



# **Cost Effective Broadband Improving Your Network ROI**

**Jack Breeding**

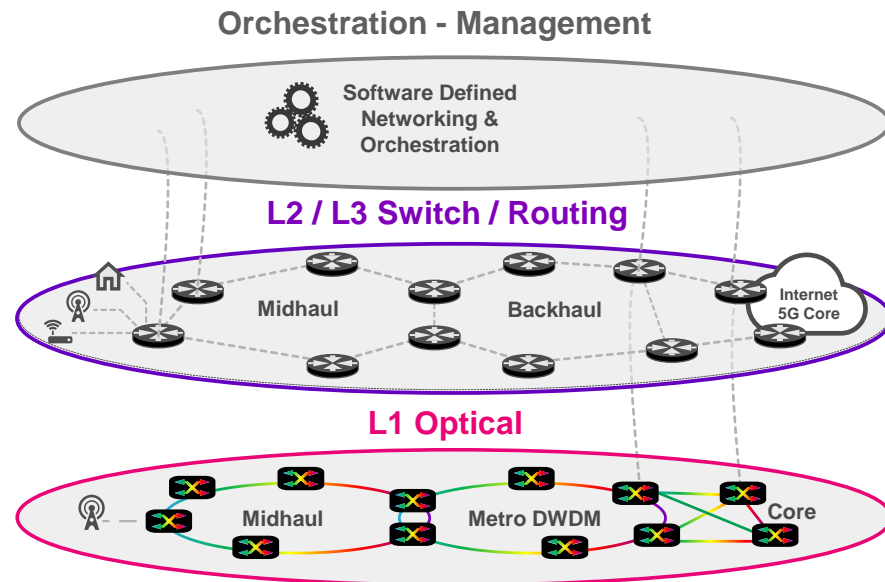
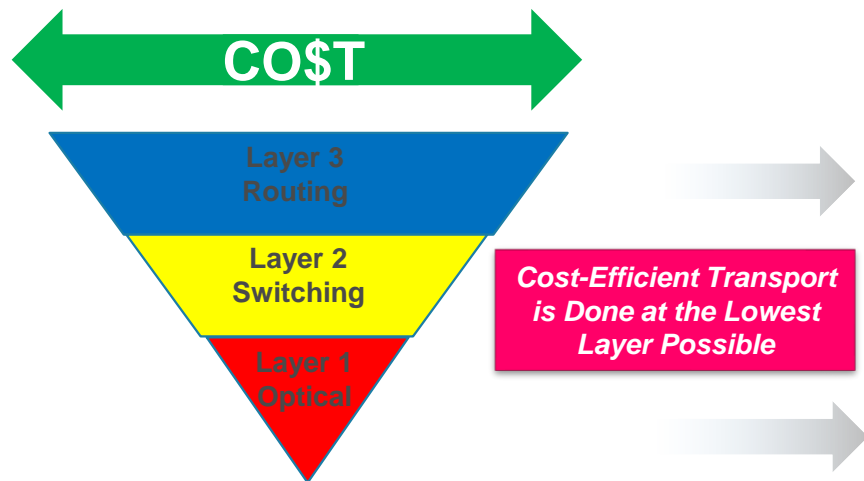
Business Unit Leader, US Rural and Tribal Markets

# Turning New Technology Into Revenue

- Cost-Effective and Service Awareness
- Available Transport Technologies
- Critical Need to Spend Wisely
- Middle Mile Scalability is Essential to Keep Up with x-PON Adoption
- Built to Last – Avoiding the Forklift

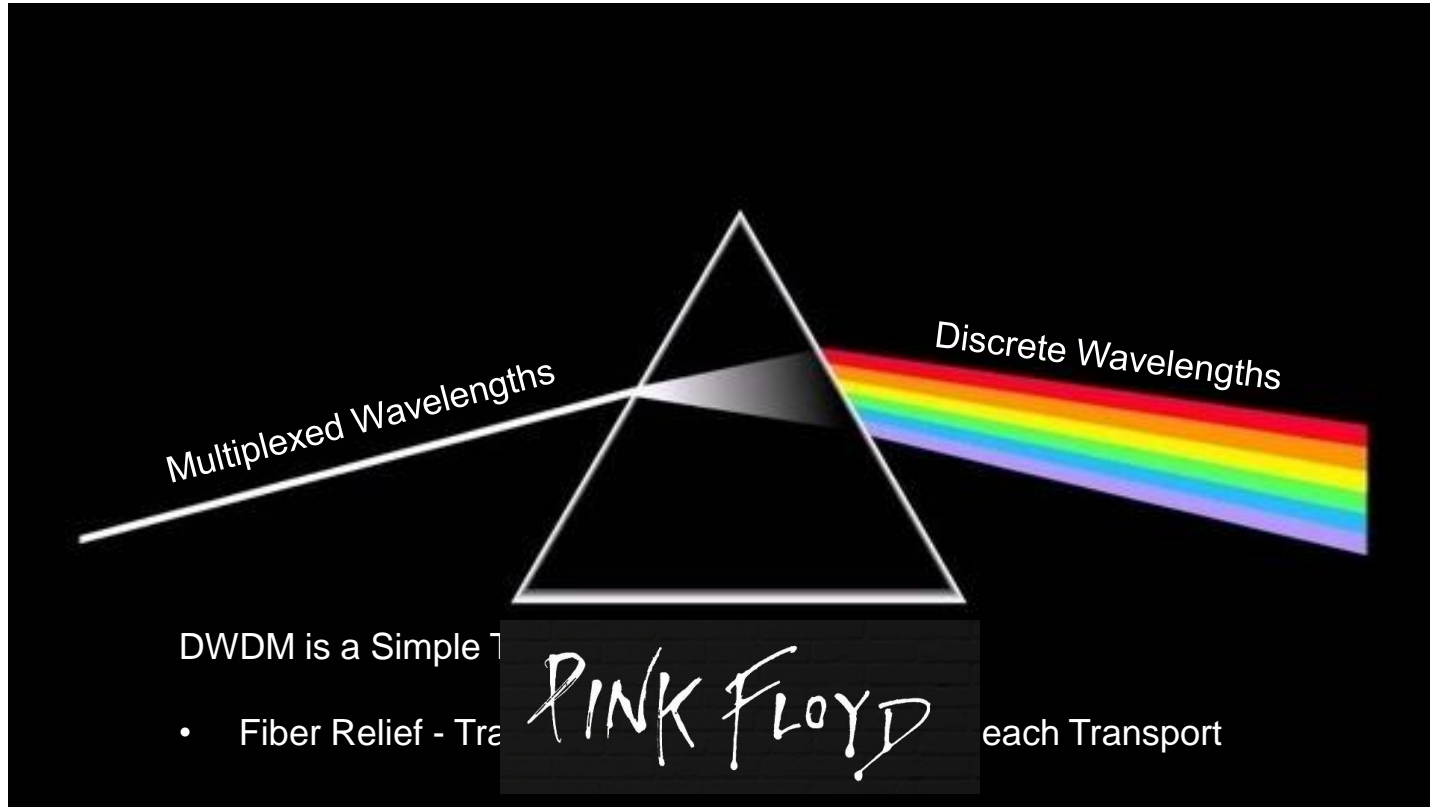


# Cost Effective Use of Technology



**Transport Technologies Can Be Deployed Separately  
or In Combinations to Support Requirements**

# DWDM Optical Transport



# Optical Layer Flexibility

## Optical Transport Solution



### Massive Scale

- Wavelengths Support Bandwidth from 10Gb to 1.2Tb+
- Typical Optical Design Provides Dozens of Wavelengths
- Increase Backbone Capacity As Needed



### Not Just 'Dumb Pipes' Anymore

- Signal Health Monitoring and Alerting
- Instant Fiber Break Detection and Geo-Location
- Layer 1 ULL Encryption



### Application

- Leased Wave Services / Leased Spectrum
- Backhaul Services

*Unmatched Capacity  
Extended Reach  
Scales Easily*

Lambda 4: 200Gb / 400Gb

Lambda 3: 200Gb / 400Gb

Lambda 2: 100Gb / 200Gb

Lambda 1: 100Gb / 200Gb

# Customer Case Study: Rural Broadband

US Cooperative for Power Generation & Transmission

## Customer Challenge

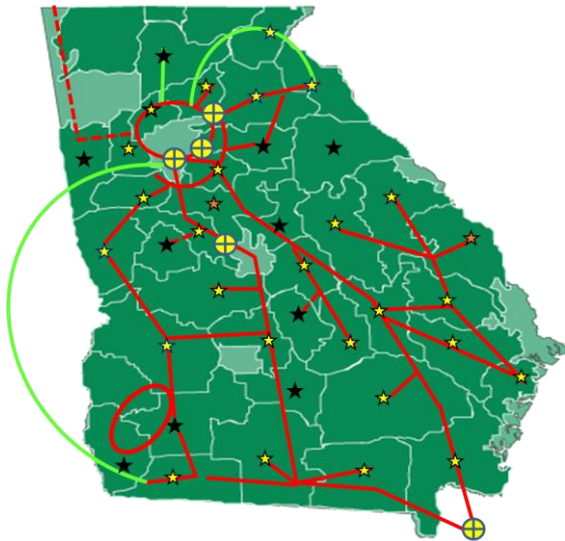
- Critical Need to Control Operational Destiny
- Need for Greater Network Capacity
- Essential to Improve Reliability and Security



Georgia Transmission

**Georgia  
Transmission  
Corp**

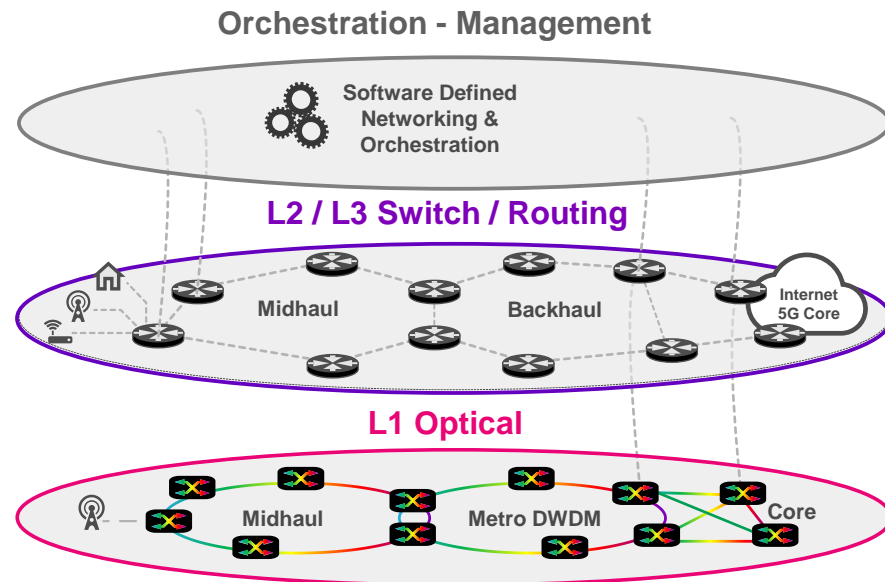
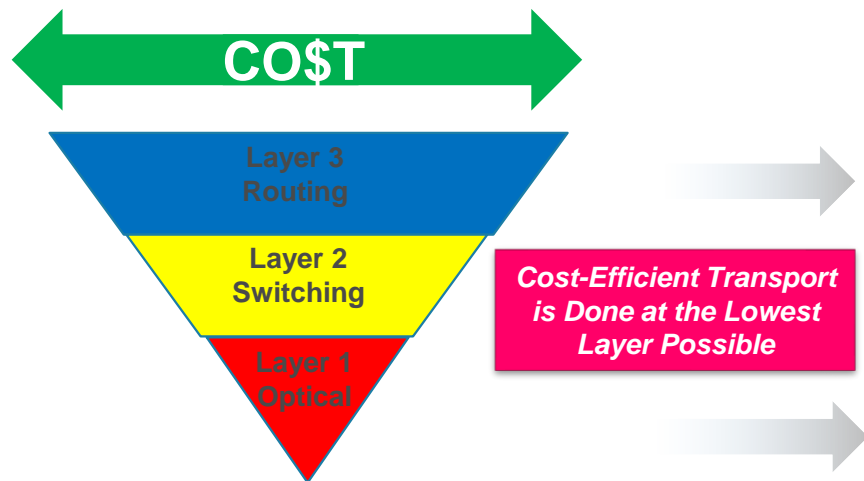
TSO owned by  
38 EMCs.



## Solution

- **Layer 1 Optical Transport**
  - Easily Scales as Demand Scales
  - Began as a 10G, Now Carrying 200G Lambdas
- **Highly Reliable**
  - 8-fold Reduction in Trouble Tickets
  - Integrated OTDR Fiber Health Management
- **Per Service Configurable Security**
  - Encryption for OT Traffic, Unencrypted for ISP/Partner Traffic
- **Statewide Backbone for Service Delivery**
  - Residential Broadband Service
  - Wireless Backhaul
  - Wave Services

# Cost Effective Use of Technology

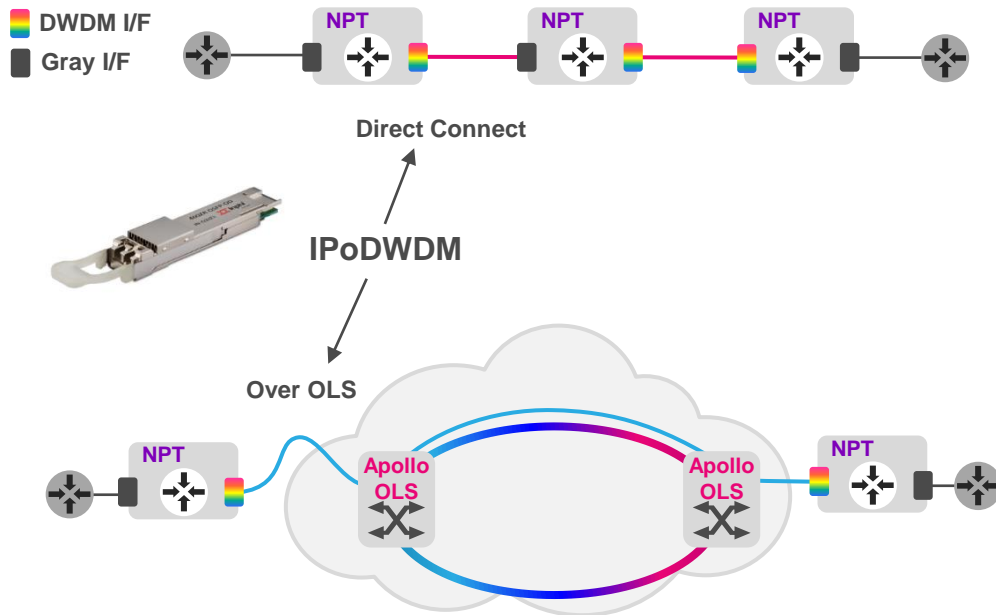


**Transport Technologies Can Be Deployed Separately  
or In Combinations to Support Requirements**

# IPoDWDM Options – Eliminate Transponders



- OIF 400G ZR and OpenZR+ for standard multi-vendor solution
- IPoDWDM single layer peer to peer high-capacity connectivity
- IP over Optical Multilayer
- Pluggable DCO tunable and rate configurable: 100G/200G/400G
- Reduce Spend on Signal Conversion





# IP Routing – Market Trends



## Traffic Growth

- Internet
- Mobile
- VOD
- Online Gaming



## Capacity

- IP Links Growth from 10G to 100G with Trend to 400G and Beyond



## Topology

- Transition from P2P Lines to Rings and Virtual Mesh Topologies



## Network Simplification

- Fewer Protocols
- Programmability and Automation



## Openness

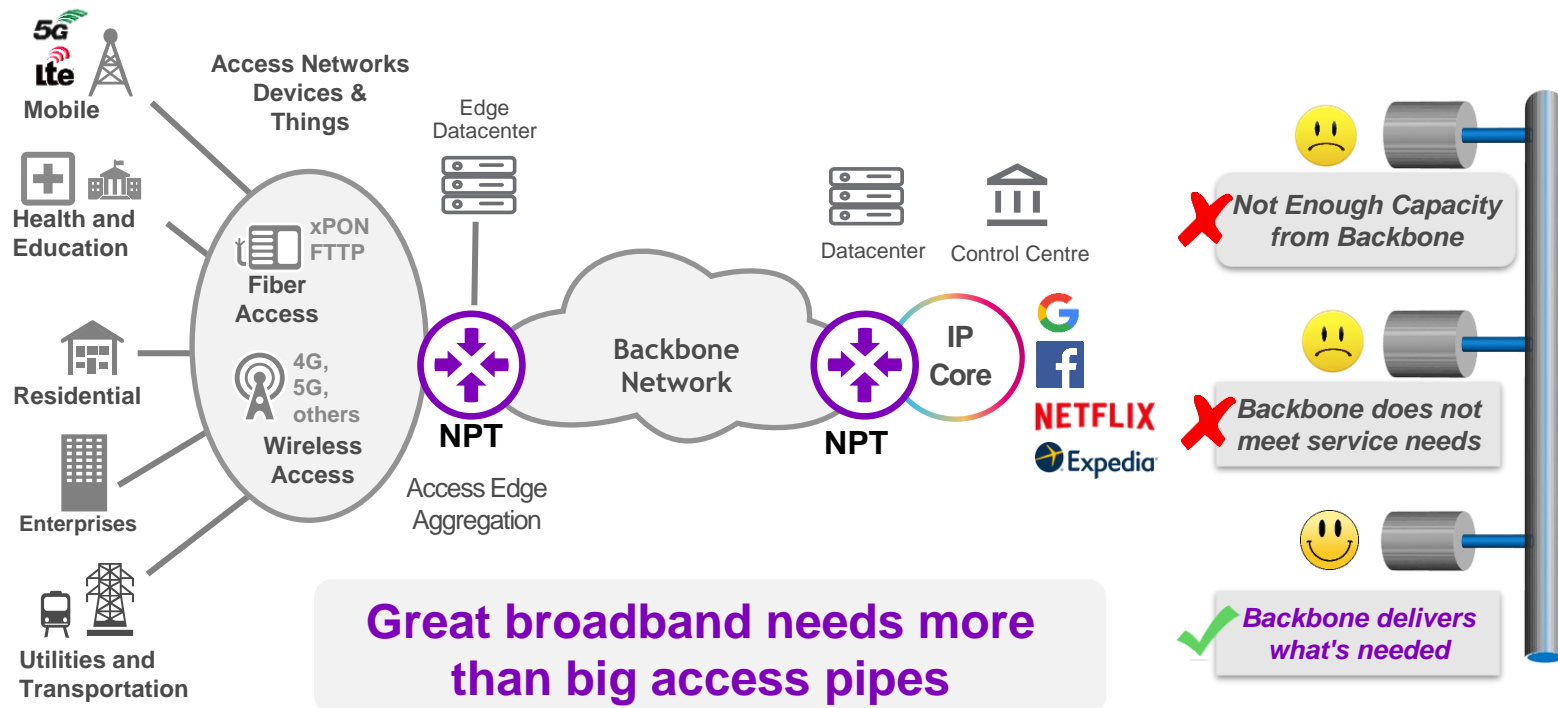
- Standardized Interfaces
- Decoupling Software from Hardware



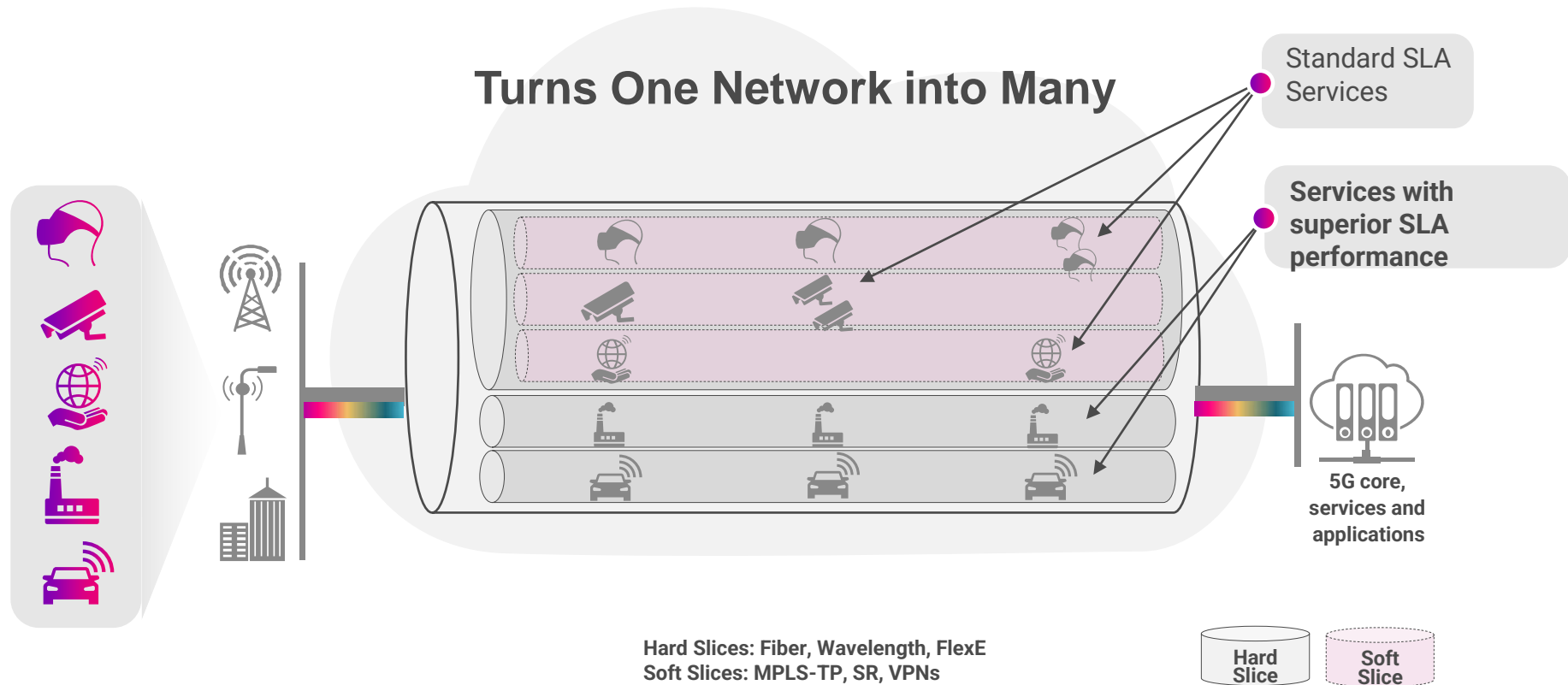
## Network Convergence

- TCO Savings
- Extended ROI
- Additional Revenue from Service Diversity

# Rural Broadband: Improve Your Service Offerings



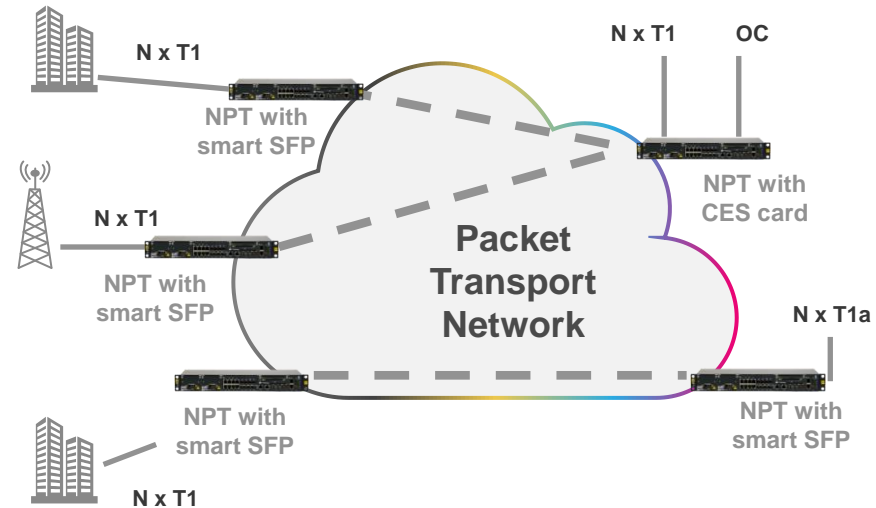
# Network Segregation using Transport Network Slicing



# TDM to IP Migration: Circuit Emulation Services

## Seamless and risk-free transport of legacy circuits

- **Comprehensive CES technology**
  - Both smart SFP pluggables and service cards
  - Supports SAToP, CESoPSN and CEP
- **Multiple Applications supported**
  - TDM aggregation
  - Voice Trunk Migration
  - Legacy Service Migration
- **Proven expertise**
  - Field proven processes for network migration
  - Supported many different solutions environments



# Bypassing 200G, the Move is to 400G+ Lanes

## Services Traffic

Yesterday

100 GbE

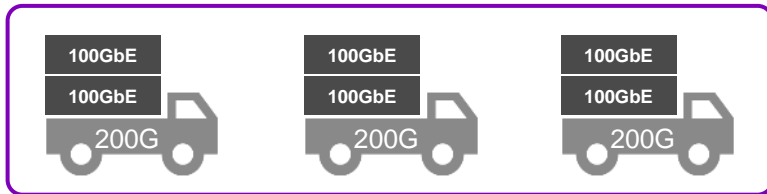
Today

400 GbE

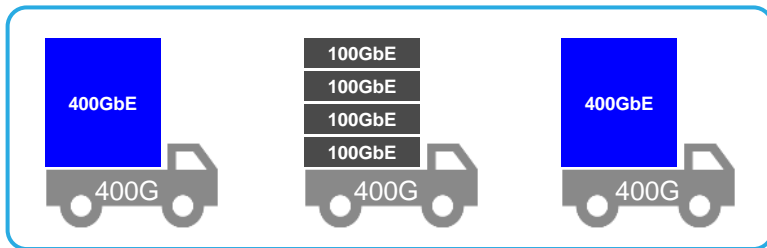
## Optical Network



100G Lanes



200G Lanes

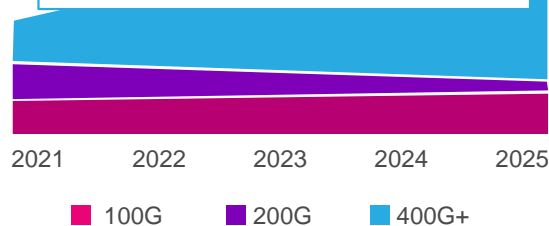


400G+ Lanes

## Market Forecast

400G+ Ports Shipments Forecast  
(Source: Signal AI)

400GbE ZR+  
Coherent  
Flexible 100-400G  
Price Parity with 100G!



# Customer Case Study: Twin Valley Telephone

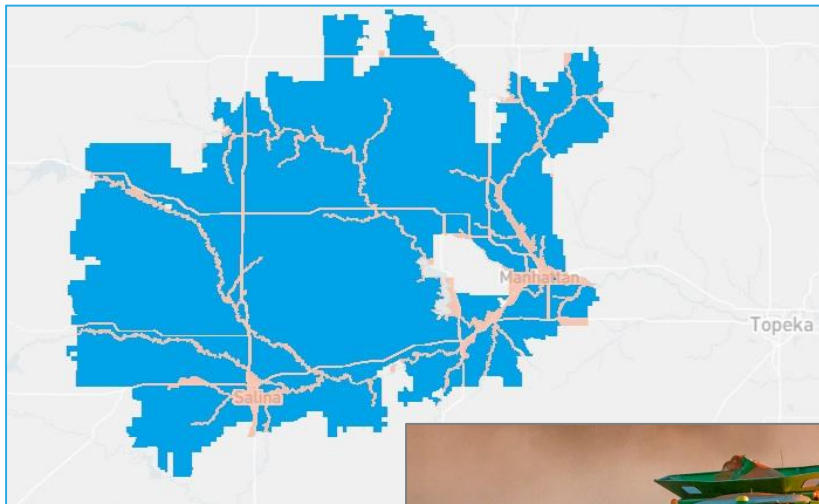
Large Rural Service Provider, Clay Center, Kansas

## Customer Challenges

- **Scale to Provide Robust Middle Mile**
  - Backbone Sized to Accommodate Current and Projected Growth
- **Network Reliability**
  - Automated, Flexible and Optimized Traffic Failover

## Solution

- **IP/MPLS 400GbE Backbone**
  - Service Awareness
  - Sub 50ms Service Restoration (TI-LFA)
  - Advanced Traffic Engineering (SR-TE)



**TWIN VALLEY**



# Customer Case Study: Wireless Backhaul

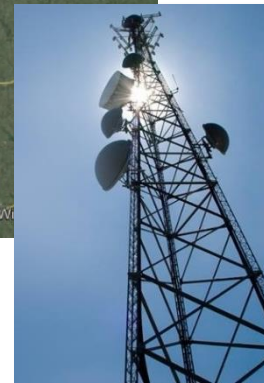
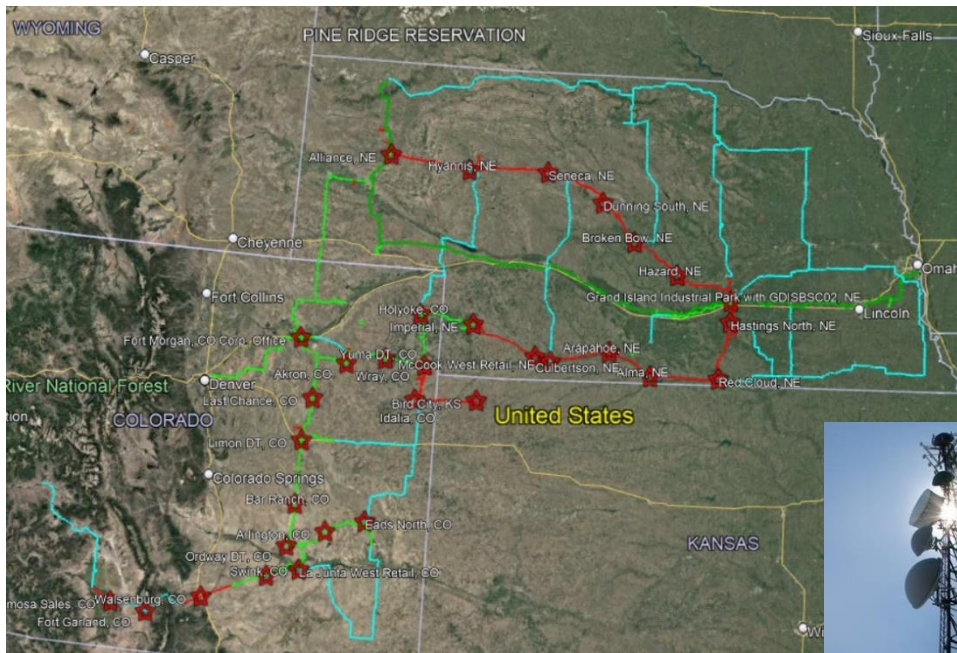
Large Rural Wireless Provider

## Customer Challenges

- **Reliability is Paramount**
  - Hard Requirement for 5 x 9s Operation
  - Monitoring 2300km+ of Fiber
  - Reduce MTTR Fiber Outages
  - Sub 50ms Service Restoration
- **Aggressive Growth**
  - Backhaul for 1000+ Towers
  - Dual Data-Center Connectivity
  - Bandwidth and Service Diversity

## Solution

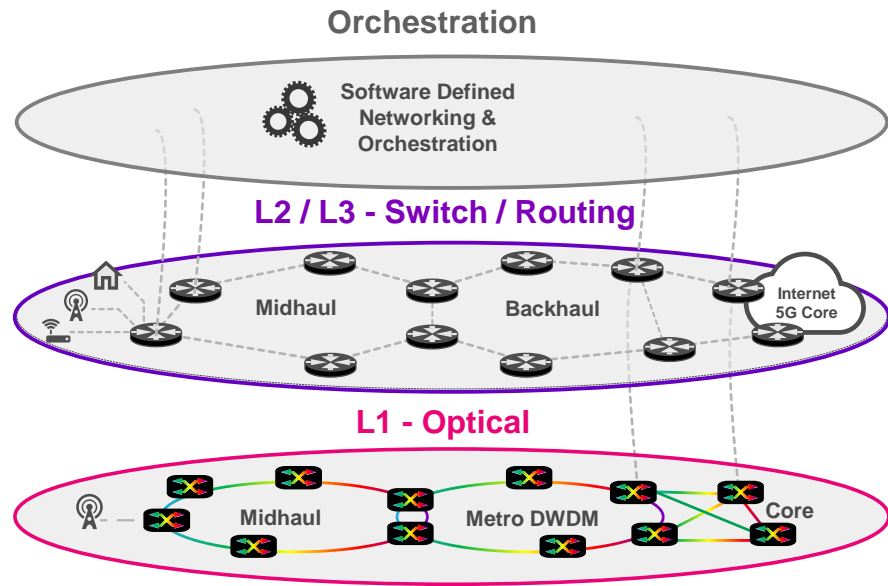
- **Comprehensive IP and Optical Design**
  - Provides Low Latency, Cost Effective Backhaul as well as Higher Level Service Awareness and Resiliency over 200GE & 400GE



**VIAERO**  
WIRELESS

# In Summary: Design for Today, Scale to Tomorrow

- Today's Advanced Feature and Protocol Availability Are Game Changers
- Build to Meet Current Requirements But...
- ...What is Built Today Should Scale to Meet Future Demands Without a Forklift
- Add Revenue Potential
  - Wave Services
  - Per Service Encryption
  - Customized Service Awareness



*These Technologies  
Can be Implemented  
Stand-Alone or In Combination*



# Highlights

- Standards-Based IP and Optical Solutions
- Globally Deployed in Over 140 Countries
- No Persistent Licensing Fees
- 100% US-Based Support
- *Buy America Act and BABA Compliant*
- 10-12 Week Delivery on Entire Catalog

 IP WAVE





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# ACCELERATING NETWORK TRANSFORMATION

