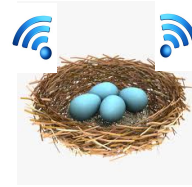


MadNEST



A prototype for a city-scale wireless infrastructure for experimentation

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Large wireless smart city initiative

- Significant funding opportunity to create a city-wide future wireless infrastructure
 - \$10-20 million in federal funding for each city
- University-led initiative but with various city and industry partners
 - Each partner benefits
 - University -> lead research and experimentation
 - Government -> Improved city services (public safety, transportation)
 - Industry -> Access to infrastructure to pilot new value-added services

An outdoor, city-wide wireless infrastructure

City-wide



Real users



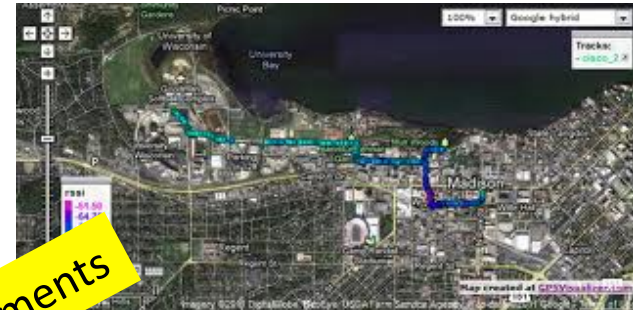
Cellular base stations



Vehicular users



Measurements



Infrastructure focus

- Smart transportation
 - Smart corridor
 - Autonomous vehicles
- Bridging the digital divide
 - High-speed wireless broadband
- Mobile **experimentation** at scale
 - Focus on density within urban + rural areas

Benefits to city

- Public safety & services



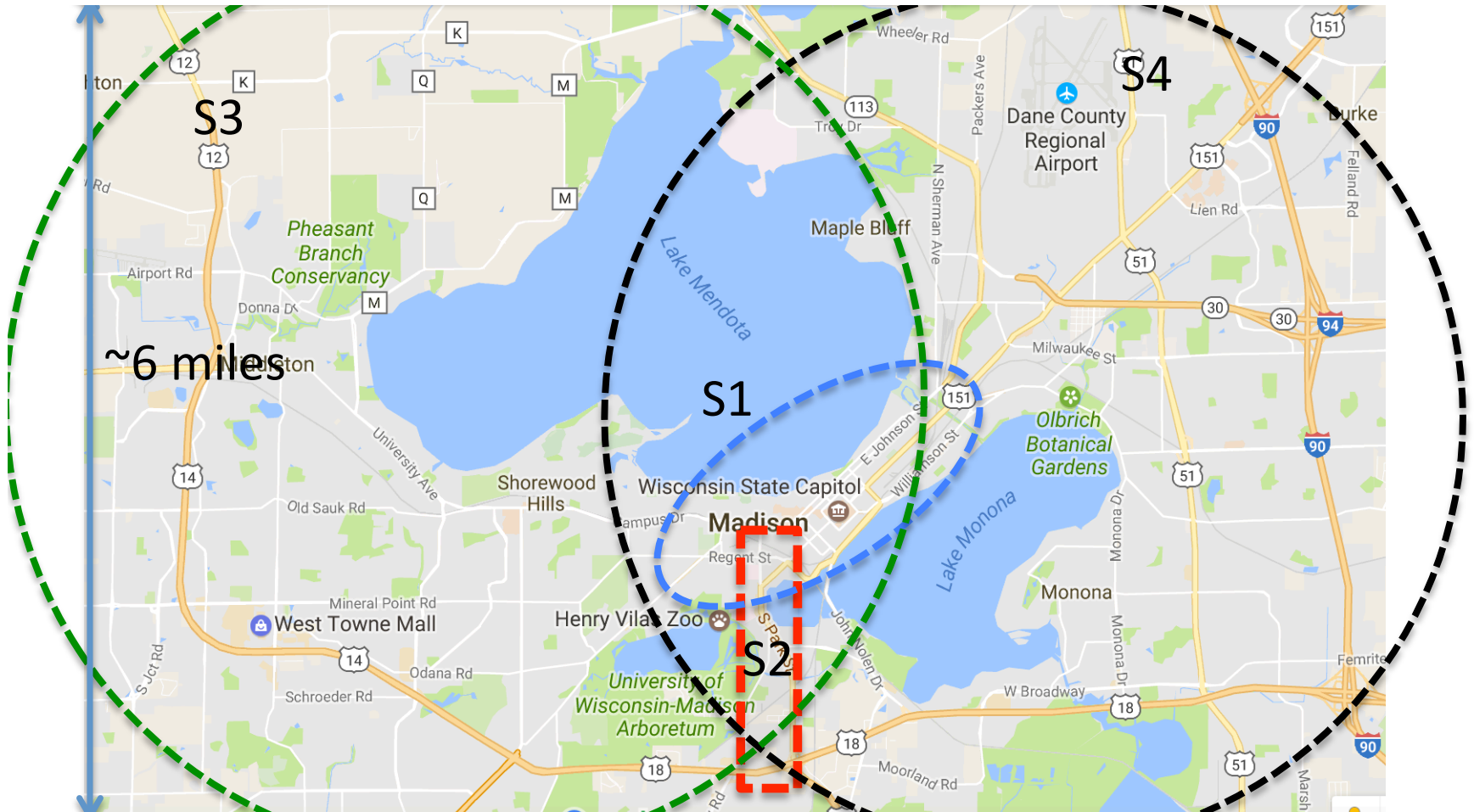
- Transportation



Infrastructure overview

- ~20 “cellular” (macro) base stations
 - On tall buildings, water towers, etc.
- ~1000 micro base stations
 - Outdoor utility poles, inside buildings, coffeeshops, etc.
 - All city buses
 - Police, ambulance, fire vehicles as desired
- Wireless coverage to 1-2 targeted neighborhoods in Madison
 - Where fixed wired broadband does not work well

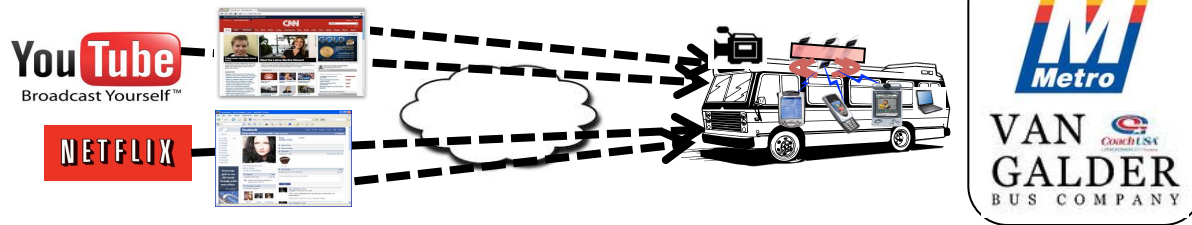
Infrastructure overview



Stages 1-4: Locations subject to change based on input received

Prior experiences

- Provide connectivity to Metro transit buses, police and ambulances



- **Buses:** > 4 years in operation for Internet connectivity
 - Madison Metro Transit (city transit)
 - Van Galder Bus (long distance)



- **Ambulances:** similar application with EMS
- **Urban Electric Vehicles:** small vehicle, all-electric



What we need?

- From city
 - General support to meet project goals (logistics)
 - Access to “towers” to install wireless hardware
 - (Project will pay for installs and management)
 - Work with project team to identify a region that will benefit from high-speed wireless broadband
 - Explore use of Urban Electric Vehicles (UEVs) for city or citizen use
 - Enable use of Unmanned Aerial Vehicles (UAVs) for wireless experimentation and measurements
 - Work with various agencies to identify innovative use and applications of novel technologies

What we need?

- From Madison Metro
 - Allow and support installation of hardware in bus cabinets (like in prior project)
 - Project will have budget for all hardware, and installs
 - General support for access
- From Madison Gas and Electric
 - Access to utility poles for installing some hardware

What we need?

- **Public safety departments**
 - Provide access to vehicles to install and use advanced wireless hardware
 - Explore novel technology use in activities
- **Traffic Engineering department**
 - Collaborate with team to work on smart corridor project
 - Provide some roadside infrastructure access
 - Project will have funds to acquire some of the advanced wireless infrastructure

What we need?

- Others
 - Parks
 - Libraries
 - Explore new applications with innovative wireless technologies
 - Provide access for deployment of wireless hardware