

# Microwave Solutions for Backhaul Problems



Bill Paulsen  
DragonWave Inc  
[bpaulsen@dragonwaveinc.com](mailto:bpaulsen@dragonwaveinc.com)  
[www.dragonwaveinc.com](http://www.dragonwaveinc.com)



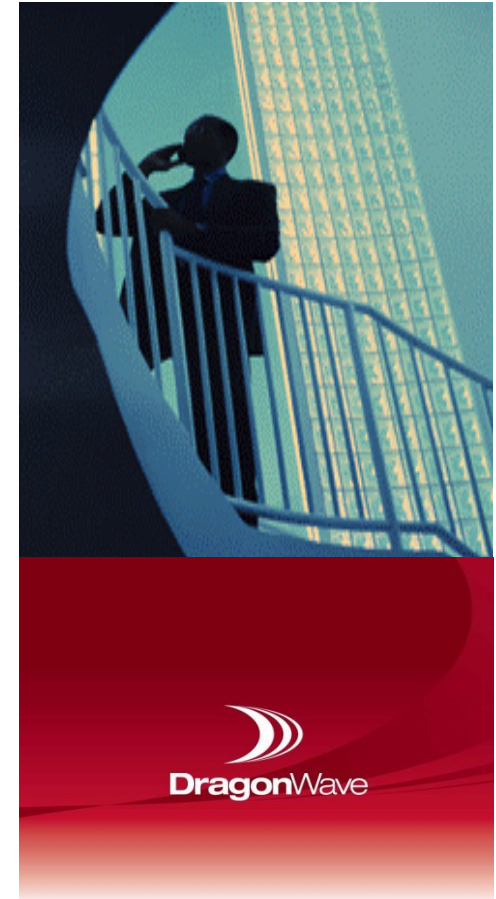
**DragonWave**

Wireless Broadband Ethernet



## DragonWave Fast Facts

- **Headquartered in Ottawa, Canada**
  - Founded in 2000
  - Office in US, UK, France, Germany, Asia and Dubai
- **Public company**
  - Traded on the TSX (Ticker: DWI)
- **Revenue**
  - FY09: \$43.3M
  - FY10: \$120M (projected)
- **Example DW Customers**
  - Clearwire, Bell Canada, Wind Mobile (Globalive)
  - Barrett, Wiband, Metrobridge, City of Edmonton





# Backhaul Challenge

## Capacity

- How do you deliver >10 Mbps near-term, growing to 100's Mbps

## Total Cost of Ownership

- Low Initial Cost
- Low 10-year costs
  - Minimize Site Lease Costs
  - Minimize recurring fiber costs

## Service Availability

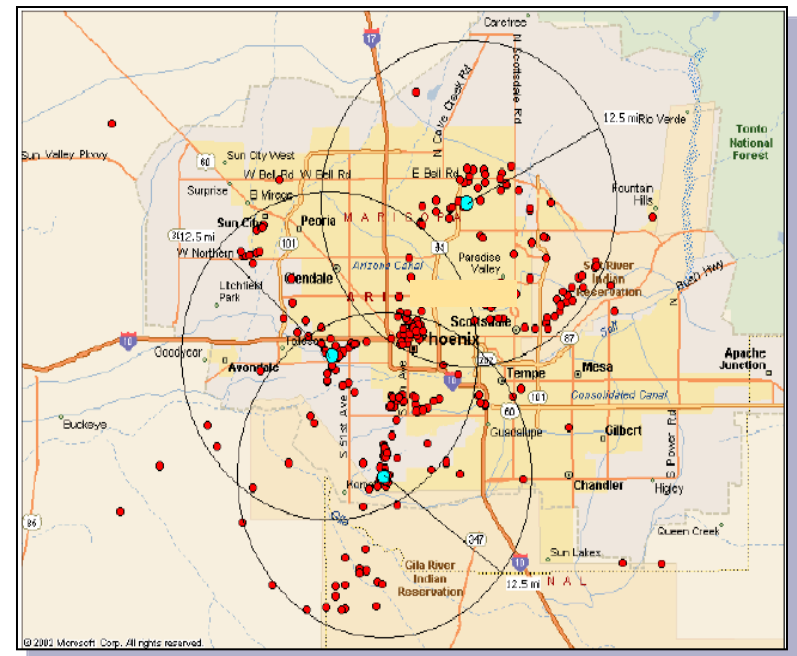
- 99.999%, low latency, 50 ms switching

## Mixed Services

- Revenue generation from traditional and NG Ethernet services

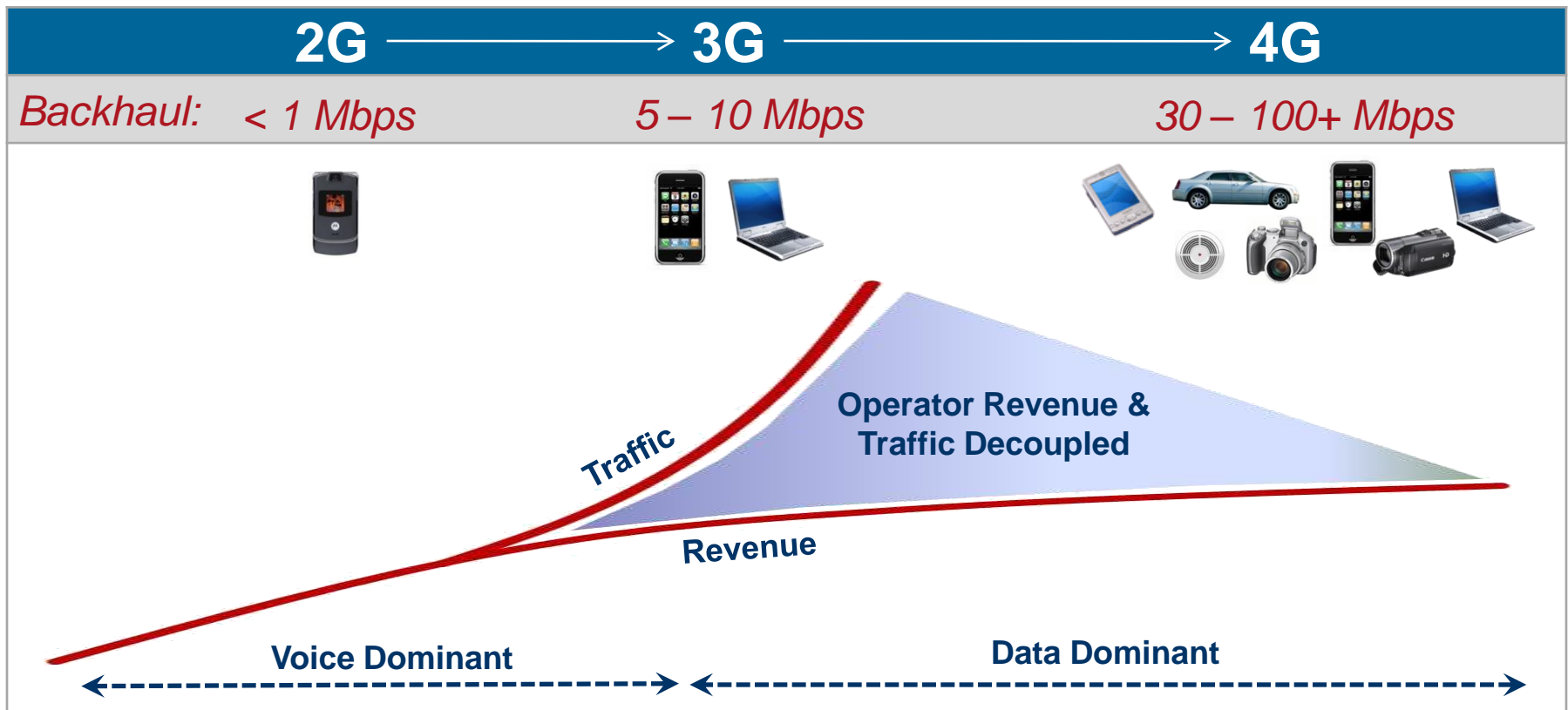
## Deployable

- Simple Installation
- Minimal Zoning and Site Acquisition





# Network Traffic Evolution



*As the gap between network traffic and service revenue widens, operators are moving to more cost effective backhaul solutions.*



## Capacity - Wireless Backhaul Alternatives

- › **Unlicensed 2.4/5.4/5.8GHz**
  - Low cost, rapid deployment, no IC licensing fees
  - Increased throughput = lower fade margin = more susceptible to interference
- › **60GHz UL & 80GHz Licensed**
  - High capacity 100Mbps & 1000Mbps
  - Unlicensed but minimal chance of interference
  - Limited Reach
- › **Licensed MW (24GHz UL)**
  - High capacity 10Mbps to 4Gbps
  - Equipment similar price at high capacity 5.4/5.8GHz
  - Barrier of entry in Canada is spectrum costs
    - 10X the cost of the FCC

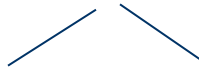
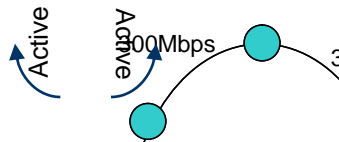
No one technology fits everywhere for every application



# Solving Capacity Challenges via Ethernet Network Gains

Ring

Hub & Spoke



	Ring	Hub & Spoke
Number of Remote Sites	5	5
Number of Links	6	7
Number of sites with HW protection	100%	40%
Average site throughput	240Mbps	100Mbps

- Ethernet rings allow transmission on both the working and protection channel (2X capacity gain)
- Community of interest for oversubscription greatly increases (2X capacity gain)



# Total Cost of Ownership

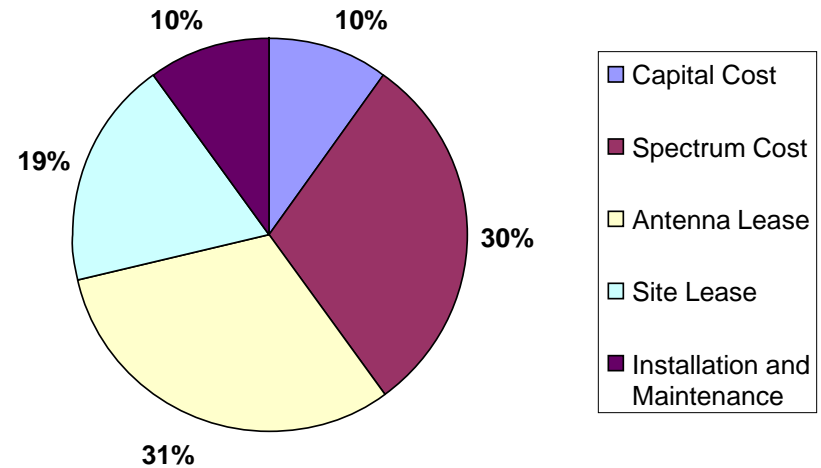
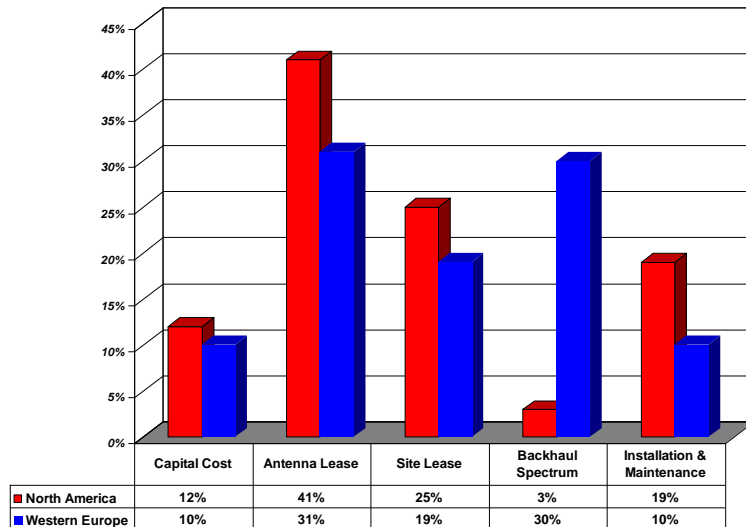
**Total Cost of Ownership is the key metric that matters to an operator:**

- CAPEX is < 15%
- Spectrum/Indoor Lease/Antenna Costs ~ 70%

**The key TCO elements vary by country:**

10 Year TCO

10 year Total Cost of Ownership



**Total Cost Challenge lies not in CAPEX, but in Spectrum, fiber and Leasing Costs.**



# Ways to reduce TCO

## › Reduce Antenna Size

- › Use Higher Power System
- › Use adaptive Modulation to improve availability
- › Deploy Ring to introduce Shorter Paths

## › Use all outdoor Microwave System

## › Put all equipment outdoors

- › Microwave, TDM, Switch, Batteries, Rectifiers



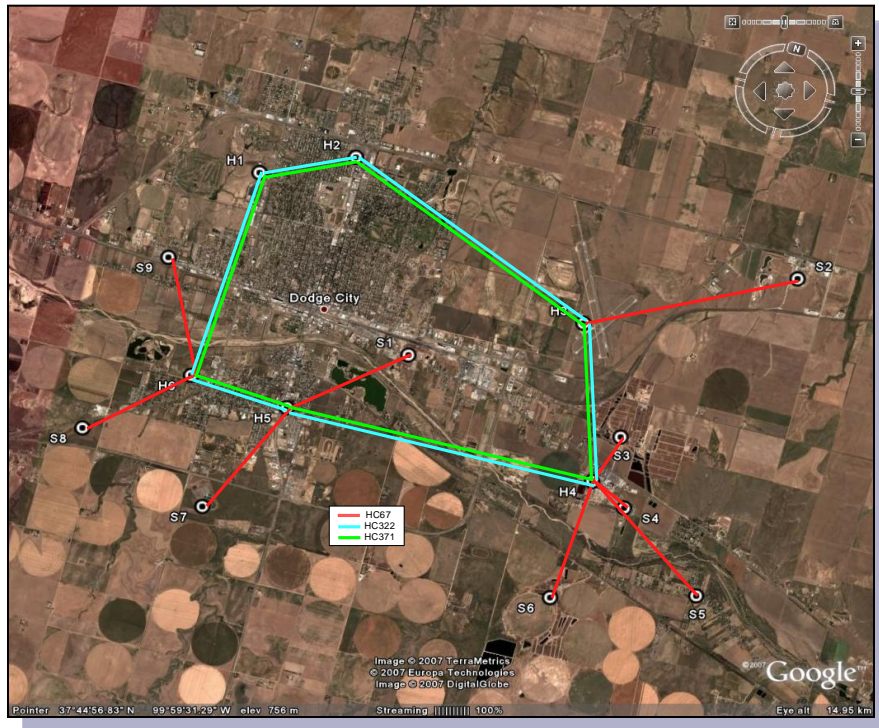
## › Minimize Fiber Costs

- › Use rings to provided extended coverage from a Fiber POP

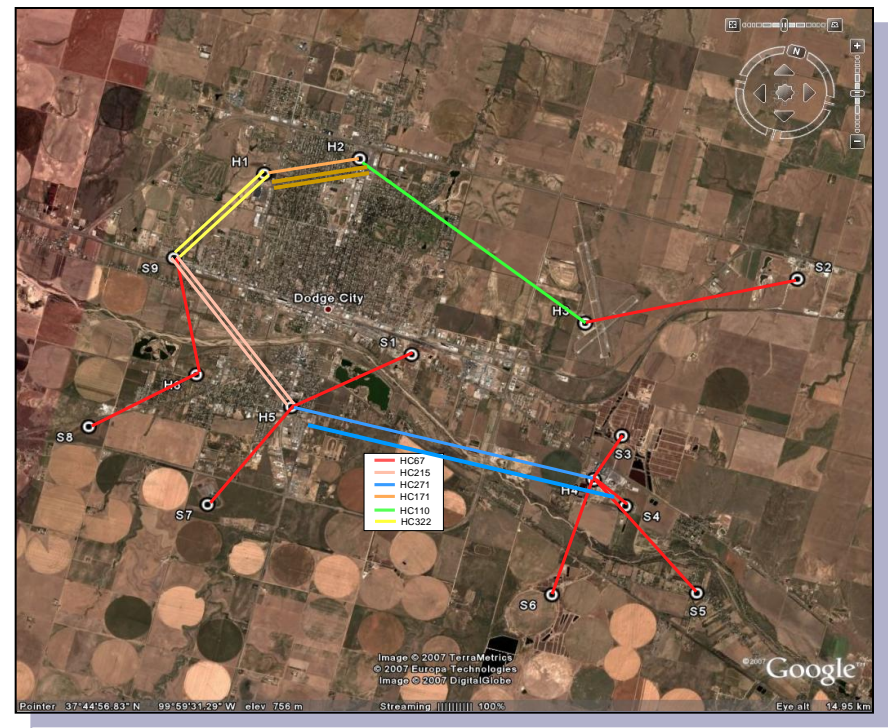


# Availability Gains

## Mesh/Ring Backhaul



## Traditional Daisy-Chain Backhaul



Initial Capacity – Initial 50 Mbps FD, future 100 Mbps FD



# Availability Gain Example

## Subnet KPIs

- Site capacity
  - 50 Mbps FD CIR initial
  - 100 Mbps FD CIR future
- Sub-Circuit
  - Cluster of 1 Fiber POP and 14 end sites
- Ring Design has equal or smaller antenna size distribution

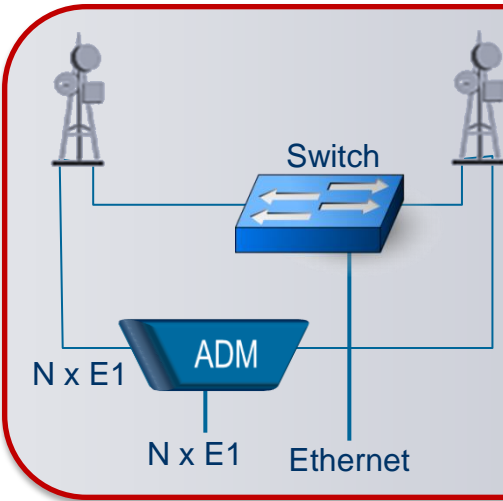
## Availability Comparison

	Ring	Hub & Spoke
S1	99.992%	99.989%
S2	99.992%	99.982%
S3	99.992%	99.983%
S4	99.992%	99.983%
S5	99.992%	99.983%
S6	99.992%	99.983%
S7	99.992%	99.989%
S8	99.992%	99.984%
S9	99.992%	99.997%
H2	99.997%	99.997%
H3	99.997%	99.990%
H4	99.997%	99.991%
H5	99.997%	99.997%
H6	99.997%	99.989%
<b>Average Site Availability</b>	<b>99.994%</b>	<b>99.988%</b>



# Addressing Mixed Services

**Parallel  
TDM &  
Ethernet**

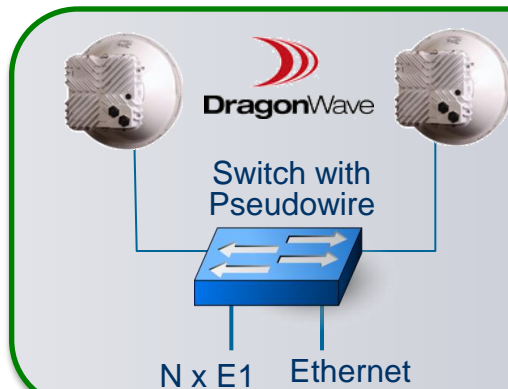


- **Operational Complexity**
  - Grooming, redundancy
  - Fixed capacity for TDM
- **Management complexity**
  - Protocol conversions at handoffs
- **Higher Network Cost**
  - Additional cabling & equipment

**Expensive  
& Complex**

**Vs.**

**Single  
Converged  
Layer**



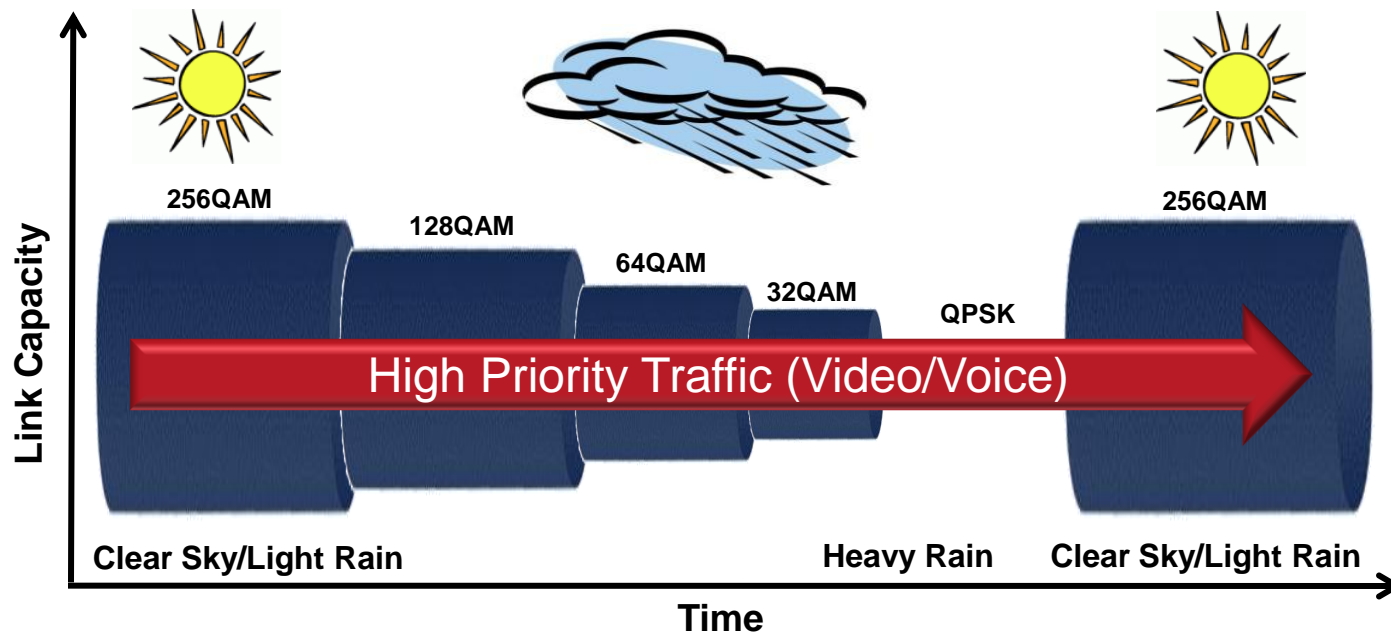
- **Operational Simplicity**
  - Single Network
- **Forecast Tolerant**
  - Core independent of traffic mix
  - Compatible with network evolution
- **Lower Network cost**
  - Slightly higher cost at edge

**Easy to  
Manage &  
Cost  
Effective**



# Removing Deployment Hurdles

## Automatic Adaptive Modulation (AAM)



*A network with AAM will typically only shift down from its highest link capacity or modulation scheme for a few hours per year.*

- Maintains high throughput during regular conditions
- Automatically shifts to intermediate modulation during rain or multi-path fade
- Hitless
- Highest priority services are maintained by Horizon Priority Queuing



## Summary

- › **Capacity**
  - Don't just think equipment... think network!
- › **Total Cost of Ownership**
  - Figure out what your biggest cost is and address it
- › **Service Availability**
  - Think 99.999%
- › **Mixed Services**
  - One network doesn't mean one service
- › **Deployable**

...one last quick topic



## How do I get a licensed link in Canada

- › **Set-up an account on Spectrum Direct**
- › **Submit a letter of intent to Industry Canada**
- › **Perform a path engineering study**
  - Determine frequency band (6/7/8/11/15/18/23/38GHz)
  - Determine a interference free channel
    - Send coordination letters
- › **Complete the application online**
  - <http://sd.ic.gc.ca/>



# What Frequencies are available?

- › **6/7/8GHz**
  - Typically used for long rural links (40-70km)
  - Requires minimum of 6' antennas
- › **11GHz**
  - Typically used for long rural links (30-50km)
  - Requires minimum of 4' antennas
- › **15GHz**
  - Typically used for long rural links (10-40km)
  - Requires minimum of 2' antennas
- › **18GHz**
  - Typically used for long links (10-40km)
  - Requires minimum of 2' antennas
- › **23GHz**
  - Typically used in metro areas (2-15km)
- › **24GHz Unlicensed**
  - Low-Interference unlicensed band
  - Good for link < 10km
- › **38GHz Area License**
  - Typically used in metro areas (1-5km)



## Fees and Timing

- › **Generally takes 4-6 weeks for the entire process**
- › **One license is granted per pt-to-pt license**
- › **Industry Canada charges are based on the over the air bandwidth rates**
  - 10 – 50 Mbps approximately \$850/year (per link)
  - 50 – 100 Mbps approximately \$1,500/year (per link)
  - 100 – 200 Mbps approximately \$2,700/year (per link)
- › **Interesting area to save money**
  - 38GHz - \$200 per link independent of capacity
  - Vertical and Horizontal polarization (V – 100% H -50%)
  - Horizon Quantum



## Introducing Horizon Quantum

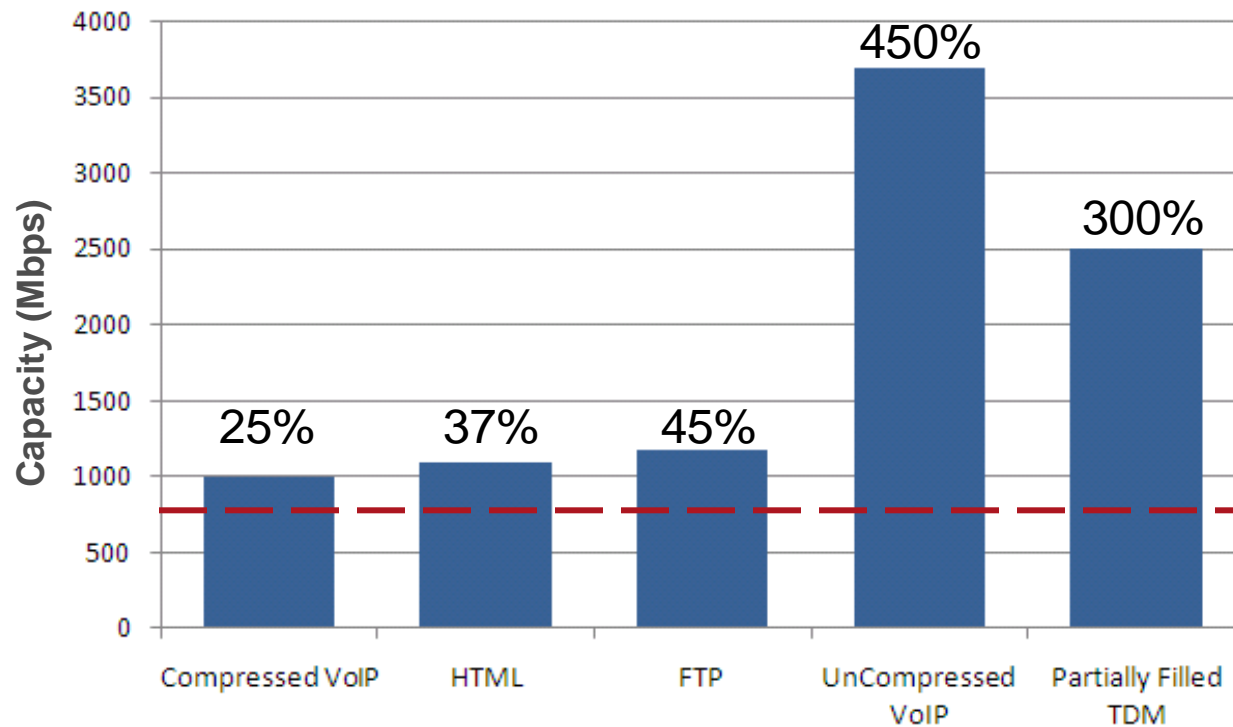
- **Taking Packet Microwave to a new level**
  - **Capacity** – up to 4 Gbps per link
    - 2 Gbps in Single XPOL 50 MHz Channel
    - 1 Gbps in single 50 MHz Channel
  - **Integration** – smallest footprint IDU and Radio
  - **Networking** – flexible synchronization
  - **Nodal Intelligence** – integrated switching

**The power to transform  
your network**





# Bandwidth Accelerator Performance



Industry  
Canada Fees

**Bandwidth Accelerator can provide more than 4 X capacity improvements without 4X the IC fees**



# THANK YOU

Bill Paulsen

[bpaulsen@DragonWaveinc.com](mailto:bpaulsen@DragonWaveinc.com)

613-599-9991 ext 2243