

# **LANs, MANs, & Beyond: Community Intranets & the COMMONS Project.**

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**CUWiN & CAIDA**

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# Overview

- What are Muni & Community Wireless Networks?
- How many are there, how fast are they spreading?
- How do these technologies work & what are the different wireless options available?
- What are the social/community benefits?
- What do some examples look like?
- The COMMONS Project.
- Where to find out more information.
- But first (literally)...

# Community Media, Historically

- 1700s – Newspapers & the Postal Service.
- 1840s – Telegraph.
- 1900s – Telephone.
- 1920s – Radio.
- Post WWII – Television/Public Access TV.
- Today – Broadband (Internet) Connectivity.
- Tomorrow – Interconnected Multi-Media Community Intranets.

# Muni & Community Wireless Networks

- Locally-grounded.
- Unincorporated, non-profit, hybrid partnerships, municipally supported.
- Off-the-shelf hardware.
- Support both social & economic goals.
- Usually proprietary.
- And still beholden.

# How Many Wireless Networks Exist?

- Nobody knows.
- In the US: over 300 active and planned (municipal) networks.
- In Europe, South America, etc.: ?
- Around the globe: ???

# Example: US CWNs (April 2006)\*

- **Regional & Citywide Networks: 58**
  - Tempe, AZ; St. Cloud, FL; Chaska, MN
- **City Hotzones: 32**
  - Los Angeles, CA; Washington, DC; Urbana, IL
- **Public Safety & Municipal Use Only: 35**
  - San Diego, CA; Las Vegas, NV; New Orleans, LA
- **City- & County-wide Projects (RFP and/or deployment phase): 69**
  - Phoenix, AZ; Mountain View, CA; Philadelphia, PA
- **Cities & Counties Considering Wireless: 11**
  - Chicago, IL; St. Paul, MN; New Haven, CT

\* Muniwireless.com April 2006 Summary of City and County Municipal Projects

# Projected Growth of US Municipal Wireless Market (in \$ millions)\*

- 2004 -- \$31.5
- 2005 -- \$76.5 (142% YTY Growth Rate)
- 2006 -- \$177.7 (132% YTY Growth Rate)
- 2007 -- \$405.6 (128% YTY Growth Rate)

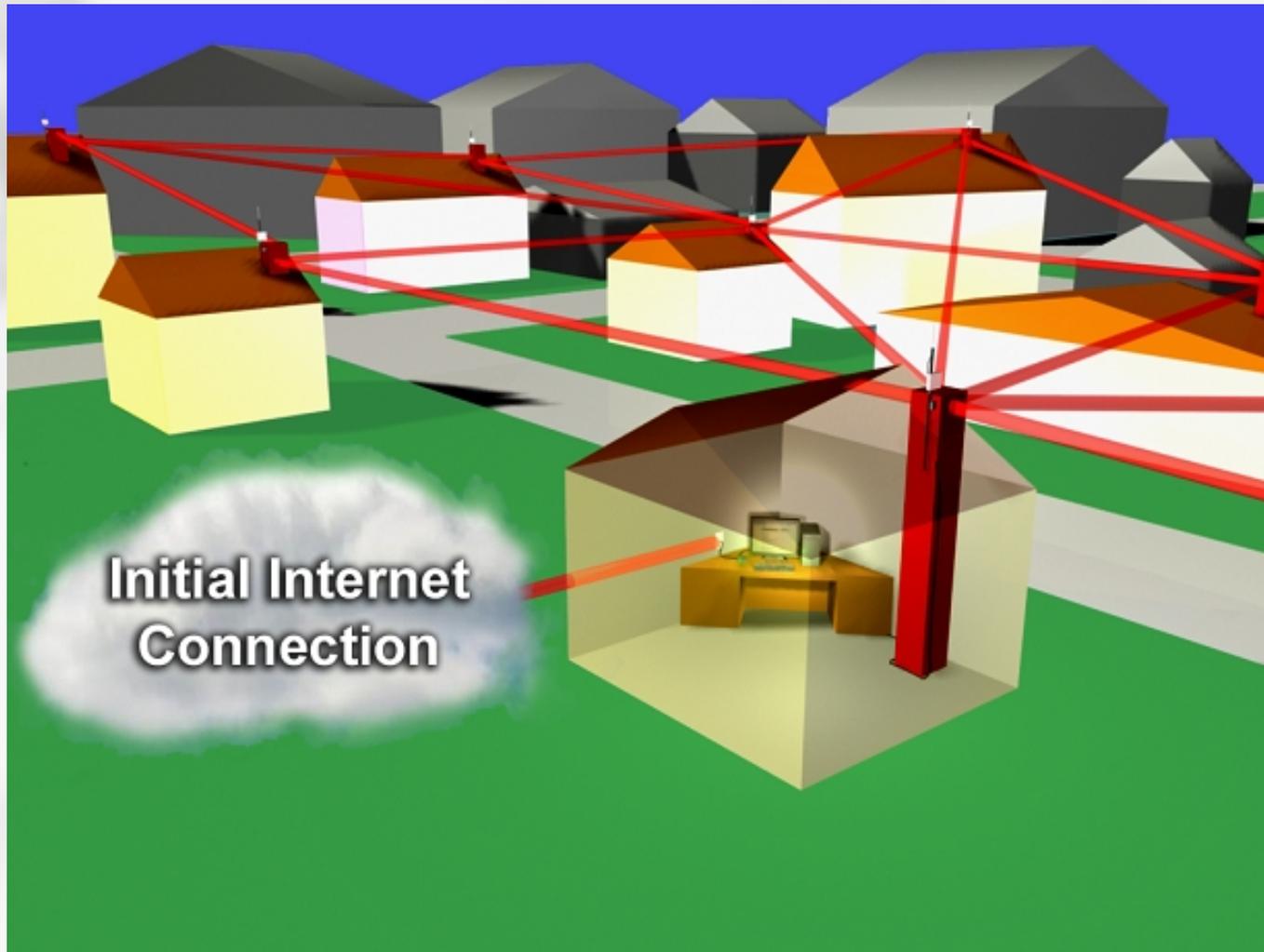
\* Source MuniWireless.com 2005 Municipal Wireless State of the Market Report

# Home Network



Graphic Credit: Pat Bergschneider

# Community Network



Graphic Credit: Pat Bergschneider

# Wired Networks



Graphic Credit: Darrin Drda

- 1840s technology
- Expensive
- Disruptive
- “Entrenched”
- Fast & High-Capacity

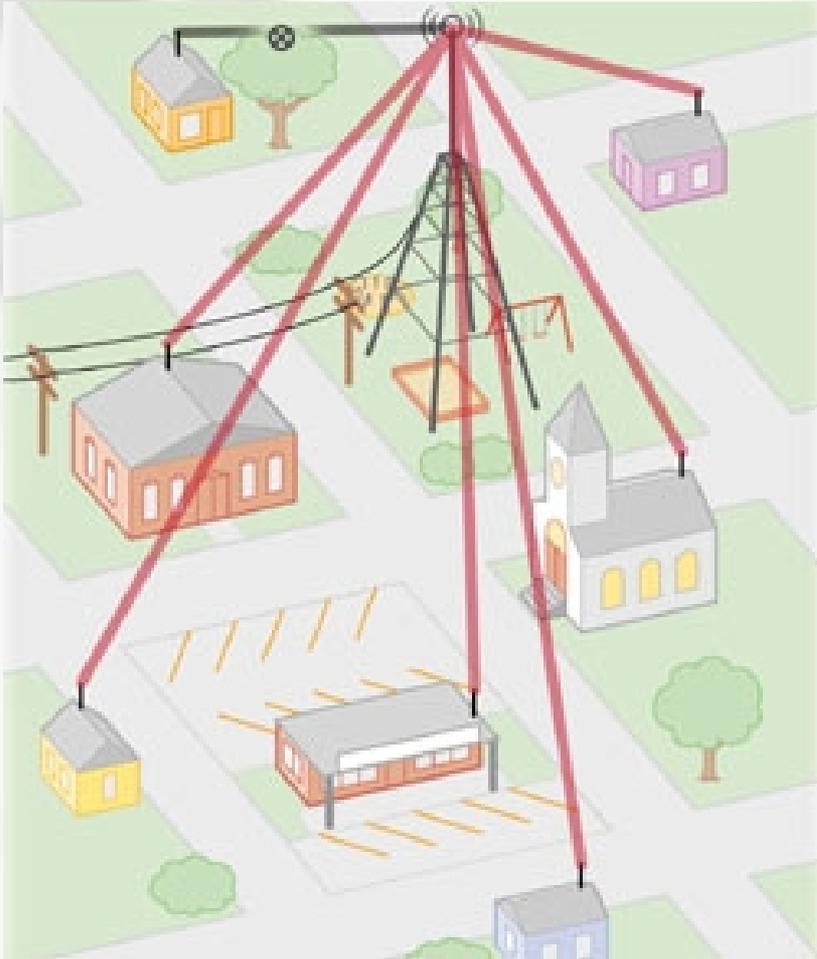
# Wireless Networks



Graphic Credit: Darrin Drda

- Cheap!
- Non-invasive
- Mobile/Portable
- Ubiquitous
- Quick & Easy

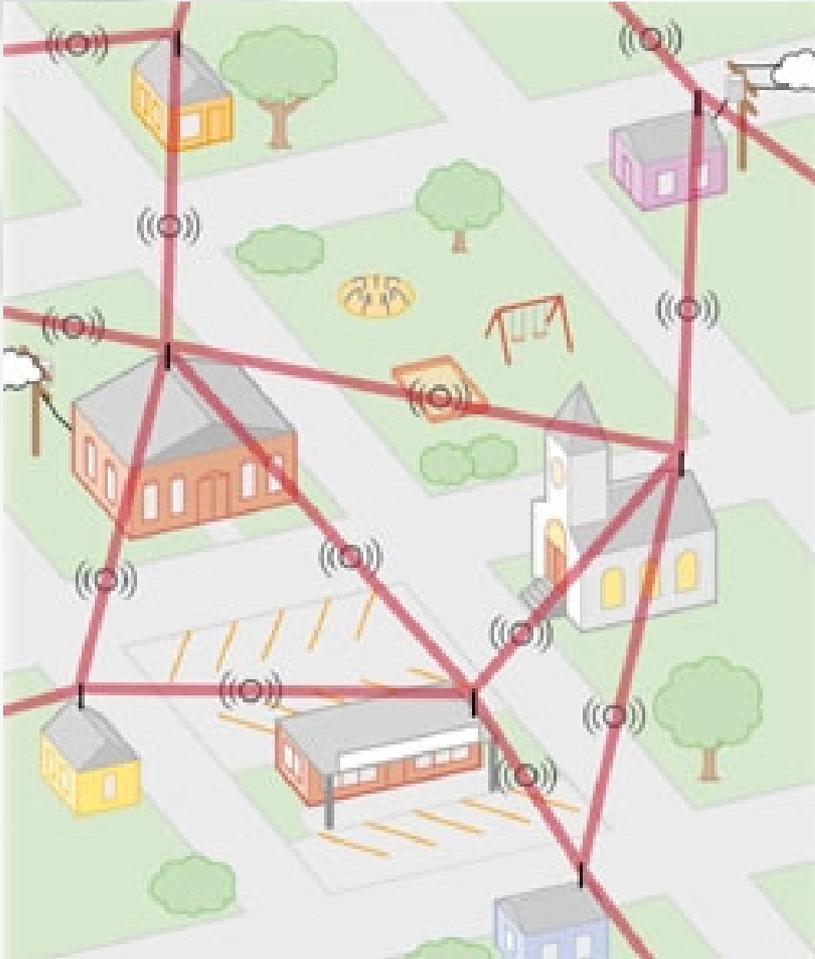
# Hub & Spoke Networks



Graphic Credit: Darrin Drda

- Centralized
- Relatively expensive
- Bandwidth-intensive
- High-power
- Single point-of-failure
- Slower than P2P/Mesh
- BUT, allow one to charge for all traffic, monitor, and control

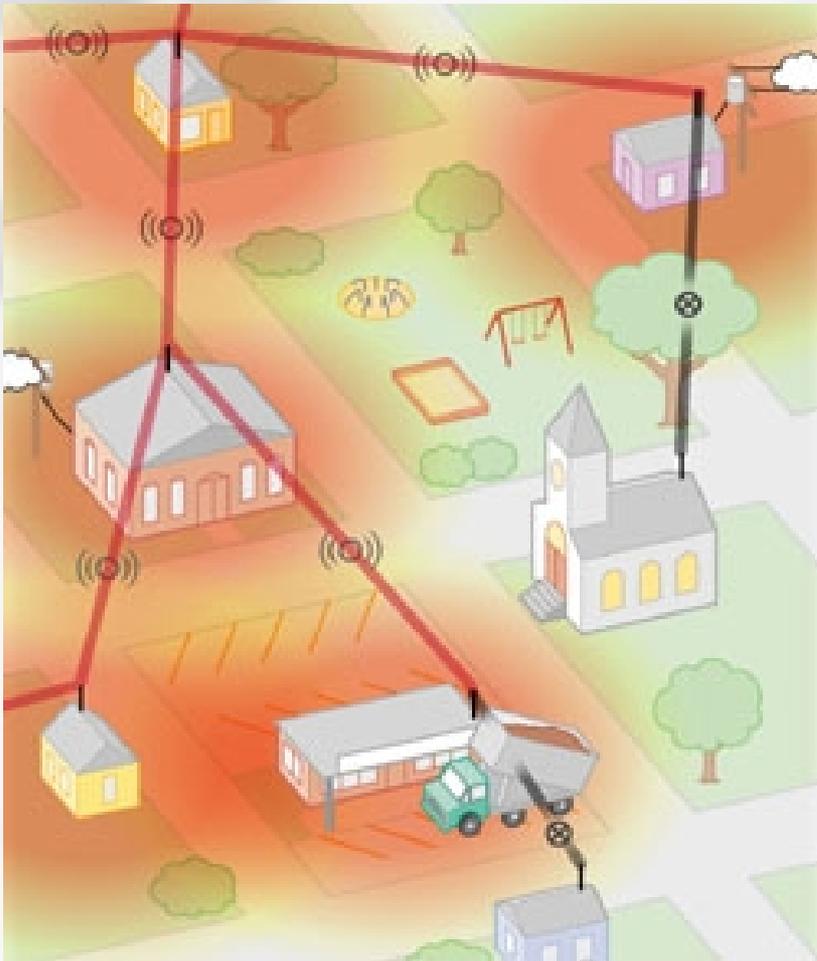
# Mesh Networks



Graphic Credit: Darrin Drda

- Decentralized
- By-passes obstacles
- Relatively cheap
- Low-power
- Very fast

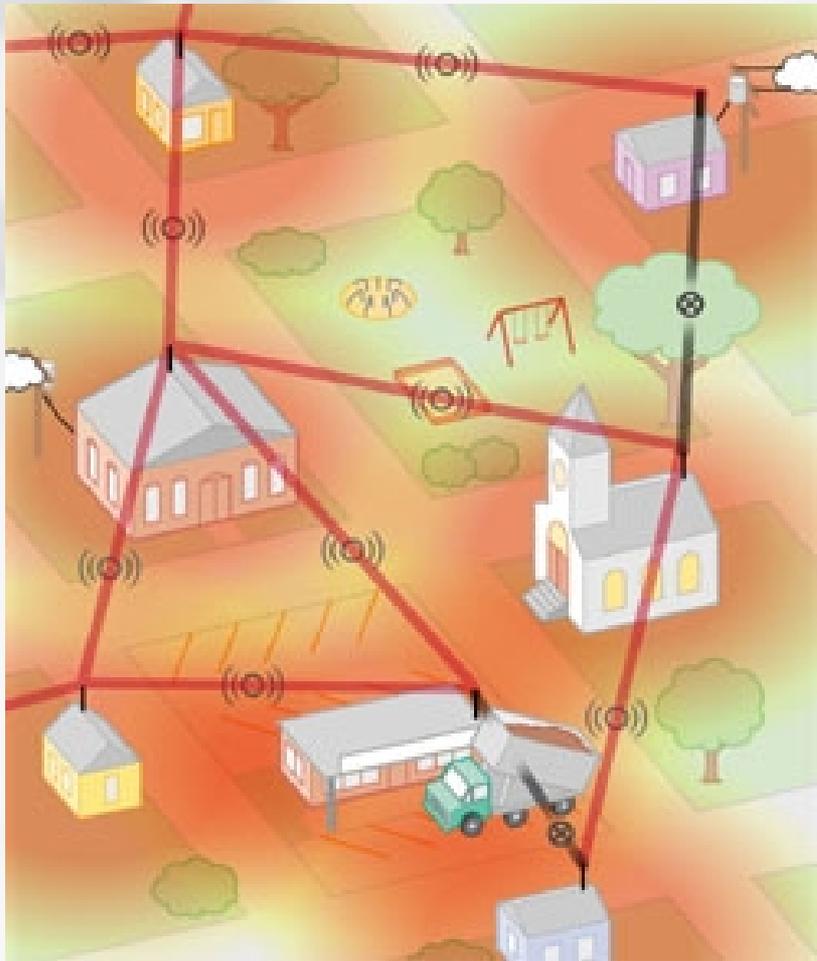
# Static Networks



Graphic Credit: Darrin Drda

- Fragile
- Non-scalable
- Time-intensive

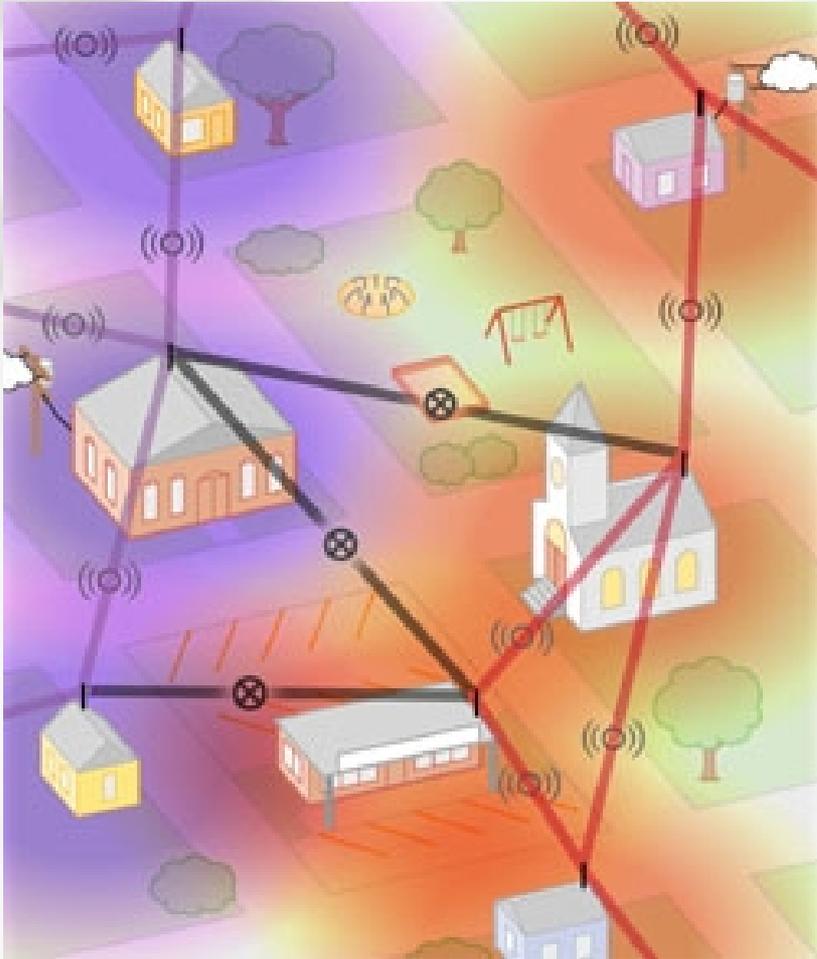
# Dynamic Networks



Graphic Credit: Darrin Drda

- Robust
- Scalable
- Adaptable

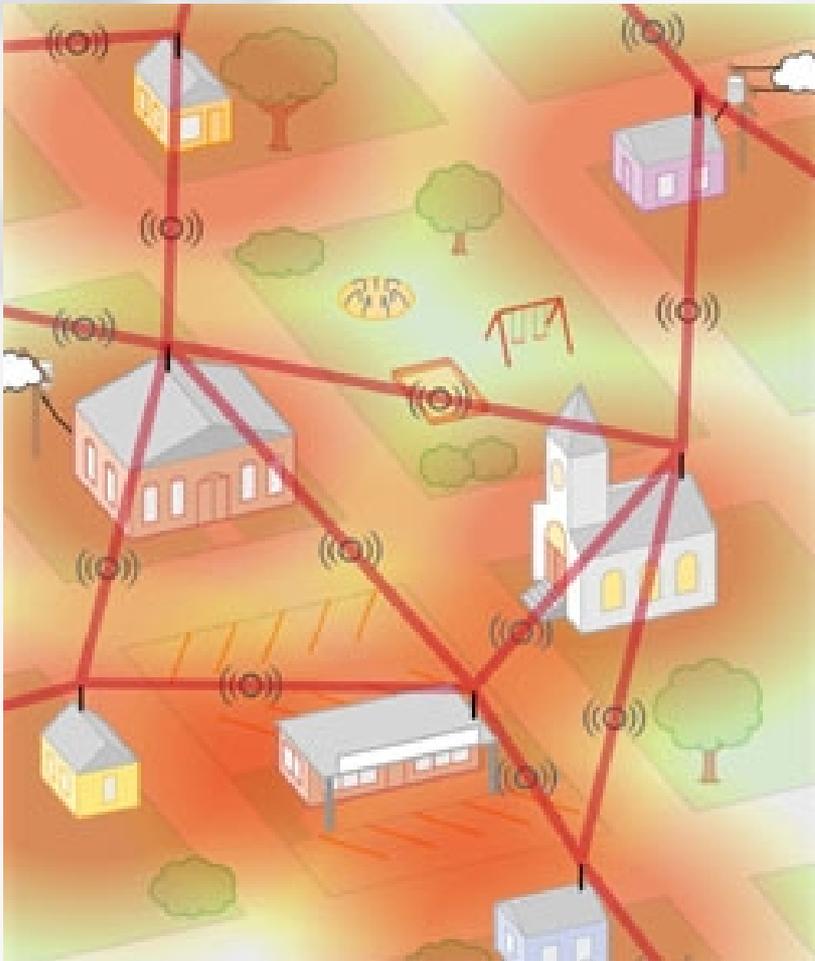
# Closed Networks



Graphic Credit: Darrin Drda

- Proprietary
- Expensive software
- Immature technology
- Factionalizes communities

# Open Networks



Graphic Credit: Darrin Drda

- More secure
- Cheap/free software
- Open source
- Allows community resources on the network

# Social Benefits

- **The general public has the opportunity to be media producers** – broadcasting Internet radio, self-publishing journalism, displaying art projects, etc.
- **Universities, colleges, and K-12 classrooms can cheaply establish wireless networks** – creating tremendous infrastructure and maintenance savings versus wired networks.
- **Health-care providers can transfer information** to patients with limited mobility as well as exchange patient information among doctors, clinics, pharmacies, and hospitals.
- Wireless networks **facilitate e-government** initiatives such as online voter registration, directions to polling stations, bill payment, access to tax advice, and public service announcements.
- Wireless infrastructures offer **job creation opportunities** as businesses take advantage of lower barriers to market entry and the advantages of high-speed, low-cost communications.



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## News :: Civil & Human Rights

### Public Hearing a success for police oversight supporters

by Ricky Baldwin  
Email: [baldwinricky@nospam@yahoo.com](mailto:baldwinricky@nospam.yahoo.com)

26 Jul 2006

Supporters of a citizens panel to oversee police affairs filled the City Council chambers Monday night.

The Champaign County Coalition for Citizen Police Review is meeting Wed. July 26 at 7pm in the PRC Meeting Room of the IDF, corner of Wright and Springfield. All are welcome.

[Read the full article...](#) (6 comments)

## Announcement :: Civil & Human Rights

### Vigil For Quentin Larry and Terrell Layfield - Saturday, July 22, 8 PM

by Brian Dolinar  
Email: [briandolinar@nospam@gmail.com](mailto:briandolinar@nospam.gmail.com)

16 Jul 2006

On Saturday, July 22 at 8 p.m. a vigil will be held for Quentin Larry,

## open newswire

This is an open publishing forum

### Local Interest

[Danielle Chynoweth](#) 07/25 13:13 CST

[Help start a local Bike Co-op - first meeting August 9](#)

[Ricky Baldwin](#) 07/24 12:59 CST

[More hearings on citizen oversight of police \(2 comments\)](#)

[chicagobusiness.com](#) 07/21 17:09 CST

[U of I gets \\$2.4M from Homeland Security for data project \(6 comments\)](#)

[Milwaukee Anti-Racist Action](#) 07/20 11:16 CST

[All Out to Confront Nazis in Southeast Wisconsin \(1 comment\)](#)

[issue69](#) 07/19 15:48 CST

# Chambana.net

Community Web Hosting That Makes A Difference

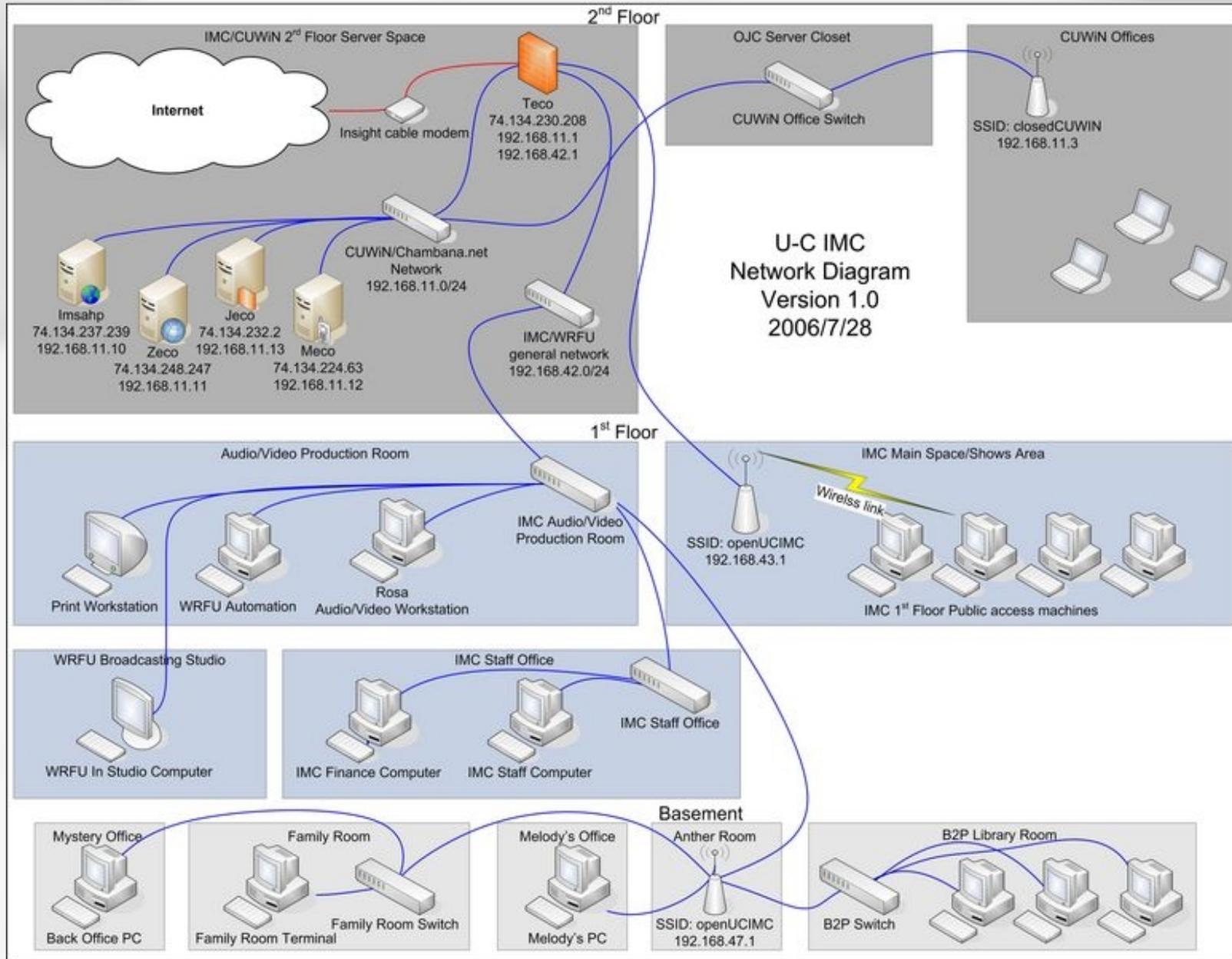
Champaign

Urbana

Graphic Credit: Jason Pitzl-Waters

- Scores of websites & portals
- Hundreds of e-mail lists
- Tens of thousands of users
- IRC Server
- VoIP Services
- Streaming Audio & Video

# The CUWIN/UCIMC Network



Graphic Credit: Dan Meredith

# Wireless Ghana

- Provides Public Services to Hospitals, Municipal Buildings, Rural Bank, NGOs, etc.
- Private Backhaul

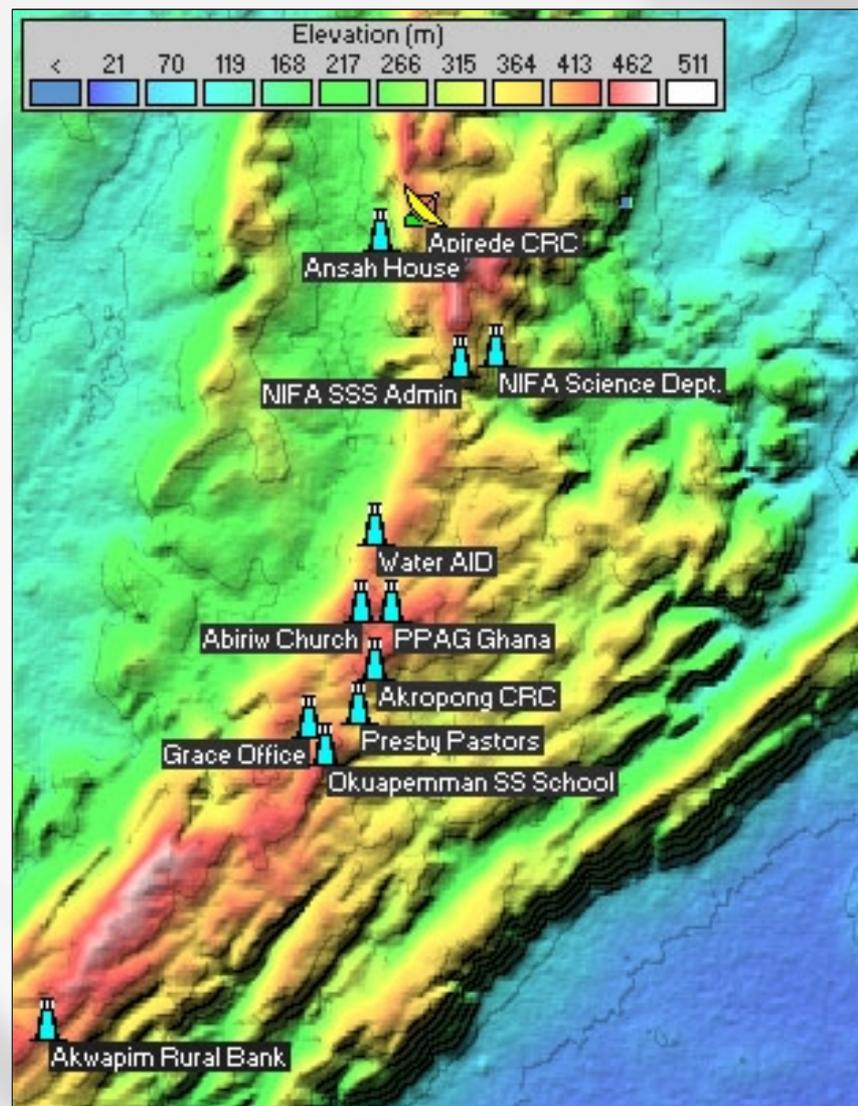


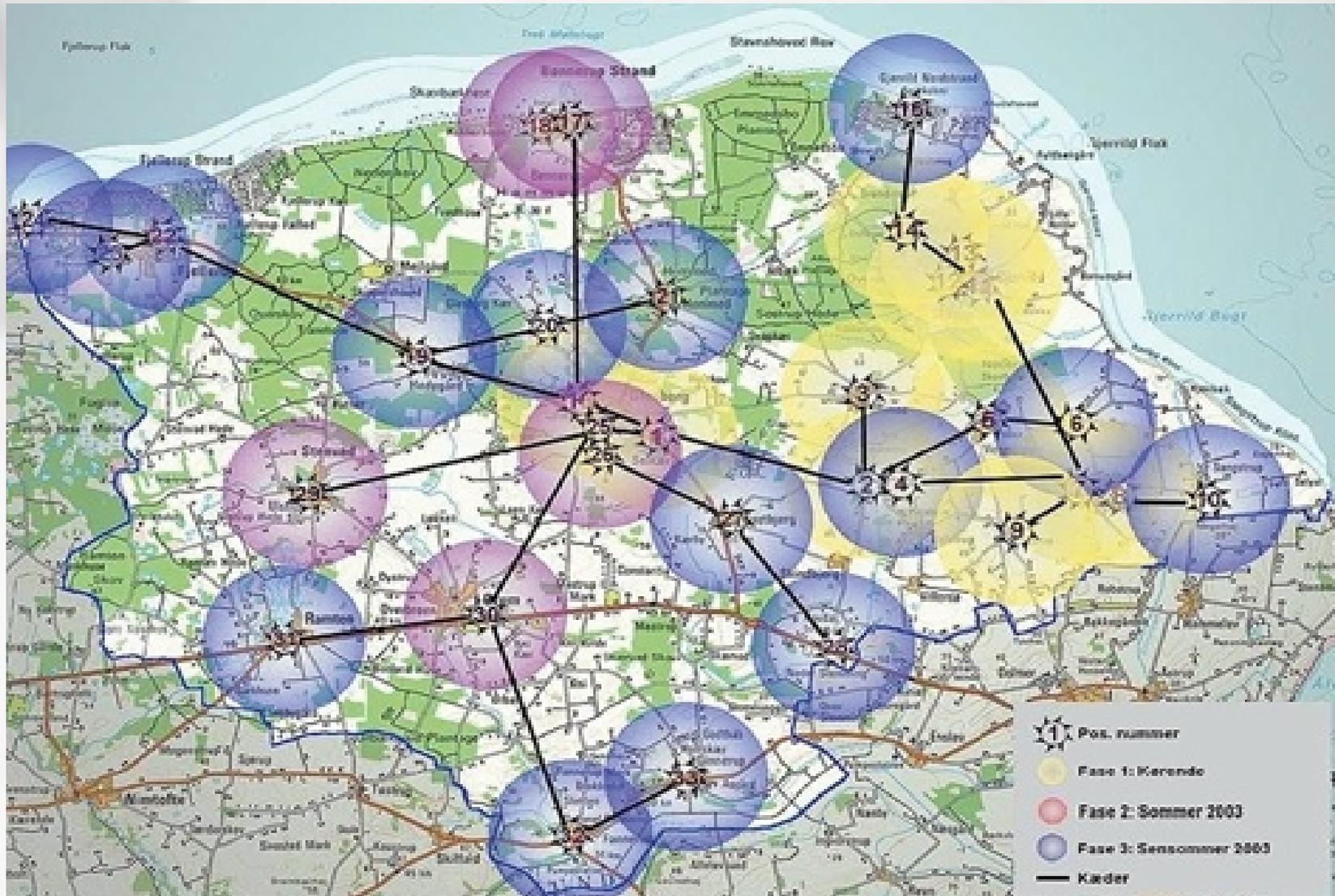
Image Courtesy of Wireless Ghana 22

# Mamelodi, South Africa



Graphic Credit: CSIR

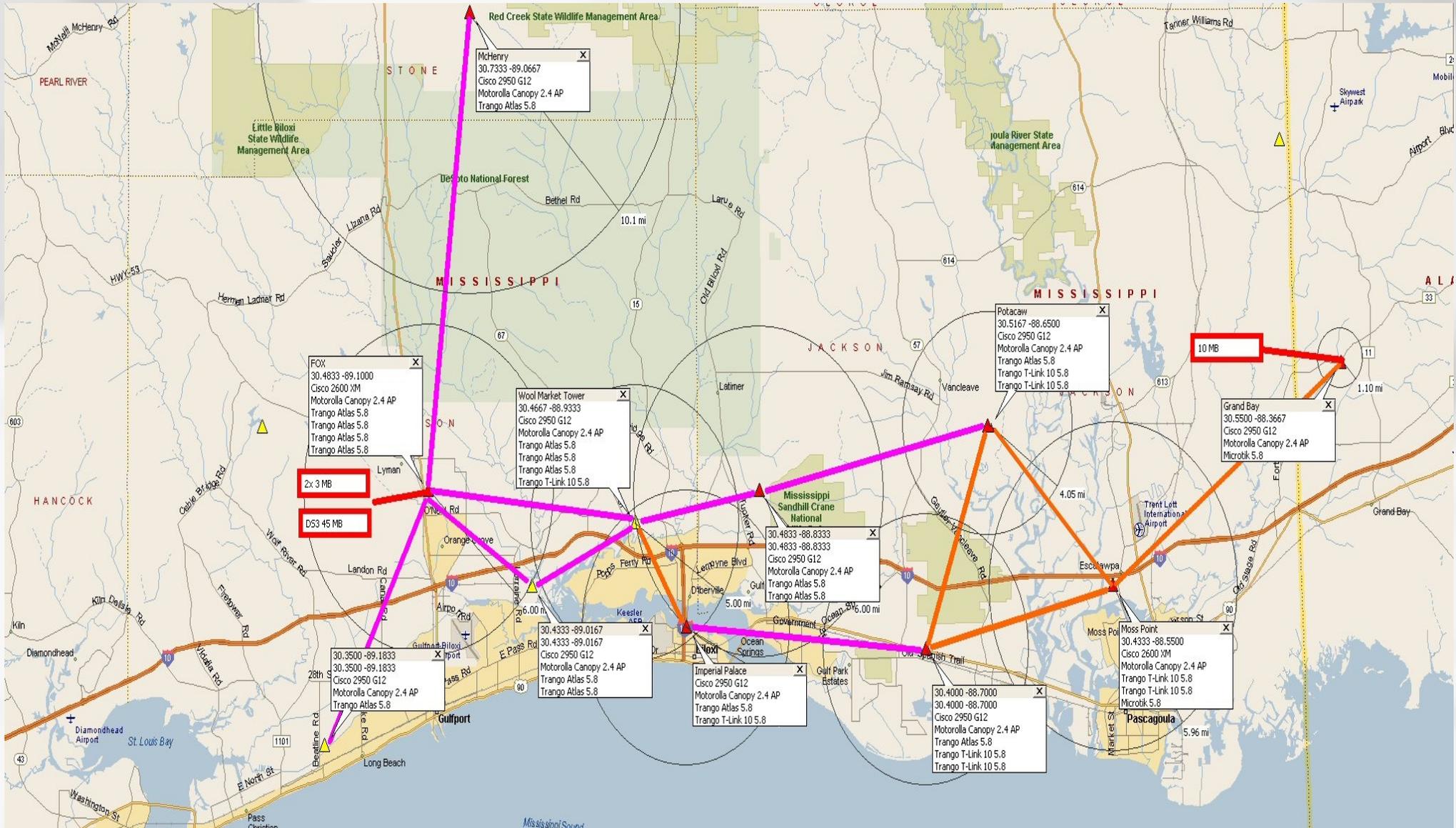
# Djursland, Denmark



Graphic Credit: Djursland Network



# Katrina Disaster Response



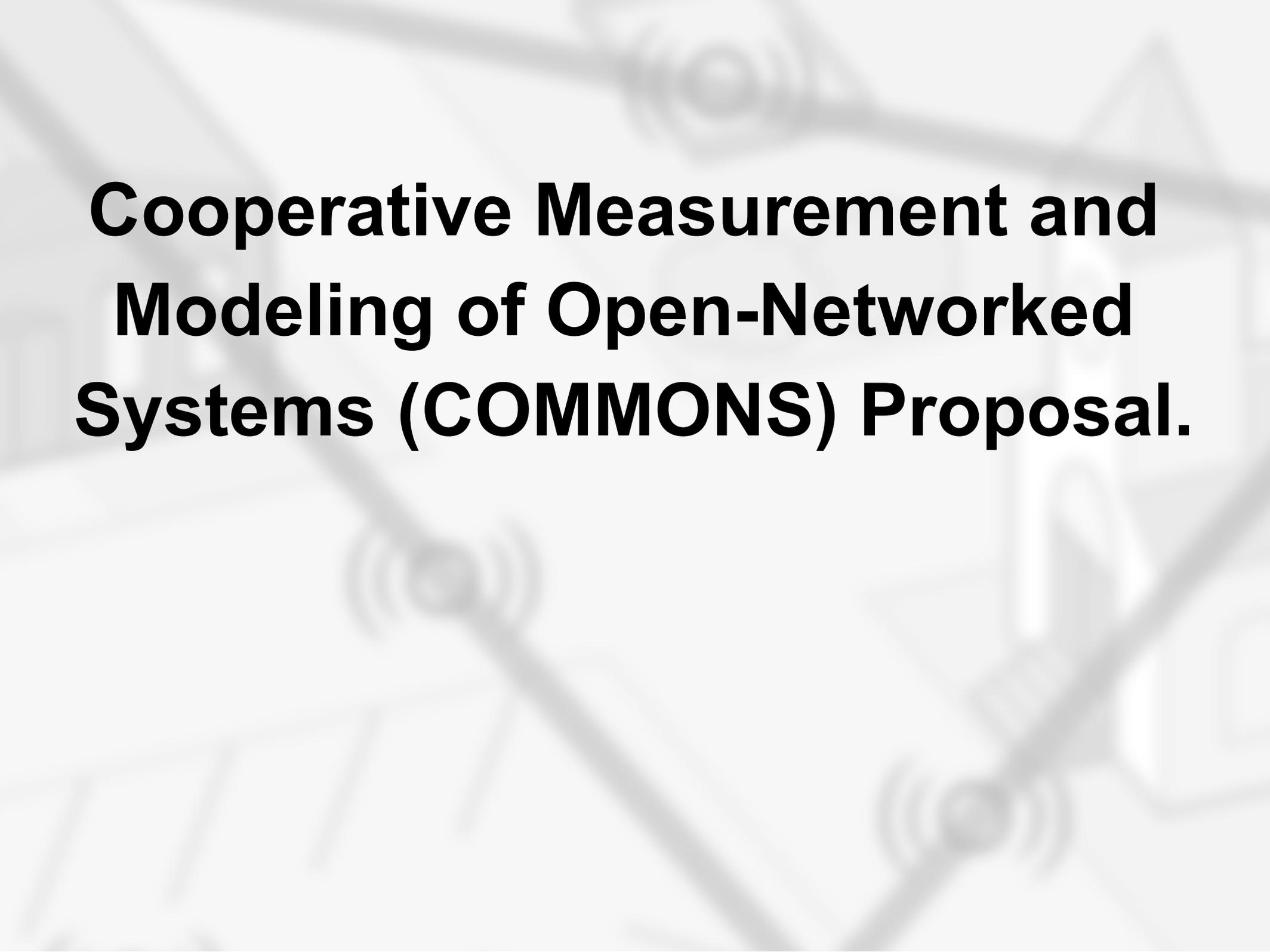
Graphic Credit: Radio Response

# Building Robust Hybrid Networks

- Use multiple different:
  - Systems (e.g., CUWiN, Tropos)
  - Frequencies (e.g., 2.4 & 5GHz)
  - Mediums (e.g., fiber, wireless)
- Ensure & mandate:
  - Open Standards
  - Open Architecture
  - Interoperability
- Have the potential to be:
  - More robust
  - Cheaper to deploy
  - Faster to deploy
  - Less path-dependent

# Take Home Messages

- Wireless is expanding around the globe:
  - Berlin – 282+ mesh nodes
  - Djursland, Denmark – 1500 square kilometers
  - Athens, Greece – 2000+ hotspots
- Dynamic & Adaptable:
  - Non-proprietary
  - Modular
  - Spur innovation beyond traditional business models
- Cost-benefits of Open Tech are enormous:
  - Tropos/Alvarion – \$150,000+ per square mile
  - CUWiN – \$3,150-49,700 per square mile



**Cooperative Measurement and  
Modeling of Open-Networked  
Systems (COMMONS) Proposal.**

# Motivating Contexts

- Commercial sector amidst financial crises that threatens first amendment rights.
- Many emerging community networks lack resources and experience to make informed provisioning decisions.
- Communities are continually under threat of incumbent-driven legislation & business practices.
- Little to no incentive or funding for public sector to provide access to data on operational infrastructure.

# Problems to be Solved

- Running out of IPv4 addresses.
- Routing system hitting their limits.
- Traffic engineering exacerbating problems.
- Internet is disrupting the phone business.
- Regulatory framework a mess.
- Field of network science stunted.
- Not enough data to have an empirically grounded conversation.

# The Foundation of Today's Issues

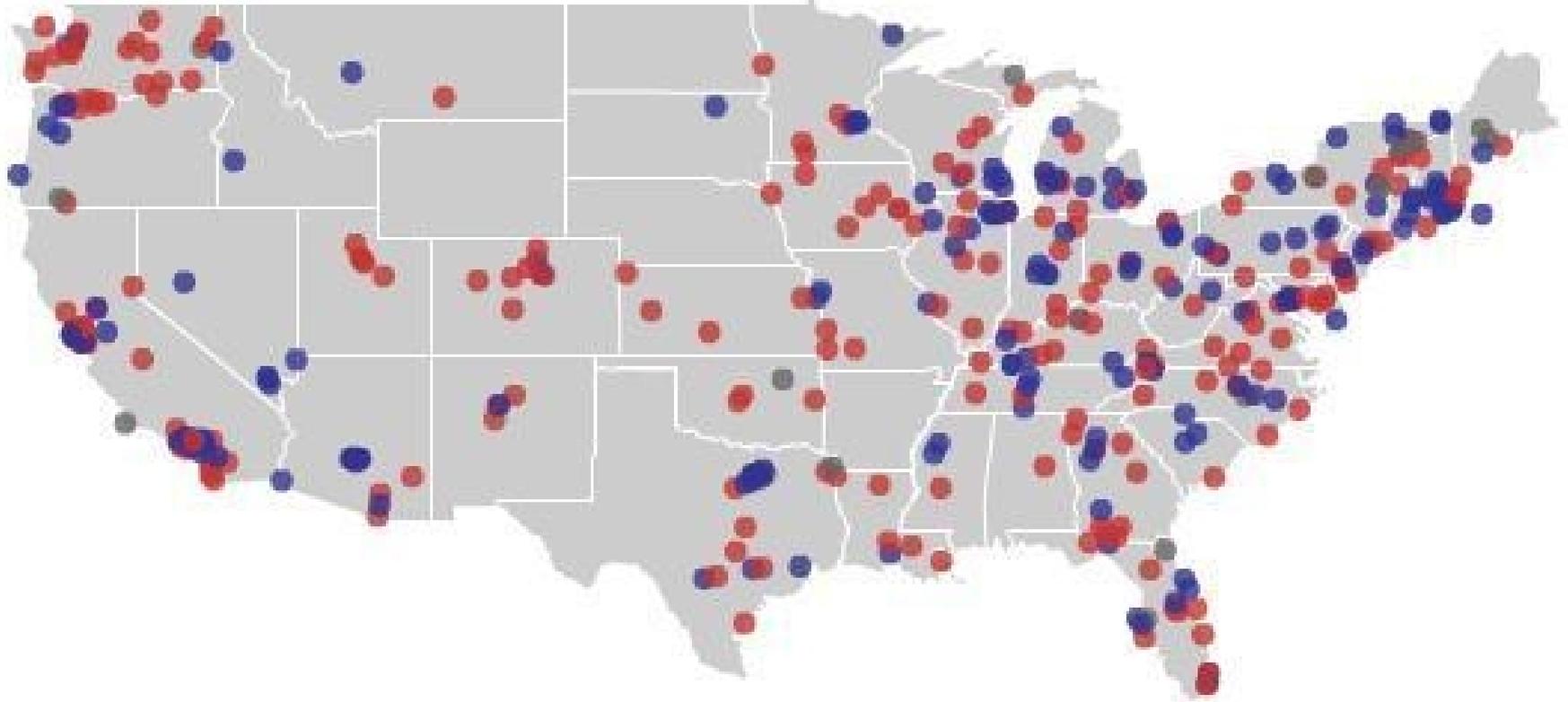
- Top unsolved problems in internet operations and engineering are rooted in **economics, ownership, and trust (EOT)**.
- Even the most theoretical computer scientists and Ivory-tower-cloistered social researchers are convinced.
- Does not mean there aren't useful technical problems to study, but there will be no technical solutions to these problems that don't solve the EOT issues.

# Community Networks Inside the US

## Community Internet Across America

*Organized By Network Status*

+



Graphic Credit: Free Press

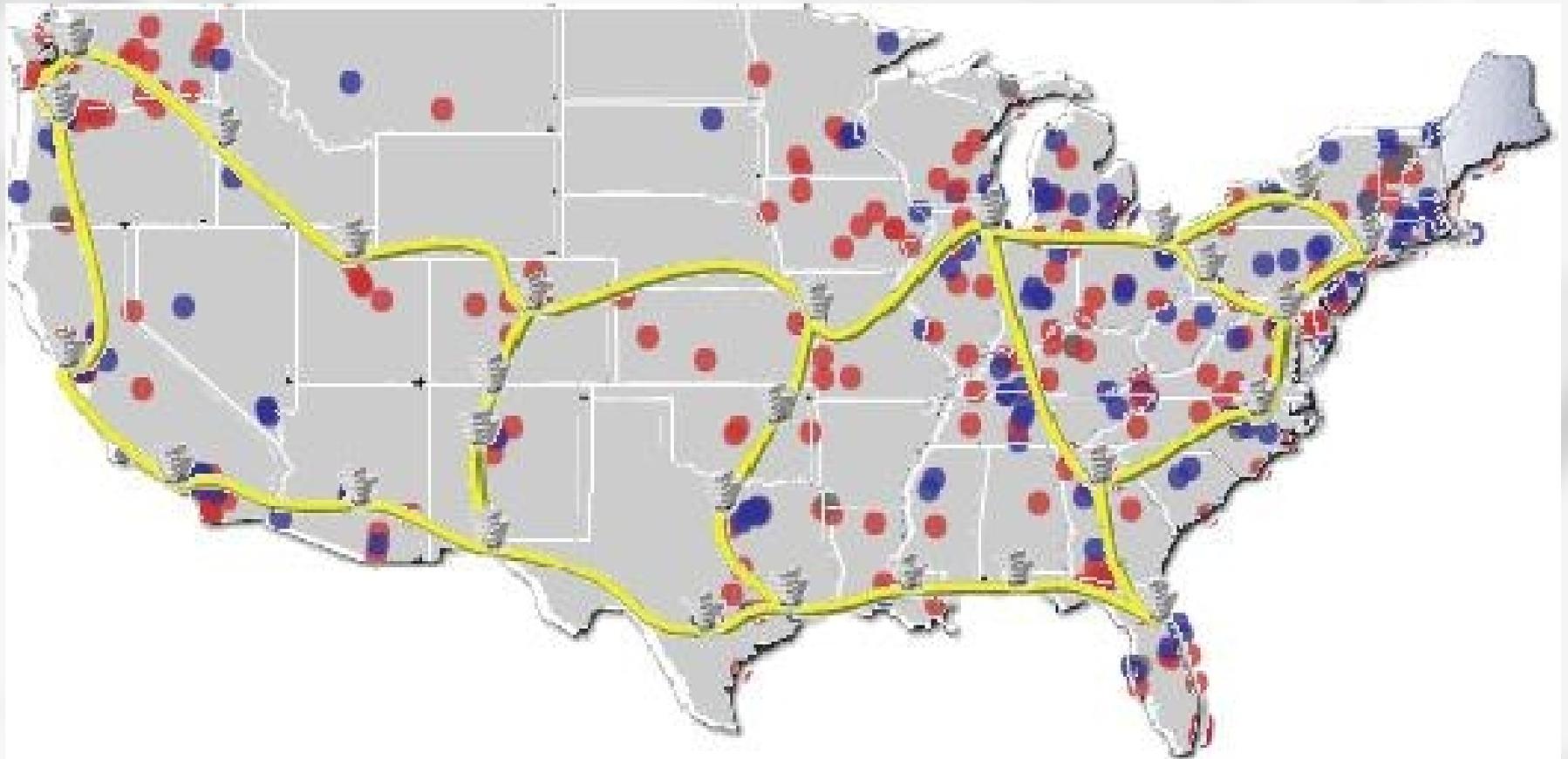
# Some Lessons Learned That Support Social and Economic Justice

- Share bandwidth – buy bulk wholesale.
- Distribute information storage.
- Integrate community intranet services.
- Foster mobile uploading & universal access.
- Support anonymous usage and downloading.
- Create immediate community-wide broadcasting & media production opportunities.
- Open Source, Open Architecture, Open Spectrum Solutions.

# Proposal

- Cooperative Measurement and Modeling of Open-Networked Systems (COMMONS):
- Experiment with different architectures: not just technical, but **economic, ownership, trust**.
- Use strengths of collaboration to overcome current Internet service provision shortcomings.
- Offer cooperative backbone in exchange for mutual, privacy-respecting, community-defined transparency across network.

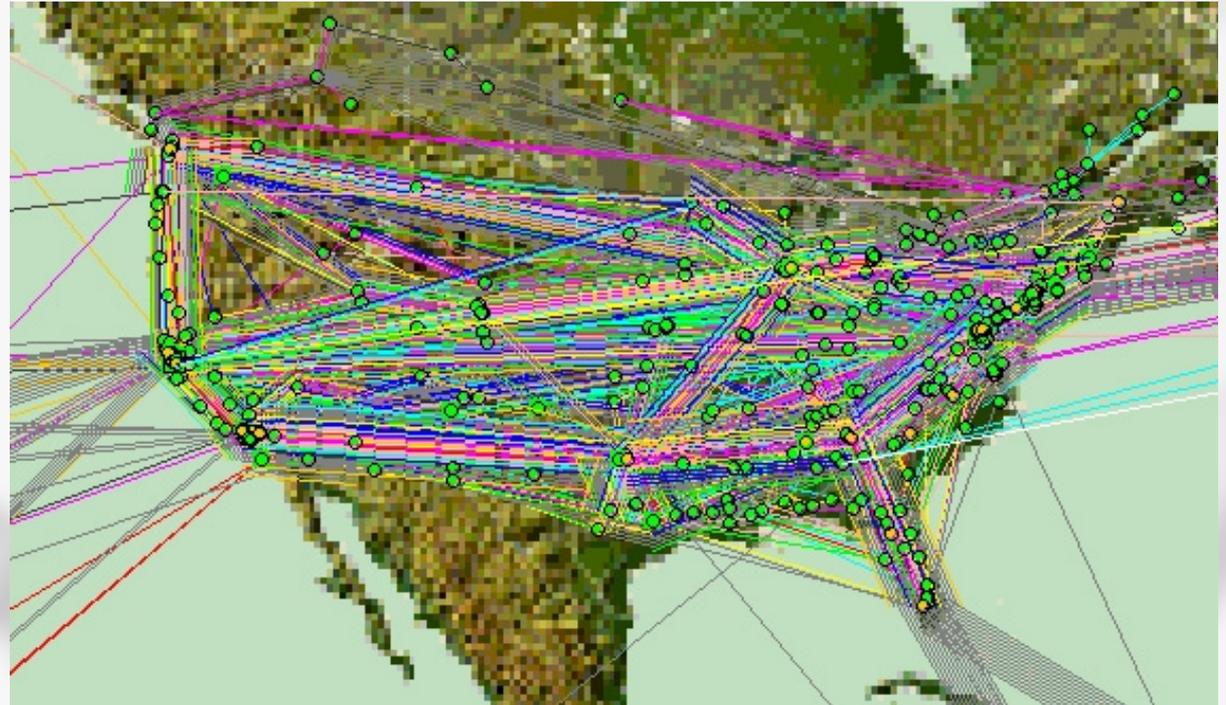
# NLR-Based Peered Network



Graphic Credit: Free Press/NLR

# The US Broadband “Backbone”

- Military
- Private Corporations
- Educational Institutions
- Not-for-profits
- States
- Cooperatives



Graphic Credit: CAIDA

# Immediate Problems Solved:

- Alleviates commercial sector of all of us so-called “impossibly low margin customers” and secures First Amendment rights of free speech and expression.
- Provides emerging community networks with a level playing field as well as a critical mass of expertise from which to draw.
- Gives science a chance – creates a resource for network research for the public good.

# Long-Term Solutions

- Creates opportunities for sound measurement and analysis – the key telecommunications policy that serves the public good.
- Helps achieve the goal of universal, affordable service – which the “free market” has failed to deliver.
- Facilitates a solution that pushes control over the network as far to the edge as possible.
- Fosters new generation of innovations in services, applications, hardware, & software.

# Potential Partners

- Internet2
- QUILT
- NLR
- RONS
- Educause, NATOA, & Other Coalitions
- State Networks
- Municipalities & Community Wifi Implementors
- CRACIN & Other Innovative Organizations

# More Information

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CUWiN: [www.cuwin.net](http://www.cuwin.net)

For Consulting: [www.ethoswireless.com](http://www.ethoswireless.com)

Wireless Summit: [www.wirelesssummit.org](http://www.wirelesssummit.org)

For Net Neutrality: [www.savetheinternet.com](http://www.savetheinternet.com)

Community Internet: [www.freepress.net/communityinternet](http://www.freepress.net/communityinternet)