

Wireless is Important

so

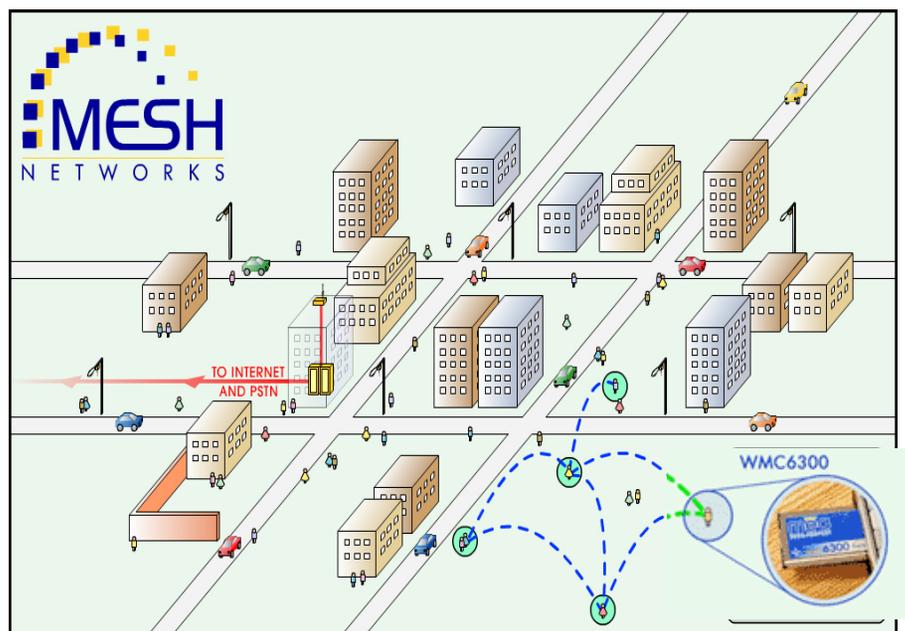
What Choices Need to be Made?

September 28, 2004

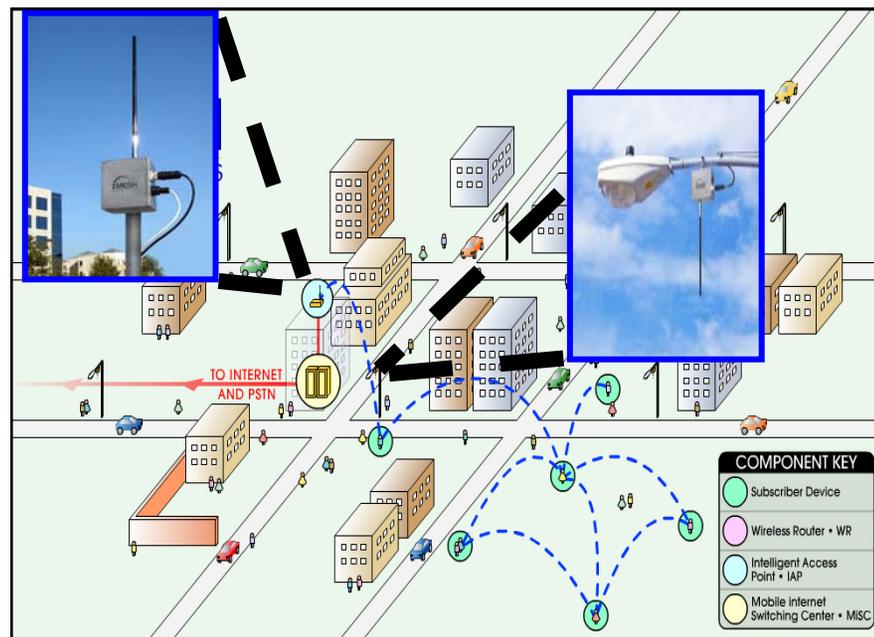
Mesh Technologies Networks Ad-Hoc Technologies

- Two modes of operation
 - Multi-hop Ad-Hoc (without infrastructure)
 - 6Mb/s peak rate
 - Mobile Broadband Infrastructure using multi-hop routing

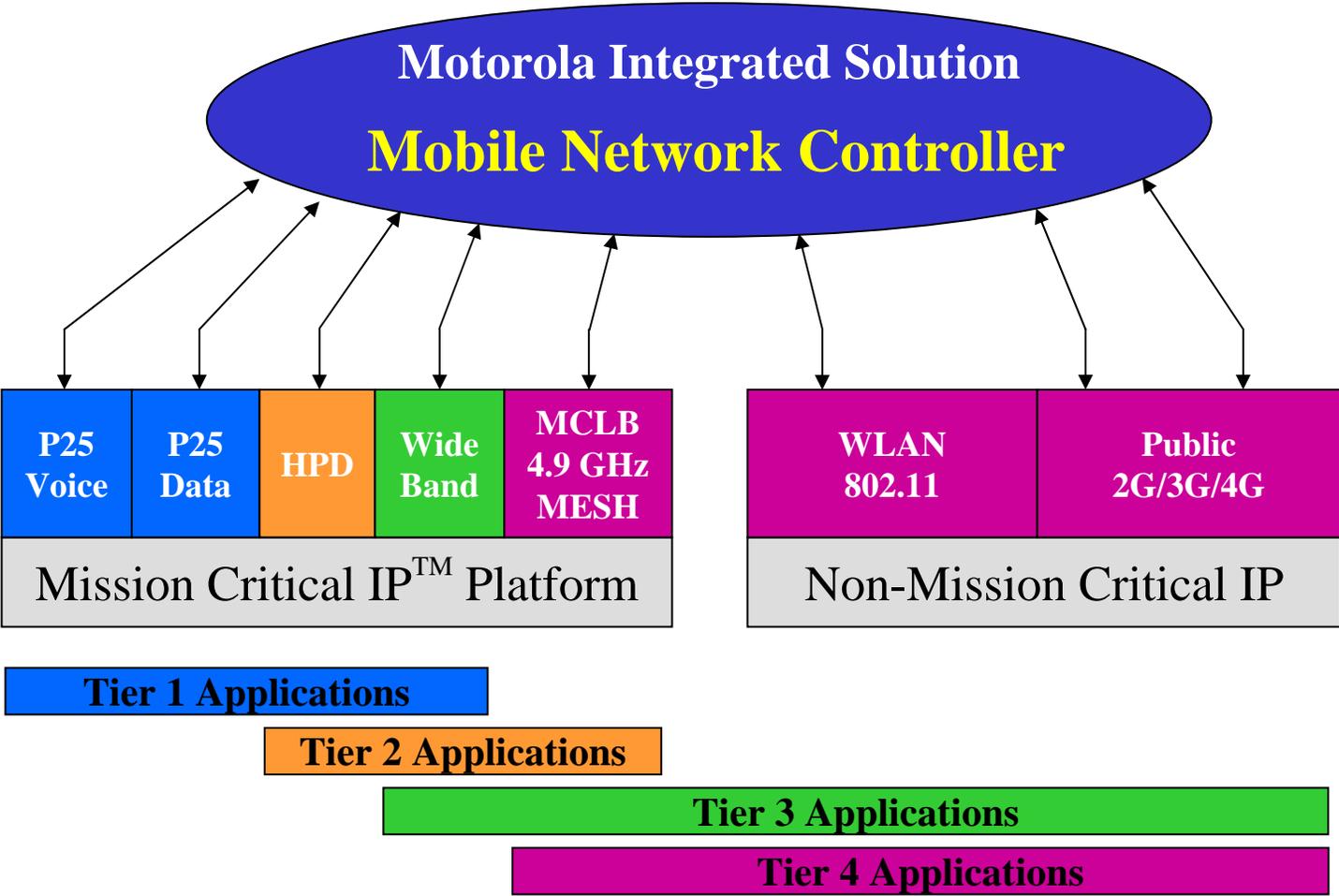
Ad-Hoc Peer to Peer



Mobile Broadband Infrastructure



Seamless Integrated IP Solution



What Should Your Data System Do?

- Coverage
 - Same as Voice
 - Possible Hot Spots
 - Specific to Application
- Mobility / Roaming / Wide Area Capabilities
 - ANY Data Network
- IP Connectivity

What Should Your Data System Do?

- Self Forming / Self Healing
 - Ad-Hoc
- Migration from / including Existing System
- Data Speeds
 - Pertinent to Applications
 - » 19,200 bps
 - » 96,000 bps
 - » 240,000 bps
 - » 1 – 54 Mbps

What Should Your Data System Do?

- Allow You to “Mix & Match”
- One Size DOESN’T Fit All
- Flexibility is Key

Any Additional Questions?

700 MHz Wideband Data

- Network management
- Licensed spectrum
- Security
- Custom coverage & capacity
- Control



Mission Critical IP™ Platform

Non-Mission Critical IP

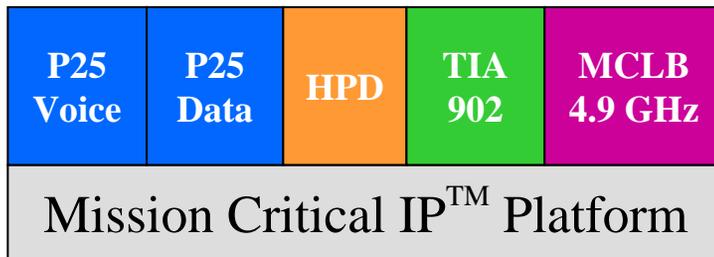
Tier 1 Applications

Tier 2 Applications

Tier 3 Applications

Mission Critical Local Broadband (4.9 GHz)

- Network management
- Licensed spectrum
- Security
- Custom coverage & capacity
- Control



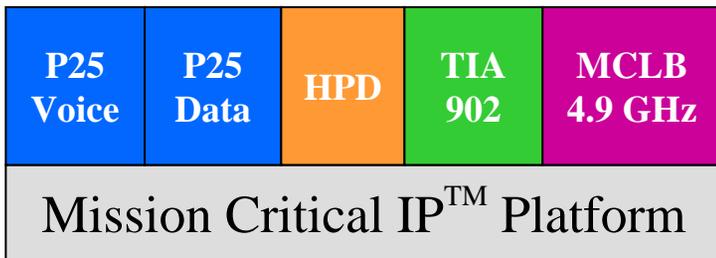
Tier 1 Applications

Tier 2 Applications

Tier 3 Applications

Tier 4 Applications

Wireless LAN (802.11)



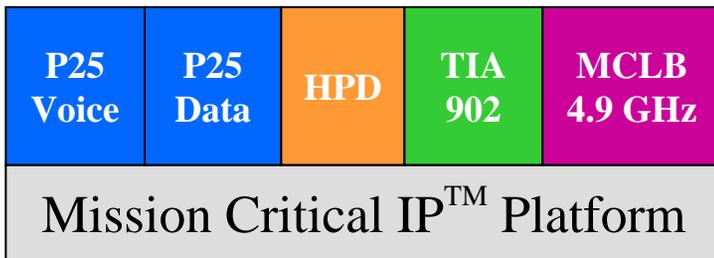
Tier 1 Applications

Tier 2 Applications

Tier 3 Applications

Tier 4 Applications

Seamless Integrated IP Solution



Tier 1 Applications

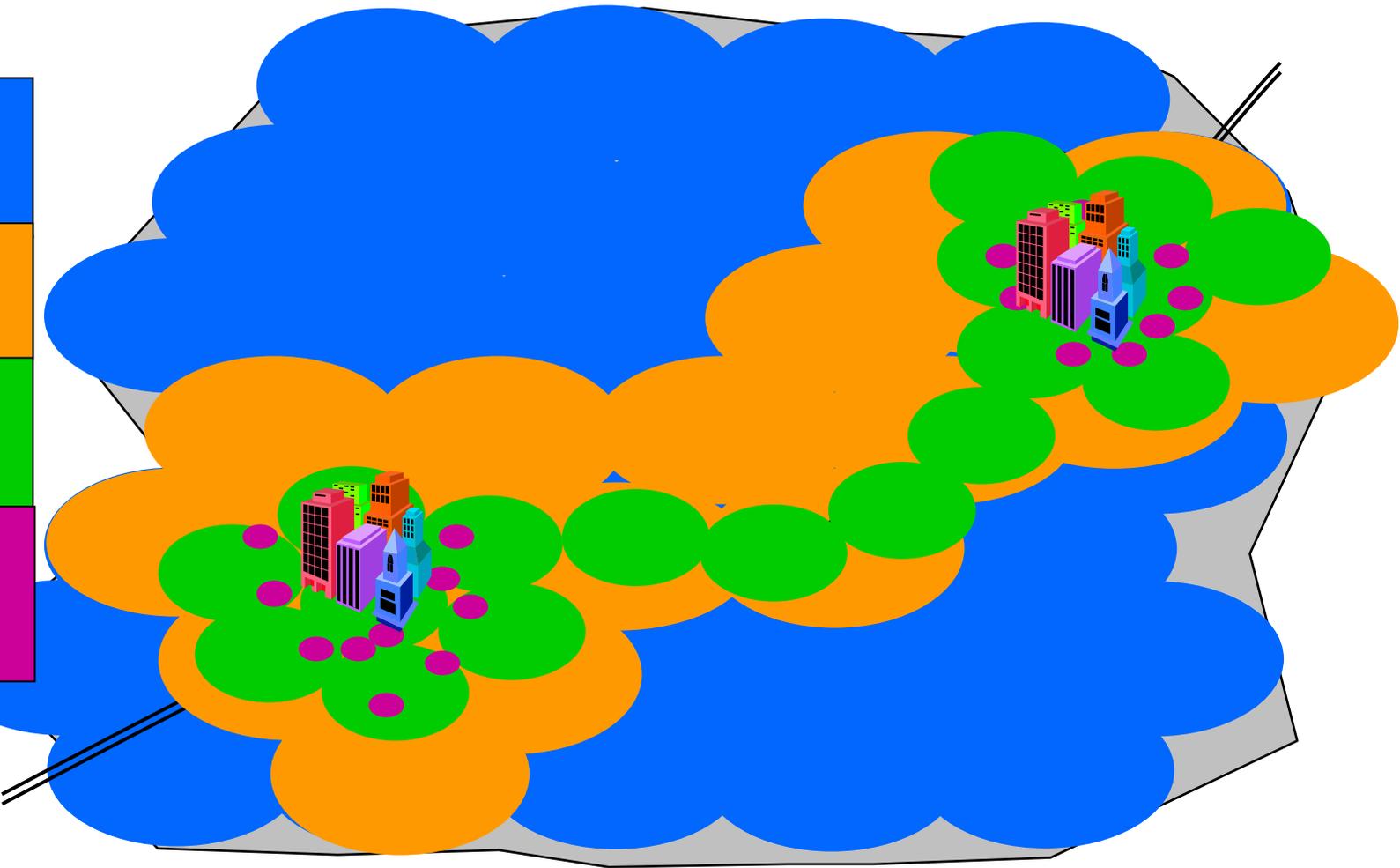
Tier 2 Applications

Tier 3 Applications

Tier 4 Applications

Broadband Coverage

ASTRO V&D 9.6 kbps
HPD 96 kbps
Wideband up to 230 kbps
4.9 GHz Up to 50 Mbps



4.9 GHz Attributes

- Licensed spectrum dedicated to public safety
 - Better performance for congested areas
 - Maximize reuse of frequencies
 - Increased range due to higher power
- Greater security based on 802.11i
- Higher data transfer rates
- Excellent complement to wide area

Trunked Voice & Data

- Network management
- Licensed spectrum
- Security
- Custom coverage & capacity
- Control

**P25
Voice**

**P25
Data**

Mission Critical IP™ Platform

Non-Mission Critical IP

Tier 1 Applications

High Performance Data

- Network management
- Licensed spectrum
- Security
- Custom coverage & capacity
- Control



Mission Critical IP™ Platform

Non-Mission Critical IP

Tier 1 Applications

Tier 2 Applications

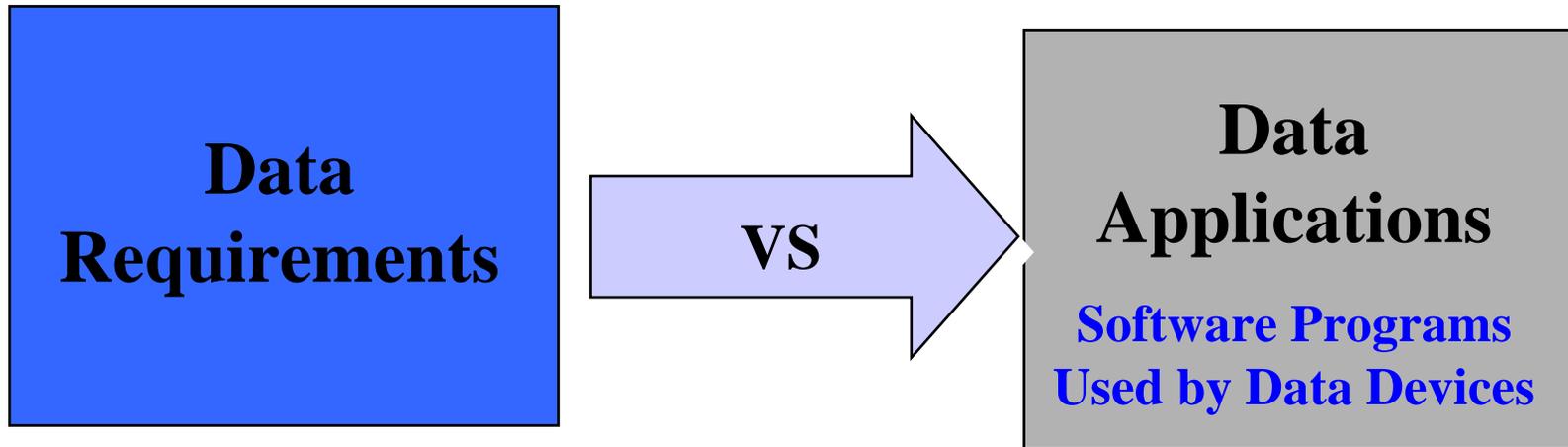
Data Technologies

- **IV&D** – Integrated Voice & Data
 - Both Voice & Data Share One Common Infrastructure
- **HPD** – High Performance Data
 - New High Speed Data in 800 MHz Band
- **Wideband** –
 - New Public Safety 700 MHz Spectrum Channels used for High Speed Data
- **Broadband** – Lots of FCC Frequency Spectrum needed to send Lots of Data
 - 2.4 GHz
 - 4.9 GHz (**Public Safety**)
 - 5.1 GHz

5 C's of Data

- Control
 - Upgrades / Service / Maintenance
- Coverage
 - Specific to Requirements
- Capacity
 - Support ALL Users
- Capability
 - Functionality Required
- Security
 - Keep out Hackers

Data Requirements vs. Data Capabilities



Data Requirements vs. Data Capabilities

**One Size
OR
Mix & Match**

**Data
Applications**

VS

**System
Technologies**

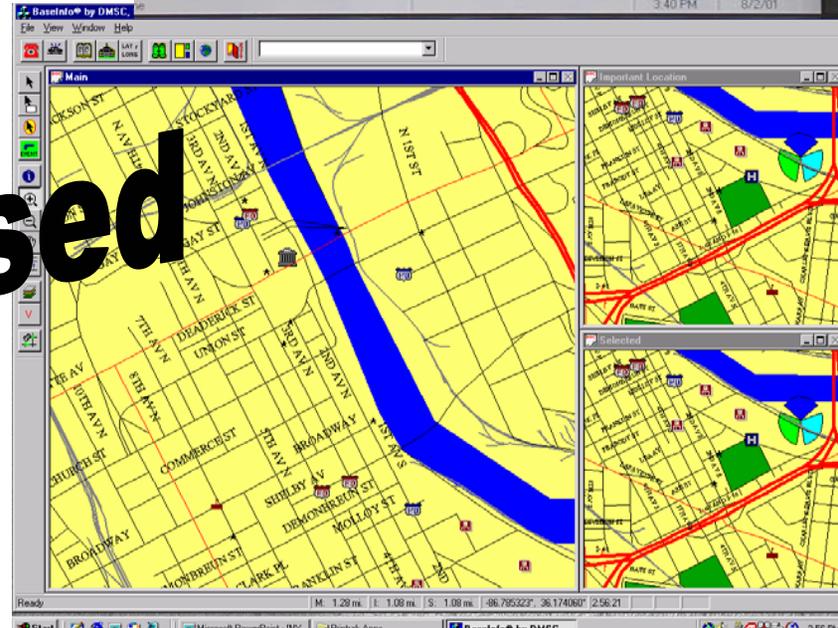
**Integrated
High Performance
Wideband
Broadband**

Integrated Data

Today's Data Applications

- AVL (Automatic Vehicle Location)
 - Using GPS
- CAD (Computer Aided Dispatching)
- Reports
- Meter Readings
- House Addresses
- Database Access
- Text Messaging

Mainly Text Based



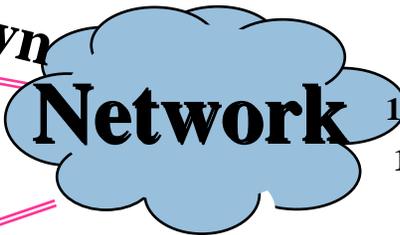
Integrated Voice and Data



10-4



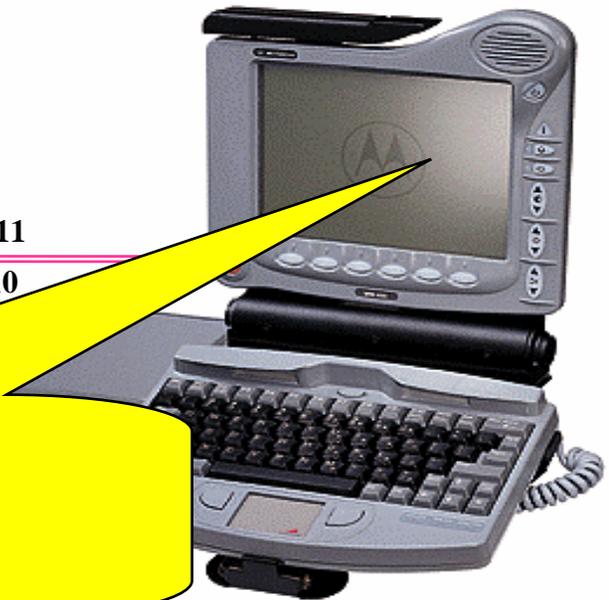
Line Down



10101 101010100 1010010 1011
10101 101010100 00011010 10



**Line Down
Interstate 90**

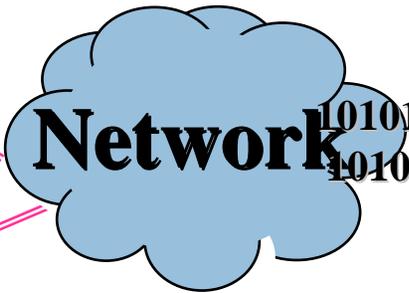


ATS – Alphanumeric Text Messaging



10-4

Assist Unit 2



10101 101010100 1010010
10101 101010100 0001101

10-4



Additional Data Requirements

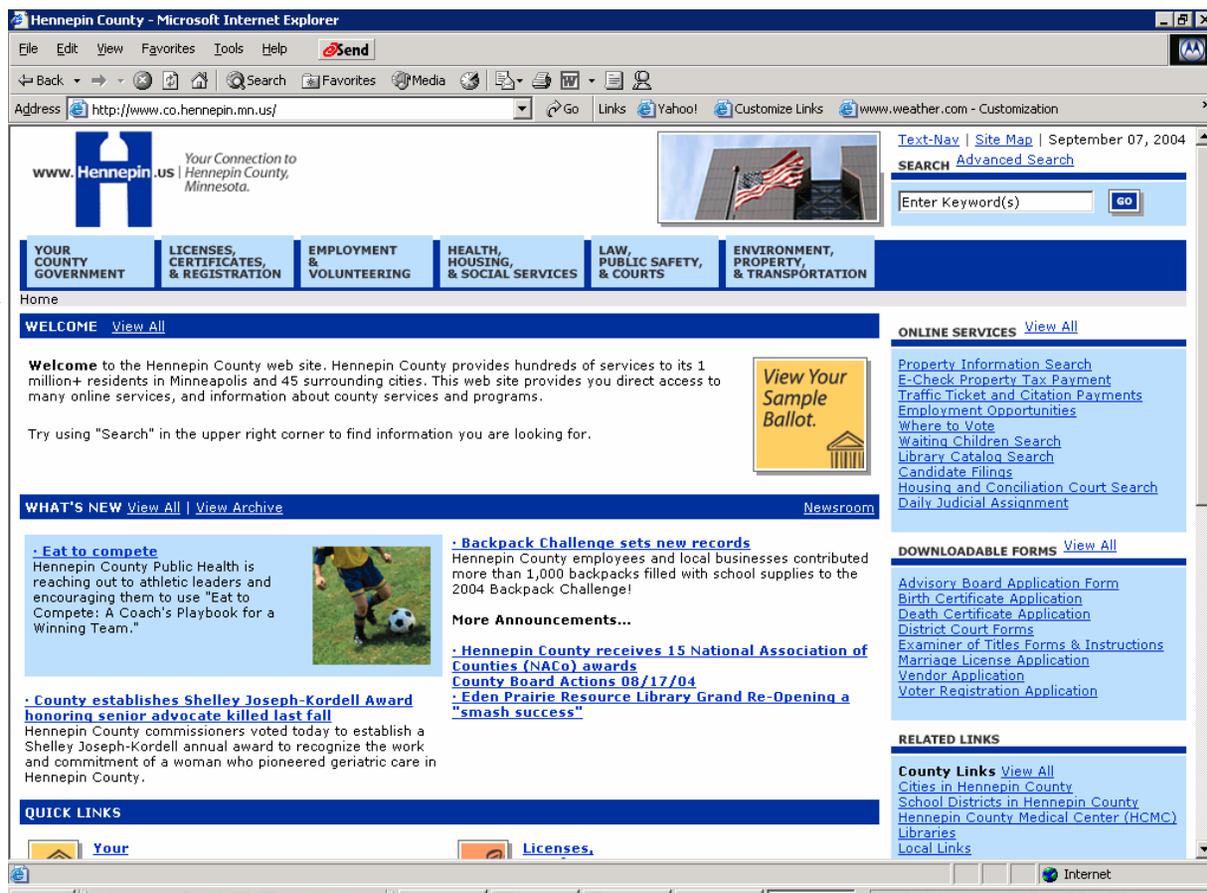
- Long Term Applications
 - Video Transmissions
 - » Mobile to Mobile Teleconferencing
 - » Weather Channel
 - Pictures / Graphics
 - Internet / Intranet
 - » Database Access

High Performance Data – 96,000 bps

- All Same ‘Text-Based’ Applications as Trunked Data

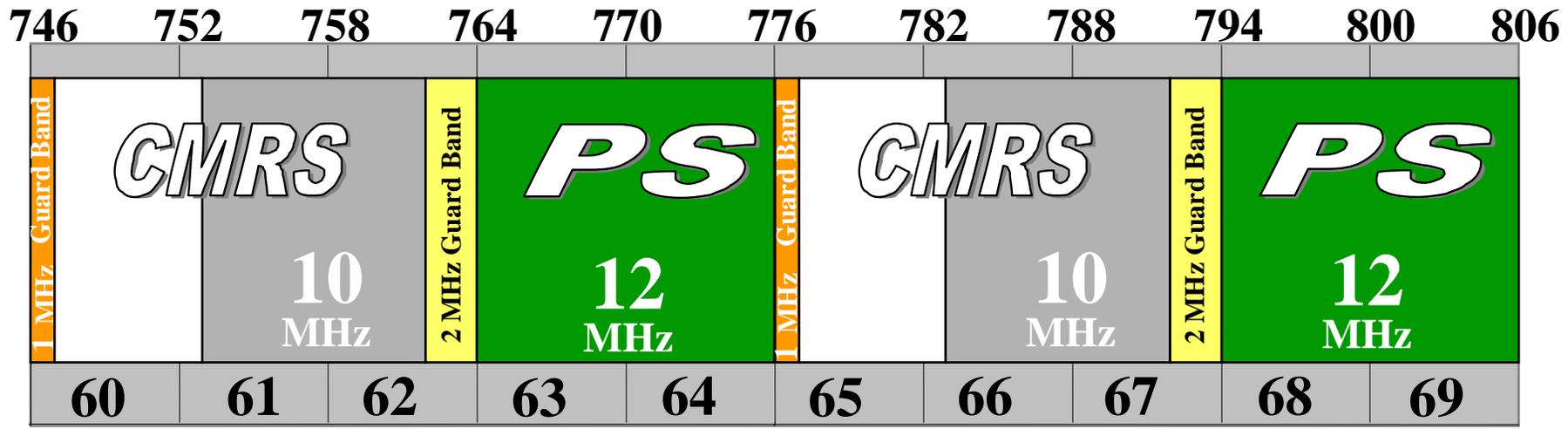
- Plus

- Graphics
- Building Maps
- Internet / Intranet
- Enhanced AVL
 - » More Users
 - » Faster Updates
- Pole Locations
- e-mail



What About Video Transmissions?

FCC 746-806 MHz Band Plan



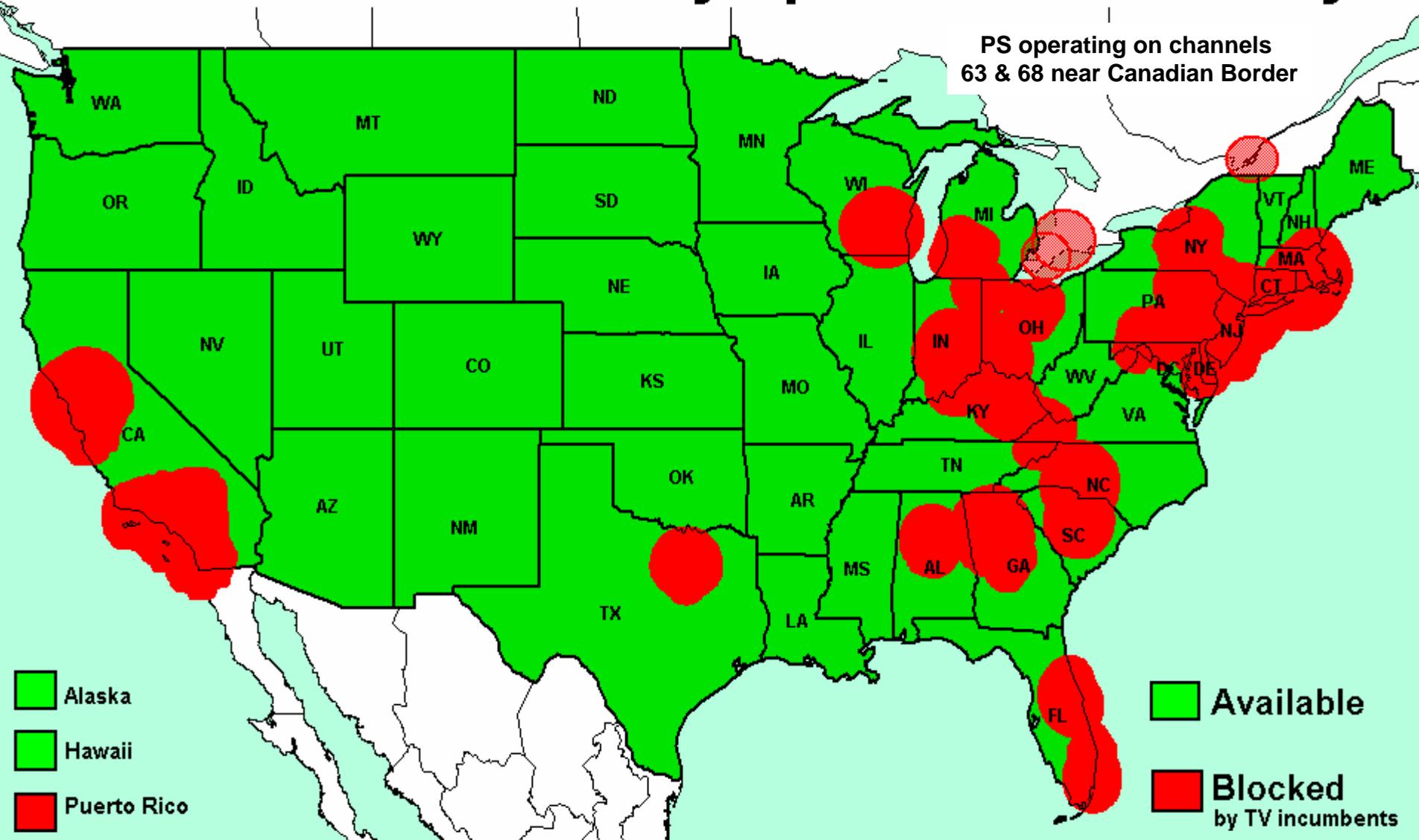
Public Safety
Mobile Receive

Public Safety
Mobile Transmit



764 MHz 767 MHz 770 MHz 773 MHz 776 MHz

700 MHz Public Safety Spectrum Availability



Blockage by US, Canadian, & Mexican TV Stations

Green area means at least half of the 24 MHz at 700 is available today

Cleared in Canada:

all analog TV stations on 63 & 68

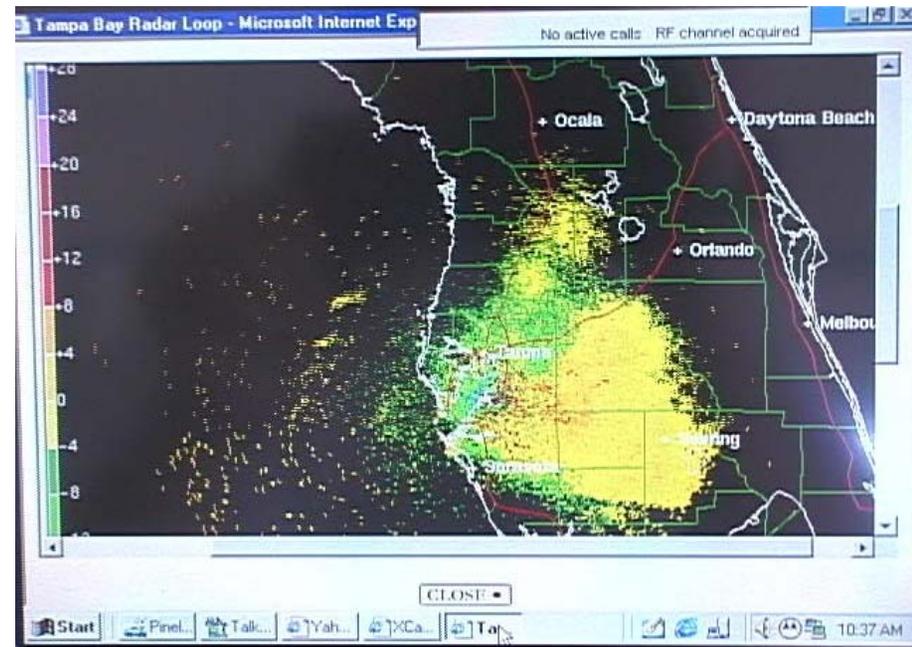
all DTV stations on channels 62, 63, 64, 65, 67, 68, & 69

Remaining in Canada:

analog TV stations on 62, 64, 65, 67, & 69

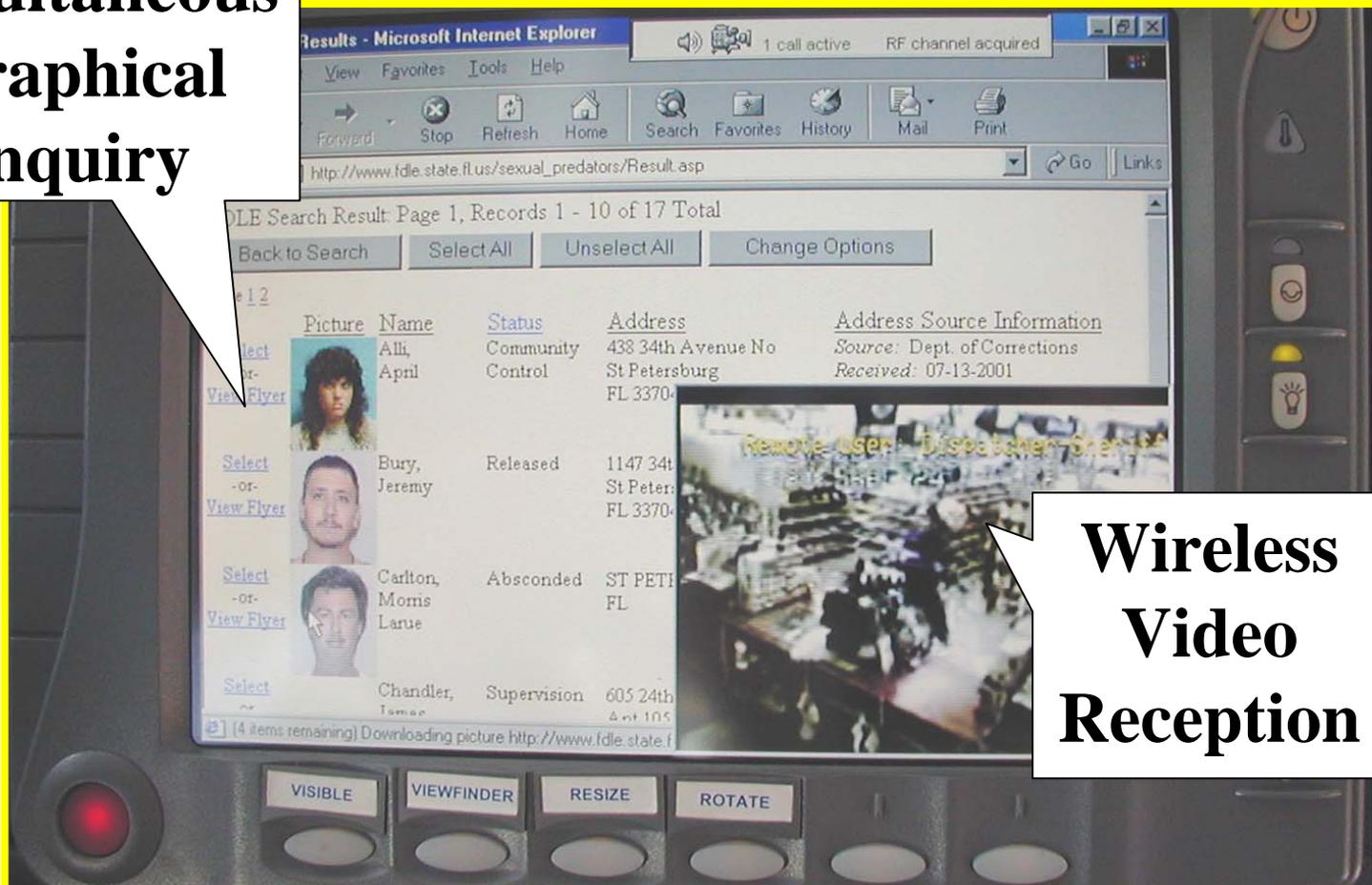
Wide Band Data 230,000 bps

- All Same Applications as High Performance Data
- **Plus Video**
 - Video Conferencing
 - Video Downloads
 - » CNN
 - » Weather Channel
 - Situational Monitoring



Video Update – Database Inquiry

**Live
Simultaneous
Graphical
Inquiry**

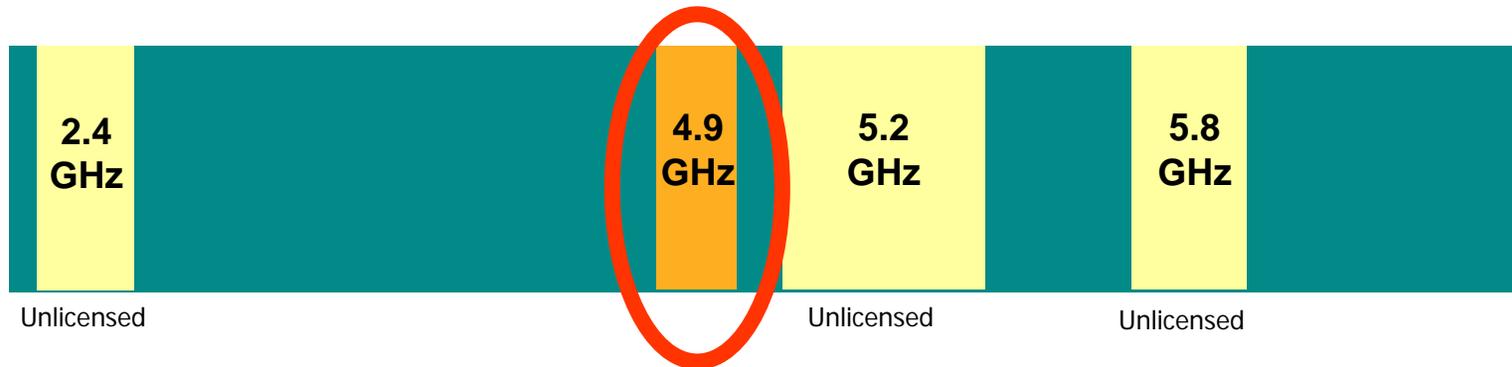


**Wireless
Video
Reception**

Broadband (WiFi) Technologies

Licensed & Unlicensed

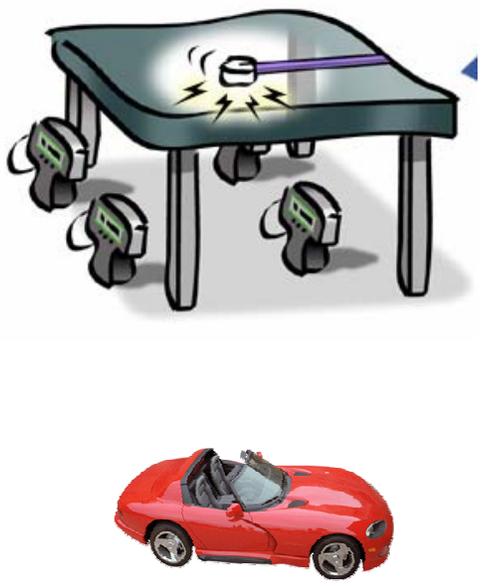
4.9 GHz Band Plan



- February, 2002:
 - FCC designates 50 MHz of spectrum at 4.9 GHz for broadband public safety use
- Standards still being Finalized

WLAN Technologies

Unlicensed/Enterprise



Public Safety Hot Spots



Unlicensed/Enterprise



Home

2.4GHz

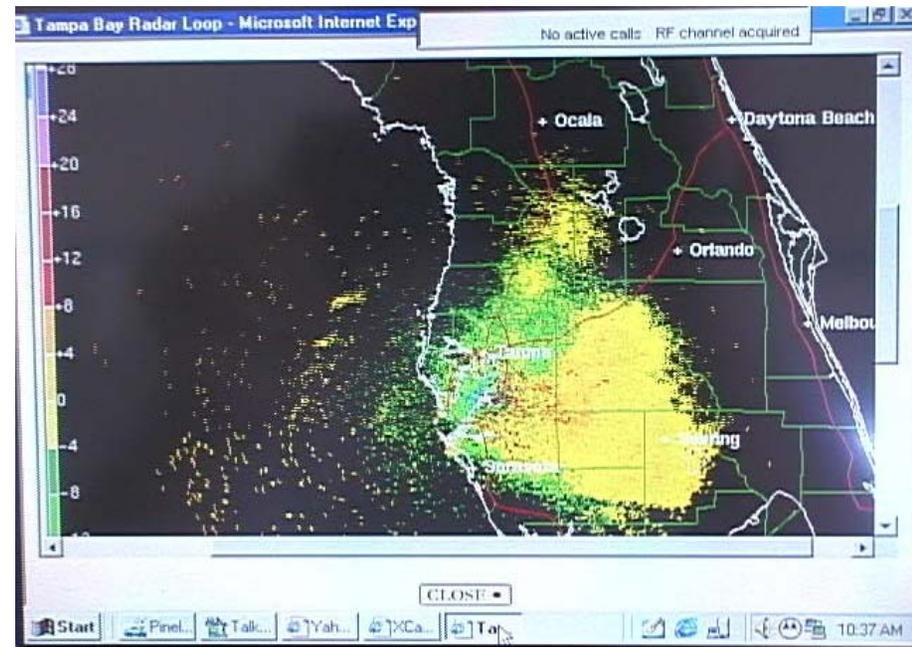
4.9GHz
US Pub Safety

5.2GHz

5.8GHz

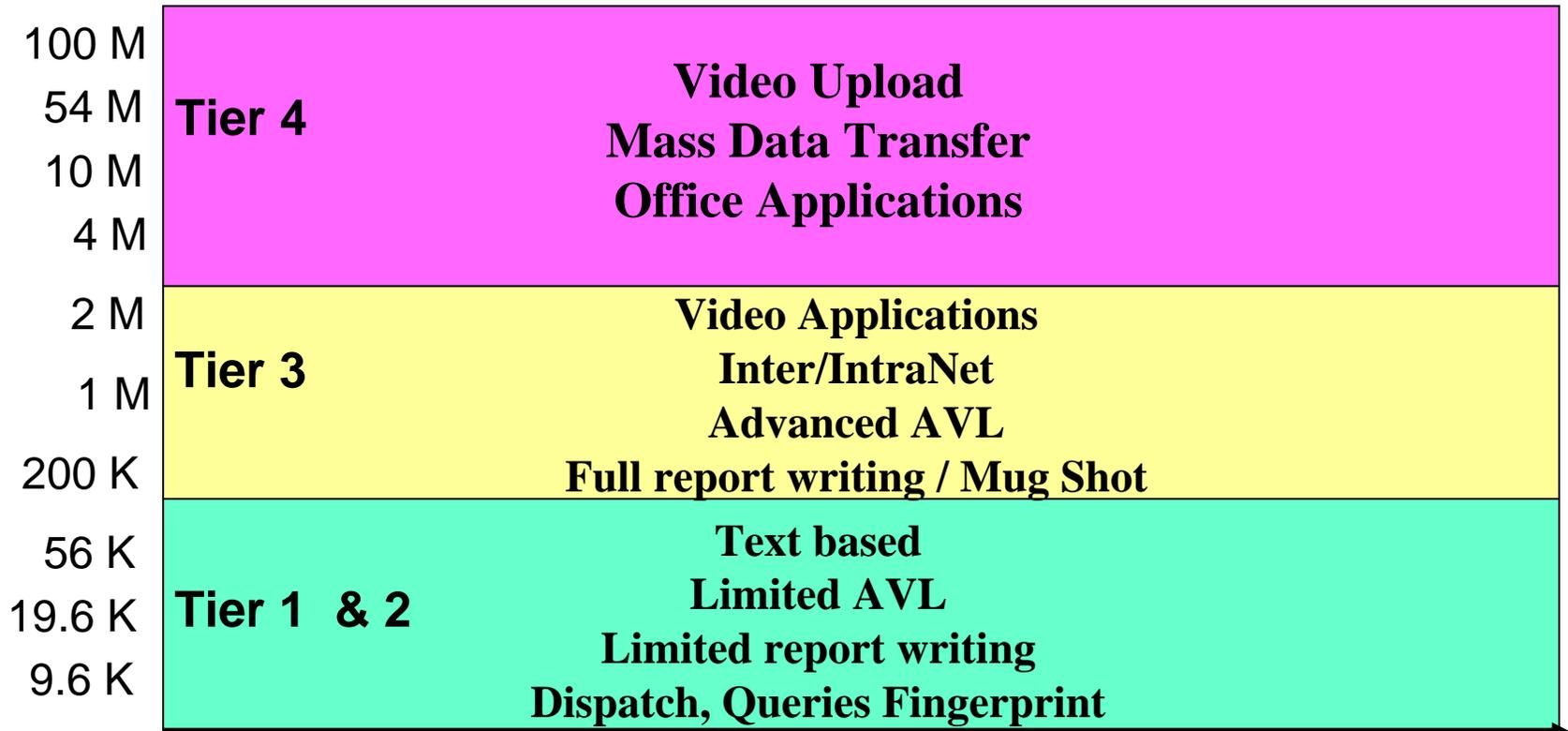
Broadband Data 1M+ bps

- Massive Upload / Download Possibilities
- Enhanced Video / Real time

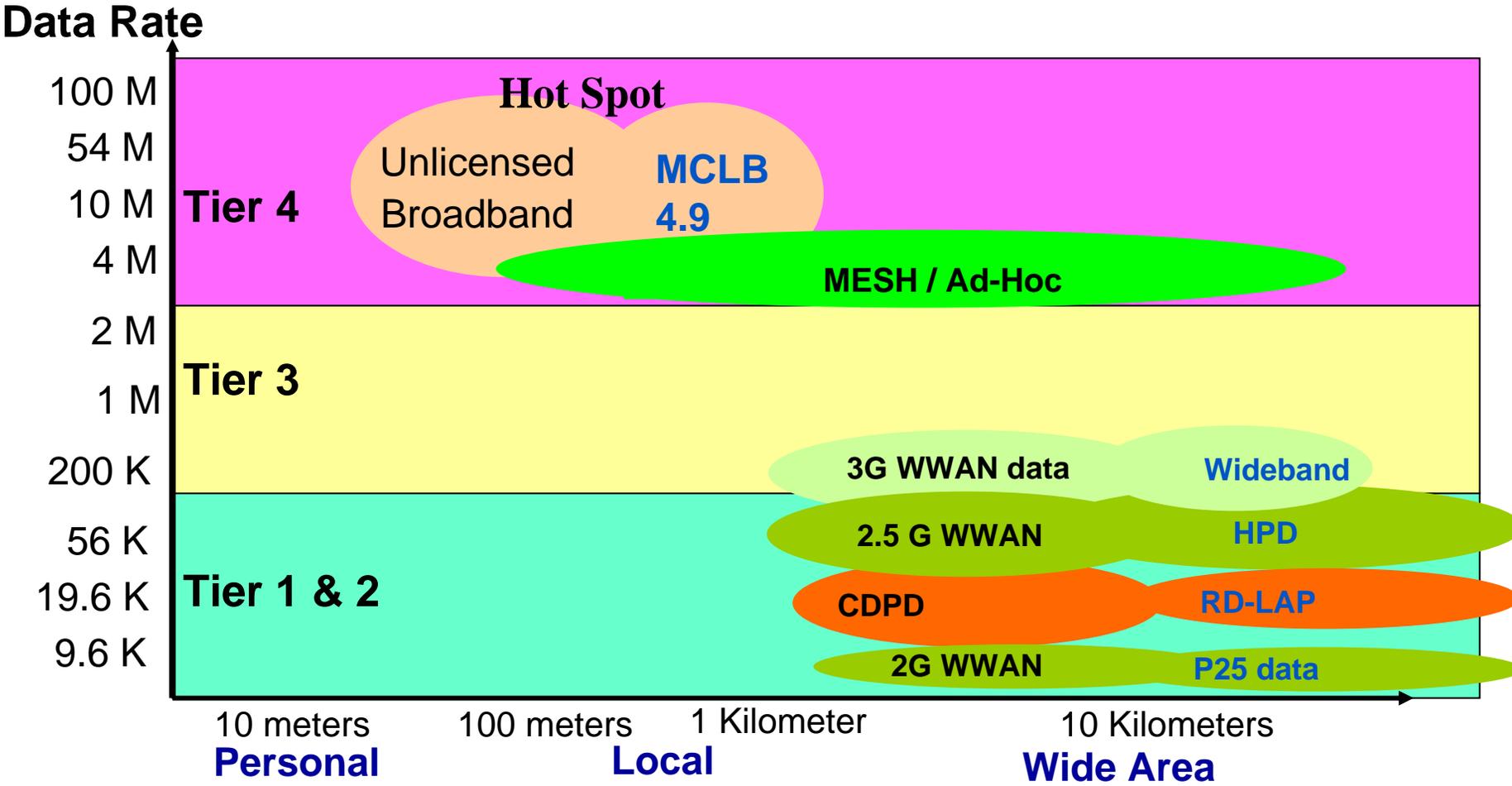


Application (Software Programs) Tiers

Data Rate



Data Options



Coverage