



# Game-changing Innovation for Next-generation Networks

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May 5, 2022



# Infinera at a Glance



Headquarters  
**San Jose, California**  
(NASDAQ: INFN)

**\$1.4B+**

2021 REVENUE

**1900+**

PATENTS

**1000+**

CUSTOMERS

**3000+**

EMPLOYEES

**45+**

COUNTRIES WITH  
OPERATIONS

## WHAT WE DO

DELIVER PIONEERING OPTICAL INNOVATION FOR  
TELECOMMUNICATIONS CONNECTIVITY NETWORKS

MOBILE



DATA CENTERS



BROADBAND



METRO



LONG HAUL



SUBMARINE

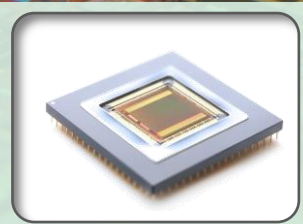




# We Solve Your Optical Transport Needs



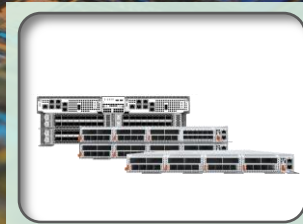
**PHOTONIC  
INTEGRATED  
CIRCUITS**



**COHERENT  
ASIC DSPs**



**MECHANICAL  
DESIGN AND  
PACKAGING**



**COMPACT  
MODULAR  
PLATFORMS**

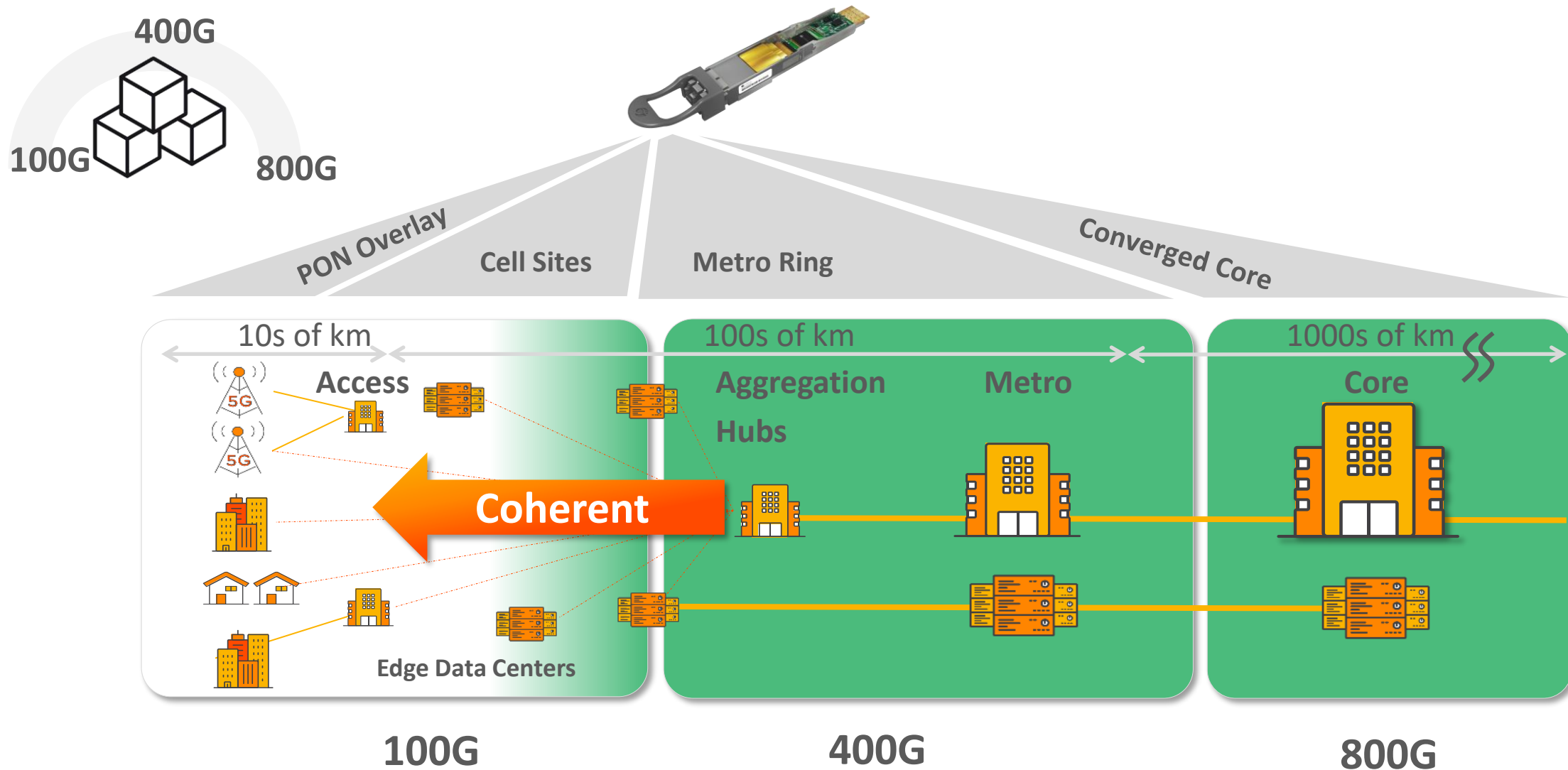


**OPTICAL SYSTEM  
SOFTWARE**



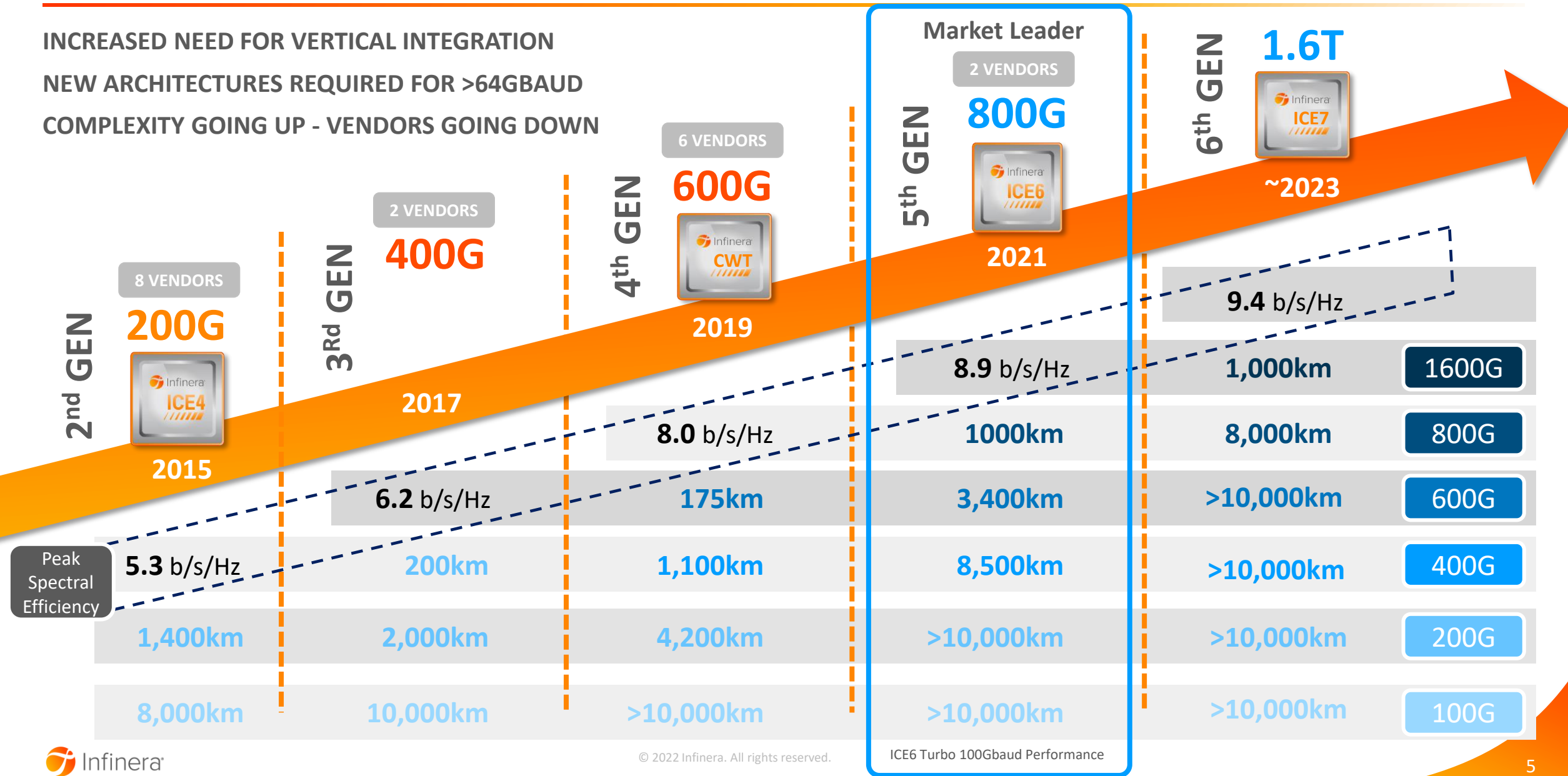
**SERVICES**

# Trend 1. Optical Transmission is Going Coherent

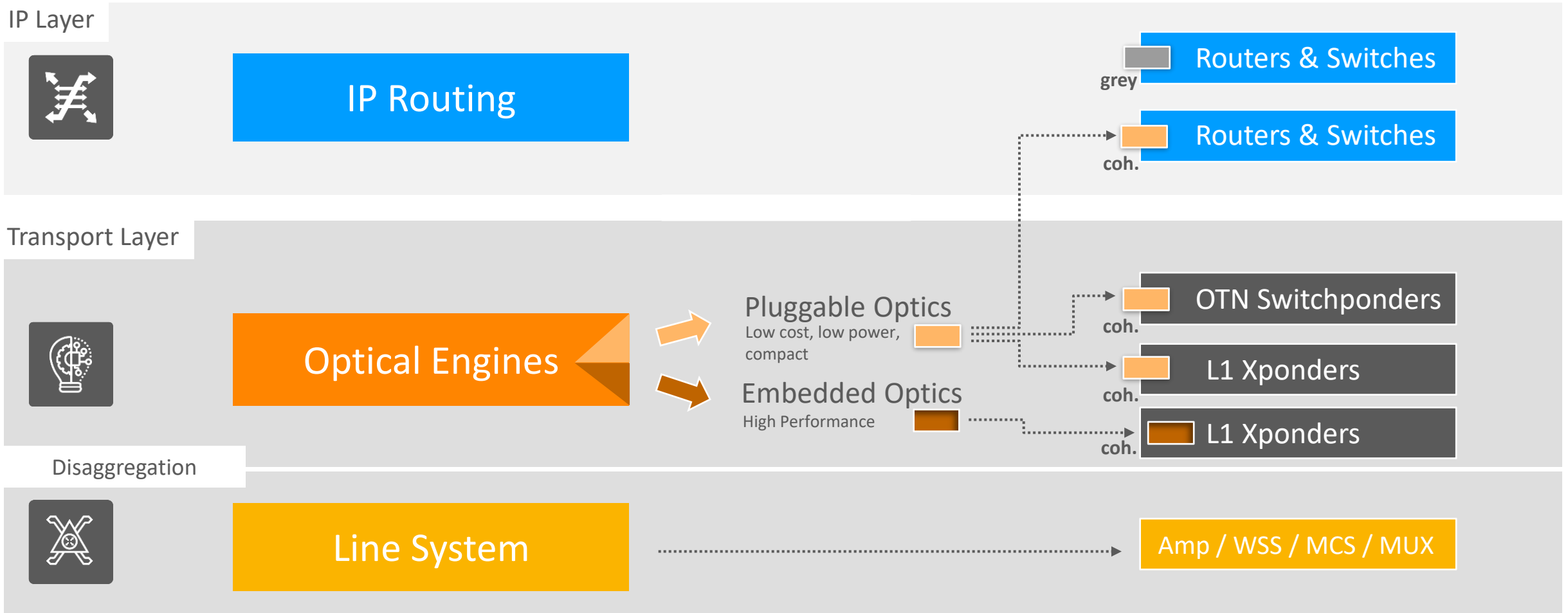


# Evolution Enabled by Coherent Transmission

INCREASED NEED FOR VERTICAL INTEGRATION  
NEW ARCHITECTURES REQUIRED FOR >64GBAUD  
COMPLEXITY GOING UP - VENDORS GOING DOWN



# Trend 2. Open Networking is Here



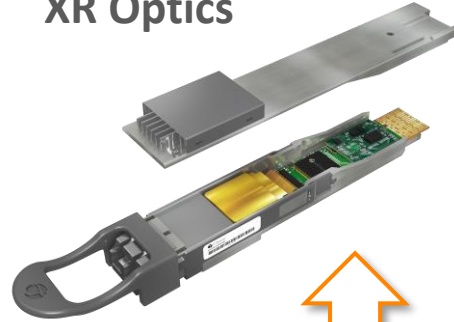
# Infinera Optical Engine Innovations

## 400G XR Pluggable

CFP2, QSFPDD, QSFP28



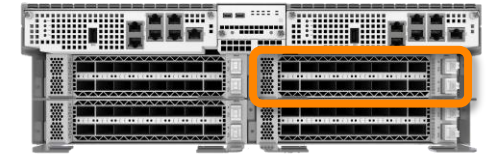
## XR Optics



The Worlds First  
Point-to-Multipoint Coherent Optical Solution



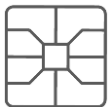
## CHM6 Transponder



Infinera G42



The Worlds Most Powerful High-Performance  
Optical Engine



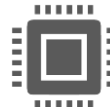
PIC  
DESIGN



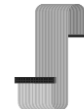
AISC/DSP  
DESIGN



HOLISTIC  
CO-DESIGN



ANALOG  
ELECTRONICS  
DESIGN



RF  
INTERCONNECTS



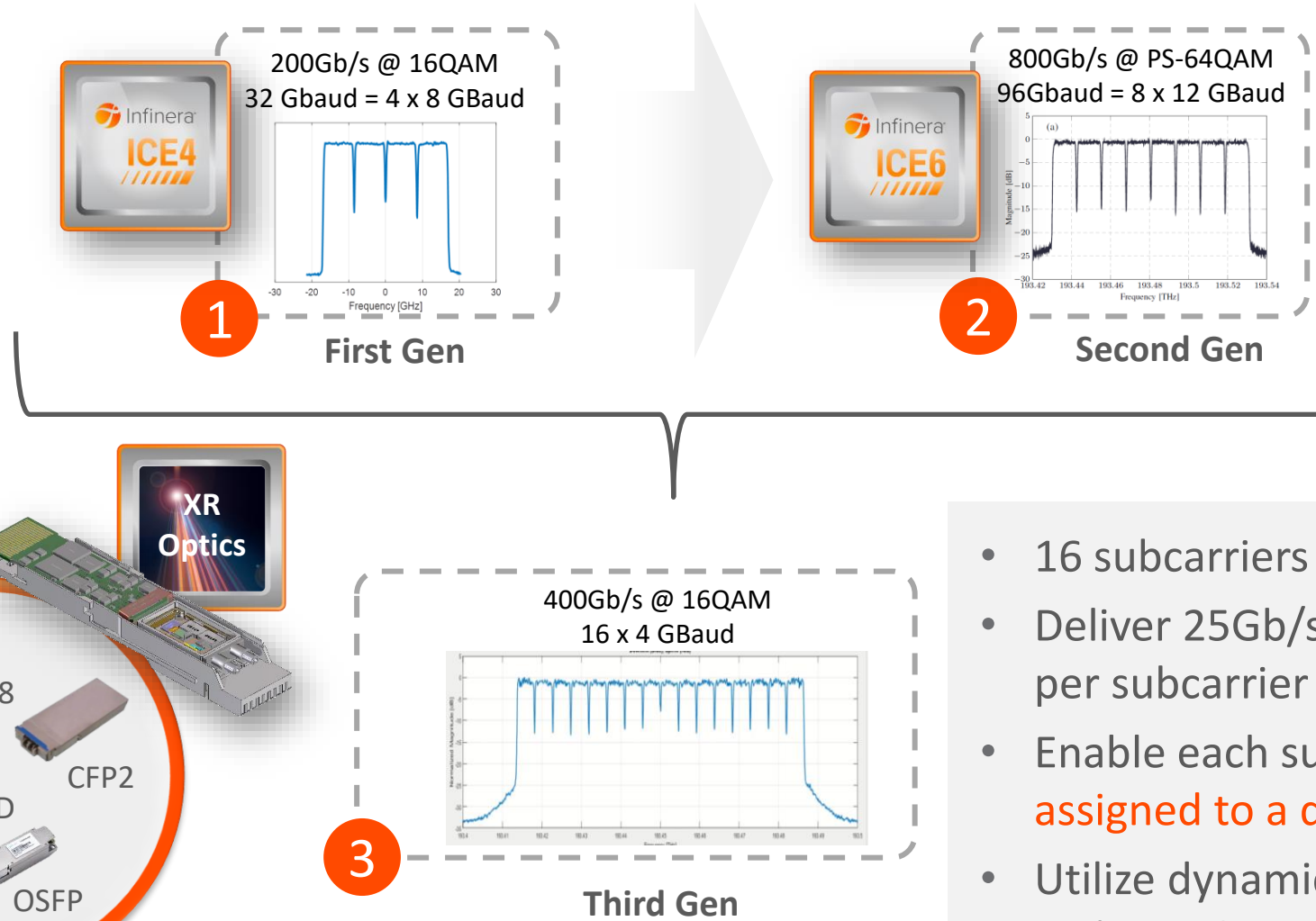
PACKAGING  
DESIGN



PIC MANUFACTURING



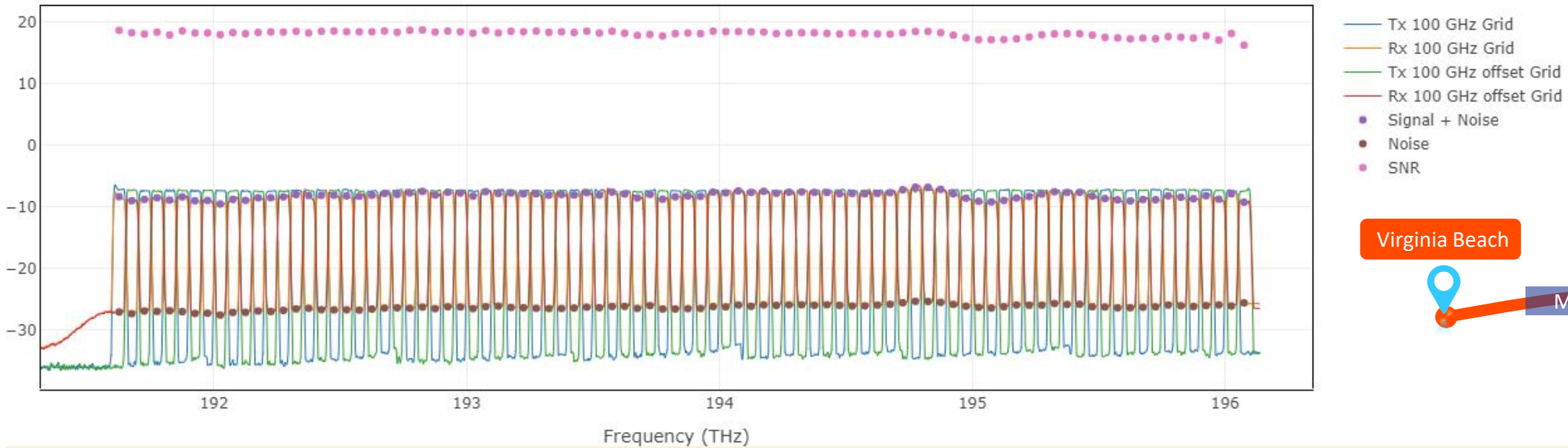
# Reimagine Network Aggregation: XR & Nyquist Subcarriers



- 16 subcarriers
- Deliver 25Gb/s increments per subcarrier
- Enable each subcarrier to be **assigned to a destination**
- Utilize dynamic signaling to assign 1, 2...N subcarriers per destination



# Nyquist Subcarriers – 25% higher Capacity



## Hero Experiment Records

- **30 Tb/s** on single fiber pair
- Up to **700 Gb/s** per  $\lambda$  at max Gb/s
- Spectral efficiency **8.75 BPS @ 700Gb/s**

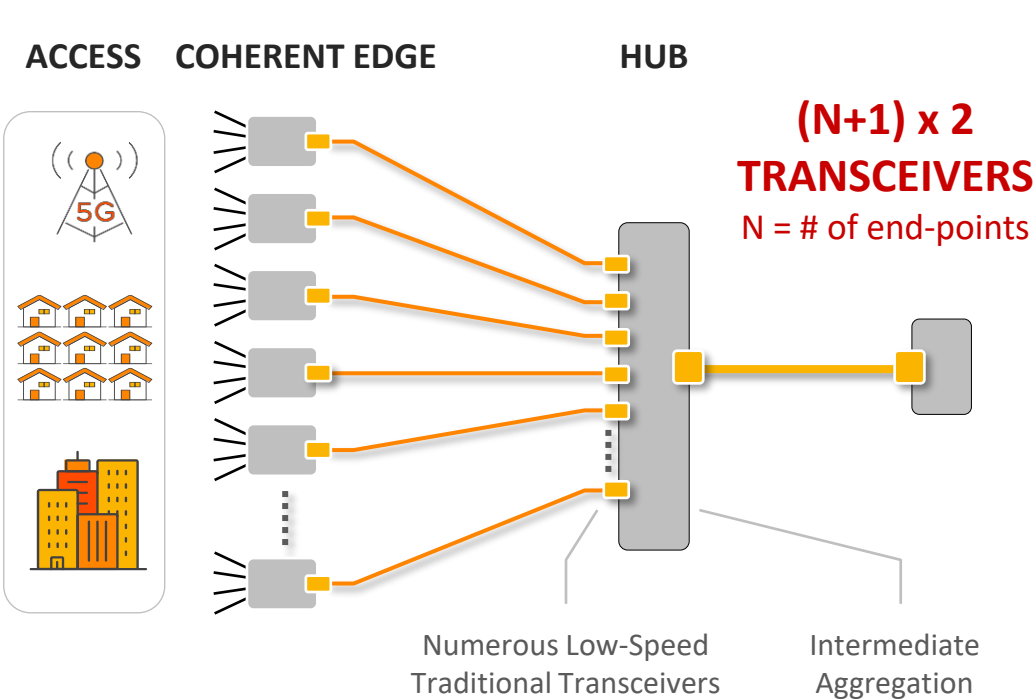
## Deployable Records

- **28 Tb/s** on single fiber pair
- Up to **650 Gb/s** per wavelength
- Spectral efficiency **8.25 to 9 BPS**
- **60% reduction** in Network Elements vs 24 Tb/s deployment

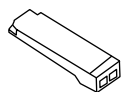
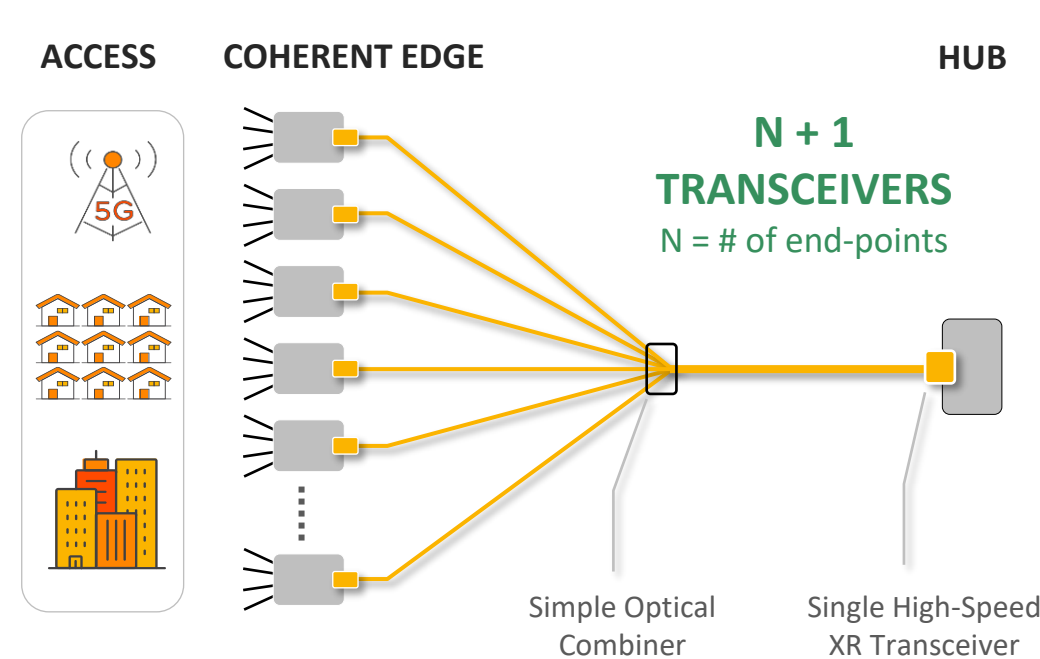
Records for commercially available equipment

# Point-to-Multi-Point Coherent Optics

## TRADITIONAL POINT-TO-POINT OPTICAL SOLUTIONS



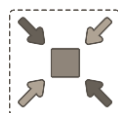
## XR OPTICS-ENABLED POINT-TO-MULTIPOINT SOLUTION



**REDUCE TRANSCEIVERS  
BY >50%**



**ELIMINATE INTERMEDIATE  
AGGREGATION DEVICES**



**IMPROVE ROUTER  
EFFICIENCY**



**REDUCE TRUCK ROLLS  
FOR UPGRADES**

**70%+  
Network  
Savings**

# Open XR Optics – Transforming Metro Optical

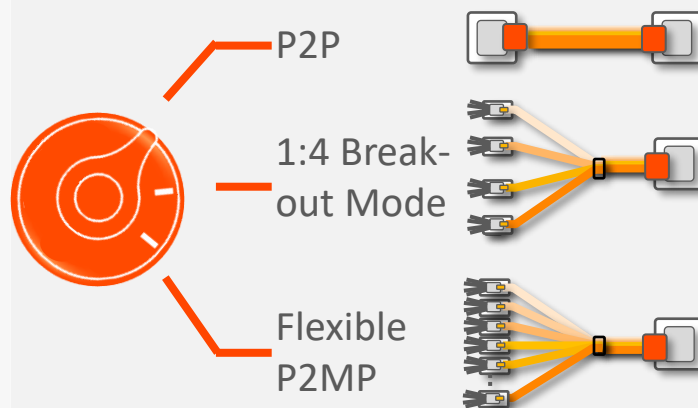


## Multiple Standards-MSA

Standard Form Factors

- CFP2
- QSFP-DD
- QSFP-28

## Any Deployment Model



## Lower CAPEX

- +50% fewer transceivers
- Up to +70% lower TCO



## Lower OPEX

- Less power consumption, compact footprint
- Simplified architecture
- No truck rolls for capacity upgrades

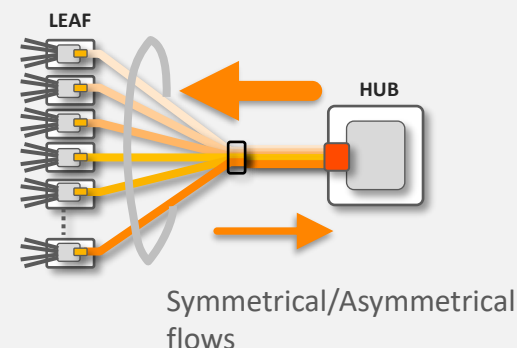


## Operational Flexibility

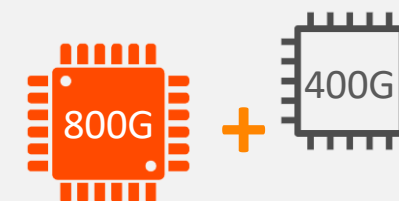


- Fiber pair/Single Fiber
- Fixed/Flex Grid
- ROADM Networks
- Transport & Packet Domain separation
- IPoDWDM Model

## Flexible Capacity Utilization



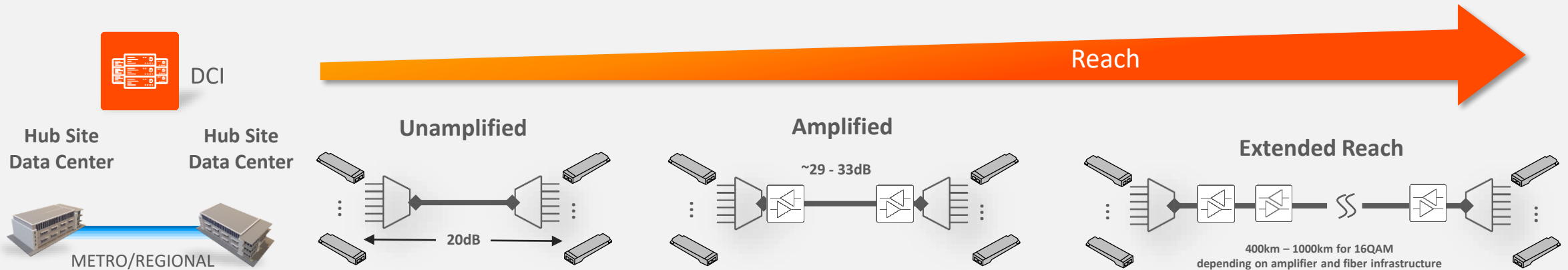
## Future Proof



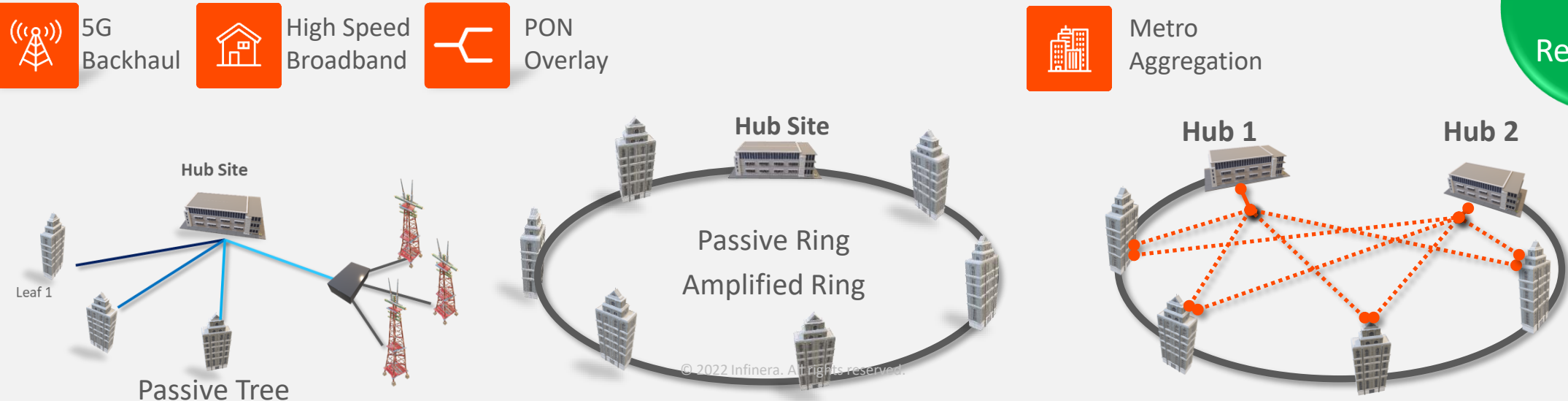
- 10Y+ Upgrade Path - No Forklifts
- Inter-generational networking
- Decouple node upgrades from network upgrades

# XR Optics Applications

## POINT-TO-POINT



## POINT-TO-MULTIPOINT

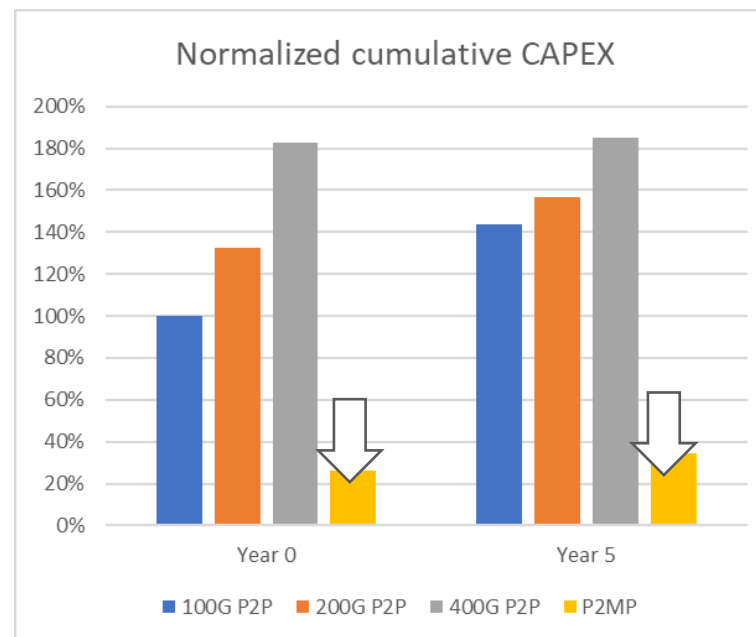


Up to 75%  
TCO  
Reduction

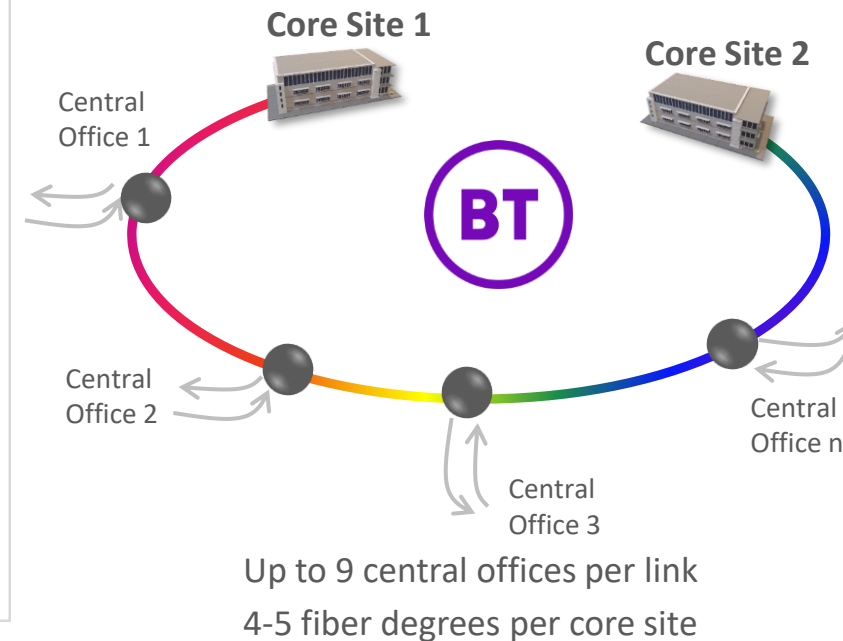


# Metro Aggregation Network Analysis

- A nationwide BT network with traffic from **1,000** central offices feeding into **100** core sites
- Hub-and-spoke traffic flows and growing 30% per year for five years
- Results published in a joint technical paper (BT/Infinera) at ECOC 2020



## 226 DUAL-HUBBED HORSESHOES



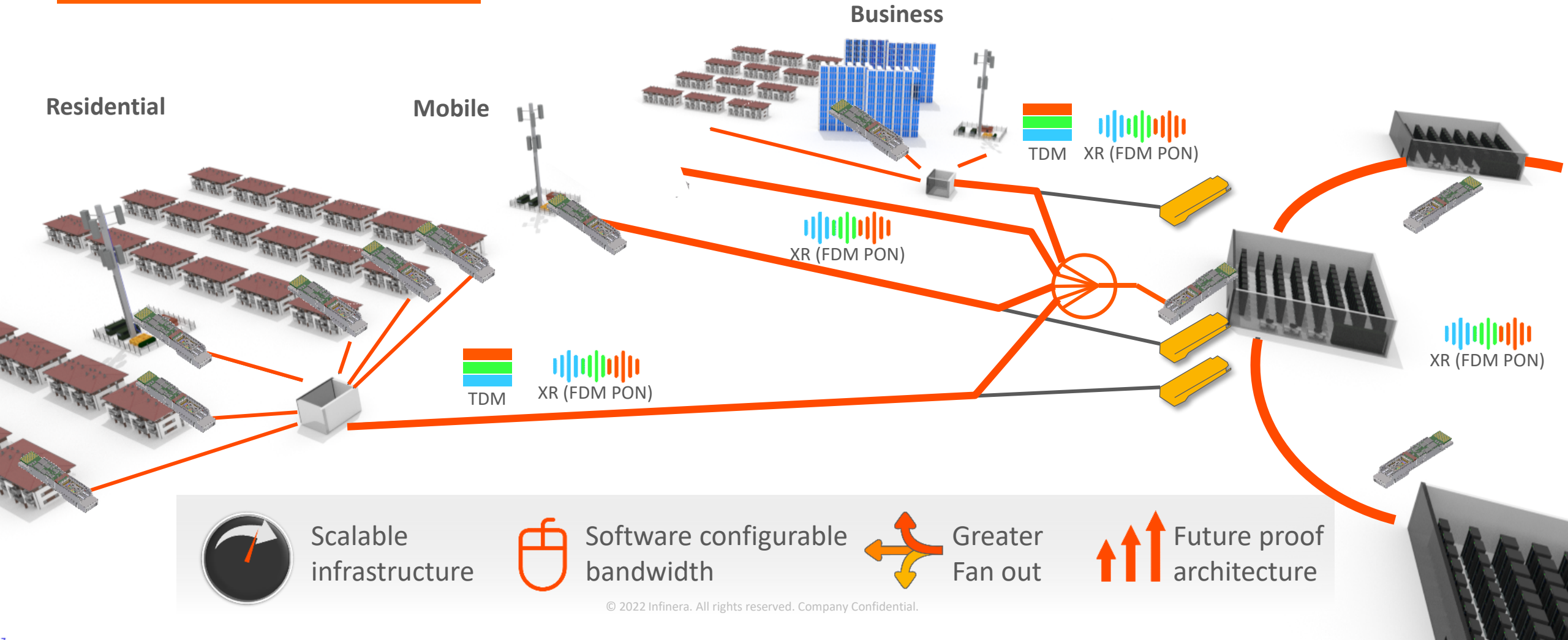
**+70% reduction in TCO**

Johan Bäck et al. "CAPEX savings enabled by point-to-multipoint coherent pluggable optics using digital subcarrier multiplexing in metro aggregation networks." *2020 European Conference on Optical Communications (ECOC)*. IEEE, 2020.

# Extending Coherent to the Edge

1. Address high capacity needs with **FDM optics overlay**

2. Coherent to the access edge



Scalable  
infrastructure



Software configurable  
bandwidth



Greater  
Fan out



Future proof  
architecture

# XR as an Industry Standard

**OPEN XR**  
FORUM



2021

Founded on June 1<sup>st</sup>



verizon

LUMEN

WINDSTREAM

Infinera



4 New members



Telefónica

zayo

CROWN CASTLE

colt

New members



AT&T joins the Forum

2022

Management Spec



Independent Management through 3<sup>rd</sup> party hosts.

New members

Additional carriers and equipment manufacturers are queued to join

# Takeaways

## NETWORK SIMPLIFICATION



50% fewer transceivers  
Less platforms

## NETWORK CAPEX/OPEX REDUCTION



Up to 70%  
reduction in TCO

## COMPATIBILITY WITH EXISTING INFRASTRUCTURE



Metro and Access networks  
Management infrastructure

## P2P, P2MP, HYBRID



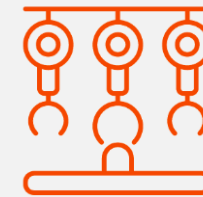
Same intelligent pluggable for many  
configurations

## SOFTWARE CONFIGURABLE



On-the-fly capacity  
allocation

## DESIGN FOR HIGH-VOLUME



Technology is fully applicable  
to low-cost, high-volume



## STANDARD/MSA BASED



# Any Questions? Come to Itectra's Booth During the Break

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# itectra



# Infinera®

