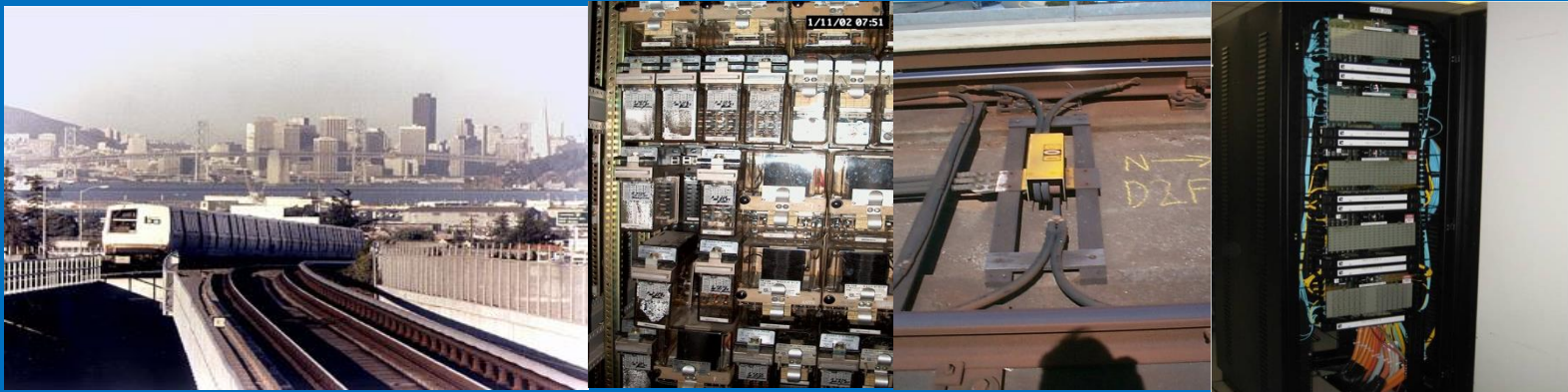




BART Train Control Modernization



C.D. Allen
June 19, 2015



Why New Train Control?

Convergence of need for increased performance
and end of life of BART train control systems

Obsolescence: Age of equipment; lack of parts; hard to maintain

Performance: Capacity, headway, run time, reliability

O&M Costs: High costs associated with maintenance of diversified equipment



Existing BART Systems

1972 - Original system, first fully automatic metro,

Westinghouse MUX audio frequency track circuits - 74 miles

1989 - 2nd generation of Westinghouse for express tracks

1995 - GRS (Alstom) on East Bay extensions – 19 miles

1998 – New SORS – core system

2002 - Bombardier on SFO extension - 12 miles

2015 - Alstom on Warm Springs and VTA extensions - 16 miles

Plus multiple upgrades over the years



Train Control Functions

Automatic Train Control (ATC)

Automatic Train Protection (ATP) – Vital safety system that controls train speed and separation

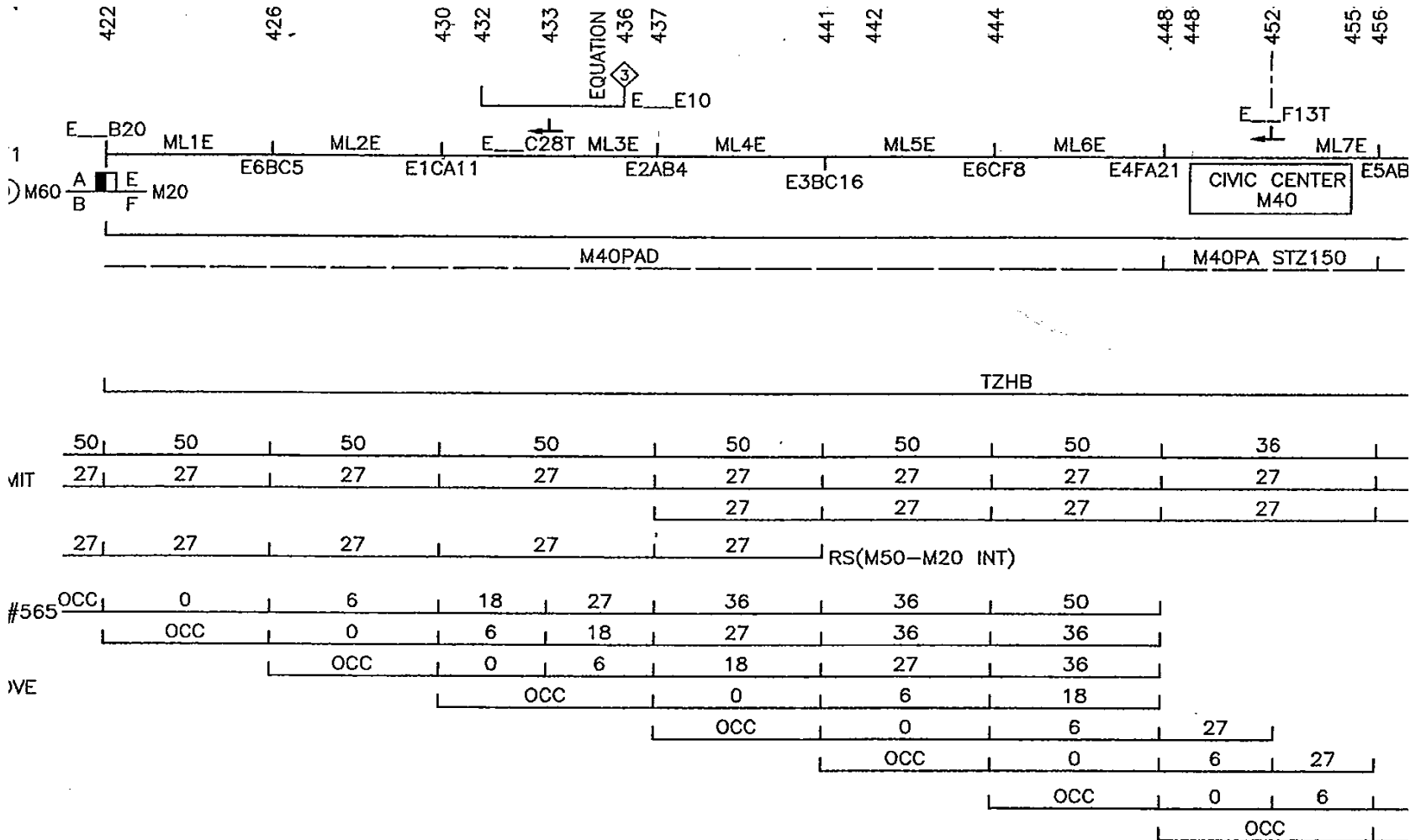
Automatic Train Operations (ATO) – Non-vital system for station stopping and other driver functions

Automatic Train Supervision (ATS) – Non-vital system that manages train schedules and provides information and control to the OCC

Interlocking – Vital system of “gates” that control movement on tracks and over switches










Fixed Block System



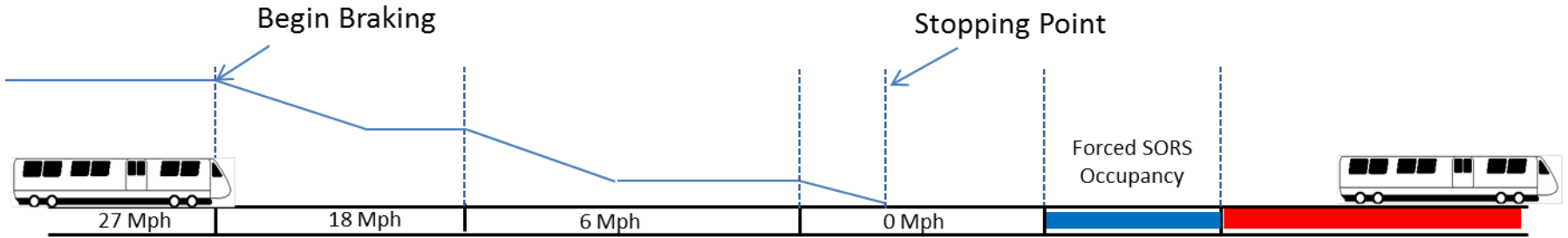


Fixed Block System and SORS

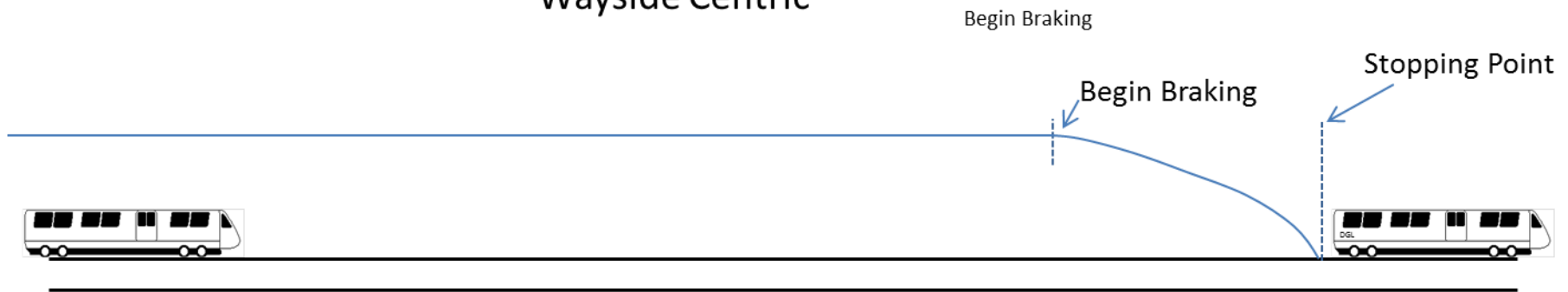
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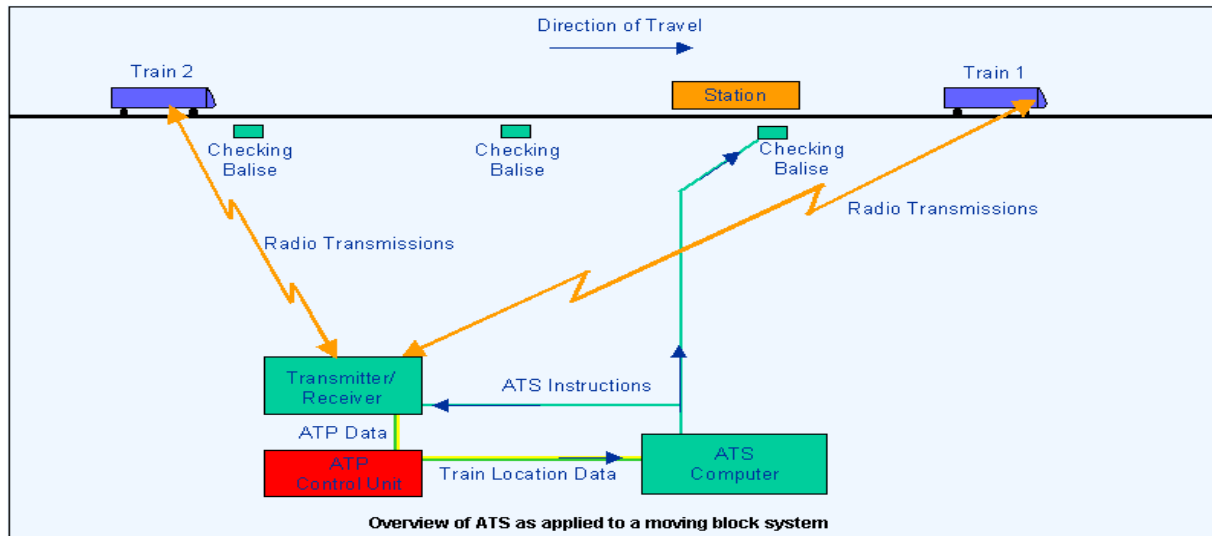
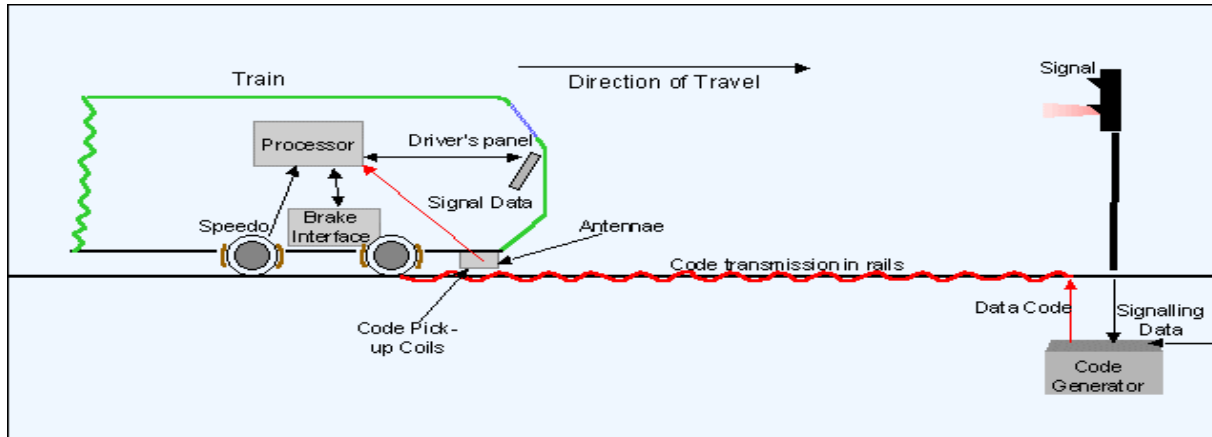
Fixed vs Moving Block



BART Fixed Block
Wayside Centric



CBTC Moving Block
Vehicle Centric



Technology Advantages

Higher capacity thru put

Higher resiliency

Very little wayside installation

Power savings

Vehicle wear and tear

Facilitates maintenance activities

Technology Challenges

Staff training

Implementation

Car-borne controller change-out

Loss of control over system content
and configuration



Central Computer System

Core Train Functions:

Train tracking

Schedule maintaining

Train routing

Dispatching

Command and Indication:

Traction power

Ventilation fans

Emergency generators

Fire systems

Water pumps, valves

UPS systems

Maintenance Data:

Vehicle miles

Equipment cycles



Central Computer System

Situational Awareness:

Big board

Real-Time status displays

Graphics workstations

Alarm management

System Safety:

Work order/clearance

Earthquake response

Ventilation control/automation

Data logging

Destination Signs:

Train destination

Customer service messages

Estimated arrival times

Advertising messages

Internet information:

Real-Time departures

Email/Text advisories

Bart Service Advisories