



GE Transportation

The Future of Optimization & Automation in Intermodal Terminal Operations

Steve Tyber, GE Transportation
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Agenda

- External pressure on intermodal rail operations
- Opportunities in terminal operations
- Smart Intermodal Management System (SIMS)
- Where it's going: Automation

Some headlines from the JOC

Chicago intermodal rail delays 'unprecedented' since January Feb 22, 2018 4:06PM EST

Chicago rail backlog forces UP to restrict draymen Mar 05, 2018 8:03PM EST

CSX suspends Chicago 59th Street Yard inbound traffic Mar 08, 2018 6:56PM EST

Analysis: Domino effect grips US intermodal industry Mar 13, 2018 10:18AM EDT

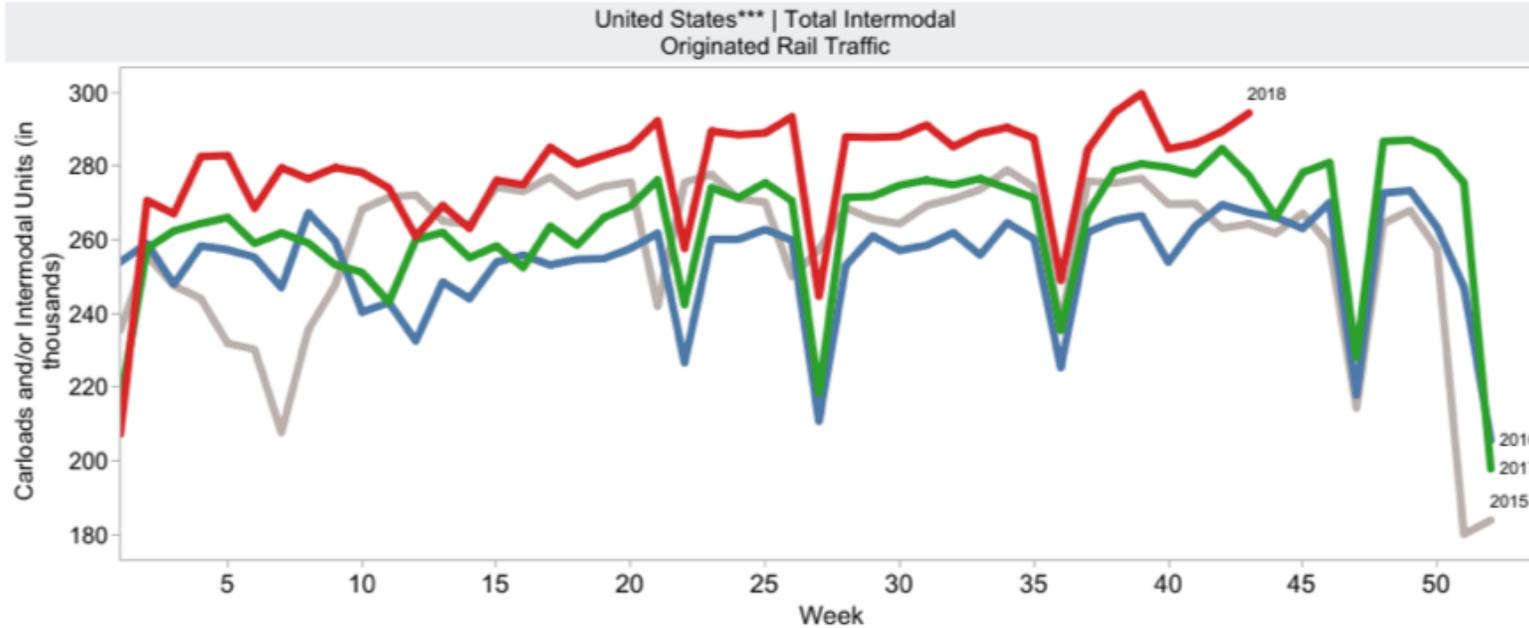
US intermodal rail fluidity improves, but larger questions remain Apr 12, 2018 6:52PM EDT

US rail service delays spark frustration from shippers, lawmakers Apr 17, 2018 4:21PM EDT

The capacity of rail and trucking to keep up with intermodal demand is being pushed to its limit.



Pressure on terminals: Surging volumes



* Canadian traffic includes the U.S. operations of Canadian railroads.

** Mexican traffic includes the U.S. operations of Mexican railroads. Comparable railroad figures are not available for Weeks 1-26, 2017...



Intermodal terminals did not see sustained relief from 2017 peaks.

Q1 2018 was the best quarter for intermodal in over four years.

Canadian National saw a 16% increase in intermodal in 2017

Bullish outlook for intermodal volumes in 2018.



Pressure on terminals: Priority freight



With e-commerce people have come to expect rapid shipments.

Rail terminals must quickly process high priority freight even at the expense of efficiency.

Pressure on terminals: Chassis shortages

Chassis supply has big swings throughout the week.

To deal with chassis shortages

- TRAC and DCLI plans to reposition ~2000 chassis to the Chicago area
- Rail terminals enforce chassis in / chassis out restrictions



Chassis are used by hostlers and trucks to transport containers

Without chassis rail terminals are forced to ground or stack containers to unload railcars, which results in equipment re-handling.

Pressure on terminals: Trucking capacity



Lack of manpower

- The ATA estimates a shortage of 50,000 drivers in 2017 and anticipates the gap to widen.

Electronic logging device (ELD) mandate

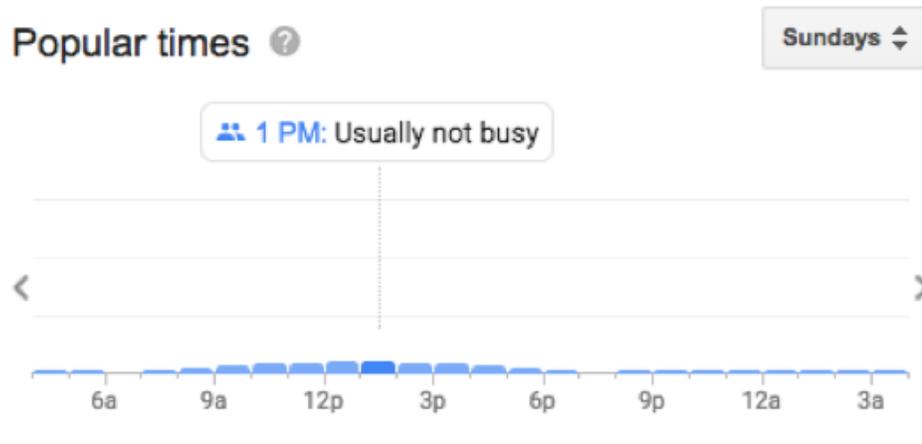
- Tighter enforcement of hours of service(HOS) regulations limits productivity

Drivers shifting away from dray

- Long waiting times at intermodal terminals with tighter HOS restrictions further hit drayage capacity

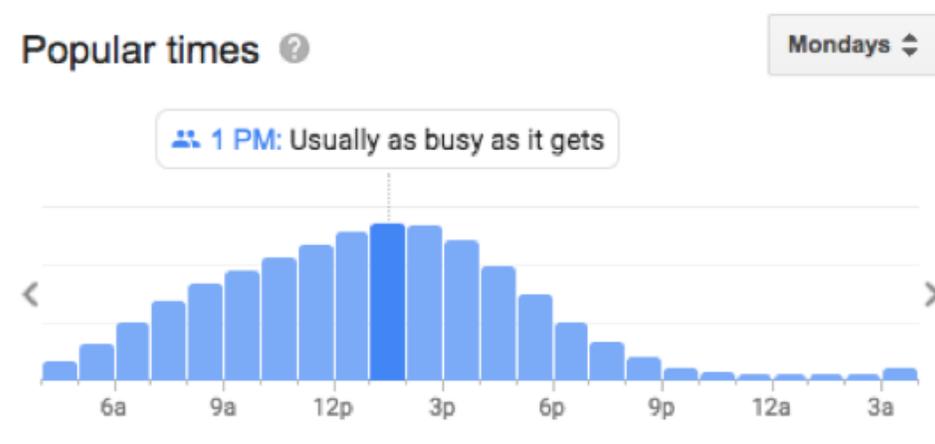
Pressure on terminals: Variable gate activity

Sunday activity at LPC



Source: Google Maps

Monday activity at LPC



Many terminals see intense gate activity early in the week and very little demand during the weekend.

A terminal might stack containers over the weekend to deal with growing volume and devote its lifting equipment to serving outside drivers during the weekday.



Opportunities in terminal operations

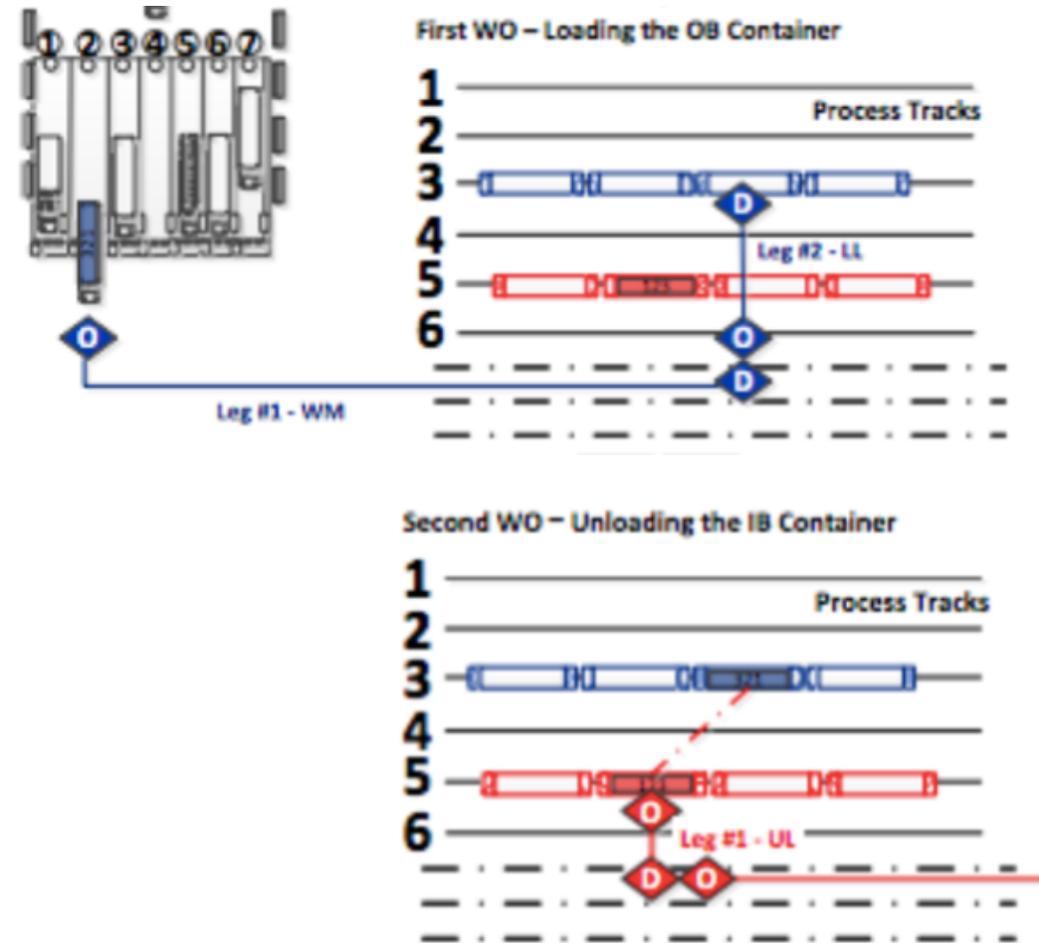
Opportunities in terminal operations

Elimination of non-productive movement

Better planning of inventory

Direct service to outside drivers

Many of these opportunities are difficult to realize in the current operation because of the scale and pace of the operation



Workflow that eliminates unneeded driver and crane movement



Container planning and grooming

Challenges in stack planning

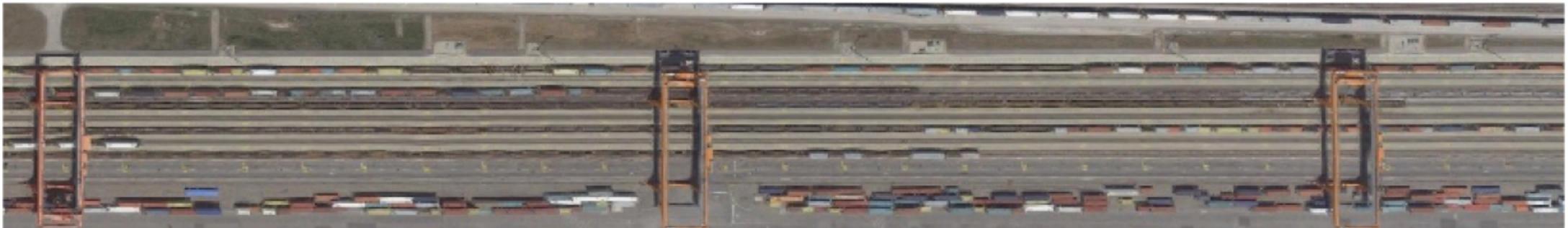
Outbound: Stacked containers may be distant from their assigned railcar

Inbound: Drivers may need a container that has been buried in the stacks

Grooming opportunities

Wheeled: Reposition units closer or farther from the track instead of bobtailing

Stacked: Surface and pre-mount containers during evening hours



Misplaced units in stacks introduces additional handling and imbalanced crane workloads



Loading off the gate



Loading a container directly from an outside driver eliminates equipment re-handling.

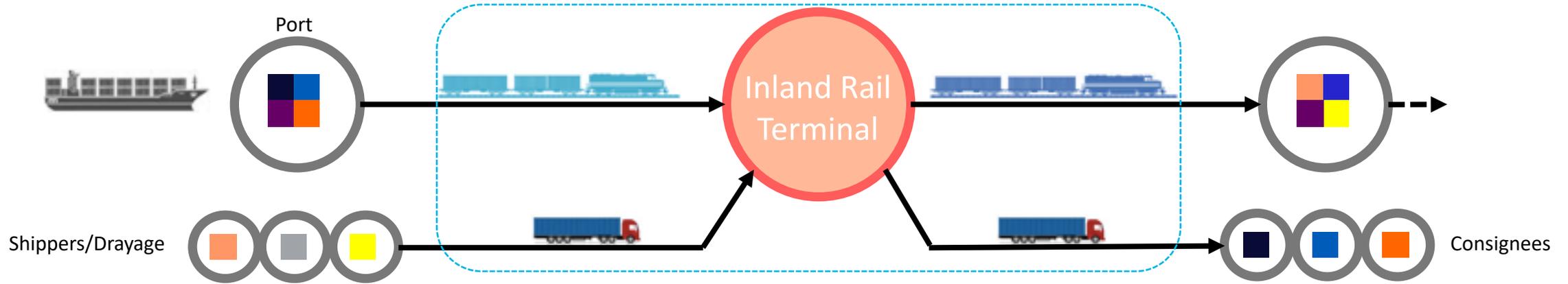
The wide span crane operation creates many opportunities for direct-to-car and direct-to-stack moves.

During peak hours, coordinators struggle to keep up with gate activity. Automated load planning can help the terminal capitalize on direct-to-car moves and balance crane workloads.



Smart Intermodal Management System (SIMS)

Smart Intermodal Management System (SIMS)





- Automated smart algorithm decisions to optimize terminal operations in real time



- Inbound/outbound rail operations management with optimized loading/unloading planning



- Advanced gate process to reduce the traffic congestion and integration with Trucker's smart phone App (DMA)



- Enable network visibility and resource planning using big data from all terminals in network

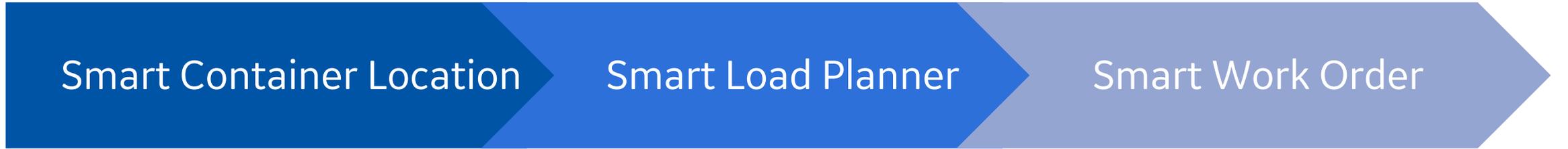


- Smart work order mgmt. & unit location assignment to improve the productivity and reduce the operation cost



- GE Cloud/On-Prem platform and User Experience design provide both high usability and reliability to operations and Customer IT

The smarts in SIMS



SCL capabilities	SLP capabilities	SWO capabilities
<p>Determines where to store incoming units in the yard.</p> <p>Key output</p> <ul style="list-style-type: none"> • Assignment of wheeled parking slots • Assignment of stack locations <p>Opportunity: <i>Inventory planning and grooming</i></p>	<p>Assign loads from inventory and in-gate to railcars.</p> <p>Key output</p> <ul style="list-style-type: none"> • Assign loads to railcars from inventory and the gate <p>Opportunity: <i>Load directly from the gate</i></p>	<p>Optimizes the assignment and scheduling of tasks for yard resources.</p> <p>Key output</p> <ul style="list-style-type: none"> • Assignment of work to resources • Sequencing of tasks for a resource <p>Opportunity: <i>Eliminate non-productive movement</i></p>



Smart Container Location

Wheeled parking assignment

- Minimize laden travel distance for hostler loading and unloading operations
- Maximize hostler cycle moves
- Maximize outside driver compliance



Stack planning

- Minimize loaded spreader movements
- Minimize digging operations for IB and OB activities
- Distribute crane workload for loading and stacking operations

Smart Load Planner

Optimize rail asset utilization

- Maximize slot utilization
- Minimize priority left-behinds
- Improve train aerodynamics
- Avoid train speed restrictions

Yard operations

- Minimize laden hostler and crane movement
- Minimize equipment re-handling
- Evenly distribute crane workload
- Maximize utilization of trackside real-estate



Smart load planner promotes automatic loading off the gate and improves asset utilization and operational efficiency.



Smart Work Order

Hostler optimization

- Minimize unproductive movement between tasks
- Minimize congestion within the terminal
- Synchronize with cranes to minimize crane idle time

RTG/WSC optimization

- Maximize compliance with train release times
- Maximize compliance with de-ramp target times
- Minimize crane gantry movement



Smart work order eliminates non-productive activity by sequencing work in the yard



Where it's going: Automation

Pressure on intermodal terminals

External conditions

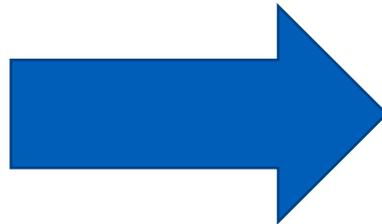
High demand

Priority shipments

Chassis supply

Dray shortage

Variable gate activity



Operational need

More stacking

Less dependence on
chassis supply

Less re-handling



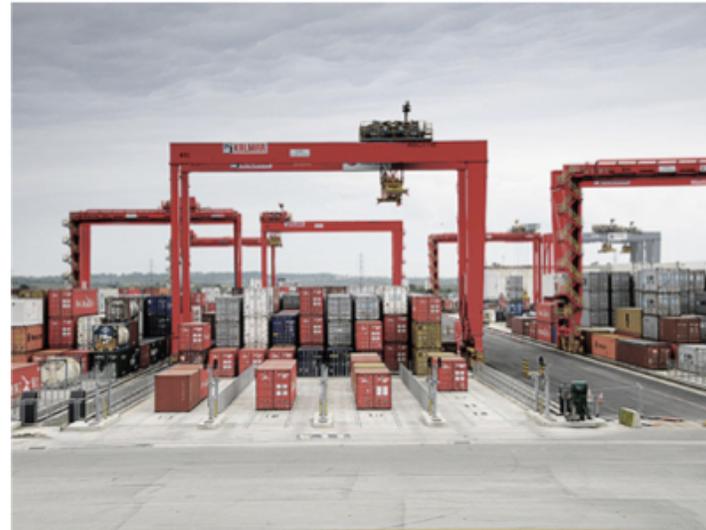
The hardware is there

Straddle carriers



Eliminates chassis dependence

Stacking cranes



Creates more capacity in the yard

Wide span cranes



Reduced footprint for loading and unloading



The next generation of TOS

“You can buy as much fancy equipment as you want, but without a good TOS, it’s not going to work.”

Wilby Whitt, General Manager of Intermodal CSX
US intermodal rail automation faces steep challenges, JOC

Market forces will continue to push continue intermodal terminals to run a better, more consistent stacked operation.

Automation will be the answer to this challenge and the next generation of TOS will be the enabler for automation.



Thank you!



For more information: tyber@ge.com