



Creating Infinite
Possibilities.

Broadening the Reach of Broadband, Powered by Distributed Access Architecture

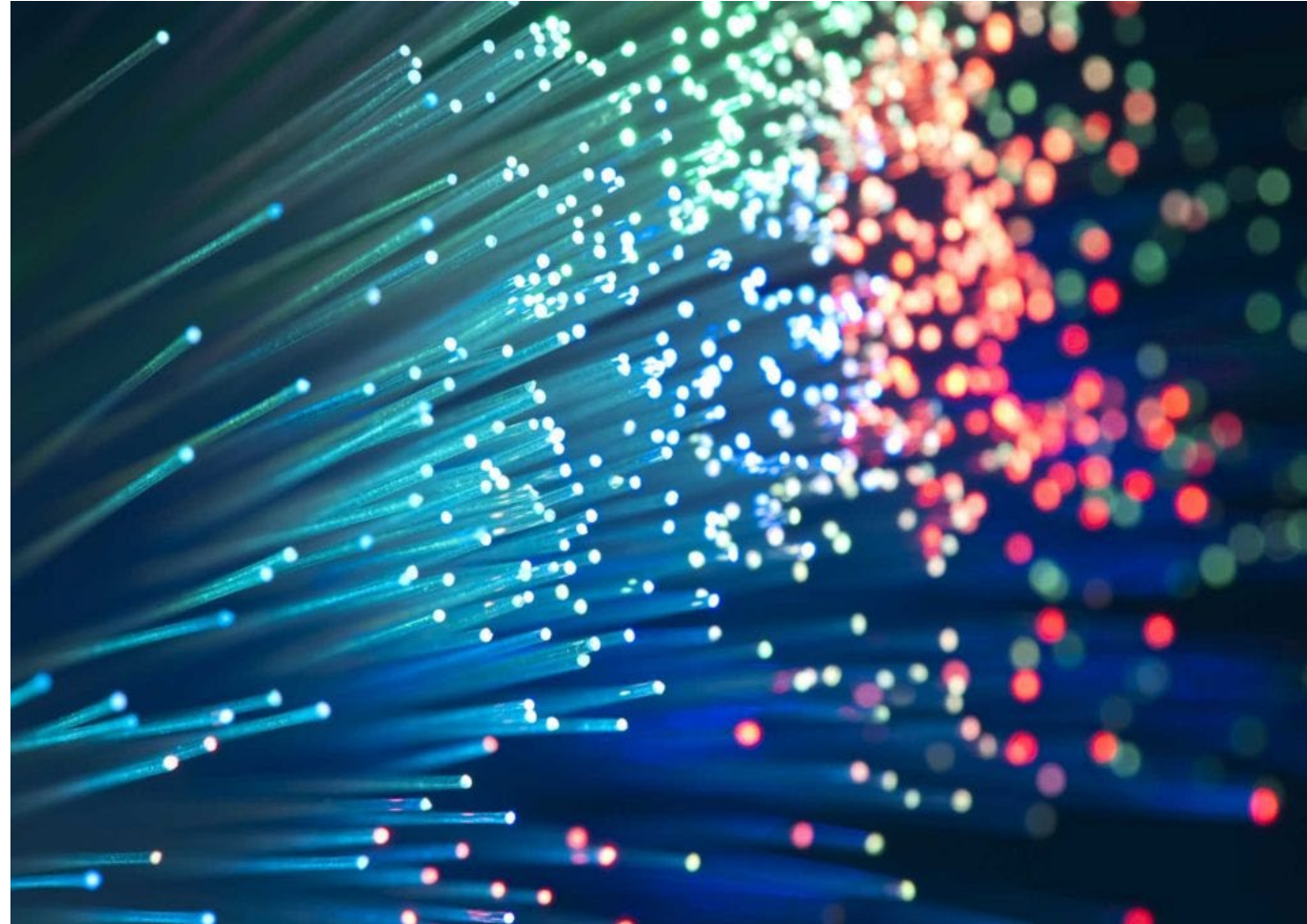
Katherine Aiello

Director, Project Management
Comcast

Katherine_Aiello@cable.comcast.com

How Comcast Will Support RBB

- Comcast's Commitment
- Technology Overview
 - Distributed access architecture (DAA)
 - Virtual cable modem termination system (vCMTS)
 - Virtual broadband network gateway (vBNG)
- Operational Alignments



We are building a better network, every day.



Internet Essentials

- Launched in 2011
- Over 10 million Americans from low-income families connected
- Nation's largest and most comprehensive Internet adoption program



Lift Zones

- More than 1,000 Wi-Fi-connected "Lift Zones"
- Works with Internet Essentials programs and further helps student
- Fosters freedom and flexibility for their education needs



Recycling

- Program to recycle coaxial cables at the end of their use
- Working with Echo Environmental to repurpose these cables
- Includes insulation and jacketing in our recycling efforts



Project UP

- Our \$1 billion commitment
- Programs and community partnership across Comcast, NBCUniversal & Sky
- Connect people to the Internet, advanced economic mobility and more

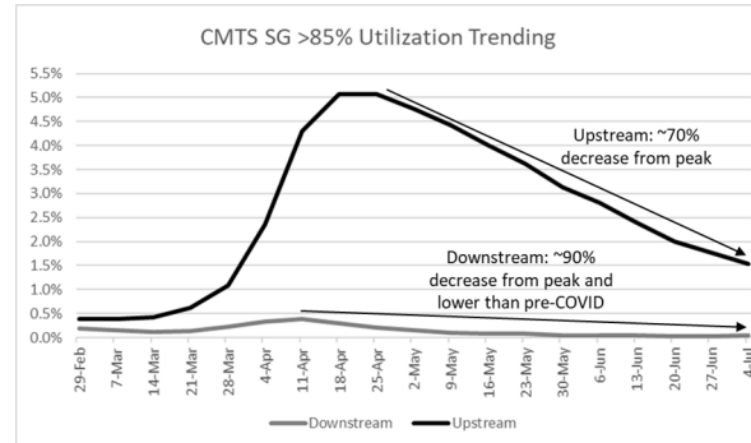
What is Rural Broadband?



- Cable providers traditionally have not had the ability to build out scalable networks to low-populated areas
- Primary & secondary headend locations very distant; coaxial RF technology not well-suited to covering very large distances
- Tens of millions of Americans do not have high-speed Internet today

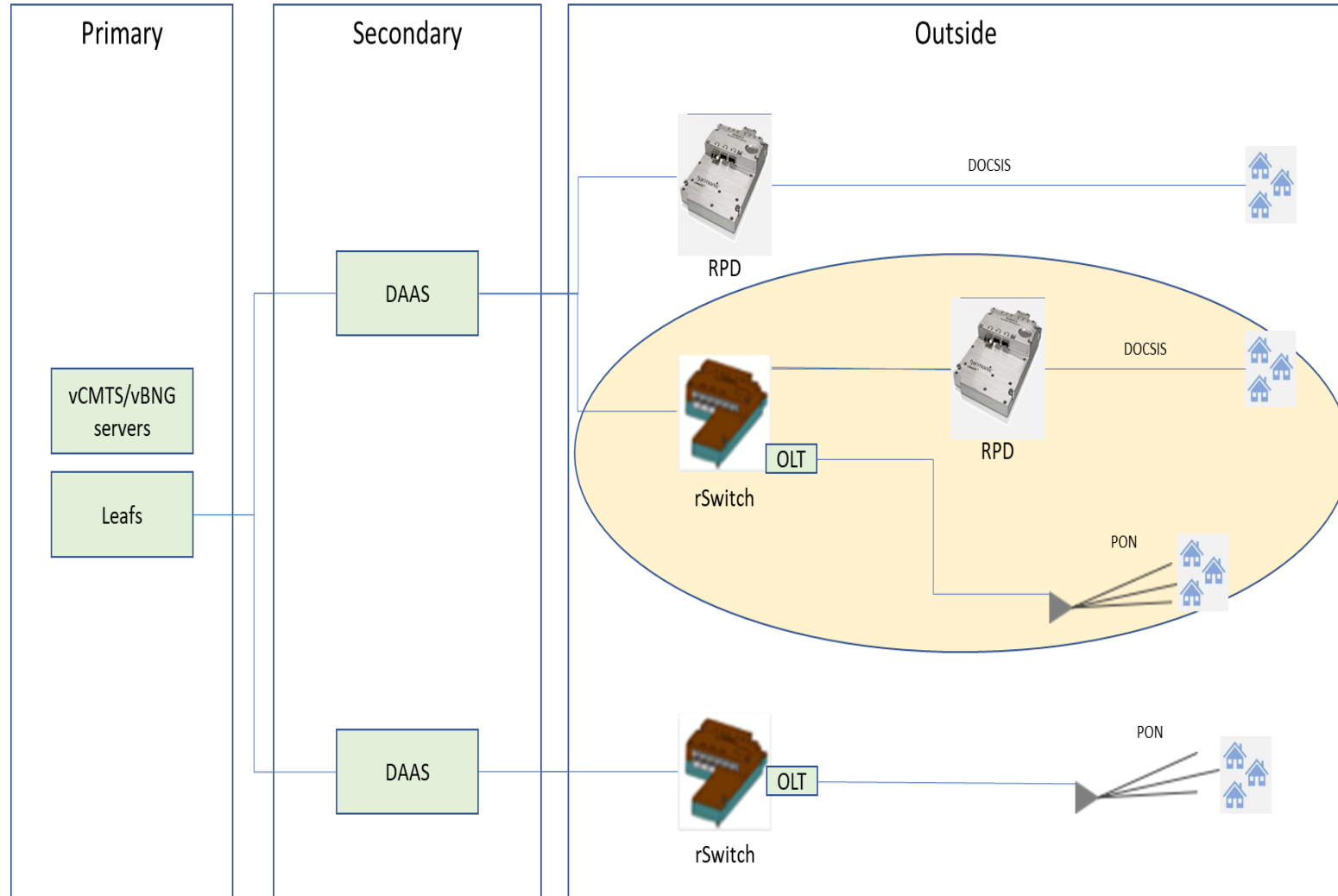
Customers' capacity needs are increasing!

- Capacity needs have been doubling every few years downstream while also continuing to grow in the more-constrained upstream; Oh...uh, also COVID
- Ability to upgrade the network for this demand using just hardware is unsustainable
- Software enhancements, pushing intelligence into the field gives flexibility of continuous increases and capacity
- DOCSIS 3.1 & OFDM/OFDMA benefit from these software investments
- PON can leverage these investments and procedures

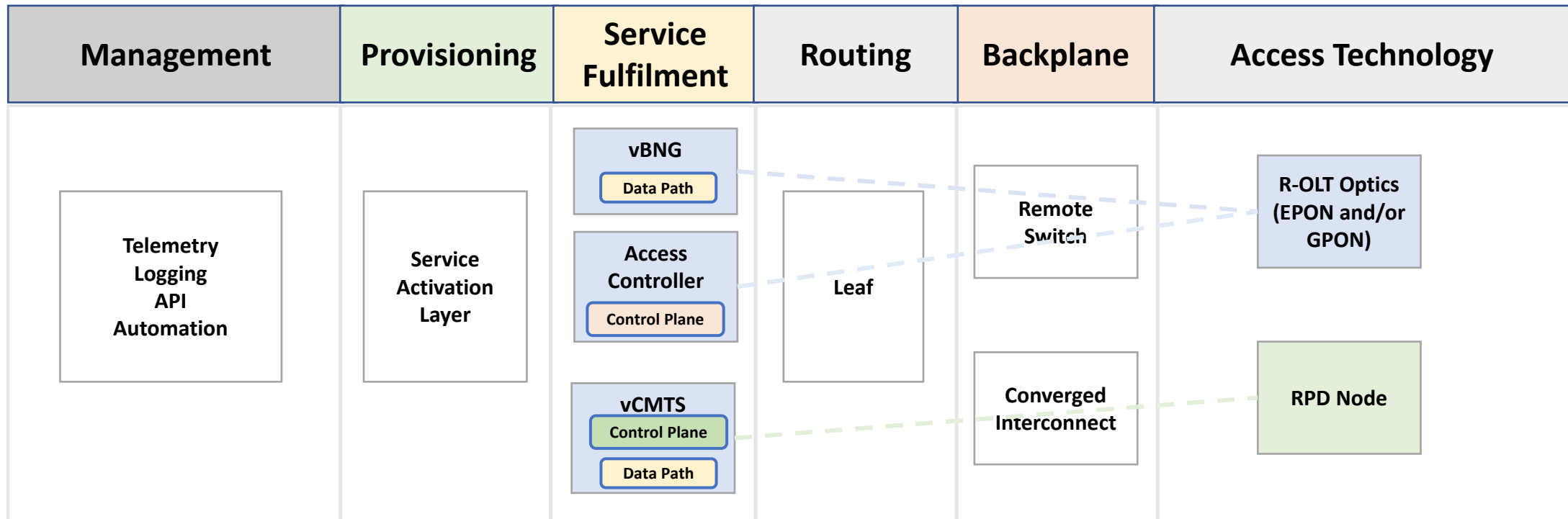


DAA for RBB Benefits

- Lower MER degradation
- Ability to deliver PON beyond distances of optical link budget standards not well-aligned to HFC
- Lower power consumption and better performance than alternate RBB solutions
- Automated change management through software development

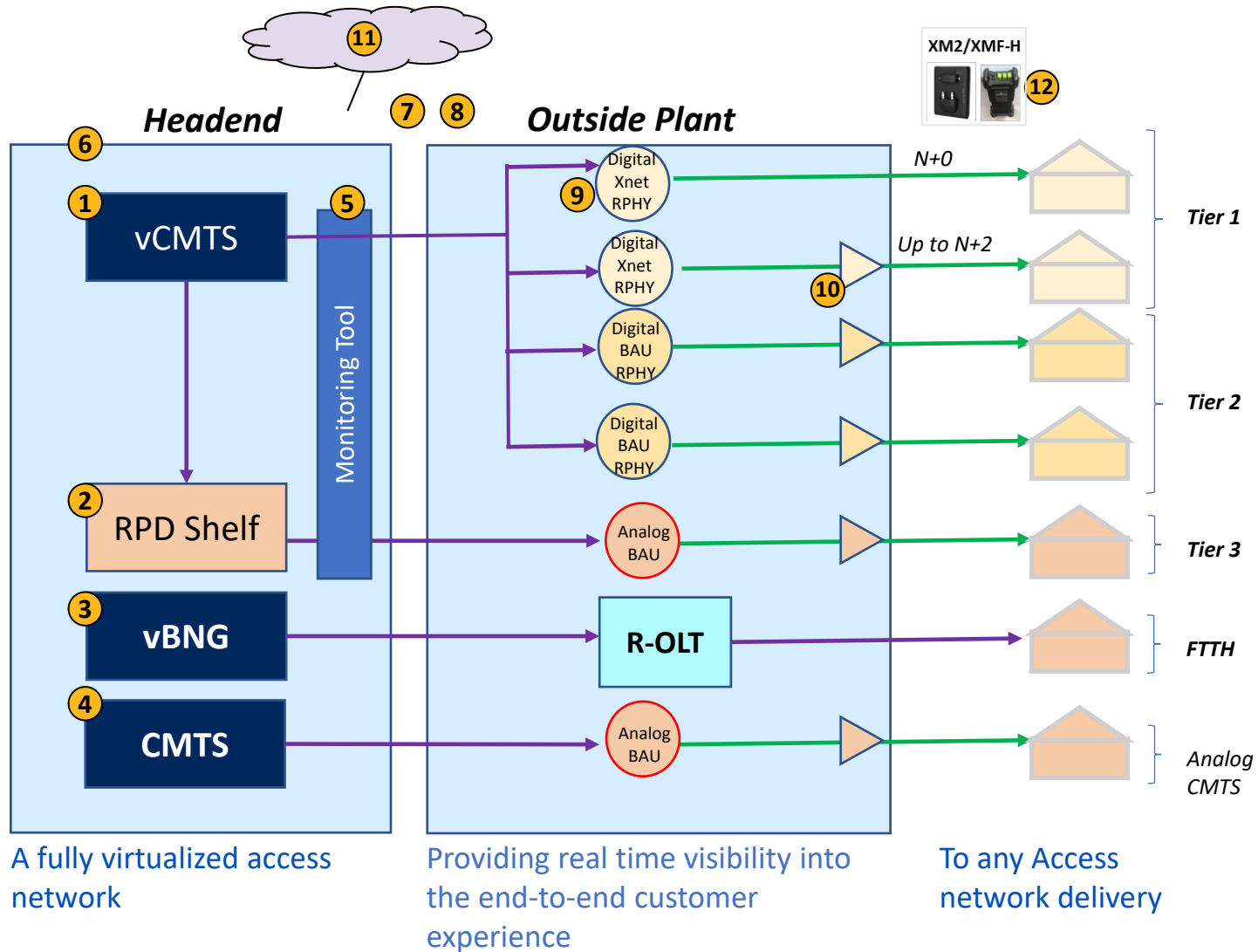


Extending the vCMTS Architecture



Allows for other access technologies while reusing common functional components

A Network in Transition



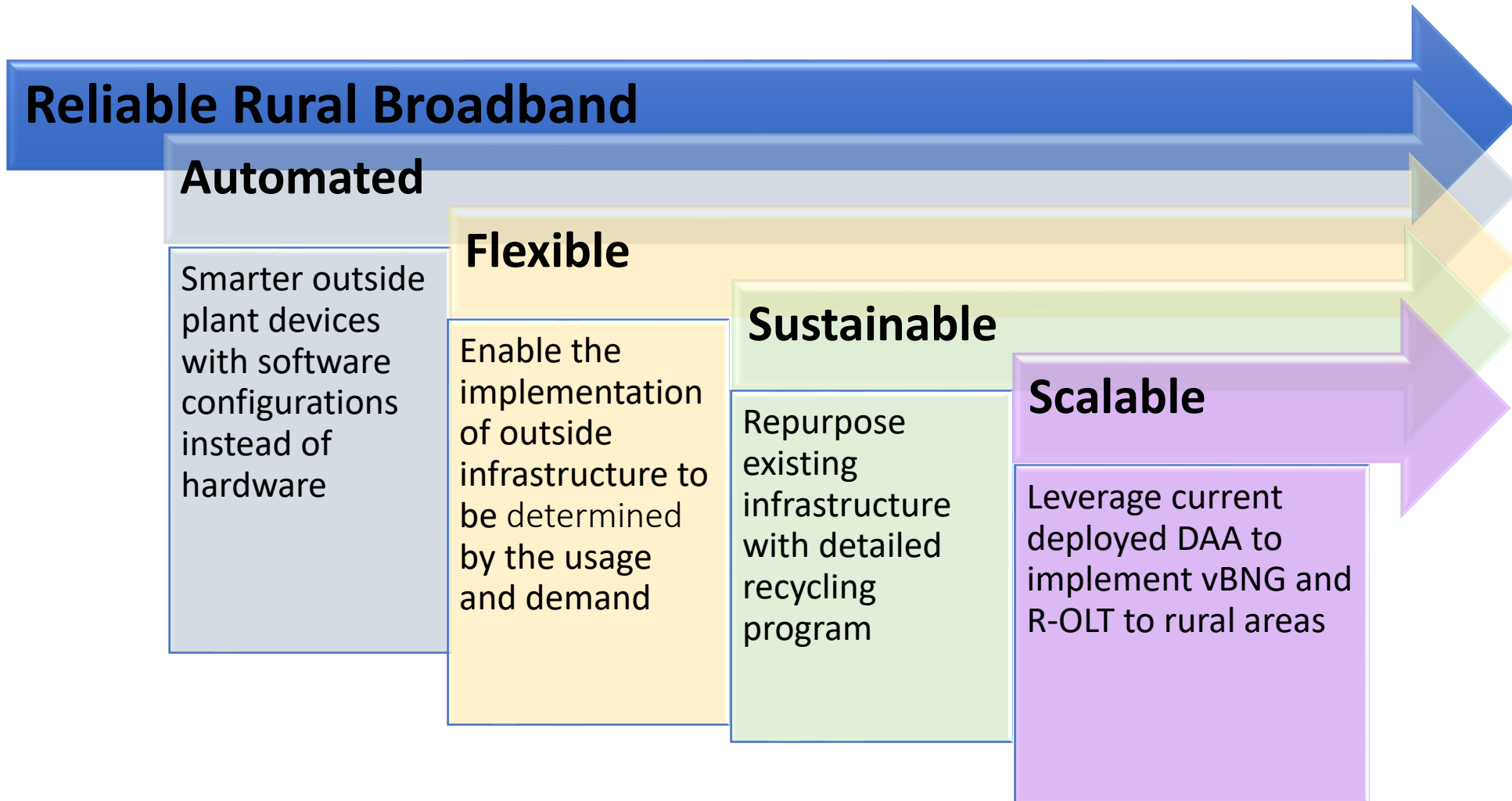
1. **vCMTS**: transition to Gen 3 HW to enable scaled migrations off legacy CMTS
2. **RPD Shelf** necessary for migration off legacy equipment
3. **vBNG**: Leverage vCMTS for FTTH architecture
4. **Legacy CMTS**: No new code drops; support capacity growth in Tier 3 markets
5. **XMF-R**: Real time fiber cut detection with monitoring applications for fiber underlays
6. Facility monitoring with **CI**
7. Automated designs and fiber management support with fiber monitoring tools
8. **Construction**: Workflow management (HFC & fiber)
9. **Node**: Analog to digital migration
10. **Amps**: Smart 10G FDX amplifiers forthcoming
11. **Detect, Mitigate and Fix** with internal applications (ROCI/Optek) and data sciences enhanced correlation
12. Handheld meters

Operational

- Leverage the same node enclosures for RPD and R-OLT hardware
- Leverage the same DAA switching infrastructure already in place
- Capture new data sets leveraging current data models
 - Build operational models of knowledge from additional data
- Monitor and dispatch tools to be integrated with vBNG, utilizing current back-office applications
- Advance the technicians' skill sets to further their scope in support of the converged access infrastructure

Environment

- Gain fiber slowly, deliberately deeper into the outside plant
- Use capacity demands to help determine fiber placement in HFC
- Prioritize power consumption efficiencies in HFC technology and RBB architecture paths
- Maximize operations and partnerships to break apart coax wiring for 70% direct reuse with 30% recycled
- Maximize our commitment to be carbon neutral by 2035
 - PON distributed network is 90% more power efficient than DOCSIS





Creating Infinite
Possibilities.

Thank You!

Katherine Aiello

Director, Project Management
Comcast

Katherine_Aiello@cable.comcast.com