

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

Key PCAST Members and Spectrum Experts

PCAST Members

- **Mark Gorenberg** (chair), Hummer Winblad Venture Partners
- **S. James Gates, Jr.**, University of Maryland, College Park
- **Craig Mundie**, Microsoft Corporation
- **William Press**, University of Texas at Austin
- **Maxine Savitz**, National Academy of Engineering
- **Eric Schmidt**, Google, Inc.

Invited Experts

- **Yochai Benkler**, Harvard University
- **Jennifer Bernhard**, University of Illinois at Urbana-Champaign
- **Vanu Bose**, Vanu Inc.
- **Michael Calabrese**, New America Foundation
- **Dale Hatfield**, University of Colorado, Boulder
- **Michael Katz**, University of California, Berkeley
- **Paul Kolodzy**, Kolodzy Consulting
- **William Lehr**, Massachusetts Institute of Technology
- **Jon Levin**, Stanford University
- **David Liddle**, U.S. Venture Partners
- **Preston Marshall**, University of Southern California

- **J.D. McCreary**, Georgia Tech Research Institute
- **Mark McHenry**, Shared Spectrum
- **Milo Medin**, Google, Inc.
- **Teresa Meng**, Stanford University
- **Jeff Reed**, Virginia Tech
- **Dennis Roberson**, Illinois Institute of Technology
- **Gregory Rosston**, Stanford University
- **Pierre de Vries**, University of Colorado, Boulder
- **Kathleen Wallman**, Wallman Consulting, LLC.
- **Tom Wheeler**, Core Capital

Staff

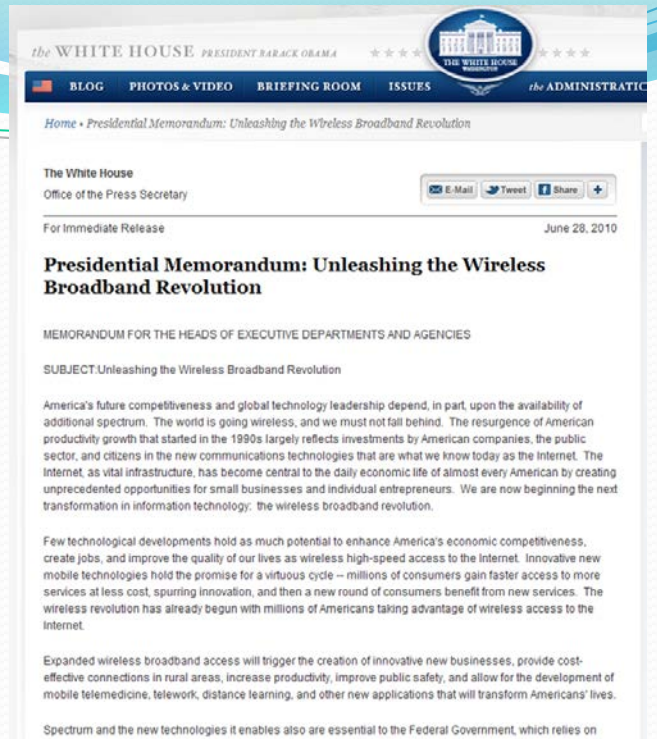
- **Deborah Stine** (executive director), PCAST
- **Thomas Power**, Office of Science and Technology Policy
- **Danielle Evers**, AAAS S&T Policy Fellow
- **David Lindley**, Writer

Federal Agency Liasons

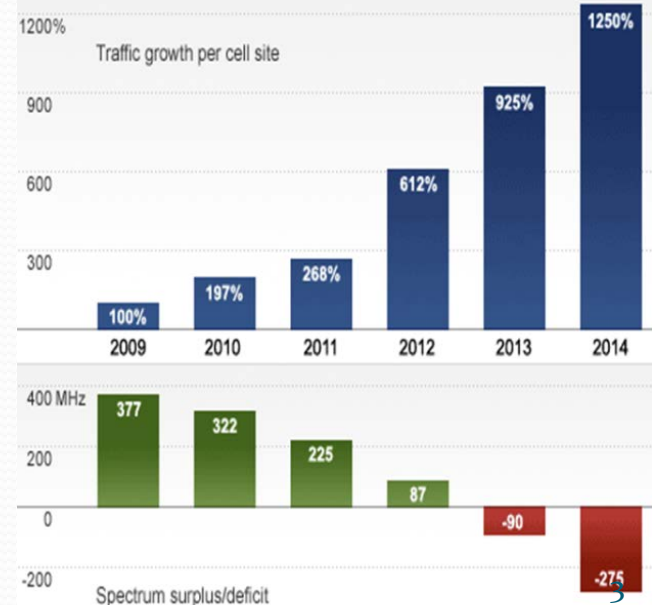
- **John Leibovitz**, Federal Communications Commission
- **Douglas Sicker**, National Telecommunications and Information Association

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 basic-feature cell phones
 - Tablets create 5X more traffic than smartphones
- **Federal Agencies also need more Spectrum**
 - DOD unmanned aerial systems increased 45X in 8 years

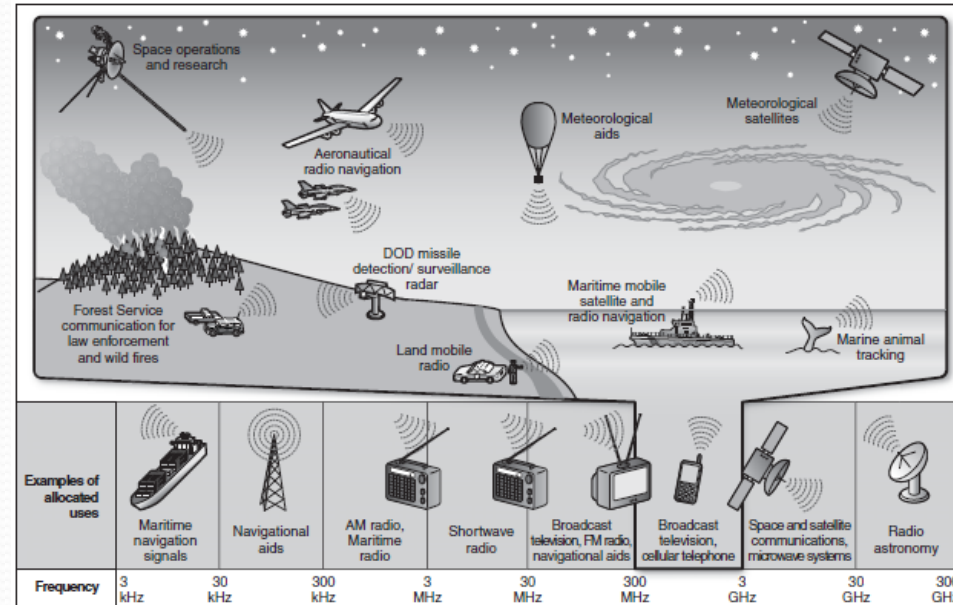


WIRELESS DATA GROWTH LEADS TO SPECTRUM DEFICIT

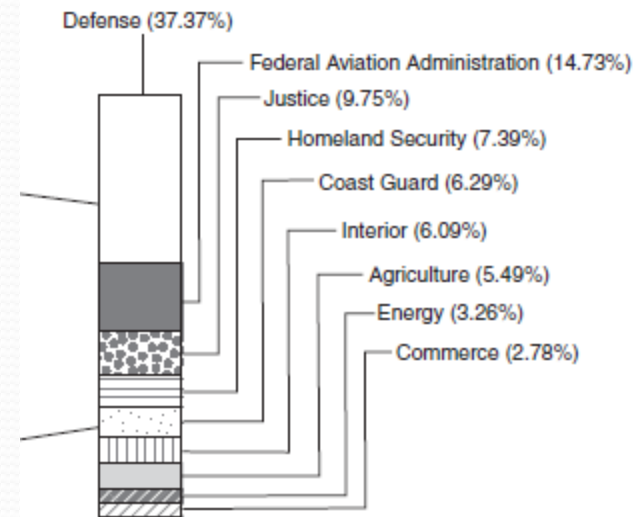


PCAST Study Concentrated on Federal Spectrum

- **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**



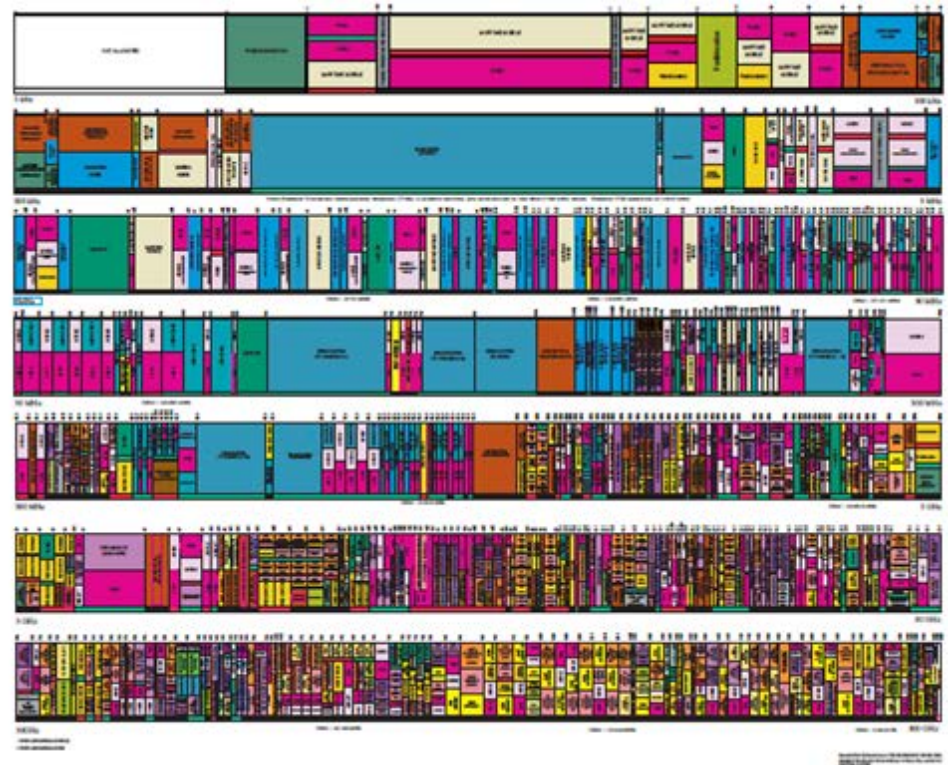
Source: GAO analysis of NTIA, federal agencies, and industry information.



Today: Wireless Spectrum Master Zoning Plan

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

UNITED STATES FREQUENCY ALLOCATIONS THE RADIO SPECTRUM



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

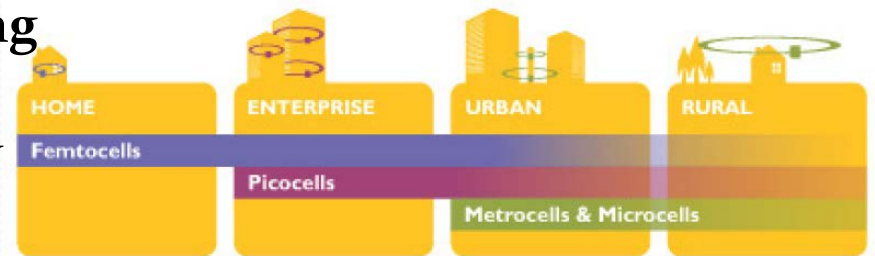
The New Spectrum Superhighway:

- 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

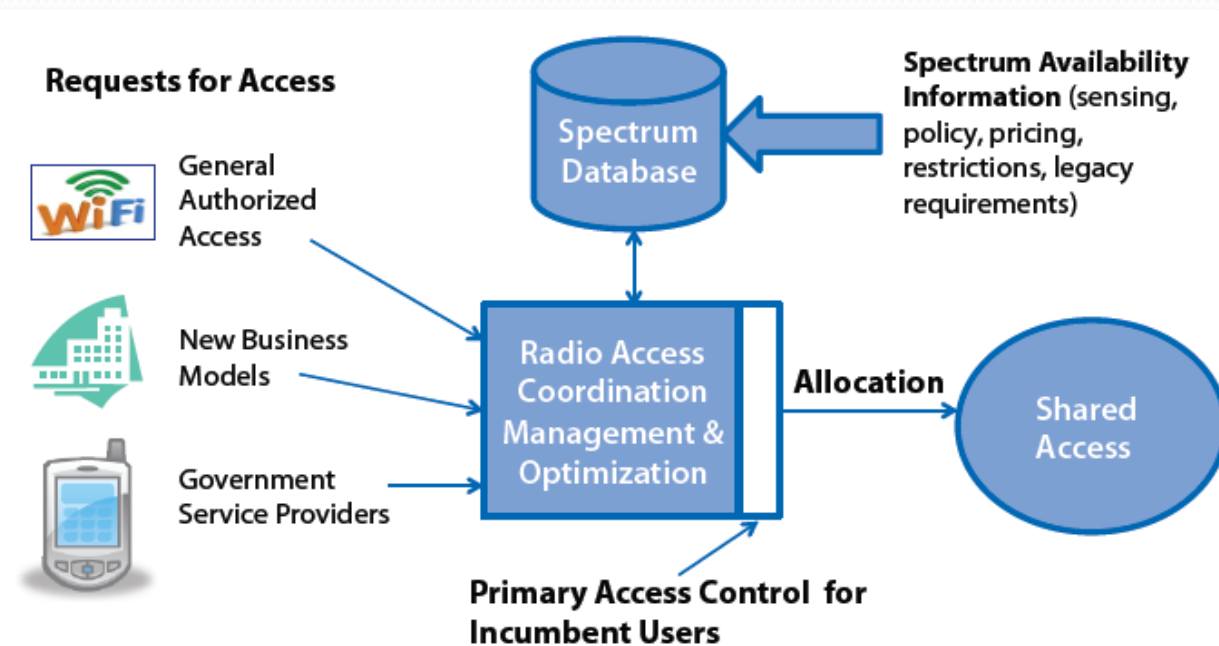


Recommended: New Federal Spectrum Access System

- **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**

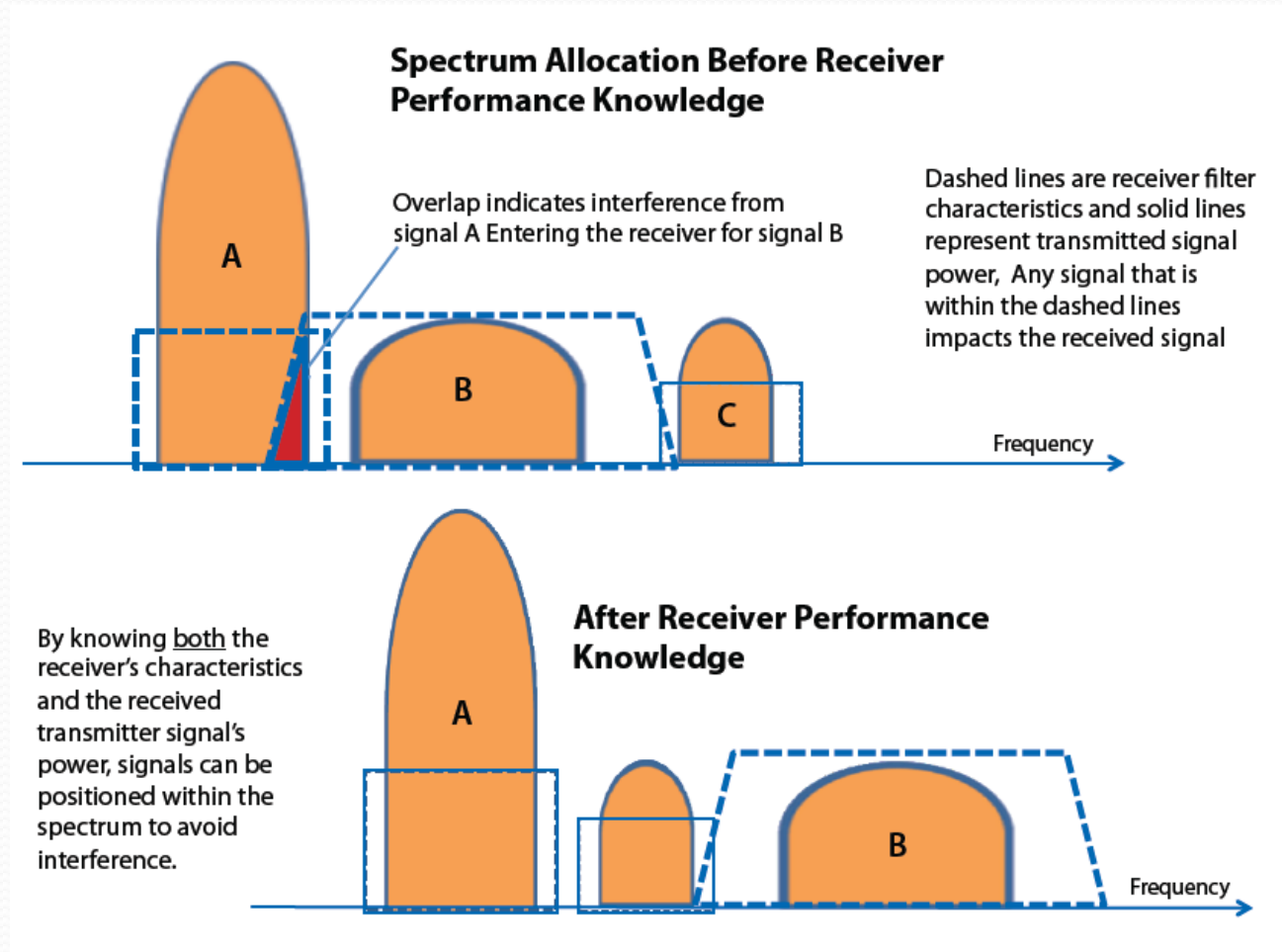
- **Allow Access to Unused Spectrum**



Recommended: Receiver Management Framework

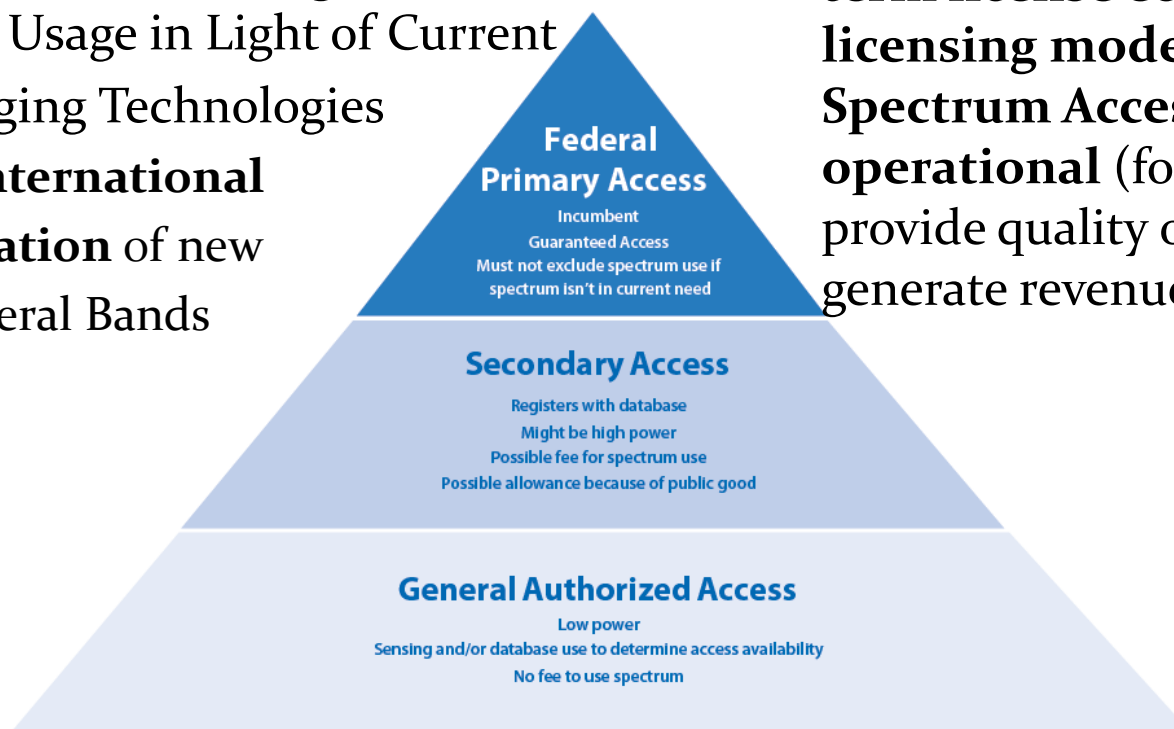
- Receiver not just Transmitter Focus

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



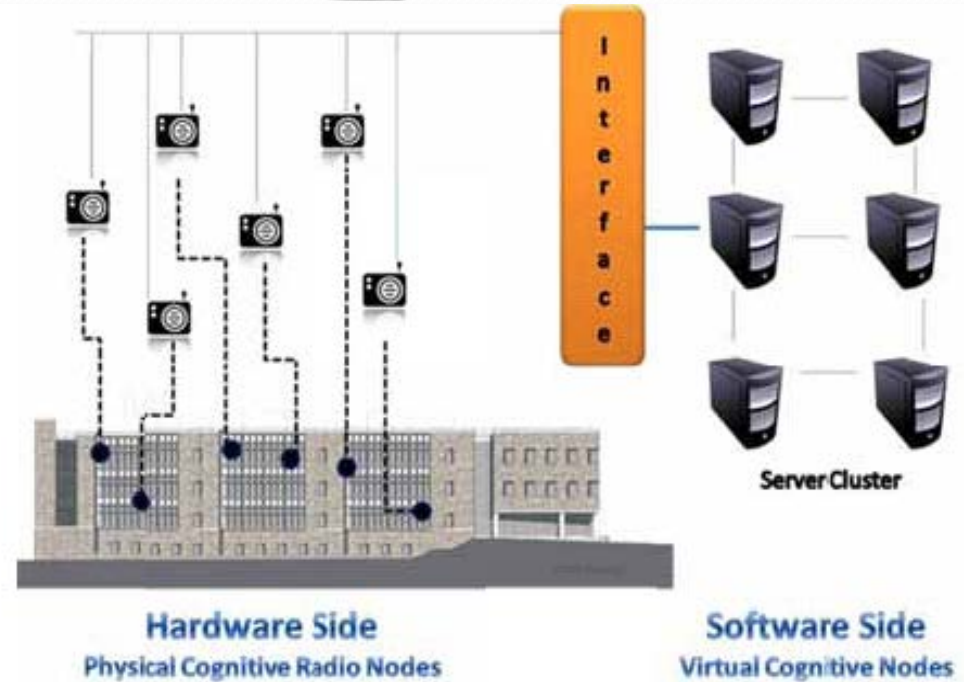
Recommended: Federal Spectrum Management Mechanisms

- **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
- **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 shorter-term license economic licensing models once a Spectrum Access System is operational** (foster innovation, provide quality of service, generate revenue)



Recommended: Immediate Pilot Actions

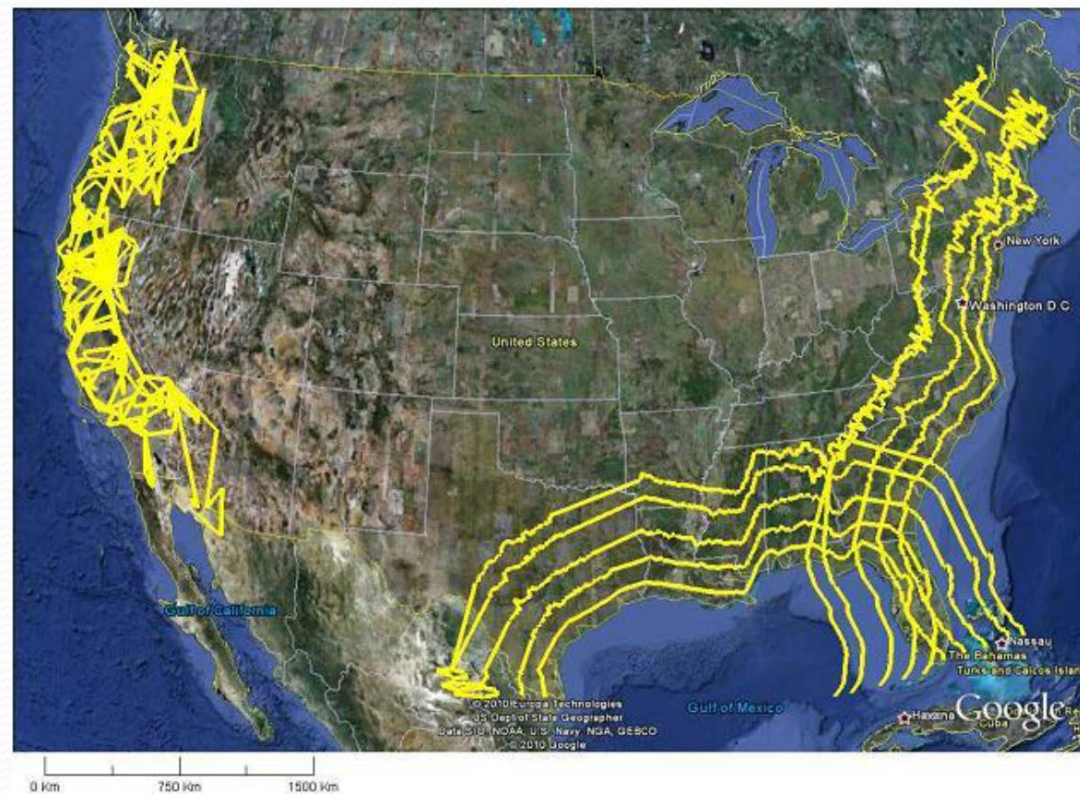
- **Establish Spectrum Sharing Partnership Steering Committee** - an Advisory Committee of C-level Industry Representatives – to Advise on Federal Spectrum Sharing System Implementation
- **Specify and fund the ongoing Scalable Real-World Test Services needed** (a Test City and Mobile Test Service) to test sharing of Federal Bands and Public Safety with industry



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