Leading the digital transformation of the rail industry

March 1, 2018
We are GE Transportation.
We move the world.
The rail transportation industry faces unprecedented challenges.
Trucking innovation

Coal declines continue

Tightening supply chains

Aging workforce, institutionalization of knowledge

Evolving customer expectations
Disconnected systems & processes
Poor integration
Legacy architecture and technology
North America
~500,000 Unexpected Train delays a year
20+ HOURS terminal dwell
~20 miles per hour average train speed
$10B Yearly fuel costs

India
91% Op Ratio
104 # of Accidents in 2016
~24 km per hour average train speed
$2.5B Yearly diesel costs

Brazil
11.6 Accidents per million train km
~12 km per hour average train speed
$1.0B Yearly diesel costs

Sub-Saharan Africa
11 days Freight wagon (dwell)
~20 km per hour average train speed
$2.3B Yearly fuel costs
Digital solutions: driving the transformation
The components of transformation

- **Optimize Asset Performance**
- **Optimize Train Performance**
- **Manage & Optimize Networks**
- **Transportation Management**

Achieve end-to-end shipment management with connected modes and nodes.
Many of the Pieces Available Now

Installed base Highlights
- 17,000 locomotives monitored
- 20,000 LOCOTROL systems
- 10K GoLINC Edge Devices
- 10,000 Trip Optimizer Systems
- 500+ short lines on TMS system
- 70 Terminals, 20 Million Lifts/year

Train Performance Optimization
- LOCOTROL Distributed Power
- Yard & Road RCL
- Trip Optimizer

Asset Performance Management (APM)
- APM: Locomotives
- APM: Railcar
- APM: Track/Wayside
- ServiceMax

Network Optimization
- Precision Dispatch
- Movement Planner
- Yard Planner Systems
- Smart Intermodal & Auto Ramp Management

Transportation Management
- Railroad TMS
- Shipper TMS
Examples of Digital Solutions

**APM**

- Enterprise asset management
- **25%** reduction in failures

▲ Reliability

**Train Performance**

- Smart cruise control for trains
- **10%** ↑ fuel eff., ~900K gallons fuel saved per week; 9000 units IB
- Vale Mozambique – 1st implementation in Africa

▲ Fuel Efficiency

**Network Optimization**

- Real-time line-of-road planning
- 2 Class 1 + 1 Int’l installs
- 10-15% ↑ in velocity

▲ Velocity

**Transport Logistics**

- Unlocks power of big data at one of the world’s largest ports
- Delivers fast, data-driven insights
- Improves cargo visibility, increases efficiency

▲ Visibility, Productivity
Network Optimization

Asset Performance Management

Train Performance Optimization

Transportation Management

- Precision Dispatch
- Movement Planner
- Yard Planner Systems
- Smart Intermodal & Auto Ramp Management

Network Optimization
The opportunity for rail yards
The rail yard of today

- Typical workstation
- Selected automation
- Minimal decision support
- Localized planning and execution
- Minimal real-time asset tracking
- Ad-hoc network considerations
The rail yard of the future: objectives

**Anticipate & prevent problems**
- Predictive maintenance
- Proactive decision-making
- Informed recommendations

**Enhance network productivity**
- Automation (as much as possible)
- Remote control
- Optimizing asset utilization

**Develop new opportunities**
- Multidisciplinary, team-based planning
- Improved customer experience
The high-level yard of the future roadmap

- **TODAY**
  - Consistent Data & Control

- **SHORT TERM**
  - Proactive Network Planning

- **LONG TERM**
  - Autonomous Yards

- **LONGER TERM**
  - Decentralize Yard Activities

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Hump yard planner system
Decision support for hump yard operations

- Train arrival
- Inbound inspection
- Hump
- Pull-back
- Outbound inspection
- Train departure

- Inbound train-to-track assignment
- Inbound train metering
- Hump sequence
- Block-to-track assignment
- Block stacking
- Re-hump sequence
- Bad order processing
- Pull-back sequence
- Class track-to-train assignment
- Outbound train-to-track assignment
- Departure-driven planning
- Departure time updates

Image source: Google Earth

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March 1, 2018 17
Three cool things our engineering team has done

There are many more...

- Class Scoring
- Planning insights
- Clear UI
Class scoring

• The planning algorithm is driven by outbound demand

• Cars are evaluated against each other
  - Desired standing order
  - Target outbound train
  - The train’s departure direction

• An integer value is created to represent the demand

• This allows cars to be easily compared with each other
Planning insights

• Goal: Let users know that planner is going to do something that may not be intuitive

• Also for user input that will affect decisions

• Eliminate the “flying blind” feeling
Clear UI
Wrap-up
Our vision: integrate across solutions

- **Interoperability**
- **Visibility**
- **Optimization**
- **Common architecture, data foundations & UX**

- **Port & Supply Chain Visibility**
- **Transportation Management**
- **Edge Devices, Cloud Connectivity**
- **Train Handling & Automation**
- **Asset Performance Management**
- **Yard & Network Optimization**
For more information:

https://www.getransportation.com/digital-solutions

Read the GE Transportation white paper: “Transportation’s Evolution: A Promising Future”
http://www.getransportation.com/whitepaper

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