



Nomadix Service Engine™

Wi-Fi HotSpot Rollouts

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Introduction

The growth in Wi-Fi™ connectivity is leading many network operators to start deploying public access Wi-Fi service as an additional service offering. Responding to the issues of connectivity, security, billing and roaming created when deploying Wi-Fi HotSpots, Nomadix sells its Nomadix Service Engine™ (NSE) embedded software suite on our family of Access Gateways to address this high growth market.

The NSE offers the most comprehensive set of features and functionality, and is available as a licensable software package or on our line of Access Gateways. Our Access Gateways are capable of servicing any type of HotSpot – from a large, multi-cell location like an airport to a small, single cell coffee shop.



Nomadix offers a series of NSE Modules that can be added to the NSE Core to support vertical billing and roaming applications or add enhanced functionality. NSE Modules can be purchased at any time allowing the NSE to grow as your network evolves providing investment protection and peace of mind that Nomadix will always offer the latest in cutting edge technology and solutions:

- **Wholesale Roaming:** Provides advanced NAI routing capabilities enabling multiple service providers to access a HotSpot location further supporting a Wi-Fi wholesale model. This allows the user to only interact with their chosen provider in a seamless, transparent manner.
- **High-Availability Module:** Provides enhanced network uptime and service availability when delivering high-quality Wi-Fi service by providing Fail-Over functionality allowing a secondary Nomadix Access Gateway to be placed in the network that can take over if the primary device fails, ensuring Wi-Fi service remains uninterrupted.
- **Credit Card Module:** Provides a secure interface over SSL to enable billing via a credit card. This Module also includes the Bill Mirror functionality for posting of billing records to multiple sources.

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Partnering with Nomadix allows the standardization of service offerings across a wide range of venue types, from the small single cell deployment to a large multi-cell environment, utilizing our complete line of Access Gateways.



The Access Gateways running the NSE leverage Nomadix' market-leading experience gained over 6 years of real world deployment experience shipping over 25,000 units. Placing a Nomadix Access Gateway at the edge of the network leverages a centralized provisioning system to maximize customer acquisition and retention while securing the very edge of the network.

Our complete solution allows a service provider to quickly provide broadband access over a large footprint of locations to mobile users to generate incremental revenue streams.

Nomadix Service Engine Overview

The NSE provides a range of features needed for the successful deployment of wired and Wi-Fi public access service. The following key areas are addressed by the NSE deployed on a Nomadix Access Gateway:

- ❑ Customer Acquisition
- ❑ Provisioning of Service

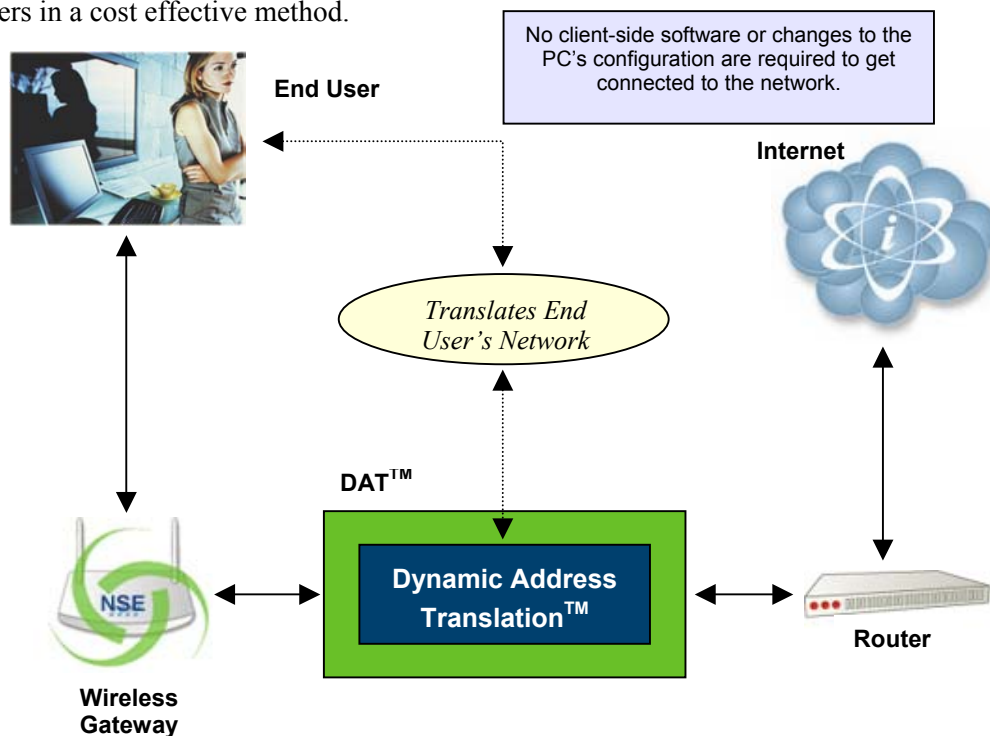
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- ❑ Access Control and Authentication
- ❑ Billing Plan Enablement
- ❑ Policy-based Traffic Shaping
- ❑ Management

Customer Acquisition

Nomadix' Dynamic Address Translation™

Nomadix' patented Dynamic Address Translation™ (DAT) technology provides transparent broadband network connectivity as users travel between different locations—without requiring any changes to their computer's settings or special client-side software—ensuring that everyone gets easy access to the network. A Nomadix-enabled network allows providers to acquire new customers in a cost effective method.



Nomadix developed DAT to actively monitor every packet transmitted from each device to ensure all packets are correctly configured for the network that computer is expecting. 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, etc., to ensure the customer gains network access without having to reconfigure their PC or load client side software.

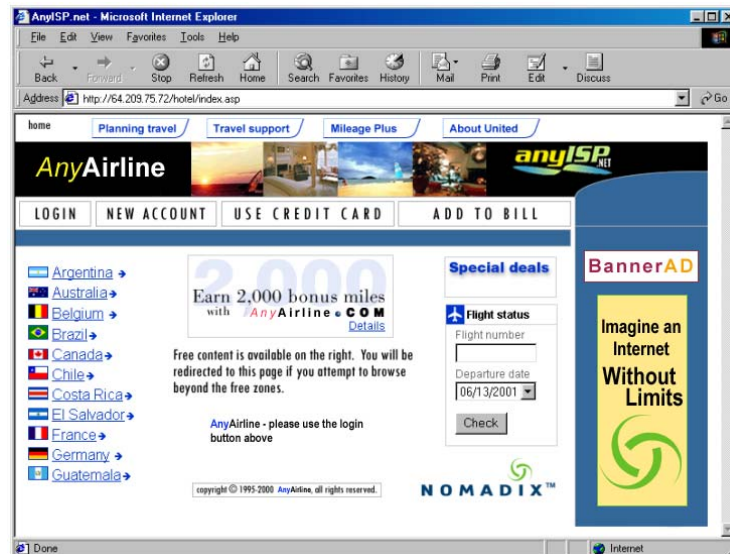
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DAT also ensures that a DNS server is always available to a user through the DNS redirection function. This function redirects a user's DNS requests to a local DNS server closer to the customer's location—improving the response time and enabling true plug-and-play access when the subscriber's configured DNS server is behind a firewall or located on a private Intranet.

Service Provisioning

Home Page Redirection

Once connected to the public access network, Nomadix' Home Page Redirection feature intercepts the user's browser settings and directs them to a web site to securely sign up for service or log in if they have a pre-existing account.



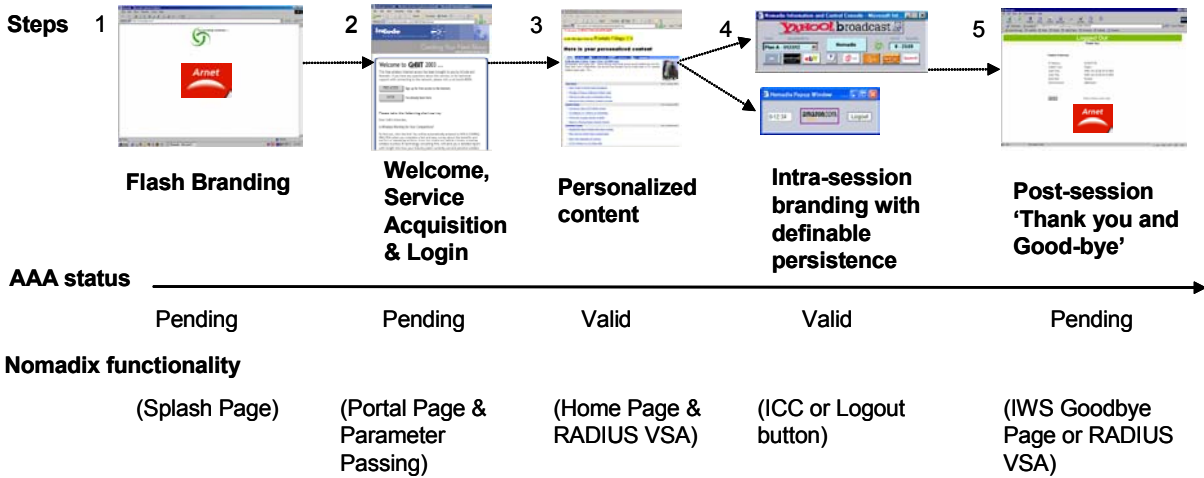
The Home Page Redirect (HPR) feature of the NSE enables the network to intercept the Internet browser's home page setting and redirect it to a new portal page determined by the Public Access Service Operator (PASO) or HotSpot owner. When redirecting the customer to a new home page, the original home page (Origin Server) is passed as a parameter to the new home page so the customer can still access their default home page after the local or personalized page has been presented.

HPR also allows unique redirects on a per subscriber basis per a RADIUS attribute stored in that customer's account.

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Service Branding

The NSE offers the unique ability to provide a 5 step service branding experience for the provider and HotSpot owner.



Nomadix offers redirection opportunities pre and post authentication as well as at service disconnect for maximum service branding capability for both the service provider and the venue owner.

Location-based Identification

Depending on the network architecture and vendor, the NSE can determine the physical location of the user to personalize the service presentation and perform security or billing functions. This is achieved by using aggregation equipment that supports port based IEEE 802.1q VLANs or using the integrated SNMP Manager to query the Bridge MIB (RFC 1493 or certain proprietary MIBs) to determine the physical port associated with the user's MAC address and each packet it came through.

A user visiting an airport can receive a Web page that contains flight schedules specific to that terminal based upon the port they are connecting into. The end user doesn't need to know where they are physically located to receive services, and since identification is performed in the network, it is secure and can be used for a billing function based upon the port they have plugged into.

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Service Awareness

The NSE can drive a HTML/Javascript window down to each customer's Internet browser providing them with the ability to self-select services and upgrade their bandwidth and billing options in real-time.



Nomadix' patented Information and Control Console (ICC) also allows the premise owner or service provider to send custom messages and advertising directly to the screen of the customer. For credit card usage, the ICC displays a dynamic "time" field to inform customers of the time remaining or expired on their account.

Multi-mode Authentication and Access Control

The NSE provides an additional layer of security for the public access Wi-Fi network by blocking access to the Internet until the user has been authenticated. The NSE also offers the ability to only allow access to a pre determined "Walled Garden" area of the web prior to authentication.

Tri-Mode Authentication

In addition to supporting the secure Browser-based Universal Access Method via SSL, Nomadix simultaneously supports Port-based Authentication using IEEE 802.1x and authentication mechanisms used by Smart Clients by companies such as Boingo Wireless, GoRemote and iPass. Nomadix products enable multiple authentication models providing the maximum amount of flexibility to the end user and to the operator by supporting any type of client entering their network and any type of business relationship on the back end.

Billing Plan Enablement

A Nomadix-enabled network can automatically authenticate, authorize, track, and bill users for access. Users can be identified and billed according to their Media Access Control (MAC) address, username/password, and/or port identification number.

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The NSE supports a wide variety of billing models enabling the deployment of profitable public access networks. Our solutions allow providers or venue owners to create billing plans using credit cards, scratch cards or enable monthly subscriptions—then bill by a host of different parameters including time, volume, or bandwidth.

RADIUS

Nomadix offers an integrated RADIUS client with the NSE allowing the service operator to track or bill based upon the number of connections, location of the connection, bytes sent and received, connect time, etc. The customer database can exist in a central RADIUS Server, along with associated attributes for each user. When a customer connects into the network, the RADIUS client authenticates the customer with the RADIUS Server, applies associated attributes stored in that customer's profile, and logs their activity (including bytes transferred, connect time, etc.). Our RADIUS implementation also handles vendor specific attributes (VSAs), required by WISPs—that want to enable more advanced services and billing schemes such as a per device/per month connectivity fee.

XML Interface

Nomadix provides a secure XML Application Programmer's Interface (API) with the NSE allowing the Access Gateway 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 an SSL tunnel in the form of an encoded query string. The XML interface enables solution providers and integrators to customize and enhance the installations with value added capabilities and services.

Advanced Security

The NSE enhances today's standards, enabling the secure deployment of large scale public access networks, regardless of the standards supported at the client, enabling a solution that covers the wide variety of clients that will roam into the location.

VPN tunneling (PPTP, IPsec) remains the recommended method for transmitting data across a wireless network for mobile workers wishing to connect back to their corporate resources. Nomadix' products feature its patent-pending iNAT functionality that creates an intelligent mapping of IP Addresses and their associated VPN tunnels allowing multiple tunnels to be established to the same VPN server creating a seamless connection for all the users at the public access location. Nomadix also allows tracking logs to support Lawful Intercept initiatives.

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Denial of Service Management

The NSE also provides Session Rate Limiting (SLR) and MAC filtering capabilities to significantly reduce the risks of Denial of Service (DoS) attacks helping 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.

Policy-based Traffic Shaping

The Bandwidth Management feature is part of the NSE Core functionality and enables the providers 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. The NSE queues traffic from overly busy instances in time and sends the packets over the WAN Link when a lull in traffic occurs.

Global Roaming

Public access locations and networks powered by the NSE enable roaming users to access wireless broadband networks globally while maintaining a single billing account worldwide. The NSE allows the “network” to make an intelligent decision on how a user is authenticated and billed for the access by directing them to the entity they have a pre-existing relationship through advanced NAI routing capabilities. This also allows multiple providers to service one location, further enabling the development of the wholesale public access model.

Management

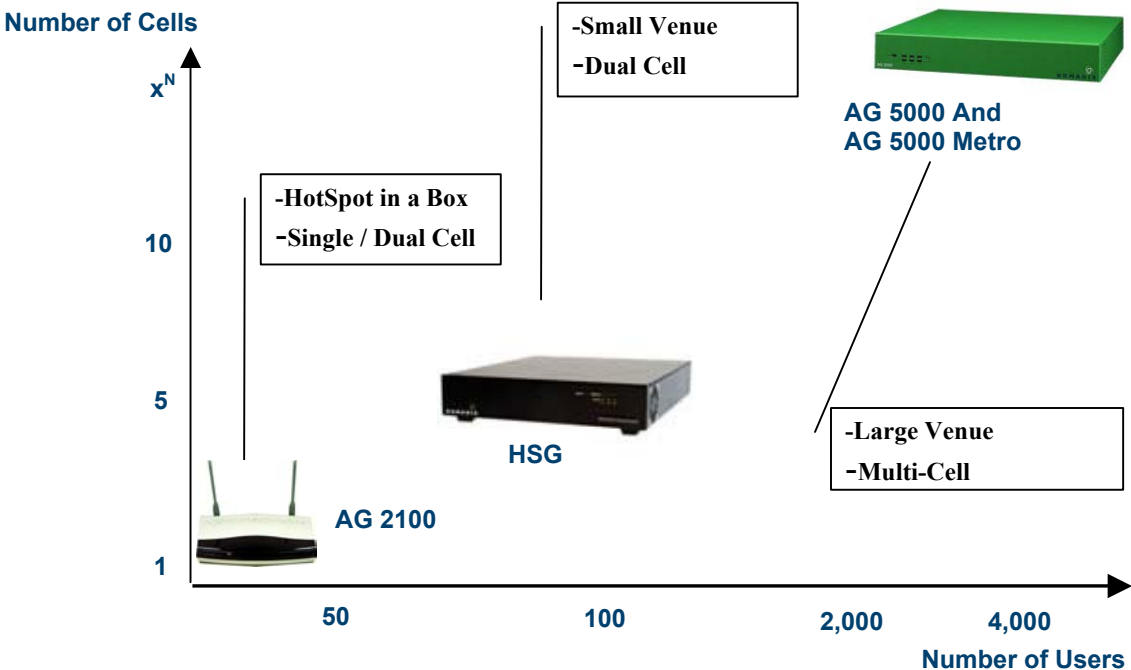
A key issue in the cost-effective mass-deployment of Wi-Fi HotSpot networks is an automated process to configure edge devices during initial installation as well as to centrally manage critical configuration parameters from the Network Operations Center. Such an automated process can lower site installation costs by removing the need to employ highly-trained personnel to perform the setup of the equipment.

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The NSE provides a unique RADIUS-driven Auto-Configuration functionality that utilizes the existing infrastructure of a provider to deliver an effortless and rapid methodology to configure devices for fast network roll-out. Once configured, this methodology can also be effectively used to centrally manage configuration profiles for all NSE devices in the public access network.

Access Gateways

Nomadix' family of Access Gateways are dedicated networking devices that can be placed in a variety of public access locations, from a small coffee shop to a large international airport – regardless of the deployment type, Nomadix has the right solution to fit your needs.



Nomadix recommends the **AG 5000** running the NSE for deployment in large public access locations such as airports and convention centers and the **AG 5000 Metro** for Metropolitan HotZones and Digital Cities. The **HSG** can be used when deploying Wi-Fi service in mid-sized locations and the **AG 2100** is the ideal "HotSpot in Box" for single cell, small site deployments.

Summary

The NSE is specifically designed for broad based Wi-Fi HotSpot rollouts allowing providers to quickly and cost effectively deploy profitable Wi-Fi service.