



National Broadband Plan Staff Workshop

Technology: Wireless Broadband

Panel 2: Rural Broadband

Thursday, August 13, 2009

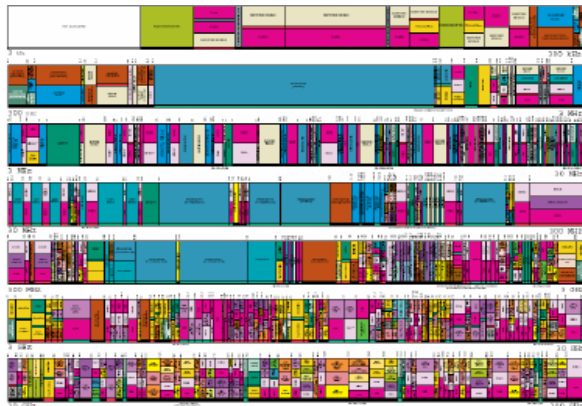
Mark A. McHenry, Ph.D.
President and CTO
Shared Spectrum Company



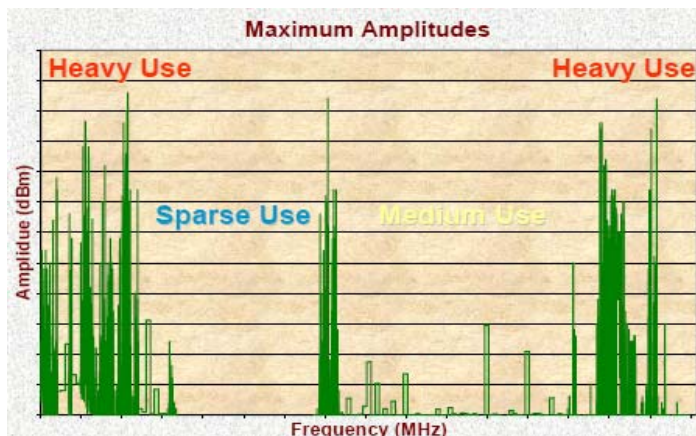


What is DSA Technology?

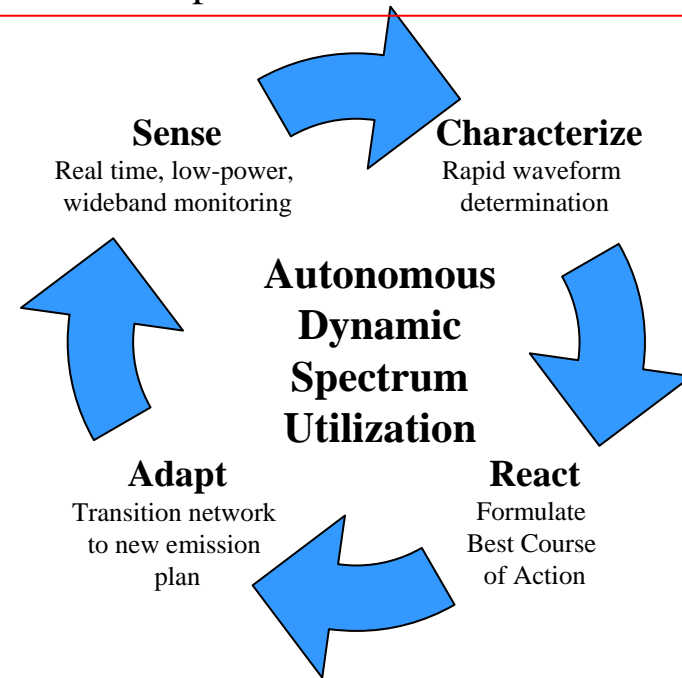
All spectrum may be allocated and assigned, but ...



... Most spectrum is unused, especially in rural areas!



SSC developed very smart radio technology and systems that allow users to dynamically and affordably access all available and authorized spectrum resources.



Result: 10-100x Increase in Spectrum Efficiency



Benefits of DSA

CRITICAL TO RURAL BROADBAND DEPLOYMENT

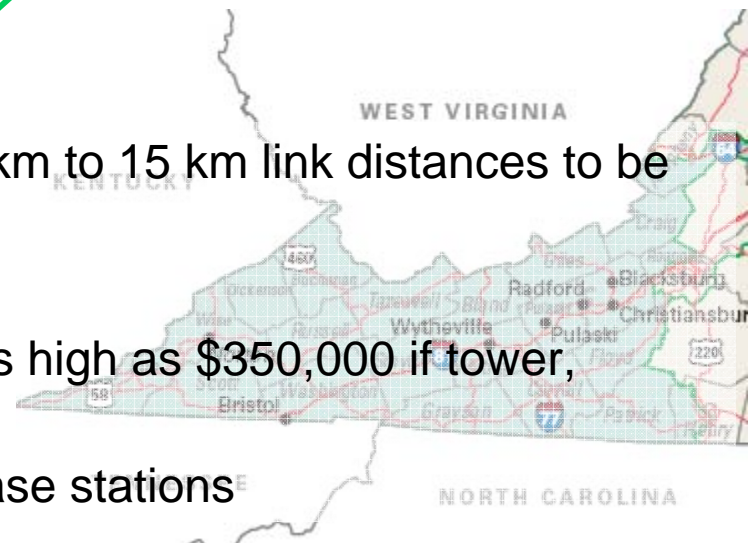
- Efficiently and safely use available spectrum in lower (VHF/UHF) frequency bands to increase link range
- Reduce propagation loss by selecting “best” frequency (building penetration, foliage attenuation)
- Reduce hardware costs
- Enable robust spectrum pooling with peer users
- Avoid intended/unintended interference
- High communication availability and reliability



Example of Cost Savings with Long Link Ranges

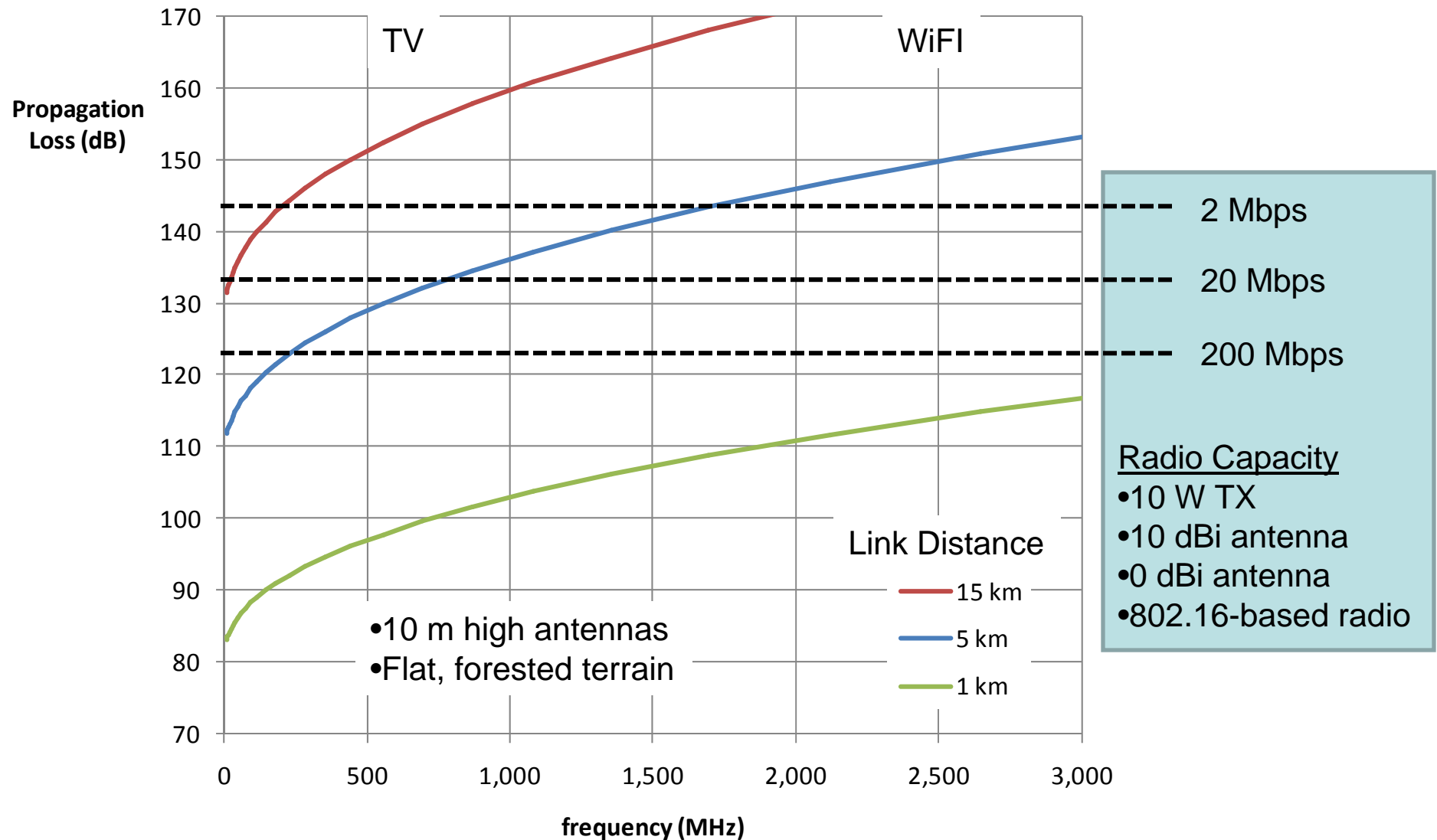
Base Station Link Range (km)	Base Station Coverage Area (km ²)	SW Virginia Area (km ²)	Number of Base Stations	Base Station Cost (\$)	System Cost (\$M)	SW VA Population (2000)	People/ Base Station	Network Cost Per Person (\$)
0.5	0.8	22,811	29044.0	\$50,000	\$1,452.2	643,514	22.2	\$2,256.67
1	3.1	22,811	7261.0	\$50,000	\$363.1	643,514	88.6	\$564.17
2	12.6	22,811	1815.3	\$50,000	\$90.8	643,514	354.5	\$141.04
3	28.3	22,811	806.8	\$50,000	\$40.3	643,514	797.6	\$62.69
4	50.3	22,811	453.8	\$50,000	\$22.7	643,514	1418.0	\$35.26
5	78.5	22,811	290.4	\$50,000	\$14.5	643,514	2215.7	\$22.57
10	314.2	22,811	72.6	\$50,000	\$3.6	643,514	8862.6	\$5.64
15	706.9	22,811	32.3	\$50,000	\$1.6	643,514	19940.9	\$2.51

- Rural wireless systems need to provide 5 km to 15 km link distances to be economically viable
- Above System Cost is a lower bound
 - \$50,000 Base Station cost could be as high as \$350,000 if tower, power, etc is required
 - Capacity needs could require more base stations





Low Operating Frequency is Critical to Link Distance



Meng, Yu Song, et al, "Empirical Near Ground Path Loss Modeling in a Forest at VHF and UHF Bands," IEEE Trans. Antenna and Propagation, vol. 57, no. 5, May 2009



Conclusion

National Broadband Plan should facilitate access to spectrum resources in rural areas by:

- Promoting investment in innovative technological advances that will ensure cost-effective, sustainable, viable, and scalable deployment of wireless broadband service, including cognitive radio and dynamic spectrum access (DSA) technologies; and
- Conducting a comprehensive and ongoing inventory of spectrum resource allocations, assignments and utilization.