

*DISAGGREGATED WIRELESS HAULING –
STAYING AHEAD OF THE 5G CHALLENGE CURVE*





THE MULTIDIMENSIONAL 5G HAULING CHALLENGE CURVE

As you evolve your network and services to 5G, past challenges are supplemented by additional requirements that together form a multidimensional challenge curve:

ACHIEVE MORE CAPACITY

This need derives from the total capacity per end device, and from the increased number of end devices.

DEPLOY MORE SITES

The need to deploy more sites derives from the need for higher capacity per area and the use of higher RAN frequency bands, which require much shorter distances between cell sites and end devices. This means massive network densification – with up to five times the number of cell sites in certain parts of the network.

ENABLE DIVERSE 5G USE CASES

Your network needs to support new services and use cases, and address new markets and requirements. Four game-changing sets of applications – enhanced mobile broadband (eMBB), ultra-reliable low-latency communications (URLLC), massive machine-type communications (mMTC), and fixed wireless access (FWA) – all need to be supported by the same network.

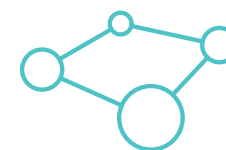
ACHIEVE MASS DEPLOYMENT

Keeping up with your business targets and shortening time to revenue requires fast mass deployment. You need to promptly deploy and connect new sites while optimizing resource use and overcoming scale & skill gaps.

All of these needs may result in a lack of timely solutions, as industry innovation falls behind the multidimensional challenge curve.



MORE CAPACITY



MORE SITES



DIVERSE 5G USE CASES

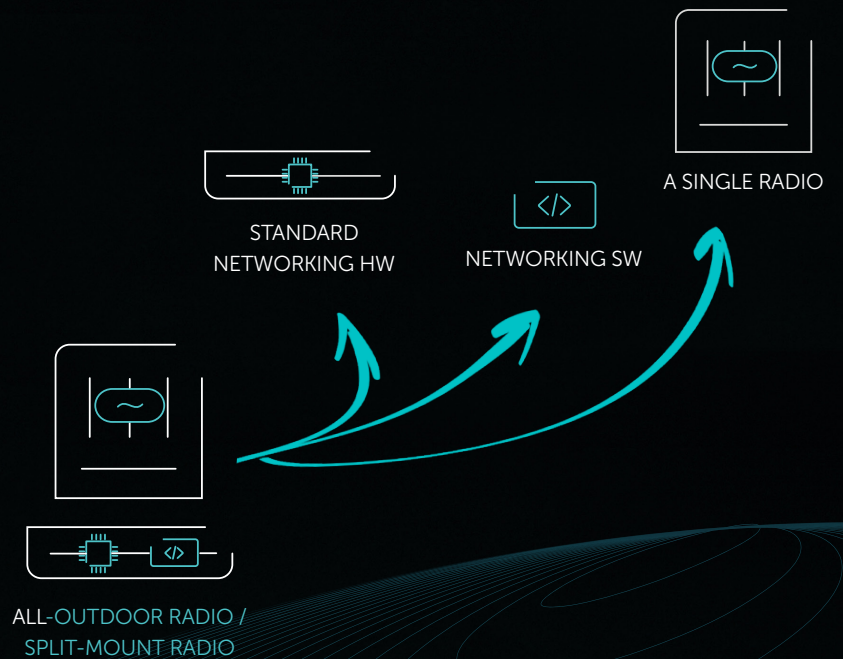


MASS DEPLOYMENT

DISAGGREGATED WIRELESS HAULING – STAYING AHEAD OF THE 5G CHALLENGE CURVE

Resolving 5G wireless hauling challenges requires a new approach to wireless hauling – disaggregation. Rather than focusing on a single innovation path, disaggregation allows operating in multiple innovation paths and excelling in every one of them independently.

Ceragon redefines wireless hauling with the IP-50 Platform, which adopts the disaggregation model and implements three independent innovation paths.



SINGLE RADIO

Thanks to Ceragon's unique multicore technology and decades of radio experience, you can achieve 4G & 5G capacity at any location, in any band. You can now have 4X the capacity with less resources and use new frequency bands. Leveraging multicore technology, you can gain additional capacity with no additional spectrum, densify your network without spectrum constraints, ramp up network capacity without truck rolls, and much more. Moreover, a single radio model can be used at any network scenario (all-outdoor, split-mount, all-indoor), supporting your mass deployment efforts and operational efficiency targets.

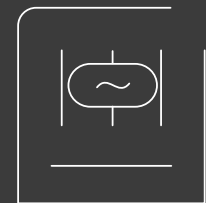
NETWORKING HARDWARE

Ceragon's wide variety of hardware options allows you to scale your network as required, achieving up to 100 times the capacity while adding interfaces where needed. This is done by developing Ceragon applications in a way that enables them to be executed on any standard merchant silicon, so you can leverage the industry's HW enhancements while leveraging the specific benefits of Ceragon's unique solutions.

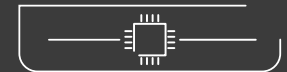
NETWORKING SOFTWARE

Ceragon combines open SDN and state-of-the-art routing capabilities, such as segment-routing, to allow service orchestration via network slicing, fast service introduction and simpler, more efficient operations. This way, you can make sure each service type is accommodated with the right resources and SLA, regardless of other services running through your network, while keeping the network optimized and cost-efficient.

If your network strategy calls for integrated L3 IP/MPLS and segment routing in your backhaul, then the IP-50 platform is a perfect fit. You can also combine IP-50 products with Ceragon's IP-20 products for a case-by-case optimized solution.



A SINGLE RADIO

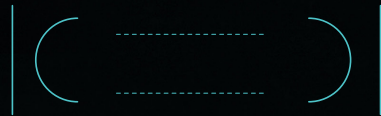


STANDARD NETWORKING HW



NETWORKING SW

OUR TECHNOLOGY – YOUR VALUE



5G CAPACITY GROWTH

1 click, double capacity



5G CAPACITY WITH NO COMPROMISE

Multiband



INCREASED LONG-HAUL EFFICIENCY AND FLEXIBILITY

Advanced Space Diversity (ASD)



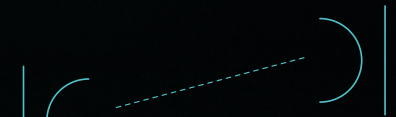
SIMPLIFIED 5G SITE ACQUISITION & INSTALLATION

All-outdoor solutions



5G CAPACITY IN NARROWBAND SPECTRUM

4x4 LoS MIMO



EASIER 5G NETWORK DENSIFICATION

Advanced Frequency Reuse (AFR)





IP-50E

20Gbps/link universal
E-Band radio

The IP-50E universal E-Band radio introduces ultra-high capacity of up to 20Gbps to your network, supporting a pay-as-you-grow strategy with up to two units in XPIC configuration with layer-1 carrier bonding over a single cable. Wherever you need fiber-like capacity for fronthaul, backhaul or wireless access applications, the IP-50E is your cost-efficient, easy-to-deploy fiber-replacement solution.

The IP-50E also allows extended E-Band reach with no compromise on availability, thanks to its unique multiband capability. Using layer-1 carrier bonding, the IP-50E enables you to combine this high-capacity carrier with any additional microwave, fiber or leased line connection, thereby insuring

your high-priority service offering meets its SLA target.

Combined with Ceragon's IP-50C or IP-20C radio and a multiband antenna, you can achieve a compact, all-outdoor, direct-mount 3-carrier solution (single-carrier E-Band + two-carrier microwave). This saves on tower load and shelter requirements while simplifying installation, allowing faster time to market, and enhancing operational efficiency.

SPECIFICATIONS

RADIO

- Radio capacity: 20Gbps (2+0 XPIC configuration, utilizing two units)
- Supported frequency bands: 71-86GHz
- Supported channel spacing: 62.5-2000MHz
- ACM steps: 9, BPSK-512QAM
- Antenna offering: parabolic, integrated flat panel (FCC, class-3 compliant), hitless multiband

INTERFACES

- 4 x 1/10GbE or 40GbE traffic interface (QSFP+)
- 1/10GbE traffic interface (SFP+, CPRI, eCPRI)
- 1GbE traffic interface (SFP) or 1/2.5GbE multiband port
- 1GbE management/PoE port

CAPACITY

- Networking capacity: 40Gbps
- Layer-1 carrier bonding: supports XPIC and multiband with any additional layer-1 connection

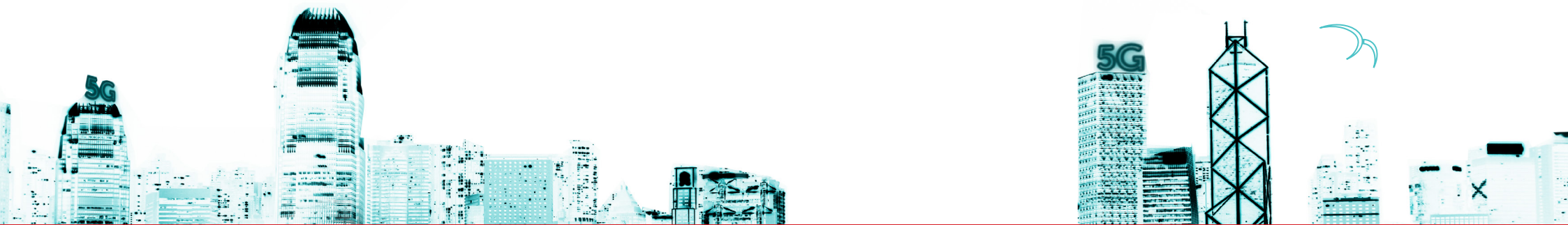
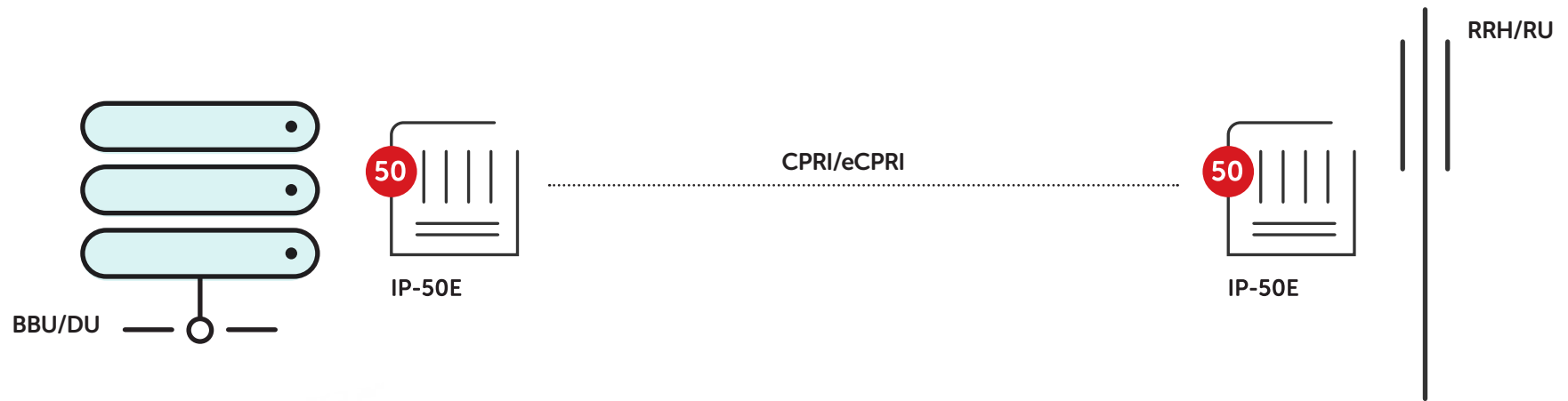
NETWORKING

Integrated Carrier Ethernet switching capabilities, MEF Carrier Ethernet 2.0 compliant | up to 30% more capacity using header deduplication | carrier-grade service resiliency (G.8032, MSTP) | SyncE and 1588 synchronization | ITU-T Y.1731 fault and performance management (MEF 35) | SDN | layer 3 (using IP-50FX)

SECURITY

AES-256 radio encryption | secured protocols and management interfaces (HTTPS, TLS, SSH, SNMPv3) | secured architecture and software design | advanced authentication and identification management

IP-50E SPOTLIGHT USE CASE
4G & 5G fronthaul





IP-50C

Universal multicore microwave radio
for all deployment scenarios

The world's best all-outdoor microwave radio just became better. The IP-50C universal microwave radio is the evolution of the IP-20C, the world's best-selling wireless backhaul outdoor radio. The IP-50C brings new capabilities that allow you to base your entire network, from small cells to massive aggregation sites, on this single radio – reducing complexity, costs and time to revenue.

The IP-50C can be deployed as a stand-alone all-outdoor radio, or combined with an indoor unit (the IP-50FX) as a scalable aggregation node and cell site router. Either way, you can leverage all the benefits of Ceragon's cutting-edge multicore technology.

A unique configuration of an all-outdoor 4+0 node (utilizing layer-1 carrier aggregation) allows you to achieve up to 8Gbps by layer-1 carrier bonding without a need for an additional indoor unit. Moreover, using the IP-50C, you may upgrade your existing all-outdoor installed base (whether Ceragon IP-20C 2+0 or any third-party all-outdoor) into 4+0 using layer-1 carrier bonding. This enables you to turn more sites in your network into all-outdoor sites, thereby reducing time to market, lowering CAPEX and OPEX, and simplifying site acquisition tasks.

SPECIFICATIONS

RADIO

- Supported frequency bands: 6-42GHz
- Supported channel spacing: 3.5-224MHz
- ACM steps: 12, BPSK-4096QAM
- 4x4 LoS MIMO
- Advanced Frequency Reuse
- Advanced Space Diversity
- Remote 2nd carrier activation

INTERFACES

- 1/10GbE (electric)
- 10GbE (SFP+)
- 1/2.5GbE (SFP)
- 10GbE extension port for advanced features or traffic interface (SFP+)

CAPACITY

- Networking capacity: 16Gbps
- System capacity: 8Gbps (in 4+0 configuration)
- Layer-1 carrier bonding: Up to 4+0 in an all-outdoor configuration using a single cable

NETWORKING

Integrated Carrier Ethernet switching capabilities, MEF Carrier Ethernet 2.0 compliant | up to 30% more capacity using header deduplication | carrier-grade service resiliency (G.8032, MSTP) | SyncE and 1588 synchronization | ITU-T Y.1731 fault and performance management (MEF 35) | SDN | layer 3 (using IP-50FX)

SECURITY

AES-256 radio encryption | secured protocols and management interfaces (HTTPS, TLS, SSH, SNMPv3) | secured architecture and software design | advanced authentication and identification management

IP-50C SPOTLIGHT USE CASE

High-capacity all-outdoor enterprise connectivity





IP-50FX

Disaggregated Cell Site Gateway

The Ceragon IP-50FX disaggregated cell site gateway (DCSG) combines three vital cell site functions into one product: a cell site router (CSR), a networking switch and a radio indoor unit (IDU).

IP-50FX supports connection to fiber and any Ethernet-connected radio up to 16+0 constellation. This includes the Ceragon IP-50C and IP-50E radios as well as any 3rd party radio connected via Ethernet. Its high switching capacity and wide port density make it an excellent fit for any cell site or aggregation site that requires ultra-high capacity, multi-directional functionality, and switching/routing capabilities.

The IP-50FX leverages software and hardware disaggregation to create an ultra-scalable platform. It integrates Ceragon's TIP-compliant gateway hardware

with an advanced network operating system (NOS) and Ceragon's Radio-Aware Open Networking (RAON) software add-on. With RAON the cell site gateway acts as a virtual IDU, with a single IP address and centralized management capabilities for all connected radios, providing easier configuration and monitoring of the entire cluster.

Among its capabilities is layer-1 carrier bonding, making the IP-50FX a highly efficient solution for any multi-carrier requirement – you can create a high-capacity trunk with any outdoor radio connected via Ethernet. The disaggregation of hardware and software enables you to increase capacity and interfaces by simply choosing another hardware variant, while keeping all software functionality and product look and feel intact.

SPECIFICATIONS

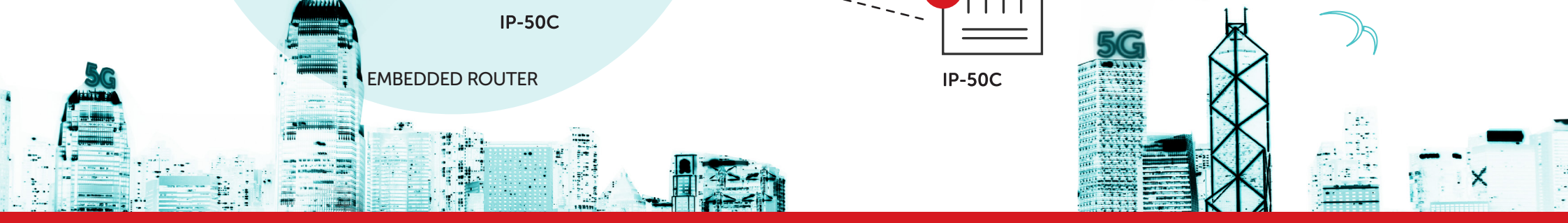
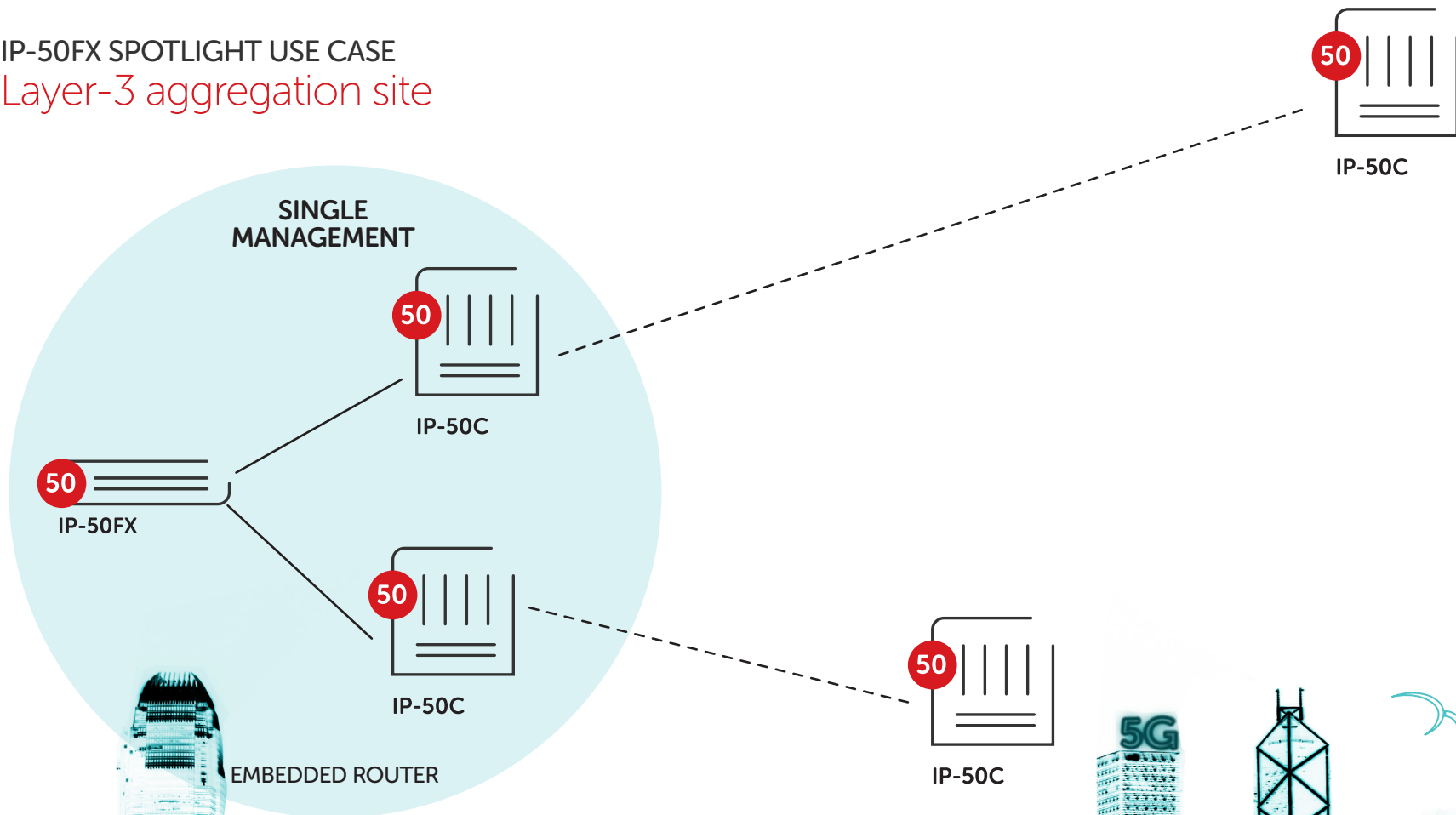
NETWORKING

- Networking capacity: 64Gbps
- Open SW standards: Complies with ONL/ONIE
- Layer-1 carrier bonding: Up to 16+0
- Multi-Protocol Label Switch (MPLS) as the infrastructure
- Layer 3 routing including BGP OSPF and IS-IS
- Segment Routing
- Full layer 2 switching stack
- Management: TWAMP, Role based CLI management, Authentication using TACAS+/RADIUS, SNMP v1, v2, and v3, DHCP client & relay, NTP client & server
- Synchronization: IEEE 1588v2 TC & BC, Support 5G requirements - Type C
- OAM functionality: ETH-BN according to ITUT G.8013/Y.1731
- NETCONF/YANG support

USER INTERFACES

- DC power, Dual Feed
- 2 x 10GbE CAT6 PoE ports
- 4 x 10GbE fiber ports
- 14 x 1/2.5 GbE fiber ports
- 8 x 1GbE CAT5 ports
- Sync In/Out
- 10MHz
- Management/protection
- Terminal
- USB

IP-50FX SPOTLIGHT USE CASE
Layer-3 aggregation site





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 & 5G 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.