Submarine cable network
- overview

Presentation to HKNOG
September 1, 2014

Anders Gustafsson
International Network Development
Submarine cables

Components
Build, Operate & Maintain
Industry trends
Example of a repeated Trunk-Branch cable

Typical building blocks

SLTE – Submarine Line Terminal Eqmt. (DWDM)
PFE – Power Feed Equipment

Note: Cable station can be a datacentre / POP
The submarine cable itself
Example of a repeated Trunk-Branch cable

Typical building blocks

Cable station A

SLTE
PFE

BMH

TRUNK

Submarine Repeaters

Branching Unit

Branching Unit

BRANCH

SLTE
PFE

Cable station B

SLTE
PFE

Note: Cable station can be a datacentre / POP
Repeaters

![Image of repeater section and transmission section](image-url)
Today with OADM functions for transit and add/drop of capacity

- more efficient use of cable system
- no need traverse branch for transit traffic
- scalable to meet branch demand
Example of a repeated Trunk-Branch cable

Typical building blocks

SLTE – Submarine Line Terminal Eqmt. (DWDM)
PFE – Power Feed Equipment

Note: Cable station can be a datacentre / POP
Cable Landing Station & Beach Manhole
Submarine cable

Build

- Long lead-times (measured in years!)
- High Capex involved
- Design considerations
  - Capacity, Diversity, Latency, Landing points, Topology, Route engineering, etc.
- Different commercial models evolved
  - Private
  - Partnership
  - Consortium

Main components of a subsea build project
- Funding & Commercial negotiations (partners, vendors, etc.)
- Permits & Licenses, Marine survey
- Manufacturing of cables, repeaters and other submerged electronics
- Marine install (shallow & deep waters)
  Cable stations, Backhauls

Many cables are announced in media, far less actually gets built!
Typical cable vessel

Build
Example of marine vessels and barges

Build
Other marine tools used – Injector, Plough, ROV, etc.

Build
Submarine cable

Operate & Maintain

• **What are the main threats to a submarine cables?**
  - Anchorage by large vessels, container ships, etc.
  - Fishing activities
  - Seismic activity, Landslides, Typhoons, etc.
  - And even Sharks!

• **Consequences of cable failures**
  - Direct: Costs to carry out the cable repair and loss of revenue
  - Indirect: severe and widespread economic loss to the associated economies

• **Example of recent issues in Asia, major events**
  - Taiwan 2006: Earthquake and landslide
  - Japan 2011: 8.9 earthquake and tsunami

• **Typical cable repair take weeks, see next slides**
Examples of cable damage
By fishing equipment and anchorage
Typical repair process

Maintenance Agreements govern the process

1. Mobilise cable ship
2. Arrange permits
3. Transit to repair site
4. Recover the faulty cable
5. Splice faulty cable onboard the repair vessel
6. Reinstall the cable
7. If applicable, post-burial
8. Transit to base
9. Demobilise cable ship
10. Issue repair report

Typical cable repair can take several weeks!
How to prevent cable failures?

• **Invest in robust marine engineering in the build stage**
  - Careful engineering of cable routes (in relation to threats, shipping routes, fishing, etc.)
  - Burial requirements
  - Cable types and protection
  - Cable and gas pipe crossings
  - Installation methodology and tools

• **Cable awareness programmes**

• **Network Operation Centres (24/7/365)**
  - Detect indications of faults early and fix proactively

• **AIS – Automated Identification System**
  - Proactive shipping monitoring in very busy waters
  - Automatically monitors vessel positions and behaviours in relation to cable zone
  - Real time communication with vessels if required to avoid cable failure
  - Historical data can also be used for damage claim against ships and vessels
Example of vessel traffic
Snapshot of Singapore and Hong Kong: 10am 26/08/2014

From www.marinetraffic.com
Some industry trends

- Continuous improvement in spectral efficiency with 10G -> 40G -> 100G -> beyond
- Most new demand met by upgrades of existing cable systems
- Worldwide utilisation of cable systems still low due to technology enhancements
- Many new upgrade vendors, openness and integration gets important -> talk about “naked systems”
- New subsea market players like content providers, mobile operators, etc.
- More terrestrial and subsea integration, e.g. city-city concept
- Reduction in footprint continues
- More intelligence in submerged electronics, example ROADM branching units
- Trunk + branch is the dominating network topology today to support meshed networks
Thank you