Keeping track of freight cars

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What Railway Managers Need to Know

- Where freight cars ***were*** (for billing, payments, and analysis)
- Where freight cars ***are*** in real time
- Real-time status of infrastructure
- Where freight cars ***will be*** at time t_1 in the future
- Where freight cars ***need to be*** at time t_2 in the future
- How best to get the freight cars from where they ***are*** and ***will be*** to where they ***need to be***
- That the correct instructions are being conveyed to the right crews and vehicles, and that the instructions are being complied with

What Shippers Want to Know

- Where their shipments ***are*** and what they are doing, in real time
- When their shipments **will arrive** at their destinations
- When circumstances occur that will cause delays, and what the revised arrival time that the shipments will arrive at their destinations

What a railroad needs to track its freight cars

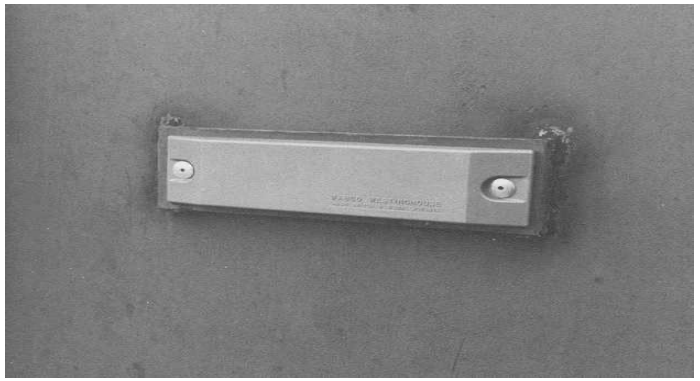
It needs to integrate:

- Car identification
- Car location information
- Work order reporting system
- Operating data system data bases
- Freight car scheduling system
- Accessibility to data

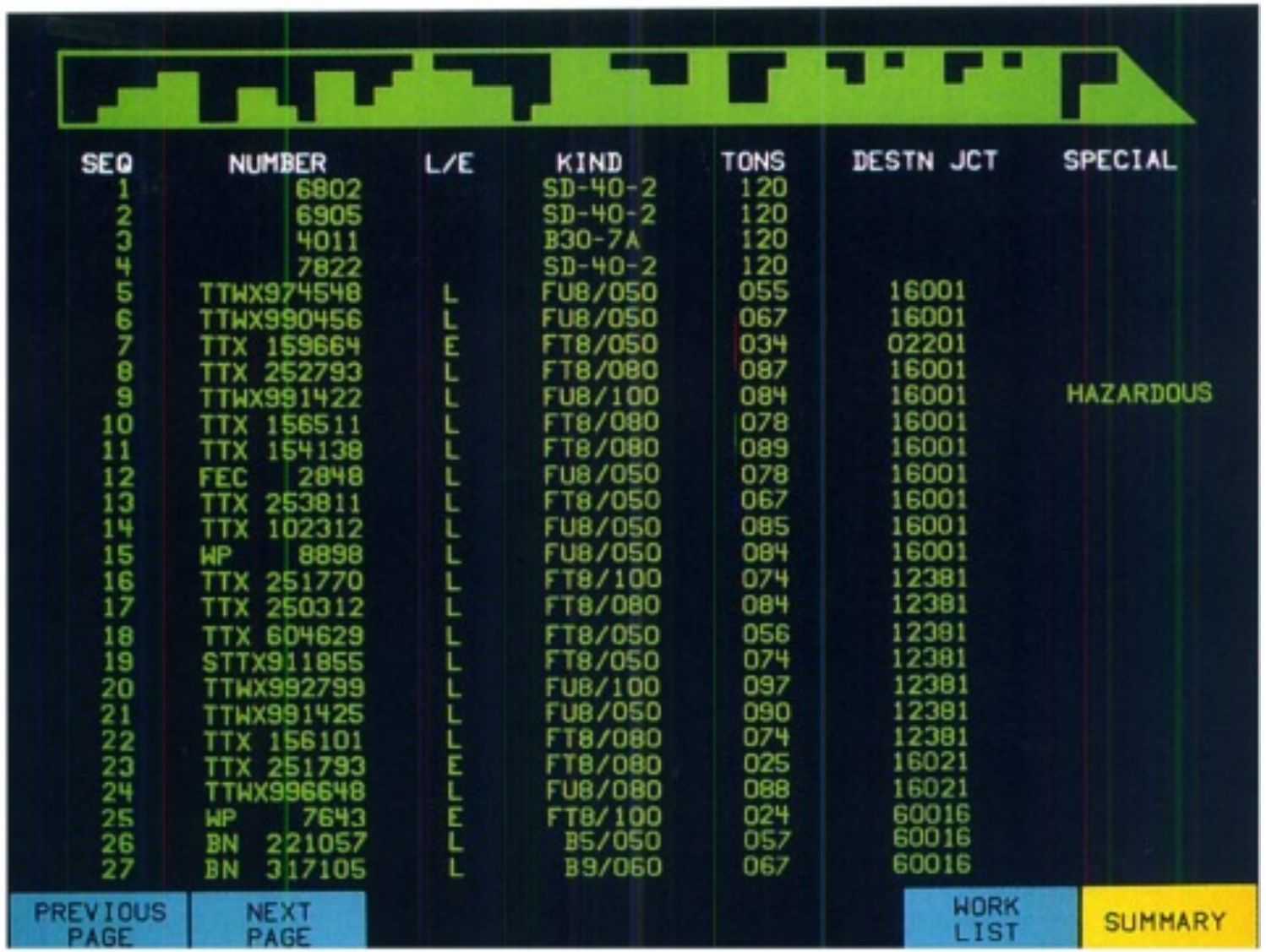
Automatic Equipment Identification

- Two passive AEI (ie., RFID) tags are already installed on each North American freight car and locomotive since 1995. It is an AAR Interchange Rule; there was and is no government involvement.
- Readers already in place at track-side at most yards, junctions, and interchange points interrogate tags at 900 MHz radio frequency; the readers require periodic "tuning" to maintain 100% read rate.
- Tags respond with vehicle initial and number and the tag readers confirm what cars are on each train.
- AEI transmits accurate confirmation of train consists to PTC on-board computers and to control center computers where train consist files are maintained.

AEI Tag and Readers



Locomotive Cab Display Showing Train Consist



Real-Time Train Location and Speed

- GPS receivers that are already on virtually all mainline locomotives generate real-time train location and speed information.

- Train position and speed are sent over the PTC digital radio network, which already exists, from the locomotive to the control center where subsequent movement authorities are created and train location files are maintained.

- The movement authorities are sent over the same digital radio network from the control center to locomotives where the train crew acknowledges receipt and the PTC computer enforces speed limits and the limits of movement authorities.

- Accurate positioning is needed at clearance points at switches.

Work Order Reporting System

- Instructions are sent from control center to train crews on where to set-out and pickup loaded and empty freight cars en route.
- The on-board train consist is updated automatically based on crew acknowledgement of work order completion and is sent to control center computers to update train consist files in real time.
- Customers can be automatically notified of impending or actual car placement.
- Important for establishing “custody chain” of shipments.
- Union Pacific developed a WOR system; not known if it is still in use.

Operating Data System Data Bases

- Train Location Data Base – contains location and speed data from PTC GPS receivers on Class I main line locomotives.
- Train Consist Data Base – contains data from AEI readers that are reading the RFID AEI tags that are on all freight cars and locomotives on each train.
- Work Order Reporting System Data Base – receives data on set-outs and pick-ups of empty and loaded freight cars, and updates the train consist data base.
- Waybill Data Base – Contains a waybill created by yard offices for every car, with car initial and number, origin, destination, contents, estimated weight, and what hazardous material or residue, if any, the car contains.
- UMLER (Uniform Machine Language Equipment Register) – A data base maintained by RAILINC listing every freight car, its initials and numbers, what kind of car it is, its length, width, tare weight, and number of axles.

These data bases, when integrated, can precisely locate every freight car and shipment.

Scheduling Systems

- When trains run on schedule, aided by the real-time information on train location and speed from PTC, scheduling of locomotives, freight cars, and crews is possible.
- Freight car scheduling permits better allocation of assets, less cross-hauling. The first freight car scheduling system was developed by the Missouri Pacific Railroad with FRA funding.
- Freight car scheduling makes it possible for railroads to offer customers the ability to make freight car reservations, and for railroads to use yield management.

Accessibility to Data

- Authorized parties (i.e., railroads, shippers, owners of freight cars, emergency responders, and government agencies) need to be able to access the operating data bases when appropriate to inquire about specific freight car and shipment status.
- “[Integrated systems], while clearly complex, can actually be described quite simply. It is all about ensuring timely and accurate information gets where it’s needed, when it’s needed, and to those who need it most.”

John G. Grimes, DoD CIO

Questions?
Want more material?
Email me, call me, or talk with me after the session!

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