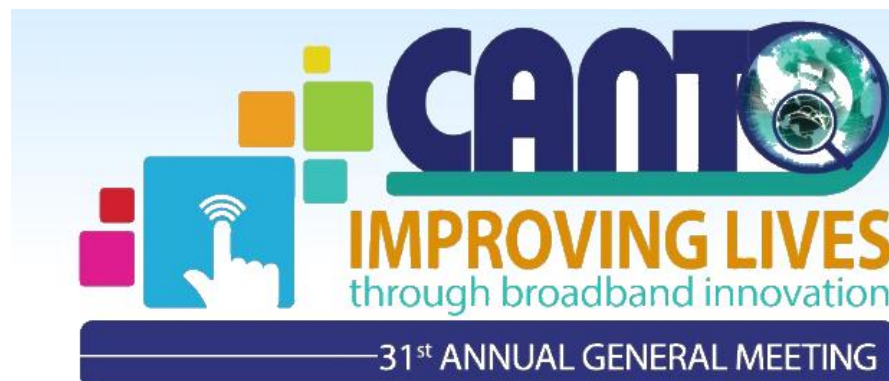


# Cambium Networks – Wireless Broadband Solutions for Service Providers



**Leading Global Provider of:  
Broadband Wireless solutions**



**Cambium Networks**

**Ene 2015**

# Cambium Networks



**Industry leader in Point-to-Multipoint and Point-to-Point IP Wireless Broadband Solutions**

**Products and platforms spanning 900MHz-38GHz**  
**- Free Band**  
**-License Band**

**Uniquely positioned to deliver breakthrough scalability, reliability, and secure outdoor broadband solutions**

**More than 4.5 million nodes shipped to thousands of networks in over 150 countries**

**Global Company with local presence in 25 + countries**

# Our Genesis



+



Point to Multipoint (PMP)  
access networks

+

Point to Point (PTP)  
backhaul infrastructure

=



# Cambium Networks

# Service Providers choose Cambium

## Applications

- Core Network and Spurs
- Cell Site on Wheels (COWS)
- Enterprise & Residential Access
- Near/Non Line of Site Paths
- Licensed and Unlicensed backhaul
- Tower Loading Constraints

## Proven Performance

- Highly Reliable
- Scalability
- High Capacity over Range
- Ease of Deployment
- Near/Non Line of Site Operation
- Interference Tolerance
- Global Homologations
- Proven for Voice, Video & Data





# Cambium's Technology

## Benefits of Fixed Wireless

Fixed wireless is the most cost effective solution for deploying broadband connectivity:

Scalable

Reliable

Outdoor

Performance



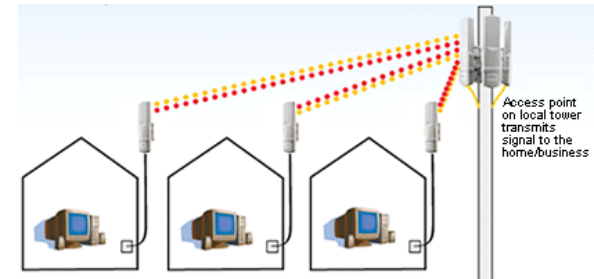
## Point to Point (PTP)

- High-speed wireless data link between two sites
- GigaBit bandwidth links, more than 2 Gbps!



## Point to Multipoint (PMP)

- Last mile access and distribution
- Up to 125 Mbps bandwidth per sector, 1.5 Gbps per tower

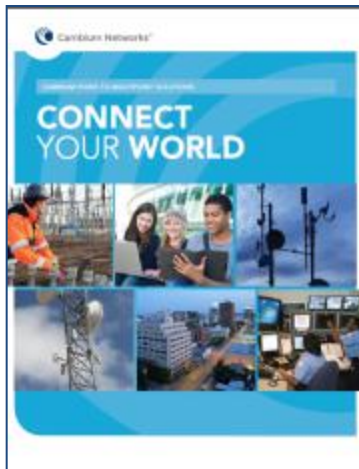




# Cambium Portfolio Overview

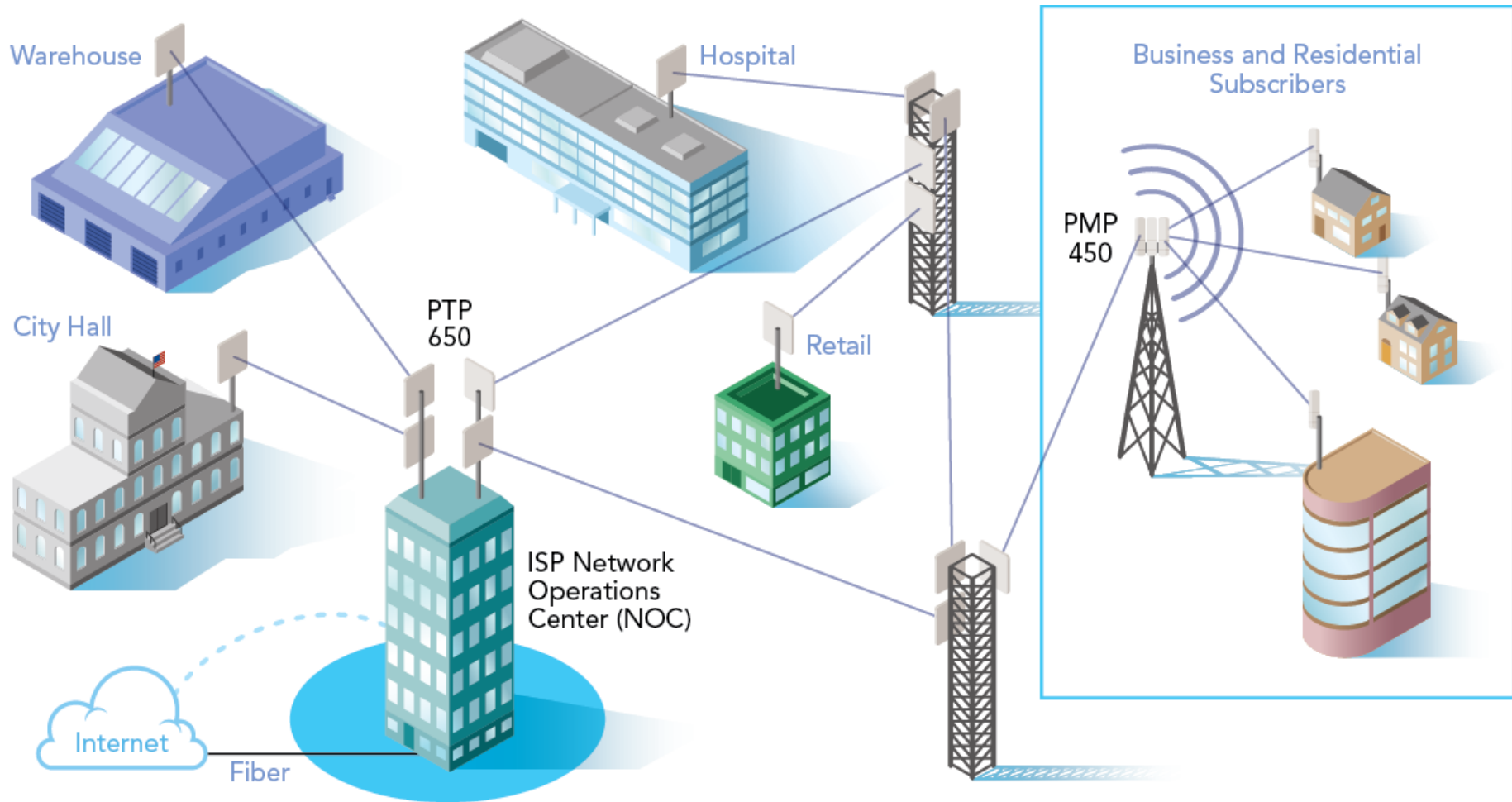
## Proven Fixed Wireless Network Solutions

Product	ePMP	450	650	820
Design Focus	Budget Constrained Residential	Unparalleled Scalability for Multipoint networks	Industry Leading Sub-6GHz Performance	Microwave Backhaul
Throughput	100 Mbps / sector	125 Mbps / sector	450 Mbps	1+ Gbps
Spectrum (GHz)	2.4, 5 GHz	2.4, 3.5, 3.65, 5 GHz	4.9 – 6.0 GHz	6 – 38 GHz



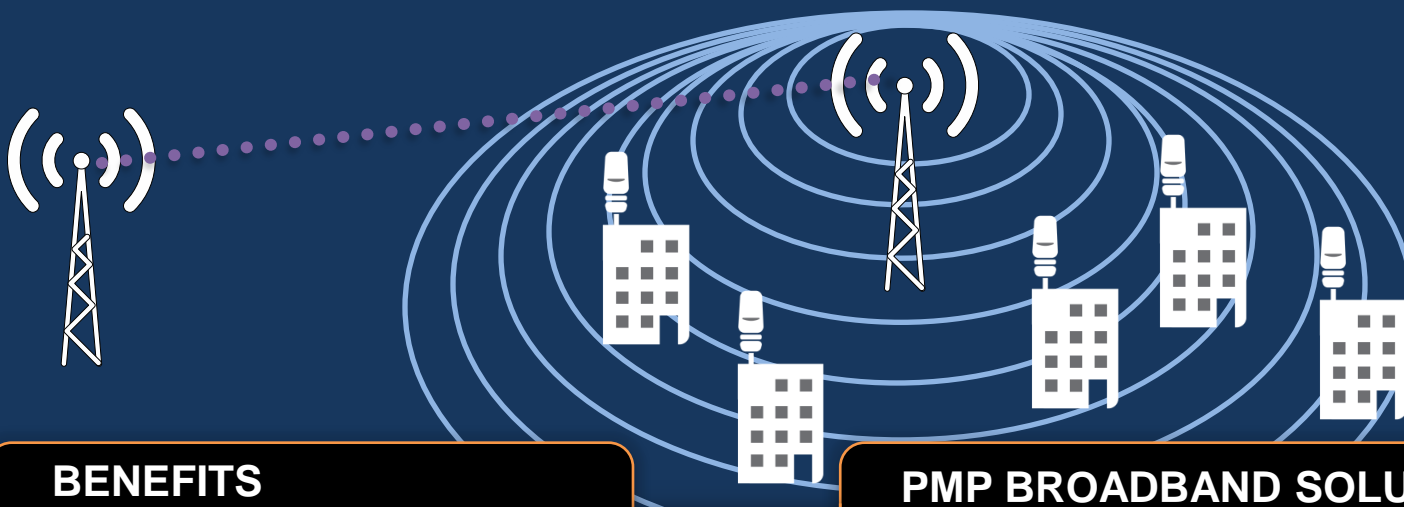
- **Extreme Capacity, Unparalleled Scalability**
- **Low-Cost, Low-Complexity, Low-Maintenance Infrastructure**
- **Scalable from small to region wide deployments**
- **Consistent throughput and low latency**
- **Rapid Deployment**
- **Supports Video, Data, Voice and Control Applications**
- **NLOS, nLOS and LOS performance**

# Internet Service Provider Networks





# Cambium PMP Wireless Access



## BENEFITS

- Consistent coverage across large service areas
- Supports voice, video and symmetrical data
- No trenching, boring, or copper needed
- Can be installed rapidly

## PMP BROADBAND SOLUTIONS

- Multiple solutions meeting all budgets and bandwidth needs
- Incredibly reliable field proven technology
- Can support VoIP, Video and Cloud access
- Can be deployed NOW off your existing towers at a fraction of the cost 3G or 4G!



# Cambium PTP Solutions



## CHALLENGES

- High-capacity dedicated links required for enterprise customers
- Economical backhaul for Wireless Service Providers
- Non-Line-of-Sight paths
- Harsh environments

## CAMBIUM PTP SOLUTIONS

- Spatial diversity and OFDM
- MIMO and intelligent dynamic frequency selection (iDFS)
- Licensed or Unlicensed products
- Ruggedized equipment



# PMP 450 Subscriber Module Tiers



# PMP 450: Subscriber Module Options

## Antenna Options

Integrated Antenna



CLIP (5 GHz only)



Reflector Dish



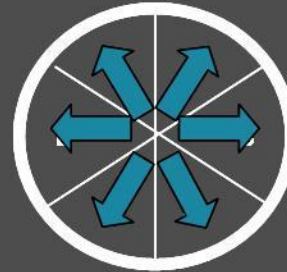
Connectorized SM



# GPS Synchronization

- AP and SM communication is synchronized (all APs and SMs have controlled alternating communication) – reducing self interference
  - All SMs within a network
  - All APs within a cluster
  - All APs on a tower (multiple clusters)
  - All APs on all towers in the network
- Enables channel re-use and easy to deploy multi-sector, multi tower networks (minimal tower separation)
- Use the same number of channels to serve a higher number of users

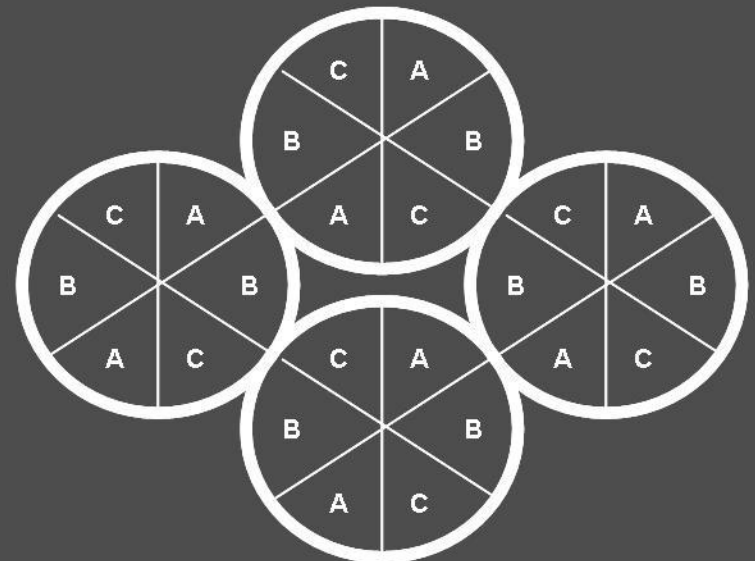
All APs  
transmit at the  
same time



All APs  
receive at the  
same time

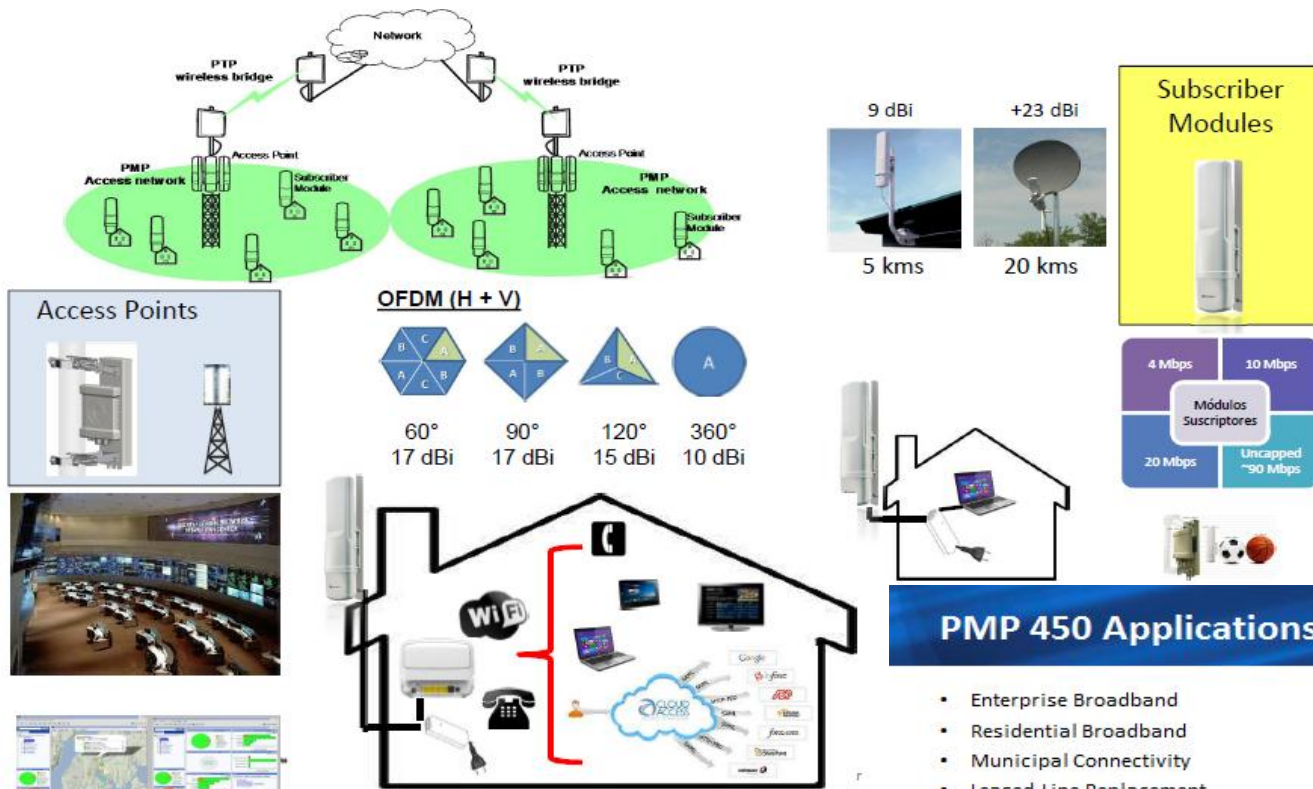


**This Reduces Self Interference  
And Enables Networks to be Co-Located**





# APPLICATIONS



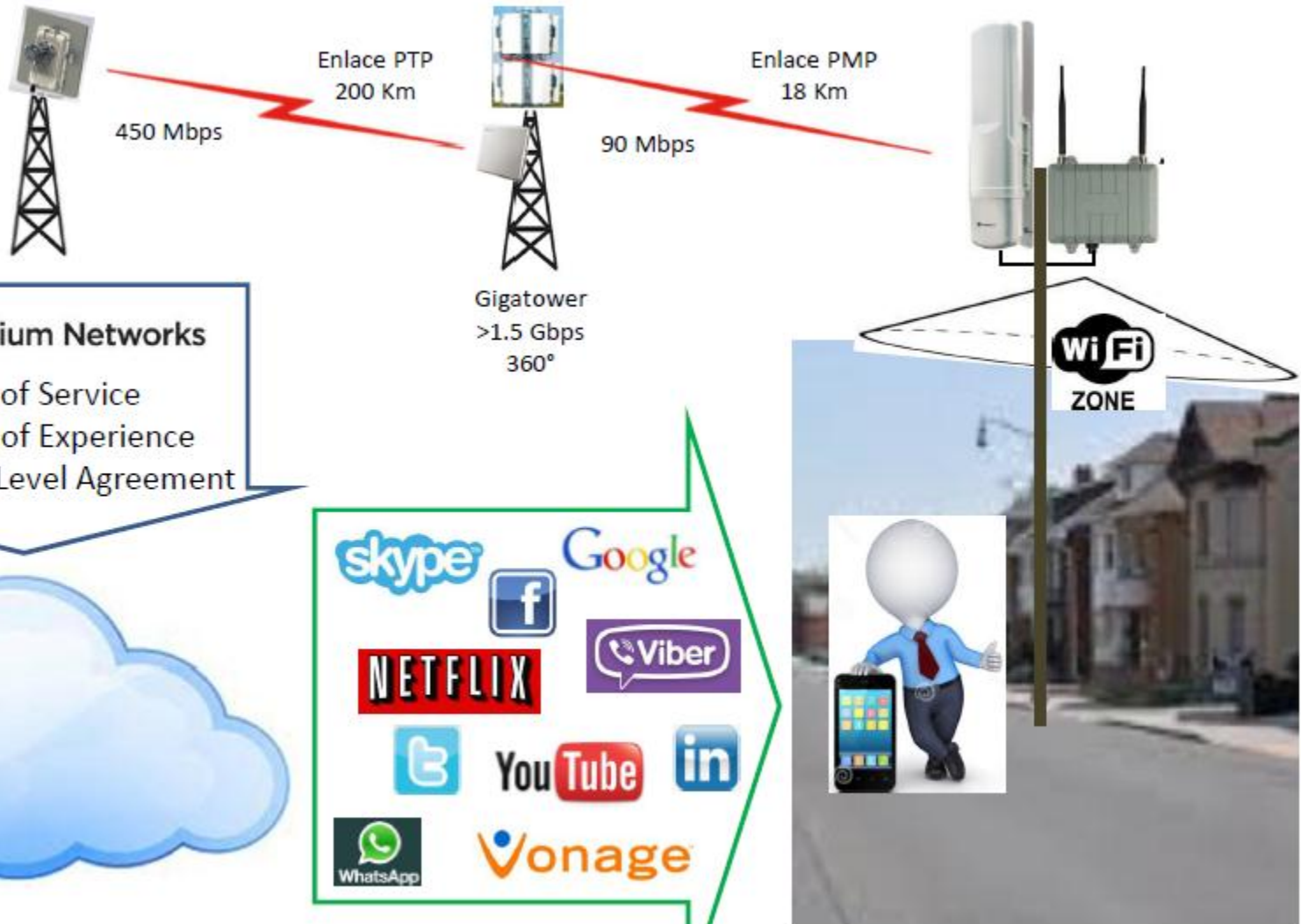
Internet Access  
Voip  
Video  
Data

- Enterprise Broadband
- Residential Broadband
- Municipal Connectivity
- Leased Line Replacement
- Disaster Recovery / Rapid Deployment
- Campus Connectivity
- Video Surveillance
- Near/Non Line of Sight Paths





# APPLICATIONS



# APPLICATIONS



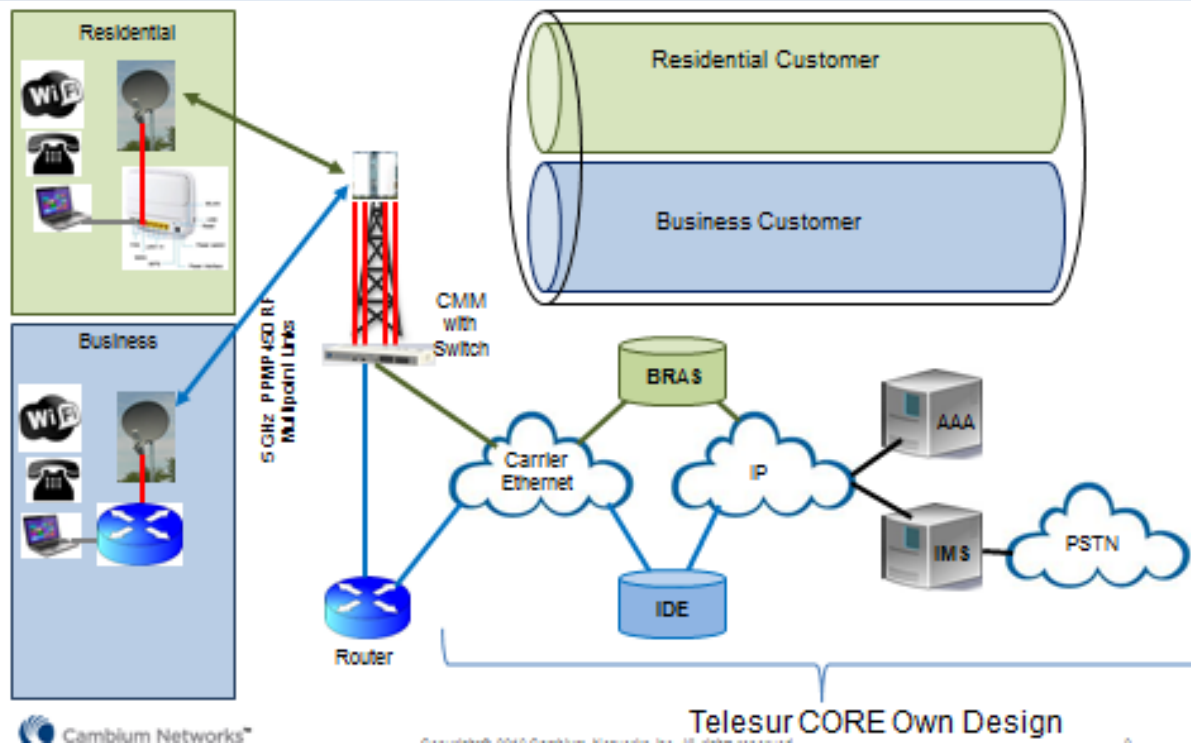
- Consistent coverage across large service areas and long distances
- Supports voice, video, and data
- No trenching, boring, or physical plant work
- Can be installed rapidly

- PMP and PTP product portfolios which meet all budgets and bandwidth needs
- Incredibly reliable field-proven technology
- Can support VoIP, VoD/NVoD, and IPTV
- Can be deployed NOW!

# Services

## Residential and Business Customer

Residential		Business	
Download	Upload	Download	Upload



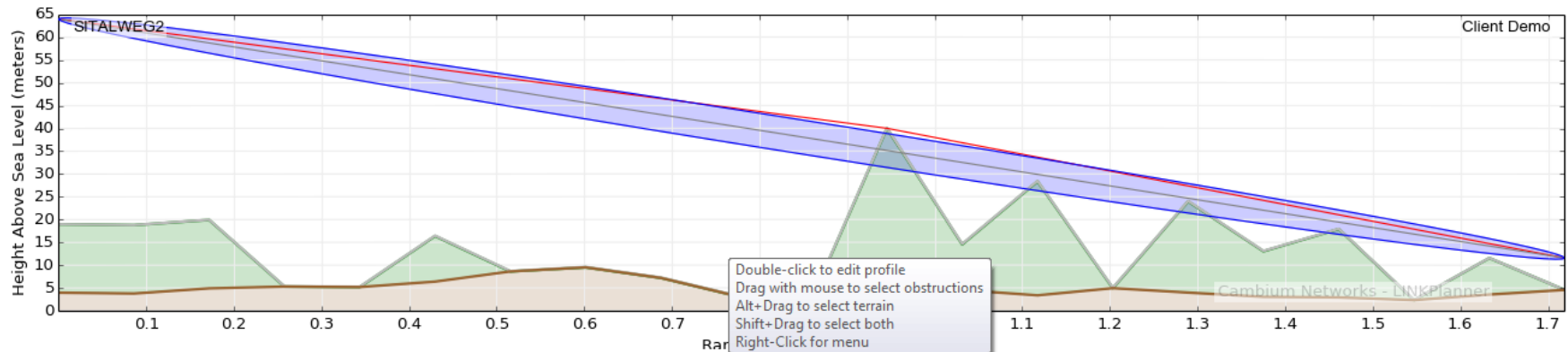
### Customer Bandwidth

# Near and Non Line of sight Performance

## Subscriber Module: Client Demo

Power  
EIRP Power Interference? ☒  
45 dBm 22 dBm -91.0 dBm  
(Max Power is 22 dBm) in 20MHz channel

### Profile: 1.7 kilometers, Non Line-of-Sight



### Performance Summary

#### Performance to AP - SITALWEG2

Predicted Receive Power : -74 dBm  $\pm$  12  
Max Usable Mode : x2 (QPSK MIMO)

#### Link Summary

Free Space Path Loss : 112.11 dB  
Gaseous Absorption Loss : 0.02 dB  
Excess Path Loss : 23.15 dB  
Total Path Loss : 135.28 dB

#### Performance to SM - Client Demo

Predicted Receive Power : -74 dBm  $\pm$  12  
Max Usable Mode : x2 (QPSK MIMO)

### Performance Details

#### Common details

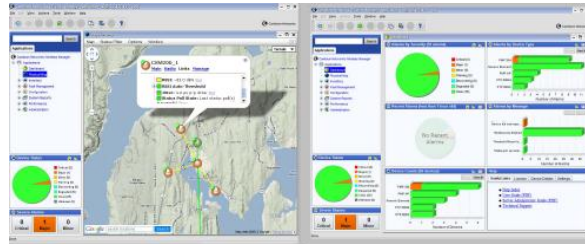
Mode: 256QAM 64QAM 16QAM QPSK QPSK  
MIMO/SISO: MIMO MIMO MIMO MIMO SISO  
Multiplier: x8 x6 x4 x2 x1

#### Performance to Access Point

# Management Wireless Manager

## SNMPv2 MIBs

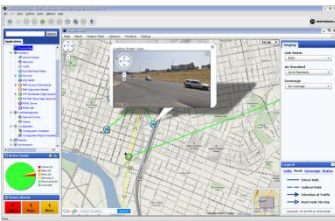
Fault Mgmt.  
Tecnología  
Google Maps



## CUSTOMIZABLE

- Relevant Information
- Defined time intervals and
- Analysis (metric and graph)

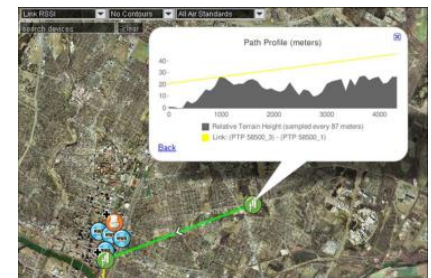
## STREET VIEW



## REPORTS

- Select reports
- Import / Export Reports
- Formats Cambium Site

## PROFILES



## INDICATORS

- Network Status conditions
- State Elements

## EVENTS

- Distinguishes events
- Denotes "above the line"
- Sort according to Sequence

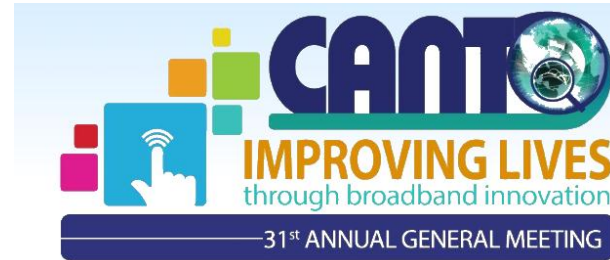


## DEVICES

- Information
- Network Levels







# Cambium Networks

# Thank You