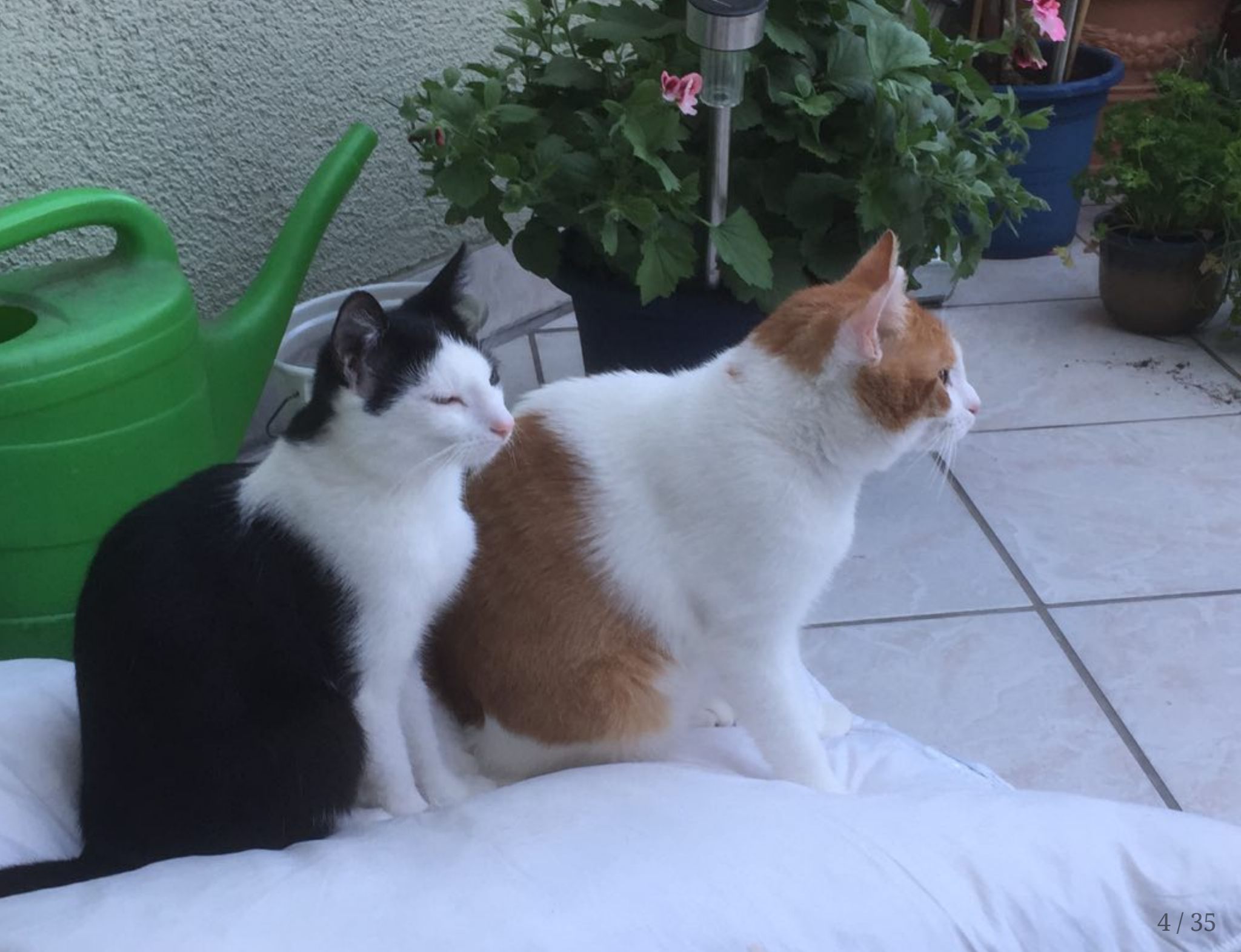
Network Design Principles

Network Design Principles

Carrier grade

Content

- Design Goals
- Design Solutions



Design Goals

- Focus on a few topics
- Can't implement all goals at 100%

Design Goals

Costs

- Many small + cheap devices?
- A few big + expensive devices?
- License costs?
- Cabling?

Design Goals

Costs

Scaling

- Expected growth?
  - Amount of new clients?
  - Amount of new servers?
  - Expected amout of ingress/egress traffic?

Design Goals

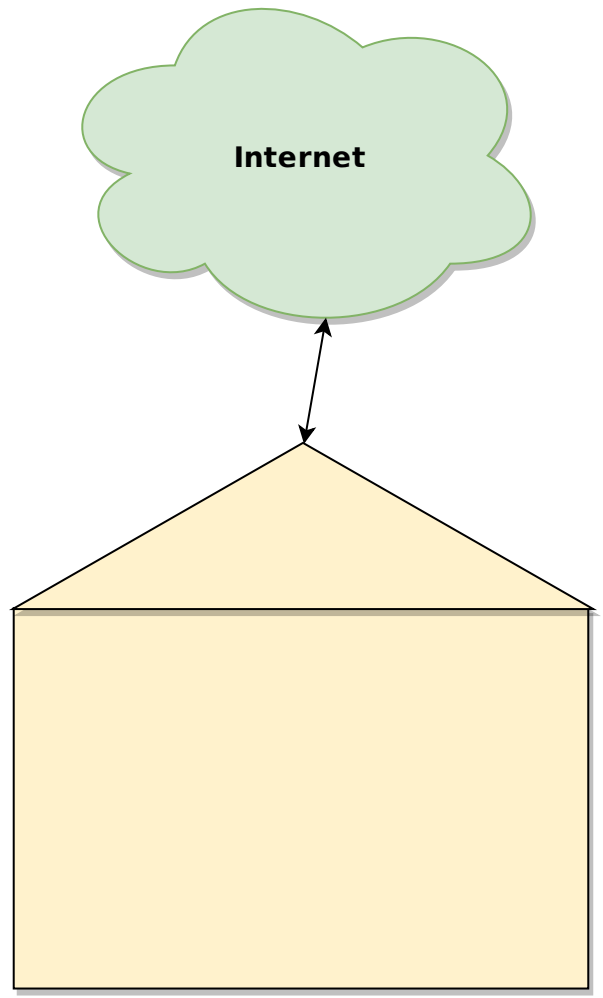
Costs

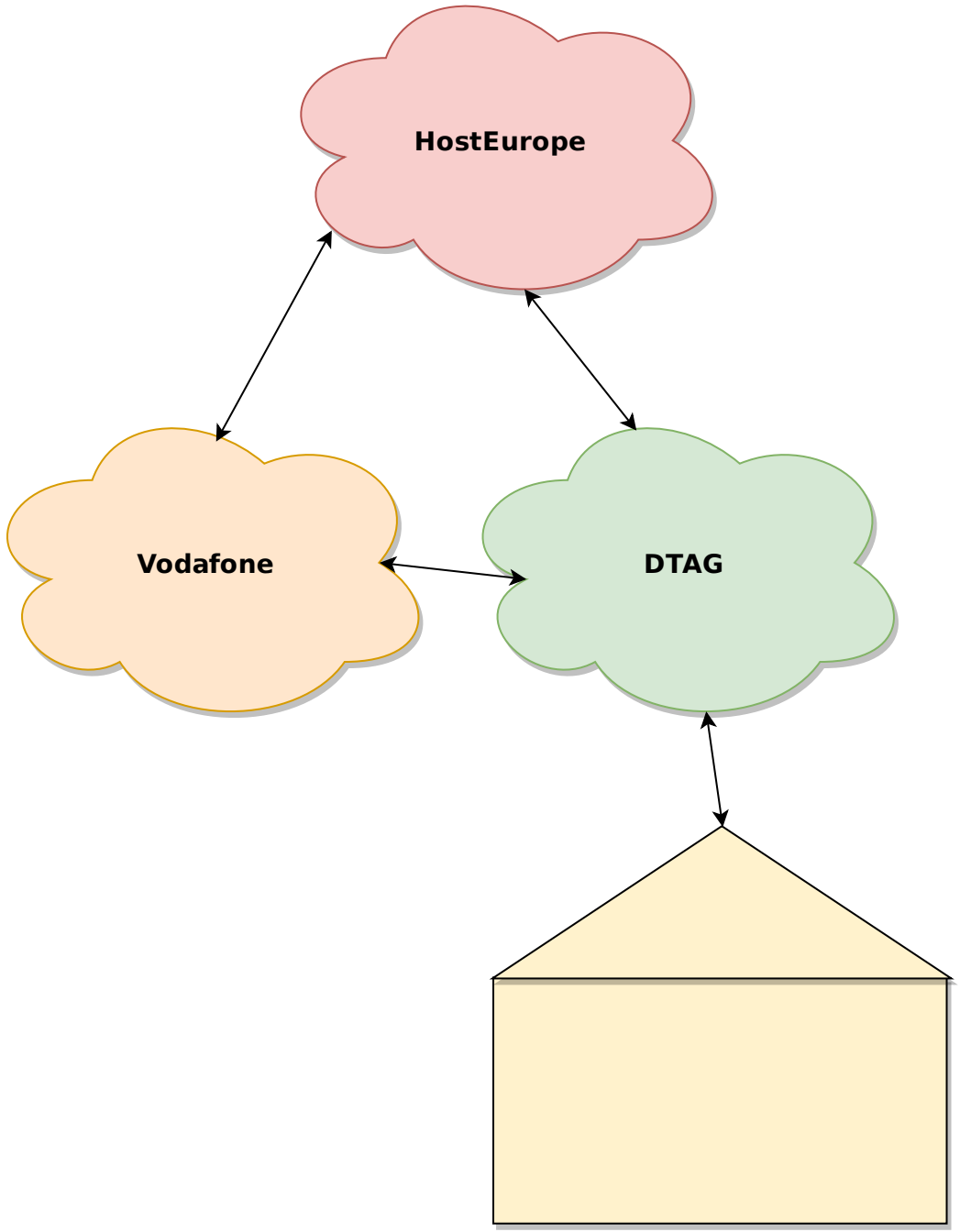
Scaling

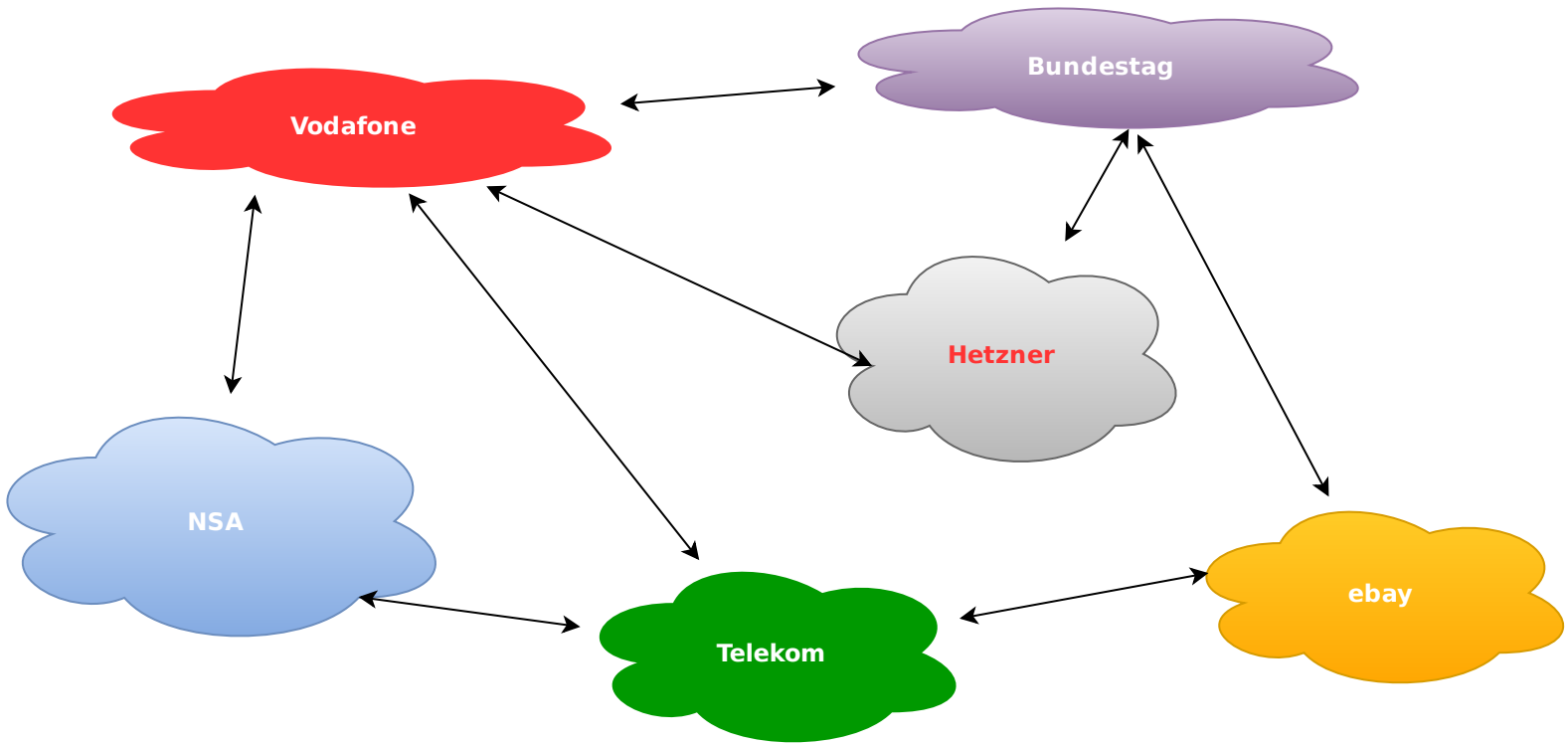
Redundancy

- On which paths do I really need redundancy?
  - Costs of redundancy vs outage?
  - Don't abuse redundant rings, stay under 50% utilization!
  - Logical redundancy? Physical Redundancy?
- Redundancy needs more configuration than a simple link
- Redundancy needs proper metrics and monitoring

Topology


Internet


HostEurope
Vodafone
DTAG



Every cloud = One AS (Autonomous system)

Design Solutions

- How to design the network edge?
- Design the core?
- Design the Datacenter/TOR?
    - TOR - Top of Rack switche

Design Solutions

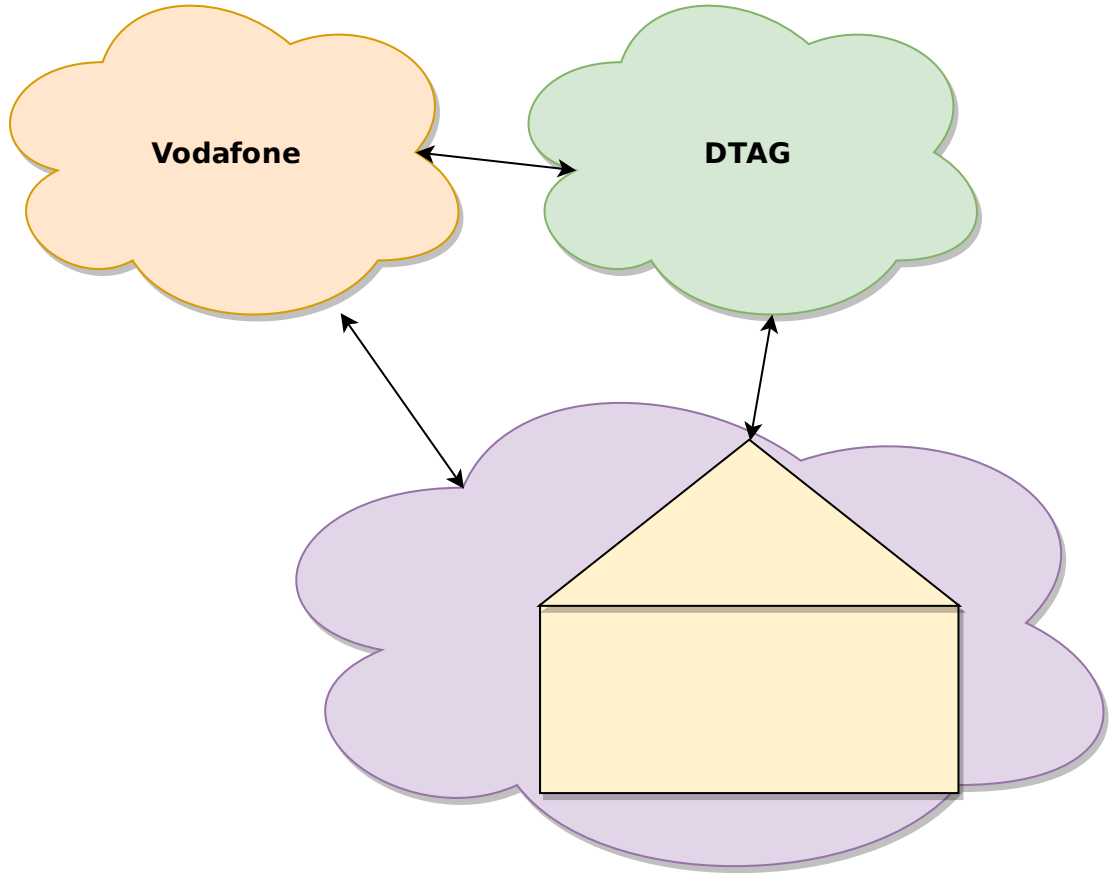
Why?

- Redundancy
- Control over routing
- More bandwidth
- Reach more clients all over the world

Design Solutions

Why?

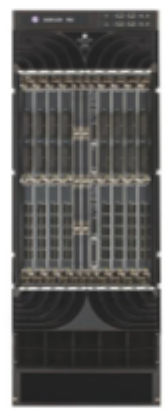
Topology



THE 7950 XRS FAMILY

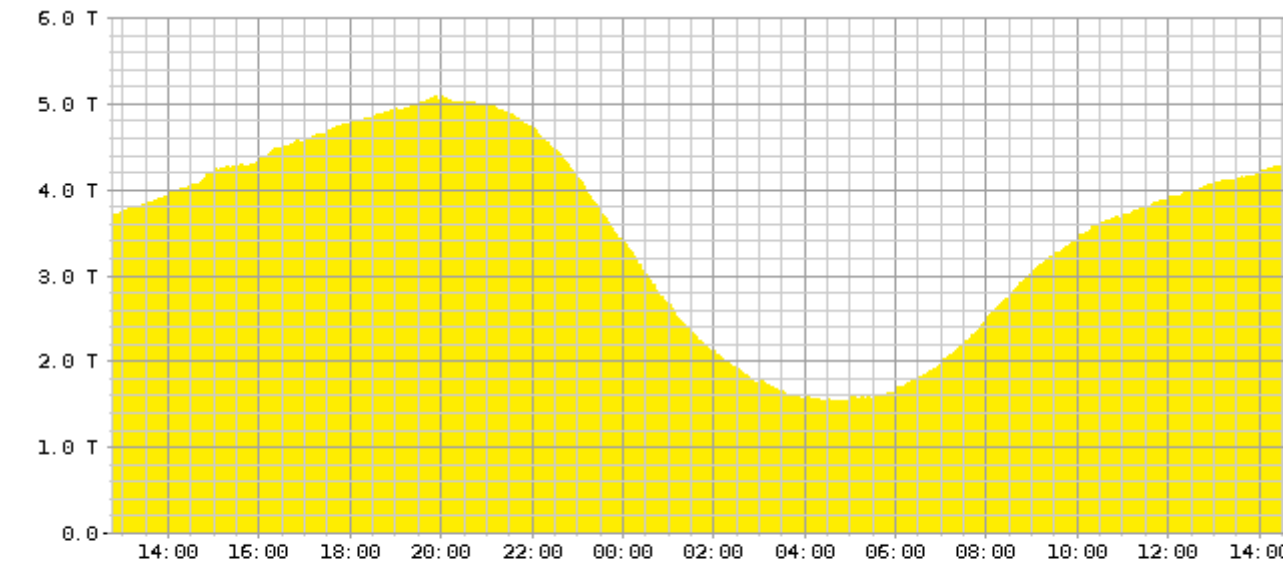
7950 XRS-40

7950 XRS-20



7950 XRS-16c

MODEL	SYSTEM CAPACITY	I/F SLOTS	100 GE PORTS	40 GE PORTS	10 GE PORTS	FOOTPRINT STANDARD 19" RACKS	AVAILABILITY	SYSTEM EXPANSION
7950 XRS-40	32 Tb/s	40	160	400	1600	2 racks	1H 2013	Multi-chassis
7950 XRS-20	16 Tb/s	20	80	200	800	1 rack	In trials now Shipping 3Q 2012	XRS-40 and/or multi-chassis
7950 XRS-16c	6.4 Tb/s	16	32	80	320	1 rack	1H 2013	Standalone



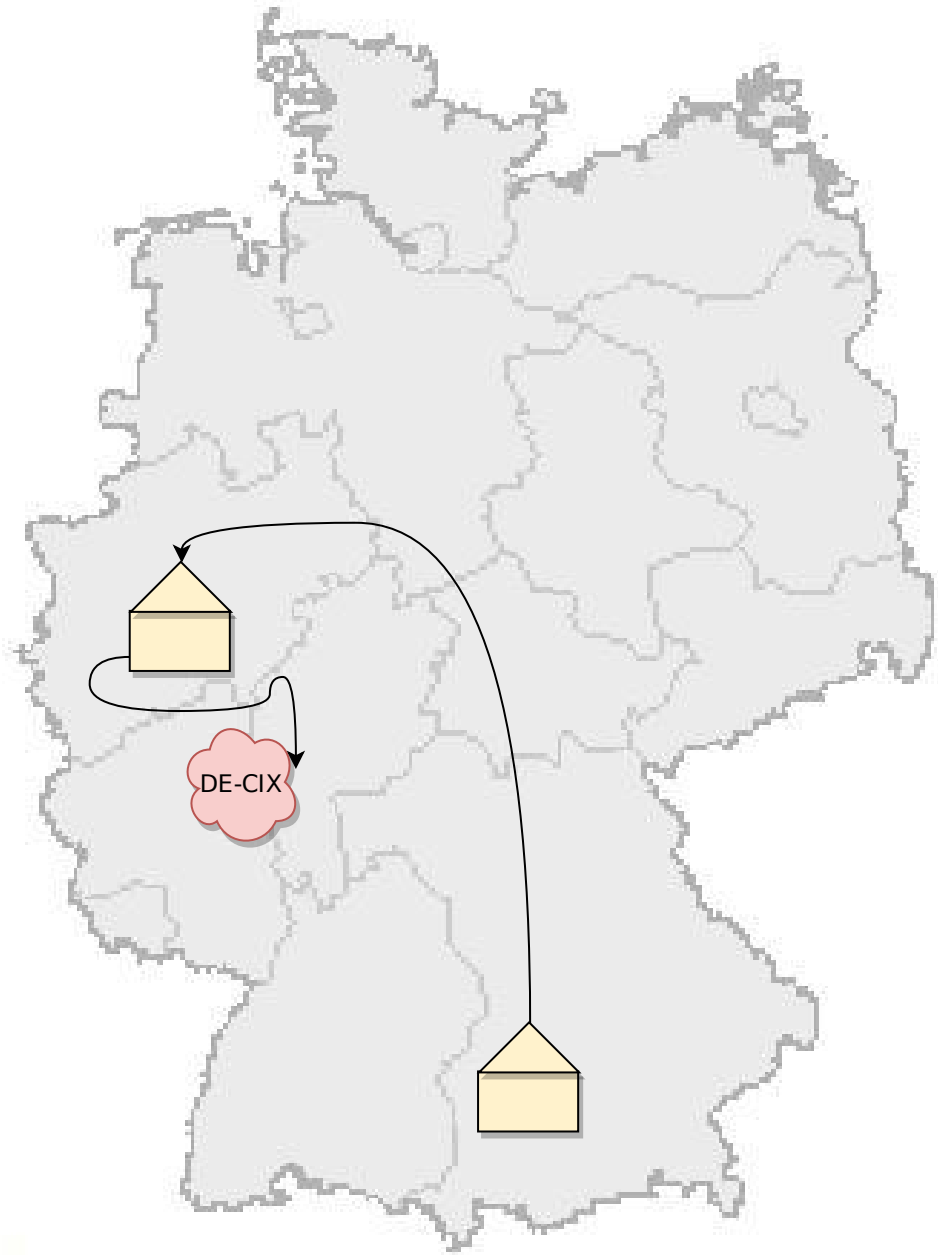
average traffic in bits per second
Current 4292.1 G
Averaged 3464.6 G
Graph Peak 5078.8 G
DE-CIX All-Time Peak 5539.09
Created at 2016-11-27 13:01 UTC

Design Solutions

Why?

Topology

Edge

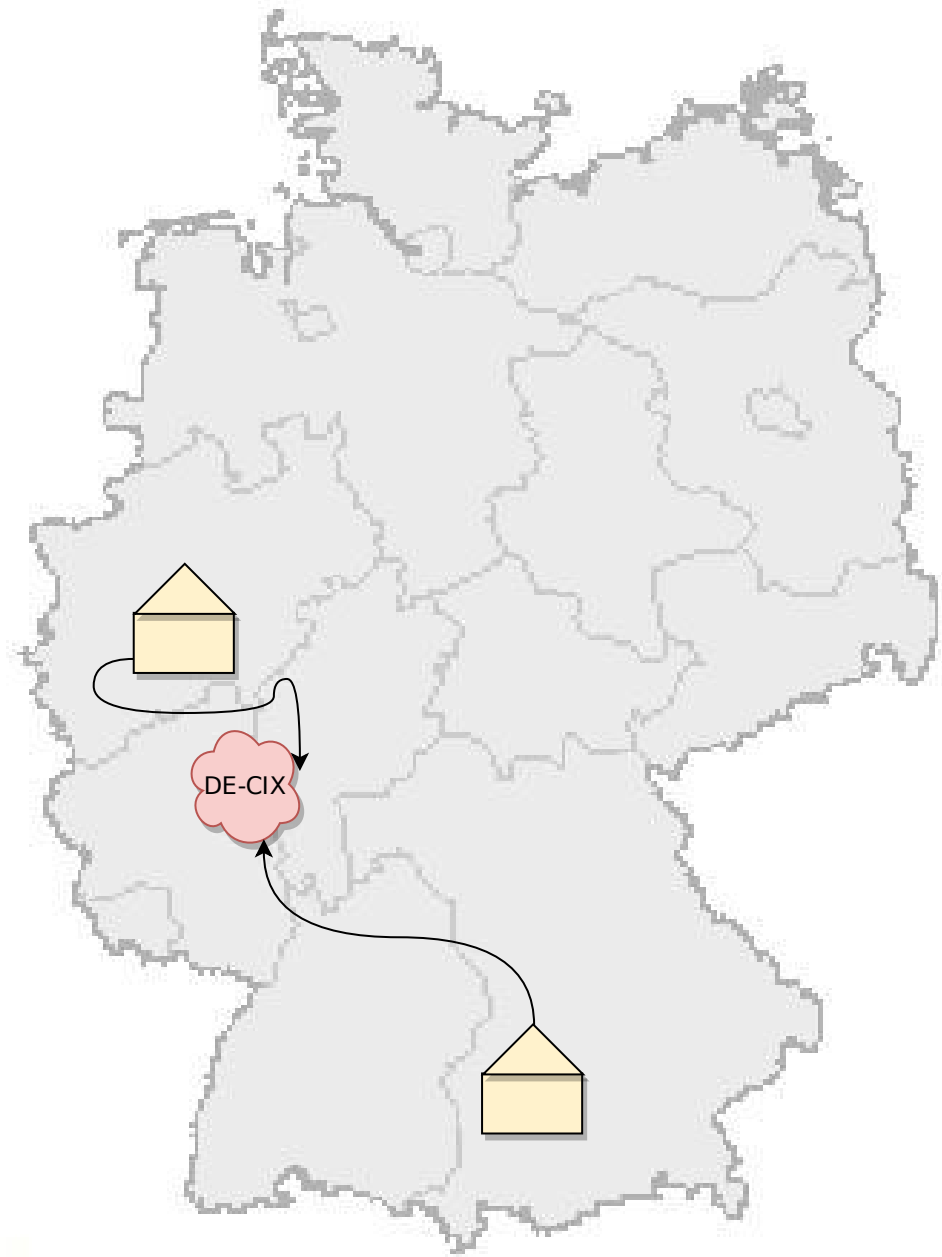


Design Solutions

Why?

Topology

Edge

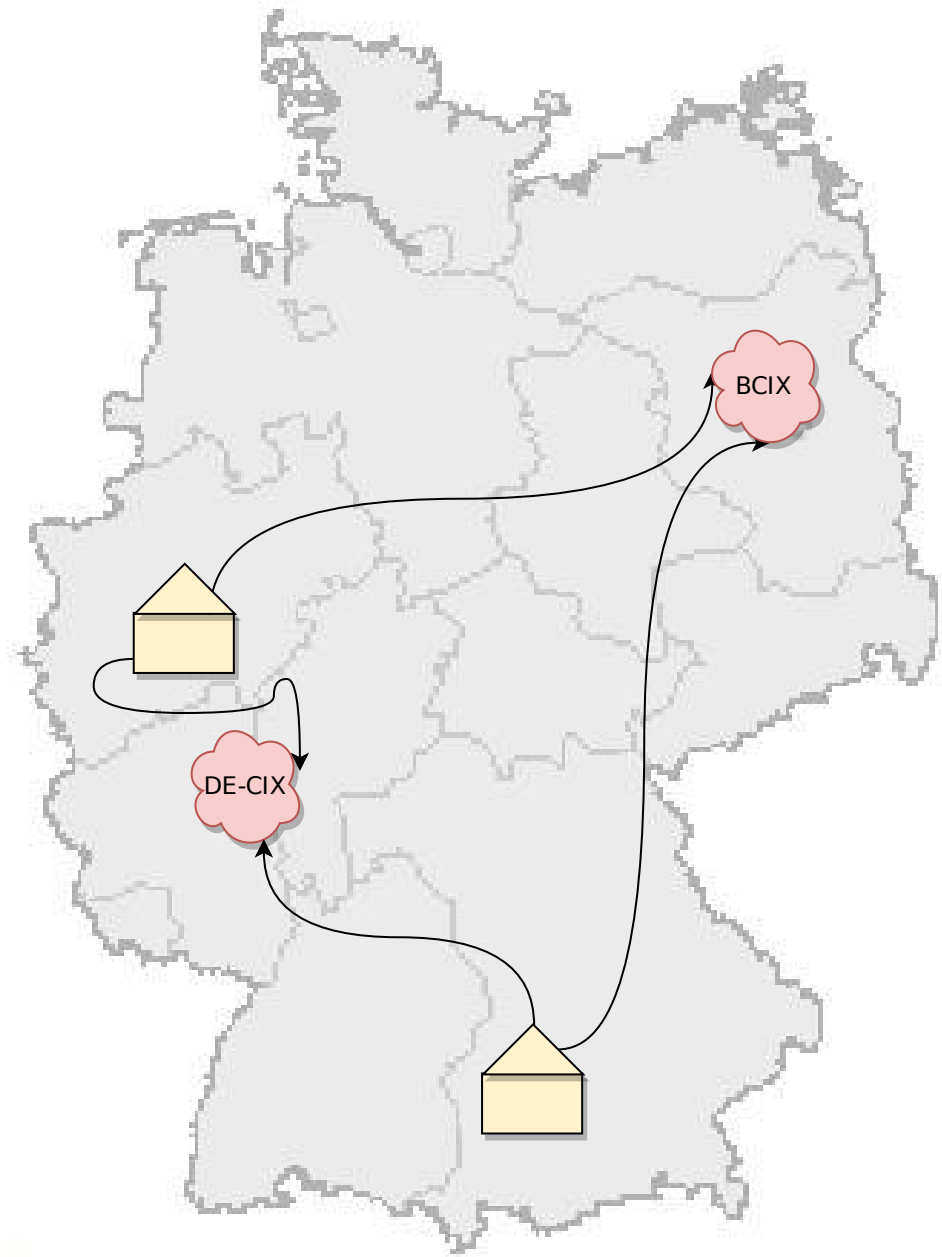


Design Solutions

Why?

Topology

Edge

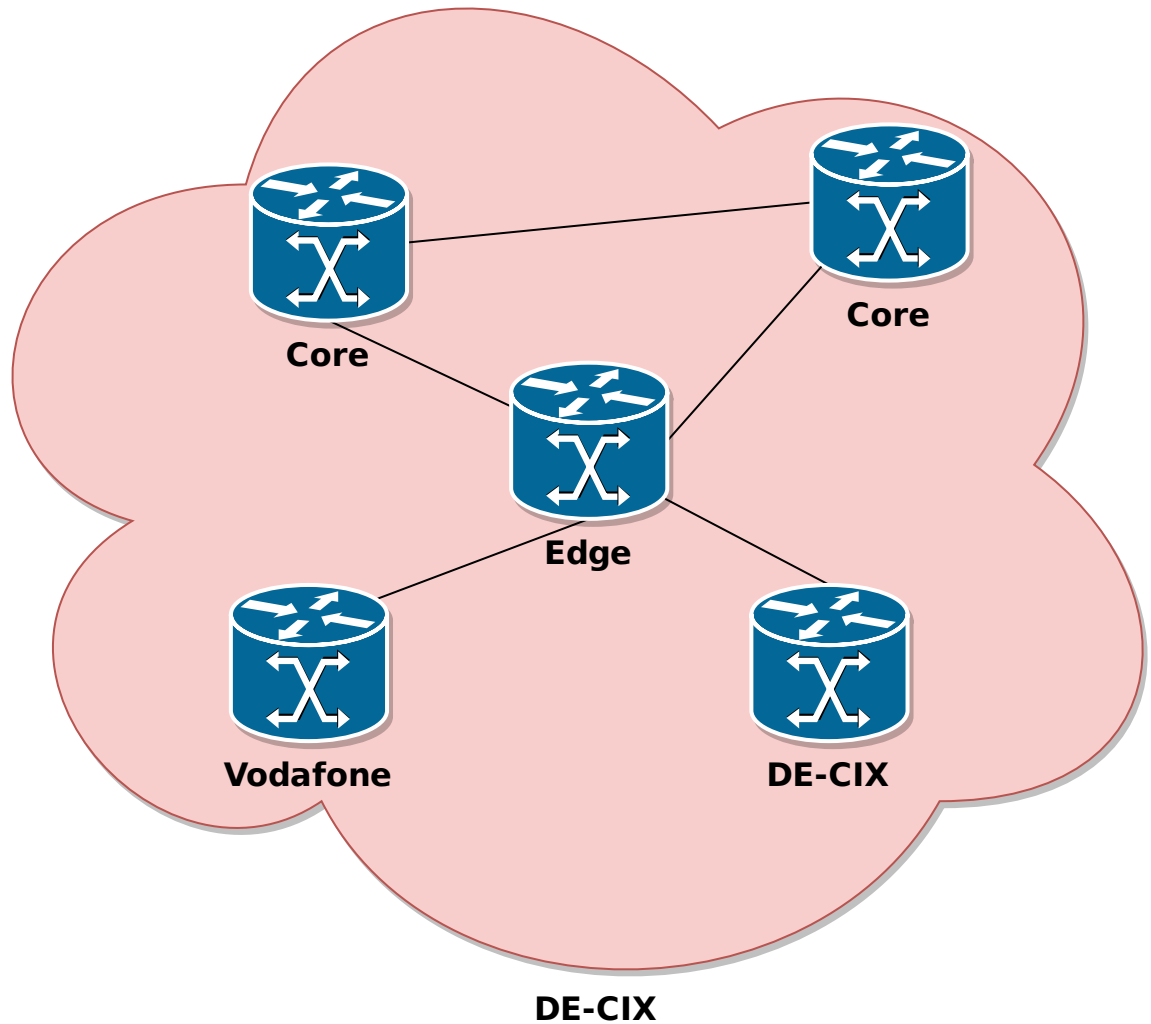


Design Solutions

Why?

Topology

Edge



Design Solutions

Why?

Topology

Edge

- Always use two core routers for redundancy at a POP
  - POP - Point of Presence
- Always use a seperate router for transit/peering
- BGP as EGP
  - Border Gateway Protocol
  - Exterior Gateway Protocol

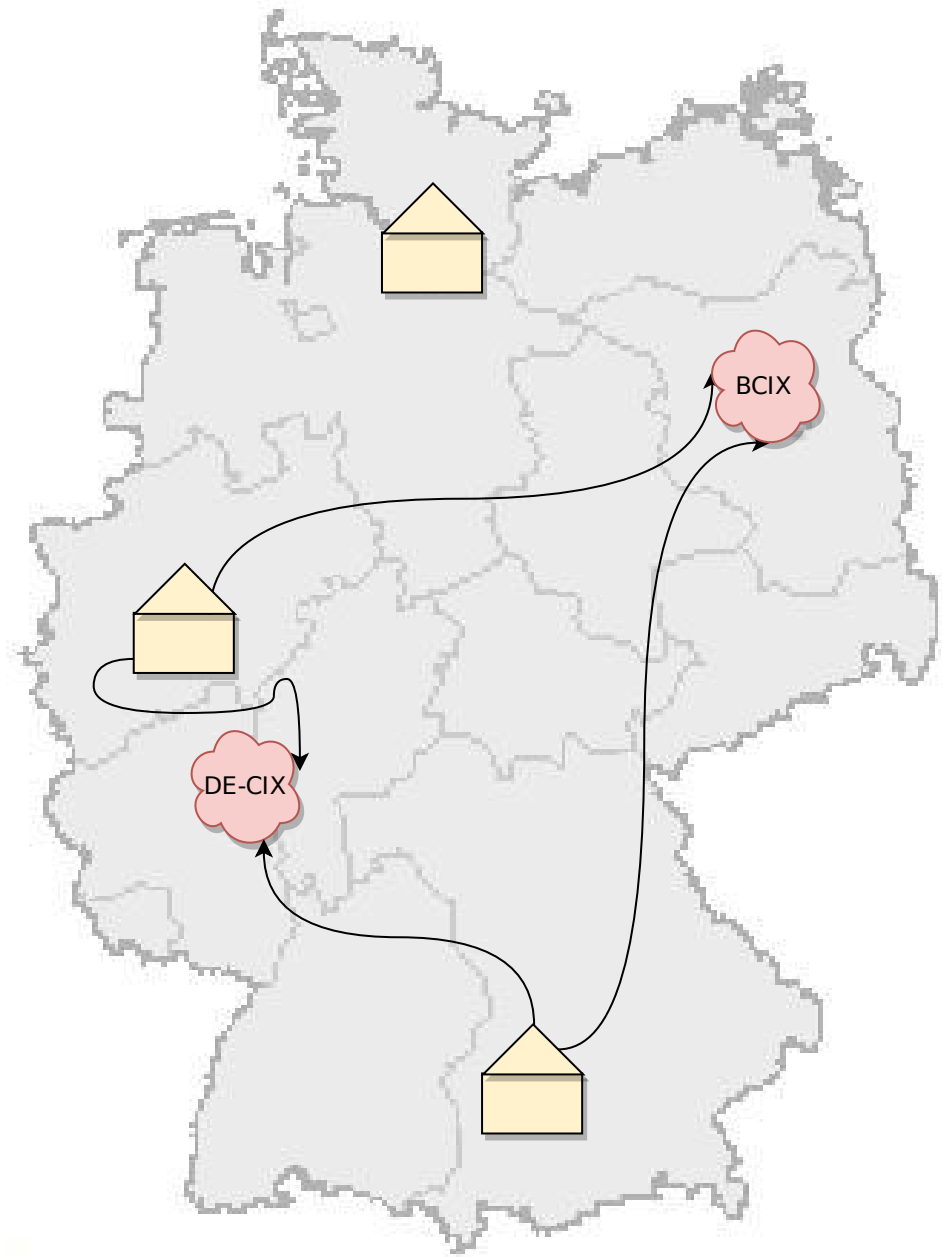
Design Solutions

Why?

Topology

Edge

Core



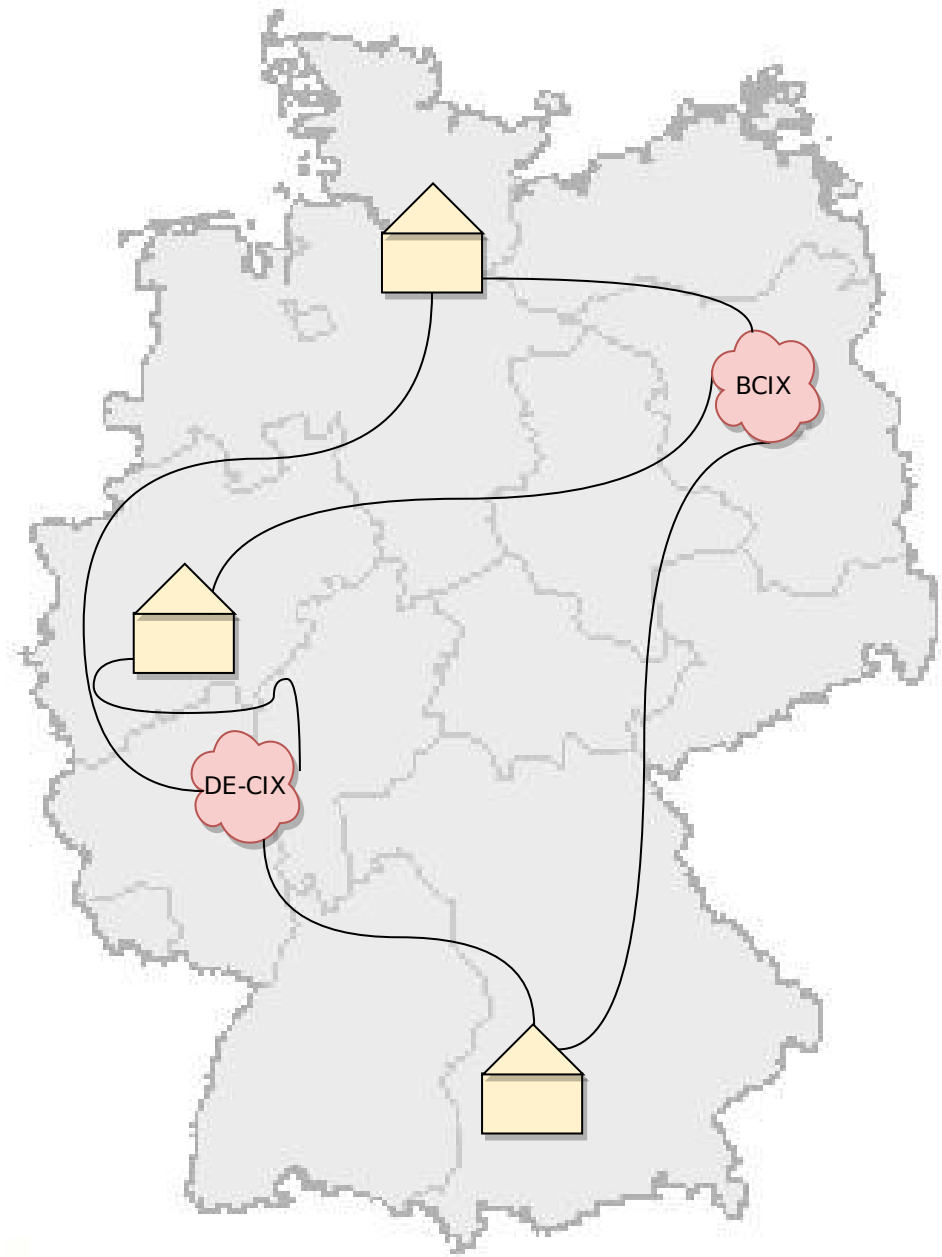
Design Solutions

Why?

Topology

Edge

Core



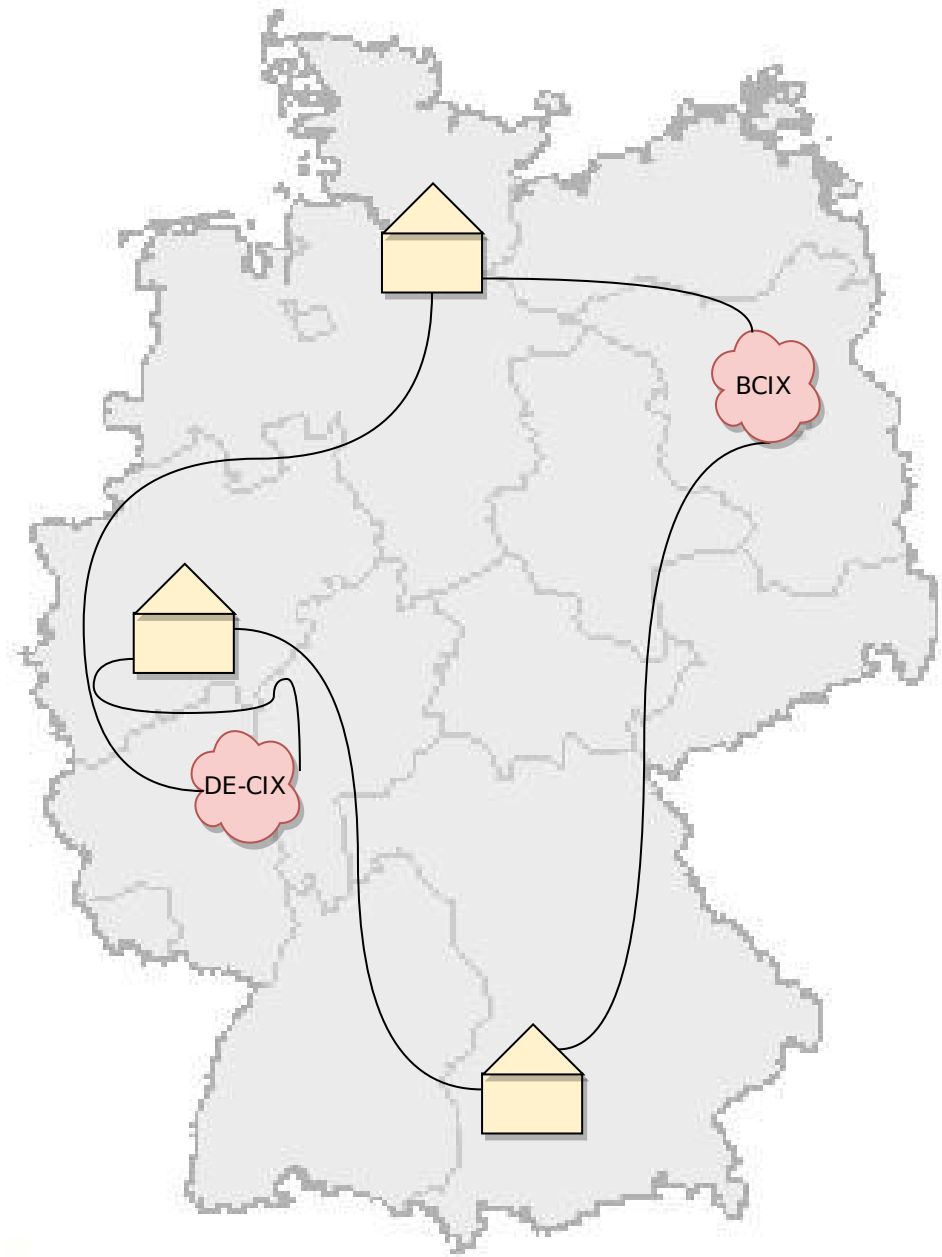
Design Solutions

Why?

Topology

Edge

Core



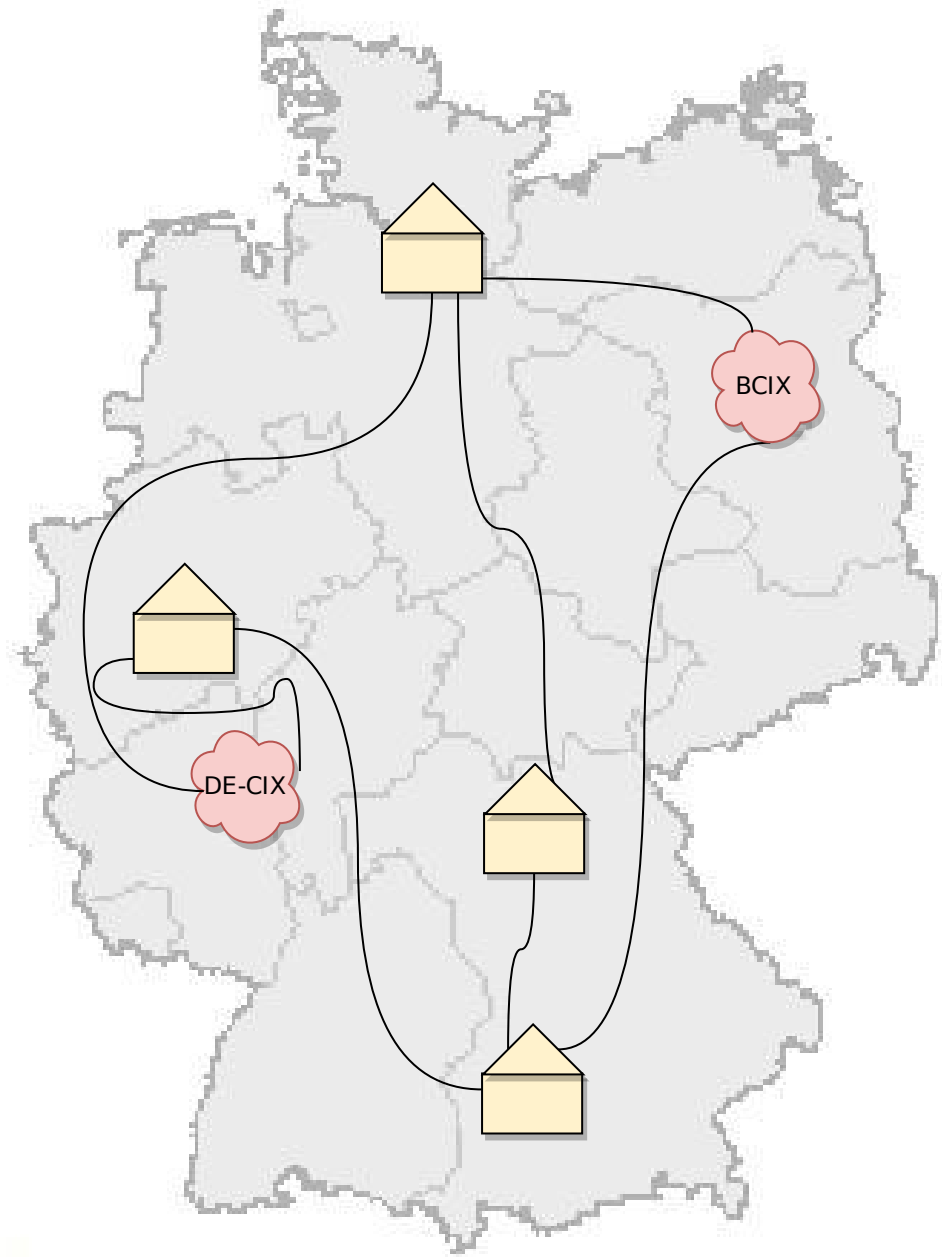
Design Solutions

Why?

Topology

Edge

Core



Design Solutions

Why?

Topology

Edge

Core

- Most important part of the network, don't make mistakes!
- Precisely monitor traffic amount + flow
- build many small and redundant rings
- Invest in huge capacities, upgrades are painful
- Automate it

Design Solutions

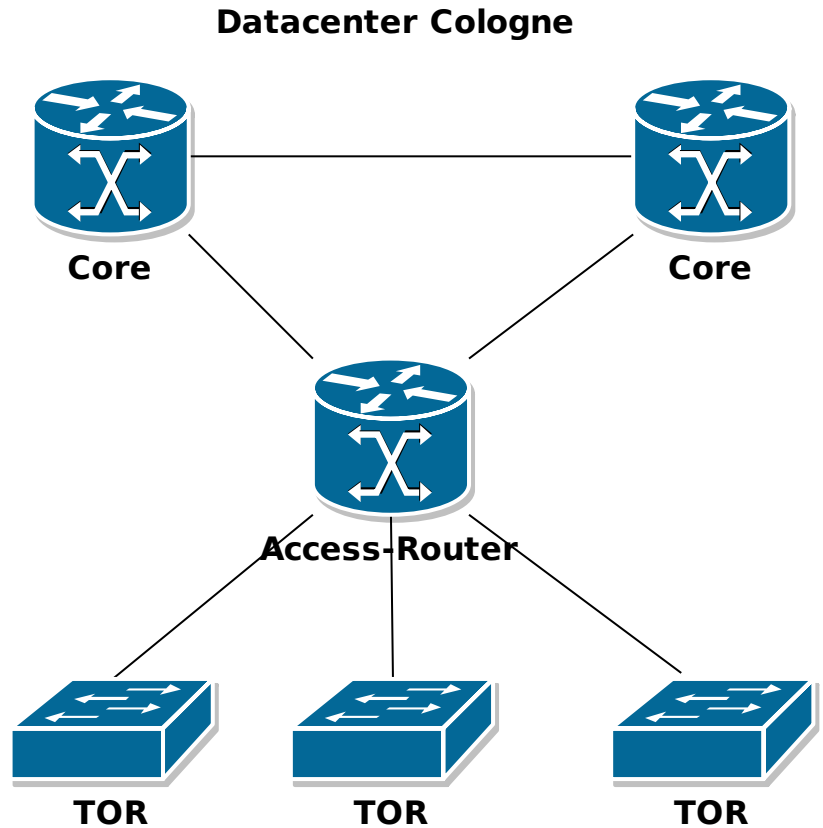
Why?

Topology

Edge

Core

DC



- Scales until the access router runs out of ports
- Router ports are expensive
- No redundant connection for TOR

Design Solutions

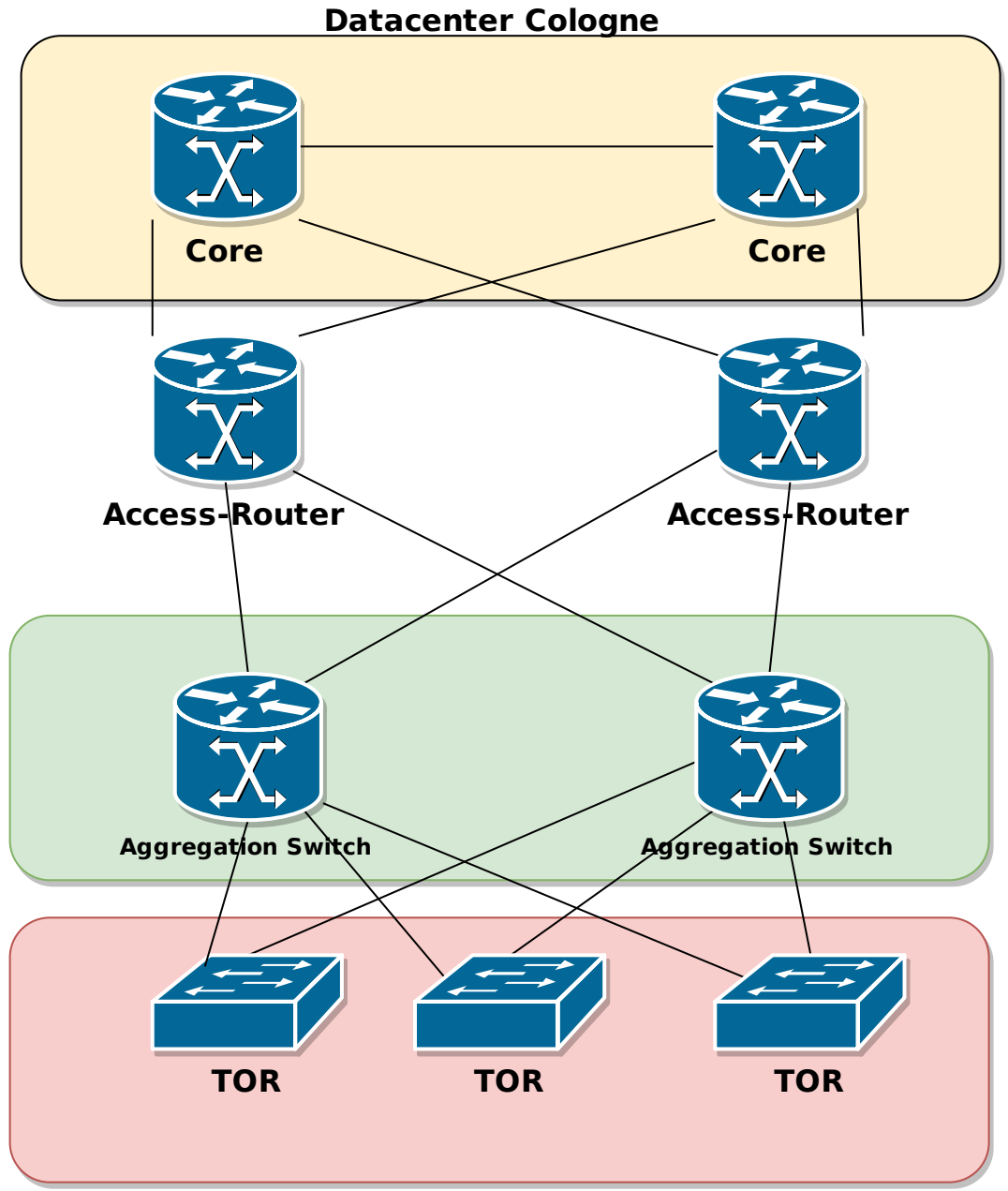
Why?

Topology

Edge

Core

DC



- Redundant
- Scales for vertical traffic
- Big clusters require more and more horizontal traffic

Design Solutions

Why?

Topology

Edge

Core

DC

Figure 1 Topology of Cisco MSDC Design Evolution—Phase 1

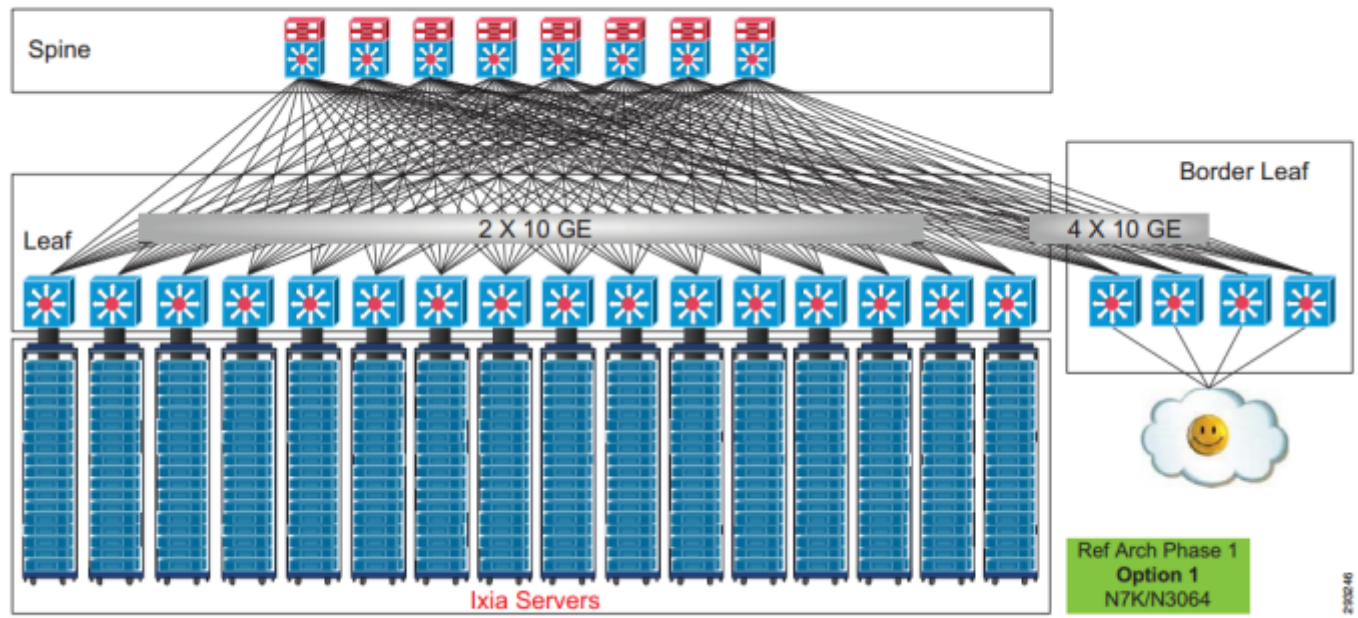


Figure 2 Topology of Cisco MSDC Design Evolution—Phase 2

(Copyright by Cisco)

Design Solutions

Why?

Topology

Edge

Core

DC

- Scales in all directions
- A lot of redundancy + bandwidth
- Only one hop to each server
- Expensive
- Impossible without automation

Conclusion

- Many different solutions
- Everything is expensive
- Proper planning, think big, spare capacity
- Always use rings
- Monitor your stuff