



Choosing the Right Partners for Your Metro Area Wi-Fi™ HotZone

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Cities around the world are launching Metro Area Wi-Fi HotZones for a variety of purposes, whether specifically for government agency use or provided free or on a pay-for-use basis to all citizens. From Washington, DC, to Auckland, New Zealand, or the London boroughs of Fulham, Lewisham and Bloomsbury, large and small municipalities are deploying Metro Area HotZones, and the trend is certain to continue.

The Value of a Metro Area HotZone

Many municipalities initially consider a metro Wi-Fi network for a specific use; for example, to allow police officers direct access to centralized systems from their vehicles while out on patrol. However, there are so many other benefits enabled by a Metro Area HotZone that cities may find the HotZone to be more cost-effective than expected, with the added benefit of providing improved services across the city. Some of the benefits made possible by a HotZone include:



- Provide high-speed Internet access for large numbers of residents, businesses, and visitors without significant capital investment such as laying fiber optic cable or upgrading existing communications equipment
- Improve communication and civic awareness by offering a community calendar and other timely information via a customized city splash page that will be seen by visitors or others who access the Wi-Fi network
- Quickly set up ad hoc networks for conventions, fairs, sporting events, or emergencies
- Deploy city-wide security and surveillance systems



- Provide continuously updated schedules for public transportation such as busses and trains that can be monitored wirelessly
- Increase productivity by giving city employees network access while working in the field
- Improve service and shorten response times by monitoring utilities and other municipal services more closely

In many cases, cities may realize the value of these types of benefits and systems, but have been unable to implement them due to the cost factors associated with high-speed wired solutions that

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require expensive cabling and on-site equipment. A Metro Area HotZone eliminates those cost barriers and provides much greater flexibility than traditional wired systems.

The Challenges of Public Access Networks

City managers, elected officials, and utility companies face challenges associated with deploying a wireless network with minimal disruption and perpetually tight budgets that limit their ability to invest in ongoing IT support. In addition to these concerns, cities face management, security, and billing issues that can arise when deploying networks that are intended to facilitate broad public availability and ease of use.

Some of the primary concerns inherent with deployment of a wireless public access network are:

- Providing access to a plethora of different types of wireless clients using a variety of access methods, including DHCP, static IP addresses, or other custom configurations
- Authenticating users to prevent unauthorized use of fee-based networks
- Managing billing, whether providing temporary free access to city visitors, giving residents access as part of a monthly fee, or charging for use on an hourly or per-day basis
- Network and user security to ensure that every network user is afforded a secure connection, and that the network and users are protected from malicious attacks
- Administration and management that aligns with existing systems and does not increase support costs
- Ability to support roaming users; for example, visitors attending a convention or special event who want to be able to use Wi-Fi service provided by their home service provider

Choosing a partner who addresses these concerns is of paramount importance when planning and constructing a Metro Area HotZone. Nomadix can assist those responsible for implementing a HotZone by providing solutions for each city's particular needs and concerns.

Nomadix: Simplifying Your HotZone

Who is Nomadix?

Nomadix is focused on providing turnkey solutions for public access deployments, offering a family of Access Gateways that run the Nomadix Service Engine™ (NSE) Core software to carriers/MSOs, Public Access Service



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Operators (PASOs), cities, utility companies, and venue owners. Nomadix also licenses the NSE Core to manufacturers of networking equipment such as Wi-Fi access points, routers, and switches. The NSE Core features a variety of module and user count options for application-specific tailoring.

Nomadix additionally offers Nomadix Interconnect Services™ (NIS), which create a large, managed roaming footprint for PASOs and venues to connect with nomadic subscribers, regardless of their location. The central component of NIS is NIS Roaming, which aggregates NSE-enabled devices and non-NSE devices. NSE-equipped access devices are deployed by thousands of venue owners and PASOs worldwide and comprise the world's largest public access footprint.

Nomadix Access Gateways

Nomadix offers two Gateways ideally suited for deployment in a HotZone. Both Gateways run the NSE Core, which powers over 20,000 points of presence worldwide, and when included in the NIS Roaming footprint, becomes part of the world's largest public access footprint. The Gateways offer several NSE Module and User Count upgrades to support network and user growth. Both are dedicated network appliances that provide maximum uptime and reliability compared to server-based offerings, which can be plagued with long reboot and set up times or run operating systems that are susceptible to virus attacks.



The AG 5000 is a turnkey, high-performance platform designed for large public access HotZones for 250 to 2,000 simultaneous users. The AG 5000 is transport agnostic and enables the deployment of wired, wireless, or hybrid networks for up to 2,000 simultaneous users.



The HotSpot Gateway™ (HSG) is a turnkey, cost-effective platform designed for small to medium-sized public access HotZones. The HSG is transport agnostic and enables the deployment of wired, wireless, or hybrid networks supporting from 100 to 200 simultaneous users.

A Better Solution for Your Metro HotZone

Through its innovative NSE Core embedded in the AG 5000 and HSG, Nomadix addresses the key concerns associated with deployment of a public access network: disparate wireless clients, user authentication, billing, security, management, and roaming.

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Supporting Disparate Wireless Clients

Unmanaged public access networks are difficult to access and manage with hundreds and even thousands of disparate nomadic clients with various DHCP, IP Proxy and other configuration settings trying to connect.

With its patented Dynamic Address Translation™ (DAT) and dynamic transparent proxy technologies, Nomadix makes sure everyone gets connected to the HotZone without requiring any changes to the client's computer settings or without having to install special client-side software.

Nomadix developed DAT to actively monitor every packet transmitted from each device to ensure all packets are correctly configured for the network. If necessary, DAT will perform standard Network and Port Address Translation and supports Application Level Gateways (ALGs) for protocols such as FTP, H.323, PPTP, IPsec, and others. DAT also ensures that a DNS server is always available to a user through the DNS redirection function. This function redirects a user's DNS requests to a local DNS server closer to the customer's location—improving the response time and enabling true plug-and-play access when the subscriber's configured DNS server is behind a firewall or located on a private Intranet. Transparent proxy assures that subscribers who have proxy configured to work with their native network get broadband access in the HotZone.

User Authentication

Regardless of whether cities want to provide free or for-pay Wi-Fi service, or some combination of both, user authentication is important to prevent unauthorized use of the network.

Nomadix provides flexible multi-mode authentication and billing that simultaneously supports browser-based authentication, 802.1x, and Smart Clients. Advanced Standards compliant RADIUS support allows the creation of pre-paid cards or monthly billing plans that support global roaming, or a secure credit card interface can be used for visiting users.

The NSE Core offers a “walled garden” feature that limits users to pre-selected sites on the Internet prior to completion of authentication. The walled garden can be used to present custom local content or offerings specific to a city or municipality. This selective access control allows localized information and user self-provisioning to be provided in a standard, efficient, low-cost, and convenient way. This also provides an additional layer of security for the Metro Area HotZone by blocking access to the Internet until the user has been authenticated.

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Multi-mode Authentication Methods

In addition to supporting the secure browser-based universal access method via SSL, the NSE enables simultaneous support for authentication using IEEE 802.1x as well as Smart Client authentication mechanisms used by companies such as Adjungo Networks, Boingo Wireless, GoRemote, and iPass. Nomadix is only company capable of delivering this type of advanced authentication functionality.

Billing Management

For Metro Area HotZones that are intended to provide access for a variety of user types, including residents who pay for service, government employees who must have service available without charge, and visitors or ad hoc users who may or may not be required to pay for service, the ability to properly manage and account for all users and payment types is of utmost importance. Providing Internet access for a fee can help municipalities recover initial deployment costs, and later provide an ongoing source of revenue for the city or utility.

Nomadix Access Gateways allow users to be identified and billed according to their Media Access Control (MAC) address, username/password, and/or port identification number. The NSE Core supports a wide variety of billing models, including billing plans that use credit cards, scratch cards, or monthly subscriptions, plus flexibility of billing by different parameters such as time, volume, or bandwidth.

RADIUS

Nomadix offers an integrated RADIUS client with the NSE Core, which allows the municipality to track or bill based upon the number of connections, location of connection, bytes sent and received, connect time, or other parameters. The user database can reside in a central RADIUS server, along with associated attributes for each user. When a user connects into the network, the RADIUS client authenticates the user with the RADIUS server, applies associated attributes stored in that user's profile, and logs their activity (including bytes transferred, connect time, or other specified parameters).

The NSE Core's RADIUS implementation also handles vendor specific attributes (VSAs) required by municipalities, utility companies, or other PASOs who want to enable more advanced services and billing schemes such as a per device/per month connectivity fee.

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XML Interface

Nomadix provides a secure XML Application Programmer's Interface (API) with the NSE Core that allows the device to accept and process XML commands from an external source for integration with OSS, provisioning, and other network management elements for subscriber management and location/port management. XML commands are sent over the network via SSL to guarantee security. The XML interface enables cities or utilities to customize and enhance the installations with value added capabilities and services

Security

Security is a formidable challenge for cities and municipalities considering the deployment of a Metro Area HotZone. Cities may want to provide free and easy Wi-Fi access to visitors or ad hoc network users at conventions, festivals, or other events; while at the same time providing highly secure connections to the city's residents as part of a monthly broadband service.

Nomadix addresses this challenge with implementations in the NSE Core that support today's standards, with the addition of patent-pending technology to improve upon the standards. Virtual Private Network (VPN) tunneling such as PPTP and IPSec is supported, and remains the recommended method for transmitting secure data across a wireless.

In addition to standard VPN support, Nomadix' products feature its patent-pending iNAT™ functionality, which creates an intelligent mapping of IP addresses to their associated VPN tunnels and allows maximum reusability of expensive public IP addresses required for establishing VPN connections. This creates seamless, secure connections for all users of the Metro Area HotZone – including temporary or ad hoc network users.

Denial of Service Management

The NSE Core also provides Session Rate Limiting (SRL) and MAC filtering capabilities to significantly reduce the risks of Denial of Service (DoS) and virus attacks, which helps ensure network uptime and reliability. Administrators can also block all ICMP packets of non-authenticated users to further protect the network against common DoS attacks.

Management and Administration

Cities, municipalities, and utilities all face a perpetual shortage of IT support staff and budgets, making the management and administration of a Metro Area HotZone a hot topic. Nomadix addresses these concerns by focusing on standards-based interfaces and automated configuration features.

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Devices running the NSE Core can be managed remotely via the built-in Web Management Interface where various levels of administration can be set. The NSE Core also contains a CLI (Telnet and serial) and extensive SNMP support. Management access can be controlled using access control functionality on the NSE and secured using IPSec.

The NSE Core also provides unique RADIUS-driven auto-configuration functions that allow devices to be easily configured for fast network rollout. Once configured, this methodology can also be used to centrally manage configuration profiles for all NSE devices in the Metro Area HotZone.

Support for Roaming Users

As Wi-Fi networks become more common, many users may already have a subscription to Wi-Fi service through their existing service provider. When these users visit a city featuring a Metro Area HotZone, they will want to connect to the city's network using their existing Wi-Fi subscription.

Nomadix' NIS Roaming service is specifically constructed to support these users, and as more and more service providers around the world join the NIS Roaming footprint, users will expect to find this functionality wherever they are.

NIS is a comprehensive service offering that creates a large, managed roaming footprint for Public Access Service Operators (PASOs) and venues to connect with nomadic subscribers, regardless of their location.

Value Added Services

Nomadix also gives the PASO, municipality and/or venue the ability to deliver value added services like advertising to users of the HotZone. Advertising can be delivered through Nomadix' patented Information Control Console (ICC) or through Nomadix Interconnect Services (NIS). Taking advantage of the ability to provide services like advertising not only provides valuable information and opportunities to users of the HotZone, but also offers a potential revenue stream to the PASO and/or municipality that owns the HotZone.

Additional Benefits from Nomadix

In addition to addressing the issues outlined above, Nomadix brings additional functionality to cities that deploy Metro Area HotZones, including Home Page Redirection and bandwidth management features.

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Home Page Redirection

The Home Page Redirection feature of the NSE software intercepts a user's browser settings and directs the browser to a specific Web site where the user is prompted to securely sign up for the service or to log in if they have an existing account. Nomadix offers redirection opportunities both pre- and post-authentication as well as at session termination, giving the municipality ample opportunity to promote, market, or provide information to users.

When redirecting the user to the “new” home page, the user's original home page (Origin Server) is passed as a parameter to the new home page so that he or she can still access the default home page after the local or personalized page has been presented. The Home Page Redirection also allows unique redirects on a per-subscriber basis using a RADIUS attribute stored in that user's account. The NSE Core can deliver limited Web pages through its Internal Web Server.

Policy-based Traffic Shaping

The Bandwidth Management feature is part of the NSE Core functionality and enables a service provider to limit bandwidth usage on a per device (MAC Address/User) basis. This ensures every user has a quality experience by placing a bandwidth ceiling on each device accessing the network so every user gets a fair share of the available bandwidth.

The bandwidth for each device can be defined asymmetrically for both upstream and downstream data transmissions. The service provider can also allow the individual user to increase or decrease their bandwidth by the minute—or on an hourly, daily, weekly, or monthly basis—without having to disconnect or re-establish a new session.

The NSE can also manage the WAN Link traffic providing complete bandwidth management through the public access location. Bandwidth Management shapes traffic going over the WAN Link to prevent its over-utilization.

A Day in Anytown with a HotZone

How can a Metro Area HotZone add value to cities and municipalities? The following “day in the life of a HotZone” in Anytown, shows the many ways a HotZone can assist residents, businesses, visitors, utilities, government agencies, and more.

John Smith, owner of an auto repair shop in Anytown, starts his day at home with a cup of coffee. He turns on his home computer to check his email, the local news, and to find out what time the Anytown Annual Chili Cook-off starts tonight.

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Meanwhile, Patricia Marshall is also starting her day in one of the city's hotels. She arrived last night to attend a conference and has already used her laptop to access the city's HotZone. When she connected last night, she was greeted with a welcome page from Anytown, and given easy-to-follow instructions on how to use the city's network. She noted that she was allowed one hour of free connection time per day, but after the hour had expired, she would need to use a credit card to continue to use the network. She also noted the information about the city's Chili Cook-off, and made a note to suggest attending the event to some of her colleagues at the conference. She also saw that the city had a new shopping outlet mall, and decided to stop there to shop before heading home the next day.

As Patricia arrives at her conference, she heads to the kiosk set up for registration. The kiosk is conveniently located right inside the door, and she is able to confirm her registration and print her badge and schedule right from the kiosk. She can also select whether she will be attending the conference luncheon and a sponsored dinner. She chooses the luncheon but declines the dinner, expecting to attend the Chili Cook-off. Her selections are updated in the database being used to prepare the meals, allowing the caterers to get an accurate headcount.

By now, John Smith has arrived at his auto shop and is greeting his employees. He tells them about the Chili Cook-off but realizes he's forgotten the cost of entry. He uses his computer at work to check the city's HotZone page and informs his workers. He finds that having a networked computer has really streamlined his business since the availability of the metro Wi-Fi network. His shop can't get DSL because of its location, and he doesn't have cable. He had never been able to justify having a separate dial-up account in addition to the merchant account he has for credit card transactions, so he didn't have Internet access until the Wi-Fi network came to town. Since then, he's been able to consolidate his business transaction system with the high-speed Internet access, and because the city offers the service, the rates are very affordable. He can now update customer status online and have emails sent to his customers to notify them of any changes in repair estimates, or to inform them that their car is ready to be picked up. There's also the added convenience of being able to check on local news and community events like he did this morning.

That evening, Patricia and her colleagues head to the local community college where the Chili Cook-off is being held. As she pulls into the parking lot, she turns to ask her passenger a question when the person in front of her suddenly slams on his brakes. She hits his bumper. She and the driver of the other car get out and assess the situation. The other driver, John Smith, looks at the damage and asks Patricia if she would like to know what the costs will be. She does, so he uses his laptop to connect back to his office computer and inputs the necessary information into his repair estimate system. Within minutes, he is able to give her a firm estimate. He tells her that he can fix her car in a couple of hours the next day if she wants to bring it by. She agrees, then using her own laptop, sends an email to her auto insurance adjuster to report the accident, since she knows it's after hours and his office is closed.

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During this exchange, an Anytown police officer arrives on the scene. A security officer had been monitoring wireless security cameras installed at the community college parking lot and had seen the accident take place. The security officer notified the Anytown police, who headed to the accident location. When they arrived, the police officer was able to use a Wi-Fi laptop installed in the squad car to access the Motor Vehicles database, where he ran both vehicles' plates, as well as their driver licenses. Because the damage was minimal and had occurred on private property, the officer decides not to file a report and leaves.

The next day, Patricia takes her car to John's shop for repair. While she waits, she logs on to the city's Wi-Fi network to connect back to her office and work on a report due that day. After an hour, she's prompted to enter her credit card for continued access. She knows it's worth the cost so she can get her report finished, so she enters her credit card information to purchase an additional hour of service.

Just as her extra hour is about to expire, John tells her the car is ready. They chat briefly and both comment on how the city's new HotZone has made their lives much easier and more productive.

Summary

Metro Area HotZones can provide a host of benefits to cities and municipalities, whether improving upon existing governmental systems, or adding new services and systems that can improve productivity, benefit residents, enable revitalization of city gathering areas, and make the city a more attractive location for tourists or conventioners.

Nomadix partners with municipalities or utilities who want to deploy HotZones, and brings leading edge technology to the table that addresses the critical concerns that accompany the deployment of a wireless public access network – the ability to support a wide variety of wireless clients, user authentication, billing, network and user security, management, and support for roaming users coming into the HotZone.

In addition, with the ability to implement multiple types of billing plans, cities may find that the HotZone pays for itself and can become a new source of revenue to the city.