- **Backhaul available from Chikura (APCN-2) and connectivity from APCN-2 onto TGN-P**



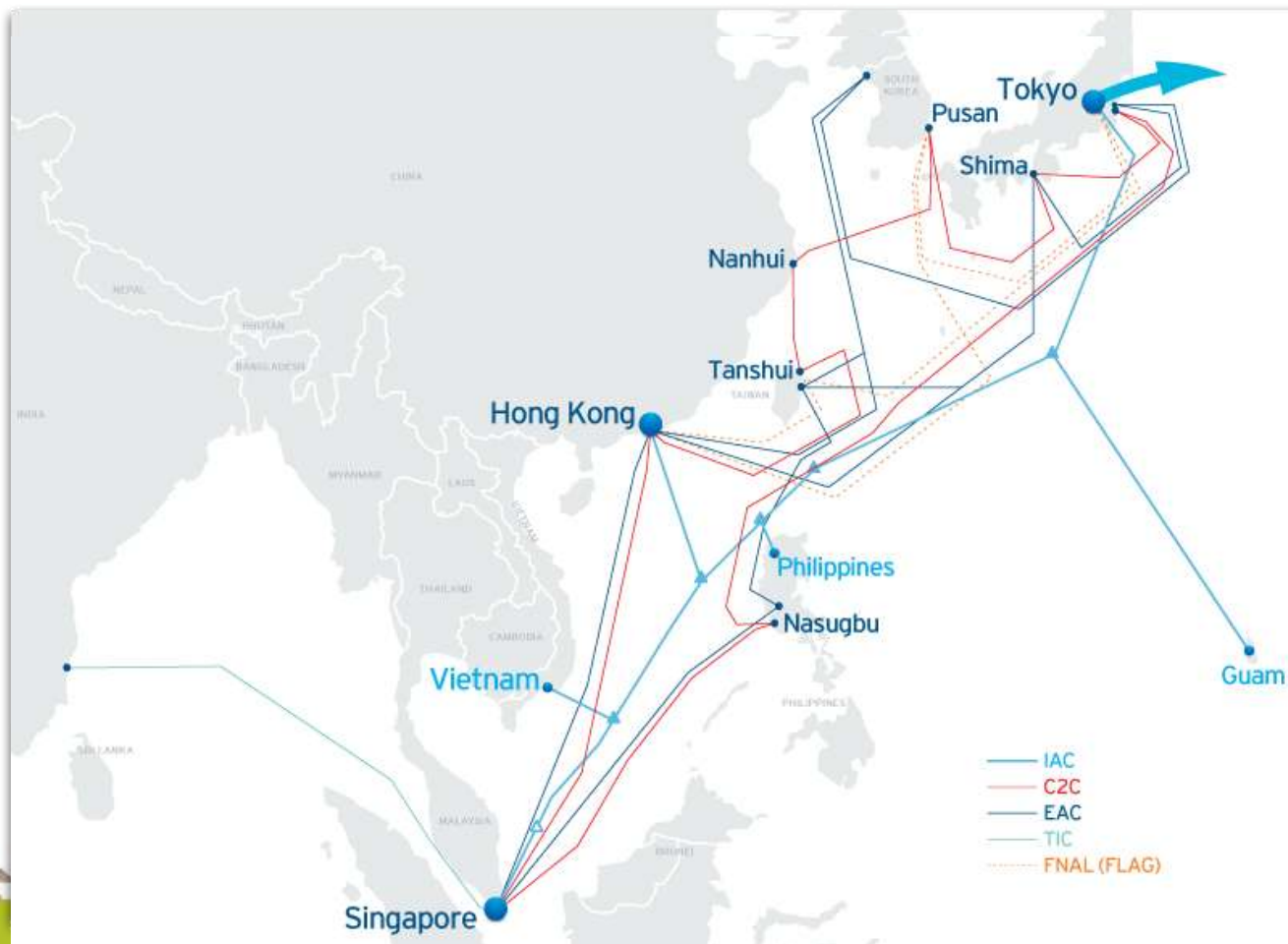
PIPE Cable System

High Speed Connectivity Into Australia via Pipe



- **2 fibre pair system**
- **Support 96x10G waves per fiber pair**
- **Total of 1.92 Terabits of capacity**
- **City-to-City Connectivity to:**
 - _ Sydney
 - _ Guam
 - _ Japan
 - _ USA, India, Asia Pac, Europe
- **Full range of Service Offerings including:**
 - _ E-1, DS-3, STM-1 through STM-16
 - _ Unprotected Services
 - _ Ethernet Services
- **Lease and IRU Contracts available**
- **Expected RFS: July 2009**

Intra-Asia Network



TGN - Intra Asia



Length: 6,800 km
of Fiber Pairs: 4
Initial Capacity: 320Gbps
Design Capacity: 3.84Tbps
Speeds available: STM-1/4/16 & 10G
Day One Landing Points:

- Singapore
- Tokyo
- Guam
- Philippines
- Hong Kong
- Vietnam

Expected Latencies

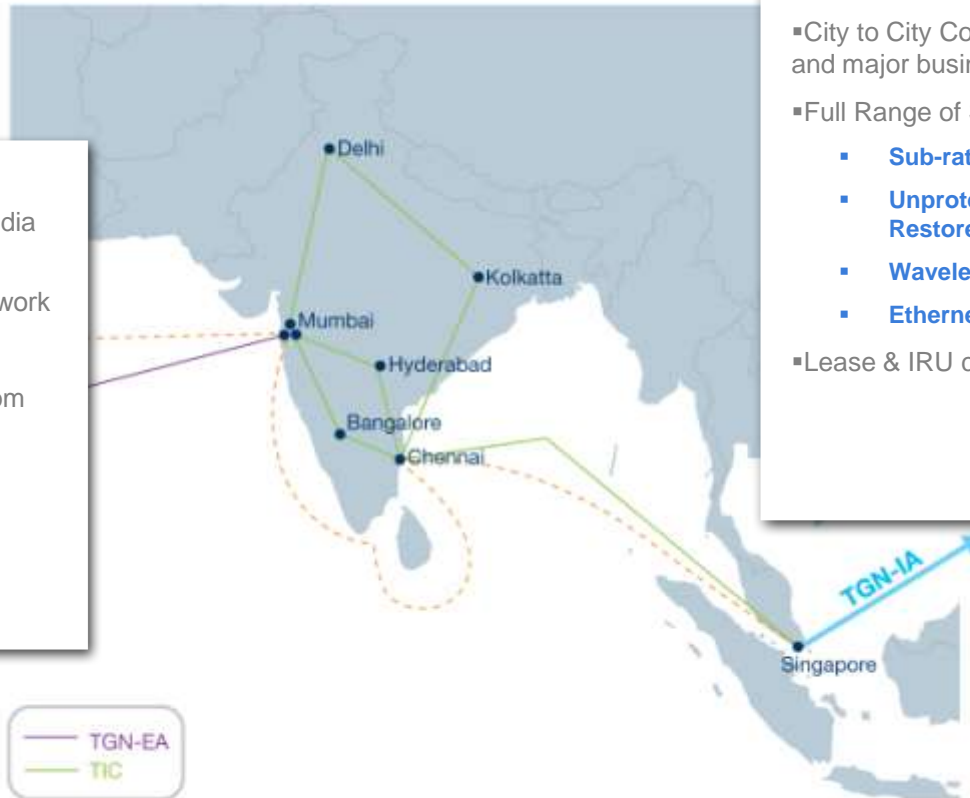
- SNG – JP = 63msec RTD
- SNG – HK = 33msec RTD
- HK – JP = 45msec RTD
- SNG – Vietnam CLS = 16.5msec RTD
- Vietnam CLS – Philippines CLS = 24msec RTD
- Philippines CLS – Japan = 33msec RTD

Ready For Service: in service June 2009
 650 gb lit capacity, 230 of which for Tata Communications as of Sept 2009. Upgrade plans for later this year, early next year. Strong demand after Typhoon Morakot. Partners are EVN in Vietnam, Globe Telecom in the Philippines, PCCW in HK

Tata Indicom Cable (TIC) and TGN-EurAsia (TGN-EA)

Owned and operated cable systems East and West from India

- TGN-EA and TIC are High Capacity Systems connecting India to Europe and Asia Pac.
- Direct Links to TCL's India Network
- Deep Shore Burial
- Redundancy East and West from India



- City to City Connectivity to all India locations and major business centers globally.
- Full Range of Services including:
 - Sub-rate through STM-64
 - Unprotected and Protected and Restored Services
 - Wavelengths Services
 - Ethernet Services
- Lease & IRU contracts available

Farther
is the place
where value
is born.



« These days all competitive advantages are fleeting. So the smartest companies are learning to create new ones – again and again and again »

Robert D. Hof , Business Week,

BUSINESS

www.tatacommunications.com