FCC Primer: Licensed and Unlicensed Spectrum

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Outline

- Licensed Wireless Services
  - Auctions and ULS
  - Licensed Wireless Regulatory Issues
- Unlicensed Wireless Technologies
  - Part 15 Rules
  - Unlicensed Wireless Regulatory Issues
Licensed Services

- Licensees are assigned spectrum usage rights in a specified frequency band over a defined geographic area
  - Licensing may be site-based or geographic
- Interference protection rights are defined
  - Different levels of interference protection possible (e.g., primary vs. secondary)
- Licenses are transferable but FCC approval required
Service Rule Issues

- Geographic Scope of License
- Spectrum Block Size
- License Term
- Interference Rules/Technical Rules
- Auction/Assignment Procedures
- Eligibility Issues
- Build-out Requirements
Geographic Area Licensing

- Most commercial mobile radio services (e.g., PCS, cellular) are licensed on a geographic area basis
- Geographic license provides flexible rights within defined area, subject to technical rules to protect neighboring licensees from interference
- License Term: typically 10 years, renewable
- Build-out requirements: vary by service
  - Most common: coverage of percentage of population or provision of “substantial service”
- License partitioning and disaggregation allowed
Geographic Licensing Areas

- **Basic Trading Areas**: 493 geographic Areas
- **The 51 Major Trading Areas (MTAs)**: 51 geographic Areas
- **220 MHz Economic Area Groupings (EAGs) and Their Constituent EAs**: 6 geographic Areas
- **Cellular Market Areas**: 734 geographic Areas
- **Major Economic Area (MEA)**: 51 geographic Areas
- **Economic Areas (EAs)**: 175 geographic Areas
FCC Auctions Authority

- All exclusive FCC licenses are potentially subject to auction except:
  - Public safety
  - Digital TV allotments to analog broadcasters
  - Public broadcasting
  - International Satellites

- Auctions are only used for:
  - Initial licensing (not license renewal)
  - Mutually exclusive applications
Designated Entity Provisions and Bidding Credits

- FCC has adopted mechanisms to enhance auction opportunities for designated classes of bidders:
  - Bidding credits for small businesses (available in all auctions)
  - In some auctions, certain spectrum blocks set aside for bidding solely by “entrepreneur” businesses (e.g., PCS C and F Blocks)

- Tribal Land Bidding Credits (adopted in 2002)
  - Designed to provide incentives for wireless carriers to serve tribal communities
  - Bidders receive credit based on size of tribal area they propose to serve
  - Tribal government consent required to obtain credit
  - Credit recipient must meet 3-year buildout requirement in the tribal area
Auctions Overview

Since the first spectrum auction was held in July 1994, the FCC has

- Completed 53 auctions
- Auctioned over 51,200 licenses
- Deposited over $14.4 billion in the US Treasury (as of 8/8/04)
- Qualified over 2,700 bidders to participate

Comparative Hearings (prior to 1982) | Lotteries (beginning in 1982) | Auctions Authority (1993 to present)
Future Auctions

- **Broadband PCS Reauction**
  - Auction Start Date: January 12, 2005
  - Auction of 242 licenses (mostly from Nextwave settlement)

- **Advanced Wireless Services (3G)**
  - 1710-1755 and 2110-2155 MHz
  - 90 MHz, five frequency blocks
  - 946 licenses total, various geographic areas

- **Upper 700 MHz Band**
  - 30 MHz, two frequency blocks
  - 12 licenses total, six regions

- **Lower 700 MHz Band**
  - 30 MHz, three frequency blocks
  - 18 licenses total, six regions
Universal Licensing System

ULS is the interactive electronic licensing system for all WTB services:

- Standardized electronic forms for all applications
- Electronic access to FCC licensing records
- Increased speed and efficiency of the application and licensing process
- Increased accuracy and reliability of licensing information
- Electronic search capabilities facilitate analysis of spectrum use, wireless competition
Analog vs. Digital Cellular

- FCC originally required all cellular carriers to deploy AMPS-based analog service
- AMPS requirement remains in effect, but will sunset in 2008
  - Nationwide carriers must report in 2006 and 2007 on whether they intend to continue providing AMPS after the sunset date
- Analog use decreasing, but . . .
  - Still the only CMRS option in many rural areas
  - Some specialized applications (telematics, hearing aid-compatible devices) rely on analog
Roaming

- FCC rule requires CMRS providers to support manual roaming by users of technically compatible equipment
- Automatic roaming not required by FCC rule, but is widely available
- Marketplace evolution has affected roaming dynamics
  - Nationwide carriers offer de facto roaming on their own systems
  - Competition has put downward pressure on roaming rates
  - Roaming continues to be important revenue source for some small carriers
Secondary Markets

- Policies and procedures allowing licensees to enter into spectrum leasing arrangements with other spectrum users
- Spectrum leasing allowed in all exclusively licensed commercial wireless services
  - Licensees may lease any or all of their spectrum on a short-term or long-term basis, up to the term of the license
  - Different procedures depending on how much control over the spectrum is retained by the licensee
  - Public safety licensees may lease to other public safety and critical infrastructure entities
  - Most recent order allows licensees to make spectrum available to others on a “private commons” basis
E911

- **Phase I**
  - Telephone number of a wireless 911 caller
  - Cell site or base station receiving call
  - Within 6 months of a request from a Public Safety Answering Point (PSAP) (began on April 1, 1998)

- **Phase II**
  - Location of a 911 caller by latitude and longitude
  - Handset-based or network-based solution
  - Phased implementation based on PSAP requests (began on October 1, 2001)
Phase I E911 Deployment

Percentages show the number of PSAPs with Phase I E911 service and are based on the Commission's estimate of 7,820 total PSAPs.
Phase II E911 Deployment

Percentages show the number of PSAPs with Phase II E911 service and are based on the Commission’s estimate of 7,820 total PSAPs.
Rural Report and Order

- Seeks to expand the availability of wireless services in rural areas by
  - Eliminating disincentives to serve or invest in rural areas
  - Helping to reduce the costs of market entry, network deployment, and continuing operations
- General definition of “rural area” for FCC purposes
  - County with population density of ≤100 persons per square mile
- Increases permissible power levels in rural areas
- New standard for satisfying “substantial service” requirement through rural buildout
- Eliminates cellular cross-interest prohibition, but cellular transfers & assignments remain subject to FCC review
- Allows licensees to grant security interests to the Rural Utilities Service
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“Unlicensed” Operations

Part 15 of FCC Rules allows operation of qualifying low power devices without a user license

- FCC relies on equipment authorization in lieu of user licensing
- Examples: Garage door openers; cordless telephones; keyless entry systems; baby monitors; wireless data networks
- More accurately referred to as “license-exempt” use
“Unlicensed” Operations
Part 15 Operating Conditions

- Part 15 devices must not cause harmful interference to licensed spectrum users
  - If harmful interference occurs, the device user must eliminate the interference or cease operation

- Part 15 devices have no right to interference protection from others
  - Device users must accept any interference that may be received, from licensed users or from other Part 15 devices
“Unlicensed” Operations

Controlling RF interference

- Unlicensed devices have no vested right to continue using any frequency
  - Unlicensed devices generally share spectrum with other radio services
  - Interference to other services minimized by careful selection of frequencies and technical standards
  - But FCC has designated some bands for extensive use by unlicensed devices (e.g., 902-928 MHz, 2400-2483.8 MHz, and 5725 - 5850 MHz)
Wireless Technologies Operating on Unlicensed Spectrum

- **Bluetooth**
  - Peer-to-peer device communication (indoors up to 10m)

- **Wi-Fi**
  - Short-range wireless Internet access (hotspots, home networking, some WISPs)

- **Wi-Max**
  - Wireless networking (higher power and more capacity than Wi-Fi)

- **Ultra-Wideband**
  - “Underlay” technology using very wide bandwidth and very low power
  - Potential applications include ground-penetrating radar, identification and location tracking, short-range high-speed data and video
Challenges For Unlicensed Spectrum Technologies

- **Adequate spectrum**
  - Number of devices operating directly affects user experience (reliability and speed)
  - More users per unit of bandwidth increases risk of congestion and interference (tragedy of the commons)

- **Coverage**
  - Unlicensed devices operate at very low power, so access to a nearby “backbone” network is usually needed
  - Using unlicensed devices to provide wide-area coverage (e.g., in rural areas) requires authorization of higher-power operation

- **Quality of Service**
- **Mobility**
- **Security**
Rule Changes to Promote Broadband Deployment by WISPs

- Wireless internet service providers (WISPs) can provide an alternative high-speed connection in areas where cable or DSL services have been slow to arrive.

- Report and Order adopted July 2004 amends Part 15 to facilitate use of unlicensed spectrum by WISPs for broadband deployment
  - Higher power allowed for sectorized antennas
  - Flexible equipment authorization for radio transmission systems – allows WISPs to customize their transmitters
More Spectrum for Unlicensed Use?

- **TV Broadcast Spectrum “white space”**
  - Notice adopted December 2002 seeks comment on unlicensed use of broadcast spectrum outside of TV broadcast contours
  - TV broadcast spectrum is well-suited for low power devices because of favorable propagation and in-building penetration

- **3650-3700 MHz**
  - Federal transfer spectrum, formerly used for radar
  - Used for international satellite earth stations mostly on East and West coasts, largely unused in between
  - Notice adopted April 2004 seeks comment on possible unlicensed use, licensed use, or a combination

- “Cognitive” radios could enable unlicensed users to operate in these bands without interference to licensed uses
FCC Contact Information

- FCC home page - www.fcc.gov
- CGB home page - www.fcc.gov/cgb
- WTB home page - wireless.fcc.gov
  - Auctions home page - wireless.fcc.gov/auctions
  - ULS home page - wireless.fcc.gov/uls
- For general FCC information, call:
  1-888-CALLFCC
  TTY: 1-888-TELL-FCC (1-888-835-5322)