TATA COMMUNICATIONS

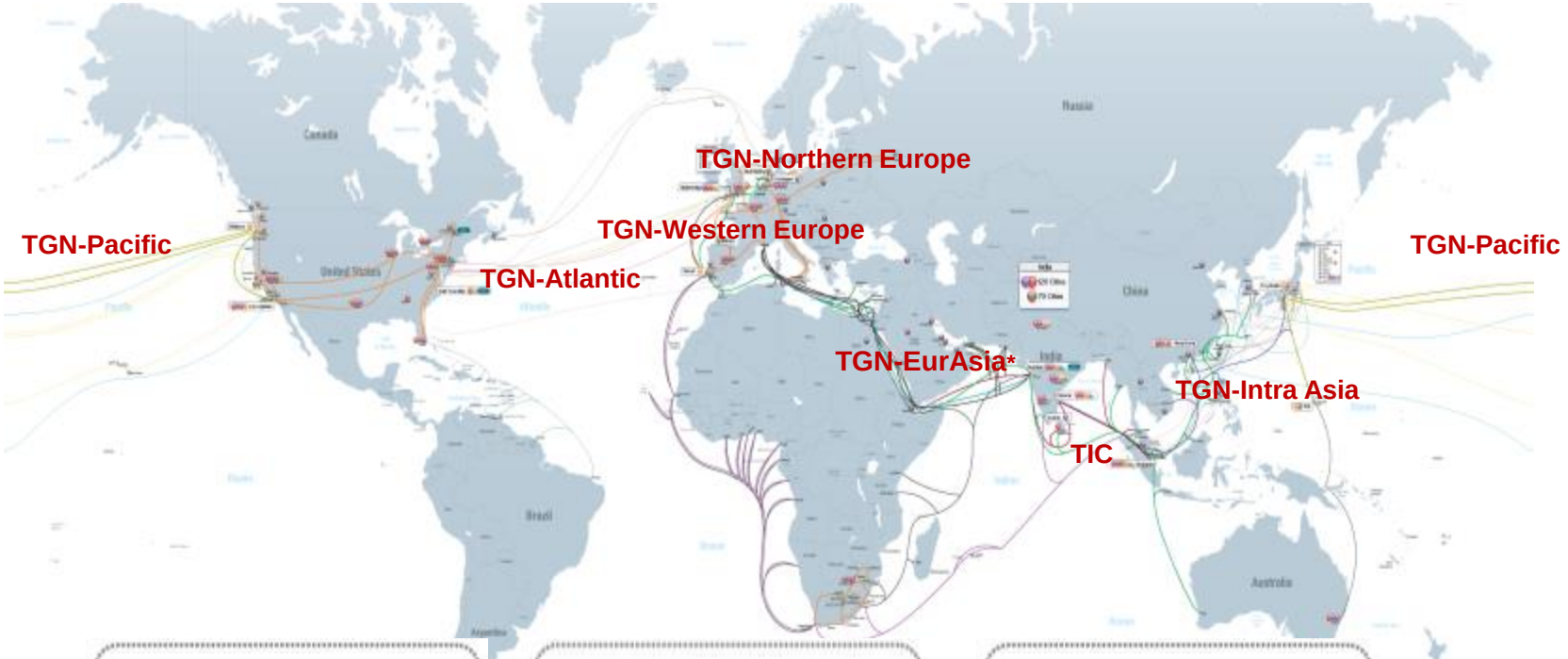
Submarine cable network - overview

Presentation to HKNOG

September 1, 2014

Anders Gustafsson
International Network Development

Global Transmission Network



OWN
- TGN-Atlantic
- TGN Western Europe
- TGN Northern Europe
- TGN-Pacific
- TIC

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CONSORTIUM
- SMW-3
- SMW-4
- SAFE/SAT-3
- IMEWE
- WACS

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WITH PARTNERS
- TGN-EurAsia
- TGN-Gulf
- TGN-Intra Asia

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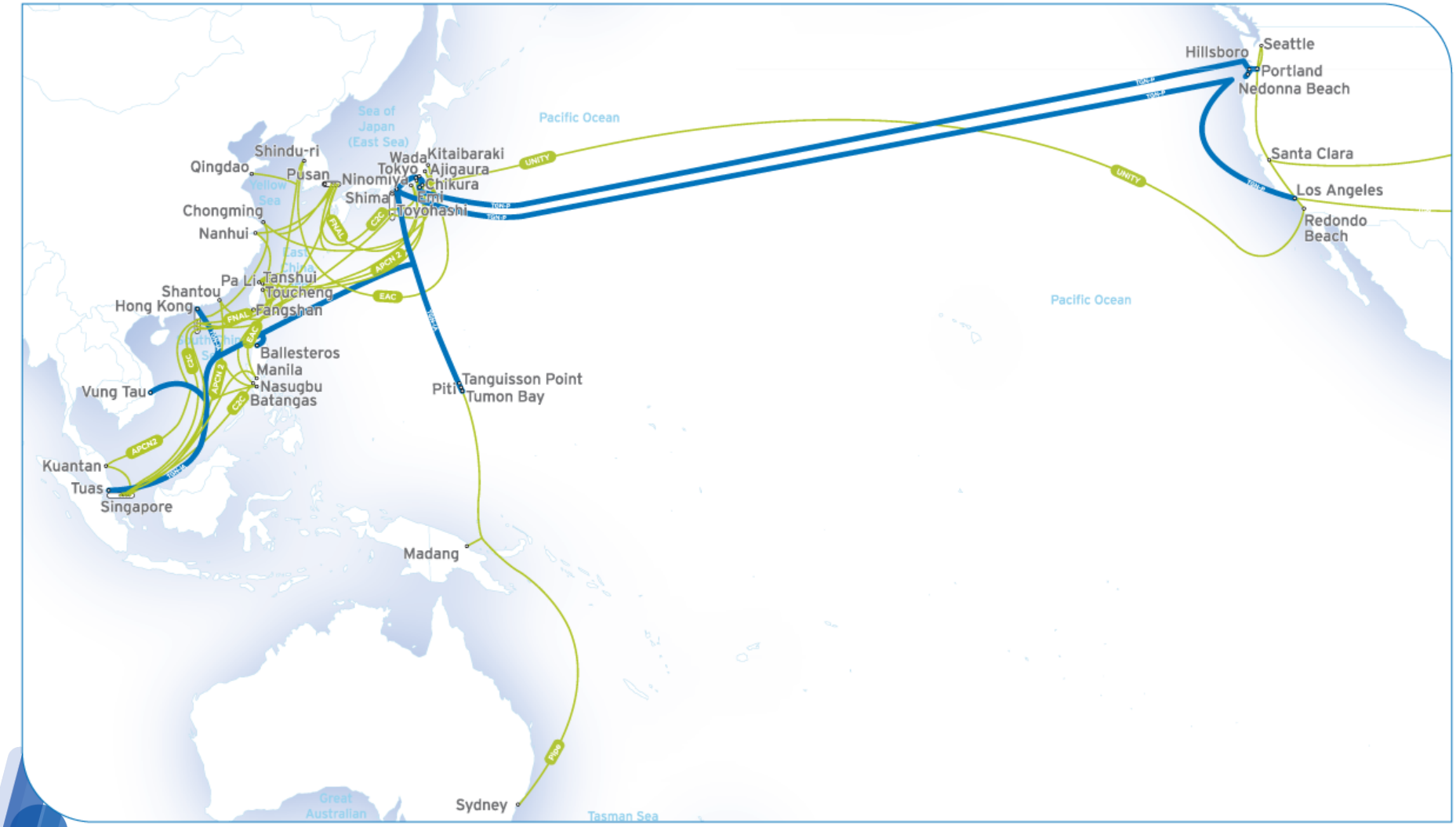
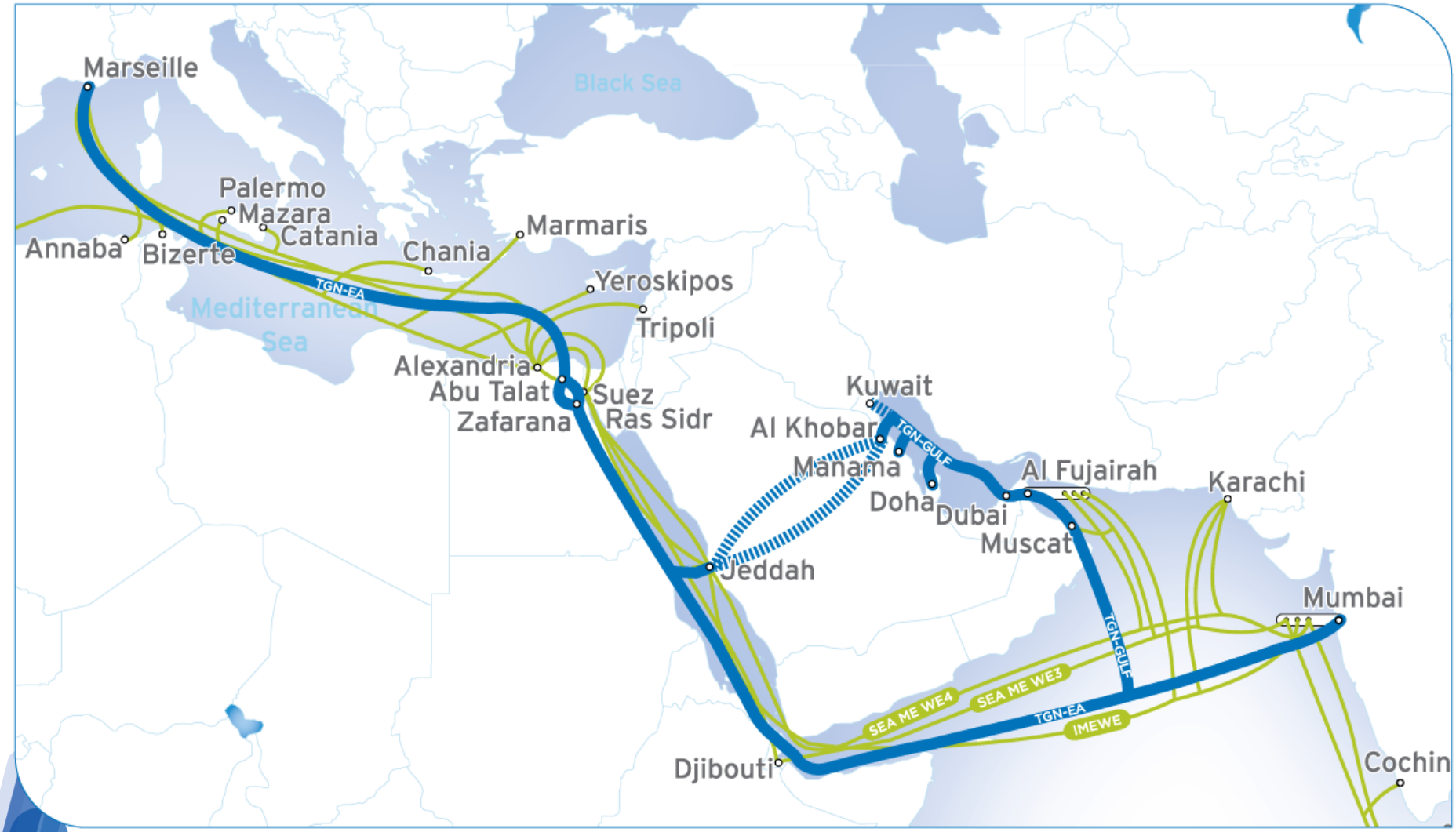
Asia Pacific Region



Asia to Europe



Europe Region

Submarine cables

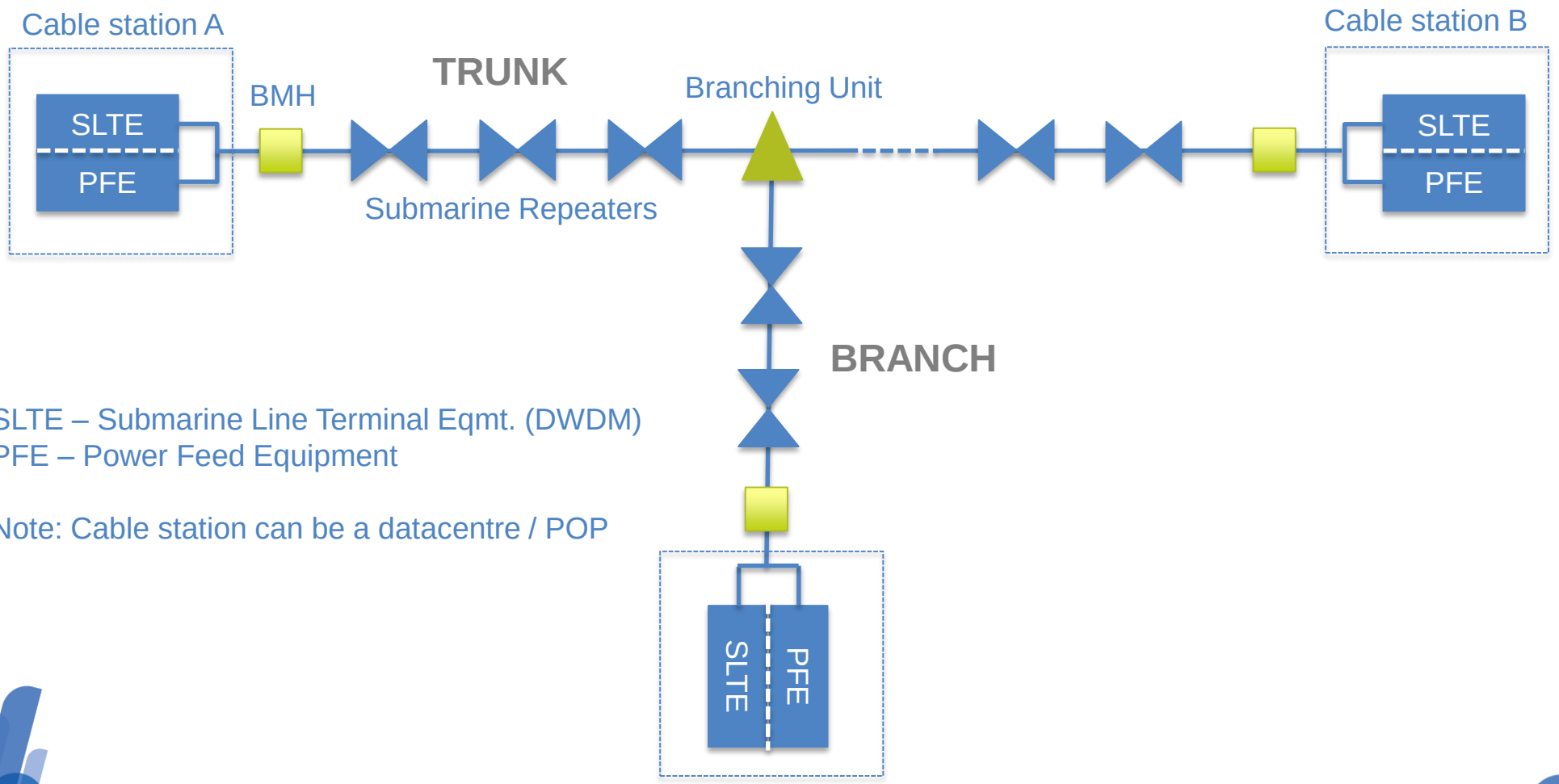
Components

Build, Operate & Maintain

Industry trends

Example of a repeated Trunk-Branch cable

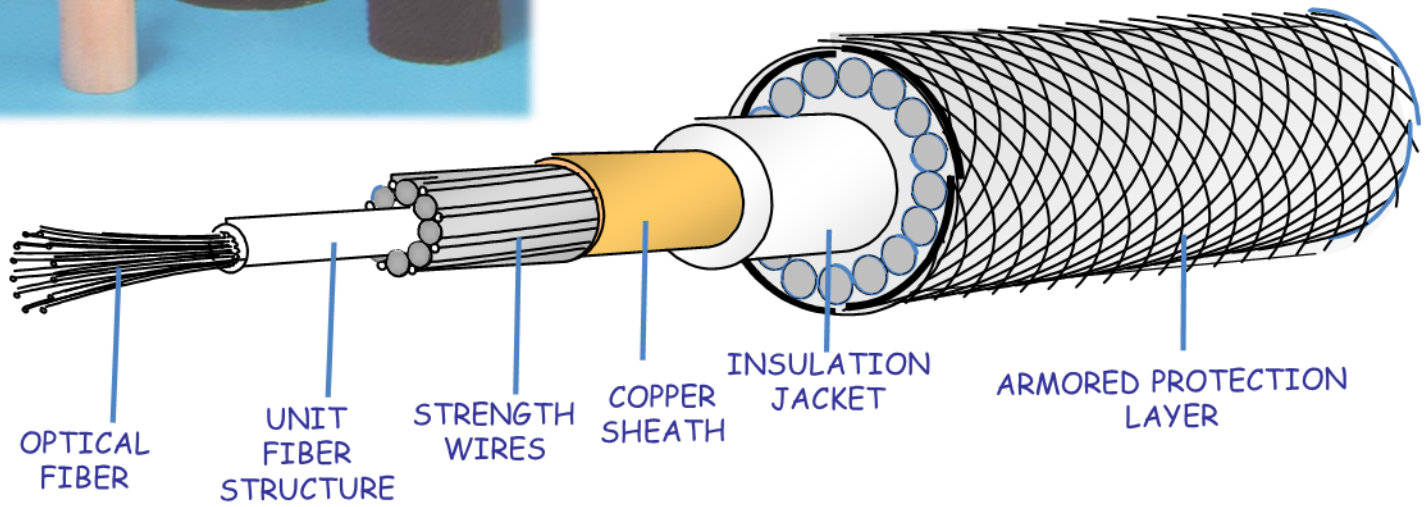
Typical building blocks



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

Note: Cable station can be a datacentre / POP

The submarine cable itself



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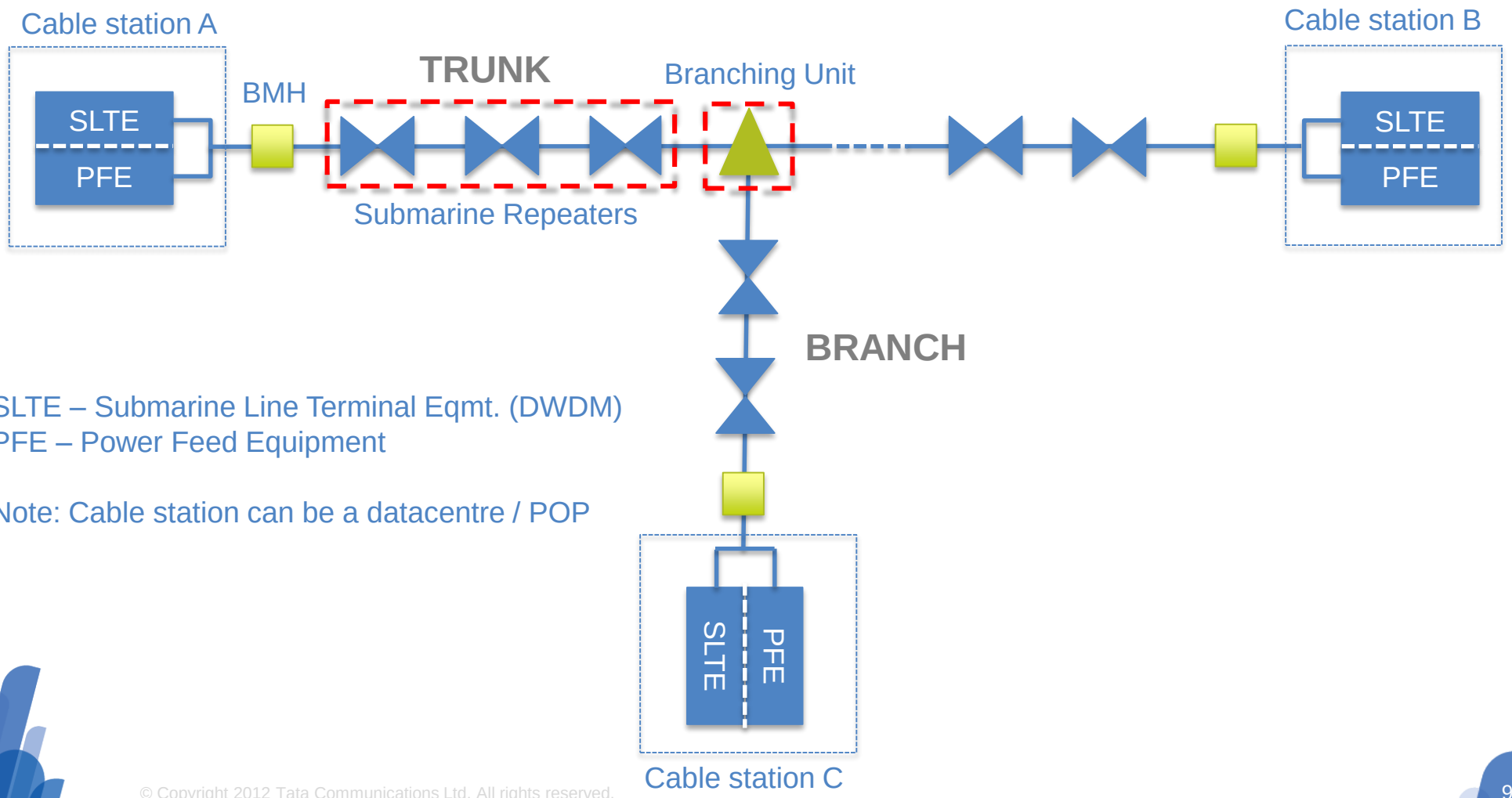

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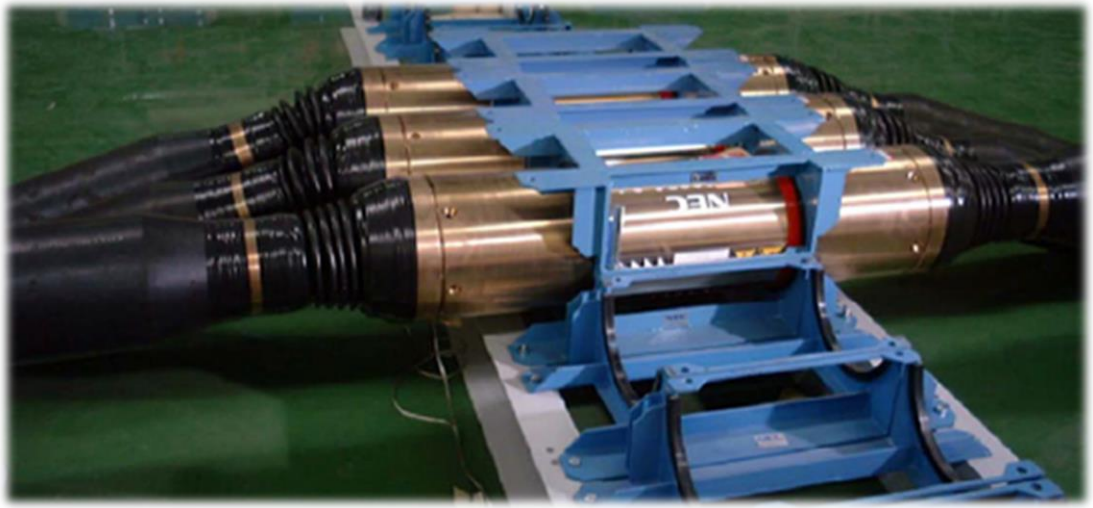
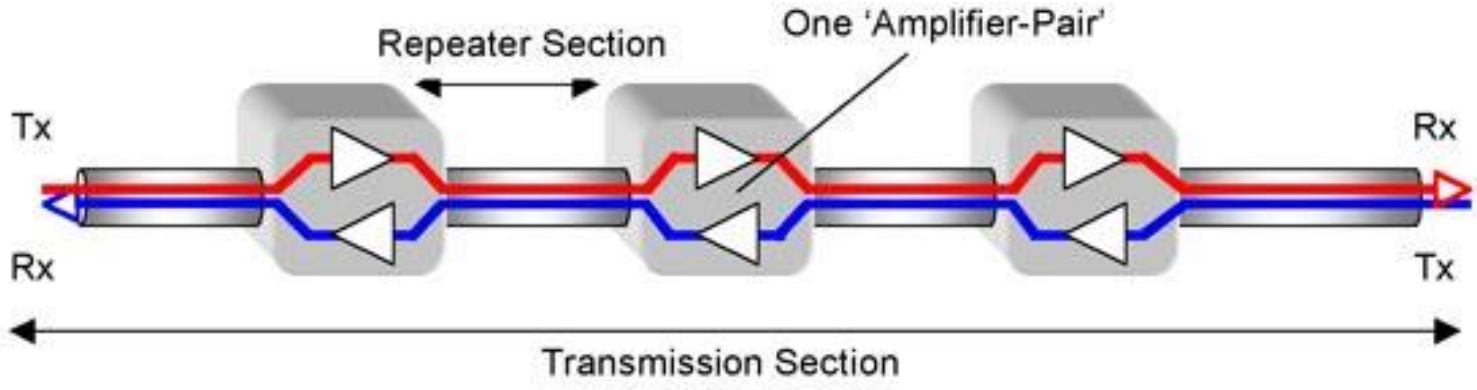
Repeaters

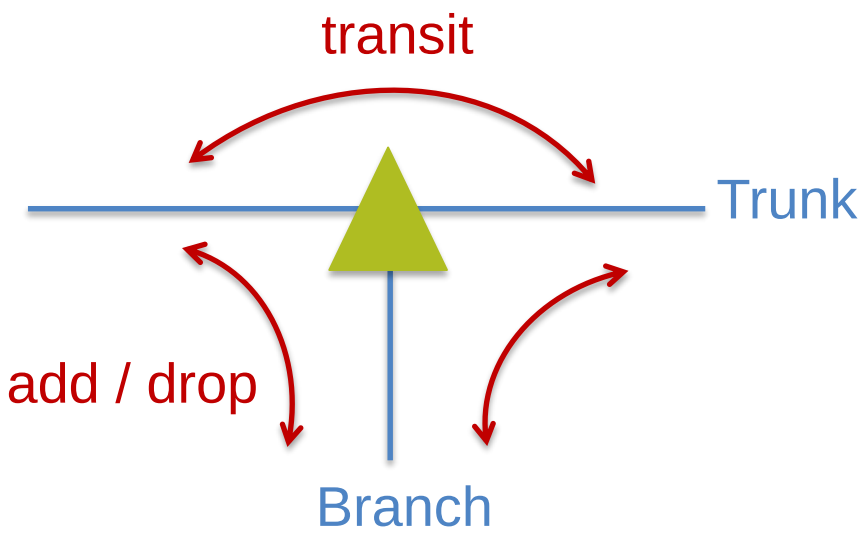




Branching Units

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



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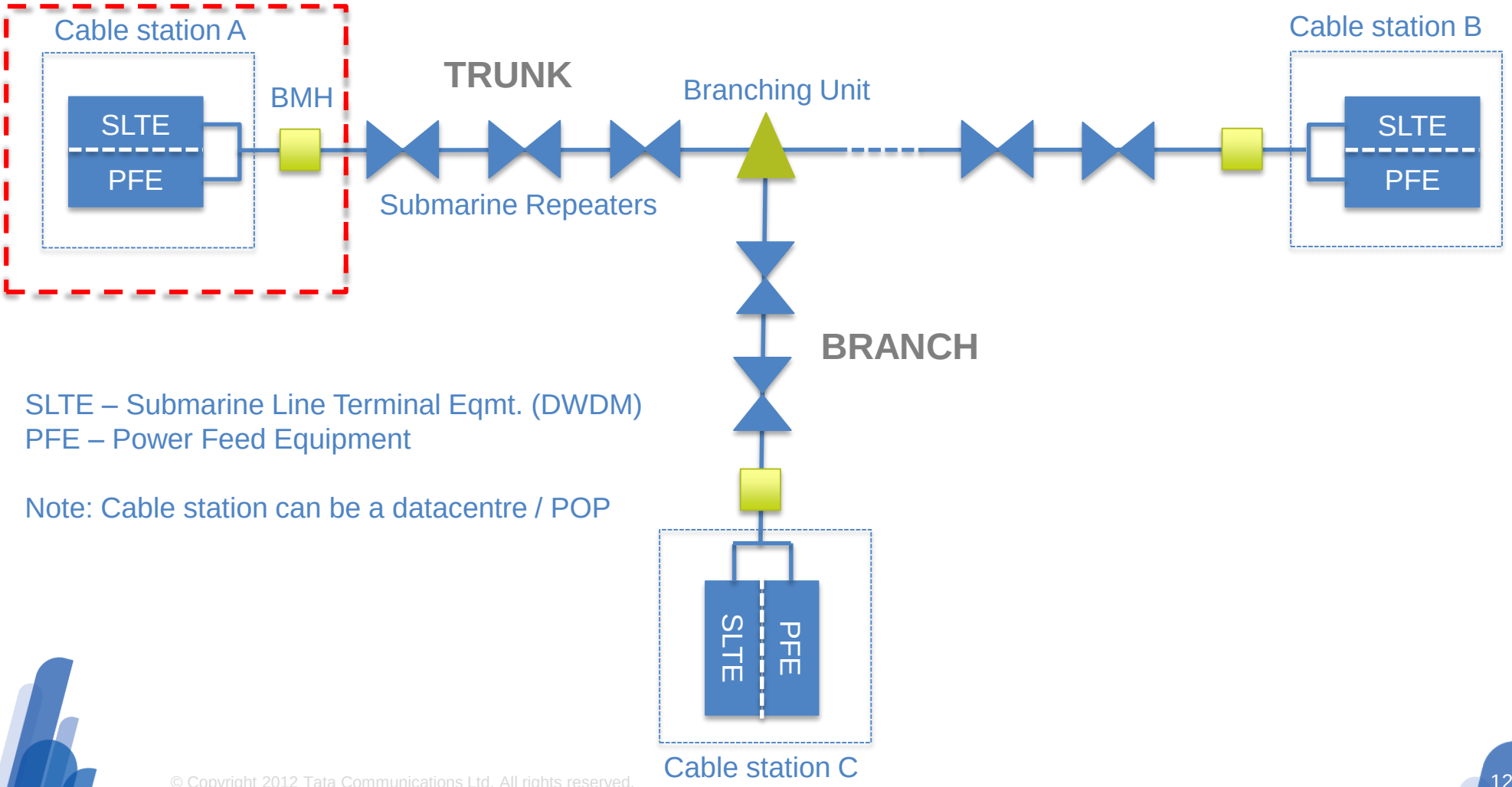

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Cable Landing Station & Beach Manhole

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

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

- **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

Typical cable vessel

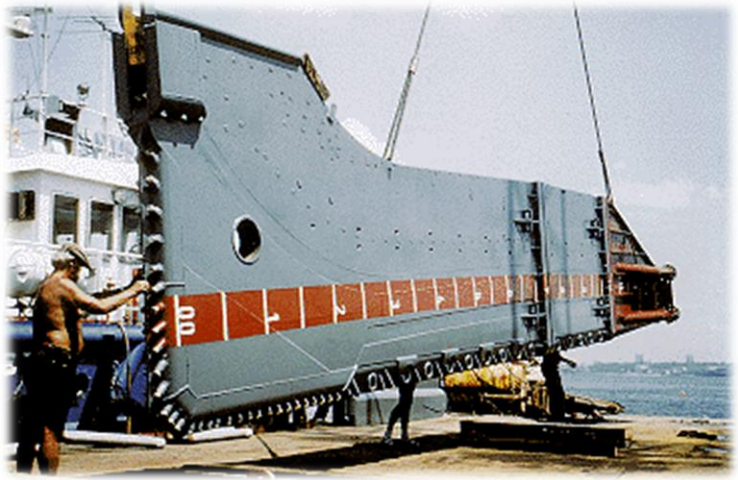
Build

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

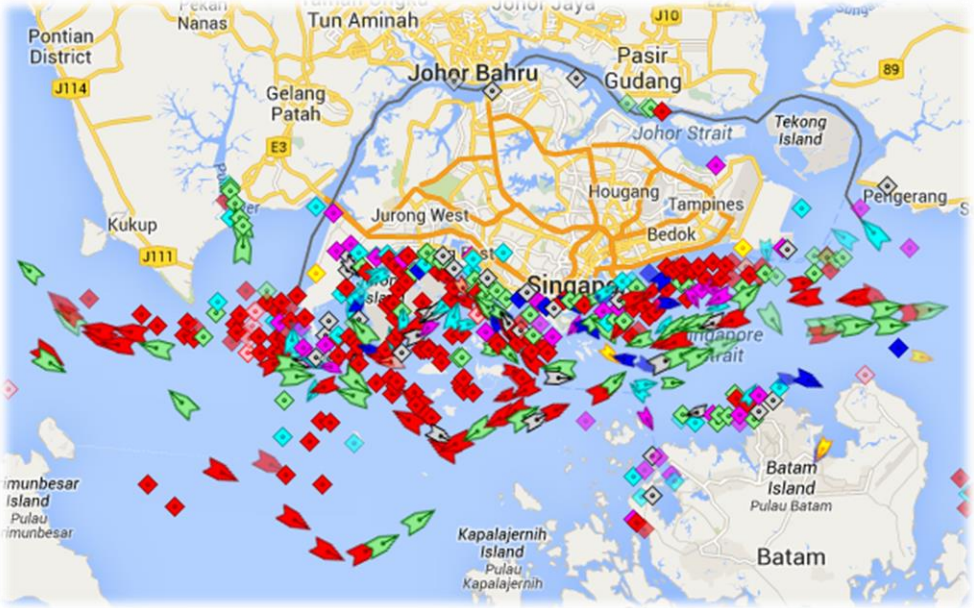
- **Cable awareness programmes**

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

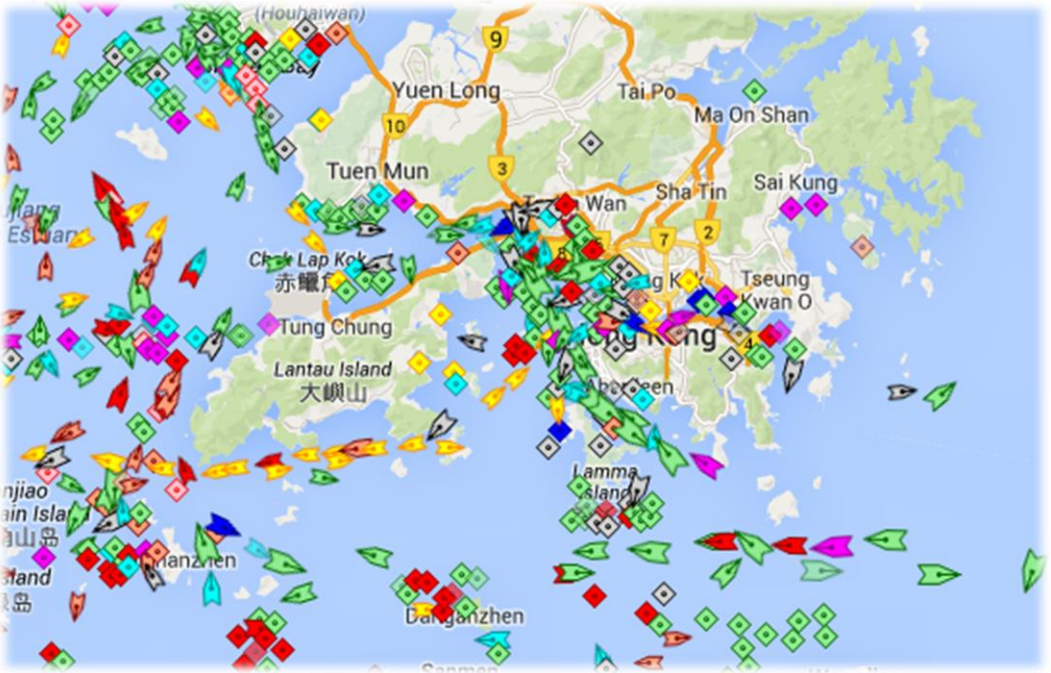
- **AIS – Automated Identification System**
  - Proactive shipping monitoring in very busy waters
  - Automatically monitors vessel positions and behaviours in relation to cable zone
  - Real time communication with vessels if required to avoid cable failure
  - Historical data can also be used for damage claim against ships and vessels

Example of vessel traffic

Snapshot of Singapore and Hong Kong: 10am 26/08/2014



Singapore



Hong Kong

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