BelWü

Landeshochschulnetz Baden-Württemberg

backbone upgrade
DWDM & 100G

BelWü?

- financed by the Ministry of Science, Research and the Arts
- connecting mostly higher-education institutions
- some commercial customers
- NOC in Stuttgart

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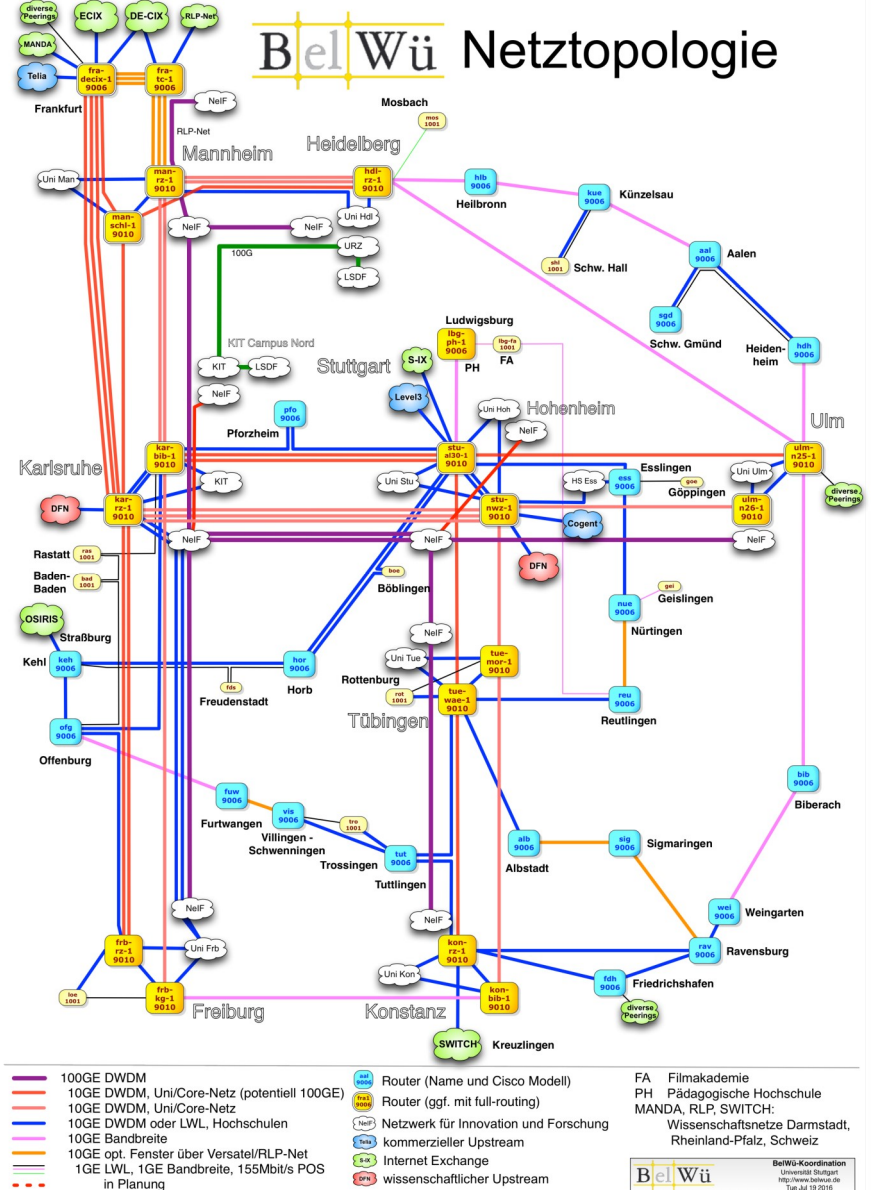
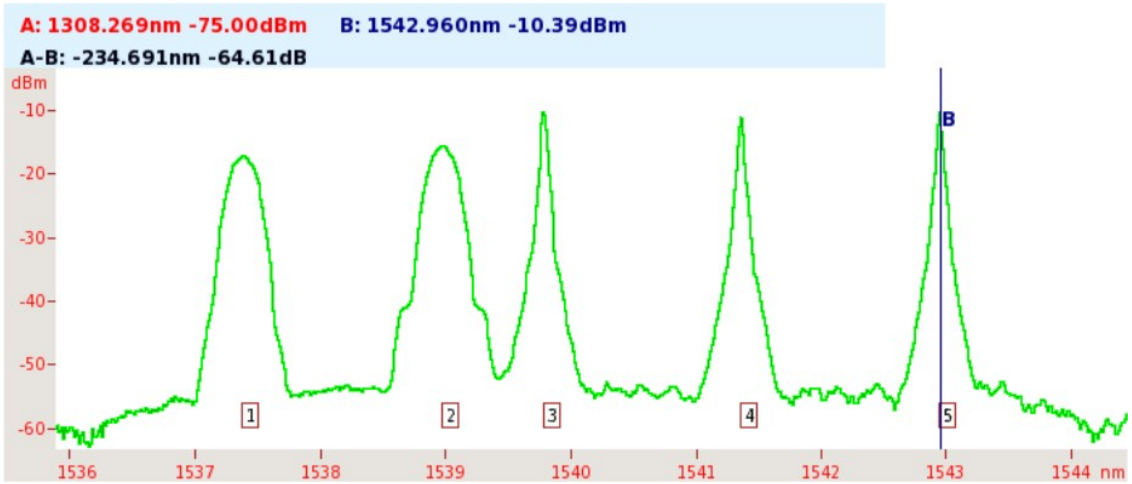
Backbone 2016

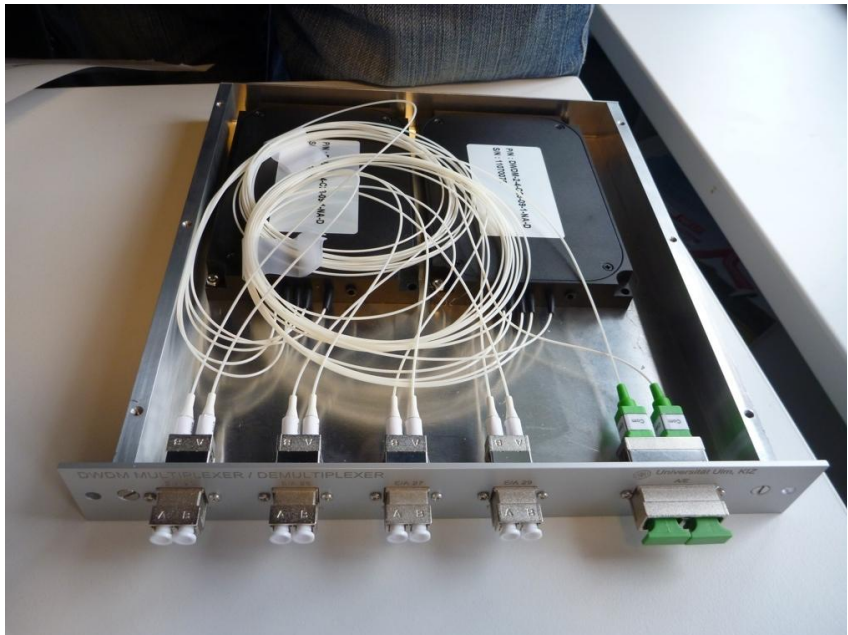
- homemade DWDM setup
- many leased 10G links
- good redundancy, but reaching limits
- not flexible at all



WDM-Setup (today)

- hand made DWDM boxes (credits to Uni Ulm)
- statically wired up
- usually 4, 8, or 16 channels





BelWü Quick Facts

- 9 Universities
- 40 Colleges
- 3k Schools
- Museums, Libraries, Government, …
- 60 PoPs
- > 3.300km Dark Fiber
- > 300 customer ports with 10G
- > 200 Backbone-Links

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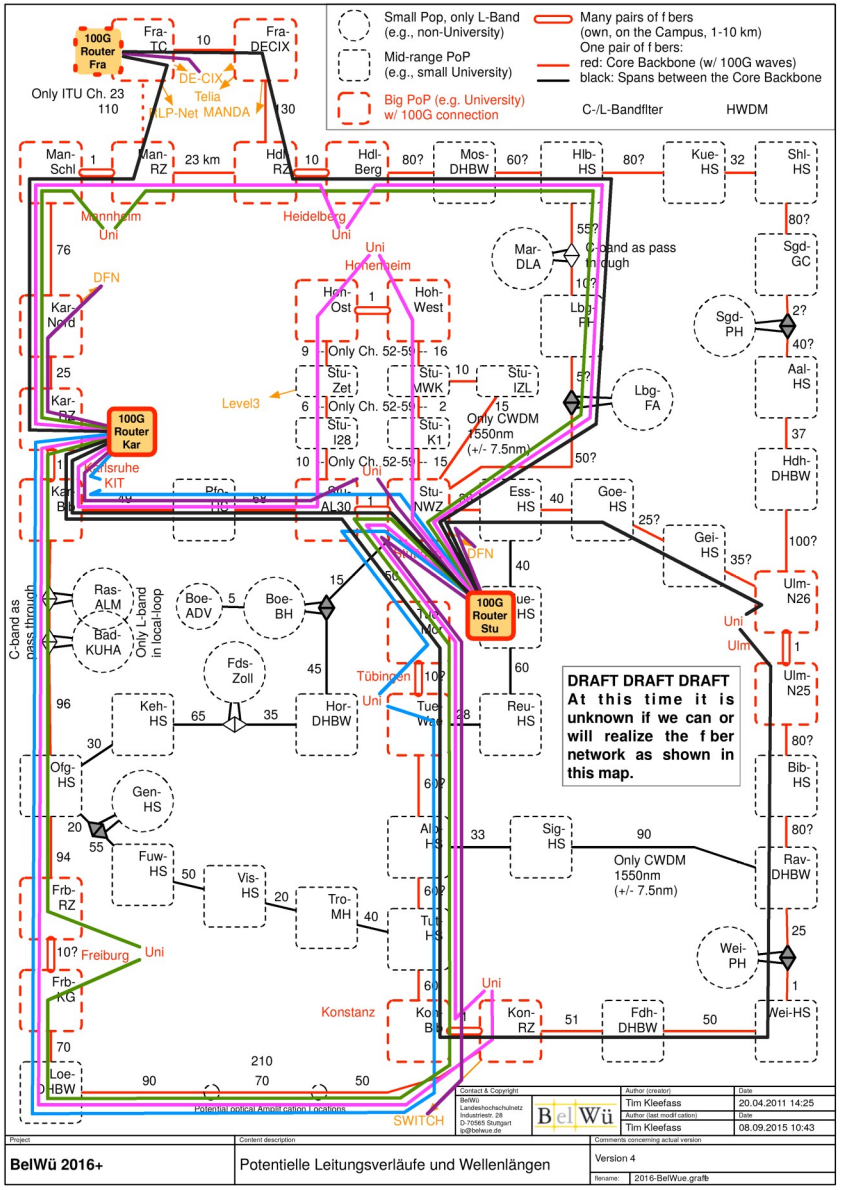
WDM-Platform

- ECI Apollo Platform
- mostly colorless, directionless
- 88 channels, Flex-Grid ready
- 55 optical POPs planned
- mostly 2 or 3 degrees, up to 8

WDM-Platform

- flexible optical networking
- get the number of backbone routers down from 60 to just a few
- 2x 100GE for each University
- much much more flexibility
- optical protection for fibercuts
- layer 1 connections for customers

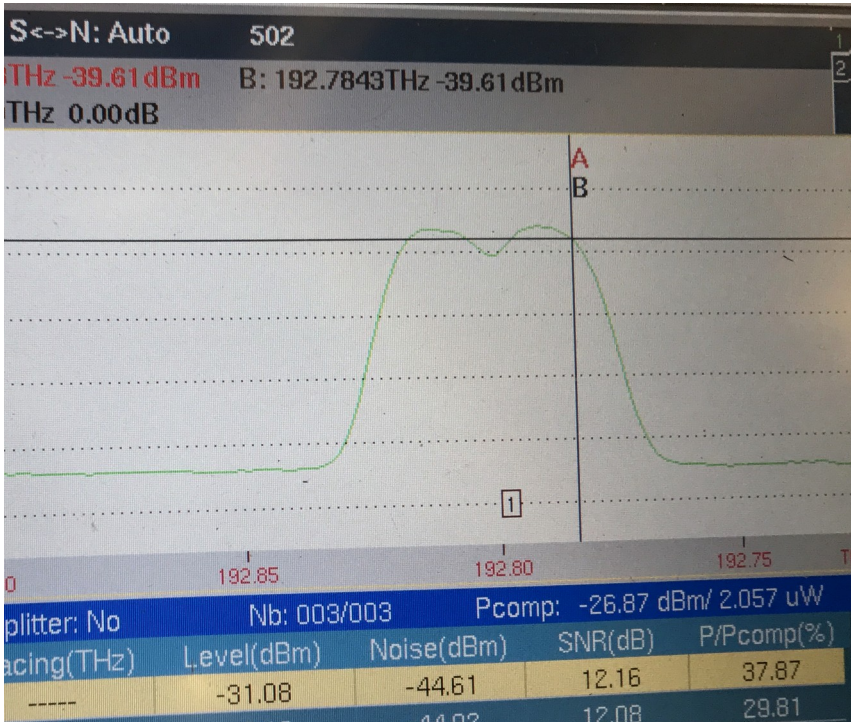


400G in one 100GHz channel

- 2x 200G in one 100GHz window
- ECI TM400 Card

  ⟶ 2x fixed line side

  ⟶ 4x D-CFP2 client side
- 4x 100G via one leased channel



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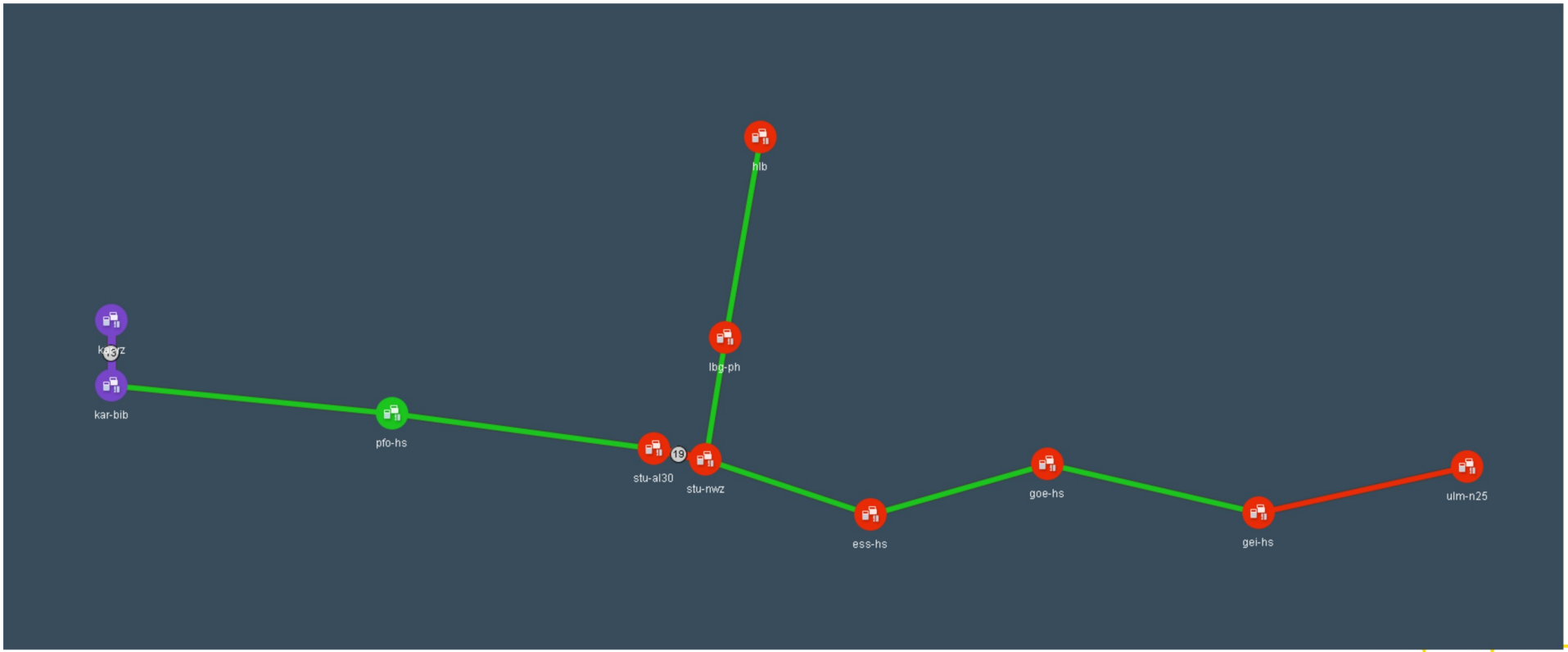
WDM Platform Rollout



YANG Development Kit

- Configuration via object oriented programming
- NETCONF for communication with routers

```
neighbor = bgp.neighbors.Neighbor()
neighbor.neighbor_address = "172.16.255.2"
neighbor.neighbor_group_add_member = "IBGP"
bgp.neighbors.neighbor.append(neighbor)
```

Thank you!