



| *Wireless backhaul is easier
with multicore everywhere*






Rising to the backhaul challenge

Since we first started providing wireless backhaul solutions over two decades ago, we've helped our customers face countless challenges – and we pride ourselves on being able to rise to them every time.

We have people who understand the technology and the business. We have products that are advanced and reliable. And as a company, we are determined to find a solution for every challenge you face.

We invite you to challenge us to take you further because we know that our solutions will help you achieve the highest value for your business.



*Challenge us
to take you further*



To achieve the highest value for you

At the heart of our solutions is the FibeAir IP-20 Platform. We recognize that the best wireless backhaul solution has to enable you to:

Increase operational efficiency

It has to be efficient to run. It needs to maximize capacity and performance, and at the same time minimize running costs such as spectrum fees, tower lease fees, rent, labor and power-related costs.

Ensure peace of mind

It needs to be reliable, ensure service availability, and answer your wireless backhaul needs now and in the future. Whether you are moving to 4G, 4.5G or considering your 5G network strategy, you need to know that you've got the technology and the people to move there with you – and who are ready to start now.

Keep your customers satisfied

That's why we're all here. We rise to the challenge because it gives your customers a better experience. That means you can acquire more customers, and keep your customers happy – and if you can keep your customers happy, you can keep your customers. Period.



Increase your
operational efficiency



Ensure your
peace of mind



Enhance your
customers' quality of experience





Your network evolution strategy towards 4.5G and 5G poses challenges to your wireless backhaul network including: capacity growth, network densification, and network modernization.

Capacity growth strains your wireless backhaul. Network densification will further challenge your backhaul resources with the number of urban sites expected to grow fivefold over the next 5 years. Network modernization is driven by the need to resolve RAN spectrum availability, which requires your wireless backhaul solution to support the gradual shutdown of your 2G and TDM services, as well as the move to a 100% IP infrastructure.

Ceragon's IP-20 multicore technology achieves tight integration between two carriers in a single radio unit, allowing you to successfully address these challenges while using less resources. The IP-20 Platform can be deployed across your entire wireless backhaul infrastructure – from small-cell backhaul to high-capacity aggregation nodes and long-haul backbones. It helps you stay on your strategic path towards 4.5G and 5G!

By expanding your available capacity, the IP-20 Platform helps you meet specific traffic needs in both the traditional microwave spectrum and new frequency bands. With its unique spectrum utilization techniques such as 4x4 LoS MIMO, the IP-20 Platform allows you achieve the required capacity with as little as $\frac{1}{4}$ of the spectrum.

FibeAir IP-20 Platform

Evolving your network to 4.5G and 5G is easier with multicore everywhere

The IP-20 Platform also addresses your network densification challenges by using high-density aggregation nodes and unique Advanced Frequency Reuse capabilities that allow you to deploy cell sites anywhere, without backhaul spectrum constraints.

It also relieves your real-estate and tower load challenges with ultra-high power radios (reaching 40dBm transmit power) and multicore high power radios (36dBm per carrier) that reduce your antenna size, extend your network's reach and enhance your service availability. In addition, the IP-20 Platform's ground-breaking Advanced Space Diversity capabilities allow you to use 25% less antennas in your network – saving on installation costs and duration, tower loads and CAPEX.

With its unique multicore technology available everywhere in your network, the IP-20 Platform makes wireless backhaul easier and enables you to effectively resolve your wireless backhaul challenges on the road to 4.5G and 5G, while using less resources!



| SPLIT-MOUNT / ALL-INDOOR



FibeAir IP-20 portfolio



Enhanced

FibeAir IP-20A

High-availability & modular,
aggregation node
for all-packet and hybrid networks

The FibeAir IP-20A is a highly-flexible aggregation node that delivers multi-Gbps radio capacity at a very large scale. Now available with multicore technology and new radio units, it features high modularity and flexibility, and supports a large number of radio carriers with an exceptionally wide variety of line interfaces via pluggable modules in a wide range of network topologies - making it the preferred node for your transport network's aggregation sites.

At Ceragon, we understand how important the resiliency of your aggregation sites is to you. For this reason, we designed the FibeAir IP-20A

to support a No Single-Point-of-Failure architecture (No SPoF), so that the main processing unit and all line and radio interfaces are protected to ensure your network can continuously support your business goals.

The FibeAir IP-20A operates within the entire microwave and millimeter-wave spectrum, offering high spectral efficiency across licensed and license-exempt frequency bands (4-86GHz). It also supports all high-speed data interfaces (10GE/1GE/FE) and a wide variety of TDM interfaces (T1, OC-3); operates with a wide variety of multicore, standard and high power radios; and accommodates various network configurations including 2x 8+0 and 8x 2+0.

- Provide the highest radio capacity and spectral efficiency in any condition and any frequency channel size (up to 80/112MHz)
- Double wireless backhaul capacity via remote activation of another radio carrier with no site visits required – the fastest transmission network setup from planning to fulfillment
- Reduce tower or roof-top equipment footprint by 50% in dual carrier configurations
- Deliver the needed wireless backhaul capacity at as little as ¼ of the spectrum otherwise needed with Ceragon's field-proven LoS MIMO 4x4 technology - enabling 4Gbps radio capacity over a single 112MHz channel

- Deploy sites where needed, removing wireless backhaul constraints by doubling the reuse of microwave frequency channels, using Advanced Frequency Reuse technology embedded in the multicore technology
- Optimize E-Band aggregation sites, supporting TDM over E-Band and enhancing existing microwave links with E-Band

The FibeAir IP-20A allows you to continuously increase your operational efficiency and provide better quality of experience to your customers.

FibeAir IP-20 portfolio



FibeAir IP-20GX

Extendable edge node
for all-packet and hybrid networks

The FibeAir IP-20GX is an extendable, split-mount edge node that delivers multi-Gbps radio capacity to your transport network, including macrocells and aggregation sites. Now available with multicore technology and new radio units, it helps you meet your operational efficiency targets and provides the flexibility you need to expand the node with more radio or line interfaces to meet the growing demands of your network.

The FibeAir IP-20GX operates within the entire microwave and millimeter-wave spectrum, offering high spectral efficiency across licensed and license-exempt frequency bands (4-86GHz). It supports two built-in radio carriers with multiple high-speed data and T1 interfaces.

It also comes with two universal slots which allow you to extend the node to support up to five radio carriers with additional high-speed data (1GE, FE) E1/T1 and OC-3 interface cards, using the same modules as in the IP-20A.

- Provide the highest radio capacity and spectral efficiency in any condition and any frequency channel size (up to 80/112MHz)
- Double wireless backhaul capacity via remote activation of another radio carrier with no site visits required – the fastest transmission network setup from planning to fulfillment
- Reduce tower or roof-top equipment footprint by 50% in dual carrier configurations
- Deliver the needed wireless backhaul capacity at as little as $\frac{1}{4}$ of the spectrum otherwise needed with Ceragon's field-proven LoS MIMO 4x4 technology
- Reduce energy costs by up to 40%

- Deploy sites where needed, removing congested wireless backhaul constraints by doubling the reuse of microwave frequency channels and using Advanced Frequency Reuse technology embedded in the multicore technology
- Optimize E-Band aggregation sites, support TDM over E-Band and enhance existing microwave links with E-Band combining (multiband), and utilize the unique E-Band RFU

The FibeAir IP-20GX allows you to continuously increase your operational efficiency and provide better quality of experience to your customers.

FibeAir IP-20 portfolio



The FibeAir IP-20G is a split-mount edge node suitable for macrocell and microcell backhaul and delivering up to 1Gbps radio capacity to your transport network. It provides you with the simplicity that comes with deploying a very compact, fixed configuration node, and helps you meet your operational efficiency targets.

The FibeAir IP-20G's fixed configuration simplifies installation, spare part management and maintenance. In addition, its passive cooling design suits harsh environments, increases reliability and minimizes ambient noise.

FibeAir IP-20G

Compact edge node
for all-packet and hybrid networks

The FibeAir IP-20G operates within the entire microwave spectrum, offering high spectral efficiency across licensed and license-exempt frequency bands (5.8-42GHz). It also supports two built-in radio carriers with multiple high-speed data, as well as T1 interfaces.

The IP-20G is also available in external-protection configuration (1+1), which allows you to achieve and maintain your SLA targets.





| ALL-OUTDOOR



FibeAir IP-20 portfolio



The FibeAir IP-20C is a highly versatile, compact and all-outdoor wireless backhaul node that suits any network deployment scenario, from aggregation sites to small cell backhaul, and is designed to help you meet a wide variety of challenges throughout your network deployment.

FibeAir IP-20C

All-outdoor, compact, all-IP multicore node

The FibeAir IP-20C operates within the entire microwave spectrum, offering high spectral efficiency across licensed and license-exempt frequency bands (6-42GHz).

- Double wireless backhaul capacity via remote activation of another radio carrier with no site visits required
- Deliver the needed wireless backhaul capacity at as little as $\frac{1}{4}$ of the spectrum otherwise needed with Ceragon's field-proven LoS MIMO 4x4 technology – enabling 1Gbps radio capacity over a single 30MHz channel or 2Gbps over a single 60MHz
- Deploy sites where needed, removing congested wireless backhaul constraints by doubling the reuse of microwave frequency channels and using Advanced Frequency Reuse technology embedded in the multicore technology

- Reduce energy costs by up to 40%
- Reduce tower or roof-top equipment footprint by 50% in dual carrier configurations

With its multicore technology, the FibeAir IP-20C allows you to continuously increase your operational efficiency and provide better quality of experience to your customers.

FibeAir IP-20 portfolio

NEW



FibeAir IP-20C-HP

All-outdoor, high-power, all-IP multicore node

The FibeAir IP-20C-HP is a high-power, compact and all-outdoor wireless backhaul node that suits any network deployment scenario with long reach requirements, from aggregation sites to remote small cell backhaul, and is designed to help you meet a wide variety of challenges throughout your network deployment.

The FibeAir IP-20C-HP operates in the 6GHz and 11GHz bands.

- Double wireless backhaul capacity via remote activation of another radio carrier with no site visits required
- Deliver the needed wireless backhaul capacity at as little as $\frac{1}{4}$ of the spectrum otherwise needed with Ceragon's field-proven LoS MIMO 4x4 technology – enabling 1Gbps radio capacity over a single 30MHz channel or 2Gbps over a single 60MHz
- Deploy sites where needed, removing congested wireless backhaul constraints by doubling the reuse of microwave frequency channels and using Advanced Frequency Reuse technology embedded in the multicore technology
- Improve system gain with 35dBm Tx power

- Reduce energy costs by up to 40%
- Reduce tower equipment footprint by 50% in dual carrier configurations and high-power radios

With its multicore technology, the FibeAir IP-20C-HP allows you to continuously increase your operational efficiency and provide better quality of experience to your customers.



FibeAir IP-20 portfolio



The FibeAir IP-20S is a compact, all-outdoor wireless backhaul node that is optimized for simple installation and operation, and helps you resolve challenges across your network – from macrocell to small-cell backhaul. Whether your challenge is establishing cost-effective connectivity to edge sites, reducing spectrum license fees, or reducing your energy-related expenses – the FibeAir IP-20S is the solution for you.

FibeAir IP-20S

All-outdoor, compact, all-IP edge node

The FibeAir IP-20S operates within the entire microwave spectrum, offering high spectral efficiency across licensed and license-exempt frequency bands (6-42GHz).

Optimized for tail sites, the FibeAir IP-20S supports advanced capabilities such as Advanced Frequency Reuse (tail-site), which allows you to deploy your cell-sites where you need to, without wireless backhaul spectrum constraints.





FibeAir IP-20 portfolio



FibeAir IP-20E

All-outdoor, compact, all-IP, E-band node

The FibeAir IP-20E is an ultra-compact, high-capacity, all-outdoor wireless backhaul node that helps you meet your capacity requirements, simplify network deployment and installation, and reduce your spectrum costs. Whether your challenge is connecting high-capacity sites, overcoming microwave spectrum limitations and costs, or simply expanding your

network in a metro environment or any other scenario where it is impossible to deploy high-volume, heavy-weight backhaul equipment – Ceragon's FibeAir IP-20E allows you to achieve your business goals.

- Provide ultra-high radio capacity and spectral efficiency of up to 2.5Gbps over a 500MHz channel
- Minimize your sites' physical footprint with an integrated flat panel antenna – allowing you to install your equipment on congested poles and street furniture
- Reduce your E-Band spectrum fees by allowing you to acquire just the right amount of spectrum you need by supporting as low as 62.5MHz channel spacing

- Allow enhancement of existing microwave links with E-Band carrier-bonding (multiband)

The FibeAir IP-20E allows you to continuously increase your operational efficiency and deliver a better quality of experience to your customers.

FibeAir IP-20 portfolio

NEW



The **FibeAir IP-20V** is an exceptional solution for small-cell backhaul. This ultra-compact, high-capacity, low-latency all-outdoor wireless backhaul node helps you meet your network densification goals with urban and environmentally blending deployments and by utilizing the license-exempt V-Band.

FibeAir IP-20V

All-outdoor, compact, all-IP, V-band node for small-cell and private network connectivity

- Avoid spectrum fees by utilizing license-exempt V-Band
- Provide a 4.5G and 5G future-proof, ultra-high radio capacity of up to 2.5Gbps
- Leverage an ultra-low latency FDD solution
- Minimize your sites' physical footprint with an integrated flat panel antenna – allowing you to install your equipment on congested poles and street furniture
- Minimize operational overhead – a single product and a single part number throughout your network eliminates the need for complicated stock management and a lengthy installation process
- Simplify your link setup in an unlicensed band with an internal scanner that maps and recommends a technician for specific sub-band availabilities – minimizing the time window required from municipal authority for site installation
- Achieve availability and SLA goals with automatic interference mitigation mechanism

The FibeAir IP-20V allows you to continuously increase your operational efficiency and deliver a better quality of experience to your customers.

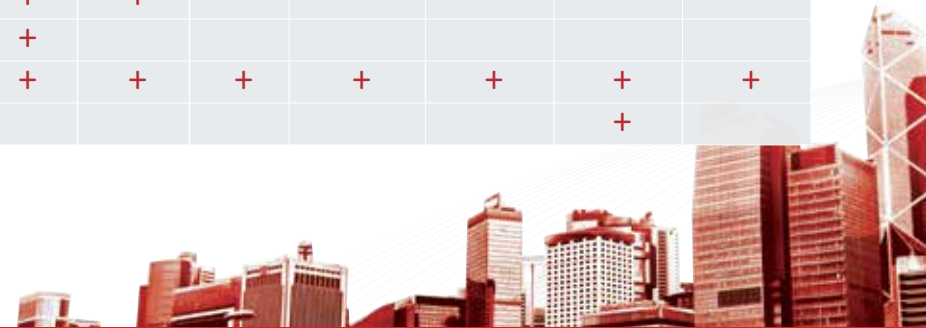


| SPECIFICATIONS



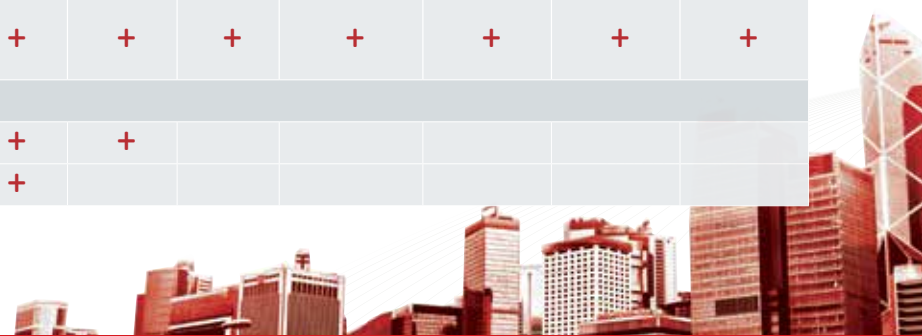
Specifications

	IP-20A	IP-20GX	IP-20G	IP-20C	IP-20C-HP	IP-20S	IP-20E	IP-20V
Radio								
4-11 GHz	+	+			+			
6-42 GHz	+	+	+	+		+		
V-Band								+
E-Band	+	+					+	
10 Step ACM QPSK-2048QAM			+	+	+	+		
12 Step ACM BPSK-4096QAM	+	+						
BPSK-1024QAM							+	+
Multicore: Advanced Frequency Reuse 4x4 MIMO	+			+	+			
All-Indoor	+	+	+					
Split-Mount	+	+	+					
All-Outdoor				+	+	+	+	+
Ultra-High-Power Radio (40dBm)	+	+						
Advanced Space Diversity	+	+			+			
Integrated Antenna	+	+					+	+
Parabolic Antenna	+	+	+	+	+	+	+	
XPIC	+	+	+	+	+			
User Interfaces								
T1	+	+	+					
OC-3	+	+						
1Gbe	+	+	+	+	+	+	+	+
10GbE	+						+	



Specifications

	IP-20A	IP-20GX	IP-20G	IP-20C	IP-20C-HP	IP-20S	IP-20E	IP-20V
Networking								
Integrated Carrier Ethernet switching capabilities, MEF Carrier Ethernet 2.0 compliant up to 30% more capacity using Header De-Duplication carrier-grade service resiliency (G.8032, MSTP) Sync-E and 1588 synchronization ITU-T Y.1731 fault and performance management: MEF 35 high resiliency to bursty LTE/LTE-A traffic using ultra-deep buffers service assurance for strict SLAs utilizing Hierarchical Quality of Service (H-QoS) SDN-ready	+	+	+	+	+	+	+	+
Layer 1 Carrier Bonding								
Unique layer 1 carrier bonding (multi-carrier Adaptive Bandwidth Control - ABC), enabling multi-carrier aggregation to a single link, carrying TDM and Ethernet traffic - enhancing equipment and spectrum utilization and increasing service availability	+	+	+	+	+			
Security								
Comprehensive, multi-layer security: AES-256 radio encryption secured protocols and management interfaces (HTTPS, TLS, SSH, SNMPv3) secured architecture and software design advanced authentication and identification management	+	+	+	+	+	+	+	+
Operating Systems								
Unified CeraOS operating system, which streamlines wireless backhaul network modernization, operation and management	+	+	+	+	+	+	+	+
Supported Radio Units								
RFU-HP, RFU-C, RFU-A	+	+	+					
RFU-D, RFU-E, RFU-D-HP, RFU-S-UHP	+	+						





| RADIO UNITS



FibeAir IP-20 portfolio



RFU-D

High-performance, multicore RFU

The RFU-D multicore RFU is based on Ceragon's unique multicore technology, which is especially designed for advanced wireless backhaul operations.

- Provide the highest radio capacity and spectral efficiency in any condition and any frequency channel size (up to 80/112MHz)
- Double wireless backhaul capacity via remote activation of another radio carrier with no site visits required – the fastest transmission network setup from planning to fulfillment
- Reduce your tower or roof-top equipment footprint by 50% in dual carrier configurations
- Deliver the needed wireless backhaul capacity at as little as $\frac{1}{4}$ of the spectrum otherwise needed with Ceragon's field-proven LoS MIMO 4x4 technology – enabling 4Gbps radio capacity over a single 112MHz
- Reduce energy costs by up to 20%
- Reduce SKUs

- Simplify operations and shorten time-to-market with Easy Set Radios (field-replaceable diplexers)
- Deploy sites where needed, removing wireless backhaul constraints by doubling the reuse of microwave frequency channels and using Advanced Frequency Reuse technology embedded in the multicore technology

The RFU-D allows you to continuously increase your operational efficiency and provide better quality of experience to your customers.



FibeAir IP-20 portfolio



The RFU-E split mount radio unit for E-Band frequency band allows you to efficiently manage your hub sites. You can now aggregate multiple E-Band links at your hub site, deliver TDM-based services over E-Band and enhance existing microwave links with E-Band carrier-bonding (multiband).

RFU-E

High performance, E-Band RFU

Whether your challenge is connecting and aggregating high-capacity sites or overcoming microwave spectrum limitations and costs, the RFU-E allows you to achieve your business goals.

- Provide ultra-high radio capacity and spectral efficiency – up to 2.5Gbps over a 500MHz channel
- Minimize your sites' physical footprint with an integrated flat panel antenna – allowing you to install your equipment on congested poles
- Reduce your E-Band spectrum fees by allowing you to acquire just the right amount of spectrum you need by supporting 62.5MHz channel spacing

- Enhance existing legacy Ceragon installations

The RFU-E allows you to continuously increase your operational efficiency and deliver a better quality of experience to your customers.

FibeAir IP-20 portfolio



RFU-D-HP

High performance,
high-power, multicore RFU

The RFU-D-HP multicore, high-power RFU brings Ceragon's unique multicore technology and capabilities to long-haul.

- Provide the highest radio capacity and spectral efficiency in any condition, any frequency channel size (up to 80/112MHz), and any form-factor (available in split mount and all-indoor)
 - Enable remote activation of additional radio carriers with no site visits required – the fastest network setup from planning to fulfillment
 - Reduce tower equipment footprint by 50% in dual carrier configurations and high-power radios
 - Further reducing tower load, saving costs, shortening time-to-market and easily locating tower space by reducing the number of antennas per link (from 4 to 3) - with the unique Advanced Space Diversity (ASD) technology and uncompromising service quality
 - Deliver the needed wireless backhaul capacity at as little as 1/4 of the spectrum otherwise needed with Ceragon's field-proven LoS MIMO 4x4 technology – enabling 4Gbps radio capacity over a single 112MHz
 - Support low-loss, multi-channel branching and mediation devices, which enable you to construct multi-carrier low-loss links for extremely high-capacity, long-haul applications
 - Utilize existing infrastructure and enhance existing legacy Ceragon installations
 - Deploy sites where needed, removing wireless backhaul constraints by doubling the reuse of microwave frequency channels and using Advanced Frequency Reuse technology
 - Reduce energy costs by up to 20%
 - Increase operational flexibility (moving from 1T1R to 1T2R and 2T2R) and offering pay-as-you-grow branching units
 - Simplify operations and shorten time-to-market with Easy Set Radios (field-replaceable diplexers/channel filters)
 - Utilize of the same radio units for filter-based and diplexer-based configurations
- With its multicore technology, the RFU-D-HP allows you to continuously increase your operational efficiency and provide better quality of experience to your customers.



FibeAir IP-20 portfolio



RFU-S-UHP

High performance,
ultra-high-power RFU

The RFU-S-UHP single carrier RFU brings long-haul to new levels of efficiency. With up to 40dBm transmit power, you can now increase your service reach and your operational efficiency by using smaller antennas and longer links without compromising capacity or availability.

- Support wide channels (up to 80/112MHz) – allows you to enhance capacity and availability to meet the standards required in today's networks and in future backbones
- Support low-loss, multi-channel branching and mediation devices, which enable you to construct multi-carrier links for extremely high-capacity, long-haul applications

- Increase service availability with Base-Band Combining Space Diversity

The RFU-S-UHP allows you to continuously increase your operational efficiency and provide better quality of experience to your customers.

FibeAir IP-20 portfolio



RFU-C

High-performance,
small-footprint, 6-42 GHz RFU

Ceragon's software-configurable FibeAir RFU-C supports a broad range of capacities and modulations, covering the entire range of channel spacing (3.5-60 MHz). The RFU-C supports multiple indoor units, enabling you to optimize your entire network deployment to fit your specific application.



RFU-A

High-power 5.8-11GHz
indoor RFU

The FibeAir RFU-A offers high-power, minimal footprint, reliable, long-term RF performance in wide-channel bandwidth up to 60MHz. This easy-to-install unit enables network operators to reach longer



RFU-HP

High-power, reduced power
consumption 4-11GHz RFU

The FibeAir RFU-HP offers high-power, reliable, long-term RF performance in wide-channel bandwidth up to 60MHz. This easy-to-install unit features a smart energy mode, which can save 35% in wireless backhaul power expenses.

With tens of thousands of units deployed worldwide, it enables network you to reach longer distances using smaller antennas. This high-quality, cost-effective unit includes two receivers and one transmitter in a single transceiver unit, enabling you to optimize your space diversity installation and increase link reliability.



| SOFTWARE





FibeAir IP-20 portfolio

CeraOs

A single, advanced operation system

All IP-20 Platform solutions share a single, advanced operation system – the CeraOs.

This allows you to increase productivity and improve operational efficiency by simplifying the planning, provisioning, management, and maintenance of your network.

The unified operating system also allows you to introduce new IP-20 products into your network with no change to your operational routines and no need for additional staff training.

NetMaster

Comprehensive Network Management System

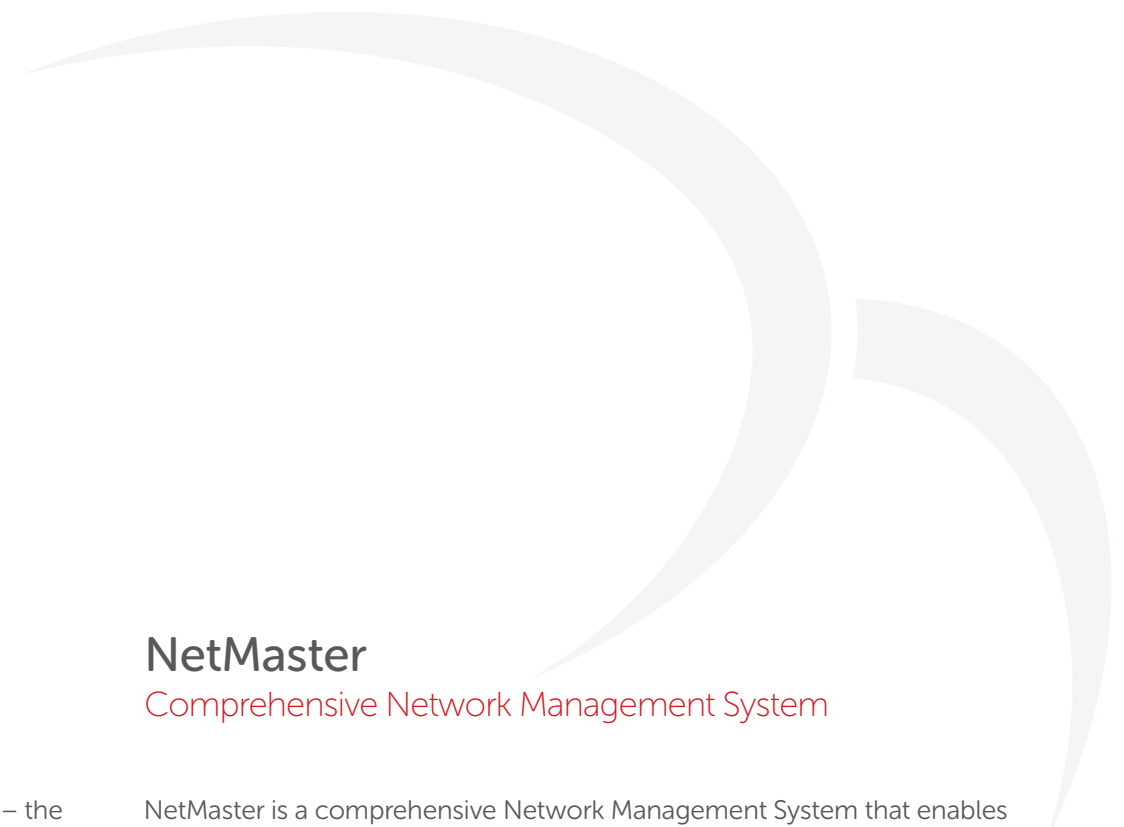
NetMaster is a comprehensive Network Management System that enables you to effectively and efficiently control and monitor all Ceragon products in your network.

The intuitive, workflow-oriented NetMaster GUI allows you to improve your service availability with fast root cause analysis. It also simplifies end-to-end service configuration to ensure prompt and accurate service provisioning and fast time-to-revenue.

The NetMaster can be easily integrated with other systems in your NOC to streamline cross-domain workflow and enhance productivity.

The NetMaster allows you to continuously increase your operational efficiency and enhance your customers' quality of experience with:

- A rich and intuitive GUI
- Detailed reports
- Efficient management task execution including scheduled operations and bulk operations on multiple NEs
- High availability - server and database redundancy with automatic switchover





*Challenge us
to take you further*

About Ceragon

Ceragon Networks Ltd. is the world's #1 wireless backhaul specialist. We help operators and other service providers worldwide increase operational efficiency and enhance end customers' quality of experience with innovative wireless backhaul solutions. Our customers include wireless service providers, public safety organizations, government agencies and utility companies, which use our solutions to deliver 4G, mission-critical multimedia services and other applications at high reliability and speed. Ceragon's unique multicore technology provides a highly reliable, high-capacity 4G wireless backhaul with minimal use of spectrum, power and other resources. It enables increased productivity, as well as simple and quick network modernization. We deliver a range of professional services that ensure efficient network rollout and optimization to achieve the highest value for our customers. Our solutions are deployed by more than 460 service providers, as well as hundreds of private network owners, in more than 130 countries.