



Advanced Communication Systems for public safety

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Public Safety - Communication

- Public Safety functions
- Communication – end user needs
- New Communication technologies
 - 60 GHz / 80 GHz Gigabit wireless links
 - Intelligent Transport System spectrum
 - AVL in metro area
 - Passenger information systems
 - Vehicle health / safety reporting system



Public Safety functions

FCC Region-8 coordinates spectrum licenses of public safety users in CT, NJ, NY.

Responders to emergency

- Police – security, crime, safety, traffic
- Fire – fighting fire, hazard clearance,
- EMS – Ambulance and life support

Emergency Support services

- Transportation – MTA, NJ Transit, Port Authority
- Hospitals – emergency care
- Community services – elderly homes, others

All agencies work within Reg-8 to ensure that they don't interfere with each other.

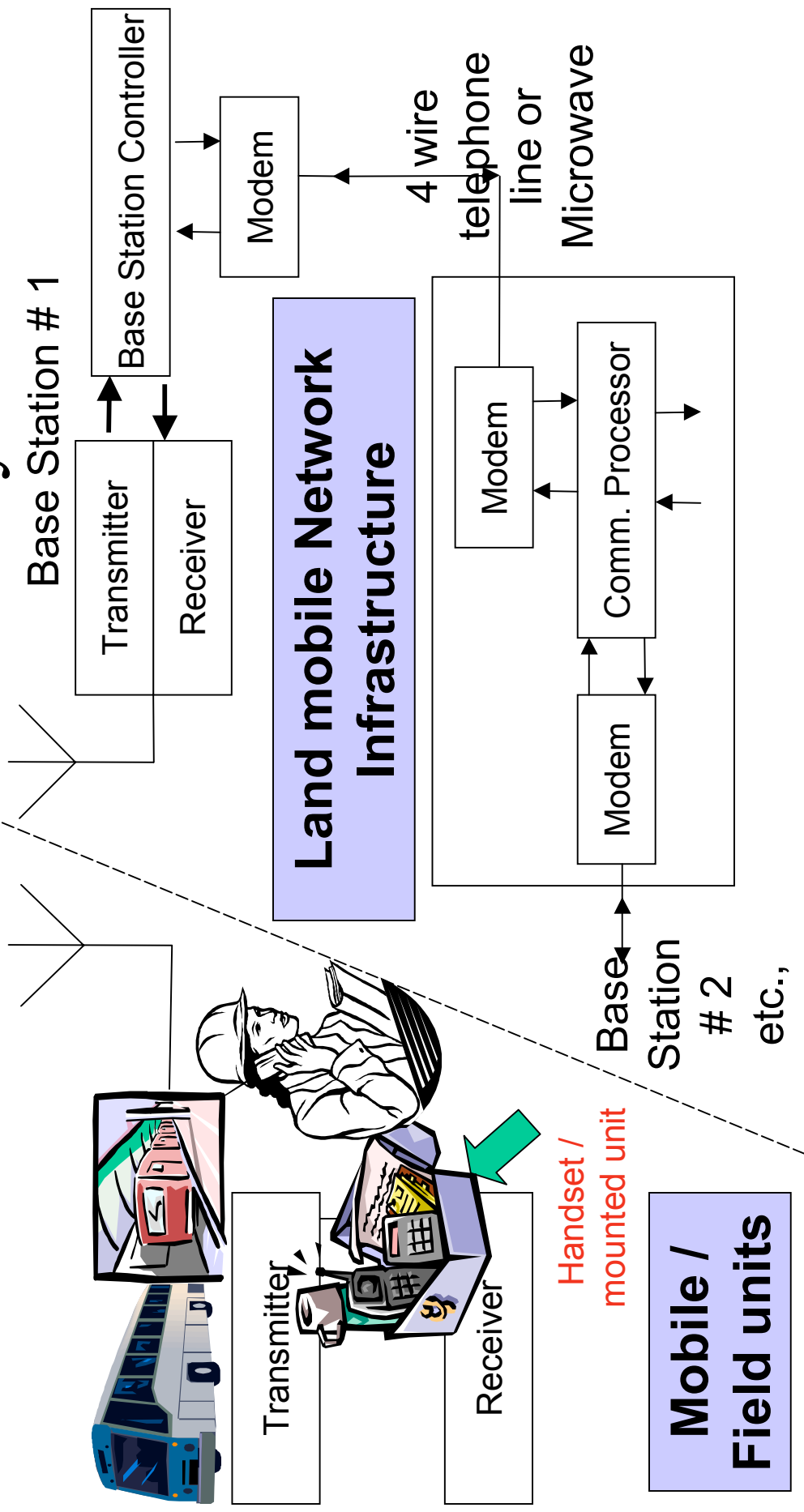


Communication – end user needs

- One-on-One and One-to-many conversations – professionals need Land Mobiles at work
- Wireless Tablets are needed for field personnel
- RFID devices for scanning (vehicle / card)
- Vehicle location services – for fleet management
- CCTV wireless links and Number plate recognition – security personnel
- Cell phones – public / official use (cellular system offers automatic priority channel allocation to public safety during emergency)



Land Mobile Communication One-on-One and One-to-many handsets





Land Mobile Communication

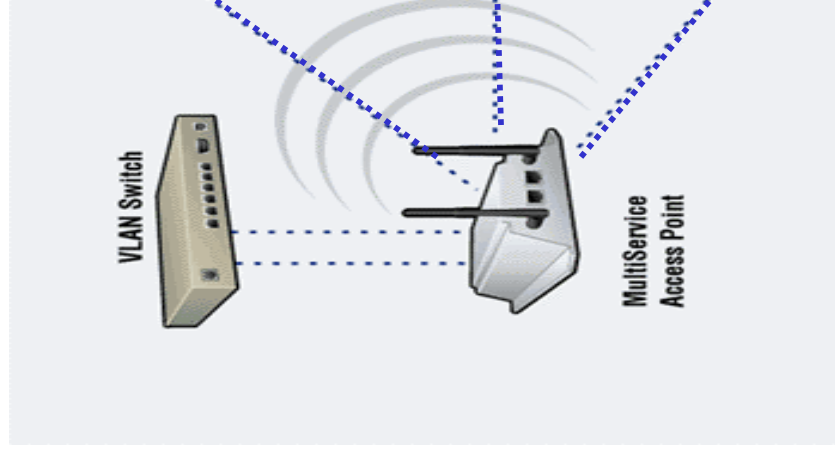
One-on-One and One-to-many handsets

- Mostly Push-to-talk communication (Walkie-talkie type of handset) between driver and control center.
- Dispatcher / controller can multicast announcements or conference with a sub group of drivers on a route
- Police, Fire and Transport agencies operate in licensed bands of VHF, UHF and 800 MHz
- Stable and reliable communication – now converting to digital systems for increased capacity
- Most communications are within the region – system supports interoperability channels between agencies
- New allocations in the 700 MHz band by the FCC



WLAN – Networks

4.9GHz Wireless Tablets for field personnel



Laptop with access to Patient Records, ambulance vehicle location, site video

Laptop with access to Records, police vehicle location

Tablet with access to data base – train / bus travel help info



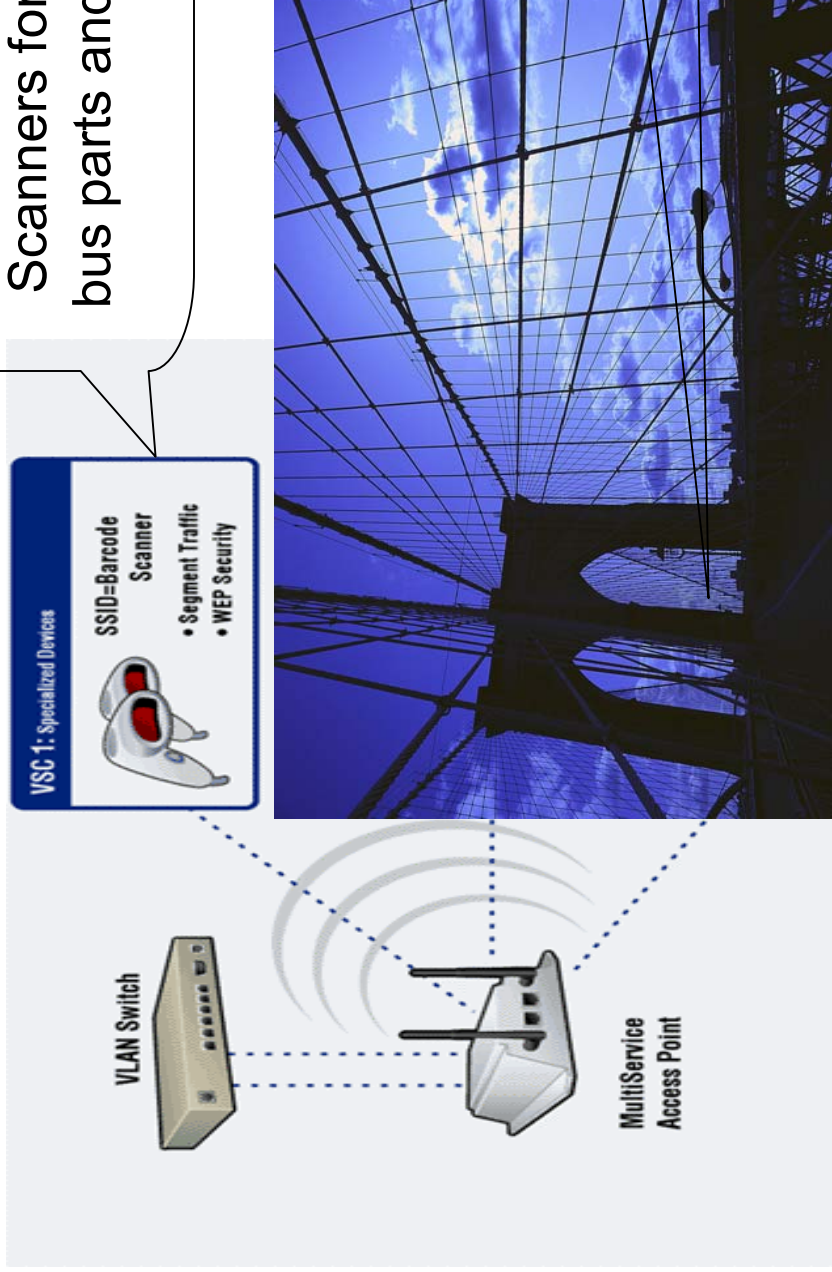
WLAN - Networks

4.9 GHz Wireless Tablets for field personnel

- Post 911 the 4.9 GHz band was licensed for mobile broadband for public safety agencies – used mobile access during an emergency and temporary back haul from site of incident.
- Full mobility – including helicopter speeds.
- Used in bus depots / rail yards / train stations to connect WLAN devices to their Intranet.
- Not accessible by general public – secured broad band system (like WiFi but on a licensed band)



RFID - Scanning devices



RFID - Scanning devices

- Metro Card swipes – passenger counting including transfer, expiry, elderly rate etc.
- Metro Card swipes – employees / on-duty persons are monitored (based on projects)
- Scanners connect to maintenance shop data bases – provides vehicle health info
- Toll booth RFID scanners for high speed (EZ pass) connect to traffic data base, user account and other services.



Vehicle location

- Used on trains for both signaling and passenger information boards
- Automated train control – self driven. Reduces distance between trains to 90 seconds
- Used by rail car maintenance personnel (whenever crew or train health parameters indicate any problem)
- Used by bus dispatchers to deploy additional vehicles during peak hour traffic. Used by maintenance personnel if bus breaks down.



CCTV wireless links and Number plate recognition - Security

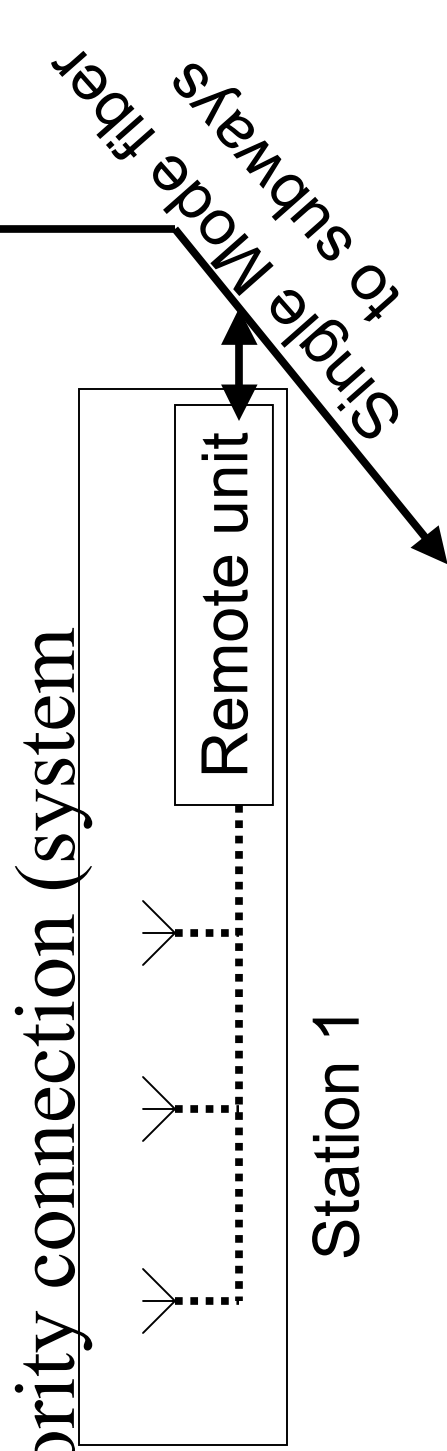
- Multiple CCTV cameras used for property protection - connected by wireless links for viewing at security booths
- Used in rail yards to monitor portal and gates
- Police cars use car mounted cameras to view vehicle number plates to track suspects
- Traffic cameras connected by wireless links for connection to the Internet / traffic control



Cell phones - public / official

To switches
Base Station Hotel

- Cell phone calls in the subways – offered in a few systems – under evaluation
- SMS on train / bus delay and weather related changes – currently available
- Handsets used by emergency personnel offer priority connection (system based).





New Communication technologies

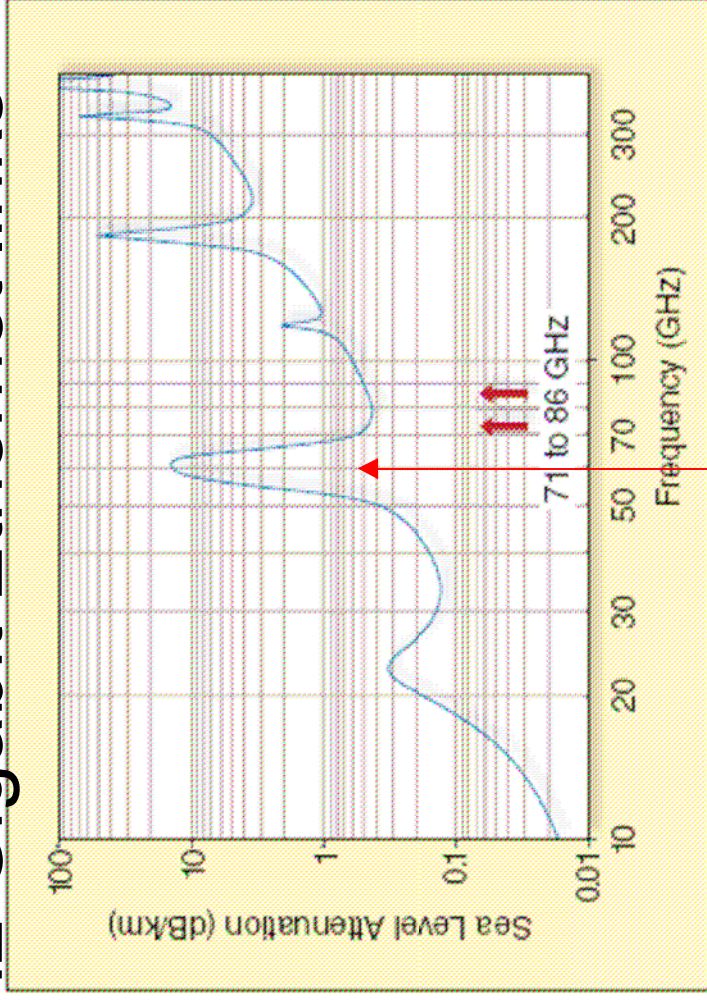
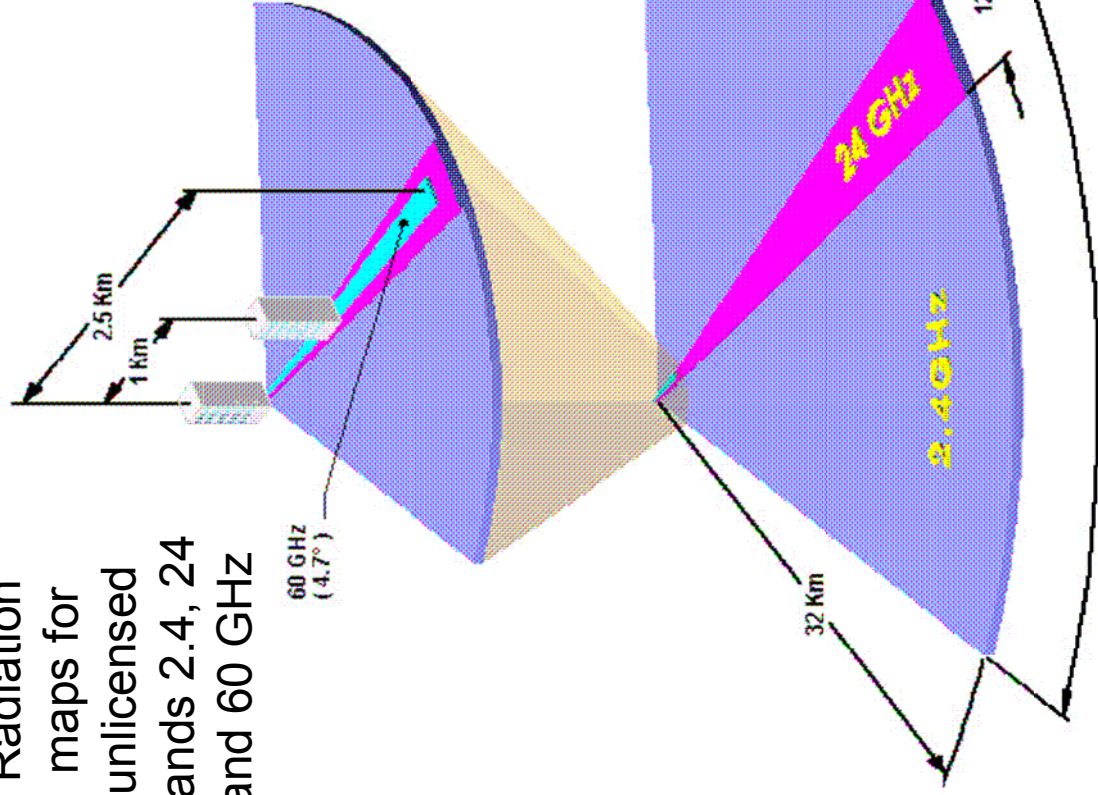


New Communication technologies

- 60 GHz / 80 GHz Gigabit Ethernet links
- Intelligent Transport System band
- AVL in metro area
- Passenger information systems
- Vehicle health / safety messages - reporting system

60 GHz / 80 GHz Gigabit Ethernet links

Radiation maps for unlicensed bands 2.4, 24 and 60 GHz



Atmospheric and molecular absorption – attenuation peaks at 60 GHz due to absorption by oxygen in air.



New Communication technologies

60 GHz / 80 GHz Gigabit Ethernet links

- 60 GHz is secure since outside the beam signal attenuates by $> 80\text{dB}$. But oxygen absorption limits distances to 1 km.
- 70 / 80GHz provides greater distance (up to 4km) and is licensed to government agencies
 - excellent alternative to laying fiber.
- Narrow beam width of less than 3 degrees (typical < 0.9 degree) needs good alignment
- Systems offer standard 1000 base SX / LC

connectors or 100 base with RJ-45 connectors



New Communication technologies

Intelligent Transport System band

- *5.850-5.925 GHz* licensed by FCC for DSRC (Dedicated Short Range Communication).
- Both the Road Side Units (RSU) and the On Board units (OBU) in a transport vehicle are licensed separately by the FCC.
- Vehicles on road – can communicate with traffic signals (extended green), way side booths
- Intelligent vehicle can communicate with other vehicles (no driver) – controlled traffic flow



New Communication technologies

AVL in metro area

- AVL (Automatic Vehicle Location) systems are typically based on GPS
- In a metro area line-of-sight to satellites is lost and usually compensated by dead-reckoning
- Wireless messages move between vehicle and control center and from control center to bus stops – data moves in short bursts in both direction
- Operating frequency band must be below 1000 MHz for effective communication – to cover long distance (FCC suggests 902-928 unlicensed band)



New Communication technologies Passenger information systems

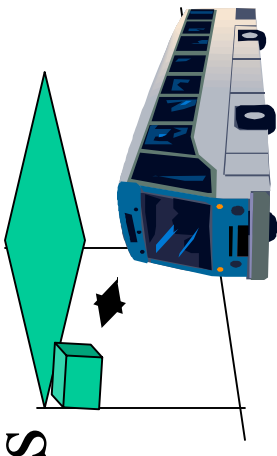
- Tunnel advertisement panels (EMI / EMC concerns)
- Text messages in subway trains (loading is wireless, but displayed from stored buffer).
- Safety and schedule info on SMS and blue tooth (connected through cellular and WiFi infrastructure)
- Satellite Digital Radio (above ground) – provides broadband broadcast channels



New Communication technologies

Vehicle health / safety reporting system

- Subway cars report health at select stations – using short wireless links
- Buses report through AVL system or using short wireless links at bus stops
- Bus depots use either 4.9GHz or other WLAN systems to report from maintenance shop to central database.





Back up slides



MTA companies

Metro area public transportation

- Commuter Buses
- City bus system
- Commuter trains
- Subway systems
- Bridges and tunnels

MTA Companies

- Communication infrastructure
- Expansion into new technologies
- Retro fit existing communication systems
- Interfaces to Police, Fire and EMS