Electronic Systems for Trains of the Future

Utilizing Today’s Available Systems and Planning for Future Advancements

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Overview

Today’s computers and electronic systems provide numerous methods by which passenger trains can enhance:

- Customer’s Experience
- Fleet Maintenance/Improved Reliability
- Transportation Management

The following presentation is to provide design concepts for the NGEC to consider and possibly integrate into the NGEC specifications for new rolling stock.
Agenda

• Issues to Consider
• Enhanced Customer’s Experience
• On-Board Fleet Maintenance Locomotives
• On-Board Fleet Maintenance Cars
• Transportation Management
• Intra Train Communication
• Summary
• Recommendations
Issues to Consider

• Life Cycle
  • Rolling Stock – Planned Approximately 30 Years
  • Electronic Hardware-Upgrades every 3-5 Years
  • Software-Upgrades – variable timelines

• Software
  • Unique to the Application
  • Proprietary Formats
    • Licensing Fees
Enhanced Customer’s Experience

- WiFi - High speed connection to the Internet
  - Control Data Streaming?
- Entertainment - movies, TV shows, music to passenger owned devices (on board server to WiFi)
  - Licensing Agreements with Entertainment Providers
- On Board Information Systems – Train status updates
  - Location, speed, arrival time, schedule performance
  - Train schedule connection opportunities
  - An ADA enhancement
- Features of the Future - Unknown
Fleet Maintenance On-Board Status Locos

- Fault Codes
  - Engine
  - Propulsion
  - Air Compressor
  - Cab Signals
- Equipment/Operational Status Updates
  - Ride Quality
  - External Cameras
  - Internal Cameras
  - Engine Idling or on ground power

Amtrak communicates these faults wirelessly to terminals and stations in advance of locomotive arrival and to a data server to analyze potential fleet failures.
Fleet Maintenance On-Board Status Cars

- Passenger Cars Faults
  - HVAC Systems
  - Automatic Doors
  - Ride quality
  - Toilets
  - Public Address Systems
  - Refrigeration
  - Wheel Slip
  - ot Box
  - TADs

- Equipment Status Updates
  - Temperature Monitoring of Cars in the Yard/Station
    - Freezing (Winter)
    - Cabins too Warm (Summer)

*These faults could be stored for maintenance troubleshooting, can be electronically communicated to terminals in advance of train arrival, and stored on servers to analyze failures*
Transportation Management

- Train Location and Speed
- On Time Performance
- Diesel Fuel Level
- Ticket Processing
- Customer Head Count
- Train Inventory
  - Food
  - Consumables
- Security
  - Internal Facing Cameras
Intra-train Communication

- Digital Train Line Communication
  - Increased bandwidth
  - Standardize cabling and connectors
  - Future expansion for safety systems
  - Utilize one WiFi/Cellphone connection per train

- Software
  - Standardized format and language (internet approach)
  - Open Source Code
  - To support interchangeability of rolling stock
Summary

• Electronic/ Computer Systems Are Becoming an Integral Part of Rolling Stock Equipment. Influencing:
  • Customer’s Experience
  • Fleet Maintenance
  • Transportation Management
• Planning Required for Life Cycle Differences Between Rolling Stock and Computer Systems
  • Multiple Computer System Upgrades During Life Cycle of Rolling Stock
• Rolling Stock Specifications Need to Include Provisions for Computer System Applications and Inter-Car Communications
Recommendations

• Create Technical Team to Define Enhancements
  • For Customer’s Experience
  • For Fleet Maintenance
  • For Transportation Management
• Interface with IT Organizations
• Edit existing new rolling stock specifications
• Investigate retrofit capabilities