



Monetizing the Middle Mile

Broadband Design for the Future

Jack Breeding
Ribbon IP Optical

First, a Few Thoughts on Money

- Historic Levels of Public Funding

- RDOF, BEAD, ReConnect, MMG, RUS
- Little to No Opex Funding Available
- Unlikely to Repeat



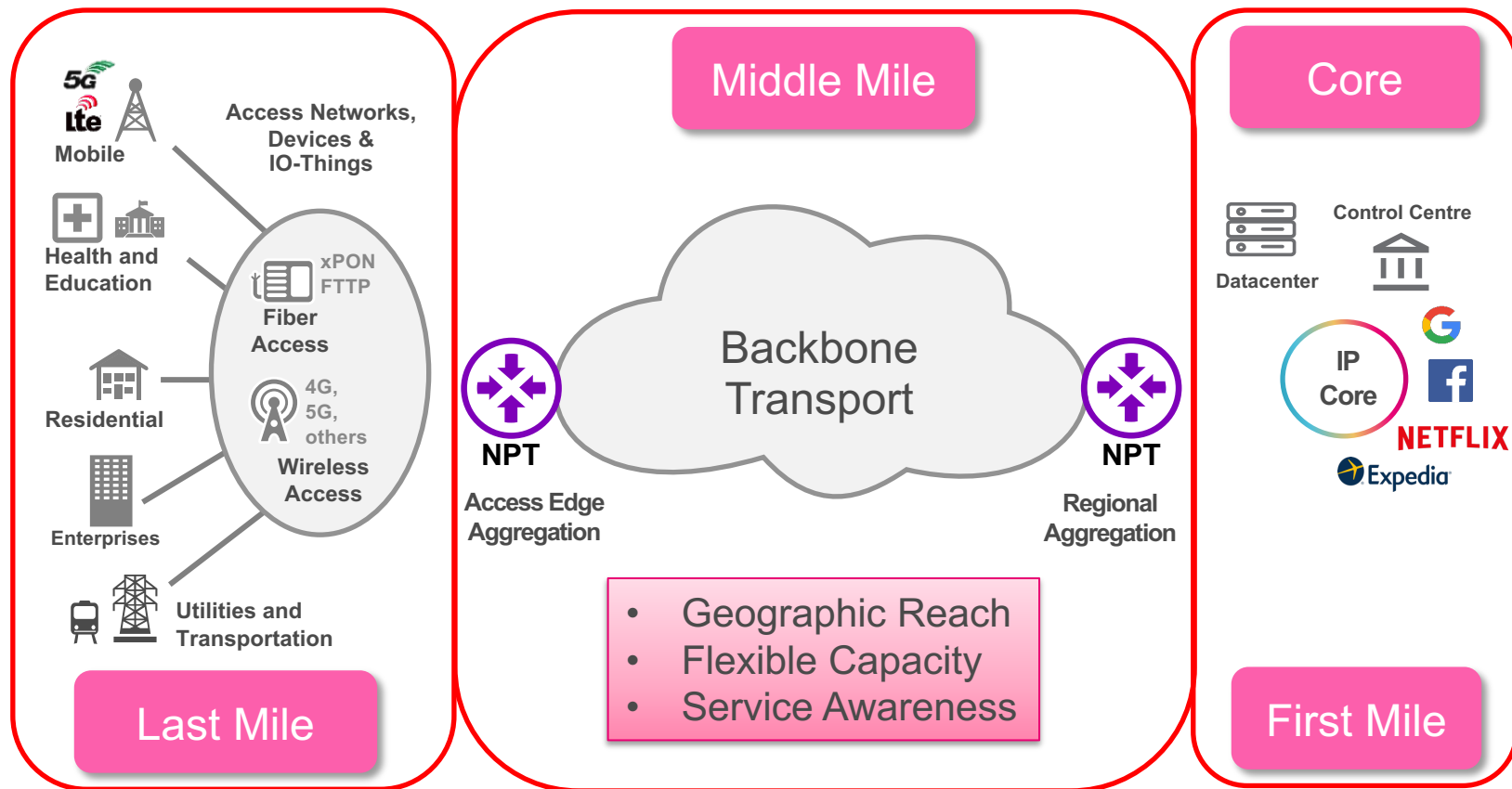
Committed to the future of rural communities.

- Cost-Effective Includes...

- Initial Investment
- Return on Investment
- Improved Time to Revenue
- Total Cost of Ownership
- Extending the Life of Your Network



What is the 'Middle-Mile' ?



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
- Move to Routed Backbone
- Programmability and Automation



Open & Unlocked

- Standardized Interfaces
- Decoupling Software from Hardware



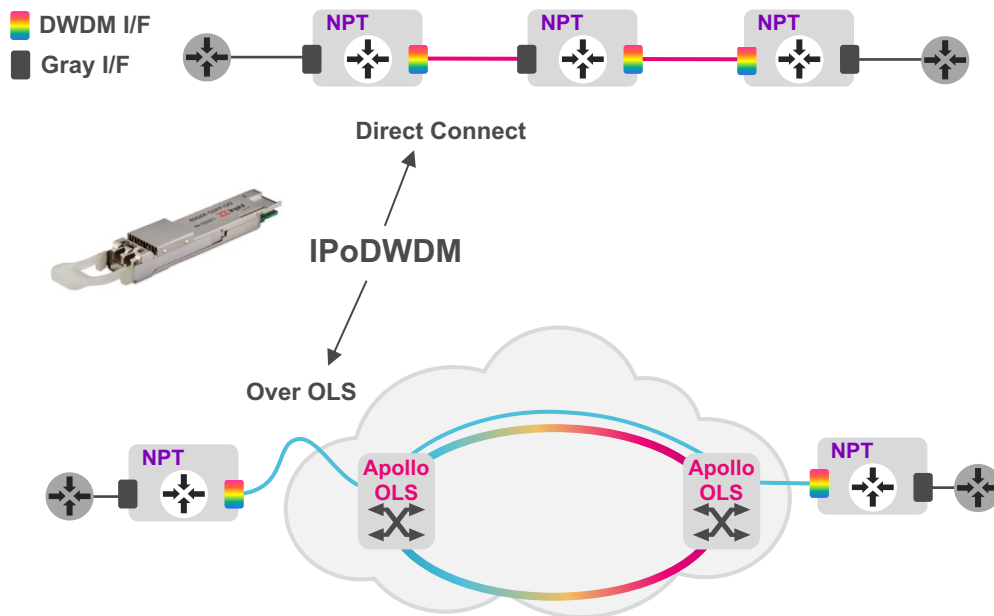
Automation

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

IPoDWDM Options – Coherent Routing



- 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



Bypassing 100/200G, the Move is on to 400G+

Services Traffic

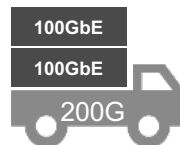
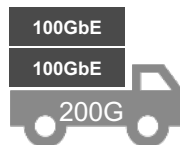
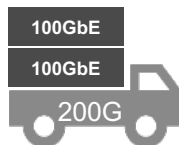
Optical Network

Yesterday

100 GbE



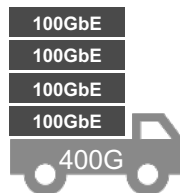
100G Lanes



200G Lanes

Today

400 GbE

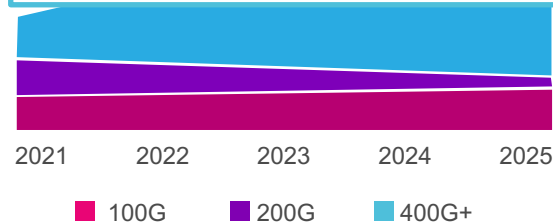


400G+ Lanes

Market Forecast

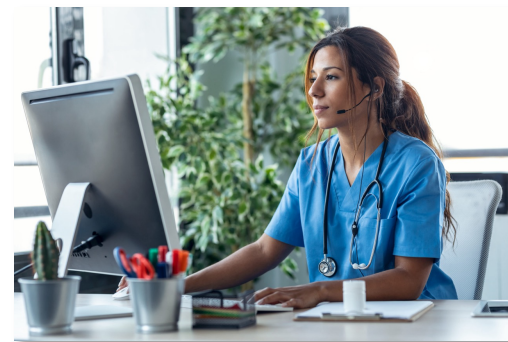
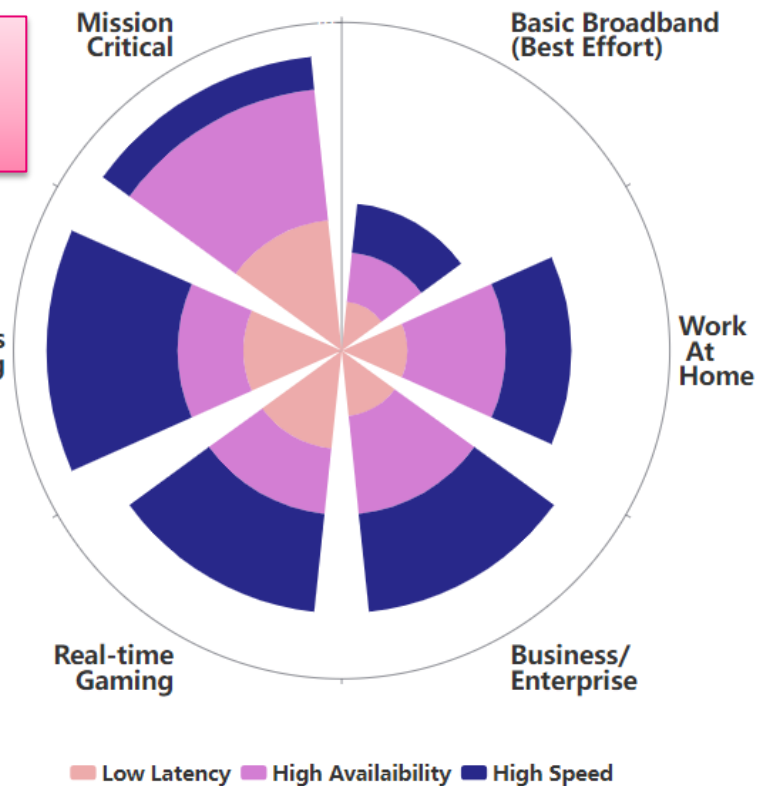
400G+ Ports Shipments Forecast
(Source: Signal AI)

400GbE ZR+
Coherent, Flexible
Approaching
Price Parity with 100G



Service Awareness and Handling

- **Quality of Experience**
- **Meet SLAs**
- **Increased Revenue**



Traffic Engineering is Critical

Internet-based Entertainment

- **High Bandwidth**, “Best Effort”
- Latency Tolerant

Business Connectivity

- **Reliability** is Essential

Distance Learning

- **Security**, Walled Garden

Telehealth

- **Encryption**, Privacy are Paramount

‘Oversubscribing’
is **Essential**

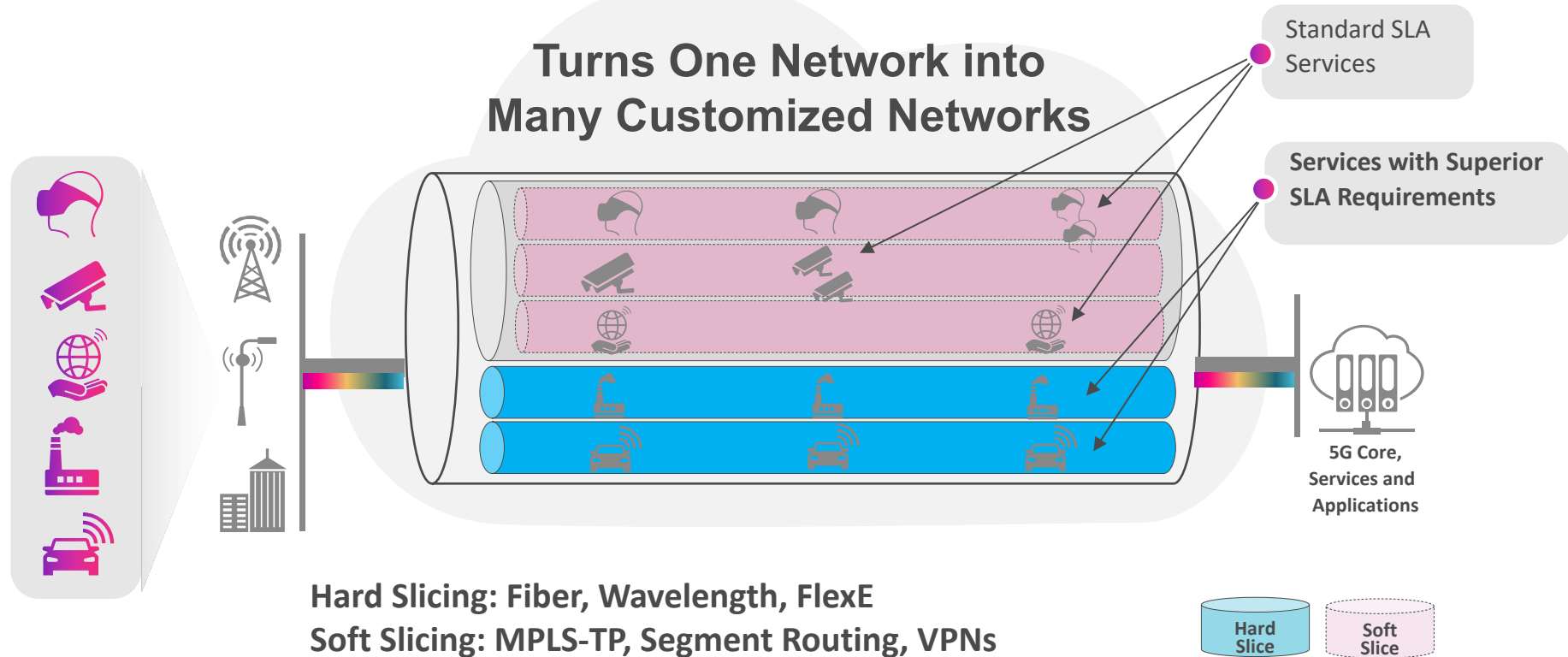
‘Oversubscribing’
is a **Disaster**

Unfettered Access
is a **Problem**

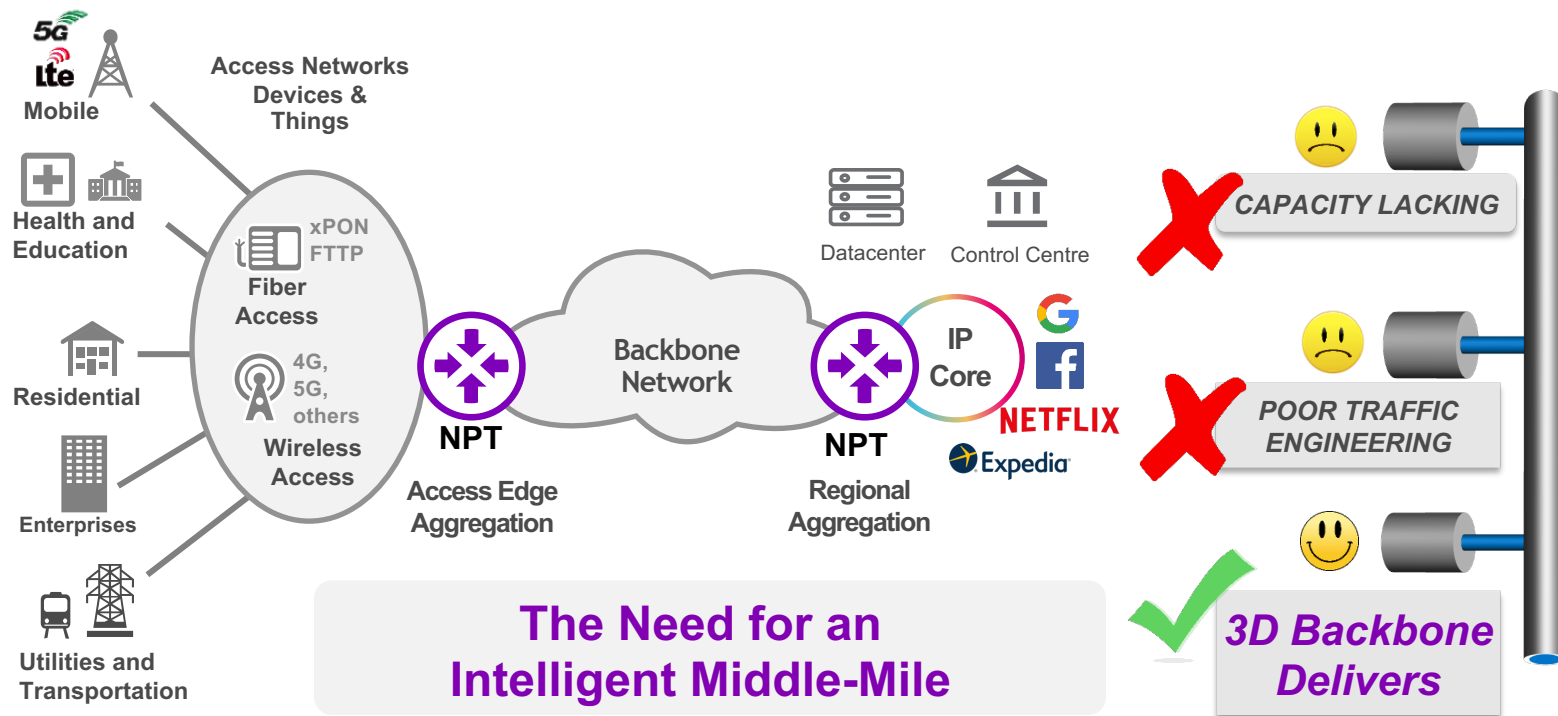
Stolen bits are
a **Disaster**



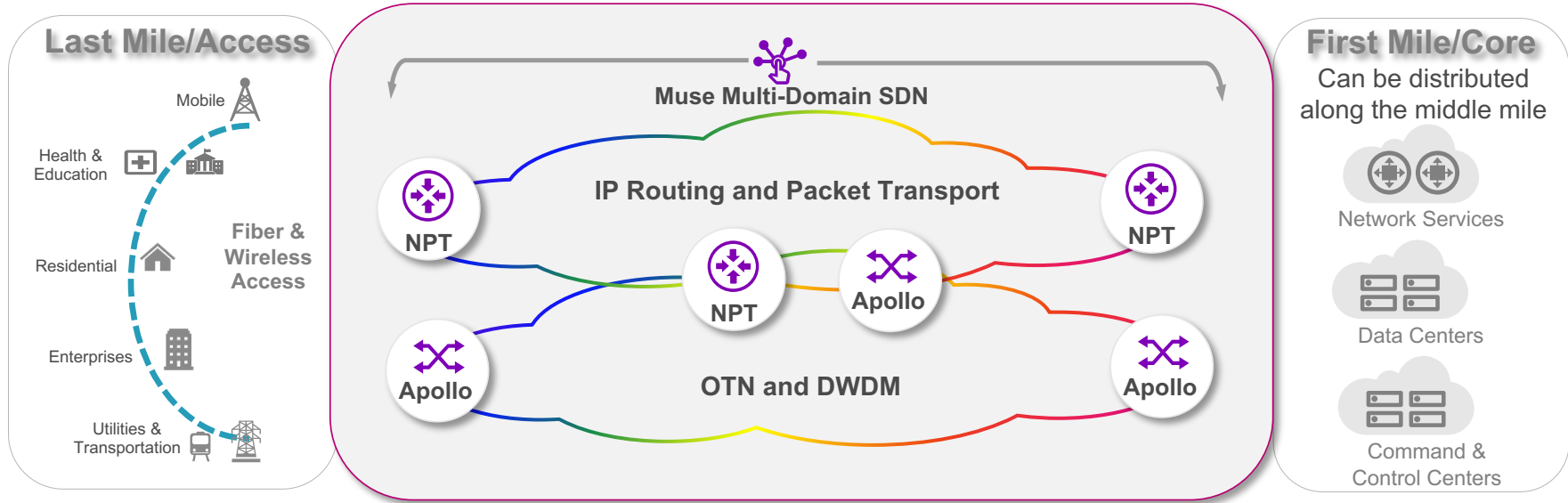
Network Segregation using Transport Network Slicing



Beyond Bandwidth – Scaling in 3D



The Intelligent Middle Mile



- ❖ Service-Aware Routed Transport Maximizes the Revenue Potential of Last Mile Investments
- ❖ Optimized IP Optical Networks with Automation Delivers Lowest TCO

In Summary – The Intelligent Middle Mile

- Public Investment is *CapEx Only* so Spend Wisely!
- Smart Transport Backbone is Key to Revenue Growth
- Traffic Engineering Enables Enhanced Service Offerings
- Cost-Improved Technology Advances
 - Advanced Service Handling Routers
 - Coherent Routing with 400G Optics





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ACCELERATING NETWORK TRANSFORMATION



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