NANOG Panel
Demystifying Submarine Cables

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Agenda

How do Cable Systems work

- Fiber Optics
- Landing Stations
- Segments
- Repeaters
- Cable Laying
- Cable Faults

Products and Services

Backhaul & terrestrial Networks

Network Operators

Looking Ahead

Other New Systems
How Do Cable Systems Work

Fiber Optics

Repeaters

Cable Landing Stations

High Power Constant Current DC Power Supplies
  Single End Fed
  Dual Fed Systems

Cable Laying (& Re-Lay)
  Oceanographic Survey
  Beach Landing
  Cable Trenching
  Cable Lay
Repeaters

Designed for extremely high MTBF, 25 year life and to withstand immense pressures.
Typical Submarine Fiber Optic Cable
Cable Landing Station
Cable Laying

Specialist Ships – Laying, Repair, ROVs
Several Key Players
Specialist Equipment

Burial capability,
Work to 2500m,
Most Cables now trenched offshore where permitted,
Pre/Post Lay Inspections
Cable Faults

JOLT - external aggression, anchor or skid from commercial fishing net but not actually breaking cable. Sometimes the bend is so sharp fibers will attenuate but not break, other times cable will part elsewhere along the cable. Planned restoration and repair required.

Shunt Fault – external aggression, friction damage has caused damage to the cable but not actually breaking the cable. The damage extends to the core power cable causing a leakage to ground; though not always traffic affecting indicative of a larger problem. Planned Restoration and Repair required.

Cable Break – immediate restoration and repair required Executed by Cable Administrator and RCO/RLO.
Severe JOLT
Cable Break
Cable Break – Recovered Internal Section
TGN Break – Net Material

24/03/2008
Backhaul Systems – Terrestrial and Landing
Backhaul Systems – Terrestrial and Landing
Products & Services

IRUs – Indefeasible Rights of Usage
  Usually 15 years
  Pre-paid
  Risk & Reward
  Operations & Maintenance Charges
  MIUs – E1, STM1, STM 4, STM16, 2.5G, 10G

Leased Services
  IPLCs
  Managed Private Lines
  Capital leases – usually 5 years
  DS0 to 10 GBPS, SDH & SONET
  Ethernet Private Line
  VPLS
  Unprotected Wavelengths
  WAN PHY (10GbE)– map to SDH SONET, LAN PHY (10GbE)
Network Operators

Consortium examples:
  TAT 14
  SE-ME-WE 4
  Japan – US
  APCN2

Wholly Owned:
  Tata Communications Atlantic & Pacific
  Intra Asia
  TIC – India to Singapore
  Apollo
  Hibernia
  360 Americas
  GC
  FLAG/RG
  GEMINI Bermuda & Hugo
  Columbus Networks
Looking Ahead

Predicted $2 Billion per year for the next 5 years in cables and related infrastructure:

- New Cables
- System Upgrades
- $200 million Intra-Asia cable for the only direct route between Singapore and Japan
- Key partner in the construction of I-ME-WE, new submarine cable linking India, West Asia, and Western Europe
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

Expected Ready For Service: 3Q2008
Intra-Asia Network- 2008

Nanog43 Demystifying Undersea Cables
TGN – EurAsia - 2009
An Express route cable from India to Europe

- Expected Length 9,000km
- Planned for 2 fiber pairs
- Day One Capacity:
  - 160 Gbps
- Design Capacity:
  - 1.28Tbps
- Design Life ~ 25 years
- Cable Builder: Tyco
- Landing Locations:
  - Mumbai
  - Egypt – 2 landings
  - Marseille
System Details:
Length: 13,000km Cable
Locations:
- South Africa (Mtunzini)
- Mozambique (Maputo)
- Madagascar (Toliary),
- Tanzania (Dar es Salaam)
- Kenya (Mombasa)
- India (Mumbai)
- Middle East
Ultimate Capacity: 1,280 Gbps
Build contract awarded to Tyco Electronics
Expected RFS: 2H2009
Other Systems

TPE – Trans Pacific Express - 2008
   China, Korea, Taiwan, USA

CFX-1
   USA, Colombia, Jamaica - 2008

PIPE – PPC 1 - 2009
   Australia, PNG, Guam

AAG – Asia-America Gateway - 2009
   South East Asia to Guam and USA

Hugo - 2008
   UK-Guernsey-France

Gemini Bermuda - 2008
   USA - Bermuda

EIG - Europe India Gateway - 2010
   UK to India via Mediterranean and ME landings

Unity -2010
   USA – Japan
Thank you

Q&A
Leveraging Major Infrastructure Ownership

- 100% owner in 3 cable systems (Trans-Atlantic, Trans-Pacific, Singapore-Chennai)
- Leading investor in another 3 cable systems (Sat3/Safe, SMW3 and SMW4)
- 206,356 km of global connectivity
- Trans-Atlantic and Trans-Pacific data transfer capacity of 1 trillion bits per second
- SDH & SONET to support IP, ATM, Gigabit Ethernet
- Diverse redundancy and protection capabilities
- Greatest diversity to, and within, India
Tata Indicom Cable (TIC)

Newest and Highest Capacity Cable System into India (320 GBPs)
Offers Hardware and Wavelength Protection on Wet Segment

Deep Shore-end Burial
Ring-Protected Backhaul in Singapore
Leading SLAs for Service Availability

Linked Directly to Tata Communications’ Redundant Network in India
Onward Connectivity from Singapore to Hong Kong, Tokyo, and USA
TGN - Atlantic

- 4 Fiber Pairs per cable; 2 Cables
- Supports 64 10Gb/s waves per fiber pair
- City-to-City Connectivity to:
  - New York to London
Full range of Service Offerings including:
  - DS3, STM1 through STM-64
  - Wavelength Services
  - Fiber Pairs
  - Ethernet Services

- Two points of presence
- US connectivity avoiding New York
  - 165 Halsey: Full range of our Services
  - Equinix, Ashburn: Wave Services
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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 - Pacific**

- **8 Fiber Pairs Cable**
  - Supports 96 10Gb/s waves per fiber pair

- **8 Fiber Pairs Per Cable Ring**
  - Supports 64 10Gb/s waves per fiber pair
  - City-to-City Connectivity to:
    - Portland
    - Seattle
    - Los Angeles
    - Santa Clara
    - Tokyo

- Full Range of Service Offerings including:
  - DS-3, STM-1 through STM-64
  - Wavelength Services
  - Fiber Plans
  - Ethernet Services
The route distance and latency between SESIMBRA and MELKBOSSTRAND is: 11989.497 km, 59.947485 ms
India National Private Line Network

- Optical Terrestrial backbone that spans over 400,000km
- Over 100+ National Private Line PoPs
- Full Range of Service Offerings
  - Sub-rate, E-1, E-3/DS-3, STM-1, STM-4, STM-16, STM-64
  - Ethernet Fast-E and Gig-E
- Annual Lease agreements & IRUs
- Connections to all the major landing stations
  - SMW-3, SMW-4 (Mumbai & Chennai), FEA, TIC
- Connections to neighboring countries
  - Pakistan & Nepal (available today)
  - China (available 1Q2009)
India International Connectivity

- Comprehensive Cable Redundancy
- Capacity on all cables coming into India

- SMW4
- Network Administrator
- One of the largest Investors

- Tata Indicom Cable
- 100% Owned and Operated by Tata Communications

NLD Backbone
40,000 Route Km covering 300 major cities
Pan India Coverage with dual line maintenance

Ring Architecture for redundancy
Most vibrant domestic network in India