Outdoor Enclosure
Mobile Backhaul Considerations

Abstract

The exponential growth in the use of cellular services continues to cause growing pains for mobile carriers. One of the central problems is the lack of indoor space available for new base-station and backhauling systems as the amount of cellular infrastructure equipment multiplies. Floor space, rental costs, heating and cooling, and regulatory and competitive concerns all add to the carrier's headache.

Outdoor enclosures, which house the equipment and alleviate the need for expensive and scarce indoor space, have become a viable and cost-saving alternative. This paper discusses the problems and costs of the traditional in-building solution, introduces the Ceragon FibeAir Outdoor Enclosure, and surveys the advantages and challenges of the outdoor enclosure approach.

Base Station Headaches

In a period of economic instability and emphasis on cost savings, the deployment of new mobile infrastructure equipment can result in extraordinary CAPEX outlays, and numerous logistical challenges.

For new-generation 3G, WiMAX, and LTE deployments, which require increasingly dense deployment of cellular antennas, the challenges become even greater. In the following sections, we take a look at the deployment of new microwave backhauling equipment, both in Greenfield scenarios, and within existing structures.

Greenfield Deployment

In areas of new development, it may be necessary to build a new structure in order to house backhauling and base station equipment. Taking into account the location of the structure, as well as prevailing real estate prices, the new structure can cost the carrier anywhere from $10K to $50K.

Adding to these CAPEX concerns, investors demand rapid rates of return-on-investment (ROI). Operators must be able to install new backhaul setups instantly and flexibly – in any kind of physical setting – in order to begin generating revenues.

In addition, zoning and other regulatory issues may exist. License applications may be delayed because of increased public awareness of and sensitivity to radiation-based issues.

OPEX issues are relevant here as well. Greenfield operations tend to have a lean operational structure, often integrating advanced networking and protection functionality in a single system. By employing a ring topology or 1+1 radio configuration, an operator can reduce the staff required to maintain the new site, as he can still maintain the service level required by the SLA.

Generally speaking, Greenfield operations – whether deployed by Greenfield operators in urban environments, or by incumbent operators in rural areas – require an efficient, integrated solution that meets all the requirements of the mobile carrier.

Urban & Brownfield Deployment

In urban and Brownfield environments, carriers must deal with even more complex problems. In many existing indoor sites, there is simply no available rack space! Even if rack space is available, it may prove quite costly to rent. Indoor rental space has been quoted as high as $500 per month per rack unit.

In indoor environments, the operator's major challenge is to reduce the overall cost of the extension of a backhaul site. In order to provide more capacity, increase the availability of links, and deploy networking functions such as SNCP (for TDM protection) or Ring Optimized STP, operators are usually forced to install additional units, requiring increased space, power and air29 conditioning resources.

A first level of savings is possible by using integrated wireless solutions that integrate all the required networking functions. (Integrated solutions are out of the scope of this paper. For

further information, please refer to *Ceragon's FibeAir IP-10 - Integrated Wireless Backhaul Solution*).

The Alternative - Outdoor Enclosures

What if you - the cellular operator - could circumvent these problems by deploying a small, cellular-optimized housing that could be quickly and painlessly installed on a cellular tower, roof-top, wall, or fixed-line telephone pole? The potential for cost savings is enormous:

- **Small form factor.** An outdoor housing's compact size reduces the cost of leasing or purchasing rack space.
- **No additional footprint.** Its versatile deployment capabilities result in zero additional footprint at the central office or in a communications room.
- **Quick roll-out.** Speedy introduction of new microwave links in Greenfield areas – at solar11 powered sites, and at repeater sites adjacent to highways.
- **Low installation costs.** One-man installation and shorter cabling reduce installation costs.
- **Environment-friendly.** Greener deployments, saving on powering and air-conditioning costs.

Outdoor Enclosures – Main Challenges

The outdoor enclosure seems like a perfect solution. However, there are a number of reasons why outdoor enclosures have not been used in large numbers until now. These concerns, which go beyond the cost of implementing a reliable working solution, must be addressed by suppliers before mass deployments can begin:

- **Uniform active units.** A single, uniform, indoor unit must be available for use in all installation scenarios – indoor, outdoor, and split indoor/outdoor. Ubiquitous functionality yields significant savings in inventory, training, and network management costs.

- **Heat dissipation.** Enclosures must offer a real heat dissipation solution, without requiring modifications to the indoor unit.
- **Sun Radiation.** Standard equipment cannot survive without proper protection from direct sunlight. Outdoor enclosures address this need.
- **Cold start.** It must be possible to start the equipment under extremely cold weather conditions.
- **Water resistance:** When talking about water resistance, people envision submarine devices that can operate underwater for years. Though this is not the case, can the equipment survive a rainstorm?
- **Dust protection:** A standard unit must be able to sustain operations in extremely dusty, desert conditions.

Ceragon's FibeAir Outdoor Enclosure

In order to meet this need, Ceragon introduced the FibeAir Outdoor Enclosure. The Outdoor Enclosure was designed to house the FibeAir IP-10 and FibeAir 1500R, Ceragon's flexible, cost-effective microwave radio platform for cellular backhauling. In designing the enclosure, Ceragon tackled each of the above concerns, creating a technological solution for a wide variety of deployment challenges.

Deploys a standard unit. Ceragon designed its Outdoor Enclosure in a way that will provide all the cost-saving benefits of unit and architecture standardization.

Excellent heat dissipation. The Outdoor Enclosure employs a special passive heat-sink design, intended to exploit the airflow of Ceragon's indoor units. This mechanism keeps powering costs at a minimum, saving over $100/year per RU. With no requirement for external fans or air conditioning systems, the quiet Outdoor Enclosure can be freely installed in residential areas. Optional active add-ons, in the form of internal and external fans, optimize the enclosure's heat dissipation capabilities.

Special anti-radiation design. An additional cover, placed on top of the enclosure, was added in order to prevent direct solar radiation on the enclosure and the IDUs inside.

Heating unit. An optional heating element is available for use inside the Outdoor Enclosure. The heater keeps the temperature inside of the enclosure above the FibeAir's minimum operating range, enabling a system cold-start at -40°C (-40°F).

Standards compliant. The FibeAir Outdoor Enclosure is compliant with NEBS and ETSI standards for protection from harsh environmental conditions and from electro33 magnetic interference.

Dust and water resistant. The FibeAir Outdoor Enclosure has IP-55 certification for resistance to dust and water penetration. The IP-55 requirements are further explained here:

- **Dust.** IP-55 dictates that an enclosure must protect active components from penetration of quantities of dust that would interfere with the satisfactory operation of the equipment.
- **Water.** IP-55 specifies protection from jets of water. Water projected by a nozzle against an enclosure from any direction shall have no harmful effects.

The FibeAir Outdoor Enclosure is an easily transportable structure for indoor microwave units that can be deployed in any kind of outdoor environment, offering the following additional benefits:

Flexible Deployment. Designed to house Ceragon's FibeAir IP-10 and FibeAir 1500R wireless backhaul platforms, the Outdoor Enclosure contains 5 RU of 19" rack space – 4 RUs for indoor units, and another 1 RU for panels and cabling. The same FibeAir product line is suitable for both indoor and outdoor deployment, saving on spare parts, training, and maintenance costs.

Low OPEX. The FibeAir Outdoor Enclosure can house the FibeAir platform in any physical environment - on a cellular tower, floor, rooftop, wall, or fixed-line telephone pole. This alleviates the need to rent expensive rack space in central office buildings, communication rooms, or street cabinets. Save thousands of dollars each month in operating expenses.

Simple Installation. The small form-factor Outdoor Enclosure can be carried and installed by a single person. No need for a truck to transport the cabinet to the site, or for a crane to lift the cabinet onto the roof.

Monitored Solution. The FibeAir platform is closely monitored by Ceragon's user-friendly PolyView Network Management System. All FibeAir accessories – enclosures, heating units, and fans – generate external alarms on the IP-10 or FibeAir 1500R that can be monitored at the Network Operations Center (NOC).

Secure Deployment. The Outdoor Enclosure eases security concerns. The enclosure door is lockable, and when opened, can generate an external "door open" alarm and forward it to the carrier's NOC via the FibeAir IP-10 or FibeAir 1500R unit deployed inside.

Suitability to Multiple Network Architectures. The enclosure's 5 RU size makes it suitable for deployment in both tail and aggregation sites, in each case offering the same advanced feature set - in a compact, zero-footprint casing. Ceragon's outdoor solution extends support to ring architectures and other redundancy topologies when 1+1 equipment protection is required.

Conclusion

The FibeAir Outdoor Enclosure from Ceragon is an ideal solution for a wide array of backhauling deployment problems. For indoor sites in which adding additional backhauling equipment is either impossible or prohibitively expensive, Ceragon provides an outdoor system that can be quickly deployed on a cellular tower, rooftop, wall, or pole.

As LTE and Wimax networks proliferate, the increased demand for inner-city antennas will make outdoor backhauling implementations even more beneficial. Ceragon's Outdoor Enclosure is the perfect solution for fast-track microwave backhaul deployment.

About Ceragon Networks

Ceragon Networks Ltd. (NASDAQ: CRNT) is the premier wireless backhaul specialist. Ceragon's high capacity wireless backhaul solutions enable cellular operators and other wireless service providers to deliver 2G/3G and LTE/4G voice and data services that enable smart-phone applications such as Internet browsing, music and video. With unmatched technology and cost innovation, Ceragon's advanced point-to-point microwave systems allow wireless service providers to evolve their networks from circuit-switched and hybrid concepts to all IP networks. Ceragon solutions are designed to support all wireless access technologies,

delivering more capacity over longer distances under any given deployment scenario. Ceragon's solutions are deployed by more than 230 service providers of all sizes, and hundreds of private networks in more than 130 countries. Visit Ceragon at www.ceragon.com.