



# Omar Baldonado

Director, Engineering

Facebook

**OPEN. FOR BUSINESS.**





2.1 Billion



1.5 Billion

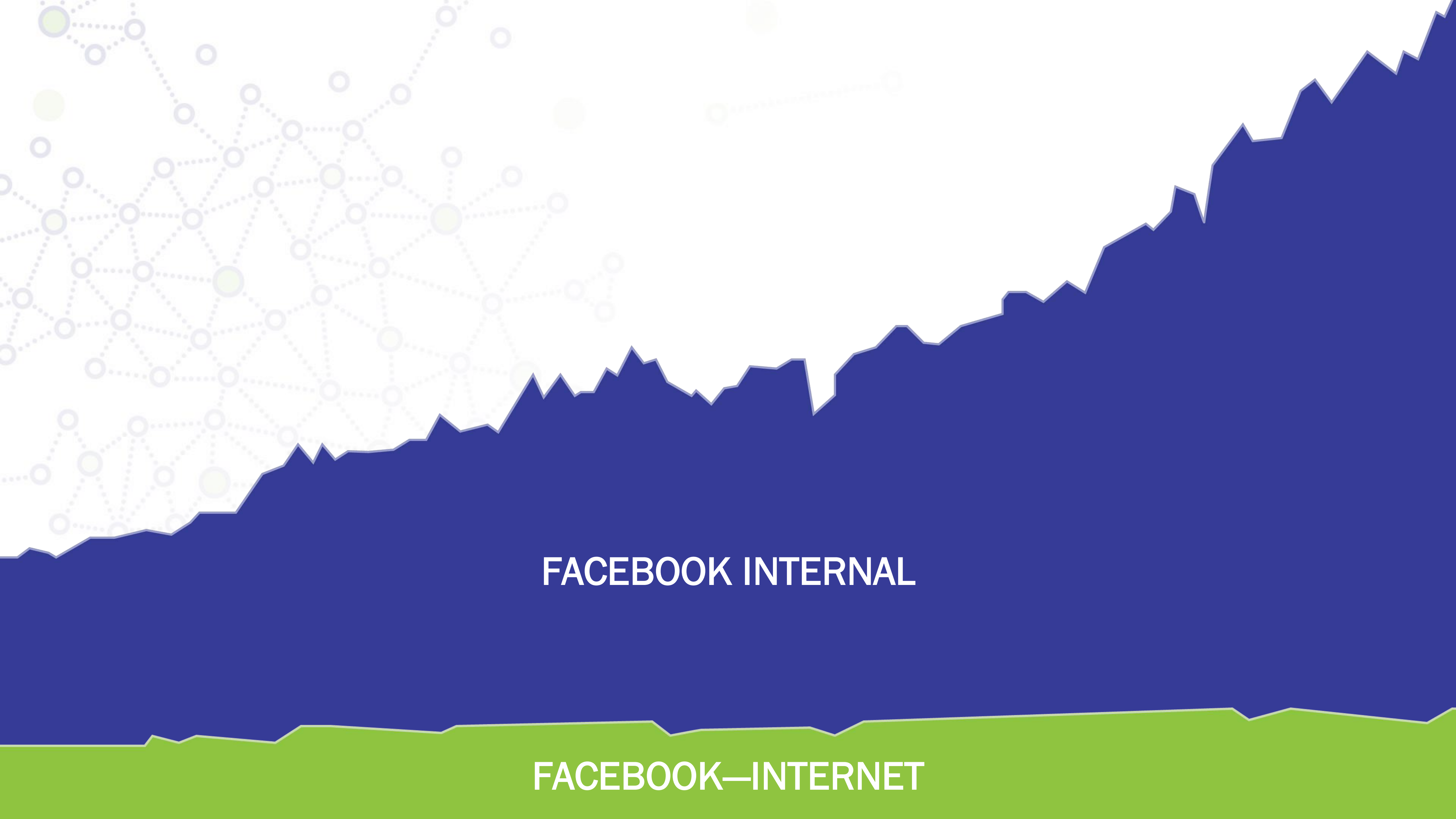


1.3 Billion



800 Million





**FACEBOOK INTERNAL**

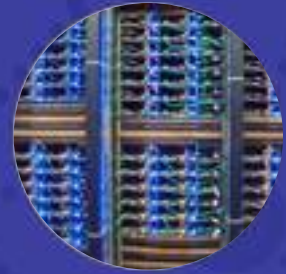
**FACEBOOK—INTERNET**

# A history of building for scale

2011



Data Center



Triplet Rack



Battery Cabinet



Freedom Servers



Spitfire Server (AMD)



Power Supply

2012



Windmill (Intel)



Watermark (AMD)



Mezzanine Card V1

2013



Knox



Winterfell



Open Rack V1



Group Hug

2014



Open Rack V2



Mezzanine Card V2



Cold Storage



Micro Server (Panther)

2015



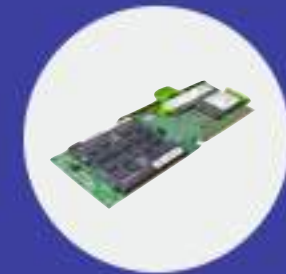
BluRay



Leopard



Wedge



Honey Badger

2016



Wedge 100



Big Sur



Yosemite



Six Pack



Backpack



Lightning

2017



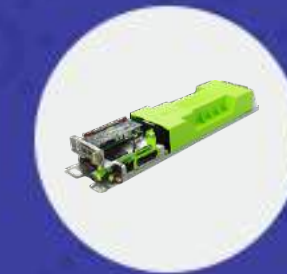
Wedge 100S



Bryce Canyon



Yosemite V2



Tioga Pass

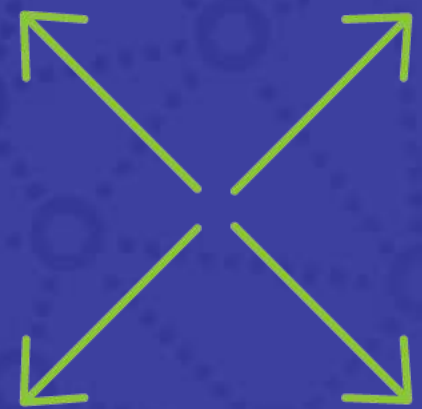


Big Basin

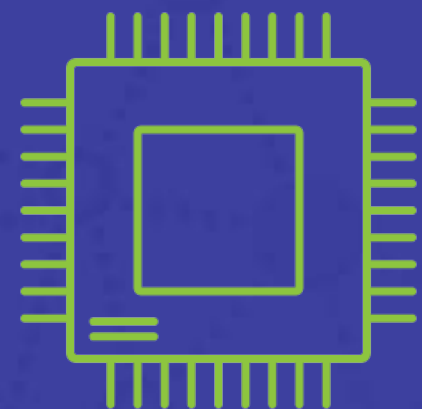
2018



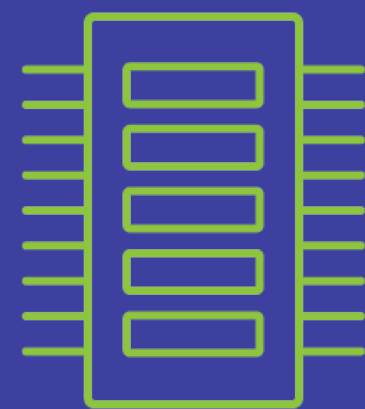
# What worked in the past is not enough for the future



Server  
Growth



CPU  
Cores



DRAM  
Capacity

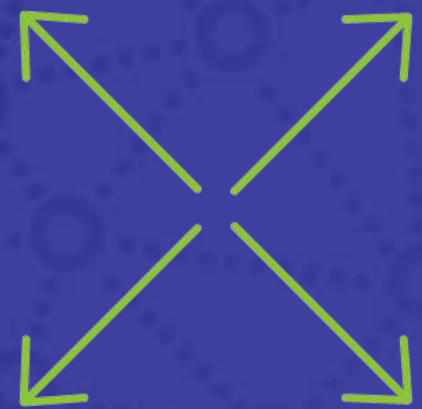


HDD  
Growth

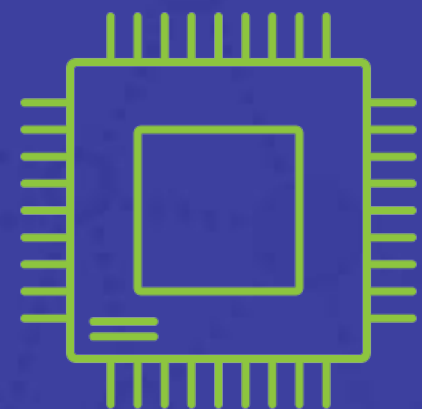


Network  
Growth

# What worked in the past is not enough for the future



Server  
Growth



CPU  
Cores



DRAM  
Capacity



HDD  
Growth



Network  
Growth



Partner



Scale



Innovate





Partner



Scale



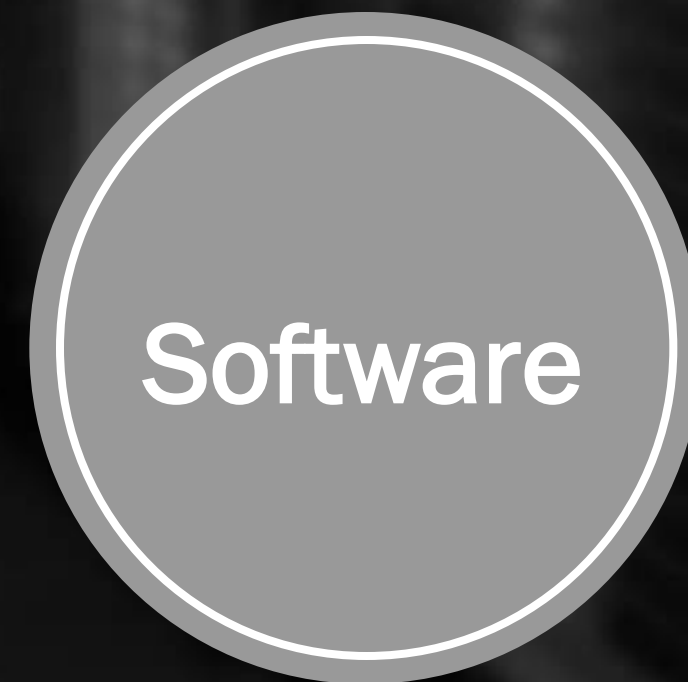
Innovate



Network



Network



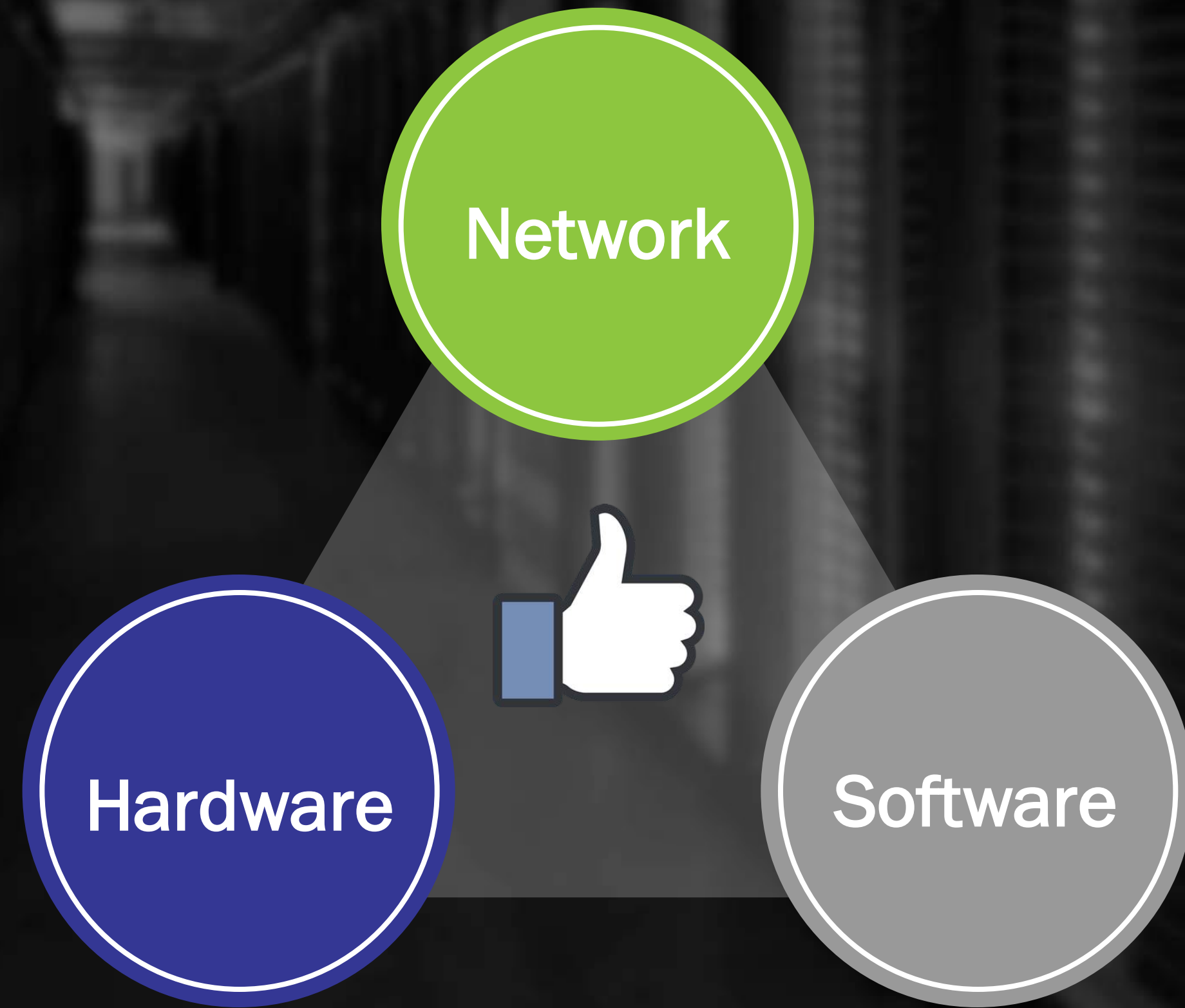
Software



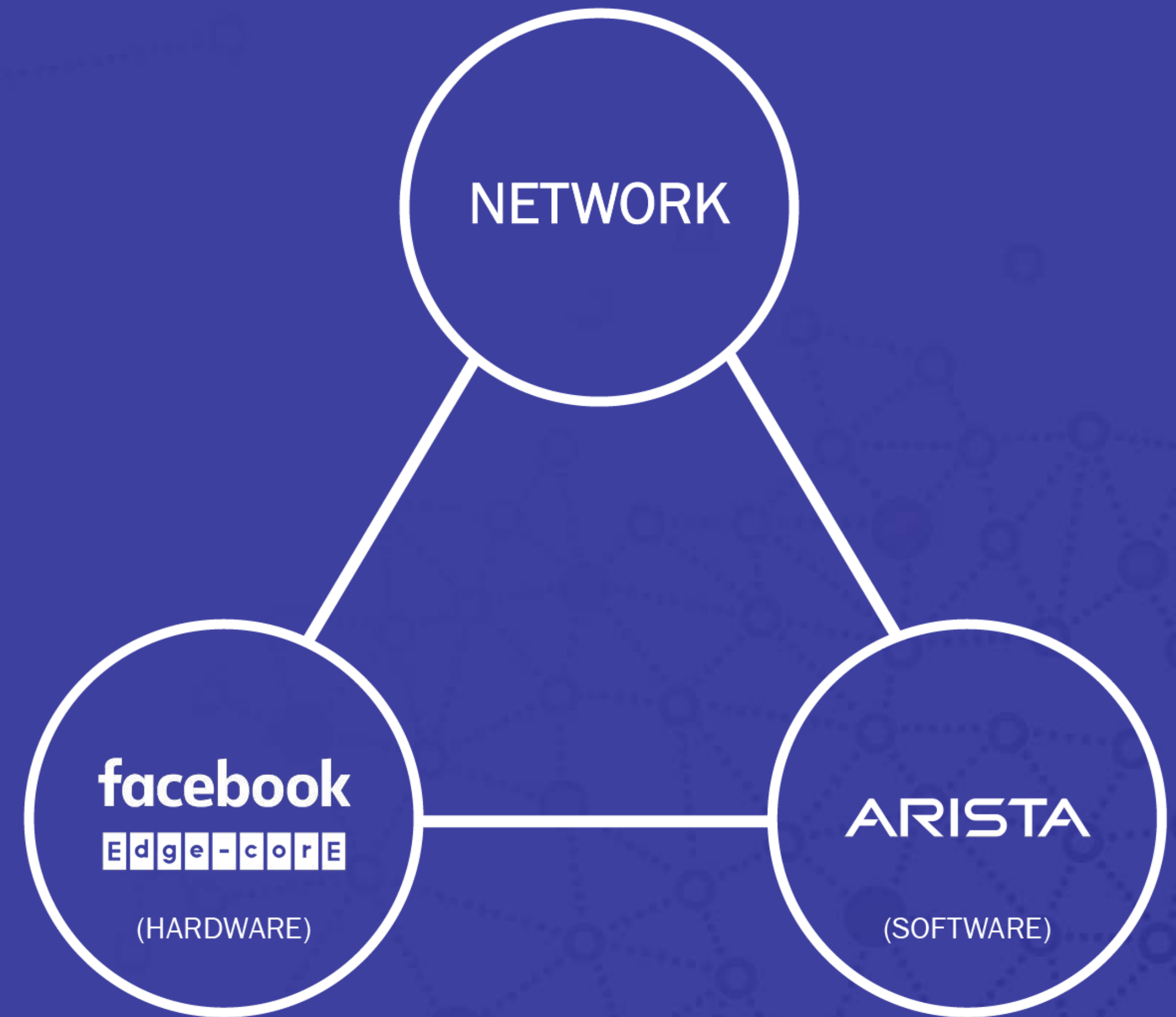
Network

Hardware

Software

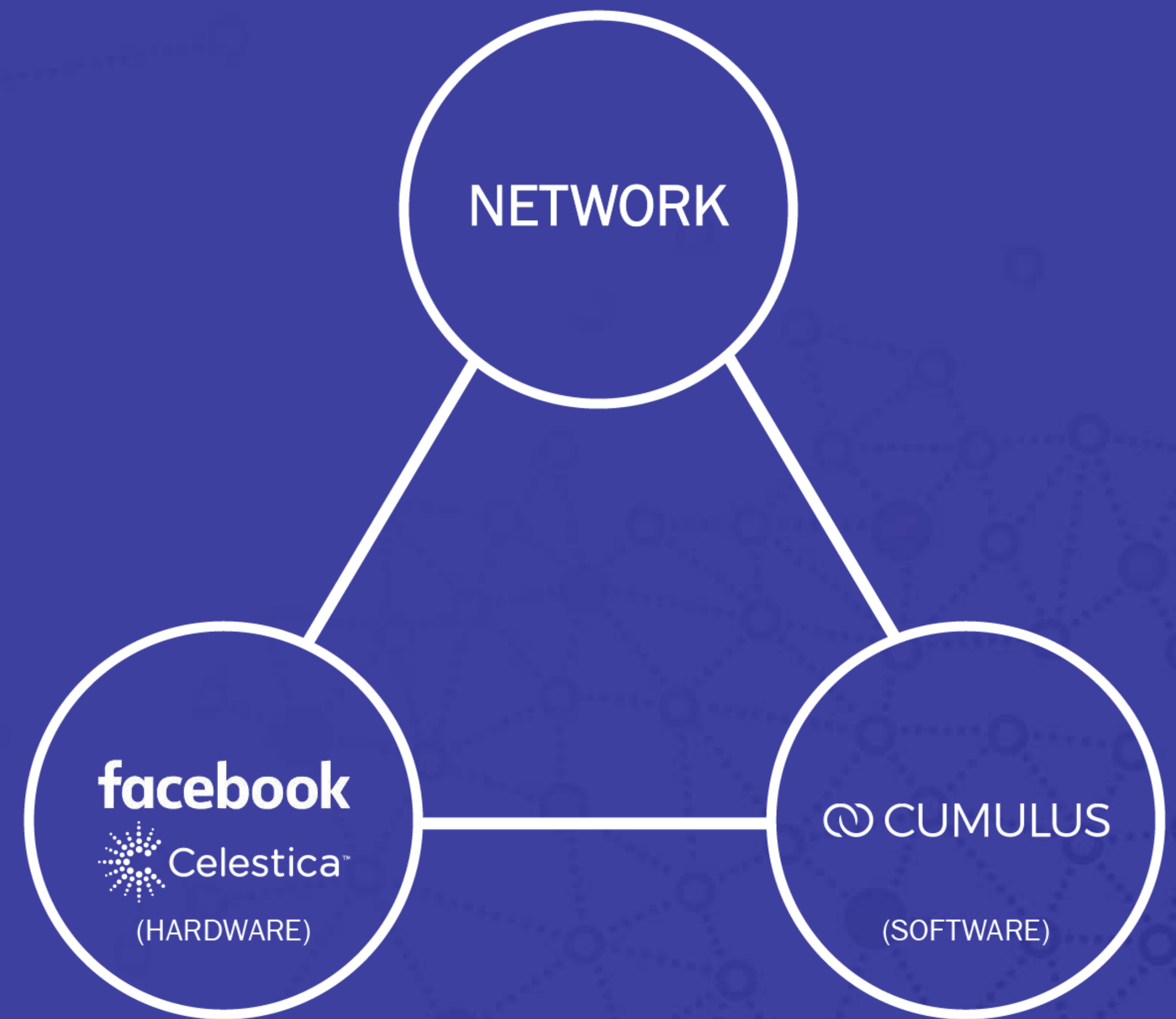


# Wedge 100 + Arista EOS



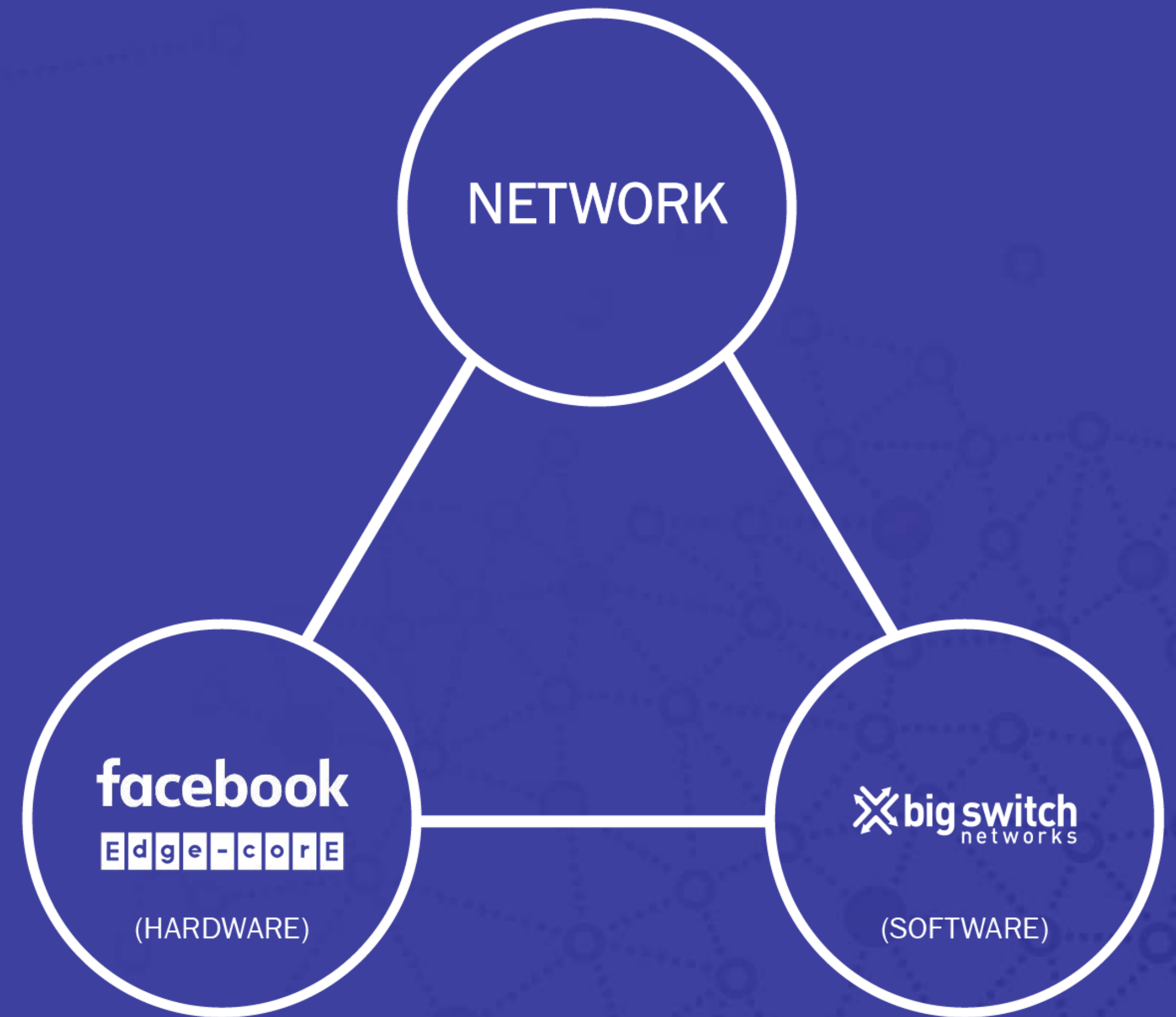
- Arista EOS available for Wedge 100 hardware – disaggregation
- Proven, familiar software

# Backpack + Cumulus



- Yahoo! JAPAN
- Engineering workshop tomorrow

# Wedge 100S + Big Switch



- Open source package
- Engineering workshop tomorrow



# Disaggregation

OPEN  
SOURCE  
SOFTWARE



OCP  
HARDWARE





Partner



Scale



Innovate



Wedge 40

2014



Six Pack

2015



Wedge 100



Backpack

2016



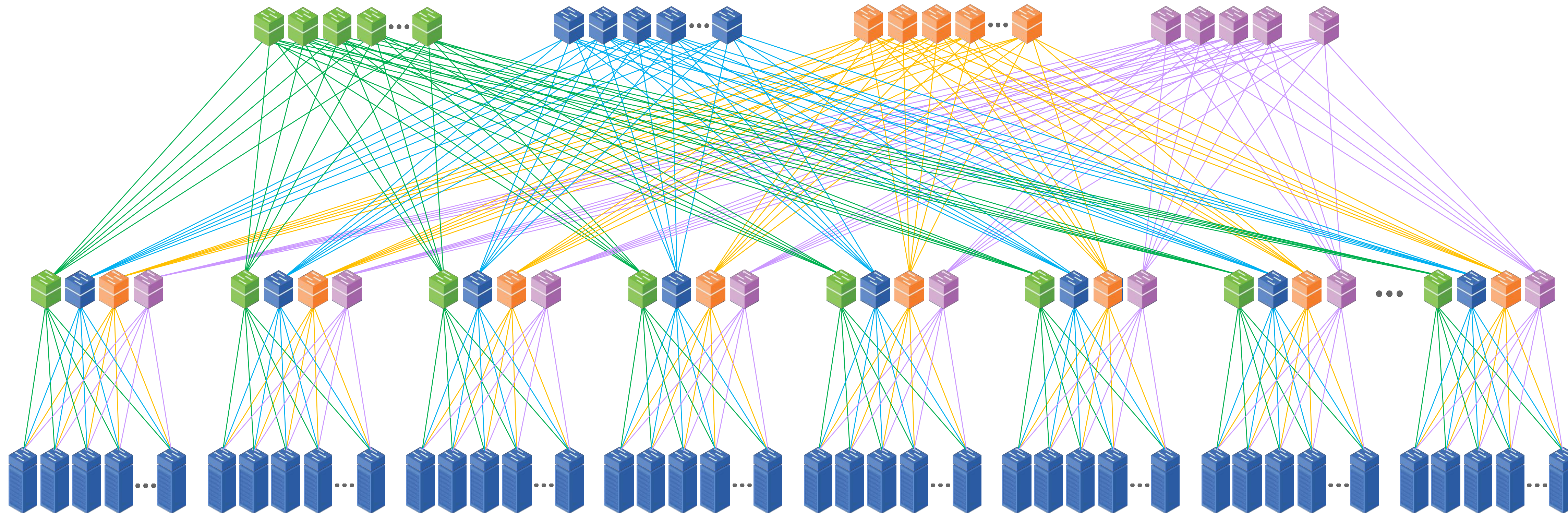
Wedge 100S

2017



Voyager





# Data centers







Partner



Scale



Innovate



# Sree Sankar

Technical Product Manager

Facebook

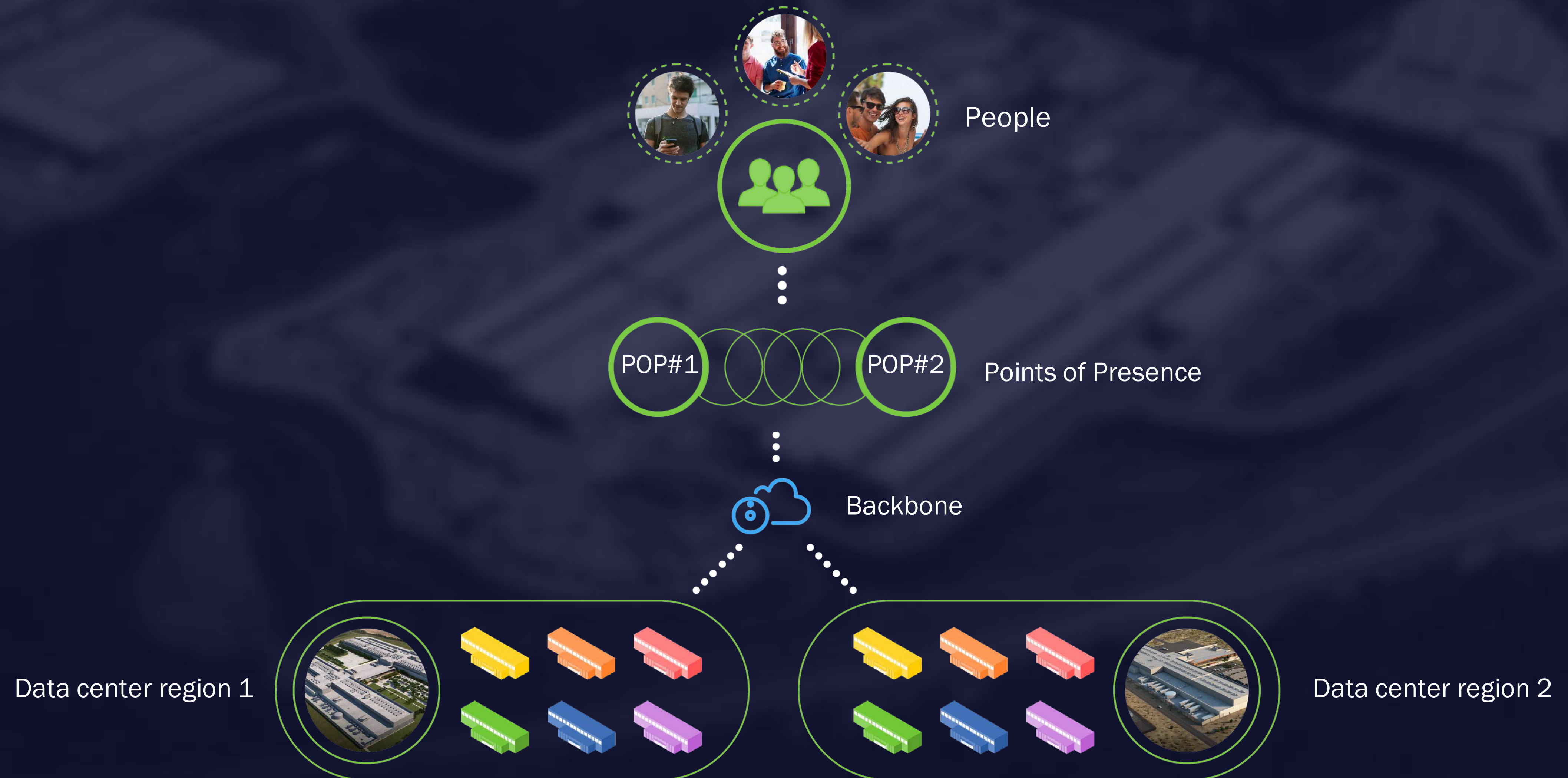
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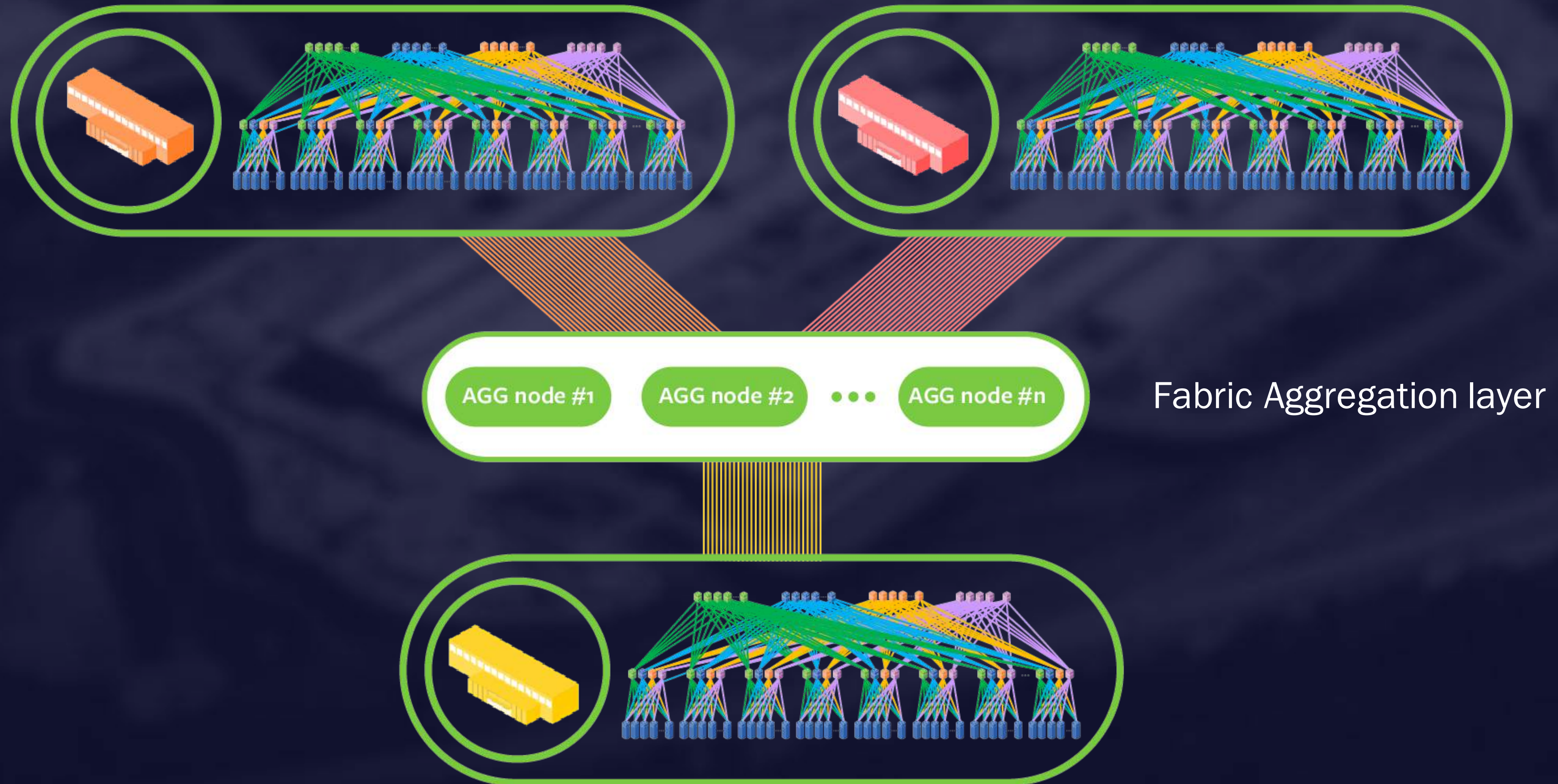
**OCP**  
SUMMIT



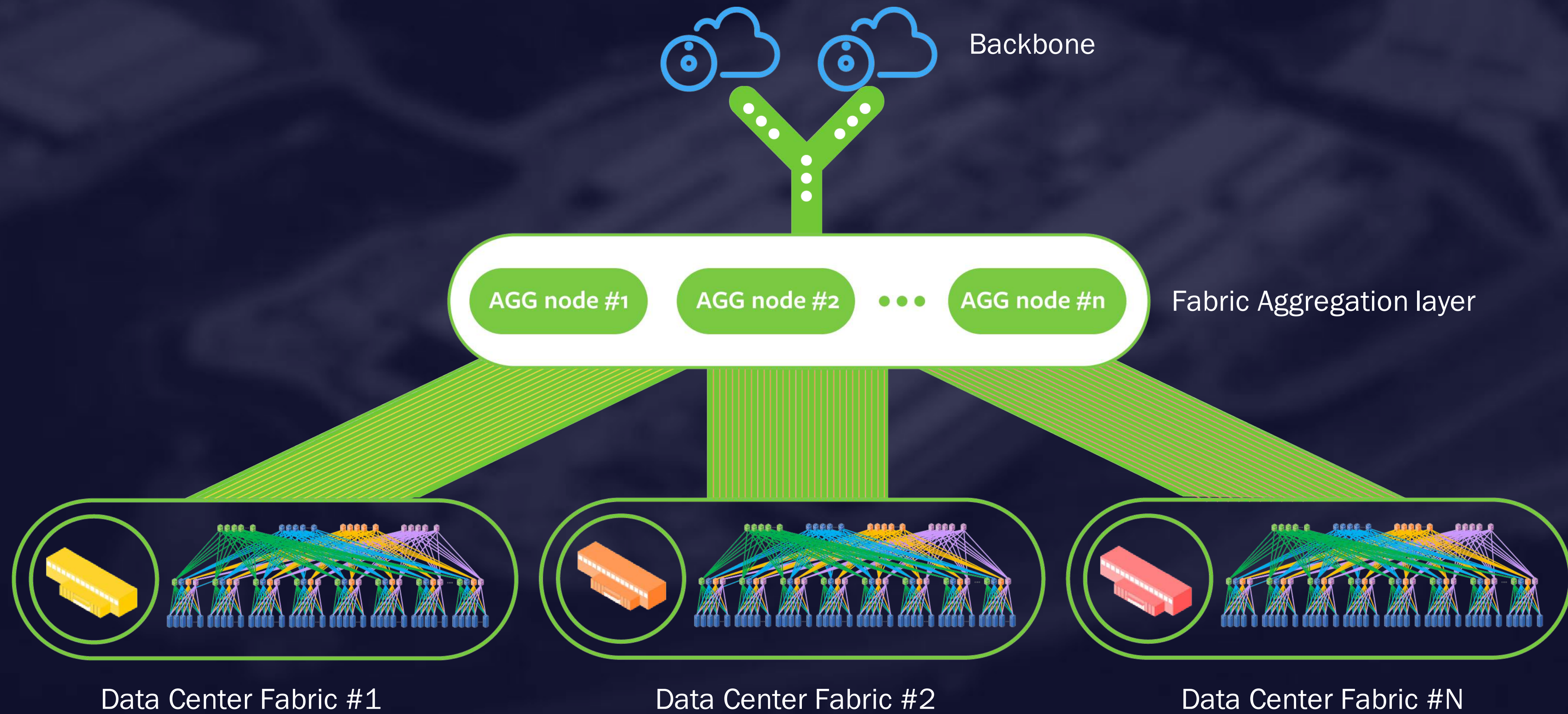
# Traffic flow in to network

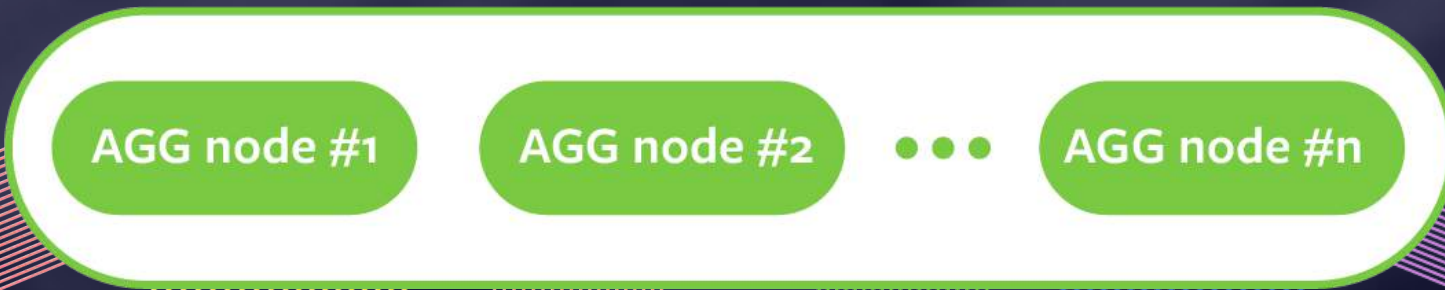


# Zoom into a region



# Role of fabric aggregation layer



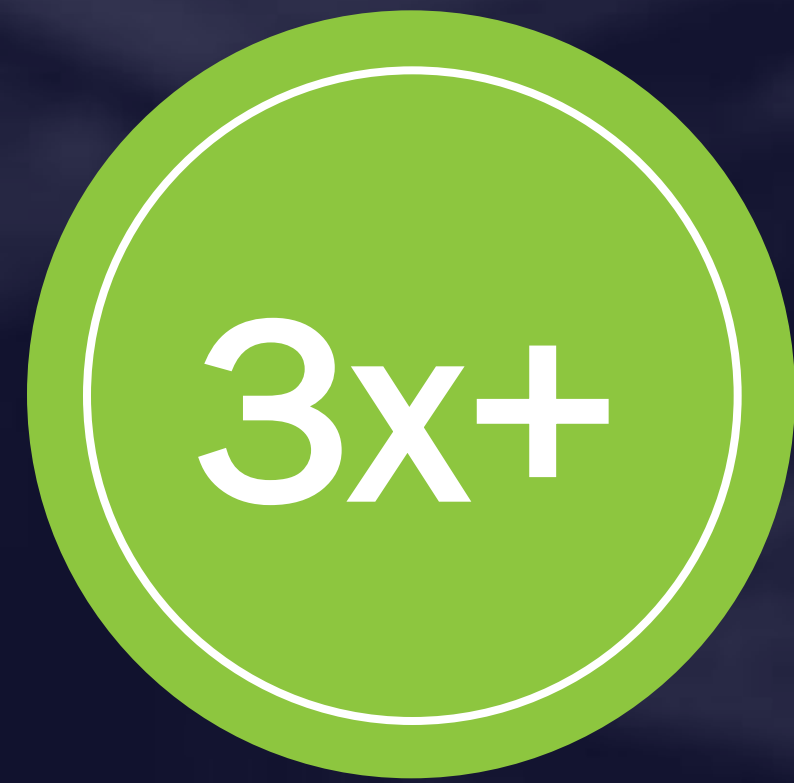


Fabric Aggregation Layer



**We had to innovate**

# Design considerations



At least  
3X more ports



Power efficiency



Flexible and  
adaptable design



To be solved in short  
duration of time

The solution:  
Fabric Aggregator



# Integrating disaggregated building blocks



Wedge 100S



# Integrating disaggregated building blocks



Wedge 100S

+



=



# Design elements



Architecture

Workshop:  
“Scalable designs for DC: Fabric aggregator”

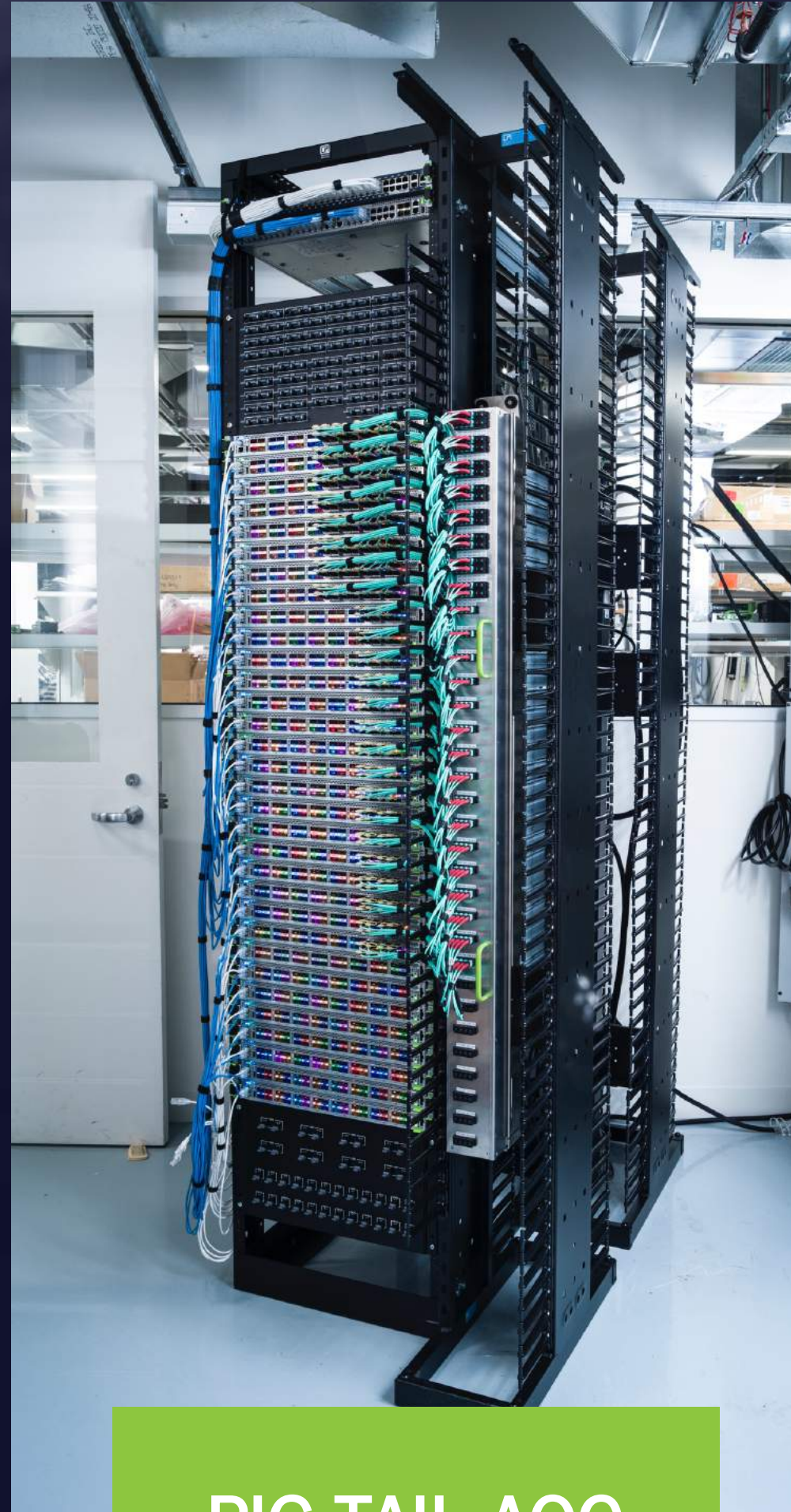
Operational  
aspects

Cable  
assembly

Workshop:  
“FBOSS Operationalization”

Software  
scaling

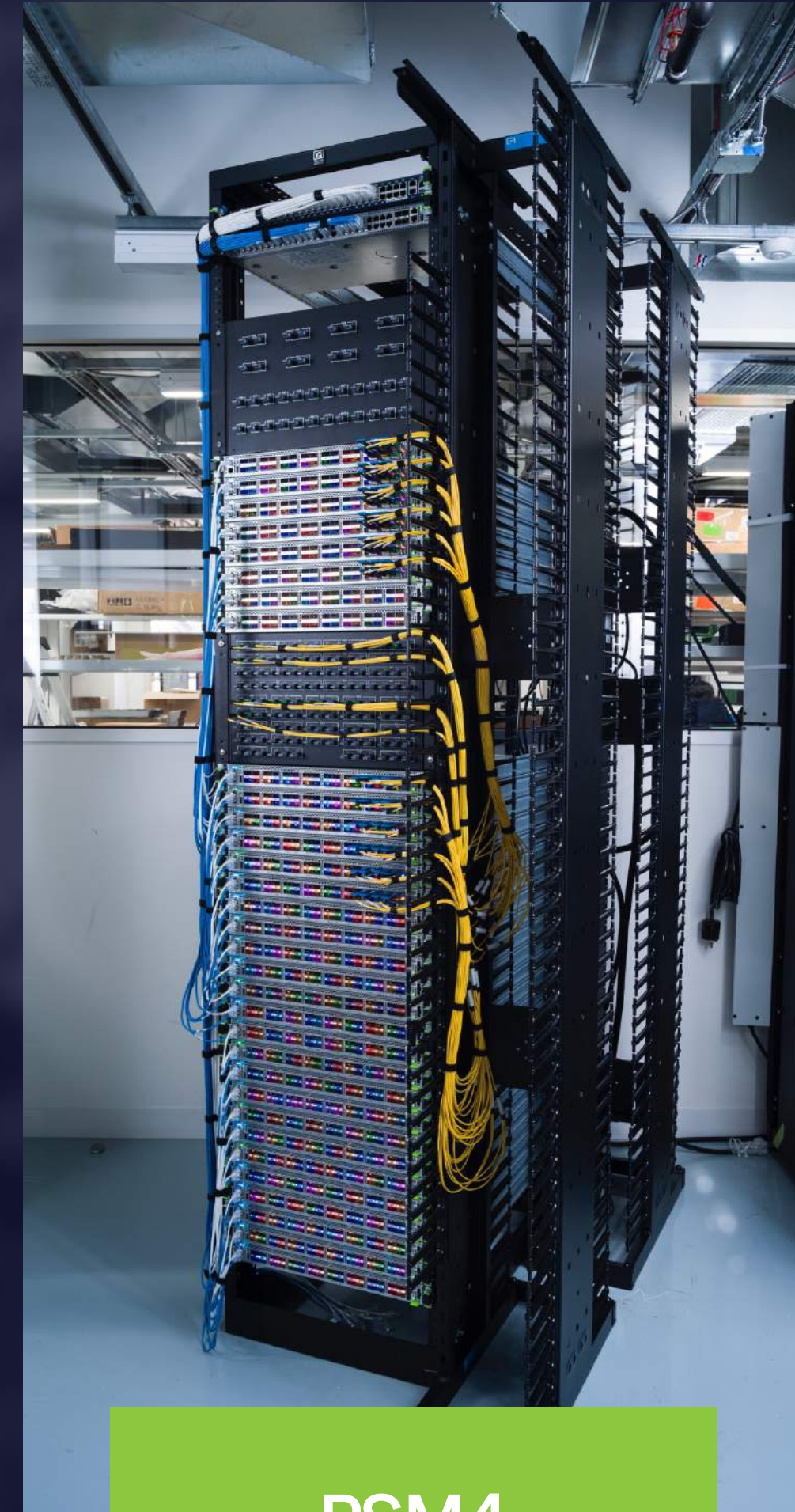
# Cable backplane options



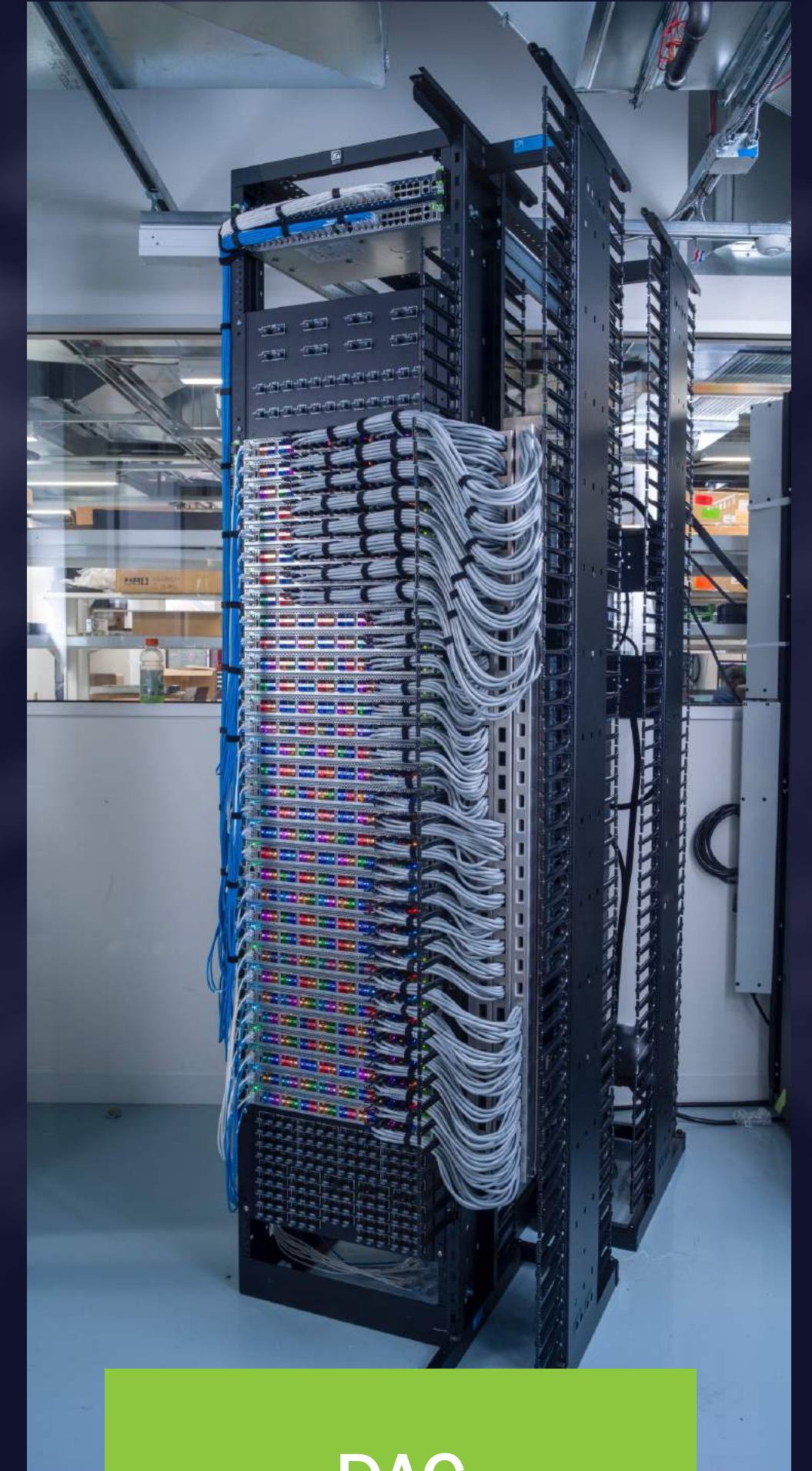
PIG-TAIL AOC



CWDM4



PSM4



DAC

# Monolithic vs Disaggregated

### Operational efficiency



- Re-use of building blocks minimizes the # of SKUS
- Significant reduction in technical and process overhead

### Power & design efficiency



- FA provides **higher port density**
- 60% more power efficiency

### Smaller fault domains



- Inherent property of distributed architecture

### Move Fast

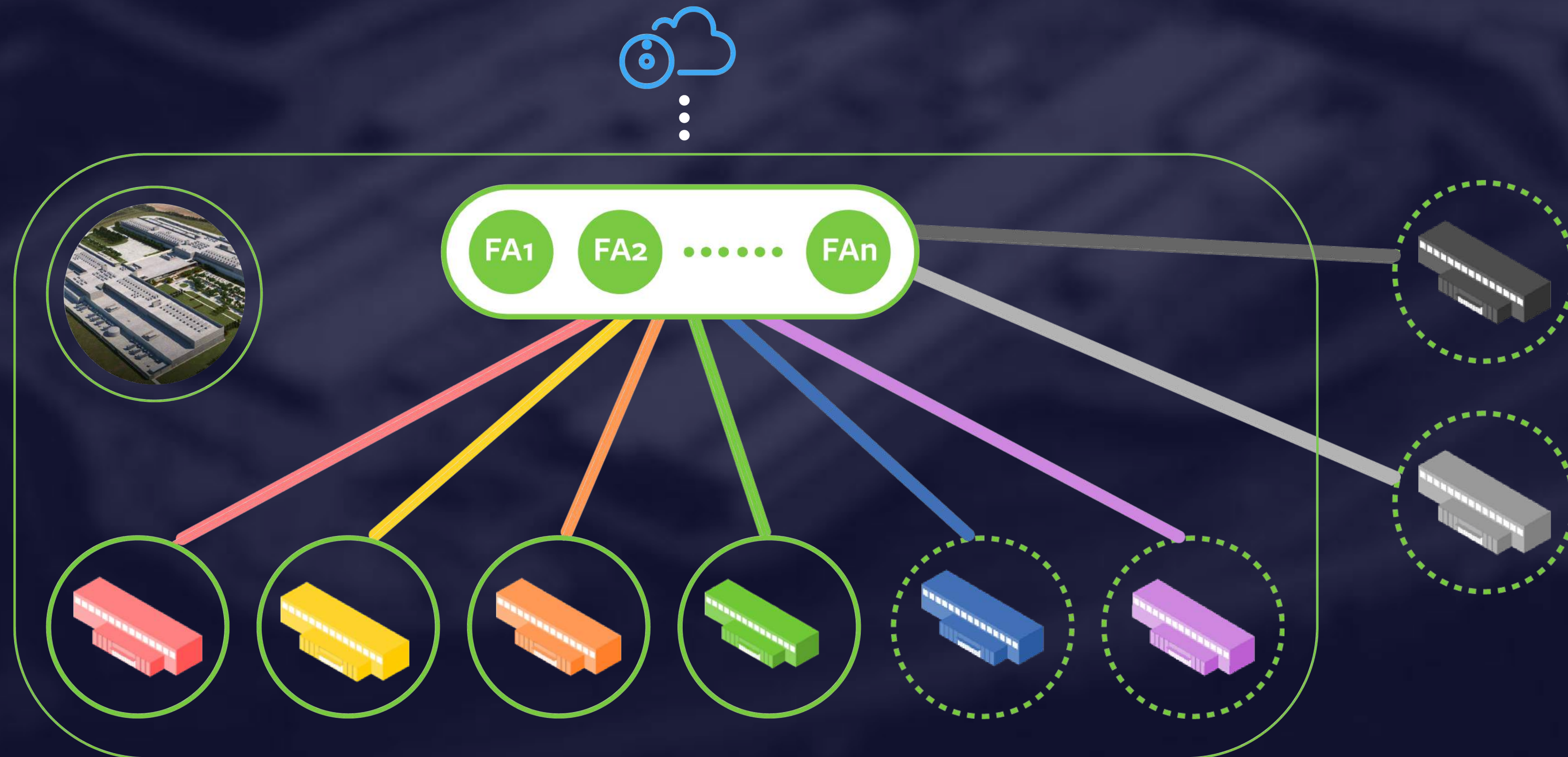


- Ideation -> Production in **5 months**
- Doubled the capacity in **9 months**

Flexible and  
adaptable design



- Flexible capacity allocation
- Disaggregation allows for adoption of new building blocks



# What next?

- Power levels stretched for 100G
- Unsustainable for 400G
- Limited by packaging

- Lower power consumption
- Enables higher density
- Requires new standards



PLUGGABLE OPTICS



CO-PACKAGING OPTICS AND ASIC WITH  
MODIFIED I/O



Partner



Scale



Innovate

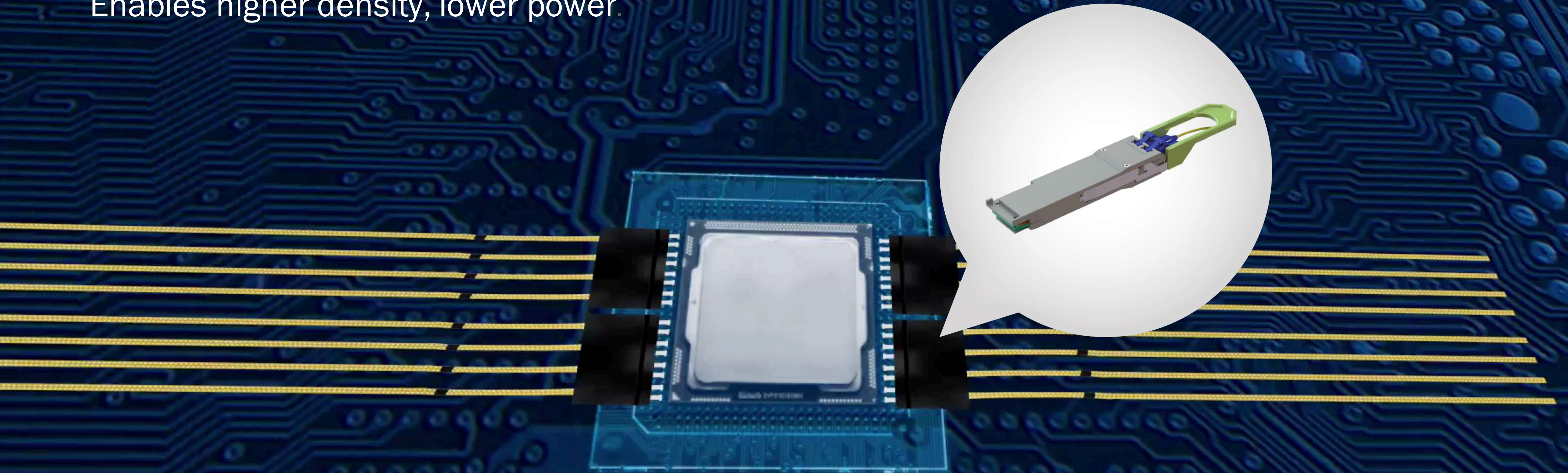


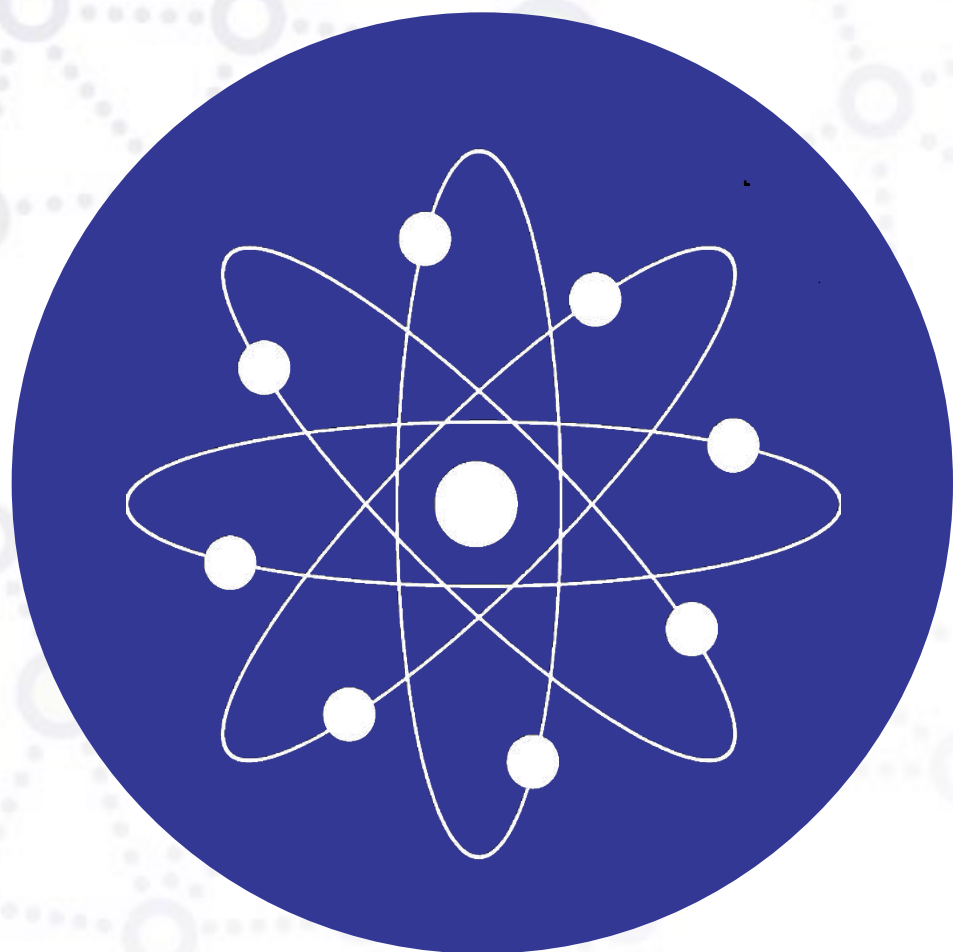


**Looking  
ahead**

# Co-packaged optics

Enables higher density, lower power.





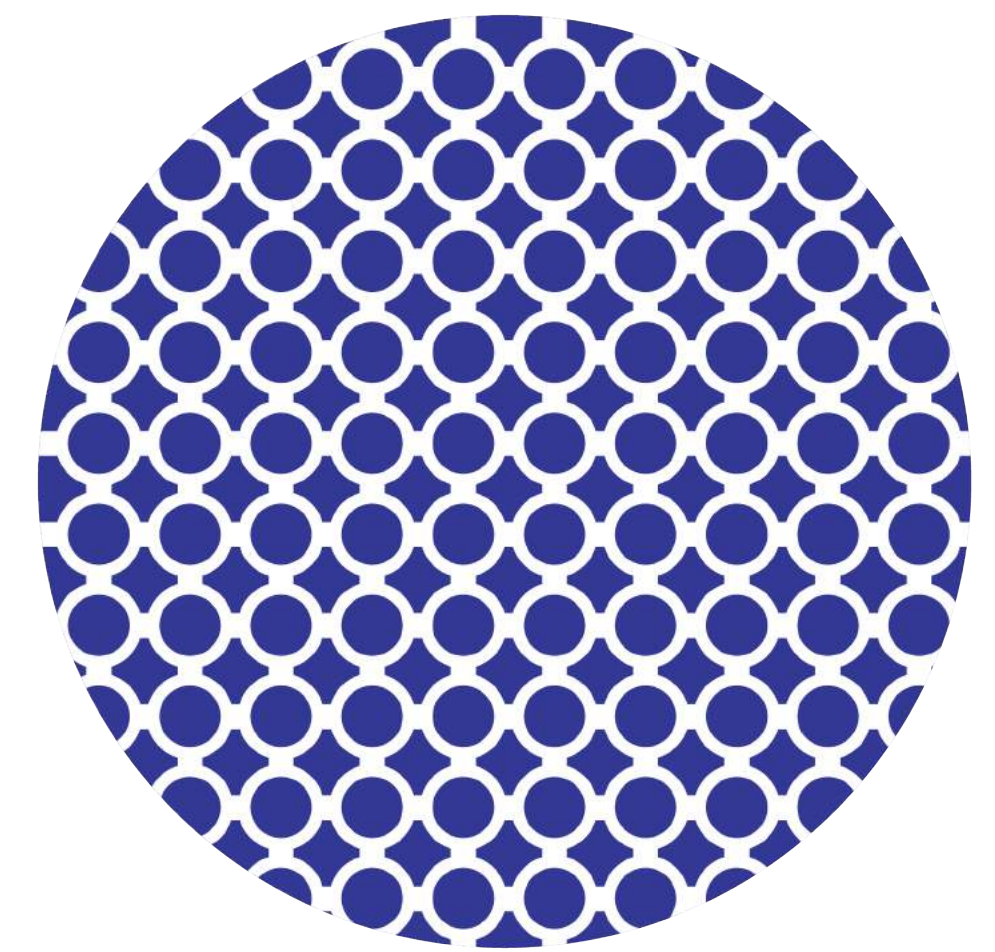
PHOTONS / ELECTRONS



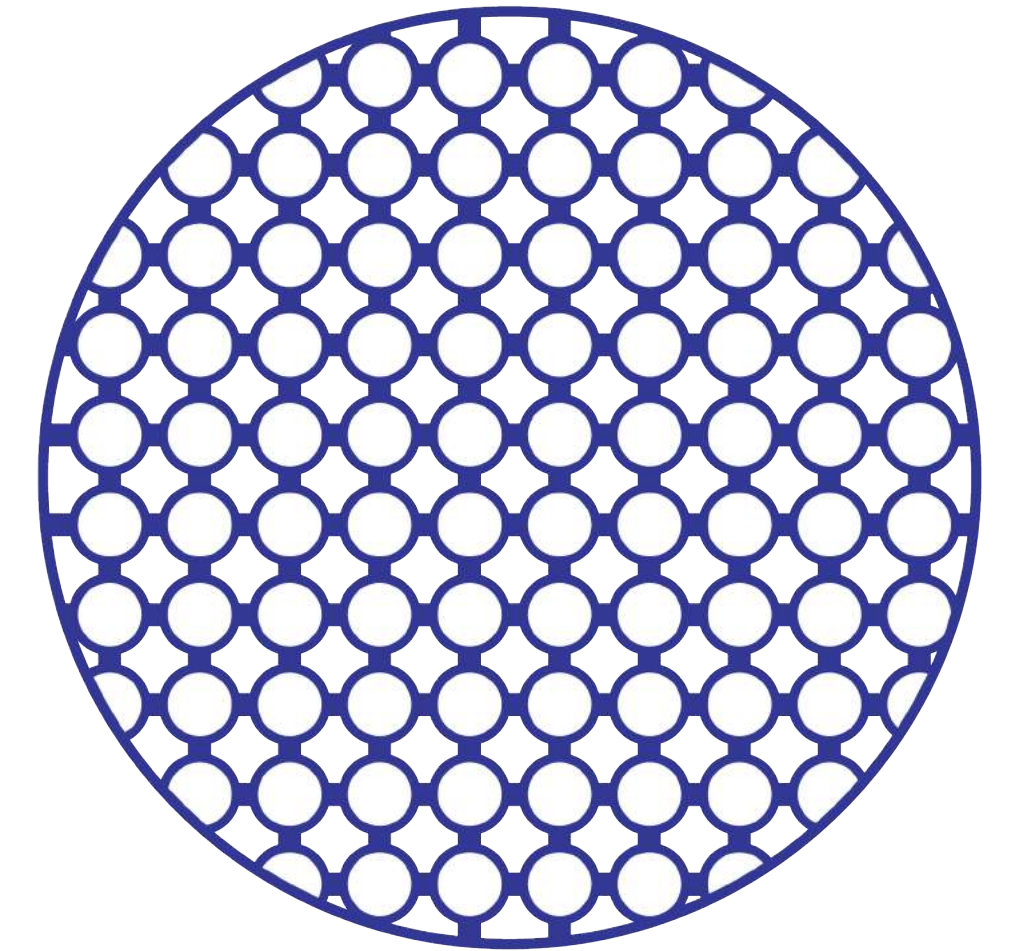
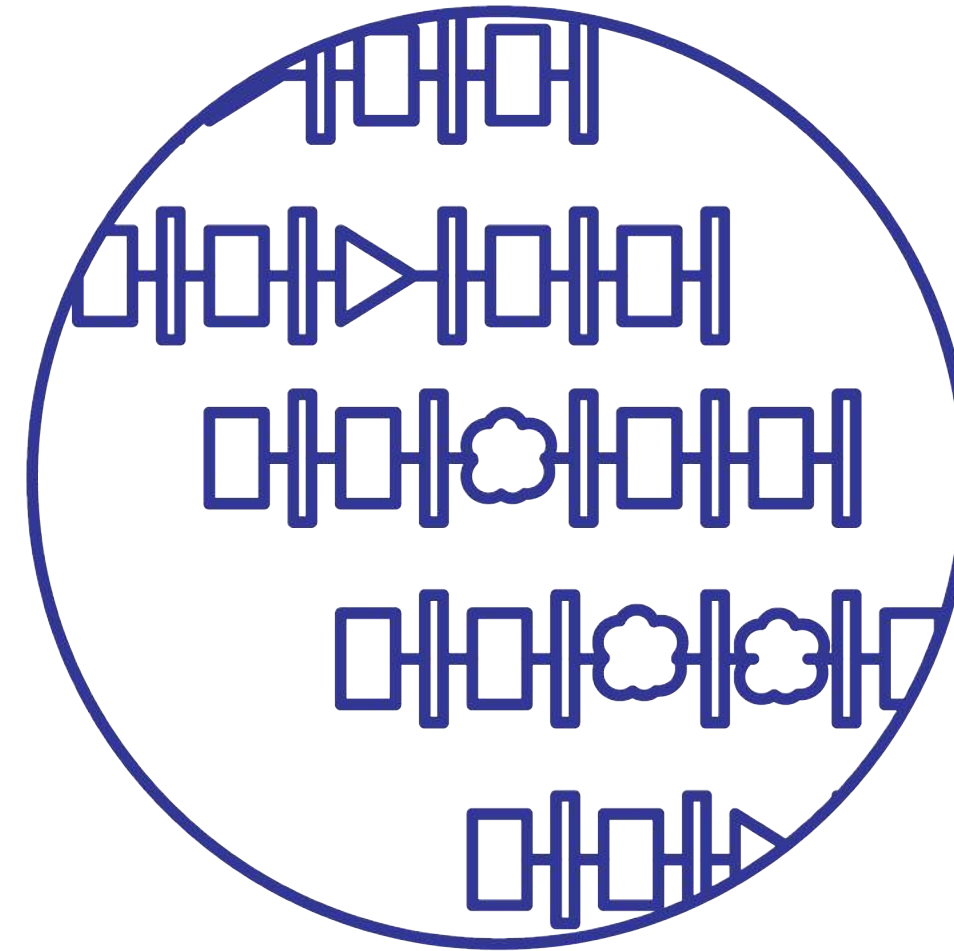
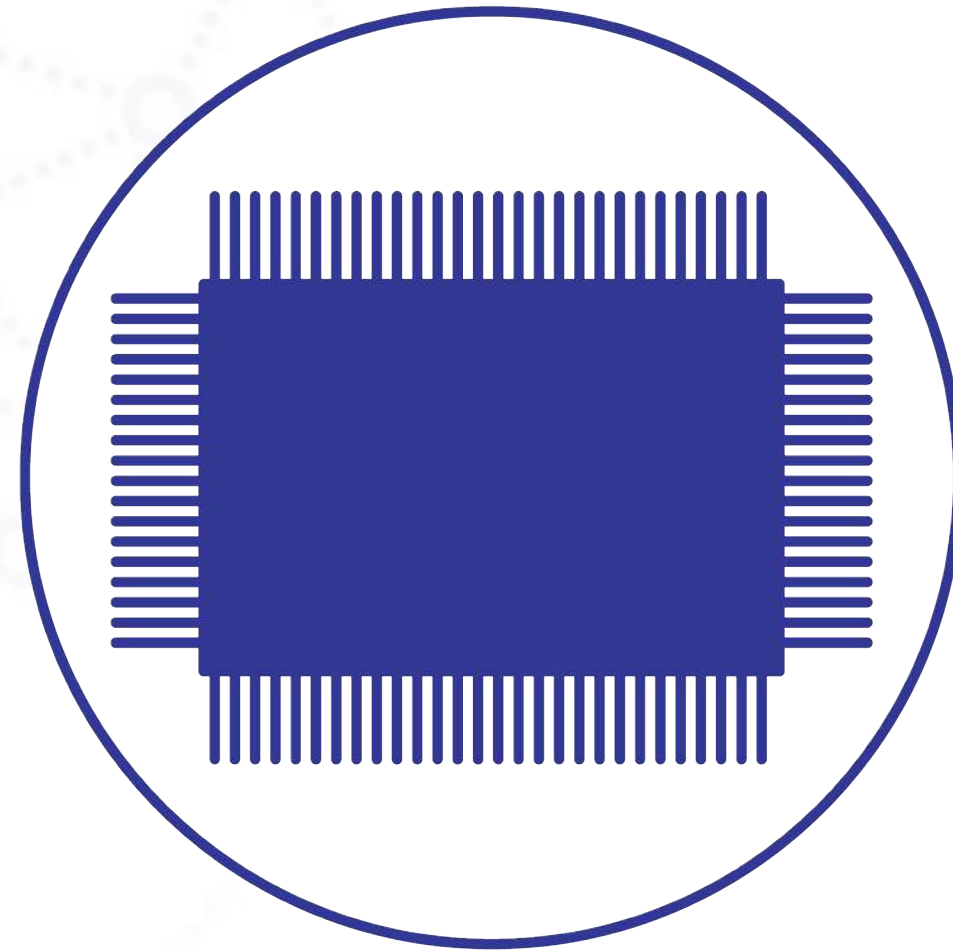
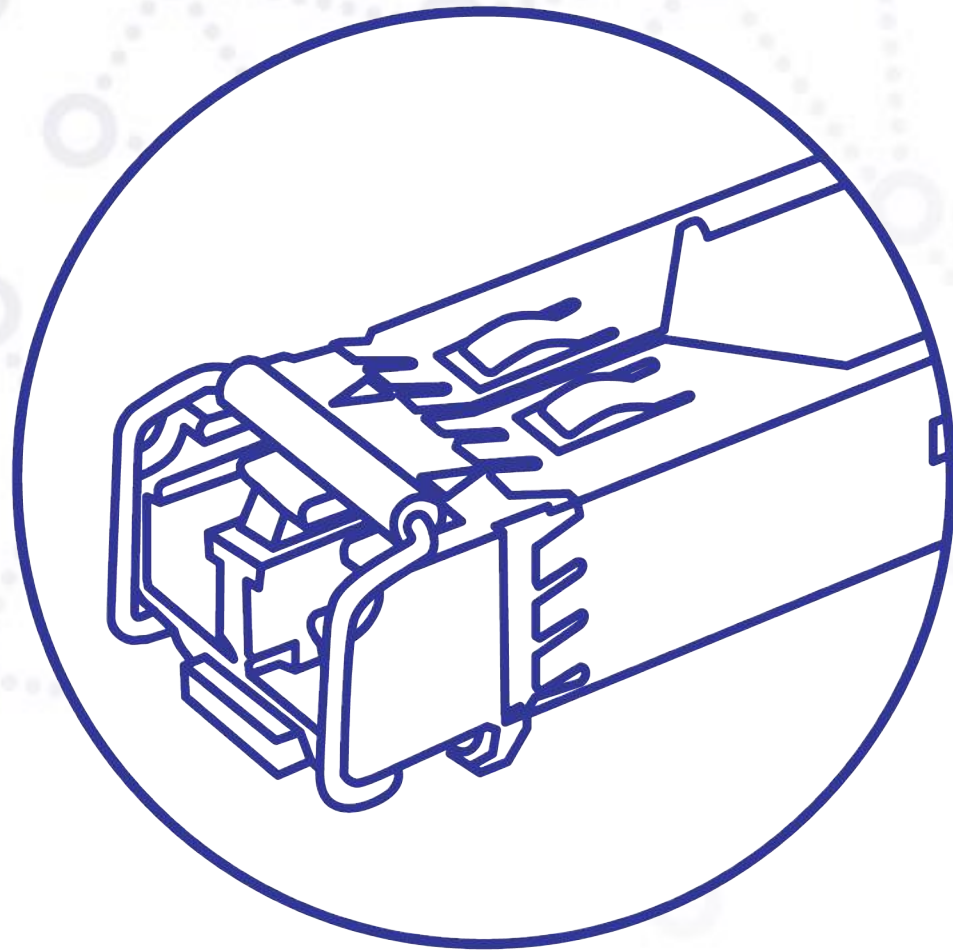
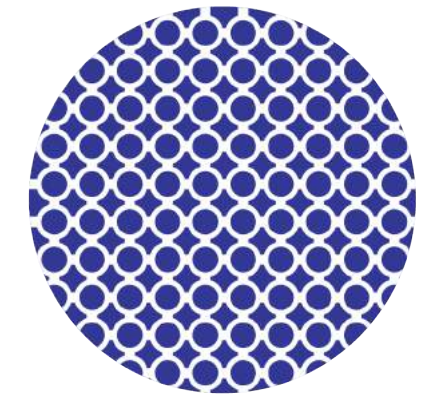
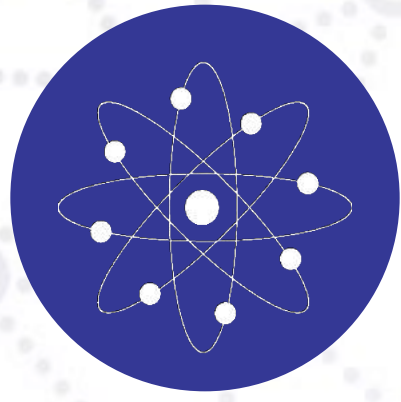
COMPONENT MATERIALS



CONTROLS / PROTOCOLS / LOGIC



SYSTEM FABRICS



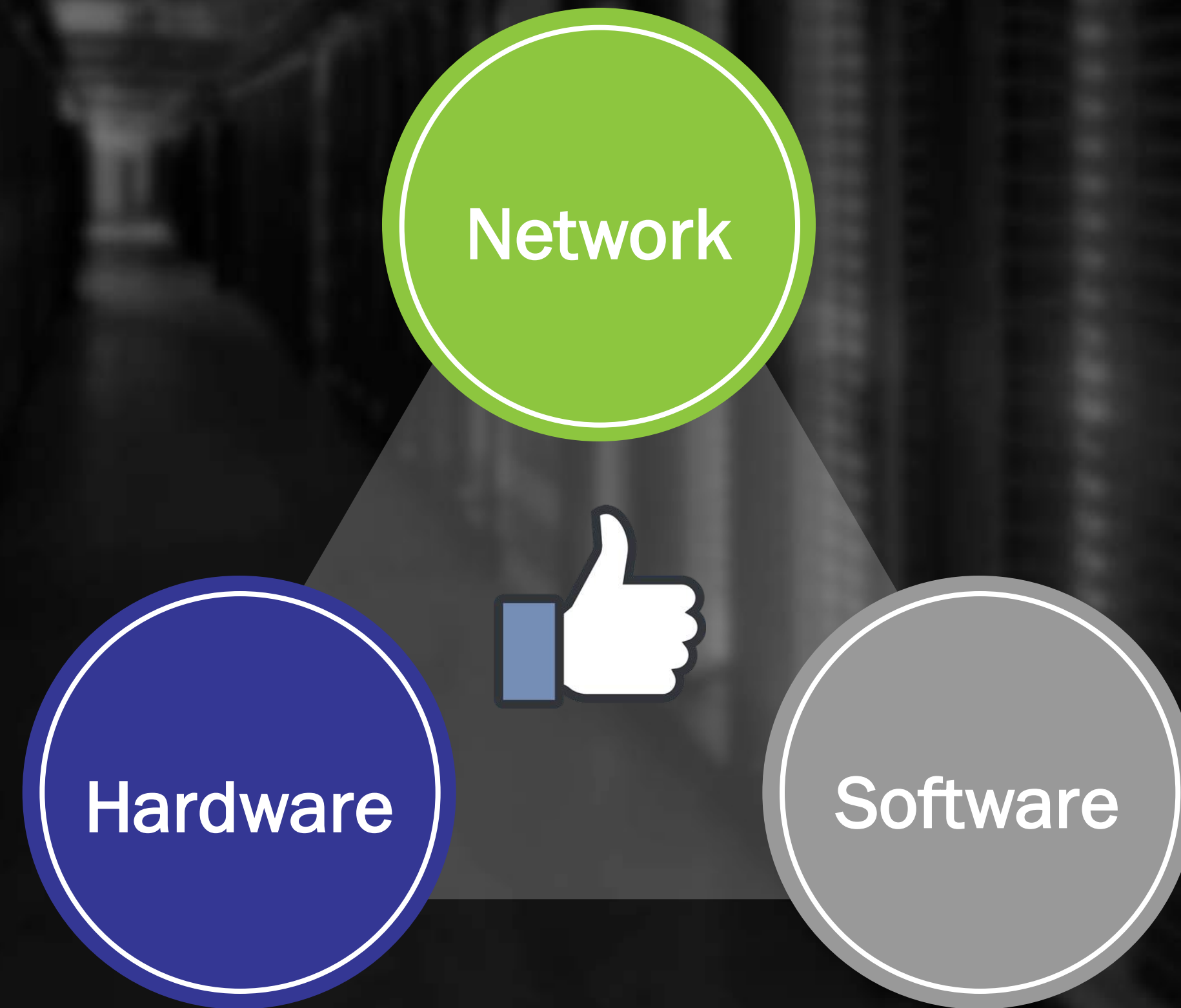
NETWORK TRANSCEIVER

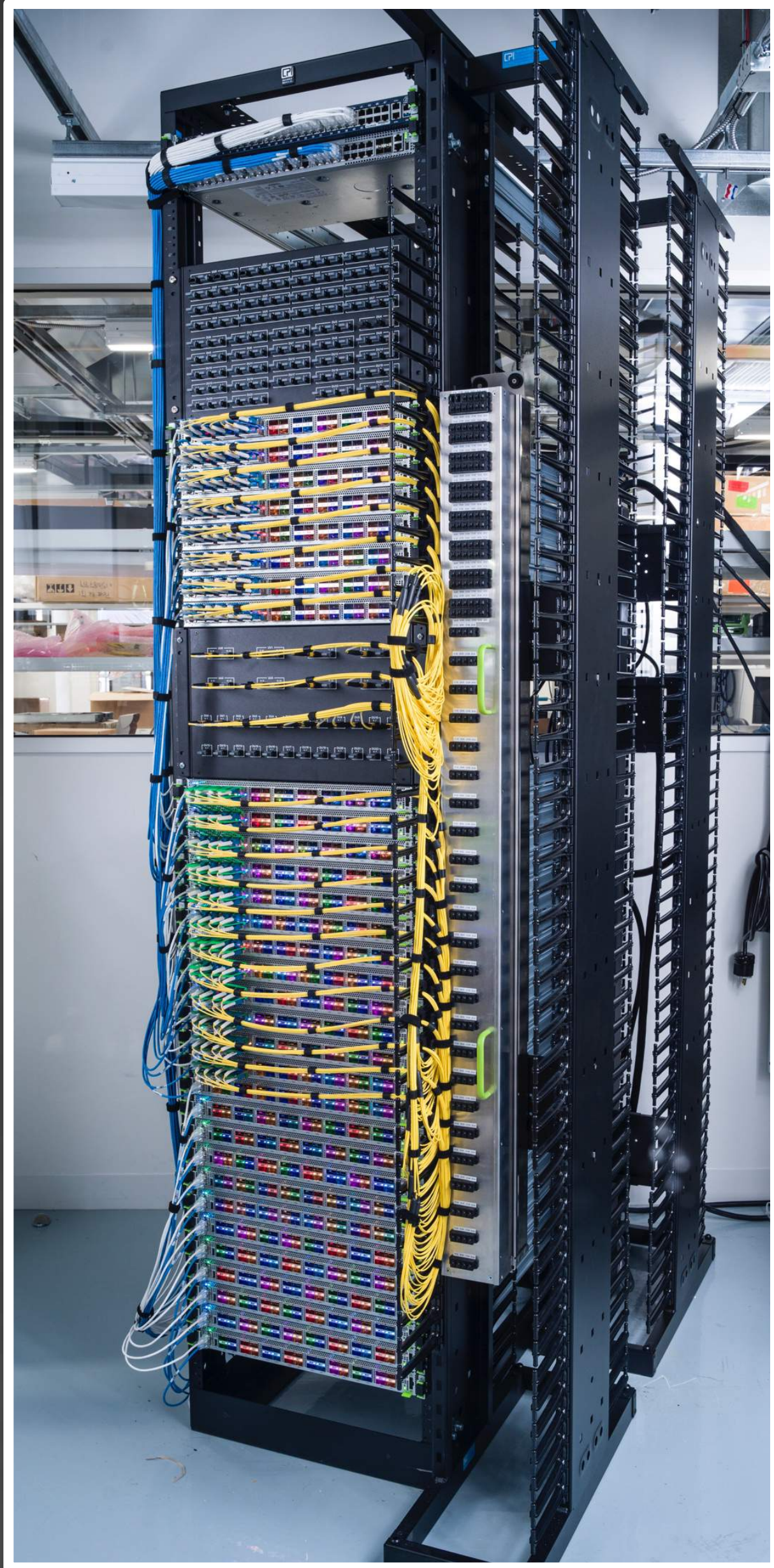
CHIPS & DISKS

FIRMWARE & LOGIC

SYSTEM FABRIC

# Moving faster and innovating as a community





**THIS JOURNEY  
1% FINISHED**



# OCP SUMMIT

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