



WiFi Clouds and Zones: A Survey of Municipal Wireless Initiatives

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This study is one of the first to analytically describe how businesses, governments, communities, and other organizations are using wireless technology to create large WiFi and wireless internet clouds. Going beyond simple hotspots, these implementations offer some of the most pervasive high bandwidth access possible and may shed light on what we can all expect in the future. We are starting to hear of cities and towns across America announcing they are now “the largest hotspot.” But exactly who is doing what? How are they doing it? And why are they doing it in the first place? Rather than provide anecdotal evidence and prognostication, this study is about data and numbers.

The New Media Institute (NMI), founded in 2000 at University of Georgia, is unusual in that it focuses on how wireless technology can improve our lives rather than the technology itself. Pervasive connectivity facilitates these kinds of innovations and led us to create WiFi coverage over downtown Athens several years ago. In 2003, industry leaders in the wireless space like HP, Intel, iAnywhere, AppForge, Air2Web, and ExecuTrain joined NMI to share insights through its Mobile Media Consortium. In Spring 2004, this consortium launched a research project to answer some of the most important questions surrounding wireless initiatives. Over four weeks in March of 2004, industry and graduate student researchers coded wireless implementations in the U.S. using secondary resources such as websites, newspaper articles, and online databases. This report contains a summary of some of the study’s most interesting findings.

Types of Wireless Coverage

The first challenge in our research was developing a nomenclature to describe the types of wireless coverage. The standard naming scheme we developed facilitates the comparison of different wireless projects.

“Hotspot” has emerged as one of the most popular terms for wireless coverage. Although its use varies, a “hotspot” is usually a single WiFi coverage area -- a single building, a store, or

a park. Typically hotspots cover areas no larger than a football field. Although their large numbers are certainly a measure of popularity and growth (the market research firm In-Stat/MDR projects that by 2007 there will be over 40,000 hotspots nationwide), coverage provided by hotspots is isolated and sporadic.

Of greater interest are the WiFi implementations which aim at truly pervasive connectivity. Our study has identified two categories of coverage that provide varying levels of ubiquity: WiFi zones and WiFi clouds.

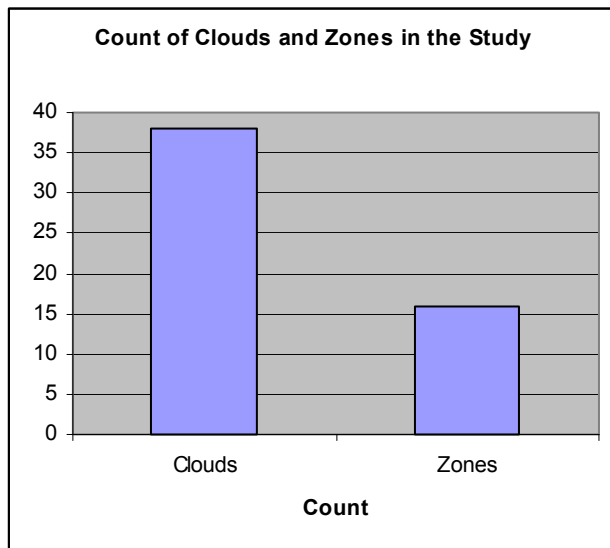
A WiFi zone is an aggregation of cooperating hotspots sharing a single management system. A single login (username and password) allows an individual to access the network anywhere in the geographic area covered by the zone. A zone may cover a large area such as a mall or a convention center. However, the area covered by the zone need not be contiguous. A zone may be comprised of two hotspots at opposite ends of a town with a large coverage gap between the hotspots. In this sense, a zone is unified by service, not by geography.

WiFi clouds offer continuous coverage over a significant portion of a city's or town's geographic area usually using multiple hotspots. Unlike a zone, the cloud offers contiguous and unified coverage. Although clouds may differ greatly in their size, they must offer coverage with no gaps. The cloud is the most significant step toward ubiquitous and pervasive coverage to be found in the WiFi movement today.

Findings

What is Out There?

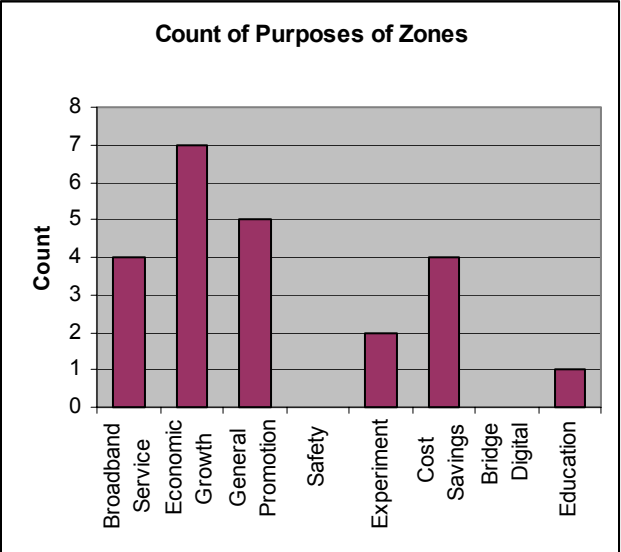
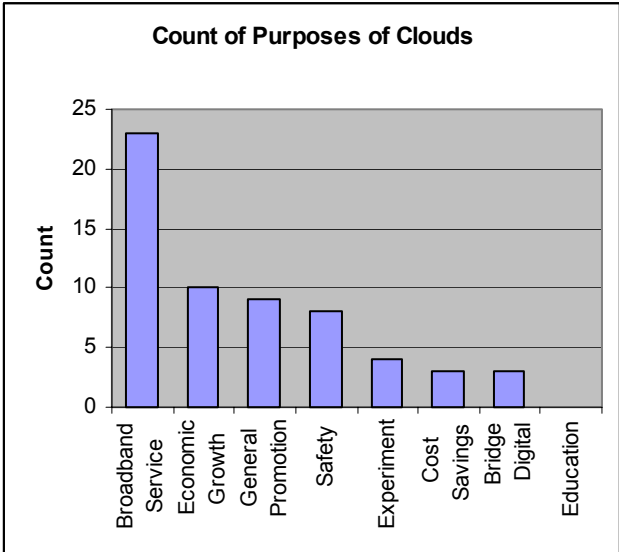
Our research revealed thirty-eight WiFi clouds and sixteen WiFi zones throughout the United States. Most of the clouds and zones publicized in media stories in print and online were classified as currently in operation (clouds: 75%, zones: 81%). All but two of the non-operational wireless implementations were in the planning phase. One cloud, a subscription service run by 3 Rivers in Pittsburg, had been shut down due to too many free access points nearby. The graph below shows the number of clouds and zones in the study.



Of the wireless initiatives we discovered, 81% support public access. To qualify as public access, a wireless cloud or zone must allow anyone meeting established membership requirements (such as purchasing a subscription) to use the wireless network. Public access clouds and zones need not be free. The remaining clouds and zones were private existing for the exclusive use of certain types of users, such as public safety personnel, or employees of a given company or organization.

What is It Used For?

To determine why clouds and zones are being built, we reviewed published reasons cited for creating the wireless deployments. Each cloud and zone could be coded for up to three different purposes. The following graphs show a summary of these coded results.



Rather than generating revenue, most wireless systems were developed to enhance the communities being served. The majority of clouds (60%) were created to provide broadband capabilities to a community. WiFi clouds provide an inexpensive high bandwidth alternative to communities underserved or not served at all by other broadband providers such as cable and DSL. Providing a broadband alternative was only cited as a reason by a quarter (25%) of the zones. The sporadic coverage patterns available through zones do not seem to make them good candidates for communities seeking to address broadband deficiencies.

The purpose cited most often for creating zones is stimulating economic development (43%). A smaller but significant percentage of clouds (26%) also cited stimulating economic growth as a reason for their initiatives. Clouds and zones believe that wireless capability in a community can fuel economic growth.

Clouds and zones also see their wireless initiatives as a method to enhance the reputation of their communities. Promoting the community was cited as a reason for building 23% of the clouds and 31% of the zones.

While saving money was cited as a motivating reason behind 25% of zones, a much smaller percentage of clouds (7%) mentioned cost-savings as a reason for building wireless coverage. Anecdotal evidence suggests retail establishments are building zones to make it easier to move back-office operations (such as point of purchase, and management tasks) around a physical plant without expensive changes in wiring. This type of business application would be much more common in zones than clouds where revenue generation is more common.

And, although public safety is currently receiving significant coverage as an important application for wireless, only 21% of the Clouds and none of the Zones cited it as a reason for their wireless initiative. The scattered coverage provided by zones make them an inappropriate choice for public safety applications. In addition, most public safety wireless initiatives utilize private networks where controlled access makes it easier to meet the requisite high security standards. The large number of clouds providing public access in this study explains the small percentage used for public safety.

In addition to these reviews, we also looked at usage models and other data about a cloud or zone to understand its rationale. In the published information about clouds and zones, profit does not seem to be a prime motivator for providing wireless coverage. Many of the clouds (28%) and most of the zones (62%) allowed free use of their systems. Overall, 38% of wireless initiatives allowed free usage. However, only half of the clouds (50%) and less than a third (31%) of the zones were created to generate revenue. Of the clouds and zones generating revenue, the sale of subscriptions for wireless access is the overwhelming revenue mechanism (88% for clouds and 75% for zones). Most of the clouds (92%) and zones (75%) do not have a process for "fee per use." Very few of the clouds (2) and zones (1) cited advertising or sponsorship as ways of generating revenue. The traditional mechanisms for generating revenue from telecommunications services such as the telephone and the Internet are dominating the early phases of wireless deployments.

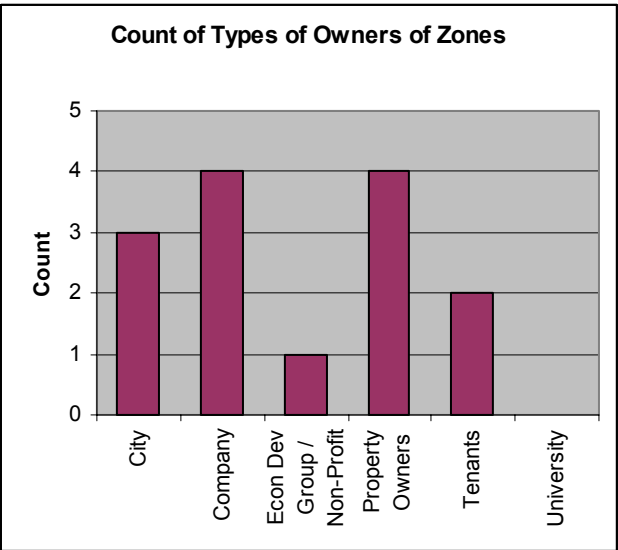
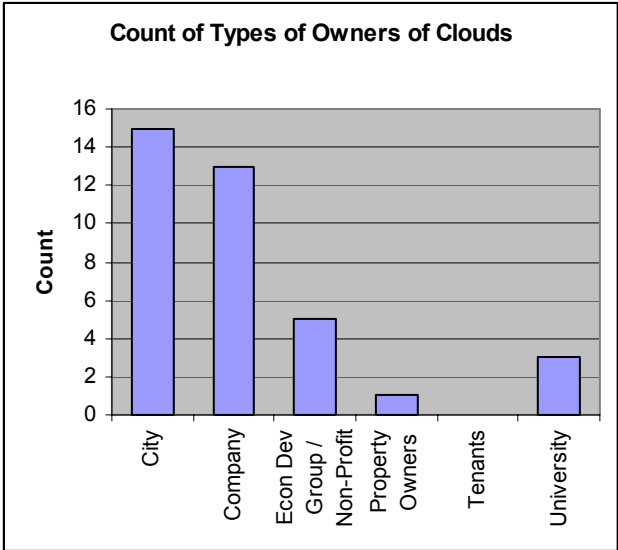
The targeted users cited by the WiFi deployments reveal the motivations for building wireless coverage. Clouds and zones have differing approaches to visitors to a community. Clouds were split almost evenly between those that targeted tourists (47%) and those that didn't. But a predominant majority of the zones targeted tourists (81%). In addition, the breakdown of clouds and zones that targeted business travelers was identical (clouds = 47% and zones = 81%). Clouds were more interested in targeting local businesses (65%) than zones (56%). These findings indicate that clouds cater to permanent residents of a community while zones are more likely to focus on visitors. Clouds are more concerned with revenue generation through subscription sales and providing broadband alternatives for a community. Full-time residents and local business owners would be logical candidates to pay subscriptions for broadband options. Because of their connection with established retail establishments, tourists, business and other occasional visitors would more valuable to zones. Visitors provide the additional foot-traffic that can mean the difference between success and failure for a retail establishment.

But perhaps the biggest indication of the ways that wireless initiatives envision their systems comes from the fact that very few clouds (15%) or zones (12%) offered any content specific

to their coverage area. The majority of wireless initiatives see their projects as offering a conduit to the Internet for web browsing, media downloading, and email. Clouds and zones have yet to explore the potential of providing localized content. The wireless initiatives see themselves as common carriers rather than broadcasters. The dominant model for community wireless today is the telephone, not the television.

Who’s Buying?

Most wireless initiatives are owned by either a city (35%) or a company (33%). However, clouds and zones have different patterns of ownership. The vast majority of clouds (89%) are owned by a single entity whereas over half (56%) of zones have multiple owners. This difference is perhaps due to the organic growth of zones. Without aspirations of continuous coverage, a zone can develop as a collaborative between different hotspot owners. The continuous coverage goal of a cloud requires a single coordinating authority. The graphs below show the ownership breakdown for clouds and zones.



Although a variety of different types of organizations pay for the wireless infrastructure, the most glaring difference between clouds and zones is the involvement of government. Where 40% of clouds are paid for by cities, municipal governments pay for only 21% of zones. Municipal governments seem much less interested in providing wireless coverage for only a portion of the cities they manage. The universal service approach that municipal governments must adopt for utilities and other telecommunications services might influence their decisions making the scattered coverage provided by zones less attractive. Overall, there is much less diversity in ownership patterns for clouds than for zones. A little over three quarters of clouds (75%) are owned by one of two types of entities: cities (40%) and companies (35%). Building a cloud requires the larger levels of funding that companies and cities can provide. However, for zones where the necessary infrastructure investment is more moderate, our research reveals greater diversity with several different types of owners: cities (21%), companies (28%), property owners (28%), and even tenants (14%). Clearly, zones come in several different flavors while clouds have more homogeneous ownership.

What Technology is Enabling All of This?

802.11b is the dominant standard used by both clouds and zones with 72% of all wireless implementations use this protocol. However, the majority is more pronounced for zones (82%) than for clouds (68%). A significant percentage (21%) of clouds utilize other unlicensed radio systems (802.11g, Wi-Max, QDMA, and 900MHz). We found only one zone uses a non-802.11b unlicensed system. The back-haul challenges clouds face could explain clouds' greater use of unlicensed radio systems other than 802.11b. With expanded geographic coverage areas, clouds typically need high bandwidth solutions capable of covering greater distances. Only three clouds and one zone utilize proprietary wireless systems. Expense and lack of compatibility with other wireless systems has probably kept this number low. And an interesting technological finding is that while close to a third (31 %) of clouds were using some form of mesh in their networks, none of the zones were using this approach. Once again, mesh approaches enable wireless projects to cover large areas with less permanent build-out (e.g.. mounting devices on electrical poles).

Conclusion

As clouds and zones spring up all over the world, municipal leaders and technologists are collaborating to explore how this powerful new technology can make their communities stronger. One of the most exciting aspects of this study is the sheer volume of wireless clouds in the U.S. that are available to the public.

A few clouds and zones in the U.S. provide content and applications specific to users within their network. The Lower Manhattan WiFi Network that provides information about the area and its merchants is a great example. What interests the NMI, its faculty and students, and the Mobile Media Consortium is the uncovering and discovery of applications like these and others that are just beginning to be possible with wireless technology. Inventing these mobile applications and creating the best way to interact with them keeps this field exciting and relevant. The challenge is not to allow our knowledge of what is being done today to limit our vision for what should be done tomorrow.



Scott Shamp is an Associate Professor in the Grady College of Journalism at the University of Georgia. He is a quickly becoming a world re-known thought leader in the field of Mobile Media. He is the Director of the New Media Institute and the Mobile Media Consortium.

About the Mobile Media Consortium

The Mobile Media Consortium (<http://www.mmc.uga.edu>) is an academic/industry partnership committed to exploring the compelling uses of mobile media as well as promoting the development and growth of wireless and mobile media. The Consortium, founded in 2003, is housed in the New Media Institute at the University of Georgia and includes the following partners:

- AppForge - <http://www.appforge.com>
- Air2Web - <http://www.air2web.com>
- ExecuTrain - <http://www.executrain.com>
- Hewlett-Packard - <http://www.hp.com>
- iAnywhere - <http://www.iAnywhere.com>
- Intel - <http://www.intel.com>

About the New Media Institute

An interdisciplinary unit of the Grady College of Journalism and Mass Communication at the University of Georgia, the New Media Institute (<http://www.nmi.uga.edu>) is dedicated to the exploration of the creative, commercial, and critical dimensions of innovative digital media technology. In Fall 2002, it collaborated closely with the Athens-Clarke County Government to implement the Wireless Athens Georgia Zone (WAGZone), which allows for wireless Internet access in downtown Athens. NMI students have been developing systems and products that utilize the WAGZone over the past two years.

To learn more about Scott, the Mobile Media Consortium or the New Media Institute, please contact us.

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The following clouds and zones were included in the study.

Name	Cloud	Zone
Adel, GA	X	
Ashland Unwired, OR		X
Atlanta FreeBee in Buckhead, GA		X
Aurora, CO	X	
Baton Rouge, LA	X	
Boston MIT Roofnet, MA	X	
Buffalo, MN	X	
Ceritos, CA	X	
Champaign-Urbana, IL	X	
Charleston, SC		X
Charlotte, NC		X
City of Atlanta, GA		X
Douglas County, GA		X
Eastern Oregon	X	
Garland, TX First Responder	X	
Gun Barrell, TX	X	
Half Moon Bay, CA	X	
Harselle, AL	X	
Henderson, NV		X
Hermosa Beach, CA	X	
Houston County, GA	X	
Island Pond, VT	X	
JAXWiz, Jacksonville, FL	X	
Kennewick, Boston County, WA	X	
LaFayette, LA	X	
Linden, TX	X	
LongBeach Hot Zone, CA	X	
Louisville, KY	X	
Lower Manhattan Wireless Network, NYC		X
Medford, OR	X	
Milwaukee Free Zone		X
Nevada, MO	X	
OneCleveland, OH	X	
Orlando, FL	X	
Owensboro, KY	X	
Park City, UT		X
Pittsburg, PA	X	
Portland VeriLAN Zone, OR	X	
Portland, Personal Telco Project, OR		X

Rioplex, South Texas	X	
Salida, CO	X	
San Francisco BARWN, CA		X
San Jose, CA		X
San Mateo, CA	X	
Santana Row, San Jose, CA	X	
Seattle, WA		X
SF LAN, San Francisco, CA		X
Spokane, WA	X	
St Louis, MI	X	
Tallahassee, Digital Canopy, FL	X	
Vivian, LA	X	
WAGZone, Athens, GA	X	
WiFi Alliance, Tucson, AZ	X	
York County, PA		X

The following clouds and zones were also identified during the study but did not qualify for analysis because not enough information was available, they provided hotspots rather than clouds or zones, or operated on licensed spectrum.

Name
Boston CityKi
MetroCloud, Boise, ID
Roanoke, VA
Cincinnati, OH
Bowie, MD
Rome, GA
Greenville, SC
Round Lake Park, Chicago, IL
Norcross, GA
Savannah, GA
Austin, TX
MetroNet, Eugene, OR
Broadband Central
National Broadband
MetroFi
TowerStream
Grand Haven, MI
Los Gatos, CA
Baltimore, MD
Daytona Beach, FL