EXHIBIT 5-B

Docket No. DCA-08-MR009

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

Union Pacific Railroad
Positive Train Control Presentation

NTSB Hearing

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March 4, 2009

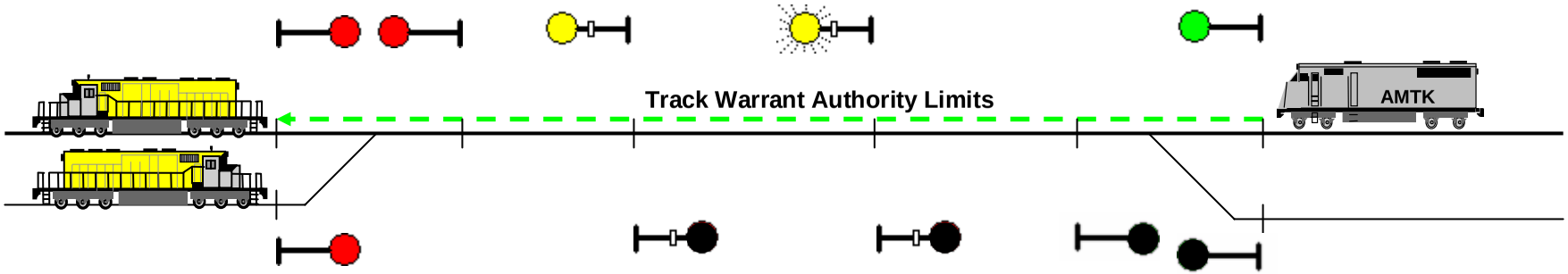
Topics to Address

- Current Train Control Systems
- Concerns with Existing Systems
- How does PTC Address Concerns with Existing Systems
- UP PTC Pilot Locations
- PTC Challenges
- PTC Implementation Plan
- PTC Project Timeline

Dark Territory
Track Warrant Control

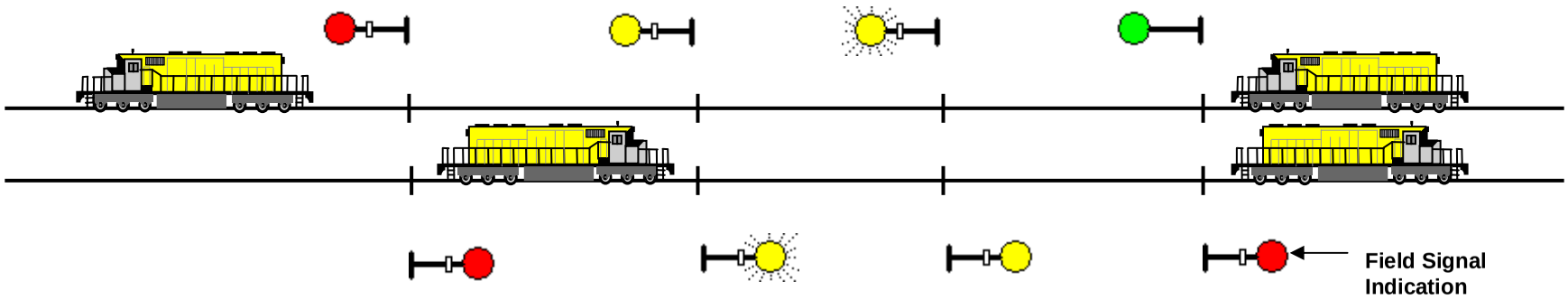
- **Main Track Not Signaled**
- **Movement Authority Conveyed By Track Warrant or Direct Traffic Control permit**
  - **2. [X] Proceed From (*Station or Location)* To (*Station or Location*) On Main Track Spokane Subdivision**
  - **8. [X] Hold Main Track At Last Named Point**
- **Train separation provided by train dispatcher and train crew**

Automatic Block System (ABS)
Track Warrant Control



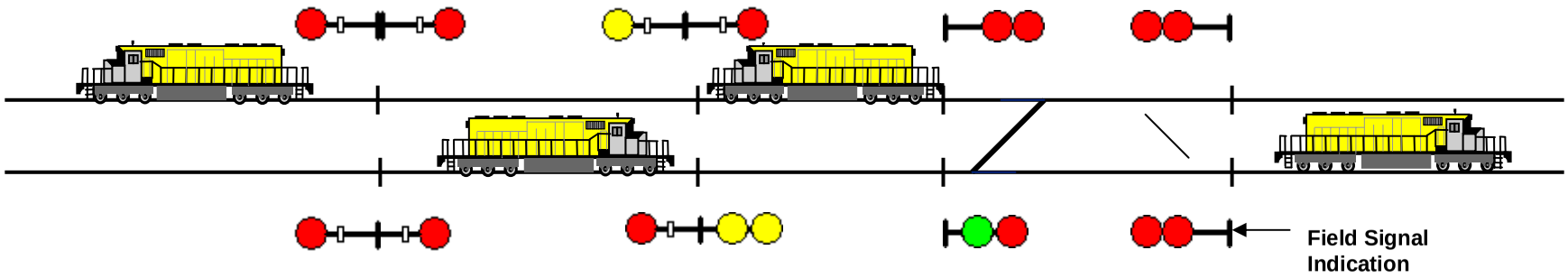
- **Main Track Signaled for Movement in Both Directions**
- **Movement Authority Conveyed By Track Warrant or Direct Traffic Control permit**
  - **2. [X] Proceed From (*Station or Location)* To (*Station or Location*) On Main Track Spokane Subdivision**
  - **8. [X] Hold Main Track At Last Named Point**
- **Train separation provided by train dispatcher, train crew and signal system**

Automatic Block Signal (ABS)
Current Of Traffic



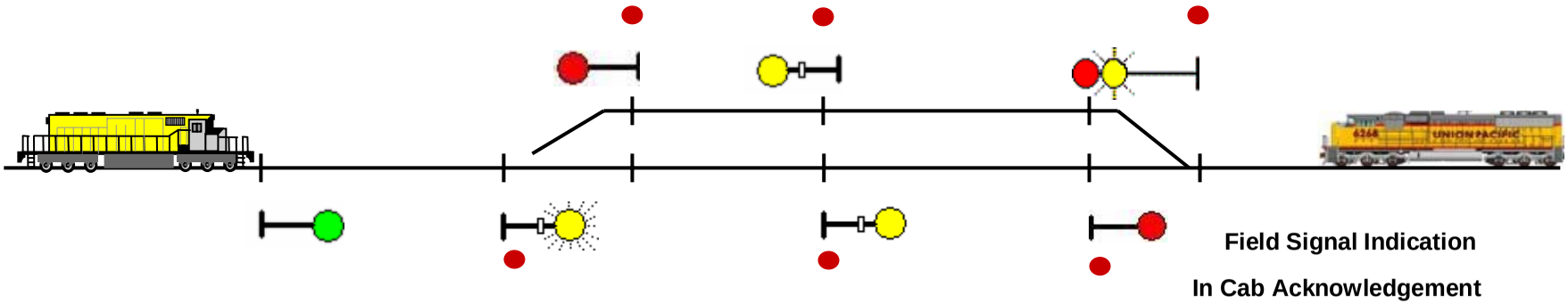
- Two Main tracks with an assigned direction of movement
- Movement authority is conveyed by signal system
- The tracks are only signaled for movement in the assigned direction
- Train separation provided by train crew and signal system

Centralized Traffic Control (CTC)



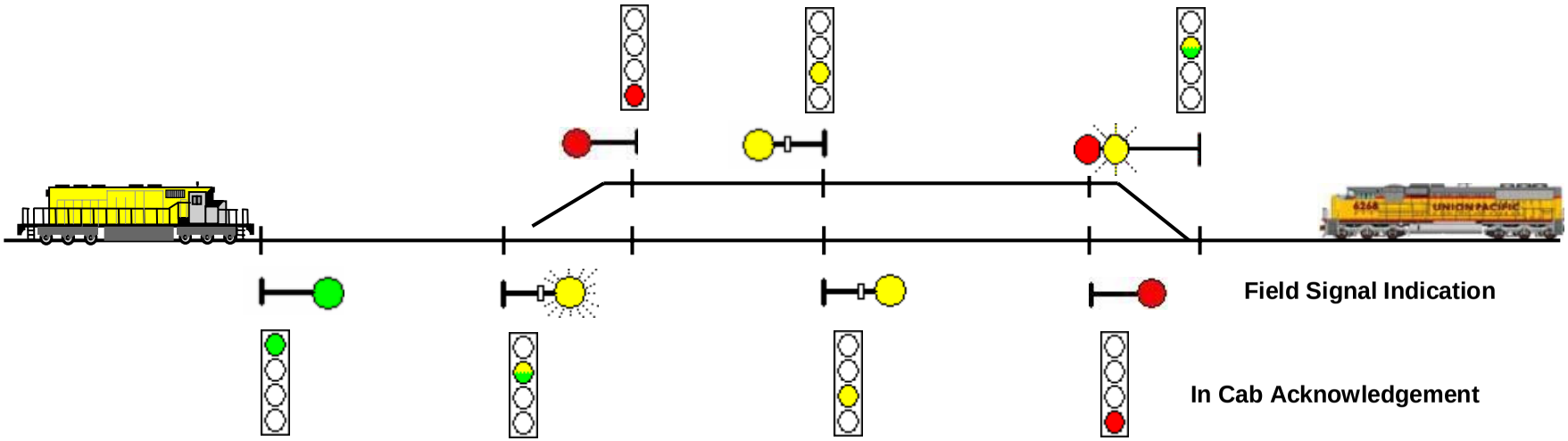
- One or More Main Tracks Signaled for Traffic in Both Directions
- Movement authority is conveyed by signal system
- Train dispatcher controls switches and signals from distant location
- Train separation provided by train crew and signal system

Automatic Train Stop (ATS) Operation



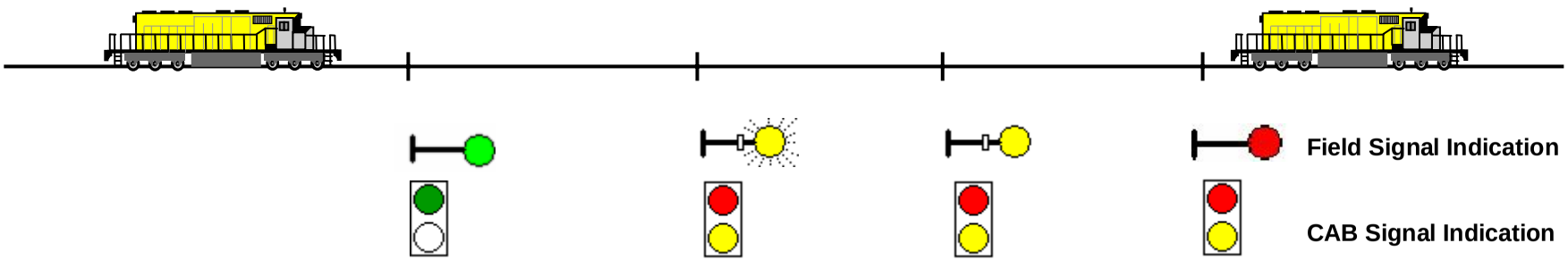
- In Cab alarm sounds when train passes any signal that is not green
- Engineer has six (6) seconds to acknowledge ATS alarm or the train brakes are applied
- Once the acknowledgement is performed, there is no further enforcement
- Train separation provided by train crew and signal system assisted by ATS alarms

Automatic Cab Signal (ACS) Operation



- All wayside signal indications are displayed in the locomotive cab
- When locomotive passes a more restrictive signal, engineer must acknowledge within six (6) seconds or the brakes are applied
- Once the acknowledgement is performed, there is no further enforcement
- Train separation provided by train crew and signal system assisted by ACS alarms

Automatic Train Control (ATC) Operation



- All wayside signal indications are displayed in the locomotive cab
- When locomotive passes a flashing yellow signal, an alarm sounds and the engineer has six (6) seconds to acknowledge or the brakes will be applied.
- The engineer then has seventy (70) seconds to reduce to 20mph or less, or the brakes will be applied.
- Once the train is under 20mph no further enforcement is applied
- Train separation provided by train crew and signal system assisted by speed control

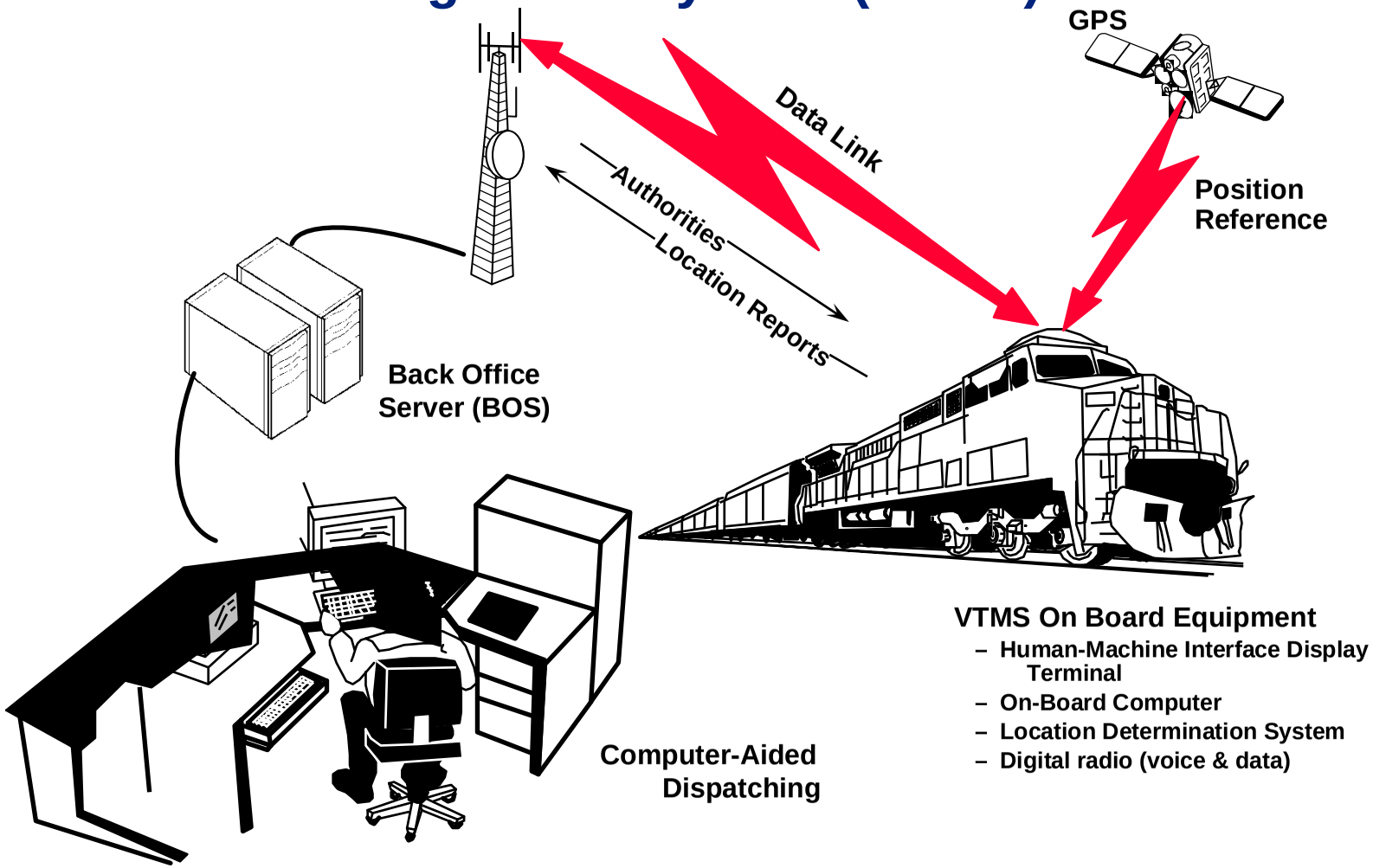
Concerns with Existing Systems

- **Systems are reactive as opposed to predictive**
  - **Many systems wait for a violation to occur before any form of enforcement is invoked (ATS and CCS)**
- **Systems depend on human compliance**
- **Very time consuming to design and install**

PTC Interoperability Objectives

- **Meet Rail Safety Act requirements**
  - **Train to train collisions**
  - **Incursions of trains into established work zone limits**
  - **Over-speed derailments**
  - **Movement of a train through a switch in the wrong position**
- **Meet regulatory requirements for production deployment**
  - **FRA's new CFR Part 236 Subpart I**
- **Support industry interoperability initiatives**
  - **Telecomm, system behavior, human factors**

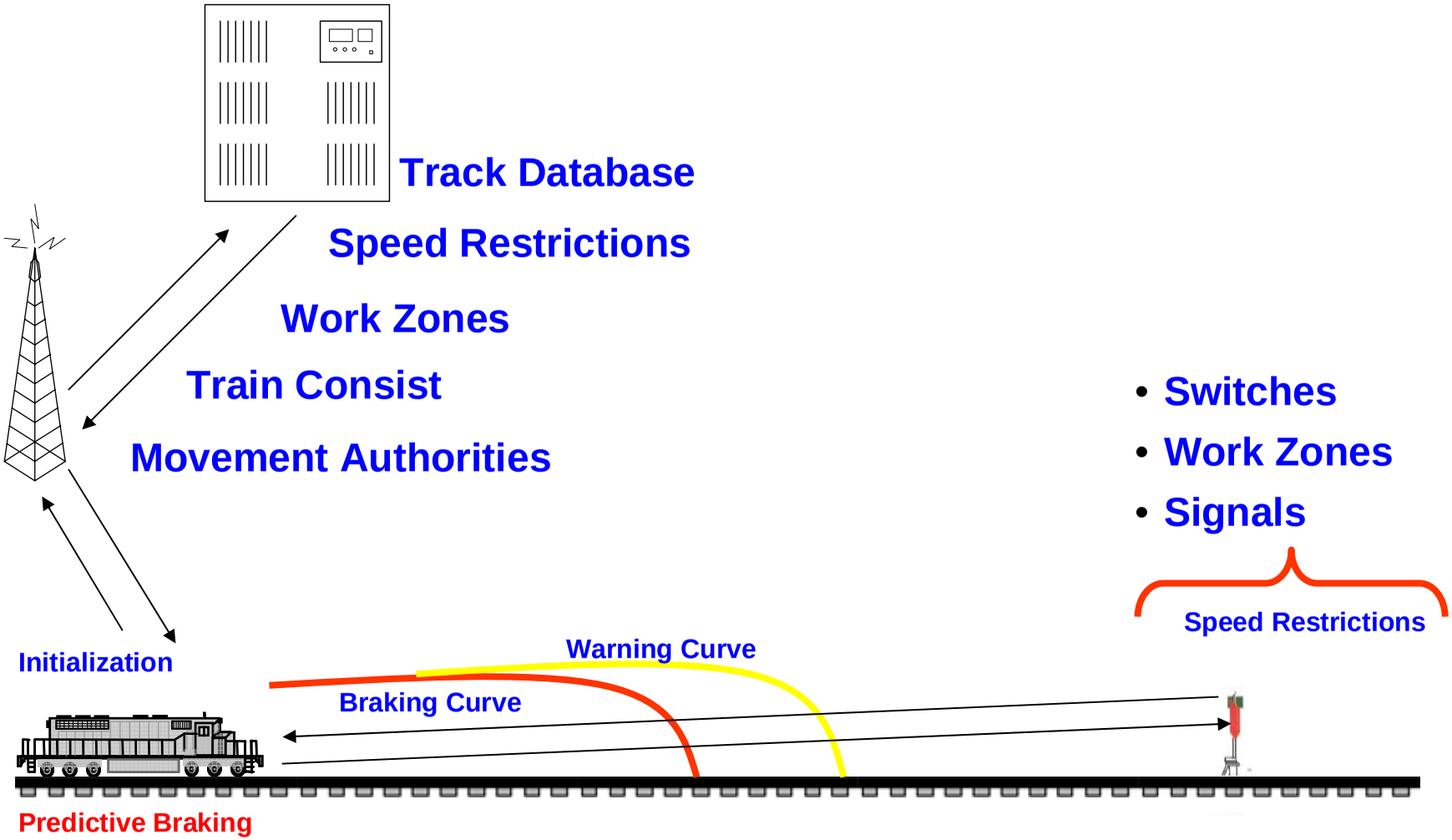
UP's PTC System
Vital Train Management System (VTMS)



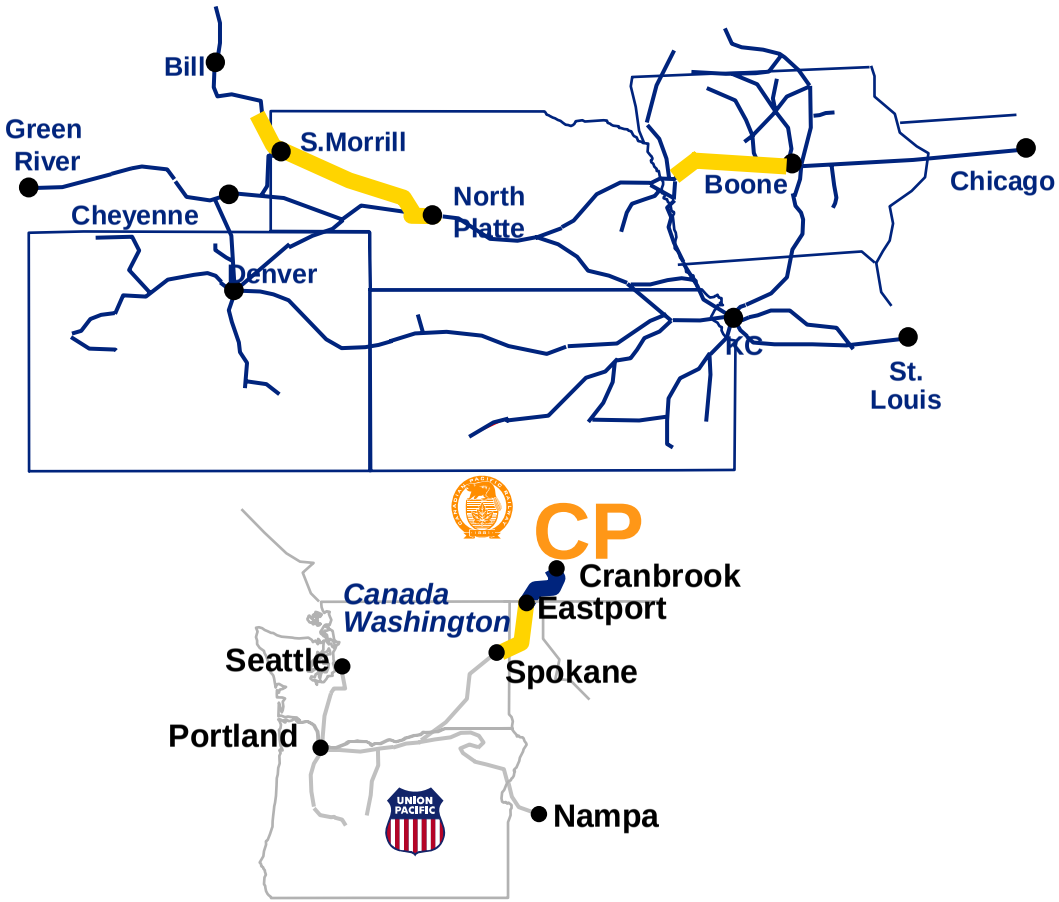
VTMS On Board Equipment

- Human-Machine Interface Display Terminal
- On-Board Computer
- Location Determination System
- Digital radio (voice & data)

VTMS – System Overview



Vital Train Management System (VTMS)
Pilot Locations



South Morrill & Powder River Subs

- 193 miles multiple track CTC/ACS
- 75+ trains per day
- 50 AC44 locomotives to equip

Boone Sub

- 123 Miles CTC/ATC
- 62 trains per day
- 50 AC44 locomotives

Spokane Sub

- 140 Miles TWC/Dark
- 7 trains per day
- 15 UP SD9043 locomotives and 15 CP locomotives

Positive Train Control (PTC) Challenges

- **Communications Spectrum**
  - Ensuring enough throughput for safe and efficient movement of trains
- **Interoperability**
  - Communications, System Behavior and Response and On Board Display
- **Predictive Enforcement Complexity**
  - Ensure safe braking calculations
- **Installation of Wayside Interface Units (WIUs), Locomotive Equipment and Telecommunications Infrastructure**
  - 24,751 WIUs to install (9.9 per day between now and 12/31/2015)
  - 6,000 Locomotives (2.4 per day between now and 12/31/2015)
  - 970 Base Station Radios
- **Uncertainty with new Subpart I Regulations**

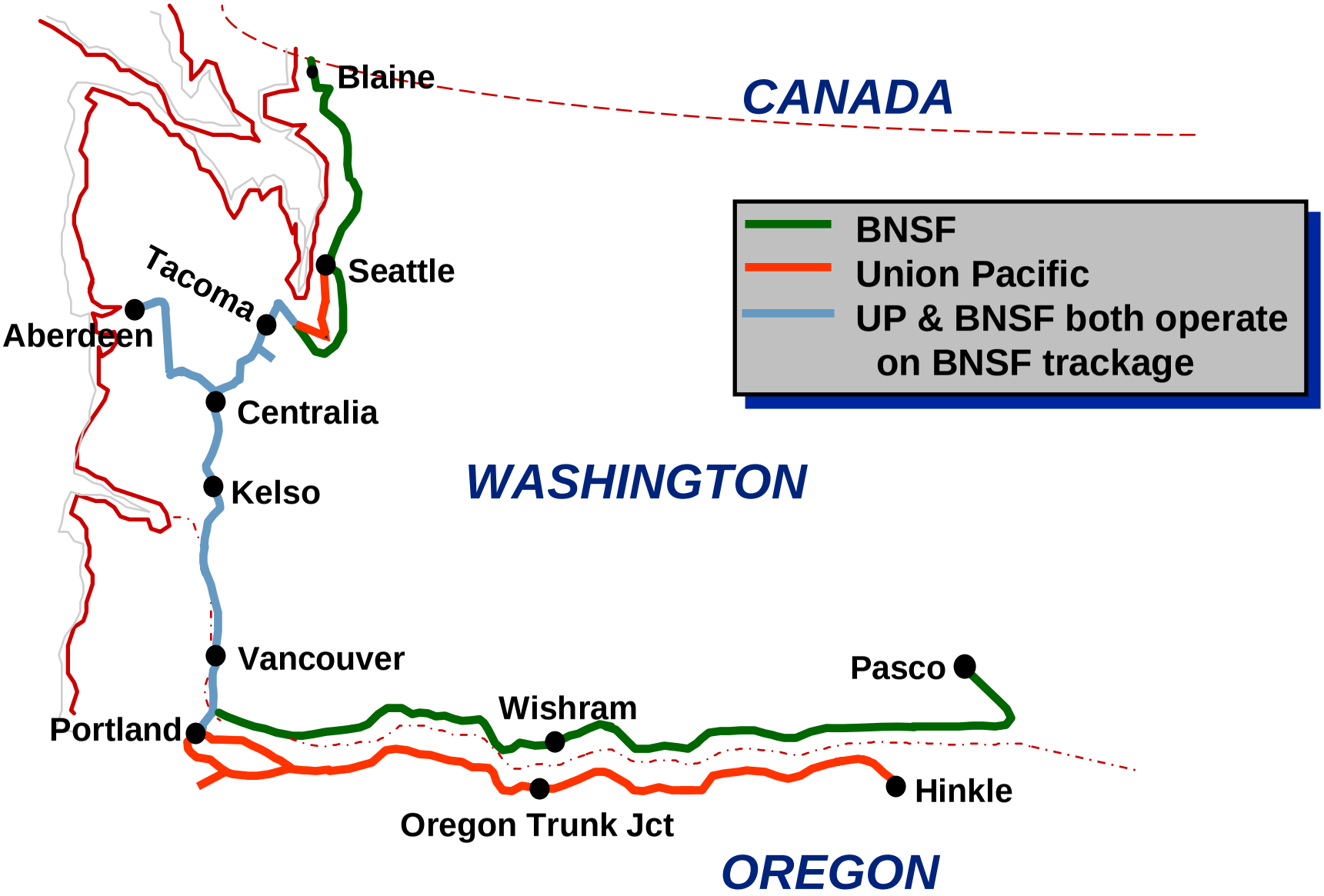
Communications Spectrum

- Spectrum is like a highway -
  - Radio channels are like lanes of the highway
- Too much traffic on a channel of Spectrum will cause congestion
- The 220 spectrum was purchased by UP and NS to support the expected data traffic from the freight railroads.
  - Additional spectrum will be needed as more railroads are added
- Early projection for spectrum is ~250 KHz (5 25KHz channel pairs) of 220 MHz spectrum
  - Spectrum demand study will commence soon

Interoperability

- **Communications**
  - **Standards that permit one railroad's locomotive to safely and efficiently operate over another railroad's infrastructure**
  - **UP, NS BNSF and CSX have agreed to interoperable communications standards**
- **The four Class 1 railroads have agreed to locomotive display standards**
  - **Simplifies training and increases safety through common operating standards**
- **UP, NS, BNSF and CSX are using WABTEC for the on board PTC system**

Interoperability Scenario



What is the Interoperability Agreement?

- **BNSF, CSX, NS and UP are signatories**
- **Agreement to implement technical standards for:**
  - **Locomotive to wayside communication**
  - **Locomotive to back office communication**
  - **Locomotive on board system behavior**
  - **Locomotive on board displays**
- **Agreement for governance**
  - **Working committee**
  - **Steering committee**
  - **Executive committee**
- **Agreement to manage 220 MHz spectrum**

Predictive Enforcement Complexity

- **Predictive braking algorithms (software) must stop trains before authority violations with very high degree of reliability**
- **Algorithms must be smart enough to adapt to changing conditions**
  - **Weather**
  - **Train tonnage**
  - **Different types of cars**
  - **Weight variation in the train**

Uncertainty with new Subpart I Regulations

- **PTC scope beyond CFR 236 Subpart H requirements**
  - **Current PTC systems development has been done to meet the standards with CFR 236 Subpart H**
- **How to deal with Class 2 and 3 railroads exempt from RSIA but operate on Class 1 lines that require PTC**

Priority Areas for Implementing PTC

- **UP has committed to have PTC installed in the LA Basin by 12/31/2012**
- **Commuter/Passenger lines will be next**
  - **Southern and Northern California**
  - **Chicago, Salt Lake City, Denver, etc.**
- **Followed by TIH routes**
- **Risk assessment will dictate remaining implementation plan**

Project Timeline