

# FibeAir<sup>®</sup> IP-MAX<sup>2</sup>

## Wireless Carrier Ethernet Solution



FibeAir IP-MAX<sup>2</sup>, Ceragon's next generation high capacity Carrier-Grade wireless Ethernet solution features an industry-first, unique adaptive modulation engine, advanced QoS and the highest throughput in the market over a single channel.

- Single Port GbE native solution up to 900 Mbps over a single channel
- Unique Adaptive Modulation - QPSK 256 QAM
- Extended Quality of Service (QoS)
- Optical or electrical GbE
- Full capacity over 6-38 GHz frequency bands
- Any topology - Ring, Mesh, Chain, Star and Tree
- First Ethernet Microwave to achieve MEF certification





# Maximum Networking

**Maximum Throughput** - Supports up to 900 Mbps over a single 50/56 MHz channel using co-channel and dual polarization (CCDP) with XPIC in a single IDU (two IDMs with two carriers and one GbE physical interface).

## Full range fast Adaptive

**Modulation** - Increases network capacity while reducing CAPEX, utilizing the highest possible modulation at any given moment according to the link quality degradation. Hitless switchover step by step, up/down between six modulation schemes from 256 QAM to QPSK.

## Unique Multi Radio transmission -

When operating in dual-radio configuration, each of the carriers is independent to fluctuate during hitless switchovers between modulations. Thus it enables increased capacity over a given bandwidth and maximum spectrum utilization. Traffic is divided among the two carriers without requiring link aggregation, and is not dependent on number of MAC addresses or their momentary traffic capacity.

**Built-in Quality of Service** - Provides priority support for different classes of service, according to packet classification of the External Header, VLAN 802.1p, TOS / TC - IP precedence, MPLS experimental field, VLAN ID and UDP packets. All classes use multiple levels of prioritization with user selectable options between strict priority queuing weighted fair queuing, with strict weights or user configurable weights.

**Fast Traffic Protection** - by automatic port shutdown and the highest priority for BPDU packets when connected to switches/routers, ensures optimal RSTP (Rapid Spanning Tree Protocol) operation and the quickest recovery time

**Flow Control Support according to IEEE 802.3x** - providing efficient networking in case of throughput reduction.

**Ethernet and Radio Performance monitoring** - with statistics based on ITU-T G.826 and RMON/RMON2.

**Super Jumbo Frame support** - The Gigabit IDM supports frame sizes of up to 12,000 bytes. With this feature, FibeAir IP-MAX<sup>2</sup> is ready to support next generation Ethernet networks. In heavily loaded networks, where continuous data transfer is required, jumbo frames can significantly enhance the efficiency of Ethernet servers and networks. Jumbo frames enable the reduction of packet processing by the server, thereby increasing end-to-end throughput.

**TDM Voice Transmission with Dynamic Allocation** - With the n x E1/T1 option, only enabled E1/T1 ports are allocated with capacity. The remaining capacity is dynamically allocated to the GbE ports to ensure maximum Ethernet capacity.

# High Capacity Wireless Carrier Ethernet System



## Introducing FibeAir® IP-MAX<sup>2</sup>

Enabling smooth migration to IP-based networks, the FibeAir IP-MAX<sup>2</sup> system is designed to provide a fast and reliable Ethernet transmission solution for mobile, WiMAX, private and metro area networks. The system is ideal for any network topology and technology from pure IP, to multi-service and hybrid networks. The FibeAir IP-MAX<sup>2</sup> incorporates comprehensive Ethernet networking capabilities including advanced QoS for differentiated services, flow control and sophisticated traffic balancing.

FibeAir IP-MAX<sup>2</sup> utilizes full range, multi-level dynamic adaptive modulation for delivering maximum capacity at any given time while guaranteeing critical services. A unique switchover mechanism ensures zero downtime connectivity, allowing smooth, noise-free transmission of real time applications.

With Metro Ethernet Forum (MEF) certification for Microwave Ethernet, the new FibeAir IP-MAX<sup>2</sup> family includes native Ethernet as well as a native Ethernet/native TDM - Native<sup>2</sup>™ functionality, providing a complete solution for all network migration scenarios.

## System Overview

FibeAir IP-MAX<sup>2</sup> enables native Ethernet transmission with multiple frequencies, software selectable capacities, modulation schemes and configurations for various network requirements - using the same hardware and state-of-the-art technology. The system also supports traditional TDM services, with optional nxE1/T1 interfaces.

This innovative system uses an "on-the-fly" upgrade method, whereby network operators only buy capacity as needed, benefiting from savings on initial investments and OPEX.

The FibeAir IP-MAX<sup>2</sup> IDU (Indoor Unit) can host up to two carriers, each delivering up to 450 Mbps, optimizing the solution for different network topologies and configurations.

Traffic capacity throughput and spectral efficiency are optimized with the desired channel bandwidth.

For maximum user choice flexibility, channel bandwidths can be selected together with a range of modulations, from QPSK to 256 QAM.

Two independent hot swappable Indoor unit modules (IDM) can be used for hot-standby HW protection, diversity, East-West configuration or double capacity (2+0).

High spectral efficiency is ensured by choosing the same bandwidth for double the capacity via two carriers with vertical and horizontal polarizations. This feature is implemented by a built-in XPIC mechanism.

## Maximum Applications

FibeAir IP-MAX<sup>2</sup> offers cost-effective, high-capacity connectivity for carriers in cellular, WiMAX and fixed markets. It is also an ideal solution for private network applications.

The FibeAir IP-MAX<sup>2</sup> system supports multi-service and converged networking requirements for the most advanced data-rich applications and services.

### Cellular Network Backhaul and Access

FibeAir IP-MAX<sup>2</sup> supports both Ethernet and TDM for cellular backhaul networks migrating to IP within the same compact package. The system is suitable for all migration scenarios where Carrier-Grade Ethernet and legacy TDM services are required simultaneously.

### WiMAX Backhaul

Enabling connectivity between WiMAX base stations and facilitating the expansion and reach of emerging WiMAX networks, FibeAir IP-MAX<sup>2</sup> provides a robust and cost-efficient solution with native Ethernet capabilities.

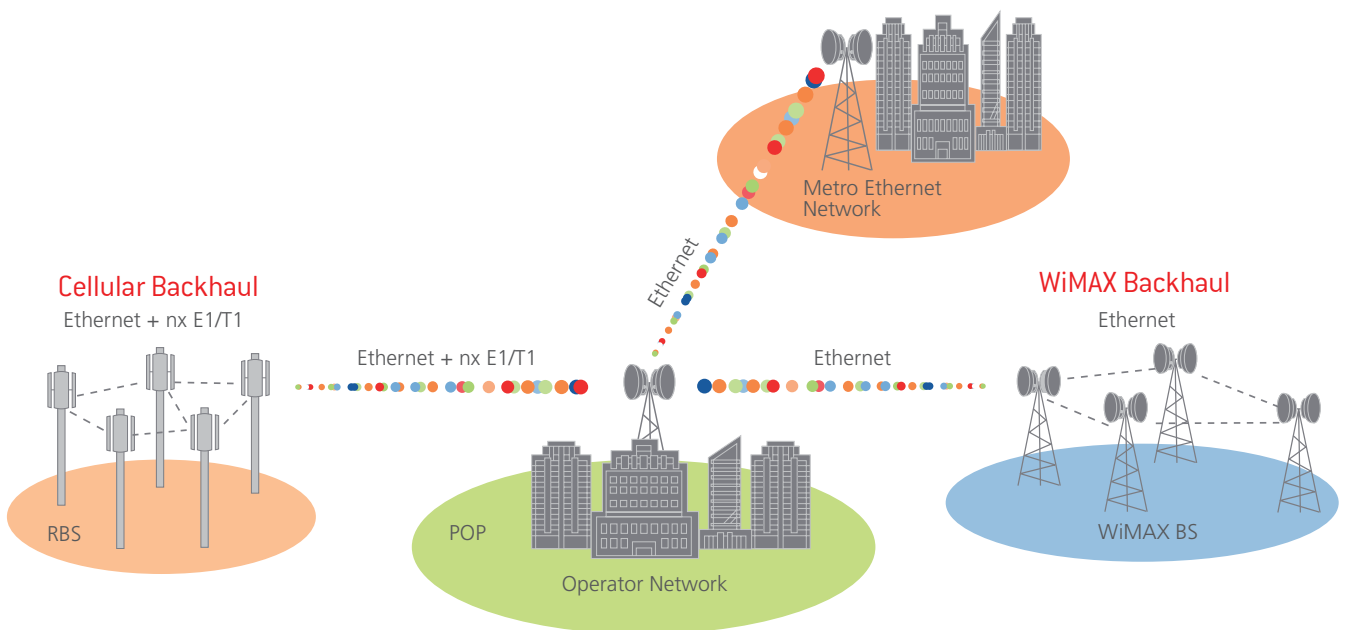
### Fixed Broadband Backhaul

With the highest available throughput on the market, FibeAir IP-MAX<sup>2</sup> provides Fixed broadband operators with wireless GbE connectivity for IP-DSLAMs, enabling the economical introduction of triple play services including VoIP, Internet access, and IPTV. By deploying Ceragon's wireless Ethernet solutions, Fixed Broadband service providers can obtain Fast/Gigabit Ethernet connectivity, differentiated services and

upgradeability paths for higher capacities, with the same cost-effective system. FibeAir IP-MAX<sup>2</sup> systems can be deployed in mesh, ring and star topologies with full redundancy and flexibility.

### Private Networks

Easy to install and operate, FibeAir IP-MAX<sup>2</sup> provides a transparent high-capacity connection of enterprise LAN and PBX systems. Users can easily expand capacity as needed using software upgradeable capacity. Hardware optimization significantly reduces communication costs, operating expenses, and maintenance requirements. Ceragon's wireless connectivity is ideal for a variety of private networks, including corporate enterprises, education campuses, governments, municipalities, hospitals, banks, and others.



Typical FibeAir IP-MAX<sup>2</sup> Applications

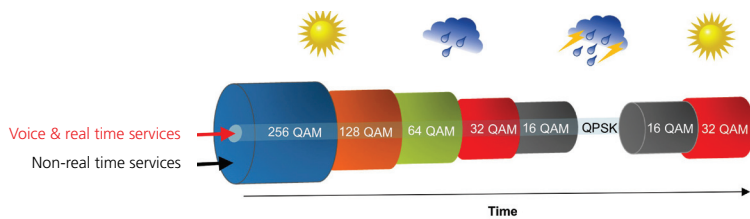
## Dynamic Adaptive Modulation

FibeAir IP-MAX<sup>2</sup> includes the Dynamic Adaptive Modulation algorithm, which ensures an increase in capacity and a reduction of CAPEX.

Using Adaptive Modulation the system automatically adjusts itself to prevent weather-related fading from causing communication on the link to be disrupted. When extreme weather conditions affect the transmission the radio system

automatically chooses the best modulation in accordance with the channel's condition. This is done to overcome fading and other interference while ensuring that real-time applications run smoothly and uninterrupted.

The modulation switchover is implemented using a Hitless algorithm, thereby enabling continuous connectivity.



## FibeAir IP-MAX<sup>2</sup> Family

### FibeAir IP-MAX<sup>2</sup>-G

Enables native Ethernet with two indoor modules (IDM) options:



Optical GbE IDM



Electrical GbE IDM

### FibeAir IP-MAX<sup>2</sup>-MS

Enables native Ethernet and native TDM (Native<sup>2</sup>™) with two indoor unit modules (IDM) options:



Optical GbE+ nxE1/T1 IDM



Electrical GbE+ nxE1/T1 IDM

## Maximum Advantages

### Gigabit Ethernet native solution

Full duplex throughput up to 900 Mbps over a single channel

### Unique full range Adaptive Modulation

Provides the widest modulation range on the market from QPSK to 256 QAM with multi-level real-time modulation changing dynamically according to environmental conditions - while ensuring zero downtime connectivity

### Pay as you grow- simple migration path

Easily upgradeable to higher capacities with license key

### Single port for full capacity

Up to 900 Mbps on a single GbE port for cost effective networking

### Sophisticated protection schemes

Using single or dual line interfaces, graceful bandwidth reduction ability, and Spanning Tree enabling features

### Extended Quality of Service (QoS)

Enables smart multi-layer packet queuing and prioritization

### Multi-Service Transport

Optical GbE or electrical 10/100/1000BaseT Ethernet data with optional n x E1/T1 interfaces over a single radio carrier

### Comprehensive Spectrum Range

Full capacity over all 6-38 GHz frequency bands

### Ultra low Latency (< 0.15 ms)

Suitable for delay-sensitive applications such as VoIP, Mobile TV and IPTV

### Multiple network topology support

Ring, Mesh, Chain, Star and Tree

### Large installed base with years of experience in high-capacity IP radios

Field-proven seamless integration with all standard IP equipment vendors

### Double the capacity per given channel bandwidth

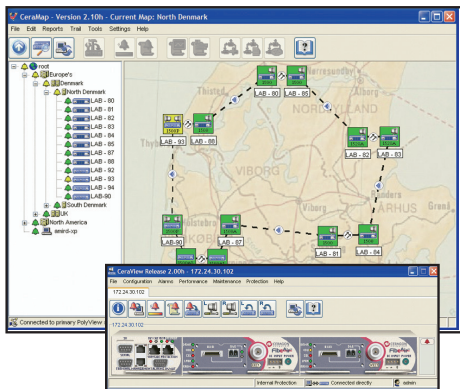
Using XPIC for co-channel, dual polarization configuration

### Longer hops and smaller antennas

Ultra-high output power with Ceragon's High-Power RF Unit (RFU) for lower frequencies reduces network costs while increasing the reach of the network

## End-to-End Network Management

Ceragon provides state-of-the-art remote management based on SNMP. The Ceragon management applications are written in Java code and enable management functions at both the element and network levels. The applications run on Windows 2000/2003/XP/Vista and Sun Solaris.



CeraView® is Ceragon's SNMP-based EMS (Element Management System) that enables the operator to perform element configuration, RF, Ethernet and TDM performance monitoring, remote diagnostics, alarm reports and more. CeraView integrates with different 3rd party NMS (Network Management System) platforms to provide end-to-end system management.

PolyView™ is Ceragon's NMS server that includes CeraMap, with a powerful user-friendly client graphical interface. PolyView can be used to update and monitor network topology status, provide statistical and inventory reports, download software and configure elements in the network. In addition, it can integrate with Northbound NMS platforms, to provide enhanced network management.

## Ceragon Networks Ltd.

Ceragon Networks Ltd. is a leading provider of high-capacity Carrier Ethernet and TDM wireless solutions for cellular and fixed wireless operators, enterprises and government organizations.

Ceragon's modular FibeAir product family is recognized as the gold standard for backhaul transmission and is the selection of choice for service providers. A scalable, future-proof solution for wireless transport of broadband services, FibeAir operates across multiple frequencies for Ethernet and SONET/SDH protocols, supporting

the emerging needs of next-generation networks that are evolving to all-IP based services. It leads the market in IP backhaul, offering a unique, native Ethernet solution that provides efficient, robust connectivity.

Ceragon supports its growing base of more than 200 customers in 85 countries by operating an extensive sales network comprised of multiple offices and numerous partners located around the world.

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