

# Decentralisation and autonomous decisions

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# Wabtec - Overview

Global Freight Headquarters  
CHICAGO, IL

Corporate Headquarters  
PITTSBURGH, PA

Global Transit Headquarters  
PARIS, FRANCE

**27K**  
EMPLOYEES

**50**  
COUNTRIES

**\$8B**  
REVENUE

FORTUNE  
**500**  
COMPANY

Equipment	Components	Services	Digital
<b>23,000+</b> Locomotives in installed base	<b>100+</b> Countries with Wabtec products on locomotives and freight wagons	<b>17,000+</b> Locomotives monitored globally +2.5 million data points analyzed	<b>20,000+</b> Locomotives equipped with PTC computers/software

Confidential & Proprietary

# With a strong footprint in signalling

An unrivalled portfolio on digital electronics solutions

## SIGNALLING

## DISPATCHING

## AUTOMATION

**+3000**

EMPLOYEES  
ON DIGITAL  
ELECTRONICS

**1B€**

1B€ REVENUES  
IN DIGITAL  
SOLUTION

**+22000 +90000**

RADIO BASED  
ON-BOARD ATP  
IN OPERATION

KMS OF ATP  
WAYSIDE IN  
OPERATION

**+30000**

KM OF NETWORK  
CONTROLLED BY ONE  
OPERATION CONTROL  
CENTER WITH  
AUTOMATIC ROUTING  
AND SCHEDULING  
ALGORITHMS

**+11000**

LOCOMOTIVES  
EQUIPPED WITH  
ATO SAVING  
10% ENERGY

# Digital Electronics mission

## We help the world to be greener, smarter, faster and safer!

### GREENER

#### 01 OPTIMIZE FUEL CONSUMPTION



Every mission has a host of variables that negatively impact fuel efficiency: track grade and curvature, speed restrictions, driver variation, excessive horsepower, aggressive braking, meets/passes, and even weather. The challenge is managing these variables consistently and at scale.

##### A Scalable Path to Fuel Optimization:

- Wabtec's integrated digital solutions can address these factors and provide a path to fuel optimization.
- Three sets of functionality: 1) improved train handling, 2) smart train and network optimization, and 3) automation ... enabling up to 30% fuel savings.
- Make every train your most fuel-efficient.
- **Featured:** Trip Optimizer Suite (primarily).

### SMARTER

#### 02 INCREASE ASSET UTILIZATION



Railroad financial performance is tightly linked to the performance of critical assets, including locomotives, and railcars. In today's challenging environment, getting more out of these assets is more important than ever.

##### Increasing Asset Performance:

- Wabtec's distributed power technology is enabling longer trains, increased payload, and optimized distribution of power. LOCOTROL XA, Wabtec's next generation distributed power platform, takes performance to the next level.

##### Improving Asset Availability:

- Track IQ enables the shift from reactive maintenance to predictive maintenance ... increasing reliability and availability for rolling stock assets.
- **Featured:** LOCOTROL XA, Track IQ

### FASTER

#### 03 TRANSFORM YARD OPERATIONS



With over 50% of carload volume passing through classification yards, these nodes impact departure performance, car cycle time, and operational efficiency. Yet, today, much of the work is manual and inefficient.

##### Boosting Workforce Productivity:

- Remote-Control Locomotive (RCL) technologies enable a single operator to remotely control a heavy-haul locomotive, increasing crew productivity, reducing human error, lowering operational costs.

##### Improving Planning and Visibility:

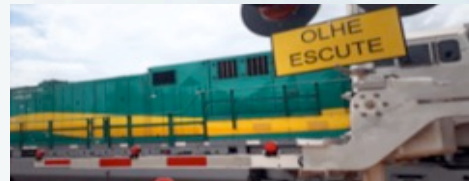
- Yard Planner combines dynamic planning tools, increased visibility, and powerful decision support to unlock productivity and network efficiency.
- Automated asset tracking with Asset Inventory Management.
- **Featured:** RCL, Yard Planner, AIM

Wabtec is participating in the European Research programme called ER JU\* focusing on Yard Automation (which includes all above featured products). The goal is to support the "Sustainable Competitive Digital Green Rail Freight Services" initiative.

\*Europe Rail Joint Undertaking

### SAFER

#### 04 INCREASE SAFETY



The PTC imperative in North America has provided a successful proving ground for Wabtec's safety-critical overlay systems and related solutions for railroads. We now have a tremendous opportunity to translate that success throughout the world.

##### Advancing Safety on the Mainline:

- Wabtec's I-ETMS system is a proven (22,000 on-board systems deployed) safety-critical overlay system that provides a means to enforce movement authorities, speed restrictions, etc., to help reduce the potential for accidents.

##### Enhancing Safety at Crossings:

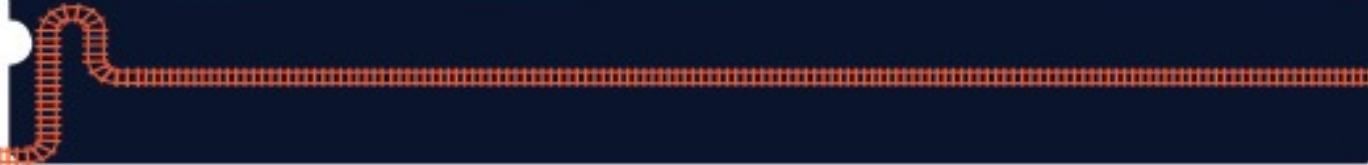
- Wabtec's Wireless Crossing Safety system is designed to improve safety while increasing average train speeds and optimizing crossing-activation times.
- **Featured:** I-ETMS, Wireless Crossing

Wabtec is delivering the worldwide most advanced train control solutions in Guinea (CBG), Liberia (ArcelorMittal) and Brazil (Rumo) combining moving block, satellite communication and precise positioning. The highest technology and the lowest CAPEX and OPEX in the market are now available to our customers.

In line with this experience Wabtec is participating in the European Research initiative ER JU focusing on Regional Lines (which includes all above featured products). The goal is to support the "Regional rail services / Innovative rail services to revitalise capillary lines" initiative to save regional railways lines at risk of decommissioning.

## Wabtec Mission in EU

# The Path to Autonomous Trains



# Our Strategy... connect and integrate the rail landscape



## Train Performance

*Improve train handling & improve fuel efficiency*

**Capacity, efficiency, automation**

- **7-13% ↑** fuel savings
- **1,900** CSX Trip Optimizer
- **775** CSX Locotrol DP

Hardware &  
Embedded Software Kits  
Services



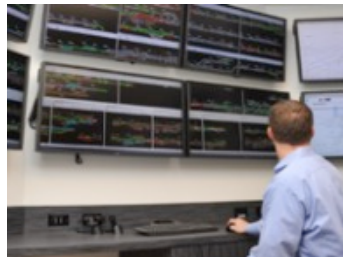
## Asset Performance

*Connect mobile networks, edge & cloud processing*

**Asset reliability, utilization**

- Up to **25% ↓** in mainline failures
- **3,000** GoLINC's on CSX
- **1,700** CSX locos with EOA

Edge devices  
Communications  
SaaS applications



## Network Optimization

*Plan and optimize mainline, yards, terminals*

**Velocity, throughput**

- **42%** of rev-ton miles in MP
- **10%+ ↑** in network velocity
- **20MM+** intermodal container lifts annually

Licensed software  
Software maintenance  
Professional services



## Transport Management

*Link shipper to rail to port to receiver*

**Visibility, productivity**

- **40% ↑** rail volume
- **>9MM** annual carloads moved through Rail TMS

SaaS applications  
Implementation

# Future: Autonomous Rail Traffic Management

## TECHNOLOGY FOUNDATION

- ✓ Safety/PTC
- ✓ Trip Optimizer
- ✓ Distributed Power
- ✓ Dispatch/CAD

## ATTENDED AUTOMATION

- ✓ PTC + Trip Optimizer
- ✓ Movement Planner
- ✓ Zero to Zero
- ✓ Smart HPT

25%

*Fuel efficiency improvements*

## SINGLE PERSON CREW

- ✓ Paperless Cab
- ✓ Road RCL
- ✓ Movement Planner

50%

*Potential productivity savings*

## DE-SKILLED ENGINEER

- ✓ Vital standalone PTC
- ✓ Yard automation
- High-bandwidth communication

25%

*Reduction in train delays*

## FULL AUTOMATION

- Moving block
- Dispatch visibility
- Wayside sensor integration
- Situational awareness, driverless

75%

*Reduction in accidents due to human error*

**Leverage our building blocks and solidify our foundation to accelerate the industry's journey of rail automation**

# The Path to Decentralization



# Key cost drivers of Signaling & Telecoms

(that makes Railways non-competitive)



## Dedicated Radio Network

**Problem:** Current solutions are based on dedicated networks → too expensive for low density lines (such as regional passenger or mine-to-port ones).

**Solution:** Intelligent use of public radio network and satellites choosing whichever is available and cheaper.



## Track circuits/ Axle Counters

**Problem:** Traditional train detection systems are expensive, prone to failures needing frequent maintenance along the track.

**Solution:** Precise and continuous localization of trains using radio, satellites, sensors and train integrity.



## Eurobalises

**Problem:** ERTMS based solutions require installing eurobalises. This is too expensive for low density lines.

**Solution:** Track data loaded on-board (not received by eurobalises as it is in ERTMS). Positioning given by radio, satellites and sensors.



## Signals

**Problem:** Signals are expensive, prone to failures and require regular maintenance.

**Solution:** A radio based train control system issuing movement authorities to the train cab.



## Cables

**Problem:** Dedicated radio, track circuits/axle counters and signals all need large amounts of copper cables. Same for level crossings and point machines.

**Solution:** Elimination of wayside equipment, other than level crossings and point machines which should be radio controlled and self-energized.



## Many Sub-systems

**Problem:** Available solutions are based on complex architectures with several sub-systems configured independently with almost the same data.

**Solution:** An integrated Operation Control Center system in order to ease configuration and testing reducing expensive engineering hours and hardware.

# The solution

Imagine the trains controlled safely with a system cost competitive and more advanced than the modern systems installed in high speed lines.

A system using public radio & satellites communication & positioning, intelligent systems on-board, cloud-based control rooms and minimal wayside equipment.

## Results:

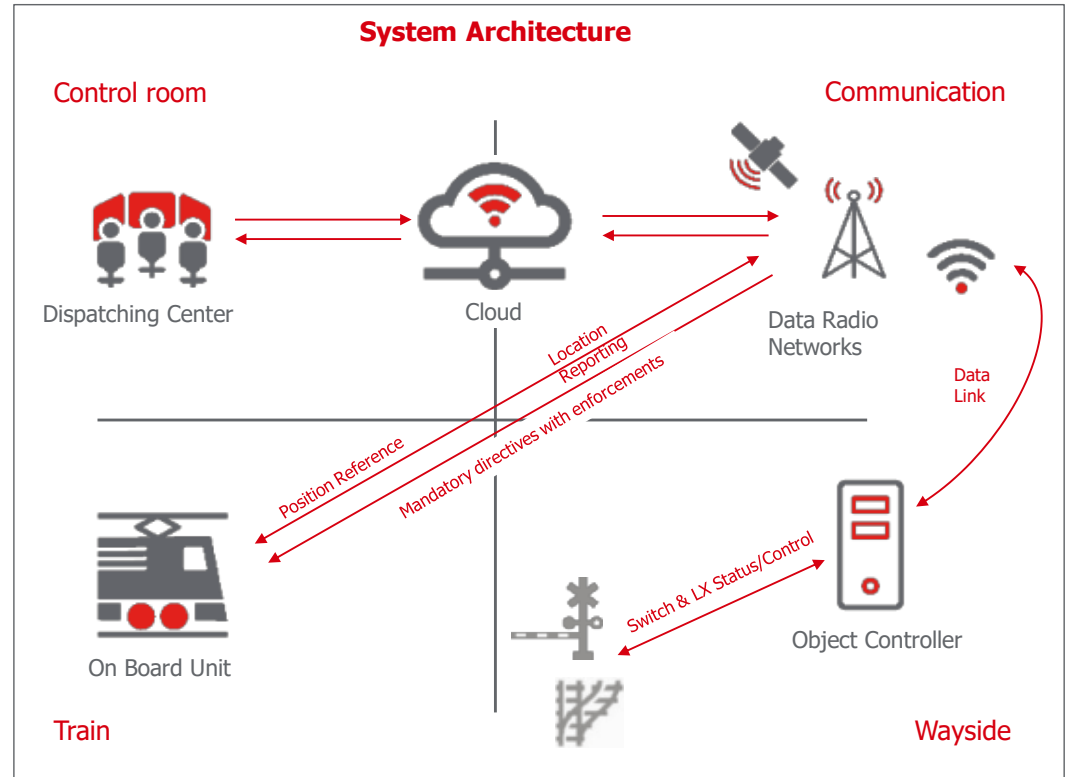
- >>50% saving on CAPEX and OPEX.
- Higher system availability (boosted by zero critical wayside elements)
- Max punctuality, precision forecast, on-demand service, energy saving

# Wabtec Train Control: a decentralised approach

- **Train:** precise satellite positioning / radio based moving block ATP
- **Wayside:** self-energized (solar panels) point machines and level crossings remotely controlled via radio
- **Control room:** cloud-based dispatching center integrating:
  - optimization (non safety related) of the real-time routing and scheduling of trains
  - interlocking function controlling point machines and level crossing via radio (SIL4)
  - remote control of rolling stock for shunting
- **Communication:** open interoperability specifications and IP based data radio protocols, applicable on different types of data radio networks (including satellites).

*No need of old expensive signalling & telecom system!*  
Zero trackside equipment\*

\*Apart switches and level crossings (where needed)



**Thank You**

