Rail has earned its place in the future of transportation

- Rail is a growth industry globally
- More networks are achieving financial viability
- The business model redesign in the Rail Renaissance saved the train

- In an era of higher market expectations
- New scarcities in key resources
- Need to tweak the Business Model
Rail freight is a large and growing transportation business. However, the US growth issues are fairly unique.

### Size of national rail freight networks
Revenue ton-kms, 2013

- **China**: 2.9
- **United States**: 2.5
- **Russia**: 2.2
- **India**: 0.6
- **Canada**: 0.4
- **Germany**: 0.1

### Traffic growth in a decade
Revenue ton-kms, 2013 versus 2003

- **China**: 77%
- **United States**: 12%
- **Russia**: 32%
- **India**: 77%
- **Canada**: 23%
- **Germany**: 32%

Sources: AAR Analysis of Class I Railroads, Railway Association of Canada Rail Trends, German Railway Market Analysis, UIC database, and various news items.
Operating ratio performance
Operating ratio is increasingly a top line success story

Total Class I operating ratio
2000 = 1.00

Source: Association of American Railroads, Analysis of Class I Railroads, 2000 through 2013, and Oliver Wyman analysis
© Oliver Wyman
Movement to resource shortages
As demand for freight rail service continues to grow, we will need to become more resource efficient

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Personnel</th>
<th>Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Locomotives that meet Tier 4 requirements not available until mid-2015</td>
<td>• HR issues with economic recovery</td>
<td>• Traffic growth in new areas putting parts of the network under intense strain</td>
</tr>
<tr>
<td>at the earliest</td>
<td>− Postponed retirements will start to kick in</td>
<td>• Even some sections with prior investment strained, e.g., Chicago</td>
</tr>
<tr>
<td>• Tank cars: Builders can’t produce fast enough, new regulations will</td>
<td>− May be better opportunities for current employees</td>
<td>• More trouble to come: prior investment focused on line capacity, not</td>
</tr>
<tr>
<td>impact supply</td>
<td>− Growing traffic demands means adding more employees</td>
<td>terminals</td>
</tr>
<tr>
<td>• Record grain harvests, growing intermodal, etc. will require more cars</td>
<td>• Increasing competition for talent</td>
<td>• Most new traffic unscheduled unit trains, take a large share of capacity</td>
</tr>
</tbody>
</table>
Infrastructure capacity
Congestion has become a major concern once again

Quarterly revenue ton-miles (RTMs), average dwell, and average velocity

- Traffic growth occurring in areas not subject to intensive infrastructure investment
- Sections with significant prior investment are strained
- Prior infrastructure investment largely focused on line capacity, not terminal capacity
- Terminals are proving incapable of handling increased traffic

Source: Surface Transportation Board, Quarterly Earnings Reports, company quarterly reports, and Oliver Wyman analysis
© Oliver Wyman
Another rail industry transition
Rail Renaissance II will be just as important as the first one.

**Railroad Renaissance I**

**Theme: Cost control**
- 5-person to 2-person train crews
- Automation/centralizing of back office
- Bigger trains
- Fuel efficiency
- Shortlining of the branch network

**Paradigm shift: Scheduled railroading**
- Scheduled operations, less expensive than maximizing train size
- Minimizing unit train resource consumption

**Railroad Renaissance II**

**Theme: Network fluidity and service**
- Resource constraints and congestion
- Tighter scrutiny by customers and regulators
- Targeted growth
- Increasing volume and revenue faster than capex

**Paradigm shift: Service is paramount**
- OR improvement becomes top line driven
- Tighter control of operations
- Better integration of commercial and operating plans
- Targeted allocation of capital
- Tighter integration into customer supply chains
Four defining elements in Rail Renaissance II

1. Supply chain transparency
2. Convergence in planning
3. Mission completion
4. New social compact
Convergence in planning

• Rail network planning remains dominated by expert teams with increasingly sophisticated models and analytics

• Parallel planning teams create their optimum operating plan with differing definitions of success

• Reality of daily operations is competition for the same three key resources locomotives, crews, and yard infrastructure
The need for a single integrated plan
In most global rail networks, irregular unit trains are seen as capacity destroyers

Non-coal unit trains traffic
Class I Railroads

Average velocity
Class I railroads

Sources: FRA Operational Data, AAR Rail Time Indicators, and Oliver Wyman analysis
Integration example: Tank car fleet additions
There will soon be 1,000 oil train sets on the network, and what Class I yard investments are being made to queue them?

New tank car supply

Integration issues

- High variation in route structure
- Spot market commodity
- Volatility in daily volumes
- Different production rates by loading and unloading sites
- Significant multiple railroad routings
- High relative queue factor in transit

Sources: Oliver Wyman analysis and AAR Analysis of Class I Railroads

© Oliver Wyman
An integrated approach - DB Netze
DB Netze’s train path pricing system rewards consistent operations while protecting capacity for unit trains

Base path price
- Varies by corridor demand
- $2.20 to $6.00 per train-kilometer

Premium for speed
- X 1.65 for express path
- X 1.50 for slow path (underpowered)
- X 0.65 for local path

Cancelation fee
- Less than 24 hours – 40% of price

Terminal trackage
- Annual rental – $3,000 to $5,000 per track

Sources: DB Netze Train Path Pricing System 2015 and DB Netze Facility Pricing System 2015
Network performance with growth
Germany’s network performance has been consistent

Overall train traffic growth
DB, US Class Is and Amtrak, 2004 to 2013

Percent on-time performance¹

Sources: DB Annual Reports; DB Facts and Figures; U.S. Department of Transportation, FRA, Operational Data Tables

1. Definition of on-trip performance: DB – all trips < 6 mins than the scheduled arrival; Amtrak – trips within 250 miles < 10 mins, 251–350 miles < 15 mins, 351–450 miles < 20 mins, 451–550 miles < 25 mins, and greater than 550 miles < 30 min. Long-distance Amtrak trips are those >= 400 miles

© Oliver Wyman
Convergence in planning - Summary

• Build a single operating and network plan with clear definition of network and resource reserves

• Reward stable operations

• Reconstruct cost allocations to track against actual operation needs and related reserves held in the system
Four defining elements in Rail Renaissance II

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Mission completion - A potential definition

- Primary mission successful
- Key operation parameters met
- Subsystem performance meets specifications
- External impacts within mission design
Class Is have a generous definition of mission success
While catastrophic failures have been massively reduced, progress eliminating other unplanned events has lagged

North American railroads have invested heavily in early detection, …

… which has reduced the number and severity of derailments, …

… but not the frequency of other unplanned events like locomotive failures and hot boxes

Sources: US Federal Railroad Administration and Oliver Wyman analysis
Larger trains require new mission standards
Our relentless drive for operations efficiencies are creating more complex rolling stock performance needs

Average gross tons per train

Gross tons per train grew by **12.2 percent** between 2000 and 2013

Average gross tons per car

Gross tons per railcar grew by **10.2 percent** between 2000 and 2013

Sources: Association of American Railroads and Oliver Wyman analysis
Unexpected events compromise mission completion
Over 500,000 unexpected delays impact over 1 in 4 trains

Estimated frequency of unexpected events
US Class I railroads in 2013

<table>
<thead>
<tr>
<th>Incident</th>
<th>Total estimated incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detector activations</td>
<td>12,000</td>
</tr>
<tr>
<td>Detector failures</td>
<td>1,000</td>
</tr>
<tr>
<td>UDEs</td>
<td>27,000</td>
</tr>
<tr>
<td>Train separations</td>
<td>2,000</td>
</tr>
<tr>
<td>Crossing protection failures</td>
<td>110,000</td>
</tr>
<tr>
<td>Unscheduled work</td>
<td>125,000</td>
</tr>
<tr>
<td>Locomotive failures</td>
<td>44,000</td>
</tr>
<tr>
<td>Recrews</td>
<td>210,000</td>
</tr>
<tr>
<td>Total</td>
<td>531,000</td>
</tr>
</tbody>
</table>

Sources: Various US Class I railroads and Oliver Wyman analysis
Mission completion failure eats sustainable capacity
Due to a higher mission failure rate, Class Is operate at a capacity discount relative to foreign networks

Sources: Association of American Railroads; International Union of Railways; Potter, et al, Transnet Ore Line Project; and Oliver Wyman analysis

Train intensity and multiple-track route miles

North American impediments

- Higher en route equipment failure rates
- Larger train sizes
- Low integration of unscheduled trains
- Poor terminal and corridor integration

Sources: Association of American Railroads; International Union of Railways; Potter, et al, Transnet Ore Line Project; and Oliver Wyman analysis
The opportunity cost of North American rail operations
Inconsistent network performance day after day reduces the potential earning capacity of the network

Train intensity and multiple-track route miles

Increase train density +1 train daily across the entire railroad network

$5B in additional revenue

Sources: Association of American Railroads and Oliver Wyman analysis
Mission completion - Summary

• **Consistent performance** on the network starts with better mission completion

• **All industry participants are part** of the solution – Fleet owners, maintenance contractors, origin customers, and railroad operators

• **Economic model** must move from cost avoidance to **opportunity cost**

• **Mission completion failure points must bear** the associated costs of the delay including **forfeit revenues**

• This will **NOT** be a one solution works for all corridors and terminal areas
Rail Renaissance II
The next natural step in professional railroading

1. Supply chain transparency
2. Convergence in planning
3. Mission completion
4. New social compact
Visit www.railplanning.com