



Maximizing Profit in Public-access Networks

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Executive Summary

Service providers and property managers face a number of questions when planning a Public-access Network offering. What are the market needs? How are those needs best satisfied? Should the deployment be broad and shallow, with limited capabilities to start? Or should it have greater depth of features to capture more marketshare?

Questions like these and others always confront network planners. But in a nascent market, like WiFi HotSpots, the answers can be elusive. This is particularly true when it comes to the fundamental choice of architecture. Some vendors advocate a centralized approach with inexpensive “thin” access points. Others advocate a decentralized approach with so-called “fat” access points that can function in a more standalone fashion. Spend too “thin” up front and you risk losing marketshare. Spend too “fat,” and you risk busting the budget before the roll-out is complete.

Nomadix believes that the greatest profit potential exists somewhere between the thin/fat extremes: a distributed, intelligent architecture that combines the cost-saving advantages of centralized control with the revenue-enhancing flexibility and scalability of fairly robust access points. With a distributed architecture, the fundamental challenge involves achieving that optimal balance between performance and price. The effort is especially challenging if a common design will be needed to satisfy the requirements of both multi-cell and single-cell sites.



This white paper outlines some of the more significant design elements of the Nomadix Service Engine™ (NSE) software running on the Nomadix family of Access Gateways, which have all been optimized for deployment in a distributed architecture. The discussion begins with a bit of insight into why Nomadix is convinced that a distributed architecture is the best choice for Public-access Networks. The “Top 10” profit-oriented features of the Nomadix Service Engine are then presented in the context of their revenue-enhancing and/or cost-saving capabilities. Each has a positive effect on profit, and their collective impact on the bottom line is extraordinary. A brief conclusion then summarizes the discussion, and raises some thought-provoking concepts that are worthy of further consideration.

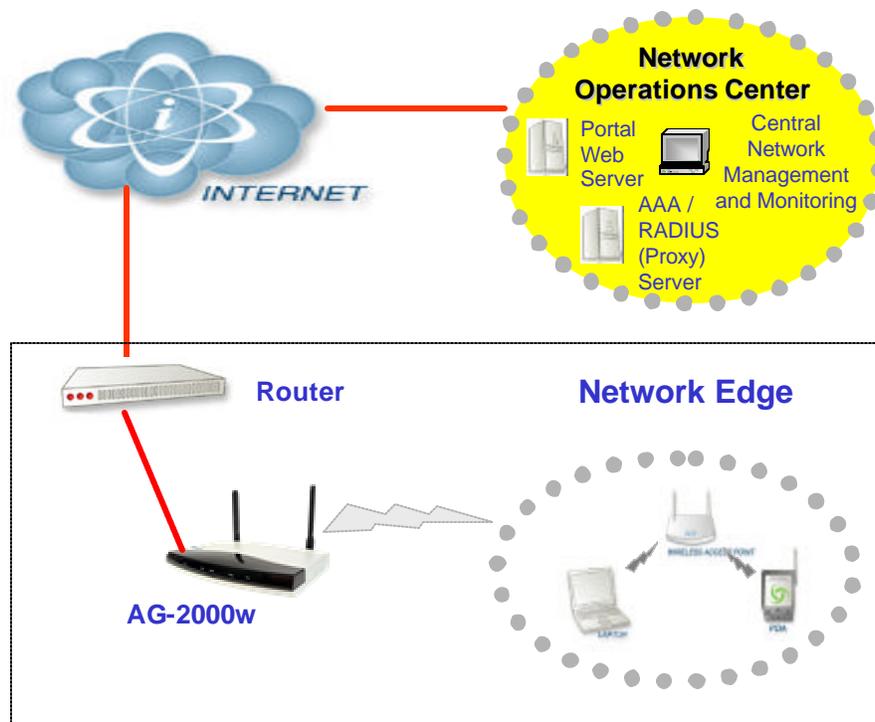
Plan Big and Start Smart

Maximizing profit in the Public-access Network marketplace requires service providers and property managers to minimize costs while offering a robust service that will maximize revenue. For many, this presents a real dilemma.

Like other nascent market opportunities where the market dynamics and business models are not yet readily apparent, some service providers focus mostly on the cost side of the profit equation. They may also tend to focus primarily on the capital expenditure (CapEx) involved, and downplay or ignore Operating Expenditures (OpEx) and revenue opportunities.

With such a focus, the preferred solution is a centralized architecture with “thin” access points. Because thin access points have a very low CapEx, service providers may feel they are “hedging their bets” with widest possible deployment at the minimal cost.

Nomadix believes it is misguided to take such a timid approach to what is certain to be a huge market opportunity. Five years from now, when the market matures and HotSpots are in demand everywhere in the world, those service providers who “got it right” from the start will be the real winners.



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The Nomadix team, with its extensive experience in networking, recognized that a distributed architecture with centralized control would rise above the alternatives to become the preferred way to deploy Public-access Networks. Every other successful network architecture—for the enterprise, the Public Switched Telephone Network or the Internet—is distributed. And for a few very good reasons. Distributed networks combine the economies of scale of centralized management with the functional efficiencies of intelligent nodes. Distributed networks are far more robust and scalable. And distributed networks afford substantially greater flexibility. The intelligence required may cost a little more up front, but over time, the savings are very real—and very significant.

Even in small venues that warrant only a single access point, the distributed architecture affords better profit potential from higher revenues and lower OpEx, despite the slightly higher CapEx. That is, of course, with the right feature set.

The Nomadix Profit Advantage

Nomadix has developed all of the usual features required to implement and operate a distributed Public-access Network, especially when it comes to element and network management. But driving down OpEx with efficient, centralized management is really only part of the profit equation. Which is why the NSE offers a robust, purpose-built feature set designed specifically to enhance the profit potential of deploying single- and multi-cell HotSpots.

Highlighted here are the “Top 10” such features that help make the NSE *the* profitable choice for public access networks. These 10 revenue-enhancing and cost-reducing capabilities are summarized in the following table.

Nomadix Service Engine Feature	Enhances Revenue	Reduces OpEx
Multi-mode Authentication	v	v
Dynamic Address Translation™ and Transparent Proxy	v	v
Flexible Multi-mode Billing	v	v
Information and Control Console	v	
Internal and External Web Servers		v
Page Redirection and Location-based Content	v	
MAC-level Bandwidth Shaping	v	v
Robust Security		v
Distributed Intelligence with Centralized Control		v
Walled Gardens	v	v

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Multi-mode Authentication

The Universal Access Method employed by NSE allows virtually any user to be authenticated from an ordinary browser using standard RADIUS protocols. NSE also supports IEEE 802.1x authentication and permits the use of special Smart Clients supplied by companies like GRIC Communications, iPass and Boingo Wireless for their global Internet roaming services.



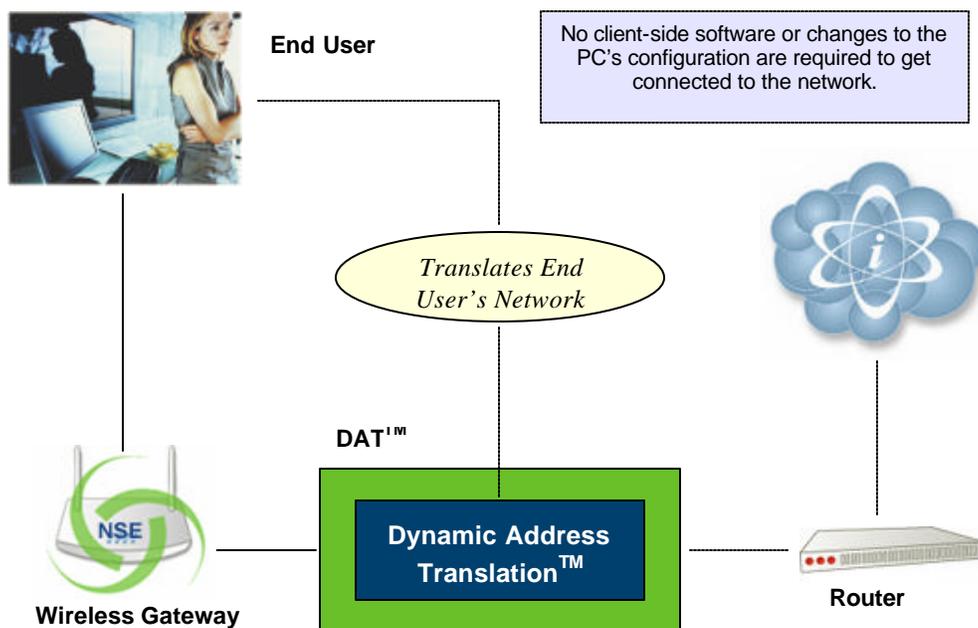
After the initial authentication of the user, Nomadix' "Remember Me" Cookie feature allows these existing users to login again with greater ease, which leads to a higher percentage of repeat customers. Eliminating the hurdles of connecting—first time, every time—delivers superior customer satisfaction and reduces Help Desk support costs. With no prospective user ever turned away, and existing users welcomed back by name, subscriber take rates and marketshare are sure to increase.

Dynamic Address Translation™ and Transparent Proxy

Patented Dynamic Address Translation™ (DAT) and Transparent Proxy features work together to overcome IP configuration and browser proxy issues, so there is never any need to alter client-side settings or install any special client software. In addition, patent-pending iNAT technology and Application Level Gateways (ALGs) allow Nomadix to accommodate virtually any IP application, including VPNs based on IPSec or PPTP,

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FTP, H.323 and many others. iNAT intelligently maps IP addresses to one or more VPN tunnels, allowing seamless VPN connectivity, while the ALGs provide support for the non-HTTP applications.



Broad application support with total transparency affords a simple, seamless connectivity experience for any user. By eliminating the hassles of connecting across the full spectrum of prospective users and uses, service providers can attract and retain large numbers of customers with minimal set-up and support costs. The resulting superior customer satisfaction quickly turns trials into repetitive use, and repeat customers into loyal enthusiasts for the service.

Flexible Multi-mode Billing

The NSE can handle just about any payment option: credit card, scratch card, monthly subscriptions, third-party Internet roaming services, and more. An Optional Property Management System (PMS) module can also interface with a hotel's billing system. The NSE can even interface to a customized subscriber management system via a secure XML application programming interface (API). And the optional Credit Card Module includes a Bill Mirror feature that permits multiple postings of billing records.

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Access services can be priced based on connection location, connect time, traffic volume (bytes sent/received) or bandwidth utilization, or any combination of these metrics. The built-in RADIUS client even supports Vendor-Specific Attributes (VSAs) that permit a variety of other billing arrangements.

By eliminating any potential payment problems, no user ever needs to give up connecting in frustration. And by allowing virtually any user to connect—and pay—with ease, customer acquisition and Help Desk costs remain low. Finally, by supporting every conceivable revenue opportunity, many with self-selecting “up-sell” options, no money is ever left on the table. After all, it is impossible to maximize profit with anything less than maximum revenue.

Information and Control Console

The Information and Control Console (ICC) gives users a convenient “dashboard” for managing their connections. The ICC can be customized with service branding options, or to direct the user to certain sites or services, as well as to up-sell to more profitable “premium” services. The Console can also display messages, such as personalized notices and paid advertisements. And a special clock is available show the time remaining on a pre-paid session.



The ICC helps maximize customer satisfaction—and revenue—by empowering users to self-select premium services. For example, users can upgrade to greater bandwidth (when available) to fully utilize LAN/WAN capacity. And the ICC provides yet another opportunity for paid ads and sponsorships.

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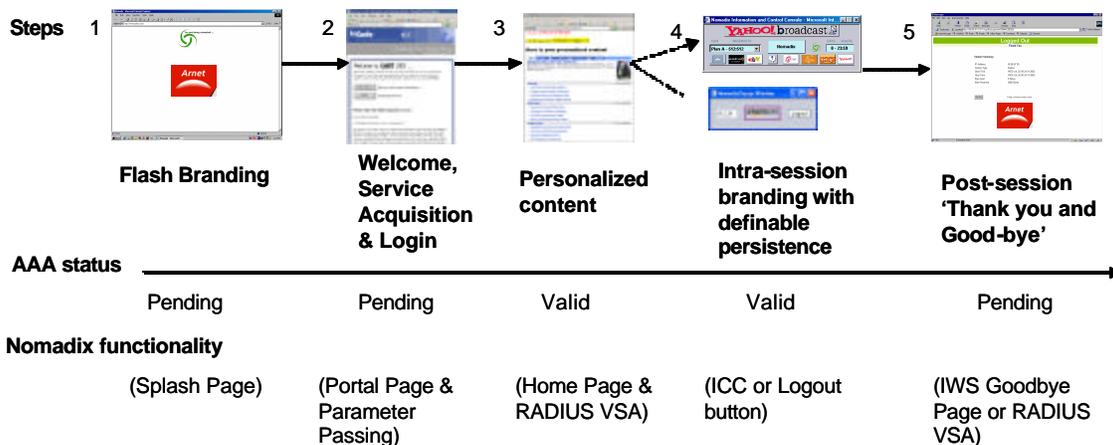
Internal and External Web Servers

The built-in Internal Web Server (IWS) permits a single-device HotSpot solution that includes both the access point and the browser-based applications required for sign-up, login and other services. An interface to an External Web Server (EWS) allows these same fundamental applications to be centralized in a distributed, multi-site environment.

Together, the Internal and External Web Servers provide tremendous flexibility, along with the ability to customize and internationalize the user interface as required to appeal to the broadest possible audience. The built-in IWS facilitates rapid and trouble-free deployment, and is ideal for trials and pilots. As the infrastructure grows, the EWS provides a more centralized complementary or alternative solution to communicating with customers.

Page Redirection and Location-based Content

The patented Home Page Redirection (HPR) feature intercepts existing browser preferences to present the user with a “Welcome” page for sign-up and login. HPR can also function on a per-subscriber basis by referencing a regular customer’s RADIUS profile. In addition to this important pre-redirection capability, NSE also offers post-login and “Goodbye” redirection to maximize the branding opportunities for service providers and HotSpot owners.



A similar capability is available with Location-based Content, which can be used to promote services that are in close proximity to the user. For example, a business traveler

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waiting at Gate14B could be informed of dining and retail establishments in that terminal. Helping users self-select additional services, potentially from paid ads and sponsorships, increases customer satisfaction and maximizes revenue.

MAC-level Bandwidth Shaping

MAC-level Bandwidth Shaping applies intelligent traffic management where it is needed most—at the edge—to fully optimize both LAN and WAN bandwidth. A profitable bandwidth utilization policy serves two important needs. First, it ensures that every user enjoys a quality “fair share” experience when connecting on a shared network.

Second, as bandwidth is available, the policy can permit an up-sell to higher throughput, naturally at a higher price. In fact, NSE lets users increase or decrease their utilization (either up- or down-stream) dynamically, and without having to disconnect or establish another session. Bandwidth management at the edge is a great way to support more users concurrently or to sell premium services when usage permits, both of which serve to maximize revenues.

Robust Security

Session Rate Limiting (SRL) and MAC Address Filtering capabilities function in concert to thwart attempted Denial of Service (DoS) attacks. SRL allows the administrator to set a threshold on the number of sessions any one (potentially infected) computer can initiate in a specified time interval. Once a user’s computer is suspected of being infected by a DoS virus or worm, its MAC address can be automatically filtered to block the attack. An ICMP Blocking feature allows administrators to block the ICMP packets from non-authenticated users to add another layer of protection against DoS attacks.

Nomadix’ Wireless Gateways support both 64/128-bit Wired Equivalent Privacy (WEP) security and dynamic generation of session keys to protect data transmitted between the HotSpot access point and local users. Support is planned in the future for the more robust WiFi Protected Access (WPA) protocol. WAN backbone traffic is protected by support for IPSec, PPTP, URL Filtering and Proxy ARP. Together these security provisions enhance end-to-end network integrity, help prevent costly and disruptive attacks or misuse, and reduce overall support costs.

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Distributed Intelligence with Centralized Control

Placing intelligence at the edge of the network makes the infrastructure inherently more stable and manageable. To fully leverage that distributed intelligence, Nomadix provides a wealth of centralized management capabilities, including an intuitive Web Management Interface (WMI) with multi-level administrative controls, an integrated VPN client for secure communications with the Network Operations Center, a detailed Syslog of activity, and support for integration with an operations support or property management system via SNMP v2c or the XML API, secured with SSL.

In addition, to minimize the need for technical expertise at the remote sites, NSE offers a RADIUS-driven Auto-configuration capability. With this powerful tool, remote sites are up and running quickly and dependably—and without a truck roll. Centralized control over a properly configured infrastructure makes administrative, troubleshooting, upgrading and other management tasks more effective—and cost-effective—resulting in enhanced network integrity.

Walled Gardens

The Walled Garden serves a dual role. When utilized with the Internal or External Web Servers, the Walled Garden restricts access to the service provider's or HotSpot operator's own Web site(s) prior to sign-up or login. The fully-customizable content allows all services, including any eCommerce applications, to be branded and promoted more effectively. In its expanded role of full Access Control, the Walled Garden can optionally permit access to a specified set of popular Web sites on the Internet. In both roles, the Walled Garden is the ideal way to let users "try before they buy" and turn prospects into customers.

Public-access Networks are relatively new, and many potential users are naturally reluctant to use them. Is it secure? Is it too expensive? Will it be a waste of time because my system cannot connect? These doubts should never be allowed to lose even a single customer. And the Walled Garden is the most cost-effective way to help people become more comfortable with the service, and in turn, earn their business.

Conclusion

No one can predict the future with absolute certainty. There are, nevertheless, some “good bets” for services providers and property managers offering Public-access Networks. One is that mobility is here to stay, and that the “Mobile Masses” will want access everywhere they roam. Another is that mobile users will demand wireless access, especially with WLAN interfaces now standard on most laptop PCs. The profit potential is indeed very real, which explains why WiFi HotSpots are popping up all over the globe.

What may be less obvious to some service providers and property managers is: What architecture is best bet for HotSpots? Nomadix is confident that a distributed architecture will prevail. Every other successful network infrastructure is distributed, and there is no reason that public HotSpot access will be any different. Which is why Nomadix optimized its solution for a distributed environment.

Already the feature-rich NSE has proven its superiority in multi-cell sites, and Nomadix has recently made the same robust feature set affordable in single-cell deployments with its Wireless Gateway. Yes, the solution does cost a little more initially than a “thin” access point. But savvy service providers know that operating expenditures soon eclipse the capital expenditure. So the modest additional cost is a small price to pay as the best way to truly “hedge your bets” against the uncertainty in this nascent market opportunity.

The WiFi HotSpot market is poised to explode as the next big wave of users joins the “Early Adopters.” And this second wave, the Mobile Masses, will choose services that are easy to use. Simply put: If these new, less technical users encounter any hassles or limitations, they will seek another service—probably for good.

There may still be a lot of unknowns in the HotSpot business. But two things are for certain in any market: The first is that losing prospective customers and failing to turn initial users into regular customers is a doomed business model, regardless of how little it costs to deploy. And second is that peak profits result only when revenues are the highest, and *total* costs are the lowest.

Nomadix believes that if you truly believe in the WiFi HotSpot market opportunity, then you will quickly learn to appreciate the profit advantage offered by a distributed, intelligent, architecture. To learn more about how the feature-rich Nomadix Service Engine can help assure your profitable success, visit Nomadix on the Web at www.nomadix.com or call +1.818.597.1500.