Introduction to DragonWave's Next Generation Microwave Solutions: Harmony Enhanced & Harmony Enhanced MC

BUILDING BETTER BACKHAUL
EVERYWHERE

DragonWave Profile

- Canadian company headquartered in Ottawa
  - Founded in 2000
  - 200 employees globally, 50% in R&D
  - History of “industry-first” technologies
- Publicly Traded on TSX & NASDAQ
- 24x7 global support center in Ottawa
- 25% market share in NA
- Established global customer base - Hundreds of carrier, enterprise and government customers

Packet Radios

Horizon Compact+
6-60 GHz

Horizon Quantum
6-38 GHz

Harmony Enhanced
6-42 GHz

Harmony Enhanced MC
6-42 GHz

Harmony E-Band
70/80 GHz

Hybrid / Switch

Hub 800 & First Mile 200
Hybrid / Full-packet / Dual Traffic

Small Cell

Avenue /Harmony Lite
Microcellular Backhaul
Sub-6 GHz

Avenue Link
Microcellular Backhaul
24-60 GHz

Long Haul

Harmony Trunk
Trunking Radio

Harmony Trunk-C
All-outdoor Trunking Radio

NetViewer Network Management

Harmony Enhanced

Harmony Enhanced^{MC}

Harmony Enhanced Brings Differentiated Value

Industry leading output power and system gain

Driving more capacity and spectral efficiency per wireless link

Simplifying installation and management

Capital and operational cost impacts

Evaluating a Next Generation Microwave Solution

Leading output power and system gain

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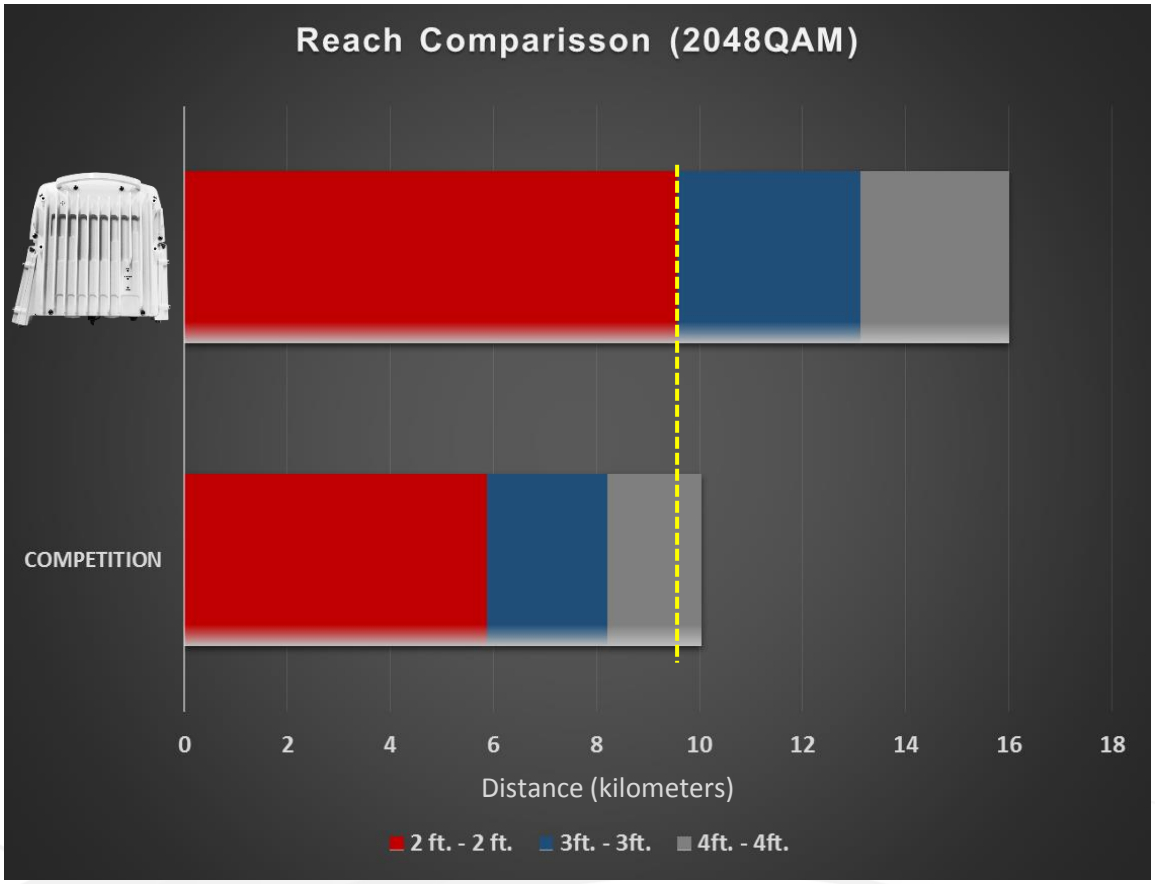
Highest Power All-Outdoor Radio

Competing all-outdoor radios	21-27dBm
Harmony Enhanced & Enhanced^{MC}	**31-34dBm**

- Longer paths
- Smaller dishes
- Improved link availability
- Reduced site leasing cost

High Power - Impact on Reach & Dish Size



- Higher transmit power allows for 50% reduction in dish size: 4’ down to 2’ in this example
- Dish capital + shipping savings
- Reduced tower load
- Significant ongoing operational & site leasing savings

Assumptions:

- 11GHz, 40MHz channels
- 99.995% availability

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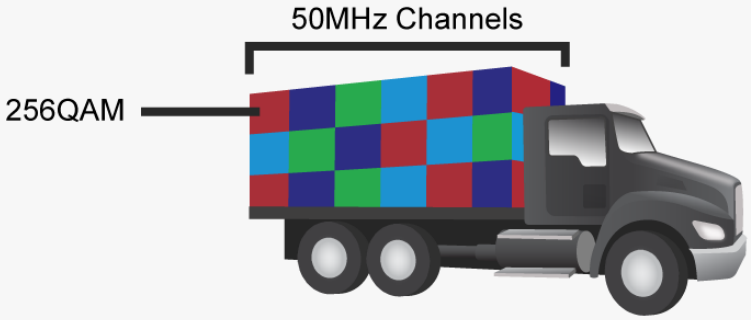
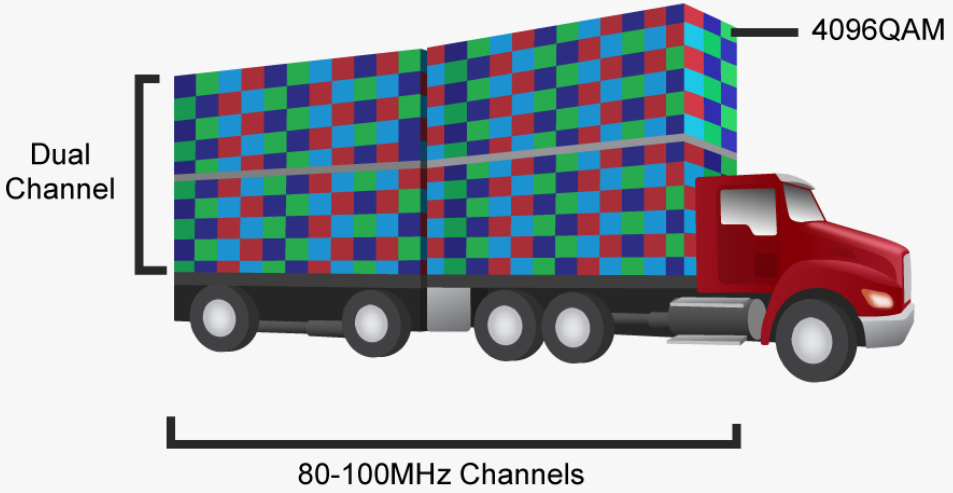
Higher Modulations and Wider Channels

Previous Generation Microwave



- 256QAM modulating support
- Narrow channels
- Single channel per radio

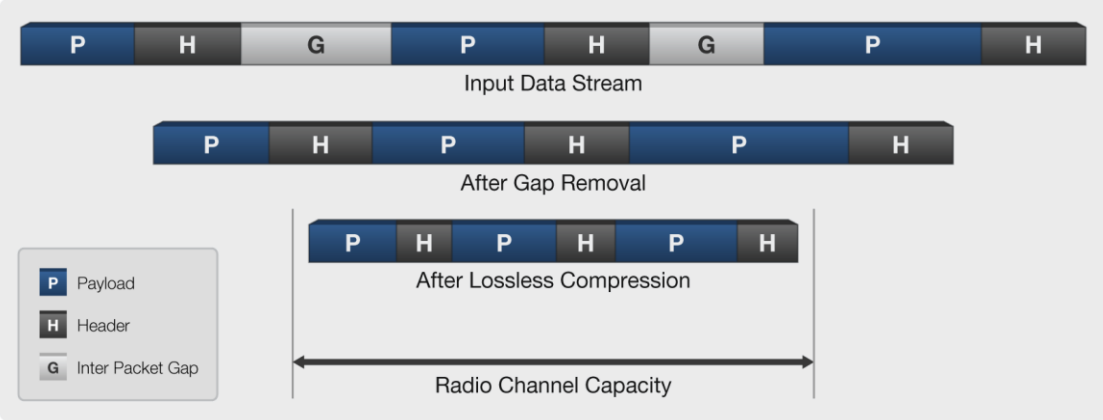
Today



- 4096QAM
- Wide channels (up to 100MHz)
- Multi-channel system

Increasing Spectral Efficiency

Payload Compression: Typical compression gain of 30-40%



Microwave Capacity Evolution

MIMO	▪ Multiple-input multiple-output technology ▪ Requires second set of radios & dishes	8 Gbps
2+0	▪ Dual radio solution ▪ Mounted to a single dish via coupler	4 Gbps
Payload Compression	▪ Wire-speed bulk data compression (header + payload) for 1.4X capacity gain	2 Gbps
Dual Channel	▪ Second channel for 2X capacity gain (co-pole, cross-pole or XPIC) ▪ Can be done without additional hardware in some PtP products	1.5 Gbps
Wider Channels	▪ 80 MHz channel bandwidth	750 Mbps
Higher Order Modulations	▪ 4096QAM modulation ▪ 50 MHz Channel	500 Mbps
Base Capacity	▪ 256QAM modulation ▪ 50 MHz Channel	350 Mbps

Link Capacity

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Cables, Connectors and Interfaces

- Connector Housing
  - Standard connectors and cabling
  - Increased durability
  - Simplified installation
  - Copper and fiber interfaces in the same unit for reduced sparing

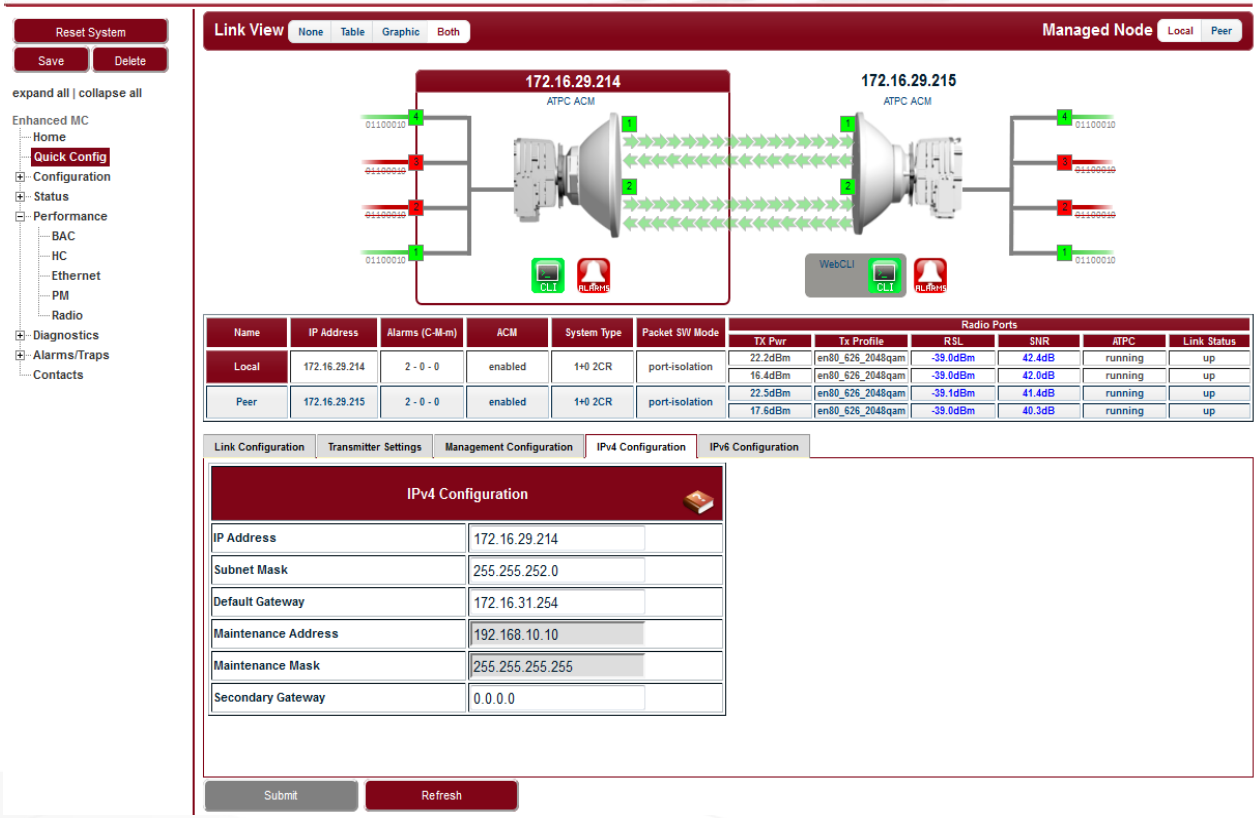
Harmony Enhanced

- 10GbE Interface (HEMC)
  - Fewer cables, no aggregation
  - Simplified installation & management

- Integrated OMT (HEMC)
  - No intermediate couplers or adapters
  - No branching or other losses
  - XPIC in a single ODU
  - Ability to easily accommodate cross-pole, co-pole and XPIC channel options

Configuration & Management: Web Interface

- The user interface is often an afterthought in the selection process
- Critical to alignment, configuration & management
- DragonWave's LinkView



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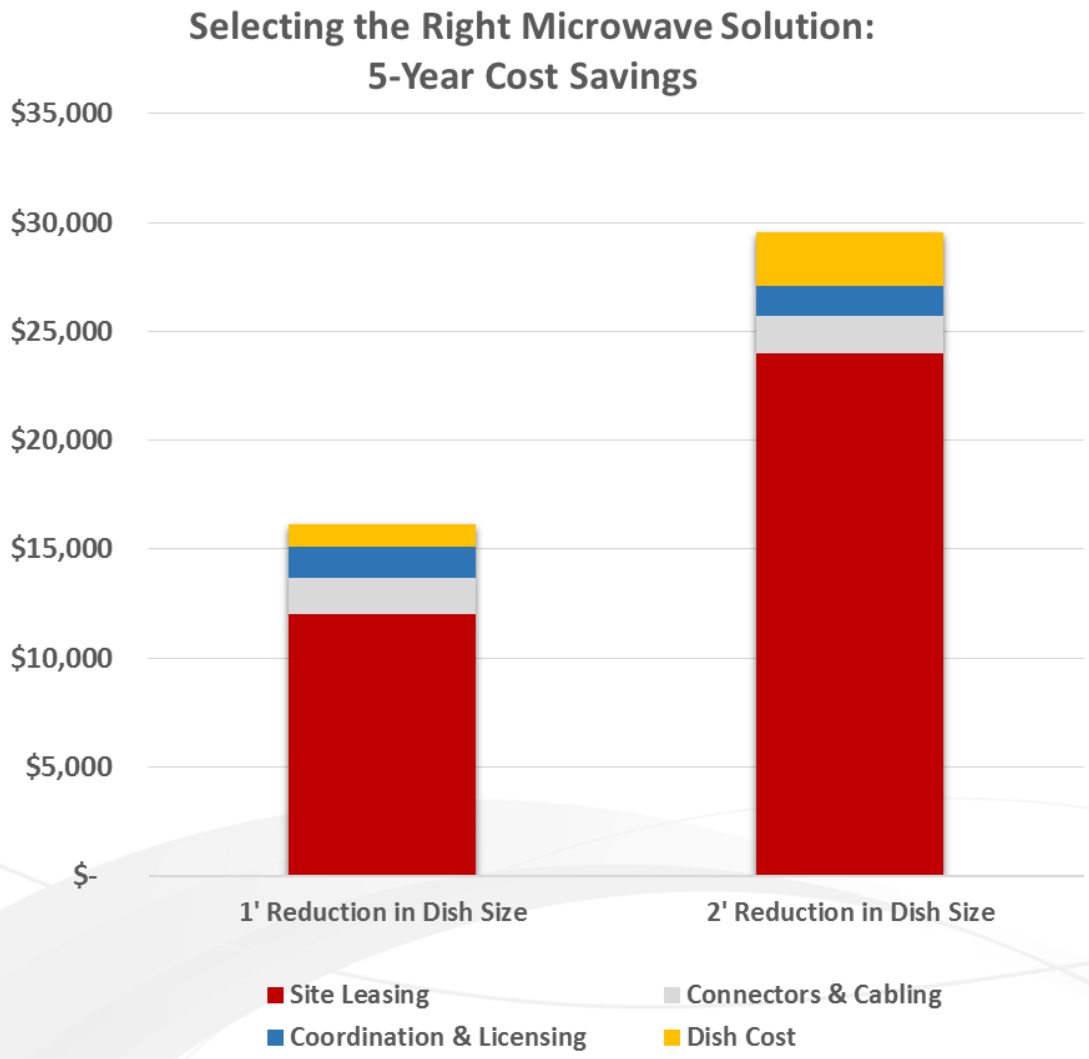
Sample Cost Savings per Link



- Assumptions:
  - Dish site leasing savings: $100/ft./mo.
  - Cabling and connector savings: $750 per site
  - Dish cost savings: $525-$1225
  - Coordination and licensing savings: $1400 per link
- Additional savings not included here:
  - Reduction in sites/towers (remove repeater sites)
  - Dish shipping savings
  - Shorter installation times
  - Dual channel vs. single channel radio in 2+0
  - Management efficiency gains
  - All-outdoor cost savings vs. indoor

Summary

- Up to 34dBm
- Longer paths, smaller dishes
- Improved link availability
- Reduced site leasing cost

- 4096QAM & wider channels
- Dual channel radios
- Bandwidth Accelerator payload compression
- MIMO

- Connector housing; standard connectors & cables
- 10GbE interface
- Integrated OMT
- Intuitive web GUI

- Reduced site leasing costs due to smaller dishes
- Capital savings on dishes, cabling, connectors
- Simplified installation and management
- Spectrum savings with Bandwidth Accelerator

DragonWave

Thank you

BUILDING BETTER BACKHAUL
EVERYWHERE

Harmony Enhanced & Enhanced MC

Harmony Enhanced

- **Extended Reach Solution**
  - Standard and high power variants up to 34dBm
  - Also allows for reduced antenna size and offers frequency flexibility
- **Higher Capacity & Spectral Efficiency**
  - Wide channel support (up to 100MHz)
  - 4096QAM modulation support
  - 750Mbps per radio, 1.5Gbps per link
  - Bandwidth Accelerator+ payload compression for 30-40% gain
  - MIMO ready
- **Multi-service Solution**
  - Full featured MEF compliant Carrier Ethernet switch
  - 4 x GE interfaces (2 optical & 2 electrical)
  - 256bit AES encryption
- **Simplified Installation and Management**
  - Standard integrated connectors; fiber and copper in same unit
  - Intuitive LinkView web interface for alignment, configuration & management
  - Simple evolution path for existing DragonWave networks; fully compatible with existing dishes, power injectors, cabling

Harmony Enhanced MC (*Multi-Carrier*)

- DragonWave's **third-generation** multi-carrier product
- Industry-leading **34dBm** transmit power in an all-outdoor unit
- **4096QAM** and wide channel support: 1.5 Gbps per radio and 3 Gbps per link
- Additional capacity gains with **Bandwidth Accelerator** compression
- Integrated **10GbE** MEF compliant switch
- **4x4 MIMO** Ready
- Innovative **connector housing** with copper and fiber interfaces, **standard cable** connections and a **clip-mount** to antenna