

Summary

Cellium’s EdgeAir “P” Private Networks solution provides a cost and power efficient solution for cellular 5G-NR/LTE (New Radio) coverage in buildings alongside legacy Ethernet for both LAN and Wi-Fi with a very low TCO (Total Cost of Ownership). The EdgeAir system, based on Cellium’s CEL1000/CEL2000 SoCs, offers an active DAS (Distributed Antenna System) like solution that is RAT (Radio Access Technology), RAN (Radio Access Network) vendor, and topology agnostic. For downstream traffic, the Cellium Interface Unit (CIU) will down-convert the radio frequencies to frequencies suitable for transmitting over standard CATx copper cables and the Cellium Remote Unit (CRU) will then up-convert the radio frequencies. For upstream traffic, the frequency conversion is reversed. The legacy LAN/Wi-Fi signals are not affected and are passed thru the same copper cables. The end-user will enjoy premium 5G-NR/LTE performance and minimal latency without any cell handover issues. The Cellium Expander Unit (CEU) allows expanding the number of supported CRUs to a total of 64 CRU ports.

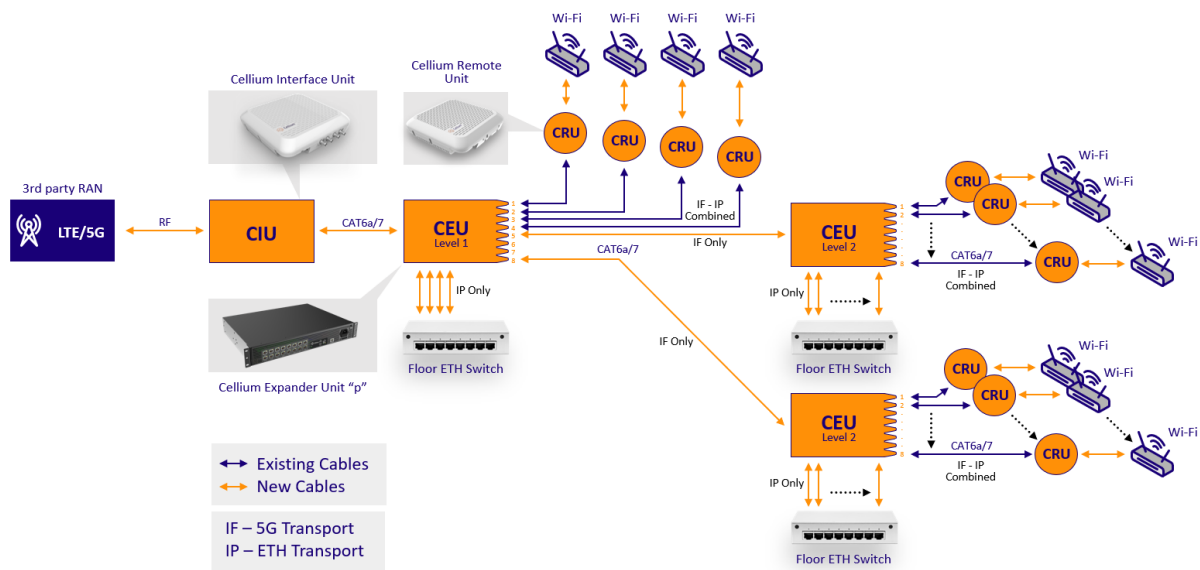


Figure: EdgeAir “P” Family Solution

Introduction

Wireless indoor connectivity has become mandatory for private networks. It is driven by the growth of emerging new applications such as Industry 4.0, connected healthcare, digitized education, mining, intelligent retail, IoT (Internet of Things), and the need to support AGV (Automated Guided Vehicles), sensors, actuators, and cameras. Facility, and IT (Information Technology) managers have been challenged to deploy different systems and solutions for wireless coverage and capacity in order to provide indoor users and devices with the bandwidth, mobility, and user experience required.

The Problem

In the past, the first indoor system to be deployed was WiFi service, due to its free use in unlicensed frequency bands, combined with the high number of devices supported by the WiFi protocols including phones,

tablets, and laptops. However, the challenges related to the WiFi services and networks such as low mobility, low quality of service, low security, and high latency, all lead to the understanding that WiFi-only service is just not enough. This compared with the advantages of cellular networks such as mobility management, advanced quality of service, SIM based security, increased bandwidth enabled by the latest 5G-NR bands, and the advantages of IoT protocols such as low latency, low power consumption, and low cost. The need to provide 5G-NR and LTE cellular coverage indoor has risen due to the modern building use of low emission glass walls and other building materials that block the outdoor macro network cellular signals. In addition, the new 5G-NR bands use higher frequencies, with a smaller outdoor cell coverage, not reaching all buildings, and not penetrating indoor.

Solution

Cellium’s patented technology, IF (Intermediate Frequencies) over Copper (IFoC), provides a RAT/RAN vendor, and topology agnostic solution for 5G-NR and indoor distribution over CATx copper. The EdgeAir “P” family is an indoor antenna subsystem solution for private network owners supporting 5G-NR cellular with legacy Wi-Fi and Ethernet.

It consists of five family members:

- The Cellium Interface Unit (CIU) has four RF ports to RAN equipment with a connection to a CEU over CATx copper cables. It is based on the Cellium CEL1000/CEL2000 SoCs.
- The Cellium Expander Unit (CEU) provides eight CRU ports. The CEU supports one level of cascading. Thus, eight CEUs connected to one CEU that is connected to the CIU can provide a total of 64 CRU ports. It has eight 10GbE Input Ethernet ports that is combined with the 5G signal and being transmitted to the CRU.
- The Cellium Remote Unit (CRU) is a 5G radio unit consisting of antennas, filters, and FEMs (Front End Modules). In addition, the CRU also provides 10GbE LAN connectivity to a local Wi-Fi AP (Access Point).
- The Cellium Line Extender Unit (CLU) allows to extend the distance from the CEU to the CRU.
- The Cellium Fiber Extender Unit (CFU) converts the signal from electrical to optical thus allows extend the distance between CIU and CEU and CEU level 1 to CEU level 2.

Benefits

The EdgeAir system provides the following market leading benefits:

- ✓ Analog solution that is both cost-efficient and provides high performance.
- ✓ RAT/RAN vendor, and topology agnostic.
- ✓ Allows both 5G-NR and LAN to share the same copper infrastructure.
- ✓ The EdgeAir system is based on the Cellium SoCs, thus reducing system costs, power consumption, physical size, and providing superior bandwidth and latency.
- ✓ Any band up to 7GHz.
- ✓ Automatic cable adaptation for solving cable impairments.
- ✓ Simple RF planning and installation.
- ✓ Single cell solution without any inter-cell interference.
- ✓ No need for handover between remote units.
- ✓ Scalable capacity and coverage.

Ordering Information

Model	Description
CIUP	Cellium Interface Unit, 4 x 4 5G-NR/LTE TDD MIMO ports
CEUP	Cellium 1:8 Expander Unit, 4 x 4 5G-NR/LTE MIMO, 8 x 10GbE LAN
CRUP	Cellium Remote Unit, 4 x 4 5G-NR/LTE TDD MIMO, 10GbE LAN
CLUP, Future	Cellium Line Extender Unit
CFUP, Future	Cellium Fiber Extender Unit

CIUP Specifications



Feature	Description
Radio	
Technology	NR/LTE
Duplex mode	TDD
Frequency*	3550-3700MHz
RAN RF connectivity	4x NEX10 (F)
Bandwidth	Up to 150MHz
Tx/Rx path	4/4
Max DL/UL MIMO	4/4
Synchronization	Signal source transparent
General	
CEU connectivity	RJ45, CAT6a and above
Power supply	PoE
Power consumption	<30W
Dimensions	270x270x70 mm (10.6x10.6x2.7")
Weight	<3.5kg
Operating temperature	0°C - 40°C
LED	Status
Reset	Push button
IP rating	IP30
Mounting	Wall, rack
Cooling method	Passive cooling

* Additional frequencies are optional

CEUP Specifications



Feature	Description
CRUs/CEUs connectivity	8 x RJ45 POE++
Cascading capabilities	Level 1 – up to 8 x CRUs, Level 2 – up to 64 x CRUs
CIU connectivity	1 x RJ45
LAN connectivity	8 x RJ45 10GbE
Management port	RJ45
Operating temperature	0°C - 40°C
LED	Status
IP rating	IP30
Power supply	220-110V AC / 48 VDC *
Power consumption	<60 W (stand-alone), <490 W (with 8 x CRUs)
Dimensions	1.5U 19" rack (66x436x330mm)
Weight	<6kg
Mounting	Rack, wall
Cooling method	Active cooling

* Different SKUs

CRUP Specifications



Feature	Description
Radio	
Technology	NR/LTE
Duplex mode	TDD
Frequency*	3550–3700MHz
Bandwidth (contiguous)	Up to 150MHz
Tx/Rx path	4/4
Max DL/UL MIMO	4/4
Max total EIRP	2W [33dBm]
General	
CEU connectivity	RJ45, 10GbE, 1x CAT6a and above
LAN connectivity	1x RJ45 10GbE
Power supply	PoE++ or DC**
Power consumption	<35W
Dimensions	270x270x70 mm (10.6x10.6x2.7")
Weight	<3.5kg
Operating temperature	0°C - 40°C
LED	Status
Reset	Push button
IP rating	IP30
Mounting	Ceiling / suspended ceiling
Cooling method	Passive cooling

* Additional frequencies are optional

** Different SKUs

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