

Project SWIFT

Secure, Reliable, Fast Wi-Fi
for Train Passengers



The mobile revolution starts here.

Online connectivity has transformed our lives – at home, work and study. The UK is one of the world's most connected populations, with the most prolific online shoppers.

Increasingly, people expect to be online wherever they are, including when travelling on public transport.

Internet access on trains can benefit everyone. However, Wi-Fi on trains is often unreliable. Even when paid for, it rarely provides reliable connectivity for users. This makes it a barrier to productivity and operational innovation - and it limits commercialisation opportunities.

The current solution is therefore not fit for purpose.

The solution.

Utilising the Cisco Connected Train solution, the Innovate UK, RSSB and Cisco funded innovation initiative “Project SWIFT” has proven the viability of mobile connectivity on trains, using Network Rail’s existing trackside infrastructure and fibre network to offer ubiquitous, broadband-level connectivity to rail passengers and the industry.

Project SWIFT was highlighted as a successful example of innovation in passenger experience in the recent Rail Sector Deal as part of the UK Government’s Industrial Strategy.

Glasgow



Key project successes



Collaboration Project SWIFT brought together key stakeholders in a joint venture including Network Rail, ScotRail, CGI, CenturyLink and Wittos. Crucially, this resulted in a unique commercial agreement that allowed Cisco to utilise Network Rail's fibre and physical assets to offer a mobile connectivity service. In addition, the Cisco team, which included several industry experts, worked extensively with telent and Network Rail to create the design standards and pass the safety and assurance procedures that allowed for a safe and secure deployment on the UK railway.



Future proof According to Ofcom's 2016 Mobile Digital Strategy report, UK mobile data traffic is set to grow at a rate of 25% to 42% annually until 2025. The Cisco Connected Train architecture is modular, allowing the adoption of new technologies such as mmWave, to deliver capacity growth in line with demand, with the ability to choose the right technology between train and track at the time of any project deployment.



Seamless service Project SWIFT is based on an integrated end to end solution, capable of providing seamless, holistic and high-speed service to the customer.



Cost effective Project SWIFT is the first commercial service to utilise the already deployed Network Rail fibre-based IP network (FTNx). Cisco met all standards and passed all safety cases and product approvals for implementation of the architecture, proving this valuable asset can be shared, whilst still protecting safety critical traffic.

Cisco built a full solution architecture covering all Connected Train components at the Rail Alliance test track near Long Marston, before deploying this solution between Edinburgh and Glasgow. Deploying the system on the live railway, with all the associated safety and approval governance, was crucial in building confidence that such connectivity could be successfully deployed going forward.

Delivering high speed connectivity to trains from trackside fibre requires an integrated network architecture that covers the on-train network, the connectivity between train and track, the trackside network and the centralised network and security services that sit in the Data Centre.

This Cisco Connected Train architecture was then also built for the Project SWIFT live proof of concept trial between Edinburgh and Glasgow. As part of the trial, two trains, 13 trackside locations and four stations were commissioned with the Project SWIFT system architecture and fully tested, both for 3G/4G backhaul and trackside Wi-Fi.

Trackside radios were fitted to GSM-R masts for the whole route and further infill sites were trialled for the 12km section between Cadder and Dullator; with the advantage that this section of route also served trains from Glasgow to Dunblane.

Edinburgh

Project SWIFT has proven the Cisco Connected Train architecture on the UK rail network. The proof of concept trial on trains between Edinburgh and Glasgow enabled passengers to experience speeds of up to **300 Mbps**.

The benefits.

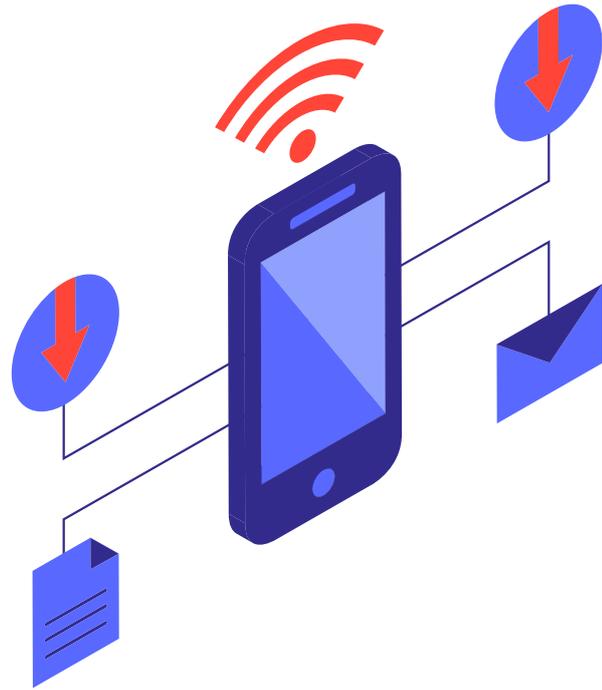
Project SWIFT is an enabler. It creates a digital platform for the railway and delivers benefits to passengers, the industry and beyond the railway – from 5G backhaul for MNOs to rural broadband. The benefits of improving mobile connectivity are therefore far in excess of the costs for delivery.

Passenger demand for greater connectivity has been proven through the increase in passenger data usage during Project SWIFT.

Given the opportunity, passengers will utilise extra bandwidth – as demonstrated by the higher volumes of data per client downloaded after Project SWIFT.

Commuters increasingly expect transport to be delivered as a ‘service’, where a digital interface is used to source and manage transport services that meet their mobility requirements.

To meet this requirement, fast and reliable mobile coverage is required while travelling.



Improved connectivity increases innovation and productivity across the economy.



Improved mobile connectivity improves passenger experience.



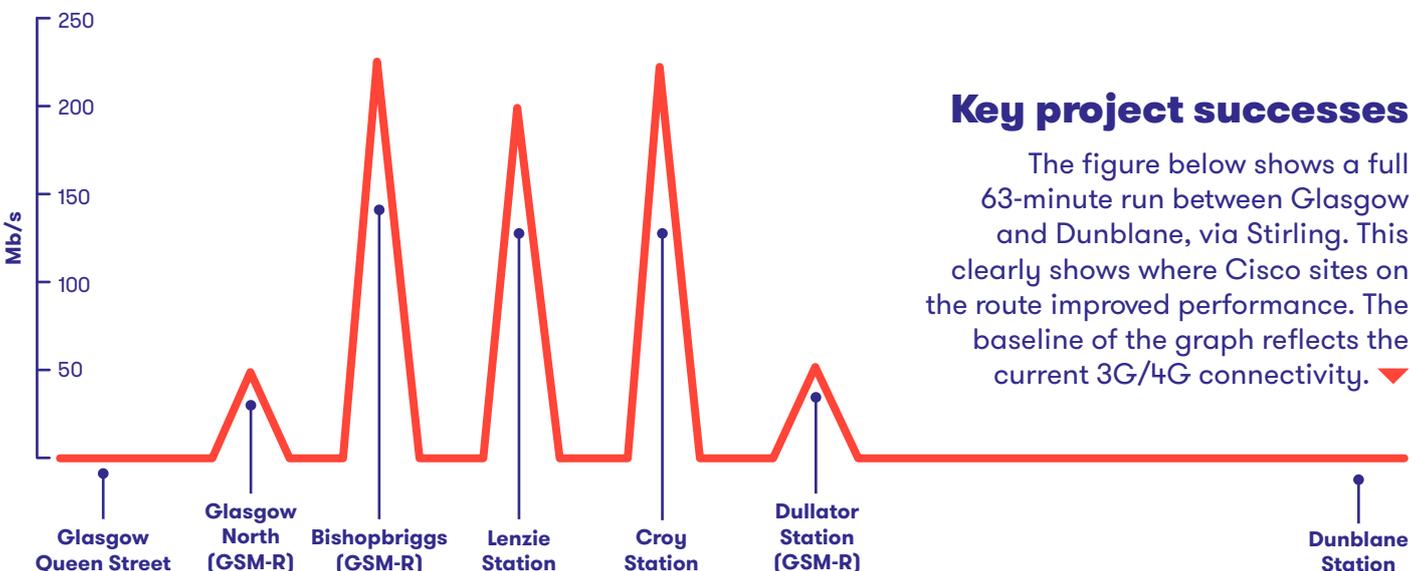
Improved mobile connectivity gives passengers, both on trains and at stations, access to better real-time information about journey times, delays and cancellations.



Improved mobile connectivity will enable further benefits to be realised from the introduction of smart ticketing.



Improved mobile connectivity is considered essential by 81% of businesses in the UK.



Key project successes

The figure below shows a full 63-minute run between Glasgow and Dunblane, via Stirling. This clearly shows where Cisco sites on the route improved performance. The baseline of the graph reflects the current 3G/4G connectivity. ▼

What have we learnt?

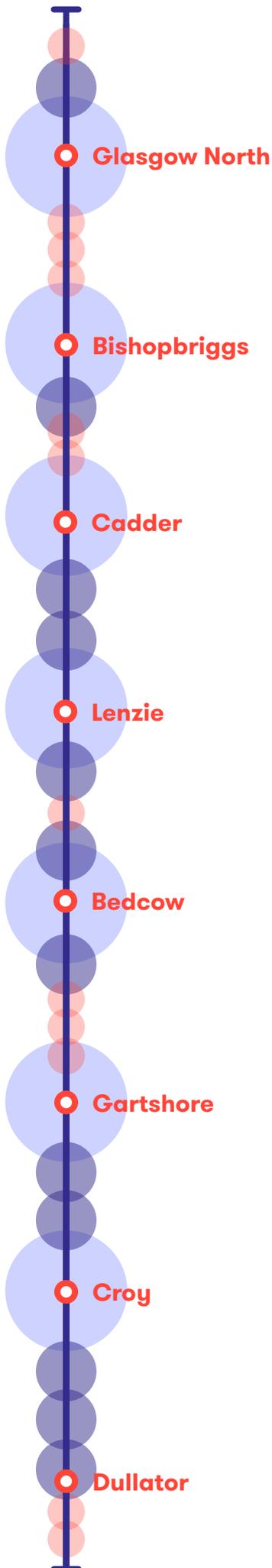
Further potential can be unlocked. Delivering Project SWIFT on a busy and operational rail corridor using Network Rail assets and fibre provided valuable experience. This will help build the successful future delivery of mobile connectivity, utilising trackside infrastructure. These lessons will be equally valid as the technology enabling higher speeds, such as mmWave, matures.

I am very proud of everyone who has contributed to this successful programme and their efforts, which have established a blueprint for cross-industry collaboration, in the delivery of digital connectivity for passengers.

Simon Atterwell,
Director,
Network Rail Telecom

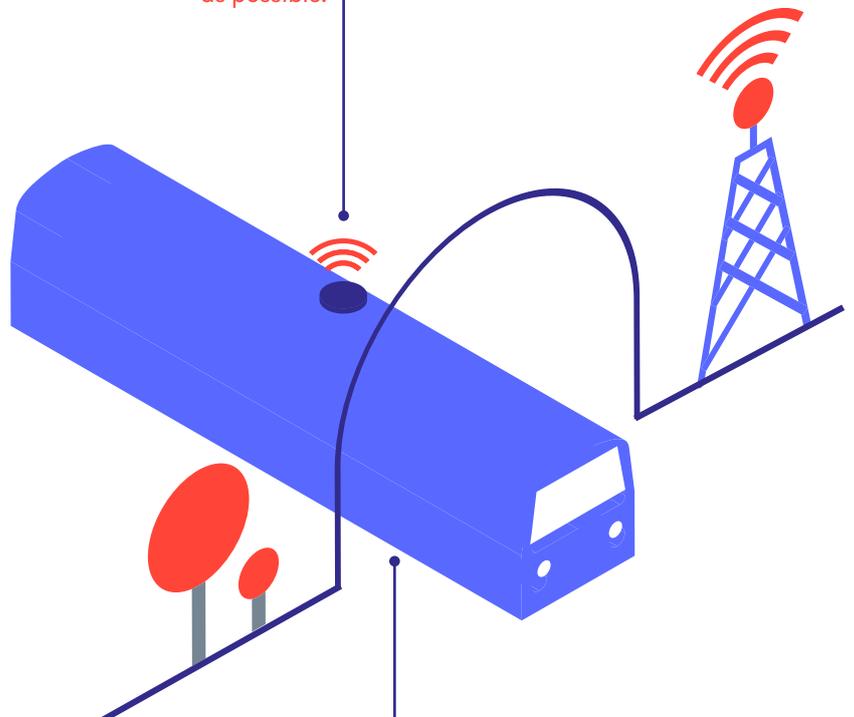
Optimising the service

◀ Lessons were learnt on the optimal lineside deployment to remove coverage gaps. The different circles show where signal strength in the trial were high to poor and demonstrates areas of the trial where signal was weaker. Valuable experience was attained on the optimal and most cost-effective way of enabling full coverage.



Location of antennas on train roof
The antennas on the Project SWIFT trains were mounted five metres from the train front due to existing footprint. Testing showed all antennas perform poorly if not at the ends of the train. Any future deployments will require the antenna mounting as near to the front and rear of the train as possible.

Location of lineside antenna
Existing infrastructure such as OLE (Overhead Line Equipment) stanchions, can both block and cause reflection of signals. Installing antennas on bridges and inside the OLE would mitigate the interference considerably and reduce costs.



Train speed
When a train is moving at close to 100mph, OLE gantry posts enhance the Faraday Cage effect. This further reinforces the need to utilise OLE infrastructure for lineside radios.

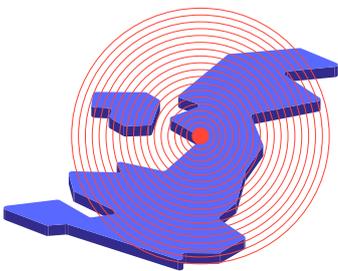
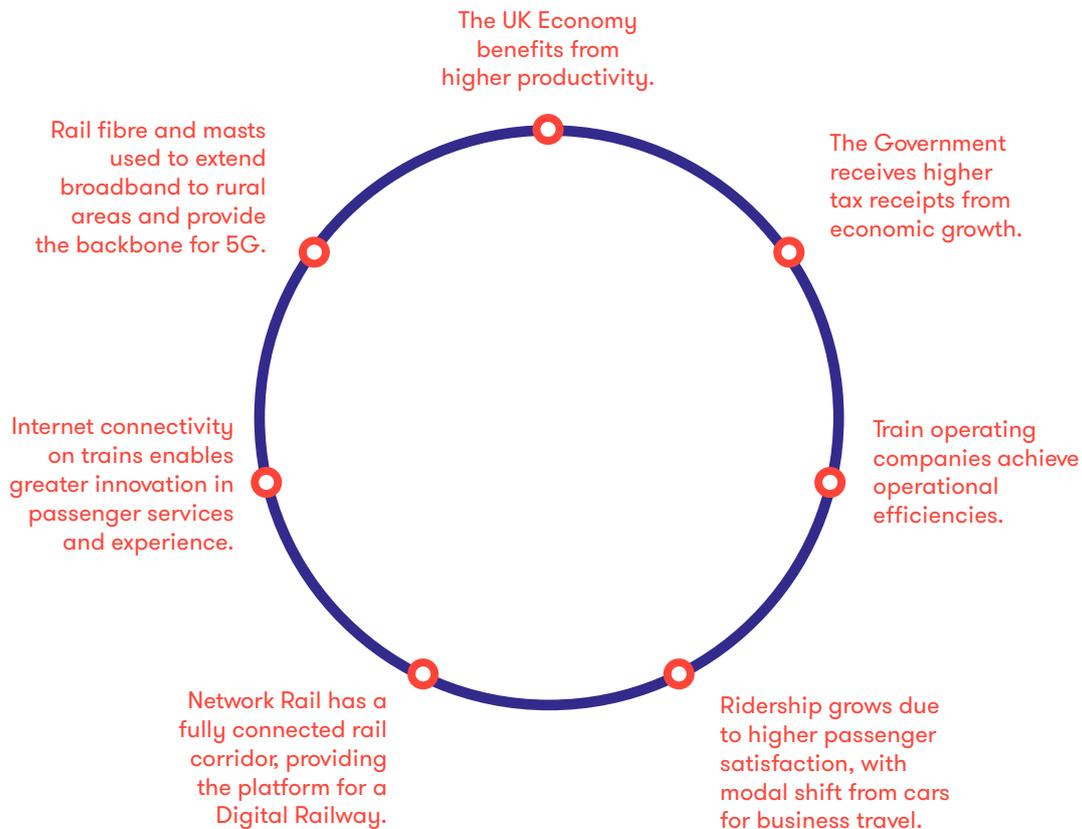
Wider rollout.

The UK Government is committed to improving Wi-Fi and mobile connectivity to passengers, and in 2017 pledged to have uninterrupted mobile phone signal and guaranteed Wi-Fi internet service on all main line trains. The Connected Train architecture can help achieve this commitment.

After years of talking about using trackside equipment to improve digital connectivity to trains, the cross-industry team of Network Rail, Cisco, telent and ScotRail have proven it can be done on an operational railway. We now look forward to team SWIFT's innovation, hard work and learnings being used to enable a step change in digital connectivity for all UK rail customers.

Scott Prentice,
Head of Business Development,
ScotRail

The benefits circle



2022

The 2017 Conservative party manifesto committed to all major roads and main line trains enjoying a full and uninterrupted mobile phone signal by 2022.

95%

The manifesto also stated that it will extend mobile coverage further to 95% geographic coverage of the UK.

The future

- Cisco, the foundation for the Internet, continues to invest in new technology and the capability to deliver ever greater speeds to trains will continue to expand. Cisco is participating in trials globally that will deliver Gigabit speeds and beyond to trains.
- Cisco has the technology in place to deploy Connected Trains now, together with the partnerships and experience required to safely deploy throughout the UK rail network.
- The Cisco Connected Train is a proven solution, developed working with live UK railways; nobody else has achieved this in the UK.
- Project SWIFT reflects the reality of people's everyday lives - always online whether working, streaming, studying, etc - and replicates it in a train environment. The result is a solution that can improve train travel for all types of passengers, from business to leisure.

Together, we can encourage a new generation to use the railway and make train travel more attractive for new and existing passengers.

Designed by

steer

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