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
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**
• Wireless Broadband internet provided to rural community in Virginia, sponsored by Congressman Rick Boucher
• Solution provided in partnership with Dell and Microsoft
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

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VHF Propagation - fills holes

200 MHz

2400 MHz
• **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

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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
Thank You

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