

# DE-KIT(GridKa) -- 100G @ LHCONE

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STEINBUCH CENTRE FOR COMPUTING - SCC

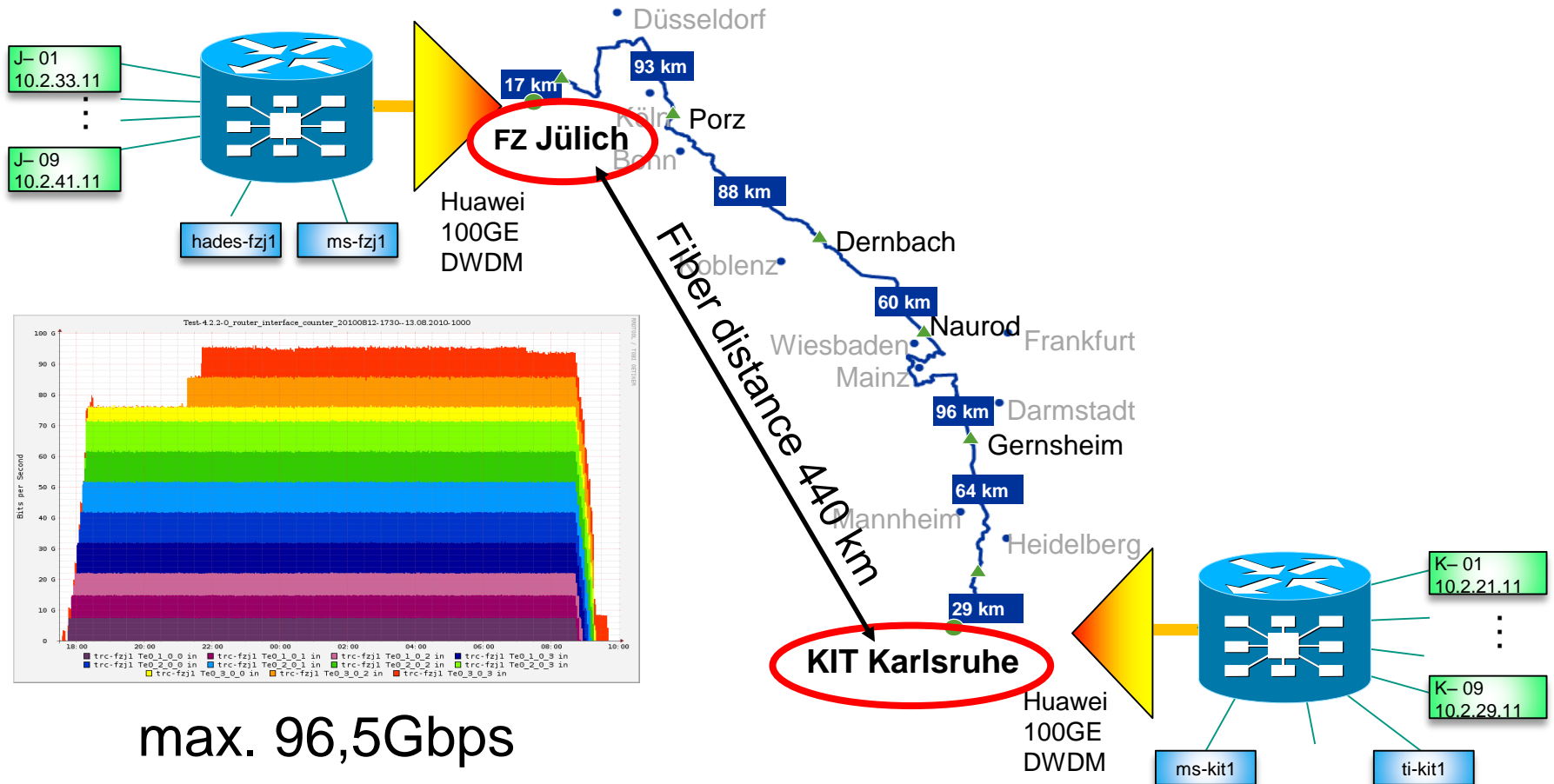


# Agenda

- History
  - 100G between KIT and Jülich (2010)
  - SC13 – 100G from KIT to SC13 (Caltech-booth)
  
- 100G @ (DE-)KIT
  - Motivation
    - NREN proposal
    - DE-KIT proposal
  - KIT -- proposed Deployment Steps
  - Upgrade Sketch
    - At Upgrade Involved
    - Splitting into Parts
  - Market survey
  - (DE-)KIT deployment

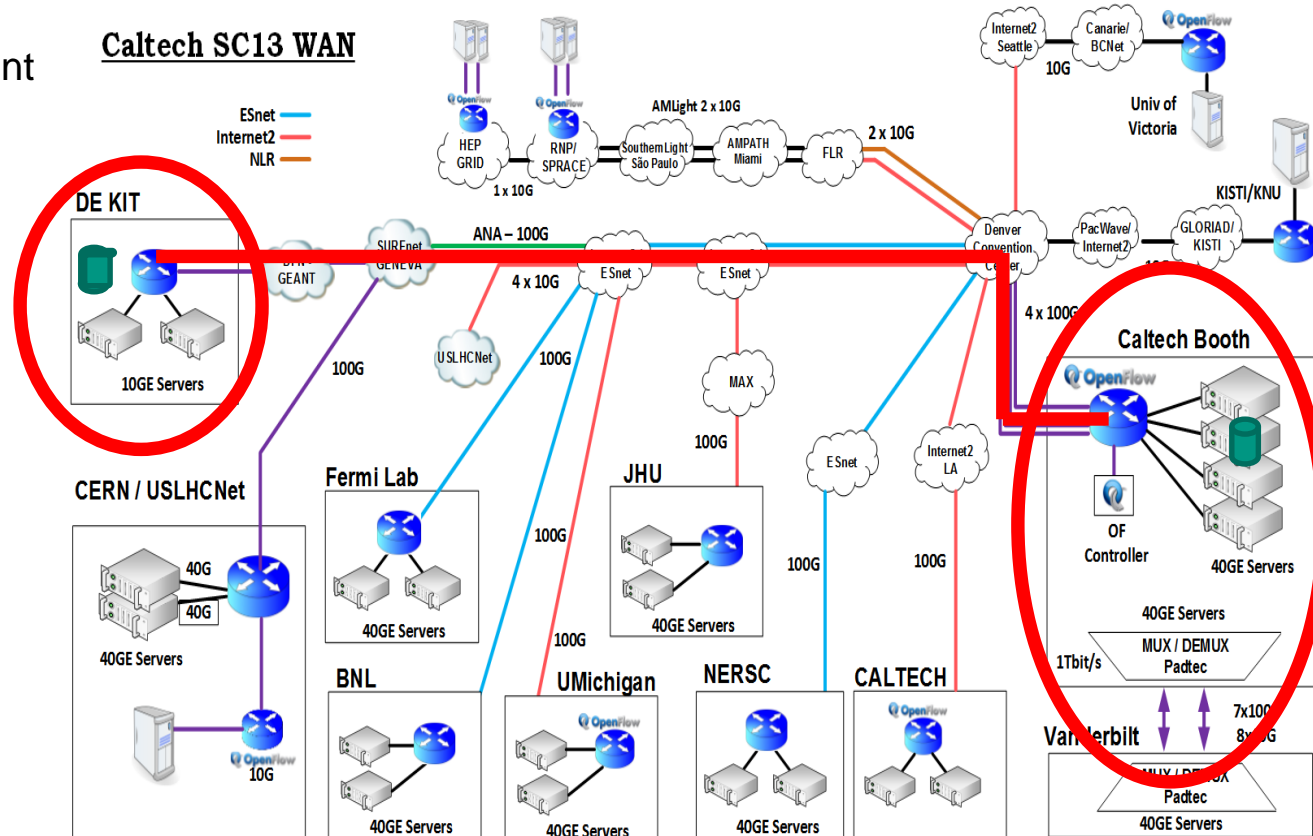
# History

- 2010 – KIT – Jülich (DFN/Huawei/Cisco/Gasline)



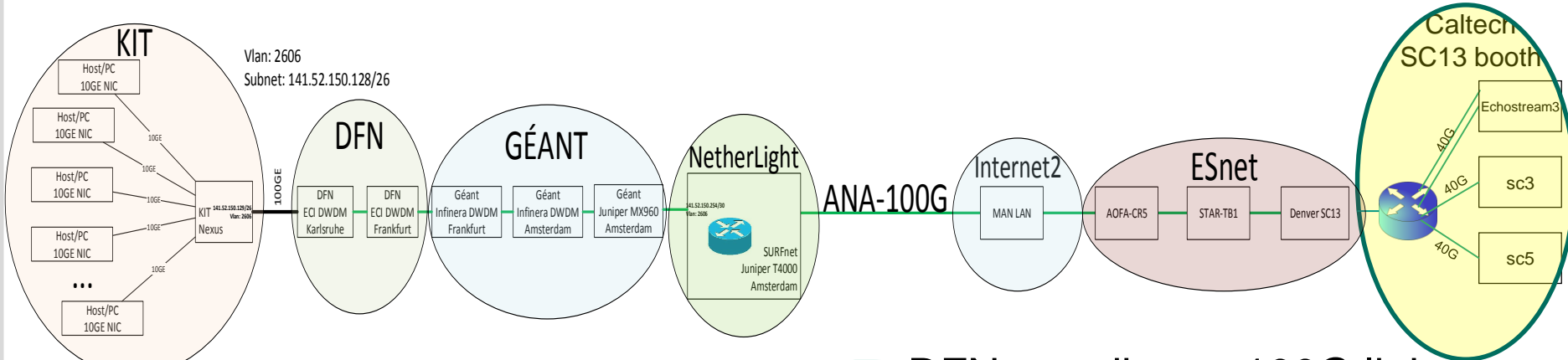
# KIT @ Caltech SC13 WAN Demo

- Storage to storage file transfer
- File transfer via FastDataTransfer (FDT) application
- @KIT
  - 20 Fileserver different capacities
  - 10G NIC
- @Caltech booth
  - 3 Fileserver
  - 1 or 2 40G NIC
  - SSD Harddisk



Supporting Vendors: Mellanox, Brocade, Echostreams, Intel, Cisco, Dell, Padtec, Ciena, SGI, Seagate, FusionIO, iWnetworks, Juniper, ADVA

# WAN – KIT ↔ SC13



- @KIT: Nexus 7010 : 100G linecard (LR-4)

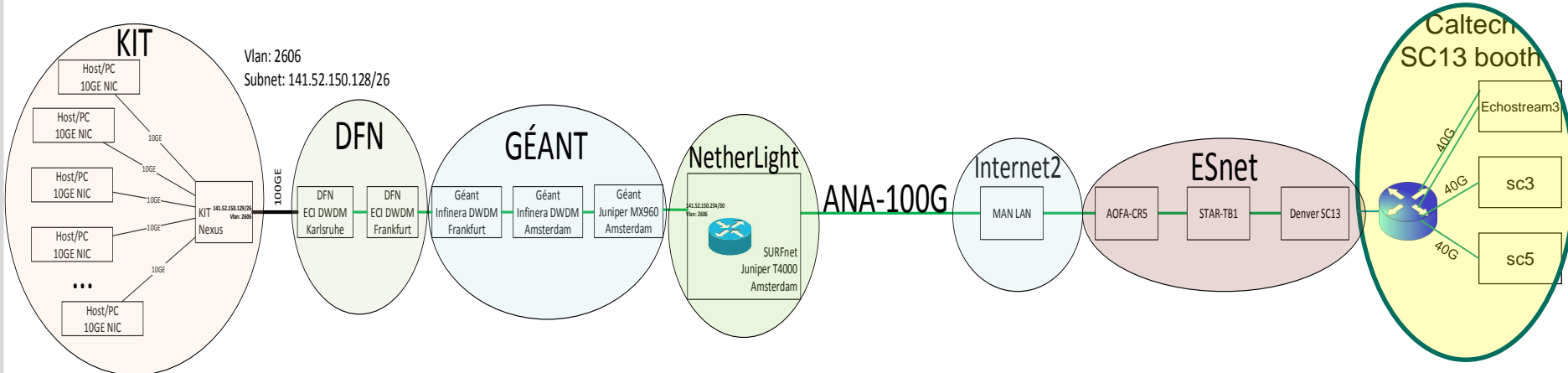
■ ■ ■

- ANA-100G (transatlantic link)
- @NewYork MANLAN (Internet2) and via Esnet to SC13 Denver

- DFN contributes 100G link Karlsruhe - Amsterdam

- DFN PoP Karlsruhe ECI 100G to DFN PoP Frankfurt
- @Frankfurt : peering to Géant
- Géant PoP Frankfurt to Géant PoP Amsterdam
- @Amsterdam Géant Peering via MX960 with SURFnet T4000

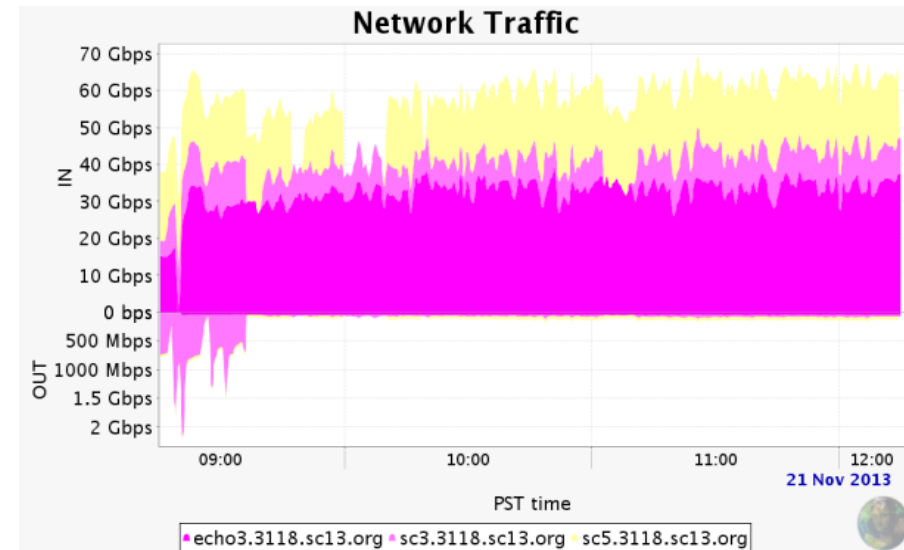
# WAN – KIT ↔ SC13



## Throughput:

### ■ Monalisa

- 70Gbps at monalisa
- peaks up to 75Gbps



# Agenda

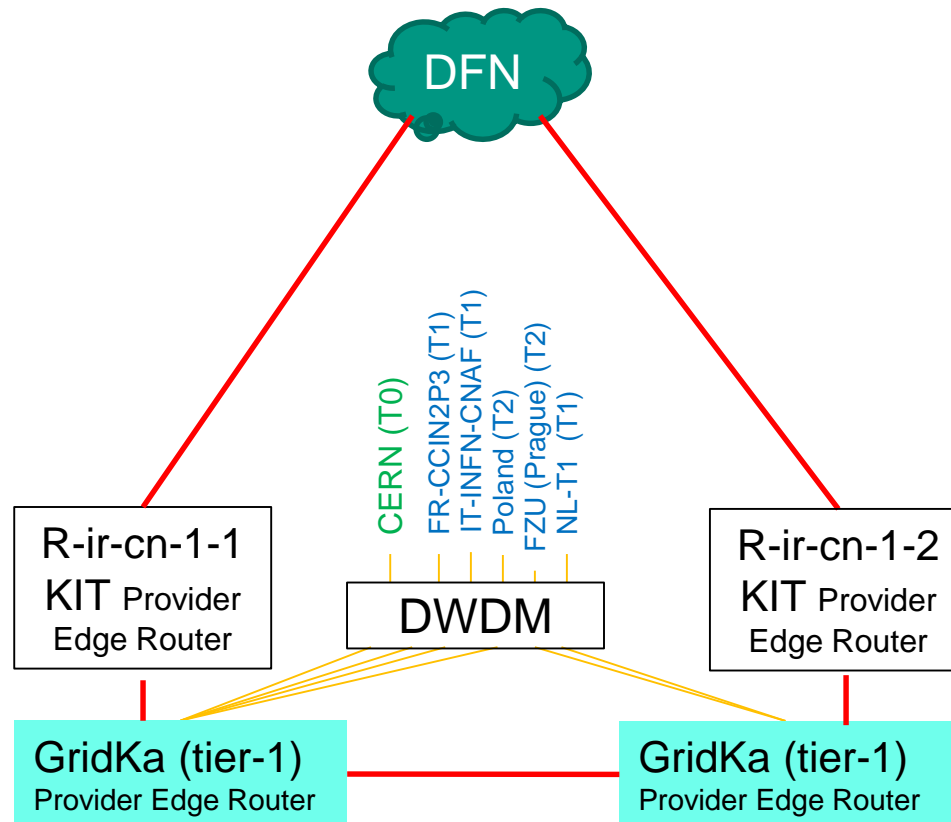
## ■ History

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## ■ 100G @ (DE-)KIT

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- (DE-)KIT deployment

# DE-KIT / GridKa German LHC Tier-1 status



## Legend:

- 10G Ethernet
- 10G VPN End-to-End

LHCOPN: T0 – T1

Direct connected sites: T1 – T[12]



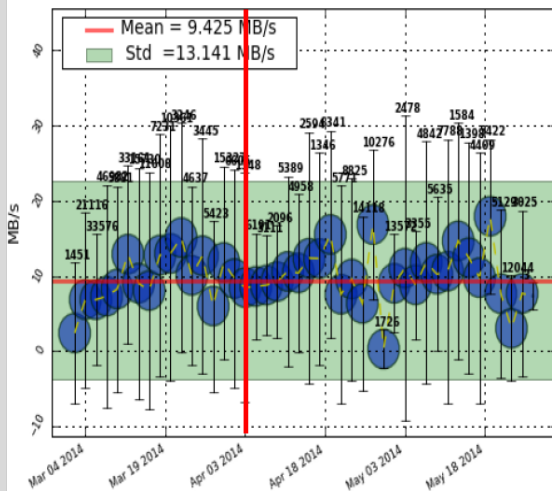
# Géant initiated merging test of dedicated tier-1 connections to LHCONE

## DE-KIT FTS Monitoring (ATLAS)

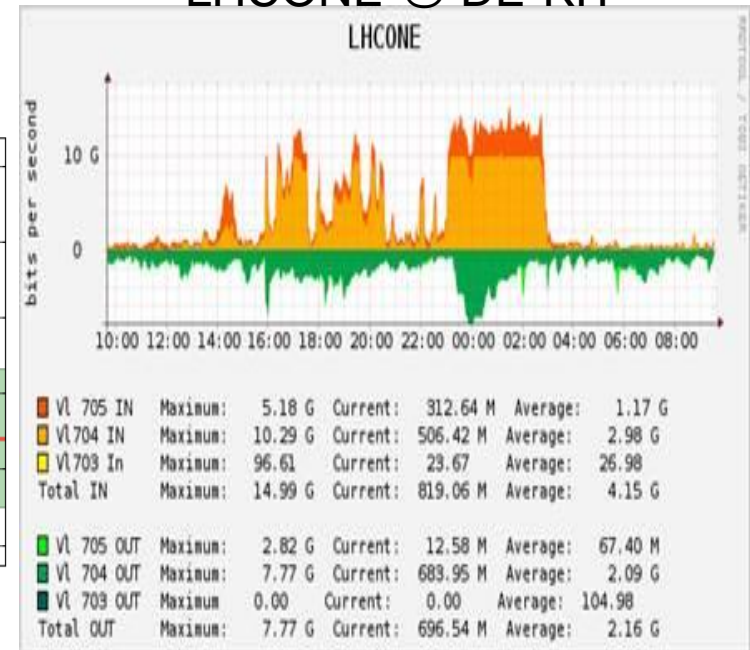
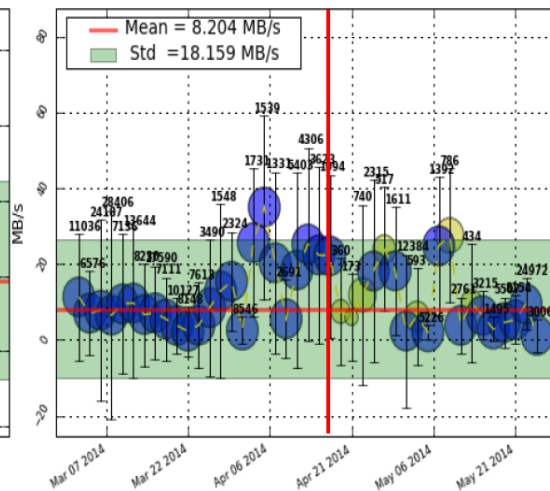


## LHCONE @ DE-KIT

FTS transfer rates per file  
From FZK-LCG2 to IN2P3-CC



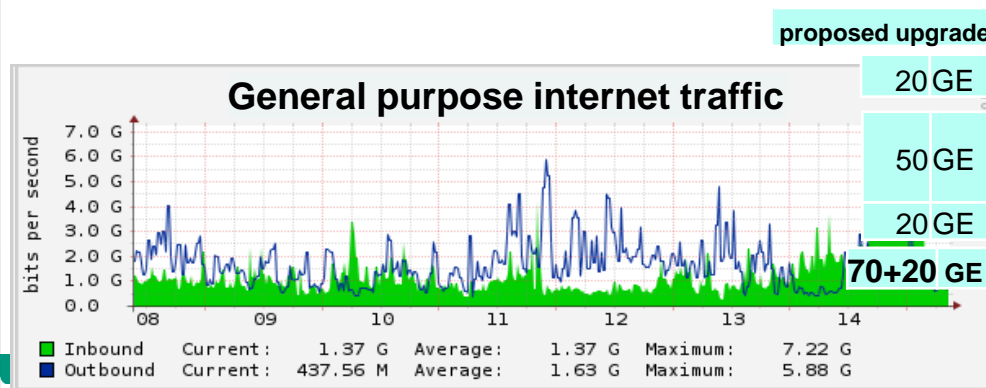
FTS transfer rates per file  
From FZK-LCG2 to INFN-T1



*N.B.: the vertical red line on the graphs highlights the route handover date*

# Upgrade Motivation

- LHCOPN link was saturated even during LS1
- LHCone → max. usage 15Gbps DE-KIT to Tier-[123]
- General Purpose Internet → max. usage 10Gbps



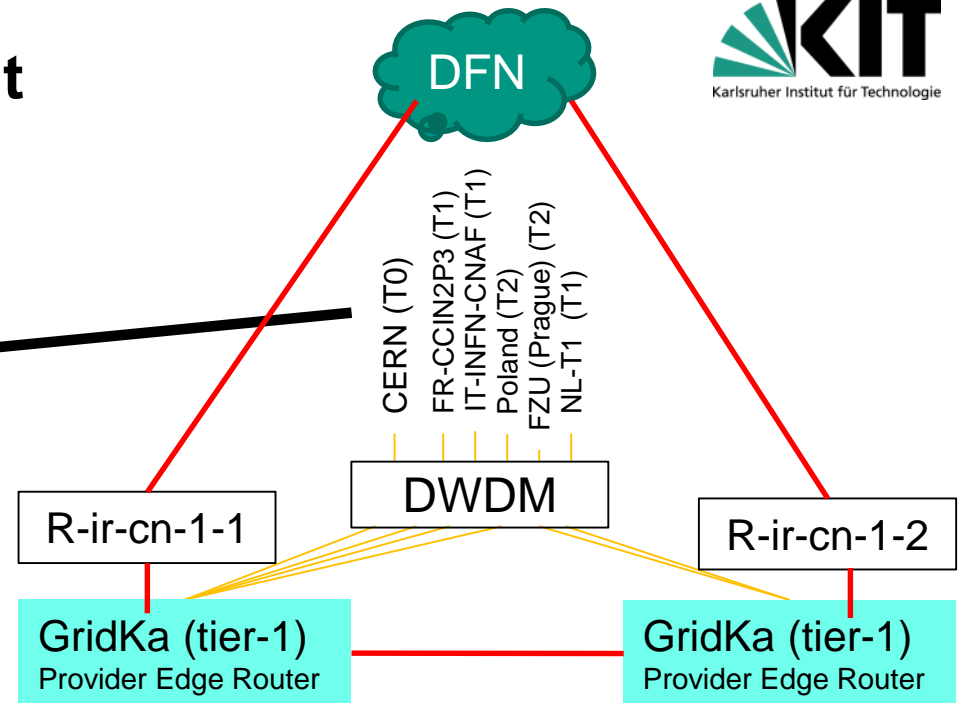
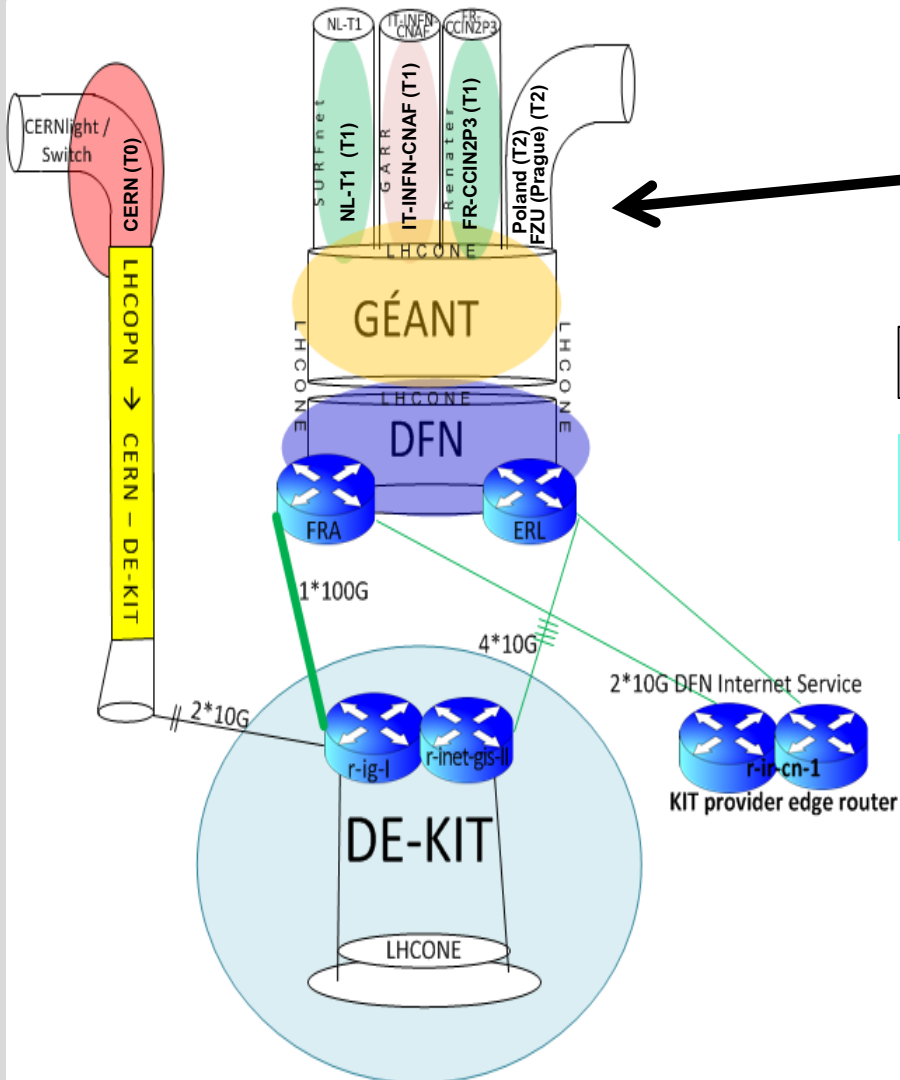
LHCone utilization → 15Gbps  
LHCOPN utilization → 10Gbps

LS1

- Expected 500MB/sec → approx. 5Gbps + additional experiment data → 2 \* 10GE LHCOPN
- Increased datarate between Tier-1 –
- Increased datarate between Tier-1 ar
- **Status and Trends in Networking at LHC Tier1 Facilities**  
(Andrey Bobyshev (FNAL) at CHEP 2012)

1 *	10 GE	GridKa	-->	LHCOPN T0	10 GE
3 *	10 GE	Gridka	-->	DE-KIT to T1	15 GE
2 *	10 GE	GridKa	-->	LHCONE (T[123])	15 GE
+	Internetconnection - KIT				10 GE
LHC Tier1 Facilities					40 GE

# Current GridKa deployment



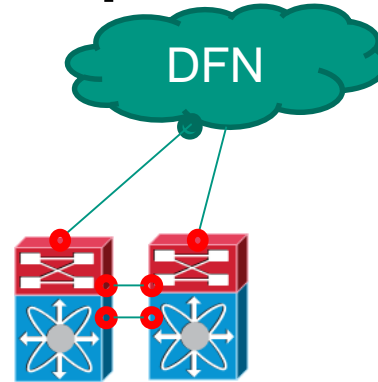
- Direct link DE-KIT to CERN (2\*10G) LHCOPN

## Migration to-LHCONE

- Direct link DE-KIT to FR-CCIN2P3 (10G) to LHCONE (100G)
- Direct link DE-KIT to IT-INFN-CNAF (10G) to LHCONE (100G)
- Direct link DE-KIT to Poznan (1G) to LHCONE (100G)
- Direct link DE-KIT to FZU (Prague) (10G) to LHCONE (100G)
- Direct link DE-KIT to NL-T1 (10G) to LHCONE (100G)

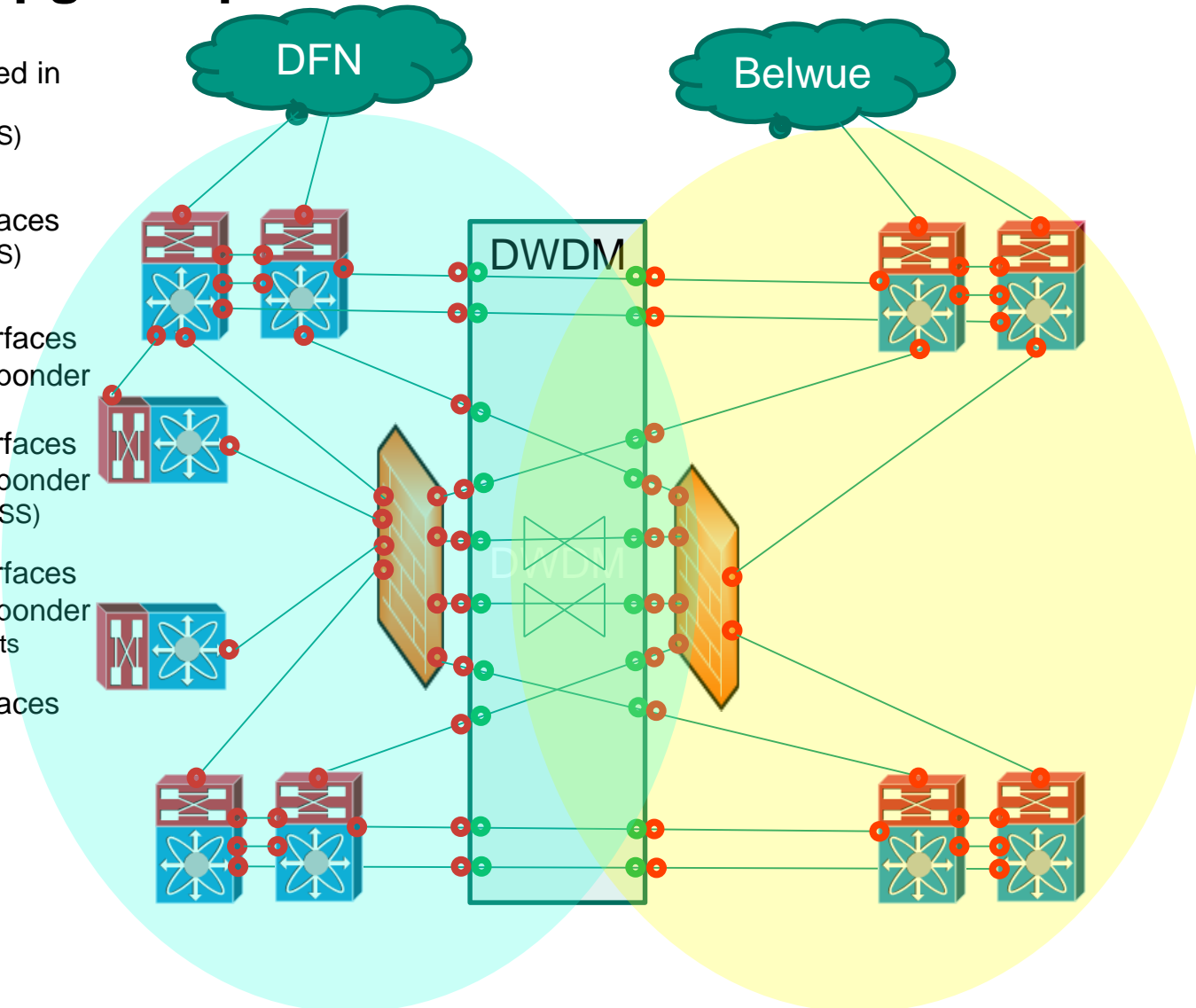
# 100G @ KIT – upgrade perimeter

- Areas needed to be included in the 100G upgrade:
  - 2 border routers (one VSS) (provider edge) (2\* KIT-CN)
  - 6\* 100GE interfaces



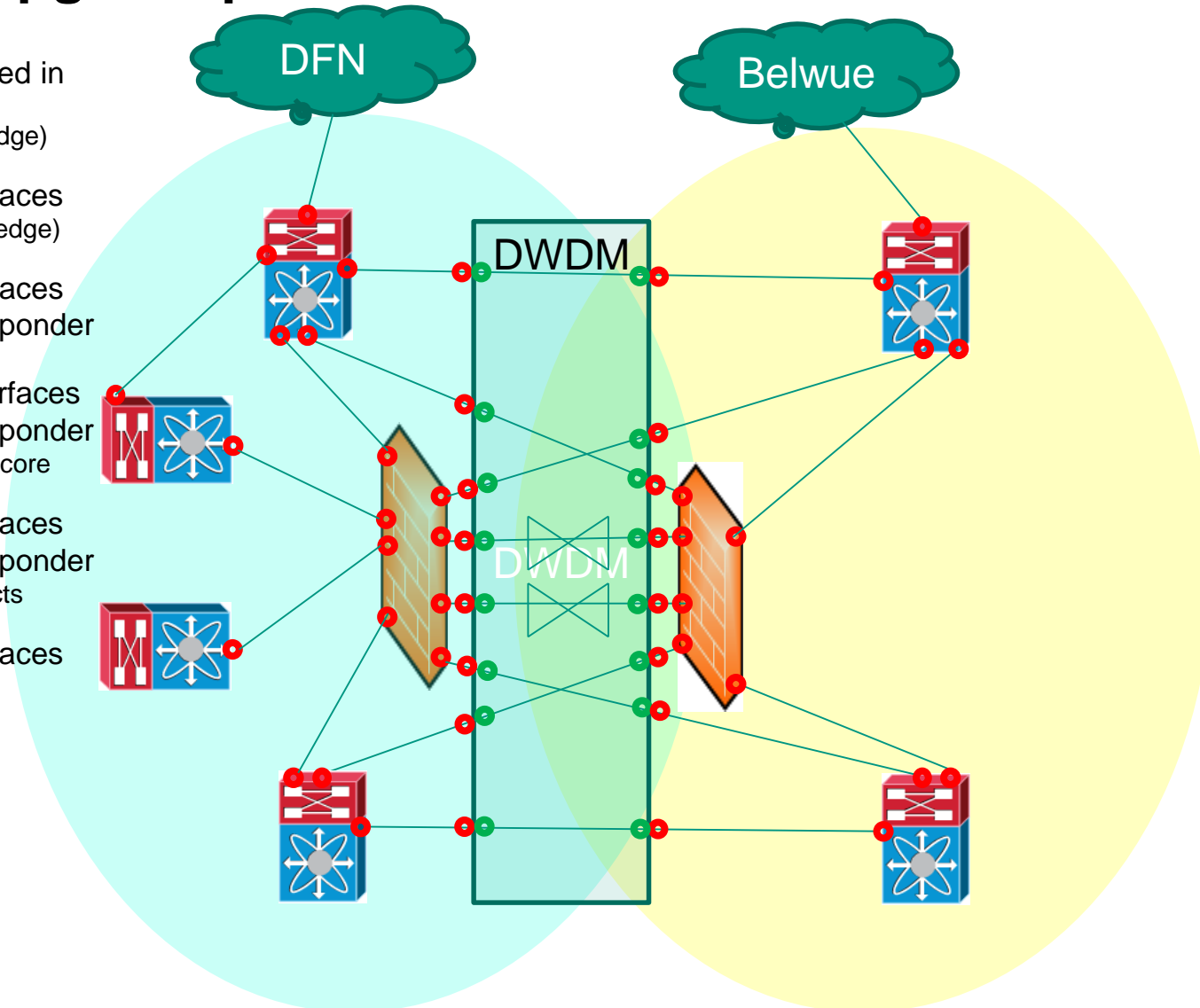
# 100G @ KIT – upgrade perimeter

- Areas needed to be included in the 100G Upgrade:
  - 2 border routers (one VSS) (provider edge) (2\* KIT-CN)
    - 6\* 100GE interfaces
  - 2 border routers (one VSS) (provider edge) (2\* KIT-CS)
    - 14\* 100GE interfaces
    - 4\* 100GE transponder
  - firewall
    - 22\* 100GE interfaces
    - 6\* 100GE transponder
  - 4 backbone routers (2\* VSS) (KIT core router)
    - 16\* 100GE interfaces
    - 4\* 100GE transponder
  - routers of different projects (per project):
    - 5\* 100GE interfaces



# 100G @ KIT – upgrade perimeter

- Areas needed to be included in the 100G Upgrade:
  - border router (provider edge) (KIT-CN)
    - 4\* 100GE interfaces
  - border routers (provider edge) (KIT-CS)
    - 7\* 100GE interfaces
    - 2\* 100GE transponder
  - firewall
    - 14\* 100GE interfaces
    - 6\* 100GE transponder
  - 2 backbone routers (KIT core router)
    - 6\* 100GE interfaces
    - 1\* 100GE transponder
  - routers of different projects (per project):
    - 2\* 100GE interfaces



# Splitting the 100G upgrade into affordable parts

- 2013
  - Project LSDF 100G link to BioQuant Heidelberg via Belwue
- 2014
  - Project GridKa 100G link to LHCONE via DFN
- 2015/6
  - KIT-CN – provider edge router
- 2016/7
  - KIT-CS – provider edge router
  - DWDM
- 2017/8
  - DWDM
  - ? Firewall ?
  - KIT core router (6\* router)

# 100G-WAN@KIT

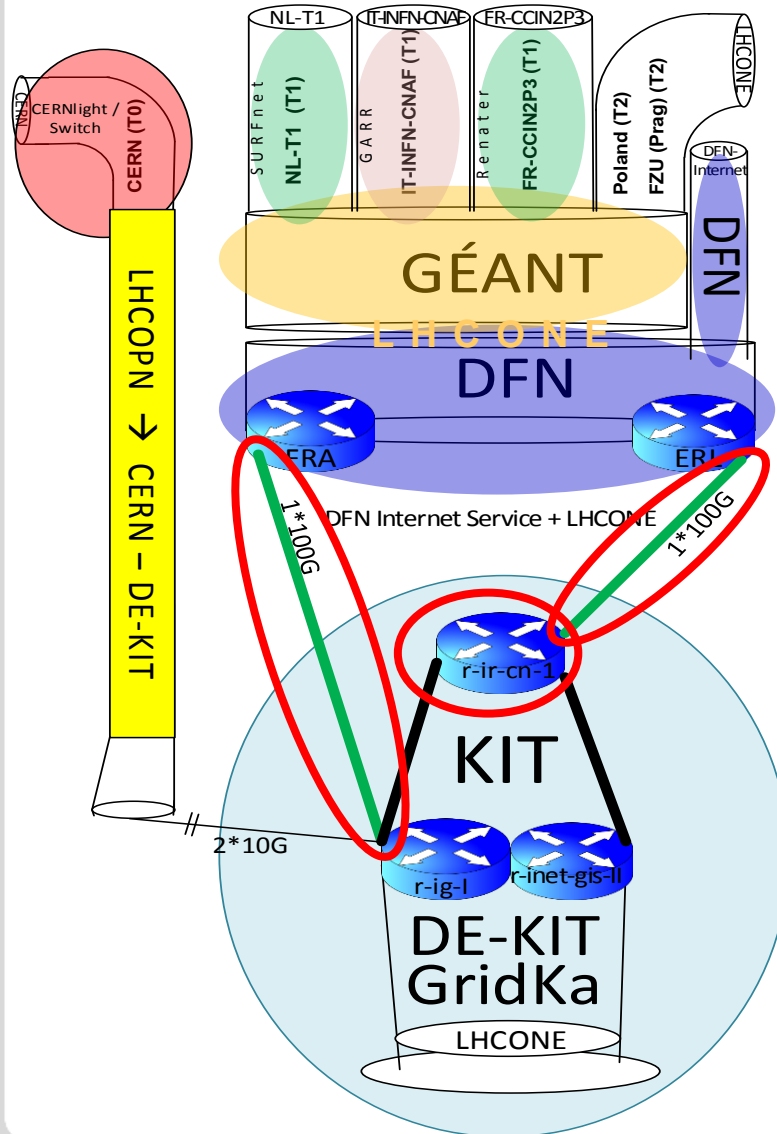
- Result of market survey
  - Brocade MLXe
    - 100GE – cfp2
    - All required protocols
      - bgp (2 \* internet routing table and still space)
      - ospf
      - pbr
      - IPv4 + IPv6
      - VLAN
    - ... adaptation required
      - snmp → cacti netgraphs
      - sflow → currently netflow
      - netdoc → home grown inventory and configuration database
      - ...



First deployments steps are in progress

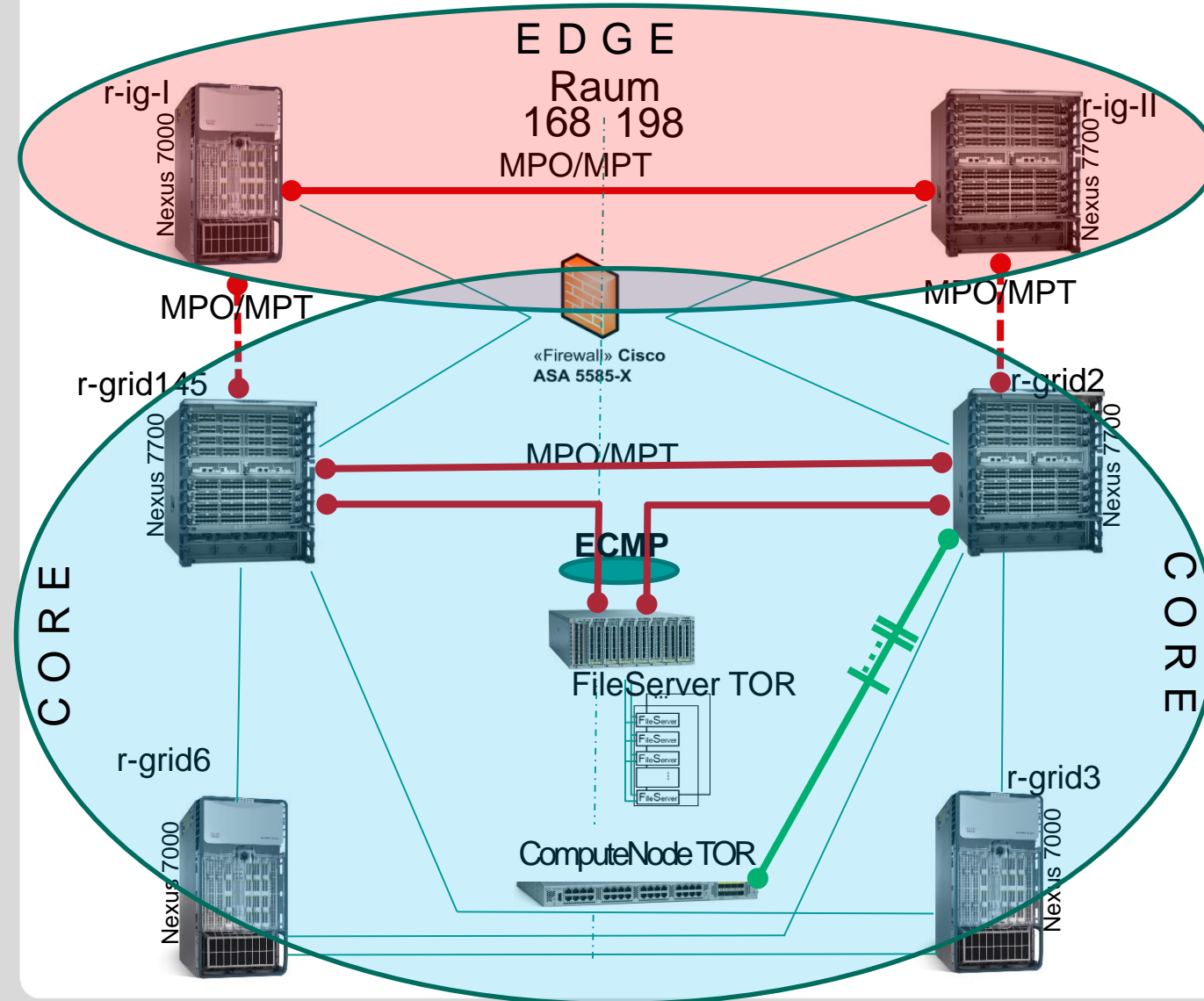


# GridKa deployment after KIT 100G upgrade



- second deployment phase (2015):
  - 1\* 100G to **Frankfurt**
  - 1\* 100G to **Erlangen**
  - “traffic shaping” to 50Gpbs at each 100G link
  - Border router of KIT receiving 100G uplinks
  - Project will get WAN access through KIT provider edge router
  
- 2\* 10G LHCOPN link will stay separate VPN DE-KIT -- CERN

# Planned 100G Upgrade of DE-KIT (GridKa) (2016/17)



- Current four Catalyst 6509 will get replaced by two Nexus7700
- Nexus N2K-C2348TQ Aggregation Switches for ComputeNodes
- FileServer aggregation switch Nexus 5696Q introduced
- Edge router upgrade catalyst 6509 to Nexus 7700 planned for 2017

## Legend:

- 10Gbps — (blue line)
- 40Gbps — (green line)
- 100Gbps — (red line)

# 100G Deployment@(DE-KIT)

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thanks for your attention  
?  
**Questions**

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