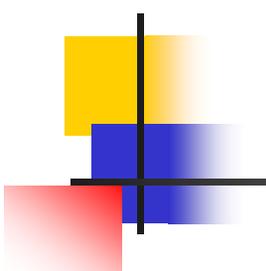


# FCC Primer: Licensed and Unlicensed Spectrum

David Furth  
Associate Bureau Chief  
Wireless Telecommunications  
Bureau, FCC

Sue McNeil  
Chief, Office of  
Intergovernmental Affairs  
Consumer & Governmental  
Affairs Bureau, FCC

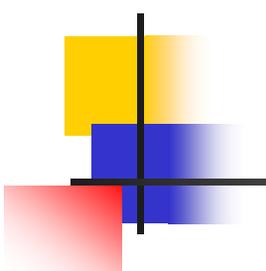
South Dakota Wireless Conference  
Spearfish, South Dakota  
September 27, 2004



# Outline

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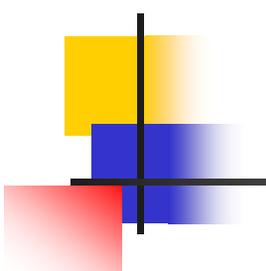
- Licensed Wireless Services
  - Auctions and ULS
  - Licensed Wireless Regulatory Issues
- Unlicensed Wireless Technologies
  - Part 15 Rules
  - Unlicensed Wireless Regulatory Issues



# Licensed Services

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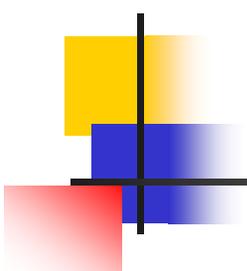
- Licensees are assigned spectrum usage rights in a specified frequency band over a defined geographic area
  - Licensing may be site-based or geographic
- Interference protection rights are defined
  - Different levels of interference protection possible (e.g., primary vs. secondary)
- Licenses are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



# Service Rule Issues

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

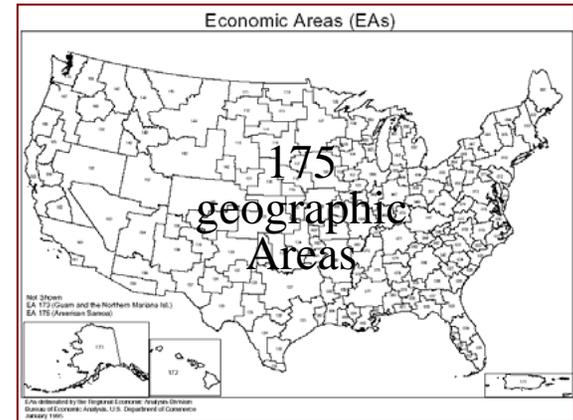
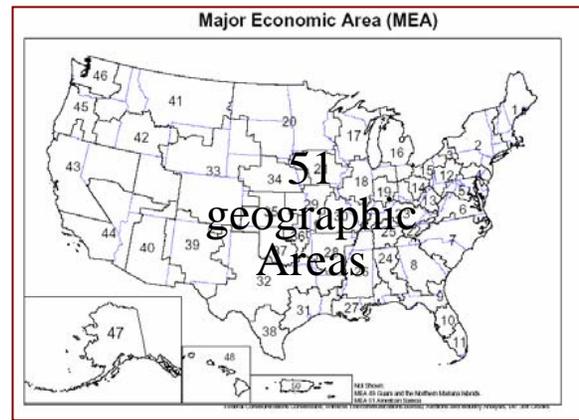
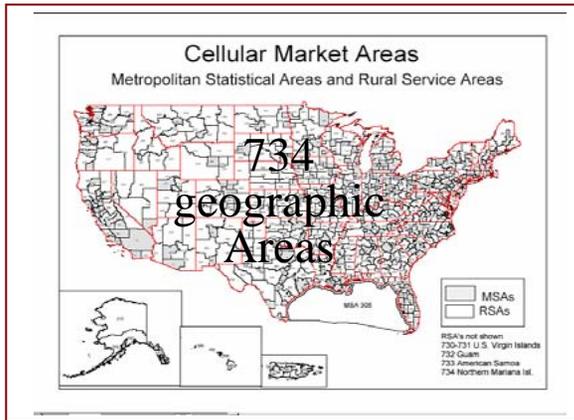
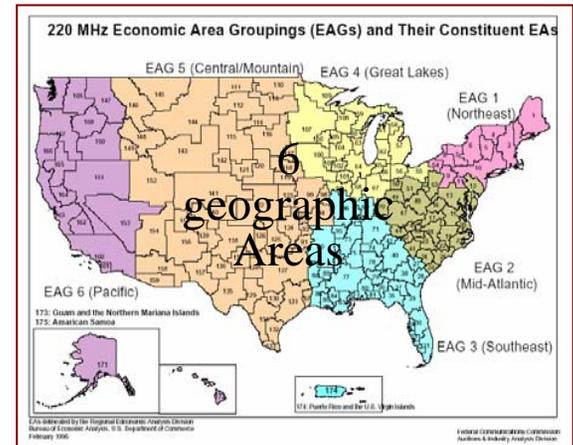
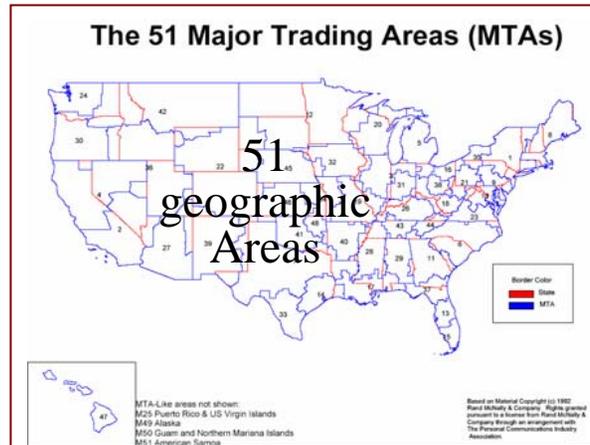
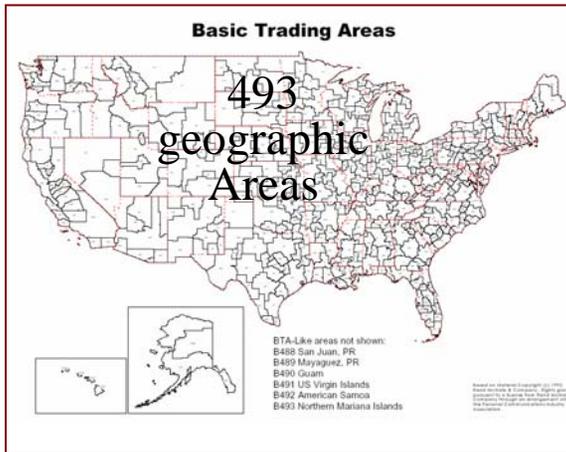


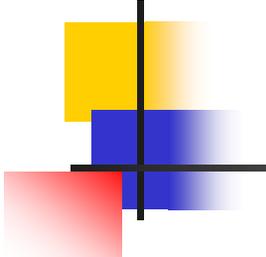
# Geographic Area Licensing

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- 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

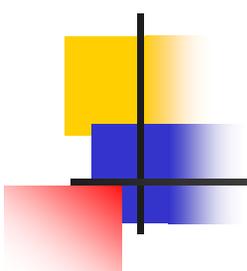




# FCC Auctions Authority

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- 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

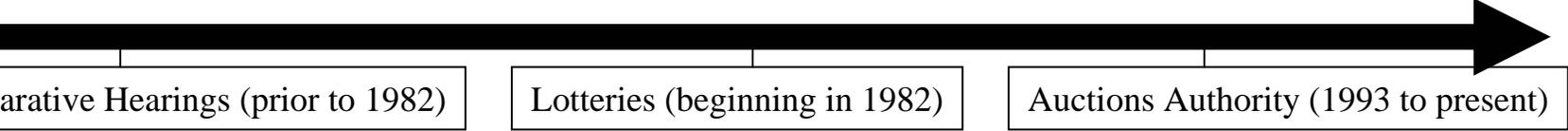


# Designated Entity Provisions and Bidding Credits

- 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

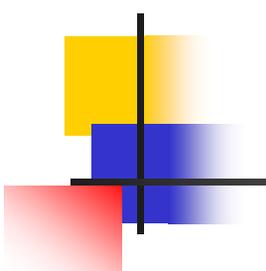
- Since the first spectrum auction was held in July 1994, the FCC has
  - Completed 53 auctions
  - Auctioned over 51,200 licenses
  - Deposited over \$14.4 billion in the US Treasury (as of 8/8/04)
  - Qualified over 2,700 bidders to participate



Comparative Hearings (prior to 1982)

Lotteries (beginning in 1982)

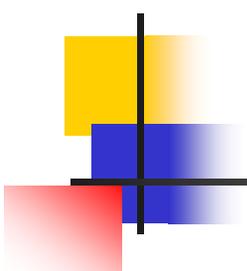
Auctions Authority (1993 to present)



# Future Auctions

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- 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

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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

## Universal Licensing System

[FCC](#) > [WTB](#) > [ULS](#)
[FCC Site Map](#)

Search:

 
[Help](#) - [Advanced](#)


### ULS Home

[About ULS](#)  
[FAQ](#)  
[Processing Utilities](#)  
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[Releases](#)  
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### ULS Downloads

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### ULS Online Systems

[CORES/Call Sign Registration](#)  
[ULS Online Filing](#)  
[Application Search](#)

### ULS Online Systems

★ New &amp; Improved

All applications are operating properly.

**REGISTER**  **CORES/CALL SIGN** Obtain an FRN and associate it with your call signs and ASRs.

**FILE**  **ONLINE FILING** Apply for a new license, renew, modify, transfer control and more.

[Filing Purposes](#) | [Batch Filing](#) | [Getting Started](#)
**SEARCH**  **LICENSES**  Find licenses using the **enhanced** license search across all services.

 **APPLICATIONS** Find applications.

 **ARCHIVES** Find archived licenses.

 Go to: [Antenna Structure Registration](#) | [TOWAIR](#) | [Ownership](#)

### Recent Releases

[All Releases](#) | [ULS Rulemakings](#) | [Weekly Public Notices](#)

4/9/2003

PUBLIC NOTICE (DA 03-1089)

[WTB Announces an Audit of the Operational Status of Certain 220 - 222 MHz Band Licenses](#)  
[pdf](#) - [Word](#)

3/25/2003

PUBLIC NOTICE (DA 03-873)

[WTB Releases Enhanced Attachment Interface for the Universal Licensing System and Ownership Filing](#)  
[pdf](#) - [Word](#)

1/17/2003

### Alerts

[CORES FRN Now Required for ASR & ULS](#)
[More Alerts](#)

### Downtime Schedule

No downtimes scheduled, with the exception of the Daily downtimes.

[Daily](#): 12:15 AM - 2:15 AM ET

### Current Audits

[Private Land Mobile \(PLMRS\)](#)

Stage: 2nd Letter Mailing Completed

### Technical & Licensing Support

[Tech Support Home](#)  
[Dialup Connections](#)  
[Getting Connected](#)  
[Help](#)  
[New Users](#)  
[Smart Updates](#)

### Accessing the System

 If you are having trouble accessing the system, contact [Technical Support](#).

# Universal Licensing System

[FCC](#) > [WTB](#) > [ULS](#) > [Online Systems](#) > ULS-GIS

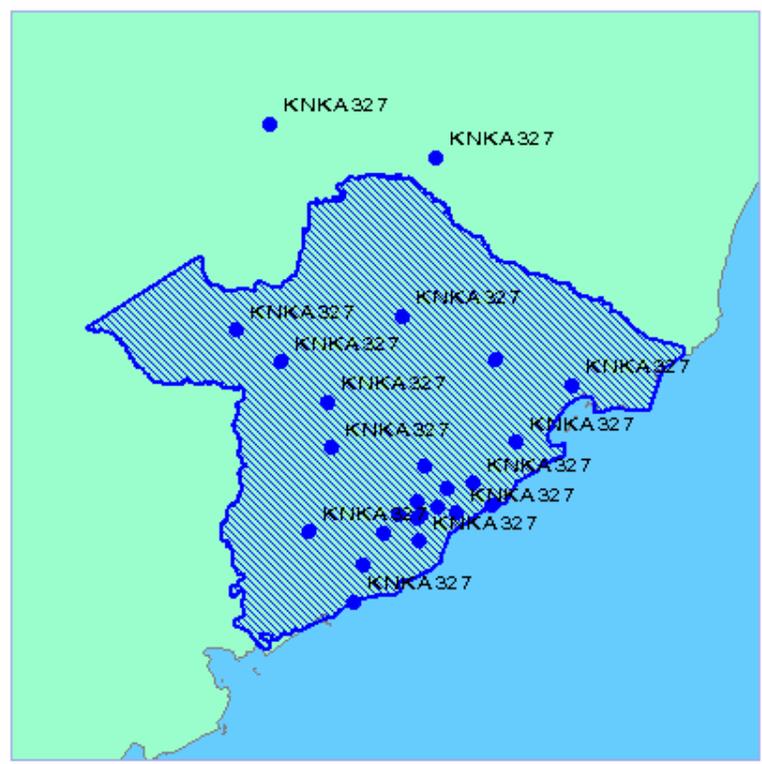
[FCC Site Map](#)

Cellular License - KNKA327 - Cellco Partnership

[? HELP](#)

## ULS-GIS

[New Search](#) [Refine Search](#) [Return to Results](#) [Return to License](#) [Printable Page](#)

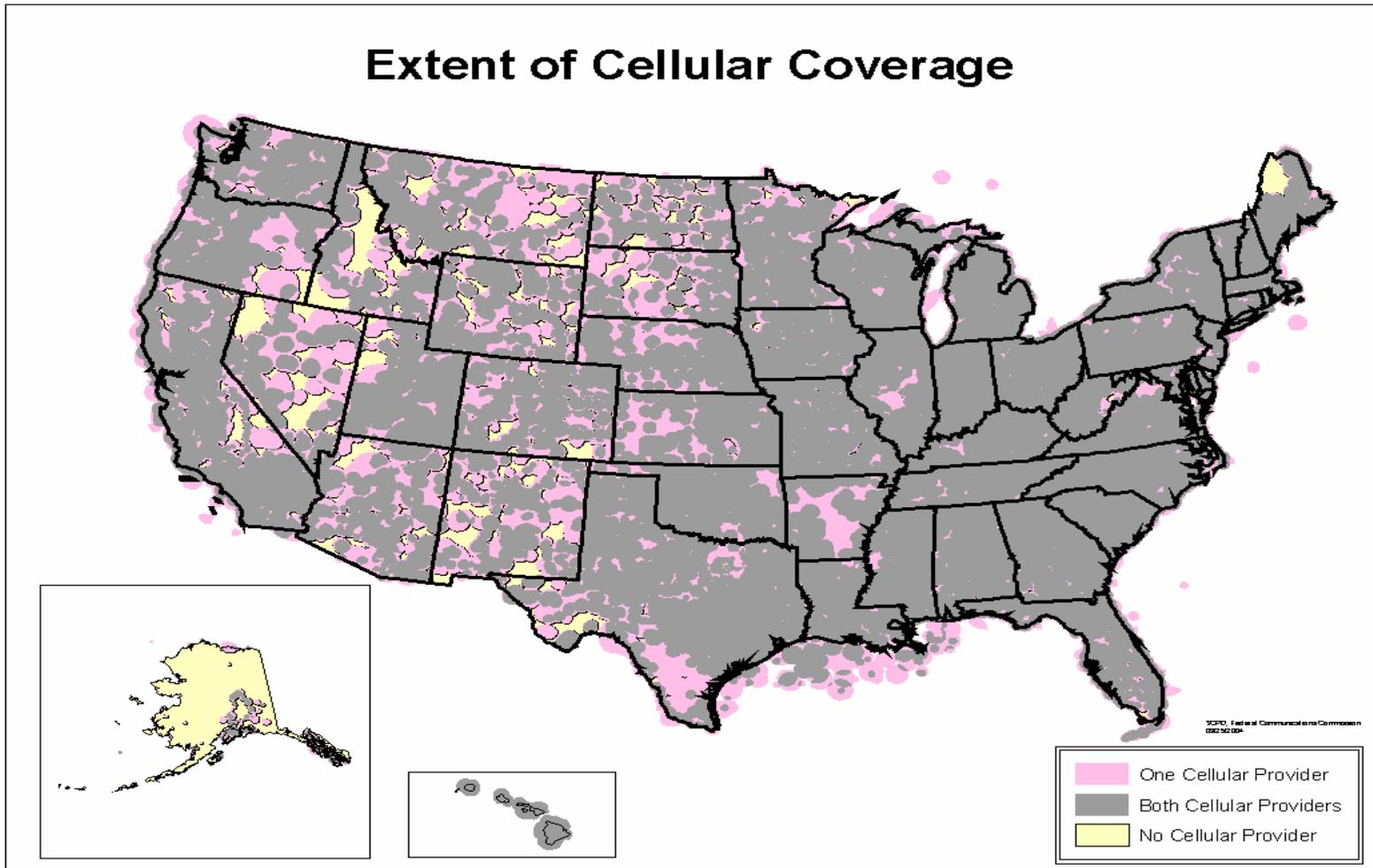


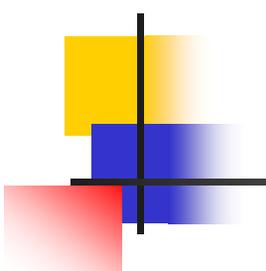
**Map Navigational Tools**

Select the tool you wish to use, and click on the map.

- Zoom In
- Zoom Out
- Drill Down
- ReCenter
- [Enlarge Map](#)

# Cellular Coverage

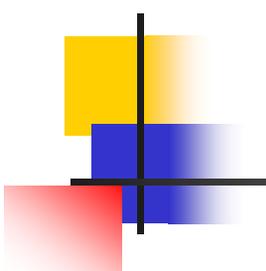




# Analog vs. Digital Cellular

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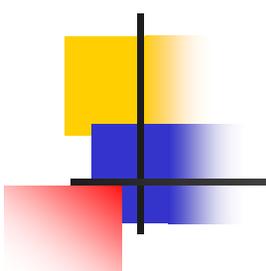
- FCC originally required all cellular carriers to deploy AMPS-based analog service
- AMPS requirement remains in effect, but will sunset in 2008
  - Nationwide carriers must report in 2006 and 2007 on whether they intend to continue providing AMPS after the sunset date
- Analog use decreasing, but .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



# Roaming

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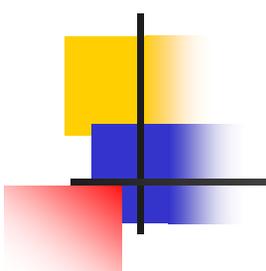
- FCC rule requires CMRS providers to support manual roaming by users of technically compatible equipment
- Automatic roaming not required by FCC rule, but is widely available
- Marketplace evolution has affected roaming dynamics
  - Nationwide carriers offer de facto roaming on their own systems
  -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



# Secondary Markets

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- 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

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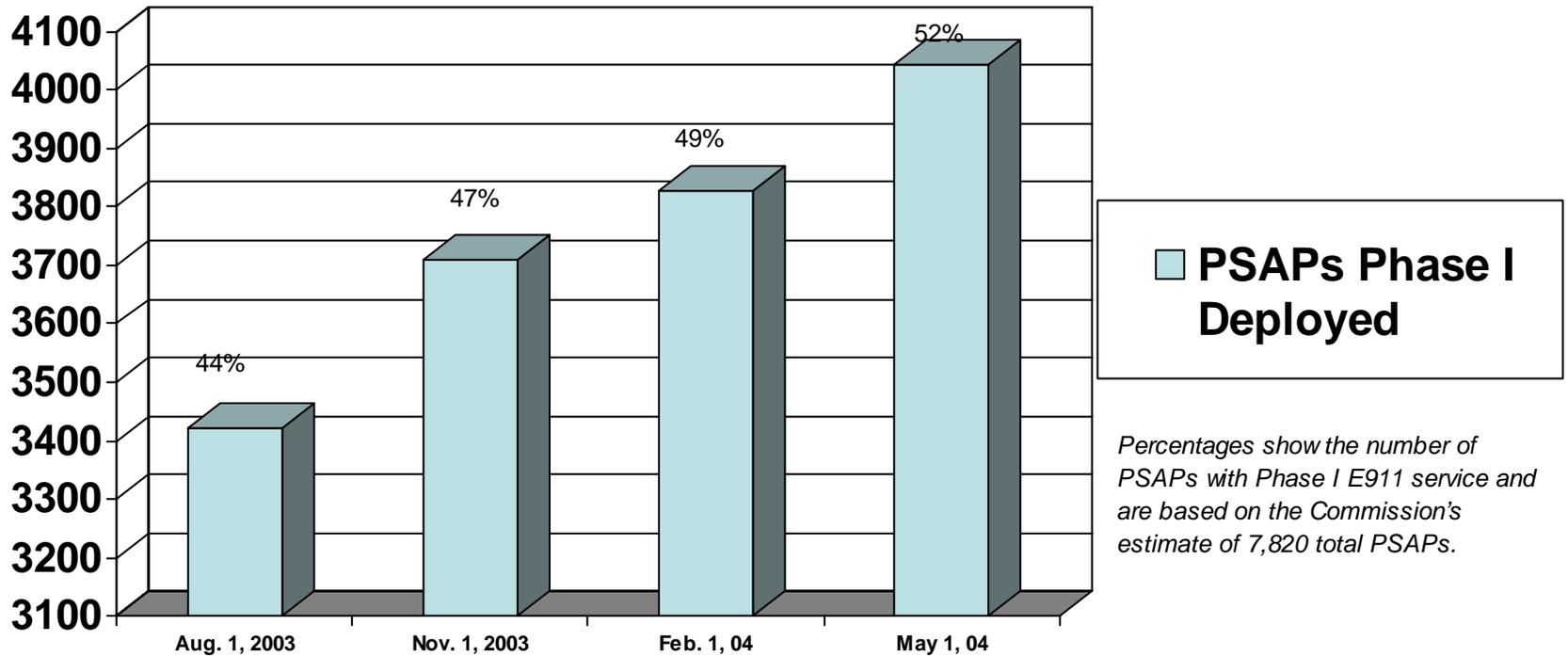
- Phase I

- 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)

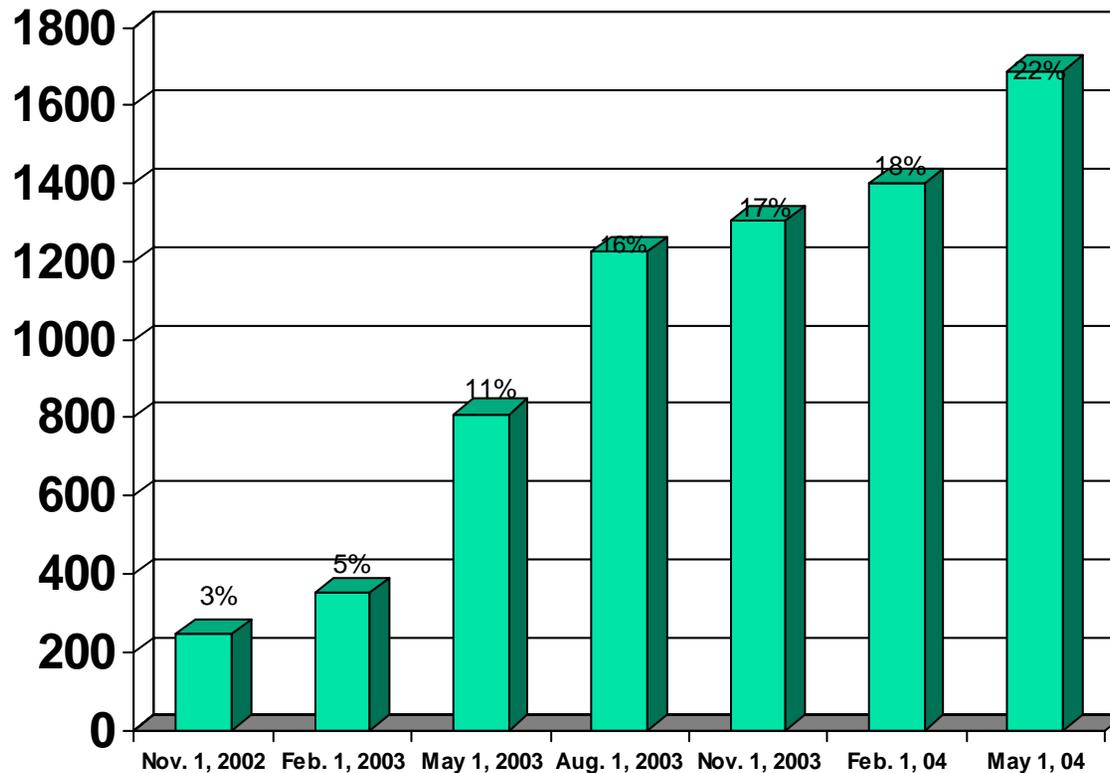
- Phase II

- 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

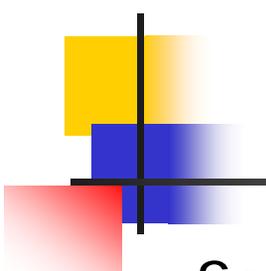


# Phase II E911 Deployment



**PSAPs Phase II Deployed**

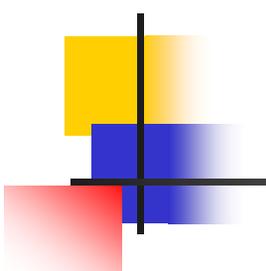
*Percentages show the number of PSAPs with Phase II E911 service and are based on the Commission's estimate of 7,820 total PSAPs.*



# Rural Report and Order

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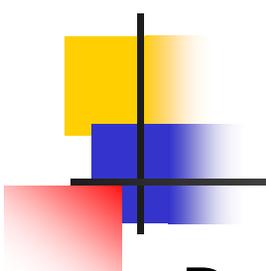
- Seeks to expand the availability of wireless services in rural areas by
  - Eliminating disincentives to serve or invest in rural areas
  - Helping to reduce the costs of market entry, network deployment, and continuing operations
- General definition of “rural area” for FCC purposes
  - County with population density of  $\leq 100$  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



# Outline

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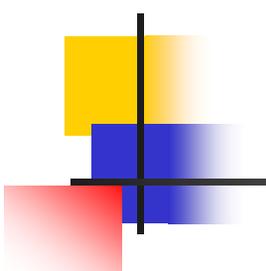
- Licensed Wireless Services
  - Auctions and ULS
  - Licensed Wireless Regulatory Issues
- Unlicensed Wireless Technologies
  - Part 15 Rules
  - Unlicensed Wireless Regulatory Issues



# “Unlicensed” Operations

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- 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

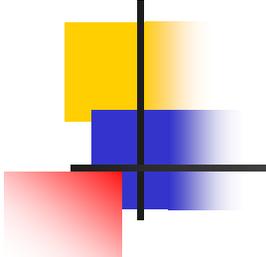


# “Unlicensed” Operations

## Part 15 Operating Conditions

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- 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

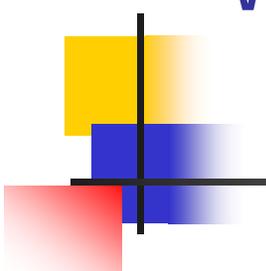


# “Unlicensed” Operations

## Controlling RF interference

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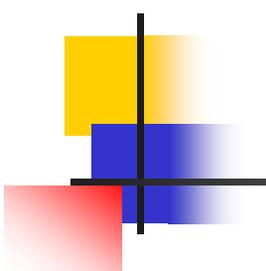
- Unlicensed devices have no vested right to continue using any frequency
  - Unlicensed devices generally share spectrum with other radio services
  - Interference to other services minimized by careful selection of frequencies and technical standards
  - But FCC has designated some bands for extensive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



# Wireless Technologies Operating on Unlicensed Spectrum

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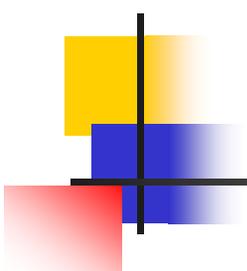
- Bluetooth
  - Peer-to-peer device communication (indoors up to 10m)
- Wi-Fi
  - Short-range wireless Internet access (hotspots, home networking, some WISPs)
- Wi-Max
  - Wireless networking (higher power and more capacity than Wi-Fi)
- Ultra-Wideband
  - “Underlay” technology using very wide bandwidth 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

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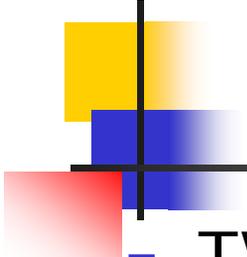
- Adequate spectrum
  - Number of devices operating directly affects user experience (reliability and speed)
  - More users per unit of bandwidth increases risk of congestion and interference (tragedy of the commons)
- Coverage
  - Unlicensed devices operate at very low power, so access to a nearby “backbone” 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

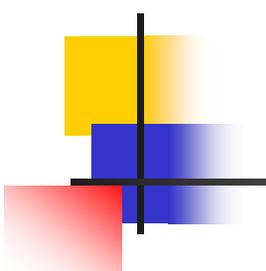
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- Wireless internet service providers (WISPs) can provide an alternative high-speed connection in areas where cable or DSL services have been slow to arrive.
- Report and Order adopted July 2004 amends Part 15 to facilitate use of unlicensed spectrum 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

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