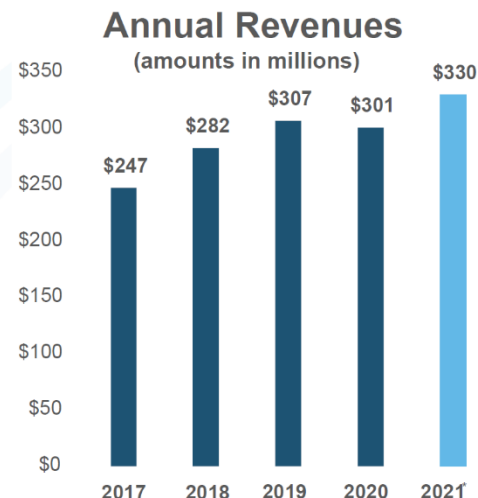# DZS Corporate Update

June 2021

A Global Leader in the development of innovative packet-based Mobile Transport, Broadband Connectivity and Cloud-Native Software Defined Networking solutions

**Mobile Transport and Broadband Connectivity Pure-Play:**

- Incumbent to ~750 Tier I and Alternate Service Providers
- Favorable Secular and Geo-Political tailwinds
- ~$15B Total Addressable Market in 2020 grows to $24B in 2024 (9.3% CAGR)

**Annual Revenues**
(amounts in millions)

| Year | Revenue |
|------|---------|
| 2017 | $247 |
| 2018 | $282 |
| 2019 | $307 |
| 2020 | $301 |
| 2021 | $330 |

*2021 revenues reflect the midpoint of guidance as of May 3, 2021*

**Business & Technology Highlights:**

- Visionary Management Team with a proven track record, delivering standard setting innovation, exponential growth and financial results
- Three consecutive quarters of Record Orders, Backlog, Revenue and Margin Expansion
- Two recent technology Acquisitions (mobile transport, software defined networking/automation) – Potential for significant future upside via amplified expansion playbook and operational streamlining
- Recent Follow-on Equity Raise of $64M in Gross Proceeds

# Supplier to Many of World's Leading Service Providers

**DZS**

**5G** **O-RAN Innovator**
Mobile xHaul

Market Leader in **Next Generation 10Gig PON (XGS / 10GE)**

**Regional Leader in Broadband Connectivity and 5G Mobile transport** to South Korea and Japan

**Software Defined Networking and Automation Disruptor**

AT&T · LG U+ · LUMEN · SK broadband · kt · etisalat · Chunghwa Telecom · TELUS · SoftBank · KDDI · Bell · Rakuten


Orchestration & **ANALYTICS**


**MOBILE** Transport


**Broadband CONNECTIVITY**


Connected **PREMISES**

tmf · Open **ROADM** · MEF · ETSI · THE LINUX FOUNDATION · TELECOM INFRA PROJECT · broadband forum · O-RAN ALLIANCE

*Source: Omdia (Fiber and Copper Access Equipment: Revenue 4Q20 2017-Present), Results are not an endorsement of DZS. Any reliance on these results is at the third-party's own risk*

# Mobile Transport & Broadband Connectivity Portfolio

**Orchestration & ANALYTICS**

A powerful end-to-end intelligence software portfolio delivering network orchestration, automation, 5G slicing, advanced data analytics and service assurance management
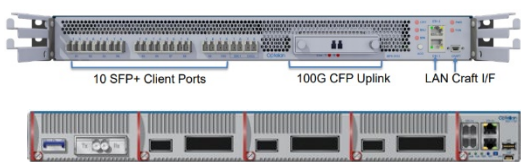
 DZS Cloud

**MOBILE Transport**

Innovative and agile mobile transport solutions enabling more capacity, coverage and QoS

10G - 400G ZR+ outside plant / network edge hardened optical transport system

10 SFP+ Client Ports    100G CFP Uplink    LAN Craft I/F

 DZS chronos

**Broadband CONNECTIVITY**

Market first 10G PON FTTx solutions delivering ultra-high speed Internet services

PoLAN solutions delivering security, reliability, cost and space savings for Fiber-based enterprises

 DZS velocity

 fiberLAN

**Connected PREMISES**

High-speed internet service, always-on, service assurance and advanced WiFi service, whole home coverage and QOS prioritization of data and video content

Enterprise ONTs          GPON ONTs          XGS PON ONTs          Fixed Wireless

 DZS helix

# ~750 Active Customers Balanced Across Americas, EMEA, Asia

Orchestration & ANALYTICS

MOBILE Transport

Broadband CONNECTIVITY

Connected PREMISES

# Experienced and Trusted Leadership Team
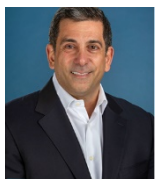
**Tom Cancro**
Chief Financial Officer

**Jay Hilbert**
EVP AEMEA Sales

**Bill Ko**
EVP Asia Sales

**Geoff Burke**
Chief Marketing Officer

**Laura Larsen-Misunas**
Chief People Officer

**Michael Martin**
Global Operations Officer

**Charlie Vogt**
President & CEO

**Justin Ferguson**
Chief Legal Officer

**Keith Nauman**
SVP Services

**Darrin Whitney**
Chief Information Officer

**Andrew Bender**
Chief Technology Officer

**Daniel Won**
Chief Product Officer

**Miguel Alonso**
VP of Product Line Management

**Doron Paz**
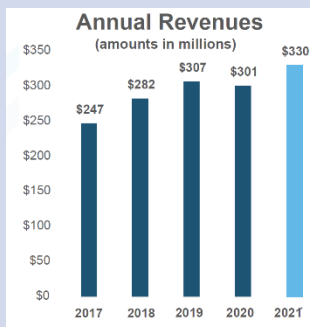VP of Research & Development

**Noel Charath**
SVP Cloud Services

# Business Highlights

**DZS**

## Record Revenue

- 3 consecutive record revenue quarters

**Annual Revenues**
(amounts in millions)



Mid-point of guidance as of May 3, 2021

## Record Orders and Backlog

- $117M Q1'21 represents the best quarter ever
- $116M Q1'21 backlog represents the most backlog ever
- Backlog increased 50% QoQ

## Diversification

- Mobile Transport increased 635%
- NA orders increased 85% QoQ / 138% YoY
- EMEA orders increased 60% YoY

**Revenue by Customer Segment**
(amounts in millions)



Mobile Transport   Fixed Broadband
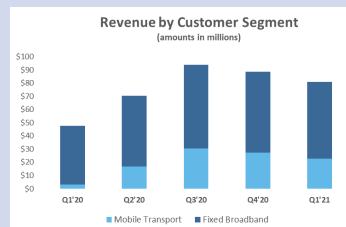
## Equity Offering

- Executed $64M equity offering, 4x oversubscribed
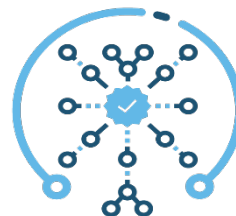- Equity raise designed to enable agility and flexibility for growth

**DEBT**

## Significant Events

- Surpassed 1.5M Mobile Transport ports shipped
- Acquired Optical and SDN technology innovators

Optelian   RIFT

AT&T   TELUS

# Alignment with Secular Mega-Trends

**DZS**

Open Standards
Open and Disaggregation
Network solutions

Fiber Deep
Leveraging an Unlimited
Waveguide

Mobility and 5G
Densification and Ultra
Low-Latency
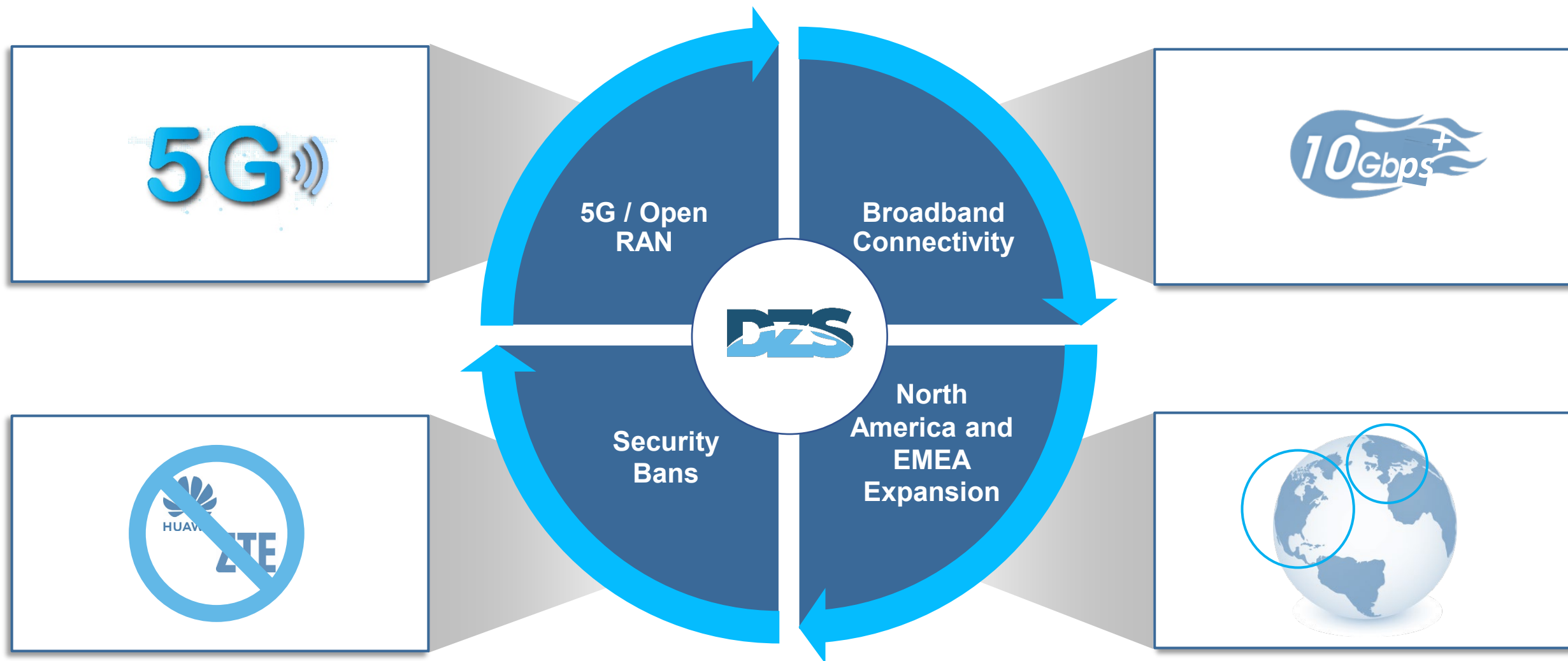
Cloud /
Data Center
Applications and
Analytics

Connected
Everything
Proliferation of
Broadband-ready
Devices, Wi-Fi6
and Mesh

**Enabling a Hyper-Connected World**

# DZS Growth Pillars

# Mobile Transport Solutions
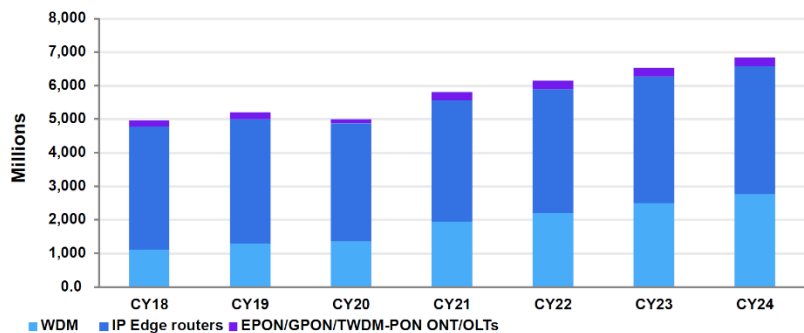
**DZS**

## 5G / Open RAN

### Business Drivers

- 4G to 5G Upgrade Cycle
- Rapid adoption of Open RAN
- O-RAN Validation from Rakuten Mobile (4M+ subs)
- Leadership in 5G Fronthaul, Mid-haul and Backhaul Technology

### Market Size

- $7.1B Revenue forecast for Mobile Backhaul Equipment (Omdia) up 28% vs. FY2020
- $1.1B Revenue forecast for Mobile Fronthaul Equipment (Omdia) up 116% vs. FY2020
- Fronthaul drives ~40% increase in backhaul TAM

### Recent Results

- 635% YoY Revenue Growth
- 1.5M Mobile xHaul ports shipped
- Major Customers Include:

  **AT&T**   **SoftBank**   **Rakuten**

  **LG U+**   **SK broadband**   **kt**

### 5G Mobile Network

**Mobile Backhaul Equipment Revenues by Select Technologies**

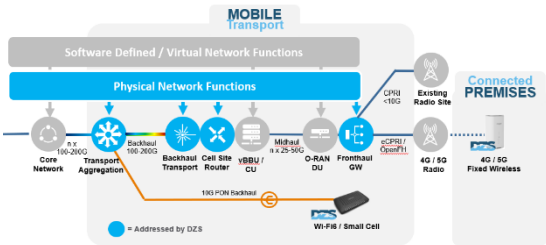Legend: WDM | IP Edge routers | EPON/GPON/TWDM-PON ONT/OLTs

Source – Omdia, Macrocell Mobile Backhaul Equipment Market Tracker 2H20 Database, Market size in terms of revenue, December 2020, Results are not an endorsement of DZS. Any reliance on these results is at the third-party's own risk.

# Broadband Undergoing Historic Upgrade Cycle

## Business Drivers

- Symmetrical Broadband Services
- 10-25Gbps Upgrade Cycle
- ~$120B of Broadband Initiatives
- Hybrid Work From Home
- FiberLAN (Enterprise)
- Reoccurring SDN/Automation Software License Model
- Reoccurring SLA Model

## Market Size

- $12.3B Revenue forecast for Broadband Access Equipment (Omdia) up 50% vs. FY2020
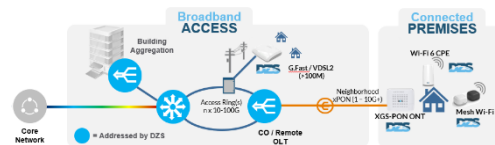- $8.7B SAM (Excluding China), forecast up 56% vs. FY2020

## DZS Results

- 30% YoY Revenue Growth in Broadband Connectivity Segment
- 24 New Customers

AT&T · SoftBank · Telefónica · vodafone
LUMEN · LG U+ · KDDI · STC
TELUS · kt · SK broadband · Bell

## FTTx Network Diagram



## Broadband Connectivity



10Gbps+

**Wireline broadband access equipment revenue – PON + P2P + DSL/Gfast: this year's forecast vs. previous forecast (published Jul 2020)**
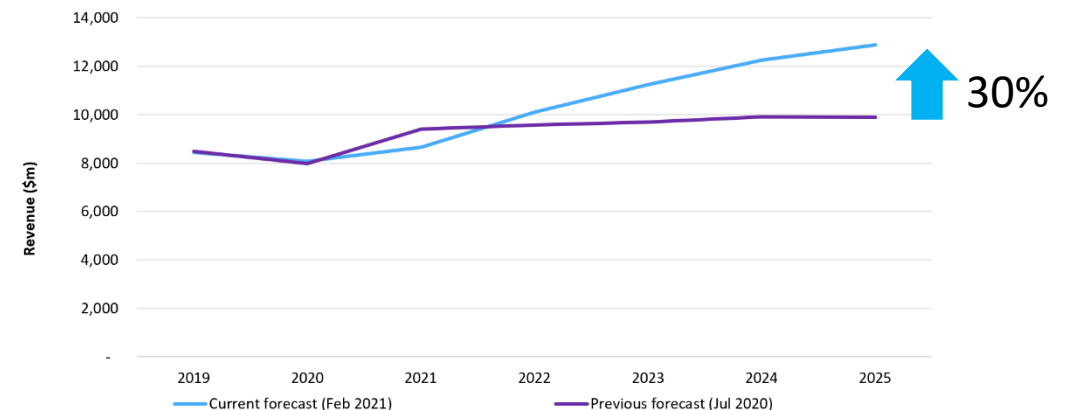


30%

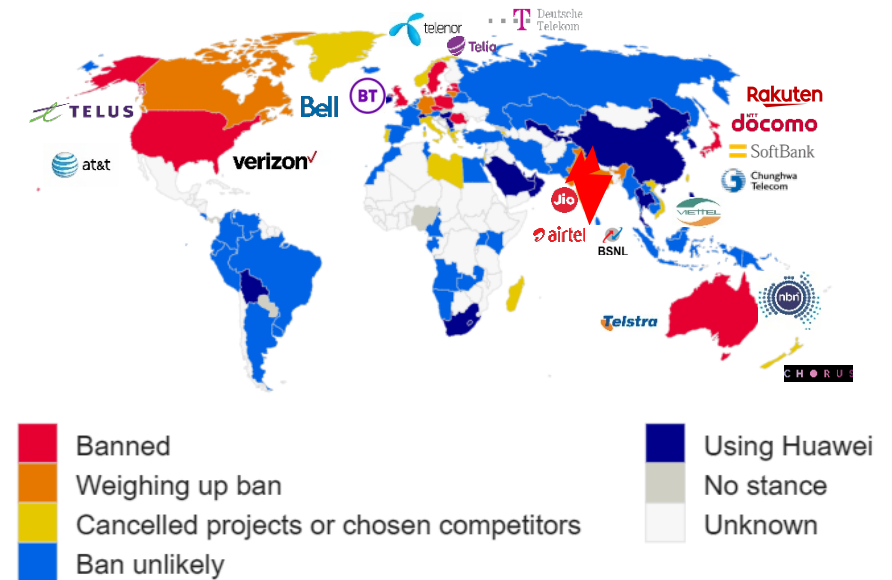— Current forecast (Feb 2021)    — Previous forecast (Jul 2020)

Source: Omdia, Fiber and Copper Access Equipment Forecast, February 2021. Results are not an endorsement of DZS. Any reliance on these results is at the third-party's own risk.

# Security Environment Creating Investment Cycle

- Chinese suppliers represent ~60% of global market, representing a generational opportunity for cap & grow, replacement and future expansion

- Banned countries represent nearly 50% of global communications equipment spend

- U.S, Japan, Australia, UK, and India are among over a dozen countries that have banned China suppliers with many other countries evaluating



**Security Bans**



- **Banned**
- **Weighing up ban**
- **Cancelled projects or chosen competitors**
- **Ban unlikely**
- **Using Huawei**
- **No stance**
- **Unknown**

Source: New Statesman (NS Tech) and DZS Analysis.

# North America & EMEA Take-Share Opportunity

## Business Drivers

- FTTx 10G+ Upgrade Cycle
- Phase I $9.2B RDOF awarded – orders expected during 2H'21
- $100B Biden Broadband Internet Infrastructure Bill
- European countries undergoing cycle from copper to fiber
- 7-10 year 5G Upgrade Cycle, O-RAN creating opportunity

## Market Size

- $12.3B Revenue forecast for Broadband Access Equipment by FY2024 (Omdia):
- NA/EMEA: 43% growth to $5.6B
- $7.1B Revenue forecast for Mobile Backhaul/Fronthaul Equipment (Omdia)
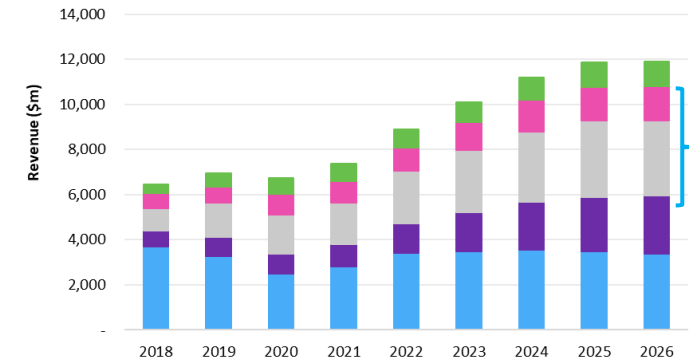- NA/EMEA: 25% growth to $3.2B

## DZS Results

- North America delivered 85% sequential and 138% YoY order growth in Q1'21
- North America delivered 16% sequential and 85% YoY revenue growth in Q1'21
- EMEA delivered 58% YoY order growth in Q1'21

## AEMEA Customers

AT&T  Bell  Consolidated communications  du  etisalat  LUMEN  mobily  STC  Telefónica  TELUS

**PON equipment revenue by region/country**



Source: Omdia

Legend: Latin America & the Caribbean · North America · EMEA · Asia & Oceania (excl. China) · China

Source: Omdia, Fiber and Copper Access Equipment Forecast, February 2021. Results are not an endorsement of DZS. Any reliance on these results is at the third-party's own risk.

North America and EMEA represent 2 of the world's fastest growing PON markets

**North America & EMEA Take-Share**

# Leading with Innovation and Customer First Culture

**DZS**
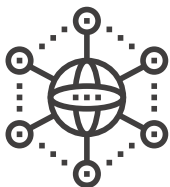
## Orchestration & ANALYTICS

Automation
Service
Orchestration
Life Cycle Mgmt
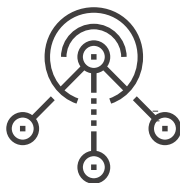
→

5G Slicing
Analytics
AI / ML

DZS Cloud

## MOBILE Transport

5G Mobile
xHaul
100G

→

Enhanced O-RAN
100G/200G/400G

DZS chronos

## Broadband CONNECTIVITY

Access Nodes
Switching/Routing
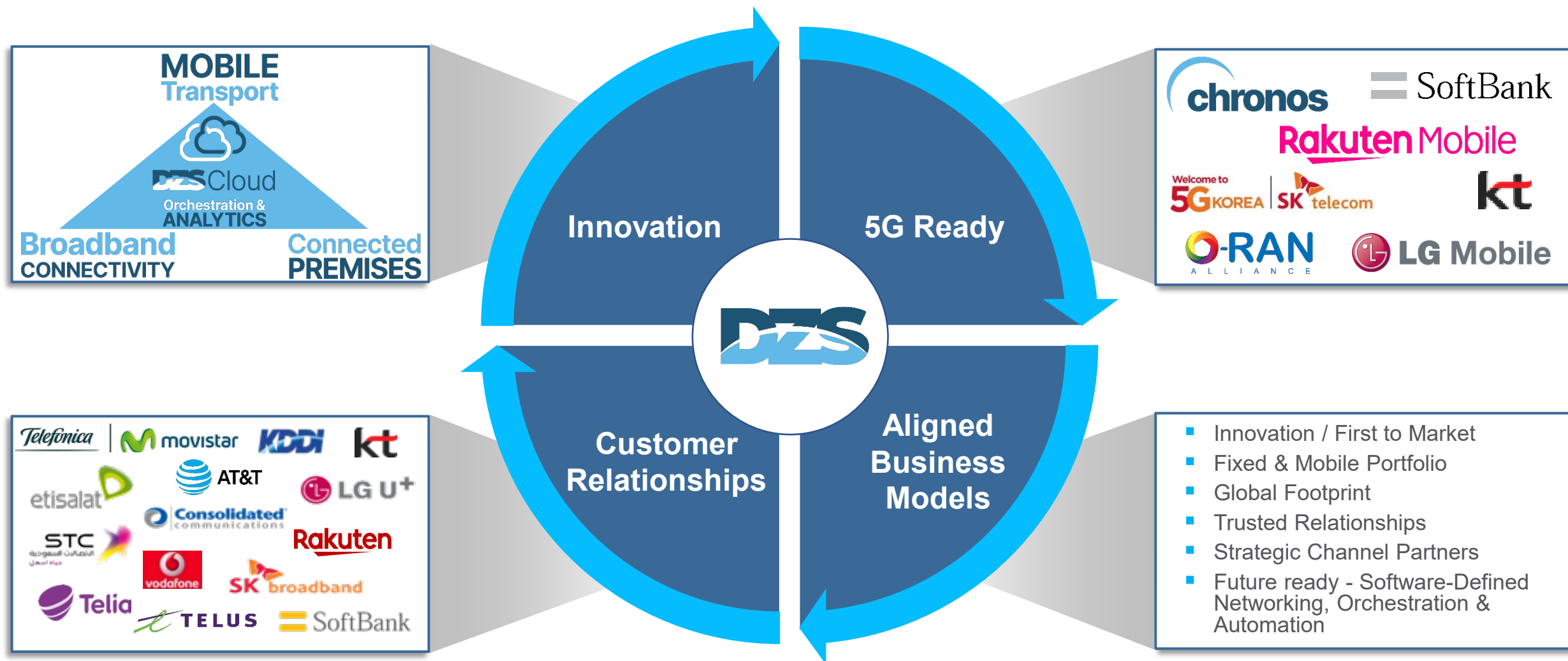
→

Cloud
Disaggregation

DZS velocity

## Connected PREMISES

Wi-Fi 6
ONT/ONU

→

5G mmWave
Fixed Wireless

DZS helix

# Why Customers Partner with DZS



**Innovation**

**5G Ready**

**Customer Relationships**

**Aligned Business Models**

- Innovation / First to Market
- Fixed & Mobile Portfolio
- Global Footprint
- Trusted Relationships
- Strategic Channel Partners
- Future ready - Software-Defined Networking, Orchestration & Automation

# Product Solution Review

# Investment Strategy
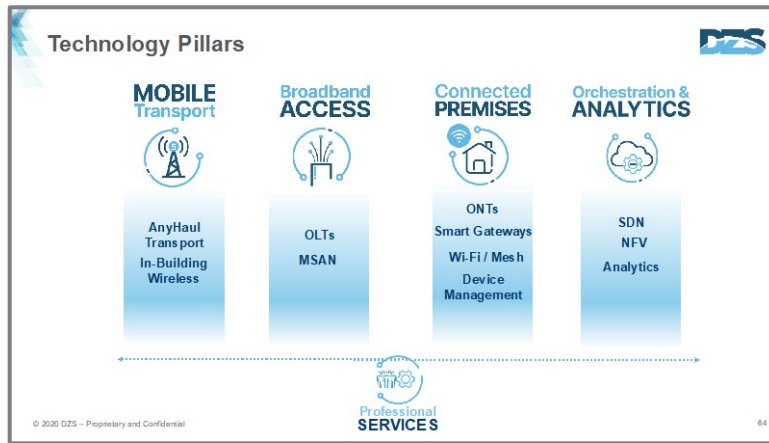
## Technology Pillars

- Mobile Transport
- Broadband Access
- Connected Premises
- Orchestration and Analytics

## Target Markets/Customers

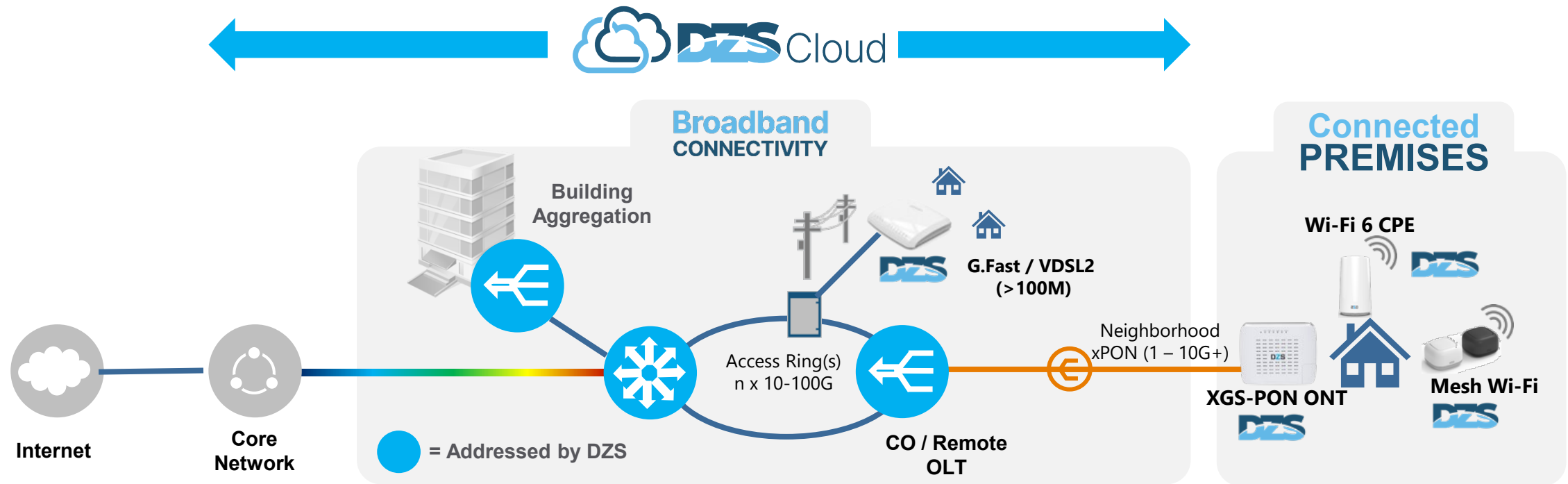- Focus on Service Providers Globally

## Company Status

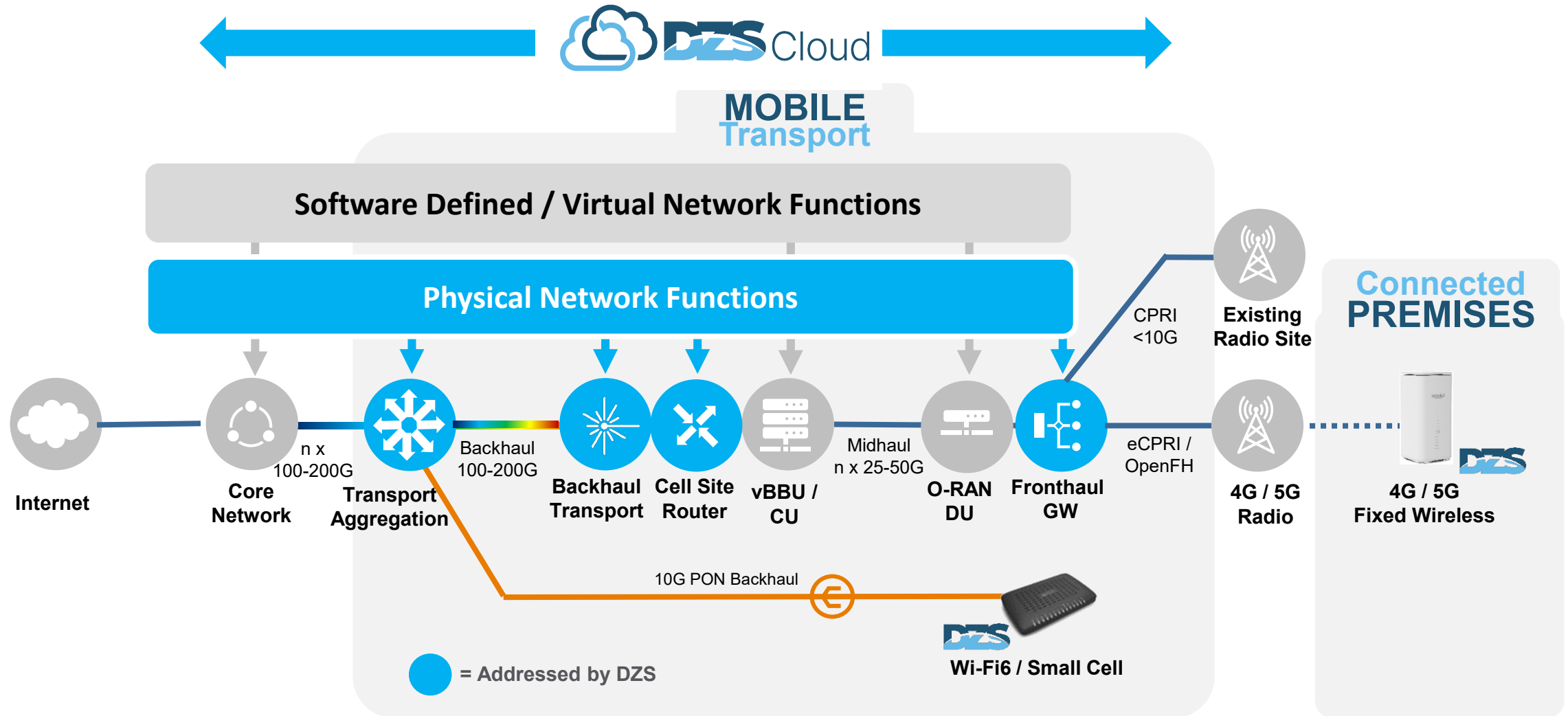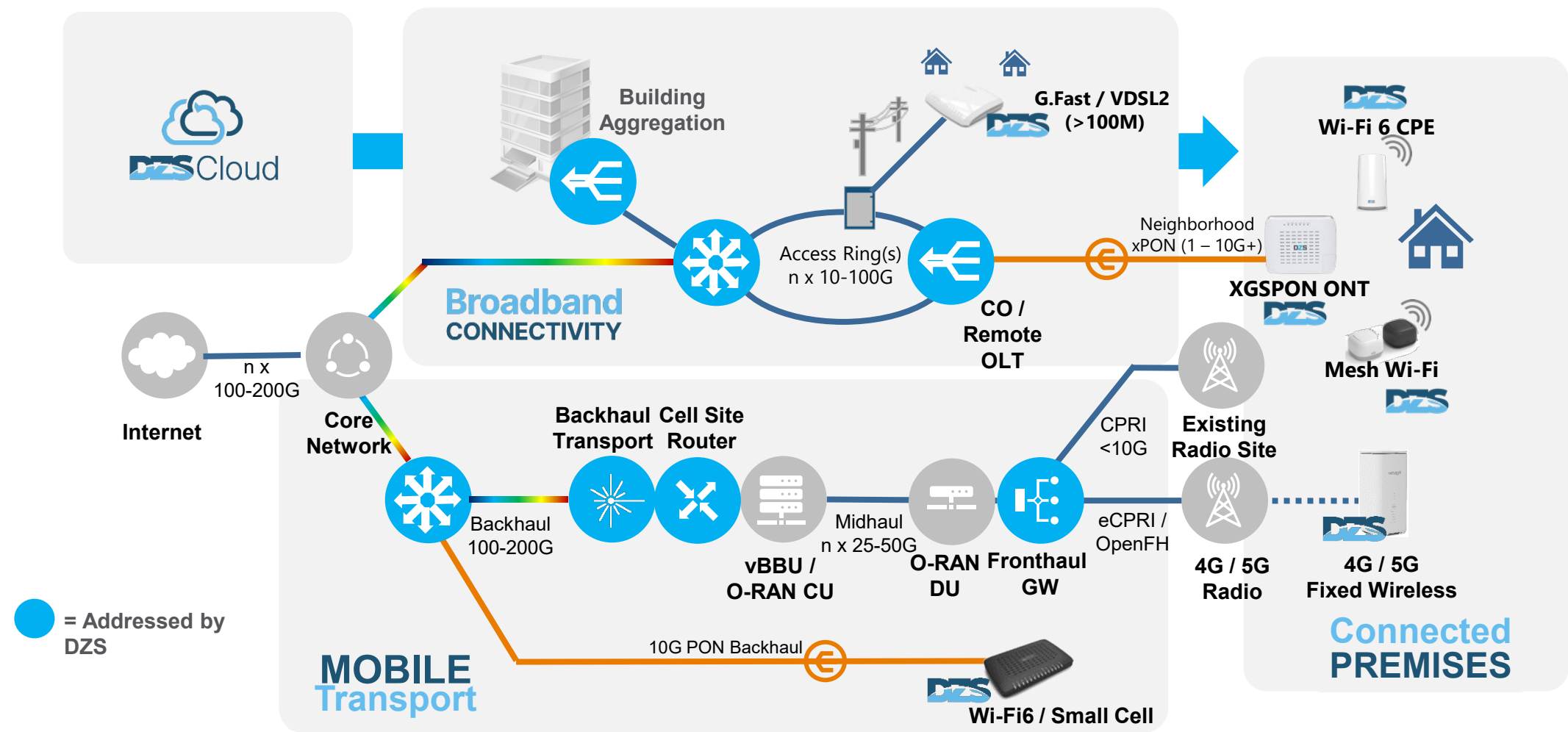- Trusted supplier with a strong financial and business outlook

# Embracing Open

# Broadband Connectivity (FTTx)

# Open and Virtualized Mobile Transport (5G / O-RAN)



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20

# Converged Fixed and Mobile



**Broadband CONNECTIVITY**

- Building Aggregation
- G.Fast / VDSL2 (>100M)
- Access Ring(s) n x 10-100G
- CO / Remote OLT
- Neighborhood xPON (1 – 10G+)
- XGSPON ONT

**MOBILE Transport**

- Internet — n x 100-200G
- Core Network
- Backhaul Transport
- Cell Site Router
- Backhaul 100-200G
- vBBU / O-RAN CU
- Midhaul n x 25-50G
- O-RAN DU
- Fronthaul GW
- CPRI <10G
- eCPRI / OpenFH
- Existing Radio Site
- 4G / 5G Radio
- 10G PON Backhaul
- Wi-Fi6 / Small Cell
- 4G / 5G Fixed Wireless

**Connected PREMISES**

- Wi-Fi 6 CPE
- Mesh Wi-Fi

= Addressed by DZS

# DZS Cloud
# Orchestration, Analytics and Automation

# New Network Orchestration & Software Automation

## Award-winning, Carrier Grade Software Platform

- Award-winning, carrier–grade DZS Cloud End-to-End Orchestration & Automation, based on RIFT.ware, simplifies the deployment of any slide, service or application on any cloud

- Launched: **DZS**Cloud    Selected by: **TELUS**

- Immediately opens new valuable solutions to 20 million mobile and fixed broadband products deployed in 100+ countries

- Adds end-to-end intelligence for software and network orchestration and automation, advanced data analytics and service management
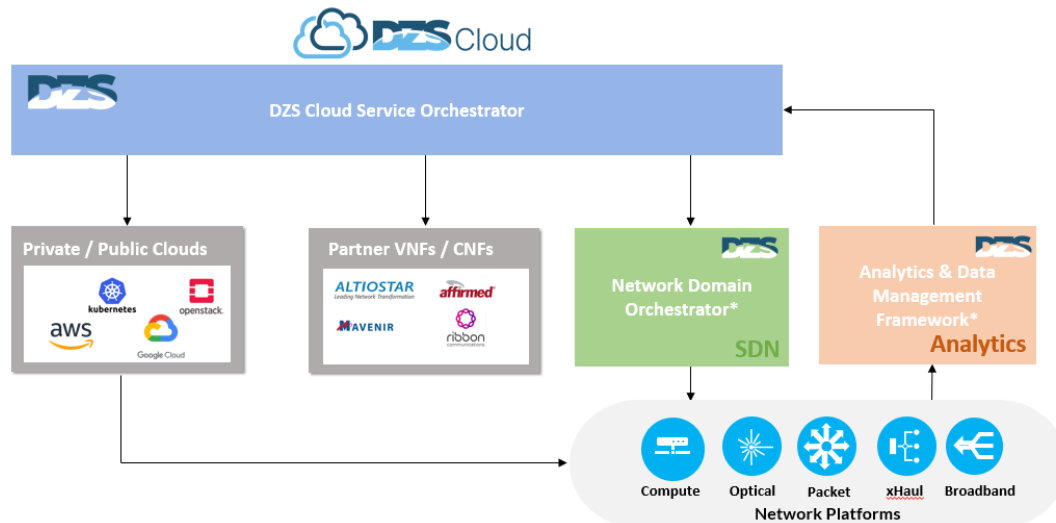
*Planned Product Capability

## Press Release

### DZS Acquires Network Orchestration and Software Automation Innovator RIFT

3/4/2021

Launches DZS Cloud to deliver a best-in-class, open, modularized, cloud-native software platform focused on eliminating network service and vendor siloes

PLANO, Texas, March 04, 2021 (GLOBE NEWSWIRE) -- **DZS** (Nasdaq: DZSI), a global leader of intelligent, packet-based mobile transport and broadband access solutions
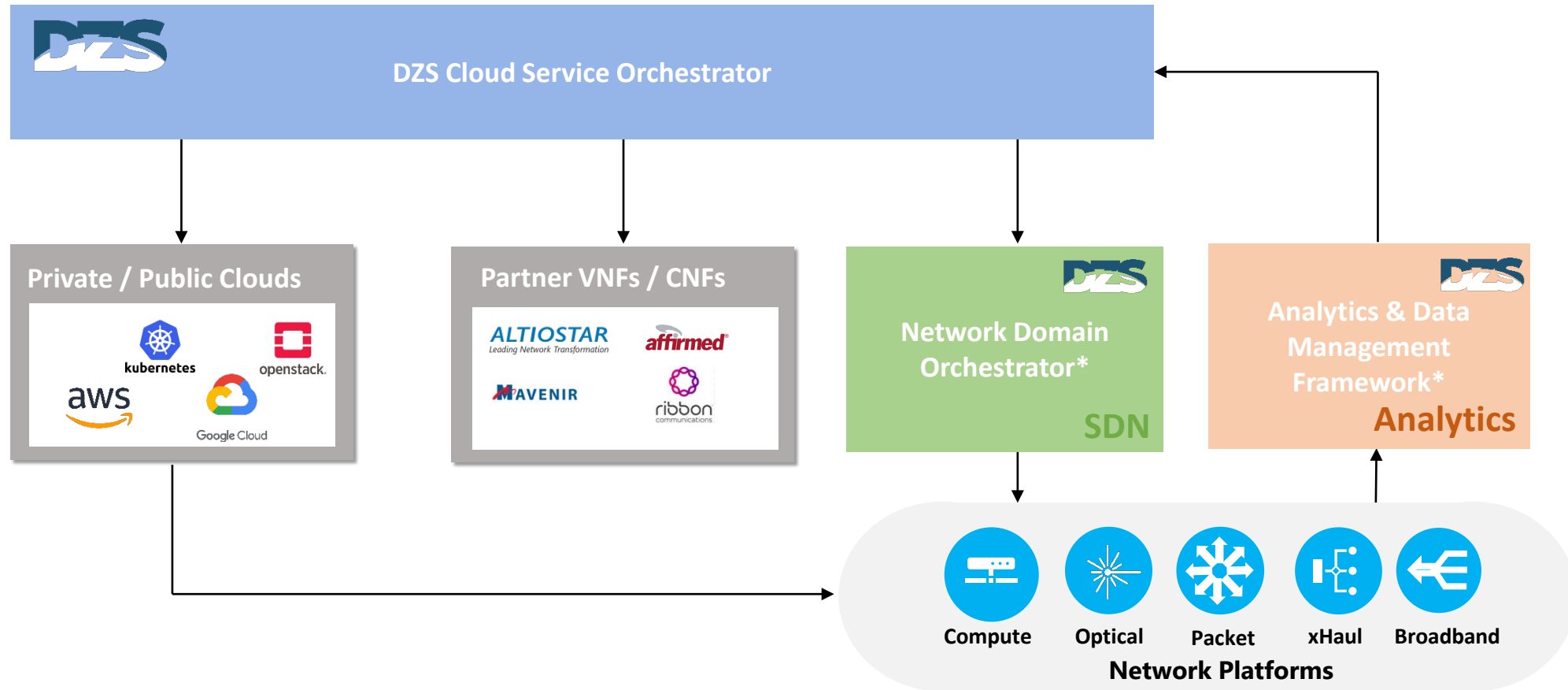
### TELECOM TV

**Telecom TV: DZS Cloud selected by Telus for network service** *orchestration, slice management and software automation*
March 16, 2021
https://www.telecomtv.com/content/nfv/dzs-cloud-selected-by-telus-for-network-service-orchestration-slice-management-and-software-automation-41057/

PLANO, Texas -- DZS (Nasdaq: DZSI), a global leader of packet-based mobile transport, broadband access, network orchestration and cloud-native automation solutions, today announced that it is has been selected by world-leading communications technology company TELUS to provide end-to-end network service orchestration with slice management functions and software automation designed to accelerate and manage digital transformation across 5G and broadband services. DZS Cloud End-to-End Orchestration and Automation (E2EO), based on the award-winning RIFT.ware solution recently

# High Level DZS Cloud Architecture

**DZS Cloud Service Orchestrator**

**Private / Public Clouds**

kubernetes    openstack
aws    Google Cloud

**Partner VNFs / CNFs**

ALTIOSTAR    affirmed
Leading Network Transformation

MAVENIR    ribbon
communications

**Network Domain Orchestrator***

**SDN**

**Analytics & Data Management Framework***

**Analytics**

Compute    Optical    Packet    xHaul    Broadband

**Network Platforms**

**\*Planned Product Capability**

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**Telus buys network service orchestration with slicing from DZS**

News Wire Feed
LIGHT READING
3/16/2021

COMMENT (0)

PLANO, Texas – DZS (Nasdaq: DZSI), a global leader of packet-based mobile transport, broadband access, network orchestration and cloud-native automation solutions, today announced that it is has been selected by world-leading communications technology company TELUS to provide end-to-end network service orchestration with slice management functions and software automation designed to accelerate and manage digital transformation across 5G and broadband services. DZS Cloud End-to-End Orchestration and Automation (E2EO), based on the award-winning RIFT.ware solution recently acquired by DZS, is a carrier-grade, cloud native platform that will simplify and automate the deployment of any slice and any service on any cloud, including brownfield discovery of existing virtual applications. The powerful DZS Cloud platform will enable the marquee Canadian communications provider to deliver agile and automated life cycle management of virtual applications and services, unlock operational cost savings, and decrease churn and time to market by reducing manual application management across TELUS data clouds.
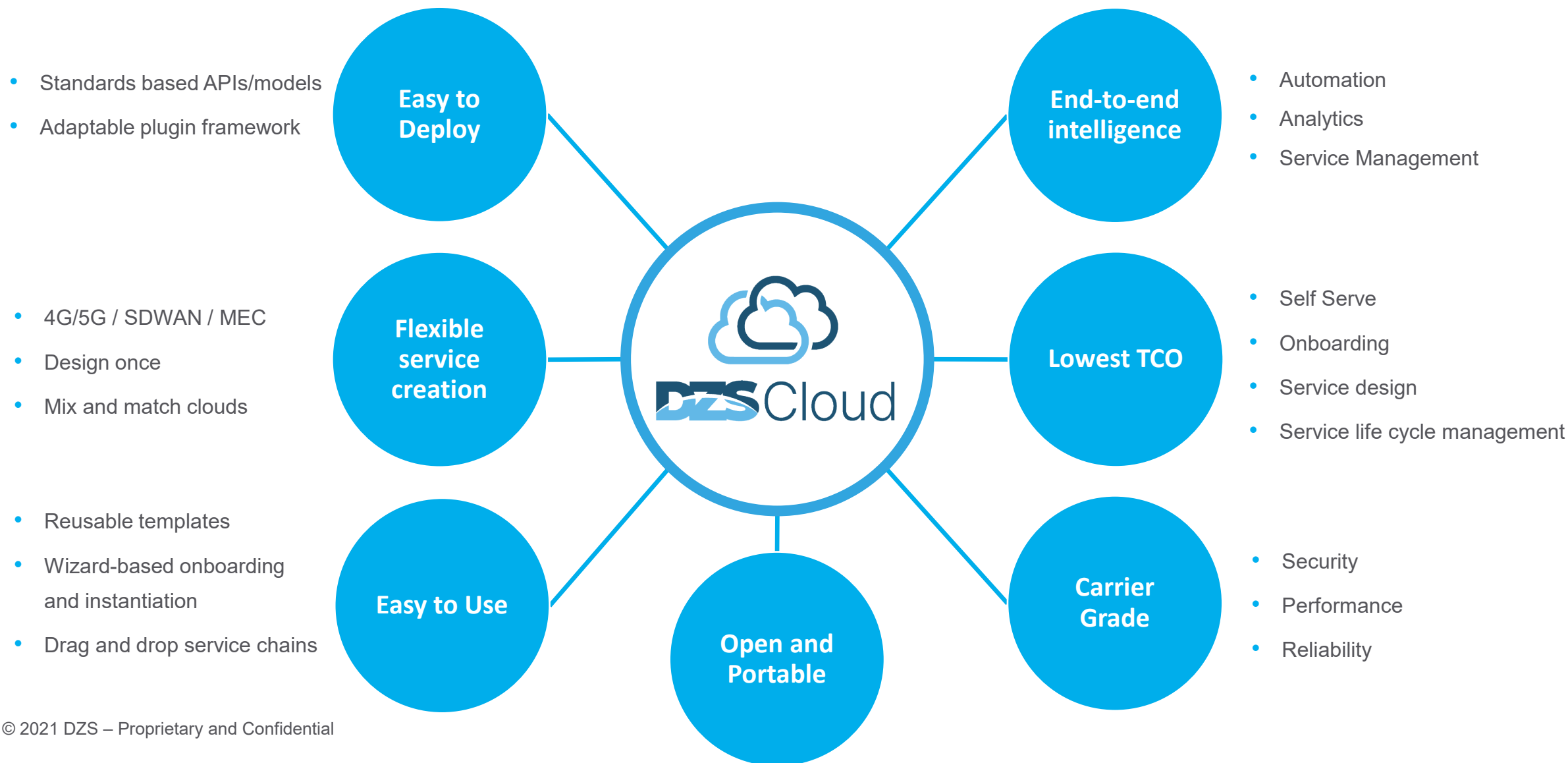
"To effectively compete and fulfill the promise of 5G and next generation 10gig and connected premises solutions, service providers need to rapidly design and instantly deliver and manage new services for customers," said Charlie Vogt, President and CEO of DZS. "TELUS is one of the most advanced, forward-thinking and innovative communications companies. Ibrahim and his team are visionary, rigorous in their technical evaluation and embody an unwavering commitment to accelerating digital transformation. We are thrilled to have been

## DZS Cloud Selected by TELUS for Network Service Orchestration, Slice Management and Software Automation

- Service orchestration, Slice Management, and digital transformation across 5G and broadband services

- "TELUS remains laser-focused on redefining how services are delivered for our customers and driving greater operational efficiencies in our network," -- Ibrahim Gedeon, CTO TELUS

# State-of-the-Art Orchestration and Automation



- Standards based APIs/models
- Adaptable plugin framework

**Easy to Deploy**

**End-to-end intelligence**
- Automation
- Analytics
- Service Management

- 4G/5G / SDWAN / MEC
- Design once
- Mix and match clouds

**Flexible service creation**

**Lowest TCO**
- Self Serve
- Onboarding
- Service design
- Service life cycle management

- Reusable templates
- Wizard-based onboarding and instantiation
- Drag and drop service chains

**Easy to Use**

**Open and Portable**

**Carrier Grade**
- Security
- Performance
- Reliability

DZS Cloud

# Simple

**DZS**Cloud

| Application Catalog | | |
|---|---|---|
| UDSF | UDM | UDR |
| AMF | SD-WAN | NSSF |
| AUSF | UPF | SMF |

| Service Catalog |
|---|
| 5G Shared Slice |
| 5G Dedicated Slice |

- Simplify construction of complex services, across hybrid clouds, over container- and VM-based NFVI, using any network

**Edge NFVI**

**Regional NFVI**

# Drag and Drop Service Design
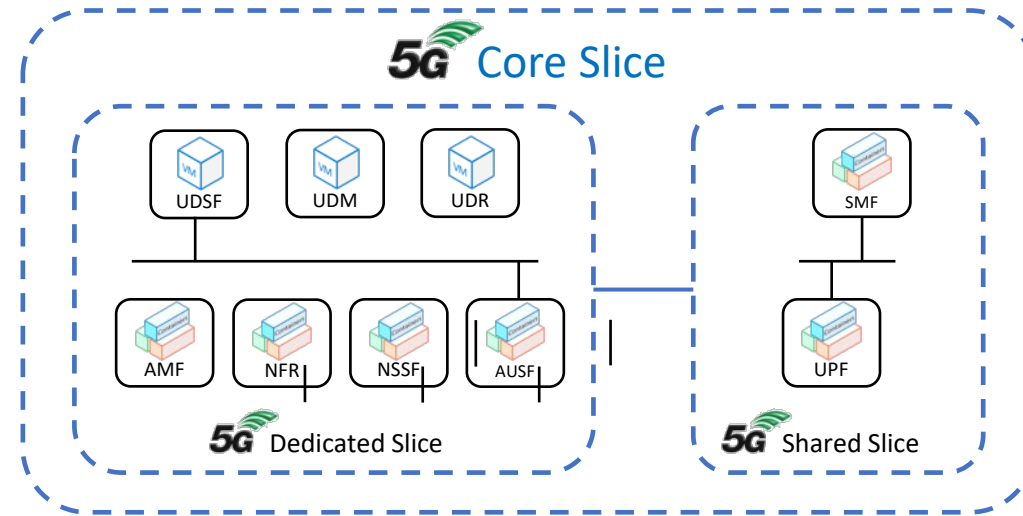
# Automation of E2E Service



**DZS**Cloud

| Application Catalog | | |
|---|---|---|
| UDSF | UDM | UDR |
| AMF | SD-WAN | NSSF |
| AUSF | UPF | SMF |

| Service Catalog |
|---|
| 5G Shared Slice |
| 5G Dedicated Slice |

**5G** Core Slice

UDSF UDM UDR

SMF

AMF NFR NSSF AUSF

UPF

**5G** Dedicated Slice

**5G** Shared Slice
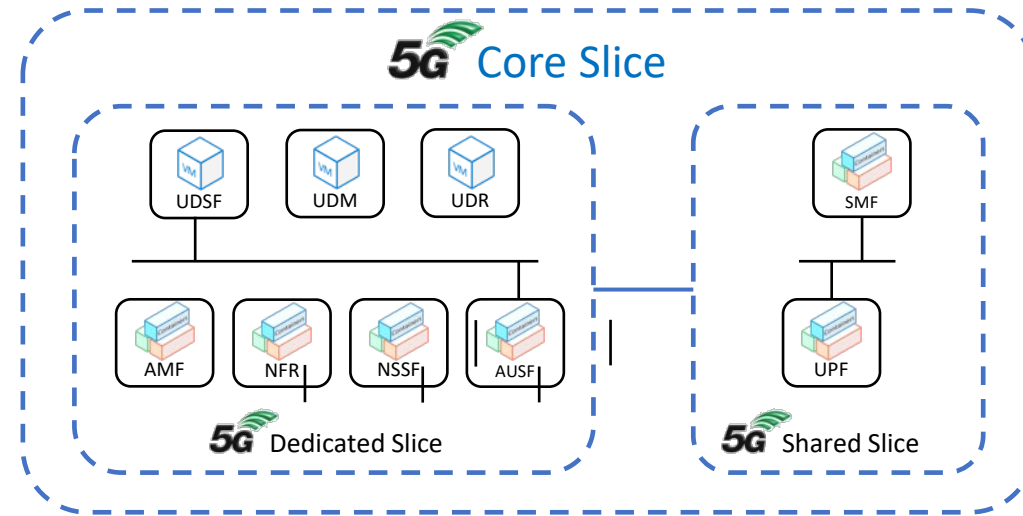
## Automated Life Cycle Management of any application over any VIM

**Kubernetes**
**OpenStack**
**uCPE / MEC**

**5G** Dedicated Slice

**5G** Shared Slice

**Edge NFVI**

**Regional NFVI**
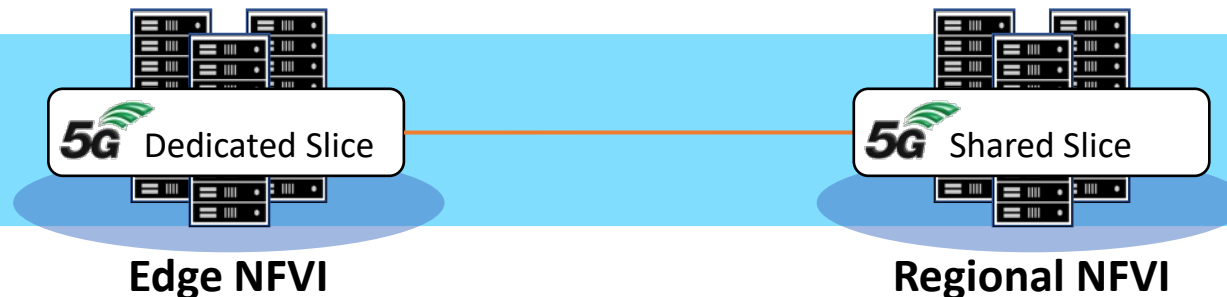
# sdNOS Platform

# State of the art Linux based OS

- Supports a range of 64-bit hardware targets
- Open hardware platform architecture support
- Development agility (access to modern development tools/environments)

# Flexible Architecture

- Choose Centralized or Distributed state management options
- Fully SDN enabled

# Extensive L2 and L3 capabilities

- OSPF, BGP, ISIS, VRRP, BFD
- PIM-SM, PIM-DM, PIM-SSM, BIDIR-PM
- IGMP (IPv4), MLD (IPv6)
- MPLS, SR, SRv6

# Portable

- NOS runs on x.86, Motorola PowerPC and ARM targets
- Sandbox simulation for accelerated OSS integration

# Carrier Grade

- In service patching / process replacement / upgrade framework
- High Reliability - Non-disruptive Start / Restart / Return to service for individual subsystems

# Field proven

- 10 Years of field deployment with Tier 1 SPs worldwide

# Intrinsic support for virtualization and NFV

- Coexistence of VNOS with higher level network functions, services, and applications on the DZS host platform
- Built in support for virtualization and container runtimes that provide security isolation and resource separation

# Unified NOS Platform for DZS Portfolio Products

# Mobile Transport Solutions

## Complete Portfolio

- Time-sensitive networking
  - Time synchronization
  - Low latency switching with frame-preemption and time aware scheduling
  - Seamless fault tolerance with FRER(zero switchover times)

- Switching capacity
  - Multiple options

- Flexible topologies
  - Point to Point, Tree , Ring, PON

- Carrier class redundant power and fans

- Enterprise PON extensibility

## Mobile Backhaul & Midhaul

- Flexible networking protocol support
  - Layer 2 ethernet bridging with advanced features
    - Large Forwarding tables (+100K entries), QoS support, 802.3ad LAG/LACP, VLANs, QinQ, PV RSTP, MSTP, LLDP, G.8032 ethernet ring protection
  - Layer 3 static and dynamic routing
    - IPv4 and IPv6; IS-IS, OSPFv2/3, BGP
    - VRRP and ECMP
    - VRF, BFD, TWAMP reflector
  - IP-MPLS, SR-MPLS, SRv6
  - OAM & Service assurance
    - Y.1731, IEEE 802.1ag Ether OAM, Y.1564 service activation test

## Mobile Fronthaul

- Flexible radio interface support
  - CPRI | eCPRI | RoE | Ethernet

- Concurrent 4G/5G RAN transport
  - 5G sub6 / 5G mmW / 4G / LTE / WiFi

- Integrated GPS timing source

- High precision class C synchronization capability
  - Sub-nano timestamping precision

- Standards-based vendor independence – Rakuten, Altiostar, Mavenir
  - DU integration option with computing module

# Lowest Total Cost of Ownership

# **Mobile Transport Solutions**

**mseries**

**cseries**

**oseries**

**vseries**

**xseries** **rseries** **eseries**

## **Mobile Transport**

- Comprehensive networking protocol support

- Small form factor Optical Transport

- Time Sensitive Networking

- Flexible Topologies

- Environmentally Hardened

## **Fronthaul Gateways**

- Flexible radio interface support and interworking

- Concurrent 4G/5G RAN Transport

- Integrated GPS timing source

- High precision Class C synchronization capabilities

- Standards-based, vendor independent

- Environmentally Hardened

- Integrated Edge Compute
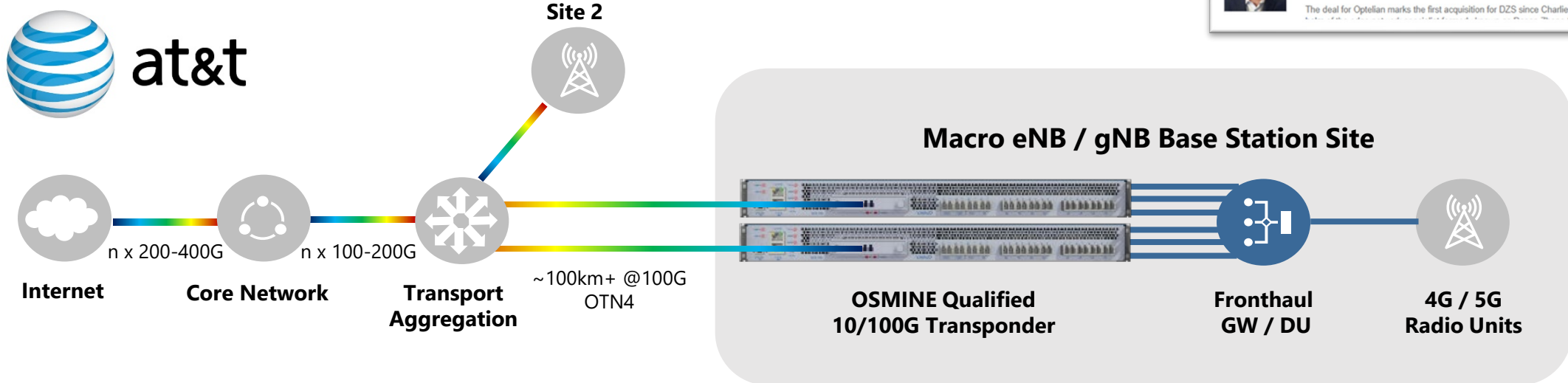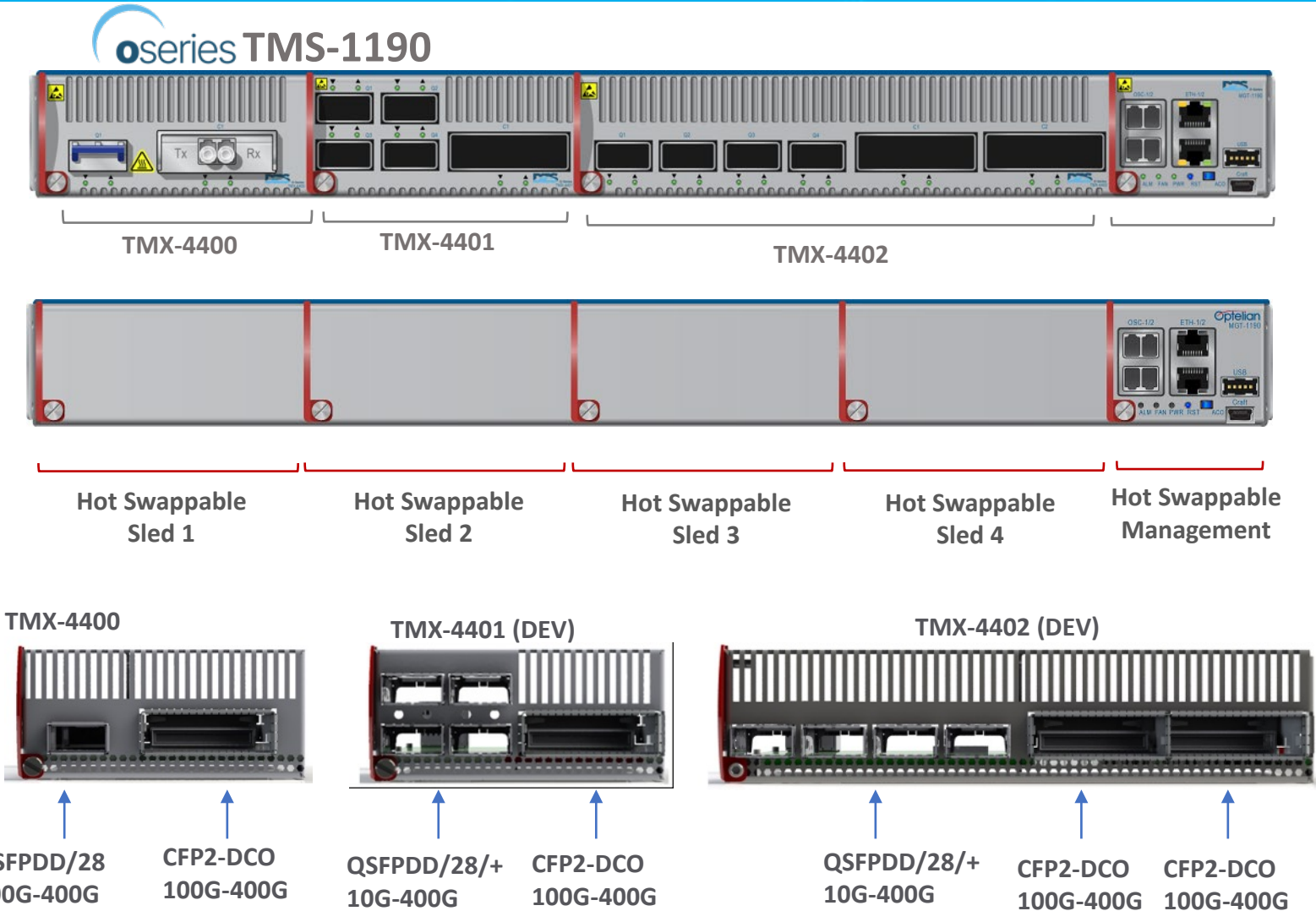
# New Coherent Optical Transport for Mobile xHaul

- **oseries MPX-9103**
  - 1RU 100G-class OTU4 DWDM transponder / multiplexer "muxponder" for metro/regional xHaul
  - Wave 2 modular product extends capability to 200G and 400G optics
  - Environmentally hardened design

**LightReading**

ANY HAUL/X-HAUL

DZS beefs up mobile transport play with Optelian deal

DZS aims to complement and broaden its mobile transport portfolio by acquiring Optelian, an Ottawa, Canada-based optics company that will tack on coherent technologies and provide DZS with a path toward 200-Gig and 400-Gig transport capabilities.

The deal for Optelian marks the first acquisition for DZS since Charlie Vogt took the



**Site 2**

**Macro eNB / gNB Base Station Site**

n x 200-400G    n x 100-200G

**Internet**    **Core Network**    **Transport Aggregation**

~100km+ @100G OTN4

**OSMINE Qualified 10/100G Transponder**    **Fronthaul GW / DU**    **4G / 5G Radio Units**

# Next Generation Optical Transport for Mobile anyHaul



oseries **TMS-1190**

TMX-4400

TMX-4401

TMX-4402

Hot Swappable Sled 1

Hot Swappable Sled 2

Hot Swappable Sled 3

Hot Swappable Sled 4

Hot Swappable Management

**TMX-4400**

QSFPDD/28 100G-400G

CFP2-DCO 100G-400G

**TMX-4401 (DEV)**

QSFPDD/28/+ 10G-400G

CFP2-DCO 100G-400G

**TMX-4402 (DEV)**

QSFPDD/28/+ 10G-400G

CFP2-DCO 100G-400G

CFP2-DCO 100G-400G

- Hot Swappable Sleds in Flexible Compact TMX-1190 1RU Platform

- Hardened : -40 to +65C

- Up to 1.6 Tb/s capacity in Single Shelf

- Programmable Line : Rate, Modulations and FEC

- Line Interface CFP2-DCO 1/2/3/400G DWDM

- Line / Client Encryption (MACSec, AES-256)

- Up to 4 Multirate Clients QSFP28/DD/+ : 10G-400G

- Line and Client Protection Switching

- PTP Assist, Crosspoint, FLEX-E, LLDP Snoop/Drop

CFP2

QSFP-DD

QSFP-28/QSFP+
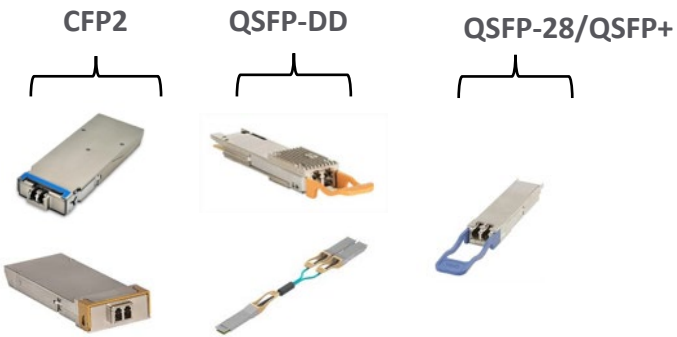
**\*Pluggable Support Snapshot**

## Customer Situation

- Requirement for aggregation of 4G, 5G and Wi-Fi

  - Outdoor solution to save infrastructure cost

  - GPS as primary time reference

  - Interop with Altiostar vDU provider

- **Goal: build the first Open, Disaggregated 5G ORAN**

**C1216RO**

- IP65 outdoor enclosure
- 2 x 50/100GE uplink(QSFP28)
- 2 x 25/50GE(SFP28 or DSFP28)
- 9 x 25GE(SFP28)
- 3 x 10GE / CPRI
- GPS Clock
- NETCONF/YANG
- Operating temperature: -20ºC to 60ºC

## C1216RO Key Attributes

- Outdoor solution requirement

  - Hardened, passively cooled, IP65 outdoor deployable platform

- Aggregation of 4G and 5G

  - 4G RRH require CPRI support while 5G use eCPRI

- Synchronization for the RU and vDU

  - Both RU in the antenna sites, ToR switches (Cisco) and x86 servers hosting Altiostar vDU synchronize to the C1216RO GPS clock

  - High precision Class C synchronization capability

- Evolution

  - Indoor version

  - Integrated DU capability

## Support O-RAN Architectures with 4G + 5G services in outdoor environments

# Broadband Access Solutions

## Flexible: Freedom of Choice

- Any Form Factor
  - 2 Slot Stackable Chassis or Fixed
- Any Aggregation
  - Non-Blocking or concentrated
- Any Use Case
  - Resi. | Business | Mobile
- Any Service
  - AE, 2.5G, 10G,,25G, 50G…
- Any Management
  - EMS or SDN
- Any Service Model
  - L2 and L3

## Evolutionary: Peace of Mind

- Backwards Compatibility
  - sdNOS line cards in current installed base
- Field Upgradeability
  - Field systems with sdNOS linecards

POWERED BY
sdNOS

## Next Gen: Disaggregated

- Leaf and Spine Switches
- Mini-Chassis options
- Common software platform
- Comprehensive and extensible L2 and L3 feature set
- SDN Managed
- "Telco rack" enabled form factor

# Broadband Access Portfolio

**mseries**

**vseries**
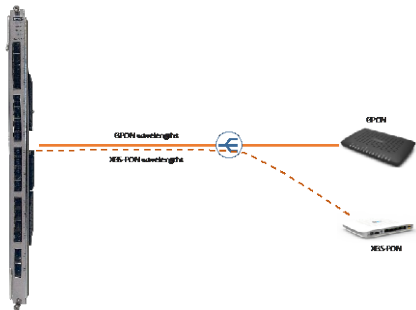
## Peace of Mind

- Backwards Compatibility
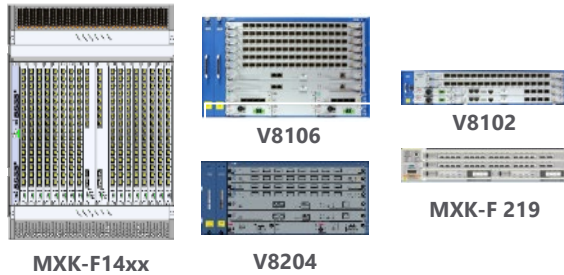- Field Upgradeability
- Future Proof

## Freedom of Choice

- Any Form Factor
- Any Aggregation
- Any Use Case
- Any Service
- Any Management
- Any Service Model

POWERED BY

sdNOS

# The velocity Broadband Access rEvolution
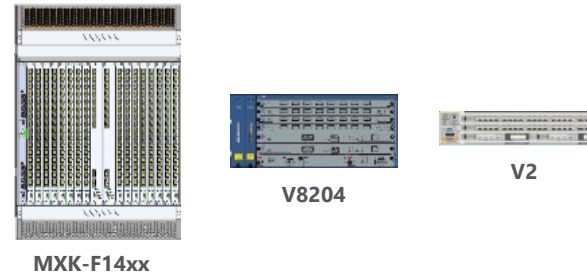
**DZS**

## Traditional Deployment



MXK-F14xx — V8106 — V8102 — V8204 — MXK-F 219

- **Any Service Interface:**
    - 1GE, 10GE, GPON, XGS-PON, Combo
- **Traditional EMS Management**
- **SDN Management with EMS Netconf NBI Module**

## Native SDN – Chassis Evolution



MXK-F14xx — V8204 — V2

- **Any Service Interface:**
- **Flexible "system on a card" architecture**
- **SDN Management and Orchestration**

## Native SDN - Disaggregated



M4500
M4000
1RU GPON
1RU XGSPON
1RU COMBO
V2 Chassis
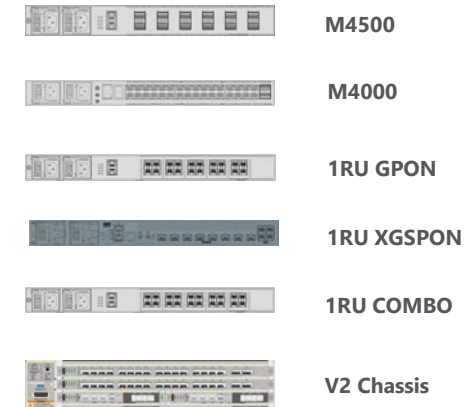
- **Data Plane Leaf Switches and small chassis:**
    - 1GE, 10GE, GPON, XGS-PON, Combo
- **Top of Rack Data Plane Spine Switches (nx10GE, nx100GE)**
- **Telco rack enabled**
- **Native Netconf/Yang**
- **SDN Management and Orchestration**

# Software Defined Networking + Disaggregation + Cloudification
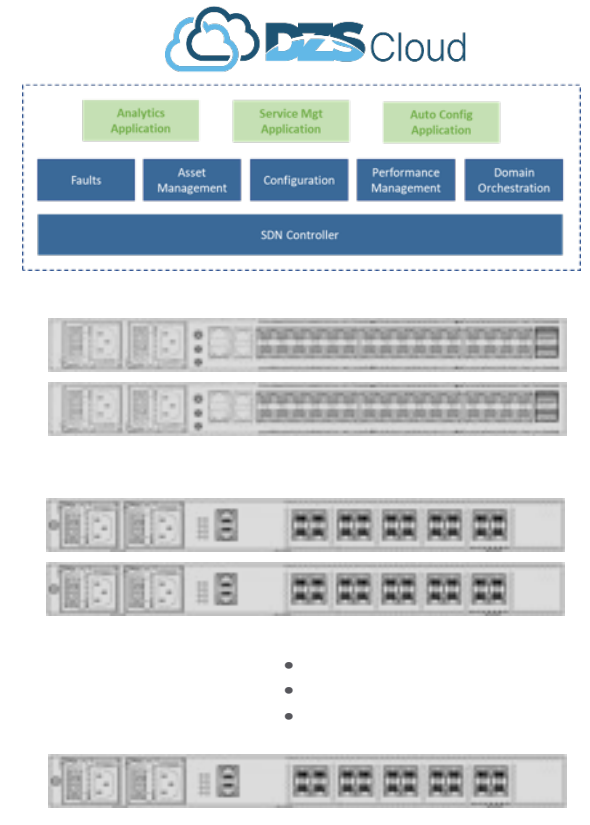
**DZS Cloud** Software Portfolio

- SDN Control and Domain Orchestration functions
- NE Management Plane functions
- In-portfolio and partner companion applications

**sdNOS** Platform Software

- State of the art Portable Linux based OS
- Modular, extensible software
- Containerized future-ready ready architecture

**DZS velocity** Disaggregated / Distributed Networking

- sdNOS-based Data Plane Functions
- Includes V-series Spine and Leaf switches
- Comprehensive and extensible L2 and L3 feature set
- "Telco rack" enabled form factor

## DZS Cloud

| Analytics Application | Service Mgt Application | Auto Config Application |
|---|---|---|
| Faults | Asset Management | Configuration | Performance Management | Domain Orchestration |

SDN Controller

**DZS Cloud**
**SDN, Control & Management Plane**

**mseries**
**Data Plane Spine Switches**

**vseries**
**Data Plane Leaf Switches**

**F1419/1421**

CO (or large RT)

**F219**

RT and Mini-OLT

- Environmentally hardened OLT portfolio

- Flexible and scalable solutions 10G services, mobile backhaul and beyond.
  - F219 (2RU) 2 Line Card- 32 OLT Port Max
  - F1419/1421 (14RU) 14/16 LC- 256 OLT Port Max
  - AE, 10G AE, GPON, XGS-PON, 25GPON (future)
  - Line card compatibility
  - Network timing distribution, 1588v2, BITS
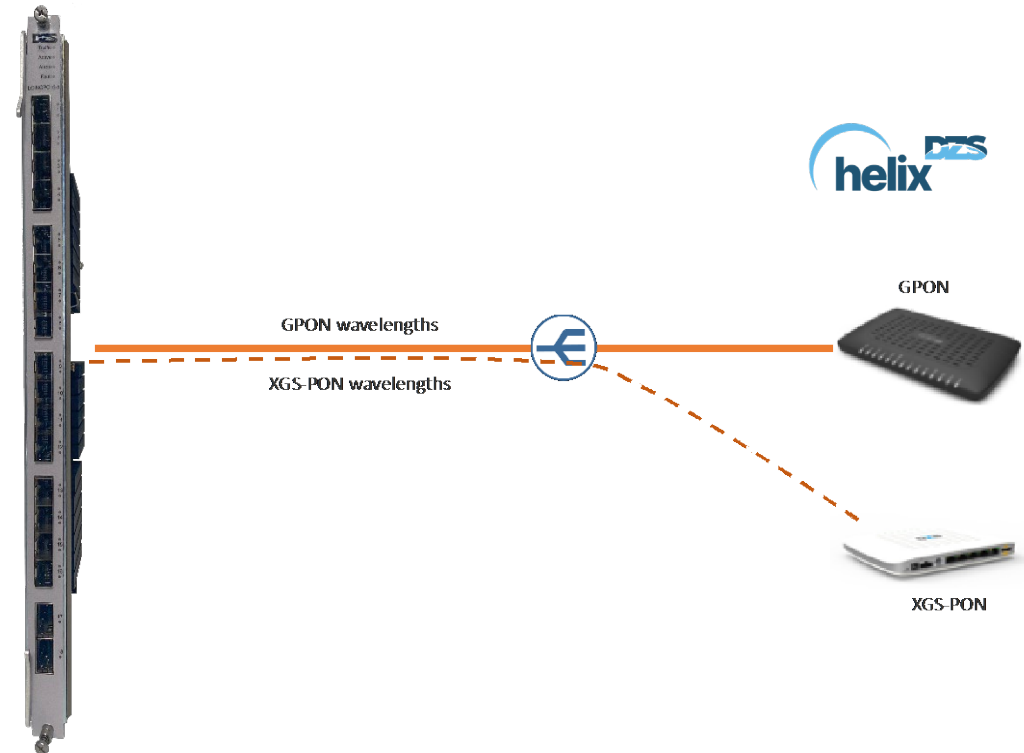  - Redundant DC power
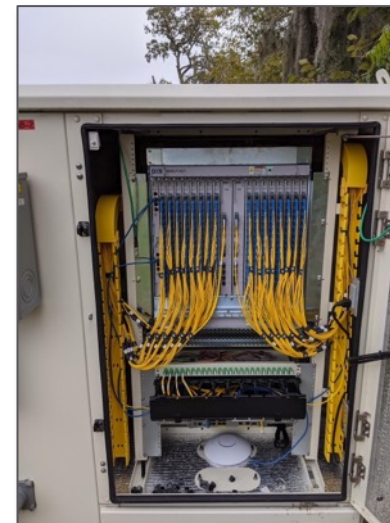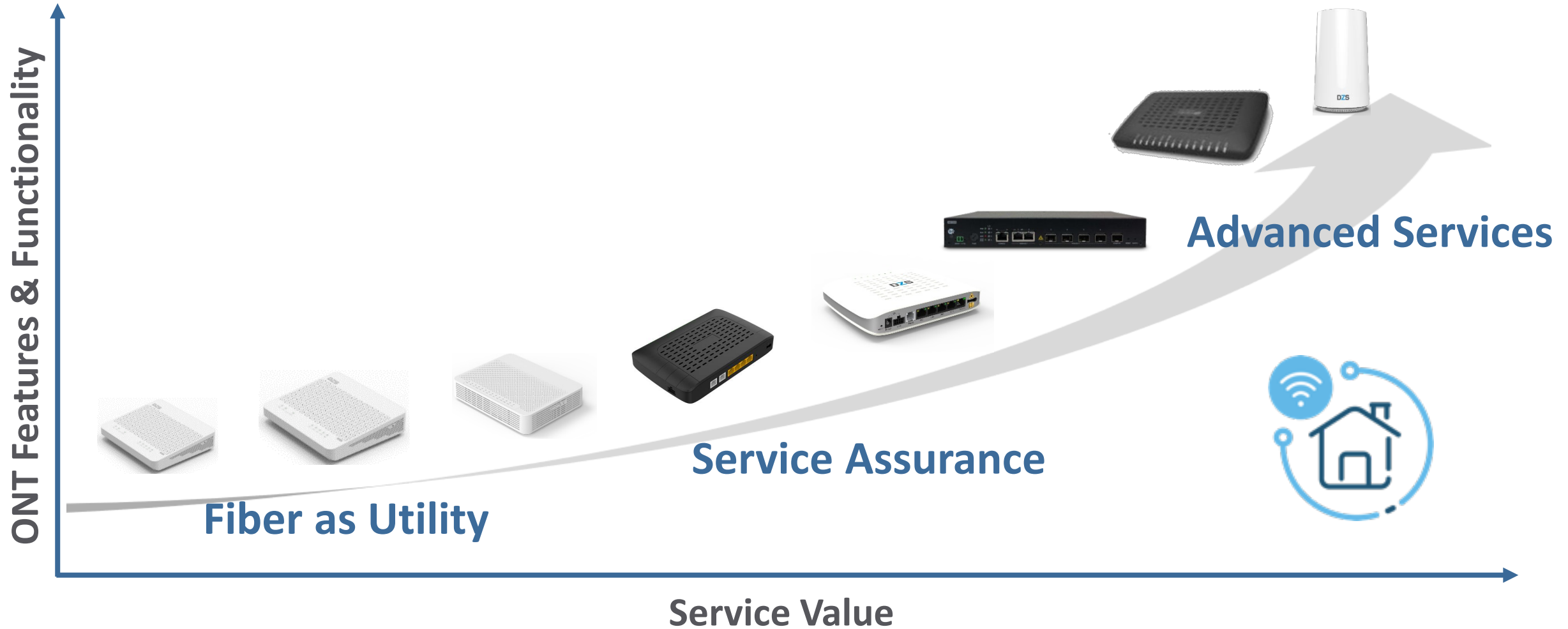
# AnyPort AnyPON Line Cards

## Next Gen Combo Fiber Service Cards

- Single-slot | 8 and 16 ports | SFP+ Optics
- **GPON and XGS-PON ONTs on same PON**
  - No external combiner
- Any port can be:
  - GPON
  - XGS-PON
  - Combo (GPON+XGS-PON)
  - 10G AE
- 2 x 100Gbps uplinks on faceplate (QSFP28 Optics)

GPON wavelengths

XGS-PON wavelengths

GPON

XGS-PON

![helix DZS logo]

# Connected Premises Solutions

Feature rich ONT portfolio to grow service value

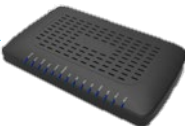# Connected Premises – Investment Focus

**GPON**

24xx

**XGS-PON**

H842    5222XG

**25GS-PON**

helix DZS

**Easy Mesh**

H660GX    W550CA

**Wi-Fi6**

2428GN    5228XG    1664DC

**Fixed Wireless Access**

DZS Cloud

**SERVICE MANAGEMENT INTELLIGENCE**

| Network Operations Intelligence | Connected Premises Intelligence |
|---|---|

**ANALYTICS AND DATA MANAGEMENT**

Visualization

Analytics

Data Repository

Data Collection

## DZS "Brilliant Buildings"

- **Thought Leadership**
  - Industry leader in fiber-access networks globally with "carrier-grade" PON and AE equipment

- **Experience**
  - Brand Recognized on the Market and Part of Some Reference Architectures
  - References in multiple enterprise verticals: hospitality, education, healthcare, …
  - Dedicated enterprise feature set
    - Specialized ONTs, System Management and SW functions to meet FiberLAN enterprise customer needs

**6024T**

**2804P2**

**2804D**

**GPON, 24xGE + PoE**

**GPON, 4xGE + PoE++**

**GPON, 4xGE + PoE, Plenum**

## fiberLAN Products

- **Scalability and Density**
  - Extensive Optical LAN product portfolio for Large, Medium & Small Locations
  - Up to 2x density of competing GPON solutions

- **Reliability**
  - Carrier-Class Equipment with 99.999% Reliability
  - Most complete set of Type-B GPON redundancy levels on the market: on port, line card, chassis level, uplinks, power, and management
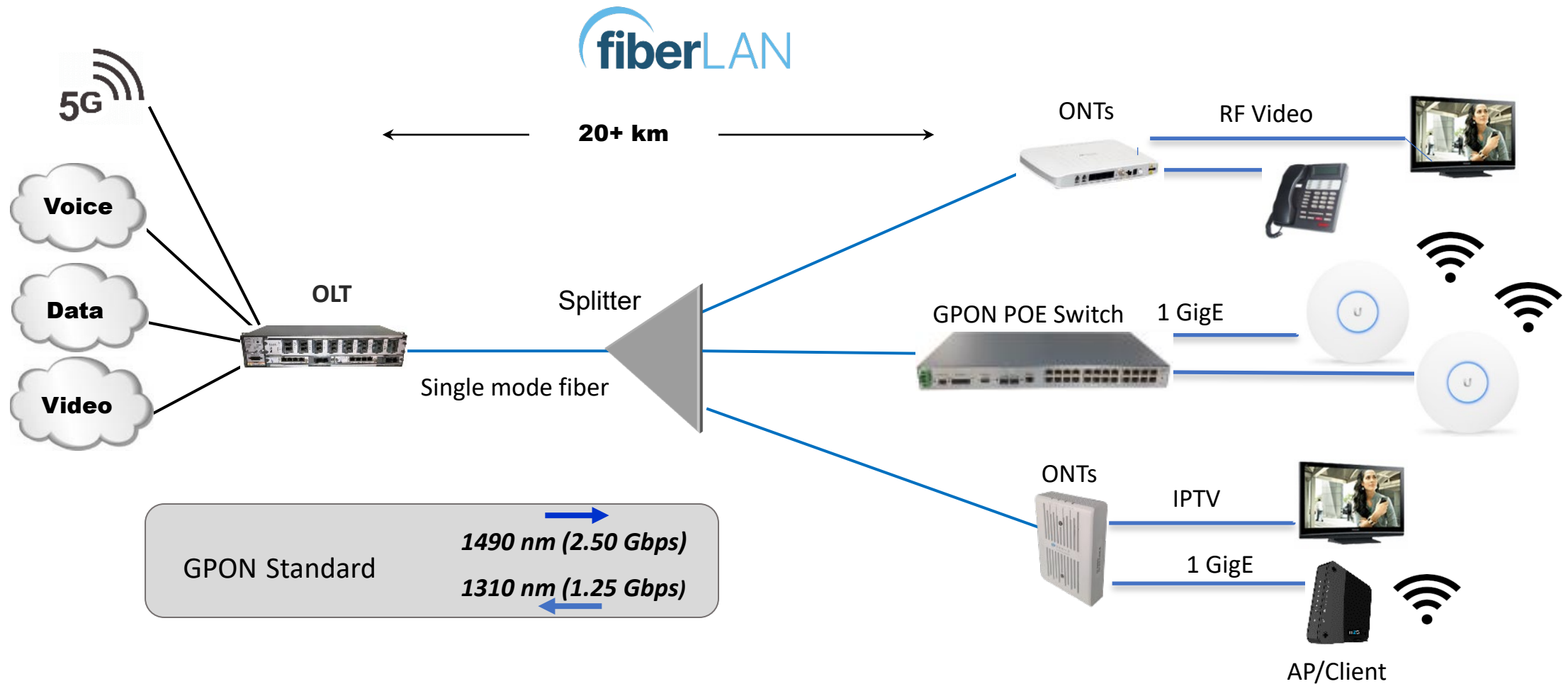
- **Optionality**
  - Variety of Ethernet Termination Device choices
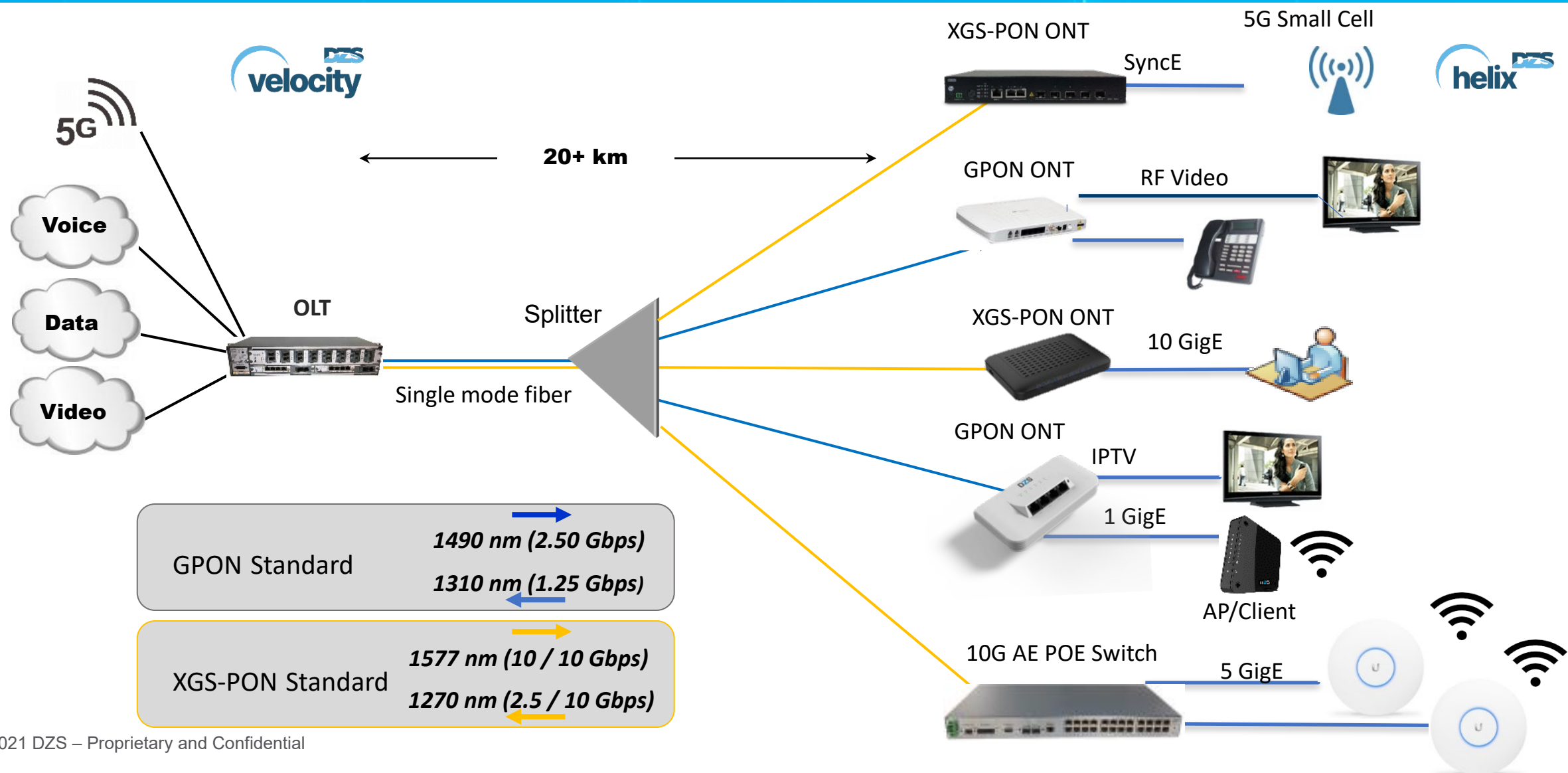    - Interfaces, port counts, WiFi, Mounting, Power, battery, indoor and outdoor

- **Cost Competitive**
  - Competitive solutions for high, medium, and low-end enterprise LANs

# GPON Residential and FiberLAN Solutions

# XGS-PON, 10GigE Migration



Voice
Data
Video

OLT

Splitter

Single mode fiber

20+ km

XGS-PON ONT
SyncE
5G Small Cell

GPON ONT
RF Video

XGS-PON ONT
10 GigE

GPON ONT
IPTV
1 GigE
AP/Client

10G AE POE Switch
5 GigE

**GPON Standard**
*1490 nm (2.50 Gbps)*
*1310 nm (1.25 Gbps)*

**XGS-PON Standard**
*1577 nm (10 / 10 Gbps)*
*1270 nm (2.5 / 10 Gbps)*

# GPON ONT Portfolio

## Residential and MDU

**2301**

GPON, 1xGE LAN

**2311**

GPON SFP ONT

**H665**

GPON SFU: 1x GE

**H660**

GPON SFU: 4x GE

**24xxA**

**24xxB**

**27xx**

## fiberLAN and MTU

**2101HP**

**204P**

**2804P2**

GPON, 1xGE + PoE++  GPON, 4xGE + PoE
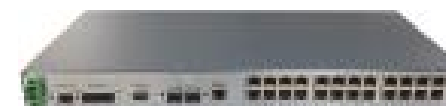
GPON, 4xGE + PoE++

**26xx**

GPON, 4x or 8xGE, POTS, PoE+, RF

**2804D**

GPON, 4xGE + PoE, Plenum

**6024T**

GPON, 24xGE + PoE

# DZS Professional Services Overview

# Available Professional Services from DZS

- **Education & Training**

- **Service Level Agreement (SLA)**
  - Unlimited Access to DZS Technical Support, Software Fixes, Online resources, and extended Warranty.

- **Remote Professional Services**
  - Configuration changes
  - Network Audits
  - Subscriber Moves / Adds / Changes
  - SW Upgrades
  - 24x7 Help Desk

- **On-Site Professional Services**
  - Dedicated Support Engineer / Resident Engineer
  - Engineer, Furnish, & Install (E,F & I)

- **Managed Services**
  - FiberLAN "GPON in a box" w/ Remote Monitoring
  - Data Collection Engines
  - Network Health Reports
  - NOC as a Service



Professional Services

- Software Upgrades
- Education & Training
- Network Audits
- Subscriber Configuration Moves, Adds, & Changes
- EF&I Engineer, Furnish, & Install
- Dedicated Support Engineer (Resident or Remote)

# Summary

# Our Opportunity

## Market, Technology and Regulatory Discontinuities

| MOBILE Transport | Broadband CONNECTIVITY | Connected PREMISES | Orchestration & ANALYTICS |
|---|---|---|---|
| ▪ OpenRAN / vRAN | ▪ Virtualization | ▪ WiFi6 and EasyMesh | ▪ Automation |
| ▪ MEC | ▪ Disaggregation | ▪ Enhanced Mobile BB | ▪ Machine Learning |
| ▪ IoT | ▪ 25G / 50G-class PON | ▪ mmWave UE | ▪ Predictive Analytics |
| ▪ >100Gbps Transport | ▪ Geopolitical Tensions | ▪ Fixed Wireless Access | |
| ▪ Geopolitical Tensions | ▪ Government Subsidies | | |

**DZS Solutions disrupt the *status quo***

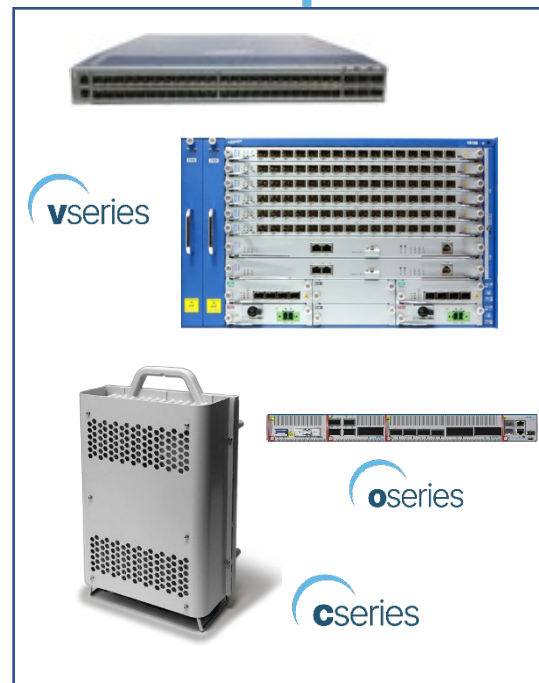**Innovation – Agility – Evolution – Flexibility – Interoperability – Lowest TCO**

# Thank You

[https://dzsi.com](https://dzsi.com)