Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth

> President's Council of Advisors on Science and Technology (PCAST) July 20, 2012

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- John Leibovitz, Federal Communications Commission
- **Douglas Sicker**, National Telecommunications and Information Association

Why Do We Need to Repurpose

Spectrum?

- Presidential Memorandum of June 2010 requires 500 MHz of spectrum to be made available for commercial use within 10 years
- Huge WW Mobile Device Growth Opportunity (2020)
 - \$4.5T Global Value
 - M2M Wave next
 - 50B devices
 - Zetta-bytes of Data
- Enhanced Mobile Devices are Already Leading to a US Bandwidth Deficit
 - Data more than doubled 4 years in a row
 - Smartphones generate 24X data of basicfeature cell phones
 - Tablets create 5X more traffic than smartphones
- Federal Agencies also need more Spectrum
 - DOD unmanned aerial systems increased 45X in 8 years

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The White House Image: Ima	Home • Presidential Memorandum: Unleashing the Wireless Br	roadband Revolution
Office of the Press Secretary For immediate Release June 28. 20 Dressidential Memorandum: Unleashing the Wireless Broadband Revolution MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES SUBJECT.Unleashing the Wireless Broadband Revolution America's future competitiveness and global technology leadership depend, in part, upon the availability of additional spectrum. The world is going wireless, and we must not fail behind. The resurgence of American productivity growth that started in the 1990s largely reflects investments by American companies, the public sector, and citizens in the new communications technologies that are what we know lodge as the intermet. The Internet, as vital infrastruiture, has beccome central to the daily economic (ife of almost every American by create unprecedented opportunities for small businesses and individual entrepreneurs. We are now beginning the ne transformation in information technology: the wireless broadband revolution. Few technological developments hold as much potential to enhance America's economic competitiveness, treate jobs, and improve the quality of our lines as wireless high-speed access to the Intermet. Innovative new mobile technologies hold the promise for a vinuous cycle – millions of consumers gain faster access to order services as toos at spuring innovation, and then a new round of consumers gain faster access to the Intermet. Expanded wireless broadband access will thigger the creation of innovative new businesses, provide cost effective connections in rural areas, increase productivit, improve public safety, and allow for the development mobile telemedicine, telework, distance learning, and other new applicat	The White House	
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PCAST Study Concentrated on Federal Spectrum

Clearing and Reallocation of Federal Spectrum is Not Sustainable.

- Recent NTIA Study Clearing of just one 95 MHz band will take 10 years, cost \$18 billion, and cause significant disruption.
- Net revenue from last successful auction of 45 MHz realized a net income of just a few hundred million a year for the government. (\$5.3 billion total)
- More Efficient and Immediate Use of Federal Spectrum will be Obtained through Sharing





Today: Wireless Spectrum Master Zoning Plan

Fragmentation of spectrum for exclusive Federal use leads to artificial scarcity and constraints on current and future users.



Tomorrow: Shared-Use Spectrum Superhighways

PCAST recommends the President issue a new memorandum that:

- states the policy of the U.S. government is to share underutilized Federal spectrum; and
- identifies immediately 1,000 MHz of Federal spectrum for sharing with the private sector; and

The New Spectrum Superhighway:

- Divides spectrum into substantial blocks with common characteristics
- Makes sharing by Federal users with commercial users the norm
- Measures spectrum effectiveness using a new metric
- Increases capacity by 1,000's of times.



Start Now: Use Existing Technologies

- Database Management Technology
 - Geo-location Database Management is already being implemented by FCC in TV Band
- Policy Immediately Enables Existing Technologies such as Small Cell
 - Optimized for Aggregate Capacity
 - Wi fi offload, already integral to Carrier traffic, is the proof point
- Not Dependent on Cognitive Radio, Smart Antenna, DSA Technologies
 - a sharing architecture will increase investment dollars and accelerate an innovation cycle
 - implementation will further improve effectiveness



Recommended: New Federal Spectrum Access System

Implement a Federal Spectrum Access System

- Hierarchy of Users
 - Federal Primary Access (Incumbent)
 - Secondary Exclusive Access (Accommodates non-shared access technologies like LTE or Quality of Service Applications)
 - General Authorized Access
- Geo-location Database with policy information
- Sensing option for Federal Systems
- Allow Access to Unused Spectrum



Recommended: Receiver Management Framework

Receiver not just Transmitter Focus

• Establish minimum technical standards for coexistence of transmitters and receivers to enable flexible sharing. Many ways to consider it.



Recommended: Federal Spectrum Management Mechanisms

Formalize a White House-based Spectrum Management Team (SMT) of the U.S. Chief Technology Officer, National Security Staff, Office of Management and Budget, and National Economic Council to work with the National Telecommunications and Information Administration.

- Reexamine Partitioning of Federal Spectrum Usage in Light of Current and Emerging Technologies
- Support International Harmonization of new Shared Federal Bands

Federal Primary Access

Incumbent Guaranteed Access Must not exclude spectrum use if spectrum isn't in current need

Secondary Access

Registers with database Might be high power Possible fee for spectrum use Possible allowance because of public good

General Authorized Access

Low power Sensing and/or database use to determine access availability No fee to use spectrum

- Implement a Mechanism that gives Federal Agencies Incentives to Share Spectrum (e.g., Spectrum Currency)
- Redefine Existing Spectrum Relocation Fund to Revolving "Spectrum Efficiency Fund"
- Experiment with new shorterterm license economic licensing models once a
 Spectrum Access System is operational (foster innovation, provide quality of service, generate revenue)

Recommended: Immediate Pilot Actions

Establish Spectrum Sharing Partnership Steering Committee - an Advisory Committee of C-level Industry Representatives – to Advise on Federal Spectrum Sharing System Implementation

 Specify and fund the ongoing Scalable Real-World Test
 Services needed (a Test City and Mobile Test Service) to test sharing of Federal Bands and Public Safety with industry



Hardware Side Physical Cognitive Radio Nodes

Software Side Virtual Cognitive Nodes



Recommended: Immediate Pilot Actions

3550-3650 MHz NTIA Exclusion Zones*

- Modify Rules to Allow
 "General Authorized
 Access" Devices to Operate
 in two bands in the NTIA
 Fast Track List specifically
 the 3550-3650 MHz (radar
 bands) and a second band to
 be determined by FCC and
 NTIA
- Use Extended TV White Space System Already in Operation as the starting system



NTIA Fast-Track Report, Figure 5-3. Composite Depiction of Exclusion Zone Distances, Shipborne Radar Systems

Summary and Conclusions

- Move Spectrum Access from Scarcity to Abundance
 - Access to spectrum is increasingly important to economic activity, growth and innovation, world-wide leadership, and national security.
 - The strategy to clear and reallocate spectrum over the next 10 years can not include significant Federal spectrum. We must accelerate sharing.
- Clear the Policy Hurdles starting with Federal Spectrum
 - NTIA and FCC must work with industry to plan and implement a new architecture and spectrum management system

Pilot and Learn Now

- Implement sharing in two Federal bands
- Create an SSP Steering Committee of C-level industry leaders
- Enable US Industry to establish leadership through scalable test services
- Form a Spectrum Management Team from the White House

• We can't wait

- We can have significant impact within the next 3 years
- World-wide leadership is "up for grabs" and follows first mover advantage
- A multiple decade innovation cycle will follow

Thank You

For More Information: www.whitehouse.gov/ostp/pcast