STREET READY SMALL CELL & Wi-Fi BACKHAUL

Gigabit capacity all the way to your small cell & Wi-Fi hotspots over the interference free millimeter wave band, designed to minimize both CAPEX and OPEX

Challenge

Mobile and Wi-Fi operators need to find a solution for backhauling street level small cells & Wi-Fi, while minimizing both CAPEX and OPEX.

Minimizing cost is critical in street level networks due to their large size – many more small cells/Wi-Fi hotspots will be deployed for every macro cell – and difficult access to street furniture.

Solution

Siklu's EtherHaul™ brings Gigabit capacity over interference free and uncongested millimeter wave bands to the street level. Designed for easy site acquisition and dead simple deployment, it's also the smallest backhaul radio in the world. The all-outdoor unit also includes cutting edge networking to reduce operational costs. Siklu's backhaul is based on market leading all-silicon technology, which results in rock-bottom prices and unparalleled reliability.

Benefits

- Deploy & Forget – 74-year MTBF & future-proof high capacity are key to reducing truck rolls
- Smallest size, easy site acquisition & frequency planning
- Minimal price due to market leading integrated silicon technology
- Optimal backhaul capacity utilization based on advanced networking
- Unmatched performance to support data-intensive services
- Proven timing technology for highest Quality of Experience (QoE)

Mobile operators need to deliver faster networks to power their customers' growing data consumption. Small cells and carrier-grade Wi-Fi access are layered into existing macro cell networks at a ratio of a few small cells / hotspots for every macro cell, in order to provide capacity and coverage boost. The small cells and carrier grade Wi-Fi access points are miniature, all-outdoor boxes designed to be located on lighting poles and building facades. However, operators are challenged with finding a cost-effective wireless solution to backhaul this new network segment installed on the street level. Access to street level furniture is limited, most installations involve stopping traffic so street level visits must be fast. There will be an exponentially larger number of sites to maintain. All in all, minimizing link costs, and installation & operation costs are critical for mass deployment of street level network backhaul.

Is Cost-Effective Street Level Backhaul Possible?

Operators need to take a three-pronged approach to minimizing installation and operational costs of small cell and Wi-Fi backhaul deployments. They need to focus on **easy deployment** including ultra-fast installation. Correctly planning **capacity** in advance in order to eliminate frequent return visits to site for capacity upgrades is also critical. And taking advantage of **advanced networking** and Carrier Ethernet will increase resiliency and simplify operations and troubleshooting.

Optimizing backhaul requires:

- Small cells / Wi-Fi will require hundreds of megabits of backhaul capacity. They will also make the macro cells more efficient and increase backhaul demands even further. Capacity planning should allow for high capacity from day 1, or additional costly site visits will be required.
- Fast and easy deployment procedures that reduce expertise required from deploying technician and minimize ground disruptions.
- Easy site acquisition and frequency planning.
- Lower networking cost by using only one type of user-to-network interface UNI—Ethernet.
- To enable smooth integration that simplifies planning, commissioning and troubleshooting, the solution must support the macro cell quality-of-service (QoS) scheme.
- Multiple logical connections which are essential for LTE small cell are required, including the new X2 interfaces that should be easily tailored. This eliminates the need for an advanced cell site switch or router at each small cell location.
- Built-in synchronization (SyncE / IEEE 1588v2) capabilities are essential at the small cell location to support the demand for fully synchronized cellular network, with no need to install a dedicated sync device at each location.
- Protected topology must be supported from day one (even if activated later) to improve reliability and ease maintenance. It eases future expansions, and redundancy additions, with no need replace or add backhaul hardware.

Deploy & Forget

In small cell deployments the number of assets an operator has to install and manage increases dramatically.

In recent years, the prices network operators are paying (CAPEX) for network equipment per megabit capacity are eroding. This is good news. However, capacity upgrade cycles are shorter and installation (OPEX) prices have held steady. Work cycles – installation, upgrades, and faults – have become a key factor in the overall TCO of any project.

Operators are seeking relief:

- Eliminate near future backhaul gear replacements / upgrades
- Simplified procedures to allow installation by non-telco technicians, who have access to street furniture
- Significantly reduced installation times when ground disturbance is to be expected
- Improved reliability to reduce # of truck-rolls
- Prepare the backhaul network for any topology and with future proof networking capabilities
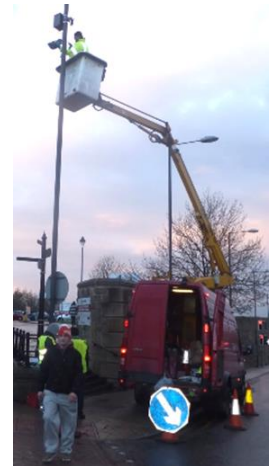
The X-Factor: Planning for Small Cell & Wi-Fi Effect on Macro Backhaul

Adding small cells and Wi-Fi to the RAN results in an overall improvement in traffic efficiency. When data subscribers in a predefined area served by a macro cell roam to a nearby small cell, the signaling load, and mutual RF interferences in the macro site is reduced. But what is the magnitude?

The Small Cells Forum studied that payload traffic impact resulted by several # (1, 4, and 10) of SC added per macro-cell, as illustrated in figure 1:
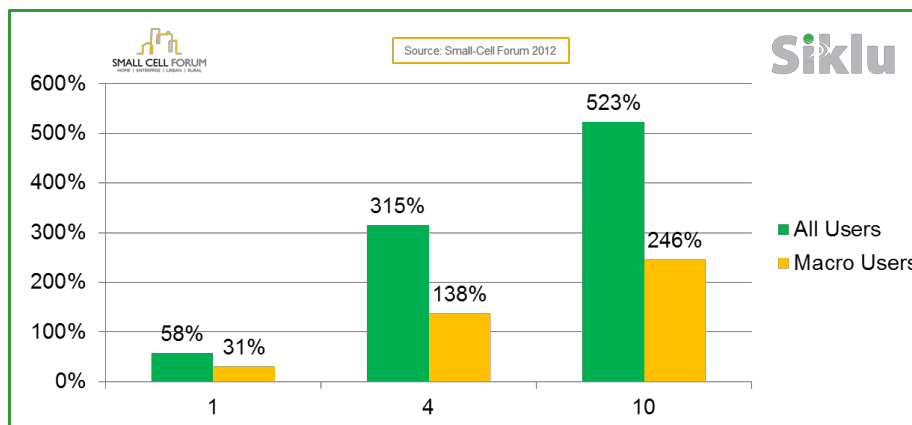

Figure 1: % Increase in median throughput, users will experience over macrocells alone

- o The green part, illustrates the throughput improvement for all users (both those served by the macro cell and those served by the small cells)
- o The yellow part, illustrates the throughput improvement for the users who were served only by the macro site, and this increase is a direct result of the offload of other users to the small cells.

Users will clearly benefit from the small cell / Wi-Fi hotspot addition. However, the macro cell backhaul network is expected to experience a significant load increase, one that operators will need to prepare for.

Optimal Backhaul Solution for Heterogeneous Macro & Small Cell / Wi-Fi Network

Use cost-effective and field-proven millimeter wave radios to expand the network footprint while utilizing the existing investment at macro cells locations.

Siklu's provides full set of wireless backhaul elements for city areas:

1. The EtherHaul-600T provides street level Gigabit capacity in the unlicensed, ultra-wide, interference free and uncongested 60GHz band.
2. The EtherHaul-1200 series delivers Gigabit capacity, over the lightly licensed, interference free and uncongested 70/80GHz bands. It enables essential, long-term upgrades to macro cell backhaul.
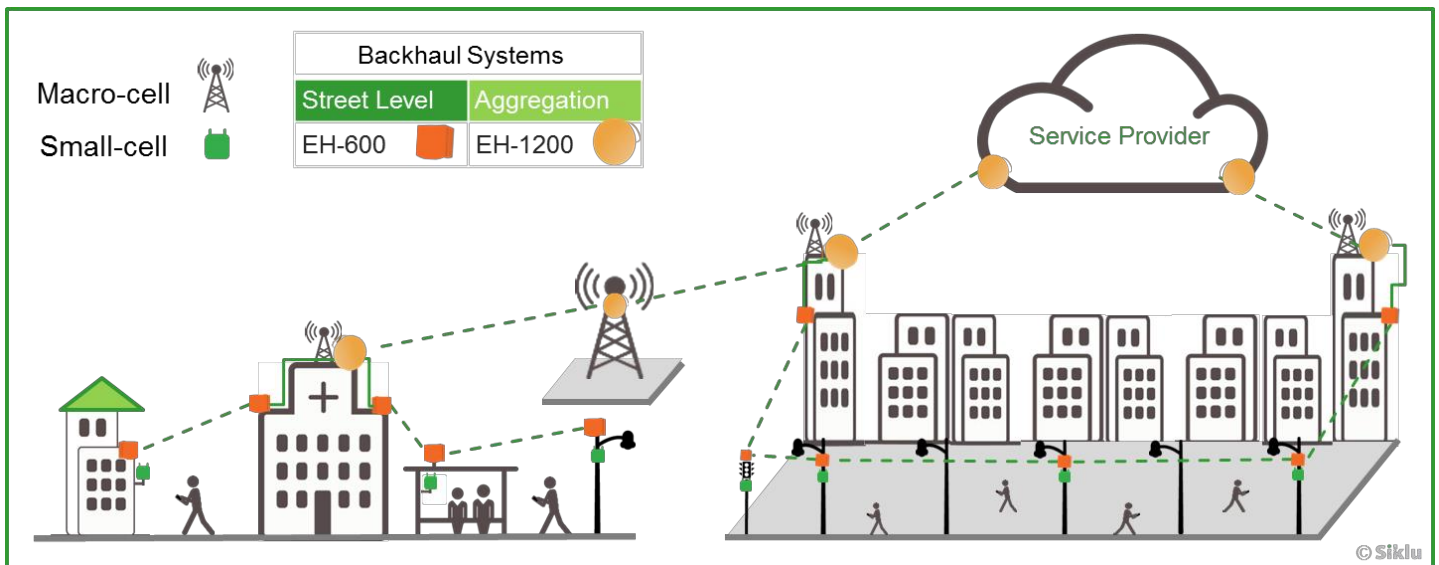

Figure 2: Small-Cell / Wi-Fi heterogeneous backhaul solution with macro-cell backhaul

On the right hand side, the backhaul links form a fully redundant Gigabit wireless ring. Siklu's EtherHaul links support the leading standard for ring protection, G.8032v2. This standard uses advanced and ultra-fast networking features to detect main link failure and route the traffic seamlessly to the backup path. With G.8032 the solution brings advanced loops prevention mechanism without compromising restoration times. The 10ms Continuity Check Message (CCM) interval supported by the EtherHaul radio links ensures sub-50ms recovery times, even with three consecutive failure messages necessary for detection assurance and re-routing of backhaul traffic. The standard based G.8032v2 is widely adopted by leading wireline carrier Ethernet gear manufacturers and thus enables seamless integration with Siklu's links to form a robust harmonized network.

The left hand side of figure 2 demonstrates a cascaded backhaul network built with Siklu's EtherHaul links. The solution enables any future expansion without the hassles of network elements replacement.

Solution Benefits

What's Tiny and Can Be Deployed Anywhere?

- The EtherHaul-600 is the smallest street level backhaul radio in the world; it's invisible on the street.
- The EtherHaul series is comprised of both street level and rooftop radios that are easy to install on any available furniture. The EtherHaul-600T is field-tested to overcome pole sway, twist and tilt.
- Unlicensed or lightly licensed, ultra-wide spectrum that is uncongested and interference free for quick frequency planning.

Deploy & Forget Toolkit

- Auto-alignment and zero touch configuration toolkit, enables installation in less than 15 minutes, by any installer, no telco background necessary.
- Future-proof Gigabit capacity, for longer investment protection & no near future site visits for upgrades.
- Innovative all-silicon field proven technology with industry leading >70 years MTBF drastically reduce troubleshooting truck rolls.

Carrier-Grade Resiliency & Networking in All-Outdoor Radios

- Resilient network expansion for all outdoor small cells with sub-50msec restoration times
- Standard-based implementation that allows easy solution expansion also with 3rd party standard optical gear
- Dual G.8032 instances to maximize backhaul capacity under normal conditions, are also possible
- Hitless, QoS-based adaptive radio modulations for smooth operation in all weather conditions
- During a failure mode of one of the ring solution's components where the ring capacity drops by up to half, QoS policies ensure hitless smooth continuity to critical services (signaling, sync, voice) and throttle down only lower priority services
- EtherHaul's standard based CFM capabilities enable easier failure troubleshooting end-to-end in the service provider network domain
- Smooth integration with third party network that will enable the service provider to sell attractive backhaul services to other mobile network operators, security networks, and business connectivity providers.
- Multiple services, control and synchronization services are easily configured for each location, including the new 'X2' logical interface which is essential for LTE small-cells.
- Service provider's network QOS and synchronization scheme maintained at wireless backhauled sites:
    - The radio links adopt the QOS concepts used at the service provider network and will prioritize, limit and shape any type of traffic based on various options (VLAN-id, DSCP, P-bit).
    - It is also possible to use 2 stage priority mechanisms. For example, first by DSCP and then by Vid. The advanced QOS support enables efficient network resources usage for both small-cells and Wi-Fi access points.
    - L1-based SyncE protocol and/or packet-based iEEE-1588v2 synchronization as configured at the service provider network, is adopted by EtherHaul radio, and delivered seamlessly to the remote small-cells.
- The EtherHaul radio transceivers are able to report link bandwidth information to aggregation optical Ethernet switch/router to take action on the signal degradation and provide optimal bandwidth. (Based on Microwave Adaptive Code Modulation (ACM) Signaling).

How will you deliver small cell and Wi-Fi hotspot backhaul on the street, profitably? How will you handle the increased traffic to macro cells?

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About Siklu

Siklu delivers Gigabit capacity through millimeter wave radios, operating in the 60, 70 and 80 GHz bands. These frequencies are ideal for dense, capacity-hungry mobile networks: spectrum is cheap and sometimes free; capacity is huge and congestion minimal. No technology offers the same cost/performance ratio. Siklu leads the market, with thousands of units that already deliver carrier-grade performance in multiple weather conditions worldwide.
For further information, visit www.siklu.com.