Building the UNINETT Optical Network

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Outline

- UNINETT's Hybrid Network Model

- RFQ process
- Status
- Future deployment

Norway in a nutshell

- ~4.5 mill inhabitants, scattered populated
- Many mountains and fjords
- Coastline of 25 148 km
  - ~62% of the length of the equator
- Shortest distance south to north: 1 752 km
  - approx 3 days by car
  - If we turn Norway upside down Spitsbergen will almost reach Africa.
- Only two owners of national fiber infrastructure ...

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hybrid networking in Norway

- Agreement with BaneTele (infrastructure owner) consist of:
  - Cost based upgrade option in existing IRU-agreement
  - BaneTele and UNINETT share the DWDM resources
  - UNINETT buy and own the initial DWDM deployment
  - BaneTele make the installations, Equipment commissioning, Operations, Maintenance and equipment housing.
- Solution includes:
  - lambdas provided for BaneTele as payment for Operations & Maintenance, equipment housing and UNINETT's use of a new optical path between Trondheim and Tromsø.
- 10000km (7500km) of fiber (5000/3750km fiber pair)

General issues regarding shared network model

- "Shared network model" check list.

1. RFQ process
   A. Different requirements and needs
   B. Different deployed technology background and technology strategy
   C. One must consolidate each parties requirements, needs and strategy
2. Management (system monitoring)
   A. Should any of two partners be able to view the entire network?
   B. Do we need to create several management domains?
   C. What are the limitations and possibilities regarding the multi domain management system in the new platform?
      1. These kinds of issues should be addressed and clarified with the vendors in the RFQ process.
3. Service activation
   A. When only one of the partners has the operational responsibility, how could we activate a new wavelength or create a new service on the DWDM platform?
   B. Operational models for dynamic handling of wavelengths must be developed

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Issues regarding shared network model (cont.)

4. Test and research activities
   A. Any test and research activity on the DWDM platform could effect other working wavelength and services.
   B. Should this kind of activity be allowed?
   C. Do we have common views?
   D. Procedures for test activity are needed
5. Documentation
   A. Two organizations probably have two different documentation systems and different ways to address the same issues
      1. The issues could be so simple as to how we could name different nodes, and address different slot positions.
6. Vendor communication
   A. Do we have a common communication channel with the vendor?
   B. How should we organize and manage it?

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Some requirement and evaluation criteria

- Support for at least 80λ
- Long reach without 3R regeneration (at least 1300km)
- 10G and 40G wavelength support
- Support for 1G, 2,5G, 10G and 40G services
  - Ability to aggregate and mux different client bitrate into same wavelength
- Mux/demux structure
  - OADM's EOL capacity
  - ROADM functionality

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RFQ evaluation

- Open tender process
- Received 8 tender
- We end up with 3 vendor in our short list
- Negotiated process on DWDM equipment since May 2006. NSN have been chosen in February 2007, negotiation of contract during April 2007.
  - "SURPASS hiT 7300" platform from NSN (Siemens)
    - Based on price, functionality, support and service ability

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SURPASS hiT 7300

Functionality

- CWDM/DWDM system for metro/regional/LH/ULH* applications
- 40/80* channels x 2.5G/10G/40G, 1800/2500* km optical reach, 65/70dB single span reach
- Full C Band tunable lasers, 100% (R)OADM, PXC*
- Point-to-Point with intermediate add/drop, ring and mesh topologies
- Common shelf and components for OTT, (R)OADM, PXC, and OLR

Services

- SDH/SONET/OTU 155M, 622M, 2.5G, 10G and 40G services
- GE, 10 GE LAN PHY and WAN PHY, SAN
- Muxponders for 155M, 622M, 2.5G, 10G, Gig E and SAN services
- Full G.709 compliance
- Optical protection

Services

- Comprehensive automation features for planning, commissioning, provisioning, and maintenance
- Full TNMS integration, SNMP v3

* 2008

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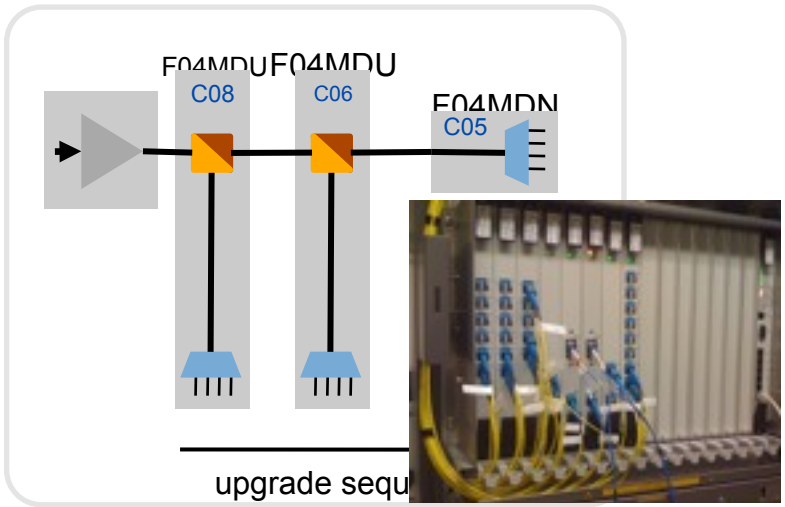
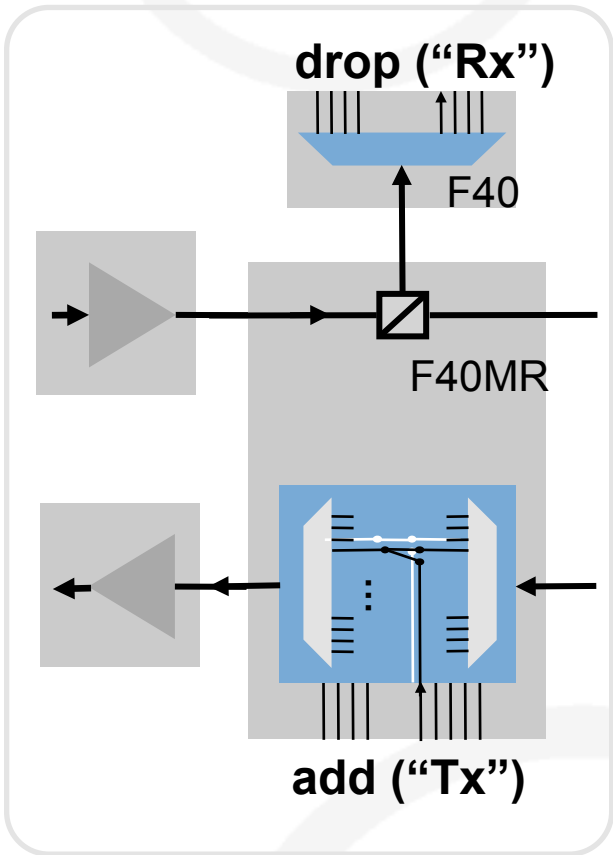
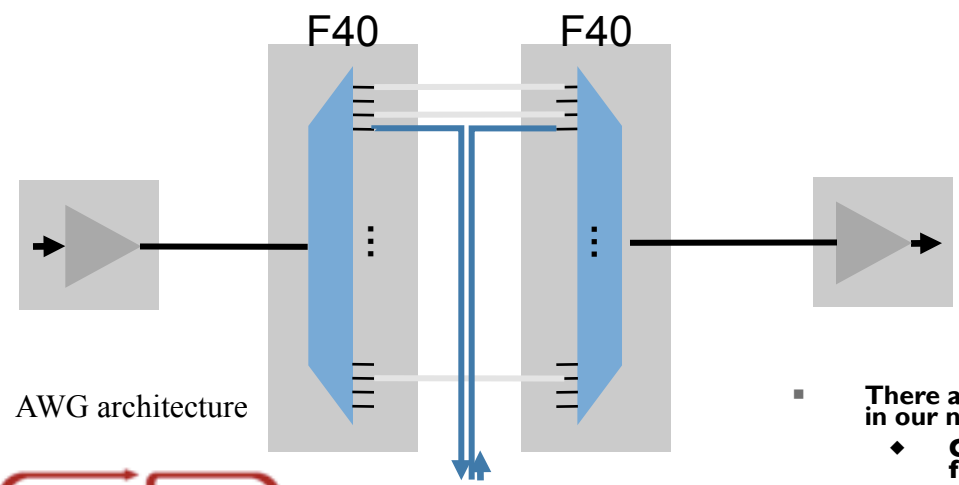
Source : NSN

(R)OADM solutions







- There are three different type terminal and (R)OADM design in our network
  - Choice of solution depends on node’s size and functionality

Source : NSN

Transponders

- Deploying only two kinds of transponder
  - 10GbE LAN

- We are planning to test alien wavelength on hiT 7300 during summer
  - 10GbE LAN with FEC
  - 10GbE LAN without FEC

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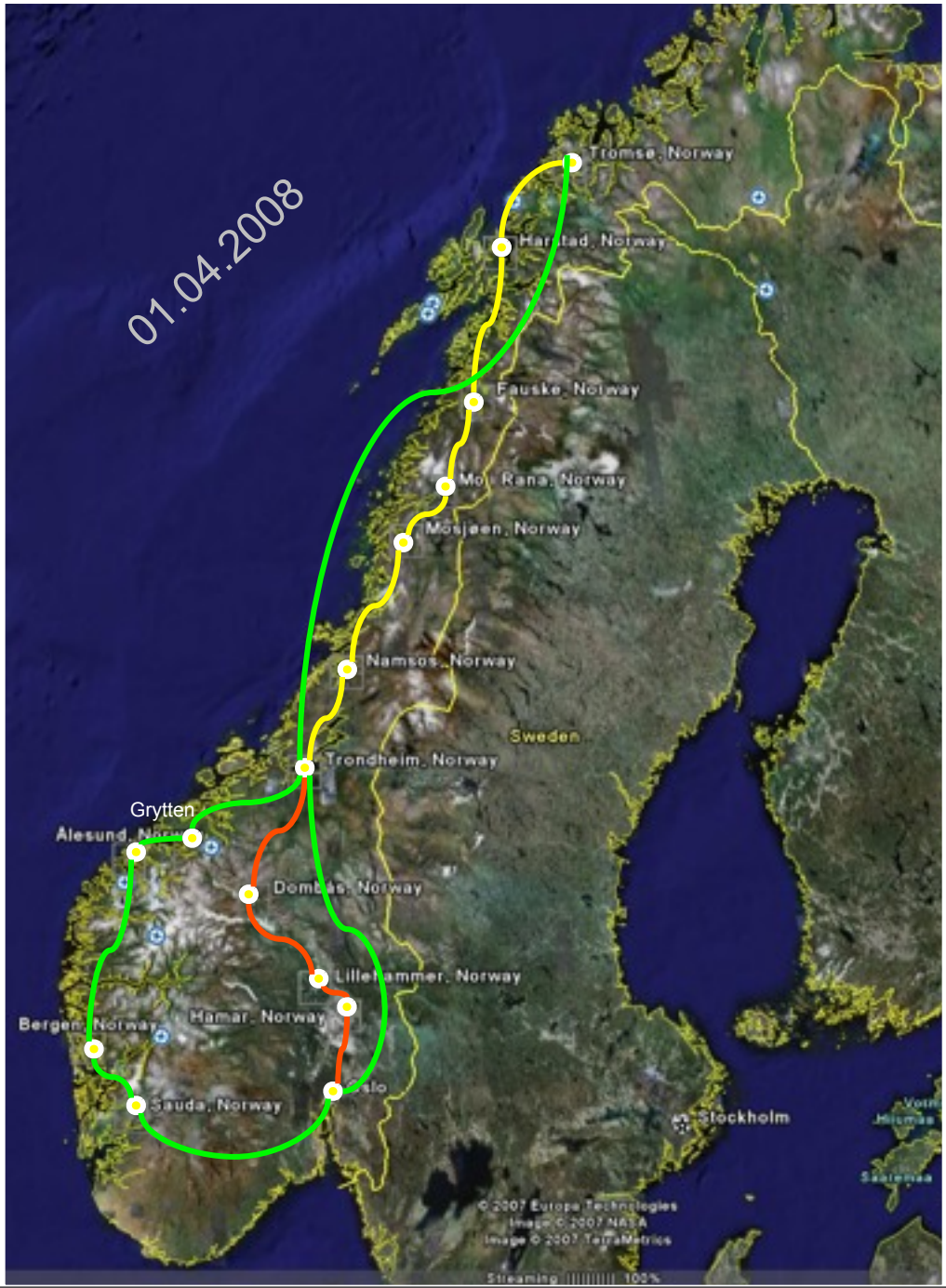
Situation today

- 4 DWDm system is up and running
- Another system is on order and plan to deploy it June/July
- The last one is planed to be in service during 2H/2008

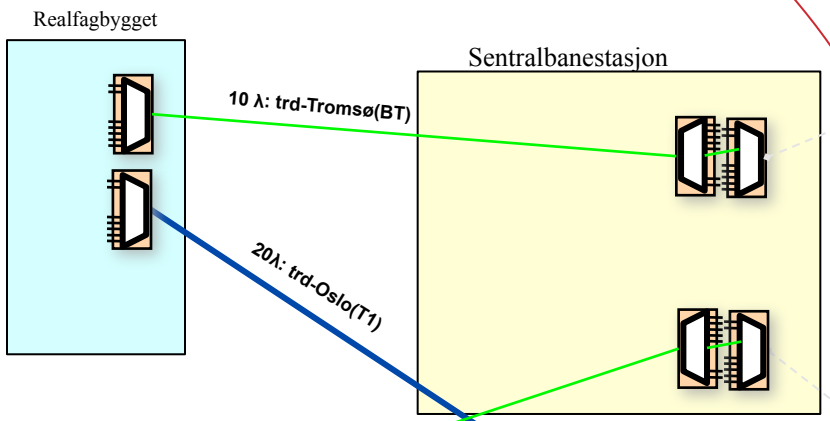


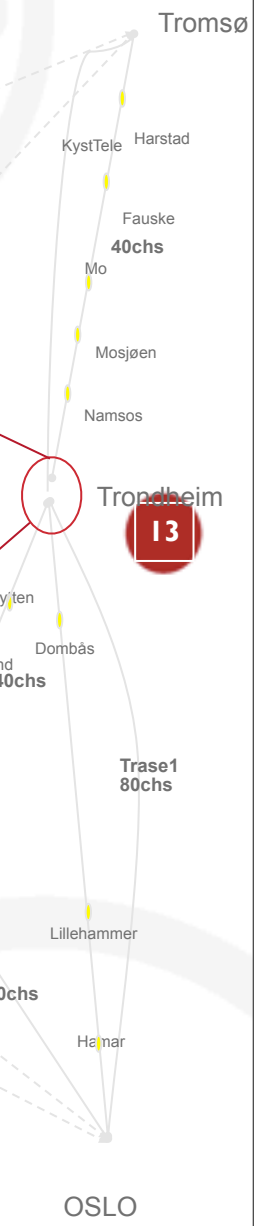
Deployed and in service

On order and planned to be in service within July

Q3 2008

Local design model in cities

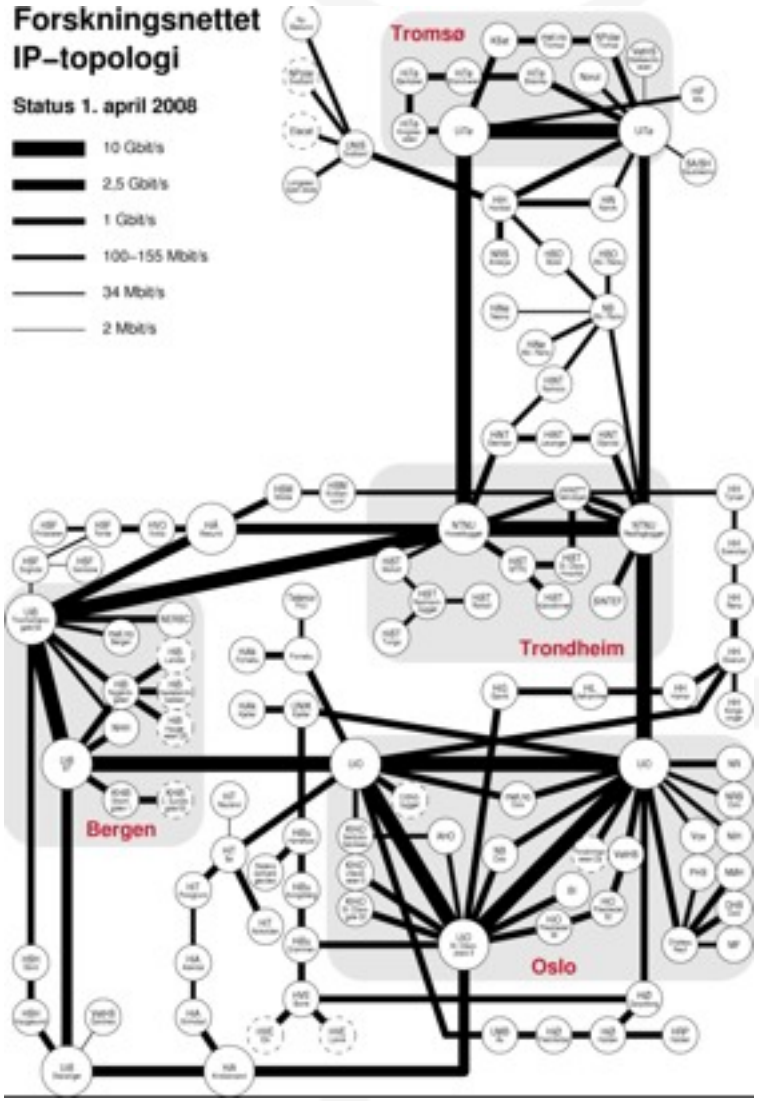




- Full redundancy between cities
  - Different fiber path
  - Different node location
- Full redundancy internal in cities
  - Different fiber path
  - Different node location in both DWDM and IP level

Norwegian research network, 01.04.2008

- 1 – 10 Gbit/s connectivity between IP-nodes based on leased line and own DWDM systems
- Redundancy
- 40 universities and university colleges
- Tradition for support to colleges and cooperation with universities, reestablished with "GigaCampus program" from 2006
- > 200 institutions 250.000 users
- Operations from Trondheim



Thanks for your attentions.

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