



OFFICE OF RESEARCH & DEVELOPMENT

2012 **R&D**
REVIEW

Shared Corridor Technical Challenges & Research Needs



U.S. Department
of Transportation

Federal Railroad
Administration

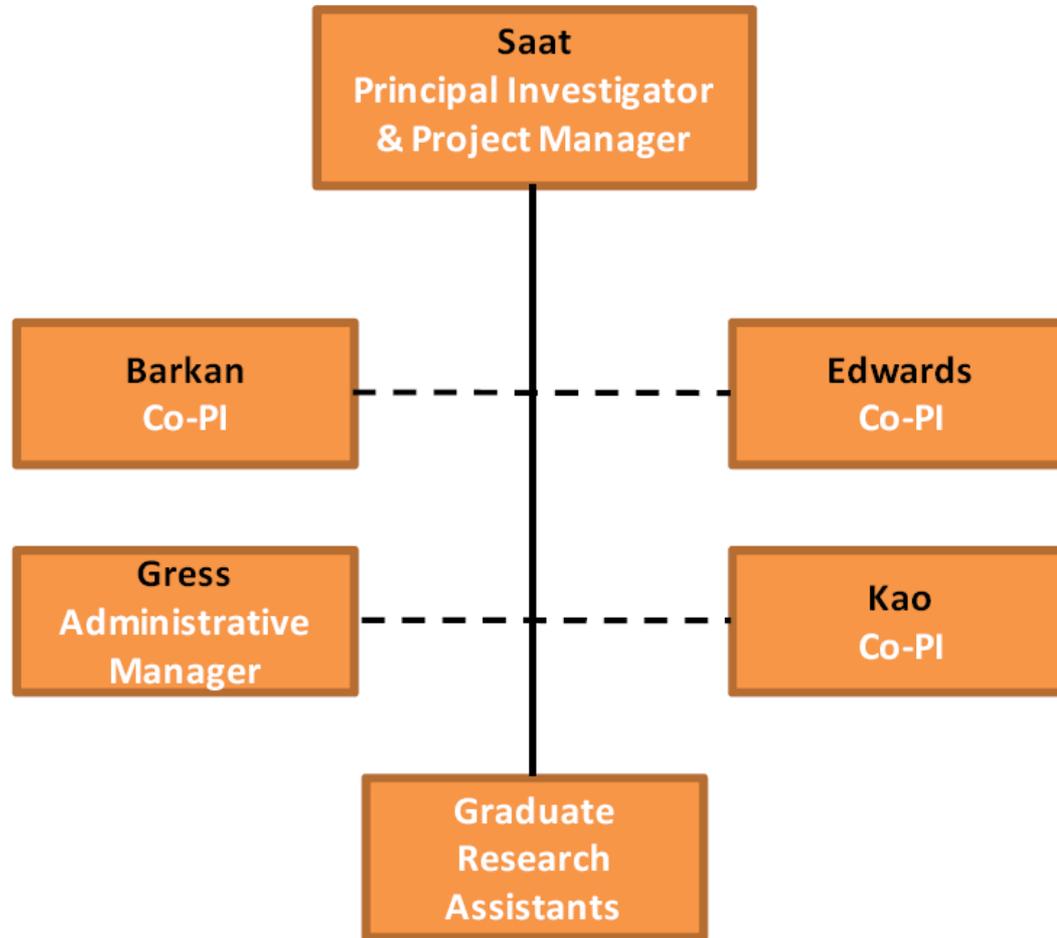
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Outline

- Overview of research project
- Shared corridor introduction
- Research needs survey, interviews & workshop
 - Safety categories
 - Rating criteria
 - Preliminary list of prioritized technical challenges
- Path forward
- Questions and discussion

Overview of Research Project

UIUC FRA Shared Rail Corridor BAA Project Team Organizational Chart



Caughron & Sogin

INVESTIGATING TECHNICAL CHALLENGES AND RESEARCH NEEDS RELATED TO SHARED CORRIDORS FOR HIGH-SPEED PASSENGER AND RAILROAD FREIGHT OPERATIONS



ILLINOIS

Rail Transportation and Engineering Center
RAILTEC



Project Description:

- New high speed rail (HSR) developments in the U.S. need to address technical challenges of shared rail corridors in the North America rail environment
- This project will develop a technology development plan (TDP) to **identify shared rail corridor technical challenges, knowledge gaps, existing and on-going research activities and research needs**

Impact on the Railroad Industry:

- Reducing the operational and program deployment risks associated with shared rail corridors
- Identification of critical areas to address in planning new HSR systems
- Expediting the process of developing efficient and safe HSR shared corridors with better prioritization in planning

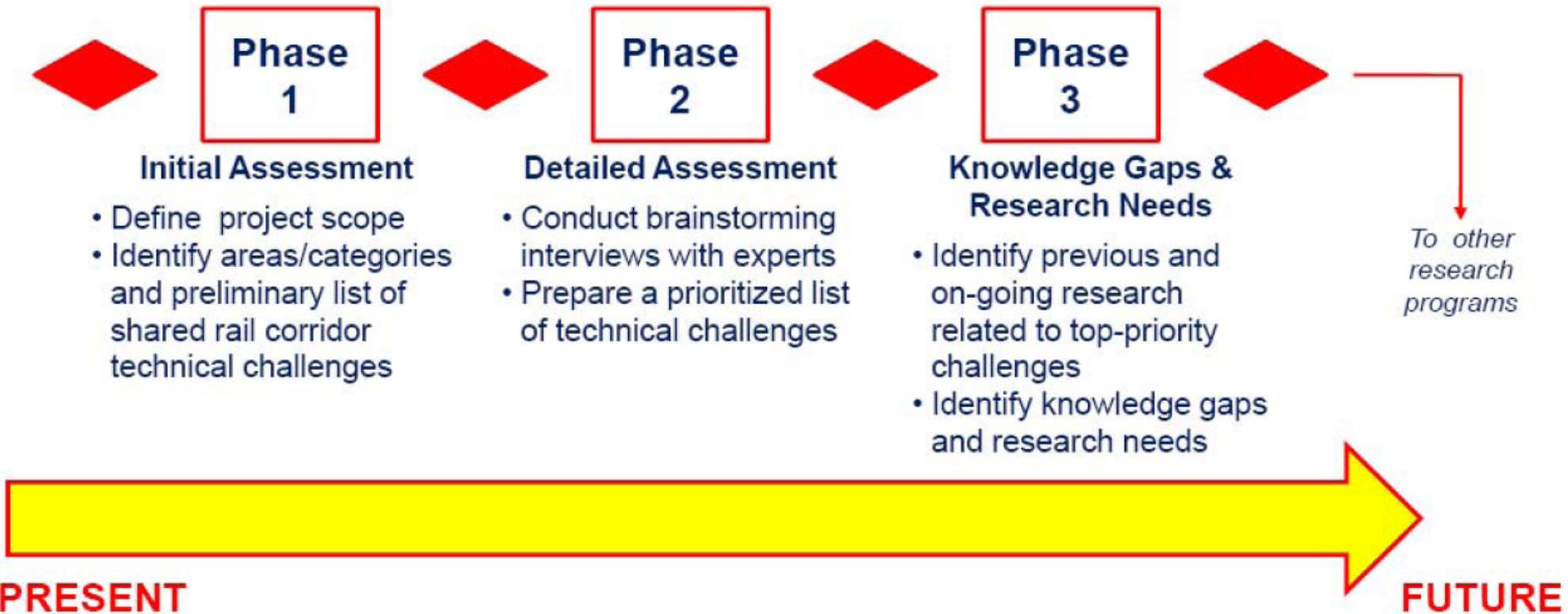
Cost & Schedule:

- FRA Funds Requested: **\$201,012**
- Total Cost Share: **\$41,783 (17%)**
- Total Project Cost: **\$242,795**
- Schedule: **1 year with interim deliverables**
- Final deliverable – a HSR TDP to understand the current state of the technology and the direction and knowledge required for the future

FRA Task Monitor: TBD

Project Partners: None

Technology Development Plan for Shared Corridors of High-Speed Rail Passenger and Heavy-Axle Load Freight Trains



Conventional Passenger & Freight Trains



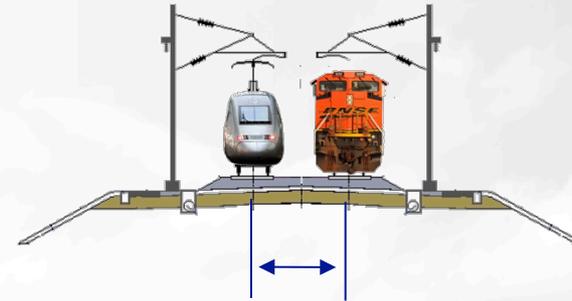
High-Speed Passenger & Freight Trains

Shared Corridor Introduction

Mixed-Use Corridors

- **Shared track:** tracks shared between passenger and freight or other service
- **Shared right-of-way (ROW):** dedicated high-speed passenger tracks separated from freight or other service tracks up to 25'
- **Shared corridor:** dedicated high-speed passenger tracks separated from freight or other service tracks by 25-200'

Shared track & shared ROW

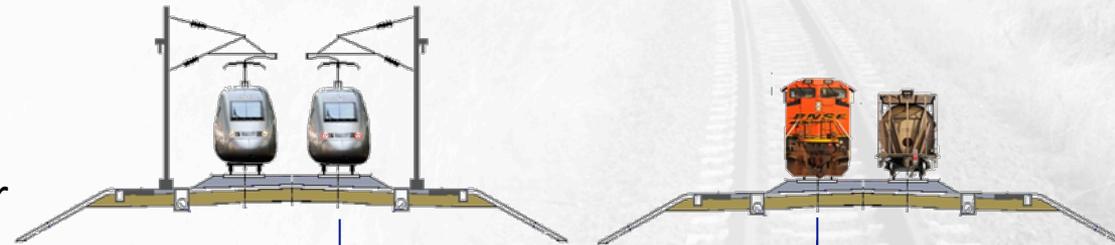


Adjacent track centers $\leq 25'$

Shared corridor

High-speed rail service

Freight or conventional passenger rail service



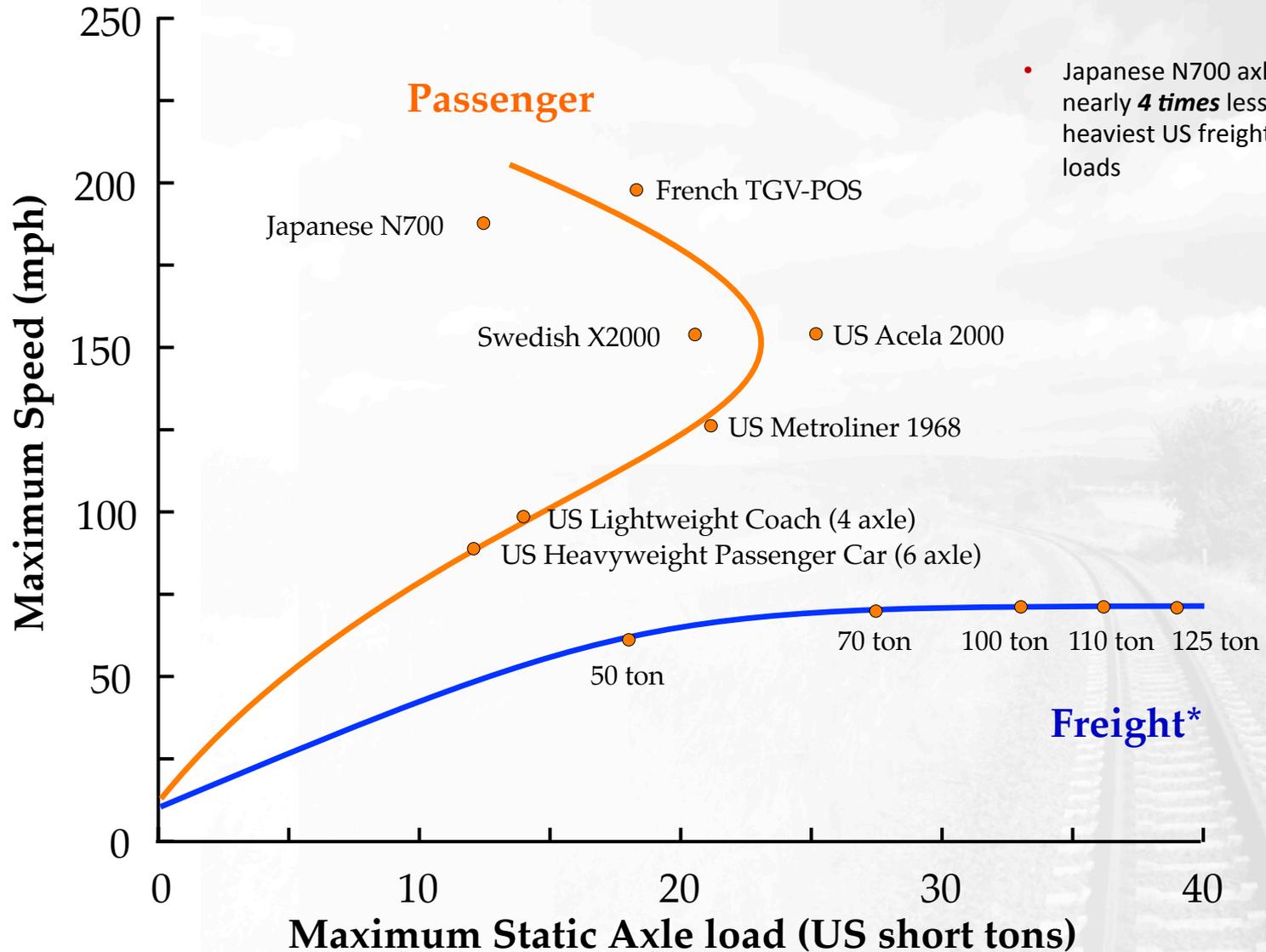
Adjacent track centers $>25' \leq 200'$

Heavy Axle Loads (HAL) & High-Speed Rail (HSR)



- Can US combine heavy axle-load freight with high-speed rail?
- Certainly not above 125 mph, but what about lower speeds?
- How can we safely and effectively accommodate new passenger rail service while sustaining ongoing rail freight transportation efficiency and growth?
- US freight axle loads range from 33 to 39 tons
- Other infrastructure and operational differences

Maximum speed vs. maximum static axle load on shared trackage



- Japanese N700 axle load is nearly **4 times** less than the heaviest US freight car axle loads

*Freight cars shown reflect AAR "nominal" capacity

Shared Corridor Research Needs Survey

Survey Categories

Safety

- Risk mitigation
- Safety operating practices
- Safety technology
- Highway grade crossings

Infrastructure and Rolling Stock

- Wheel load characteristics
- Track structure and components
- Special trackwork
- Vehicle track interaction
- Stations
- Signaling systems

Planning and operations

- Planning process
- Host railroad negotiation
- Train scheduling
- Capacity planning
- Train control and operations

Economic challenges

- Capital cost sharing
- Passenger operation sustainability
- Freight level-of-service preservation

Institutional challenges

- Regulatory compliance
- Performance incentives/penalties
- Grant agreement structure
- Liability

Website and Survey Interface

- Project website developed to post information and conduct industry survey
- Invitations to participate were solicited by flyer at AREMA Interchange 2011 and through RailTEC industry contact lists
- Survey open from 9/21/2011 to 1/31/2012

Safety

Evaluate each challenge in terms of its potential impact on the following rating criteria:

- Potential to increase safety
- Potential to increase corridor effectiveness
- Overall importance
- Research priority

For each criteria, assign a value of 1-5, with 1 indicating the highest importance or greatest potential.

Please provide your email so that we may match survey results from different sections. Your email will not be used for purposes outside of this survey.

Email: _____

Infrastructure and Equipment

Investigate

Evaluate each challenge in terms of its potential impact on the following rating criteria:

- Potential to increase safety
- Potential to increase corridor effectiveness
- Potential cost savings
- Overall importance
- Research priority

For each criteria, assign a value of 1-5, with 1 indicating the highest importance or greatest potential.

Please provide your email so that we may match survey results from different sections. Your email will not be used for purposes outside of this survey.

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Planning and Operations

Evaluate each challenge in terms of its potential impact on the following rating criteria:

- Potential to increase safety
- Potential to increase corridor effectiveness
- Potential cost savings
- Overall importance
- Research priority

For each criteria, assign a value of 1-5, with 1 indicating the highest importance or greatest potential.

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Economic Challenges

Developing computer models

Evaluate each challenge in terms of its potential impact on the following rating criteria:

- Potential to increase corridor effectiveness
- Potential cost savings
- Overall importance
- Research priority

For each criteria, assign a value of 1-5, with 1 indicating the highest importance or greatest potential.

Please provide your email so that we may match survey results from different sections. Your email will not be used for purposes outside of this survey.

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Institutional Challenges

Developing

Evaluate each challenge in terms of its potential impact on the following rating criteria:

- Potential to increase safety
- Potential to increase corridor effectiveness
- Potential cost savings
- Overall importance
- Research priority

For each criteria, assign a value of 1-5, with 1 indicating the highest importance or greatest potential.

Please provide your email so that we may match survey results from different sections. Your email will not be used for purposes outside of this survey.

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Development of passenger equipment safety standards beyond the current maximum Tier II level, allowing for the operation of passenger trains at speeds exceeding 150MPH on dedicated lines while enabling intermixed operation with freight traffic at slower speeds

	1 - high importance / potential	2	3	4	5 - low importance / potential
Potential to increase safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potential to increase corridor effectiveness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potential cost savings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall importance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Research priority	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Investigating different methods of indemnifying freight railroads from the accident liability added by passenger traffic on existing freight lines

	1 - high importance / potential	2	3	4	5 - low importance / potential
Potential to increase corridor effectiveness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potential cost savings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall importance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Research priority	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Developing a new track wedge fee structure that takes into account the amount of capacity used by a particular train type and priority

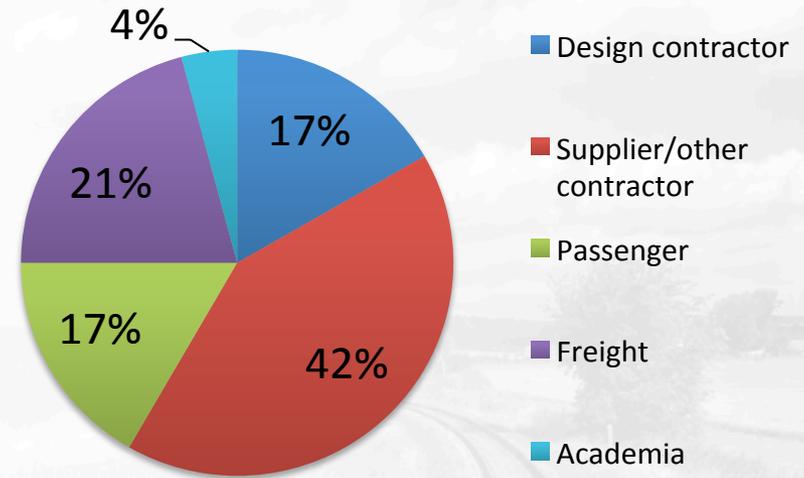
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Potential to increase corridor effectiveness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potential cost savings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall importance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Research priority	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Rating Criteria

- Criteria assessed on a scale from 1 (*high*) to 5 (*low*)
- Potential to increase safety - incident severity, frequency
- Potential to increase corridor effectiveness - tonnage, speed, ridership, reliability
- Potential to reduce costs - initial costs, maintenance and operating costs, lifecycle costs
- Research priority
- Overall importance (2x)

Survey* Participation

- 24 total participants



**The online survey complement in-person interviews with industry experts and a shared corridor research symposium at the University of Illinois in November 2011*

Top Challenges (1 of 3)

Safety

- Adjacent track derailment risk
- Highway grade crossing risk
- MOW/TYE employee risk

Infrastructure and Equipment

- Special track work optimization for mixed traffic
- Ballasted track optimization for mixed traffic, taking into account geometry degradation and maintenance costs
- Stiffness transition zone design and effects on geometry degradation and Vehicle Track Interaction (VTI)

Top Challenges (2 of 3)

Planning and Operations

- Train scheduling patterns and effects on delay for mixed traffic environments
- Maintenance of way scheduling patterns and effects on delay in mixed traffic environments
- Capacity planning methodologies that factor in present and future level of service as well as cost of improvements

Economic Challenges

- Capacity cost allocation for line upgrades
- New shared track line feasibility with temporally separated traffic types (ex. Hanover–Würzburg)
- Economic impact of imposed temporal separation and reduced industry access on existing lines

Top Challenges (3 of 3)

Institutional Challenges

- Liability and indemnification challenges with third party operators
- Potential tier III rolling stock standards
- Developing a standardized incremental track cost structure that takes into account infrastructure damage and consumed capacity

Path Forward

- Conduct a comprehensive literature review to identify current and past research in each area, knowledge gaps and future research needs
- Verify/discuss the preliminary, prioritized list of research needs with industry experts

