(Demystifying)

Datacenter Network Monitoring and Management

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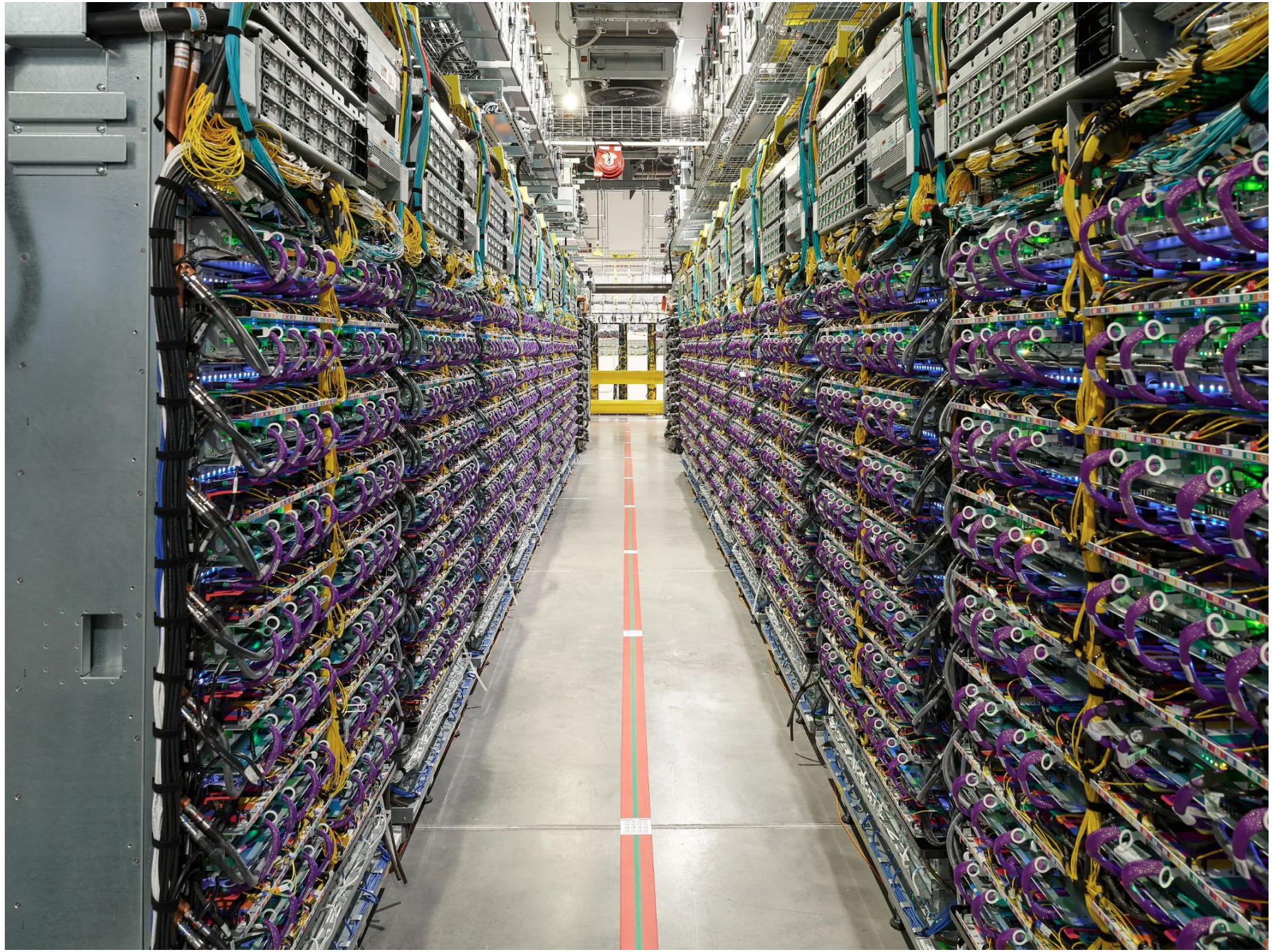
Course schedule and materials

https://vojislav.dukic.ch/teaching/2026-dcnet/

Grading

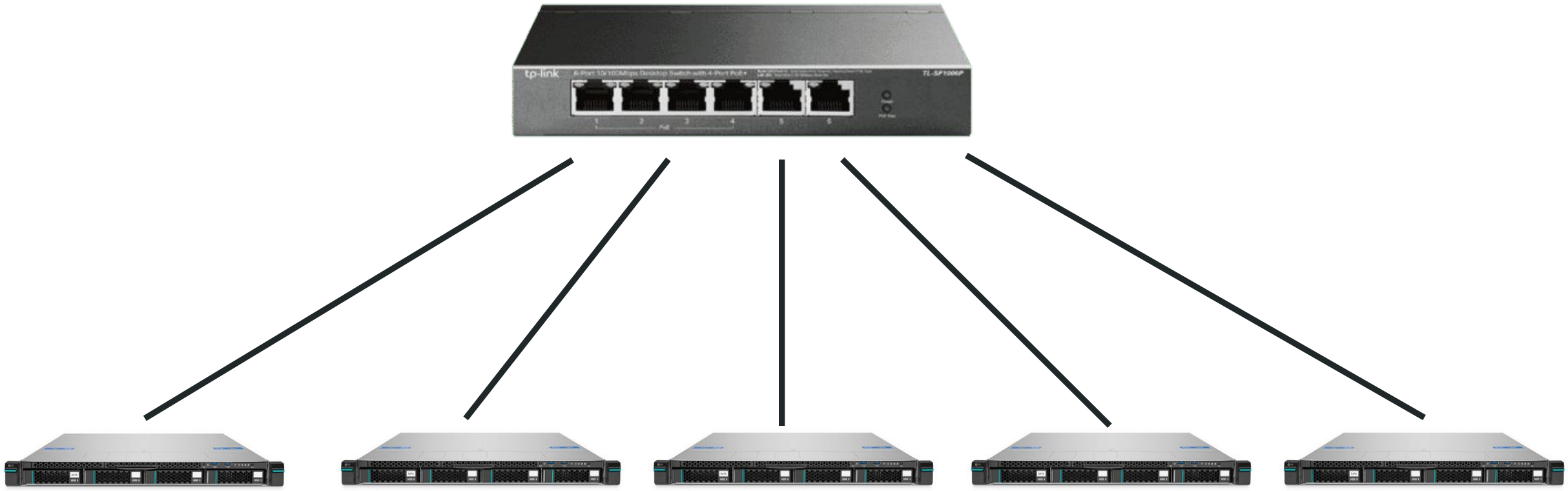
1 (2) report(s) every week +
one time 15 minute presentation

presentation in groups of 2 (3)

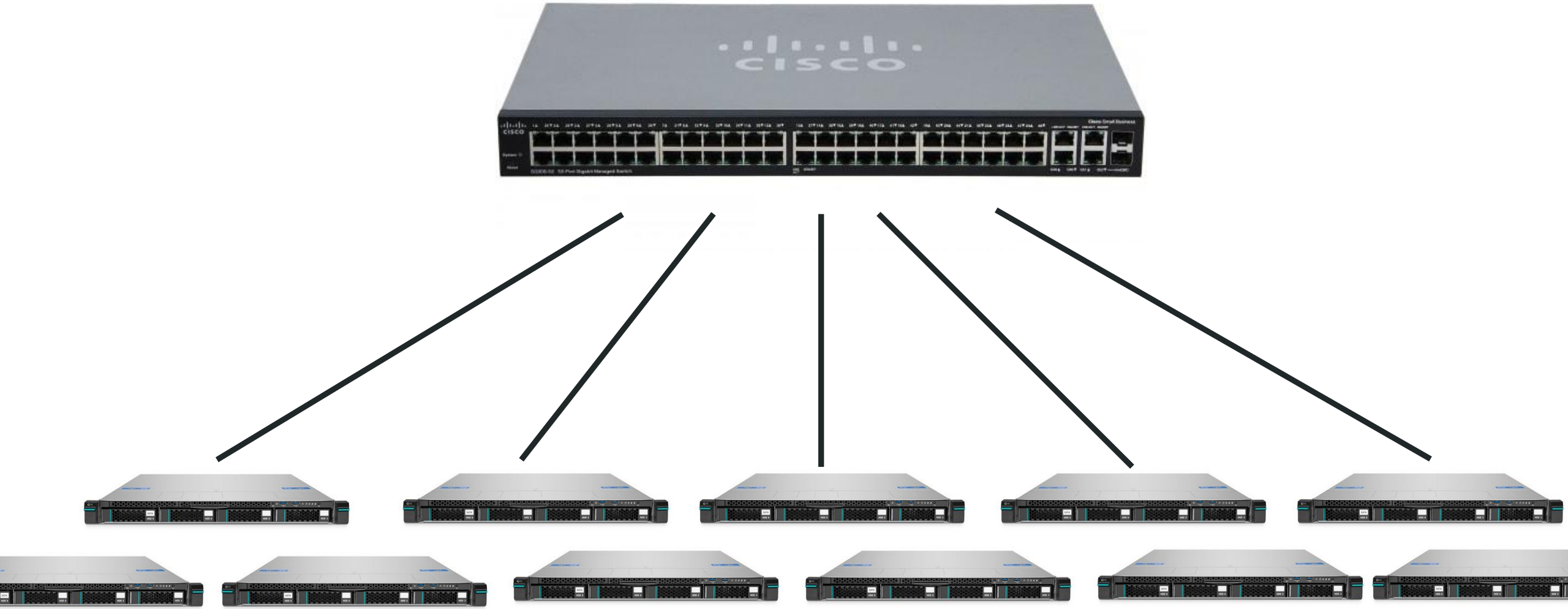


Commodity hardware

One machine – not enough. How about 5 machines (Rack)?



5 not enough? How about 48? Buy a bigger switch approach



Beyond 48? They don’t sell bigger switches. How about connecting two switches?

1 wire

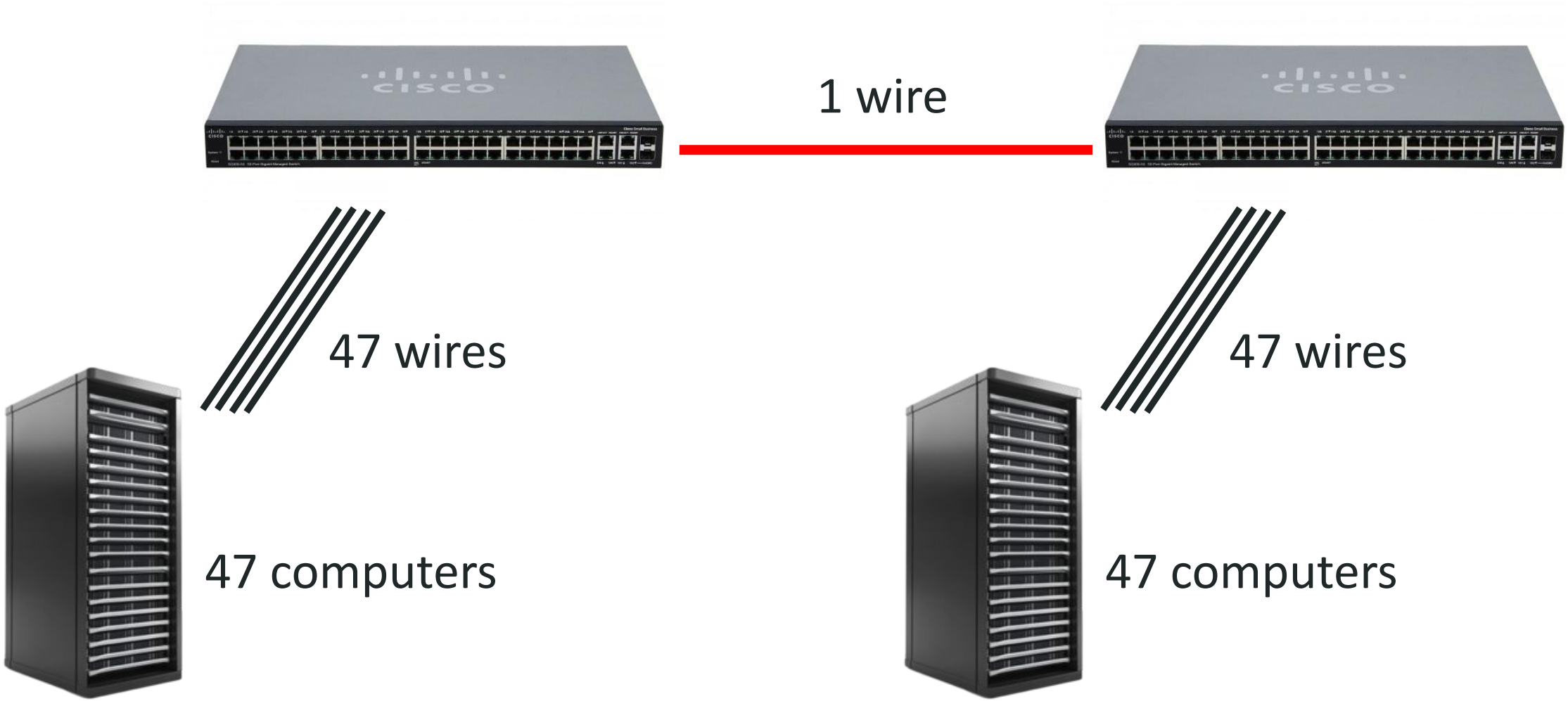
47 wires

47 wires

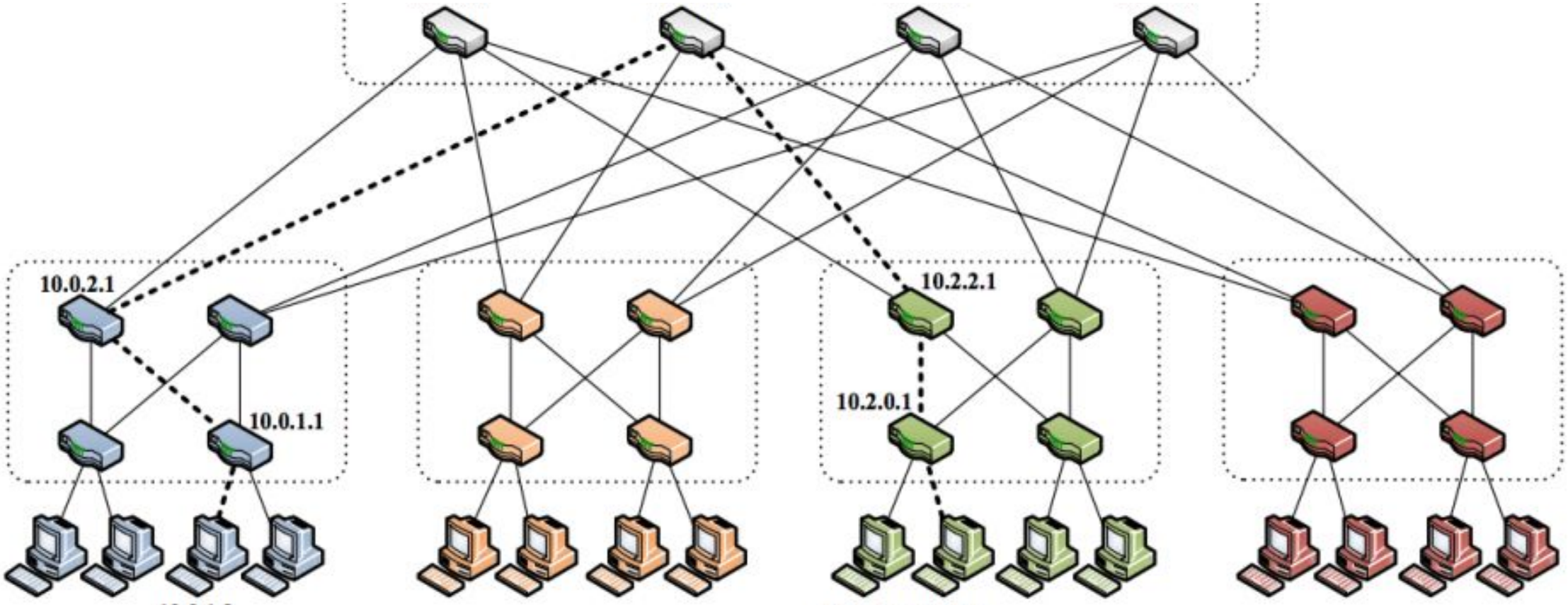
47 computers

47 computers

Bandwidth problem: The bottleneck link prevents congestion-free communication between machines



Solution – Fat Tree
non-blocking clos topology



* A scalable, commodity data center network architecture, SIGCOMM ‘08

Solution – Fat Tree
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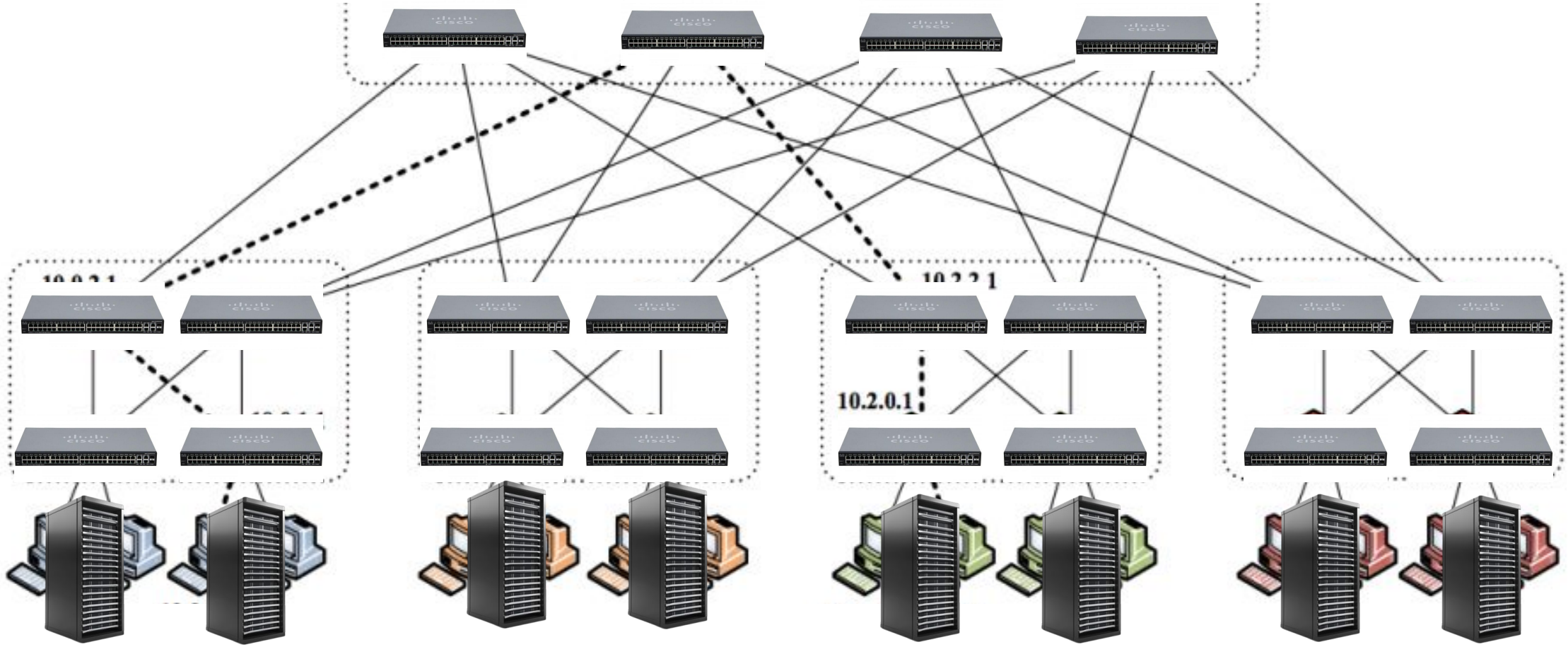
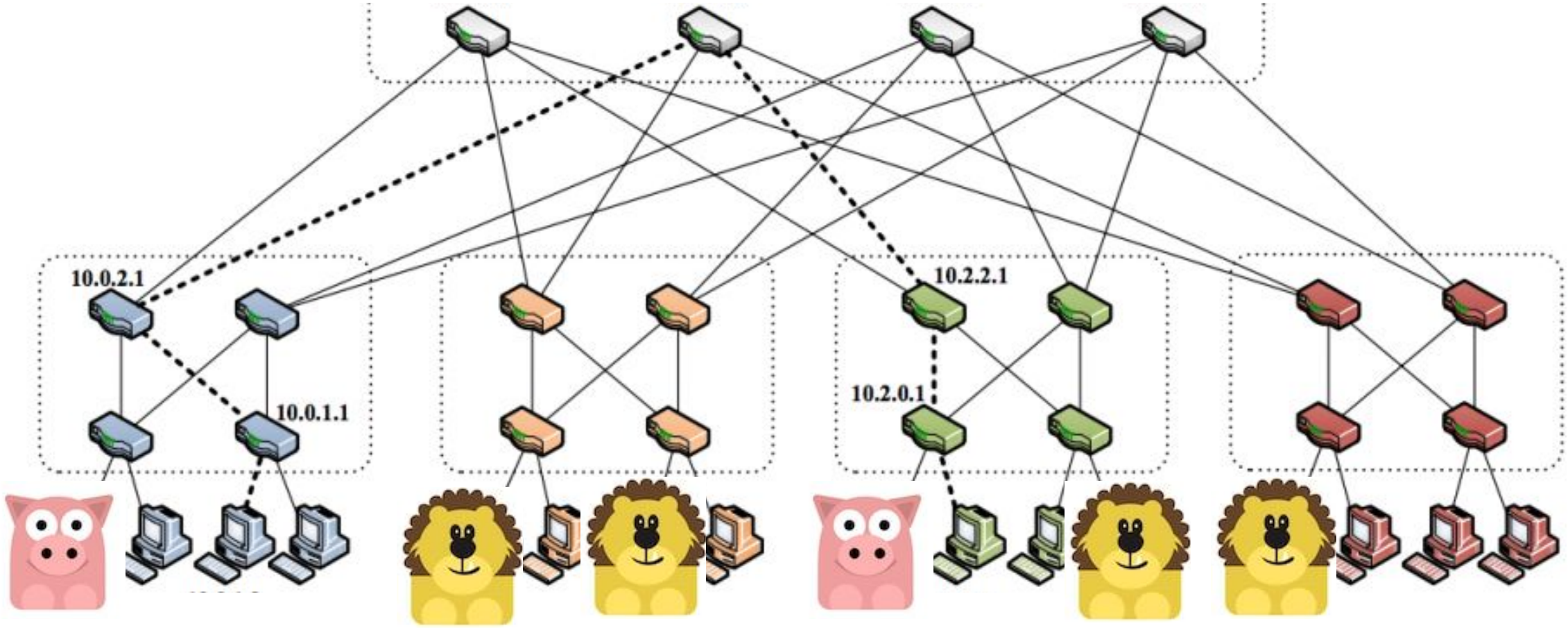
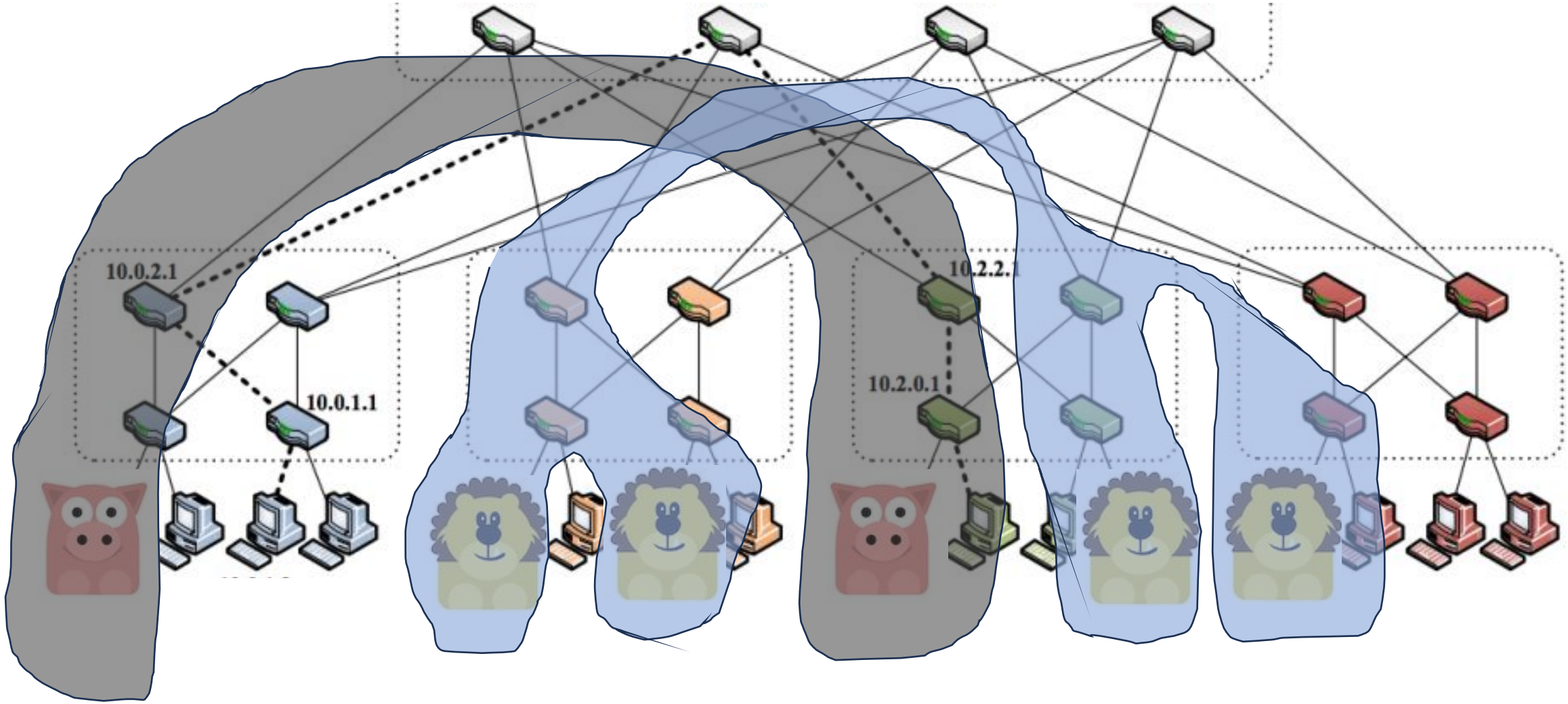


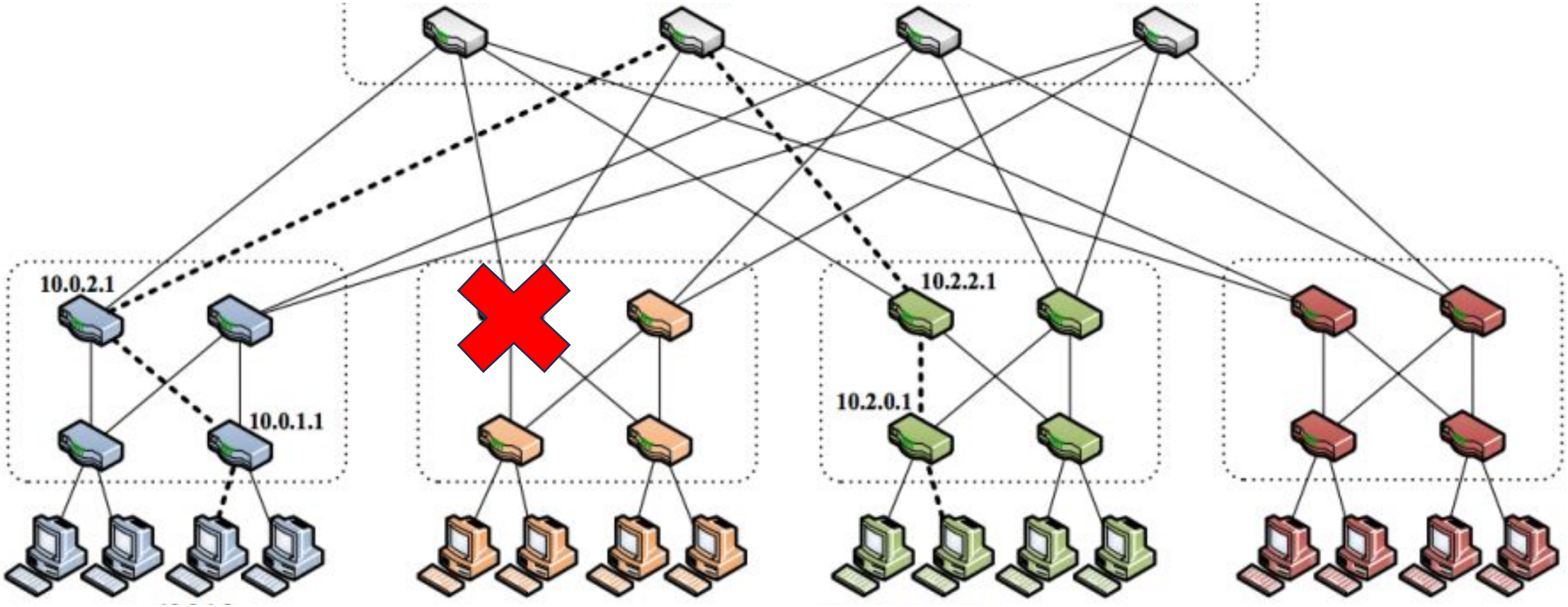
Problem: The infrastructure is too large for a single customer – sell it to multiple tenants



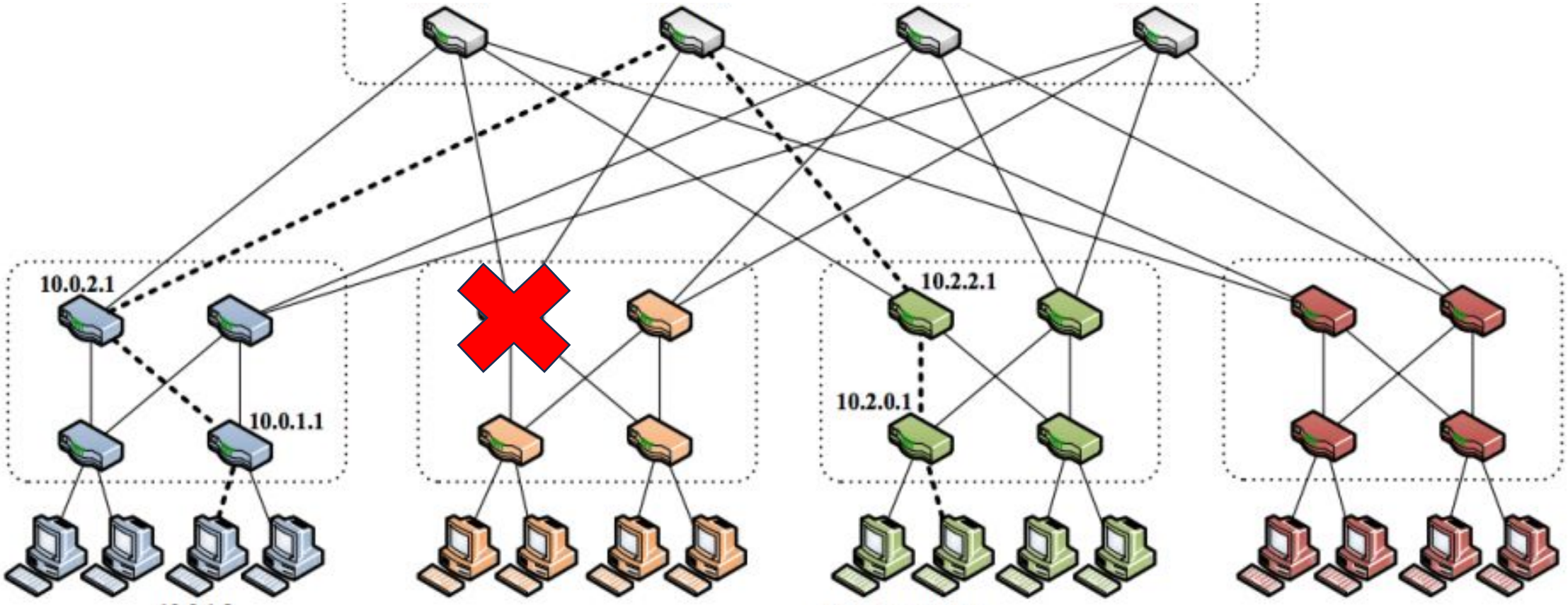
Solution: Virtual Private Cloud (VPC)
A logical layer on top of the physical network



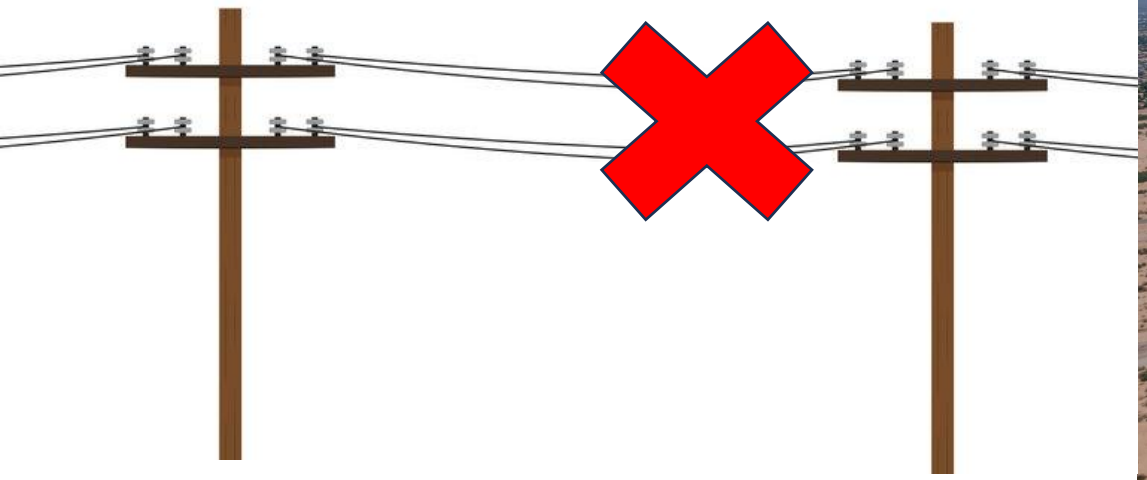
Problem: What if something fails?



Problem: What if something fails?
Solution: Fat-tree has enough redundancy

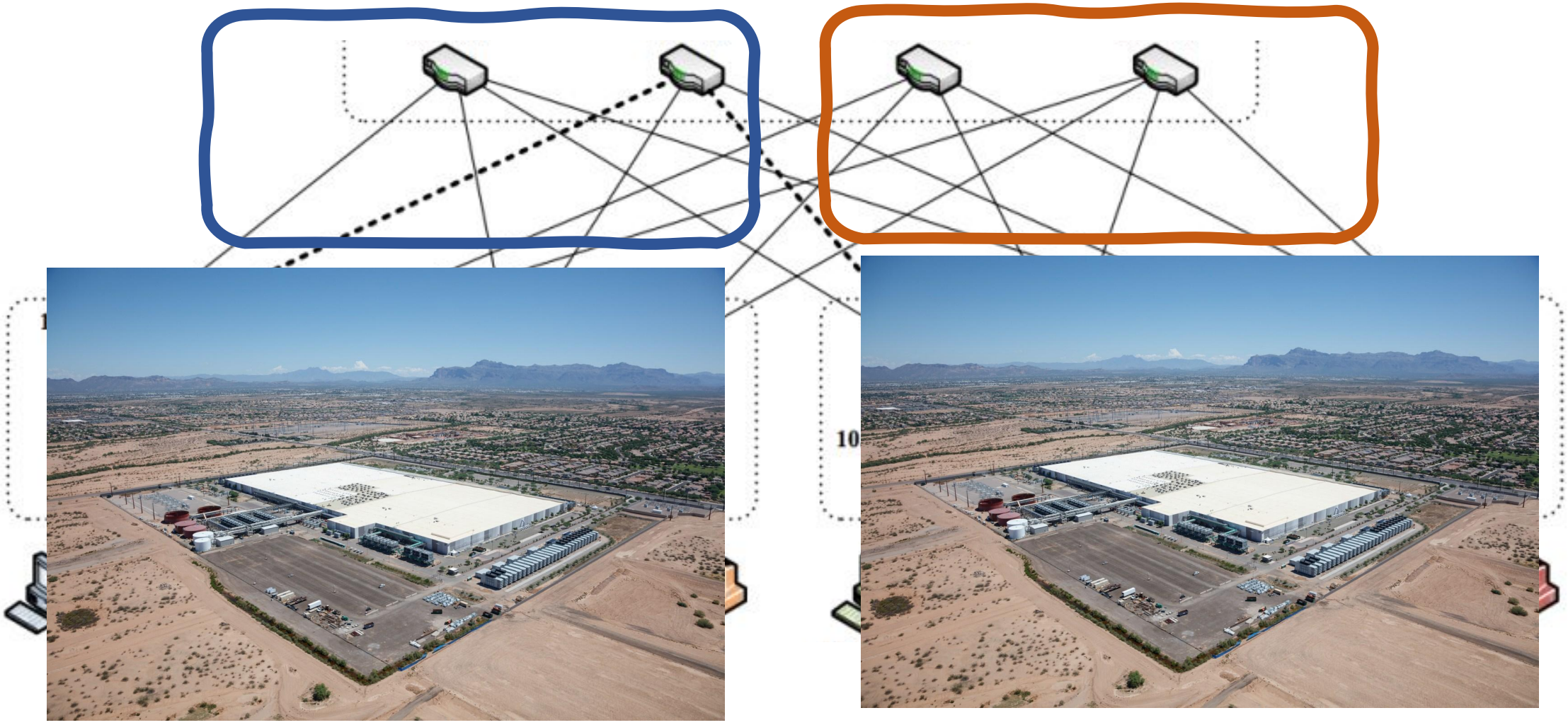


Problem: What if a data center fails?

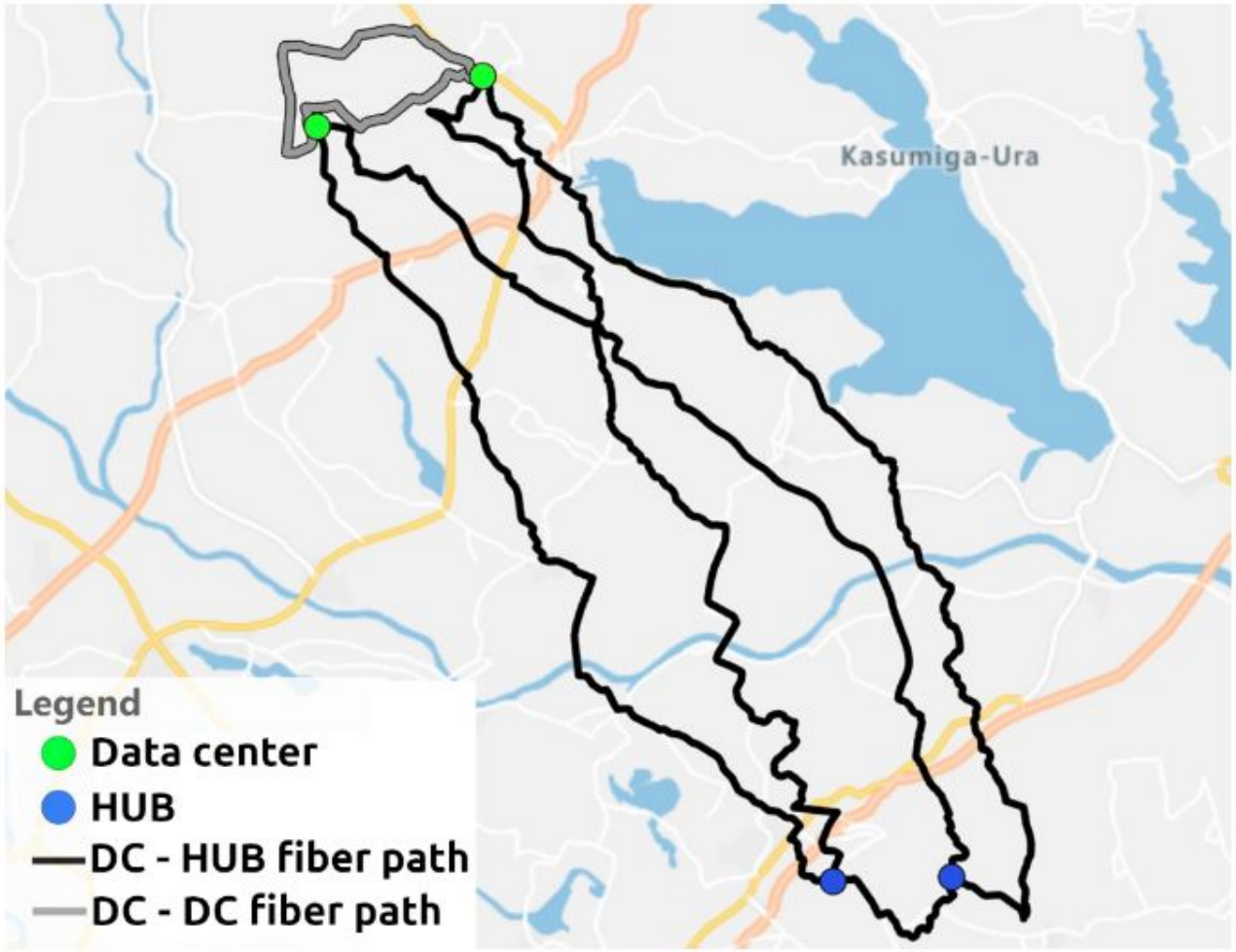


Diesel generators

What if the generators fail?
Solution: Availability Zones – run your app in multiple AZs



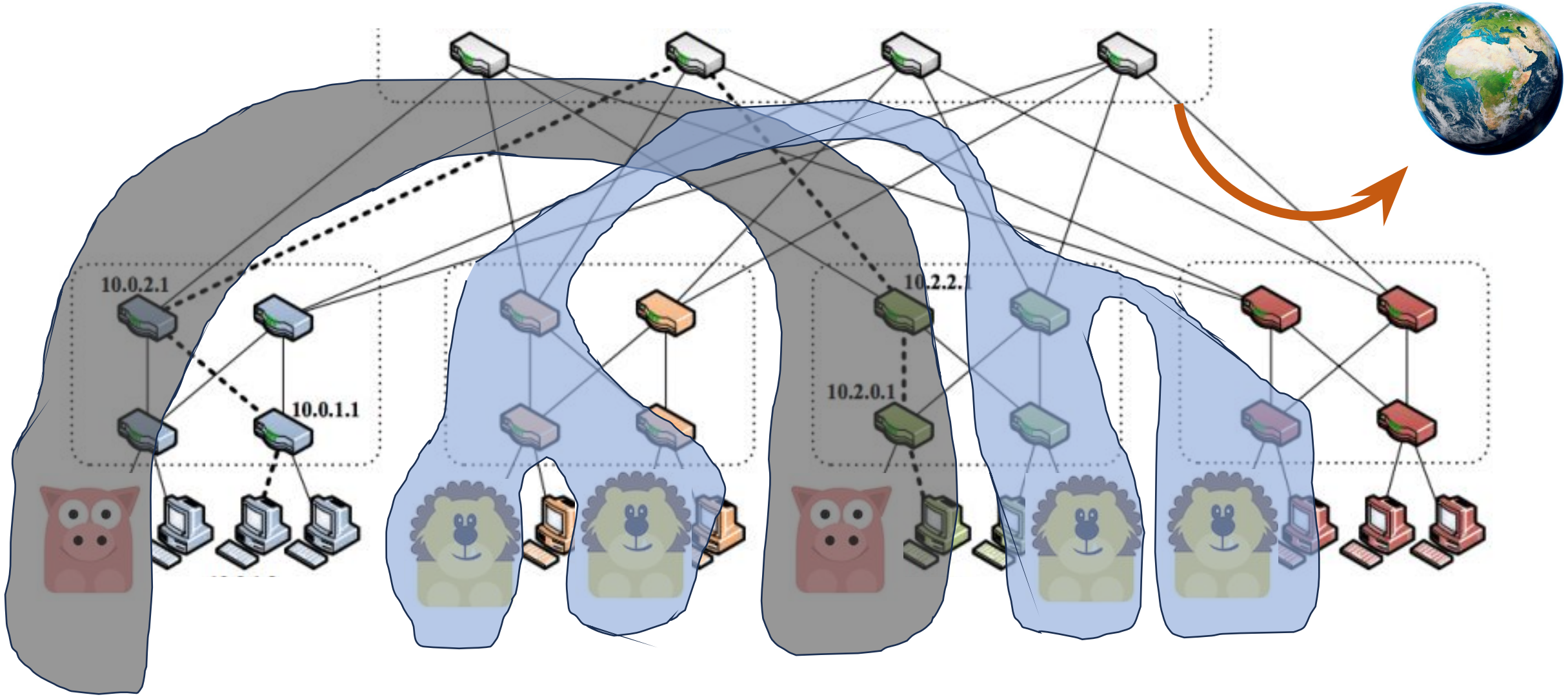
Data Center Interconnect (DCI)



Data Center Interconnect (DCI)

Fiber huts

Problem: Users want to connect to the Internet



Solution: Gateway – you need to enable it for your applications

- Access right
- Virtual Private Cloud
- Firewall

Core network switch

Cisco Firewall
(NFV more generally)

Internet

Problem: Users are far away

Limit – c speed
Speed of light through a fiber cable – 2/3 c speed
Real path = 3 x Geodesic

Solution 1: Move your workload closer to the user

Cloud providers have infrastructure in multiple regions across the world

Solution 2: Use Content Delivery Networks

100s of regions across the world
Mostly for static content

Problem: Internet bandwidth is expensive

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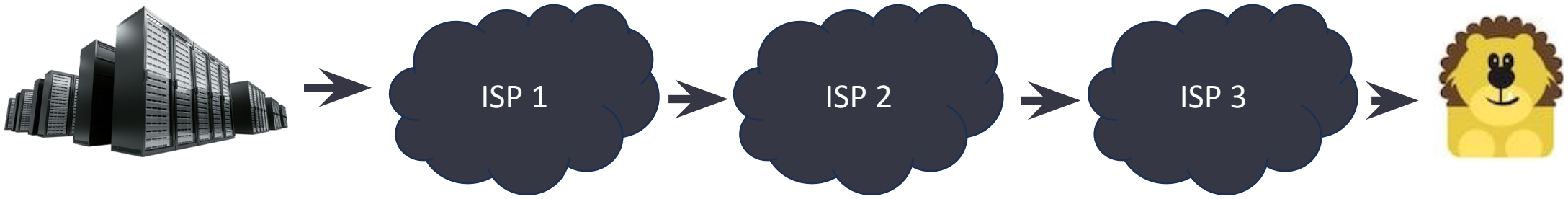
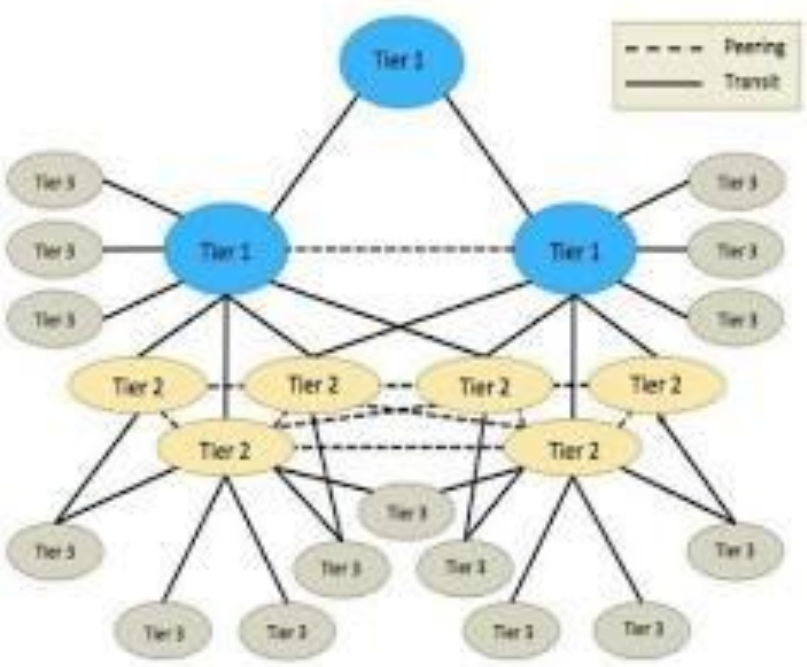
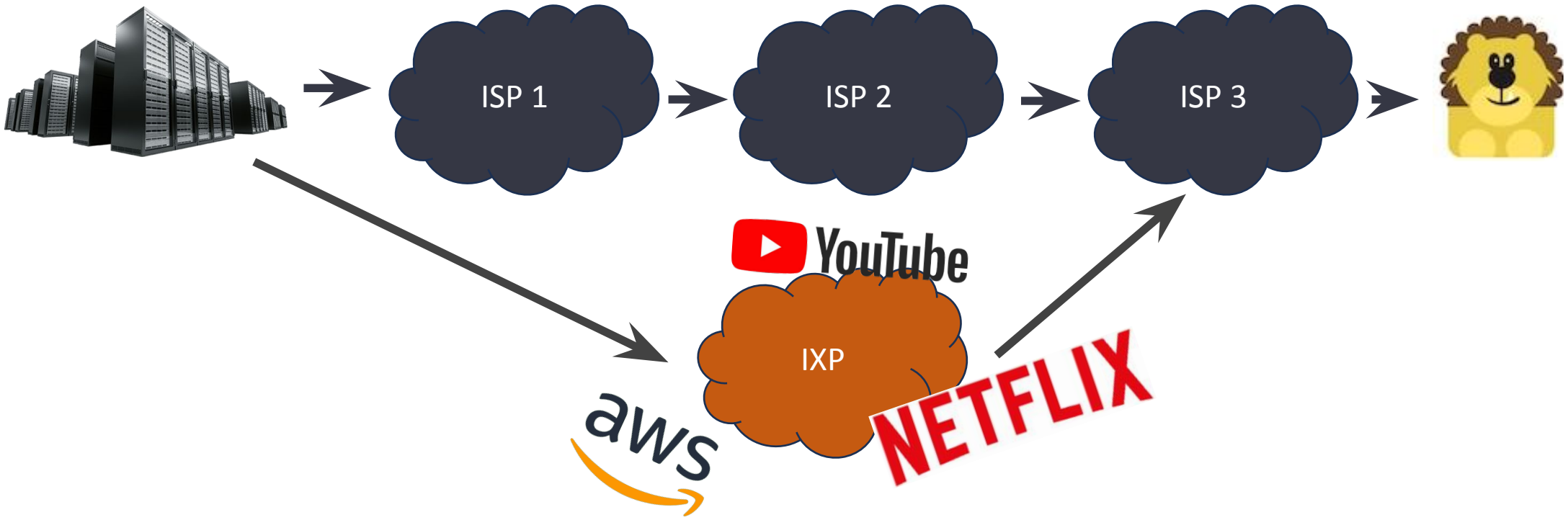




ISP Tiering – Tier 1, Tier 2, and Tier 3

(One possible) Solution:
Internet Exchange Points (IXP)



The final path: From the cloud to the user

Computer

Top of rack

Core layer

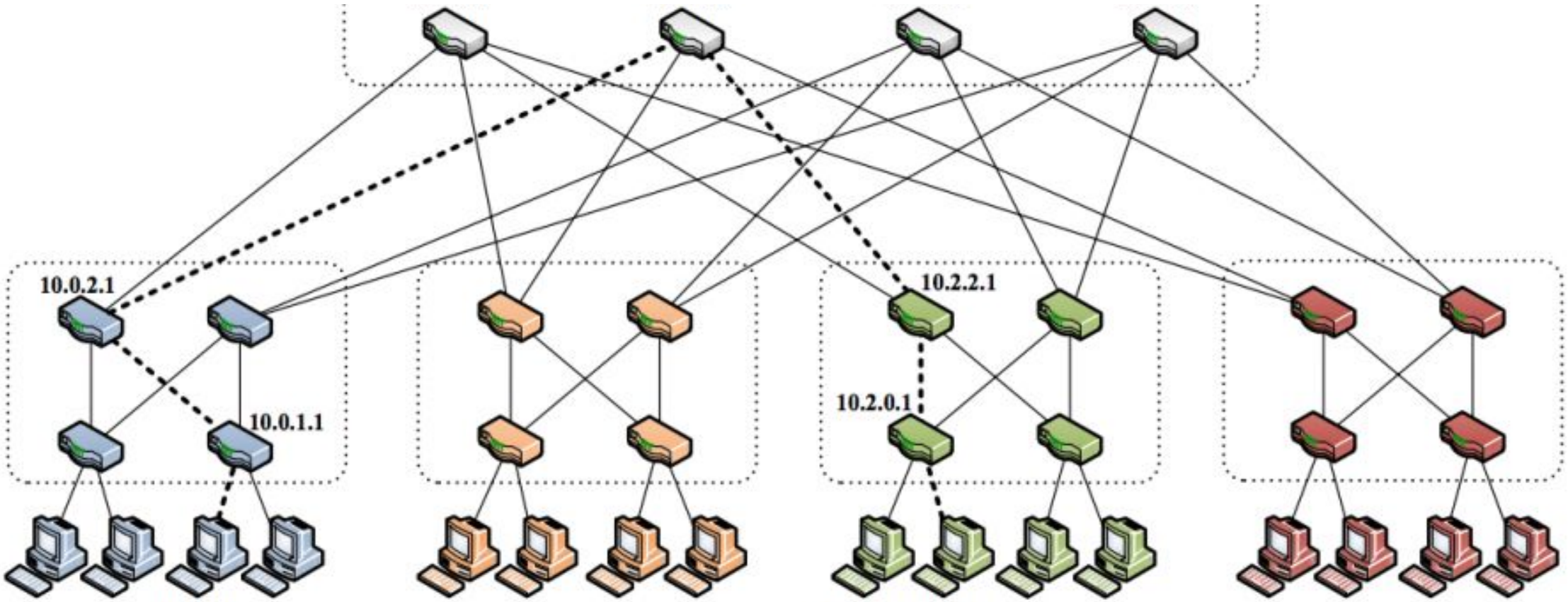
Gateway

IXP

Within a fiber hut

CDN

Last mile ISP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