

PSR and the Digital Transformation of Rail Yard Planning

Jeremiah Dirnberger

jeremiah.dirnberger@wabtec.com

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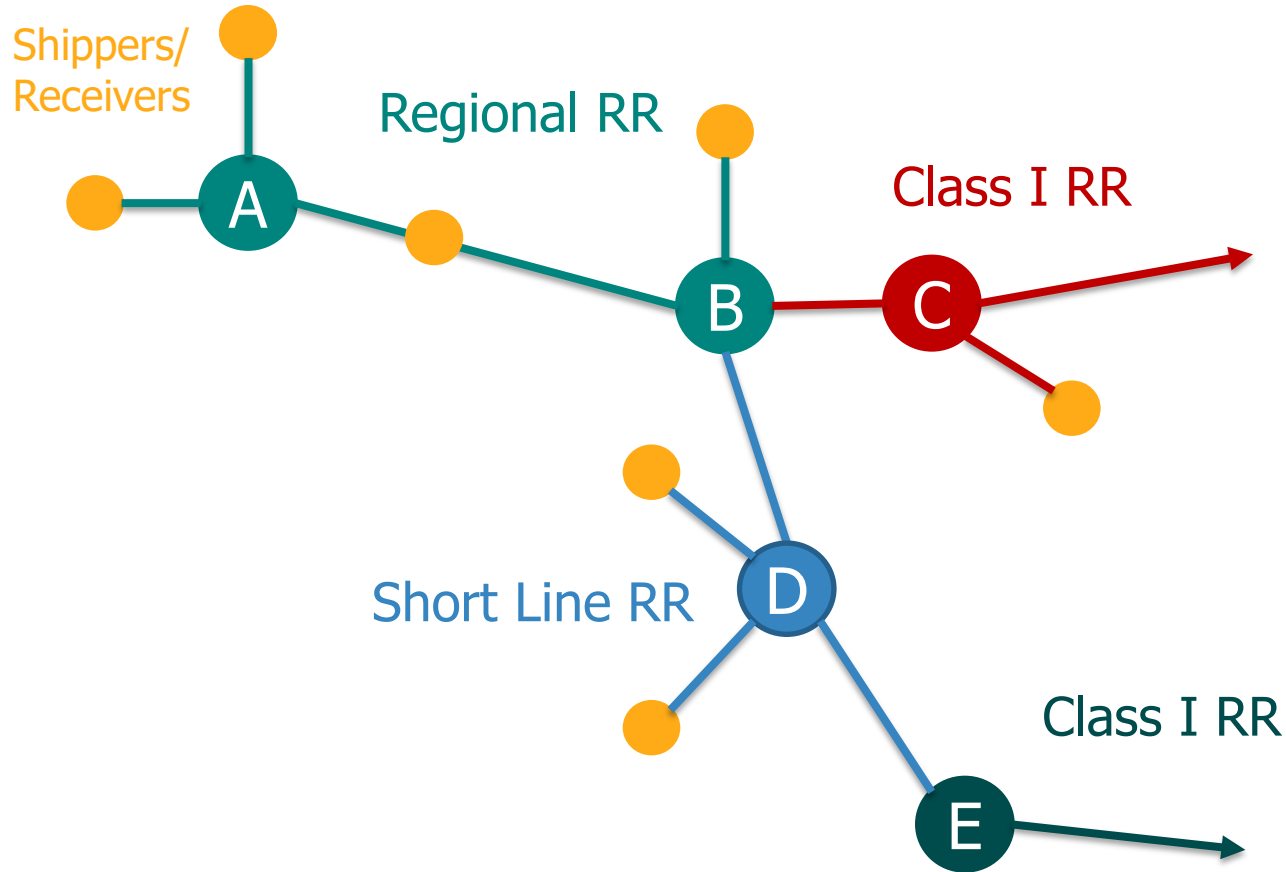
Discussion overview

- A Unique Challenge
- PSR and Yard Operations
- Transforming Planning and Operations across Short Lines and Class Is



A Unique Challenge

How do we balance the rigidity of PSR operating principles with the variability of daily yard operations?



Current Situation: Inefficiencies and service failures at yards/terminals/interchange

more time spent at the yards/terminals/interchange than in transit

Our vision: More automation, enhanced visibility PLUS advanced decision support will unlock network efficiency & productivity beyond the PSR gains already achieved

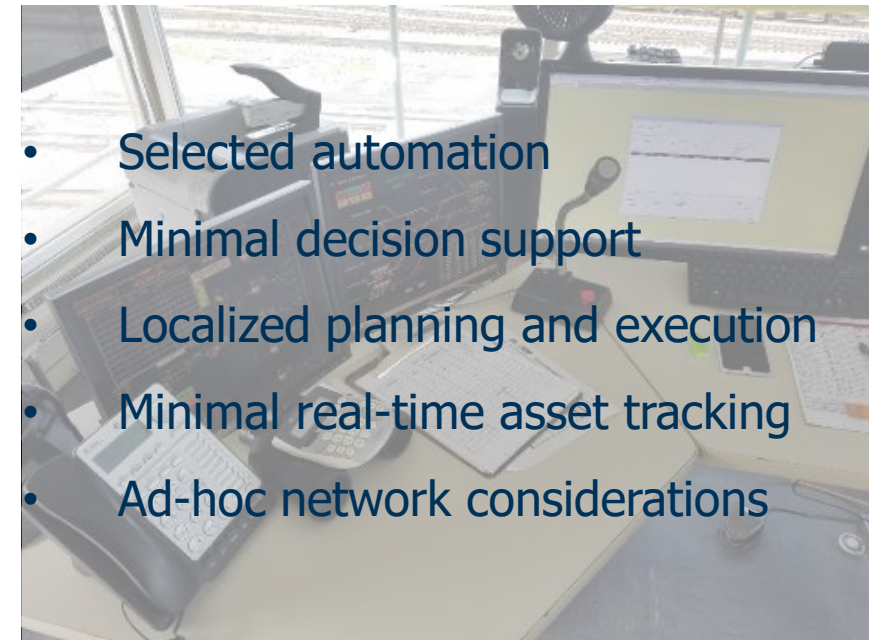
Network level changes have led to operational disruptions... but technological disruptions have yet to gain momentum

PSR tends to prefer the flexibility of flat switching over the efficiency of humping

How much has the North American rail industry invested in the remaining yards?

	Jan '12	Jan '17	Nov '17	Jul '18	Nov '19
Hump Yards	28%	26%	21%	22%	20%
Flat Class Yards	72%	74%	79%	78%	80%

*author's estimate of yards used primarily for classification on Class I and Short Line RRs



- Selected automation
- Minimal decision support
- Localized planning and execution
- Minimal real-time asset tracking
- Ad-hoc network considerations

PSR and Yard Operations

Hump Yard Planner Pilot is Successful!

- Phased deployment in October and November 2019
- High level of user acceptance
- Designed for “traditional” hump yard operations, modifications under way to incorporate PSR principles
- Will serve as the interactive playbook for PSR-based yard operations across the network



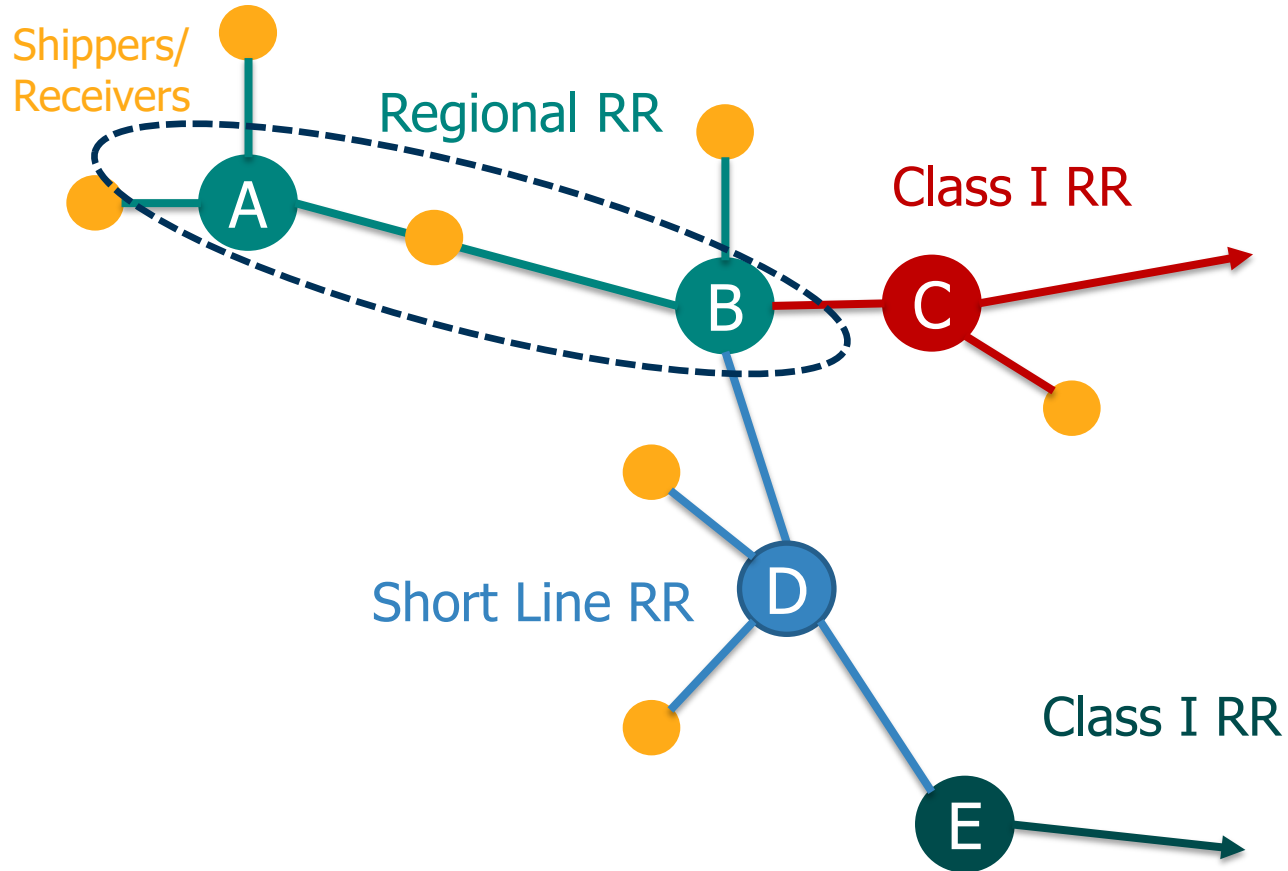
PSR principles for yards

1. First In, First Over (FIFO) hump sequence
2. Maintain Static Block-to-Track assignments in the Class Yard
3. Wait to Start Building a train until the time dictated by the plan
4. Use available resource time on hump and pull-back to help the train building process (couple tracks, switch out mis-routes, etc.)
5. Follow the plan



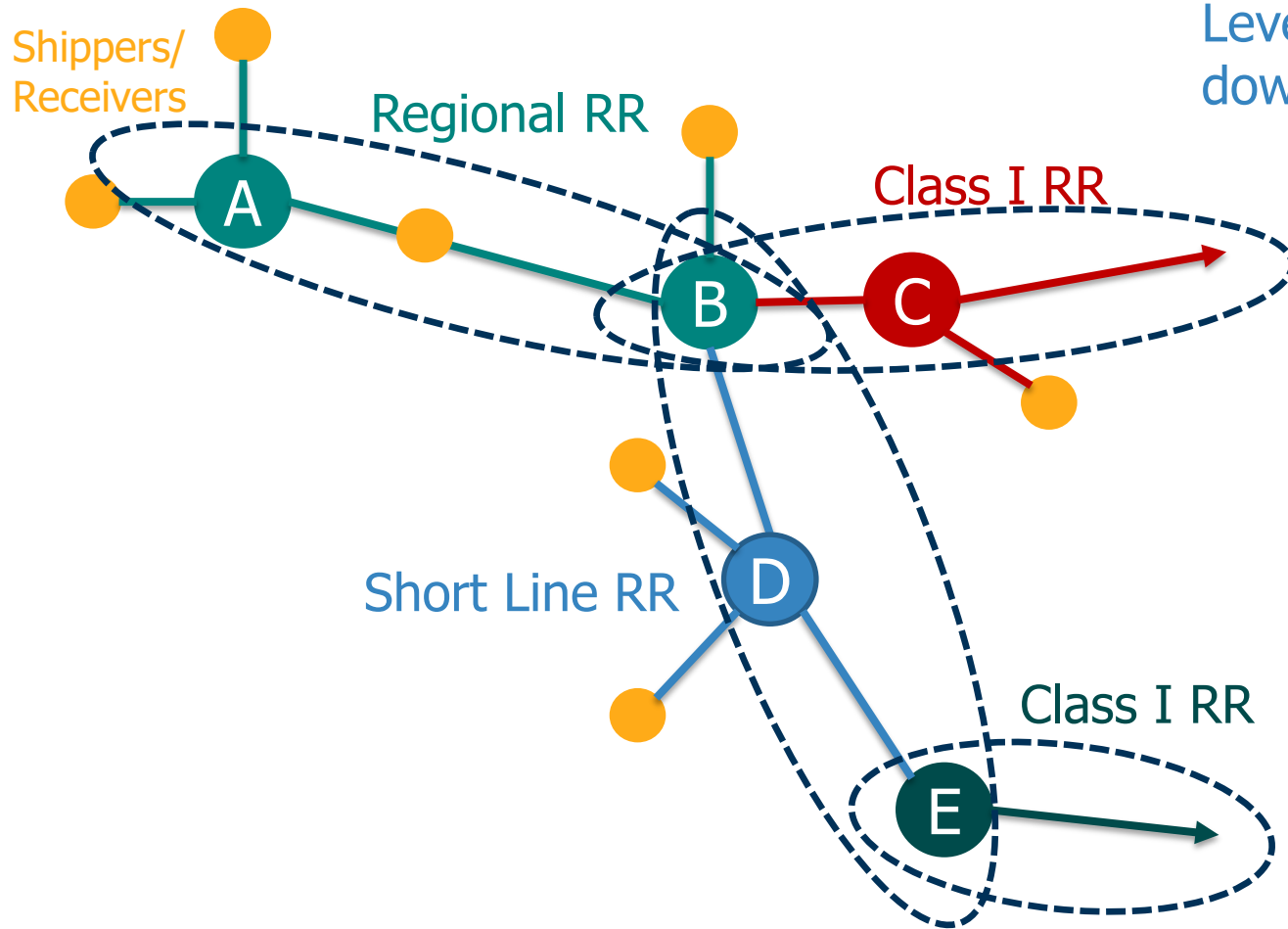
Transforming Planning and Operations across Short Lines and Class Is

Opportunity 1: Increase asset velocity intra-network



- Transform a railroad's corridor/terminal area
 - Leverage integrated components to drive:
 - Load balancing across terminals
 - Further dwell time reduction
 - Increased car throughput
 - Increased asset productivity

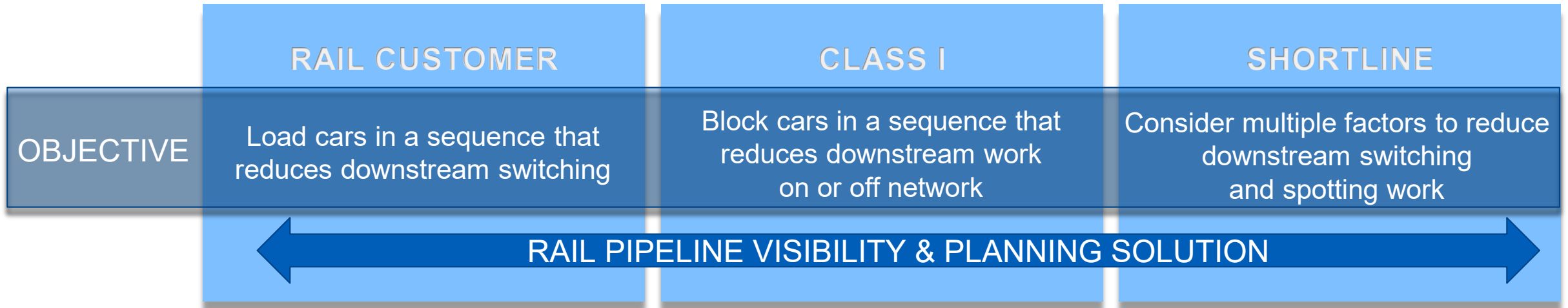
Opportunity 2: Increase asset velocity inter-network



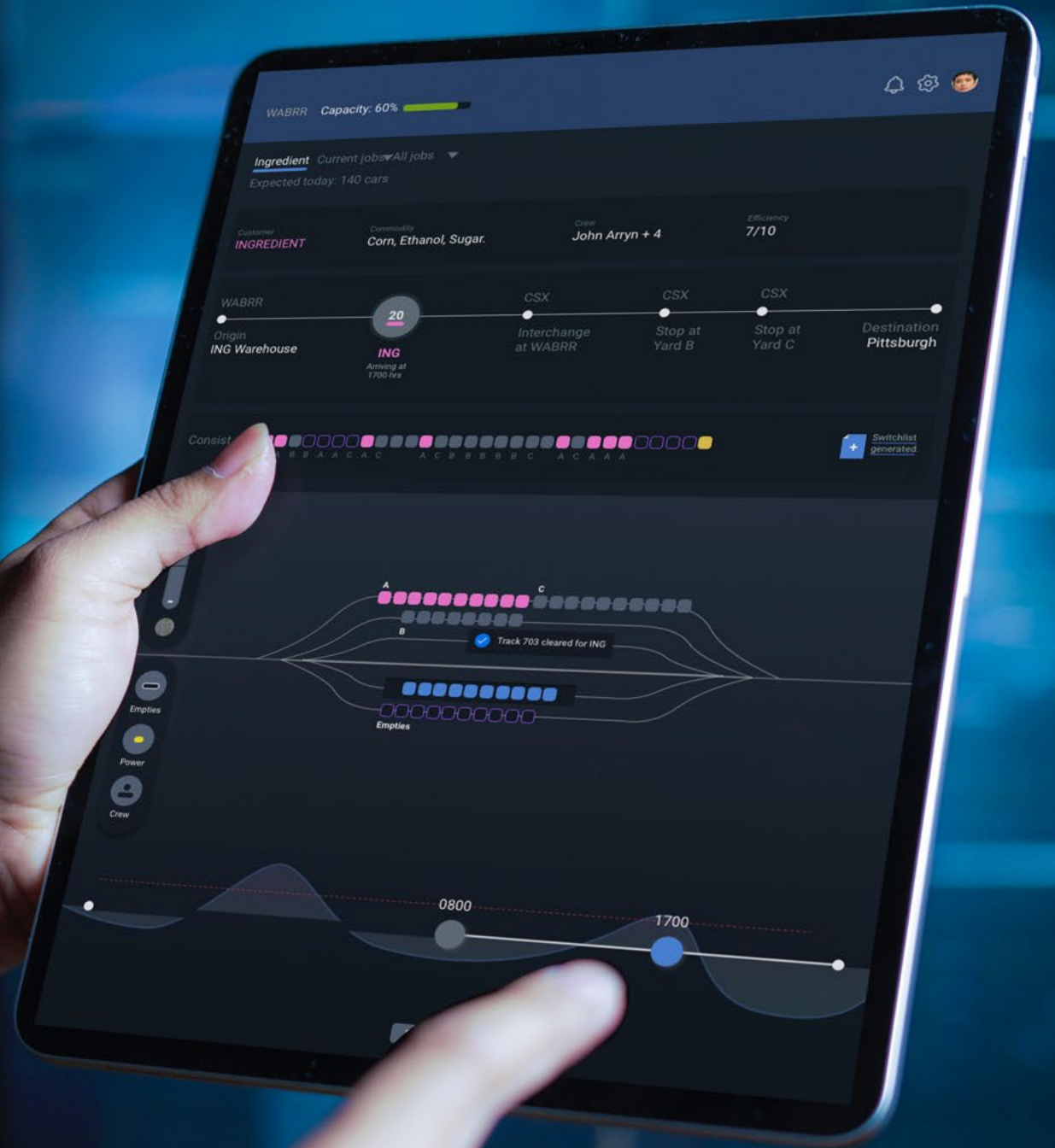
Leverage data integration to remove work downstream across carriers

- Transform more than one railroad corridor/terminal area
 - Provides a competitive advantage by driving
 - Increased supply chain visibility
 - Dwell time reduction
 - Increased car throughput
 - Increased asset productivity

Opportunity 3: Increase asset velocity through the supply chain

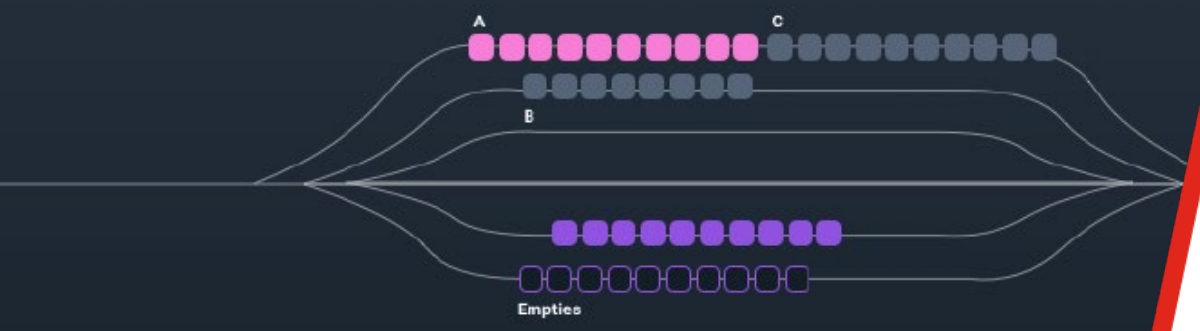


In 2019, we created a clickable concept to illustrate possible solutions to these opportunities



Expected today: 140 cars

Customer: **INGREDIENT**
Commodity: Corn, Ethanol, Sugar.
Crew: John Arryn + 4
Efficiency: 7/10



Multi-Carrier Block Optimization

Partner and trip visibility, to reduce the overall workload of every train in circulation and increase capacity through smarter asset, infrastructure, and crew scheduling.

Working toward the future



To advance the Yard of the Future, a unified approach is needed

Data visibility across partners

Seamless sharing of the right information to the right party at the right time



Real-time asset tracking

Scalable platforms that remove the need for manual yard inventory data entry



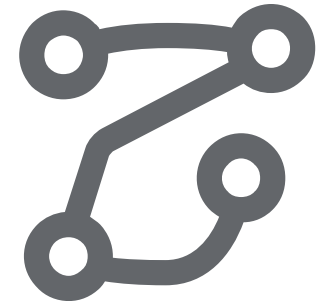
Integrated planning tools

Proactive decisions that consider network conditions and keep assets moving



Remote planning and execution

Move from local control to regional control of yards to...



Railroad Automation is about people first, processes second, and products third

Accelerating the future of transportation