Cambium Networks™

A Wireless Fabric Company

5G

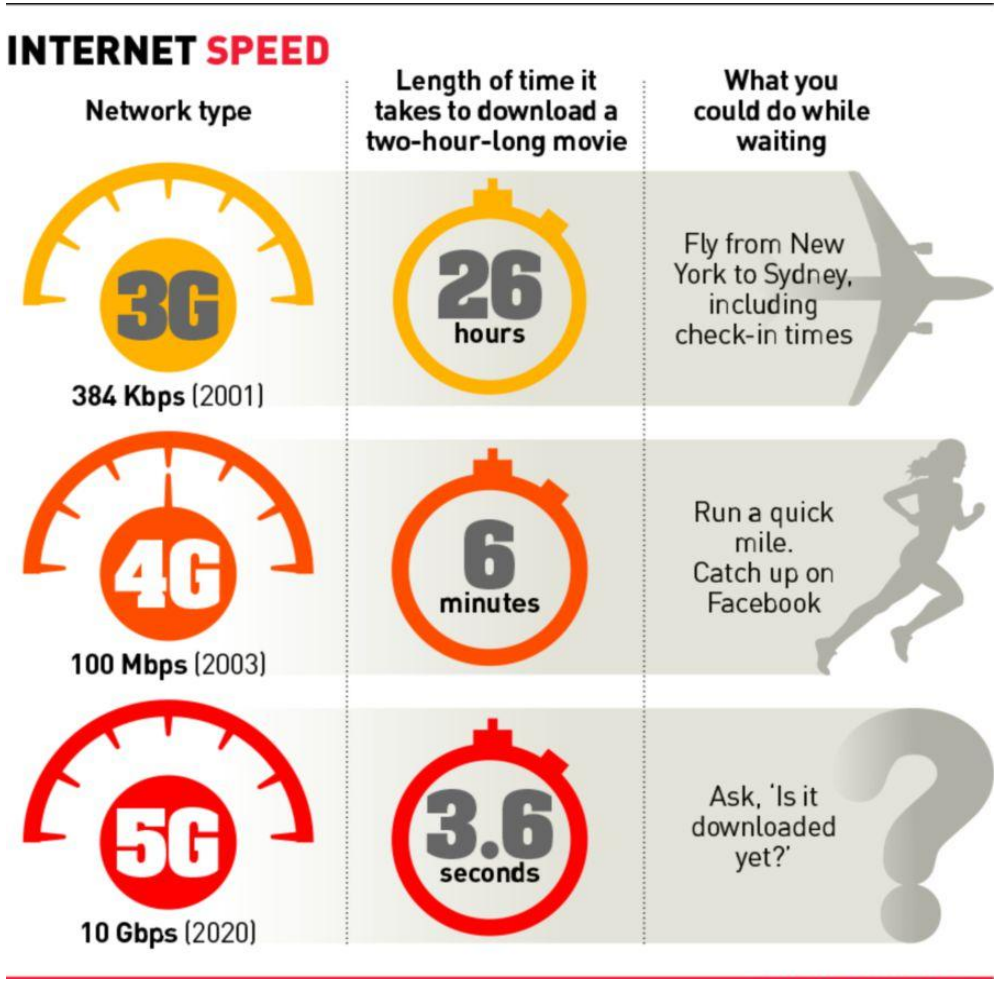
Bharat Sharma

Presales Manager- India & SAARC

5G – the basics

- DL : 10 Gbps
- Latency: 1ms
- Spectrum Efficiency: 30 b/s/Hz

A better way to understand – 5G Speed



Source: NST.com

High-band: Spectrum Frontiers ruling for 5G mmWave

Shared and unlicensed spectrum is key for more bandwidths

Licensed access

- 27.5 - 28.35 GHz: 850 MHz (2x425 MHz)
- 37.6 - 38.6 GHz: 1 GHz (5x200 MHz)
- 38.6 - 40 GHz: 1.4 GHz (7x200 MHz)

Shared and unlicensed access

- 37 - 37.6 GHz: 600 MHz (3x200 MHz)
- 64 - 71 GHz: 7 GHz expansion of existing 60 GHz band

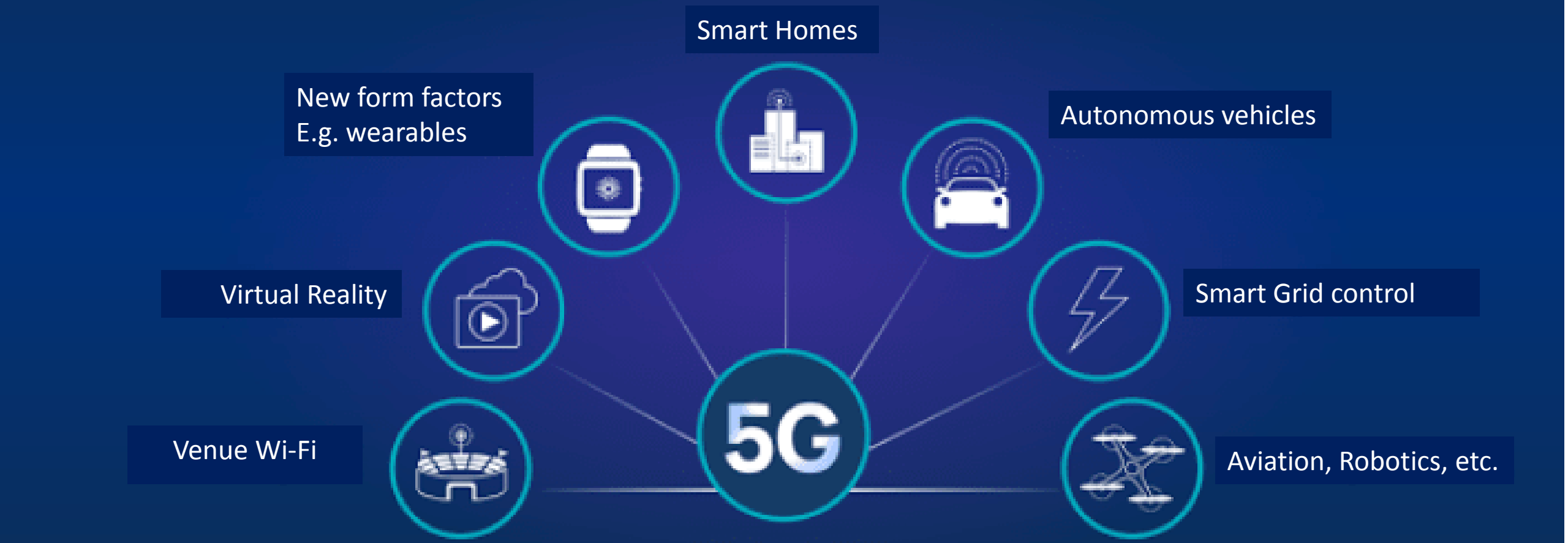
Total spectrum = ~11 GHz

FCC ruling expected in 2017 for additional candidate bands

Including 24.25-24.45, 24.75-25.25, as well as 42-42.5

Source: Qualcomm Dec 2017

5G will enhance existing and expand to new use cases



Source: LTEto5G File Photo

Why should we be excited for 5G ?

- True global consensus on technology. First time ever!
- LTE evolution. Co-exist with 4G LTE
  Wi-Fi revolution (802.11ax). Co-exist with 802.11ac, 802.11n and older standards
- Disrupting while coexistence
- First time ITU is addressing verticals via “Network slicing”
- And Importantly: **Opportunity for India**
  - Take leadership in spectrum and regulatory approval.
  - Demonstrate 5G leadership to the world.
  - China took the jump to define LTE (TDD LTE)

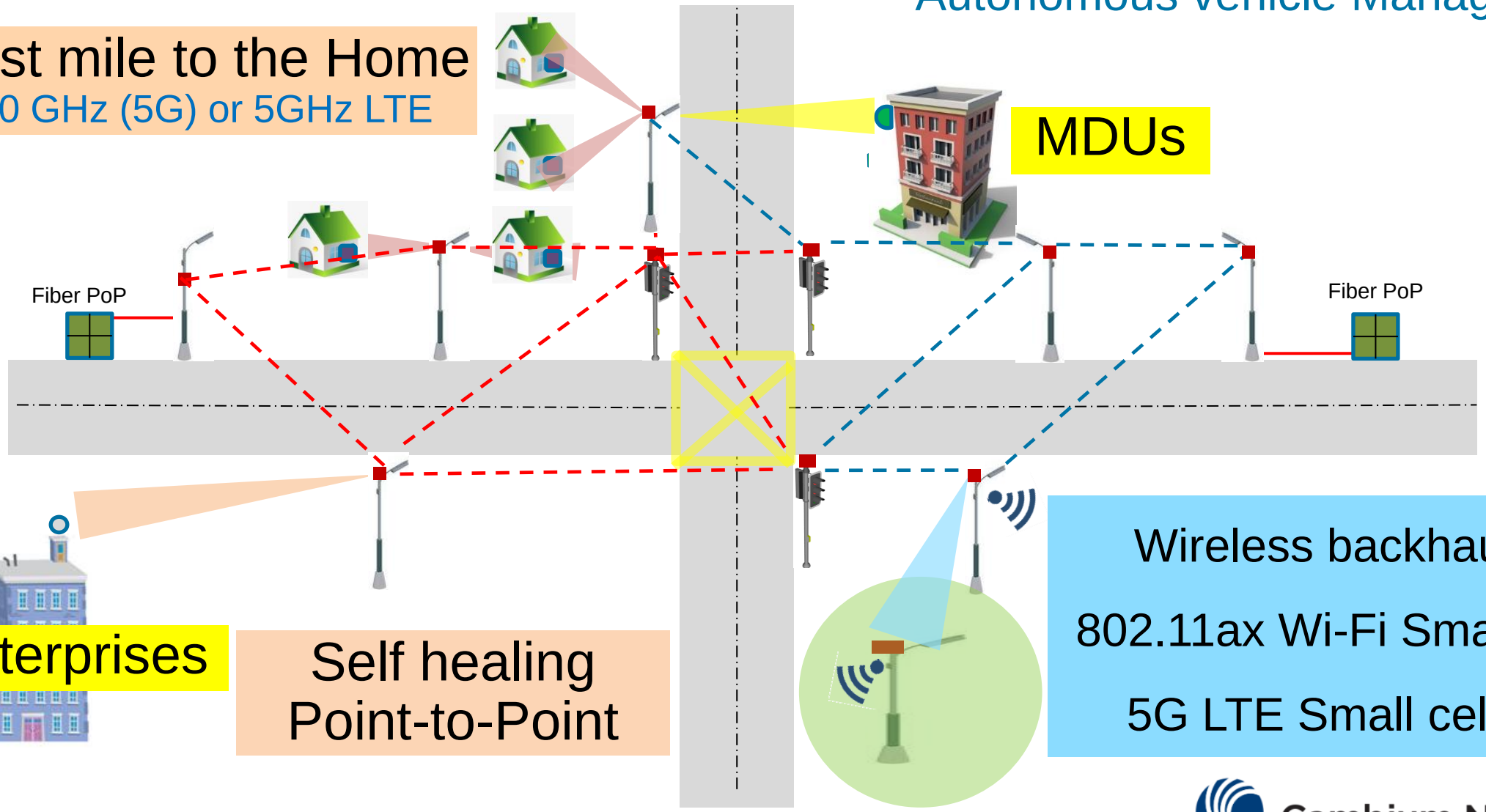
Looking to the 5G future

Security, Traffic, Broadband, IOT

Autonomous vehicle Management

Last mile to the Home

60 GHz (5G) or 5GHz LTE



Cambium Networks™

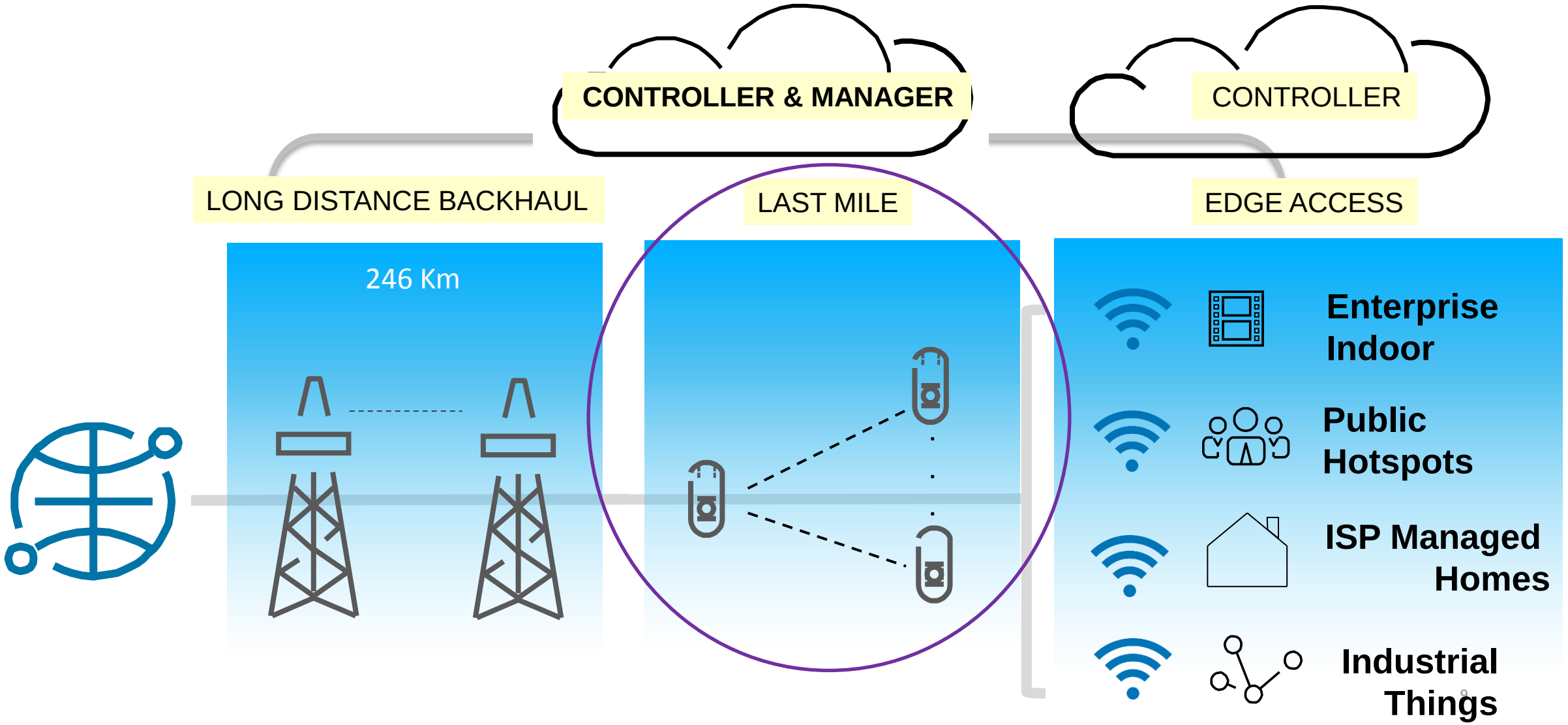
5th generation thoughts:

- 5G needs mm-wave spectrum with high bandwidth to deliver high speed wireless data
  Answer: 28 GHz, 60 GHz, …
- Mm-wave High frequency cell radius is very small.
  Answer: Lots of small cells needed on street furniture
- Question: Can we put fiber to every “small cell”?
  Answer: Bring wireless backhaul into the picture!

  The good news: 5G technology can be adopted for backhaul sooner (No device dependency)

Cambium is building the stepping stones for 5G - TODAY

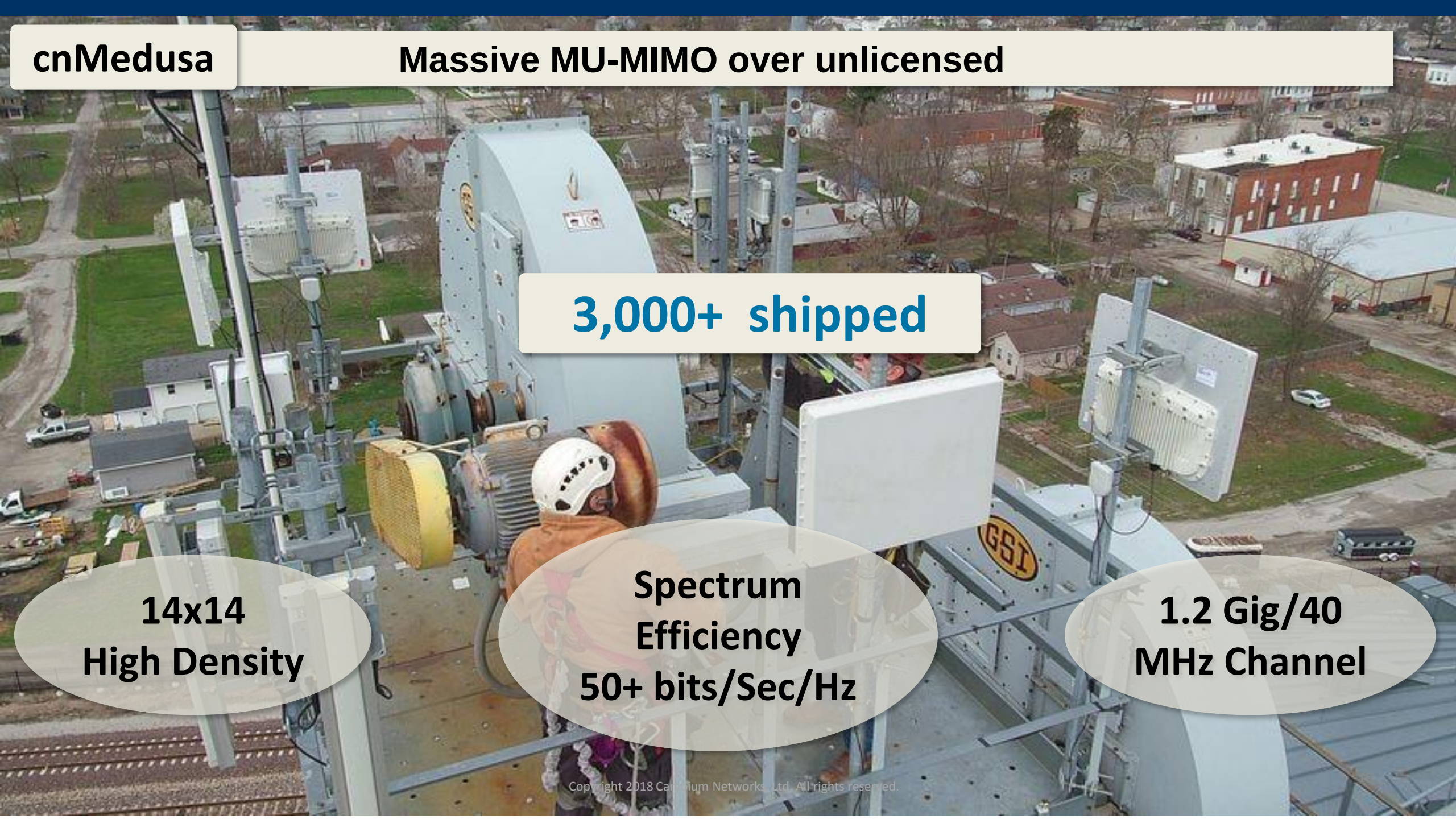
The World's Most Advanced Wireless Fabric



Cambium Networks™

cnMedusa

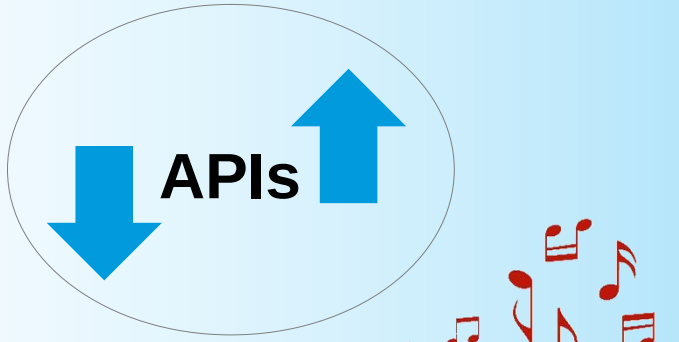
Massive MU-MIMO over unlicensed



FWB – The first to market

- For 5G user experience, mobile devices must go on 5G and must be at a price point that makes economic sense. This is expected to take at least until 2020.
- In the meantime, FWB pt-pt links can be implemented by Manufacturer and one of the most expensive parts of network installation – last mile access can be solved by FWB

The Cambium world of tomorrow

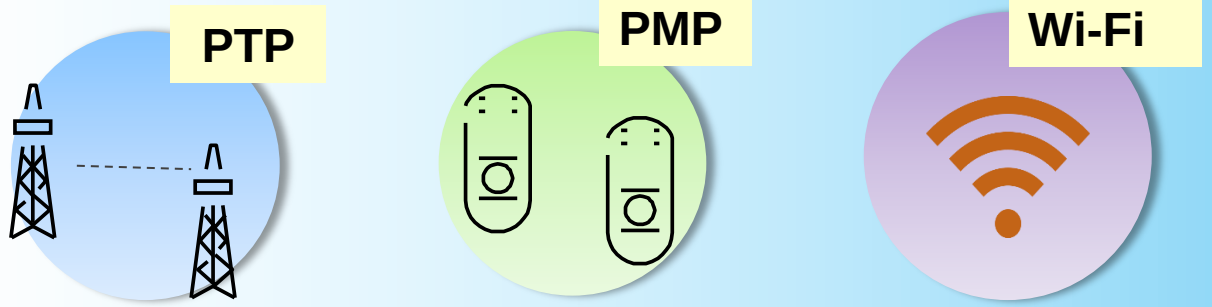


cnMaestro
Controller & Manager

Spectrum Orchestration

Network Tuning - Machine Learning

Vertical APIs: Smart Cities, Security, Highways



5G LTE for backhaul

802.11ax for Wi-Fi

NB-LTE/LORA for Backhaul

Connecting people-

Everest Link
extreme internet

The World's Highest Hotspot

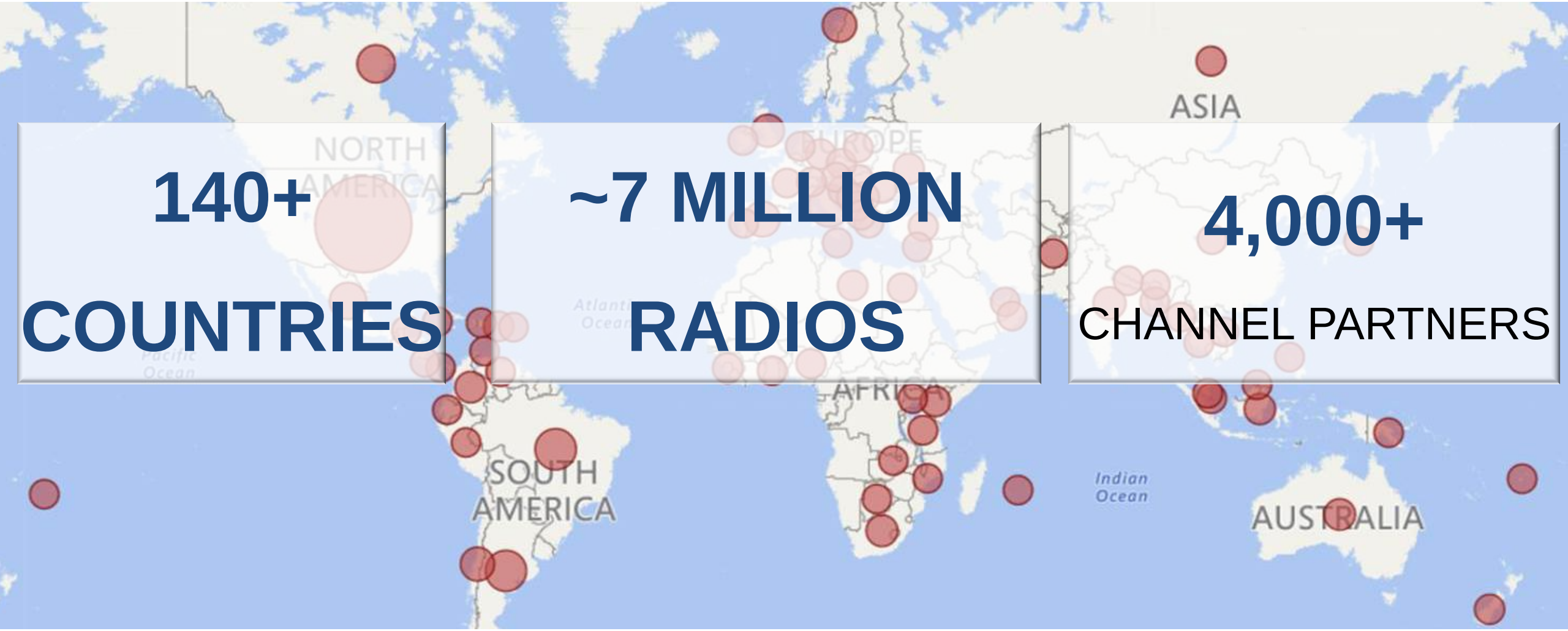
- 1,600 Climbers/1,500 Sherpa's
- 98 Km PTP link + 802.11ac Wi-Fi

Real Connect the unconnected- Transforming a Girls School in Bihar

Before & After

Edge connectivity in villages

Cambium Networks



140+

COUNTRIES

~7 MILLION

RADIOS

4,000+

CHANNEL PARTNERS

cnPilot Frictionless Wi-Fi