

The Spectrum Challenge for New Public Transportation Communications



Bradley Banks and Blake Russo
Parsons Brinckerhoff

David Turner
Turner Engineering Corporation



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Spectrum Challenge for New Public Transportation Communications

Agenda

1. Demand for Service
2. Two Case Studies
 - California High Speed Train
 - Denver Eagle P3 Commuter

Applications

New Demands, Interoperability,
Threats, Opportunities, Advertising

- Dispatch, Security, Maintenance
- ATC, including CBTC and ERTMS
- PTC

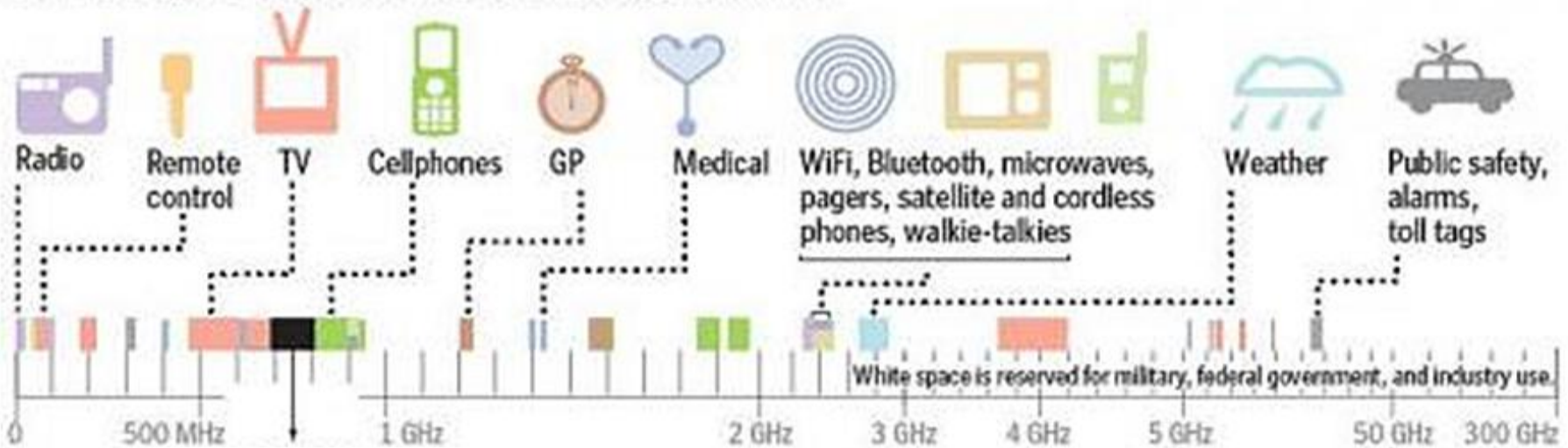
Applications

New demands, etc.

- Security and CCTV, Real time on the Mainline, and batch data in the yard
- Train Health and Diagnostics, Real time on the Mainline, and batch data in the Yard
- Passenger Info, Passenger Counting
- Infotainment, Wireless Data onboard by passengers.

Spectrum is Valuable

Some everyday uses of the radio frequency spectrum



← Signals can go through dense objects (buildings, forests, mountains, and storms) →

← Signals have difficulty going through dense objects →

Signals can't go through dense objects but travel long distances

Signals travel short distances

Value of spectrum compared with real state



Spectrum and Technology Drivers

Prime spectrum is incredibly valuable for commercial use - \$\$\$bbb

- Intense mobile uses (e.g., consumer streaming video)
- Unserved demand for new spectrum for new services

Transit - small user - special reqs & opportunities

- Economies of scale don't always favor transit
- In the US, let the market choose...
- In Europe, ERTMS legislated into GSM bands
- Transit can sometimes slip into a niche, co-exist with other users.
- Transit has distinct corridors, radio towers, and captive users, and could play 'let's make a deal'

Spectrum and Technology Drivers

Lots of regulatory activity

- Narrowbanding below 512 MHz
- 700 MHz Public Safety - Broadband and Narrowband
 - Tough spectrum interfaces – e.g., GPS @ 1560 MHz precludes Lightsquared @ 1530 MHz
 - Rail Safety Improvement Act of 2008



Source: IEEE Spectrum

Candidate Spectrum and Technologies

Each candidate technology is tied to spectrum

- GSM-R
- GPRS
- LTE
- P25
- TETRA
- WiFi
- WiMAX
- Sole Vendor Systems

Spectrum Challenge for New Public Transportation Communications

Two Case Studies: Rail Wireless Communication

Case Studies

California High Speed Train

California High Speed Train

Locations:

Mainline

Onboard

Yard and

Terminal

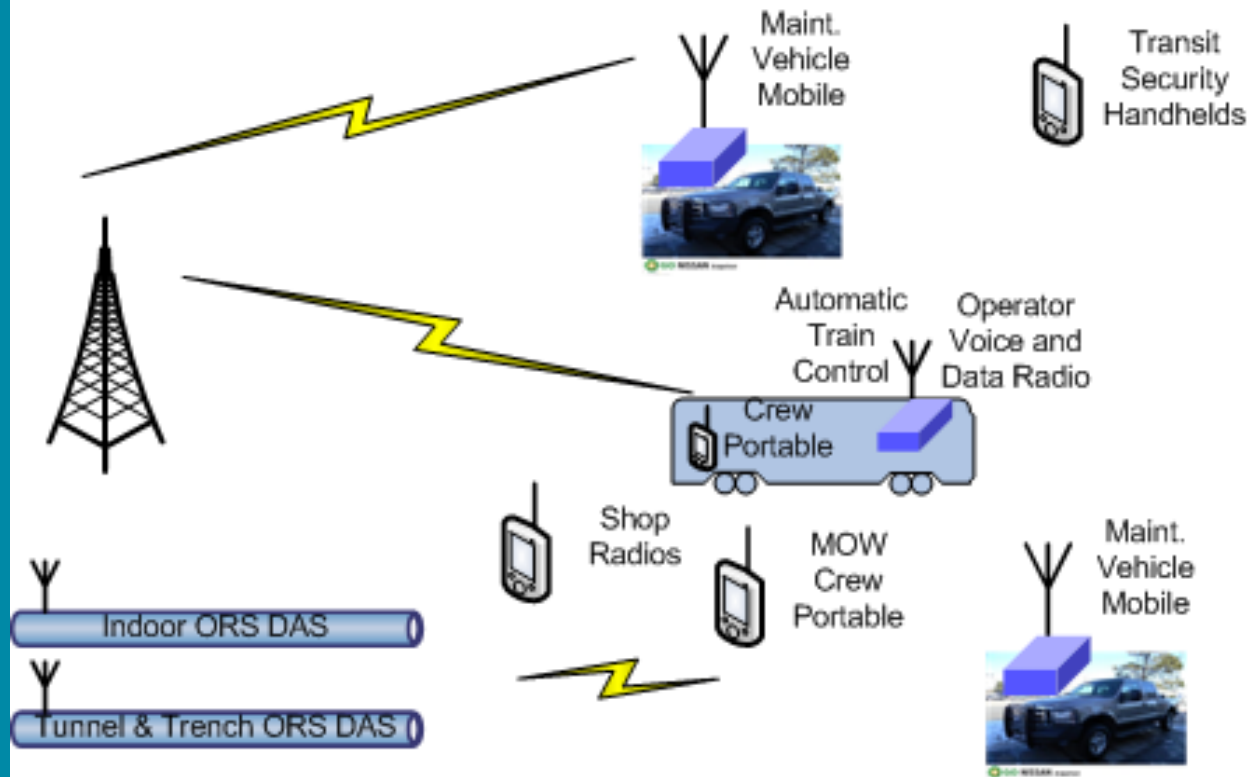
Train Ops, Maint, and
Police: Voice & Data

Real-time Mobile Video
Surveillance

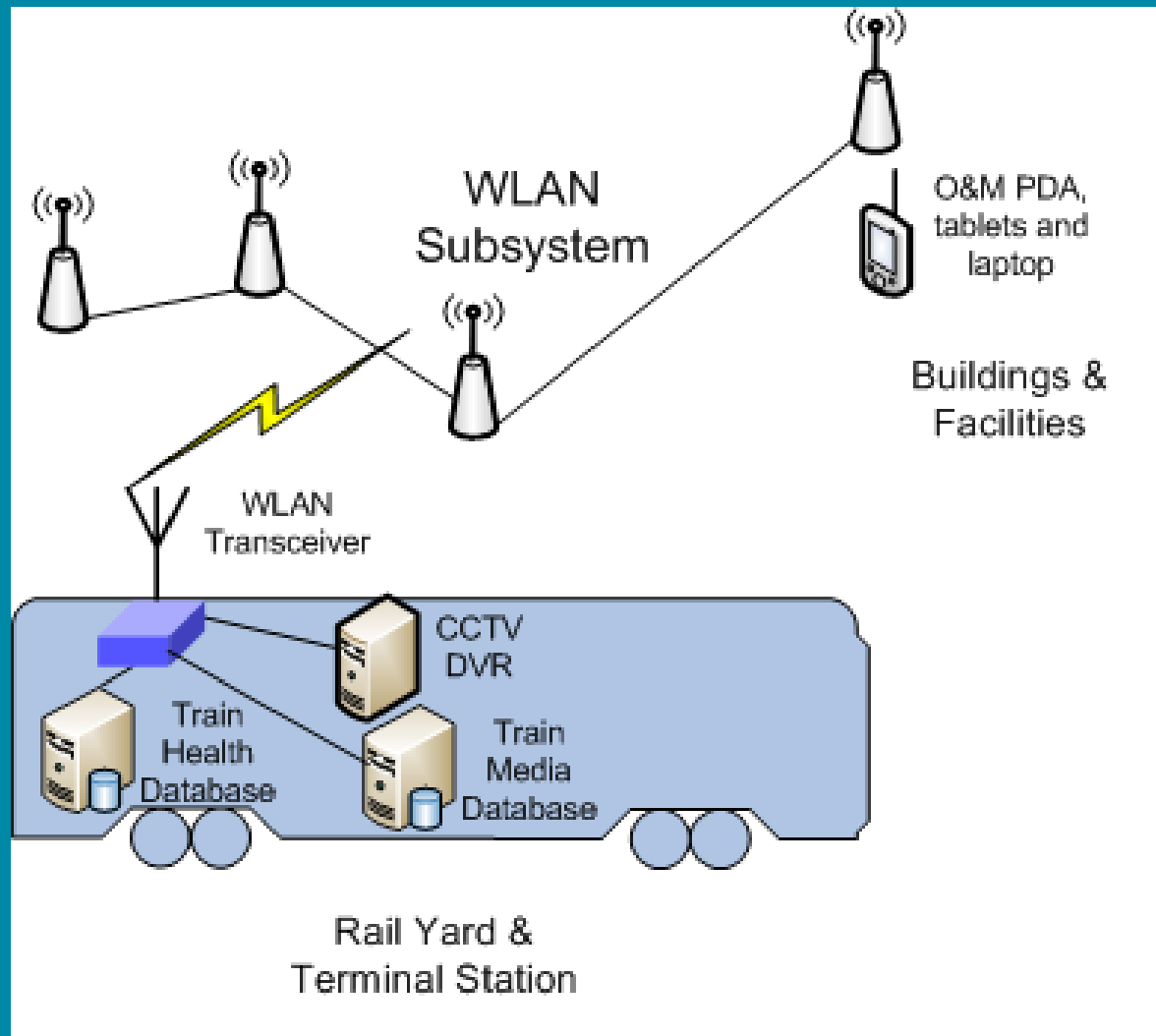
Via Third Party Wireless:
Infotainment, Voice, Data

CHST: O&M + Police

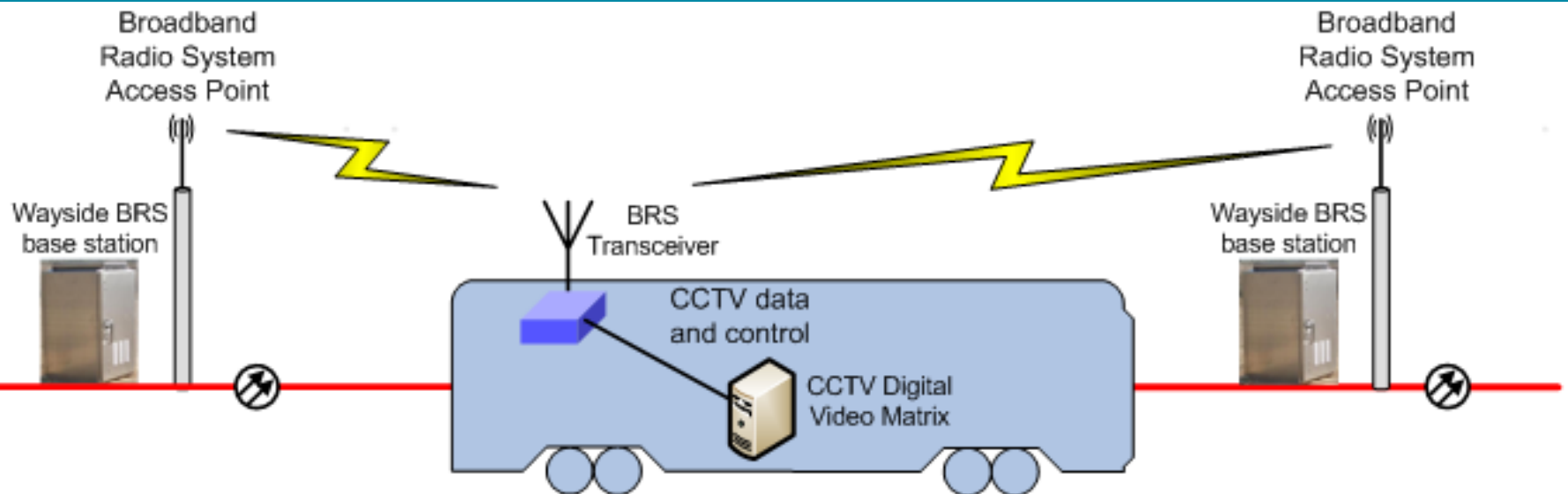
"Operations Radio System" Voice and Low Bandwidth Data Radio System



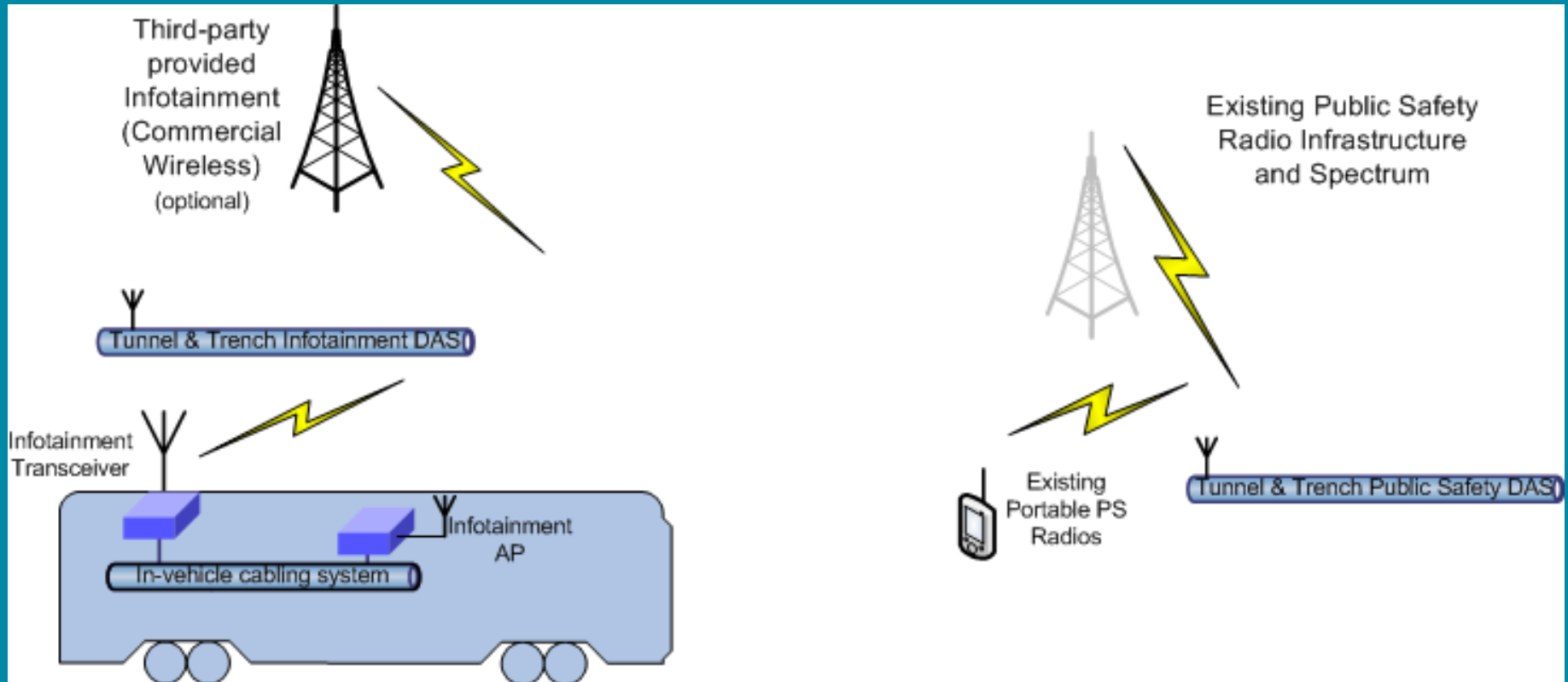
Yard, Station, & Facilities



CHST: Real-time Video



CHST: Third Party Services



Case Study

Denver Eagle P3 Commuter Rail

Denver Eagle P3

Locations:

Mainline

Onboard

Yard and
Terminal

PTC, Pass Info, Safety &
Security, Train Heath

O&M + Police,
Voice & Data

PTC Interoperability

Denver 4.9 GHz License

Eagle P3 Project applied for and got a 4.9 GHz license

- Denver Regional Transportation District (RTD) filed application
- From RTD to the FCC - no spectrum advisory board approval
- Frequency coordination is required if and when other users join the band

Other spectrum users can include Denver International Airport (DIA) and the City and County of Aurora CO

- Must channel coordinate the 4.9 GHz band between DIA and Eagle P3

License not technology dependent

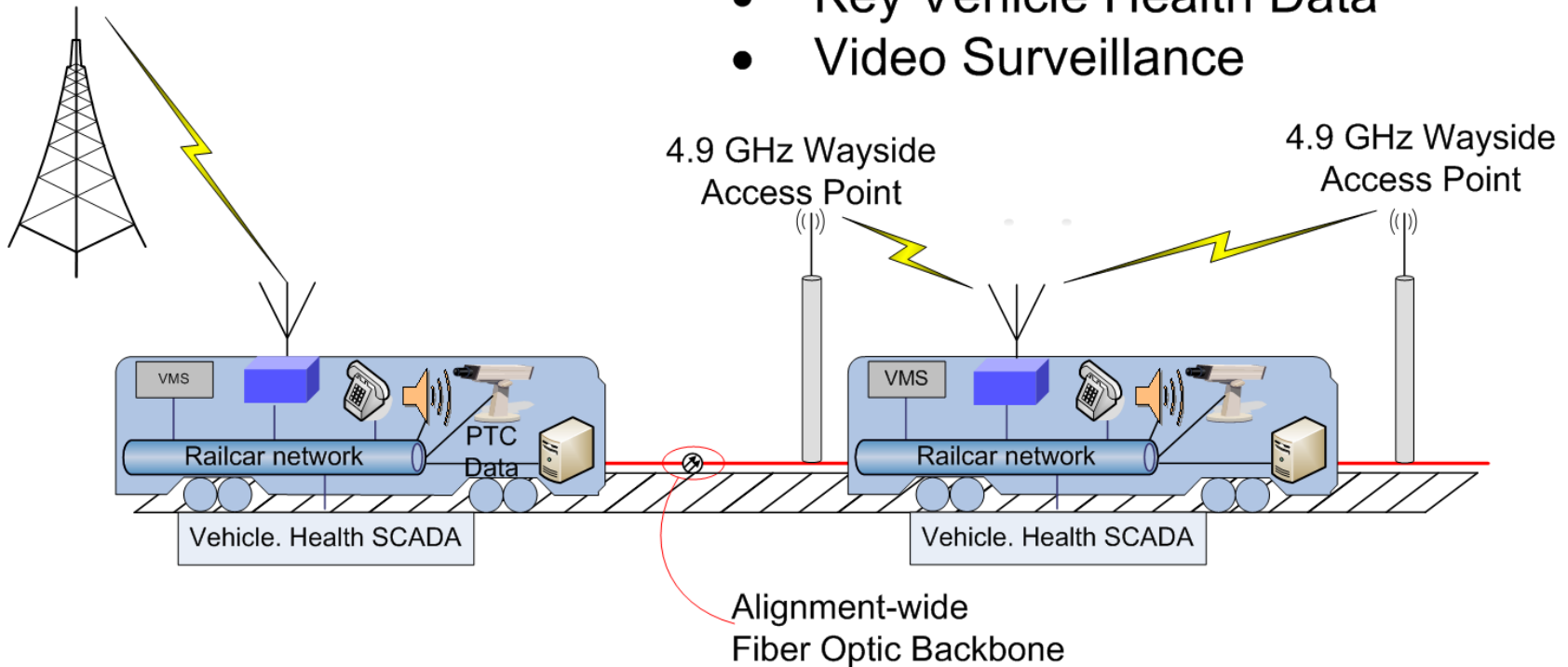
- May implement whatever radio technology meets the 4.9 GHz FCC's power and emissions mask
- Eagle P3 can implement any suitable technology and can evolve the system for the long-term operation

Denver: PTC, Pass Info, Safety & Security, Train Health

4.9 GHz Wireless Network:

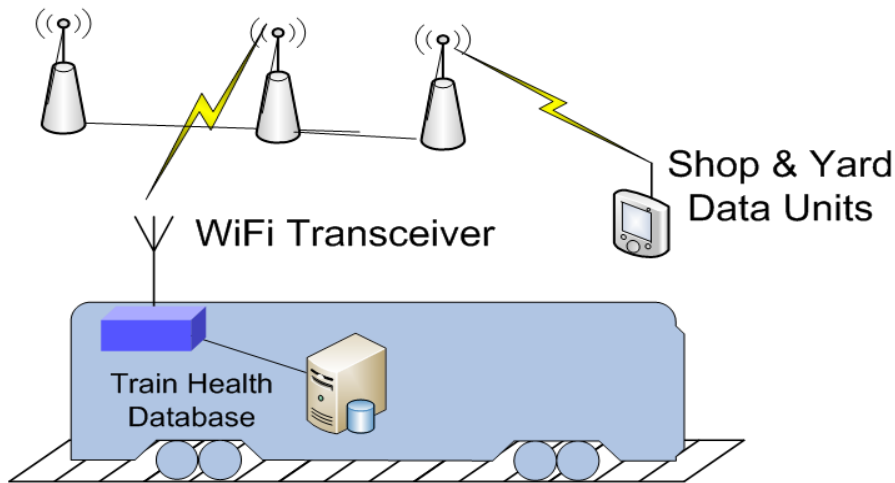
- PTC Data
- On-board VMS
- Emergency Telephone
- Key Vehicle Health Data
- Video Surveillance

Third-Party Wireless -
Backup for the
4.9 GHz network



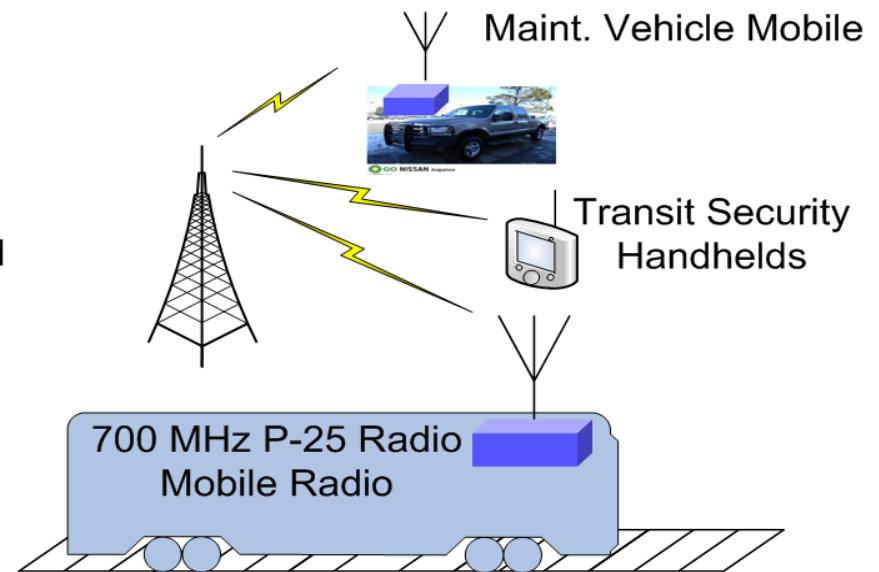
Denver Ops and Maintenance

Commuter Rail WiFi – yard & shop



- Yard: MDS Data Download
- Shop: Maintenance Data

RTD 700 MHz P-25 Wide Area Voice Radio

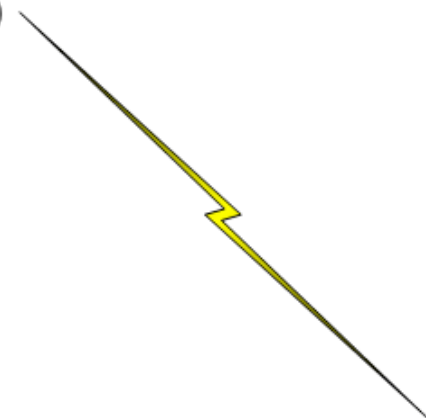


Voice for:

- Train to OCS
- Field Supervisors
- MOW trucks and portables
- Commuter rail security

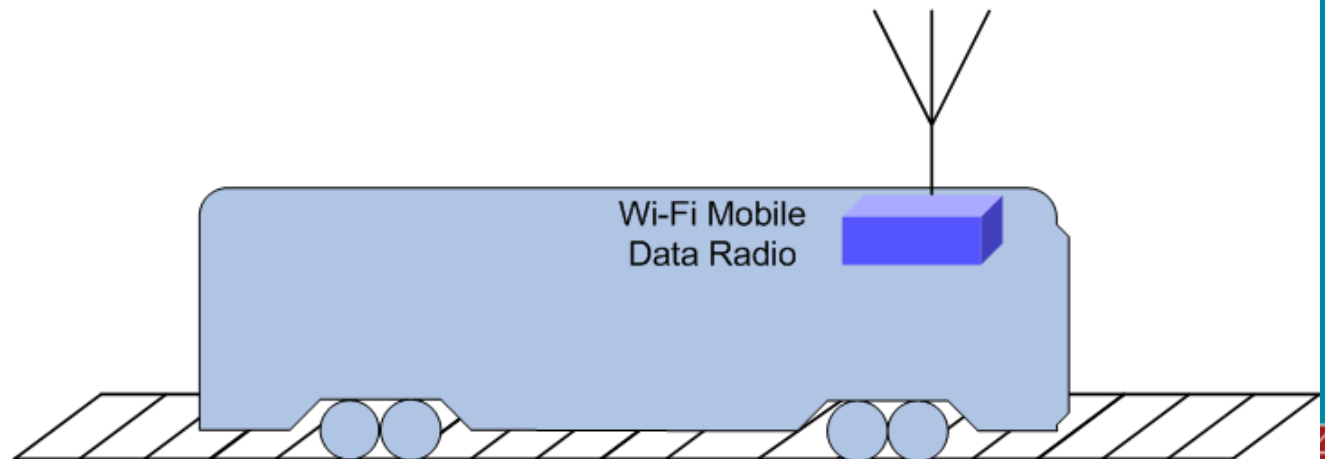
Denver PTC Interoperability

WiFi Subsystem



WiFi SERVICES

- Interoperability with Existing PTC Systems
- Amtrak at Denver Union Station



Paths To Action

1. Realize: Transit is a Public Safety agency!
2. Find and work with allies, e.g.: Other Public Safety Agencies, Regional Spectrum Coordinator, Airport Operator, etc.
3. Make the most of your assets: land and towers, wired transport infrastructure, and passengers.
4. Avoid Congestion: New technology in less-used spectrum.
5. Work with Advocacy Partners: APTA, Joint Council on Wireless Communications, to make case for spectrum.
6. Consultants, Specialists, Lawyers can navigate regulatory landscape.