

IN THE MATTER OF the *Ontario Energy Board Act, 1998*, S.O.
1998, C. 15, (Schedule B);

AND IN THE MATTER OF an Application by **Canadian
Distributed Antenna Systems Coalition** for certain orders under
the Ontario Energy Board Act, 1998.

AFFIDAVIT OF

MICHAEL STARKEY

ON BEHALF OF

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED
(“THESL” or “Toronto Hydro”)

ATTACHMENT MTS-06

Solving the Capacity Crunch – Small Cells' role in a 4G LTE Network



Mobile operators planning their 4G LTE networks should view femtocells as an integral part of their network architecture. With femtocells, operators can tap diverse new revenue streams while also delivering on subscribers' expectations for seamless mobile broadband coverage, wherever they are, whatever they are doing.

Few operators expected the staggering growth in mobile internet traffic we have seen since the emergence of the iPhone and Android. Now there are dozens of devices and operating systems supporting non-traditional mobile applications such as social media, gaming, productivity tools, location-based services, navigation and book readers. On top of this is a growing army of HSPA data users that either utilize mobile broadband as their principal source of internet connectivity at home, or as an alternative to Wi-Fi for connectivity out and about.

The end result is a mobile network drowning in data traffic. Investment bank Morgan Stanley predicts that global mobile internet traffic will grow by a staggering 39 fold between 2010 and 2014, exceeding two terabytes per month. And Informa Telecoms & Media estimates by 2015, the average US smartphone user will consume 776MB per month, ten times what they do today.

One tactical response to this

insatiable demand for data has been to try to curb demand. Fair use policies may have stopped the bandwidth hogs, but they have done little to stem the overall demand as millions more mobile subscribers are turned on to smartphone devices.

Another response has been to try to alleviate the strain on the radio access network by offloading mobile internet traffic onto Wi-Fi hotspots. Not only has this had only limited success, it is unlikely to be a sustainable solution, as we will discuss later.

A third response has been to "hang in there" until new spectrum is released. Operators may soon have access to 3G extension bands, allowed to refarm their GSM spectrum for 3G/4G use, and may benefit from the analogue TV switch off (sometimes called the Digital Dividend). This relief, however, may be short lived. Even with LTE's spectral efficiency, there is no escaping the fact that spectrum will always be a limited resource, yet subscribers' appetites are seemingly insatiable.

The only sustainable solution for LTE network design is to redesign the radio access network to manage the available spectrum more efficiently.

Challenges of relying solely on Wi-Fi

Wi-Fi offloading has so far had limited success. But could it play a role in future network design? Aside from the reality that not all mobile devices are Wi-Fi enabled, Wi-Fi technology is best suited to simple wireless internet access for stationary users. Mobile devices, on the other hand, need to be mobile.

Firstly, Wi-Fi suffers from significant interference problems as the access point density grows. This is because Wi-Fi access points cannot regulate their power output so access points in close proximity can drown each other out (co-channel interference) leading to coverage black holes.

If mobile operators were to rollout, or commission, thousands of new Wi-Fi access points to offload growing mobile data traffic, they would be pushing Wi-

Fi beyond its capabilities. For each new access point installed, the interference results in the effectiveness of an established one being diminished. This is non-linear growth.

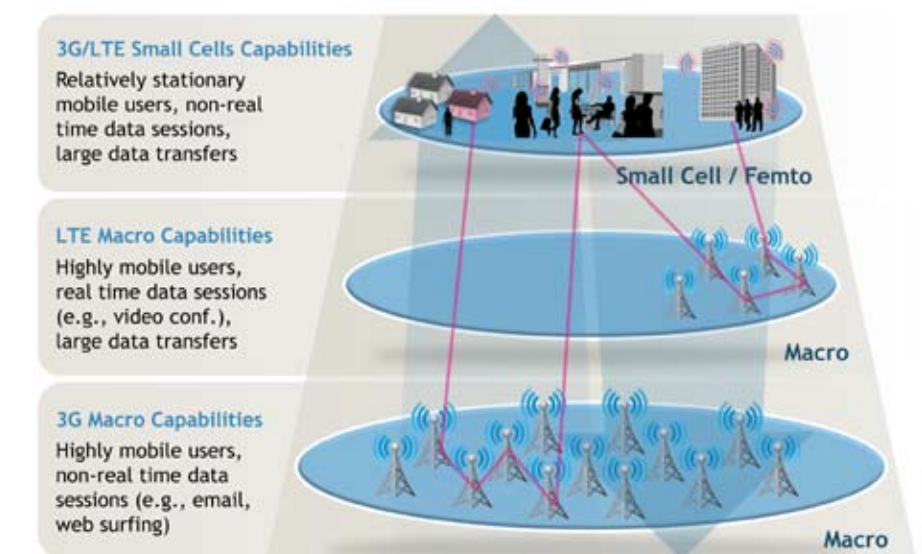
And an additional reason why Wi-Fi is not an ideal offload technology is the user experience. Assuming a mobile subscriber has Wi-Fi and that they have the capability turned on, they must still voluntarily log-on to an access point. If they move between access points (i.e. they are mobile), the session will drop and a new access point will need to be found. Even when stationary, a session can end if the access point becomes over-crowded, which is a frequent occurrence with hotspots in busy locations. Because Wi-Fi is best effort, there is no inherent ability to reserve capacity for individual users.

The large value of femtocells

Femtocells, because they use the same radio technology as the rest of the network, do not have these problems. Unlike Wi-Fi, femtocells are self-organizing. When a user device is in close proximity to a femtocell, both radiate less power which means less battery drain in the user device, and less energy used by the access point.

The presence of another access point on the same frequency nearby will cause the femtocell to regulate its

Figure 1 – Utilizing Different Layers to Deliver the Best Quality of Experience



power output so that there is seamless coverage from an end user perspective. Consequently for every additional femtocell you install, you get one additional femtocell capacity. Unlike Wi-Fi, this is linear growth, and ultimately more cost effective.

On top of that femtocells provide a seamless experience. Users do not need to manually authenticate and when they move around their session automatically hands over to the next femtocell or macro cell without interruption, and because there is inherent quality of service, they will not

be crowded out by other users.

Because of these qualities, femtocells are able to play a much larger role than simply offloading traffic or coverage infill. Femtocells could become the beating heart of a new architecture.

The heterogeneous network

The physical limitations of current and future spectrum bands mean that operators need to re-think the way they build their networks, depending less on a "macro cells only is sufficient" strategy to one that combines the advantages of the macro cell with

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those of femtocell. We call this heterogeneous network.

Figure 1 shows how the network can be built in layers, leveraging the existing 3G network for wide area coverage; 4G macro cells for providing targeted urban coverage; and various types and sizes of femtocells delivering surgical coverage where usage is most concentrated.

Around 70% of mobile device usage is indoors, yet macro cells can only penetrate walls, steel and glass when their power is turned up. Small cells can support indoor users much more effectively and efficiently. For instance, a residential femtocell delivers 2-4 channels of simultaneous connections to registered users within a very small radius. Larger enterprise femtocells can work together to cover an entire building, with integration into a corporate IP-PBX and a single subscriber management function. In public spaces, network coverage can be provided by metro femtocells offering 32-64 channels to shoppers, diners or travelers.

Femtocells can also be used effectively outdoors. Metro femtocells can be used to cover a small community that does not have the subscriber density to justify a macro cell. Alternatively, with directional antennae, femtocells can provide coverage in topographically challenged areas, much more cost effectively than a macro cell can.

Combining these different network layers can deliver a seamless service. At home the subscribers' mobile

internet sessions are routed through the residential femtocell; on their commute into the city, their service is delivered by the wide-area 3G. Once in the city, data sessions are delivered by urban 4G LTE macro cells. As the subscriber stops for coffee and a croissant, service is then routed via a metro femtocell. As they walk into their office next door, data sessions are then routed through enterprise femtocells. Subscribers get a continuous, high-quality experience, and operators can meet the data demand both geographically and during peak loads.

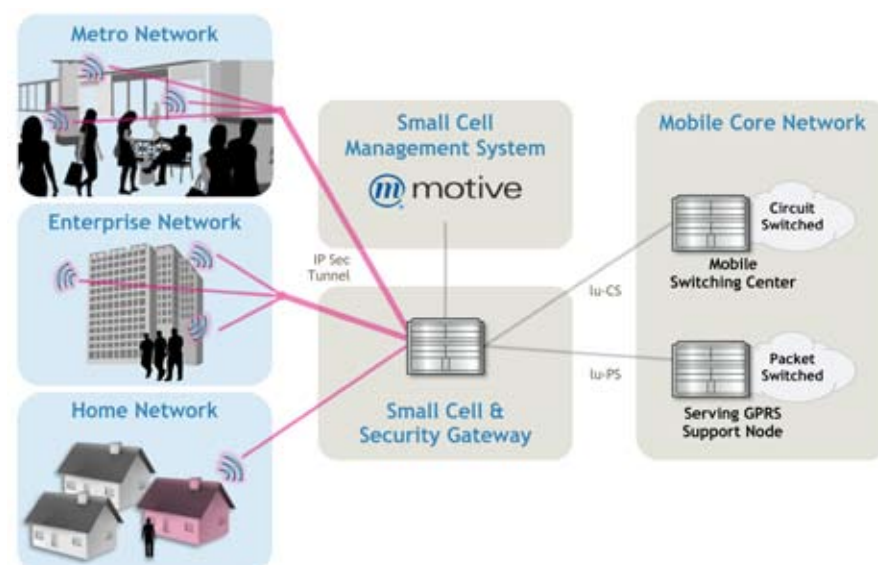
The role of SON in femtocell deployments

Key to a heterogeneous network strategy is the concept of a self-

organizing network (SON). Algorithms manage the load-balancing between cells (data capacity); they assess the complex, evolving radio interplay between cells in close proximity (power management and device handover); they identify the type of data session the subscriber is having (e.g. voice, real-time, streaming, download, bursty) and route the session through the appropriate cell while guarding against errant behavior such as a virus-infected device committing a denial of service attack on the network.

By assessing and controlling all these parameters, SON functionality provides a means to ensure service quality. But how does an operator leap from maintaining a few thousand macro cells to potentially millions of cells?

Figure 2 – Small Cell Network Architecture



Deployment needs to be simple enough for home users, shopkeepers and IT managers to install the femtocell themselves without needing a site survey or a support call to a helpdesk.

Simply plug the device into a DSL modem and it works. The femtocell will scan the local area for other cells – femto and macro – and modulate its power output accordingly.

The SON functionality combined with the femtocell's on-board intelligence means that the next generation network can be built up, on a cost-efficient, evolving basis. Density can be increased at all layers – in the 3G and 4G macro layers, and the 4G femtocell layer – without needing to reconfigure each cell to cooperate with its neighbors, big or small. And as spectrum will continue to be a limited resource, operators will be able to introduce more smaller cells to alleviate spectrum strain.

See inside the cell

In addition to managing the radio interface, Motive femtocell management software lets operators perform one-to-one diagnostics to retrieve useful information about the status of a device and push out updated configurations and patches. This means operators no longer have to depend on subscribers to describe the symptoms of the problem or perform complex and time consuming trouble-shooting tasks.

For an office environment with a number of femtocells, policy-based operations can be used to remotely update or fix devices en masse,

either when a fault occurs or during predefined maintenance windows, without having to dispatch an engineer.

Diagnostic and configuration tools will allow operators to remotely manage the RF profile, and send updates and patches via the fixed broadband connection directly to the femtocell. This means operators will not receive countless calls from subscribers that need help with setting up their femtocell or making minor changes.

This ability to reach into the femtocell and control it remotely using the same tools as those used to control macro cells, gives operators unprecedented granularity into how the network is performing and where demand is peaking.

Self-organizing femtocells working collaboratively with macro cells are essential to spectrum optimization. Only by managing spectrum more intelligently will operators be able to satisfy the ever-growing demand for mobile data. Femtocells, as part of a heterogeneous network strategy, allow operators to efficiently deliver the promise of 4G.

Learn more, visit www.wilson-street.com and www.alcatel-lucent.com/femto

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New business case study makes the case for Metro-Femtocells

Written by David Chambers

Wednesday, 15 June 2011 18:12



Accurate cost analysis to justify the deployment of femtocells in public areas can be difficult to come by. Although the Femto Forum provides a detailed business case analysis spreadsheet template for its members, few operators are likely to release sensitive commercial figures about their operating costs. However, Alcatel-Lucent has studied this issue in depth and published their findings in a new report out this month. Sofia Flores, Sr. Product Marketing Manager at Alcatel-Lucent, provided further insight into the study.

The primary driver is capacity

You would have to be working in a salt mine not to have seen the constant reminders to the industry of the impending data traffic demand forecasts for the next few years. At almost every conference, graphs are shown with mobile data traffic growth off the scale which revenues don't match. Alcatel-Lucent forecast mobile data traffic growth of 30x between 2010 and 2015. Network operators have to find ways to deliver this high capacity as cost-effectively as possible.

Traditional solutions have their limits

At this month's Mobile Data Optimisation conference ([read my full report here](#)), network planners explained how they were currently adding capacity at existing cellsites. Those with additional frequency spectrum were adding 2nd and 3rd carriers to their 3G network, but this has its limits. One planner explained how the natural topology of their country (it has lots of hills) meant there was a lot of interference, presenting challenges which increased when the higher speed HSPA was used. It also meant they couldn't easily use their full set of 3 carriers everywhere and had effectively assigned one for use in the difficult, interference prone areas.

With this traditional approach, additional macrocell and microcell sites will inevitably be required to increase capacity further. These both have long lead times – it can take months to negotiate with landlords and planners – and typically cost hundreds of thousands of Euro to install.

The Metro-Femtocell alternative

The femtocell industry has developed a technical alternative called [Metro-Femto](#), where a number of small "hotspot" basestations are sprinkled around high traffic areas. Pedestrian and stationary users camp on to these, relieving the macrocell network. These operate with any 3G phone – no special handsets or dongles are required – and support all existing voice and data services.

Because these are designed using very cost effective femtocell components, the total budget can be very attractive. Femtocell software, refined over several years of operation in difficult residential environments, is sophisticated enough to be self-configuring and self-optimising – important to reduce the planning and operational management of the solution.

Unlike residential femtocells, these are "open access" and can be used by any customer of the network operator. They are owned and installed by the operator themselves, and can share the same femtocell gateway and other back-office systems used for residential and/or enterprise femtocells.

Comparing Macro expansion with Metro-Femto

The analysis defined a typical case for an operator with both fixed (wireline) and mobile (wireless) assets over a 5 year period. It assumed there were already 28 Macro sites covering this urban area which had to be expanded, and a further 11 installed. The total cost of this approach was estimated at €1.43M.

By comparison the Metro-Femto approach totalled €0.64M, some 45% lower than the macro only approach. Even though many more small cells are involved – over 140 in this example – the individual costs for hardware, installation, site rental and backhaul are all very significantly lower.

Cashflow

A closer analysis reveals a more steady level of investment is required for the metro-femto approach since the cost is more evenly spread across years 3 to 5 – around 200K per annum. The Macro expansion case shows rapidly escalating costs which grow from 77K in year 3 up to 1.1M in year 5.

The radio access budget planning cycles for network operators aren't really able to cope with such rapid and possibly unforeseen growth rates.

What this suggests to me is that while the current strategy of simply adding extra carriers to 3G cellsites combined with slowly increasing the number of cellsites might appear to meet today's traffic demands, there will come a time when this approach will require a sudden (and possibly unplanned) growth in CAPEX to remain competitive. Even were funds are available, long cellsite acquisition and deployment times (6 months is not unusual), would make it more difficult for network operators to respond.

Strong competitive advantage

What the business case study shows is that network operators who prepare well in advance, and have metro-femto capability in place within the next 2-3 years, will have a strong competitive advantage. This will allow them to respond quickly to position

additional capacity in identified hotspots areas, will move towards sustainable investment levels. Those that adopt Metro-Femto early can use the time to familiarise themselves and their engineering teams with the operation, capabilities and constraints of these small cells over the next 1-2 years. This will give them a choice of how they want to respond in meeting increased data demands, balancing the options of expanded macro cellsites, additional spectrum, LTE with the choice of metro-femto.

Other advantages

The study also highlights some further benefits of the metro-femto approach. Their small footprint and unobtrusive appearance allows them to be deployed almost anywhere. They can be mounted outside a building, on a street pole or indoors in public areas.

By offloading heavy users, this also frees up precious capacity in the macrocells which can reach fast moving users or those in less populated areas.

In the short range, the metro-femto approach improves radio link performance, which translates to higher data rates, lower latency and better quality. Users can watch that video clip, enjoy higher quality voice and faster web access.

The 10 page report can be downloaded from the [Alcatel-Lucent Small Cell](#) website

My thanks are due to Sofia Flores, Sr. Product Marketing Manager at Alcatel-Lucent, for sharing her insights into the study with us.



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3G Femtocells Now Outnumber Conventional 3G Base Stations

By: Ian Mansfield | 21st Jun 2011

There are now more 3G femtocells in use than there are 3G base stations, according to a study commissioned by the Femto Forum. According to study, carried out by Informa Telecoms & Media there are now in excess of 2.3 million 3G femtocells globally compared to 1.6 million 3G macrocells.

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There are now 31 commercial Femtocell services worldwide which represents over 60% growth in deployments in the past quarter alone.

This market growth is reflected in the fact that eight of the top 10 mobile operator groups (by revenue) now offer femtocell services, which includes AT&T Group, France Telecom Group, NTT DoCoMo, Sprint Nextel, Telefonica, Deutsche Telecom, Verizon Wireless and Vodafone. Furthermore, in the vast majority of these markets, the devices now outnumber all generations of cell sites.

Informa forecasts this growth to continue with 48 million access points in use globally by 2014.

Where last quarter Informa noted the recent growth in enterprise femtocell usage, this quarter has been notable due to the growth in femtocells for public access, especially as a means for speeding up mobile broadband in busy areas as exemplified by SK Telecom's pure data offload strategy. The technology is also expected to grow in 4G networks with 60% of operators believing that small cells will be more important than macrocells for an effective LTE deployment strategy according to a recent Informa survey.

"Femtocells haven't just passed a major milestone - it is now apparent that they are rapidly becoming less of a differentiator for service providers and more like an essential offering. Consumers are increasingly going to expect something that for a long time seemed impossible - near ubiquitous coverage for voice and high speed data. Femtocells make this a very real possibility," said Dimitris Mavrakis, Senior Analyst at Informa Telecoms & Media.

Furthermore, the past quarter has also seen important progress in femtocell technology. The first industry-wide agreed set of API specifications for advanced mobile applications based on femtocell technology have been published. The API provides awareness information so developers can incorporate enhanced presence, context and location-sensitive features into new and existing apps, and can also take advantage of the lower cost and faster data connections enabled by femtocells.

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Alcatel-Lucent small cells set new milestone at Mobile World Congress



Dramatically augmenting mobile service experience at home, at work and in public areas, and contributing to achieve lightRadio™ objectives

Paris and Barcelona, February 14, 2011 – Alcatel-Lucent (Euronext Paris and NYSE: ALU) today announces a significant expansion of the breadth and capabilities of its 9360 Small Cells portfolio. At Mobile World Congress, Alcatel-Lucent is launching its 3G small cells approach for indoor and outdoor high-traffic “metro” areas (such as shopping malls, airports, railway stations, etc.) as well as the second generation of its 9362 Enterprise Cell. The company is also unveiling its concept for the 9361 Home Cell X-Series: a sleek, compact range of USB-powered small cells able to deliver high-capacity data and crystal-clear voice for up to eight users simultaneously.

“In the context of the lightRadio™ approach, there is a strong continuum between the deployment of small and macro cells in order to establish converged, IP-based, flexible and smart networks,” says Wim Sweldens, head of Alcatel-Lucent’s Wireless activities. “Our ongoing small cells innovations are crucial to the creation of this new, more powerful mobile network architecture – bringing major coverage, capacity and services benefits to service providers and subscribers alike.”

Increasing network coverage and capacity in public spaces – both indoors and outdoors

Alcatel-Lucent’s 9363 & 9364 Metro Cells extend 3G wireless coverage and capacity to high-traffic public spaces, indoors and outdoors. Alcatel-Lucent’s 9363 & 9364 Metro Cells can function in shopping malls, hotel lobbies or airports, or open up the networking possibilities of bus stops and busy shopping streets - or even more remote, rural locations. Their plug-and-play and self-organizing networks (SON) capabilities - combined with macro-like, real-time management - make for easy deployment and control. Mobile service providers can use Alcatel-Lucent’s 9363 & 9364 Metro Cells to deliver outstanding performance in public spaces of any kind and size, at a lower operational expense.

Alcatel-Lucent’s 9363 & 9364 Metro Cells easily integrate into existing 3G networks. By avoiding the cost and complexity associated with current macro site deployments, metro cells contribute to reduce by up to 50% the total cost of ownership per bit of the mobile access infrastructure. An added advantage is that, using Alcatel-Lucent’s application programming interface (API) innovation, service providers can use small cells to offer new, revenue-generating services based on location and presence. In retail environments, for example, promotional offers could be sent to shoppers as they walk past or browse in particular areas.

Launching the higher-capacity second-generation small cell for enterprise users

Businesses of all sizes need clear reception and low latency – a five star, five bar mobile broadband experience – throughout their buildings. Alcatel-Lucent’s second-generation 9362 Enterprise Cell, providing additional capacity and serving a larger coverage area, eliminates dead zones and revives the “connected office”.

But the 9362 Enterprise Cell is more than just a wireless access point; Alcatel-Lucent’s open API innovation again drives the delivery of innovative, value-added services which boost the efficiency of business communications at a lower cost. Examples include connecting mobile phones to the company’s PBX system, or automatically sharing real-time presence and availability information with other colleagues in the building.

Introducing a miniaturized residential small cell – the 9361 Home Cell X-Series

Alcatel-Lucent sees the future trend towards miniaturized small cells, and the 9361 Home Cell X-Series is a sign of its readiness to meet this oncoming market need. The X-Series devices are powered by a standard USB port, allowing for easy connection to a wide range of Internet-enabled devices such as PCs, TVs, home routers and even game consoles, while delivering high-speed data and crystal-clear voice for up to 8 simultaneous mobile users.

Alcatel-Lucent’s 9360 Small Cells portfolio is displayed at Alcatel-Lucent’s booth (# 6C23 in Hall 6) at the Mobile World Congress ’11 (Barcelona, Spain - February 14th till 17th).

About Alcatel-Lucent’s small cells approach

Alcatel-Lucent is clearly establishing itself as the leading end-to-end Femto/small cells vendor, holding more than 20 trials and 17 commercial deployment agreements. Commercial contracts include the selection of Alcatel-Lucent by **Telefonica** in Spain, **Etisalat** and **du** in the United Arab Emirates (UAE) and by **Vodafone Group** as its preferred vendor for the deployment of a nationwide Femtocell service in the UK.

Alcatel-Lucent is leading in small cells with an unrivalled end-to-end portfolio that includes innovation from Bell Labs such as support systems for customer care and self-organizing networks (SON). Not only does SON empower small cells to automatically configure at power up; it also enables them to periodically monitor, update and optimize their neighbour relation lists and handover parameters – thus reducing handover failures by up to 80%. Using SON technology, Alcatel-Lucent’s small cells also have the capability to continuously adjust transmit power to the surrounding environment - to deliver the best possible coverage. Bell Labs studies have found that its SON features translate in a 20 percent CAPEX savings and 50 percent OPEX savings.

More information: http://www.alcatel-lucent.com/wireless/femto_small_cells.html

About Alcatel-Lucent (Euronext Paris and NYSE: ALU)

The long-trusted partner of service providers, enterprises, strategic industries and governments around the world, Alcatel-Lucent is a leader in mobile, fixed, IP and Optics technologies, and a pioneer in applications and services. Alcatel-Lucent includes Bell Labs, one of the world’s foremost centres of research and innovation in communications technology.

With operations in more than 130 countries and one of the most experienced global services organizations in the industry, Alcatel-Lucent is a local partner with global reach.

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Alcatel-Lucent supports Telefónica's commercial femtocell deployment in Spain



Improving 3G coverage in indoor locations and high-traffic public areas

Paris and Madrid, February 11, 2011 — Alcatel-Lucent (Euronext Paris and NYSE: ALU) today announced it has been selected by Telefónica for its commercial, Femto-based small cells deployment in Spain - extending 3G coverage in indoor locations and high-traffic public areas, and targeting a better user experience for Telefónica's residential and business subscribers.

This deployment will ensure that Telefónica's customers have high-quality wireless network access, even in circumstances where meeting mobile service demand can be a challenge. As such, it will demonstrate that Femto-based small cells are the right and complementary solution to classical wireless infrastructure deployments to offer mobile broadband services.

The use of Femto-based small cells will also enable new converged services at home, and open the door to a new range of applications in the future in public areas - based on the use of enablers like location, presence or context-awareness.

"We work closely with our customers to design new network and business models and are committed to help them deliver quality services to their subscribers, indoor and outdoor. This deployment with Telefónica in Spain illustrates our leadership in the small cells space and will enable us to show the flexibility of femtocells to deliver innovative applications," said Federico Guillén, Alcatel-Lucent's global account leader for Telefónica.

About Telefónica

Telefónica is one of the largest telecommunications companies in the world in terms of market capitalization. Its activities are centered mainly on the fixed and mobile telephony businesses with broadband as the key tool for the development of both.

The company has a significant presence in 25 countries and a customer base that amounts to more than 278 million accesses around the world. Telefónica has a strong presence in Spain, Europe and Latin America, where the company focuses an important part of its growth strategy.

Telefónica is a 100% listed company, with more than 1.5 million direct shareholders. Its share capital currently comprises 4,563,996,485 ordinary shares traded on the Spanish Stock Market (Madrid, Barcelona, Bilbao and Valencia) and on those in London, Tokyo, New York, Lima, Buenos Aires and São Paulo. For more information: ☞ www.telefonica.com

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Alcatel-Lucent's small cells approach benefits from the company's unique expertise in bringing together wireless and IP technologies into a single, coherent network. It is an integral part of Alcatel-Lucent's Application Enablement vision - building on its High Leverage Network™ architecture to deliver wireless IP services. Alcatel-Lucent is leading in small cells with an unrivalled end-to-end portfolio that includes innovation from Bell Labs such as support systems for customer care and self-organizing networks (SON).

Not only does SON empower small cells to automatically configure at power up; it also enables them to periodically monitor, update and optimize their neighbour relation lists and handover parameters - thus reducing handover failures by up to 80%. Using SON technology, Alcatel-Lucent's small cells also have the capability to continuously adjust transmit power to the surrounding environment - to deliver the best possible coverage. Bell Labs studies have found that its SON features translate in a 20 percent CAPEX savings and 50 percent OPEX savings.

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With operations in more than 130 countries and one of the most experienced global services organizations in the industry, Alcatel-Lucent is a local partner with global reach.

The Company achieved revenues of Euro 16 billion in 2010 and is incorporated in France and headquartered in Paris.

For more information, visit Alcatel-Lucent on: <http://www.alcatel-lucent.com>, read the latest posts on the Alcatel-Lucent blog <http://www.alcatel-lucent.com/blog> and follow the Company on Twitter: ☞ http://twitter.com/Alcatel_Lucent.

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Picochip Extends SK Femto Deal

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BATH, U.K. -- Picochip has been chosen to supply the technology for the second wave of femtocell access points from Contela, used by Korea's SK Telecom (SKT) for data offload. Building on the success of Contela's first-generation data-only product, also based on Picochip technology, the new 2FA combines a 16-user 'dual-carrier' HSPA+ femtocell with Wi-Fi in an integrated access point. SKT will deploy the 2FA in high-traffic areas such as cafés, shopping malls, train stations, offices and apartment blocks.

SKT's on-going femtocell rollout was the first in the world specifically for data offload. Designed to deliver capacity where end-user demand is highest, it was also the world's first network to be based around the new 3GPP standard Lte interface. SKT launched the initial service last year and announced on May 24 that it is expanding deployment with the new 2FA, aiming to install 10,000 femtocells by the end of 2011.

"Operators around the world are facing massive growth in data traffic and femtocells provide one of the best strategies to address this challenge," commented Picochip VP of Marketing Rupert Baines. "Many people are discussing 'small cells' and higher capacity femtocells, SK Telecom's volume deployment demonstrates Contela's leadership in this area. This roll-out proves that femtocells can increase capacity, improve network efficiency and ensure smartphone users get the best out of their devices."

picoChip Designs Ltd.

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SEARCH

IN THE MATTER OF the *Ontario Energy Board Act, 1998*, S.O.
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AFFIDAVIT OF

MICHAEL STARKEY

ON BEHALF OF

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED
(“THESL” or “Toronto Hydro”)

ATTACHMENT MTS-08

Easing inner city congestion with public service femtocells

Posted on March 16, 2011 by admin

By Julia Mason

With the residential femtocell business model now proven, operators are turning their attention to how femtocells could be used in public indoor and outdoor locations. In the past year, at least three operators have started metro femtocell services (two urban, one rural).

They've been able to do this because of an increase in both the capacity and range of femtocells: a metro femtocell can now support 32 simultaneous users, and we expect this to increase, all from a box the size of a home broadband gateway.

The range of metro femtocells can be extensive as well: in the inner city, an outdoor range of 150–300 metres can be expected and in rural locations, a femto footprint can be boosted to 2 km if positioned high enough.

So surely this is just a small macro cell? Not at all.

The metro femtocell has the same architecture as a residential femtocell except that it is set up for open access (rather than a closed user group). An engineer simply needs to mount the access point on a building or street furniture, plug in the power and the broadband and it is ready to go. Unlike repeaters and distributed antennas, no site planning required. Metro femtocells self configure, their inherent RF power management ensures they cooperate with other nearby femtocells and macrocells.

So why should operators be interested?

Capacity and coverage. In our cities, mobile broadband has been a staggering success at the expense of a mobile network struggling to cope with demand. And in villages, operators have had to over provision just to ensure they reach their coverage goals. Yet, this coverage is typically for voice calls. The emergence of smartphones and 3G mobile broadband has put a significant strain on rural networks that were designed for delivering widespread voice coverage, not fast broadband for users located at the edges of a macrocell.

By using femtocell technology to deliver capacity and coverage where it is needed most, operators can cut costs while also improving customer satisfaction, which in turn will reduce churn. The cost benefits to providing capacity through metro femtocells compared to macrocells are:

Less expensive backhaul: you can use DSL to backhaul mobile internet traffic. And fibre, Ethernet, microwave, WiMax, satellite and so on. The range of backhaul options means there will always be something available.

Quick to set up: don't have to get planning permission for new macro cell sites, and fight public opinion. Metrocells can be mounted discreetly on street furniture and walls

Simple to set up: metro femtocells are like femtocells, they are plug and play. This means you do not need complex site planning, and you don't need engineers to deploy them. All you need are field staff that can mount a box to a wall and plug in the power and broadband. The height of the mounting will be dictated by the required range and the location.

Great for indoor coverage: for indoor spaces like shopping malls and sports stadia, good coverage from a macrocell means turning up the power to penetrate the walls and glass. But with strategically placed femtocells, entire in-building coverage can be achieved easily and at a low cost.

Collocating with Wi-Fi: Rather than being competing technologies, Wi-Fi and femtos can complement each other by

ATTACHMENT MTS-08

being integrated within the same metro access point. This saves money by sharing on site rental, backhaul, power, install/maintenance and even manufacturing costs.

Overall, the costs for deploying 3–4 metrocells (including power, backhaul and installation) can be 10x less than achieving the same coverage & capacity with a new macrocell.

Julia Mason is WCDMA Metro Cell Program Leader, Alcatel Lucent

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Frank discussion with telecom's most experienced editors

T-Mobile quietly builds up its WiFi data offload operation

by Kevin Fitchard

February 8th, 2011

..T..Mobile..

When you think of WiFi mobile data offload, AT&T is the first operator that comes to mind. It's been the most publicly aggressive (<http://connectedplanetonline.com/commentary/att-wifi-lte-081710/index.html>) of all of the operators in using local area network technology to augment its 3G network. It gives iPhone and other smartphone users free unlimited access to its nationwide hotspot footprint, it's built dedicated hot zones ([./2010/05/25/att-tests-free-wi-fi-for-mobile-offload-in-times-square/](http://2010/05/25/att-tests-free-wi-fi-for-mobile-offload-in-times-square/)) in high mobile data traffic areas, and it even limits certain applications—such as the iPhone 4's FaceTime video chat app—to WiFi connections.

But in the last few months, T-Mobile appears to have built up a considerable WiFi offload operation.

Kineto Wireless, which supplies the unlicensed mobile access (UMA) solution in T-Mobile's hotspot@home fixed mobile convergence (FMC) service, said today that it has tallied 1 million downloads of its new Smart Wi-Fi Android application in just 60 days of its November launch.

The app basically extends hotspot@home SMS-, voice- and data offload features to any accessible WiFi access point, removing millions of voice conversations, text messages and megabytes of data traffic from the operator's macro network to the Internet.

T-Mobile isn't Kineto's only customer for Smart Wi-Fi, but considering the only other is U.K. operator Orange—not to mention T-Mobile's generally higher penetration of Android devices—a good deal of those 1 million users are bound to be T-Mobile customers.

T-Mobile has pre-loaded the app on many of its newer Android devices such as the MyTouch 4G, making it available as a download for customers with older devices. But as newer devices emerge, Kineto expects the application to be automatic. It has negotiated deals five device manufacturers to have it preloaded on 30 smartphones released in the first half of the year. Kineto didn't reveal any info on just how much voice, SMS and data traffic was offloaded from the mobile network, but given that smartphone users tend to be some of the highest volume users in almost every service category, the numbers are likely considerable.

T-Mobile appears to be moving away from the provisioning of dedicated FMC access points at homes and in the office and moving toward a generic strategy in which it doesn't lift a finger to deploy any new WiFi access but instead relies on the growing base of freely available WiFi networks popping up everywhere. Contrast that with AT&T's strategy, which requires it to build an ever growing network of hotspots and hotzones that only offload data traffic and a femtocell network to offload voice and SMS traffic.

Other vendors besides Kineto are starting to tap into WiFi's potential. WiFi access point vendor Ruckus Wireless is starting to sell its platform to operators as a private offload network rather than a public hotspot or residential WLAN network. Nokia Siemens Networks today announced a new Smart WLAN platform ahead of Mobile World Congress, which will allow operators to manage WiFi access points as nodes on their radio access networks.

Neither of those solutions, however, takes a completely agnostic approach to the network like Kineto's. Ruckus' platform is designed to work with Ruckus access points. While NSN's platform is AP agnostic it requires operators to either own or partner with WiFi providers so it can authenticate users to specific access points.

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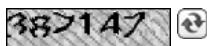
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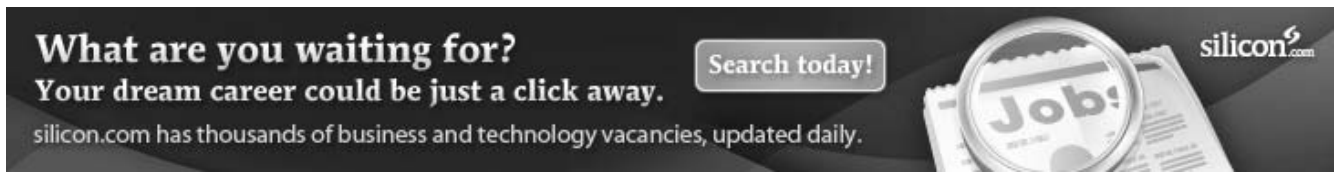
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O2 announces free wi-fi for all

O2 plans to launch 15,000 free wi-fi hotspots...

By Shelley Portet, 26 January 2011 16:30

NEWS O2 has today announced the launch of a major wi-fi network, free to O2 customers as well as to those on other networks.

With O2 Wifi, the mobile operator will go head to head with BT to compete in the public wi-fi market. BSkyB is also likely to enter the battle for public wi-fi usage, with the announcement of its acquisition of The Cloud, a network of wireless hotspots, expected later this week.

O2 says its network will provide twice as many wi-fi hotspots solely for public use as BT and The Cloud combined, although its figure of 15,000 is not due to be reached until 2013.

The 15,000 O2 wi-fi hotspots will run on dedicated internet connections with download speeds of up to 24Mbps. This contrasts with BT's service, which uses residential connections with potentially limited bandwidths for its two million hotspots. BT and The Cloud currently provide about 7,000 hotspots dedicated to public use.



The O2 wi-fi network will be free for all consumers to use, making wi-fi access from smartphones more accessible
(Photo credit: Shutterstock)

Experts have attributed O2's decision to operate a free wi-fi network to a need to offload data from its network. The popularity of the iPad and iPhone has placed a strain on the mobile network's infrastructure, particularly in cities such as London. The increased capacity of the new wi-fi network should ease the data load and improve smartphone wi-fi access.

The move by O2 to allow customers from other networks to access its free wi-fi network marks a change from the approach adopted by BT, whose Openzone hotspots are free only to BT customers.

Currently, only 20 per cent of O2 customers with access to free public wi-fi actively use it.

Tim Sefton, O2's new business development director, said current wi-fi services may be putting consumers off. "Customers are discouraged by barriers which include complexity in activation, uncertainty of where wi-fi is free and the variable quality of the current experience," he said in a statement.

O2 says the new wi-fi network will offer smartphone users a simpler way to access the internet.

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Crown Castle to Deploy Distributed Antenna System

By: [Ian Mansfield](#) | 5th Oct 2010

Crown Castle International says that one of its subsidiaries has initiated construction of a distributed antenna system (DAS) for The Colonial Williamsburg Foundation. Crown Castle has also entered into an agreement to deploy additional system nodes at the nearby historic College of William and Mary.

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A distributed [Antenna](#) system is a network of antennas connected by fiber to a communications hub designed to facilitate [Wireless](#) communications services for multiple operators. When completed, the projects are expected to improve wireless service for guests and staff throughout Colonial Williamsburg's Historic Area, local [Hotel](#) properties and Merchants Square, as well as for students, faculty and visitors of the College of William and Mary.

The system being deployed utilizes existing infrastructure for antenna placement, including rooftops, the cupolas of historic buildings and a light pole at the college's football stadium. In addition, two stealth flagpole antenna locations are planned for construction.

"Crown Castle is dedicated to providing wireless communication operators with complete solutions and support, so a distributed antenna system is a natural extension of our core business," stated Pat Slowey, Crown Castle's Senior Vice President -- Sales and Customer Relations.

Colonial Williamsburg welcomes more than 1.7 million guests a year, and reliable wireless communication reception is essential to meet the demands of conference planners and guests. "For venues and destinations such as Colonial Williamsburg's Historic Area, aesthetics play an important role in the visitor experience," stated Mr. Slowey, "With thousands of visitors and conventioners expecting reliable voice and data [Coverage](#) every day, the distributed antenna system enables us to solve a modern day problem in a colonial setting. Further,

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we understand the College of William and Mary's need to provide reliable wireless voice and data service to its students, faculty and visitors. The system we plan to deploy provides a coverage solution that does not compromise the beauty of the campus."

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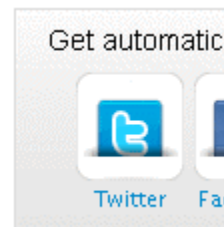
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PRESS RELEASE:

Crown Castle Announces Distributed Antenna System in Paradise Valley, Arizona

* Reuters is not responsible for the content in this press release.

Wed Mar 30, 2011 7:00am EDT

HOUSTON, March 30, 2011 (GLOBE NEWSWIRE) -- Crown Castle International Corp. (NYSE:CCI) today announced that one of its subsidiaries has completed construction of a distributed antenna system (DAS) to facilitate wireless communications services in Paradise Valley, Arizona. The community near Phoenix approved a DAS wireless solution in order to provide enhanced wireless coverage, preserve the town's aesthetics, and accommodate multiple wireless carriers. The Paradise Valley DAS network provides wireless coverage for residents and first responders throughout the 16 square mile community. AT&T Mobility is the first wireless provider to utilize the DAS network, and the network has the capacity to support up to four additional carriers.

Working with town leaders and citizens, Crown Castle designed and constructed a forty-two node outdoor DAS system for the town. The system utilizes three streetlights, two traffic signals, and thirty-seven faux cacti to conceal wireless antennae and equipment.

"Crown Castle worked closely with the town council and residents to develop a wireless solution that would satisfy coverage demands and preserve the aesthetics of Paradise Valley," stated Mike Kavanagh, President -- DAS for Crown Castle. "Crown Castle invested a lot of time in public outreach in order to educate residents about DAS and to collect their input on what the system's components should look like and where they should be located. As a result of the public outreach campaign, the town leaders approved the DAS network, allowing construction to begin without delay."

"Our town government is dedicated to preserving the residential character of the community. The town's residents expect ubiquitous wireless service, but not at the expense of changing the peaceful, quiet surroundings of the town," said Scott LeMarr, Mayor of Paradise Valley. "With Crown Castle we found a company that recognized the special character of our town and that developed a design solution that preserved the town's aesthetics while providing great wireless coverage."

The town of Paradise Valley, Crown Castle and AT&T Mobility will celebrate the new DAS network at a Ribbon Cutting Ceremony on Wednesday, March 30th at 10:00 AM (PDT) at the Police Department Auditorium on the Town Hall Campus. Paradise Valley's mayor and council members, as well as representatives of Crown Castle and AT&T Mobility, will "flip the switch" to activate the DAS network.

About Crown Castle

Crown Castle owns, operates, and leases towers and other infrastructure for wireless communications. Crown Castle offers significant wireless communications

respectively. For more information on Crown Castle, please visit www.crowncastle.com.

The Crown Castle International Corp. logo is available at <http://www.globenewswire.com/newsroom/prs/?pkgid=3063>

CONTACT: Jay Brown, CFO
Fiona McKone, VP - Finance
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ATTACHMENT MTS-12



PERMIT FEE SCHEDULE

Openings in the Public Way

| Placement | Per Opening/Cut | Asphalt Restoration Fee |
|------------------------|----------------------|-------------------------|
| ADA Ramp installation | \$372.00 per opening | No Charge |
| Street / Alley | \$372.00 per opening | \$60.00 per square foot |
| Sidewalk | \$372.00 per opening | No Charge |
| Parkway | \$186.00 per opening | No Charge |
| Soil Borings – Street | \$372.00 per opening | No Charge |
| Soil Borings - Parkway | \$186.00 per block | No Charge |
| Well Monitoring | \$372.00 per opening | No Charge |

*Note: Fees double on moratorium streets
Fees increase 5% annually*

Dumpster Placement in the Public Way

| Placement | Class A (30 cubic yards or less) | | | | Class B (greater than 30 cubic yards) | | | |
|-----------|-------------------------------------|-----------|------------|-----------|--|-----------|------------|-----------|
| | Outside the CBD | | In the CBD | | Outside the CBD | | In the CBD | |
| | 1-3 Days | Per Month | 1-3 Days | Per Month | 1-3 Days | Per Month | 1-3 Days | Per Month |
| Alley | \$50.00 | \$100.00 | \$100.00 | \$200.00 | \$100.00 | \$200.00 | \$200.00 | \$400.00 |
| Curb Lane | \$50.00 | \$100.00 | \$100.00 | \$200.00 | \$100.00 | \$200.00 | \$200.00 | \$400.00 |
| Parkway | \$50.00 | \$100.00 | \$100.00 | \$200.00 | \$100.00 | \$200.00 | \$200.00 | \$400.00 |
| Sidewalk | \$50.00 | \$100.00 | \$100.00 | \$200.00 | \$100.00 | \$200.00 | \$200.00 | \$400.00 |

Operating Equipment in the Public Way (Daily)

| Placement | Outside the CBD | In the CBD |
|---------------------|---|--|
| Alley | If 10 ft or greater unobstructed then \$2.50 per foot, if less than 10 ft unobstructed then \$5.00 per foot | If 10 ft or greater unobstructed then \$5.00 per foot, if less than 10 ft unobstructed then \$10.00 per foot |
| Bicycle Lane | \$2.00 per lineal foot | \$4.00 per lineal foot |
| Curb Lane | \$5.00 per lineal foot | \$10.00 per lineal foot |
| Sidewalk or Parkway | If partial obstructed then \$1.00 per lin. foot, if total obstructed then \$2.00 per lin. foot | If partial obstructed then \$2.00 per lin. foot, if total obstructed then \$4.00 per lin. foot |
| Traffic Lane | \$10.00 per lineal foot | \$20.00 per lineal foot |

Special Truck Use of Roadway

| Travel Permission Requested | 1 – 5 Miles | Greater than 5 Miles |
|---|-----------------------------|-----------------------------|
| Oversized Vehicle | \$50.00 | \$50.00 |
| Overweight Vehicle over 100,000 lbs. | \$100.00 | \$150.00 |
| Overweight Vehicle 80,000 to 100,000 lbs. | \$50.00 | \$75.00 |
| Overweight Truck Axle | \$50.00 | \$50.00 |
| Display Vehicle | \$25.00 per day per vehicle | \$25.00 per day per vehicle |
| Truck Travel on the Industrial Corridor | \$100.00 per vehicle annual | \$100.00 per vehicle annual |
| Truck Travel on LSD and Boulevards | \$50.00 | \$50.00 |



PERMIT FEE SCHEDULE

Parking Vehicles

| Placement | Outside the CBD | In the CBD |
|---|--|---|
| Parking Moving Van | \$25.00 per day per vehicle | \$25.00 per day per vehicle |
| Citywide (Annual) | \$500.00 per vehicle | \$500.00 per vehicle |
| Residential (Annual) | \$100.00 per vehicle | \$100.00 per vehicle |
| Work Vehicle Daily-Alley | \$25.00 per vehicle per day | \$25.00 per vehicle per day |
| Work Vehicle Daily-Curb Lane | \$25.00 per vehicle per day | \$25.00 per vehicle per day |
| Work Vehicle Daily-Curb/Traffic Lane | \$25.00 per vehicle per day | \$25.00 per vehicle per day |
| Work Vehicle Daily-Traffic Lane | \$25.00 per vehicle per day | \$25.00 per vehicle per day |
| Work Vehicle - Alley | If 10 ft or greater unobstructed then \$10.00 per foot, if less than 10 ft unobstructed then \$5.00 per foot | If 10 ft or greater unobstructed then \$20.00 per foot, if less than 10 ft unobstructed then \$10.00 per foot |
| Work Vehicle -Bicycle Lane | \$4.00 per foot | \$8.00 per foot |
| Work Vehicle - Curb Lane | \$10.00 per foot | \$20.00 per foot |
| Work Vehicle - Curb-Traffic Lane | \$20.00 per foot | \$40.00 per foot |
| Work Vehicle - Sidewalk or Parkway | If partial obstructed then \$2.00 per foot, if total obstructed then \$4.00 per foot | If partial obstructed then \$4.00 per foot, if total obstructed then \$8.00 per foot |
| Work Vehicle - Traffic Lane | \$20.00 per foot | \$40.00 per foot |
| Parking/ Various Locations (Monthly) | \$20.00 per vehicle | \$100.00 per vehicle |
| Parking/Various Locations (Semi-Annual) | \$100.00 per vehicle | \$500.00 per vehicle |
| Media Parking | No Charge | No Charge |

City Provided OEMC or Police Services related to a Public Right-of-Way Permit

| Service | Duty | Hire Back |
|-----------------------------------|------------------------------|-------------------------------|
| Deputy Chief | \$84.00 per officer per hour | \$125.99 per officer per hour |
| Commander | \$81.94 per officer per hour | \$122.90 per officer per hour |
| Captain | \$65.87 per officer per hour | \$98.79 per officer per hour |
| Lieutenant | \$58.75 per officer per hour | \$88.13 per officer per hour |
| Sergeant | \$50.61 per officer per hour | \$75.91 per officer per hour |
| Marine/Mount Officers | \$42.88 per officer per hour | \$64.33 per officer per hour |
| Detective | \$44.20 per officer per hour | \$66.29 per officer per hour |
| Police Officer | \$40.84 per officer per hour | \$61.27 per officer per hour |
| Traffic Control Aides - Full Time | \$36.93 per TCA per hour | \$55.39 per TCA per hour |
| Traffic Control Aides - Part Time | \$25.42 per TCA per hour | \$38.13 per TCA per hour |
| TMA - Traffic Aide | \$25.42 per TCA per hour | Not Applicable |



PERMIT FEE SCHEDULE

City Provided Services related to a Public Right-of-Way Permit

| Service | Fee | Special Instructions |
|---|---------------------------|--|
| Bicycle Rack Removal | \$150.00 per bicycle rack | None |
| Demolition/Construction Inspection | \$1.00 per foot | |
| Electrical Inspection Service (Buildings Department) | \$80.00 per inspection | Department of Buildings |
| Electrical Inspection Service (Bureau of Electricity) | \$100.00 per inspection | Department of Transportation |
| Parking Meter - Removed | \$150.00 per meter | Department of Revenue. A "lost revenue" charge will be assessed for each day the meter is out of service |
| Parking Pay Box - Removal | \$1,000.00 per pay box | Department of Revenue. A "lost revenue" charge will be assessed for each day the pay box is out of service |
| Parking Restriction Signs | No Charge | Department of Streets and Sanitation |
| Sign Removal | \$150.00 per sign | |
| Re-Inspection Fee | \$100.00 per inspection | CDOT Inspectional Services |

Miscellaneous Permitting in the Public Way

| Activity Type | Process Fee | Permit Fee | Special Instructions |
|-------------------------------|-------------|--|---|
| Ad Bench | No Charge | \$8.79 per month | |
| Art Fair | No Charge | \$25.00 per day | Requires Department of Cultural Affairs and Special Events Approval |
| Assembly | \$35.00 | No Charge | OEMC and Police Approval |
| Athletic Event | \$100.00 | No Charge | OEMC and Police Approval |
| Block Party | No Charge | No Charge | Requested and approved by Alderman |
| Boulevard - Carnival/Festival | No Charge | \$25.00 per day | |
| Bus Way Use or Work | No Charge | No Charge | OEMC and METRA approval |
| Festival | No Charge | \$25.00 per day | Requires Department of Cultural Affairs and Special Events Approval |
| Flower Cart | No Charge | No Charge | Must meet specifications of the Department of Business Affairs and Consumer Protection |
| Freight Tunnel | No Charge | \$50.00 fee plus additional \$5.00 per day | CDOT Approval |
| Helicopter Lift | No Charge | \$300.00 per lift | |
| Horse Drawn Carriage | No Charge | No Charge | Special use outside of licensed operators by the Department of Business Affairs and Consumer Protection |



PERMIT FEE SCHEDULE

Miscellaneous Permitting in the Public Way cont.

| Activity Type | Process Fee | Permit Fee | Special Instructions |
|---|-------------|---|---|
| Marine Boat Rental | No Charge | \$800.00 per day | Police Department Services |
| Miscellaneous Obstruction | No Charge | \$25.00 per object displayed | |
| Movie or Other Filming | No Charge | \$25.00 per day | Requires Film Office Approval |
| Newspaper Rack | No Charge | No Charge | Police Approval Required |
| Newspaper Stand | No Charge | \$50.00 each | Must adhere to construction guidelines and regulations |
| Overhead Work on Poles, Lines, etc. | No Charge | \$25.00 | |
| Parade | No Charge | No Charge | CDOT, OEMC and Police approval |
| Reviewing Stand(s) | No Charge | \$25.00 per stand | Approved in conjunction with a Special Events Parade Permit |
| Pole Use – Light (Annual) | No Charge | \$1,654.00 per calendar year per pole | <i>Fees increase 5% annually</i> |
| Pole Use – Traffic (Annual) | No Charge | \$3,307.00 per calendar year per pole | <i>Fees increase 5% annually</i> |
| Public Place Obstruction | No Charge | \$50.00 per Obstruction | |
| Public Place Obstruction - CBD (Annual) | No Charge | \$100.00 per Obstruction | |
| Sidewalk Full Closure | No Charge | \$1.00 per foot per month outside the CBD, \$2.00 per foot per month inside the CBD | |
| Sidewalk Sale | No Charge | \$25.00 per day | Requires Alderman approval |
| Temporary Driveway | No Charge | \$100.00 per month per 25 foot driveway increments | |
| Utility Pole Storage in the Parkway | No Charge | No Charge | Approved in conjunction with an opening permit |
| Walkathons | \$35.00 | \$100.00 | |

Dedications/Vacations of the Public Right-of-Way and Street Closures

| Activity Type | Permit Fee |
|-------------------------|---------------------------------------|
| Alley/Street Dedication | Fee based on CDOT inspection findings |
| Alley/Street Vacation | Fee based on CDOT inspection findings |
| Street Full Closure | Fee based on CDOT inspection findings |
| Closures Street/Bridge | Fee based on CDOT inspection findings |



PERMIT FEE SCHEDULE

Refuse Container Permit

| Container Size | Permit Fee |
|---|--|
| Under 1 cubic yard | \$17.00 per tri-annual period per container |
| 1 to 2 cubic yards | \$32.00 per tri-annual period per container |
| Over 2 to 10 cubic yards | \$63.00 per tri-annual period per container |
| Over 10 cubic yards | \$164.00 per tri-annual period per container |
| Container used exclusively for recyclable items (regardless of size) | No Charge |
| Container used by a unit of local government or school district that levies a property tax exclusively within the City of Chicago | No Charge |

Note - Under the provisions of the Refuse Container Permit Ordinance (4-260-150) the permit periods run as follow:

| Permit Period | Payment Due Date |
|------------------------------|------------------|
| April 1 through July 31 | July 15 |
| August 1 through November 30 | November 15 |
| December 1 through March 31 | March 15 |



PERMIT FEE SCHEDULE

Obstructions to occupy the Public Right of Way

Note: For all Obstructions to occupy the public right-of-way months are based on 30 day increments.

| FOR MAINTENANCE PERMIT ACTIVITY (outside the CBD) | OBSTRUCTION TYPE | 1-3 DAYS | 1-3 DAYS (min fees) | 4-180 DAYS | 4-180 DAYS (min fees) | 181-360 DAYS | 181-360 DAYS (min fees) | 361-540 DAYS | 361-540 DAYS (min fees) | 541+ DAYS | 541+ DAYS (min fees) |
|--|------------------------|---------------------|------------------------|---------------------|-----------------------------|---------------------|-------------------------------|---------------------|-------------------------------|---------------------|----------------------------|
| Sidewalk or Parkway - Partial Closure | Type I and Type III | \$1.00 X Length | \$20.00 per month | \$2.00 X Length | \$40.00 per month | \$4.00 X Length | \$80.00 per month | \$6.00 X Length | \$120.00 per month | \$8.00 X Length | \$160.00 per month |
| Sidewalk or Parkway - Total Closure | Type I and Type III | \$2.00 X Length | \$40.00 per month | \$4.00 X Length | \$80.00 per month | \$8.00 X Length | \$160.00 per month | \$12.00 X Length | \$240.00 per month | \$16.00 X Length | \$320.00 per month |
| Bicycle Lane - Total Closure | Type I and Type III | \$2.00 X Length | \$40.00 per month | \$4.00 X Length | \$80.00 per month | \$8.00 X Length | \$160.00 per month | \$12.00 X Length | \$240.00 per month | \$16.00 X Length | \$320.00 per month |
| Street Lane Containing Parking Spaces | Type I and Type III | \$5.00 X Length | \$100.00 per month | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month | \$30.00 X Length | \$600.00 per month | \$40.00 X Length | \$800.00 per month |
| Street Lane Normally Used for Vehicular Traffic, Including a Bus Lane | Type I and Type III | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month | \$40.00 X Length | \$800.00 per month | \$60.00 X Length | \$1,200.00 per month | \$80.00 X Length | \$1,600.00 per month |
| Alley - If a Lane of at Least 10 Feet Is Left Unobstructed | Type I and Type III | \$2.50 X Length | \$50.00 per month | \$5.00 X Length | \$100.00 per month | \$10.00 X Length | \$200.00 per month | \$15.00 X Length | \$300.00 per month | \$20.00 X Length | \$400.00 per month |
| Alley - If a Lane of at Least 10 Feet Is Not Left Unobstructed | Type I and Type III | \$5.00 X Length | \$100.00 per month | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month | \$30.00 X Length | \$600.00 per month | \$40.00 X Length | \$800.00 per month |



PERMIT FEE SCHEDULE

Obstructions to occupy the Public Right of Way cont.

Note: For all Obstructions to occupy the public right-of-way months are based on 30 day increments.

| FOR MAINTENANCE PERMIT ACTIVITY (inside the CBD) | OBSTRUCTION TYPE | 1-3 DAYS | 1-3 DAYS (min fees) | 4-180 DAYS | 4-180 DAYS (min fees) | 181-360 DAYS | 181-360 DAYS (min fees) | 361-540 DAYS | 361-540 DAYS (min fees) | 541+ DAYS | 541+ DAYS (min fees) |
|--|------------------------|---------------------|------------------------|---------------------|-----------------------------|---------------------|-------------------------------|----------------------|-------------------------------|----------------------|--------------------------|
| Sidewalk or Parkway - Partial Closure | Type I and Type III | \$2.00 X Length | \$40.00 per month | \$4.00 X Length | \$80.00 per month | \$8.00 X Length | \$160.00 per month | \$12.00 X Length | \$240.00 per month | \$16.00 X Length | \$320.00 per month |
| Sidewalk or Parkway - Total Closure | Type I and Type III | \$4.00 X Length | \$80.00 per month | \$8.00 X Length | \$160.00 per month | \$16.00 X Length | \$320.00 per month | \$24.00 X Length | \$480.00 per month | \$32.00 X Length | \$640.00 per month |
| Bicycle Lane - Total Closure | Type I and Type III | \$4.00 X Length | \$80.00 per month | \$8.00 X Length | \$160.00 per month | \$16.00 X Length | \$320.00 per month | \$24.00 X Length | \$480.00 per month | \$132.00 X Length | \$640.00 per month |
| Street Lane Containing Parking Spaces | Type I and Type III | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month | \$40.00 X Length | \$800.00 per month | \$60.00 X Length | \$1,200.00 per month | \$80.00 X Length | \$1,600.00 per month |
| Street Lane Normally Used for Vehicular Traffic, Including a Bus Lane | Type I and Type III | \$20.00 X Length | \$400.00 per month | \$40.00 X Length | \$800.00 per month | \$80.00 X Length | \$1,600.00 per month | \$120.00 X Length | \$2,400.00 per month | \$160.00 X Length | \$3,200.00 per month |
| Alley - If a Lane of at Least 10 Feet Is Left Unobstructed | Type I and Type III | \$5.00 X Length | \$100.00 per month | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month | \$30.00 X Length | \$600.00 per month | \$40.00 X Length | \$800.00 per month |
| Alley - If a Lane of at Least 10 Feet Is Not Left Unobstructed | Type I and Type III | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month | \$40.00 X Length | \$800.00 per month | \$60.00 X Length | \$1,200.00 per month | \$80.00 X Length | \$81,600.00 per month |



PERMIT FEE SCHEDULE

Obstructions to occupy the Public Right of Way cont.

Note: For all Obstructions to occupy the public right-of-way months are based on 30 day increments.

| FOR NEW CONSTRUCTION PERMIT ACTIVITY (outside the CBD) | OBSTRUCTION TYPE | 1-3 DAYS | 1-3 DAYS (min fees) | 4-540 DAYS | 4-540 DAYS (min fees) | 541+ DAYS | 541+ DAYS (min fees) |
|---|-------------------------|------------------|----------------------------|-------------------|------------------------------|------------------|-----------------------------|
| Sidewalk or Parkway - Partial Closure | Type II | \$1.00 X Length | \$20.00 per month | \$2.00 X Length | \$40.00 per month | \$4.00 X Length | \$80.00 per month |
| Sidewalk or Parkway - Total Closure | Type II | \$2.00 X Length | \$40.00 per month | \$4.00 X Length | \$80.00 per month | \$8.00 X Length | \$160.00 per month |
| Bicycle Lane - Total Closure | Type II | \$2.00 X Length | \$40.00 per month | \$4.00 X Length | \$80.00 per month | \$8.00 X Length | \$160.00 per month |
| Street Lane Containing Parking Spaces | Type II | \$5.00 X Length | \$100.00 per month | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month |
| Street Lane Normally Used for Vehicular Traffic, Including a Bus Lane | Type II | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month | \$40.00 X Length | \$800.00 per month |
| Alley - If a Lane of at Least 10 Feet Is Left Unobstructed | Type II | \$2.50 X Length | \$50.00 per month | \$5.00 X Length | \$100.00 per month | \$10.00 X Length | \$200.00 per month |
| Alley - If a Lane of at Least 10 Feet Is Not Left Unobstructed | Type II | \$5.00 X Length | \$100.00 per month | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month |

| FOR NEW CONSTRUCTION PERMIT ACTIVITY (inside the CBD) | OBSTRUCTION TYPE | 1-3 DAYS | 1-3 DAYS (min fees) | 4-540 DAYS | 4-540 DAYS (min fees) | 541+ DAYS | 541+ DAYS (min fees) |
|---|-------------------------|------------------|----------------------------|-------------------|------------------------------|------------------|-----------------------------|
| Sidewalk or Parkway - Partial Closure | Type II | \$2.00 X Length | \$40.00 per month | \$4.00 X Length | \$80.00 per month | \$8.00 X Length | \$160.00 per month |
| Sidewalk or Parkway - Total Closure | Type II | \$4.00 X Length | \$80.00 per month | \$8.00 X Length | \$160.00 per month | \$16.00 X Length | \$320.00 per month |
| Bicycle Lane - Total Closure | Type II | \$4.00 X Length | \$80.00 per month | \$8.00 X Length | \$160.00 per month | \$16.00 X Length | \$320.00 per month |
| Street Lane Containing Parking Spaces | Type II | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month | \$40.00 X Length | \$800.00 per month |
| Street Lane Normally Used for Vehicular Traffic, Including a Bus Lane | Type II | \$20.00 X Length | \$400.00 per month | \$40.00 X Length | \$800.00 per month | \$80.00 X Length | \$1,600.00 per month |
| Alley - If a Lane of at Least 10 Feet Is Left Unobstructed | Type II | \$5.00 X Length | \$100.00 per month | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month |
| Alley - If a Lane of at Least 10 Feet Is Not Left Unobstructed | Type II | \$10.00 X Length | \$200.00 per month | \$20.00 X Length | \$400.00 per month | \$40.00 X Length | \$800.00 per month |



PERMIT FEE SCHEDULE

Obstructions to occupy the Public Right of Way cont.

| PUBLIC PLACE OBSTRUCTION | OBSTRUCTION TYPE | FEE |
|---|-------------------------|--------------------|
| Construction or Maintenance outside the CBD | Type I and Type III | \$50.00 per permit |
| Maintenance inside the CBD | Type II | \$100.00 annually |

Note: For all Obstructions to occupy the public right-of-way months are based on 30 day increments.