

# All Roads Lead to NYURoam

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**W**ires: there are still plenty of them around, but the increasing popularity of wireless Internet access is starting to reduce some of the clutter, while making it easier than ever to connect. NYU introduced its wireless access network, NYURoam, during the Fall 2003 term. At the time, the service was truly in its infancy, in terms of both its availability and utilization. Luckily, things grow up quickly on Internet time. Since its inception, the service has expanded greatly, and now provides convenient access to NYU-NET (NYU's network) and Internet resources for thousands of NYU community members.

## **MORE! MORE! MORE!**

NYURoam service is no longer viewed as simply a convenience. Wireless is fast becoming the preferred way to connect to the Internet, and NYURoam is rapidly approaching "utility" status; it is expected to be available and reliable all the time. And enthusiastic users of NYURoam want more! As the desire increases to freely roam the campus while staying connected, the need to expand coverage follows suit. Over the past 18 months, ITS has moved forward to address this growing demand.

The key component of the NYURoam network is the hardware that operates at the "edge" of the network. These devices, known

as access points, provide coverage and connectivity to people who use NYURoam and serve as the bridge between wireless client data traffic and the campus' wired network. In the early stages of the wireless network's deployment, several dozen access points were installed in select locations. As of February 2005, there were approximately 400 access points, with more being activated on a regular basis as requests for service are received (see <http://www.nyu.edu/its/wireless/locations.html> for a current list of locations).

The increasing popularity of NYURoam is easy to see in two key areas: NetID logins to the network, and network traffic rates. The number of unique NetID logins per month grew steadily throughout the Fall 2004 semester, beginning with 2,207 in August and growing steadily to 3,418 in September, 3,889 in October, 4,146 in November and 4,381 in December. In total, some 6,116 people logged on via NYURoam wireless connections one or more times during the Fall term.

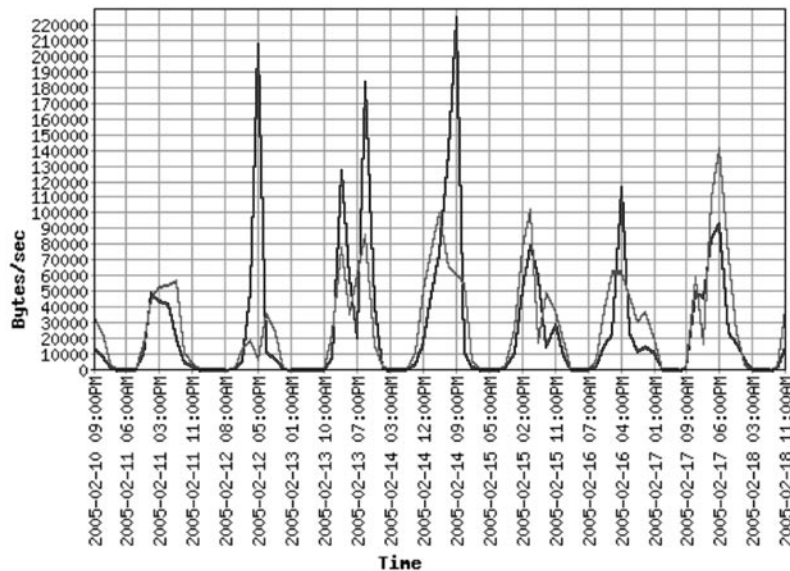
The expansion in usage can also be gauged by measuring bandwidth consumption (the amount of data being moved onto and off of the wireless infrastructure). Early in the Fall 2004 term, as NYURoam coverage continued to expand, utilization was at approximately 700-800 gigabytes worth of bandwidth per month and rising at a steady rate. In February

2005, by comparison, approximately 2.5 *terabytes* of data moved through the NYURoam router. For those of you who like numbers, that translates into approximately 2.75 trillion bytes of data!

The graph on the next page shows a bandwidth sampling of one access point deployed at the NYU School of Law. The data, graphed over a week's time, show the daily peaks and valleys in demand. The darker line represents data transmitted from the access point, and the lighter line represents data received from wireless devices that were connected to that access point. You can see that, on several occasions in just this one week, the combined inbound and outbound traffic exceeded two megabits per second (Mbps).

## **A STUDENT-FOCUSED SERVICE**

When planning the geographic locations of NYURoam's many access points, students have been and will continue to be ITS' primary consideration. All of the initial locations for coverage focused on areas where students tend to congregate in numbers and where they would most likely find wireless access useful. The Kimmel Center for University Life, for instance, was provided with wireless coverage from top to bottom; there are 52 access points distributed throughout the facility (more than any other building on campus) to



*This graph, created by the Cisco Wireless LAN Solution Engine, shows that combined inbound (lighter line) and outbound (darker line) traffic on this NYUROam access point often exceeds two Mbps.*

provide coverage whether a client is in the food court, a meeting room, or any one of the many lounges located throughout the building.

The Bobst Library also boasts a significant NYUROam presence, with the majority of the building covered. Some of the University's general purpose classrooms are also supported by NYUROam, including the 2nd and 3rd floor classrooms at 194 Mercer Street; the basement classrooms at 25 West 4th Street; and the new ground floor classroom at 19 West 4th Street. Service continues to expand, and coverage will soon be available in even more classroom settings. As faculty members begin to embrace wireless technology and find new ways to integrate network or Internet resources into course curricula, we will surely see more requests to deliver NYUROam services into the classroom.

### WHAT'S COMING

The lynchpins enabling wireless software clients and hardware devices to interoperate properly are the IEEE standards. The technical specifications outlined by standards ensure that manufacturers produce products that will work properly in a "standards compliant" environment.

When most of the access points that comprise the NYUROam service were deployed, they used what is known as the 802.11b standard. This radio interface is capable of providing 11 Mbps of bandwidth per access point. Since wireless networking is a shared medium, this means each access point would deliver 11 Mbps for all of the wireless clients associated with that particular access point. The subsequent ratification and availability of the 802.11g radio standard raised the available radio bandwidth provided by an access point to 54 Mbps. NYUROam is committed to providing the fastest, most reliable connections available, so we are actively upgrading over 250 installed access points to handle 802.11g wireless connections.

As part of the 802.11b standard, which was ratified years ago, a Wired Equivalent Protection (WEP) key was introduced as the encryption mechanism to be used by wireless clients. It was thought to be the answer to all security concerns until it was demonstrated that, under certain conditions, the WEP key could be "cracked." NYU has implemented a variety of additional security features for NYUROam and does not rely on the basic 802.11b security

standard to protect the data transmitted on the NYUROam network. Nonetheless, the flaws in 802.11b have led us to begin planning for the adoption of the new security standard: 802.11i. The 802.11i standard, originally called WiFi Protected Access (WPA) in its pre-standard form, is something NYUROam clients will be hearing more about in coming months. It will eventually become the preferred authentication and access method for NYUROam clients. The 802.11i standard introduces several new methodologies that increase the security of radio transmitted data.

Once all of NYUROam's access points are upgraded to use 802.11g, we will introduce a new network that will join the current three-part network: "NYUROAM1," "NYUROAM2," and "NYUROAM3," each of which currently supports different client/connection type combinations. The new network will simplify the process of configuring your computer to connect to NYUROam, and support the 802.11i standard, using the Advanced Encryption Standard (AES). AES is the next-generation cryptography algorithm designated for use by the U.S. government, which will replace the long-standing methods: Data Encryption Standard (DES) and Triple-DES (3DES).

As wireless technologies and speed requirements evolve, and vulnerabilities emerge, new communications standards are continually developed in the effort to maintain stability and reliability of wireless communication. Each new standard creates opportunities to enhance and diversify the services offered by NYUROam, and ITS will continue to test and evaluate these new possibilities as we strive to deliver to NYU the most secure, robust, and flexible wireless network possible.

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