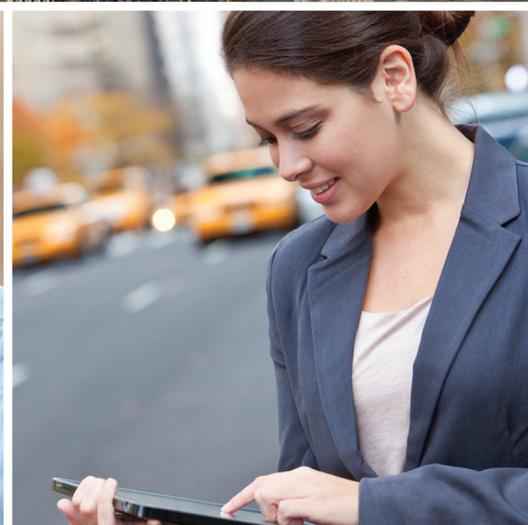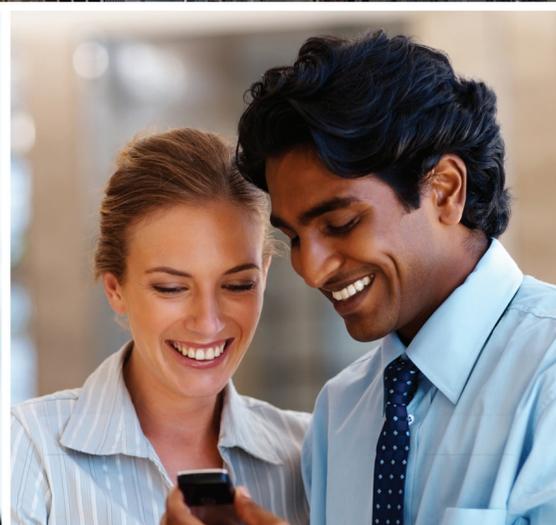# DRAGONWAVE PRODUCT GUIDE

BUILDING BETTER BACKHAUL SOLUTIONS

BUILDING BETTER BACKHAUL SOLUTIONS

As service providers and enterprises scale their wireless access networks to enable powerful new applications and services, many existing backhaul solutions are rapidly becoming a major bottleneck. DragonWave's packet microwave and packet convergence backhaul solutions hold the key to unleashing true broadband: delivering the capacity, flexibility and cost efficiency needed for a smooth evolution to high-bandwidth packet networks.

4G-Optimized Backhaul

Engineered for the requirements of tomorrow's networks, DragonWave's solutions respond to the needs of WiMAX and LTE service providers, delivering native packet transport, sub 0.1 ms latency, multi-Gigabit capacity and convergence of existing TDM traffic.

Multi-Generation Mobile Backhaul

DragonWave's backhaul solutions offer a smooth transition from 2G to next generation 3G or 4G networks by offering TDM and packet interfaces and a single end-to-end management framework.

Leased Line Replacement

Replace TDM leased line services and eliminate expensive recurring telecom costs while improving capacity and availability with an Ethernet packet network.

Last Mile Fiber Extension

Extend high-speed IP services beyond your existing network. DragonWave products are ideal for network hardening and disaster recovery, as well as for applications that require both legacy TDM services and carrier-grade, high-capacity native Ethernet.

Network Evolution

With TDM and packet interfaces, DragonWave's converged packet network solutions offer a simple progression to an IP-optimized network, while seamlessly carrying legacy TDM services.

New Service Enablement

Cable MSOs, fiber providers and other packet network operators gain immediate new revenue opportunities by offering profitable traditional services such as T1/E1 private line and PBX voice backhaul, as well as advanced Carrier Ethernet services.
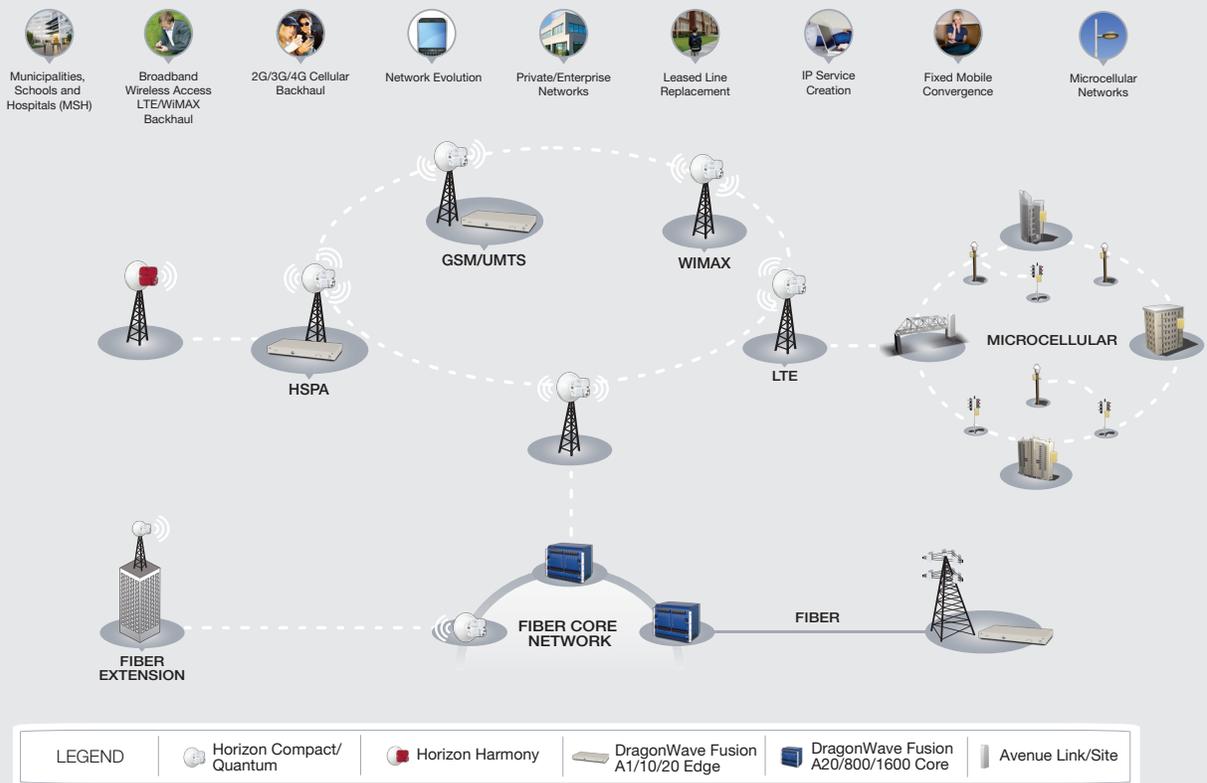
Private and Enterprise Networks

Municipalities, healthcare facilities, financial institutions, schools, government institutions and other organizations can build carrier-grade private networks, achieving payback within the first year.

Public Safety

DragonWave provides essential inter-site connectivity and backhaul solutions for first responders, city facilities, wireless mesh networks, surveillance systems, city fleets and sensor networks.

Microcellular Networks

DragonWave's fully integrated, zoning-friendly microcellular platforms allow mobile operators to expand their mobile presence, improve in-building coverage and increase network capacity in high user-density areas.

Municipalities, Schools and Hospitals (MSH)

Broadband Wireless Access LTE/WiMAX Backhaul

2G/3G/4G Cellular Backhaul

Network Evolution

Private/Enterprise Networks

Leased Line Replacement

IP Service Creation

Fixed Mobile Convergence

Microcellular Networks

GSM/UMTS

WIMAX

HSPA

LTE

MICROCELLULAR

FIBER CORE NETWORK

FIBER

FIBER EXTENSION

| LEGEND | Horizon Compact/ Quantum | Horizon Harmony | DragonWave Fusion A1/10/20 Edge | DragonWave Fusion A20/800/1600 Core | Avenue Link/Site |

PRODUCT PORTFOLIO

HORIZON

PACKET MICROWAVE

DragonWave's Horizon packet microwave solutions deliver new levels of capacity, spectral efficiency, reliability and a simple evolution to all-packet networks—all at the lowest total cost of ownership. For all outdoor requirements, the Horizon Compact+ delivers big performance in a small package by integrating the radio and modem into a single highly compact unit. The Horizon Quantum split-mount system delivers unparalleled capacity, while supporting multi-carrier operation, advanced synchronization and nodal intelligence, making it the most powerful packet microwave solution available today. Operators looking to evolve existing 2G/3G mobile networks can achieve significant efficiencies with the Horizon Harmony by converging TDM voice and data traffic onto a single packet-based transport layer.

With unmatched radio performance, simple installation and operation, as well as sophisticated remote management capability, Horizon solutions deliver significant life-cycle cost savings for service providers and enterprises alike.

- Massive capacity – 1 to 2 Gbps per 56 MHz channel with DragonWave's Bandwidth Accelerator and XPIC
- Hybrid TDM/Ethernet interface options for network evolution
- Intelligent nodal ring and mesh switching
- Service aware Hitless Automatic Adaptive Modulation (HAAM)
- Network synchronization with SyncE and optimized transport of 1588v2
- Zero footprint all-outdoor, split mount and all-indoor deployment options
- Pay-as-you-grow with automatic remote scalability
- Advanced security with integrated 256-bit AES encryption
- Comprehensive Ethernet OAM support (802.3ah, 802.1ag, Y.1731)
- MEF certified
- 6 to 60 GHz operation

AVENUE

INTEGRATED MICROCELLULAR PLATFORM

DragonWave's Avenue portfolio comprises several microcellular solutions ranging from a single microcell backhaul link (Avenue Link), to a fully-integrated microcellular unit (Avenue Site) containing up to three high capacity packet microwave backhaul radios and antennas, Ethernet switching, power supply, battery backup and a slot for a 3G/4G micro base station.

All Avenue solutions are integrated within an environmentally hardened enclosure that is optimized for street-level deployment in urban environments. Engineered to provide the greatest flexibility for mobile operators, Avenue products can be deployed on any number of structures including street lamps, traffic light poles, or building sides. Avenue systems are designed to meet size, weight and aesthetic requirements set by city zoning officials, allowing the units to blend into urban environments.

Avenue systems operate in 24, 28, 31, 38 and 60 GHz bands and are completely interoperable with other DragonWave solutions.

- Avenue Site offers a fully integrated microcellular platform:
    - Up to 3 independently aligned packet microwave radios
    - Battery backup
    - Power supply
    - Ethernet switching
    - 3G/4G RAN slot
    - 5" flat-mini antenna(s)
- Avenue Link includes integrated backhaul radio and 5" flat-mini antenna
- Zoning-friendly, environmentally hardened enclosure
- Backhaul powered by Horizon for unparalleled packet microwave performance

FUSION

PACKET CONVERGENCE

DragonWave Fusion packet convergence solutions enable a smooth migration to a flat packet network, driving greater efficiency, lower cost, simplified operations and new revenue opportunities from mobile backhaul and business services. Fusion products come in a variety of both fixed and modular configurations with port and packet processing capacities to meet a wide range of edge or central office site requirements and network topologies.

Mobile service providers can cost effectively transition from TDM-based backhaul to hybrid and all packet-based backhaul while replacing costly leased line access and avoiding the complexity of running multiple overlay networks. Wireline service providers are able to preserve customer revenue from traditional services while migrating to next generation networks. Carrier Ethernet service providers gain immediate new revenue opportunities by offering profitable traditional services such as T1/E1 private line and PBX voice backhaul, as well as advanced MEF certified ELINE and ELAN Ethernet services.

DragonWave Fusion solutions can be deployed in standalone applications or as a companion to Horizon radio systems.

- A single packet-based network to operate and manage
- Converged packet transport for less cabling, fewer network elements, and simple configuration of services
- Multiservice pseudowire capabilities
- ELINE and ELAN support
- Ethernet switching, aggregation, LAG and 8032 ring redundancy support
- High Precision Clock Recovery (HPCR®) — the industry's most robust adaptive clock recovery technology
- Comprehensive QoS and Ethernet OAM support
- Field-replaceable line cards and power supplies
- Carrier-grade redundancy
- Multiple interfaces (T1/E1, OC-3/STM-1, OC12/STM-4, 10/100/1000 Ethernet)
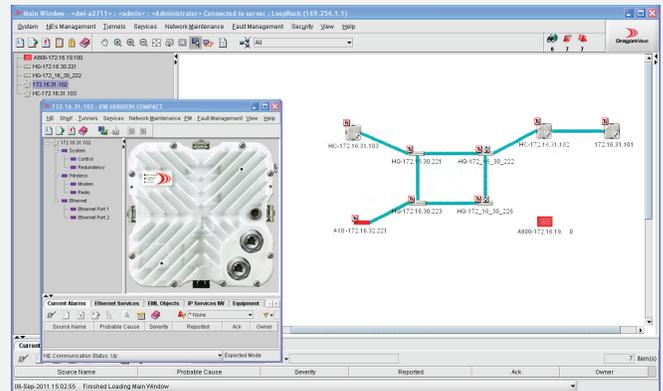- MEF certified

DRAGONVISION

NETWORK AND ELEMENT MANAGEMENT SYSTEM

DragonVision is a comprehensive carrier-class management solution for both the network and element system levels (NMS/EMS). DragonVision offers network operators a broad set of tools that simplify the operation, administration, maintenance and provisioning of DragonWave's products. This solution also provides extensive fault management, performance monitoring, and security management capabilities.

This standards-based solution uses a highly scalable application server and delivers a real-time representation of network topology, connectivity, and operational status. DragonVision enables operators to respond quickly to changing requirements, thereby reducing time-to-service, and delivering significant operational cost savings.

- Simple and intuitive point-and-click Graphical User Interface (GUI)
- End-to-end service provisioning
- Network-wide device discovery
- Real-time dashboard with performance monitoring, statistics and charting
- Bandwidth utilization indicators
- Advanced fault isolation and management
- Real-time configuration and security management
- Simple integration with external OSS
- Platform-independent architecture – Microsoft Windows and Unix
- Innovative and scalable application server architecture

DRAGONWAVE
FEATURES AND BENEFITS

Unparalleled Capacity

- DragonWave's Bandwidth Accelerator drives 1 to 2 Gbps per 56 MHz channel
- Highest capacity XPIC
- Maximum throughput at the lowest cost per bit

Flexible Deployment

- Available in all-indoor, all-outdoor or split-mount implementations
- Licensed and unlicensed deployment options from 6 to 60 GHz
- Hybrid solutions for TDM/Ethernet convergence
- Modular, pay-as-you-grow platforms

Microcellular Architectures

- Fully integrated microcellular platforms
- Single link or nodal applications
- Designed to meet city zoning requirements

Spectral Efficiency

- Bandwidth Accelerator drives more capacity within existing spectrum allocations
- 7 to 56 MHz channel size options
- 256QAM modulation across all channel sizes
- XPIC enables channel reuse

Extended Reach

- Hitless Automatic Adaptive Modulation (HAAM) for longer link spans, smaller antennas and fewer sites

- Provides up to 111 dB system gain, enabling link lengths beyond 50 km (30 mi)

Eco-Friendly

- Zero footprint
- No trenching or traffic disruption required
- Lowest power consumption per bit
- Zoning friendly

Advanced Security

- Advanced security with integrated 256-bit AES encryption
- Narrow beamwidth, directional point-to-point communications
- Bit-level data stream with Horizon synchronization and framing
- Horizon authentication
- Leading network management security

Network Intelligence and Protection

- Intelligent nodal switching for simplified operation
- Advanced ring and mesh configurations with 50 ms switching for carrier class services
- Active use of both working and protection channels eliminates wasted capacity
- Offers 1+0, 1+1, space diverse, and frequency diverse options
- Integrated bandwidth management features include advanced prioritization and flow control

Seamless Multiservice Convergence

- Converged packet solutions for microwave and fiber networks
- T1/E1, nxE1 ATM IMA, Ethernet convergence
- Integrated bandwidth management
- Simplified operations and management
- Comprehensive services, including TDM, ATM, HDLC/PPP, Frame Relay, Ethernet
- True packet network convergence—no need to manage TDM connections at intermediate network points

Timing and Clock Recovery

- HPCR® – the industry's most robust adaptive clock recovery technology
- IEEE 1588-2008 (Precision Time Protocol)
- External clock (BITS)
- Clock protection
- Loopback timing
- Synchronous Ethernet (SyncE) support
- Optimized transport of 1588v2

Comprehensive Management

- End-to-end management and provisioning with DragonVision NMS
- Advanced Ethernet OAM & PM support (802.3ah, 802.1ag, Y.1731)
- TDM and Layer-2 OAM & PM

Advanced QoS

- Advanced traffic management
- 8 levels of prioritized queuing
- Service-aware HAAM