

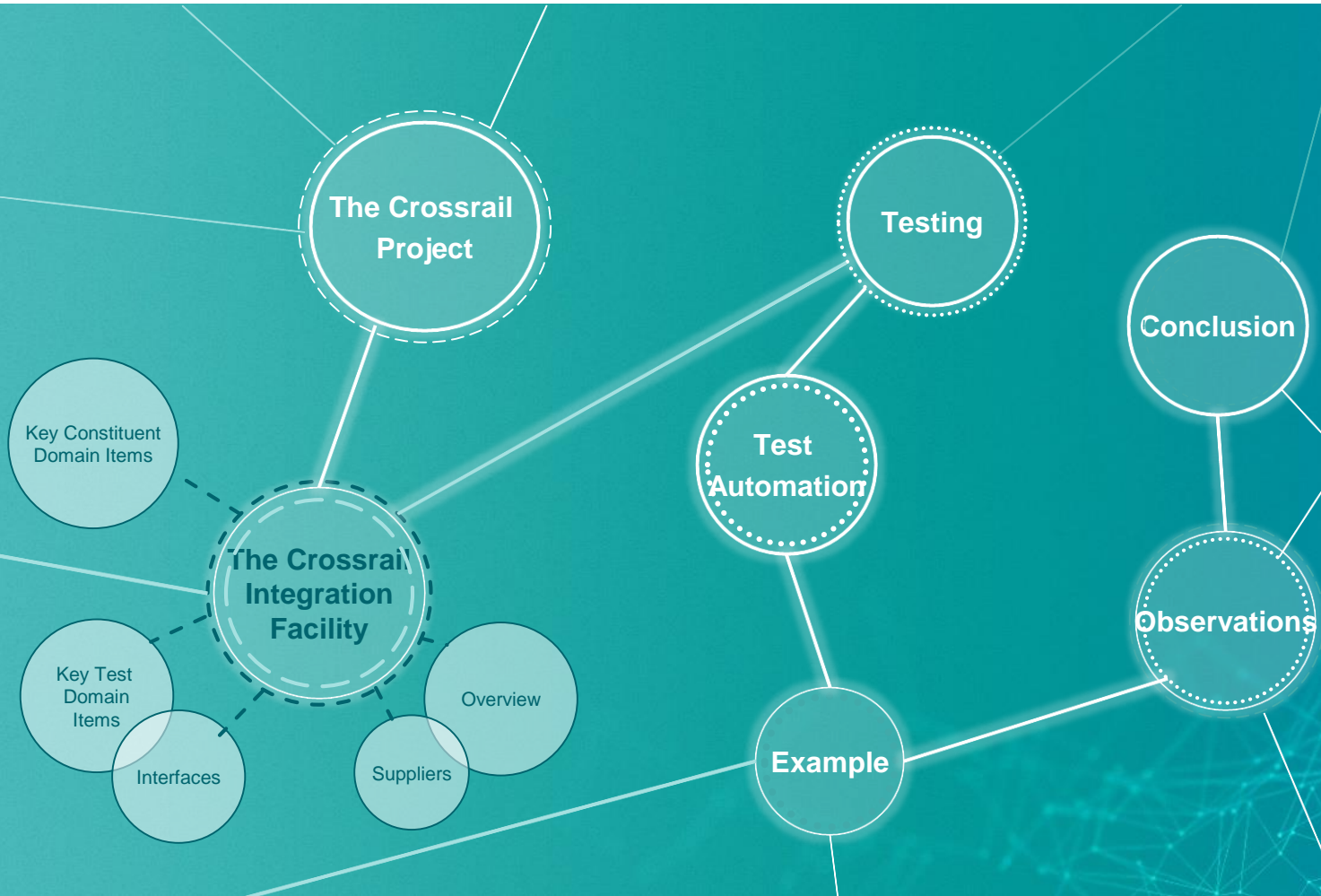


# Crossrail Integration Facility and Test Automation

How an off-site fully automated test facility increases resilience of complex signalling projects

Alessandra Scholl Sternberg, Systems Engineer, Siemens Mobility Limited

# Content





# The Crossrail Project



# Why build Crossrail?





*Londinium in late Antiquity*

Presumed roads	Streams
Paved roads	Waterfront 2nd/3rd century AD
Thames bridge	Waterfront 2nd century AD (high tide)
Roman walls and gates	Waterfront 1st century AD

0 m 500 m



Source [http://upload.wikimedia.org/wikipedia/commons/5/59/Map\\_Londinium\\_400\\_AD-de.svg](http://upload.wikimedia.org/wikipedia/commons/5/59/Map_Londinium_400_AD-de.svg)

Author Fremantleboy, Drallim



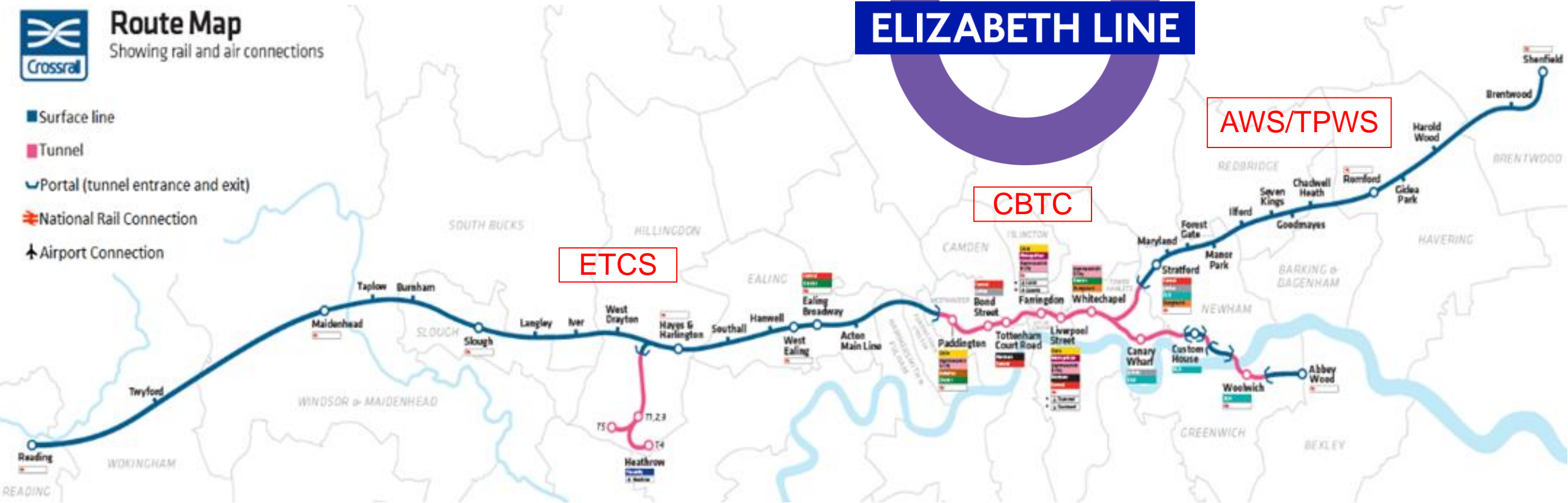


# Route Map

Showing rail and air connections

- Surface line
- Tunnel
- ↔ Portal (tunnel entrance and exit)
- 🚆 National Rail Connection
- ✈️ Airport Connection

# ELIZABETH LINE



ETCS

CBTC

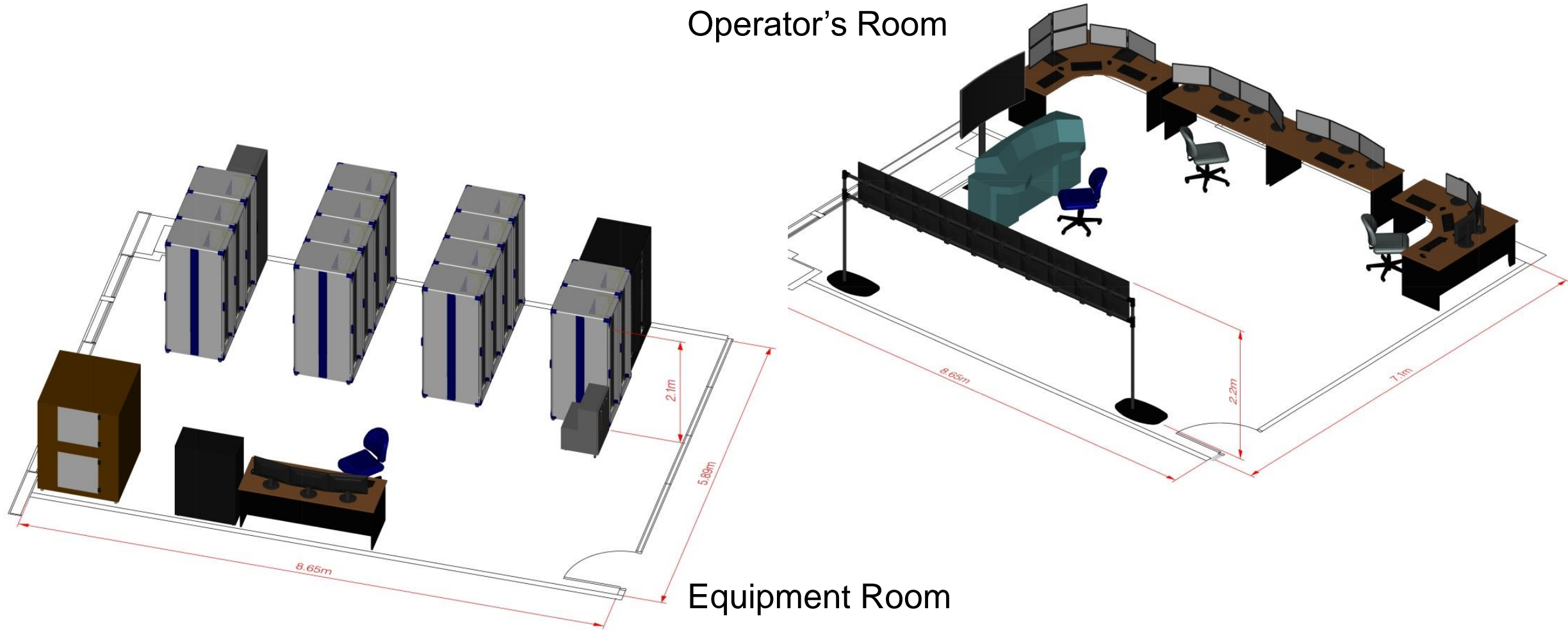
AWS/TPWS



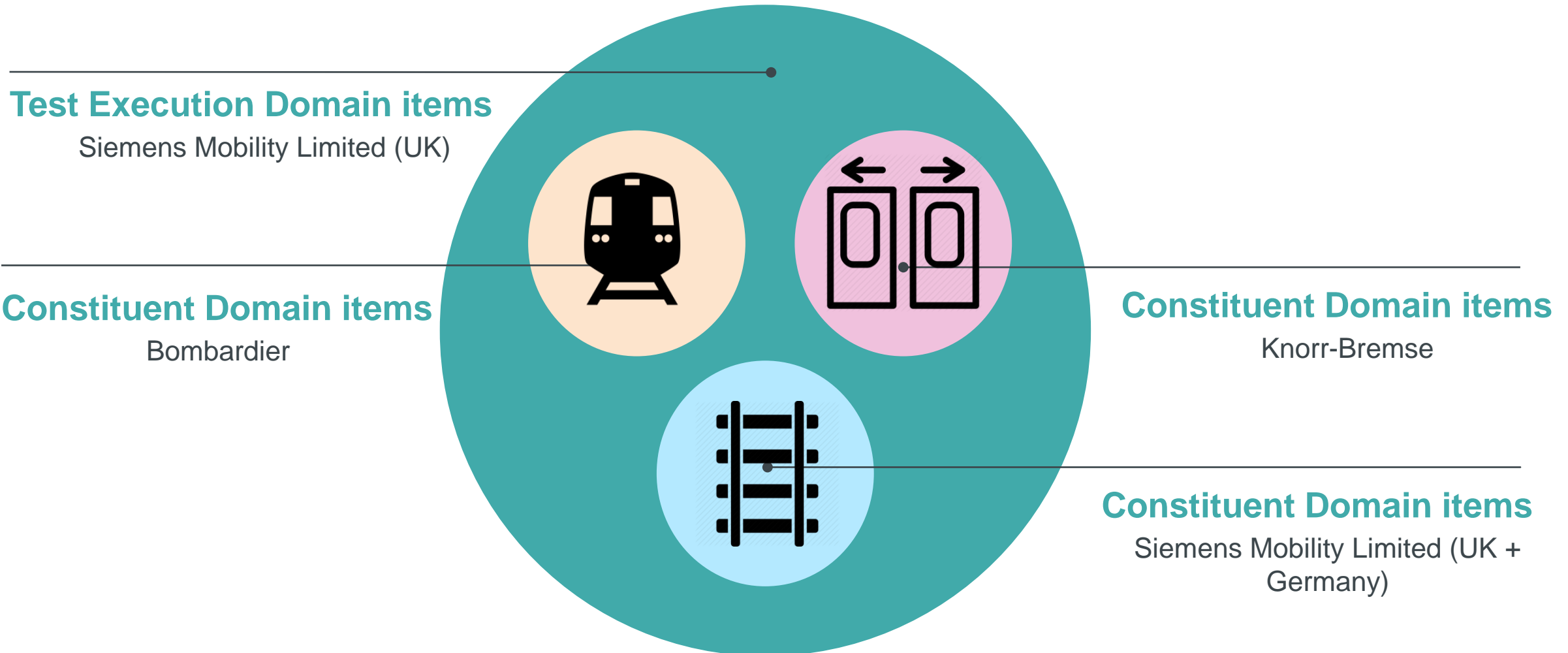
# The Crossrail Integration Facility



# Crossrail Integration Facility



# High-level System Architecture of the Crossrail Integration Facility



## Uses of the Facility

```
graph LR; A[Uses of the Facility] --- B[Faults Testing]; A --- C[Stress Testing]; A --- D[Familiarisation]; A --- E[Updates Testing]; A --- F[Interface Testing]; A --- G[Integration Testing]; A --- H[Timetable Testing]; A --- I[Transition Testing];
```

Faults Testing

Stress Testing

Familiarisation

Updates Testing

Interface Testing

Integration Testing

Timetable Testing

Transition Testing



# Test Automation

# Test Automation

## Why?

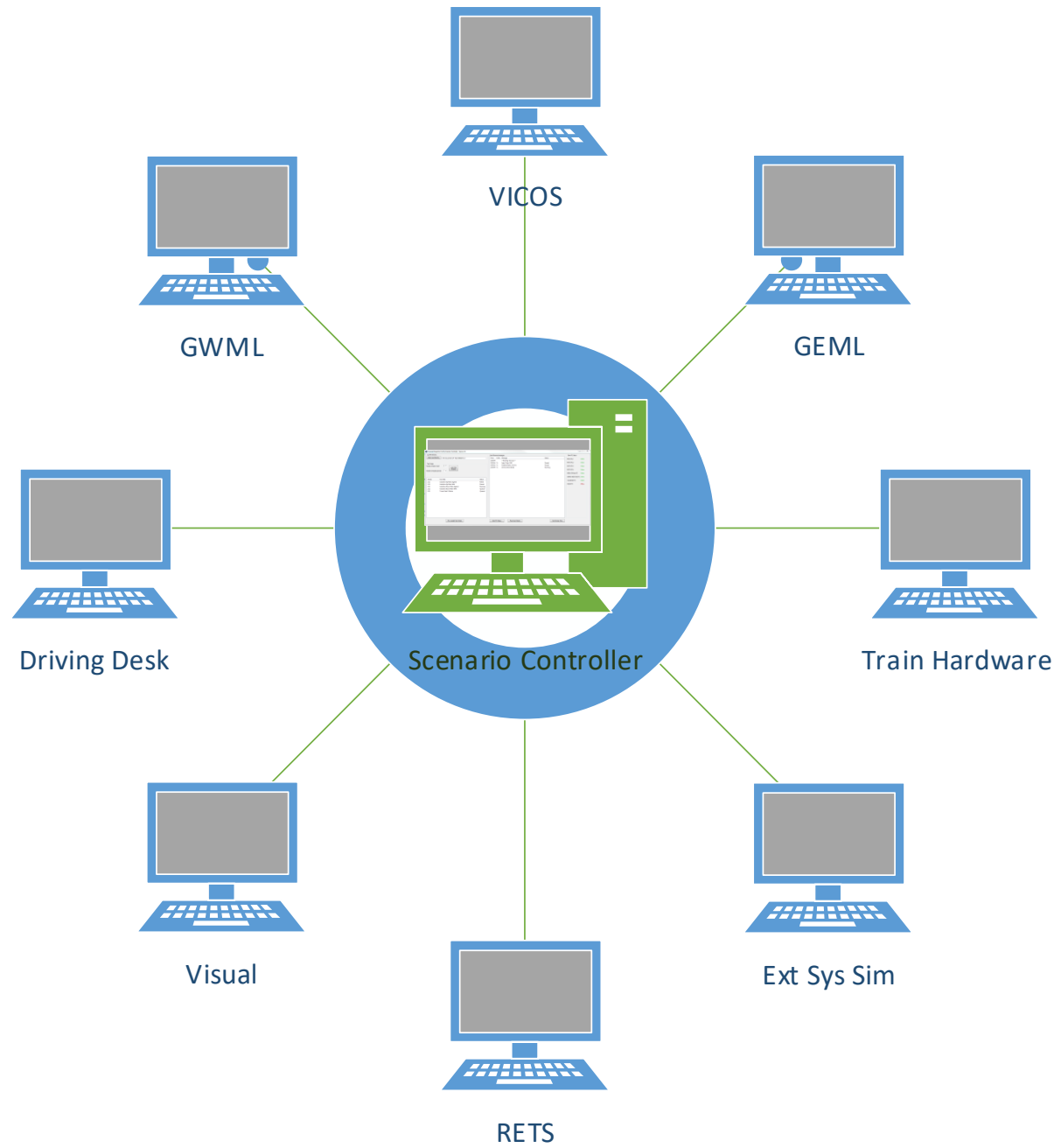
- Utilisation
- Repetitive Tests
- Consistency and Reproducibility

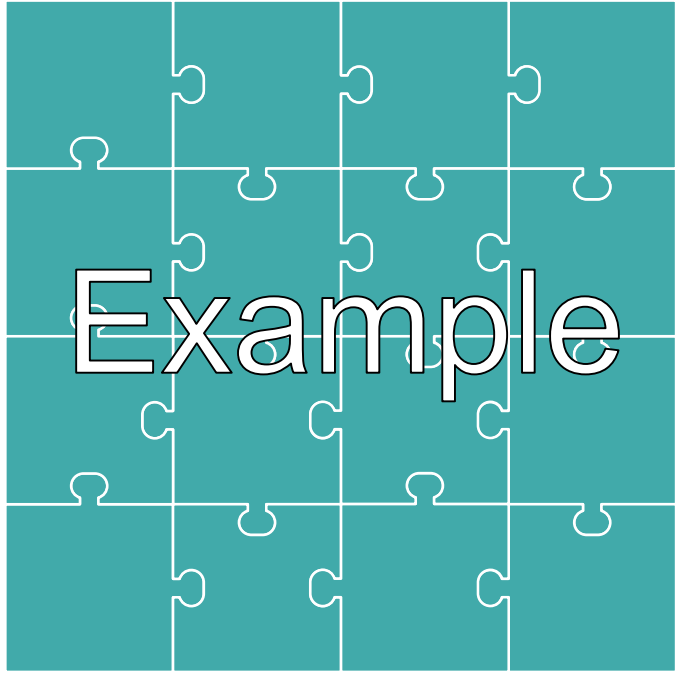
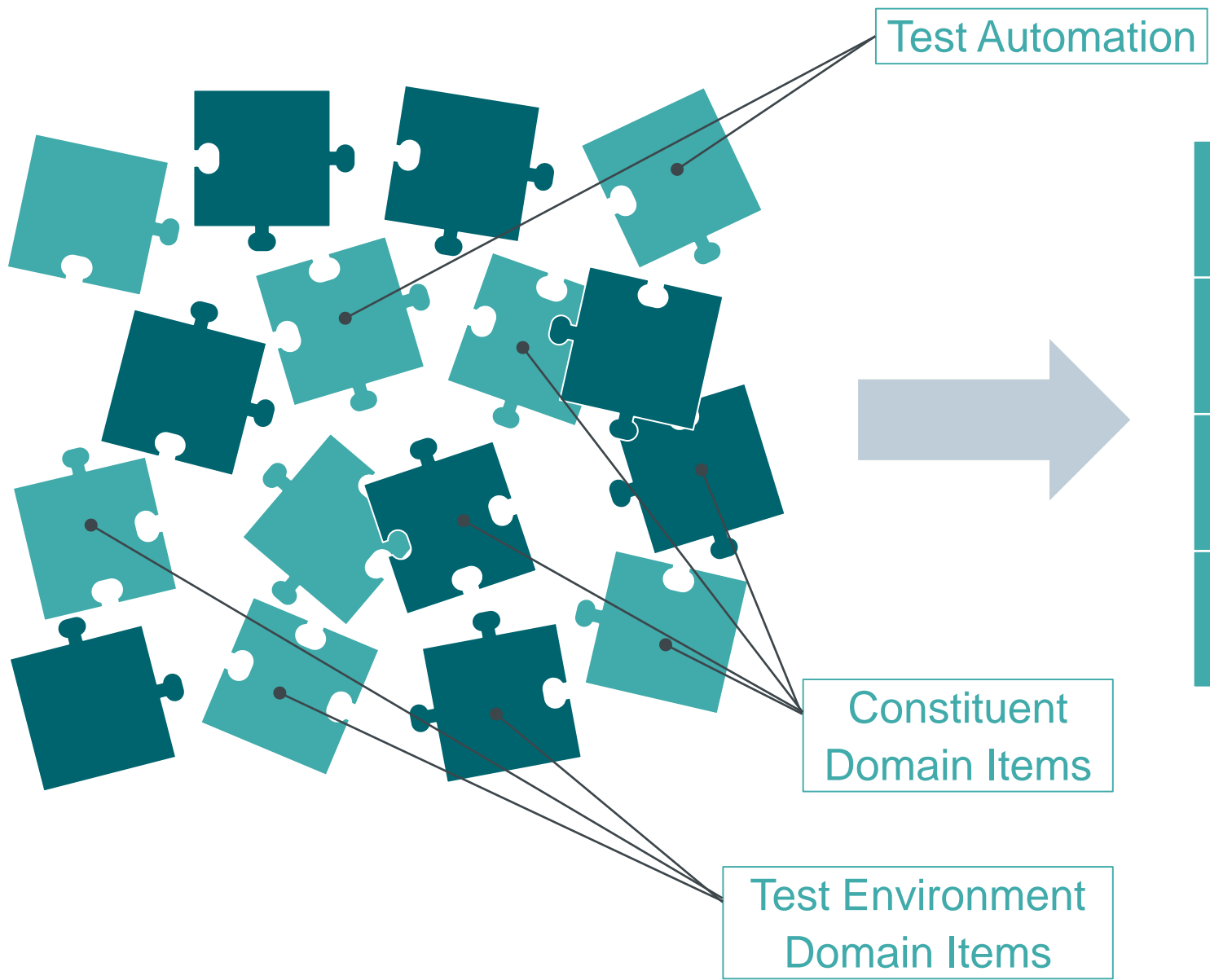
## Factors to consider?

- Difference in behaviour
- Resilience and Interpretation

## How?

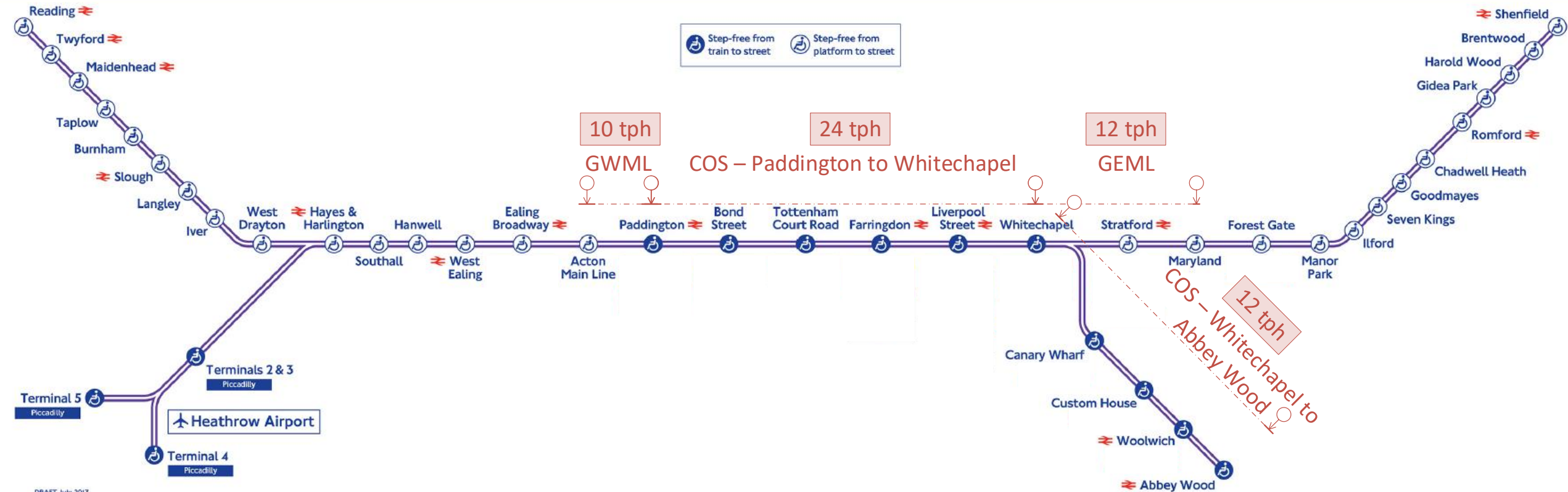
- Extensive automation library
- Test Clients + Scenario Controller





# Elizabeth line

Source: modified diagram from <http://www.crossrail.co.uk/route/maps/route-map>



DRAFT July 2017

MAYOR OF LONDON

Tph = Trains per hour



RAILWAY REGION	FREQUENCY (TPH)
COS – Paddington to Whitechapel	30
COS – Whitechapel to Abbey Wood	15
GEML	15





# Overview



# Scale

Cost-benefit

Early detection of defects

Ease of fault-finding and debugging

## Automation

Execution of resilience tests

Test updates

Familiarity for maintenance and operation teams

Cooperation between stakeholders

Benefits

Crossrail Integration Facility

Building complexity  
Initial investment  
Extra step to be managed

Challenges





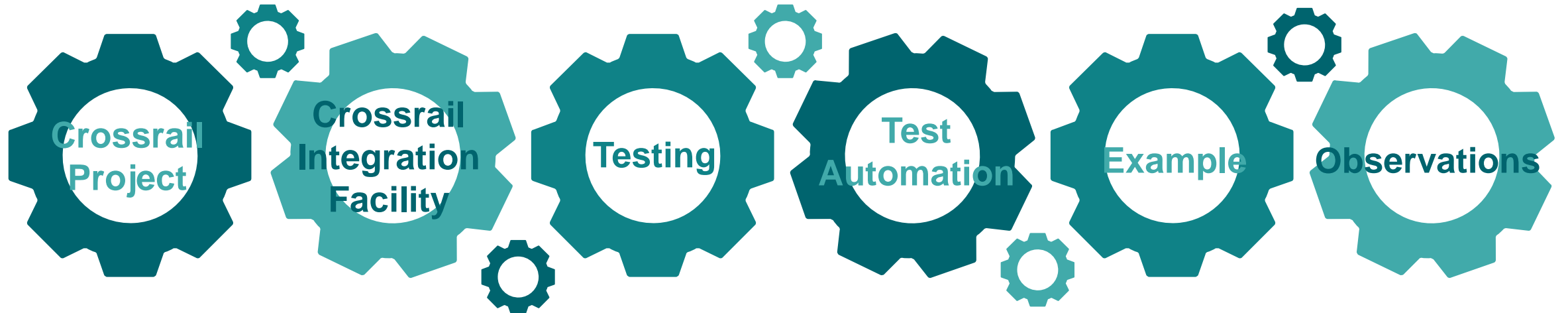
# Recap + Conclusion

# Recap + Conclusion

- High capacity
- Tight schedules
- Limited access

- Integration
- Resilience

- Stress Timetable test



- Off-site testing facility
- Constituent Domain Items
- Test Domain Items

- Rig Utilisation
- Reproducibility

“Any idiot can build a bridge that stands, but it takes an engineer to build a bridge that barely stands.”

Anonymous

## Contact page

### **Alessandra Scholl Sternberg**

Systems Engineer  
Siemens Mobility Limited

17 Langley Park Way  
Chippenham SN15 1GG  
United Kingdom

**Mobile:** +44 7921 806202

**E-mail:** [alessandra.scholl\\_sternberg@siemens.com](mailto:alessandra.scholl_sternberg@siemens.com)

**LinkedIn:** [linkedin.com/in/alessandrasternberg](https://www.linkedin.com/in/alessandrasternberg)

[siemens.com/mobility](https://www.siemens.com/mobility)

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**Thank  
you!**

