Automatic Train Control At the Port Authority Trans-Hudson

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2012 RAIL CONFERENCE

Introduction to PATH

Goals

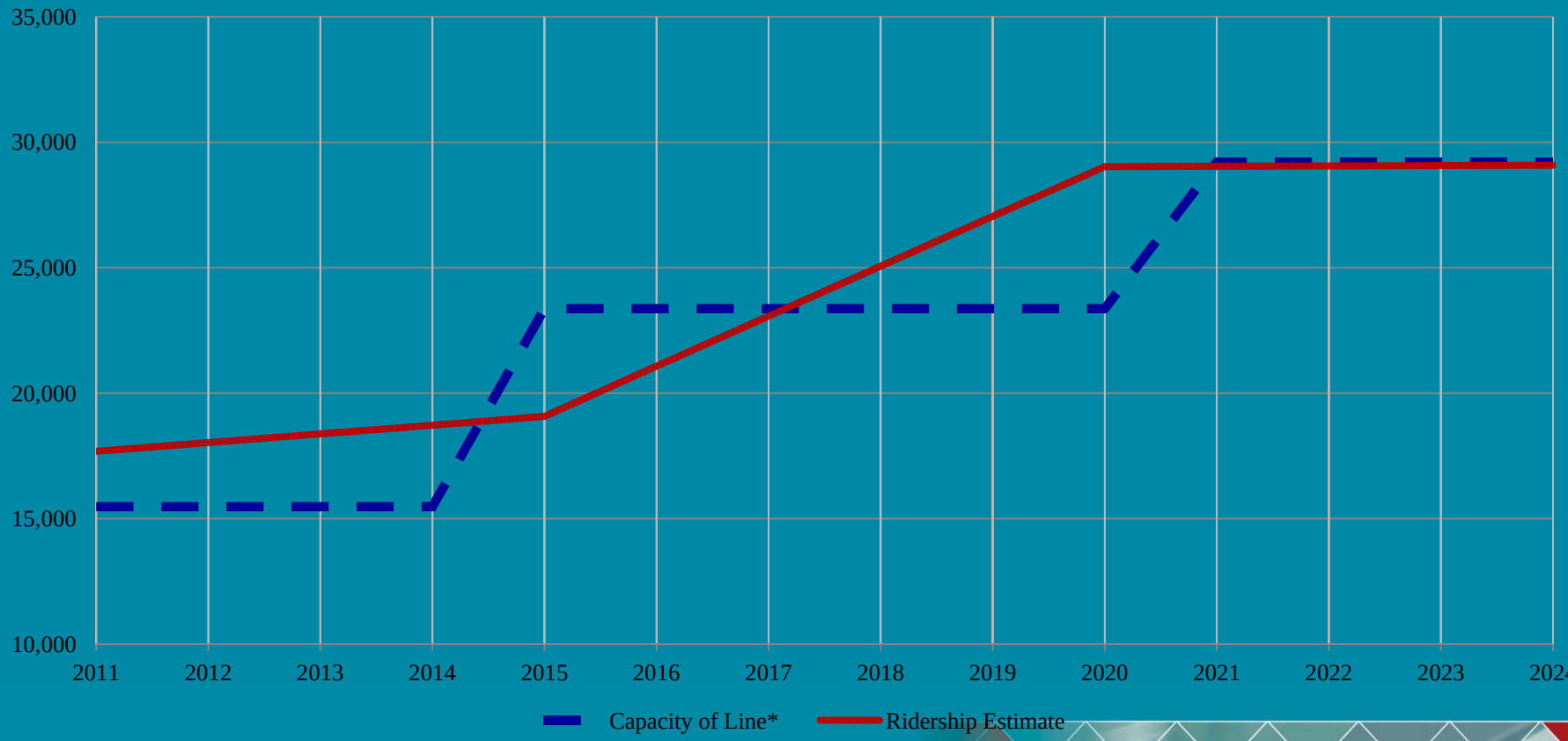
- Support increased ridership
- Replace signal system at end-of-life

Goals
Increased Ridership

- World Trade Center site buildout
  - 20% expected increase
- Current system is fixed-block
  - Minimum headway fixed at 90 seconds
- CBTC moving block will overcome headway constraint
  - Allow trains to follow more closely
  - Increase throughput

Goals
PATH Ridership Projections

Available Capacity Versus Demand
NWK to WTC Line - AM Peak Hour



Goals
System Replacement

- Last major overhaul: 50 years ago
- Processors replace relays
- New bungalows and re-equipped relay rooms
- New signal power distribution with UPS
- New control center
  - Existing becomes backup
- Track circuits
  - For backup wayside system

Additional Benefits

- Dynamic schedule adjustments
- Passenger comfort
- Crew scheduling

PATH ATC Project Participants

- Consortium under a Design/Build Contract: Siemens Team
  - Siemens Industry, Inc. (Communication-Based Train Control)
  - Invensys Rail Corporation (Conventional Signaling)
  - D/A Builders, LLC (Installation)
- Program Management Services
  - CH2M HILL
- Independent Safety Assessor
  - Rail Safety Consulting, LLC

Design Approach

- Robustness
  - Operate service in the presence of failures
- Secondary Train Detection System (STDS)
  - Vital foundation for CBTC and wayside backup
- Communication-Based Train Control (CBTC)
  - Moving-block overlay
  - Data Communication System (DCS)

Design Approach
Secondary Train Detection System

- Vital interlocking and route integrity
  - Backup without CBTC
- Wayside signals
  - Longer control lines, increased separation
  - Enforced by train stops
- Track circuits
  - Jointless where feasible
- Cutover first, before CBTC

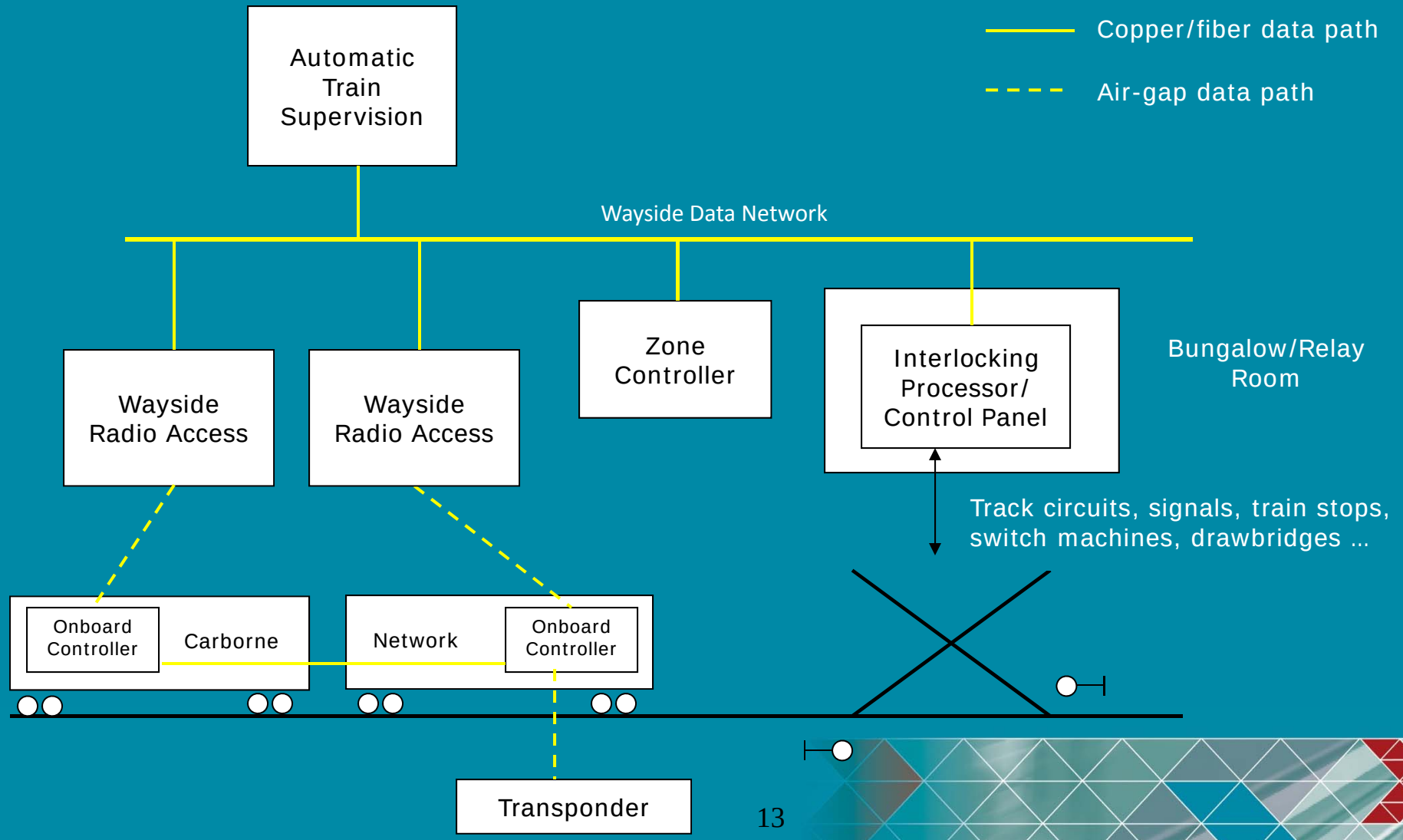
Design Approach
Communication-Based Train Control

- Why CBTC?
  - Moving block overcomes headway constraints
  - Install as overlay
  - Available and proven for transit
- Location determined onboard
  - Using wayside transponders
- Wayside zone controllers track trains
  - Issue Movement Authority to *any* location
  - Based on database of civil features
- Carborne calculation of speed profile

Design Approach
Communication-Based Train Control

- Overrides of STDS under CBTC operation
  - Cut back control lines (MALs govern)
  - Drive down train stops (carborne speed profile enforcement)
  - Wayside signals display flashing green (CBTC)
- Operating modes
  - Automatic Train Operation (ATO)
  - Manual Cab Signal (MCS)
  - Bypass
  - Manual operation required periodically

Design Approach
Block Diagram



Implementation Challenges

- Maintain 24/7 operations
  - Tunnel is more demanding than outside
- Tunnel space
- Competing projects in tunnels
- Ballast condition
- Amtrak access
- Test Track

Design Challenges

- 4-track operation on 2 tracks
- FRA compliance
- Operation without CBTC
- Training

Conclusion

- Past
  - A century of fixed-block
- Present
  - Installation and testing progress
- Future
  - Commissioning
  - Meeting increased passenger demand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