On Track to Smarter Railways

Manish Gupta
IBM India Research Laboratory
Something meaningful is happening…

“Every human being, company, organization, city, nation, natural system and man-made system is becoming interconnected, instrumented and intelligent. This is leading to new savings and efficiency—but perhaps as important, new possibilities for progress.”

The world is flatter.

The world is smaller.

The world is getting smarter.

• Today, there are 1 billion transistors for each person on the planet.

• The internet of people is 1 billion strong. The Internet of things—cars, appliances, cameras, roadways, livestock -- is headed to 1 trillion.

• Every day, 15 petabytes of new information are being generated. This is 8x more than the information in all U.S. libraries.
What is Smarter Rail?

- Smarter rail systems are highly instrumented, extremely interconnected and far more intelligent.

- Intelligence that is networked, communicating and aware across Rail System

- Instrumentation helps rail companies collect new information to monitor operations more closely and act more proactively

- Information integration, sophisticated analytics and data modeling can infuse strategic and operational decision making with new level of intelligence

- Information shared across the enterprise and with different partners including:
  - Shippers
  - Partners
  - Government Agencies
IBM’s solution strategy is aligned with Smarter Rail

- Provide a Safer Rail Experience
- Provide a More Reliable Rail Service
- Create a More Efficient and Cost Effective Rail Operation
IBM’s solution strategy is aligned with **Smarter Rail**

**Smarter Rail**

**IBM is investing in...**

- Enhancing Rail Operations Centers by integrating/sharing security, train control, booking, ticketing and boarding data.
- Creation of Crisis management system and emergency response
- Innovations in wireless Condition Based Monitoring Systems for Locomotives, EMU’s and Rail Infrastructure
- Innovations in video surveillance technologies
IBM’s solution strategy is aligned with Smarter Rail

Smarter Rail

IBM is investing in...

Provide a Safer Rail Experience

Provide a More Reliable Service

- Rail network planning, scheduling, and optimization
- Asset management, maintenance repair and overhaul
- Supply Chain Network Optimization
- Project Lifecycle Management for Infrastructure Projects
IBM’s solution strategy is aligned with Smarter Rail

- **Provide a Safer Rail Experience**
- **Provide a More Reliable Service**
- **Create a More Efficient and Cost Effective Rail Operation**

Information Repository for
- Historical Data Storage and Analysis through Enterprise Data Warehousing (EDW)
- Operational Decision Support to interface Rail Operations /ODS
- Planning and Analytical System using operational and Historical data
- Enterprise Financial Management Systems that integrate with strategic and tactical operational data
Rail Safety – Video Infrastructure For Car Inspection, Track & Bridge Monitoring

**Video Infrastructure**
Infrastructure design and optimization
Leverage the video infrastructure for proactive safety applications for rail yard operations

- Potential integration with active RFID for hazardous environments (e.g. S3 + ATLAS)

**Automated Car Inspection Station**
Replace slow and labor intensive manual/visual inspection (e.g. mandated 1K miles inspection) with machine vision/technology based systems to improve velocity

**Track And Bridge Monitoring**
Detect excessive vibration caused by track/bridge with on-board sensors

- Help triage inspection/maintenance schedule
Detect impacts on a bridge caused by, e.g., a barge, with WSN/motes

**Technology**
- Video Analysis, Computer Vision and Pattern Recognition, Multi-media Indexing, Scalable Data Management

**Differentiation**
Unique video indexing technology to make surveillance video searchable. Indexing allows the user to look at patterns of activity across large numbers of cameras, allowing both rapid investigation and predictive security. Real-time alerting functionality
Video Alert System for Rail Safety

**Motion Detection**
*Triggers on movement of object within a zone*

**Operational Safety**
*Accident Response, Irregular Operations, Accident Avoidance*

**Sensitive Detection**
*Tripwire function with high-motion sensitivity – triggers on the man crossing the track*

**Object Removal**
*Triggers when object outlined in blue is removed from its position*

**Directional Motion**
*Triggers on rail cars and trains move in the direction of the arrow*

**Operational Analytics**
*Travel patterns, safety assessment, terminal congestion, seasonality*
IBM Rail Projects: Mote-Based Wireless Sensor Networking

**Business Challenge**

Data from existing trackside sensors, including the RFID-based Automatic Equipment Identification (AEI) System, Hot Box Detectors, Wheel Impact Load Detectors (WILD), are sparse due to high deployment costs.

Data does not provide timely information (e.g. bearing failures) to circumvent problems (e.g. derailment).

**Strategic Initiative**

Develop next generation rail car technology infrastructure to provide near real-time information

One infrastructure supporting multiple sensor modalities

**Proposed Solution: Mote-based wireless sensor networking**

Maintains a mesh network for the train that is continuously updated as railcars are added to / removed from the train

Supports periodic condition reports and real-time alerts
Investing in Smarter Railroads

IBM Global Rail Innovation Center, Beijing – Opened June 2009

• Foster collaboration across ecosystem of partners and advisors
  • Passenger and freight railroads from US, Canada, Europe and Asia
  • Prestigious universities in US and China including Michigan Tech
  • Solution providers including RMI, Motorola and Sabre
  • Evolving advisory role for government agencies worldwide

• Drive co-creation of solutions, industry standards, research and thought leadership

• Help railroads increase capacity, network velocity and efficiency while enhancing customer service
  • Asset management, maintenance, scheduling, and rail network management
  • Wireless monitoring of rolling stock and fixed infrastructure
  • Supply chain and energy use optimization – for railroads and their customers
  • Safety and security including Digital Video Surveillance
  • Passenger sales and service

• Draw on assets and expertise from across IBM:
  • IBM Watson and China Research Centers
  • IBM China Software Lab
  • IBM China Systems Center
  • IBM Analytics Solution Centers (Beijing and other global sites)
  • Global Delivery Centers worldwide
  • Recent acquisitions including ILOG, Cognos and Maximo

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IBM Research Overview

Famous for its science and vital to IBM

Innovation that Matters

Corporate funded research agenda
Technology transfer
Centrally funded

Collaborative team
Shared agenda
Effectiveness
Joint programs

Work on customer problems

Create business advantage for customers
eBusiness research
Research in the marketplace

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IBM India Research Lab has developed a tool that called **Emerald** that helps reduce the energy costs of data centers. Studies done on several major accounts have shown the ability to reduce energy consumption averaging about 35%, while meeting service levels, via workload consolidation.
Let’s Build a Smarter Planet Together

Thank You