

# Coordination of Commercial and Government Spectrum Use

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# Coordination of Commercial and Government Spectrum Use

## Topics to be covered

- Commercial and government spectrum uses
- Finding spectrum for new services
- Reallocation cases
- Market-based spectrum pricing cases




# Commercial and Government Spectrum Uses

- Government spectrum usage
  - National defence-related communications and coordination
  - Domestic safety and emergency services
  - Quality of life services – education, medical services
  - Safety of life applications - Air traffic control
  - Space applications and scientific studies
- Governments often use significant amounts of spectrum
  - In the United Kingdom the Government indicated that the armed forces occupy more than 30 percent of the spectrum below 30 GHz
  - In the United States most of the spectrum bands between 100 MHz and 100 GHz is actually shared between Government and Commercial users



# Commercial and Government Spectrum Uses

- Commercial spectrum usage
  - Commercial mobile voice and data services
    - Considerable growth over the past 15 years and expected to grow further as new services are introduced
  - Broadband wireless services
  - Terrestrial broadcasting
  - Private point-to-point/point-area communications services
  - Fixed and Broadcasting satellite services
  - Mobile satellite services



# Commercial and Government Spectrum Uses

## Commercial Drivers for More Spectrum

- Provide “connection” anytime anywhere
- Provide higher data rate services in all environments from stationary to highly mobile with the same quality of service
- Meet demand for increased personal security
- Respond to new market opportunities
- Take advantage of higher-capacity networks



# Commercial and Government Spectrum Uses

## Government Drivers for More Spectrum

- Heightened emphasis on domestic security at all levels of government
- Increased awareness of need for direct communications between emergency service personnel
- Need to provide education, health and economic assistance users in rural areas
- Foster national priority programs – i.e. space programs, cooperative international science and technology efforts



# Commercial and Government Spectrum Uses

- As commercial spectrum users seek to introduce new services and expand existing ones there is pressure to obtain access to more spectrum
  - Resulting in increased pressure on the Government user
- Government users are under increasing pressure to justify the amount of spectrum they have access to and to use it more efficiently
  - Need to deploy more advanced communications technologies while at the same time providing necessary services



# Finding Spectrum for New Services

- Increased Sharing
- Increased Technical Efficiency
- Extend the Upper Limit of the Useful Range
- “Band Clearing”/Reallocation
- Market-based Spectrum Pricing



# Finding Spectrum for New Services

- Increased Sharing
  - Different services can use or “share” the same spectrum
    - Effective only where risk of interference is minimal
    - Uses are compatible or can be coordinated
  - Increased sharing usually comes at the expense of increased complexity and cost



# Finding Spectrum for New Services

- Techniques for Increasing Efficiency
  - Increasing the amount of information that can be transmitted in a given amount of spectrum (*e.g.*, through improved modulation techniques)
  - Reducing the amount of information that has to be transmitted (*e.g.*, through compression techniques)
  - Exploiting frequency reuse (*e.g.*, by utilising smaller cells in a cellular mobile radio system and/or by taking advantage of antenna directivity)



# Finding Spectrum for New Services

- Extend the Upper Limit of the Useful Frequency Range
  - The usefulness of extremely high frequencies is constrained by
    - The state-of-the-art in microwave component technology
    - Propagation limitations
  - The highest frequency with service rules has steadily increased -- today the upper limit is 77 GHz



# Finding Spectrum for New Services

- “Band Clearing”/Reallocation
  - Lightly used spectrum can be reallocated for other purposes
  - Existing operations required to move to other bands (or other modes of communications)
  - Various techniques can be and have been adopted to facilitate band clearing (e.g., voluntary negotiations between incumbents and new entrants)
  - Growing demand/congestion makes band clearing increasingly difficult and contentious
  - In most countries, government spectrum use exceeds commercial use



# Band Clearing/Reallocation

## United States 1.7 /2.1 GHz Advanced Wireless Services (AWS) Decision

- Following WRC-2000, Intra-Government 3G Planning Group (IG3GPG) established to consider spectrum required to support AWS
  - Presidential Memorandum – October 2000
  - Representatives of National Telecommunications and Information Administration (NTIA), the Federal Communications Commission (FCC), the Department of Defense, the Office of Management and Budget, the Office of Science and Technology Policy, and the Department of State, Other Federal Users



# Band Clearing/Reallocation

## United States 1.7 /2.1 GHz Advanced Wireless Services Decision

- IG3GPG tasks included
  - Identifying the spectrum requirements of incumbent users
  - Determining if additional spectrum for AWS was required and if so where could it be found
  - Analyzed possibility and cost of relocating incumbent users to other bands
  - Analyzed methods of sharing spectrum
- Of bands available between 1-3 GHz in the United States, 1.7/2.1GHz deemed most promising for AWS



# Band Clearing/Reallocation

## United States 1.7 /2.1 GHz Advanced Wireless Services Decision

- NTIA assessed 1710-1770 MHz band used by the Federal government
  - Used primarily by Departments of Defense and Energy
  - 1997 Congressional decision to allow shared Government/private sector access to 1710-1755 MHz
- FCC assessed 2110-2170 MHz band used by the private sector
  - FCC's 1992 Emerging Technologies decision to relocate fixed microwave systems from the band set the stage



# Band Clearing/Reallocation

## United States 1.7 /2.1 GHz Advanced Wireless Services Decision

- **Conclusions**

- NTIA and Department of Defense determined significant relocation of Government users in 1710-1755 MHz was possible to bands > 4 GHz
  - DoD granted access to 2025-2110 MHz on a co-equal primary basis
- FCC developed relocation plans for commercial users in the entire 2110-2170 MHz band
  - Initiated in 1992
- Relocation costs to be defrayed by AWS auction revenues – August 2006



# Band Clearing/Reallocation

## United States 1.7 /2.1 GHz Advanced Wireless Services Decision

- Reasons Why This Was Successful
  - Had support of leaders in all organizations involved and this was conveyed to all personnel working the issue
  - Methodology used to conduct studies and analyses were agreed by all parties
  - Numerous interactions – meetings, working sessions...
  - Direct involvement of private sector interested parties before final decisions made public
  - All parties got something out of the effort



# Band Clearing/Reallocation

- U.S. 700 MHz band (digital television transition)
  - In 2001, the FCC adopted rules to facilitate voluntary clearing of upper 700 MHz spectrum as television broadcasters migrated to digital television
  - Upper 700 MHz spectrum freed by digital television transition made available for commercial and public safety usage
  - Lower 700 MHz reallocated to fixed and mobile services, as well as broadcasting during the transition period
  - CITELE recommendation divides the 700 MHz spectrum:
    - 764-776 MHz and 794-806 MHz bands for public safety systems
    - 698-764 MHz and 776-794 MHz bands for advanced wireless systems
- India
  - Recent agreement to vacate defence users from 45 MHz of spectrum to be reallocated for commercial use



# Finding Spectrum for New Services

- Market-based Spectrum Pricing
  - Economic incentives can be employed to ensure efficient spectrum usage
  - Spectrum fees can reflect market value rather than administrative costs, increasing likelihood that spectrum will be used by those whom it will benefit most
  - Market-based spectrum pricing can be achieved through methods including
    - Auctions
    - Administrative pricing based on perceived value



# Market-based Spectrum Pricing Cases

- U.K. Administrative Incentive Pricing
  - Government policy that public sector users should pay spectrum charges comparable to private sector
    - Provides same incentives to use spectrum efficiently
    - Key factor in securing support for spectrum pricing to promote efficiency rather than cost recovery
  - December 2000 – Consultation laid out principles for administrative pricing (license fees set by spectrum manager)
    - Incentive pricing – attempts to set prices to promote efficient use – based on principle of opportunity cost of spectrum



# Market-based Spectrum Pricing Cases

- U.K. Administrative Incentive Pricing
  - February 2005 – Statement providing further details of pricing for certain public spectrum
    - Emergency services spectrum fees to be comparable to business radio rates
    - Defence spectrum fees increased substantially (more than doubled) to reflect updates in comparative fees and to reflect a review of alternate possible uses for such spectrum



# Key Spectrum Sharing Issues for India

- Governments around the world are increasingly seen as the solution to spectrum issues
- Indian telecommunications and economic development goals rely heavily on increased use of wireless networks
  - Pressure on telecommunications providers to both obtain more spectrum and to use their existing spectrum more efficiently
- Leveraging telecommunications to reach economic development goals requires integrated approach to
  - Universal service
  - Convergence
  - Spectrum management
  - Commercial and government coordination

# Thank You

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