

Operational Technology Strategy 2015

Date: 18th January 2016

Version: 1.0

Document Control

Document Title	Operational Technology Strategy 2015
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Owner	Robert Castleman
Distribution	David Brewer
Document Status	Issued

Revision History

Version	Date	Description	Author
Draft 0.1	11 November 15	Reviewed following meeting with David Brewer 21 st Nov	David Bradbrook
Draft 0.2	09 December 15	Updated following feedback 8 th December	David Bradbrook
Issue 1.0	18 January 16	Issued following approval by David Brewer	David Bradbrook

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What is Operational Technology?

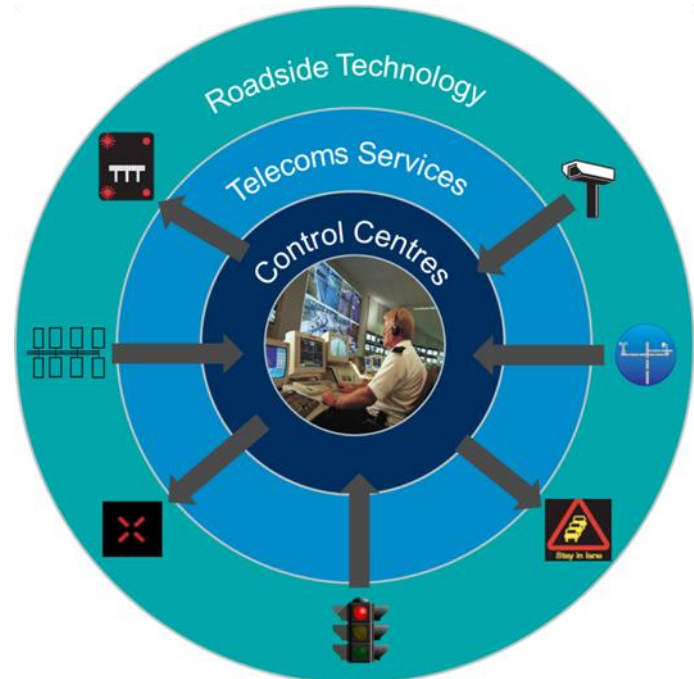
Operational Technology is the term used to describe the technology that enables us to operate and monitor the Strategic Road Network (SRN). In addition to supporting the management of the SRN, our operational technology also provides us with the data we require to model the current demands upon the SRN, predict future needs and identify areas for future investment.

Our operational technology is categorised into the following areas:

Roadside Technology - technology deployed at the roadside (signs, signals, CCTV cameras etc.).

Telecoms services - the systems and services that interconnect the roadside technology with the control centre systems.

Control Centres - centralised systems that are used to monitor and control the roadside technology.



There are over 100,000 roadside technology assets installed across the SRN. Operational technology has an estimated capital value of £1.5B.

The role of Operational Technology in delivering our business requirements

Operational Technology supports us delivering the business requirements set out in our Delivery Plan¹ and plays an important role in delivering major programmes of work such as the Smart Motorway and Expressway programmes.

To maximise the benefits of these and other programmes to road users we need to ensure that the technology we deploy is high performing and available when required.

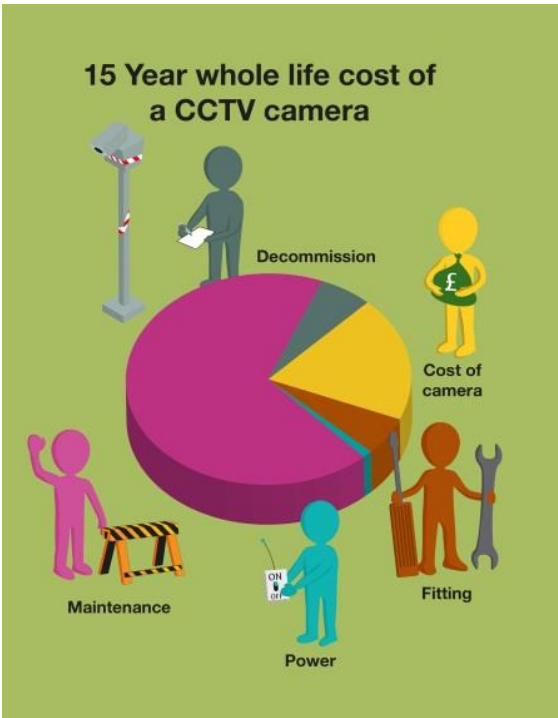
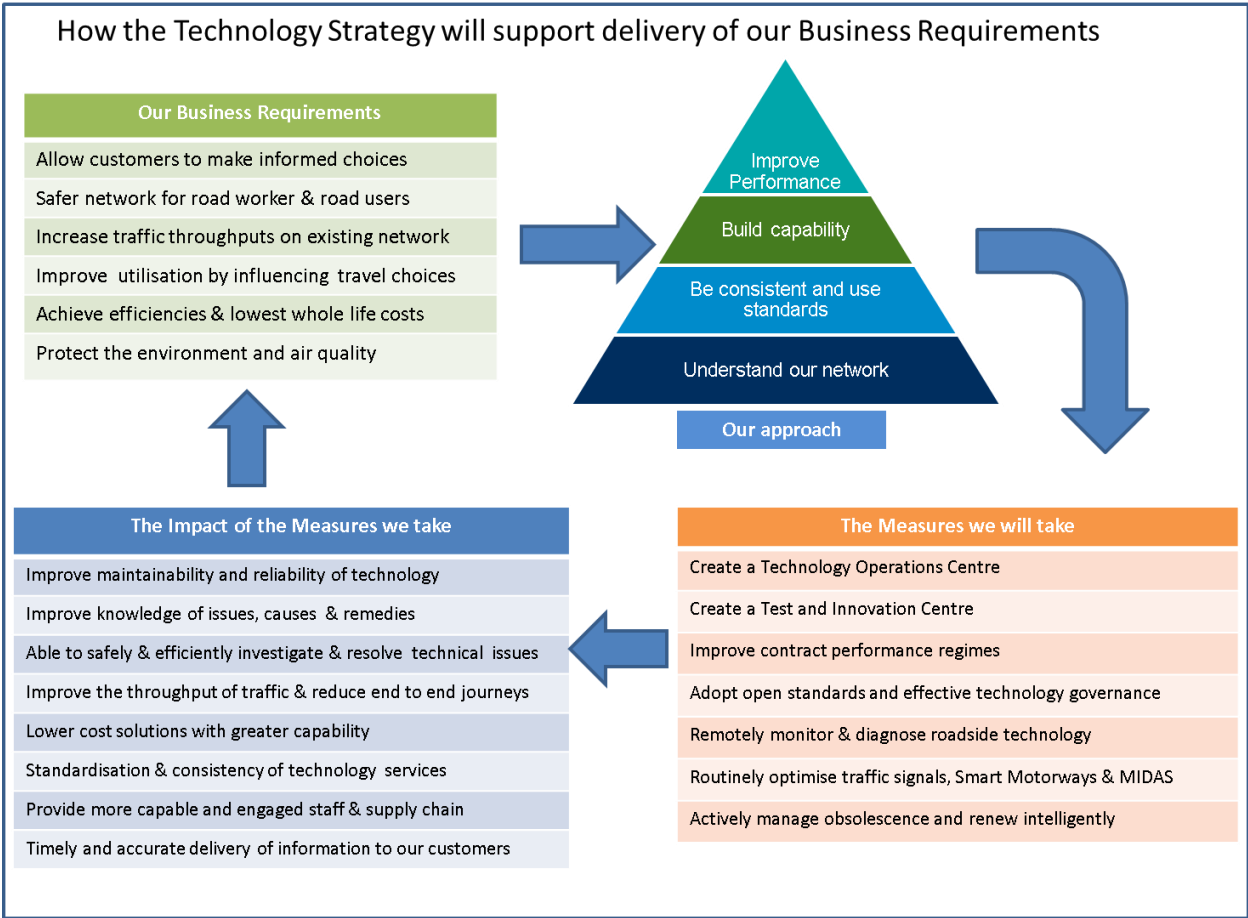
Our Approach will be to **understand the performance of the SRN** and its future needs whilst **building the capability** of our people and technology in a **consistent manner using standards**. By doing this we will **improve the performance** and availability of technology.

Using this approach we will deliver a number of measures over the coming years to address business requirements and support delivery of the Roads Investment Strategy².

¹ <https://www.gov.uk/government/publications/highways-england-delivery-plan-2015-2020>

² <https://www.gov.uk/government/collections/road-investment-strategy>

The diagram below shows the key measures we plan to take and the impacts they will have. The remainder of this strategy describes these measures and the expected outcomes.



The challenges of operating technology at the roadside

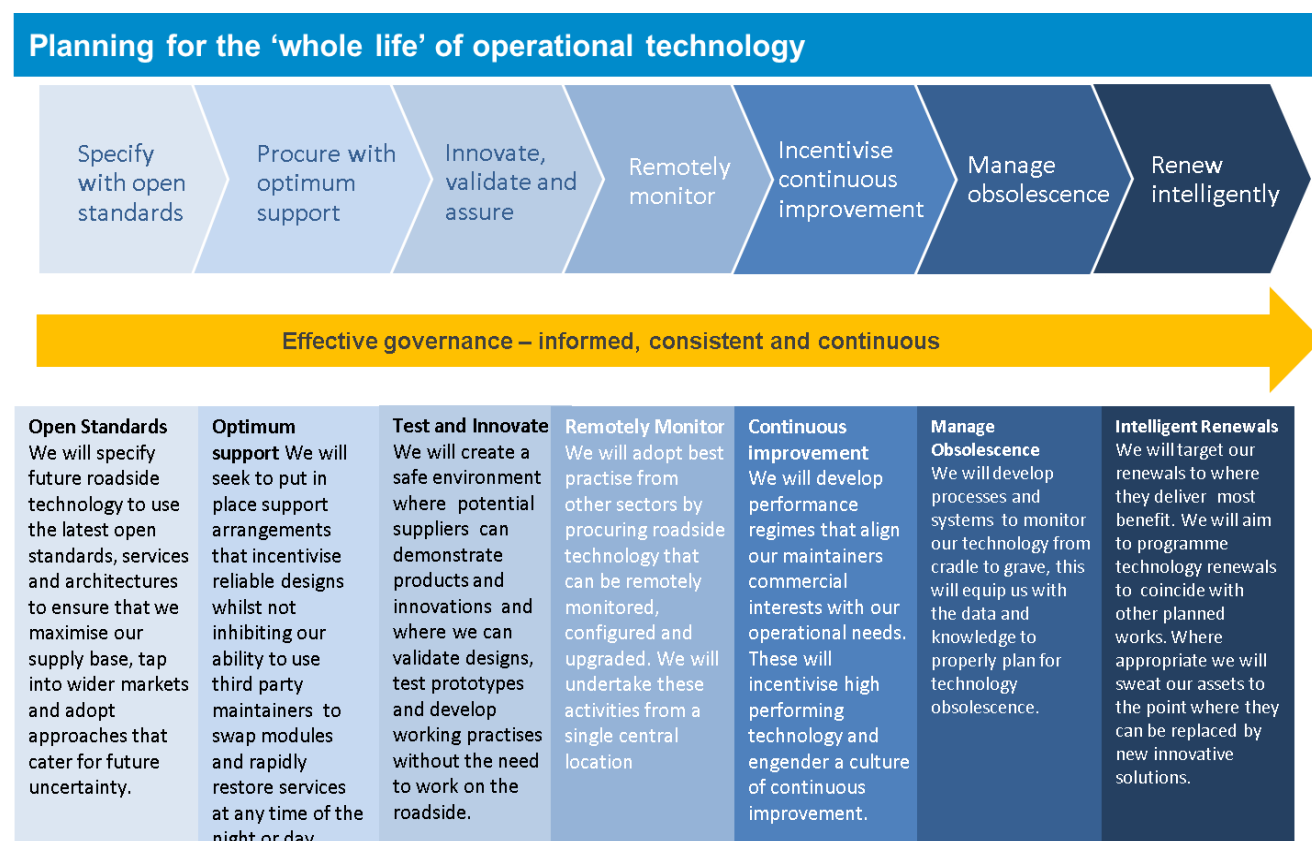
There are a number of challenges in providing technology at the roadside, such technology is designed to withstand harsh environmental conditions and is located in areas that are difficult to access.

There are also important considerations regarding Health and Safety for those installing and maintaining the technology. A consequence of this unique operating environment is that the initial capital cost of roadside technology normally represents only a fraction of its overall whole life cost. Furthermore Roadside technology is designed to have a relatively long life, typically 15 years, and so the benefits of any change in our approach can take many years to be fully realised.

Being consistent and using standards

Considering the whole life of technology

Improving capability and delivering consistent results will require us to apply suitable governance to every stage in the life of technology. This will ensure that we maximise the benefits delivered to our customers whilst minimising the whole life cost of technology. The figure below summarises the measures we will take to ensure that we properly consider all aspects of technology throughout its life.



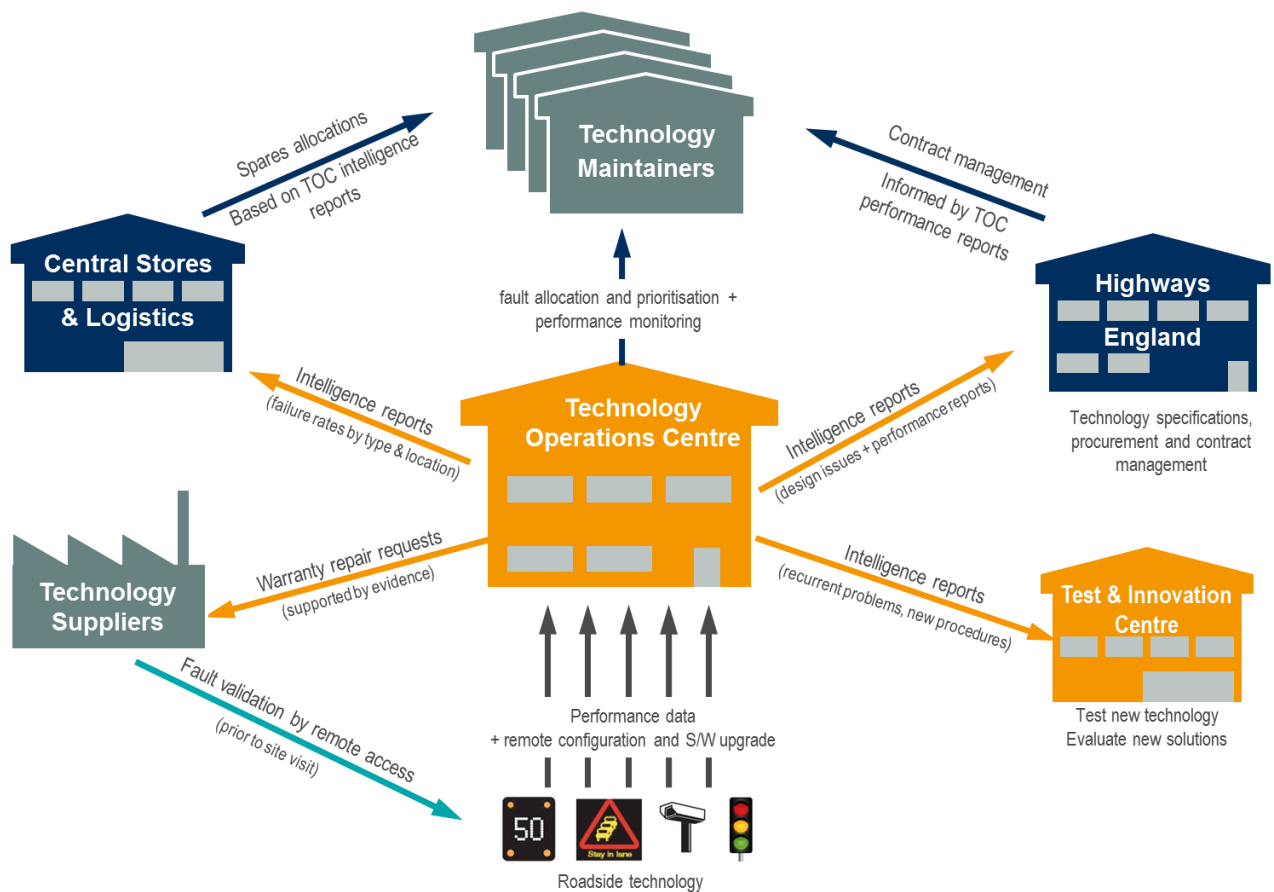
Furthermore we will develop and move towards a new technology architecture based on extensive use of Internet services, an Enterprise Service Bus, cloud based services and adoption of internationally recognised standards including those from transport and other relevant sectors.

Improving the performance of operational technology

Taking greater control over the operation of our technology

Applying technology governance will not, by itself, deliver high performing technology. We need to take control of a number of key aspects of the delivery and operation of technology, in other words we need to create a new operational model for technology. Key to delivering this operational model will be the creation of a Technology Operations Centre and a Test and Innovation Centre.

The Technology Operations Centre will sit at the heart of our operations and will adopt best practise developed by other sectors such as telecommunication operators and utilities who are experts in managing a large number of technology assets dispersed over an extensive geographic area. This approach also builds on our own experience from the National Roads Telecommunications Services contract.



The Technology Operation Centre will provide a focal point for analysing and acting on fault and performance data collected from roadside technology. A summary of the key functions of the Technology Operations Centre are provided below:

- Minimising the number of visits to Roadside Technology – by remotely undertaking activities such as diagnostic tests, re-setting devices, commissioning devices, updating firmware.
- Prioritising the fixing of faults to maximise economic benefits – by attributing, allocating and proactively following up faults and issues with our technology maintainers and suppliers.
- Prioritising the allocation of spares to maximise benefits – by analysing technology deployments and fault data and liaising closely with our stores and logistics teams.
- Analysing data to better understand the causes of failures - being proactive in finding root causes and remedies for recurring and self-clearing faults.
- Collecting and processing data to measure the performance of technology and our contractors - to support contract managers with applying contracted performance regimes.
- Ensuring that every technology asset installed, repaired or renewed is properly accounted for and tracked from cradle to grave - through accurate logging of asset and fault data.
- Ensuring that 'lessons learnt', knowledge and best practise is properly recorded, disseminated and shared between our staff, maintainers and the wider supply chain.
- Provide a centre of excellence for traffic engineers who will routinely optimise the performance of traffic signals, MIDAS, ramp metering etc. to maximise traffic throughput.

This approach to operating technology delivers great economies of scale by providing a single point of focus (rather than seven regional views) on those parts of our operation that most influence the performance of technology. The approach is aligned with a new approach to road maintenance currently being developed in Highway England's Area 7.

Providing a safe environment for conducting essential parts of our business

The SRN is a hazardous environment for road workers. Roadside technology maintenance activities are often restricted to off-peak hours or night time working which limits the scope and depth of investigations into technology issues. We will create a Test and Innovation Centre which will provide all the elements of our end to end solutions but in a safe (off-road) location. We will use the Test and Innovation Centre to undertake a number of activities to improve the performance of our technology and the capabilities of our people and maintainers. These activities will include:

- Investigating challenging technical problems, in particular systemic and intermittent faults that occur under very particular conditions.
- Training for those commissioning and maintaining technology but also our own staff involved in specifying technology or managing technology contracts.
- Compatibility testing between roadside technology, Control Centre Systems and Telecoms Services.
- Testing security measures to ensure that they are robust.
- Developing test and configuration procedures.
- Trials of new ideas and innovations - suppliers can demonstrate the capabilities of new equipment and we may choose to use such an approach to support tender evaluations and integration testing.



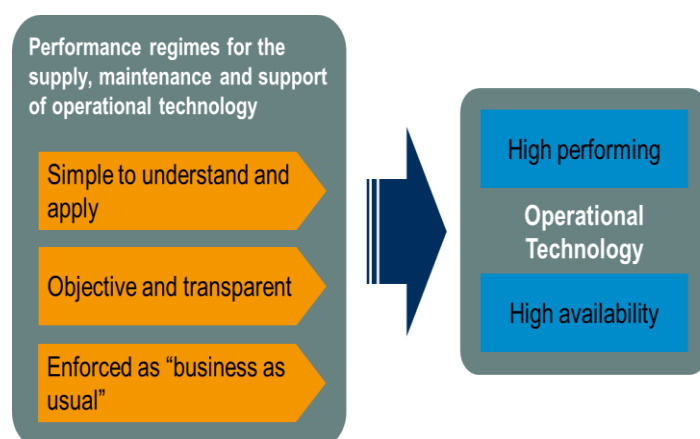
Developing our people systems and processes to support the new way of working

To fully realise the benefits of the Technology Operation Centre and the Test and Innovation Centre we will adopt a service management framework which aligns with industry best practise, this will ensure that our approach is consistent, transparent and understandable to our staff and our supply chain. Furthermore we will update our technology asset and performance management systems to provide our staff with the tools and data required to properly undertake their new roles. Through these and other measures we will improve the capability of our staff to ensure that we are informed of emerging technologies and able to shape the role that technology plays in our future.

Developing our contracts to incentivise high performing technology

We will review the contracts we use to supply, maintain and support our operational technology and develop performance regimes that motivate our suppliers to continuously improve the quality of the services they provide. We will ensure that these regimes put greatest emphasis on those performance indicators that most directly link to technology performance and availability.

We will also ensure that performance regimes are 'joined up' across our supply chain and that they are fair and equitable and don't penalise contractors for areas over which they have little or no control. This approach will align the commercial objectives of our contractors with the operational objectives of Highways England.



Developing Capability

Delivering our capital programmes over the next 5 years

Over the next 5 years Highways England will be delivering two large areas of capital investment which involve extensive use of Operational Technology: the Smart Motorways programme; and the Expressways programme.

In the case of Smart Motorways, well developed approaches have already evolved over recent years and so the emphasis moving forward will be to find ways of delivering solutions at lower whole life cost and using approaches that improve the safety of our workforce and the travelling public.

In the case of Expressways, the A road network presents particular challenges with the absence of regularly spaced power and telecommunications services. We are already addressing these constraints by developing new wireless services and considering the use of renewable energy.

Our capital programmes will contribute to us achieving a target to reduce fatal and major injury accidents by 40%. In support of this we will ensure that no new equipment is deployed on the road network unless it can be remotely monitored, configured and updated.

Using technology to drive business change

Much of our Control Centre technology is based on out-dated solutions and architectures which constrain rather than facilitate business change. Such constraints limit the extent to which our Traffic Officer Service can adopt new and modern working practises.

We are addressing these issues through the procurement of an Advanced Traffic Management System (known as CHARM) which will allow us to adopt a more flexible approach to operating our network. This will include the ability for roadside technology to be monitored and, where appropriate, controlled by any of our staff or stakeholders wherever they may be located. The system will also keep our roadside traffic officers updated with the status of incidents and can facilitate this through the use of smart devices. More importantly CHARM will adopt a modern and open architecture allowing us to easily cater for currently unknown future requirements by allowing us to add functionality through open competitions. We are committed to build on the CHARM approach and ensure that all future operational technology solutions adopt the same enterprise wide architecture and approach.

Improving end to end journeys

Within our Strategic Business Plan³ we are committed to building collaborative relationships with partners, such as Local Authorities, to facilitate better end to end journeys. In support of this initiative we will consider the benefits of connecting all our Traffic Signals (traffic lights) onto an Urban Traffic Control (UTC) system allowing us to monitor and better manage these important assets and also interconnect with Local Authority Urban Traffic Control systems to optimise traffic flows across neighbouring road networks.

Understanding and future proofing our network

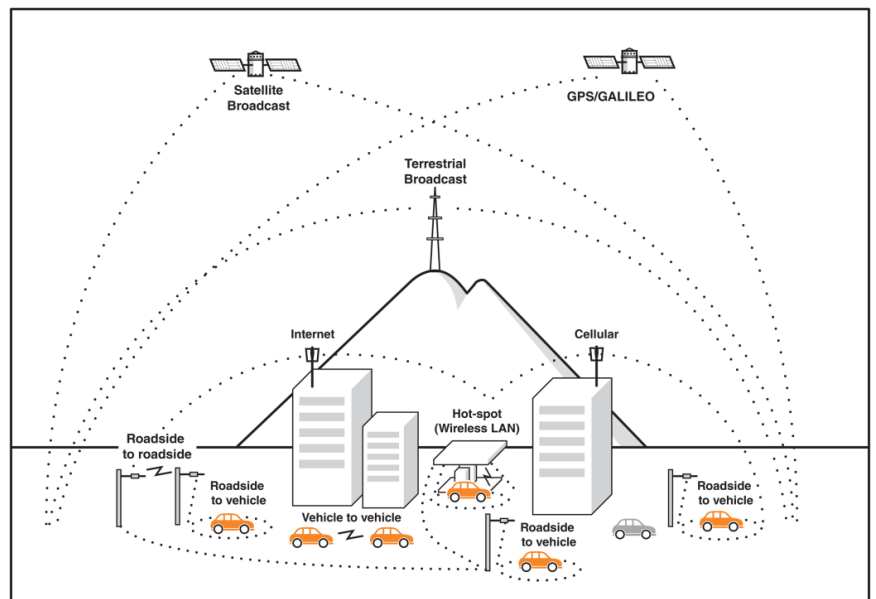
Understanding our network

Technology already plays an important role in our ability to understand the performance characteristics of the SRN with systems already used to alert customers of queues and congestion; also providing data on speed, headway and vehicle categorisation. However, there is a high volume of largely untapped data that is routinely collected from the SRN and with the advent of the connected vehicle; we will be able to access an even richer source of real-time data including air quality data. Interpreting this data to understand how planned and unplanned events impact on the demand, availability and utilisation of the SRN will enable us to provide the tools to better operate the SRN and improve the service we provide to our customers.

Preparing for future connected highways

Most vehicle manufacturers now offer functionality such as lane assistance and adaptive cruise control which is reducing reliance on the human in the driving task. These advanced driver assistance systems (ADAS) not only mitigate against factors such as fatigue and distraction but also have the potential to greatly increase the traffic throughput of our roads. However, without connecting vehicles with each other and with roadside infrastructure these benefits will be limited.

Existing roadside technologies, such as message signs, limit how effectively we can communicate with a diverse range of road users, not all of whom are English speaking. Connected vehicle technology can overcome these constraints whilst also providing a means to receive information from our customers and their vehicles. Such information will allow us to better understand the types of vehicles and customers using our network and gain new insights into a wide range of factors that impact on operating the SRN for example identifying localised weather conditions (by detecting vehicles using wipers and fog lights) or the impact of vehicles on air quality by identifying types of vehicle using the network.



³ <https://www.gov.uk/government/publications/highways-england-strategic-business-plan-2015-to-2020>

The development of connected vehicle technologies is now well underway through a number of significant trials in Europe and America. In the UK DfT has announced a connected corridor trial on the A2 and M2 in which Highways England has a significant involvement. Through this trial we will establish our future role in supporting the connected vehicle agenda and as appropriate amend our standards to enable a move towards a vision where we install minimal roadside technology, but provide seamless information to users via in-vehicle devices enabling safe, efficient operation of the network. Where connected vehicle technology has the potential to replace existing Highways England systems (such as message signs) we intend to take a leading role in future developments however where such technologies are used to deliver commercial services (such as passenger access to the Internet) we intend to leave this to commercial operators.

Next steps

This strategy is expected to have a life of 5 years but will be updated regularly within this period. A detailed roadmap of actions to deliver this strategy is provided in a separate document which also identifies the alignment between proposed actions and the eight key areas being used to measure our performance and that of the SRN.