

Information Response from Washtenaw Wideopen
Wireless to Washtenaw RFI #6200

County of Washtenaw, MI



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Executive Summary (Section 1)

Cybernet Systems, Synergy Broadband, and IC.net propose to form the initial membership for Washtenaw Wideopen Wireless¹ (WWW), a not-for-profit, cooperative corporation that will support deployment of advanced 802.11b/g mesh networking technology comparable to, but more advanced than, what is available from other entrants into this market.² WWW membership will grow as additional service providers chose to join the initial group.

The network technology proposed was developed and proven in rigorous US Army applications³. It implements scalable, metropolitan, roaming networks and fixed wireless mesh using standard wireless networking foundation technology (802.11 b/g) and is compatible with personal computers,⁴ digital video recorders,⁵ PDAs,⁶ and wireless access points. Because the mesh routing technology is software based, it can operate over multi-vendor wireless hardware⁷ platforms with already deployed hotspot access points, and through future infrastructure upgrades for longer range, higher speeds, and alternative backbone supporting networks.⁸ This allows WWW to incorporate much of the already deployed wireless equipment in use in the County into its network, reducing deployment expenses and taking advantage of the current “wireless noise” rather than having to fight it.

The WWW cooperative business concept is to define four levels of WWW partner.

- (1) The first level is the *Full WWW Partner Organization*. This type of WWW partner would provide access to some or all of its available bandwidth facilities that route traffic through to the larger Internet (i.e. via WAN links). The WWW pays each *Full Partner Organization* a fee based on the bandwidth utilized to connect to the Internet. This payment allows the Full Partner Organization to recoup their Internet cost and make a fee for the fraction of their Internet capacity, which is consumed by WWW. Since we expect that Full Partner Organizations will often be operating ISPs, WWW partnership does not in anyway constrain or limit the full partner from execute its current commercial Internet business operations.
- (2) The second level is a *WWW Infrastructure Partner*. The Infrastructure Partner invests in the hardware necessary to place a high-point repeater node on top of a building, on raised RF towers, or on prominent geographical positions in the County area. WWW defines how these high-point repeaters must be built and operated and takes responsibility for assuring that these repeaters do not adversely affect overall network operations. WWW’s decision in these matters is final for all WWW partners. WWW affiliated hardware and software technology providers can supply critical components, but *Infrastructure Partners* can also purchase and integrate any compatible hardware at their discretion. *Infrastructure Partners* provide the investment capital for high-point repeaters, typically because they also want to provide reimburse routes the Internet (i.e. they are Full Partners as well) or because they would like to offer reliable service to

¹ WWW for short and at registered domain www.WASHTENAWWIDEOPENWIRELESS.com

² For instance Tropos Networks. <http://www.tropos.com/>

³ Army field testing has been done for over two years.

⁴ Mac, Windows-based, and Linux-based.

⁵ Like TIVO

⁶ Currently Windows CE – expanding to Palm in the future.

⁷ Linksys, Dlink, Netgear, and many others.

⁸ The routing approach is an improvement of AODV – ad hoc on-demand distance vector – documented as Internet Working Group standard RFC 3561. Standard AODV is improved for better security and improved mobile ad hoc network performance in the metropolitan or field setting.

subsets of the community which they serve (for instance, high density building operators might become *Infrastructure Partners* so that they can provide Internet service to their tenets or schools might become Infrastructure Partners so that they can provide Internet services to classrooms).

- (3) The third level is *User Partners*. *User Partners* can download *free of charge* WWW network management/routing software that incorporates into their Windows, Mac, or Linux PC that allows route establishment to any other node in the WWW mesh cloud (i.e. anywhere covered in Washtenaw County) or to outside Internet nodes (routing through one of the Full WWW Partner Organization Internet connections). Traffic in the network is managed by version control of the User Partner's WWW management/routing software (updated as needed on demand from the network). At WWW network launch the plan is to make all traffic from a point in the WWW mesh cloud to another point in the WWW mesh cloud (i.e. from anywhere in the County to anywhere else in the County) available *free of charge*. All traffic from the cloud out through a Full WWW Partner Organization Internet connection will be charged at the rates set by the WWW (this income being split between WWW to implement network management, expansion, and subsidies to worthy public groups to pay for community free network access and the Full WWW Partner Organization which routes the data and makes uplink maintenance and operations cost and a WWW-partner determined fee).
- (4) In addition, WWW will partner with *Technology Provider Partners* that define
 - a. Network routing software (for overall network operational compatibility and management),
 - b. Standard network hardware configurations
 - i. Which 802.11 b/g cards which are supported,
 - ii. Low cost User Partner rooftop node requirements,
 - iii. Moderate cost Infrastructure Partner high-point router requirements, from time-to-time,
 - iv. Incorporation of new network technology options, and
 - c. May sell, service, and support hardware components or full routers

WWW will be responsible to Washtenaw County for execution and management of the WWW rollout plan. As needed, any outside financing acquired will be directed into WWW. WWW will be governed by a board of trustees, which includes all full partner organizations and a seat reserved for the Wireless Washtenaw Private Sector Partnership. The initial Full Partner group will be Synergy Broadband, IC net, and Cybernet Systems (Initial board chair). Each organization maintains a substantial Internet routing capacity to service its current business and e-commerce operations and this capacity can be readily expanded as needed to support the initial WWW launch.

Key Features of the Proposed approach:

- (1) No initial need for State, County, or City resources to establish Phase 0 and I deployment – (Phase II and III could draw on convenient County locations)
- (2) No requirement for County direct investment
- (3) An inclusive organizational approach that allows participation from any and all Internet service providers that currently or plan to operate in the County – regardless of size and current market share (the proposers include the current market share leaders that operate in the County provisioning business customers and that stimulate network technology employment growth in the County).
- (4) State of the art network technology with provision for continuous upgrade
- (5) Full network interoperability with in-place 802.11 hotspot infrastructure and wireless PCs

Business Model (Section 2)

Summary

As outlined in the previous section, WWW will provide intra-County Internet free of charge. This is possible because:

- Individuals (User Partners) have literally no added hardware expense to be added to the network. Any wireless enabled PC type device can be configured to enter the County-wide mesh through a free software download.
- Infrastructure is extended by incorporating existing 802.11 wireless routers already deployed
- Adding small rooftop wireless router/repeaters purchased at User partner expense allow entering the mesh from a fixed wireless service point (nominally homes and small premises).
- Adding wireless backbone/long reach repeater/routers purchased at Infrastructure Partner expense allows preferred access from fixed points into the mesh (and also supports routing of data from the mesh into a land Internet line if the member is accepted as a Full WWW Partner Organization).

Intra-County Internet to outside the County Internet will be provided for a fee paid by each User Partner that wishes data routed intra-County to outside the County on a monthly basis. This fee supports WWW network administration and operations, establishing Infrastructure points as needed where no coverage is provided by an existing WWW Infrastructure Partner, paying each Full Partner for Internet routing services based on traffic which that partner routes, and subsidizes community network access. Users will sign up for outside routing on a per fee basis at the same WWW web site which is used to distribute the free network management/routing software downloads.

Responses to specific RFI questions

1. Given the goal to provide wireless Internet access for all residents, business, and visitors throughout the county, please identify your strategy for providing a blend of “free” and “for fee” services. Describe what would be provided for “free” and what would be “for fee”.

All intra-County service will be provide free of charge. Rooftop repeaters will be purchased to WWW specification by the user/partner who deploys it – existing 802.11 routers will incorporate into the network as is. All users with wireless capability in their current computing device will be able to join the intra-County network free of charge with the download of free management/routing software which incorporates into Windows, MAC, or Linux PCs and later other PDA type devices.

All routes from inside the County to outside of the County over land Internet connections (provided by Full Partners) will be made available to users who sign-up and pay for a subscription service.⁹ Income derived from this fee structure will pay the routing expenses (to Full Partners), will subsidize community access free service (based on criteria establish through deliberation by the WWW Board of Trustees and Wireless Washtenaw), and will be used to fill in the service footprint not covered by voluntary Infrastructure Partners.

⁹ Pricing will be competitive with alternative Internet services

2. How does this type of arrangement fit with your current business model?

Cybernet...

- Sells Linux-based security and file sharing products – these products provide the base for Infrastructure to be prevalently used to build the proposed network.
- Performs network, software, and IT integration for Government Agencies – This will be a necessary part of deploying the proposed network.
- Operates the largest private bandwidth e-commerce site in Ann Arbor supported by an optically fiber coupled OC3. This is ideal for a Full Partner routing point.

The proposed plan is fully consistent with Cybernet's goal to commercialize advanced technology developed and tested for the Defense infrastructure to profitable commercial applications.

Synergy and IC.net combined have the largest share of the hybrid line/wireless Internet Service Provider (ISP) to business customers in greater Ann Arbor and the back end bandwidth to support this share. This experience deploying wireless access to demanding users provides the experience the WWW needs to launch early deployment. As ISPs, IC.net and Synergy are basically resellers of bandwidth and therefore as Full WWW Partners, they will be extending this role through a slightly different business model. We believe that the higher level of quality assurance management inherent in both of their business customer models will survive introduction of the lower cost WWW service proposed without substantial change. The real effect will be that both IC.net and Synergy will achieve large scale in their core bandwidth reseller businesses.

3. Would this be viable for you as a private business entity?

WWW is set-up as a cooperative or not-for-profit entity so that it can be the basis for wider community collaboration in investing in and building the proposed network. Everybody wins, including larger communication providers like Merit, Comcast and SBC because they can (1) join WWW as full partners, or (2) they can provide Internet backhaul to other Full Partners.

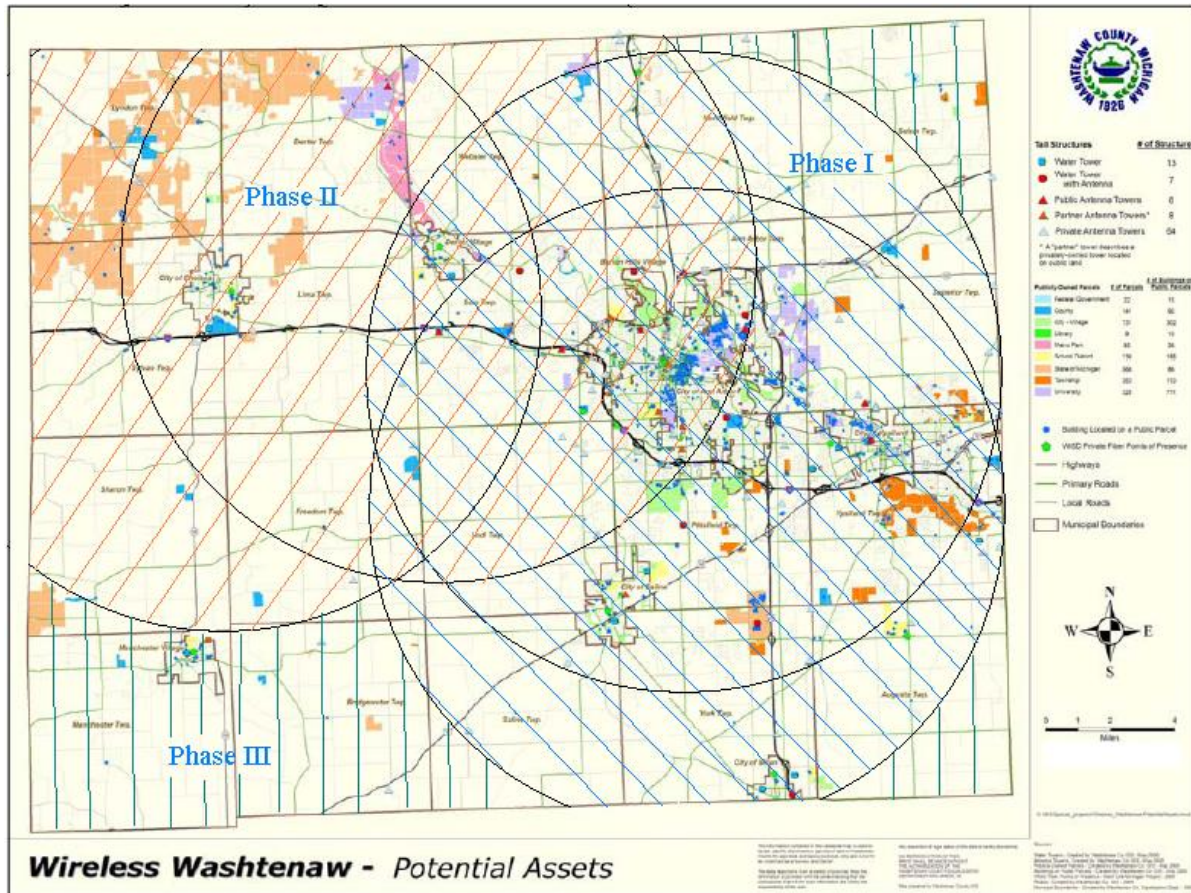
As proposed, the current Full Partners will generate enough revenue to support this effort indefinitely. If proven successful, the business model will be propagated elsewhere by the partners through a franchising model (i.e. other WWW type organizations will be chartered and supplied technology and know-how in comparable community settings).

The billing model proposed mimics on a County-wide basis the model Boingo uses for hotspots nationally, but we believe it will more viable because this project will build-out *complete* coverage over a useful operating area so user subscription fees for County residents is a better value proposition.

4. Would your proposed business model have the ability to serve the diverse service demands of the different geographic regions in the county?

Properly configured 802.11 repeater/routers can reach up to 10 miles. This means that end-to-end nominally as few as 8 towers could cover the entire County (not considering shadowed areas). Shadow areas can be completed on demand by the subscribing user's community for as little as \$500 per subscriber (and free if existing computer gear can be leveraged through the

free network management/routing software patch). This means covering the proposing group can cover with current locations approximately the area shown below.



Approximate coverage map.
Phase 0/I deployment provides coverage to greater Ann Arbor based on current high points operated by the existing WWW team. Phase II deployment is also shown (deployment in Dexter/Chelsea). Phase III finishes uncovered portions of the County. A more accurate map is viewable from the companion software propagation model CDROM that incorporates accurate County terrain and antenna location.

5. Articulate how you would expect your business model would recoup the costs associated with the rollout of the project and provides a long-term sustainable business for the private sector partner(s) involved.

User partners will pay a small monthly fee to WWW for routing service from the Washtenaw County net through Internet uplinks provided by the Full Partners. WWW will use the paid user routing fee to reimburse Full Partners at the agreed to fee rate based on traffic each Full Partner routes and to cover community access free services.

6. How would your proposed model provide for inter-partner involvement?

Each Full Partner (those providing routing to the open Internet from the Washtenaw County net) will be given a WWW Board of Trustees seat (along with a seat to the Wireless Washtenaw group – most like a County representative). The WWW Board sets network policy, oversees

WWW network operations, sets fee rates to the User Partners and determines necessary payment rates to the Full Partners to reimburse their Internet uplink expenses. The only limitations on Full Partner participations are:

- (1) Full Partners must have a staffed office in Washtenaw County.
- (2) They must operate an Internet uplink route (one or more) within the County.
- (3) They must operate one or more Infrastructure high point routers in the County (i.e. must accept traffic from other routers) that route traffic to the Internet uplink.
- (4) They must accept WWW network policies and fee structure (which they have one vote each on the Board of Trustees to effect).
- (5) If the Full Partner elects to withdraw from WWW they give up their board seat and must continue to accept traffic from the County net for a predetermined period of time (nominally 60 days). This give the rest of the partners time to adjust capacity to accept all routing requests.

Infrastructure partners must set-up a WWW high point router at their premise. User Partners must download current management/routing software and register for fee payment if they wish to route traffic outside of the County at the rates established by the WWW board. All parties must agree to WWW network policies of proper use.

7. How flexible is your business model to allow for influence or feedback from different stakeholders such as, government, business, and education?

As a responsible provider organization, WWW will naturally be responsive to all “customers,” namely User Partners and Infrastructure Partners. It will be governed by the Full Partners, which includes a board seat for the Wireless Washtenaw representative who is chartered to provide the County oversight and to represent the needs of the community (government, business, and education).

It is advisable to organize a community access board that is chartered to specifically advise the WWW board in general and the Wireless Washtenaw representative specifically as to possible and proper community access uses of the network.

The WWW board will be dominated by Full Partners so it is not likely that they would recommend operations of WWW so as not to be ultimately profitable and sustainable. Should WWW partnership decisions be against the best interests of any Full Partner Internet Service provider either through policy or fee rate structure, the Internet Service Provider can withdraw from WWW and the board. If all providers withdraw, WWW would not have any access to the open Internet and this would effectively degrade WWW service. For this reason, the community access board and those it represents (government, business, education, and the users community in general) would most like accept a reasonable rate structure from the WWW board so that Full Partners are encouraged to continue high quality service.

8. What would you anticipate the fee structure to be for this “free” and “for fee” type of arrangement?

We would suggest a reasonable fee structure for User Partner routing to the Internet. Fees would be set based on (1) cost to provide service in the aggregate (i.e. costs accumulated to be payable to uplink connection providers that accept traffic from each Full Partner); (2) a reasonable overhead to fund network operations and an acceptable fee; (3) costs to provide

infrastructure where the community of partners elects not to purchase and deploy it as individuals and organizational members.

Cybernet operates on such a basis with the US Federal Government for Defense work. We keep auditable expense records that cover all operations. We then yearly or upon government demand use these records to prepare operation cost projects, which become the basis of our fees for work. Government auditors are free to examine the records and the computation of fee, request clarification or further backup, and accept or reject the rates. When consensus is reached, the fees for work are set.

Similarly the initial WWW partnership would set a User Partner routing fee based on prior experience serving the Internet to users. Then actual costs to operate the WWW would be kept and used for future fee setting. This fee setting will also include provisions for subsidized free community access service based on rules determined through deliberation between the WWW board and the community access board (for instance, perhaps free service to schools and public libraries).

The fee structure would likely provide for short term routing (i.e. one to several days worth that might be useful to a visitor to the County); monthly paid service; service prepaid for a longer period (perhaps one year at a time); and assure quality of service (typical of business or critical government services). At the present time, we would recommend that WWW allocate assured quality of service to specific WWW Full Partner Organizations because these organizations are already operating service of this type in the County and have the experience to do a good job at the process.

As an incentive to Full Partners to join the WWW, we propose that the County would purchase all of its institutional Internet services through the WWW based on competitive bidding per County purchasing agency defined rules. The WWW Full Partners would be the qualified bidders for these purchases, and would be selected by the County for services through any criteria that the County deems proper. This would help the Full Partners, collectively; to offer the County and WWW Internet routing services at the best possible pricing due to aggregated larger purchases of bandwidth from upstream providers. The WWW would thus be chartered to aggregate bandwidth purchases for partner organizations (including the County government itself) within the County so we collectively have the lowest possible Internet charges from upstream providers.

9. Who would own/make the capital expenditures for this initiative?

To the first order, the capital expenditures will be made collectively by the community of users and partners based on their own requirement for service quality and bandwidth used. Building operators (Infrastructure Partners) will purchase and deploy larger roof top units for lighting up their respective buildings. Full Partners will purchase bandwidth and network routers needed to support the bandwidth so that they receive their respective shares of the User Partner fees. User Partners will pay their respective routing fees and if they wish to have fixed wireless roof top units, these must also be purchased or fabricated to WWW specification. As a participating Infrastructure Partner or possibly also a Full Partner, the County and/or Wireless Washtenaw can elect to provide its share of the capital expenditure, but the proposing partners can and would like to proceed without this if the County elects to move forward with this proposal without any County capital commitments.

10. Describe how customer support would be provided. Describe how you would encourage or deliver hardware/software required for customers to use the wireless network.

WWW will provide management/routing software free of charge from the Cybernet Systems Internet site, which will be within the network.

IT and network support will be available from the Full Partners and the Technology Provider Partners. Full Partners proposing this effort all provide on-call and email support for their respective network and IT products. This service will be extended to WWW network users (support fee policies would be based on current member policies – generally “normal” or “routine” support is provided free to customers but “consulting” or “repair” support is performed on a fee per hour basis – each partner organization will publish its support policy and fee rates if applicable so that the community of users understand these options).

Technology Provider Partners will be a typical source for purchasing infrastructure equipment. Since this equipment will be specified by the WWW partnership from existing standard gear (802.11 b/g and PC-based routers), most of the computer purveyors in the County can be qualified as WWW technology providers. The Technology Provider Partner must:

- (1) Take instruction from designated WWW personnel to understand how to assemble, purchase, and support WWW compliant network gear;
- (2) Must provide the gear at a market reasonable price;
- (3) Must provide proper industry standard warranty and service for its equipment;
- (4) Accept WWW software and testing operating on its equipment.

These criteria are well within the range of virtually all computer equipment resellers in the County so we would expect that they would all want to and would be capable of qualifying. Qualified vendors will be awarded a WWW seal of approval for display to their customers. The proposing partners will act as the first tier of Technology Provider Partners for Phase I rollout and WWW will solicit wider Technology Provider participation from that point forward.

11. Describe how you would assess the level of demand and profitability for each level of service you'd offer.

The core service we will offer is intra-County Internet and access/routing to the open upstream Internet. Specific services beyond this will be provided within the County-wide commercial market for data services.

Cybernet Systems would provide NetMAX-based server and security devices and services (content monitoring, remote backup, VPN, uptime monitoring, antivirus, antispam, etc.) to the community (www.netmax.com).

Cybernet Medical (a division of Cybernet Systems) would provide MedStar home patient medical monitoring devices and data services (www.cybernetmedical.com).

IC.net and Synergy would provide quality assured business class Internet services

We would expect that other providers would offer web development, IT support, product sales and service, data and information services, and access to libraries and public offices. Our goal is to create an Internet entrepreneurial zone, which restricts access as little as possible and

expands services. One could imagine online restaurant reservation systems, local Internet grocery services, and even on-line maid, landscaping, and hand-person services.

12. If you ran a pilot, describe what information you would be looking to learn to validate your proposal.

Primarily we would like to determine that demand for the service would justify rollout expenses for the partners and the community members that participate. Initial pilot rollout (we call this Phase I) would be a limited expense because; we already have the high points, basic router equipment, and the software technology for network control/routing (graciously developed under funding by the US Army).

The partnership or cooperative approach we propose has not been done anywhere as far as we know. While we think it is ideal for an active participatory community like that in the County, this model will be proved by a pilot Phase I deployment.

13. If your proposal includes the collaboration of various partners to own & operate the network, describe how the group would be structured, how each would benefit, and how the group would maintain their respective interests as technology changes.

This has been already detailed in prior responses but to summarize:

- (1) User Partners will pay an Internet routing fee but will have intra-County free of charge. They will purchase and own their own rooftop routers for fixed wireless access. PC-based access management/routing software is available free of charge.
- (2) Infrastructure Partners will have the same basic arrangement as User Partners, but will have purchased a better rooftop router so that they can participate in a better quality of service.
- (3) Community access users will have freely subsidized service.
- (4) Full Partners will collectively set fee structure and payment for uplink bandwidth purchased by the WWW from the Full Partner group. This allows the group to profit from the aggregate new Internet use generated by the project and does not interfere with current business focused service models.
- (5) Government will enjoy simpler Internet management and vendor qualification because it will use the Full Partner group as qualified vendors. Further, it will enjoy reduced Internet fees and costs due to bulk buying which the WWW will be able to arrange for its members.
- (6) Technology Providers will have the opportunity to sell into a well organized and standardized IT community. Specifically, Cybernet will be able to demonstrate the value of its US Army developed network management/routing software in a civilian setting.
- (7) Washtenaw County will be lit up for Internet at the lowest cost to the people and government possible.
- (8) The vendor agnostic industry standards-based approach to this implementation will be new to the metropolitan network enterprise and will gain the region much needed national attention which will help bring more high tech investment and industry to the County.
- (9) If we prove this model, high-tech Washtenaw County businesses can replicate the model throughout the country and the wider world.

Technical Solution (Section 3)

Summary

WWW proposes to launch using standard 802.11 b/g hardware so that all members are signal compatible and we can leverage existing 802.11 hotspots rather than fight them for signal space. Furthermore, this allows clients to use built-in RF networking inherent in many portable and PC devices today.

Like other wireless efforts, we will seed the area of coverage with high point repeater/routers at locations already controlled by the proposed in initial partnership. In Phase II we will move out into areas where we located personnel and terrain knowledge and in Phase III we will cover areas not yet lit.

Ad hoc mesh routing software that is downloaded into user PCs and low cost rooftop units will support the high point backbone – this approach closes shadowed areas and allows user PC mobility within the area of coverage. To support fixed wireless access points and older PC systems (like Win 98/ME) the routing software subsets to network authentication control through built-in Windows networking support.

Mesh routing is based on a proprietary improvement to AODV, defined in IETF RFC 3561. The routing software will be supplied to the WWW community in binary form for MAC, Windows PC, and Linux and later for PDAs and phones under a license that allows free use and copy, but not reverse engineering.

As capacity needs increase, higher speed, high capacity backbone technology will be incorporated (WiMAX and addition of more mesh to wired backbone Internet gateways provided by Full Partner Organizations).

Standards: MAC OS X
 Windows 98/ME, NT, 2000, and XP
 Linux
 802.11 b/g
 AODV RFC 3561

Routing to the Internet from the ad hoc mesh will be without encryption or firewalls so each individual user will need to configure for appropriate antivirus and anti-intrusion defense. Technology provider partners will provide configurations and hardware/software options to satisfy security and defense needs:

- Open VPN and IPsec VPN services
- Firewall
- Open Source/Shareware Personal Antivirus software
- Compatibility with commercial version of above

Addressing specific RFI questions for this section

1. Provide a brief overview of the general technology infrastructure that would be leveraged for your potential solution. Please provide a conceptual design of your potential solution.

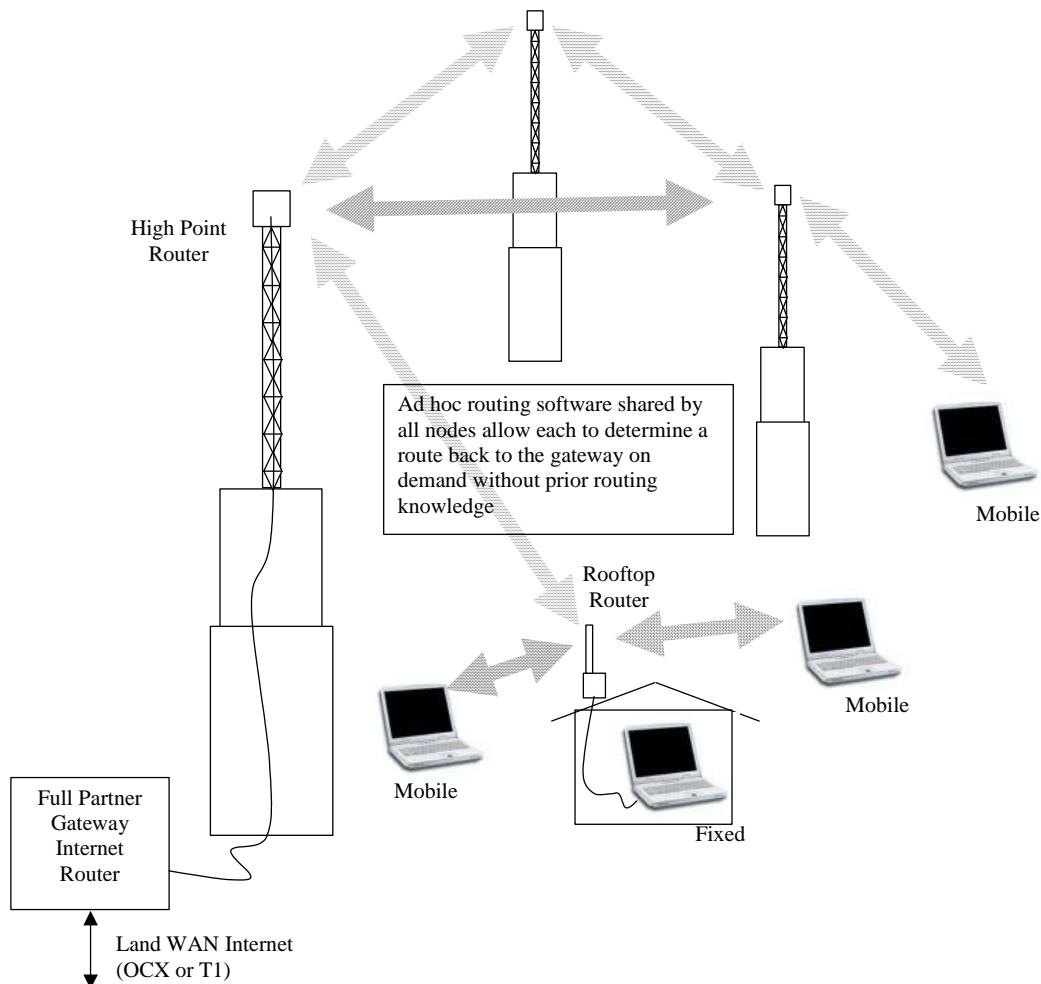
We will use an 802.11 b/g two level infrastructure. The first level provides high point rooftop routers that gateway into upstream provider Internet connections. In Phase I we will use IC.net,

Synergy, and Cybernet backhauls as shown in the diagram on page 5. In Phase II we will add points in Dexter and Chelsea (and others as partners come forward to participate in the program).

These tower points will transmit over relatively long ranges, but will be often shadowed by buildings, trees, and terrain features.

If service is denied to a particular point where it is needed, we will provide to the denied service customer the means to purchase smaller rooftop routers. These units transpond with the high point routers, and in turn provide a smaller radius of coverage closer to the ground which fills in shadows in coverage. “Hackers” will be able to build these local routers from WWW plans (as will local Technology Providers) and commonly available 802.11 gear (or through reuse of gear that they already have). Less sophisticated users will be able to buy them from technology providers for nominally \$500 each or less.

Mobile users or those within the shadow of a high point of another rooftop unit can access service through download of a free software management/routing layer that works through the existing 802.11 network layer in a Windows PC, Mac, or Linux PC.



Conceptual design of the WWW proposed network solution

2. Wireless access must be provided for “consumer-based” technologies with appropriate wireless support.

Users will connect with a standard 802.11 b/g wireless card or rooftop router system.

What experience would users encounter? Users will use an existing Internet connection or a set-up CD ROM to install management, routing and network access layer software. This software finds the wireless card, sets peer-to-peer mode, selects the WWW network, and sets the 802.11 channel. The user is then on the network. It's that simple.

He/she has an application which tells him/her where they are in the network logically based on the number hops to infrastructure and gateway nodes (i.e. a network map). The application also provides network diagnostic information.

After this, WWW network access can be turned on or off through a simple dialog.

When rejoining the network, the user's access software checks versions with the network to be sure that the most recent updates are in use. If an update is needed, the user is prompted through a dialog to update for continued proper service. If the update is selected (which is required to allow continued network access), the new update is downloaded, installed and the user's computer initiates a reboot. When it come back up it rejoins the network automatically.

For example, is there specific technology, software, or other special configuration needs that users would need to address to obtain access? In addition to above, if the user wishes out-of-the-County Internet routing, they can go to www.www.org (or an alternative URL which is available to the WWW partnership at the time of establishment) to sign up for this service and present method of payment. For community access users, some alternative credential (code number/sign-on) will be presented. Payment and user information will be associated with the MAC address or the requester. Mac address tracking could be a service extended to prevent or track stolen computer gear in the County at a future point.

3. Would your envisioned solution support both outdoor and indoor wireless access?

Please explain. Yes. Outdoor access is determined by line of sight to a high point repeater, a rooftop unit, or a close-by connect user PC. Indoor access is also based on the same approach so a user would either need to be near windows in line of sight of an access point or would have to install rooftop units that bring Internet routing into the building. Once inside, access is through a wired connection or a commercial wireless access point connected to the wired net. This is normal commercial wireless technology from Linksys, D-link, Netgear, etc.

4. What is the best and worst communication speeds expected for both outdoor and indoor access?

Approximately the same for both. 802.11b provides 11 mb/s. When through an ad hoc router repeater systems one can expect to see this speed reduced by about ½ to 5 mb/s. If there is interference or extreme range rate can be as low as 500 kb/s. If we connect via 802.11g, rates are increased by about 5 times so 5 mb/s becomes 25 mb/s and 500 kb/s becomes 2.5 mb/s. Since this is pretty fast, the actual throughput will most likely be limited by the backhaul capacity of the network shared by the community.

5. What provisions would be needed to provide network security?

The network protocol software resists malicious attempts to crash it. It does not, however, offer any particular encryption for data security. To add security over communications we propose widespread adoption of OpenVPN, which uses an SSL, encrypted VPN tunnel technology over the basic network. OpenVPN is reliable open source available for Sun, Linux, Windows, and Mac and can be freely distributed and installed for all users that download the network management/routing software.

As far as we know, no technology can prevent a malicious user from jamming the network locally with traffic and then creating a local denial of service condition for people around this user. Interruption like this can be tracked at some point, but presently the primary prevention approach will be to deny routing keyed by MAC address of the malicious user. This does not prevent denial of service interruptions but makes the network useless to the malicious user until he/she agrees to proper network behavior and etiquette.

6. Is there specific access, infrastructure, assets, or other needs the solution would require that leverages existing solutions? For example, right of way issues, leveraging existing fiber networks, electrical needs, etc.

The proposed approach leverages existing fiber networks for backhaul and convenient location of high point infrastructure nodes. Use of right-of-ways for locating rooftop class units might make eliminating shadows easier – under this plan, the County would have to determine how it would make these areas available to a private repeater system purchaser (or to groups of purchasers like a local neighborhood). Substantial use of light poles or public right of ways is probably not necessary under the proposed architecture (except where they offer free-of-charge centrally located high points).

Coverage & Implementation Plan (Section 4)

Summary

As indicated in the previous sections, a uniform ad hoc routing mesh will be established with gateway uplinks to Internet provided by and open set of Full WWW Partners (i.e. new Full Partners will be allowed to join the group as the project rolls out and continues operation).

There are three aspects of the County's diversity that effect rollout:

- (1) Terrain – even though the County is relatively flat, rolling terrain especially descending towards the Huron River causes line of sight issues that can cause shadowing and forces multiple high point antennas for coverage of the area.
- (2) Population density – Ann Arbor and Ypsilanti located centrally in the County represent the densest group of data network users, but also already have access to the highest density of alternative Internet provider links due to landlines of various types – the major carriers have determined that service to this area is more profitable than service to less densely population out areas of the County.
- (3) Data density – clearly the density of ground data links in the Ann Arbor/Ypsilanti area is directly correlated to the higher data requirement of these areas.

The proposed Phase I deployment consists of high points already controlled by the proposing Full Partner set. These high points are centered in and around Ann Arbor because of points (2) and (3). Phase II rollout is required due to point (1) and follows a major population growth path in the County. Phase III can be served by smaller lower cost antenna set-ups and perhaps a

slow data backbone system because the population density in these regions is lower, and demand, at least initially, can also be expected to be lower.

Addressing specific RFI questions for this section

1. Do different community types have unique infrastructure needs?

All require Intra-connect to the County network and from there interconnection to the Internet at nominally the same burst data traffic rates – however, overall data traffic capacity out of each section of the County can be tailored to demand which is nominally correlated to population.

What are they? Tailoring data capacity is done via the quality of the backhaul to Internet routing points. Land wiring or wireless routing can accomplish this.

How would they be addressed? Lowest capacity routes will be via wireless backhaul due to lowest cost. If line of sight or range limitation prevents this approach, T1 landlines can be used assuming the population density supports the recurring expense of leasing the line from the organizations with proper right of ways. Higher capacity links will be centered around Ann Arbor and will have connection through an Ann Arbor SONET ring operated by a major telecom like KMC Telecom. KMC and companies like them interconnect with the University of Michigan, IC.net, Cybernet, and Synergy at the present time.

2. Would the County be segmented into different logical service areas?

How would those segments/districts be created? No. Even with multiple Full Partner Internet uplinks and multiple high point antennas that concentrate traffic and route to the Full Partner gateways, we propose treating the entire County as a single service area with a fixed price fee structure. Policies of appropriate use would put use limits on each user enforced by the routing system. Burst rate will be high enough that this will only limit significant education and business users (like those who already have large backhaul links already and would continue to be off the wireless grid for these high traffic applications).

3. How can seamless coverage between segments (or zones) be accomplished to accommodate mobile workers? The proposed enhanced AODV routing software provided by Cybernet provides seamless access and hand-off to mobile workers as they move from coverage zone (rooftop router or high point router) to coverage zone.

Additionally, how can interoperability be accomplished between multiple providers? The WWW Board of Trustees can accept new Full Partners (i.e. operating new Internet gateways) at any time. All will use the same user identification method and payment clearinghouse operated by the WWW cooperative.

4. What other unique considerations must be addressed to get County-wide coverage?

Because it will be difficult to predict in minute detail how repeaters must be placed to cover all shadowed areas or the insides of buildings, our approach puts the responsibility of purchasing and placing low cost rooftop repeater cells in the hands of the user community. We would expect to upgrade management/routing software and to some extent already placed 802.11 gear because of the incentive of supporting entry in the County-wide network for all 802.11 users. This will help cut down on out-of-network 802.11 users so we can make all 801.11 transmission help and not noise to be overcome.

As an aside, other protocols over encapsulated regions (for instance like ZigBee) will tie into the County-wide grid via protocol gateways appropriate to the particular use.

5. What would an ideal timeline be for County-wide rollout?

Phase I starts as soon as the go-ahead is given – 2005. 2006 will rollout Phase II.

Is the stated goal of 2007 achievable? Yes, Phase III should be quite feasible for full coverage by the end of 2007. Our ability to rollout the project by the set date to outlying areas of the County, would be somewhat contingent on the County's ability to provide free and unfettered access to assets (perhaps facilities, towers or water towers which are available as assets from the County) and in general "red-tape" cutting access to buildings. See below.

6. What physical access is needed to assets during implementation?

Phase I will primarily use assets already available to proposing team. Phase II will require acquisition of high point assets in approximately the proposed sites in Dexter and Chelsea. Phase III will require some additional sites – perhaps facilities, towers or water towers which are available as assets from the County.

Would multiple visits to the same asset be required for tuning, upgrades, or adjustments to technology? Perhaps during insertion multiple visits would be needed. Additional visits would be needed at high points to establish connection to higher capacity backhauls as traffic steps up. Visits are required whenever hardware fails and must be repaired. Software upgrades would not require visits under normal circumstances. In conclusion, it is prudent to place equipment where visits are possible so that repairs and upgrades can be easily deployed.

7. What involvement from Wireless Washtenaw, the County, or other stakeholders would be required for successful implementation?

- Aid in accessing high points for repeaters (Phases II and III) free of charge (because demand is difficult to predict, it is important to not require fee per month tower or building top charges in early rollout until demand is stabilized and predictable).
- Creation of as much predictable demand as is feasible – earlier we suggested using the WWW as a prequalified group for servicing the County's Internet requirements.

Proof of Technology & Pilot Program (Section 5)

Summary

The proposing team is initiating a Phase 0 pilot in the next several months using antenna infrastructure and backhaul located at 727 Airport Boulevard, Ann Arbor (nominally at Eisenhower and State). This location will provide coverage to the unshadowed area shown on page 5 as the southern-most circle. This Phase 0 test will prove management/routing system stability and scalability under test but relative large loads.

The test will include user place rooftop repeaters placed by interested test participant and freely downloaded management/routing software for PCs.

The test will allow more accurate scale-up to complete the Phase I deployment shown on page 5 by the end of the year. Because we already have team-owned equipment at the second high points shown, deployment here will be primarily a network software upgrade.

Phase II would be the first new deployment effort to cover the growing population arc from Ann Arbor to Chelsea.

Phase III will include lower capacity repeaters to cover the last bits of the County not covered by prior deployments. Also it is likely to include backhaul improvements (and addition or new Full Partners to serve the backhaul) as overall network traffic grows.

Addressing specific RFI questions for this section

1. Is the 2005 timing realistic for the pilot programs?

Yes.

2. What geographic regions should be included?

See page 5. We are most interested in deployment test in high traffic areas to better model traffic throughput from the mesh network model there – these areas will have the most diverse terrain (due to higher buildings and shadowing problems) and will stress test the mesh system the most due to high and intermittent traffic patterns. This area will also house the largest number of “hackers” who might create denial of service problems we have to overcome before full-scale deployment. Rural areas present the problem of placing repeaters properly, but are not a significant traffic problem and will not entail large added costs.

3. What goals other than those described in section 4.3 would you like accomplished with the pilot program?

Proving that the billing/fee model will support the network as it expands. Establish a mature working relationship between the WWW Board members.

4. How long should each test phase be?

Depends on problems we encounter, but the plan is to be Phase I complete by year-end if we start relatively soon. This would mean Phase 0 2-3 months and complete Phase I 2-3 months.

5. What barriers to you foresee in these test phases?

None.

6. In the pilot program, how would you expect to engage the public?

In Phase 0 we will provide free service and free routing until achieving a meaningful full traffic level. Then we would extend service to the Phase I area under a preliminary charging model. The public would be engaged by free public relations through the County and Ann Arbor News reporting supported by Internet-based marketing.

Because of the novelty of the proposed business model, we would expect to gain substantial project notoriety from the effort.

Why should our approach be adopted?

There are basically four models that might be employed by the County to implement this project:

- (1) Accept a proposal from a large telecom/cable provider to, “do the whole deal.” This kind of proposal is not likely to be economically beneficial to a large provider, so, it would likely be a “poster child” project designed to gain notoriety and perhaps to “lock-up” the territory at the expense of other Internet providers. Regardless of how attractive such a proposal might appear on the surface, it will have the effect of reducing competition in the County and will reduce net Internet technology operations, development, and employment in the County. Also, it is likely that in the climate of reduced competition that would evolve, achieving of the goal of Countywide coverage will occur at the pace of the provider and not the County.
- (2) Accept a proposal from an existing nonprofit group. This kind of proposal will also tend to reduce competition because there will not be any incentive for commercial ISPs to participate or invest time or money to expand in the County. Furthermore, regardless of the potential leverage possible through public funding sources like the Michigan Broadband authority, it is quite likely this type of nonprofit bidding group would be capital limited and thus network roll out would be retarded.
- (3) Accept a bid from smaller more agile broadband or telecom or wireless equipment provider. This model has been almost the exclusive one chosen by other publicly initiated wireless projects. While we advocate agility and efficiency of the previous two models, to make this work the County will have to make investments in the infrastructure and may eventually run afoul of State of Federal telecom legislation.
- (4) Accept a bid from a new nonprofit organized like a utilities rate setting organization. This is basically the novel approach we have put on the table and seeded by jointing of three of the current commercial market share leading service providers in the County area. To make the concept even more enduring, we have laid out a basic approach, which will keep the competitive base open, growing, and able to change with the technology. This approach allows and encourages both small and large telecoms and ISPs, or even pre-existing nonprofits to join together under a common set of business practices designed to get the largest coverage of the County as quickly as possible by exploit all already place hotspots, backhauls (wireless and wired), and ISP services providers.

We think this approach will serve Washtenaw County the best. It is the quickest to implement and represents the lowest cost possible. Furthermore, we suggest that it will foster local growth of Internet jobs and economic development within the county far more effectively than any of the alternative plans.

Private Sector Partner Profile & Background (Section 6)

WWW is a team that will expand as the project rolls out. However, we have secured participation from three of the largest Internet operators in the County region as the initial seed team. As an aside, we welcome direction of other potential teammates to the effort catalyzed by the County even now before the effort begins – our goal is a fully open culture like that used in rural areas for supporting grain silos, power and telephone cooperatives, etc. We believe that without this type of structure it will not be feasible to move from the cherry picked zone coverage we now do to exploit high density areas toward broad universal coverage which includes rural areas.

1. Organization Name. *WWW (Washtenaw Wideopen Wireless)*

2. Who at the company has primary responsibility over wireless-related services? Mr. Nathan Pitts

3. Address of primary service location for Washtenaw County. Preliminary address is 727 Airport Boulevard, Ann Arbor, MI 48108, co-located with Cybernet Systems Corporation.

4. Where is the company's headquarters? Preliminary address is 727 Airport Boulevard Ann Arbor, MI 48108, co-located with Cybernet Systems Corporation.

5. In a formal proposal, would you anticipate being the primary partner or a subcontractor? Primary partner.

6. Please provide a brief overview of your company. WWW is formed specifically to respond to this RFI.

7. What experience do you have in other initiatives such as Wireless Washtenaw? See the experience of the WWW proposing team members individually that follows.

8. What other types of Government or Public Sector work has the company done in the past? See the experience of the WWW proposing team members individually that follows.

9. Does your organization participate in any industry standard groups? Yes.

10. Please describe your organization's wireless technology experience. See the experience of the WWW proposing team members individually that follows.

11. If Private Sector Partner oral presentations are desired by the Wireless Washtenaw team, are you available between July 5 and July 15, 2005? Because of prior commitments we would prefer the oral presentation be scheduled for July 7th or later.

Proposing WWW Full Partners

1. Organization Name. *Cybernet Systems Corporation, NetMAX Division*

2. Who at the company has primary responsibility over wireless-related services? Mr. Nathan Pitts, contracts@cybernet.com

3. Address of primary service location for Washtenaw County. 727 Airport Boulevard, Ann Arbor, MI 48108.

4. Where is the company's headquarters? 727 Airport Boulevard Ann Arbor, MI 48108.

5. In a formal proposal, would you anticipate being the primary partner or a subcontractor? Primary partner.

6. Please provide a brief overview of your company.

Cybernet Systems Corporation has been a developer of network, robotics, and computer intensive systems for all branches of the US Government and commercial companies since 1988 when it spun out of ERIM and the University of Michigan. Cybernet is SBA certified by the Federal Small Business Administration as a woman owned small disadvantaged business.

In 1999 Cybernet launched a Linux-based commercial network and file sharing appliance division called NetMAX (www.netmax.com) which operates one of the largest e-commerce points of presence in the Ann Arbor area. This e-commerce operation is supported by an OC3 served through KMC Telecom and connects directly to the KMS SONET ring. NetMAX appliance servers bundle Linux operating systems, Web-based administrative and user page interfaces, and (optional) PC-based appliance hardware into a complete back-office security, network attached storage, and web/file sharing services solution. NetMAX appliances offer 802.11 native access point and client support and also incorporate ad hoc mesh routing for ease of multi-unit deployments.

In the last month, Cybernet leveraged its Linux expertise to launch and sponsor www.netmax.org, which is an open source group that develops and distributes a purely open source Linux desktop solution, called NetMAX Desktop. NetMAX Desktop offers live-boot operation, integrated wireless, OpenOffice and Mozilla office and browsing support, and is built to run most native MS Windows applications including MS Office, Internet Explorer, and Visual C Studio.

Cybernet operates a secure, Internet connected, home care medical monitoring system based on the MedStar line of patient monitors (www.cybernetmedical.com). This system currently has over 2000 patients being monitored in Alabama, Jackson, MI, Oklahoma, Georgia, Florida, and Illinois from Cybernet's hub site here in Ann Arbor.

Cybernet has been developing wireless solutions for the US Military and other Federal agencies since 1994. Cybernet built the first 802.11 wireless medical monitor (US Patent 6,050,940); it has built Instant Mesh Radios, basically 802.11 repeaters that integrate an improved AODV (RFC 3561) route self-discovery protocol for the US Army Communications and Electronics Command; and is currently under contract to build shipboard 802.11 wireless mesh enabled portable maintenance aids for the US Navy.

In the proposed effort we will bring the RF platform independent network management and ad hoc routing software development and deployed at the US Army forward into the WWW implementation. This technology is a superior standards-based implementation of the technology available in proprietary form from vendors Tropos Networks.

7. What experience do you have in other initiatives such as Wireless Washtenaw?

NetMAX E-commerce site and wireless products

The NetMAX product line is sold through e-commerce and a worldwide network of VARs (Value Added Resellers) from a secure e-commerce site located in 727 Airport Boulevard. The NetMAX site supports all forms of electronic payment, information dissemination, and secure transaction processing.

The NetMAX product line includes NetMAX wireless appliance servers sold as software bundles (loadable on any Intel/Pentium architecture platform), sold as software HP server bundles (Cybernet is a qualified HP reseller), or sold bundled with Cybernet built-to-order small

appliance servers (Openbricks). Openbrick servers make ideal personal wireless file sharing systems and repeaters. They incorporate state of the art security (IPsec VPN, SLL-based OpenVPN, stateful firewall, network-based antivirus, and content management/blocking), wireless routing, and multi-gigabyte storage.

MedStar – Medical monitoring network services

Cybernet has established a fully-owned subsidiary called Cybernet Medical to develop and sell remote patient monitoring solutions. The MedStar business places small data hubs into a patient's home that reads data from home blood pressure devices, glucometers, weight scales, and other medical devices, stores the data and forwards it to a central server for archival, and then presents the data to clinical staffs through secure authenticated web access. The process allows clinicians to oversee chronically ill and aged patients without doctor's visits, with reduced error, and no subjective patient symptom reporting. The result is lower medical cost for emergency hospitalization, greater health care work efficiency, and improved health for the patient, allowing the elderly to stay in their homes longer and more comfortably.

The MedStar data center is operated by Cybernet Systems from the same site as the NetMAX e-commerce facility. The data center is 24/7 power backup protected and served by Cybernet's connection into the KMC SONET ring.

US Army wireless services

Cybernet has developed, tested, and deployed an "Instant Mesh Radio" system for the US Army CECOM for bridging between soldiers and vehicles operating in training facilities and the field. These IMR units are very much like the proposed WWW rooftop units. They house a small NetMAX router/computer and an 802.11 RF interface unit in an outdoor military qualified package. Each IMR is powered for up to 72 hours from rechargeable Li Ion batteries. A unit can place any number of the IMRs over an area to provide instant 802.11-based IP connectivity over the area. The IMRs power-up, boot, and initialize when placed and connected to their battery packs. They then operate an improved AODV routing system that discovery on-demand routes from a calling IP cognizant computer back to other nodes in the mesh. Some of the nodes are gateways to upper echelon Internets. The routing protocol can discover these nodes on demand and furthermore, can discover routes to nodes on the other side of the gateway as well (i.e. routes from in the mesh to an outside Internet).

This software routing technology is exactly what is proposed for WWW, because it is software it can be operated over virtually any 802.11 radio set (and later 802.16 WiMAX for backhaul wireless network legs). This includes the Linksys WRT54G wireless APs – that are available commercially from local computer retailers and over the web for less than \$100 per unit for the complete node usable in-buildings or on rooftops. *These units are widely deployed in the Ann Arbor and Saline area by IC.net and Synergy to support hotspots. They are brought into the proposed network through a simple firmware patch, which can be installed via the web. Similarly, all client PCs, PDAs, and other network aware devices can be enabled through a similar network (or CRDOM) software download.*

US Navy wireless services

Cybernet is developing, and will test and deploy a wireless maintenance system to be used on Navy ships to reduce crew manning levels. The system is called the Shipboard Wireless Maintenance Assistant (SWMA), and is funded by the Navy through congressional mandate in fiscal 2005-2007. The concept places an ad hoc wireless mesh on and within the ship (using technology similar to that developed and deployed in the last project), which allows a portable slate computer, optimized for presenting maintenance information to be used by sailors. The

SWMA portable computer and its supporting wireless network support data acquisition, two-way video/audio (Voice of IP or VoIP), access to share web and file data, and location tracking services. The SMWA appliance is basically a hardened version of the normal portable laptop computer operating 802.11 wireless network protocols. Each ship becomes like a miniature WWW at sea.

8. What other types of Government or Public Sector work has the company done in the past?

Cybernet has been a Government contractor for over 15 years. In that time over 200 contracts have been awarded to the company and successfully completed under the strict oversight of the Defense Contracts Auditing Agency in Detroit. The following is an abbreviated list of contracts.

Government Agency	Contract Description	End Date
GSA	GSA Federal Blanket Purchasing Contract	10/10/2008
USAF/AFMC WPAFB	Cockpit ADN PHII	3/10/2007
USDA	RUS Grant	11/3/2006
Army CERL	Vehicle Dynamics Monitoring	10/29/2006
Air Force AFRL Kirtland	Laser Health Monitor	7/30/2006
Air Force (Rome AFB)	Multiple UAV GUI	5/12/2006
Army	Projectile ID System	2/18/2006
Army TACOM	VSIL	2/6/2006
Air Force	Enterprise Portal SA	1/27/2006
Air Force	Hands-Free Interface	1/15/2006
Tyndall AFB	DMO Cockpit	12/30/2005
FAA	3-DOF	12/30/2005
Army	Wireless Local Area Network	11/15/2005
Army TEC	Terrain Data Viewing	9/23/2005
Air Force (Rome AFB)	Quantum Computation	9/18/2005
MEDC	MEDC: Fall Detector	9/9/2005
MEDC	MEDC: Medication Compliance	9/9/2005
US Army Space and Missile Defense Command	Kinetic Energy Sim	8/16/2005
US Army Space and Missile Defense Command	Distributed Mission Sim	8/15/2005
US Army Space and Missile Defense Command	C2BMC ADN	8/15/2005
Army ARDEC	Weapon-Target Matching	7/18/2005
NAVAIR	Immersive Display	6/30/2005
Army TEC	Geo Telemetry Network	6/17/2005

Naval Air Warfare		
Center Patuxent River	Obstacle Database	6/17/2005
NIH - NIAAA	Medication Compliance	2/28/2005
Navy	AnitBallistic Airbag	2/24/2005
WPAFB	PVCMS	2/11/2005
	Wearable Wireless Fall	
NIH - Ntl Inst. of Aging	Event Detector	1/31/2005
WPAFB	Cockpit ADN	1/12/2005
USARMC	OSD Haptic Med	12/31/2004
MDA	MDA Gesture	11/24/2004
OSD/Navy	OSD Brain Oxygenation	11/24/2004
Navy	Power Emissions	10/27/2004
	Reconfigurable All Terrain	
U.S. SOCOM	Vehicle	9/14/2004
	Advanced Personal	
NAVSEA	Communicator	9/4/2004
Dept. of Ed	DoEd Astronomicon	8/31/2004
NASA Goddard	NaviGaze	7/19/2004
Air Force WPAFB	Satellite Training	7/9/2004
	Full-Body Haptic	
Army PEO STRI	Simulation	6/10/2004
	Vehicle Dynamics	
Army CERL	Monitoring	1/30/2004
	Virtual Prototyping	
Army TACOM	Architecture	12/1/2003
	Wireless Local Area	
Army CECOM	Network	9/30/2003
Army Natick	Parachute BOA	9/2/2003
Army Natick	327 plus up	9/2/2003
Marine Corps	Wearable OCU	8/14/2003
Army ARI Medical		
Research	Warfighter Evaluation	7/31/2003
NASA MSFC	Autonomous Docking	7/13/2003
NSF	Virtual Gorilla	6/30/2003
NSF	Disease Modeling Toolkit	6/30/2003
OSD	Intelligent Agents	6/18/2003
	Haptics Probe for	
Army CECOM	Landmines	6/15/2003
	Handheld for Embedded	
Army via NAWC	Training	6/13/2003
Air Force AFRL		
WPAFB	Target ID	4/2/2003
Air Force AFRL Rome	Quantum Computation	3/27/2003
Air Force AFRL Rome	Multiple UAV GUI	3/26/2003
Air Force AFRL		
Kirtland	Laser Health Monitor	2/21/2003
AF WPAFB	Assessing UAV Behavior	2/16/2003

Army TACOM	HAAMER Joint II	1/24/2003
Army TACOM	Projectile ID System	1/17/2003
Army TEC	Terrain Data Viewing	1/16/2003
Army TEC	INS/GPS Phase II	12/4/2002
Army CECOM	FCS Telemaintenance	11/12/2002
DOT	Dot Aircraft Navigation	10/9/2002
Army STRICOM	STRICOM Gesture Ph II	9/28/2002
Army TACOM	Moire Interferometry	9/14/2002
Cybernet	UseYourHead	8/25/2002
	Readiness Assessment	
Army OSD	Tool	7/2/2002
Army TEC	Sand Table	6/20/2002
	Advanced Personal	
Navy NAVSEA	Communicator	5/14/2002
	NASA Command	
NASA JSC	Generation	5/3/2002
Army Natick	Parachute AAD II	3/29/2002
Dept. of Ed	DoEd Mouse like Interface	3/16/2002
Army ARL	HMD2, Hands Free	3/14/2002
Army ARL	HMD2, Hands Free	3/14/2002
Dept. of Ed	DoEd Astronomicon	2/28/2002
Air Force WPAFB	Satellite Training	2/20/2002
Air Force WPAFB	Distributed Crew Interface	1/23/2002
Army AMCOM	Dynamic Modelbase II	12/28/2001
Navy NSWC	NetMAX Data Migration	11/2/2001
OSD @ STRICOM	Game Development	8/3/2001
	Virtual Model Building	
NSF	Astronomy - Astronomicon	6/30/2001
NASA JSC	NASA Gestures II	4/30/2001
ARL Fed Labs	Fed Labs Tracker	3/31/2001
AF WPAFB	Assessing UAV Behavior	2/16/2001
Marine Corps	Wearable UGV	2/8/2001
Army TEC	Enhanced INS/GPS	12/4/2000
Army ARI	Gesture Recognition	11/17/2000
	Adaptive Instructional	
OSD	Systems	7/24/2000
NASA JPL	Self Assembling Robots	6/10/2000
Army STRICOM	Dismount Gesture I	6/9/2000
AF Robins AFB	AF Flaw Sensor	6/7/2000
AF Tinker AFB	AF NDI by Speckle	6/2/2000
Army TACOM	Image Rendering	3/31/2000
Air Force - Edwards		
AFB	Smart Sensors	1/19/2000
Army ARL	Interface Design	12/29/1999
Army -SSC	Parachute AAD	12/18/1999
Army AMCOM	Dynamic Modelbase	11/30/1999
Navy	Omni Platform	10/8/1999

AF Brooks AFB	FF Refueling II	9/21/1999
USSOCOM	Casualty Retrieval	6/18/1999
NASA Goddard	Image Database	6/14/1999
AFRL Kirtland	Behavior Rec	4/10/1999
AF Tyndall AFB	Fuse II	1/31/1999
DARPA	Arpa Medical	1/31/1999
Army CECOM	ODT Collection	1/3/1999
AF RADC	Object Middleware	1/1/1999
Army STRICOM via MARCOR	VR Test Range	12/31/1998
Army STRICOM via MARCOR Albany, GA	Dismount	12/31/1998
AF Kirtland AFB RADC	Kirt/RADC Satellite	12/3/1998
Navy NSWC	SimSpace HLA	11/13/1998
Navy NSWC	Content Retrieval	10/13/1998
NASA JSC	NASA Gestures	10/9/1998
Army EPG	Real Time Data - Ft Huachuca	9/30/1998
Army MICOM	OCU Meter/Barker Teleop, (incr 1)	9/30/1998
Army ARL APG	IES for Soldiers	9/6/1998
NIMH	NIMH - Portable EEG	7/31/1998
Army ARI	Gestures Recognitiion	7/31/1998
Army HRED	CRDA ARL Hummer	6/1/1998
ARMY TACOM	Articulated Joint HAAMER	5/13/1998
Army ARDEC	COTS Firefighter	5/7/1998
Army ARL	HAAMER	5/5/1998
NASA JSC	Mini Physio Monitor	4/30/1998
AF Bolling AFB	Capacity Measurement	3/31/1998
OSD @ STRICOM	Game Development	3/10/1998
AF Wright-Patterson AFB	Force II	1/10/1998
Army MICOM / ARPA	HF/Vision, Strat	12/31/1997
DARPA	Human Gestures	12/15/1997
MDA (Formerly BMDO)	Object-Oriented Fusion	9/25/1997
MichCon	MichCon	6/30/1997
Marine Corps	Haptic Plug & Play	6/9/1997
AF Robins AFB	AF Flaw Sensor	6/3/1997
State of Michigan	SRF Mobile Service Robot	5/12/1997
Army ARO Triangle Park	MEMS Tactile	5/1/1997
Army CECOM	Image Distrib. Using PC	5/1/1997
Army ARL	Interface Design	4/24/1997
Army ARL	HMD, Hands Free	4/24/1997
Army CECOM	GPS-CECOM	3/30/1997

AF Tinker AFB	AF NDI by Speckle	2/3/1997
AF Brooks AFB	FF Refueling	1/14/1997
Army Watervliet	Safe-to-Load-Sensor	9/14/1996
NASA Johnson Space Center	Fingers II	9/13/1996
Army	Real-Time Pose	8/29/1996
MDA (Formerly BMDO)	Image Interpretation	8/26/1996
Army TACOM	Image Rendering	8/19/1996
Army CECOM	Multi-Sensor Suites	8/15/1996
NSF	NSF Spatial	7/31/1996
AF Tyndall	RRR	4/12/1996
Navy NRL	Multispectral Imaging	1/25/1996
AF Hanscom ESC	Active IFF	1/5/1996
Army MICOM for ARPA	ARPA P3 OCU	12/31/1995
AF Kirtland AFB	Flexible Dx Agent	12/23/1995
DOE	3-D Tank Inspection	11/24/1995
AF Phillips Lab/PKW	Imaging Spectrometer - AZ	11/21/1995
Army ARO	NDI of Composites	9/30/1995
AF RADC	RADC Parallel	9/29/1995
Army Medical Research Material Command	The "MOST"	9/14/1995
NASA Langley	NASA VR Trainer	9/12/1995
Army STRICOM via MARCOR Albany, GA	VR Test Range	9/9/1995
Army	Real-Time Pose	9/7/1995
Army STRICOM via MARCOR Albany, GA	Body Locomotion Simulator	9/6/1995
NASA Goddard	NASA IETM	8/29/1995
NASA JSC	Mini Physio Monitor	6/15/1995
NASA Management Office - JPL	Micro-Spheres Gyro	6/6/1995
NASA JPL	Graphics, Robotics	6/6/1995
DOT/RSPA/Volpe National Transportation Systems Center	Vision Blocks	6/1/1995
AF Tyndall AFB	Fuse	4/10/1995
Army TACOM (Tank and Automotive), Warren MI	Portable Operator's Control Station	12/30/1994
Navy NPRDC	Dist Test NPRDC	12/30/1994
AF Brooks (WPAFB)	Object Rep	11/16/1994
Army MICOM	ARPA Medical Mon.	9/30/1994

WPAFB (Navy)	Molec. Sim.	9/8/1994
U Delaware	Delaware Stick #2	8/31/1994
NASA JPL	JPL – Image II	7/17/1994
Army CBDA, Aberdeen Proving Ground, HRED	VR for UGV	5/20/1994
LAI /WPAFB	WPAFB Molecular Study	5/1/1994
DOT	DOT Performance	3/20/1994
Army MICOM	Reducing Data - IES	2/28/1994
NIMH	NIMH - Portable EEG	2/28/1994
Army MICOM for ARPA	Computer Vision	1/31/1994
NASA JPL	Part of 221:JPL Stick	12/10/1993
Army Topographic Engineering Center	Personal Navigation	8/10/1993
NASA JSC	Force Fingers	7/19/1993
State of Michigan	92-SRF-0738G	3/15/1993
WPAFB	Hand Controller Base Unit	3/3/1993
DOE	3-D Tank Inspection	1/27/1993
Marines Quantico	Marine Retrofit Kits	1/16/1993
Army MICOM / ARPA	IES:II	1/12/1993
AF Kirtland AFB	Neural Nets	12/24/1992
NASA JPL	JPL Planning Systems	7/22/1992
NASA JSC	6-DOF - Phase II	6/15/1992
State of Michigan	SRF OCU	5/31/1992
Army CECOM	Video Compression	3/27/1992
DARPA Program Office, MICOM	NGC Planning Systems	3/2/1992
AF RADC	RADC C3	1/15/1992
AF Eglin AFB	Runway Repairers	11/16/1991
MDA (Formerly BMDO)	Vision Based Dx	11/13/1991
Army EPG, Ft Huachuca AZ	AI Taxonomy	10/14/1991
Army Aviation Systems Command	Rotorcraft PVI	9/11/1991
NASA JPL	JPL Image Data	8/14/1991
NASA MSFC Marshall Space Flight Center	Holographic Targets	7/9/1991
Army LABCOM - HEL	RCC	12/14/1990
State of Michigan	6 dof Bridge	5/15/1990
Army MICOM for DARPA	IES-I	4/6/1990
Army EPG (Electronic Proving Ground)	V&V	12/22/1989
NASA JSC	6-DOF	7/23/1989

9. Does your organization participate in any industry standard groups? Yes.

SISO (Simulation Interoperability Standard Organization)
IEEE (Institute of Electrical & Electronic Engineers)
ATA (American Telemedicine Association)
NAHC (National Association for Home Care and Hospice)
AUSA (Association of the US Army)
AFA (Association of the Air force)
NDIA (National Defense Industry Association)
Nominated by IT zone as one of three IngenuiTy Z Award candidates

10. Please describe your organization's wireless technology experience.

Cybernet's wireless experience has been summarized in sections 6, 7, and 8. The only point to add here is that Cybernet is unique in that it:

- o has a wealth of wireless technology experience and experience in solving unique problems for government agencies
- o has been in business and profitable for 15 years – even before the Internet and wireless become a household word. Cybernet founders brought the Internet to ERIM in 1987
- o is a local owned, woman-owned, and nationally recognized innovator in the computer and networking field.
- o is experienced in project management, well capitalized, stable and secure.

11. If Private Sector Partner oral presentations are desired by the Wireless Washtenaw team, are you available between July 5 and July 15, 2005? Because of prior commitments we would prefer the oral presentation be scheduled July 7th or later.

1. Organization Name. *Synergy Broadband*

2. Who at the company has primary responsibility over wireless-related services? Mr. Norm Roe

3. Address of primary service location for Washtenaw County. 455 East Eisenhower, Suite 74, Ann Arbor, MI 48108

4. Where is the company's headquarters? 455 East Eisenhower, Suite 74, Ann Arbor, MI 48108

5. In a formal proposal, would you anticipate being the primary partner or a subcontractor? Primary partner.

6. Please provide a brief overview of your company.

Synergy Broadband has operated a hybrid (mixed wired line and wireless) ISP since 2000. It operates and oversees Points of Presence (POPs) in Pitkin County, CO, Galesburg IL, Fenton MI, Whitmore Lake, MI, Brighton MI, Grand Blanc MI, Howell, MI, Hartland, MI and Ann Arbor, MI (from several hubs in Ann Arbor). Synergy is a Building Local Exchange Carrier (BLEC) as well as a Wireless Internet Service Provider (WISP).

Synergy is the exclusive broadband provider serving customers in University Towers, centrally located in Ann Arbor. Synergy has over 30 wireless POP locations located throughout Ann Arbor mostly residing on commercial office building in the metropolitan area of Ann Arbor.

These locations (including some of the highest elevation buildings in town) provide ideal high points for covering the central city area and beyond.

In addition to broadband services to University Towers and business customers, Synergy also provide structured wire service, IT consulting, web hosting/e-mail services, network design consulting, and collocation services. Synergy was the first wireless ISP operating in Washtenaw County and operates one of the largest Metro Area Networks in the County.

7. What experience do you have in other initiatives such as Wireless Washtenaw?

Synergy has deployed several wireless hotspots with browser force re-direct for use by its customers and some free usage in Ann Arbor and other surrounding area's. Synergy helped set up security and networks for companies as large as American Express and Toll Brothers Inc., to residential clients throughout the area. We helped the Michigan Broadband Authority set up it's offices in Ann Arbor and did all the structured wire for them as well as provided Internet Service in conjunction with the Michigan Treasury.

8. What other types of Government or Public Sector work has the company done in the past?

As mentioned above Synergy was the first ISP for the Michigan Broadband Authority, working with the Michigan Treasury to secure that contract. Our Service Provider Identification Number (SPIN) is 143029639. Providers with a (SPIN) number have the ability to provide services to public schools and others who seek to take advantage of the Universal Fund Discount. Synergy in fact does business with several school systems in the surrounding area including Grand Blanc schools and Howell Public schools. Synergy has also provided a critical wireless link project from Children's Center to Harper Hospital in Detroit, and still maintains the link to this day.

9. Does your organization participate in any industry standard groups?

Synergy is in regular attendance at Industry trade shows and other Wireless Expos held throughout the country. We are involved with the Washtenaw Linux Users Group as well as participants in local forms held by the IT Zone, the Chamber of Commerce and other like-minded groups.

10. Please describe your organization's wireless technology experience.

Synergy has a large amount of real world experience in deploying and managing wireless technology of all kinds from the ground up. Wireless experience involves deployment, R&D, monitoring of links, support staff, structured wire experience, and technical expertise. Synergy has deployed long and short-range wireless, point-to- multipoint service as well as wireless bridging to large multi-tenant facilities.

Synergy has deployed and is familiar with wireless products and brands including Aperto, Orthagon, Redline, Dragonwave, Karlnet, Proxim, Motorola Canopy and Trango Broadband, and others. As an ISP we understand and have experience tying our wireless technology back into a completely functional and usable WAN network.

Often overlooked in planning wireless technology systems and its deployment are the many intangibles. Contracting, negotiations with property owners, electrical concerns, grounding of equipment, environmental effects (like lightning) and the effect that noise from other RF devices

can have on a network. These mundane elements significantly affect the performance and profitability of the Wireless Internet service provider' system. Until you have re-aligned a wind blown antenna or climbed a 20 foot ladder hatch to get your network back online you have not lived in the wireless world. Synergy's real-world practical experience will be one of the most valuable contributions we will make to WWW.

11. If Private Sector Partner oral presentations are desired by the Wireless Washtenaw team, are you available between July 5 and July 15, 2005? Yes.

1. Organization Name. *IC.net, Inc.*

2. Who at the company has primary responsibility over wireless-related services? Mr. Ivars Upatnieks

3. Address of primary service location for Washtenaw County. 106 N. Fourth Ave., Ann Arbor, MI 48104

4. Where is the company's headquarters? 106 N. Fourth Ave., Ann Arbor, MI 48104

5. In a formal proposal, would you anticipate being the primary partner or a subcontractor? Primary partner.

6. Please provide a brief overview of your company.

IC.net, Inc. is a full service Internet Service Provider (ISP) based in Ann Arbor, Michigan. Formed by Ivars Upatnieks in 1993, the company continues to offer state-of-the-art broadband technology to the small and midsize markets throughout southeastern Michigan.

IC.net provides DS3, T1, DSL, wireless, ISDN, Co-Location, Web Hosting, Consulting Services and more. A decade of experience, solid infrastructure and emphasis on local service provides you with fast, reliable and cost effective solutions. Access speeds from dial-up to DS3 are available to fit your business and budgetary requirements.

Customers Include:

- Ann Arbor Chamber of Commerce
- Arbor Partners
- ADR North America
- Amerinet
- Biotechnology Business Consultants
- DTE Energy
- Hundreds of other local businesses

7. What experience do you have in other initiatives such as Wireless Washtenaw?

IC.net's experience in the wireless field is based on success wireless service to local business and public sector customers. IC.net acquired the wireless customers, sites and assets of Catalyst Broadband in 2003. Since approximately that time IC.net has been operating a wide area wireless network providing Internet connectivity to its customers in the Ann Arbor and Saline areas. IC-Net has been providing open access Wi-Fi hotspots for 1 year. IC-Net is the

best-prepared ISP in the greater Ann Arbor area to monitor, maintain and support wireless Internet customers. IC.Net is one of Ann Arbor's largest Hybrid ISPs has significant wireless expertise.

8. What other types of Government or Public Sector work has the company done in the past?

Exclusive Wireless Internet provider for the City of Saline
Scio Township
Pittsfield Township
Ann Arbor Charter Township
Washtenaw Development Council
State Street Area Association

9. Does your organization participate in any industry standard groups?

Not directly, but the firm keeps current on emerging Internet and wireless technology to support its business and IC.net staff has been at the forefront of Internet technology utilization through prior employment at Internet 2, ERIM (a.k.a. Veridian and now General Dynamics Advanced Information Systems), etc.


10. Please describe your organization's wireless technology experience.

IC.net has experience with wide area backhaul wireless systems such as those acquired from Catalyst and equipment manufactured by Motorola. IC.net has operated its wireless infrastructure to Saline and Ann Arbor business clients for over 3 years and builds on a base provided by Catalyst dating several years earlier in those locations and in Fort Wayne Indiana. IC-Net has provided open access Wi-Fi hotspots for 1 year and is the best-prepared ISP in the greater Ann Arbor area to monitor, maintain and support wireless Internet customers.

11. If Private Sector Partner oral presentations are desired by the Wireless Washtenaw team, are you available between July 5 and July 15, 2005? Yes. The period of July 5th to July 15th poses no significant problems.

Required Forms

Response Signature Page

	
_____ Signature	_____ Cybernet Systems (for WWW) Company Name
_____ David Denomme Print Name	_____ 727 Airport Boulevard Company Address
_____ Contracts Manager Title	_____ Ann Arbor MI 48108 City State Zip
_____ 734-668-2567 Telephone #	_____ 734-668-8780 Fax #
_____ contracts@cybernet.com Email Address	<i>CHECK ONE</i> Partnership _____ Non-Profit Corp. _____ Profit Corp. <u> X </u> Other: _____
_____ 43-0924383 Federal Tax ID#	

The above individual is authorized to sign on behalf of company submitting response.