Spectrum Bridge
802.19 TV White Space Working Group

TV Band Pioneers/Lessons Learned

Spectrum Bridge in TV White Spaces

- ## **Spectrum Bridge has lead several deployments of TV White Space Networks**
  - Working with Radio manufacturers and System Integrators in bringing solutions to market.
  - Deploying Networks with partners for later expansion.
  - Spectrum Bridge Database provides radios and networks the access to TV White Space channels.
  - Licensing Software solutions in radios and infrastructure to enable TV White Space use.
  - Delivering Software Applications for end user devices and within the core network to optimize bandwidth and access.
  - Performing FCC certification of radios.

Creating New Opportunities in TV White Spaces

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White Spaces Trials

Deployment of four White Spaces trials with several more domestic and international planned this year

Trials attempt to achieve one or more objectives

- Political/Regulatory push
- Application validation/demonstration
- Technology development/validation

Three radio vendors involved (today)

- Proprietary FSK, 50KHz-5MHz channels VHF & UHF
- Re-banded 802.11, 5MHz channels, VHF band
- Re-banded WiMax, 3.5 MHz and 5 MHz channels, 500 – 700 MHz

All the trials are running successfully and are great testimonials

- Demand for Trials and deployments far exceeds our capacity

To date - no interference with incumbent operations

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Spectrum Bridge Deployment
Claudville, VA: First TV White Spaces Network

- Wireless Broadband internet provided to rural community in Virginia, sponsored by Congressman Rick Boucher

- Solution provided in partnership with Dell and Microsoft
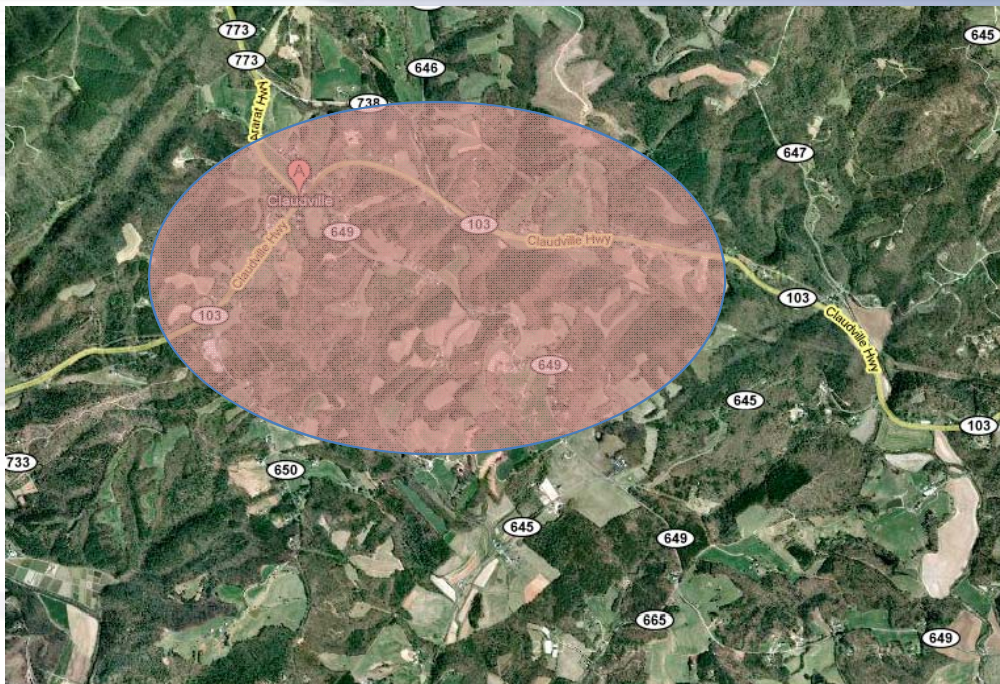
Spectrum Bridge Deployment
Claudville, VA: First TV White Spaces Network

**Previous: Dial-up and Sat-based internet only**

Deployed a 5 node TV WS system:

- ➢ Main radio transmitter at edge of town
- ➢ Radios at school, business district, 2 residences
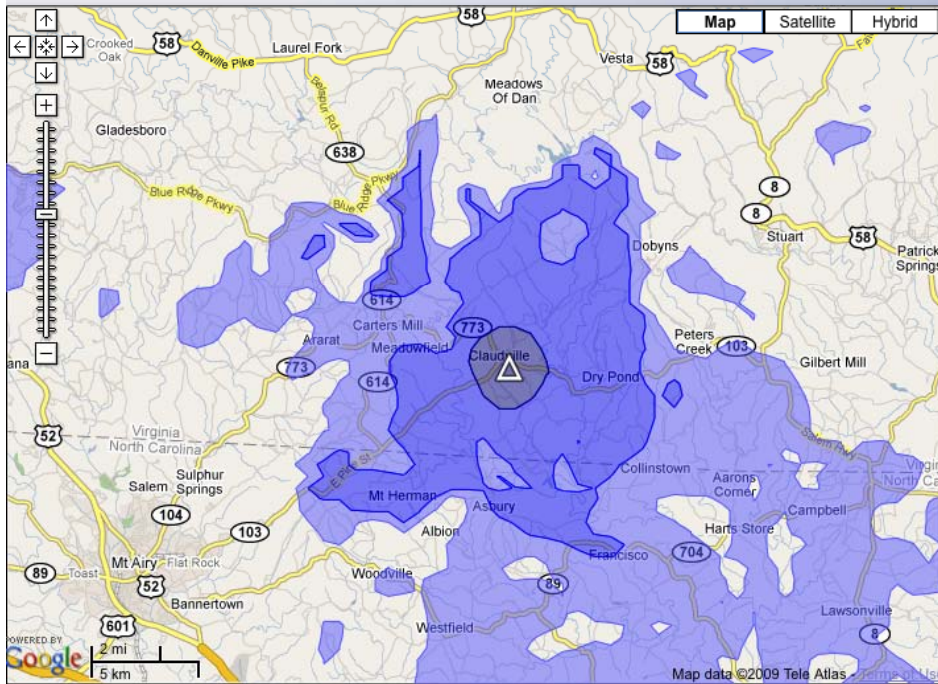- ➢ WiFi hotspots at school and business district

Results:

- ➢ Over 1.8 miles NLOS
- ➢ 100% uptime (even in heavy rain/snow)
- ➢ 2Mb/s links
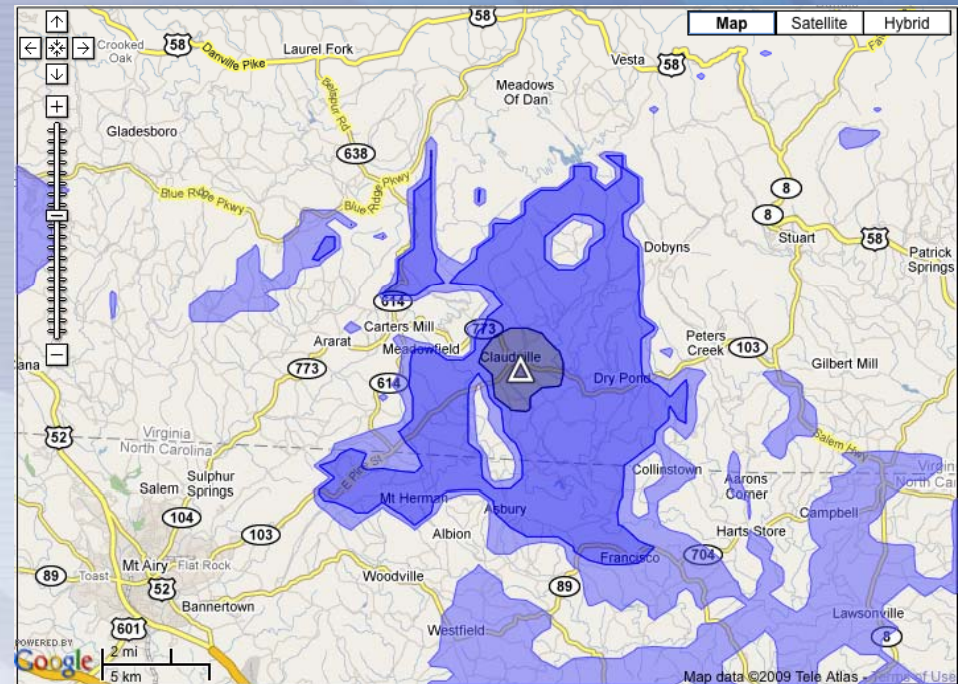- ➢ School recently dropped their sat internet service

Experimental license, prototype radios
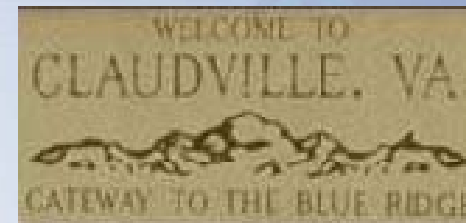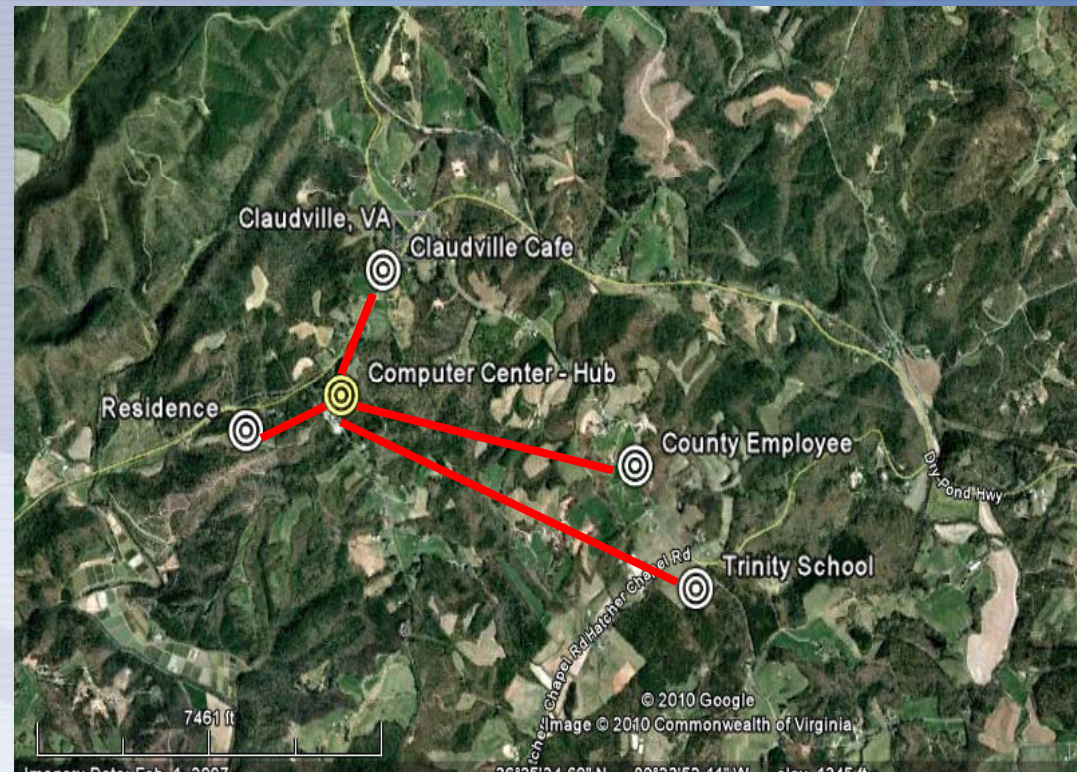
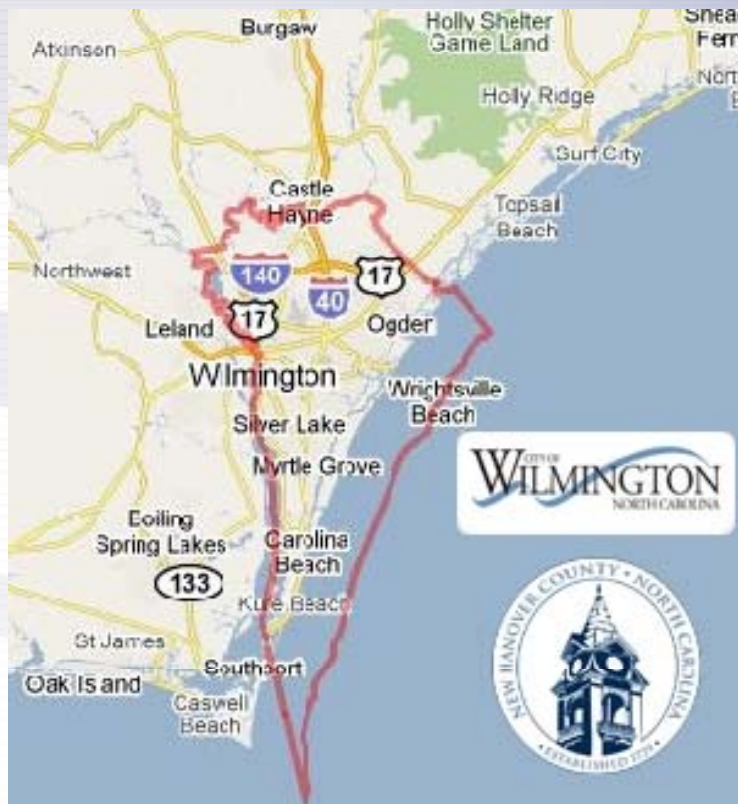**SPECTRUM BRIDGE**

VHF Propagation - fills holes

200 MHz

2400MHz

Spectrum Bridge Deployment Wilmington, NC: Smart City Services

- **Goal: Extend network connectivity into areas where it is not cost effective to reach using current technology.**

- Deployed TV WS system:
  - Wirelessly extend the reach of the City and County's broadband communications.
  - Use of SBI's TV White Spaces Database to allocate available spectrum to wireless transmitter hubs
  - Applications:
    - Department of Transportation traffic cameras
    - Public Safety and Wi-Fi Access at Community Parks
    - Water and Wetlands Monitoring

- Other trials to be implemented in 2010

Spectrum Bridge Deployment
Plumas County, CA: Smart Grid/Broadband

Previous: Narrow Channel Telemetry and Dial-up internet only

Deployed a 20 node Smart Grid system:

- ➢ Collect Sub-station Data and video monitoring.
- ➢ Smart Meters for real time monitoring of electric usage.
- ➢ Broadband connectivity to the home

Results:

- ➢ Over 4 miles NLOS
- ➢ 100% uptime (even in heavy rain/snow)
- ➢ 2Mb/s links

Experimental license, prototype radios

Rural Electric Cooperative

TV White Spaces Summary

- ## Benefits of White Spaces
  - Building penetration and Propagation
  - Broadband Data Rates
  - Protocol Agnostic allows wide range of applications

- ## Lessons Learned
  - Bandwidth limitations may constrain applications
  - Database protocols and API template
  - 174 MHz – 700 MHz is too wide for single front end
  - Antenna considerations depend on VHF,or UHF band operation.
  - High demand in rural and underserved areas.
  - Proposed Emission requirements present a challenge for COTS Radios.

- ## Wi-Fi vs. White Space
  - Wi-Fi in the Home, White Space for Middle/Last Mile Connection
  - White Space is ideal for Remote M2M, Rural Access
  - Wi-Fi Consumer Access until chips are available

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Thank You

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