

The background of the slide is a night-time photograph of a city skyline, likely New York City, with numerous skyscrapers illuminated and their lights reflecting on the water in the foreground. The CableLabs logo is prominently displayed in the upper center in a large, white, sans-serif font. Below it, the tagline "Future of Connectivity" is written in a smaller, white, sans-serif font. In the bottom left corner, there is a small red vertical bar. The overall aesthetic is modern and tech-oriented.

# CableLabs<sup>®</sup>

Future of Connectivity

**CableLabs**

Curtis Knittle, PhD | Vice President, Wired Technologies

[c.knittle@cablelabs.com](mailto:c.knittle@cablelabs.com)

CableLabs is the **global innovation** and R&D lab for the broadband cable industry, and a **catalyst** for collaboration with member companies and the broadband ecosystem.

To support industry growth, we deliver **impactful network technologies** for the entire industry through future-forward innovation.



# CableLabs Governance

Board of Directors & Technical Committee, CEOs and CTOs from...



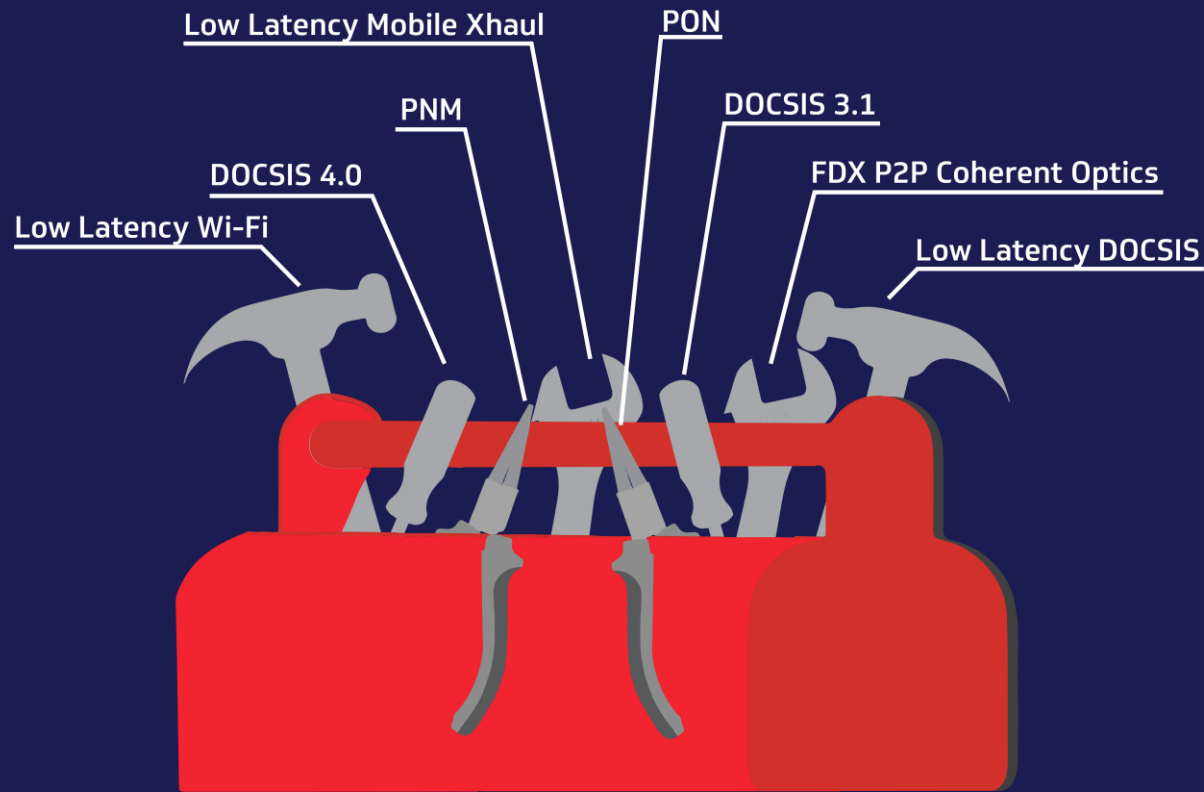
LIBERTY GLOBAL



COMCAST



# 10G



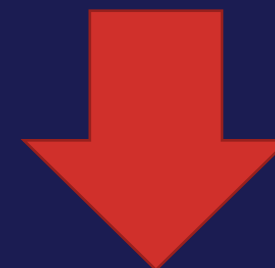
**10x Speed**



**More Reliable**



**Better Security**



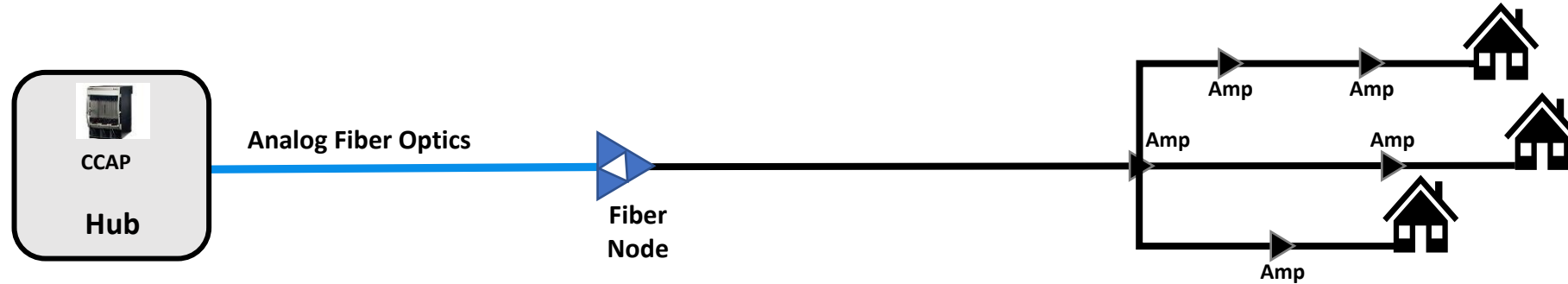
**Lower Latency**



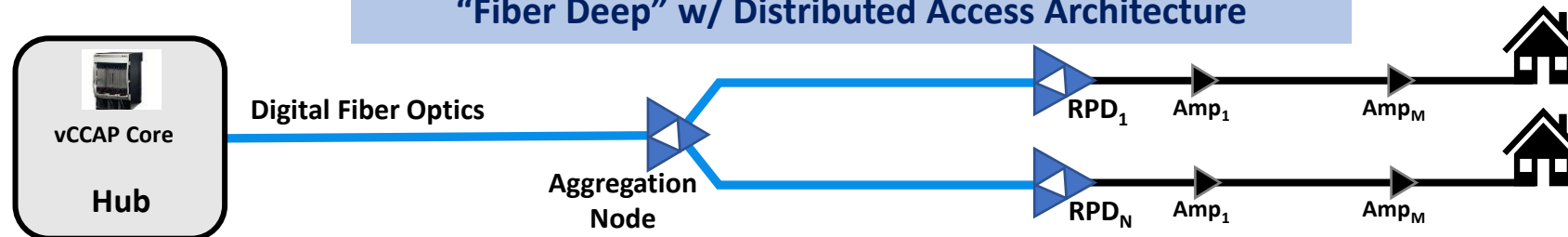
# Cable Networks: Then, Now & Near Future

Substantially fiber, video/data/phone, ~400 homes passed per fiber node

Original HFC

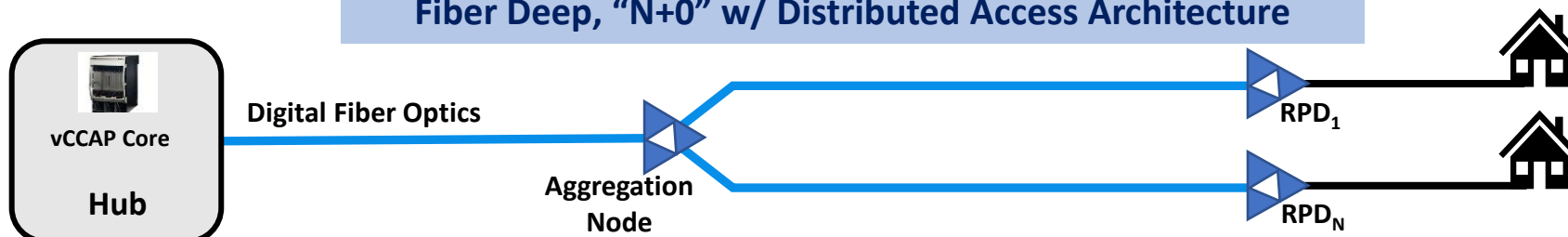


“Fiber Deep” w/ Distributed Access Architecture



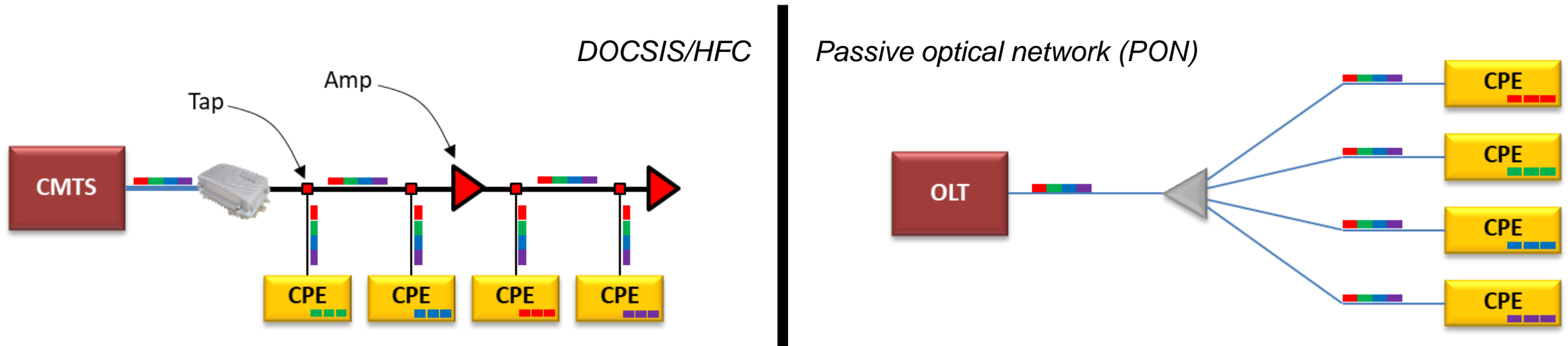
Now & Near Future

Fiber Deep, “N+0” w/ Distributed Access Architecture



# Sharing Network Capacity

*Myth: FTTH networks don't share capacity, while cable networks share capacity.*



- DOCSIS/HFC and PON have the same fundamental operating principles
  - Both DOCSIS/HFC and PON solutions use a point-to-multipoint topology which shares capacity in both upstream and downstream
  - Single downstream transmitter sends to all customer premise equipment (CPE) simultaneously, packets are received by all CPE and filtered accordingly
  - Upstream transmissions must be scheduled to avoid collisions on the media

# Latency

*Myth: Fiber media has lower latency than coaxial cable*

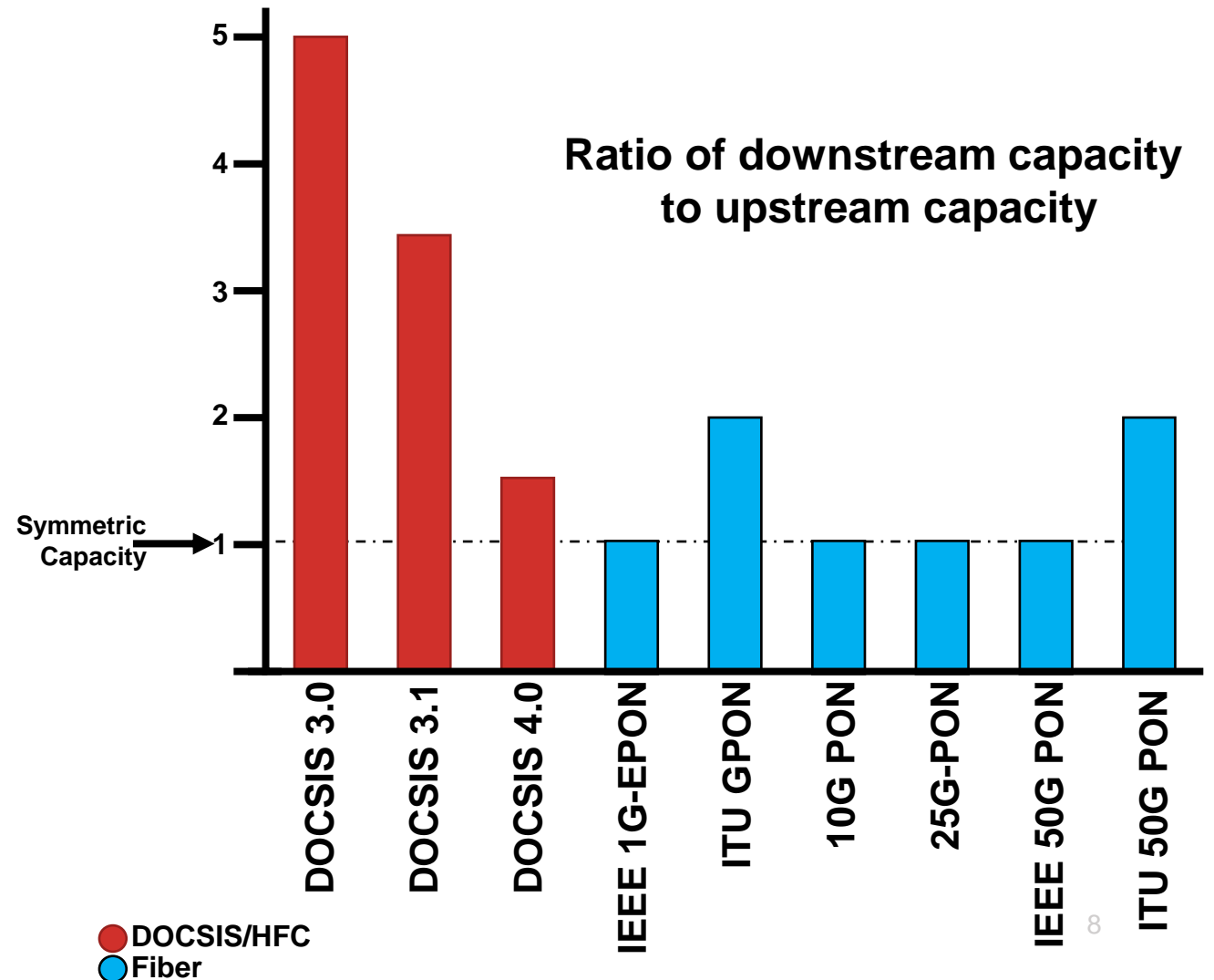
- Velocity of propagation for radio frequency on coaxial cable is 87% of speed of light, while photon in single mode fiber is 68%
- Telecom signals propagate faster on coax than fiber



# Symmetry of HFC versus FTTH

*Myth: Cable broadband can't provide symmetric capacity*

- HFC and FTTH are both capable of providing symmetric capacity
- Networks are *designed* to provide services to meet consumer demand
- Even the most recent PON technology (ITU 50G/25G PON) is designed to be asymmetric





# Broadband Usage Asymmetry

## Average Broadband Household

*A snapshot of the average U.S. broadband household.*

OVBI Average Broadband Household Index – 4Q21



**536 GB**

Average Bandwidth Usage



**504 GB**

Average Downstream Usage



**269 Mbps**

Average Downstream Speed



**9 per household**

Average Number of Streaming Services\*

\*Deloitte Insights- Digital media trends survey, 14th edition



**32 GB**

Average Upstream Usage



**19 Mbps**

Average Upstream Speed



**25 per household**

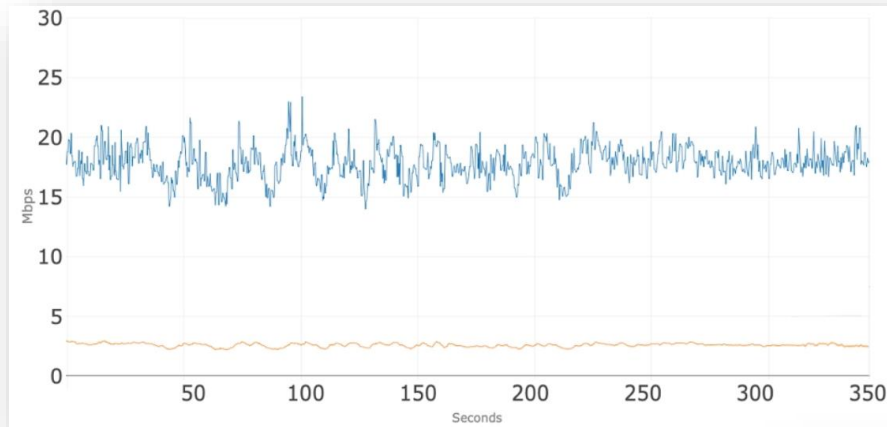
Average Number of Connected Devices\*

\*Statista

[https://openvault.com/wp-content/uploads/2022/03/OVBI\\_4Q21\\_Report\\_FINAL-1.pdf](https://openvault.com/wp-content/uploads/2022/03/OVBI_4Q21_Report_FINAL-1.pdf)

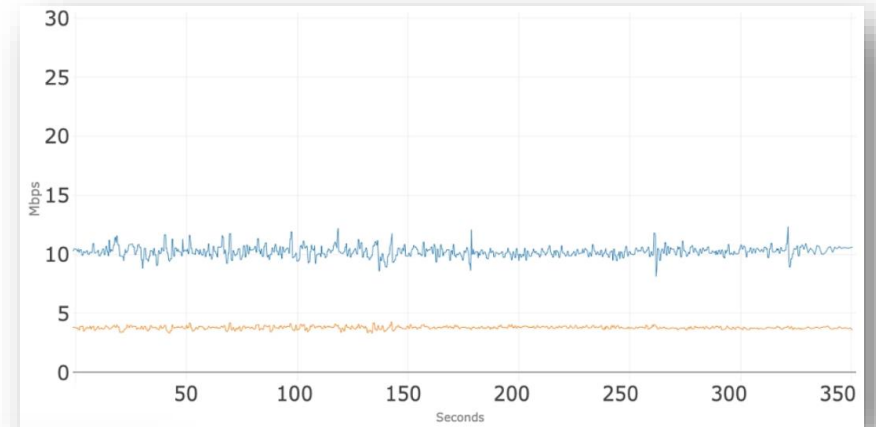
# Work and Learn from Home

*Myth: Only FTTH will support work and learn from home*

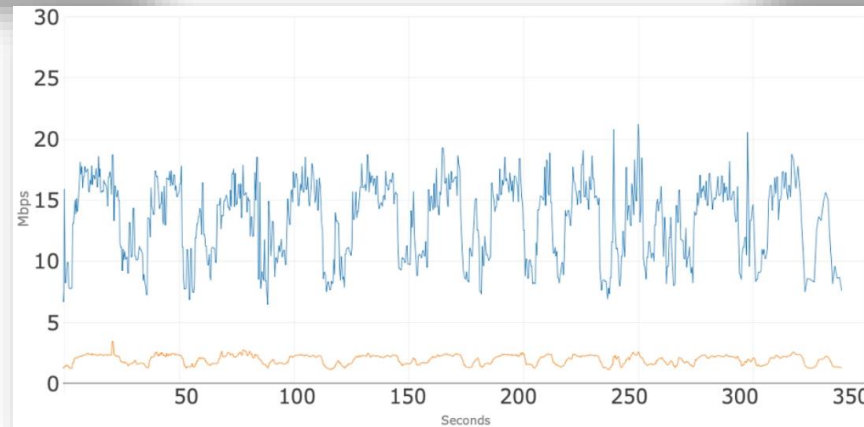


← Downstream bandwidth

← Upstream bandwidth



A recent study measured upstream and downstream rates required for consumption of 10 concurrent sessions of Facetime, Google Meet, and Zoom in a single home



*Cable service tiers provide more than enough bandwidth to support work and learn from home*

# Pace of Upgrade

- Jan 7, 2019: “In just 2 years, the cable industry has made an unparalleled technological leap by increasing availability of 1 gigabit broadband Internet from only 4 percent to 80 percent of U.S. households.” This fast-paced work continues today.

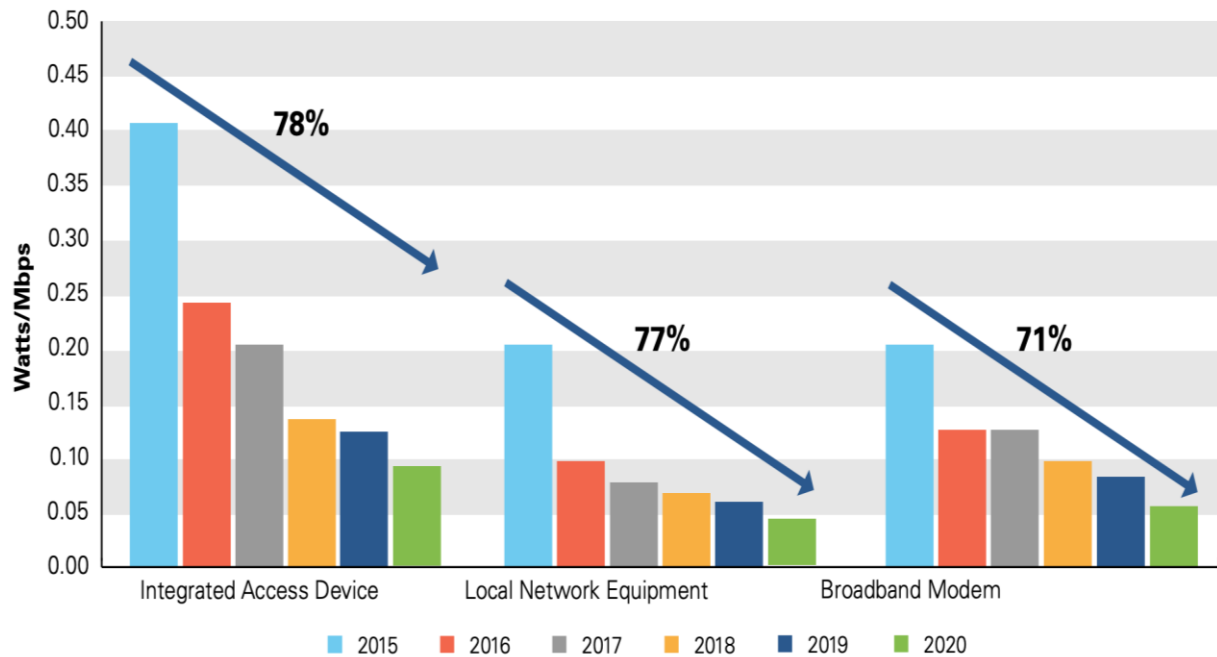


<https://www.cablelabs.com/blog/10g-platform-coming-to-homes-offices-cities-near-you>

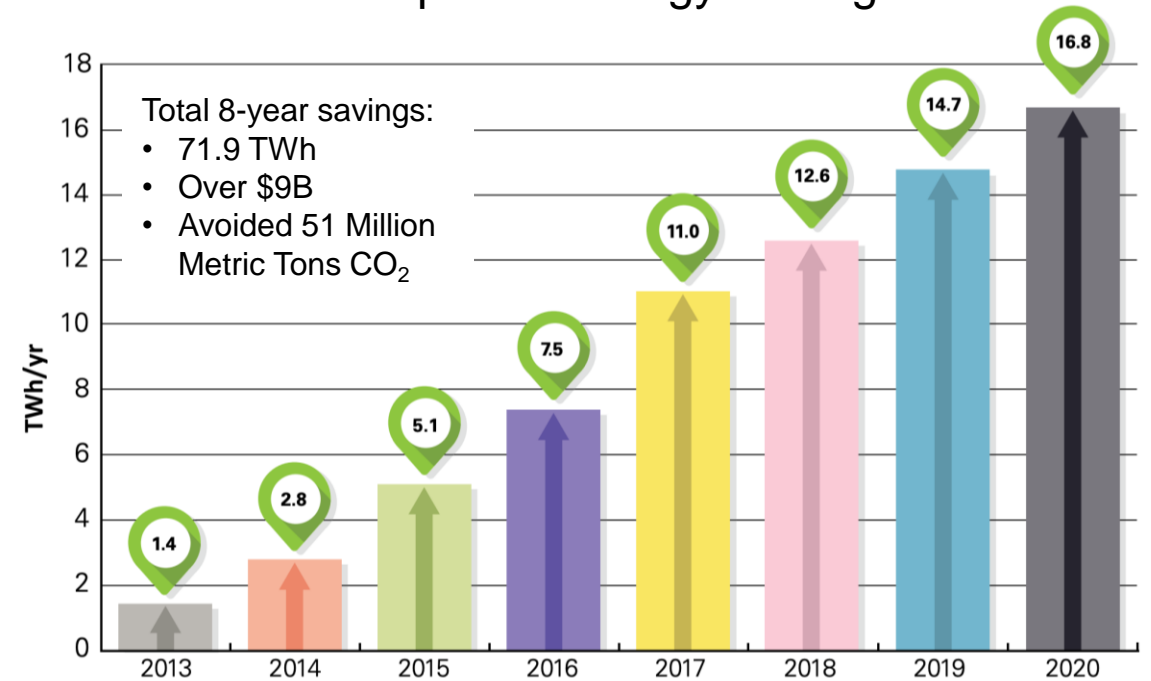


# Energy Efficiency

## Broadband Consumer Premise Equipment



## Set-Top Box: Energy Savings



# Key Policy Implications

- Scalable Technology: The roadmap for cable broadband technology provides the performance consumers want and need well into the future
- Technology Neutrality: Focus should remain on broadband performance rather than the underlying network technologies
- Evolving Performance Requirements:
  - Speed -> Speed + Reliability, Security & Latency

# Invent the Future