

# Network Design Principles

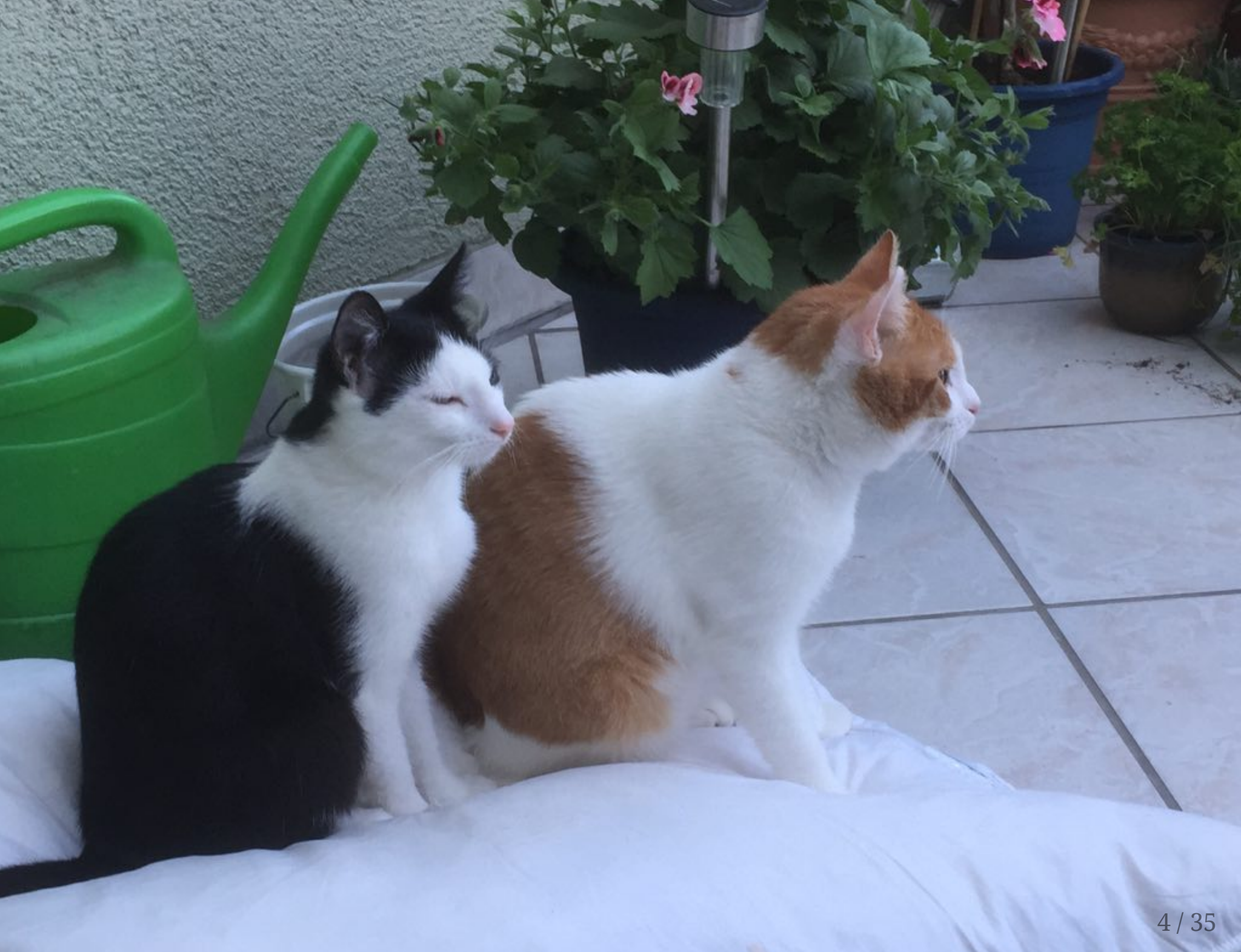
# Network Design Principles

Carrier grade

Topology Setup

# 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 amount of ingress/egress traffic?

# Design Goals

## Costs

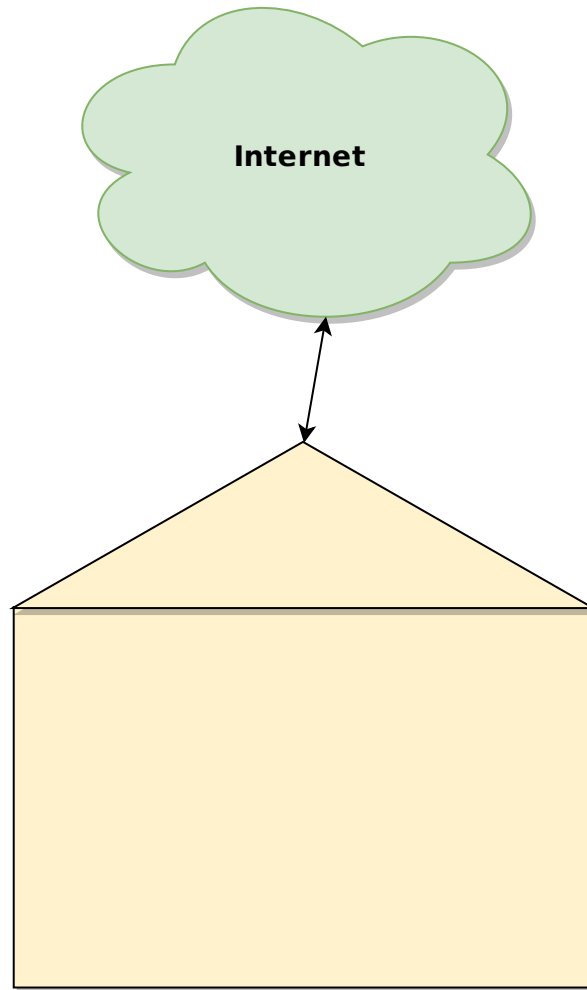
## Scaling

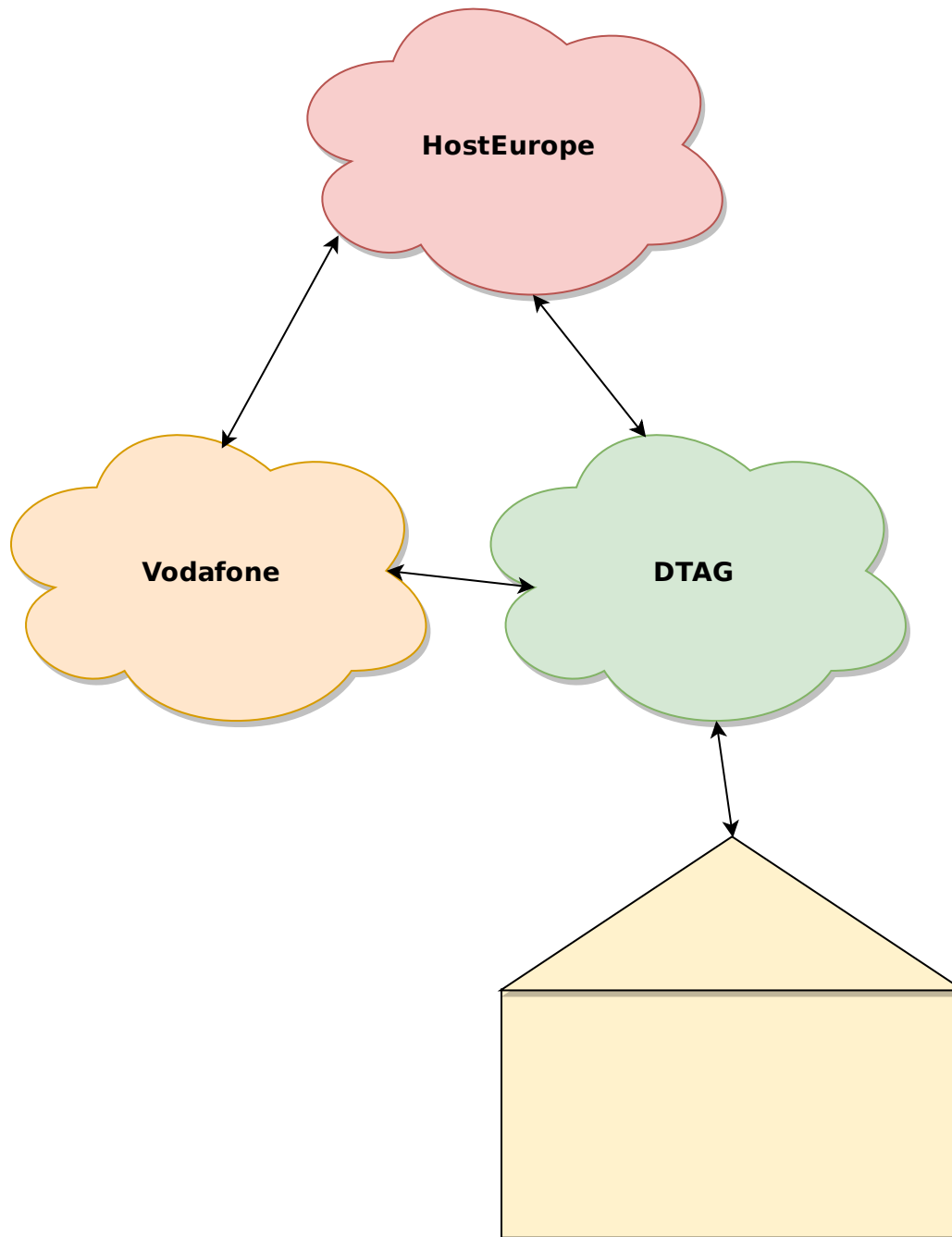
## Redundancy

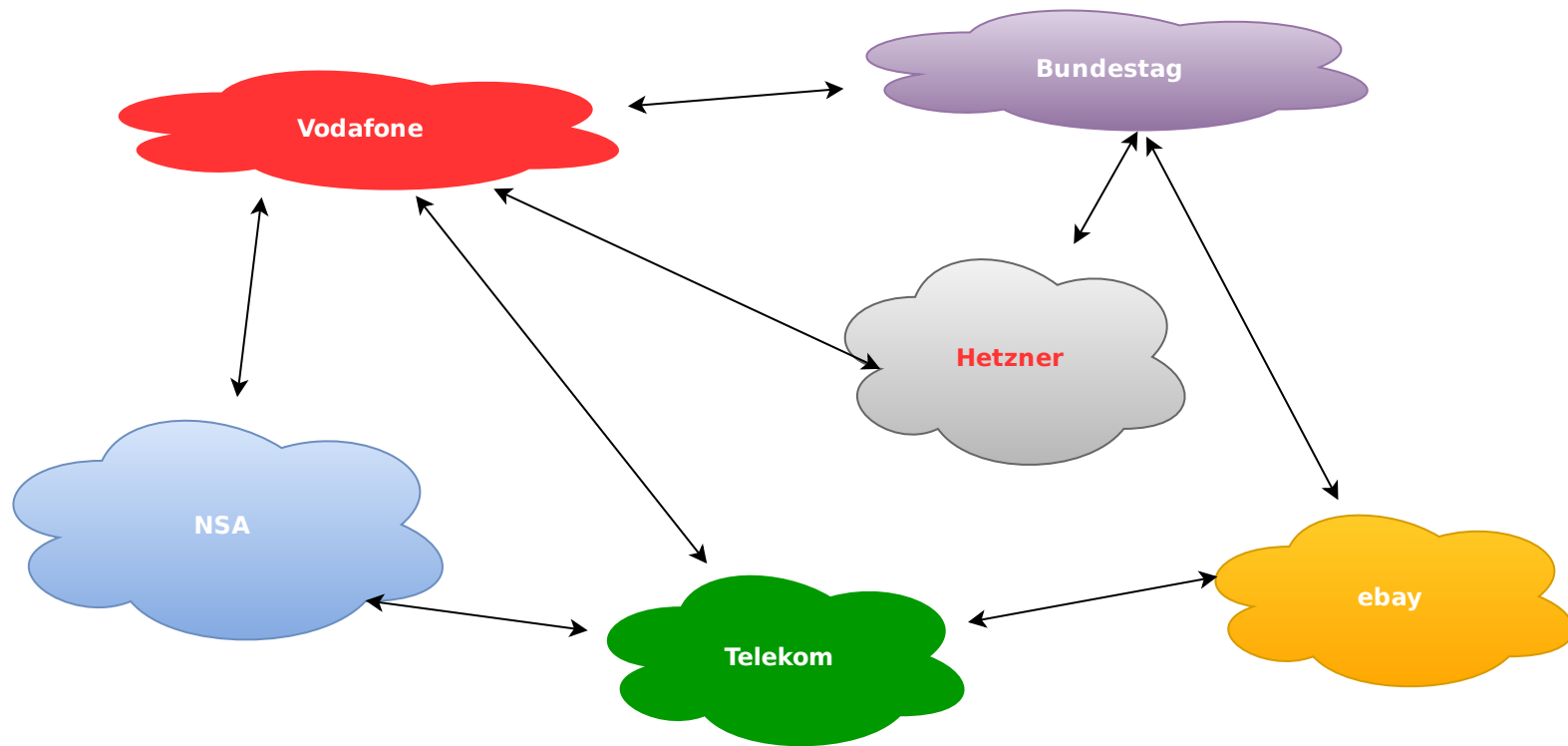
- On which paths do I really need redundancy?
  - Costs of redundancy vs outage?
  - Don't abuse redundant rings, stay under 50% utilization!
  - Logical redundancy? Physical Redundancy?
- Redundancy needs more configuration than a simple link
- Redundancy needs proper metrics and monitoring



# Topology







**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 switch

# Design Solutions

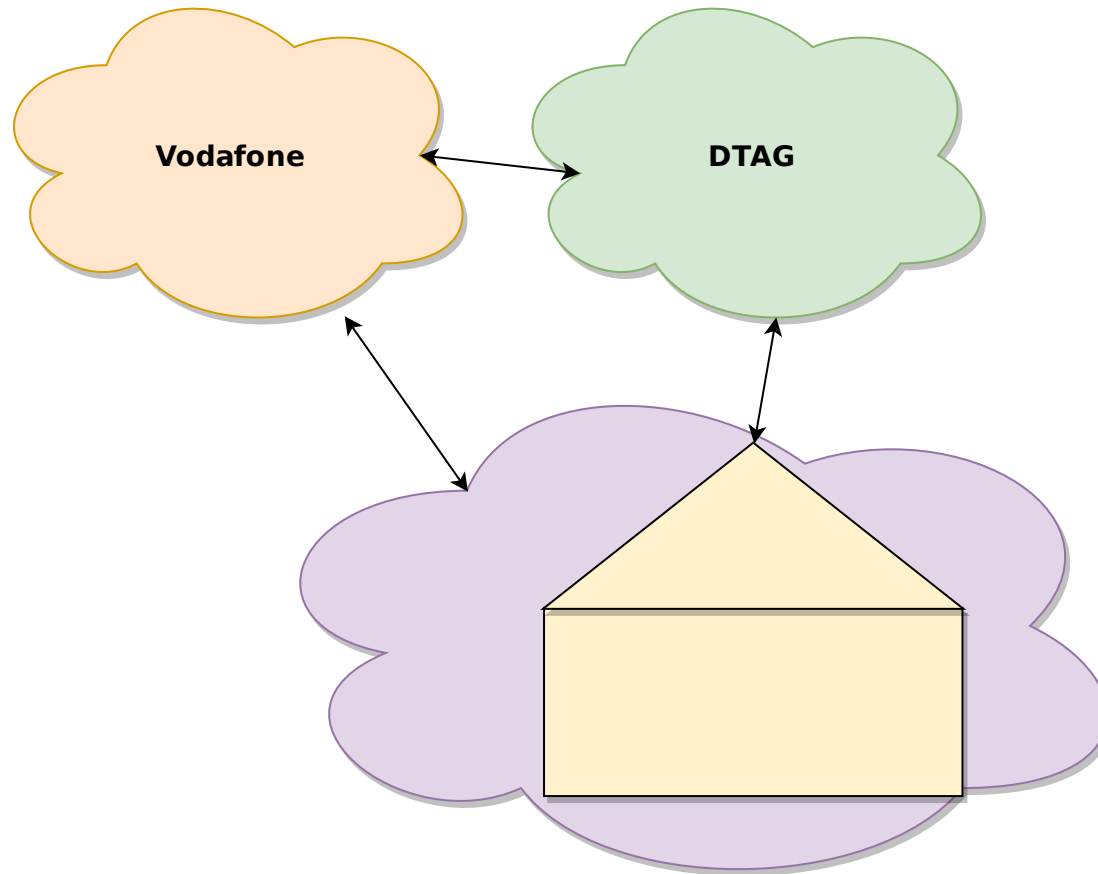
## Why?

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

# Design Solutions

Why?

Topology

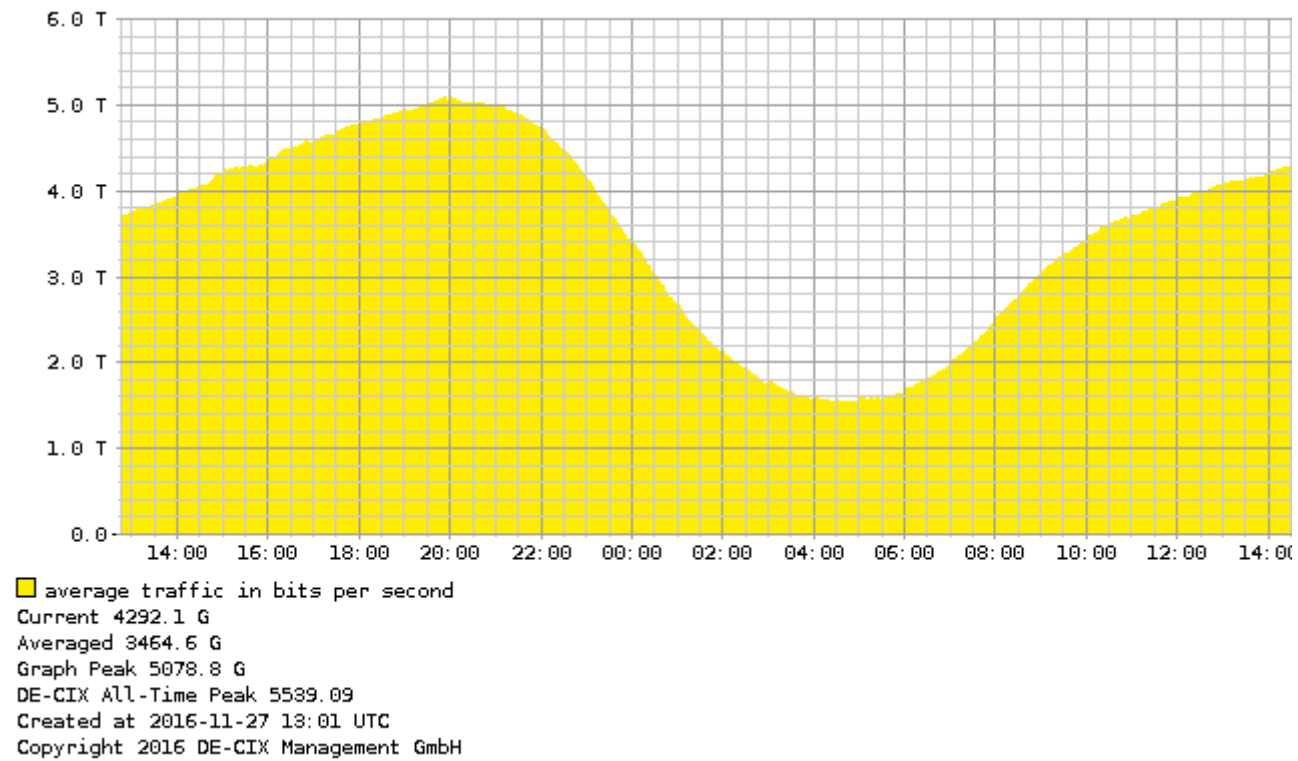




## THE 7950 XRS FAMILY



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

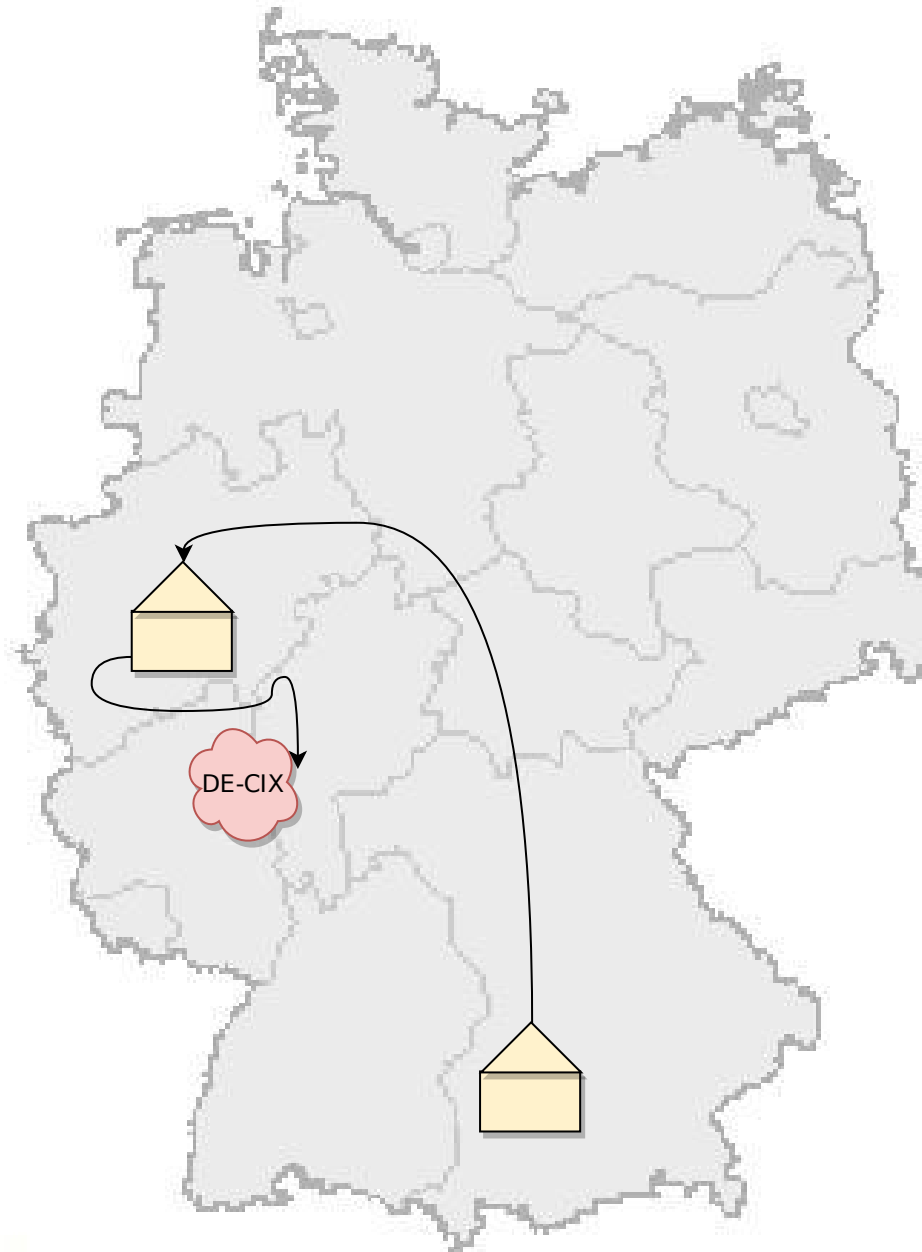


# Design Solutions

Why?

Topology

Edge

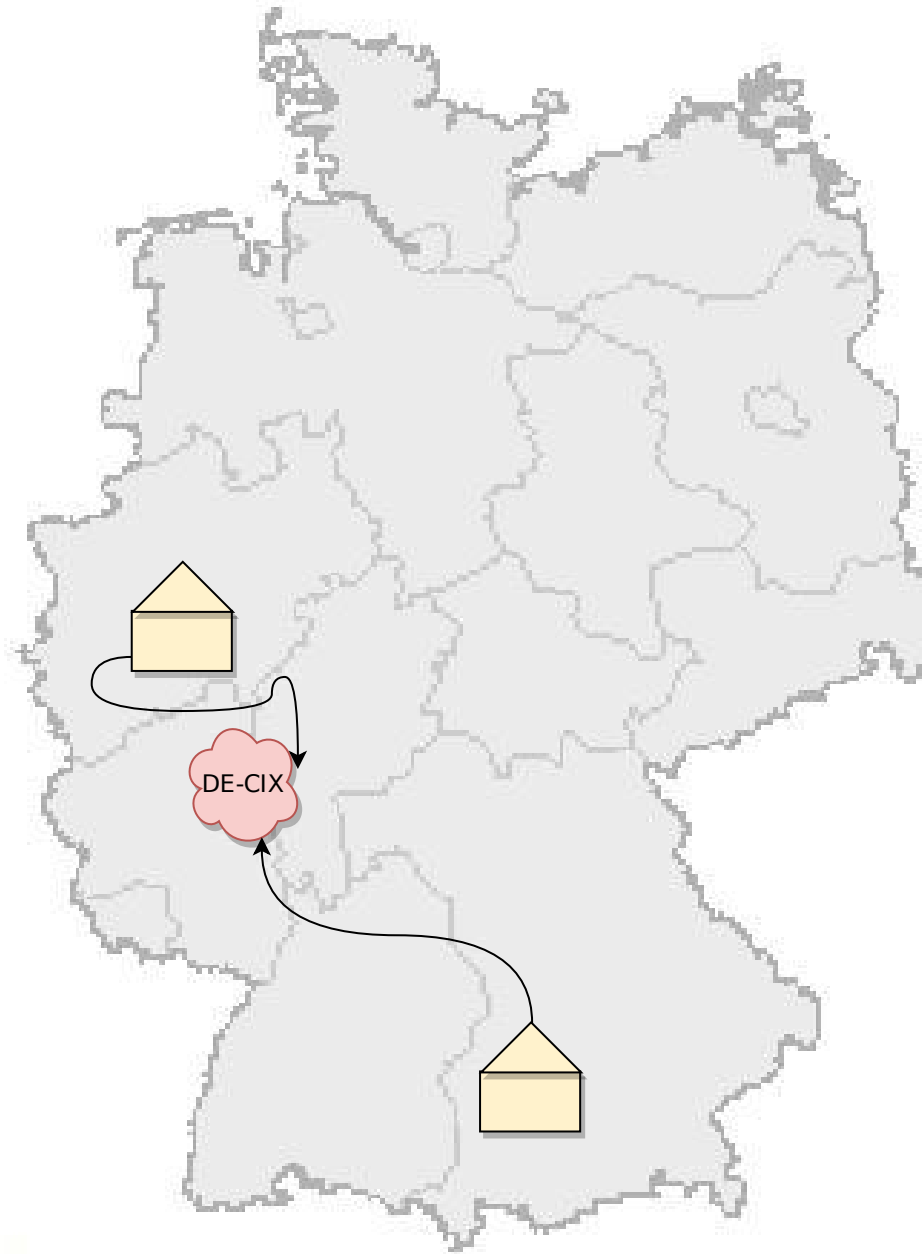


# Design Solutions

Why?

Topology

Edge

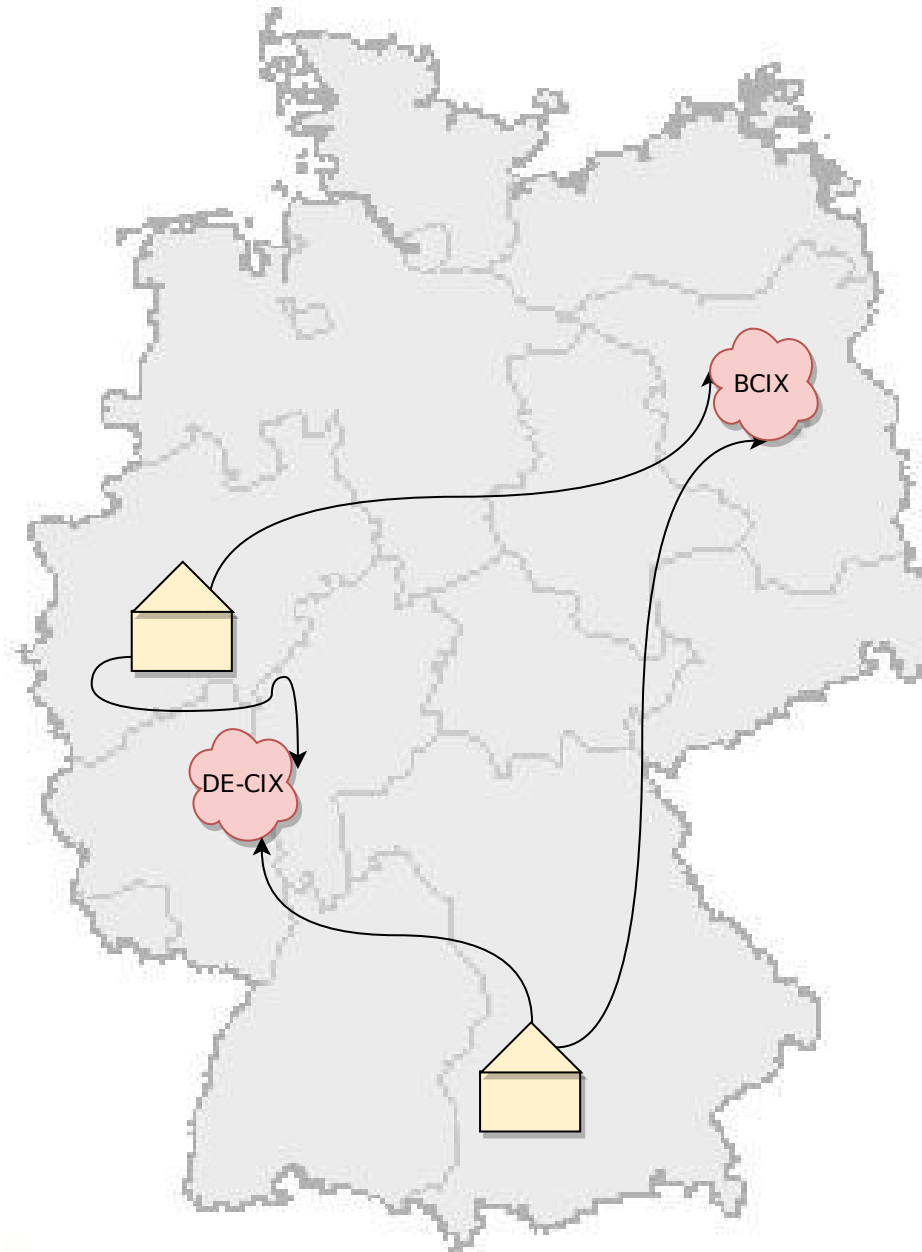


# Design Solutions

Why?

Topology

Edge

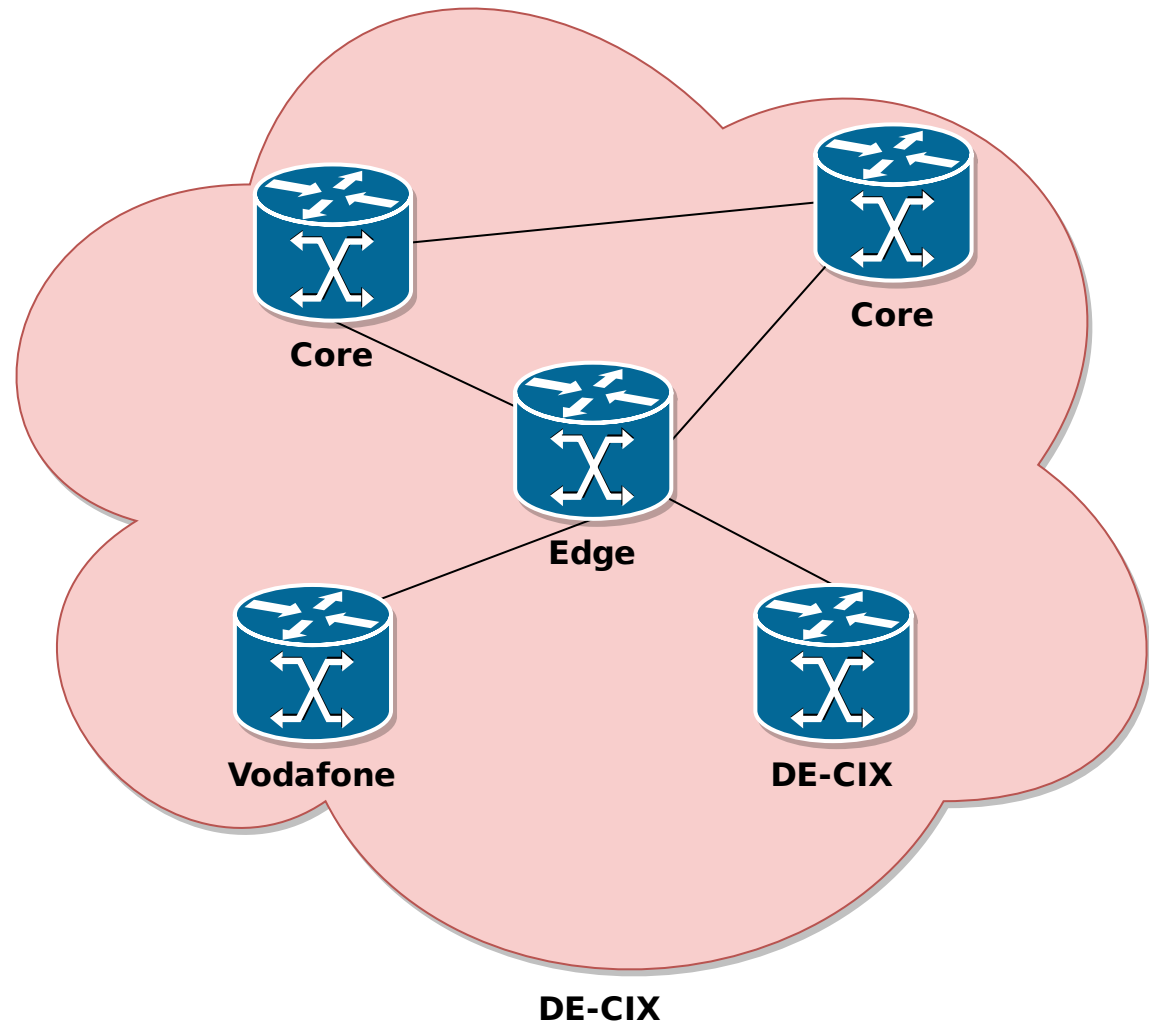


# Design Solutions

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 separate router for transit/peering
- BGP as EGP
  - Border Gateway Protocol
  - Exterior Gateway Protocol

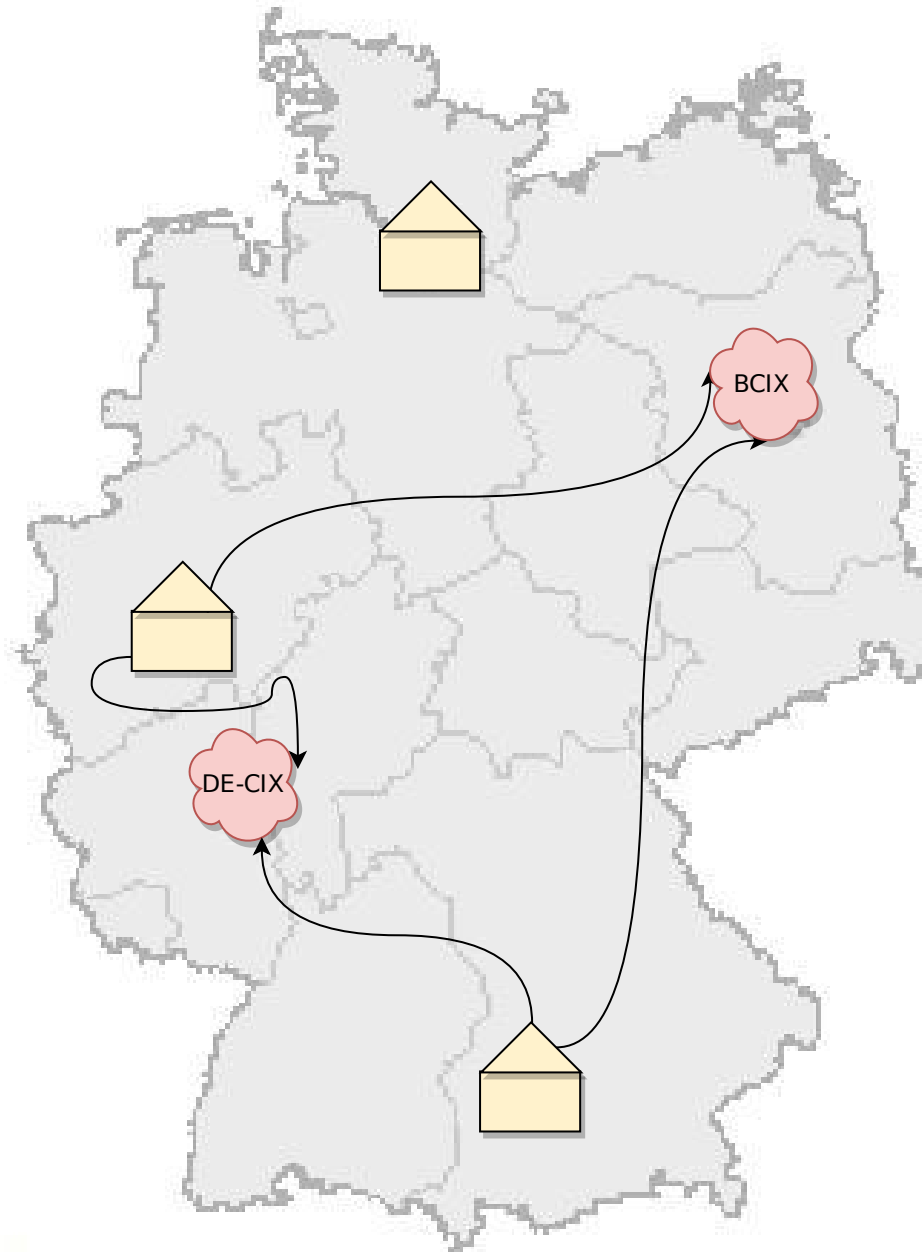
# Design Solutions

Why?

Topology

Edge

Core





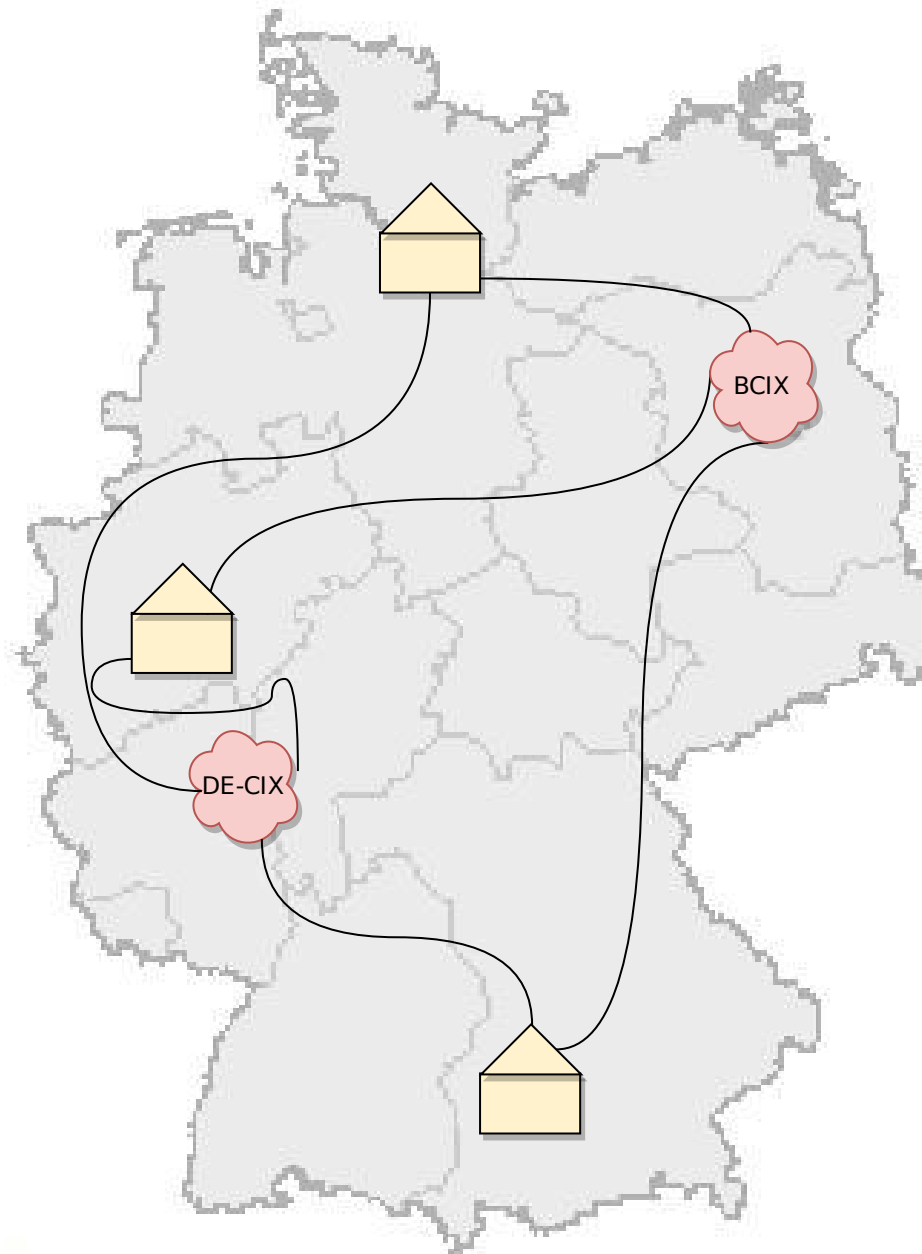
# Design Solutions

Why?

Topology

Edge

Core



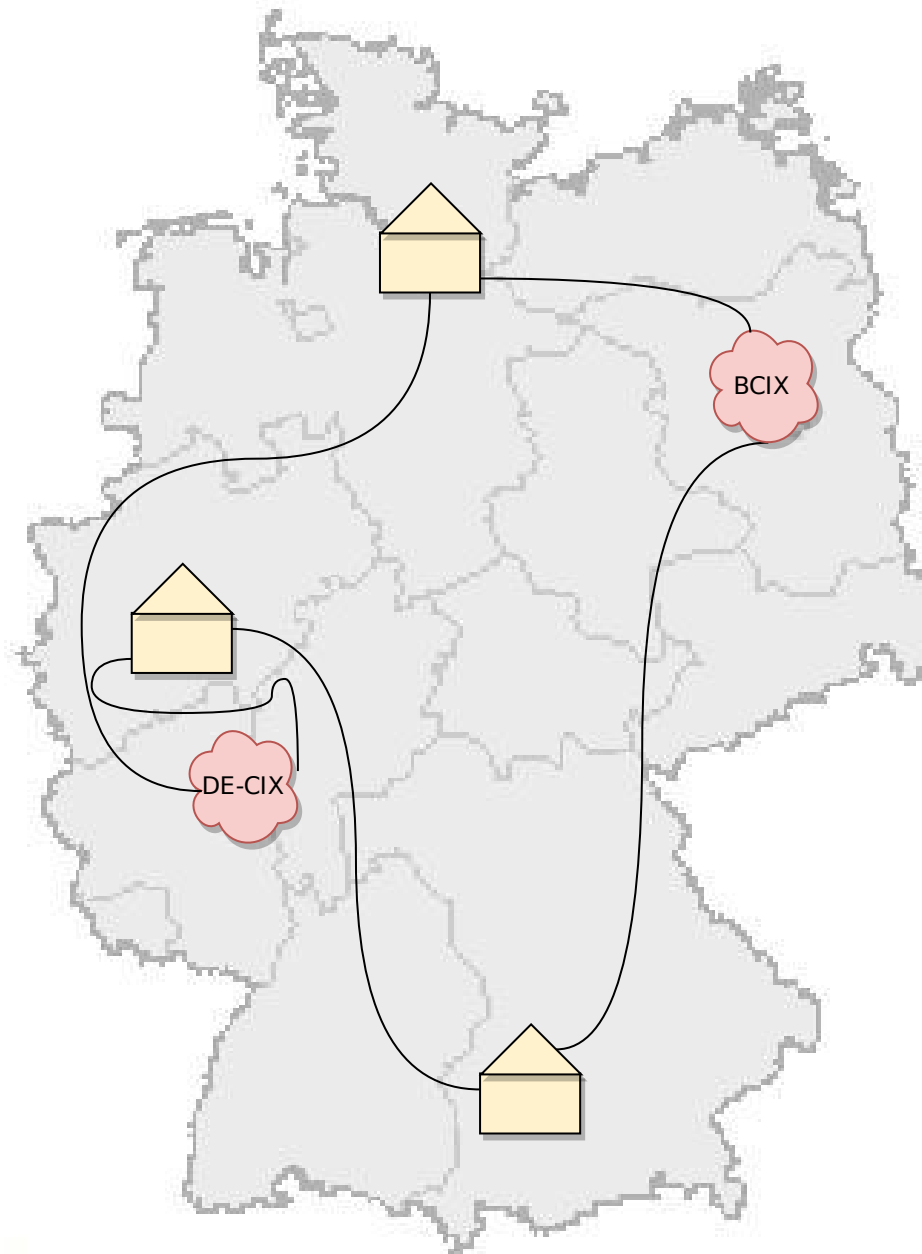
# Design Solutions

Why?

Topology

Edge

Core



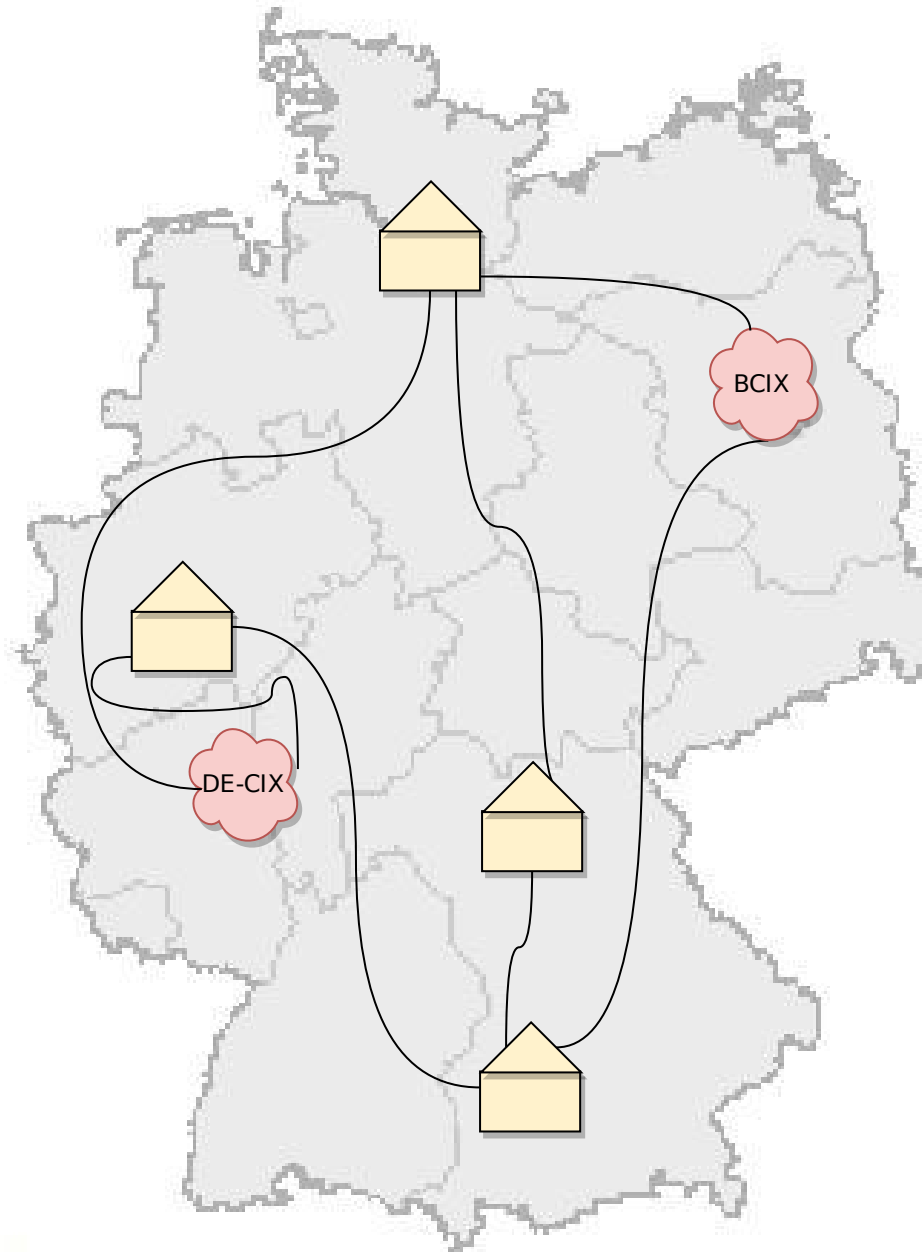
# Design Solutions

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

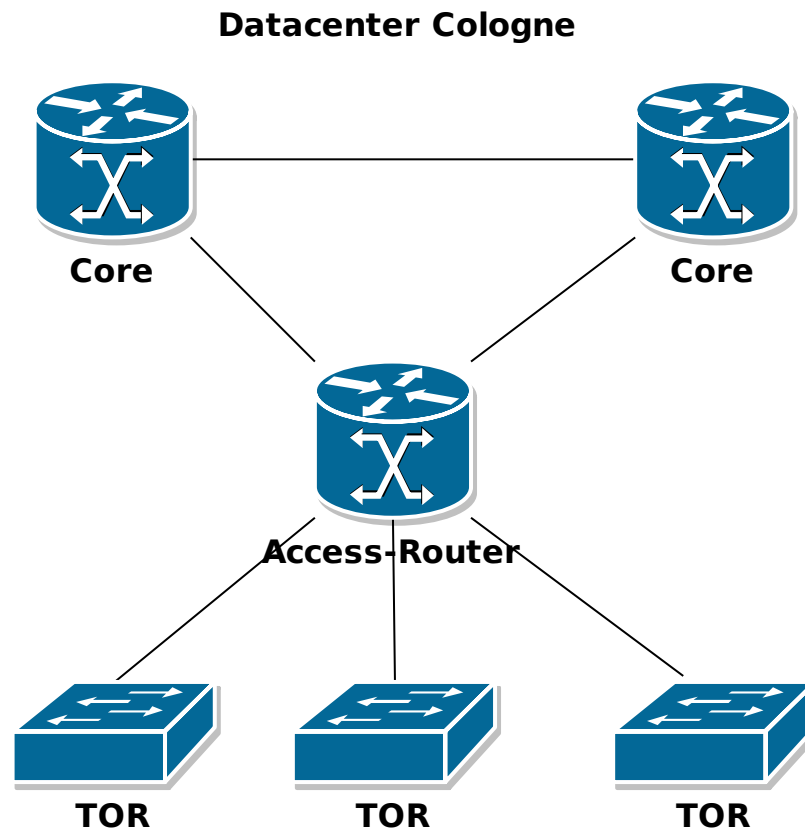
Why?

Topology

Edge

Core

DC



# Design Solutions

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

Why?

Topology

Edge

Core

DC

# Design Solutions

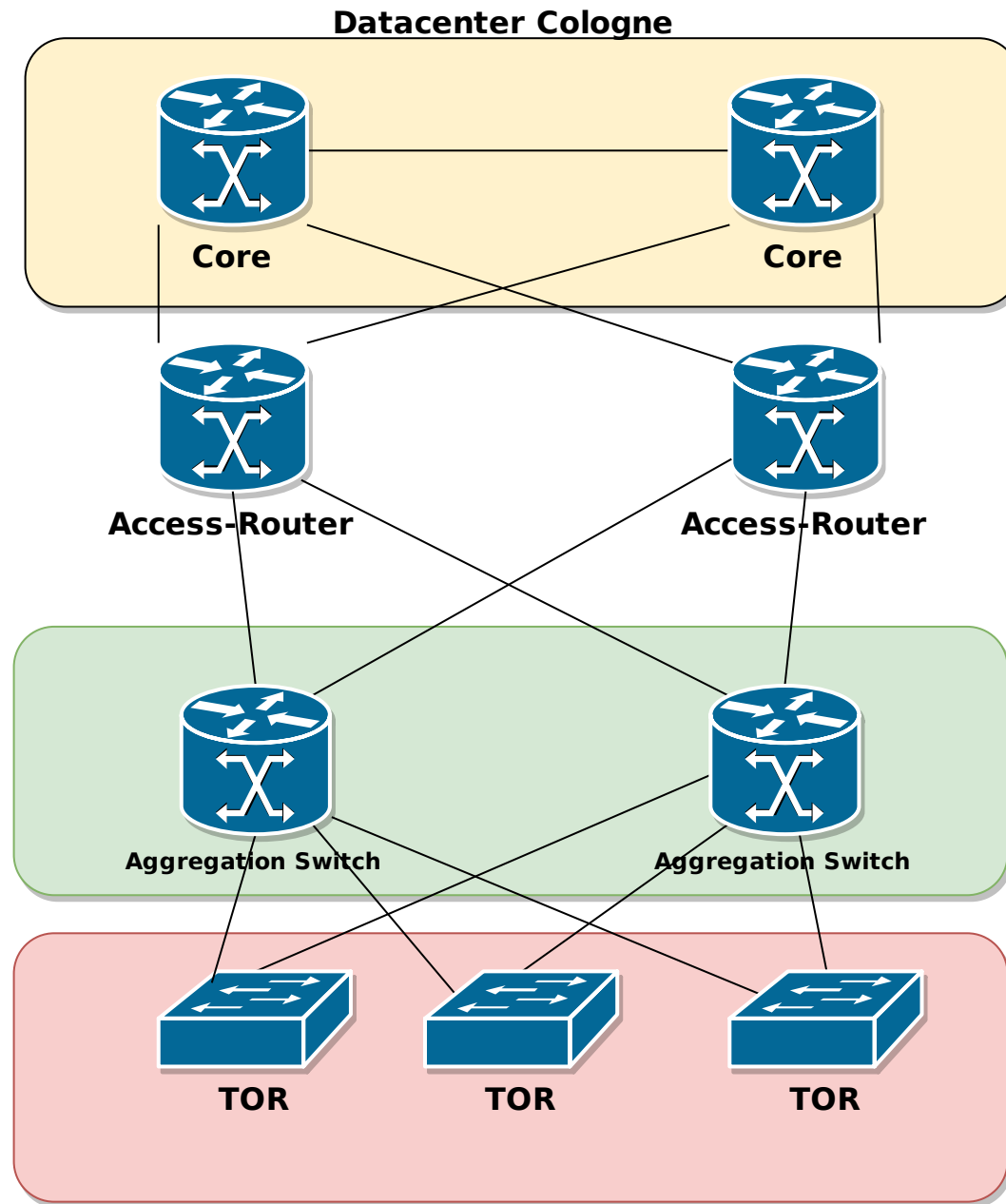
Why?

Topology

Edge

Core

DC



# Design Solutions

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

Why?

Topology

Edge

Core

DC



# Design Solutions

Why?

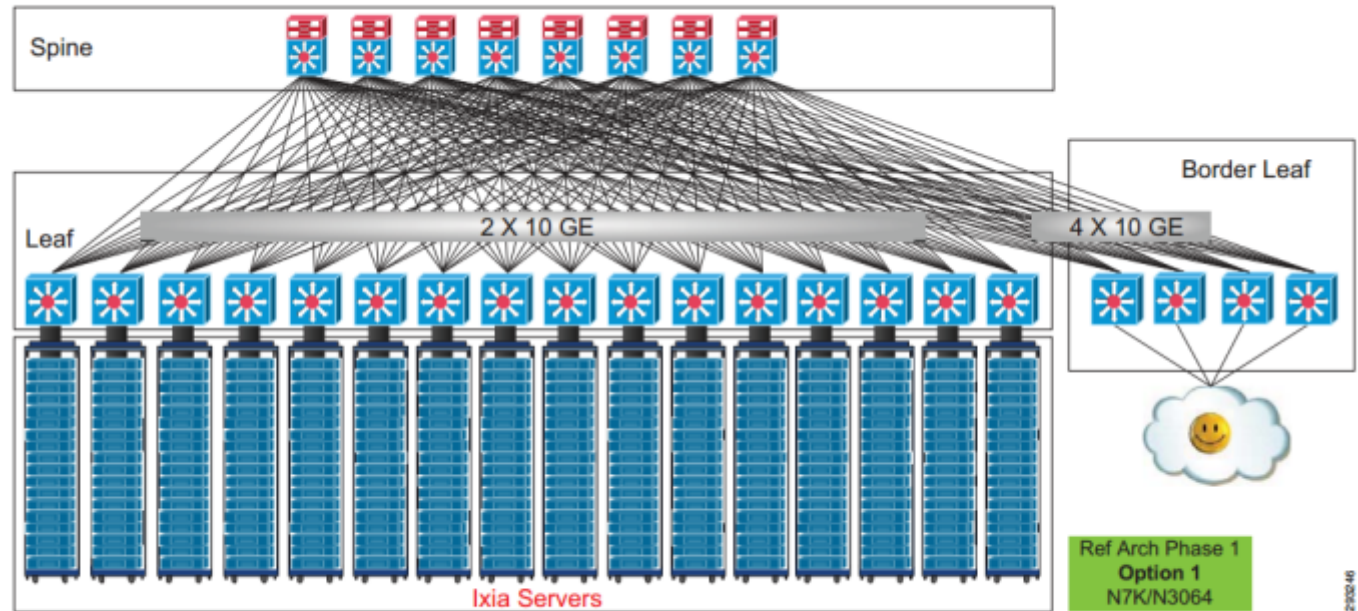
Topology

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