# DE·CIX

Where networks meet

# Migrating DE-CIX to Apollon: lessons learnt

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Where networks meet **DE·CIX**

# DE-CIX…

- was founded in 1995 and is the world's largest Internet exchange with more than 3.2 terabits per second peak traffic

- serves and connects 580+ networks and keeps 65,000+ active peering sessions stable

- has 1000+ 10GE and 20+ 100G switch ports connected

- is the most valuable IXP with more than 4.8 Gbit/s per customer

- has had 100 percent uptime since 2007

- operates IXs in Frankfurt, Munich, Hamburg, New York and Dubai

- operates the world's largest Ethernet interconnection platform DE-CIX Apollon

# Arnold Nipper: Founder and CTO/COO

- After studying maths, physics and computer sciences in Heidelberg and Mannheim, Arnold Nipper worked at the University of Karlsruhe

- In 1989, he established the first Internet connection there

- In 1995, he was one of the founders of DE-CIX

- Until today, he is the CTO and COO at DE-CIX

- In about 20 years, he accompanied the growth of DE-CIX from 3 customers to more than 500, developing DE-CIX's infrastructure to the world's largest Ethernet interconnection platform

## DE-CIX Topology
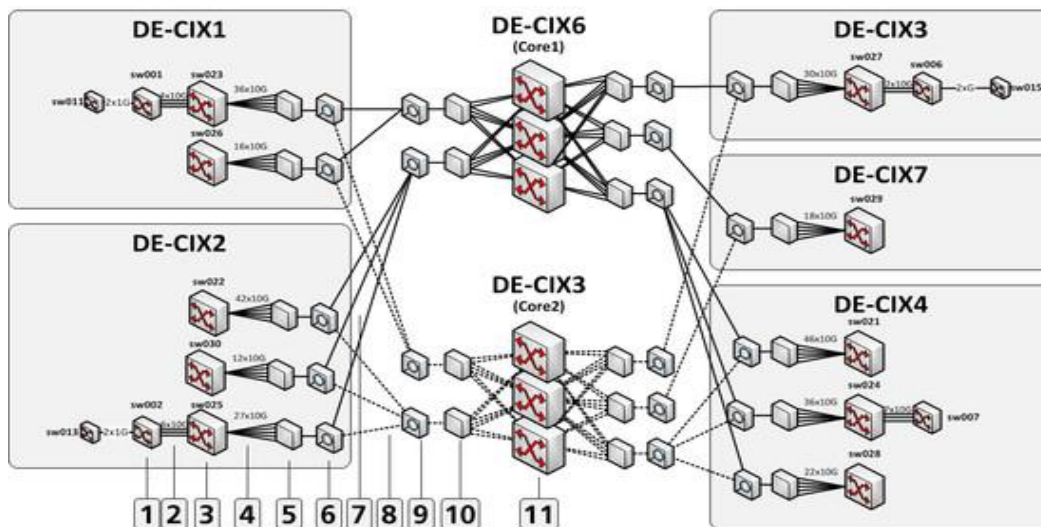


1 Force10 Terascale E1200
2 Multiple 10G-Connections
3 Force10 Exascale E1200i
4 Multiple 10G-Connections
5 DWDM MUX 32 Channel
6 Lynx LightLeader Master Unit
7 Dark Fiber Working Line
8 Dark Fiber Protection Line
9 Lynx LightLeader Slave Unit
10 DWDM MUX 32 Channel
11 2xBrocade MLX32 and 1xForce10 Exascale 1200i per Core

# APOLLON
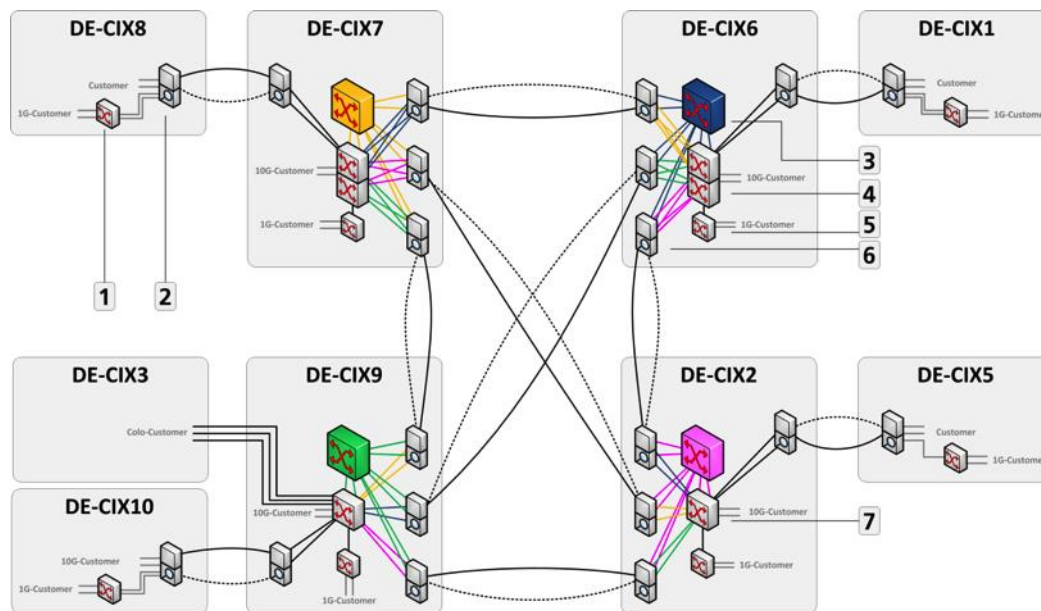
DE·CIX APOLLON. CUTTING EDGE INTERCONNECTION.

apollon.de-cix.net

# DE-CIX Apollon Topology



1. Alcatel-Lucent 7210 SAS-M
2. ADVA FSP3000R7 for Remote-Locations
3. Alcatel-Lucent 7950XRS20 Core-Node
4. Alcatel-Lucent 7950XRS40 Edge-Node
5. Alcatel-Lucent 7210 SAS-M
6. ADVA FSP3000R7 for Interconnect-Connections
7. Alcatel-Lucent 7950XRS20 Edge-Node

# Mission accomplished? – Yes! ✓

- Apollon needs to support traffic and customer port growth for the next 3-5 years. This includes scalable capacity in the core of up to 20Tbps in 2016 and 45 Tbps in 2018 ✓

- Replace 1:1 redundancy in the core with n+1 redundancy ✓

- Keep local traffic local (switch and site) ✓

- Core links must be 100GE to reduce the number of links, to better utilize bandwidth, and to be able to accommodate larger flows ✓

- Redundancy and multipathing on upper protocol layers ✓

- Make 100GE ports available to customers ✓

- Allow flexible and scalable implementation for Reseller ports ✓

# Lessons learnt: Configuration guide

- Configuration guide was produced in tight cooperation between Alcatel-Lucent and DE-CIX

- All configuration details have been tested during two lab sessions

- Some (important) details were lost on the way from the lab to the final configuration guide

- This caused some problems during the migration

- Higher attention to the configuration guide would have prevented some stupid mistakes

# Lessons learnt: Migration planning

- Planning for migration started in 2012

- Many details had to be considered

- Tests were carried out with various hardware vendors

- Led to a sophisticated migration procedure

- Smooth migration even with
  - A high number of customer ports
  - Peaktraffic at 3Tbps
  - Evolution from plain layer 2 to MPLS based infrastructure
  - Complete exchange of all optical stuff
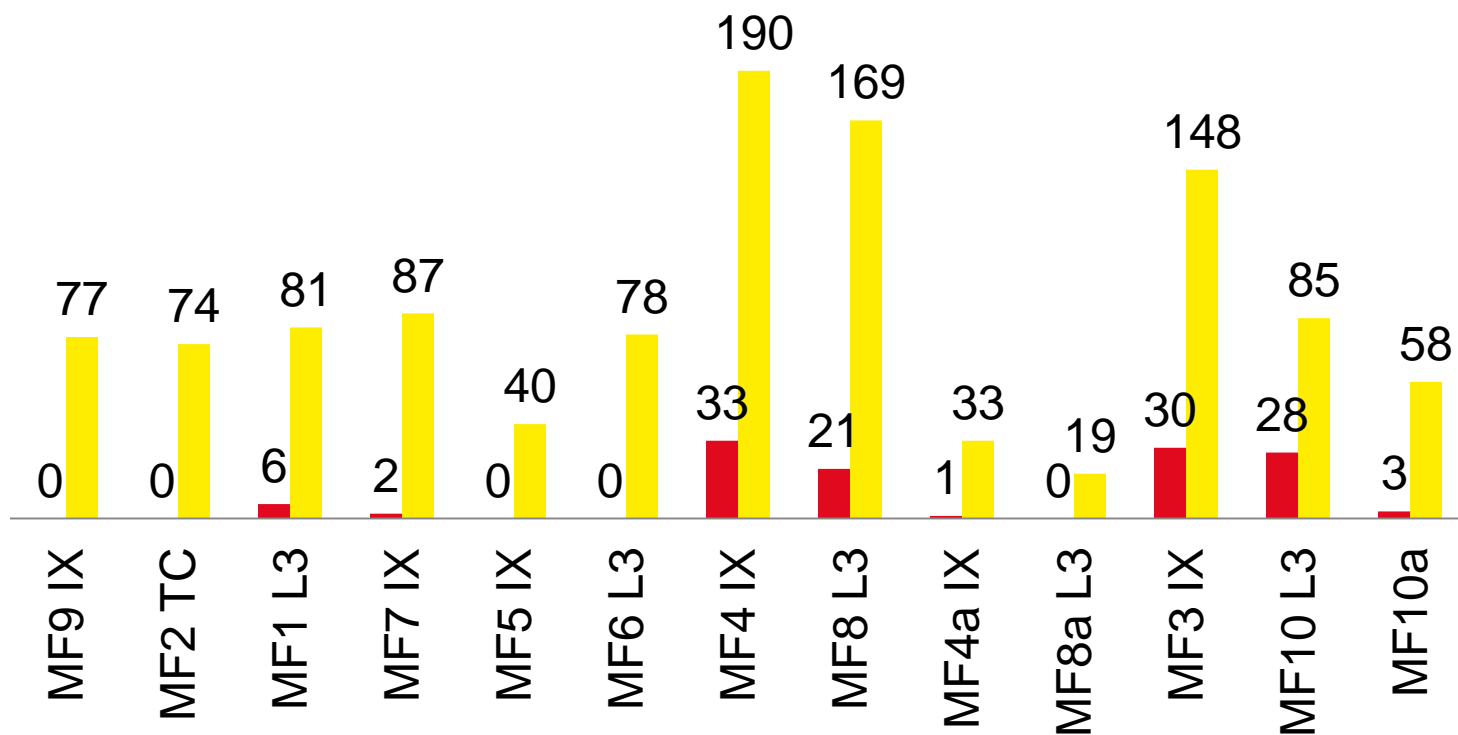
# Lessons learnt: Network Freeze

- A network freeze would have been a good idea, but:
  - Not upgrading/connecting customers for three months was a no-go
  - We did have to slow down on certain upgrades
  - For only a very few number of upgrades we could migrate/upgrade at the same time

- Lesson learnt: Communicate clear freeze times to sales department well before migration start.

# Lessons learnt: Tools used

- We had to communicate the circuits and ports to be moved to our partners
    - For this, a rather sophisticated Excel Sheet was used
    - Sending this forward and backward caused multiple versions of the same sheet to exist at the same time
    - That some colleagues used OpenOffice instead of Excel did not make things easier
- Lesson learnt:
    - Start early enough and implement a web accessible database (recommended!)
    - Or use ONE file which everyone can access (like Google Documents)

# Lessons learnt: Customer notification

- Number of customer communication tickets: 734
    - One ticket per customer port to be migrated
    - created 4 weeks before the migration
    - reminders sent 2 weeks and 1 day before
    - notification immediately once migration of port was completed.

- Lesson learnt: Here we did the right thing. All customers knew about the migration. Nobody was surprised.

# Lessons learnt: Size of each migration

- Large migrations were no problem, but
  - a clear plan for when to migrate "leftovers" was necessary
  - Dependencies between migration windows did hurt us

- Lessons learnt:
  - Make larger migration windows with fewer dependencies
  - Have a communicated strategy for when to migrate ports not done during main migration

# Lessons learnt: Don't underestimate your backend!

- profound technology change needs extension if existing data models
- care about your processes
- we're sure you have a lot of little undocumented helpers (scripts) too….
- you're good if everything is tested before you really need it

## Lessons learnt: More than a network platform renewal

- DE-CIX decided to switch to a fully new provisioning backend
- formerly scripts and now a fully featured web application
- benefit: customer provisioning is now just a bunch of clicks
- drawback: lots of additional efforts and pain during migration

# Lessons learnt: Process optimization pays off!

- We have spent a lot of time testing and optimizing "the inner loop": the actual port move (executed some 1.000 times)
- Like in programming: optimizing parts of the process that is being executed very often, deserves a lot of optimization
- We've reduced this loop to the absolute minimum necessary, preparing as good as possible
- The "inner loop" took around 3 minutes

# Lessons learnt: Apply the proper amount of attention!

- Every team (in fact: every person) might require a different amount of attention and control
- Be good in your estimation, adjust where necessary
- The race is only won, once the whole project team has passed the finishing line

# Lessons learnt: Expect the unexpected!

- We've had buffers in our time line to compensate for upcoming problems
- We were quite good in handling problems of all sorts
- We've managed to keep our initial time line – due to thorough planning and lots of overtime

# Lessons learnt from previous migrations / upgrades

- Last upgrade was in 2006/2007
- Migrated ~200 1GE and 40 10GE ports from three Cisco 6509 to three Force10 TeraScale
- Installed one additional Force10 TeraScale
- Switch selection process took three months
- Migration planning almost all on the fly, i.e. between each migration window
- Migration lasted 2-3 months
- Main issue to get cabling straight
- Total traffic at that time ~100Gbps
- Lessons learnt: complexity of migration grows exponentially with number of ports / traffic / sites

# Join DE-CIX now!

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