Re-Defining Core and Access

A New, Two-Tier Network Model

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Chicago Network Operators Group

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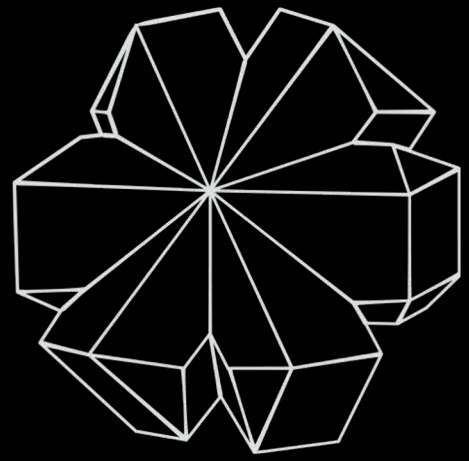
myriad SUPPLY

Who's talking?

- 15 years in networking
- On computers since single digits
- Spoken at NOGs/NOFs in 34 countries
- Started "SDN" research in 2011
- Principal Architect at Myriad
- http://ChrisGrundemann.com



Here we go...

Network Models

Huh, what?

You know what a network is

- Passing Packets
- Forwarding Frames
- Routers, Switches
- Middleboxen
- Connections

But what is a model?

mod·el

/ˈmädl/

noun

1. a three-dimensional representation of a person or thing or of a proposed structure, typically on a smaller scale than the original.
   "a model of St. Paul's Cathedral"
   synonyms: replica, copy, representation, mock-up, dummy, imitation, duplicate, reproduction, facsimile More

2. a system or thing used as an example to follow or imitate.
   "the law became a model for dozens of laws banning nondegradable plastic products"
   synonyms: prototype, stereotype, archetype, type, version; mold, template, framework, pattern, design, blueprint
   "the Canadian model of health care"

   - prototypical, prototypal, archetypal
     "model farms"

A Conceptual Model...

https://en.wikipedia.org/wiki/Conceptual_model

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A Conceptual Model...

- is a set of concepts
- is an abstraction of real things
- is a representation of a system
- is used to help people know, understand, or simulate a subject

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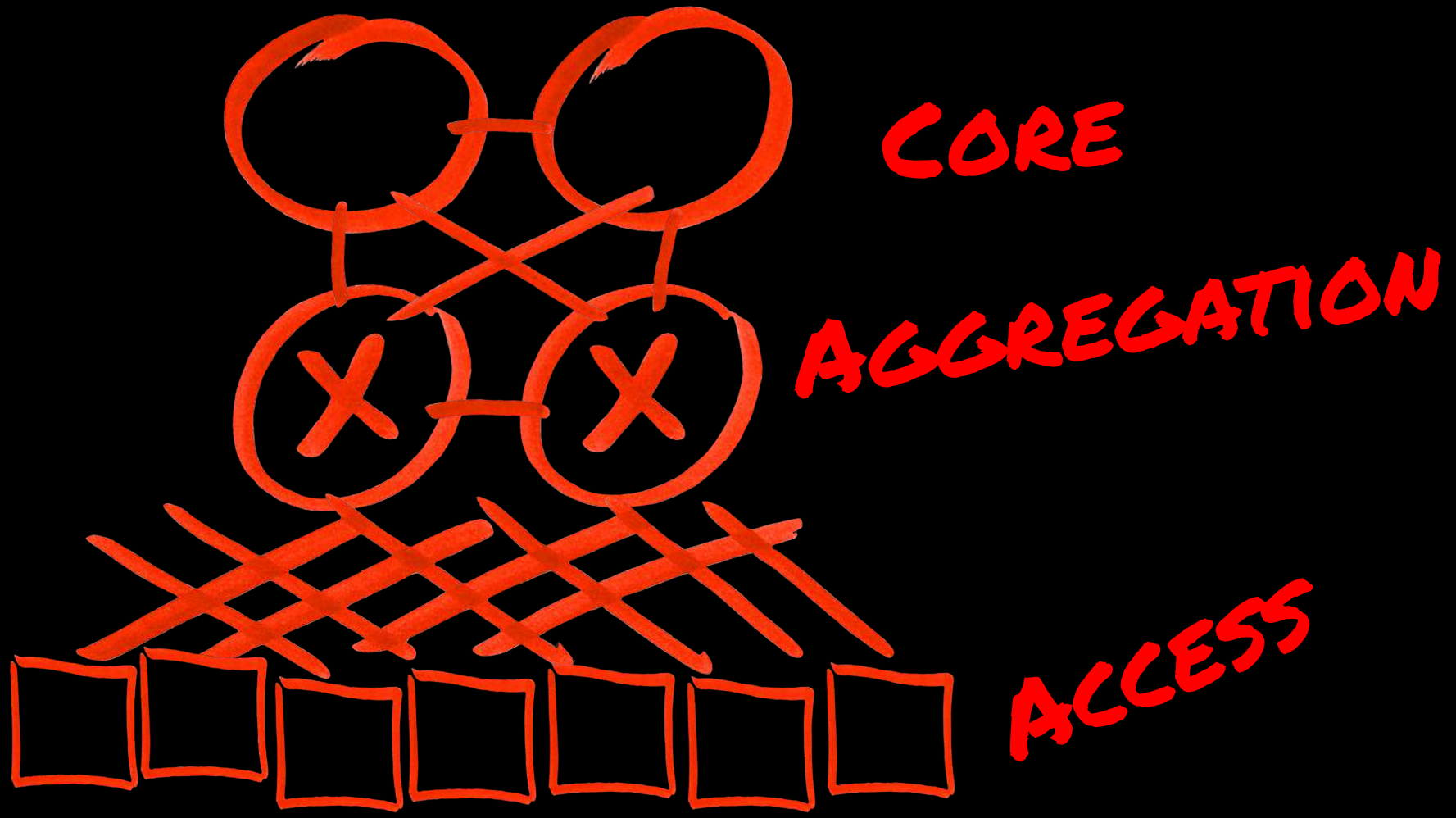
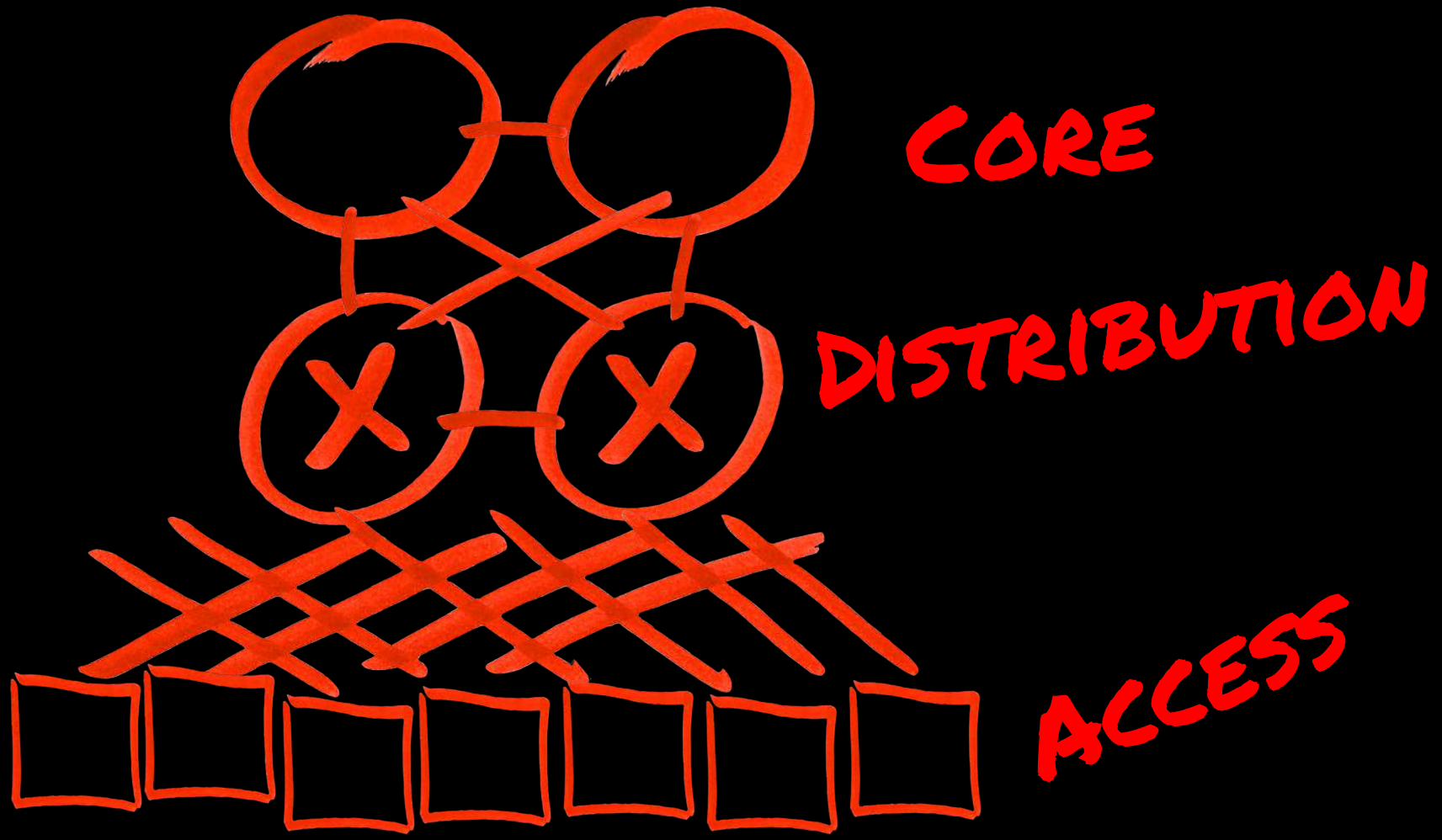
The Old Model

"Three-tier Hierarchical Network Model"

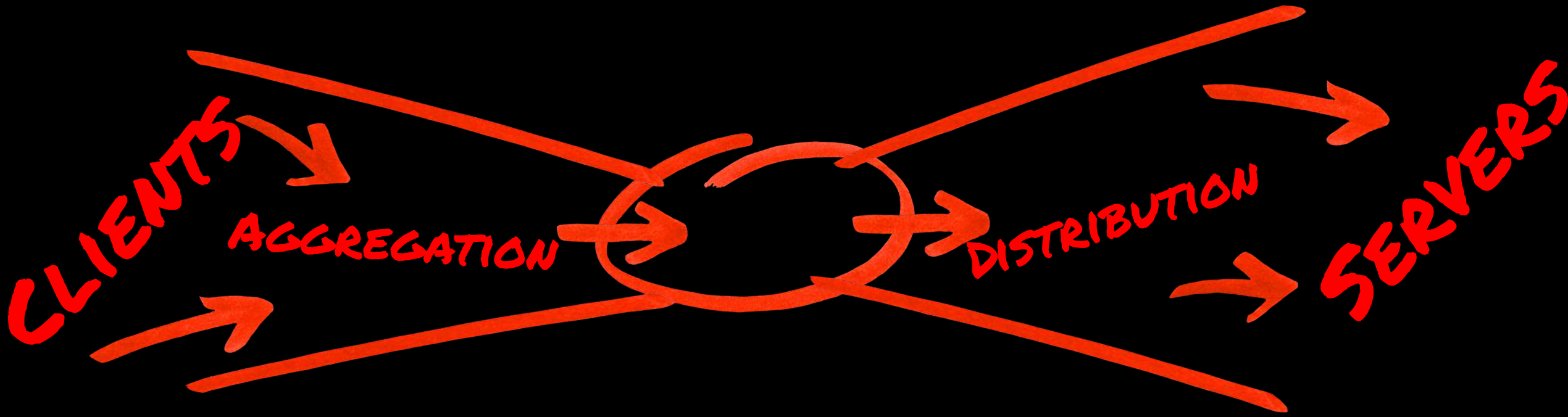
Three Tier Campus Network



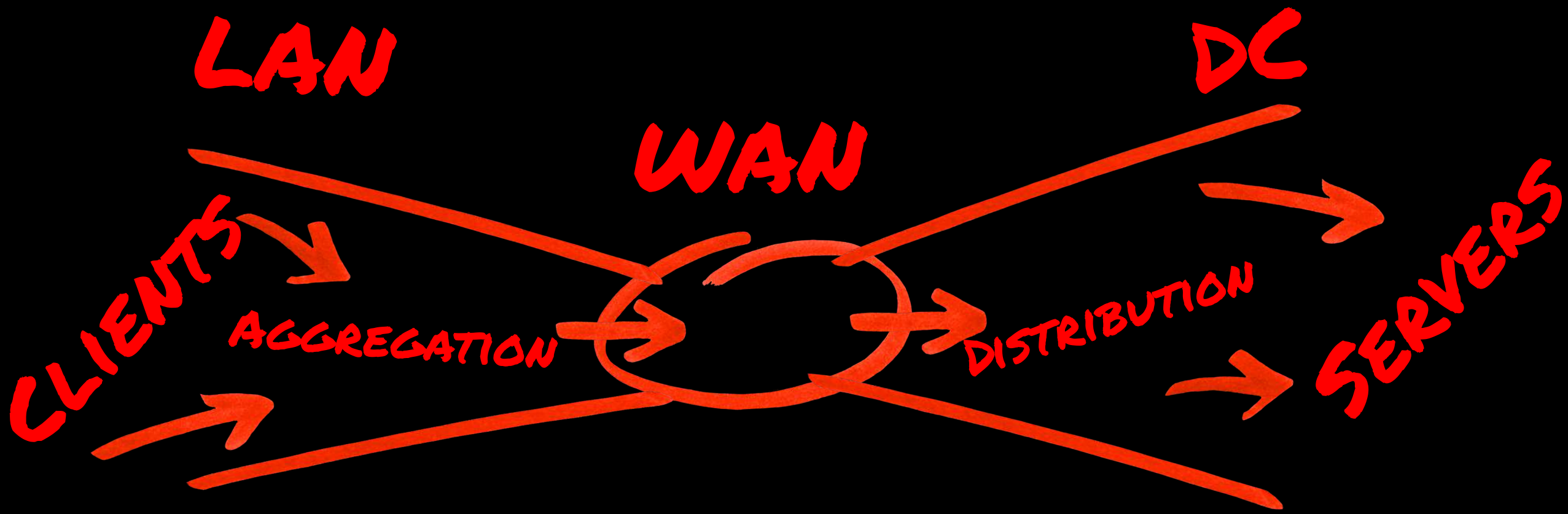
Three Tier DC Network



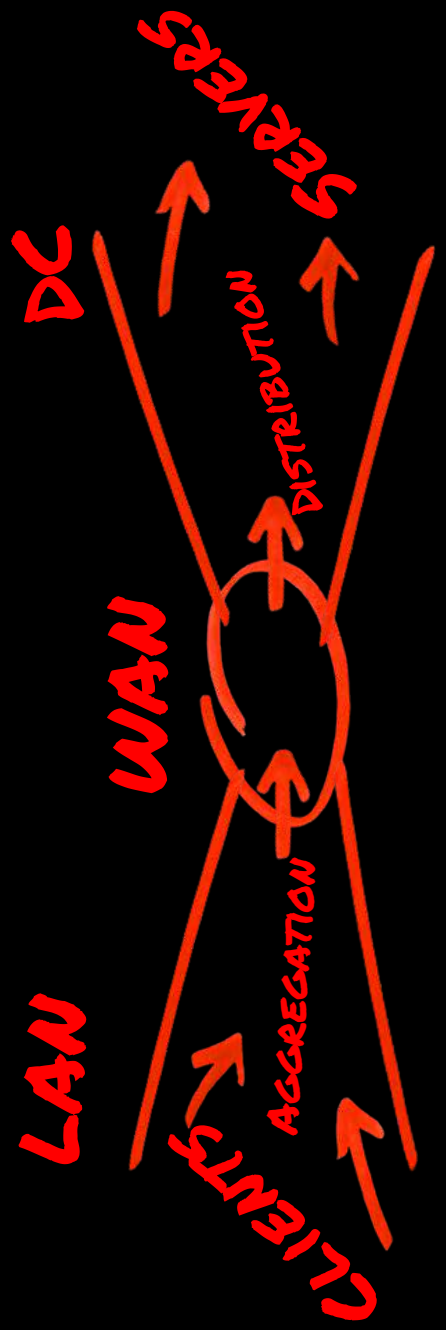
Why Agg & Dist?



The other 3



North/South



The Three Tiers

- Core
  - Fast forwarding
- Aggregation/Distribution
  - Routing, policy, ACL, load balancing…
- Access
  - Connect endpoints and applications

Leaf / Spine

Folding that Clos

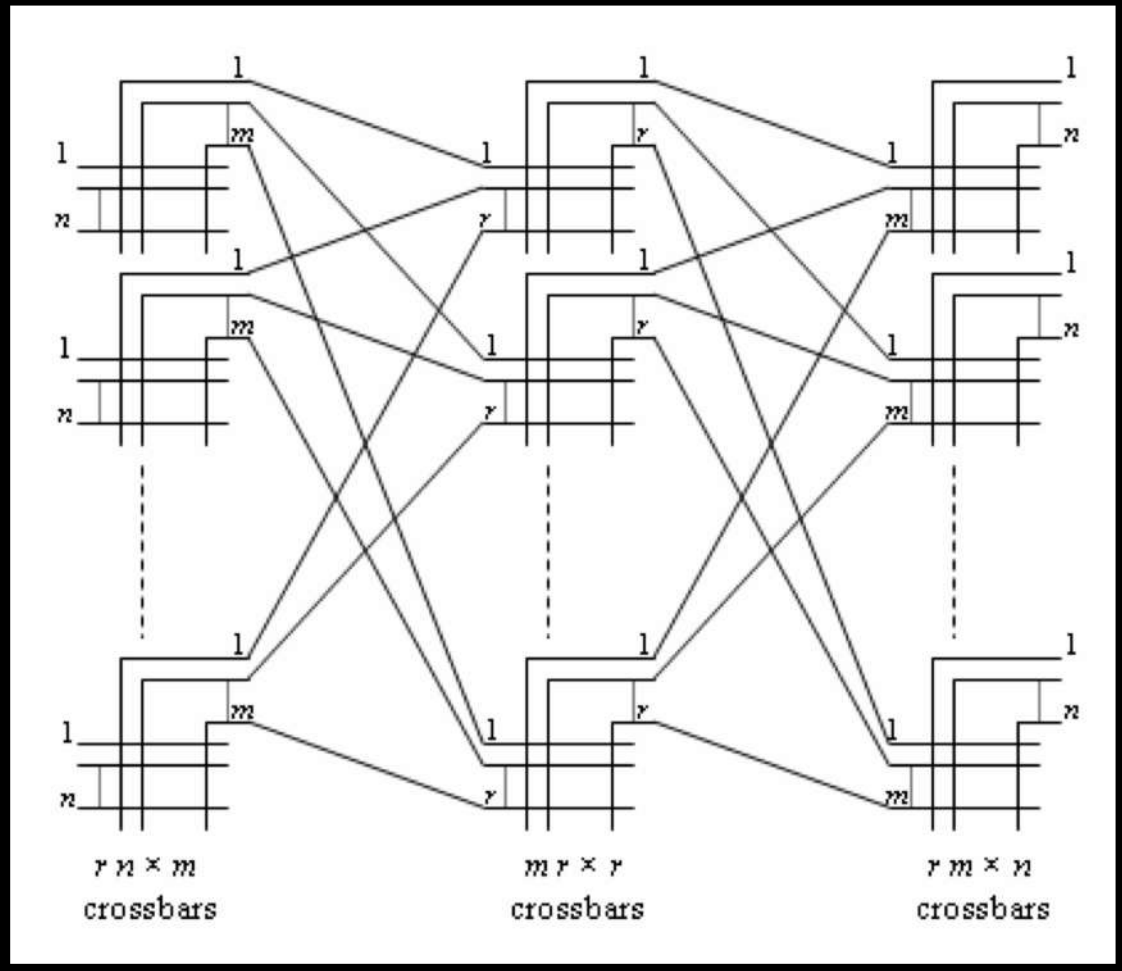
Along came (server) virtualization

- East/West vs North/South...
- Turn up and turn down
- Mobile workloads
- Massive scale

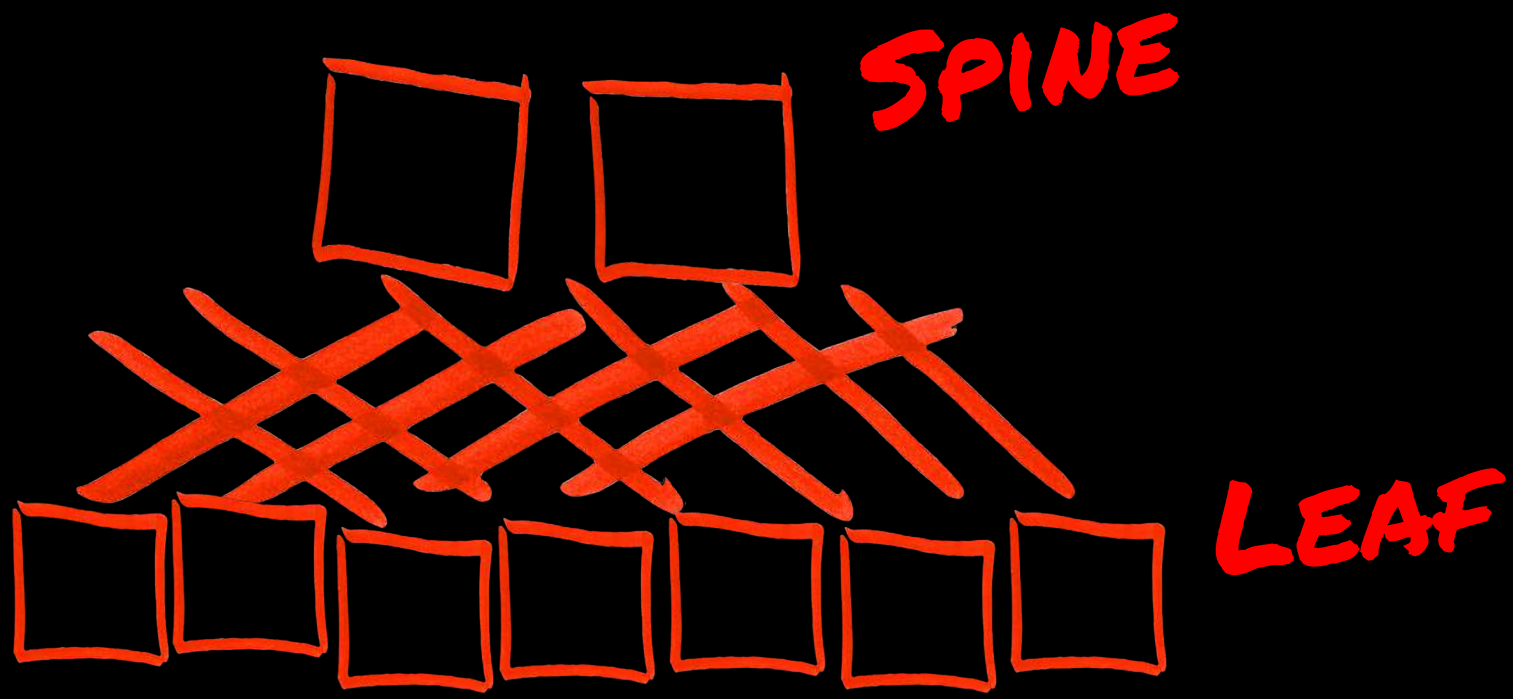
Clos

- Name not acronym
- Telephony
- Fold it

- Nonblocking!



The Leaf-Spine Network Model



The Leaf-Spine Network Model

NOT THE TWO TIERS WE'RE TALKING ABOUT!

Problems with 3

Why the three-tiered model is a legacy model

Directionality

- North/South vs East/West
- Scale up vs scale out

Resiliency

- Spanning Tree Sucks
  - Half the BW
- Redundancy at all three layers
  - More (expensive) boxes

Hardware Centricity

- Hardware layer provides services
  - Dependent on service availability in box
- Physical connectivity dependent
  - Where do you put the FW/RTR/LB/etc.
- Slow!
  - Manual (box by box) configuration
  - Feature velocity?

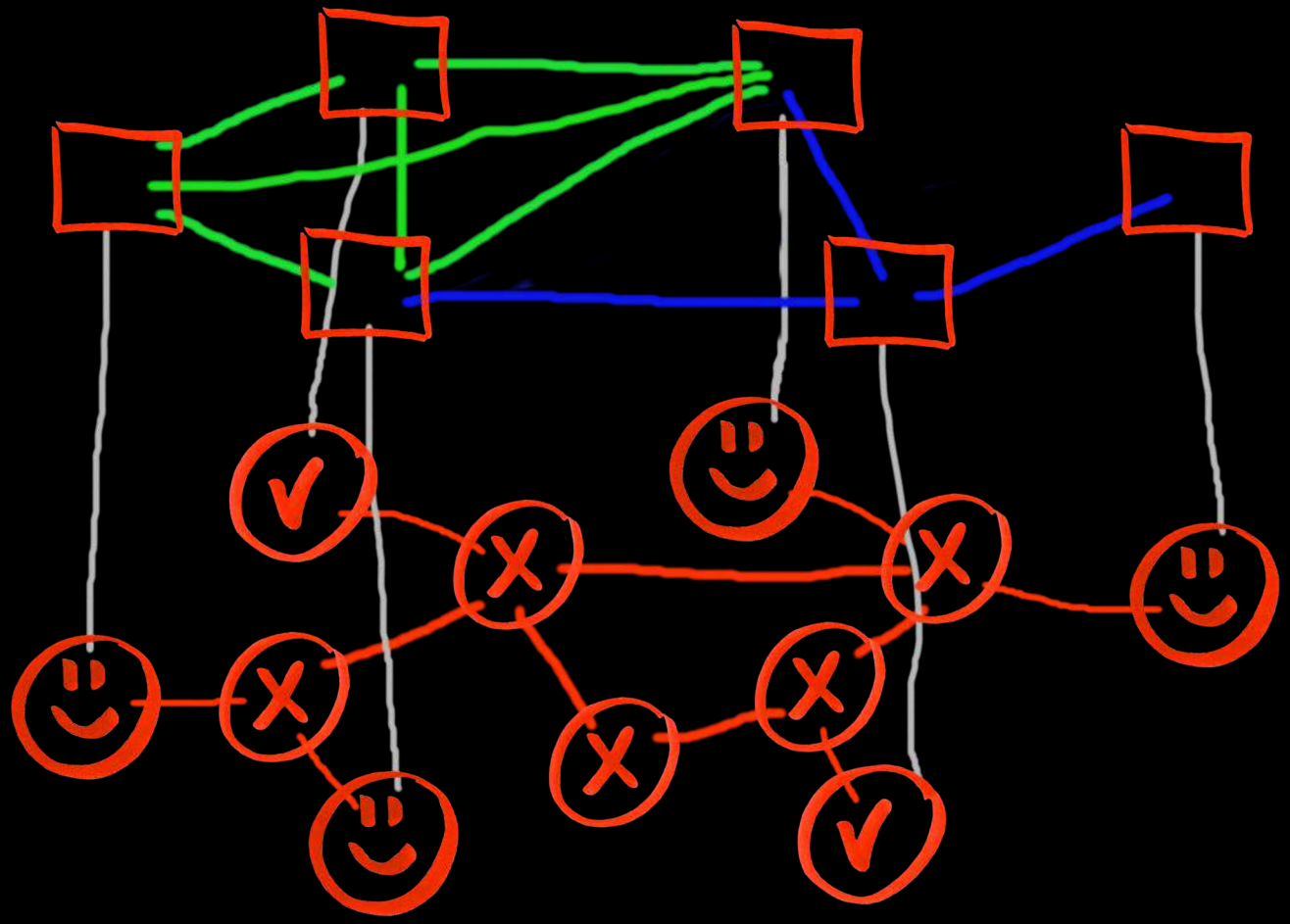
Network Virtualization

Welcome to the new normal

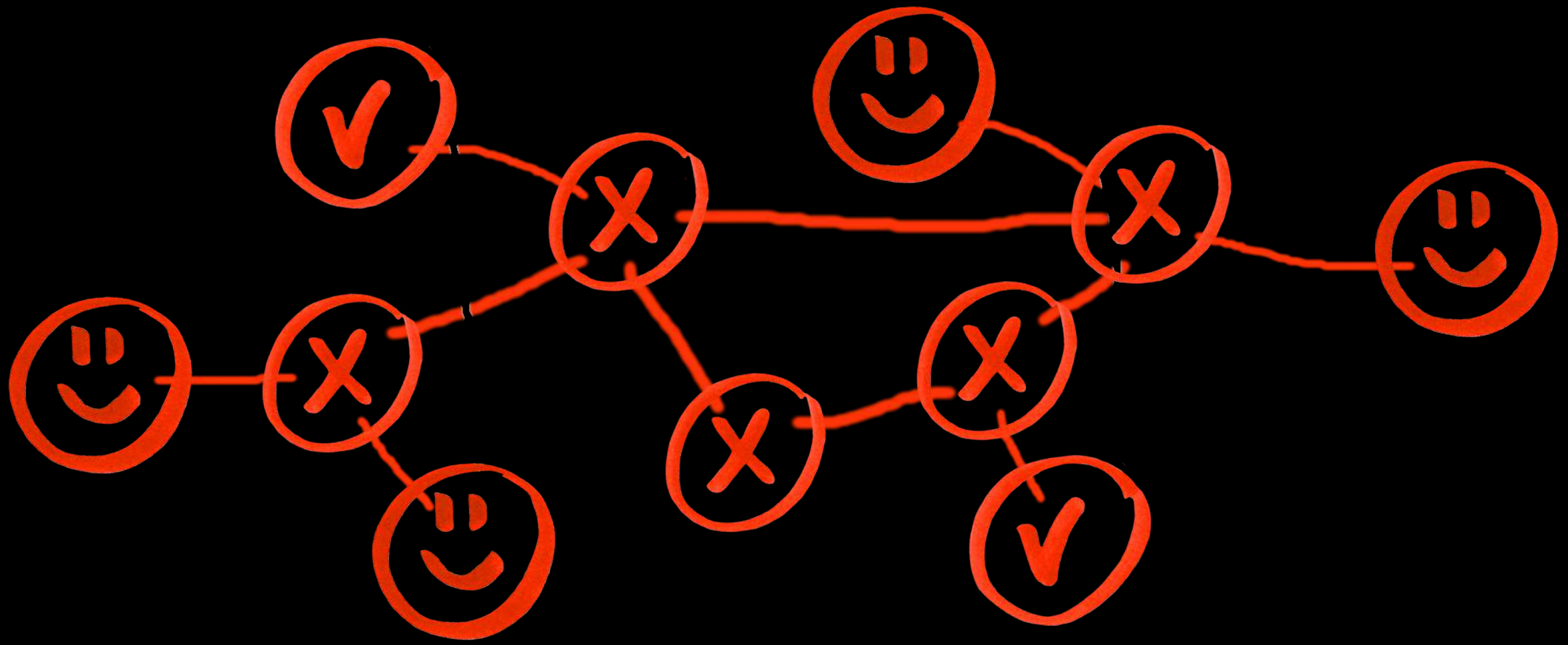
NFV / VNF

- Virtualizing devices...
  - Virtual Switches
  - Virtual Routers
  - Virtual Firewalls
  - Virtual Load Balancers (ADCs)

Virtualizing the Network



Virtualizing the Network



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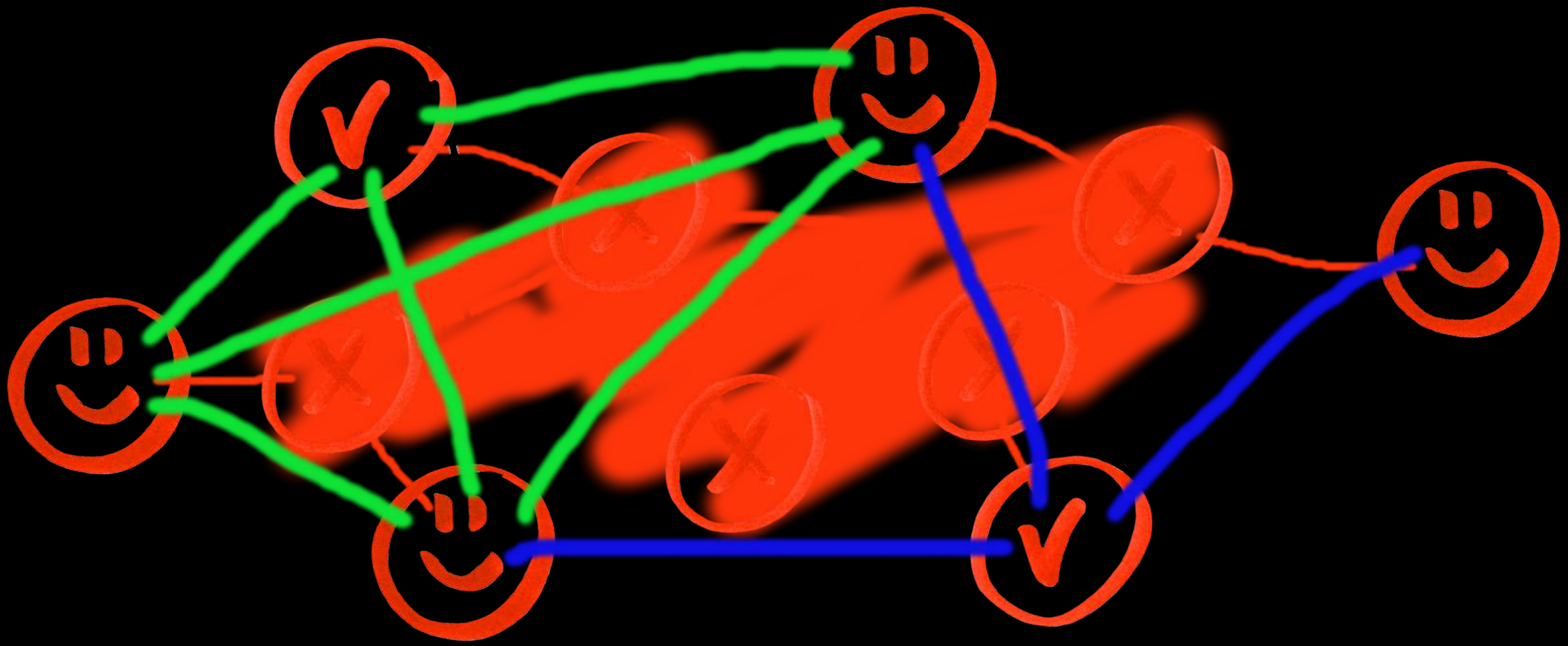


On Overlays

- Not new...
- VLAN, MPLS, GRE
- Optical, Ethernet, IP

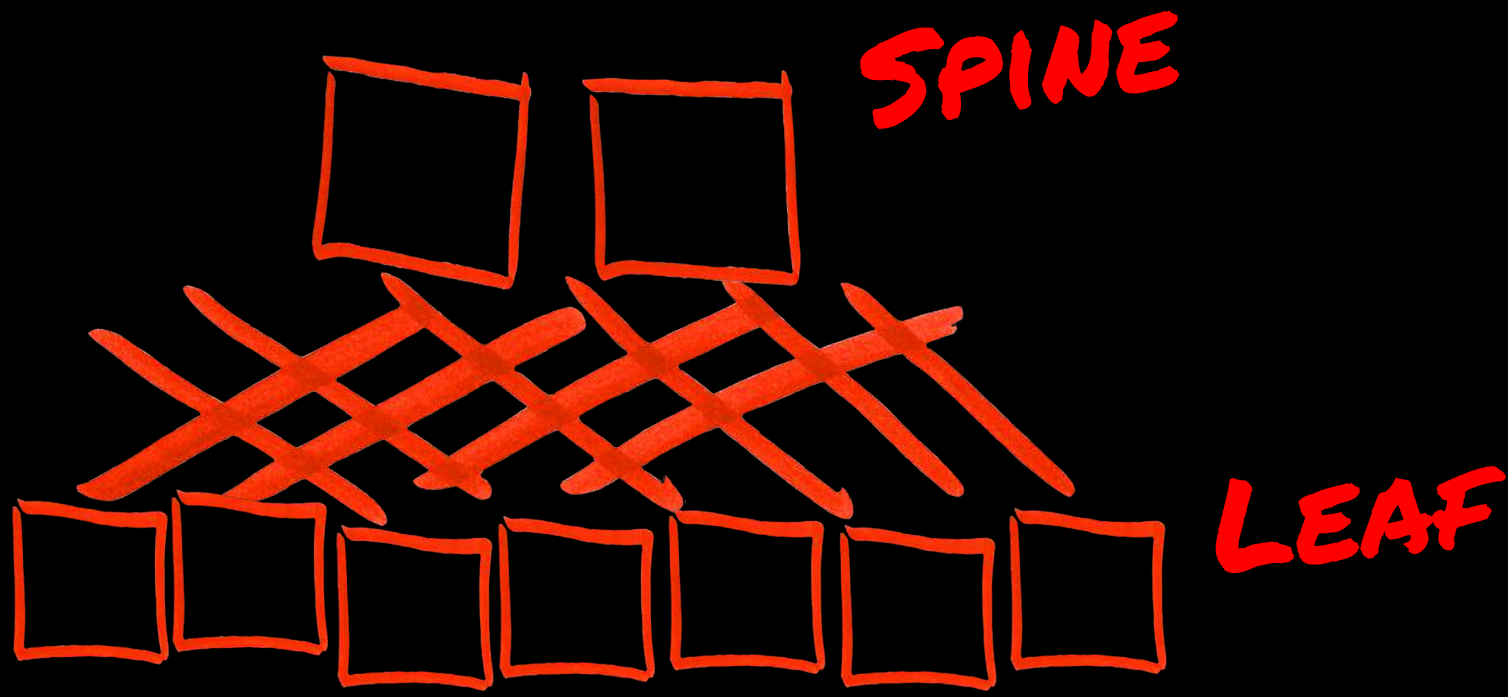
The New Model

Isn’t that what we were supposed to be talking about?

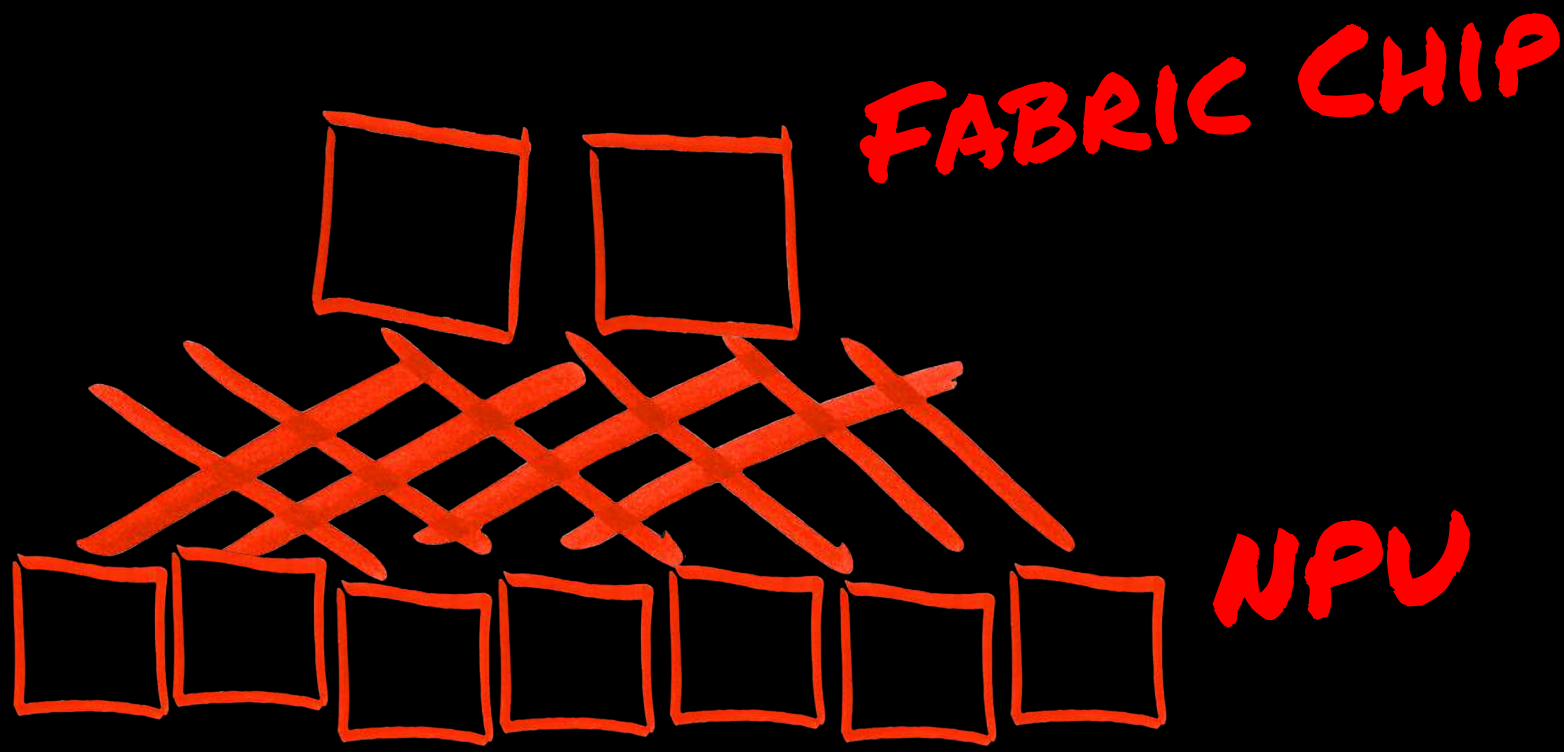
Switch Inception

- Switches in Switches
- Folded Clos vs multi-chip switch
- Visibility and control (by exploding it)

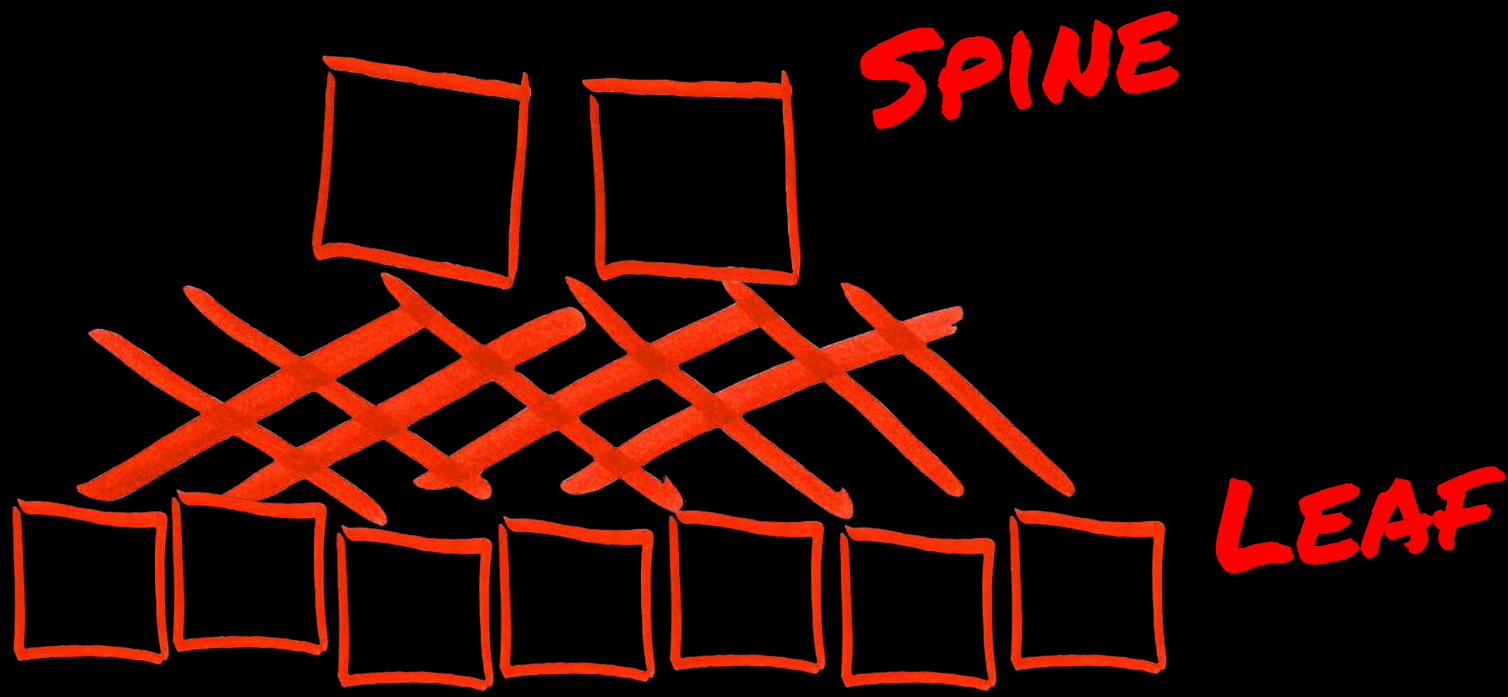
Inception - Clos



Inception – Multi-Chip Switch



Inception - Clos



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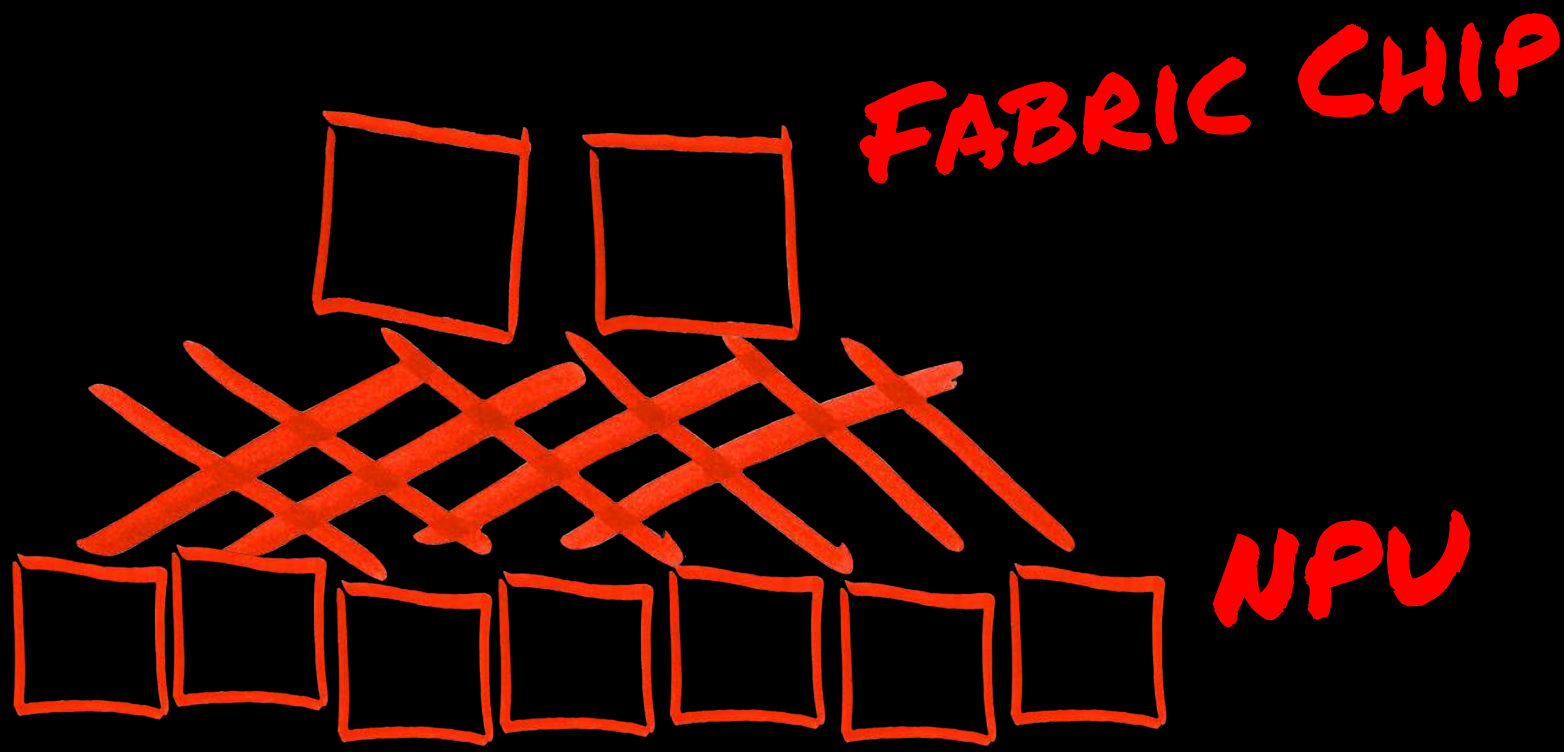

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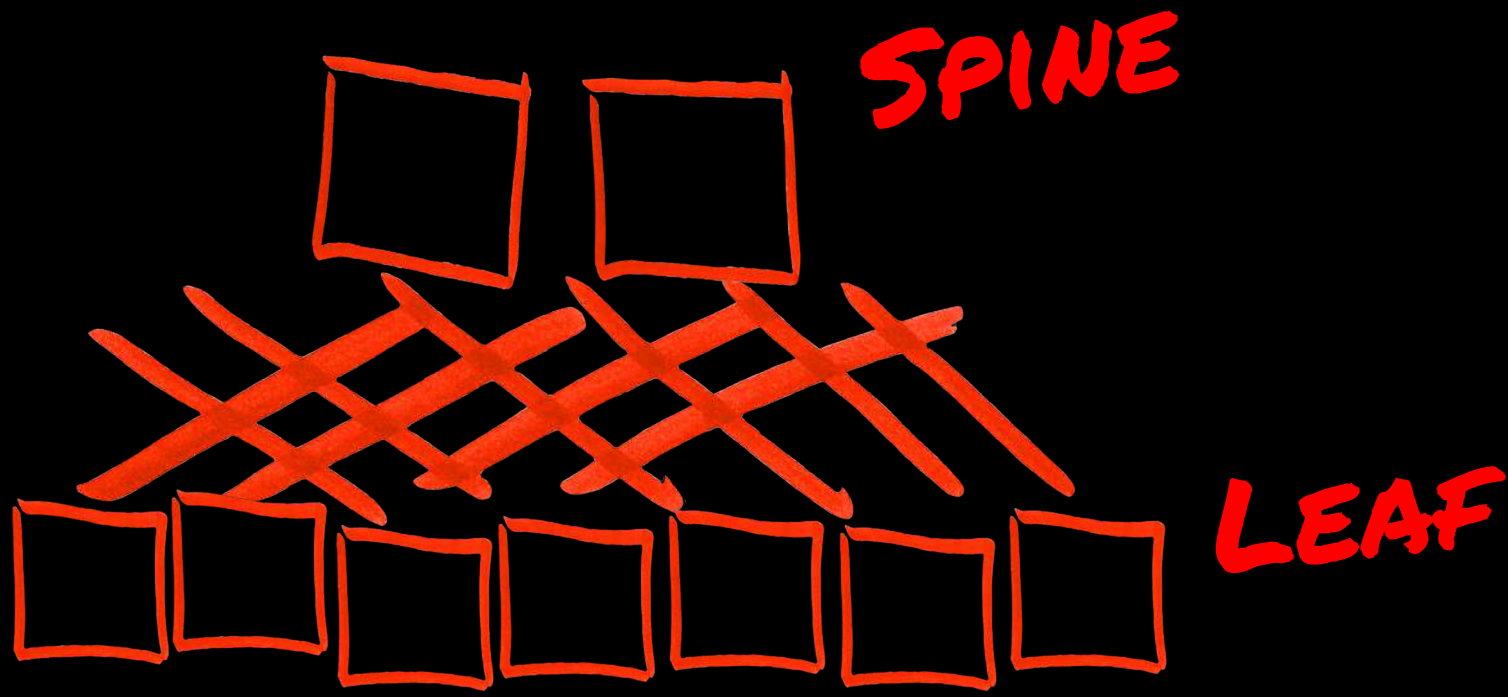
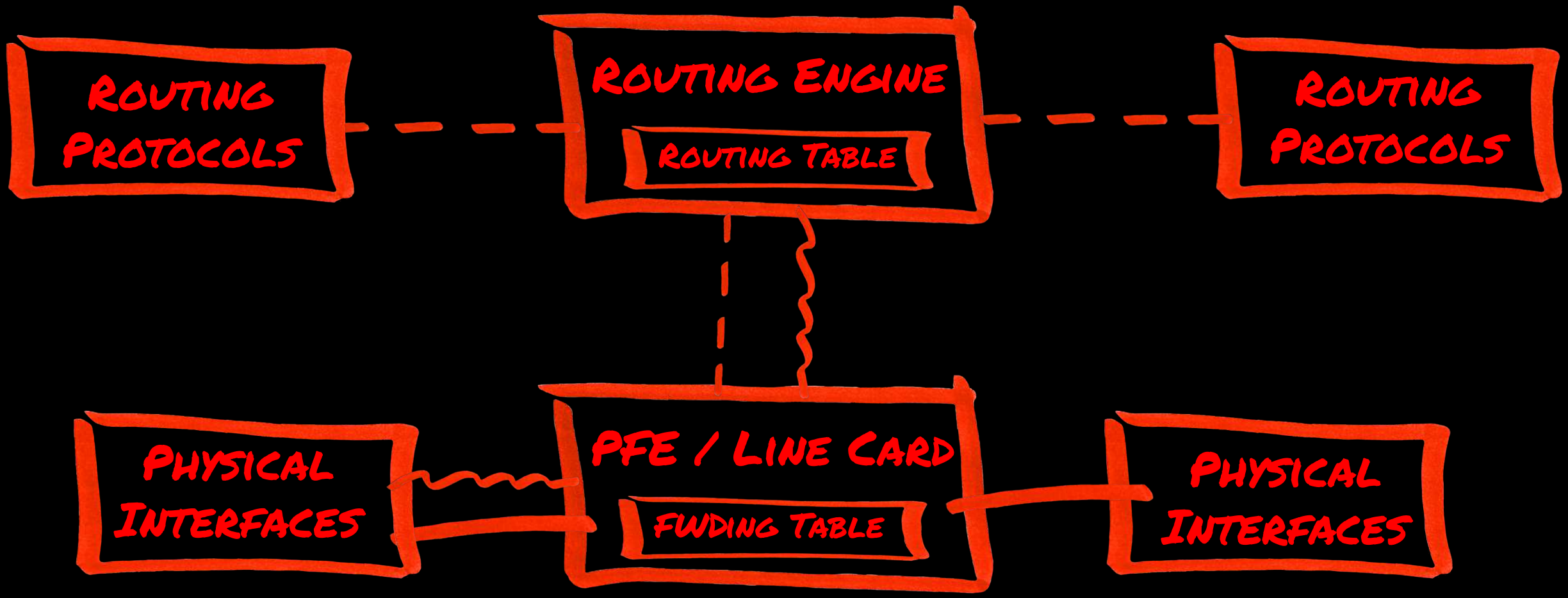


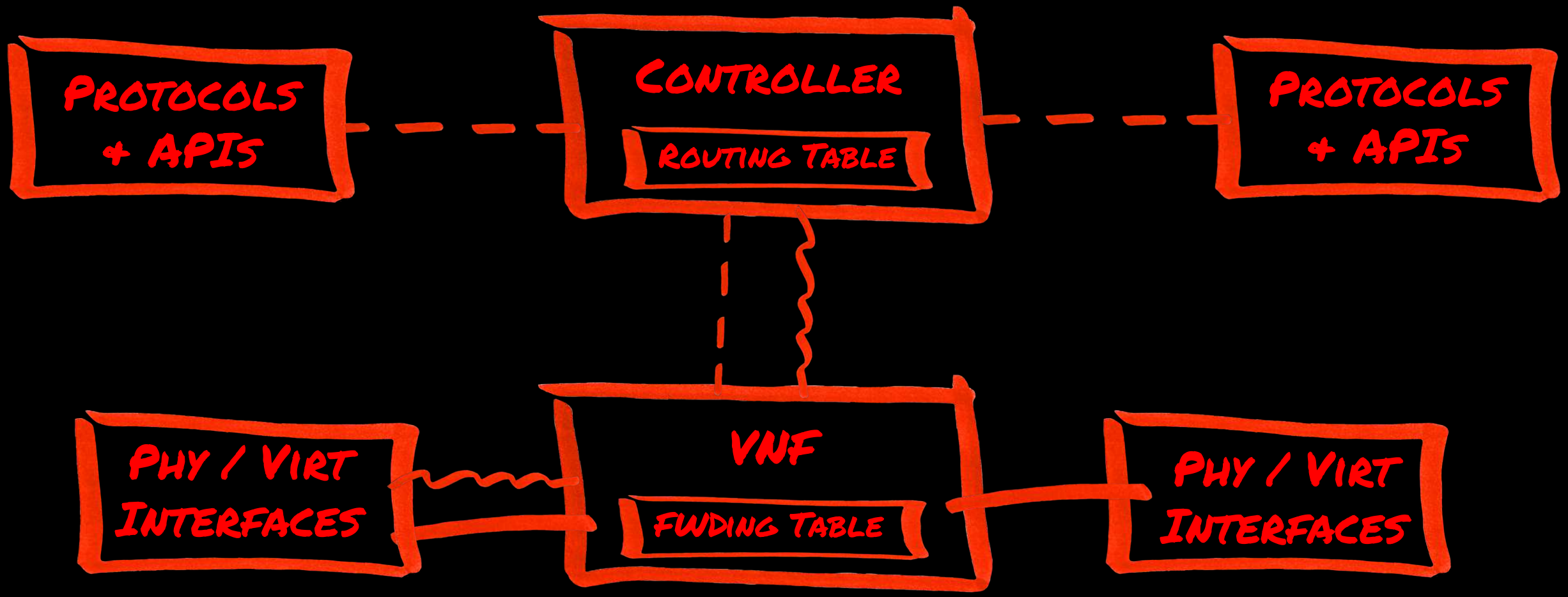
Router Explosion

- Controller as virtual RE (RP / Sup)
- VNF as virtual PFE (line card)
- Tunnels as virtual circuits

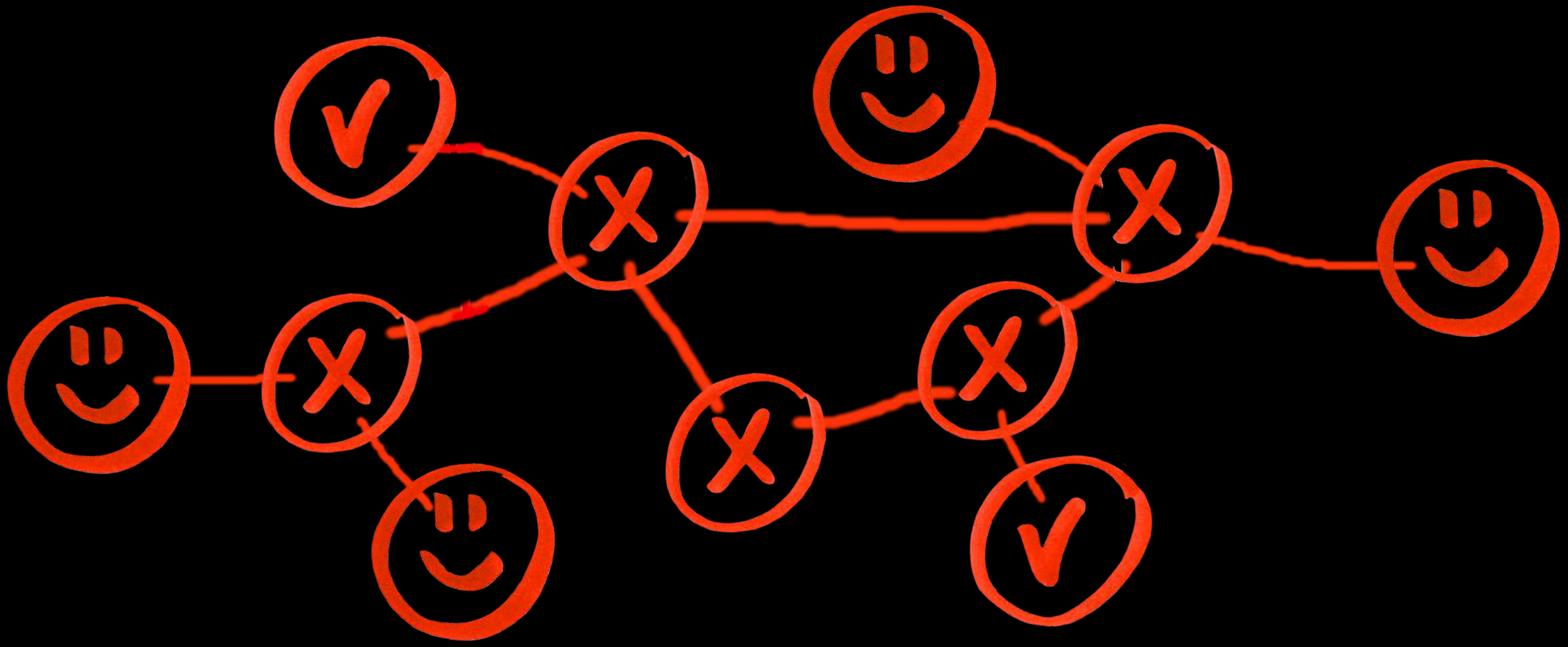
Explosion - Router



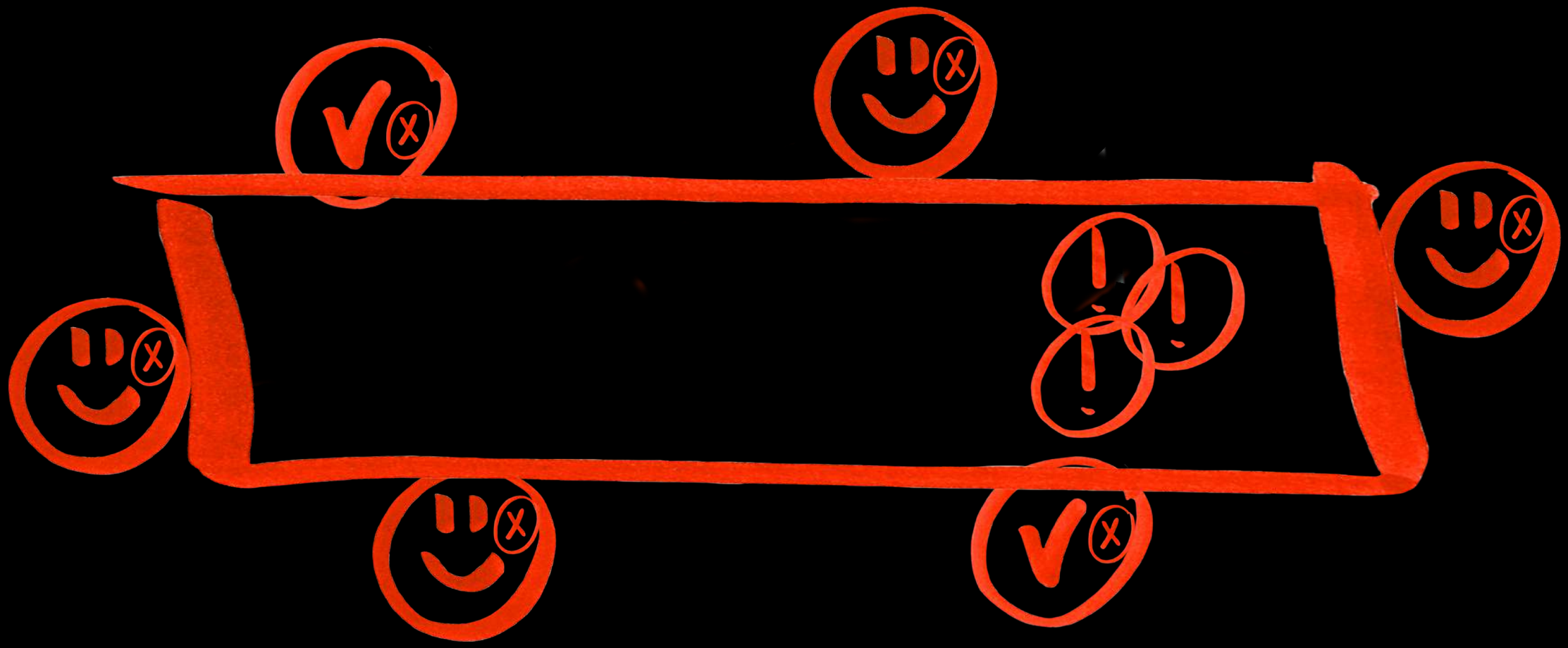
Explosion - SDN



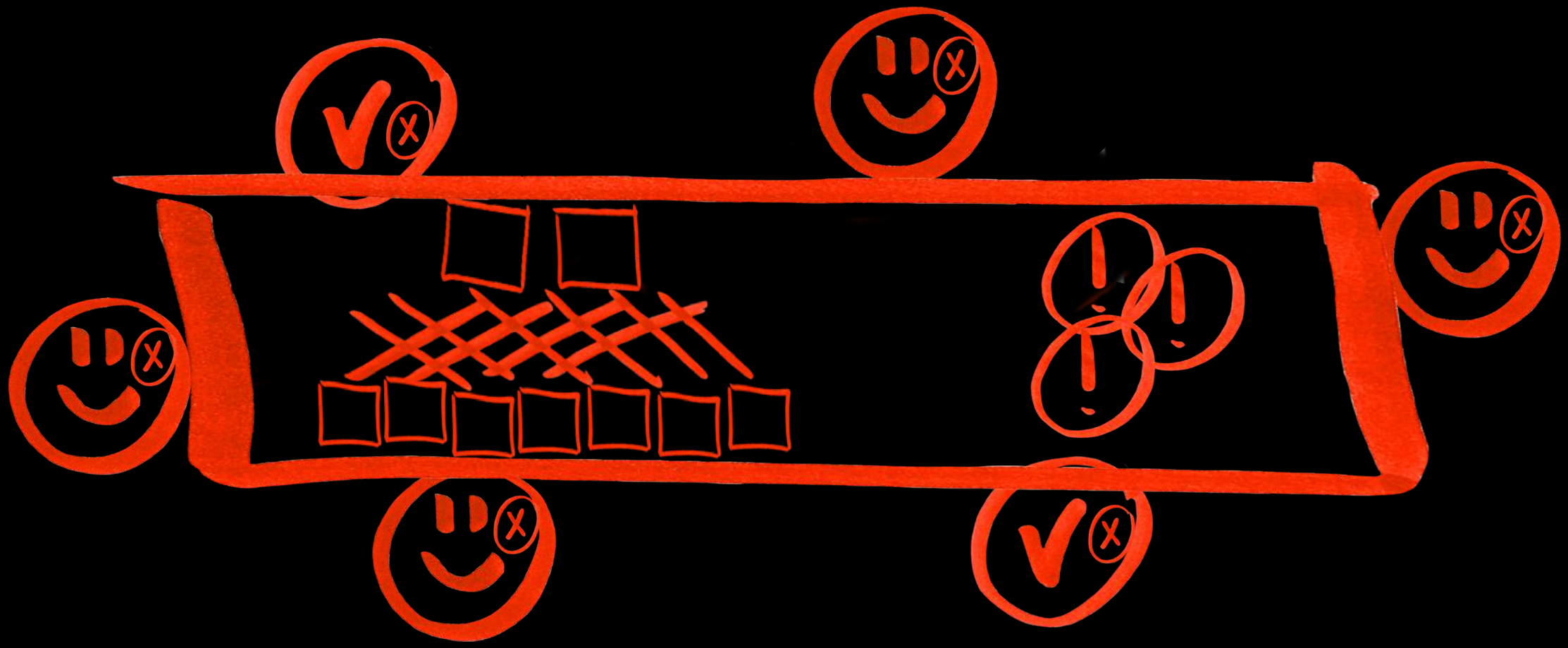
Lot's of Routers



"Single" Distributed Router

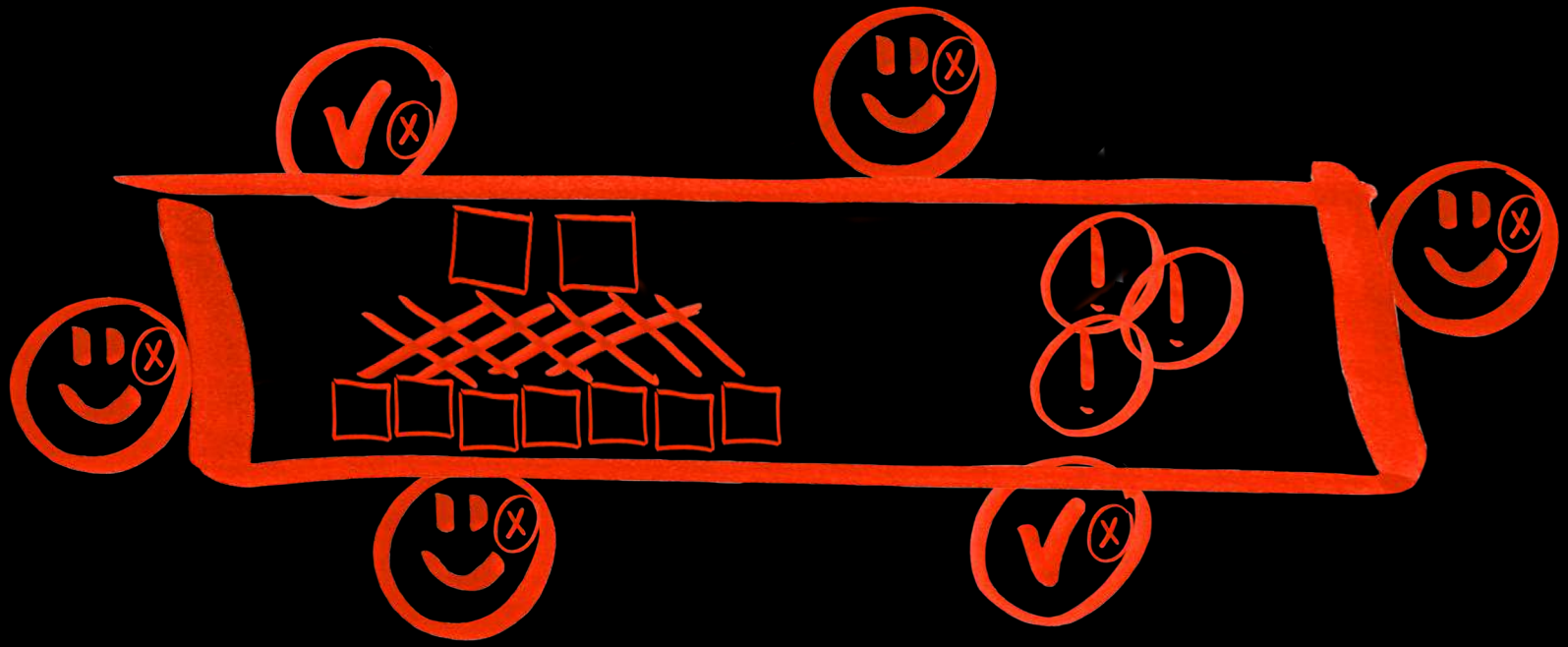


The Two



The Two

- Underlay is Core Switch
- Overlay is Access Router

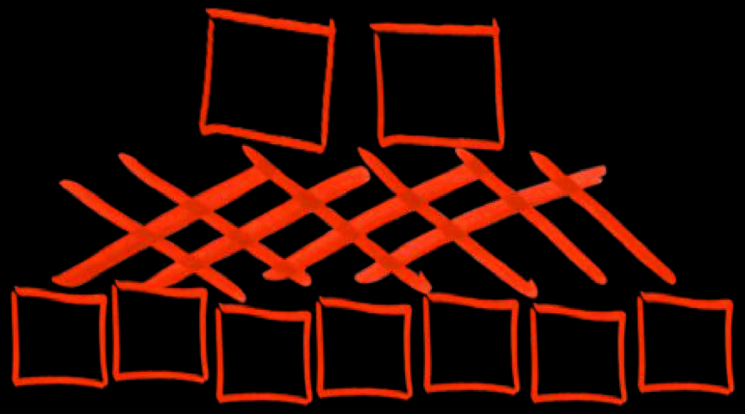


Characteristics

- Underlay
  - Non-Blocking ECMP
  - Resilient & High BW
  - Physical Devices
- Overlay
  - Tunnels (w/ hashing)
  - PBR/SBR
  - Virtual Devices

The Two-Tier Network Model

Routing, Policy, Services & Security (in SW)



Connectivity (in HW)

Who Cares?

Seriously, why are you still talking?

How this model helps (theory)

- Focus on what matters
- Church and State

How this model helps (practice)

- Scale
  - TCAM
  - Tables, policies, etc...
- Updates
  - Patching
  - Adding features

Universal Network Platform

- Consistency...
- Simplicity...
- Visibility...
  - Unify the domains (WAN is new LAN)

Use Cases

- Service Provider
  - Being done…
  - Dumb pipes, services OTT
  - SD-WAN / MSP
- Enterprise
  - Campus/Branch/Remote
  - DC & Multicloud
  - Unite the overlays

What if I don’t want a controller?

- EVPN

What happened to OpenFlow?

- ”Native” SDN vs Overlay SDN
- Underlay’s are already out there...
  - Have you heard of the Internet?

The return to End-to-End!

- Placed bets on IPv6
- Cashing in on network virtualization

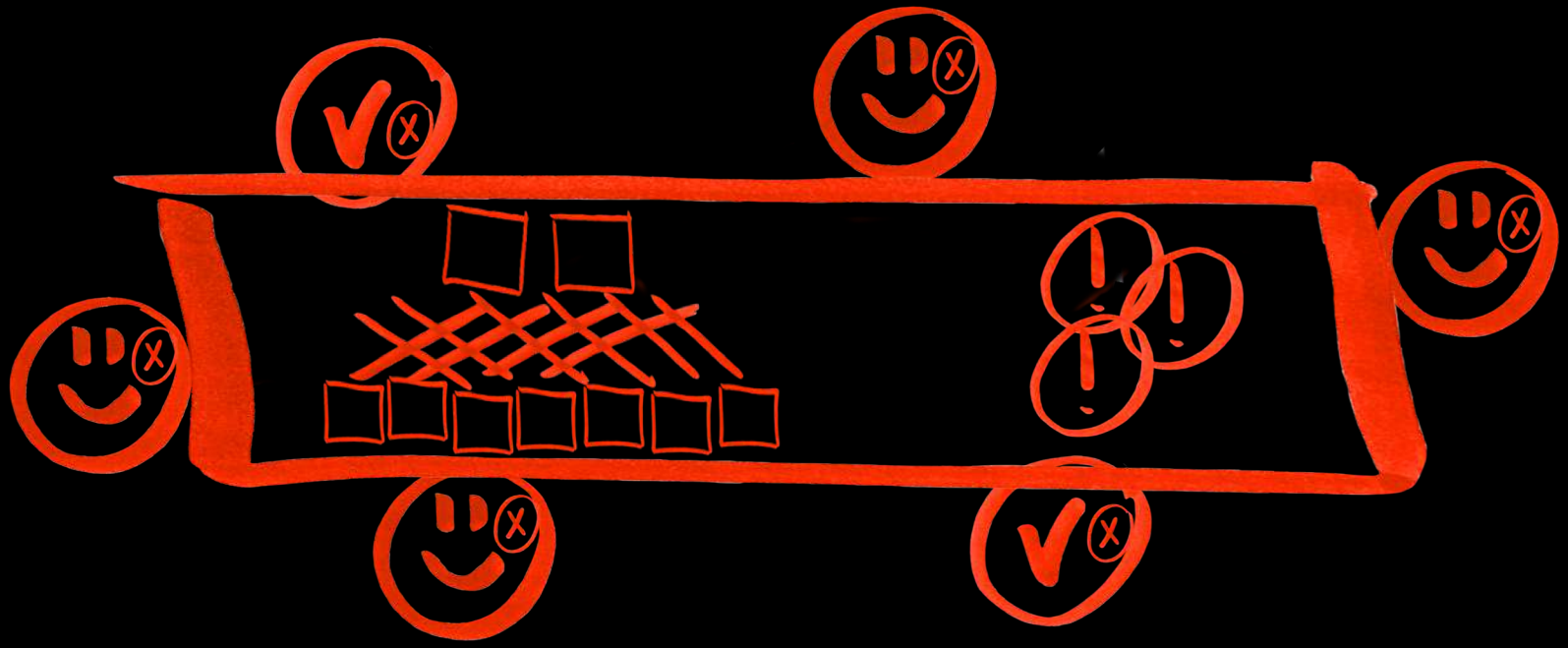
  - Kind of

Wrap-Up

Finally, he’s almost done

The map is not the terrain

- Model vs reality
- A tool



Summary:

- Overlays are normal
- Models are helpful
- It's a digital world (software is king)
- Use the Two:
  - Core underlay to move bits
  - Access overlay to provide services

If you want to find new solutions, find new ways to see your problems.

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