From Tender to Deployment of Fiber

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Dark Fiber Specifications

DF spans

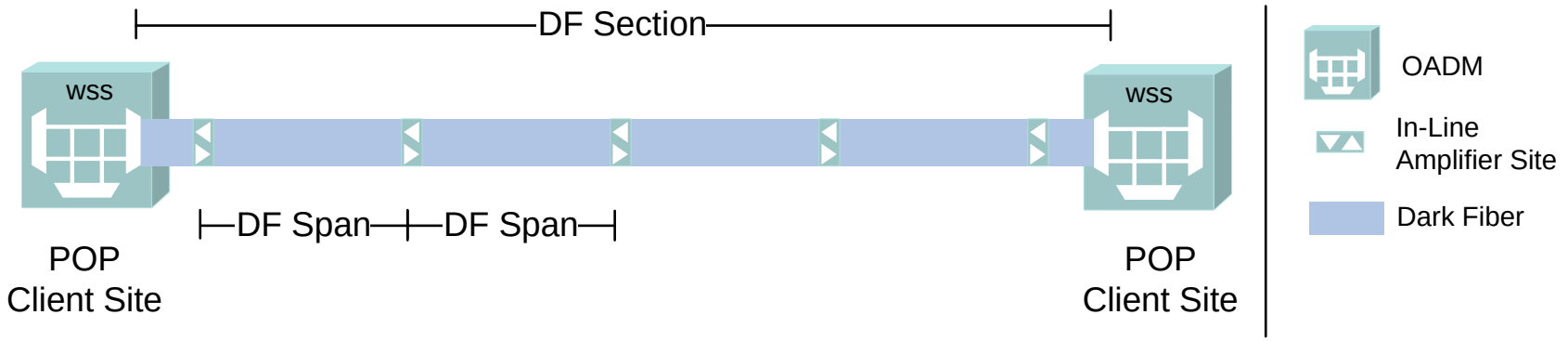
- Is the DF between adjacent sites used for active amplification of the signal
- The attenuation of a terrestrial span at 1550 nm shall not exceed 23 dB
- DF length shall not exceed 80 km
- The attenuation of a Submerged 1550 nm shall not exceed 26 dB

DF section length

- Consists of a number of DF Spans that connects two geographically specified POP's
- A DF section shall be less than 1200 km.
- Same ITU recommendation shall be valid for a DF Section

Uninterrupted fibre

- **A DF span shall consist of an uninterrupted glass fibre E2E**

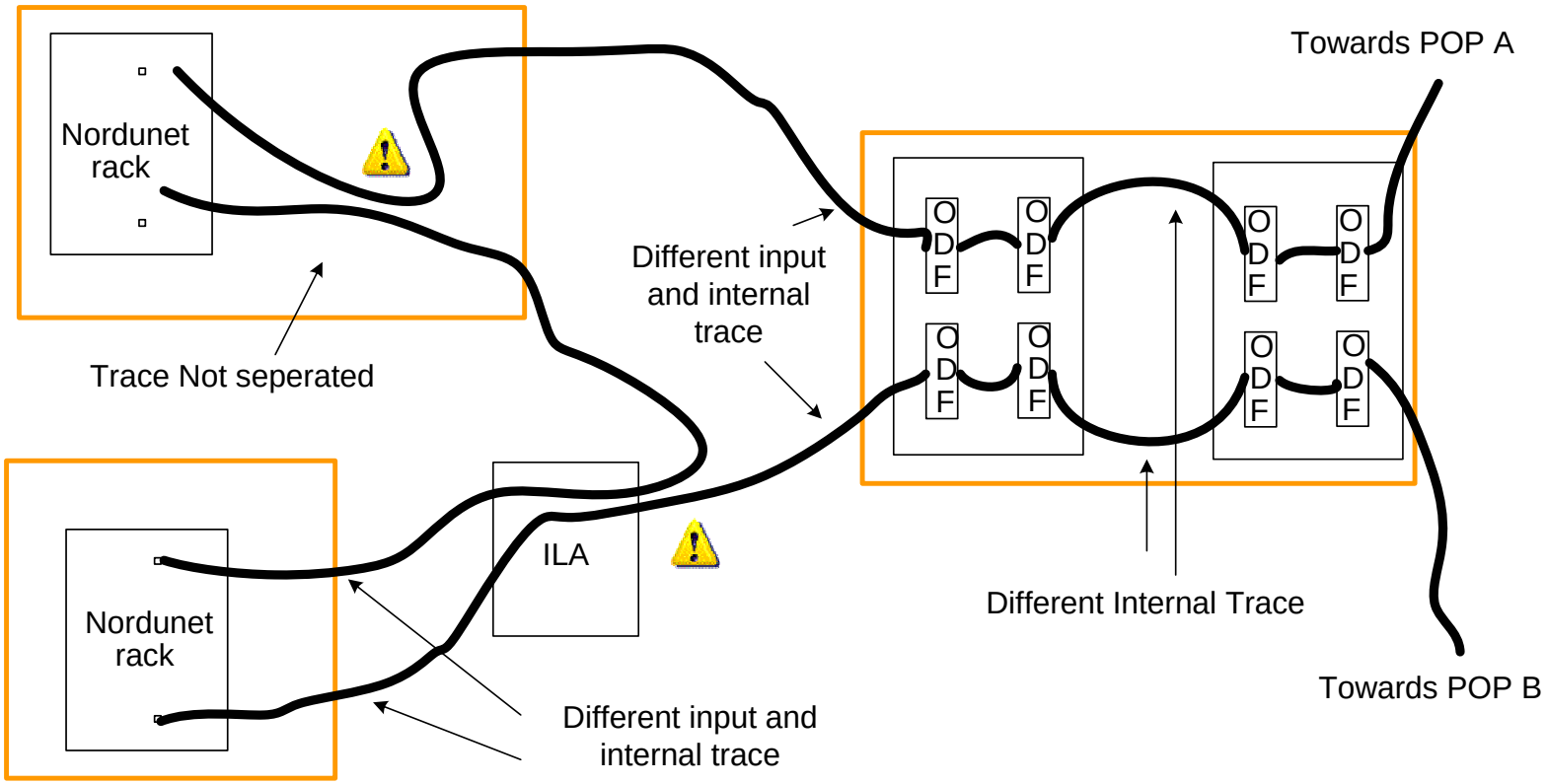


BOL and EOL DF Specifications

- Fibres shall be specified according to ITU-T 652 or 655 Fiber recommendation
- Fibres installed after 1992
- Attenuation at 1550nm and 1310nm
- Chromatic Dispersion at 1550nm and 1310nm
- Polarisation Mode Dispersion at 1550nm
- Bend losses and Seasonal variations in the fiber parameter
- Connector losses
- The attenuation for a connector splice
- Reflection
- Average DF Span splice attenuation
- Connection type according to ITU-T
- Reflection and attenuation for connections

Outside Cable Management

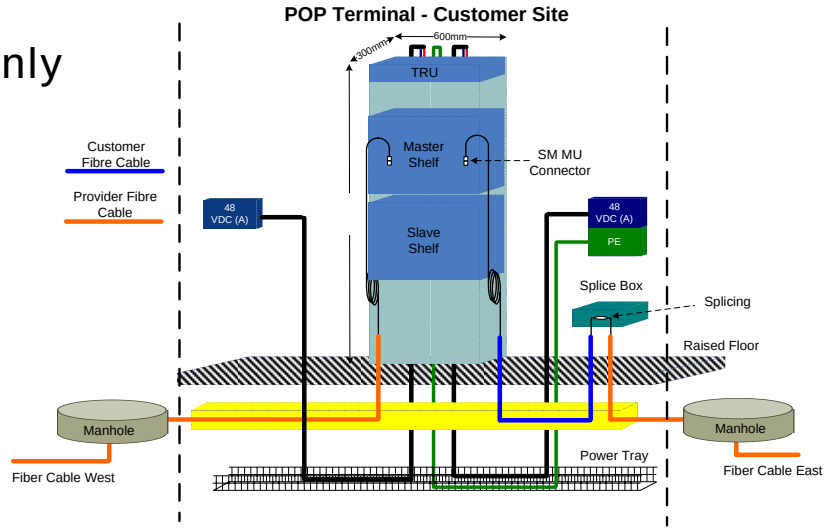
- Seen from an ILA or POP - East and west DF span cable must minimum have a horizontal or vertical separation of 5 m
- Exposed fibre part shall be secured with heavy armouring



Site Specifications

Housing facilities must fulfil basic Tele-housing standards

- Shall have a local and remote controllable security system
- Access possible for third parties 24 hours/day and 365 days/year
- Specify required floor space – with room for expansion
- Temperature and the relative humidity shall be controlled
- Power System
  - Resilient Power system following different traces
  - Power system backup
  - Protection Earth – Star Topology only
- Insure Proper cable management



Acceptance Process (1)

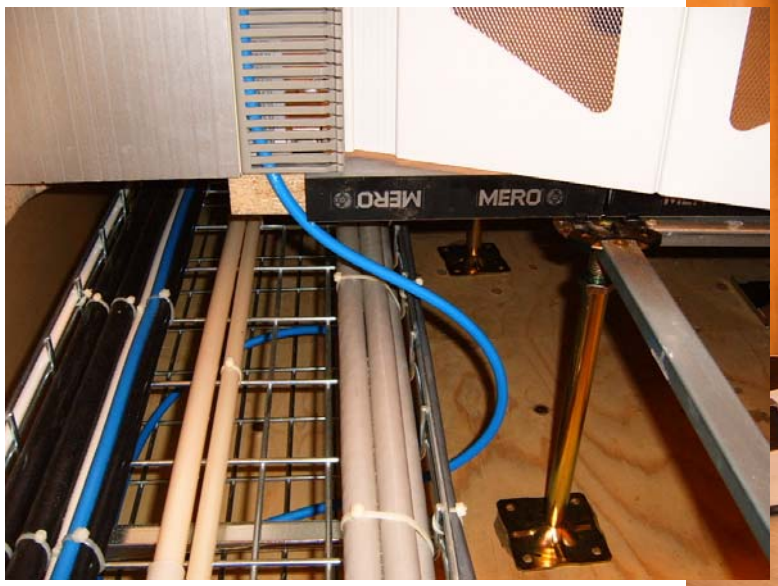
Acceptance of a DF span and a DF section

- E2E OTDR measurement between two ILA sites of the attenuation at 1310 nm and 1550 nm
- Complete documentation of each fibre pair is made by the Provider
  - Showing all splices, patches and attenuation values
  - OTDR traces shall be supplied in an electronic format
  - Labeling information
- Verification of interconnection between fiber sub contractors
- A geographical map showing the placement of the fibre trace and the network diversity

Acceptance Process (2)

Acceptance of a ILA or POP

- Site survey – Physical inspection (random check)
- Power test



Dark Fiber – Second Hand or ?

- Buying a brand new Car do you expect it to come with second hand tires?

- It's a new ballgame for the Fiber Suppliers
  - Fibers installed 5 to 20 years a go
  - Running Revenue – Small expenses
- Tuning ULH Transmission Equipment requires accurate fiber data – **Measured**
  - Attenuation
  - CMD
  - PMD
- Measuring a 1000 km. DF Section – Cost 15.000 EURO
  - Who should take this cost?
    - Fiber or the Equipment Supplier

Service Level Agreement

- Service Specification
- Delivery terms
- Uptime
- Response time
- Penalty and Compensation Model
- Escalations procedure

Project Management

Key Word >>> FLEXIBILITY

Steering Committee

- NORDUnet Project Manager
- Telenor Project Manager
  - Sub Contractors – Project Manager Eltel
- Alcatel-Lucent Project Manager
  - Sub Contractors Installation – Project Managers Eltel
  - Alcatel Lucent Commissioning Team

Project kick off Meeting and initial phase

- Every thing must be aliened and understood by all parties
  - The cable lug
- Resource demanding process

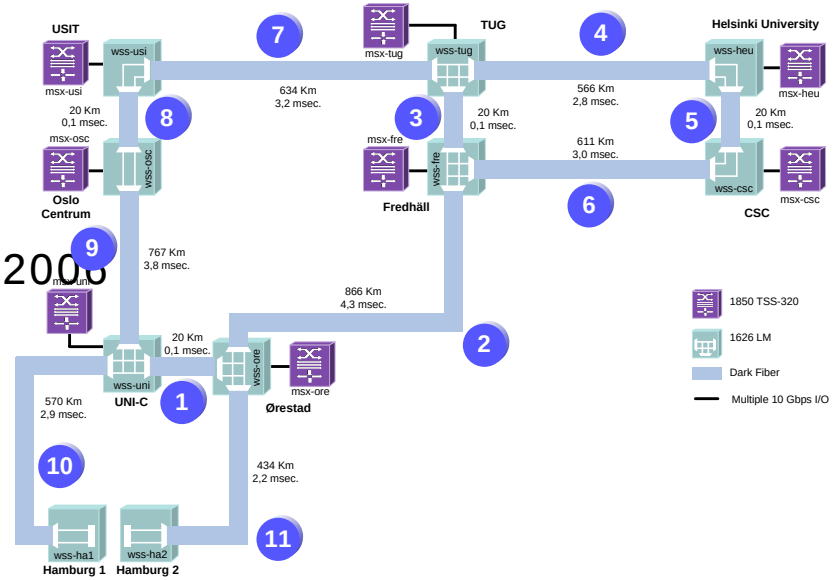
Running Project

  - Problems, unforeseen tasks etc. Solve that by putting the different performing engineers together

Project Re-Cap

Rollout progress:

- History / Recap
  - Project SR and FL start – mid October 2006
  - Project SC start – mid January 2007
- Achievements
  - All HW deliveries has been on time.
  - LINK 1-2-3-4-5-6 Installed
  - LINK 1-2-3 Commissioned wk07 (wk02)
    - Acceptance docs will be distributed in wk09.
  - LINK 4-5-6 Commissioned in wk08/09
  - LINK 7-8-9 Commissioned in wk10/11
  - LINK 10-11 “Southern Cross” on track



Lessoned Learned

- Your organisation participating in the tender process must possess good knowledge about fiber optic and ULH transmission – In order to specify and validate the tender process
- Real fibre data are crucial – Can be the difference between a huge unforeseen extra cost and a business case on track
- During project kick off make sure that your Supplier Technical project implementation team are aware of all your requirements and KPI's – Put all of that into the first MoM
- Your organisation participating in the implementation process must also possess good knowledge about fiber optic and ULH transmission – In order to validate the sub and main deliveries
- Perform a complete inspection of the first deployed site before continue deployment – In order to correct for mirrored errors based on misunderstandings

End Of Presentation

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