Advanced Radio Technologies: A Critical Component of the National Broadband Plan

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Note: The views expressed in this presentation are those of the author and may not necessarily represent the views of the Federal Communications Commission

The National Broadband Plan

Congress's charge in the Recovery Act led to the creation of the National Broadband Plan

Congress said that the plan should:

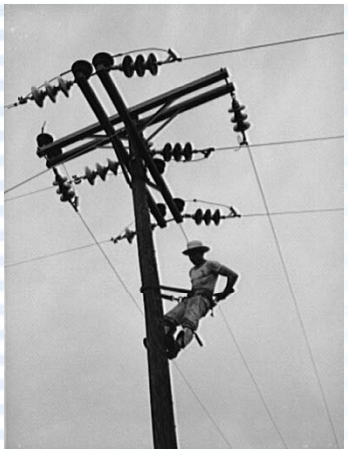
- "Ensure that all people of the United States have access to broadband capability and establish benchmarks for meeting that goal."
- "[I]nclude . . . a detailed strategy for achieving affordability . . . and maximum utilization of broadband infrastructure and service"
- "[I]nclude . . . an evaluation of the status of deployment of broadband service"
- "[I]nclude . . . a plan for use of broadband . . . in advancing consumer welfare, civic participation, public safety and homeland security, community development, health care delivery, energy independence and efficiency, education, worker training, private sector investment, entrepreneurial activity, job creation and economic growth, and other national purposes."

CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN

Why a National Broadband Plan?

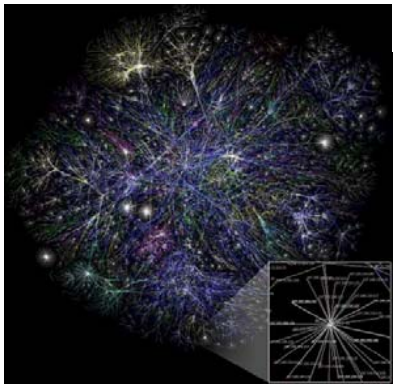
Because broadband is the great infrastructure challenge of the early 21st century

Transcontinental railroad (1860s)



Rural electrification (1930s)

Interstate highways (1950s)

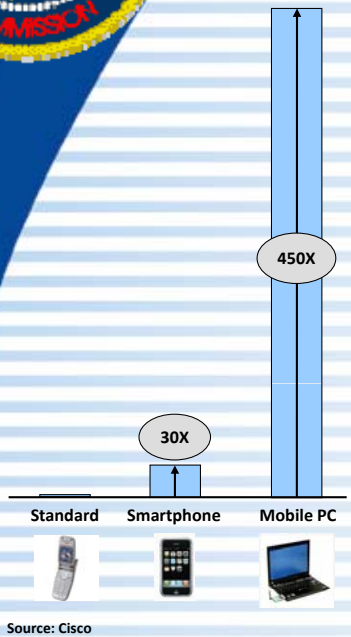


Broadband

Spectrum

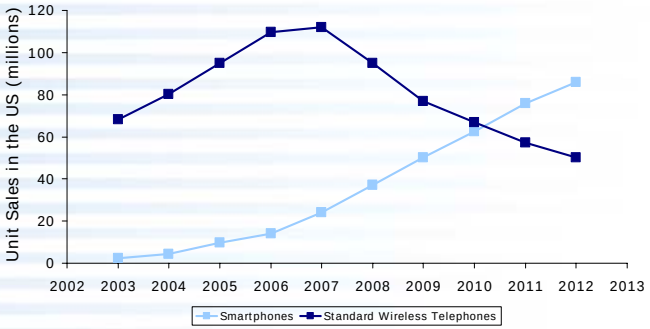
Spectrum is the “oxygen” that wireless broadband needs to thrive

Hungry Devices



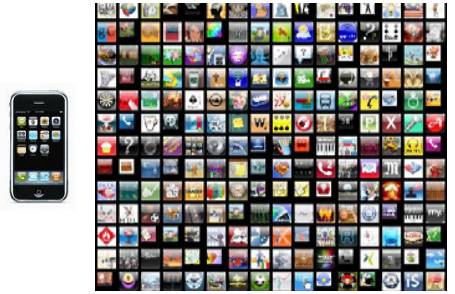
Source: Cisco

Smartphone sales to overtake standard phones by 2011



Source: TIA, Wilkofsky Gruen Associates from “TIA’s 2009 ICT Market Review and Forecast”.

Consumer Apps



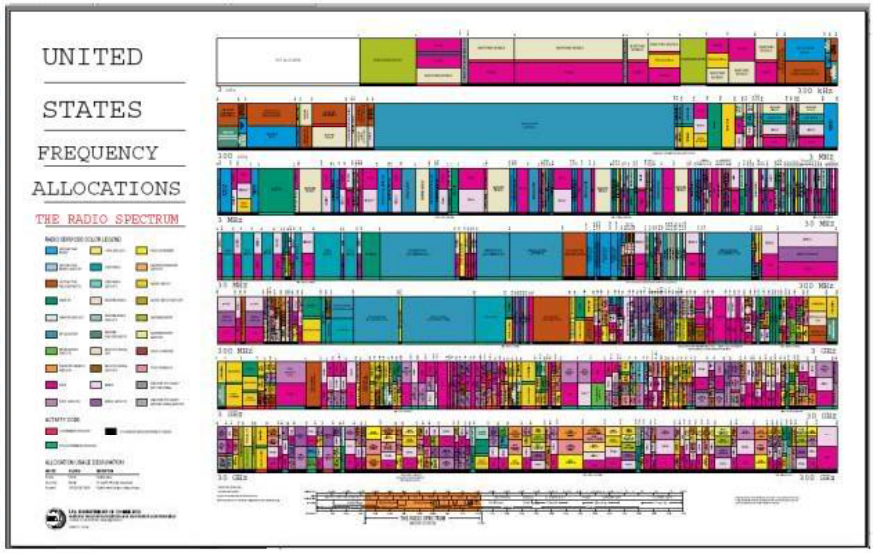
National Purposes

Civic Engagement

Telemedicine

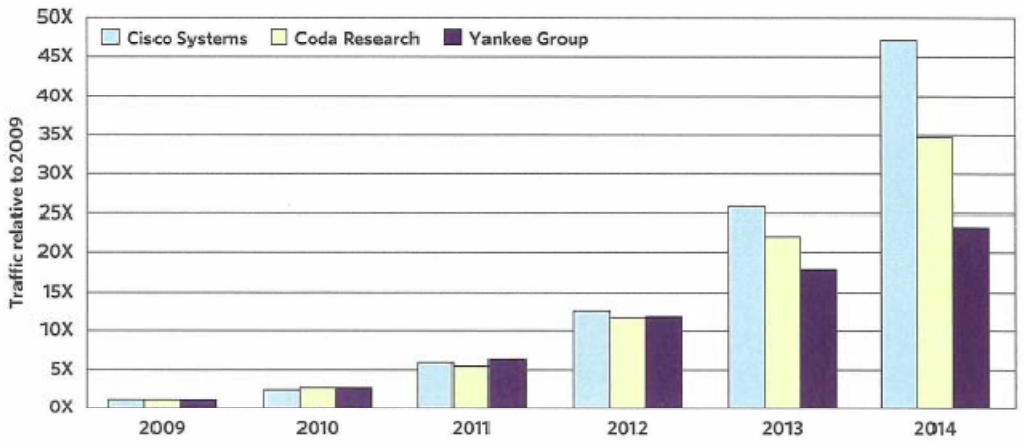
Public Safety

Smart Grid

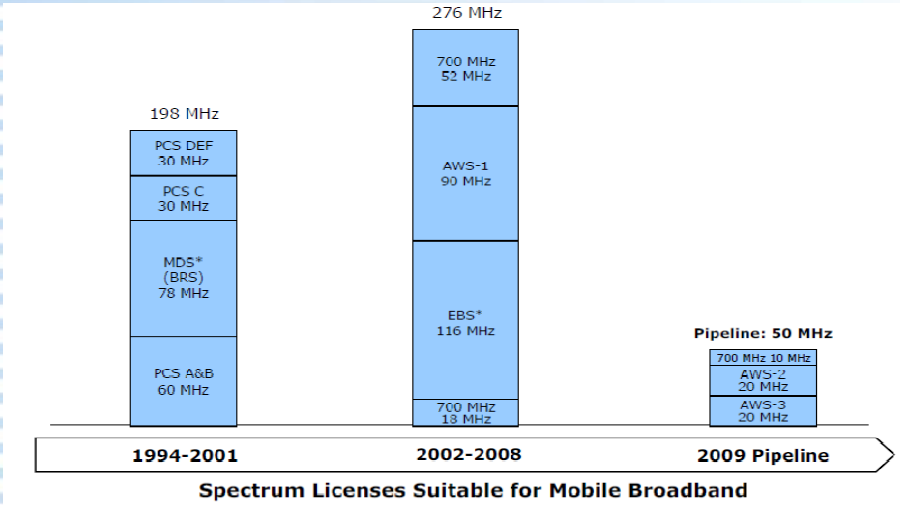


Trends in demand and supply suggest a looming spectrum gap

Forecasted mobile data traffic in North America



Mobile broadband spectrum pipeline



*In 2004 MDS/ITFS was rebanded to create the EBS/BRS band

Need to transform spectrum policy to meet wireless broadband demands

Framework for recommendations

1 Ensure greater transparency in allocation and utilization

- Spectrum dashboard

2 Expand incentives and mechanisms available to reallocate or repurpose spectrum

- Incentive auctions
- Spectrum fees

3 Make more spectrum available

- Within 10 years, 500 megahertz total
- Bands under consideration include Broadcast TV, MSS, WCS and AWS

4 Facilitate deployment of spectrum for wireless backhaul

- More flexible rules

5 Expand opportunities for innovative spectrum access models

- New unlicensed allocation
- Opportunistic use
- R&D

6 Increase comprehensiveness of spectrum policy

- Work with NTIA
- Tribes
- International

Unleash More Spectrum for Mobile Broadband

The Plan recommends that the FCC make 500 MHz newly available for broadband use within the next ten years, of which 300 MHz of high-value spectrum between 225 MHz and 3.7 gigahertz (GHz) should be made newly available for mobile use within five years.

Band	Key Actions and Timing	Megahertz Made Available for Terrestrial Broadband
WCS	2010—Order	20
AWS 2/3[2]	2010—Order 2011—Auction	60
D Block	2010—Order 2011—Auction	10
Mobile Satellite Services (MSS)	2010—NPRM 2010—L-Band and Big LEO Orders 2011—S-Band Order	90
Broadcast TV[3]	2010—NPRM 2011—Order 2012/13—Auction 2015—Band transition	120
Total		300

NBP Recommendations

- ***Identification of Contiguous Spectrum for Unlicensed Use*** (Rec. 5.11): In conjunction with ongoing work on the strategic spectrum plan and triennial assessments, in Q2 2010 begin meetings with stakeholders to collect initial ideas regarding candidate bands to make more spectrum available for unlicensed use, and by the end of 2010 make a recommendation regarding initiating a proceeding to free up a new, contiguous nationwide band for unlicensed use within the next ten years

- ***TV White Spaces Reconsideration and Database Opinion and Order*** (Rec. 5.12) : To accelerate the introduction of innovative products and services that access the "white spaces" spectrum between TV channels without interfering with other spectrum uses, in Q3 2010 complete the final rules for TV white space devices by resolving outstanding challenges to rules and selecting a device database manager.

  .

- ***Opportunistic Use of Spectrum NPRM*** (Rec. 5.13): To enable more efficient use of spectrum by increasing opportunities for dynamic spectrum access technologies in different bands, in Q3 2010 propose rules to facilitate the use of smart radios in spectrum held by the FCC (such as in certain license areas where spectrum was not successfully auctioned) that would otherwise be unused.

Executive Memo & Other Important Developments

- President Obama issued and Executive Memo on on June 28, 2010 on unleashing the wireless broadband revolution
- Collaborate with the Federal Communications Commission (FCC) to make available a total of 500 MHz of Federal and nonfederal spectrum over the next 10 years, suitable for both mobile and fixed wireless broadband use. The spectrum must be available to be licensed by the FCC for exclusive use or made available for shared access by commercial and Government users in order to enable licensed or unlicensed wireless broadband technologies to be deployed.
- Collaborate with the FCC to complete by October 1, 2010, a specific Plan and Timetable for identifying and making available 500 MHz of spectrum.
- We can use our American ingenuity to wring abundance from scarcity, by finding ways to use spectrum more efficiently. We can also unlock the value of otherwise underutilized spectrum and open new avenues for spectrum users to derive value through the development of advanced, situation-aware spectrum-sharing technologies.
- FCC is working with NTIA
  - FCC Chairman Genachowski & Commerce Assistant Secretary Strickling met to discuss spectrum matters on June 11
  - FCC collaborating with NTIA and federal agencies on fast-track spectrum and long term spectrum planning
- Chairman Genachowski sent response on July 14 to Senators Rockefeller and Kerry – will conduct spectrum inventory
- Pending legislation

FCC Spectrum Task Force

- Chairman Genachowski created Spectrum Task Force
- Co-Chaired by Ruth Milkman and Julius Knapp
- Participation by all of the bureau and office chiefs with spectrum responsibilities
- Primary Focus is implementation of NBP
- NBP was “beta” - - task force provides vehicle to explore new issues and ideas as they arise

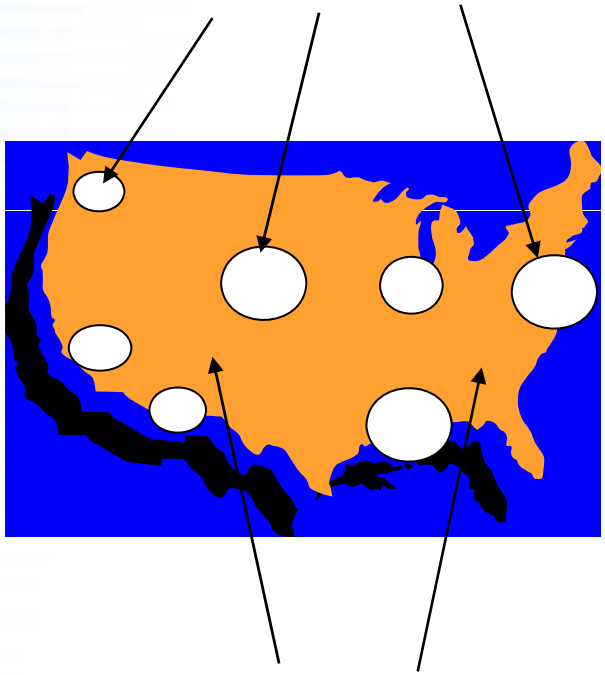
Experiences Thus Far With Advanced Radio Technology

- Commercial wireless systems use “sensing” to measure signal levels for hand-offs
- Unlicensed PCS
- Med Radio rules
- Unlicensed technologies – Wi-Fi
- FCC SDR rule makings – 2001 & 2005
- U-NII rules - DFS
- 3650 MHz – Restricted/Unrestricted bands
- Spectrum test bed

Opportunistic Use of Spectrum

- Finding 500 MHz will not be easy
- Reallocation not always feasible
- Opportunistic use of spectrum can play a significant role in meeting spectrum demand
- Some services only operate in certain areas
- Some services may not operate continuously
- Creates opportunity to operate outside the existing service areas or dynamically with time

Existing Service Areas



Unused Spectrum

Concerns/Challenges

- Incumbent concerns:
  - Technology is unproven
  - Characteristics of systems are unknown and therefore must assume worst case interference analysis
  - Technology safeguards can be defeated
  - Inadequate enforcement
  - Lack of trust that users will yield back spectrum
- Advocate challenges:
  - Current opportunities are limited
  - No clear path to prove the technology
  - Overly restrictive interference protection
  - No standards for protection from attacks
  - Business models may not attract investors

Some Observations from Conference

- Interference Protection :
  - Harmful interference is in the eye of the beholder
  - Need to better define interference rights & responsibilities
  - Consider balance of incumbent interference protection and achieving more-efficient overall system of spectrum management
  - More work is needed on interference risk assessment
  - Better interference resolution tools - separate rule making from adjudication

- Paradigm shifts:
  - From radio model to IP model - - new path every millisecond
  - Hybrid allocation and licensing models (already here - - to stay)
  - Multi-band and smart devices have implications for spectrum management

- Need better tools for repurposing spectrum - - incentive auctions, spectrum fees; relocation (& innovation) funds?

- Occupancy measurements – complicated & difficult to interpret results, but important for understanding actual use of the spectrum

A Way Forward

- Improve transparency of existing use of the spectrum
- Initiate rule making on opportunistic use of the spectrum
  - Consider both licensed and unlicensed access models
  - Identify candidate spectrum
- NTIA/FCC & agencies work in partnership
  - Cognitive radio working group
  - National Science Foundation Workshop
- Develop a strategy to “advance” advanced radio technology
- Take concrete steps to develop technology & build confidence:
  - Develop and execute research strategy working with science agencies, industry, academic community and stakeholders
  - Indentify test beds/experimental zones
  - Establish interference protection principles
  - Shift the debate from legal/policy to technical arena

TV White Spaces (TVWS)

- TVWS Rules Adopted - *Second Report and Order* 11/ 4/2008
- Allows operation of unlicensed devices in TV White Space
- Provides protection for licensed services (TV, land mobile, b/c low power auxiliary, some others)
- Selection of Database Manager(s)
  - 9 proposals submitted to be a data base manager
  - Comments and replies have been filed
  - OET evaluating
- Received 17 petitions for reconsiderations requesting changes to the TVWS rules. Issues:
  - Technical provisions
  - Improve or alter protections for wireless microphones
  - Allow higher-powered for network systems
  - Allow licensed fixed operations at higher power
  - Improve protections for cable TV systems
  - Numerous others

Wireless Microphones

- Report and Order and Further NPRM - 10/14/10
- R&O: Removed wireless mics from 700 MHz
- NPRM:
  - Proposed some expansion of Part 74
  - Proposed others operate under Part 15
  - Recognized interplay with TVWS

TV White Space Next Steps

- Address petitions for reconsideration
- Select database manager(s)
- Resolve Wireless microphone issues
- Action planned in 3rd Quarter

Conclusion

Questions and Answers