

Summary

Cellium's patented EdgeAir™ solution provides a cost and power efficient solution for cellular 5G NR (New Radio) coverage in buildings with a very low TCO (Total Cost of Ownership). The EdgeAir system, based on Cellium's CEL1000/CEL2000 SoCs, provides an analog solution that is RAT (Radio Access Technology), RAN (Radio Access Network) vendor, and topology agnostic. For downstream traffic the EdgeAir Base Unit (BU) will down-convert the radio frequencies to frequencies suitable for transmitting over standard CATx copper cables and the EdgeAir Remote Unit (RU) will then up-convert the radio frequencies. For upstream traffic the frequency conversion is reversed. The end-user will enjoy premium LTE/5G performance and latency without any cell handover issues.

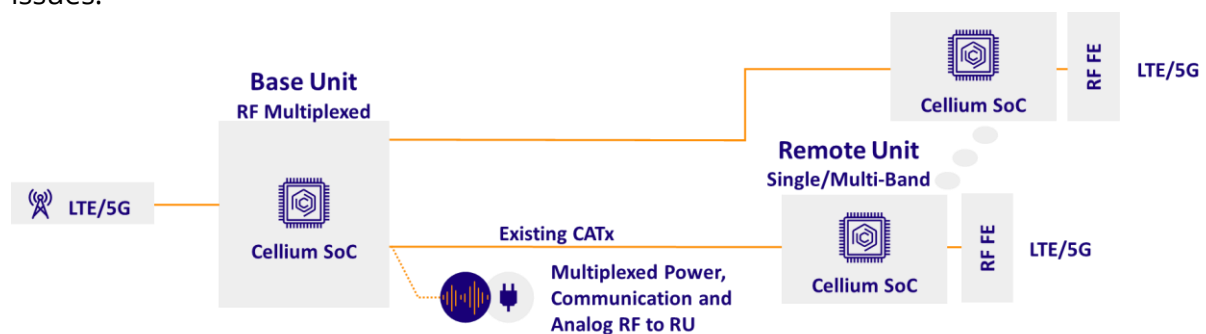


Figure: EdgeAir Distributed IF Technology and SoC

Introduction

Driven by the ever-growing number of smartphones, tablets, laptops and IoT (Internet of Things) wireless connected sensors, appliances, cameras, and other mobile devices, 80% of wireless data traffic originates or terminates indoor. Wireless indoor connectivity has become a mandatory utility like water, and electricity. Building owners, facility managers and information technology (IT) engineers have been challenged to deploy different systems and solutions for wireless coverage and capacity in an effort 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 lower mobility, low quality of service, lower security, and higher 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 bands, and the advantages of IoT protocols such as low latency, low power consumption, and low cost. The need to provide LTE and 5G cellular coverage and capacity systems 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 bands use higher frequencies, with a smaller outdoor cell coverage, not reaching all buildings, and not penetrating indoor.

The Solution

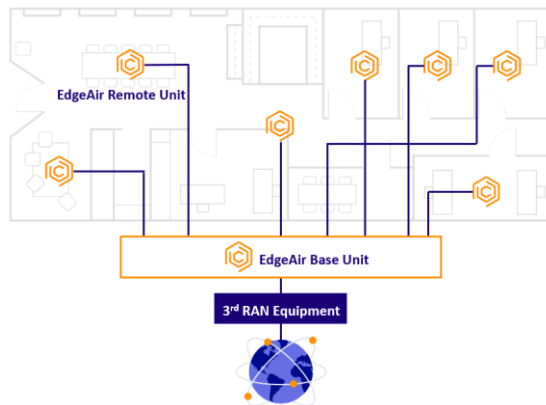


Figure: Indoor Deployment

Cellium's patented technology, IF (Intermediate Frequencies) over Copper (IFoC), provides a RAT (Radio Access Technology), RAN vendor, and topology agnostic solution for LTE, 5G and indoor distribution over CATx copper. The EdgeAir is Cellium's family of MNO (Mobile Network Operator) enterprise indoor antenna subsystem supporting multi-RAT, Non-Standalone (NSA) RAN implementations. The EdgeAir consists of four family members:

- The EdgeAir Base Unit (BU) has six RF ports to RAN equipment and connects eight indoor Remote Units over CATx copper cables. It is based on the Cellium CEL1000/CEL2000 SoCs.
- The EdgeAir Remote Unit (RU) is a radio unit consisting of antennas, filters and FEMs (Front End Modules). It is based on the Cellium CEL1000/CEL2000 SoCs.
- The EdgeAir Repeater Unit (PU) allows to extend the distance from the BU to the RU by an additional leg (100m).

- The EdgeAir Extender Unit (EU) can be cascaded to each BU's RU port providing eight RU ports. Thus, a fully populated BU can provide 64 RU ports.

The EdgeAir system provides the following market leading benefits:

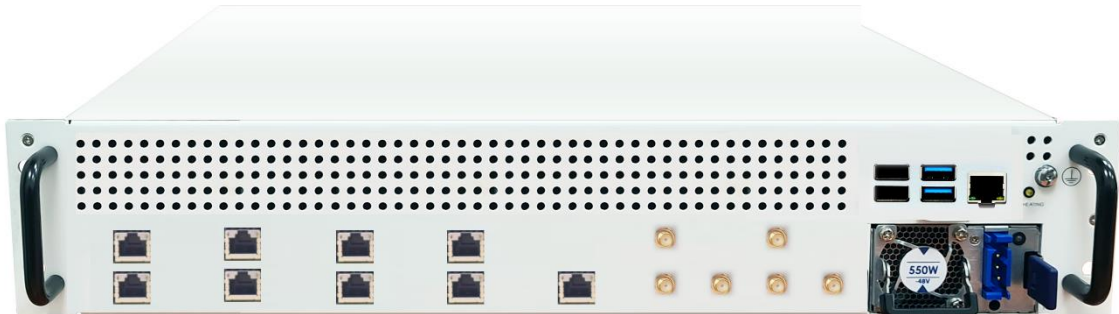
- ✓ Analog solution that is both cost efficient and provides high performance.
- ✓ RAT, RAN vendor, and topology agnostic.
- ✓ The EdgeAir system is based on the Cellium SoCs, thus reducing system costs, power consumption, physical size, and providing superior bandwidth and latency.
- ✓ Any band up to 7 GHz
- ✓ 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
mB4280	EdgeAir Base Unit, 4 ports 5G NR MIMO, 2 ports LTE MIMO, 8 ports RU
mR2201	EdgeAir Remote Unit, 2 x 2 5G NR MIMO and 2 x 2 LTE MIMO
mP2201, Future	EdgeAir Repeater Unit, 2 x 2 5G MIMO and 2 x 2 LTE MIMO
mE4280, Future	EdgeAir Extender Unit, 8 Remote Unit ports

Specifications

mB4280 Specification



Feature	Description
RAN split option towards RU	IF ("split 9")
Number of connected RUs	8 RJ45
Cascade mode	1 level EU
RAN connectivity	6xSMA RF
RU connectivity	8xCATx POE++ Type 3
Management port	RJ45 1Gbps
Operating temperature	-5° - 40°C
IP rating	IP30
Power supply	48 VDC
Power consumption	<60 W (stand-alone) <900 W (with 8 RUs)
Dimensions	2U 19" Rack
Weight	<10 kg
Mounting	Rack

mR2201 Specification


Feature	LTE	5G NR
Radio		
Bandwidth	5/10/15/20/40 MHz	Up to 100 MHz
Deployment options	LTE only or LTE + NR (NSA)	NR only or LTE + NR (NSA)
3GPP compliance	Release 15	
Tx path	2	2
Rx path	2	2
DL MIMO	2	2*
UL MIMO	2	2*
DL modulation	256 QAM	256 QAM
UL modulation	64 QAM	64 QAM
Synchronization	Signal source transparent	
Physical / Interfaces		
Connectivity	CATx, 100m reach	
LEDs	LTE, NR, PWR, STATUS	
Reset	Push button	
Antenna type	Internal	
Operating temperature	-5° - 40°C	
IP rating	IP30	
Power supply	POE++Type 3	
Power consumption	<50 W	
Dimensions	<300 x <300 x 70 mm	
Weight	<3 kg	
Mounting	Ceiling	
Cooling method	Passive Cooling	

*In cooperative 4x4 MIMO (Network MIMO) the BU can transceive 2x2 MIMO to each of two RUs. The UE (User Equipment) interacts with the two RUs at the same time.