



Operational technology: our 2035 strategy



Our strategy to 2035



Our operational technology services are vital to the smooth and safe running of our roads. The growing use of operational technology over recent decades has resulted in a complex landscape which we recognise needs to be made more accessible for our customers and our workforce. Our strategy is based around seven themes and we have set out our objectives and initiatives across this road period and the subsequent two road periods.

	2025	2030	2035
Safety	Support the business in achieving its Home Safe and Well vision through the optimisation of operational technology.	Continue to enhance the speed of response to incidents on the strategic road network.	Eliminate implementation of roadside technology requiring maintenance.
Net zero	Quantify the whole life carbon impact and benefits for operational technology.	Tailor procurement and deployment strategies to reduce carbon impacts.	Optimise service deployment to minimise carbon impacts.
Connecting customers	Improve availability, and maximise the quality, of our current information channels.	Expand the range of information channels for customers. Gain more granular and real-time insights into our customers' journeys.	Significantly influence the journeys our customers make based on their needs.
Collaboration	Increase our participation in industry working groups and engagement.	Develop manufacturer relationships to inform our future. Lead UK's Cooperative Intelligent Transport Systems (C-ITS) developments.	Integrated working with other transport authorities to provide seamless services.
Efficiencies	Agree operational technology governance and responsibilities and seek greater benefit from our data and technology.	Streamline the process taking operational technology service requirements through to deployment.	World leading seamless end to end management of operational technology services.
Legislation and regulation	Understand how new and emerging legislation and regulation affects operational technology (and ensure compliance).	Proactively shape and adopt new legislation and regulation.	Be a leading advocate of regulatory change to support in-vehicle technology.
Technology	Develop, publish and maintain technology roadmaps to aid planning.	Fully align with industry standards. Complete alignment with business services.	Reduce and, where possible, eliminate the need for roadside technology in favour of C-ITS solutions.

Our vision is for operational technology to bring trusted, sought after, timely, relevant information, to the heart of our customers' experience. This information will help us deliver world leading personalised services.



Introduction

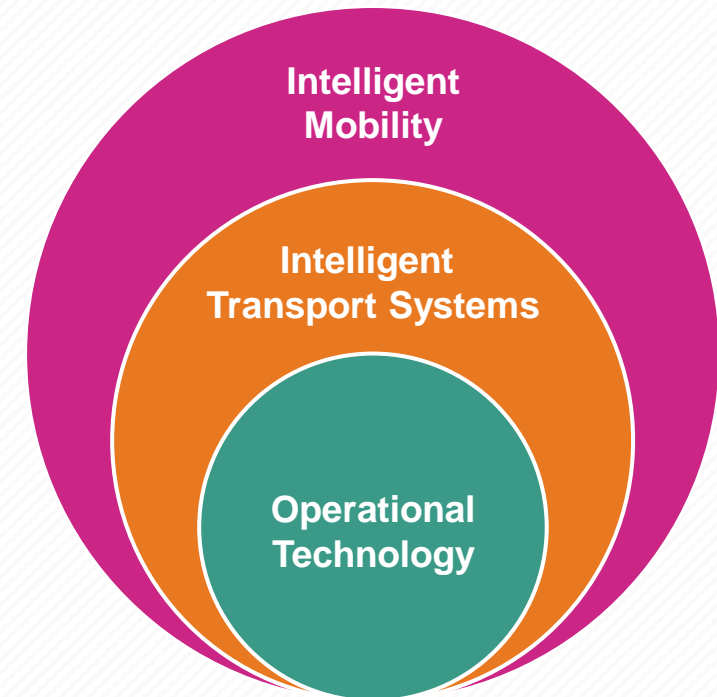
Every day, our customers and workforce rely on operational technology services for safe, reliable and efficient journeys on our roads. Many of our services are unseen to our customers, but they help them safely reach their destinations.

With 1.1 million miles driven every hour on our roads, any problems with operational technology can lead to disruption for our customers, our colleagues also face operation management challenges when there are technology issues.

The growing use of operational technology over recent decades has left a complex landscape that is challenging to navigate. We recognise that this landscape needs to change, and that our customers' expectations and technological advancements are also evolving.

This strategy lays out a unified vision for the future of our operational technology services. This will provide a focus to drive improvements that bring value to our customers.

What is operational technology?



Intelligent Mobility: the broad term for the application of technology to support the movement of people and goods.

Intelligent Transport Systems (ITS): the technologies employed by transport network operators to enable the delivery of their services.

Operational Technology: the subset of ITS we use to operate and maintain the strategic road network.

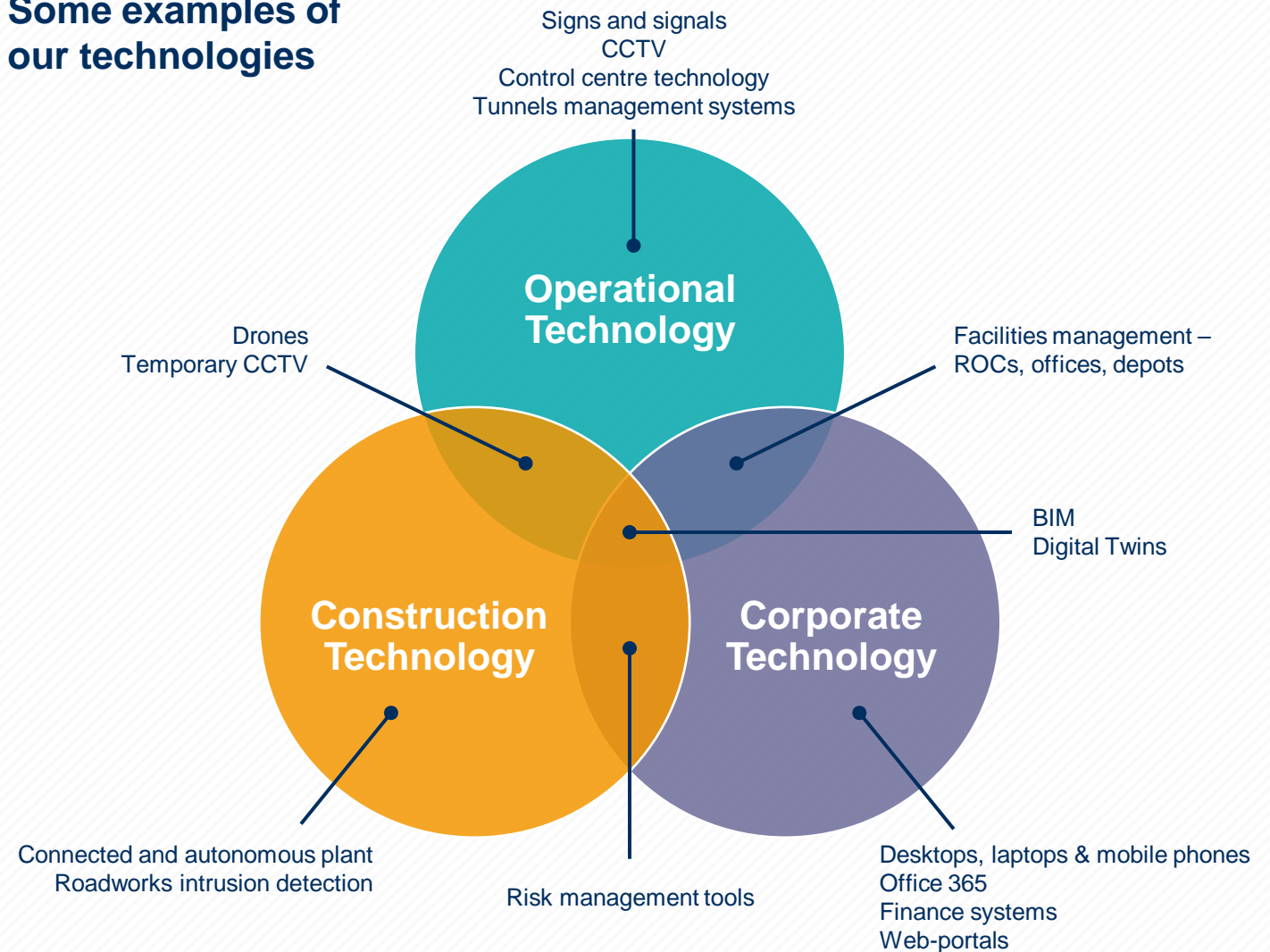


What is operational technology?


National Highways employs technology to support the work we do, from road construction and maintenance to producing documents. Broadly, we can categorise our technology into three groups, namely: corporate, construction and operational (as illustrated in the figure with examples). Whereas corporate technology is fairly familiar to most people as the computers and information systems used in their day to day lives, construction and operational technology are generally more specialised in their nature. Operational technology is specifically used to operate and enable maintenance of the strategic road network and can be found at the roadside and in our regional operations centres.


Over time, it is expected that some specialist technologies will become more mainstream and may also be employed for a broader range of applications.

Some examples of our technologies



Our operational technology estate

 **4,000** CCTV cameras
16 million camera view changes monthly

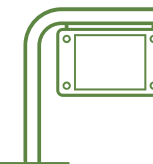
 **10** traffic management centres
7 Regional, 1 National, 2 Tunnel centres with 350 control room operators

 **8,750** traffic monitoring sites
30 million vehicle counts per site per year

250 weather monitoring sites
Informing 535 gritters



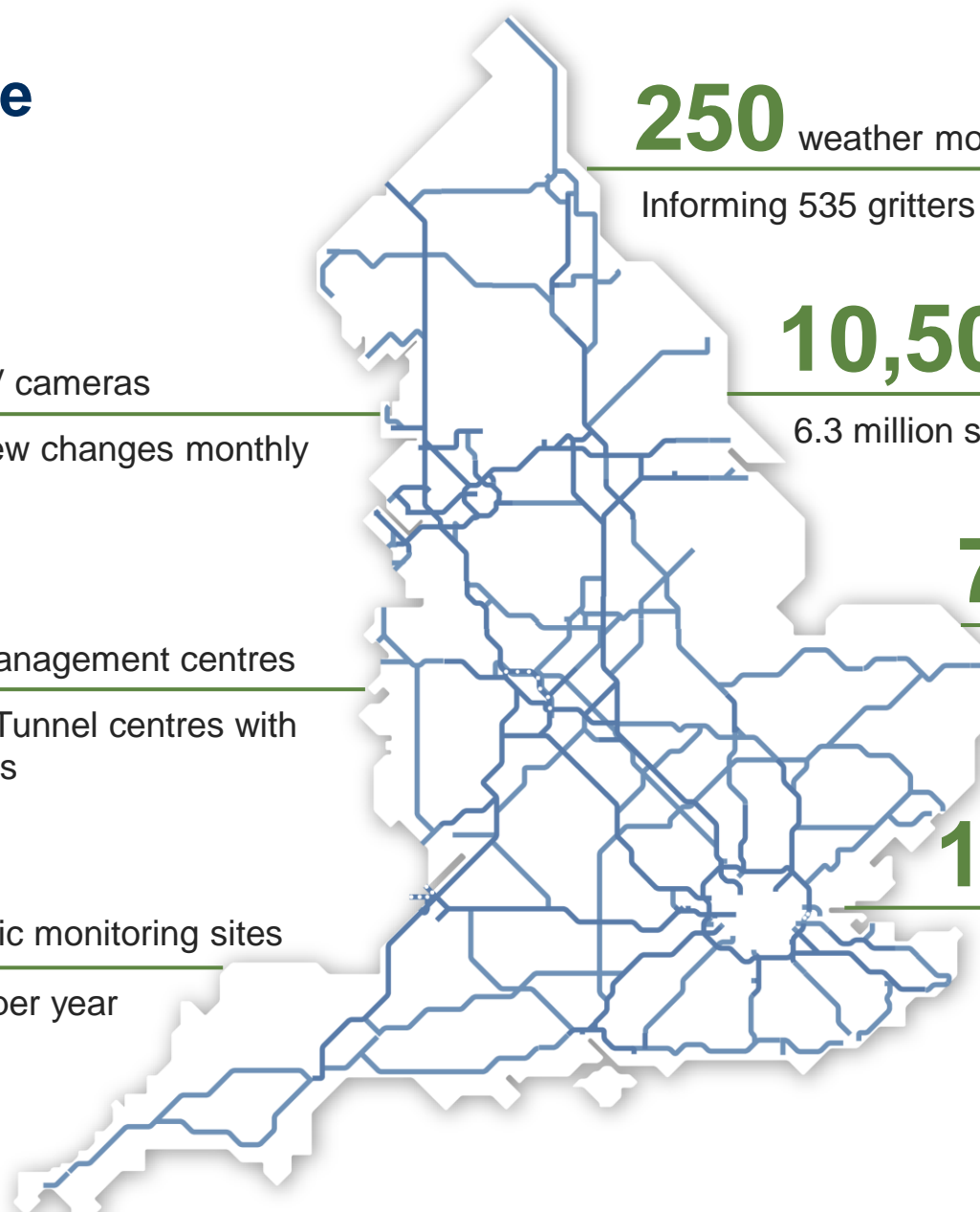
10,500 electronic signs
6.3 million settings monthly



7,200 emergency roadside telephones
39,000 calls handled annually



1,900 miles of road with fibre optic cable
30 billion vehicle miles supported annually





Foreword

Mark Austin, Head of Operational Technology Systems Engineering

I joined National Highways over 15 years ago as an advocate of technology to achieve the objectives of our business and to delight our customers. We have made great strides on this journey.

Now, as the Head of Operational Technology Systems Engineering, I am excited about what possibilities the future holds and recognise that we need a clear direction to keep us true to our imperatives, which is why I am pleased to present our strategy for operational technology services.

Why is this important to me and why should it matter to you? Everybody that uses our network should arrive home safe and well. When we say goodbye to our loved ones in the morning, we expect that they return home safely at the end of the day. Operational technology helps us to achieve this endeavour. We must get operational technology right, for the sake of our colleagues and customers.

We must be flexible, agile and ready for the challenges we face in a period of great change. Amit Zavery, Vice President and Head of Platform at Google Cloud stated,

“Think of digital transformation less as a technology project to be finished than as a state of perpetual agility, always ready to evolve for whatever customers want next, and you’ll be pointed down the right path.”

This strategy sets out our 15-year vision for operational technology and what we need to do to get there. It considers not only how our technology will change, but also how our ways of working and skills need to develop to adapt to significant advancements in vehicle technology (automation, connectivity and propulsion), an evolving marketplace and changes in government, or global priorities.

A series of objectives and initiatives aligned to this road period, and the subsequent two will provide focus as to what we need to achieve and how we will succeed.

This strategy needs to be understood, believed in, and owned by the community of people within our business and supplier community who enable our operational technology services.

I encourage you to take the time to explore the contents, reflect on how you can be part of this work and give us your thoughts on what we can do to make things better for our customers and our business.



Building this strategy

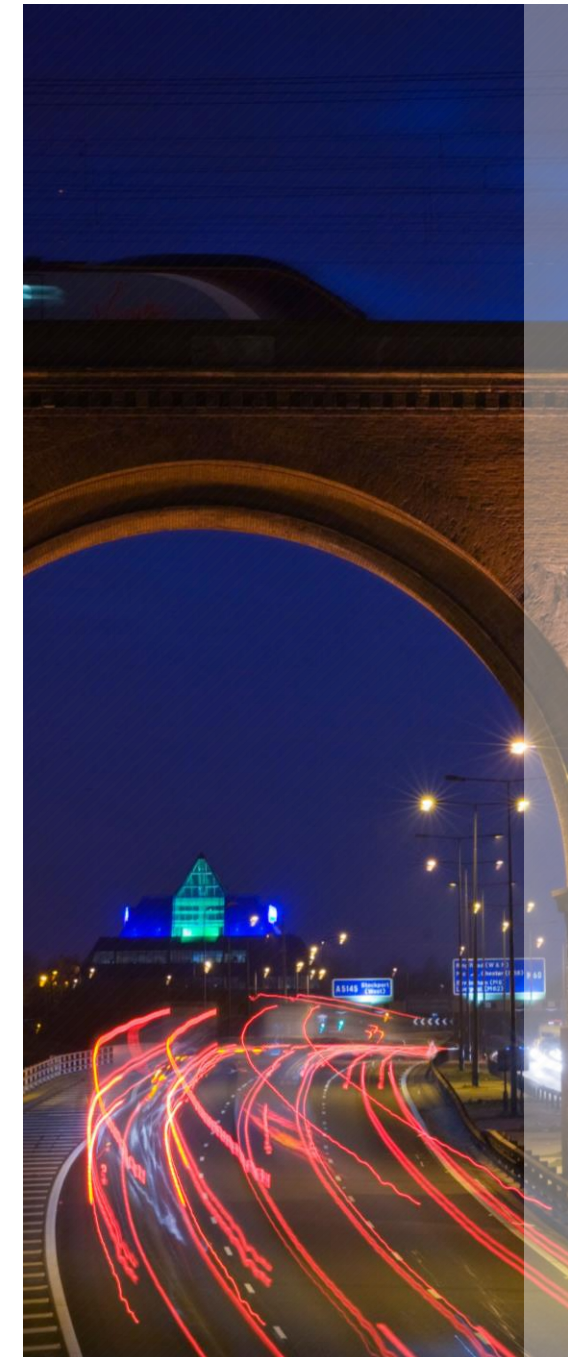
The government's Road Investment Strategy 2 (RIS2) 2020-2025 set the scene for the strategic road network during this period. RIS2 set out five visions for the strategic road network:

- A Network that supports the economy
- A Greener network
- A Safer and more reliable network
- A More integrated network
- A Smarter network

These 'visions' are the leading force for key decisions and are underpinned by our key imperatives of safety, customer and delivery. When setting the future vision for operational technology, we must understand how it influences these visions and our wider initiatives. It is important they align and bring benefit to our organisation and our customers.

Operational technology has helped us make great strides in what we deliver to our customers and workforce, providing reliable services to allow them to be safe, and enabling us to tailor services. However, we must also consider that the demand for our service is increasing due to changes in customer needs and the technology employed in delivering mobility. Customers are demanding more interaction with our network and want highly reliable information to be available almost instantly. At the same time we are managing our legacy technology estate whilst seeking to deliver for our customers in the most cost-effective way for the taxpayer.

We are also aware of the environmental and ecological impact of our operations, and seek to minimise its effects for future generations. Wider environmental trends will also change the way we will operate the strategic road network in the future, for example how we deal with extreme weather conditions.



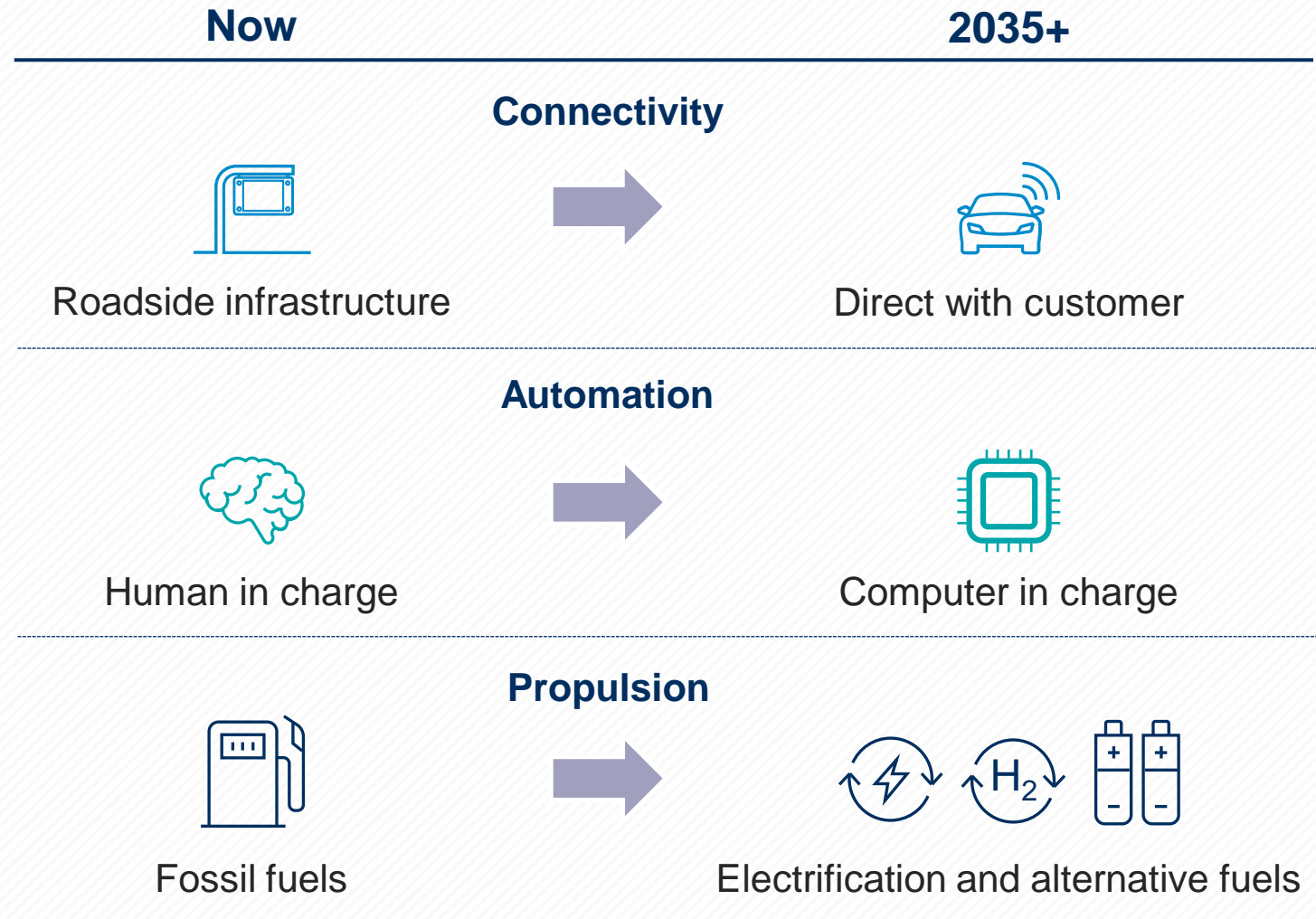
External influences



Technological developments in the vehicle fleets that use our network will require us to adapt our own infrastructure and services. This will present opportunities to reduce the amount of roadside infrastructure we need to use and maintain, offering significant safety and cost benefits.

However, we will need to be able to process more data to provide personalised travel support to our customers.

Changes in propulsion may require us to be able to manage demand for charging and refuelling facilities at our motorway service stations.
















Changing vehicle capabilities

The vehicles that use our network have increasing capabilities related to safety and connectivity. This drives our needs to modify and adapt our operational technology services.

Understanding when these features will be commonplace helps us to plan changes to our infrastructure and services.

The figure builds upon the detail shown in the previous slide and illustrates our current assessment of the maturity of vehicle technologies both in terms of their readiness for mainstream adoption and also their commercial viability. Higher numbers indicate greater maturity (TRL ranges from 1 – 9 and CML 1 – 5).

		 Motorcycle			 Cars, taxis & small vans			 Light goods vehicles			 Heavy goods vehicles			 Buses & coaches			 Specialist vehicles		
		TRL now	CML now	Norm	TRL now	CML now	Norm	TRL now	CML now	Norm	TRL now	CML now	Norm	TRL now	CML now	Norm	TRL now	CML now	Norm
		 Cleaner transport	Electrified – battery	9	5	2030	9	5	2028	9	5	2030	6	3	2035	9	5	2027	9
	Electrified – hydrogen fuel cell	9	2	2030	9	3	2030	8	2	2030	8	2	2030	7	2	2027	9	3	2030
	Synthetic fuels	5	2	2050	5	1	2050	6	2	2035	4	2	2035	5	2	2040	5	1	2050
 Data & Connectivity	Location, navigation and routing	9	5	<2021	9	5	<2021	9	5	<2021	9	5	<2021	9	5	2023	9	5	<2021
	Traffic sign recognition	-	-	-	9	5	2024	9	4	2026	9	4	2026	9	4	2026	9	5	2024
	E-call	7	2	2028	9	5	2024	9	5	2026	5	1	2030	5	1	2032	8	4	2025
	Intelligent Speed Assistance	2	1	2032	9	5	2029	9	4	2031	9	4	2030	9	4	2030	9	5	2028
	General digital connectivity (real time) consumer	9	3	2030	9	3	2030	9	3	2030	9	3	2030	9	3	2030	9	3	2030
	Operational digital connectivity (real time)	2	1	2050	4	1	2036	4	1	2039	4	2	2035	4	1	2040	4	2	2035
 New modes	Road trains (multi articulated)	-	-	-	-	-	-	-	-	-	9	1	2030	-	-	-	-	-	-
	Passenger shuttles	-	-	-	-	-	-	-	-	-	-	-	-	8	2	2035	-	-	-
	Freight / logistics shuttles	-	-	-	-	-	-	5	1	2035	-	-	-	-	-	-	-	-	-
 New business models	Digital / dynamic demand responsive transport	-	-	-	9	5	<2021	-	-	-	-	-	-	9	5	<2021	-	-	-
	Lorry parking – real time availability and advance booking	-	-	-	-	-	-	8	4	2030	8	4	2030	-	-	-	-	-	-
	Load share	-	-	-	9	2	2040	7	2	2030	7	2	2035	-	-	-	-	-	-
	Lift share	-	-	-	9	5	<2021	9	5	<2021	9	5	<2021	-	-	-	-	-	-
 Changing Attitudes	Eco-routing	-	-	-	6	3	2025	6	3	2023	9	5	<2021	9	5	<2021	6	3	2025
	Eco-driving	-	-	-	9	4	2030	9	4	2030	9	5	<2021	9	4	2030	9	4	2030
 Automation	SAE Automation Levels 0 - 2	-	-	-	7	3	2028	7	3	2028	5	3	2032	6	3	2029	6	3	2029
	SAE Automation Levels 3 - 4	-	-	-	5	1	2040	5	1	2040	3	1	2043	4	1	2040	4	1	2041
	SAE Automation Level 5	-	-	-	2	1	2055	2	1	2055	2	1	2055	2	1	2055	2	1	2055
	Autonomous emergency braking (vehicles)	-	-	-	9	5	2021	9	3	2023	9	5	<2021	6	1	2032	9	4	2021
	Cruise control	9	5	2024	9	5	<2021	9	5	<2021	9	5	<2021	9	5	2024	9	5	2022
	Blind Spot Monitoring	8	3	2030	9	5	2021	9	4	2028	9	3	2036	9	3	2028	9	5	2024
	Adaptive cruise control	4	1	2040	9	5	2028	9	5	2028	9	3	2030	-	-	-	9	4	2029
	Autonomous emergency braking (pedestrians)	-	-	-	6	1	2035	6	1	2035	-	-	-	-	-	-	6	1	2035
	Driver attention warning	-	-	-	9	5	2026	9	4	2031	9	4	2031	9	4	2031	9	4	2029
	Lane keep assistance	-	-	-	9	4	2028	9	3	2030	9	3	2028	9	3	2028	9	3	2028
	Emergency Lane Keep System/ Automated Lane Keep System	-	-	-	9	3	2028	7	2	2029	7	2	2036	-	-	-	8	2	2031
	Stop and Go	-	-	-	9	2	2040	9	2	2040	9	2	2040	-	-	-	9	2	2040
	Automated overtaking	-	-	-	4	1	2041	3	1	2050	3	1	2050	-	-	-	3	1	2047
	Platooning	-	-	-	3	1	2050	3	1	2041	5	2	2039	-	-	-	3	1	2050
 Aggregation	Mobility as a Service	-	-	-	9	3	2027	-	-	-	-	-	-	9	3	2027	-	-	-

TRL = Technology Readiness Level (as of Q2 2021)
CML = Commercial Maturity Level (as of Q2 2021)

Norm = Potential year at which the technology is adopted at scale
Specialist vehicles includes emergency vehicles, NH traffic officers and maintenance vehicles



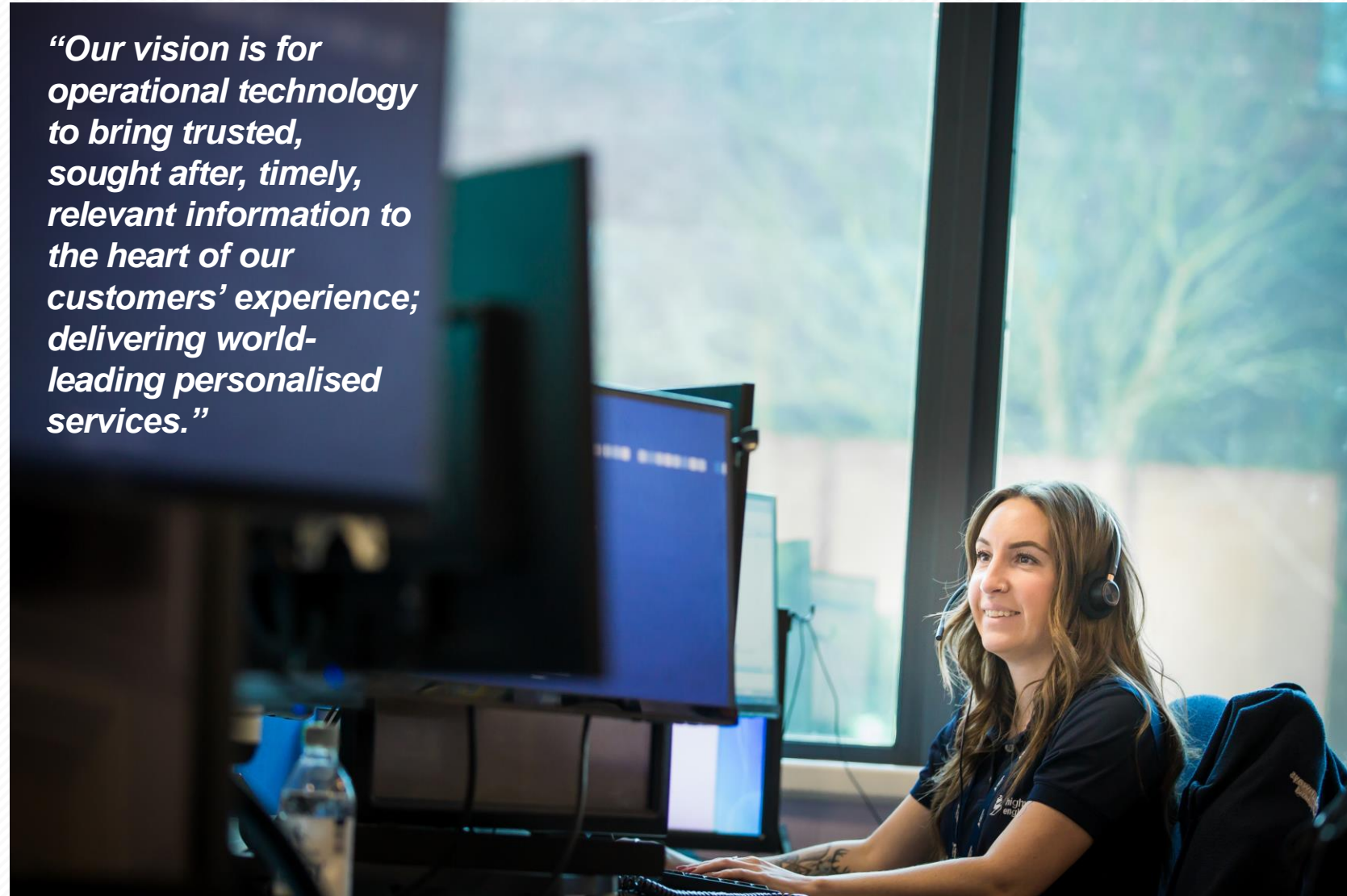
Our vision

The operational technology strategy is integral to our organisation's strategic direction. Deliberately choosing our initiatives to deliver a unique mix of value is the best way to develop an optimal strategy. Our vision sets out where we aspire to take our operational technology services to deliver the value for our organisation and its customers. This strategy will challenge the way we think of operational technology and provide a foundation and framework for future decisions.

We should also remember that there are many moving parts when considering the wider context for our strategy. These parts all influence the future of operational technology services. It is important to bring all these elements together to establish our direction.

Our vision for operational technology on the strategic road network has been informed by this strategy's context and our future strategic goals, which are underpinned by our key imperatives of safety, customer and delivery.

“Our vision is for operational technology to bring trusted, sought after, timely, relevant information to the heart of our customers’ experience; delivering world-leading personalised services.”



Our mission



For more than 40 years we have used technology to augment our business services and provide more insight into the operation of our roads. This technology has evolved over time to support specific safety and congestion related issues, though these have not been considered in terms of a 'service', but rather as a system or product with a bespoke purpose. Additional complexity has emerged as often the systems and products we have introduced provide more than one service through their integration over time, allowing them to be used in new ways. This leads to increased dependency on these systems or components and subsequently, issues experienced at the component level can affect multiple services we offer.

Our mission reflects the current state of our operational technology evolution, and it helps us focus our activities to ensure these systems and services deliver benefit to our customers.

“Operational technology enables a safer and more efficiently connected country by integrating systems and data to benefit our customers, seeking to support freedom of travel while maximising the safety of those that we love.”










Strategic themes



We know there are factors internally and externally which are going to affect how our transformation will progress. Many of these challenges will need to be monitored as we operate in an ever-changing environment. The alignment of operational technology will need to have a flexibility to it, allowing us to monitor and tailor this strategy over time to ensure our imperatives and themes stay at our core.

We have used icons throughout this strategy to identify benefits. Each part of the strategy will contribute towards these benefits and we use the colour blue to identify which benefits we will see from each strategic initiative.

Strategic theme	Description	Icon
Safety	Minimising the number of injuries and fatalities that occur on our network.	
Net zero	Achieving a carbon neutral business and assisting government to reduce the carbon impact of transport.	
Connecting customers	Understanding our customers' needs and ensuring they are provided with the right information at the right time to inform their journeys.	
Collaboration	Working together internally and with external organisations (suppliers, academia, industry bodies, stakeholders) to achieve better outcomes for our customers.	
Efficiencies	Achieving time and monetised savings through ways of working.	
Legislation and Regulation	Keeping up to date and compliant with the latest changes in legislation and regulation. Actively engaging government to amend laws where change is considered necessary.	
Technology	Understanding and actively managing our operational technology estate to align with our customers' needs.	

Our objectives



To maintain focus and allow meaningful measurement of progress towards the vision we have set interim objectives that take us in the right direction. We have chosen a three-horizons framework to align with the road periods and to allow us to manage change.

Time horizon 2025 focuses on the near term, our current capabilities and how we can extend them for our future needs. We currently have technology systems that are in different lifecycles. We need these to operate but as we move incrementally to future aspirations, we must consider their limitations and how we can address them.

Time horizon 2030 looks at relevant emerging technologies and activities needed to create further value for our customers and organisation. In Time horizon 2035+ there is less certainty, but there are enough indicators to set a general direction of travel. However, we need to be flexible and adaptable to changes as there may be unforeseen advancements in technology or other outside factors that we can not predict.

	2025	2030	2035+
Safety	Support the business in achieving its Home Safe and Well vision through the optimisation of operational technology.	Continue to enhance the speed of response to incidents on the strategic road network.	Eliminate implementation of roadside technology requiring on-site maintenance.
Net zero	Quantify the whole life carbon impact and benefits for operational technology.	Tailor procurement and deployment strategies to reduce carbon impacts.	Optimise service deployment to minimise carbon impacts.
Connecting customers	Improve availability, and maximise the quality, of our current information channels.	Expand the range of information channels for customers. Gain more granular and real-time insights into our customers' journeys.	Significantly influence the journeys our customers make based on their needs.
Collaboration	Increase our participation in industry working groups and engagement.	Develop manufacturer relationships to inform our future. Lead UK's Cooperative Intelligent Transport Systems (C-ITS) developments.	Integrated working with other transport authorities to provide seamless services.
Efficiencies	Agree operational technology governance and responsibilities and seek greater benefit from our data and technology.	Streamline the process taking operational technology service requirements through to deployment.	World leading seamless end to end management of operational technology services.
Legislation and regulation	Understand how new and emerging legislation and regulation affects operational technology (and ensure compliance).	Proactively shape and adopt new legislation and regulation.	Be a leading advocate of regulatory change to support in-vehicle technology.
Technology	Develop, publish and maintain technology roadmaps to aid planning.	Fully align with industry standards. Complete alignment with business services.	Reduce and, where possible, eliminate the need for roadside technology in favour of C-ITS solutions.



Ambitions

Building upon our objectives, we have developed a set of ambition statements to help drive the right outcomes from this strategy. Several have been set relative to those found in our *Strategic Business Plan* and *Net Zero strategy*. The remainder have been set through consultation and experience, with the aim of being ambitious and challenging us to continuously improve.

	2025	2030	2035
Safety	Reduce personal injury collisions by 5%. Reduce technology road worker exposure to hazards by 10%.	Reduce personal injury collisions by 10%. Reduce technology road worker exposure by 50%.	Reduce personal injury collisions by 15%. Reduce technology road worker exposure by 80%.
Net zero	Reduce the carbon impact of operating our operational technology by 5%.	Reduce the carbon impact of operating our operational technology by 15%.	Reduce the carbon impact of operating our operational technology by 40%.
Connecting customers	>10,000 direct to customer / vehicle links.	>1,000,000 direct to customer / vehicle links.	>10,000,000 direct to customer / vehicle links.
Collaboration	Actively participate in at least three standards working groups relevant to operational technology annually.	Demonstratable and mutually beneficial relationships with our >50% of our supply chain.	Day to day collaborative traffic management with >25 local authorities.
Efficiencies	Reduce the time taken to test operational technology by 50%.	Reduce the time taken to bring a solution to operation from concept by 50%.	Be able to deploy a new operational technology service within six months.
Legislation and regulation	Continued compliance with all current legislation and regulation.	Actively participate in legislative and regulatory working groups that affect the development and application of operational technology.	Actively participate in legislative and regulatory working groups that affect the development and application of operational technology.
Technology	Publish a complete set of roadmaps and be actively using them to drive product development and procurement.	Support all business services requiring operational technology. All superfluous services are decommissioned.	Reduce the number of new roadside equipment deployed on an annual basis by >75%.

Implementing our strategy



Our opportunities for improvement have been organised to allow for a natural grouping of activities necessary for our transformation. This enables us to maintain our focus in the implementation of future programmes and projects developed from our initiatives. Our series of initiatives will help us move towards our vision. Our implementation plan, which is in development, supports these initiatives and the strategy.

Services

Services define how we deliver value to our customers and stakeholders

People

The competencies, skills, roles and responsibilities

Culture

How people feel, their behaviours, what motivates them and the drive to a common goal

Technology

Technology we use to produce our service, physical or software

Performance

Incentives, KPIs and measurements which motivate

Governance

The policies, security, compliance and effective decision making

Our initiatives



Services



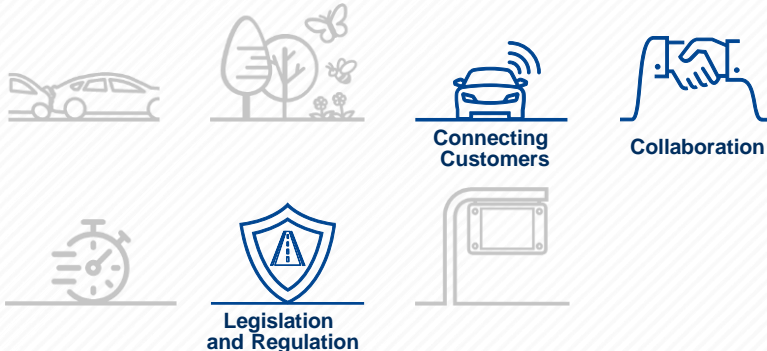
Initiative

Our future service offering

Opportunity for Improvement

Understand how our changing role as a network operator – as shaped by UK Government policy – may impact our service offering over the next 15 years.

Benefit contribution



What we will do

We will work with the Department for Transport and wider government to understand our future role in managing the strategic road network. The scenarios we will consider range from individual vehicles making their own decisions, to a fully managed approach (similar to Network Rail). We will consider how technology companies might support the delivery of our services (such as direct near real-time communication with our customers) through their significant market penetration and expertise. There will be services needed in the future to compensate for gaps which private industry do not address.

Additionally, strengthening relationships with Local Transport Authorities will achieve significant savings and efficiencies for government by enabling end-to-end journeys through collaboration. Connectivity and standardisation will integrate journeys seamlessly for customers.

We will continually review and test the strategy against the marketplace and government guidance to be prepared for changes in transport.



Our initiatives

Services



Initiative

Service alignment

Opportunity for Improvement

Ensure our technology services continue to serve the changing needs of our business and customers.

Benefit contribution



What we will do

We will build upon the work done to ratify our business services and map our operational technology to them. We will use this to determine where there are gaps in support for these services and also identify where services no longer need to be supported. These can be added to our service backlog and managed through our portfolio and programme leads.

We will proactively engage with the stakeholders to ensure their needs are identified, captured and implemented to deliver the right outcomes.

As our services change over time, we will maintain alignment with the data strategies and requirements set within our organisation.

Our initiatives



Services



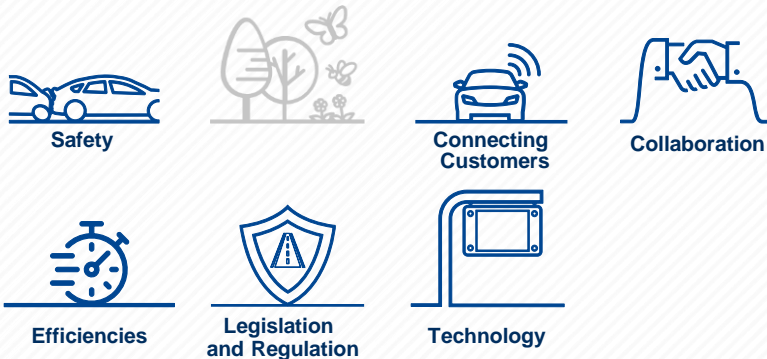
Initiative

Technology operations capability

Opportunity for Improvement

Continue to transform the way we maintain our roadside technology assets, keeping pace with industry good practice, to deliver safety and customer benefits.

Benefit contribution



What we will do

We will continue to insource the monitoring and management aspects of our technology maintenance. We will do this by expanding the geographical remit of the technology operations capability, as well as the services it provides. This will enhance its effective handover into maintenance by schemes and improve the way we maintain our roadside technology.

Key to this will be identifying, securing and developing the right resources to staff the technology operations capability, as well as supporting its transition into our service operations team.

Ultimately, this capability will be critical to us improving the availability of our operational technology services.

Our initiatives



Services



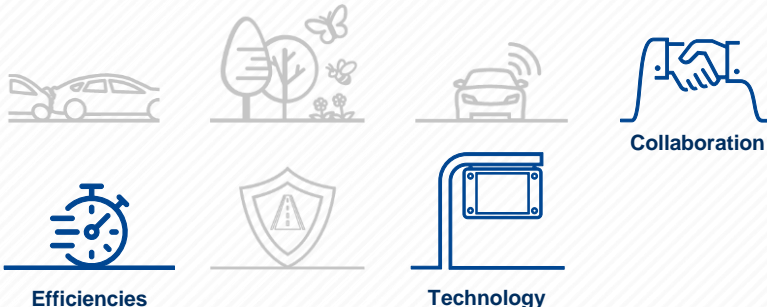
Initiative

Build and operate a test capability

Opportunity for Improvement

Insource the assurance of the technology products and services we procure, to deliver the outcomes required by the business more efficiently, aiding scheme delivery.

Benefit contribution



What we will do

We will design and implement an overarching framework for testing to cover the full lifecycle of operational technology including: product development; pilots and trials; in-service diagnostics; and root cause analysis. This will be supported by detailed approaches for product and tunnels equipment testing.

We will foster and grow an in-house capability to coordinate, undertake and assure testing activities. This will enable us to consistently and robustly assess the

technology products we use, enhancing their compatibility and reliability. This will enable a better service to be delivered to our customers and reduce maintenance needs.

We will encourage suppliers interested in developing products that address our service requirements to make use of our facilities and in-house expertise, as well as exploring the commercialisation of this aspect.

Our initiatives



People



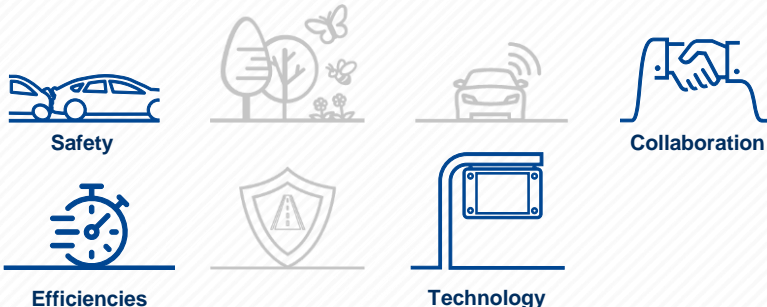
Initiative

Embedment of operational technologies roles and responsibilities

Opportunity for Improvement

Rationalise and embed the roles and responsibilities required for the lifecycle management of operational technology.

Benefit contribution



What we will do

We will build upon the work started in defining roles and responsibilities for the lifecycle management of our operational technology. We will engage our colleagues across the National Highways business to communicate our business wide operating model for operational technology, as well as how we plan to embed the roles and new ways of working. We will seek their endorsement and challenge them to align with our model to enable seamless cross-directorate working. Once agreed, we will implement the changes.

We will continually review and adjust these roles and responsibilities as we proceed through our horizon timeline to ensure they remain appropriate and deliver value.

Our initiatives



People



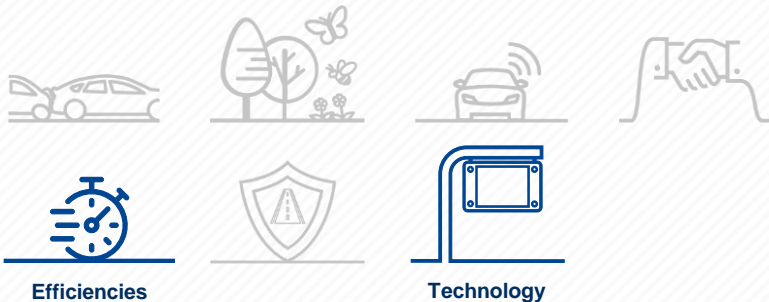
Initiative

Develop our people

Opportunity for Improvement

Continue to upskill and augment our people to deliver the needs of evolving technology developments and business requirements.

Benefit contribution



Efficiencies

Technology

What we will do

We will ensure our employees understand the products, services and tools we employ to operate and maintain the strategic road network

We will regularly take stock of the skills we possess within our business and match those to the skills we need to deliver our services now and in the future. This will allow us to identify the nature and scale of the skills gaps, which can then be used to assess options for how we can address those gaps.

Key to enabling this will be to review how we share knowledge across our business (links to culture initiatives) building upon the knowledge management strategy we commissioned. We will also identify training courses from leading providers and industry groups and, where appropriate, engage academia to support our development.

Our initiatives



Culture



Initiative

Foster an operational technology community

Opportunity for Improvement

Improve teamwork and collaboration across our business and supply chain to create a consistent understanding of our operational technology and deliver the customer and business outcomes.

Benefit contribution



What we will do

Operational technology is a key enabler for many of our business services, and as such touches every part of our organisation. As the delivery of our business services remains paramount, we will transform our ways of thinking to create an inclusive community around operational technology and transition to a more collaborative way of working. To be able to achieve our strategic objectives, effective cross-directorate working will be vital, bringing efficiencies, but also ensuring the full spectrum of requirements and experience delivers best value to our customers.

The cultural change which is required to support our continued development and evolution of operational technology is not just internal to National Highways. Being able to collaborate with our supply chain, academia, research and development and other government agencies will be vital in determining the success of this operational technology strategy.

Our initiatives



Technology



Initiative

Technology developments

Opportunity for Improvement

Monitor and understand how emerging and disruptive technologies may provide an opportunity to deliver better outcomes to our customers.

Benefit contribution



Safety



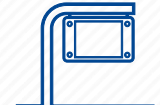
Net Zero



Connecting
Customers



Legislation
and Regulation



Technology

What we will do

In our journey forward, we will proactively track changes in connectivity, automation, and propulsion.

Connectivity will change the need to deploy roadside infrastructure used to monitor and manage the strategic road network, instead these will be achieved through in-vehicle systems or apps. Similarly, increases in connectivity will augment automated features, such as automated braking in response to another vehicle experiencing a collision or breakdown.

Automation will introduce features that will negate the need for us to provide some of our existing services. Services such as queue protection and speed management will be replaced by automated driving aids such as autonomous emergency braking and adaptive cruise control.

Changes in propulsion may change the need to provide features in service areas and their supporting infrastructure to allow refuelling and recharging, plus payment mechanisms.

We will monitor trends in market saturation of connected or automated features used by our customers, to determine when the business case for providing related services is no longer justifiable. This will allow us to determine when to retire services and inform our future scheme designs.

Our initiatives



Technology



Initiative

Development of product roadmaps

Opportunity for Improvement

Capture and communicate operational technology product developments to aid lifecycle planning and integration.

Benefit contribution



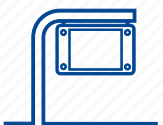
Safety



Collaboration



Efficiencies



Technology

What we will do

We will produce roadmaps for all of our operational technology products, capturing the detail of their current status, support arrangements and spares availabilities, so we can plan for their development and obsolescence. This will allow us to understand what future products we may need to design or procure and consider the future requirement for the services.

We will then be able to prioritise those products with critical time horizons that underpin important business services that affect our customers. This will also inform how we source these products and leverage the economies of scale afforded by centralised procurement. To do this we will engage with our in-house experts, procurement teams, current suppliers and the wider industry.

Our initiatives



Technology



Initiative

Development of an enterprise architecture

Opportunity for Improvement

Establish a single view of our operational technology estate (enterprise architecture) to enable more efficient and effective management of critical components and changes to our systems.

Benefit contribution



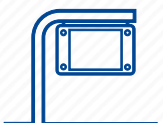
Safety



Collaboration



Efficiencies



Technology

What we will do

We will build on the work that defined our business and technology services, as well as the work undertaken for the future operational technology architecture and product roadmaps. We will seek to adopt an industry standard enterprise architecture approach and utilise a common platform to capture and develop a model of our operational technology.

Key to this will be engagement with the right teams to capture the appropriate detail for the data model and cyber-security assessment requirements. We will prioritise the development of the model around our critical services to prove its benefits before progressing to complete the model for all operational technology. This model will then be maintained and actively used in our forward planning of operational technology services.

Our initiatives



Technology



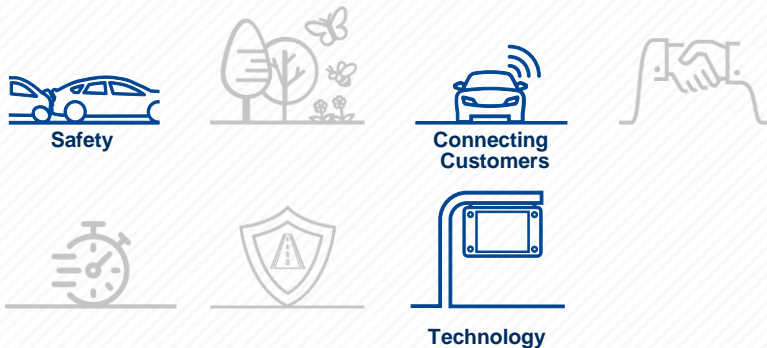
Initiative

Connected vehicle data preparation

Opportunity for Improvement

Embrace changes in vehicle connectivity to benefit our customers and facilitate changes to our operational technology.

Benefit contribution



What we will do

Leveraging the learnings from our connected vehicle trials, we will use our data science team to research and report on the potential data volumes, timeliness and processing requirements of communicating with connected vehicles using our network. We will work to understand how these might grow over time as these technologies become more mainstream. We will use this information to assess the impacts on our current infrastructure and applications to understand what developments and investments might be required to provide this service.

We will leverage the expertise of our cyber security team to understand the challenges of connecting directly to vehicles and 'uncontrolled' end devices. This will aid the development of our technical solutions and ensure security is built in from the outset, including documenting the necessary processes and training needed for our colleagues.

We will align our approaches and technical solutions with current and emerging industry standards to maximise our compatibility with original equipment manufacturers and customer devices. We will support the integration with adjacent transport authorities.

Our initiatives



Technology



Initiative

Carbon impact assessment and reduction plan

Opportunity for Improvement

Reduce the carbon embodied within and used by our operational technology.

Benefit contribution



What we will do

We will research best practice from the wider technology industry, as well as from the carbon trusts, to better understand the carbon impacts from our activities related to operational technology. We will seek to reduce those impacts, such as enhancing product specifications or our choice of suppliers. We will work with the wider business to seek to offset the carbon generated through operating and maintaining operational technology.

We will work with our colleagues in Operations Directorate to assess how our technology maintenance providers are seeking to decarbonise their business and identify areas where we can support them to accelerate their initiatives.

We will also seek to understand the carbon savings our technology services can provide, to build into the business cases for schemes.

Our initiatives



Performance



Initiative

Managing expectations

Opportunity for Improvement

Embed a performance framework to improve the design, implementation and support of new operational technology services.

Benefit contribution



Safety



Collaboration



Efficiencies



What we will do

We will monitor the embedment of a performance management framework for the technology operations capability. From this we will capture good practice from across our directorate and the wider business to understand where performance targets lead to tangible benefits.

We will build and drive the right behaviours in order to improve our internal working relationships.

We will examine where implementing operational level agreements or interface agreements would result in a better service for colleagues, business and customers.

We will examine alternative ways to measure the performance of our services to drive the right behaviours and improve our ability to support the management of the strategic road network. This will also satisfy our RIS commitment to government.

Our initiatives



Governance



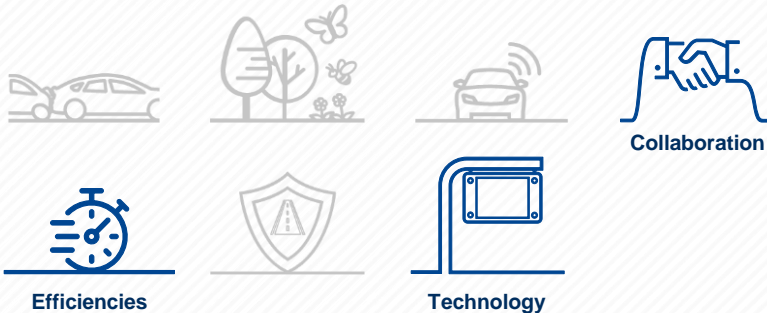
Initiative

Development and embedding of a governance model for operational technology

Opportunity for Improvement

Implement a cross-directorate approach to operational technology governance to facilitate consistency and efficiency.

Benefit contribution



What we will do

Linked to the work to establish an enterprise-wide set of roles and responsibilities for operational technology, we will examine how governance can be effectively enacted that spans our organisation. We will build upon the work undertaken for the technology operations capability to identify areas for improvement. We will assess how changing to a holistic governance model will lock in the benefits of the changes to roles and responsibilities, as well as the those provided by other initiatives set out in this strategy.

We will identify and assign owners for our products and services, empowering them to make decisions and holding them to account for delivery.



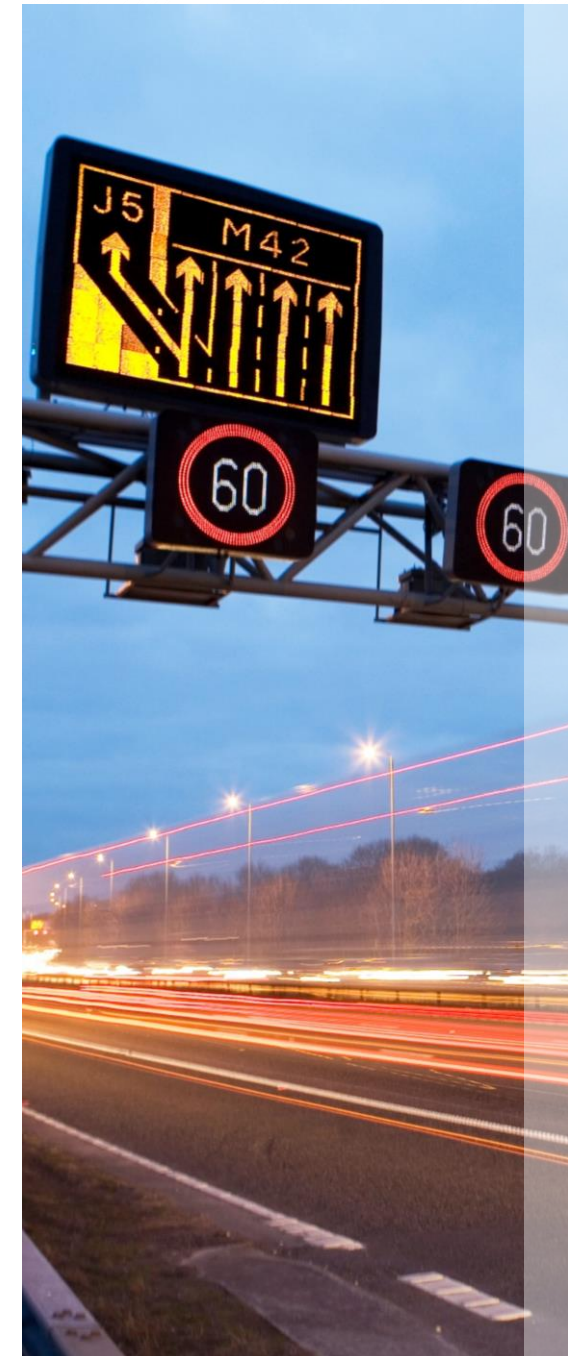
Measuring success

In setting out this strategy we are aspiring to improve the service to our customers, our colleagues and our business. It is important we can determine if we have been successful, and seek to understand areas we need to address.

We will measure the delivery of our objectives set out in this strategy. Through engagement we will also determine if we are fostering the right culture to support the next 15 years of our operational technology.

Following the publication and wide distribution of this strategy, we will engage with our stakeholders to understand:

- where we are currently?
- where we want to be?
- the journey to get there?
- what is expected of them and their contribution?
- what support is required by their decision makers?
- If they support our plans?
- Will they provide constructive feedback?





Scope and constraints

Ownership

- The Chief Digital Information Officer will be accountable for our operational technology strategy and its subsequent revisions.
- The Head of Operational Technology Systems Engineering is responsible for its production and upkeep.
- Active consultation with relevant stakeholders internal and external to the business will provide assurance our strategy remains valid and changes are being tracked.

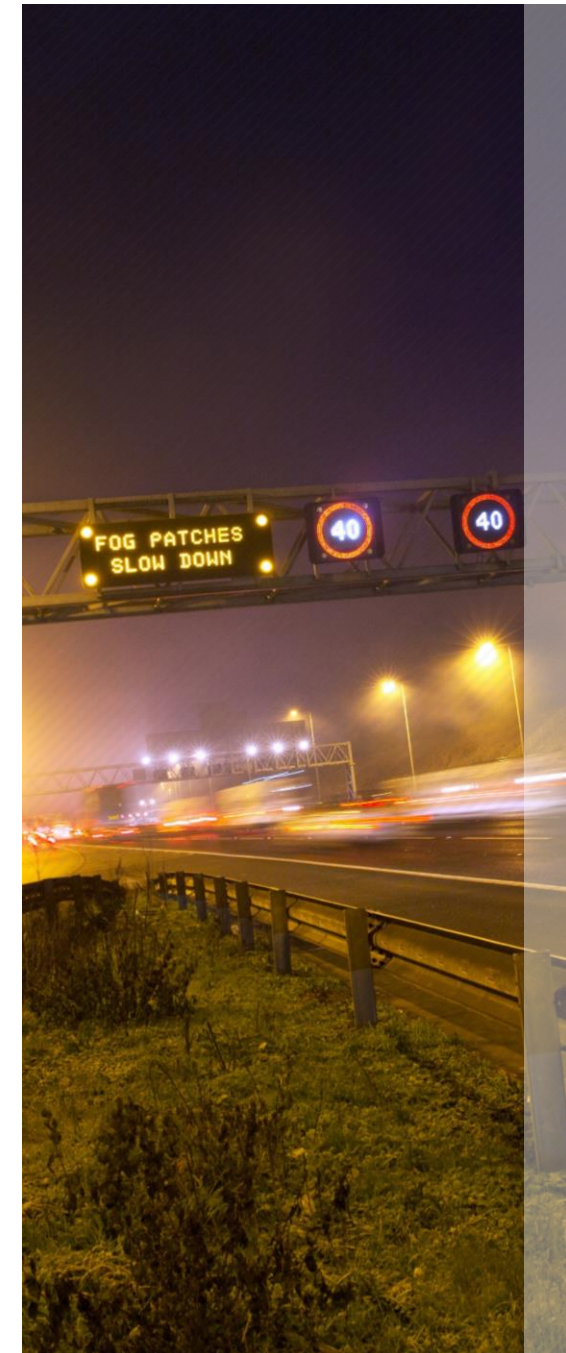
Stakeholders

Our stakeholders include a wide range of groups within and outside of our organisation. They include, but are not limited to those who:

- use operational technology to perform their roles, such as control room operators
- we help to protect with operational technology, such as core responders
- use our network as part of their journey, namely our customers
- help maintain our operational technology, our maintenance community
- we buy products and services from, our supplier community
- dictate and oversee what we do as an organisation, namely government
- operate networks that are adjacent to ours, namely local government.

Constraints

- This strategy focuses on the future services being provided by our operational technology to operate and maintain the strategic road network. This strategy and services compliment and work with plans we have for our corporate technology.
- Publications and existing insight across the Digital Services Directorate and supply chain have been used in the production of our strategy. Several documents were still in development and unpublished at the time of writing our strategy. As more information becomes available or constraints are removed, we will review our strategy.





Accounting for change

As described in the early stages of this strategy, the level of uncertainty increases with the time horizons over which we are planning. We must account for these changes in our strategy to ensure the vision remains aligned to a changing environment, thus it will be necessary to regularly review the strategic direction and adjust when necessary. There are key milestones in this strategy that are logical review points. Being aligned with the Government's second Road Investment Strategy, it will be critical for a review of the strategic direction as future strategies are published.

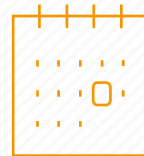
Additionally, annual audits will allow us to track the benefits this strategy is delivering. When these audits take place there will need to be a review of the operational technology against the business environment. If any deviations are apparent, then we will be able to make the adjustments to either the objectives or re-alignment of the strategy. The regular monitoring and review ensures the strategy is always relevant to business objectives through this long timeline.

External influences



There will always be changes in our environment which will effect our strategy. It is expected as these changes arise we will take these into account and adjust our strategy accordingly. These changes do not come at any particular time frame so they will need to be on an ad-hoc basis.

Annual



It is not anticipated that the strategy will be refreshed annually, but an internal annual review is required to monitor progress in the delivery of the strategy's success factors to ensure they meet expectations. This allows us to consider additional initiatives or interventions to bolster delivery, whilst providing the opportunity to recommunicate the strategy.

RIS period



Detailed reviews of the strategy will be aligned to the launch of each new Road Investment Strategy. In addition to monitoring progress against success factors, this will include a review against relevant wider factors (internally and externally to our organisation). We expect this will lead to a refresh of the operational technology strategy to ensure it remains relevant to our environment and business aims.



Next steps

Operational technology is a key enabler for many of our business services. It allows us to operate the strategic road network, and as such, its impact is felt across our organisation. We will now engage across the business and supplier community to seek shared ownership for the future vision of operational technology. We will move towards a more collaborative culture for our operational technology.

This strategy will provide a focal point for the operational technology community and will be supported by a set of operational technology product roadmaps and an overarching framework for testing operational technology. Details of these will be shared with the community when they are sufficiently developed.





Operational technology: our 2035 strategy



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