

Systems Integration



Background

In order to meet future passenger and freight demand, the British rail network faces the challenge of running more services and increasing capacity. Whilst new high speed lines are part of the solution, the majority of the increase in capacity is met by making incremental improvements to the infrastructure, timetable and rolling stock; whilst at the same time reducing whole life cost and improving performance.

The Challenge

Enhancing existing infrastructure requires specialist skills in systems integration in order to create the optimum portfolio and manage the integration of the work with the existing network such that it delivers the required benefits and change in capability.

How We Can Help

Systems integration works in partnership with Systems Analysis and uses the modelling outputs to help define the interventions. This approach is applied from strategic planning through to delivery stages, and is also used to assess the impact of temporal and geographic overlapping interventions where projects are developed and implemented over a longer time period.

Systems integration consists of requirements elicitation and development, requirements management, option development, change control, configuration management, interdisciplinary engineering assurance, safety assurance, business integration, technical system integration, and verification & validation (V&V).

We have a strong in-house systems integration capability with significant knowledge in the practical application of a variety of systems engineering techniques which enable us to make informed trade-offs and identify optimum solutions to a range of operational and engineering challenges.



Thameslink Programme

Systems Integration techniques assisted the programme team in planning how to upgrade the network. Configuration diagrams were used to communicate the change to stakeholders; showing how the railway assets changed over time to realise the benefits of a 24 trains per hour service across London.

Structured requirements management techniques were used to link the Department for Transport's requirements to the functional specifications for Thameslink infrastructure and rolling stock. This serves as a means to control the scope and identify evidence to demonstrate that the programme deliverables meet the client requirements.

Crossrail Programme

Network Rail (NR) is a key partner of Crossrail Limited (CRL) in making Crossrail a reality. Network Rail is integrating Crossrail with the national rail network, delivering faster, more

frequent trains into central London from the east and west. Network Rail's £2.3bn upgrade works for Crossrail include upgrades to track, major civil engineering projects, new overhead electrification equipment, improvements to stations and bridges, new control centres, significant enhancements to the signalling systems – including the overlay of the European Train Control System (ETCS) Level 2 from Heathrow Airport to Paddington, one of London's major terminal stations and supporting the signalling interface with the central section which uses Communication Based Train Control (CBTC) technology.

For the Crossrail Programme NR has adopted a systematic, structured requirements management method. This approach provides traceability through each layer of the requirements hierarchy. The requirements hierarchy also includes Interface Control Documents (ICD) and Detailed Interface Requirements (DIR) that specify the agreed technical and operational interface arrangements.

NR applies extensive and progressive V&V activities to confirm the requirements are correct and being met. This has three primary threads:

- ▶ performance modelling, analysis and simulation tools
- ▶ evidence provided by the suppliers
- ▶ in service performance measurement.

ATCS Programme

A Network Rail Consulting team is working with Transport for New South Wales on the business case for introduction of the European Train Control System Level 2 and a traffic management system (together known as the Advanced Train Control System, ATCS) to the Sydney network. The team is providing systems engineering and systems integration advice, including the draft business requirements for the circa \$1.5bn programme.