



Our Technology and Data Strategy

2016/17

MAYOR OF LONDON



**TRANSPORT
FOR LONDON**
EVERY JOURNEY MATTERS

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CONTEXT

“Technology and data underpin everything we do – they drive all aspects of our business”

Introduction

Technology and data underpin everything we do. From mission critical systems that govern the movement of trains to desktop computing to enhance productivity, technology has become the driver of all aspects of our business. Vast amounts of data is generated as a by-product of all this technology and used to improve services for our customers.

There are many areas of our work where technology implementation has driven clear operational, financial and customer benefits. Signal technology allows more frequent train services and optimised journey times for our roads; vehicle location systems on buses allow better operational management as well as better customer information; providing station staff with mobile devices has given them access to tools to better support customers. Our customer information is seen as world class. In some areas, such as contactless ticketing, we have a leadership position and have changed the payments and transport industries worldwide.

Likewise, our exploitation of data has produced results. Our open data policy has enabled better customer information with hundreds of third party apps built by an independent developer community. Our work on big data, combining ticketing and operational data, is informing planning and customer support. Predictive analysis of faults is enabling a better maintenance regime in some areas of the business.

We realise that much more remains to be done. There are opportunities for delivering significantly more efficient, lower cost operation, unlocking more transport capacity, and providing our customers with even richer information, that can all be enabled by better exploitation of technology and data. We must do all of this while substantially reducing our operating costs.

To guide our efforts, we are crafting a new, proactive and organisation-wide technology and data strategy.

Our strategy will support our core purpose as an organisation – to keep London moving, working and

growing and make life in our city better. In addition to being a customer-focused, commercially driven service provider, our aim is to become an example of public service excellence in the technology and data domain.

Our Challenge

Change is continuous as London develops. We must change as an organisation to enable huge population growth and meet the rising expectations of our customers and users at a time when we are receiving much less money following last year’s government spending review. We must ensure that transport remains affordable for the millions of people that rely on it every day. Our immediate challenge is to take action to cover all of our operating costs within three years, which will make us unique among transport authorities in any major global city.

To meet the challenge, we will:

- ◆ put **customers and users** at the core of our decision making
- ◆ drive improvement in **reliability and safety** across our network
- ◆ accelerate the **growth** and increase the **capacity** of our network
- ◆ invest in **our people** and lead them to be the best they can be every day
- ◆ **cost less** and generate more income
- ◆ exploit **technology and data** for better and faster results

We currently spend around £1.25bn per annum on technology and data, which equates to 10 percent of our turnover. We have over 2,000 people, with a high number of non-permanent labour, duplicated activities and silos across teams resulting in a non-optimal shape and size for our technology and data function. We have around 850 projects managed by multiple delivery teams in different ways without a TfL-wide view of solutions being delivered, resulting in duplication and unnecessary complexity. There is no organisational-level view of end-to-end technology and data costs, for projects as well as operations. We know that we have a disparate contractual landscape, with over 600 technology and data vendors, which is fragmented and costly.

We have an overly complex systems landscape with too many applications, without a clear pan-TfL target landscape and appropriate governance to deliver it. We have over 70 governance groups in existence today, which is not conducive to effective decision making, adding bureaucracy and cost.



We must do better and will use this strategy to set out the approach to how we will address our challenge.

The Opportunity

By taking an integrated approach across the organisation, we will ensure that we are as efficient and effective as we can be. We will deliver more with much less money by pooling our skills, knowledge and experience and working collaboratively towards commonly agreed outcomes.

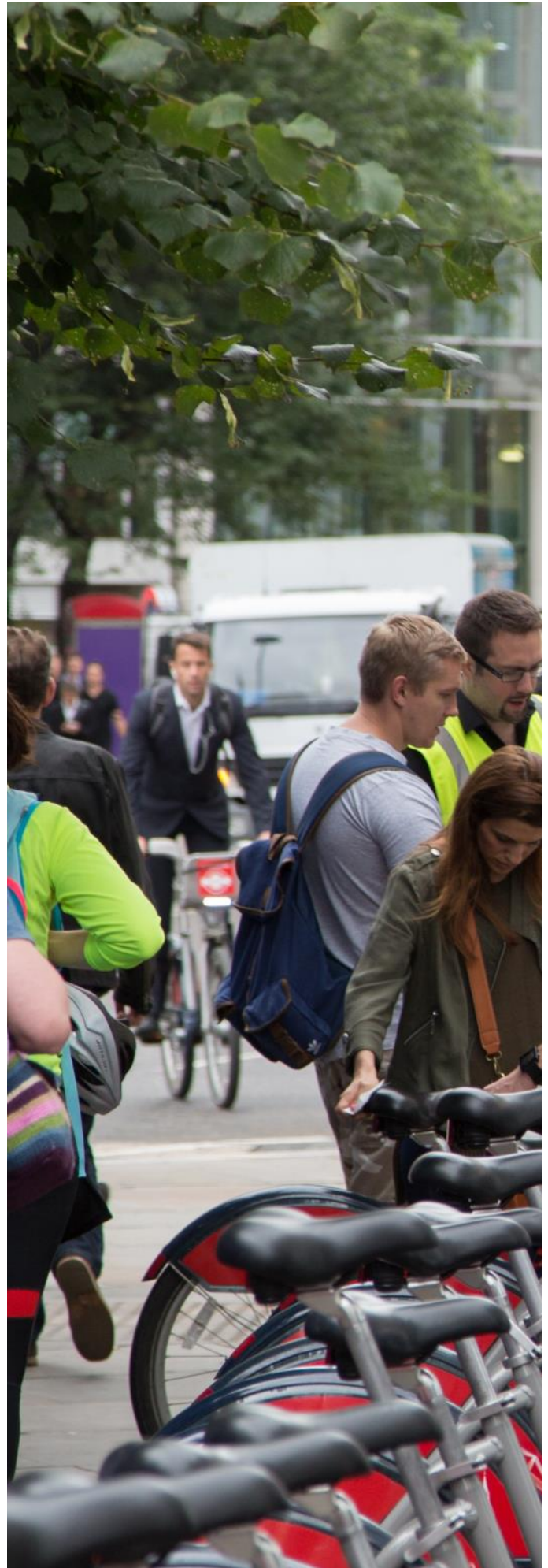
Consumer technology is developing constantly, which changes the expectations of our customers and our people. We need to be able adapt quickly by providing timely relevant products and services for our customers and for our people to deliver better transport at lower cost.

We need to understand that technological developments often require us to change the way we operate. We have driven this change through our approach to ticketing, where over 27 percent (and rising) of our 'pay as you go' travel is done via a contactless card. This drive to take advantage of technology to deliver better for customers and to reduce our costs is an example of how technology can drive better outcomes. Moreover, through our website and open data, we have delivered information directly to millions of Londoners, and reduced the need for customers to ring customer services for journey planning advice.

There are many more opportunities that we can exploit in technology and data. We can drive better value through managing more commercially; we can take advantage of our scale and brand to influence the market. We can do more with our assets, commercialising them to generate new sources of revenue. We can realise efficiencies through pooling talent and adopting a portfolio management approach which brings people together across themes, rather than tackling similar issues within silos.

We must seize the opportunity to adopt new business models enabled by new technology and better data to reduce our operating costs.

It is up to every one of us and our teams to ask ourselves, "how can we use technology and data to help deliver an affordable service for our users and customers?" Our strategy will help us answer this question and then take action.



The scope of the Technology and Data Strategy

Our strategy will provide the direction for all our technology and data across TfL without exception, using the following definitions:

(a) Technology “Any object embedded with electronics, software or sensors, which generates, transmits, processes, stores or consumes data.”

(b) Data “Facts and statistics collected together for reference or analysis / interpretation.”



OUR VISION

We will meet our objectives of delivering more effectively with less by focusing on four priority areas and delivering actions within our core portfolios as illustrated on page seven. Four overarching priority areas are detailed on the subsequent pages and summarised below:

1. Commercial outlook

- ◆ We will improve our overall commercial approach to technology, making build versus buy decisions early. We will engage with the market more effectively.
- ◆ Many technology projects suffer from an inherent inability to define our requirements to match a fast-moving landscape. We will incorporate the resulting need for flexibility into our commercial processes to achieve the best outcomes.
- ◆ We will also explore the opportunity to generate more revenue through exploiting the development of our technology.

2. Simplified business processes

- ◆ We will simplify our underlying processes to help reduce the complexity of some of our technology. This includes moving away from more expensive bespoke solutions where cheaper and more straightforward approaches will do just as well.
- ◆ Agile development will be used wherever possible to achieve faster results. Attention will focus not just on the acquisition of technology but also on its operation to provide our people and customers the technology support they need.

3. Highly capable and accountable people

- ◆ Success in delivering technology and making use of data hinges on having the right people. We will adapt our approach towards attracting, growing and retaining talent to address this.
- ◆ We will provide our people with the appropriate support for collaboration and creative thinking.

4. Innovative and productive partnerships

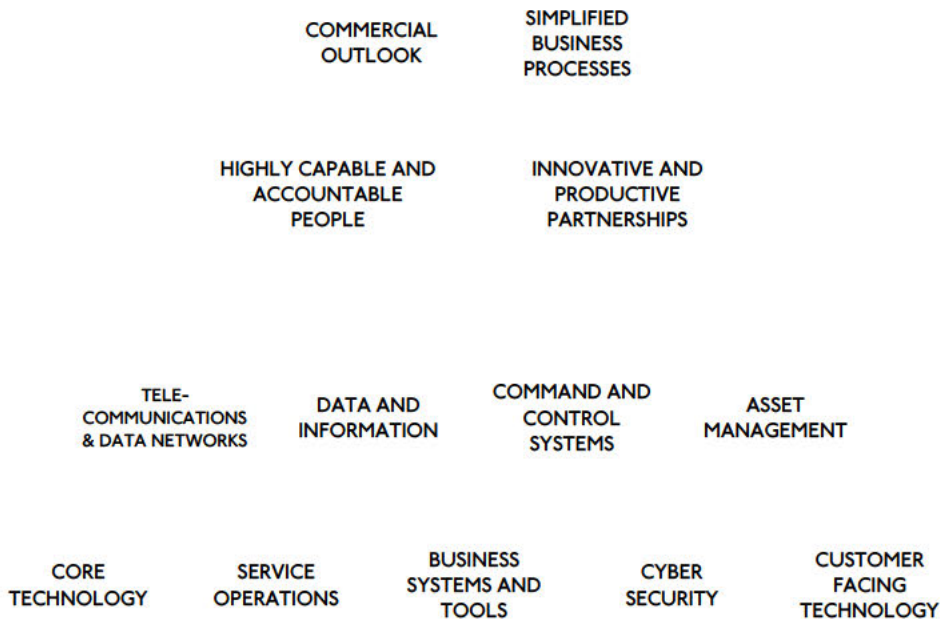
- ◆ We are forging new partnerships with technology and data organisations to foster innovation and speed-up delivery. These partnerships go beyond traditional supplier-client relationships; we seek to gain value from exchanging data, platforms and assets and working with our partners to address business problems together in a new, collaborative environment.
- ◆ Our open data policy offers an example of this, having already enabled a thriving app industry that provides our customers with a valuable service and unlocking significant value for London at minimal cost to us. We seek to create new, deeper partnerships with the developer community and other partners to gain additional value for customers at low cost.



- ◆ We will use technology to address city challenges with the right balance of partners, suppliers and our own teams to provide effective solutions which deliver best value to London.

In some areas this new approach is already starting to produce results. In telecommunication networks, for example, we are already engaged in a new procurement to replace hosting contracts. This will deliver consolidation across our fragmented landscape and substantial cost savings. The same approach will be applied to other areas of technology and data.

The diagram below brings together our vision, priorities and core portfolios along with how we will work in the future.



COMMERCIAL OUTLOOK

Guiding Principles

- ◆ We will understand and manage the total cost of ownership (TCO) of our technology and data
- ◆ We will aggregate demand and rationalise duplicate systems and contracts on our estate
- ◆ We will invest in and contract scalable services where any decision to increase costs to provide scalability is supported by business plans
- ◆ When building systems and capability we will identify opportunities for commercialisation
- ◆ We will robustly measure our benefits

Why is it important?

We must substantially reduce our costs to meet our funding challenge. The stark reality is that our income does not cover our costs. We must take up the challenge of closing that gap ourselves to make our business sustainable. Adopting a more commercial outlook is fundamental to this

This is particularly important given the scale of what we spend on technology (£1.25bn per year) and the fact that, historically, we have not managed our technology implementations efficiently. There are many instances where we have procured systems individually instead of aggregating our demand and leveraging our purchasing power with suppliers in line with existing or newly developed category strategies and plans.

We need to take a pan-TfL approach to managing our supplier contracts and relationships for each technology type to get the best value for money for our contracts.

In order to reduce the cost of our technology, we must manage our demand and remove the procurement of standalone systems and rationalise duplicated contracts and systems on our estate.

Accountable management also need to understand the total cost of ownership (TCO) of our technology and, importantly, the associated costs of people

and business processes. For example, we have looked at the end to end cost of revenue collection and reduced the cost from approximately 14 percent to eight percent.

By investing in scalable services, we will support technology rationalisation and integration of shared capabilities and processes across our organisation. For example, a shared approach to systems and applications required to operate our control rooms will deliver savings as a result of fewer contracts, licences and assets to manage.

What does good look like?

We will make decisions on technology investment based on TCO and future needs as described in our portfolio strategies. Accountable management will fully understand the TCO of delivering their services and, supported by the commercial function, will take ownership of the internal and contracted costs and take action to ensure that both are minimised while maintaining an acceptable level of risk.

We will have a single approach to our suppliers that recognises the different considerations of contracting with multinational suppliers to small to medium sized enterprises, to deliver best value.

We will make supplier strategies and proactive management plans central to our contracting process.

We will bring together the procurement and contract management of portfolios of like goods and services into single units who can provide joined-up, pan-TfL management plans in line with the portfolio strategies.

Where we sensibly can, we will generate revenue from our technology and data.

We will make considered commercial decisions on whether to build or buy technology services.



COMMERCIAL OUTLOOK

How do we measure it?

- ◆ Reduction in technology TCO (including customisation, change control)
- ◆ Convergence towards similar systems – reduction in number of contracts and systems
- ◆ Reduced contracting time through use of existing procurement frameworks and contracts.
- ◆ Increased revenue opportunities

Next steps

We will apply the principles to existing opportunities, including:

- ◆ Telecommunications and data networks strategy
- ◆ Business Systems and Tools - Enterprise Resource Planning (ERP) strategy
- ◆ Surface Intelligent Transport Systems Programme
- ◆ Customer Relationship Management Systems for customer and stakeholder services

We will rationalise contracts and cost less by actively sharing technology and data roadmaps across our teams. New controls and plans have already been implemented for telecommunications and data networks.

We will reduce customisation of systems which currently loads unnecessary costs on our operations.

We will ensure alignment for technology contracts to spend categories. This will help create the baseline for each technology domain TCO. A chart of accounts for each technology portfolio will be created in the financial management system to act as a key control on cost.

We will continue working on improving finance data in SAP to help us understand the TCO of technology.



SIMPLIFIED BUSINESS PROCESSES

Guiding Principles

- ◆ We will clearly define the business outcomes we need to achieve and examine the most effective technology and data options
- ◆ Business processes will be simplified and standardised to avoid bespoke or customised technology solutions. This will open up increased opportunity for "off the shelf" technology at lower cost
- ◆ We will make best use of the services that we already have on our estate and exploit what we have already paid for under commercial contracts and managed services
- ◆ We will automate where possible, reducing costs and removing duplication
- ◆ We will track benefits and be prepared to change direction if they are not being realised
- ◆ We will treat our data as a valuable asset to be shared across the organisation
- ◆ We will learn fast, stopping initiatives that are not demonstrating value
- ◆ We will employ agile governance to fund innovation and will learn from the things which did not work in order to improve

Why is it important?

Our business processes and technology solutions are interwoven. Business processes can become more effective and efficient through the use of technology. However, we are often unwilling to change business processes and instead we "bespoke" technology services to fit our current model. This prevents us from sharing common services and drives up our costs with no associated benefit.

Moreover, when we customise off-the-shelf products it is more difficult for us and our suppliers to support, slows down the ability to innovate and change quickly and increases the overall TCO.

We need to approach every part of our business with new eyes. Where in the past we might have just automated a poor existing process or procured a newer version of an existing system we now need to ask whether we can make a bigger and more

transformational leap. By rethinking the problem we're trying to solve and the potential solutions to that problem, we can make step-changes in our cost base and outcomes.

Applying innovation to business change can allow us to radically change our costs and capabilities – for example by chopping the problem into smaller pieces and trying a number of proofs of concept to see how they work. Those that succeed we can pursue and those which fail we can stop.

What does good look like?

Before investing in new technology we will take a step back. We will set out in plain language the outcomes that we want to achieve, and will develop user stories to guide our decisions. We will challenge existing business processes and identify improvement and/or standardisation opportunities. We will ensure that we have the right process and business change skills available. We will continually improve our processes using the right technology and we will exploit the technology we already have to its full potential

Our legacy systems will benefit from an innovation led approach to see whether digital transformation principles can be applied. In many cases this will lead us to use industry available 'as a service' products so we continually take advantage of platforms with bigger scale and lower cost bases than our own bespoke solutions.

Clear sponsorship and delivery portfolios for all technology change will provide the necessary guidance and challenge to ensure we invest in services that we buy once and use many times. We will reuse services and contracts which already exist wherever feasible in order to reduce cost, be faster to market and improve outcomes.

We will adopt a more flexible yet consistent and robust approach to approving and managing our portfolio of projects which will allow us to apply different levels of oversight and controls depending on a project's size and complexity. This way, large programmes, projects and small change will be treated differently and in accordance with their scope and benefits.

Under this new model large programmes will be subject to a rigorous technical and commercial challenge every 60-90 days. Only those programmes which are able to demonstrate satisfactory progress toward benefit delivery will be funded for the next 60-90 cycle.



SIMPLIFIED BUSINESS PROCESSES

Other projects will also be split into 60-90 day pieces based on their strategic importance as well as complexity and overall costs. We will differentiate between waterfall and agile projects and adjust our review and approval process accordingly. Small change will not be subject to the same level of scrutiny and challenge as projects and large programmes but we will make sure that this does not result in bespoke solutions proliferating throughout the organisation.

We will ask ourselves what problems we are trying to address and how best to do that, rather than starting with a procurement. Key questions on any new technology challenge or project will be 'what areas are suitable for transformation?', 'how might we innovate to radically improve these?' and 'what could we try to prove this would work?' We will share what we learn with our colleagues and build up a knowledge base of methods, approaches and reusable solutions.

We will increase our capability in agile management and delivery, creating more rounded capability to be deployed as most appropriate. We will take a 'product' approach to continuous improvement, developing roadmaps and lifecycles to improve key services as assets. We will manage our data in a more disciplined and standardised way across the organisation.

How do we measure it?

- ◆ Projects with benefits management plans in place.
- ◆ Percentage of spend on core systems versus customisation/configurations.
- ◆ User stories prepared prior to finalisation. Benefits reviewed against user stories to measure whether objectives achieved.
- ◆ Overall reduced TCO and improved performance for technology services
- ◆ Specific examples of cost savings and performance improvements through an 'as a service' approach
- ◆ More reliable delivery of technology projects with a greater degree of measurable step-change and transformational outcomes
- ◆ Reduction in number of projects and spend

- ◆ A register of case studies of where transformation through innovation and proof of concept methods are being employed
- ◆ Community sharing of applicable resources, methods, approaches and reusable solutions based on these principles and case studies

Next steps

We will gather a consolidated view of all technology and data projects and programmes, including benefits profiles identifying opportunities to remove duplication and projects with low benefits realisation. Conduct twice yearly reviews of our technology and data project portfolio.

We will strengthen internal governance to ensure that projects adhere to these principles and that strong justification is needed for any deviation.

We will adopt a 'Patent Office' approach that allows us to easily see what tools and systems we already have on the estate when requests for new technology services are made. We will document end-to-end process and give accountability to named owners who have a remit to continually improve by regularly revisiting the process to ensure it delivers against its expected outcome.

We will implement user story templates to capture the business outcomes and business process requirements. This approach will support both agile and waterfall delivery methods and supports the sponsor in deciding on the most appropriate technology for the business processes. Review assumptions about our business processes in the project lifecycle.

We will establish a case study capability and repository, adding existing case studies already available and develop a data and information portfolio strategy to ensure we continue to champion open data effectively and manage our data as an asset. We will rationalise the project portfolio and focus on effective pan-TfL portfolio management of remaining projects.



HIGHLY CAPABLE AND ACCOUNTABLE PEOPLE

Guiding Principles

- ◆ Controlling costs is everyone's responsibility
- ◆ Accountable management will have a firm grasp of TCO and will be proactive in managing contractual relationships to deliver the best value
- ◆ We will have the right people in the right roles with the right support

Why is it important?

To be a collaborative, innovative, commercially minded, and technically excellent organisation, we must have the right people in the right roles.

We must also create the environment to allow our people to take decisions, and also correspondingly hold them accountable for delivery.

The Challenge

We have areas responsible for delivering technology with significant skill gaps, both on the technical and business side.

We often take a narrow view. Individual cost centres and departments guide our focus, rather than what's right for TfL as a whole.

We must clearly evaluate cost in everything we do. We will ask: Are we providing value and benefit to our customers and users in an efficient manner?

This will require a considerable culture change. We recognise there are vast opportunities to improve.

What does good look like?

We will understand the roles that the organisation needs to be successful across the technology lifecycle—from software developers, to support engineers, to project and programme sponsors.

We will review the skills and capabilities of our people to highlight where we have gaps. We will identify and recruit the right talent and support people to keep their skills current. When we

anticipate future changes, we will adjust our skills mix.

We will work collaborating as an integrated team for business benefit. We will provide the means for people to collaborate on a wide range of business problems rather than by 'silo'. And should we discover a closed approach, we will challenge.

As leaders and sponsors, we will take a pan-TfL perspective when making decisions on technology and data. We will be informed about both business needs and technology and data areas.

How do we measure it?

- ◆ Clarity of accountability
- ◆ Through Viewpoint's employee engagement score to see if our people feel that they have the tools and support needed to do their jobs.
- ◆ Through monitoring our implementation of the Maximising Potential framework, which looks at senior capability.

Next steps

We will work with the Business and Finance Review People Workstream to review the management and technical capabilities across our organisation and spans of control. We will ensure that our People Strategy includes our requirements for technology and data.

We have already identified that we have gaps in key technical roles, and our current structure hinders our ability to attract top talent. We will review our reward and recognition packages for technology and data roles to ensure that we are appropriately competitive.

We will create 'communities of interest' for our staff to share knowledge and best practice across teams.



INNOVATIVE AND PRODUCTIVE PARTNERSHIPS

Guiding Principles

- ◆ We will build on our partnerships with the external technology community, big and small, to grow our capabilities, bring ideas to market faster, gain access to and utilise other people's platforms and develop a sharing economy alongside what we buy
- ◆ We will continue to champion our open data approach and apply greater proactive engagement to create shared value from new and existing data sources.

Why is it important?

Success in technology comes from strong customer propositions that can be executed effectively in a timely and cost effective manner.

We have great reach with our customers and some good data, however other platforms also have great reach and data. By collaborating with partner businesses on areas of mutual benefit we can unlock value for our customers at low cost, meaning we can do more with less. We seek rich and deep partnerships with the leading technology platform providers, app developers, academic institutions and other data users alongside our supply chain to get better outcomes for our customers at a lower cost.

We will continue to build partnerships with a wide range of stakeholders, showcasing our reputation as an exemplar public service.

What does good look like?

Our partnerships with app developers will create additional reach and new services for our customers at a much lower cost than only procuring or building ourselves.

Big tech companies will partner with us to share data and resources for mutual benefit, facilitating better operation of our networks and new services for customers at a much lower cost than only procuring or building ourselves, highlighted in the work already underway with Google, Twitter and others.

We will also champion open data and endeavour to make as much TfL data available as possible, increasingly using partnerships, hackathons, accelerators and incubators to create innovation and value for customers and viable ecosystems for developers.

Sharing and monetising our knowledge, expertise and experience in technology and data innovation with other organisations will raise revenue and consolidate our reputation as an efficient exemplar public service, allowing us to become the 'envy of transport authorities, cities and governments around the world.'

Adding the capability to leverage the 'sharing' economy, alongside our 'buy or build' activity will unlock additional value at low cost. We will put in place the people and skills required for this and integrate it with what we continue to buy and build.

We will develop and maintain the appropriate capability and capacity to make this happen.

How do we measure it?

- ◆ Clear examples of where partnerships and sharing (rather than buying) have enabled new business and innovation opportunities, improvements to outcomes or access to resources at no cost or under beneficial economic arrangements.
- ◆ Examples of how sharing of information and expertise have helped to develop the capabilities of other public sector organisations, for example, the recently created Transport for the North.
- ◆ Quantifiable city value generated, cost savings to TfL and direct revenue generated from partnerships.

Next Steps

A partnerships group will be created to prepare detailed actions and determine the best way to implement.

A partnerships strategy and plan will be developed to manage and maximise the benefits from our relationships with key technology partners and external stakeholders.

A partnerships scorecard will be developed.

Resources, processes, guidance and collateral will be developed to assist in applying these principles.



ACHIEVING OUR VISION

To achieve our vision we will deliver the activities described under the four priorities above.

We have also identified core portfolios, which represent areas of significant technology investment or business priority (e.g. asset management) and/or pure technology areas which require concerted focus to ensure we have the foundations required to deliver business outcomes (e.g. telecommunications and data networks). These portfolios are not intended, at this point in time, to comprehensively cover all aspects of technology and data but rather focus on areas where there is the most opportunity to achieve our desired outcomes.

Each core portfolio will develop a strategy within our overall framework. Within the next twelve months, we will have a published strategy for each portfolio and work will have begun to deliver change. Each portfolio has an owner accountable for delivering both the strategy and its associated delivery plan. The portfolio owners will be supported by an IIPAG member, who will provide non-executive guidance. No portfolio strategy can be delivered in isolation and so a collaborative approach will be taken to developing these.

Each portfolio will adhere to the principles set out in this strategy and will report into the Technology and Data Group.

TELECOMMUNICATIONS & DATA NETWORKS

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IIPAG Lead Paul Jenkins
Delivery End March 2016

DATA & INFORMATION

Lead Caroline Harper
IIPAG Lead David Meyer
Delivery Q3 2016/17

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Delivery End May 2016

CUSTOMER FACING TECHNOLOGY

Lead Phil Young
IIPAG Lead Chris Shoukry
Delivery Q1 2016/17

*IIPAG = The Independent Investment Programme Advisory Group



TELECOMMUNICATIONS & DATA NETWORKS

LED BY MARK BULLE

The telecommunications and data networks strategy is being developed to address our uncoordinated approach to data network services. This strategy will set out the simplification and standardisation approach through which we will deliver well-managed, lower cost, secure and agile data network services. It will also define how we plan to take advantage of the synergies that exist between our cost reduction and revenue generation agendas.

Scope

A data network is defined as a system of wired or wireless transmission links and supporting infrastructure, which is used to transfer data between network-connected technology, such as PC's, printers, CCTV cameras and operational systems infrastructure.

The scope of this strategy is all data networks pan-TfL.

Vision

We will provide our business with a well-managed, cost effective and secure network, which is capable of satisfying our business needs on a 'service provision' basis.

We will progressively establish a unified data network, which is shared by our entire organisation: the 'TfL Network.' This network will be made up of several interconnected networks, the number of which will be restricted to the absolute minimum to satisfy our collective requirements.

We will source and deliver network services in the most cost effective and service appropriate manner and duplication of network footprints will be kept to the absolute minimum.

There will be two categories of network services, which will be seamlessly integrated to form a single network: "Bought-In Network Services" (network services where we buy-in the transmission network) and "Owned Network Services" (network services where we own the underpinning transmission network).

We will, wherever possible, adopt an asset ownership model and reuse existing assets where appropriate.

The Challenge

Our network requirements have historically been satisfied through the implementation of vertically integrated networks. These data networks have invariably been implemented as a component of an operational system e.g. a signalling system, and have typically been specified, designed, procured and managed locally wherever the need arose. The absence of a coordinated approach to the development of our data network services has led to unnecessary duplication of cost, increased security risk to our IT systems, increased time to market for new and changed services and no clear understanding of the data network services deployed, assets owned or costs incurred delivering these services.

There are over 40 network service contracts in operation across TfL today, which costs us upwards of £155m p.a. (£78m p.a. excluding Connect PFI charges). In addition, we rely on an unknown number of vertically integrated networks, which have typically been implemented for the sole purpose of supporting specific operational systems.

How we get there

The first version of this strategy was published in March 2016.

The size, complexity and diverse nature of activities required to realise this strategy means that we must adopt an execution approach structured around a portfolio of projects. These portfolios will be run in parallel with each other and will consist of:

Project Portfolio 1 this will consolidate our Bought-In Network Services (the current IM, Customer Experience and Surface Transport contracts). We will do this by taking advantage of the in-flight re-let of the core IM network contract (currently with Fujitsu) to source a new contract onto which we can consolidate the majority (if not all) of these services. A key requirement of this new contract will be flexibility: as an enabler for Project Portfolio 3 we must be able to add/remove sites as required.

Project Portfolio 2 this will deliver the Owned Network Services and progressively consolidate Rail and Underground network services onto this shared network backbone. There are a number of different ways in which this could be accomplished, and work is ongoing to finalise the preferred approach. A key first step in realising the Owned Network Services will be to map our existing fibre assets.



TELECOMMUNICATIONS & DATA NETWORKS

LED BY MARK BULLE

Project Portfolio 3 this will address duplication between our Bought-In Network Services and our Owned Network Services e.g. the IM and CE network services delivered to Rail and Underground locations.

Project Portfolio 4 this will address the capability, governance and organisational issues which, if not addressed, would negatively impact our ability to fully realise the benefits that the strategy will deliver.

The realisation of the telecommunications and data networks strategy will be a four to five year programme of activity, the duration being in part dictated by the terms of existing outsourced contracts, and in part the time required to execute the substantial transition programmes which will realise the consolidation. Smaller, less complex contracts will be consolidated as a matter of priority where it is possible and cost effective to do so.



DATA AND INFORMATION

LED BY CAROLINE HARPER

The data and information strategy describes how we collect, manage and deploy data to make a difference to our customers, users and achieve our business objectives. It describes how:

- ◆ we will continue to champion our open data approach, making data more open internally, as well as externally to TfL
- ◆ we will treat our data as a valuable asset
- ◆ we will drive evidence-based decision making

Scope

Our TfL Data and Information strategy will identify strategic opportunities to use data to guide decision-making.

Any information generated, transmitted, processed, stored or consumed by or on behalf of TfL is in scope.

We need to establish a data foundation taking a best practice approach to how we manage and govern our data. We will agree common data definitions, and data quality principles to allow us to use our data collectively to benefit TfL, and take a collaborative approach to minimise the cost of doing so.

Vision

We will optimise the delivery of value from data. Data will be used in multiple places to deliver the best outcomes for our customers and users, and for our business. Our key principles (currently in development alongside an update of the strategy) are:

1. **Visibility** - Data will be easy to access and will be provided openly to all parts of the organisation and externally as set out in our Transparency Strategy). We should give people data when and where they want it, including access and interaction via mobile devices, and reap the benefits of easily-navigable

technology, allowing people to focus quickly in relevant data.

2. **Trust** – We will provide data that can be trusted, using recognised data lifecycle management processes, enabling an environment where information is presumed correct rather than suspected wrong. We will integrate data from multiple sources to form a single set of common data using common data and process standards. Data will be used for analysis and reporting by multiple people from a consistent baseline.

3. **Cost Effectiveness** – We will take a cost effective approach to delivery. Information requirements will be defined, and the cost of accuracy and speed balanced with value delivered.

4. **Collaboration** – Professionals working with data and information will take a collaborative approach. This will enable learning from colleagues, both internally and externally.

5. **Agility** – We will take an agile approach to changes in the marketplace, responding to disruptive technology that adds value.

6. **Added Value** - Reporting will turn data into information that gives actionable insights. Automated processes will enable people to add value through analysis, commentary, and engaging, easy to use visualisations. Data will be used to build forward looking models which will enable decisions that control what will happen, rather than react to what has.

The Challenge

We have some great examples of work in this area – open data, the role of data in improving London Underground reliability, our use of customer ticketing data to provide analysis of travel patterns, and examples of collaborative working on analysis. Another example is Surface Playbook, which gives a single source of information on our road schemes and programmes, disruption data, traffic management infrastructure and future projects – enabling greater collaboration between departments.

Visibility Currently, there are many departments working on and with data and there is often more than one way to access the same data. We do not currently have a single approach to data storage, so



DATA AND INFORMATION

LED BY CAROLINE HARPER

there are significant barriers to accessing our own data for analysis, reporting and operational decision making. Data is in local systems, spreadsheets and warehouses, making it opaque and expensive to maintain.

Governance The current data governance arrangements are disjointed, with no central body ensuring that our overall data needs are being met. This can result in a lack of cohesion in what we prioritise and invest in. The lack of consistent rules and central data management result in a lack of cohesion, efficiency and trust.

Quick wins As part of this strategy, work is underway across the business to collect and prioritise a list of the questions that we would like to be able to answer (but currently do not) to assess where there are quick wins that could add value quickly through better collaboration.

How we get there

We will build on existing groups, identifying key players to lead specific areas, such as data quality and governance, data storage and our analytics strategy.

Visibility We will build on the big data catalogue that we put together in 2015 to create a data asset inventory to inform opportunities and address data gaps. We will converge towards a shared storage capability to store data for business use. We will work across the technology domains to ensure that when new services and infrastructure are planned, we consider our information requirements, and assess the opportunities for designing the systems and services to provide data streams as a by-product (for example, through installing sensors).

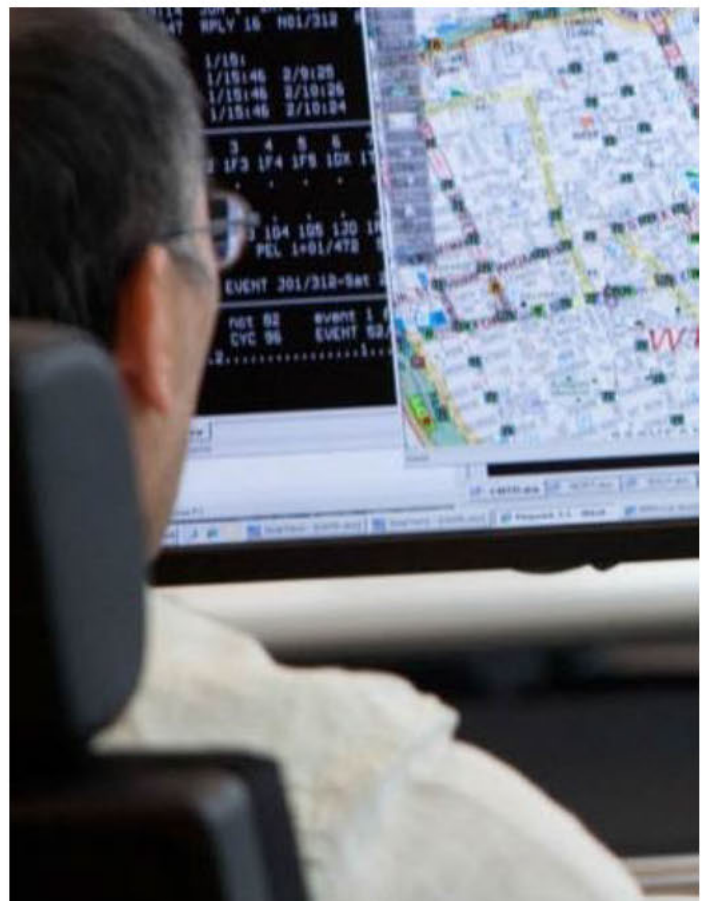
Governance The key principles of the data strategy will be embedded across our organisation, and a data and information board or council to leverage data will be set up. This will set up data governance principles, specifically around data quality processes and metadata (to enable data to be joined together), and manage (approve) changes to these. This board will have as membership the owners of the key data

sets within TfL, and will also be accountable for ensuring conformity to the principles, approving key decisions on data and re-configuring working-level groups to clarify decision making on data, identifying key individuals to lead specific areas such as data quality and master reference data.

Trust Each data set will have a specified owner, and data stewardship requirements will be defined, to include management of data quality and metadata

Cost Effectiveness We will reuse our existing data storage infrastructure, where fit for purpose, to maximise current investment. Where the current environments are not suitable, we will look for the cheaper shared storage solutions that are scalable and support the needs of the business. We must challenge ourselves to always look to store data once and use many times to reduce cost of duplication across our business.

Collaboration We will remove system and cultural barriers to internal sharing. Externally, we will continue to use universities and hackathons on business problems, and explore other partnership options. We will also explore the use of new or developing data sets that could add value, for example through crowdsourcing, bring your own data, or social media.



CORE TECHNOLOGY

LED BY STEVE TOWNSEND

Core Technology describes the applications, systems and infrastructure required by our people and partners to be able to perform their role. It is an enabler for the other portfolios and underpins everything we do to deliver safe and reliable services to our customers. The strategy will set out the future direction for core technology across our organisation.

Scope

The scope of this strategy will cover all aspects underpinning an effective core technology service including infrastructure, datacentres, hosting, core applications, desktop and mobile applications and platforms as well as the management of these services. The areas of focus are:

Core Technology Investment Planning and Governance our operating model will have the right capabilities, governance and investment planning required for core technology to be delivered effectively. We will continually improve and refresh our core technology to current standards and builds to support the development of new applications and services.

Providing our people with the right tools understanding our customers, their needs, ambitions and opportunities to ensure that our core technology supports current and new ways of working. We will do this by focusing on the user experience; using user centred design to provide our people with the right devices, applications and services to collaborate with each other and serve our customers. This includes all employee mobile and desktop applications and the devices themselves.

Delivering and Running Core Technologies We will have a user centric approach to technology. This means selecting and providing technology based on the business outcome or user experience rather than the technical capability alone as defined in our simplified business process priority. This includes all datacentres and hosting across private, public and hybrid clouds; devices such as desktops, laptops, phones, printers and wearable technology; operational devices such as scanners, cameras and internet enabled sensors; employee communications such as instant messaging, voice

and email; identity management; collaboration and messaging; the applications lifecycle; all tools that keep technology and data running; including monitoring, back office applications; information management applications such as document and records management, and finally the underlying platforms and technologies that support our data and information strategy.

Vision

Core technology plays a pivotal role in driving the digital transformation of our organisation. It will provide the means by which technology can be called upon and relied upon by our people. We must ensure technology is agile and flexible, exploiting new capabilities that can bring maximum business benefits at the most affordable cost. Technology will be delivered faster and cheaper, by removing duplication and moving to the cloud where appropriate allowing scalability for services based on demand at a lower cost.

Solutions will be designed with mobility in mind enabling our people to spend more time with customers and delivering safe and reliable services with access to share content in real time.

Our data platforms will ensure that information can be made available to our colleagues and customers in the most efficient and secure manner possible. Insight will grow as we continue to unlock data from our operational systems and services. The way in which we respond to this insight, in some cases automatically, will be made possible by the solutions we put in place - allowing quicker and more accurate decisions to be made, that could help unlock capacity on our roads, or improve the reliability and safety across our network.

Our systems need to be supported by a modern, agile, robust and scalable infrastructure, replacing obsolete technology components. This will be achieved through effective design and monitoring of our services supporting our service operations strategy and leveraging the market place to deliver core services.



CORE TECHNOLOGY

LED BY STEVE TOWNSEND

The Challenge

Our core technology supports over 44,000 users and partners 24x7. We do this via a combination of 22,000 desktops, 23,000 mobile devices, in over 600 locations across London. Whilst change at such a scale must always be planned, our current method for providing core technology to our workforce is prohibiting us from achieving our potential. Majority of these services are delivered in-house on infrastructure located within TfL owned and managed data centres. This method means the pace at which we leverage new opportunities to make our workforce stronger has been slow and often expensive.

We have successfully introduced mobile devices and a range of apps to over 14,000 people who work both on the frontline, operational and support functions by adopting an agile approach to delivery and support. This meant adopting a risk based approach to innovation and governance for core technology to achieve the outcomes.

Sometimes in trying to give our people the best tools to do their jobs we have introduced complexity, which could have been better handled through standardisation. We have recognised this, and have been running an initiative for 18 months that has seen us remove over 900 of our 2500 applications from our estate, with plans to address a further 450.

Whilst we deliver core technology at scale well in some areas, the experience for our people is not consistent or reflects their expectations. Our peoples working habits and expectations of technology have been evolving faster than the tools we provide, which has created frustration with some of these services. This has led to many teams developing or procuring their own technology, often duplicating services and increasing overall spend.

How we get there

- ◆ The strategy will present quick wins with benefits that will be realised in the short term and activities that will realise benefits on a longer timescale.
- ◆ Some of the immediate activities that have been identified for focus include:
- ◆ A governance review for core technology pan-TfL
- ◆ Delivering video conferencing, to provide flexibility in our ways of working
- ◆ Creating the pan-TfL 'data lake' to enable our data community to derive insight in a cheaper and common way
- ◆ Continuous refresh capability for maintaining current levels of software (including browsers) for core technology
- ◆ Develop the business case for a User Experience/Service Design Authority to demonstrate the hard savings that can be realised by giving our people and our customers a consistent, intuitive experience for the services they consume

We also plan to look at these long term activities:

- ◆ Leveraging cloud technology - speeding up our adoption of cloud technology to better align ourselves to the needs of our customers. We will also speed up our migration of legacy services, which is anticipated to reduce our £13m a year spend on data centres
- ◆ Building on the immediate video conferencing activity, we will develop a comprehensive unified communications roadmap, based on greatest benefit to our colleagues
- ◆ We will conduct an immediate review in collaboration with the Service Operations portfolio of all core technology services and define a list of most at risk services with respect to stability. We will develop a plan to address these in priority order as quickly as possible.



SERVICE OPERATIONS

LED BY STEVE TOWNSEND

Service Operations relates to the people, processes and services used to manage and support the ongoing provision of technology services throughout our organisation and wider GLA family.

Simply implementing new technology is not enough—we must ensure that when we launch our services to our customers and to our people we provide suitable support to manage incidents and changes to the service.

We currently have a fragmented implementation of our support model. Therefore, we must step back and evaluate how we can best consolidate. We will do this building on the widely adopted industry standards.

Scope

Our strategy will include all aspects of operating and maintaining technology and data across the organisation including; people, processes, services, software technology and commercial contracts. At a more detailed level, the strategy will define the operating principles for Service Operations; a common approach to defining and sourcing of support services, supply chain management, lifecycle management, investment, whole life cost management, governance and process. The service operations strategy will apply to all portfolios described within this strategy.

Vision

We will simplify our support service systems and introduce a more self-service capability. We will provide a robust service that understands and focuses on business impacts and availability – get the basics right.

We will deliver a structured service management function that supports all of our technology and data services, achieved through a comprehensive standard set of principles and processes, which all areas of our organisation will be able to follow. This approach will set a standard against which we can continually improve and evolve the relationship with our customers and our colleagues as our business

continues to change.

We will develop a single view of types, standards and measurements of service across the organisation. With an end-to-end view of service, we will ensure that during and after an incident, we remove confusion over who owns each element of the service as this can have a detrimental effect on our customers.

We will deliver a continually improving service to our customers; enable change and the introduction of new services swiftly and safely, while demonstrating an improved service and value for money. We will enable a performance culture; benchmarking our services against similar sized commercial enterprises to ensure we are offering industry-leading performance.

We will develop our capability in other areas while building on the things we already do well, rationalising where we have duplication and immediately reducing costs, operating with efficiency as one organisation. We will ensure our investments offer the best returns and report our cost of operations in a more transparent manner.

We will adapt our ways of working to enable us to react in a more agile manner to disruptive technologies and new services.

The Challenge

Service Operations exist within each of our core business areas; sometimes in complete isolation. The scale of complexity and level of customer focus of each varies considerably. We do not have an accurate consolidated view of the cost or levels of service within in our operating businesses. We do not know where we have duplication, deficit or excellence. In areas, we do not always focus on the right priorities, and as such, we haven't always put our customers first. Some of our communications and reporting exemplify this, being too technical and not customer outcome based.



SERVICE OPERATIONS

LED BY STEVE TOWNSEND

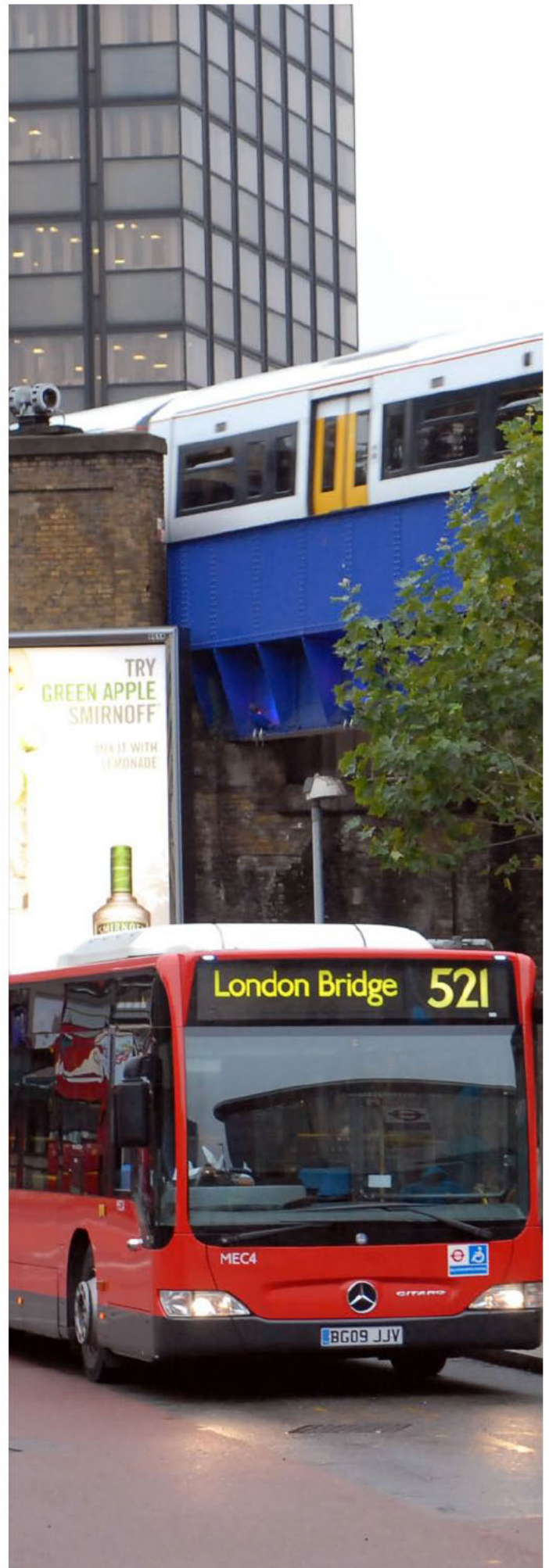
How we get there

We will deliver a full strategy by the end of Q1 2016/17.

Under the wider financial review we will understand, the status of Service Operations throughout the organisation. We will approach this as a multi-stage process focusing on:

- ◆ We will look at the various operating models utilised across the organisation to improve the consistency of service offered to our customers – an end-to-end view service operations view.
- ◆ By taking an end-to-end service approach with accountable service owners we will reduce the need for ‘small works’ or projects to modify or improve existing services.
- ◆ Working with our ICT frameworks and third parties to make best use of standard ‘off the shelf’ services where appropriate and economical; retaining key elements that are not available in the market place.
- ◆ A review of all third party contracts to either terminate where deemed unnecessary and novating or consolidating the remainder of the contracts.
- ◆ A rationalisation of tool sets across the organisation to deliver a single view of services and both internal and external applications, while reducing costs.
- ◆ Clear communication, devoid of jargon and management speak, focusing on what the customer needs to know and expressing it in plain language.
- ◆ Developing our performance reporting to ensure it is business and customer focused for our Technology and Data services.

We will continually review to ensure we are driving efficiencies across the organisation while improving our services.



BUSINESS SYSTEMS AND TOOLS - ENTERPRISE RESOURCE PLANNING

LED BY POOJA BAGGA

Enterprise Resource Planning (ERP) is a broad set of activities that help us to manage our business. Often referred to as 'back office' processes it incorporates the processes we use to conduct our human resource, financial, commercial, procurement and materials management activities.

We rely on these processes to recruit, manage and pay our people; manage the cash we take in from our customers and account for and report on our finances; select, contract with, order from and pay our suppliers and ensure materials are in the right place at the right time to maintain our assets.

Scope

Our strategy will encompass all enterprise resource planning processes such as people management, finance, payroll, commercial, procurement, and materials management. It will cover all people, processes, tools, services and systems supporting these business processes.

The strategy will address the objectives, guiding principles and their implications, scope (process, organisation and technology), governance, roadmaps and recommendations for ERP and will be supported by a commercial category strategy being developed by Commercial ICT.

Vision

Our ambition is to simplify processes, enable our people and drive value.

Sponsorship the strategy and outcomes Clear focus and accountability for our end-to-end processes across the organisation enabling business transformation, integration and efficiencies. This requires a collaborative approach to our investment and operations of our ERP asset.

Value driven investment and prioritisation Value will be measured against our strategic priorities; this means making decisions based on an integrated and commercially driven service.

Enabling our people Making the day-to-day easier for our people by providing up to date business information, simple processes and intuitive tools. Our people will have access to accurate and relevant information they need to perform their roles more effectively.

Common processes End-to-end processes will be standardised, optimised and compliant. Simpler processes remove ambiguity and unnecessary variation, enabling efficient and accurate decision making and cost savings. There will always be some special areas where variation adds value, but these instances will be exceptions and will require justification

Shared data Our data will be managed as a valuable asset with an agreed single source of truth. Data quality needs to improve to provide our people with more consistent, accurate and timely data. Data governance and common processes and standards will facilitate the required improvements in data quality. We will work with the data and information strategy workstream to achieve this.

Exploiting existing technology investments Technology will be selected based on simplified business processes, ability to deliver at an acceptable whole life cost. We will build upon and leverage existing solutions where possible to make best use of our resources and provide value for money. We will monitor technology trends and harness those that can deliver value within cost/risk profile. Solutions that do not meet these criteria will be stopped.

Responsive Capability To accelerate our ability to respond to business change to provide better and faster results we must re-shape our ERP capabilities and commercial partnerships so that we can integrate new services, organisational units and programmes quickly, cost-effectively and with minimal business disruption.



BUSINESS SYSTEMS AND TOOLS - ENTERPRISE RESOURCE PLANNING

LED BY POOJA BAGGA

The Challenge

Currently, our ERP processes are non-standardised and sub-optimal, lacking end-to-end integration, highly varied across business areas and often not following best practice. This adds cost to our business operations in a variety of ways: we cannot share common services and systems; we have no single source of data; supporting solutions are heavily customised, costly to maintain and slow to respond to business change; and we are not able to fully leverage economies of scale.

It is estimated that we have spent up to £500m on ERP related investments over the past decade. This investment has not always resulted in best value as there has often been duplication and lack of integration.

Aware of these challenges, we are starting to collaborate and develop a strategy and plan. We have recently agreed a sponsor for ERP, Ian Nunn, CFO and Managing Director Finance and created a single, Business Steering Group for ERP. This allows us to make decisions once, for the benefit of TfL as a whole and considering all the factors involved.

However, there are still many challenges to address in this space. For example, in the next 12-18 months there are up to 50 projects and programmes which are looking to make changes and investments to our ERP landscape (both process and technology and data). We need a clear strategy and roadmap for our ERP to ensure we are able to make the right decisions and strong governance to ensure those decisions is implemented and the strategy complied with.

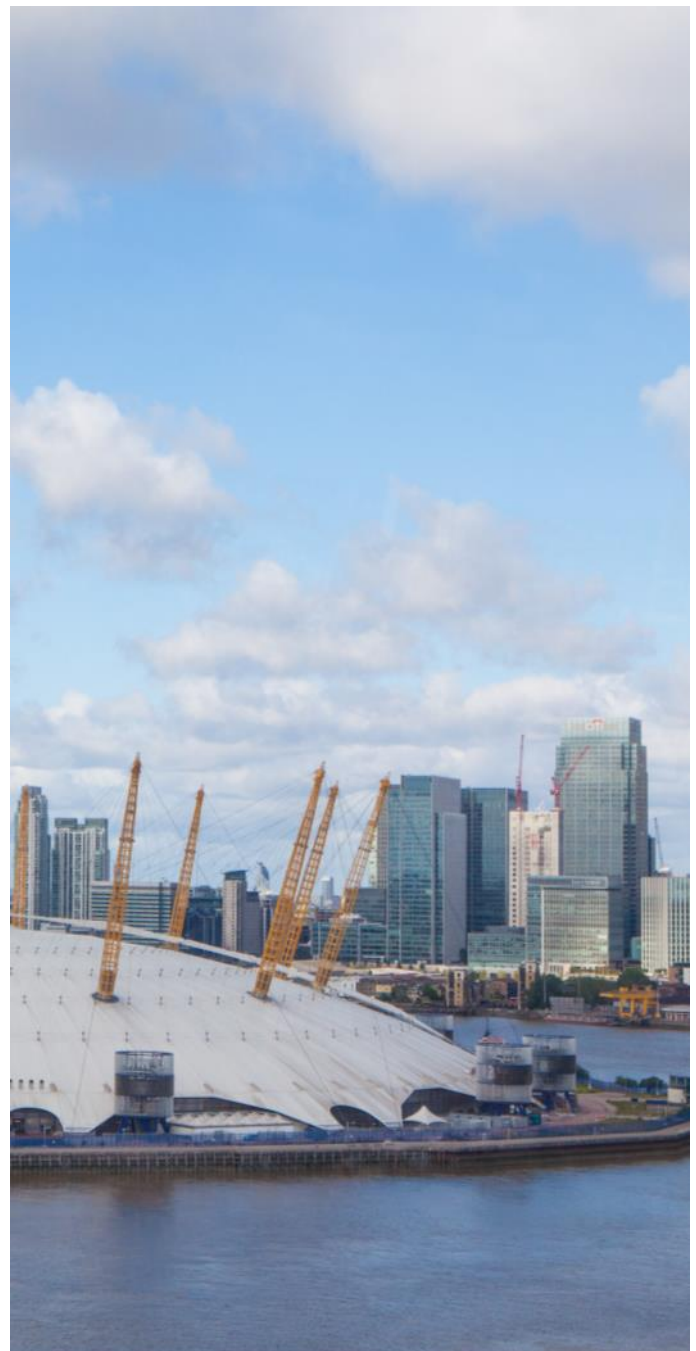
How we get there

The ERP Strategy will be released in Q1 2016/17 along with the implementation of pan-TfL ERP governance.

The plan for the implementation of the strategy will be developed in Q1 2016/17 and will be aligned with the results of the Business and Finance Review.

Implementation will focus on four areas:

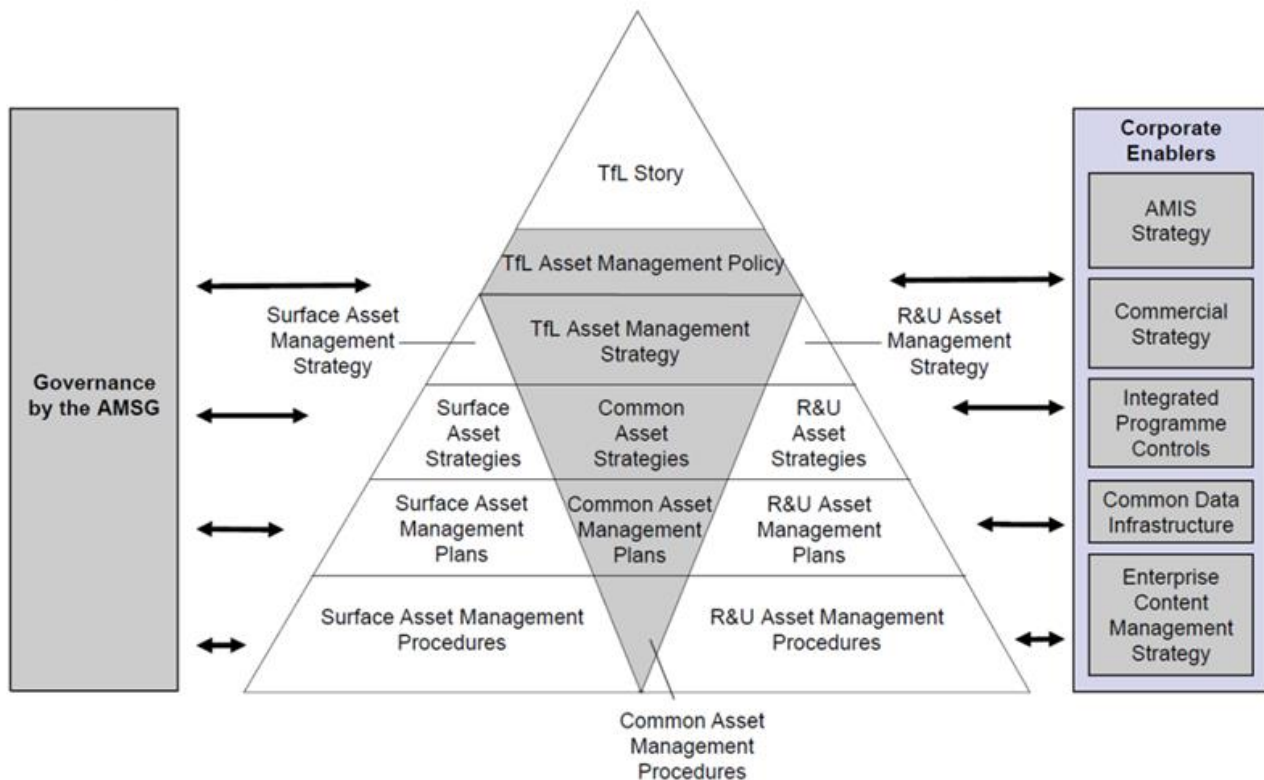
- ◆ Governance
- ◆ Process ownership and simplification
- ◆ Exploiting ERP solutions
- ◆ ERP capability and partnerships



ASSET MANAGEMENT

LED BY DANA SKELLEY

The objectives of the our Asset Management Strategy are: to bring to life our joined-up approach to asset management; to give an overview of the assets we manage; to explain the role of the Asset Management Steering Group (AMSG); to describe how the strategy fits with other asset management documents and to outline the asset management improvement activities sponsored by the AMSG. The TfL Asset Management Strategy was last updated in early 2016.



Scope

This strategy covers the business processes, procedures, policies, tools and capabilities required for our Asset management. The grey areas in the figure above show the scope governed by the AMSG. Our operating businesses and functions retain autonomy over the strategies, plans and procedures that need to be specific to a business, function or location.

Vision

TfL will use co-ordinated asset management activities to select, inspect, maintain, renew, improve and dispose of our assets in order to maximise customer satisfaction, maintain high levels of safety, manage risks, minimise whole life costs and enable delivery of our outcomes and priorities.

There will be clear asset management objectives, strategies and plans and single governance in the form of the TfL Asset Management Steering Group.

We will consider whole life value (including capital and operating costs) when making decisions at each stage of the asset lifecycle and embed practices that support and inform consistent decision making and prioritisation.

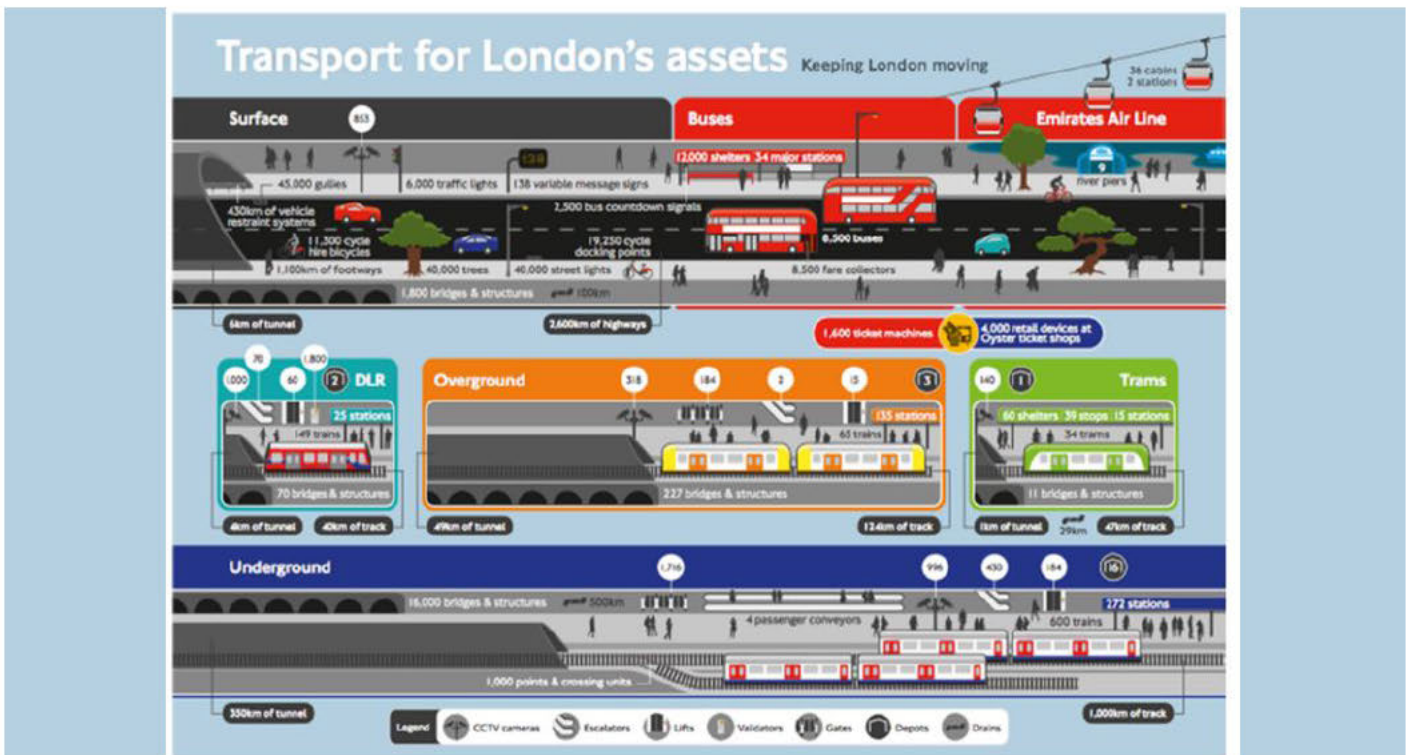


ASSET MANAGEMENT

LED BY DANA SKELLEY

The Challenge

The infographic below gives an overview of the volume and scope of the assets we manage. Our assets are very diverse – from lifts and escalators to bus shelters, from track to blacktop, and trains to trees



The value of our assets is estimated to be in the order of £150bn and our annual expenditure on assets constitutes approximately 66 percent of our total Business Plan investment (excluding corporate business unit expenditure).

We have a wide range of asset management information systems (AMIS) – over 70 were identified as part of the asset management information systems strategy work. They have different contracts and commercial arrangements and have limited integration – making for considerable duplication of functionality across our organisation. There is a clear opportunity to deliver business improvements and efficiencies by developing a clear and joined up strategy for AMIS.

How we get there

Each business will undertake asset management information maturity assessments against the principles within the asset management information strategy by July 2016. Each business will develop their asset management information improvement plans by December 2016. Plans will be coordinated to promote best practice with oversight from the asset management steering group.



CUSTOMER FACING TECHNOLOGY

LED BY PHIL YOUNG

Customer facing technology describes the digital services which our customers use in order to interact with us. It falls into three product groupings; wayfinding, customer information and payments. The customer facing technology strategy (formerly the 'Digital Strategy') sets out how we seek to develop these product families and related enablers across all available channels.

Scope

All technology relating to wayfinding, information and payments along with associated enablers, such as the underlying technology and platforms required to support these services.

All customer touchpoints are covered including; customer devices and related web and native applications; fixed devices such as ticket machines, kiosks, information displays and interactive elements; staff applications used to serve customers in person or through a contact centre; ticketing and payments services; data (open or otherwise) to enable these propositions.

Vision

We will provide great digital services, enabled by all of our data on all devices in all customer touchpoints to achieve digital maturity. This is so we can deliver the best outcomes for customers and our business.

Our benchmarks are the best retail and service companies.

Our key principles (currently in development alongside an update of the strategy) are;

1. High quality experiences we provide consistently high quality user experiences across all channels and touchpoints, allowing fast and efficient interaction. We are easy to do business with.

2. Personalised conversations customers and staff are treated as individuals and remembered across all devices, services and interactions through their TfL ID. Every new interaction builds on the previous ones. We proactively inform customers of things they need to know at the right time.

3. Intelligent data we produce, acquire, analyse, link, share and use data to make our services better, to keep customers and staff better informed and to create better focused commercial propositions.

4. Customer in control customers can control how we use their data, we are trustworthy and secure.

5. Channel of choice customers and staff receive information and can interact with TfL in their locations, devices and channels of choice.

The Challenge

We have numerous examples of world-class customer technology, from a multi-award winning website to contactless ticketing and open data. We set the benchmark for cities worldwide who seek to replicate our methods and services.

However our delivery still reflects the limitations of our organisation and we need to do further work in order to deliver consistency, meet rising customer expectations, operate better, squeeze more out of our network capacity, use our extensive data and deliver more integrated and personalised services for customers seamlessly across all their channels of choice.

In web we have too many websites driving higher than necessary cost and are not making best use of our world-class assets across all areas. Because of historic contracts and ways of working we have outsourced our proposition in some areas to third parties, meaning we cannot easily change and implement personalised and integrated propositions.

A particular area for development is staff technology used to serve customers, such as the mobile devices and applications used in tube stations, contact centres, enforcement operations and other front-line areas. In many cases this lacks the effectiveness of some of our self-service tools for customers, is under utilised and inconsistent.

In ticket machines, kiosks and information displays and interactive displays we lack a consistent experience both in terms of design, user experience and quality and lack consistency of quality of experience and visual design between these and our other self-service channels.

The effectiveness of tools for customers to contact us and engage with us is lacking and below the standards expected by our customers and stakeholders, also leading to significant and rising cost.



CUSTOMER FACING TECHNOLOGY

LED BY PHIL YOUNG

Exploitation of our data to raise external revenue is only beginning to be explored, as is sharing and partnerships with technology companies and others to bring new opportunities to our customers at no cost or low cost.

How we get there

We will address the fragmented governance of customer facing technology services to enable a clear flow-down from the digital strategy to the customer facing technology product roadmaps and programme.

A new approach to governance for customer facing technology will be explored, for the ongoing development of the strategy, definition of the products and their roadmaps and the planning and delivery of the customer facing technology programme.

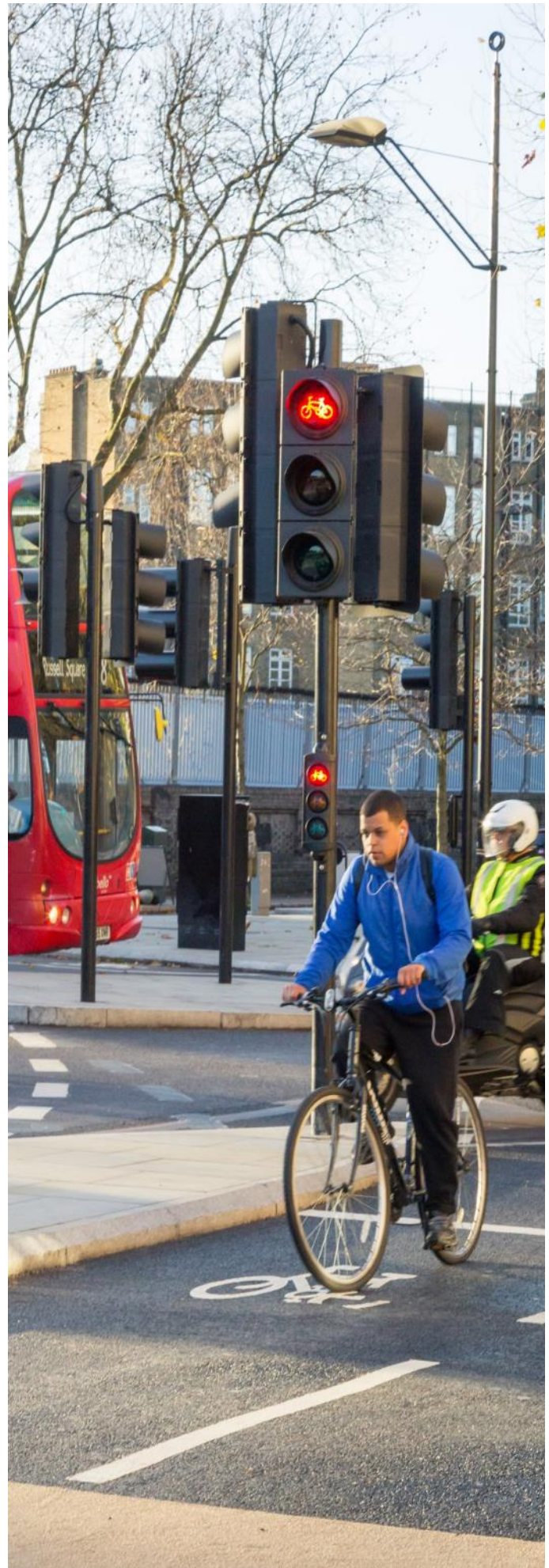
For the first time we will have a single customer facing technology programme which aligns and prioritises all the activities in this space.

We will optimise spend by reducing duplication and rejecting unnecessary activity, operating within a fixed budget at a lower overall cost than at present.

We will exploit rich and deep partnerships with key technology organisations, which have platforms and services where our customers choose to spend their time. We will do this to extend our reach and acquire further data to use for our customer's benefit at lower or no cost.

We will create space and mechanisms for innovation and exploration of propositions and concepts to enable step-change transformations. We will open up opportunities to work on these with start-ups and established businesses to create and bring new ideas to fruition.

We will support our commercial propositions through the optimum combination of advertising, data and marketing our world leading services.



COMMAND AND CONTROL SYSTEMS

LED BY GLYNN BARTON AND BRUNO CARR

Command and control describes the systems and processes which our staff use to control the transport network, respond to incidents and influence customer behaviour in real time. It falls into four high-level product groupings; control, monitoring, recording and reporting, and communications. No pan-TfL command and control strategy currently exists; this document will be the first step towards developing a set of principles and philosophy for command and control.

Scope

All control systems, monitoring systems, recording and reporting systems, and communication systems and, where appropriate, their associated operational processes, including but not limited to signalling systems and Urban Traffic Control (UTC) systems for roads. This will give a full picture of not only the technology we use but also how it benefits the business and customers.

The focus will be on critical operating technology, or technology that is crucial in supporting operations e.g. those that if removed would disrupt or delay the transport network immediately or within hours. These have nominally been termed Tier 1 and Tier 2 systems respectively for the purposes of this workstream.

Vision

- ◆ The to-be vision for command and control is still under development and will require input from a huge number of stakeholders across the business. Three initial principles have been identified, which will underpin the vision however; these are subject to change and develop as the domain strategy evolves:
- ◆ We will utilise a unified set of principles and operational philosophy for command and control across our network.
- ◆ We will seek commercial and technical harmony for our technology where it can benefit all our transport services

- ◆ We will deliver an operational package that is seamless from our customers' point of view.

The Challenge

Our command and control systems tend to function under three overarching operational conditions; routine, non-routine (planned events) and by exception (incidents). The operational services will enact different business processes dependent upon the severity of the operating condition, the interaction between the operators of different services tends to be more prevalent during non-routine and exception events.

During normal operations interaction between the operating areas of the business is limited; this is demonstrated outside of tube stations where there is limited interaction between the real time control processes for pedestrians in the surface environment and in the station environment. This reflects the operational history of the organisation and moving forwards there needs to be a more integrated approach to the management of London's transport network. This requires better information and data sharing between all our transport operations, which are underpinned by appropriate technology.

Across our organisation, a huge number of often siloed technologies are used for command and control processes. These do not always integrate at a modal level and rarely at a pan-TfL level. Colleagues from Rail and Underground, Surface Transport and Customer Experience have identified four groups of operational technology that seem to underpin all of these processes:

Control Systems These control the transport network by instructing assets, or influencing customers or staff. The level of control we can exhibit depends upon the purpose of the control system; generally we have more absolute control over London Underground and Rail assets which operate in a bounded network.

Monitoring Systems These monitor assets operating on the transport network; customers using the transport network or any other metric that may impact upon operations (e.g. weather). Monitoring systems are often a key input to control systems, either automatically or through human interpretation, and should be viewed as a key input to the successful operation of control systems.



COMMAND AND CONTROL SYSTEMS

LED BY GLYNN BARTON AND BRUNO CARR

Recording and Reporting Systems These record incidents which occur and actions taken to mitigate them during network operation. They also provide a method of reporting prioritised incidents and actions to senior management.

Communications Systems These are used as a method for systems and personnel to communicate with each other across geographical areas (ranging from pan-London to within local stations). They underpin many of the three other systems and are vital in ensuring that the correct information reaches the correct personnel in a timely manner for decision making purposes.

A workstream is underway to classify existing systems across these four areas, to allow exploration of synergies and similarities between systems in different business areas. It should be noted that many of these systems are operationally critical and cannot be replaced without severe disruption and/or cost. During the process of identifying systems, consideration will be given to commercial agreements and predicted operational lifetimes.

How we get there

We will utilise the four groupings identified above to develop a holistic view of the systems used to manage the London Transport Network. Using this we will identify systems or processes that could be implemented at a pan-TfL level. Currently it is thought that there will be no benefit in centralising some systems, however, for these systems the use of a pan-TfL process or philosophy for operation will be explored.

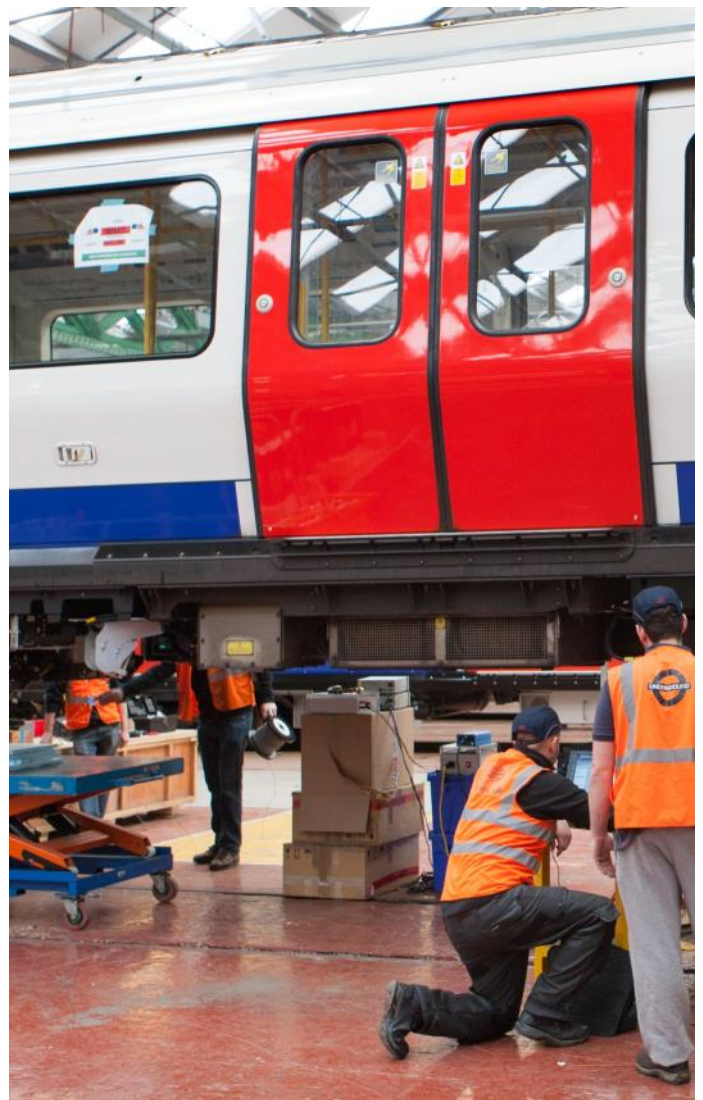
We will ensure all of the stakeholders involved in the operation of London's transport network are consulted and are invited to the working group. The work to date has highlighted Buses, Rail and representatives for the Command, Control, Co-ordination and Communications (C4) programme to be obvious omissions.

We will hold customer focused workshops to explore how our operational systems could be improved to meet the needs of our customers as well as the needs of our operating staff.

We will undertake workshops to develop a pan-TfL vision for command and control, which is customer not transport mode focused. At the core of this will be the flexibility to apply one vision across all of our services without dictating technology or systems.

We will ensure that all previous work to integrate aspects of operation are learnt from and utilised in this workstream (such as the work undertaken by Buses and London Underground to consider integrated incident response and the work undertaken to integrate data networks).

We will deliver a more detailed command and control technology strategy by the end of Q2 2016-2017. This gives time for a review of as-is systems and to develop user/customer needs for a to-be vision.



CYBER SECURITY

LED BY MICHELE HANSON

The purpose of the TfL Cyber Security Strategy is to create and maintain cyber resilience. The CSIRT (Cyber Security Incident Response Team) delivers to the business tactical and strategic services. Tactically the CSIRT delivers incident response, risk assessment, threat assessment, project support, awareness and day to day governance. Strategically the team work with like organisations, regulatory bodies and technology initiatives to support future requirements.

Scope

We have the duty to protect our customers and our people, our assets and our data from cyber misuse throughout the lifecycle. The cyber security strategy is the protection of personal and customer data, the technical controls related to cyber security, cyber incident response, threat awareness, and governance and third party management. The strategy includes the focus on our peoples' roles and responsibilities in cyber security. The cyber security community of interest will act as the appointed body for ensuring cyber security due diligence.

Vision

The vision for the cyber security strategy is to exploit technology effectively to protect the brand and to implement a secure cyber infrastructure that inspires technological innovation and fosters safety, trust and customer satisfaction across our network. We along with our partners have the duty to protect our customers and our people, our assets and our data, in both Operational Technology and Information Technology, from cyber misuse throughout the lifecycle.

The Challenge

Currently TfL has a single cyber security team but TfL does not have a single set of agreed upon principles and strategies. Culturally cyber security is a new discipline. Our operational and technology environments are not aligned under a single set of priorities and this makes for multiple directions of efforts with on one single goal.

How we get there

We will adopt the following six central cyber principles across TfL and create a single cyber security organisation responsible for the application of the principles.

Contracting foundation We will put in place cyber contracting terms and guidelines calibrated to the level of risk that exists in the vendor relationship.

Technical controls Our technical controls will align with the CPNI 10; an industry recognised set of critical security measures and controls.

Threat We will employ cyber security risk assessments based on intelligence-led information to manage our vulnerabilities and threats.

Cyber incident response A pan-TfL process for monitoring, reacting and remediating a cyber incident in a timely-manner whilst communicating with key stakeholders – leadership and asset owners. The incident response capability in order to minimise the impact, damage, cost, disruption to customers and reduce any potential reputational damage. The cyber response capability will support bringing the asset back on line in a coordinated and as needed fashion.

3rd party engagement We will ensure that our suppliers, with access to sensitive information manage cybersecurity risk exposure by exercising strong due diligence across the lifecycle of the relationship. The suppliers will CPNI 10 will be our core technical controls. We will work with the TfL owners of current and future contracts to ensure named points of answerable cyber security contacts are identified on third party contracts.

People We will make certain that all of our technology and data users are informed and trained and understand their specific roles and responsibilities. We will create a role based access model and deploy it across TfL.

The cyber security community of interest will drive the adoption of the 6 principles of the strategy. The tactical elements of the principles will develop over time as business as usual through governance, cultural change and lead by. There will be clear reporting against the principles. And the principles will be assessed for relevancy. The direction and principles of cyber security include a TfL awareness programme devoid of jargon and directed at delivering relevancy across TfL.



GOVERNANCE

Introduction

Our strategy sets out a proposed programme of work at a point in time. Priorities and demands on us are likely to change over time, and it is important that the strategy and the delivery of our technology remain aligned with our goals.

It will require on-going review to ensure that it remains relevant and aligned to the changing priorities of our business and the needs of its customers.

Technology and Data Governance

The Technology and Data Group is the governance body that provides the leadership, strategy, oversight and co-ordination of delivery against the technology and data strategy. This group reports directly into the TfL Executive Committee.

The Technology and Data Group has the following responsibilities:

- ◆ Sets the strategic direction for technology and data to deliver against the TfL priorities
- ◆ Owns the technology and data strategy, ensuring it is kept up to date and has alignment with business priorities
- ◆ Measures progress and delivery against the plan by regularly reviewing a range of metrics against targets set
- ◆ Ensures effective communication of the technology and data strategy internally and externally
- ◆ Owns the technology and data operating model
- ◆ Approves technology and data decisions which have pan-TfL implications, e.g. approval of supplier engagements for telecommunications and data networks when establishing new network contracts, or adding new network services or capabilities

The group meets every four weeks and is chaired by the Managing Director, Customers, Communications and Technology. Members represent technology functions, business units and the core portfolio strategies; membership includes:

- | | |
|--|---|
| ◆ Chief Information Officer (CIO) | ◆ Head of Campaigns, Communication & Engagement |
| ◆ Chief Information Security Officer (CISO) | ◆ Head of Core Technology Transformation, IM |
| ◆ Chief Operating Officer (COO), IM | ◆ Head of Digital, Commercial Development |
| ◆ Chief Technology Officer & Director of Customer Experience | ◆ Head of Group Financial Accounting |
| ◆ Director Commercial | ◆ Head of Information Governance |
| ◆ Director of Business Transformation | ◆ Head of Insight |
| ◆ Director of Finance, Surface Transport | ◆ Head of RSM Business Operations |
| ◆ Director of Internal Audit | ◆ Head of Strategic Analysis |
| ◆ Director, Operations, Crossrail | ◆ Head of Strategic Planning & Governance, HR |
| ◆ Director of Road Space Management | |



GOVERNANCE

- ◆ Head of Technical Strategy, Systems Performance & Innovation
- ◆ Integration & Business Development Officer
- ◆ Lead Sponsor, R&U Technology
- ◆ Marketing Director
- ◆ Programme Director, Data Networks
- ◆ Systems & Data Manager, Planning & Performance
- ◆ Head of TfL Online
- ◆ Head of Transformation
- ◆ IIPAG (Paul Jenkins, Chris Shoukry and David Meyer)
- ◆ Head of Analytics
- ◆ Head of Asset Strategy & Investment
- ◆ Head of Business Engagement, IM
- ◆ Director of Surface Strategy & Planning
- ◆ Director of Strategy, LU & COO London Rail

Next Steps

We will develop a new operating model for technology and data in TfL that is leaner, simpler and more effective than what we use today. It will foster innovation, where appropriate, and avoid duplication. It will include governance for the core portfolio strategies, such as telecommunications and data networks which already has an approved approach for governance. We will ensure that governance across the portfolios aligns to a central model.

Going forwards, the Technology and Data Group will be responsible for approving engagements with network suppliers, following evaluation of such requests by the Programme Director, Data Networks.



TECHNOLOGY & DATA STRATEGY PLAN

Financial year 2016/17

Financial year 2016/17											
Q1			Q2			Q3			Q4		
April	May	June	July	August	September	October	November	December	January	February	March
T&D Strategy Development	First draft T&D strategy		Communicate Strategy to TfL and externally								
	BCG 10 week exercise		Define and implement new operating model								
	Plan and mobilise strategy activities		Track and monitor strategic plan								
	Look at existing opportunities to apply principles e.g. ERP, Networks; CRM systems										
Commercial Outlook	Rationalise Contracts										
	Align technology contracts with spend categories										
	Chart of accounts for each technology portfolio										
Simplified Business Processes	Implement portfolio management										
	Adopt 'Patent Office' approach										
	Process owners and mapping										
	Implement user stories										
Highly Competent and Accountable People	Business & Finance Review – people workstream		Review reward and recognition packages for tech and data roles								
	Implement role families for technology and data										
	Communities of interest / expertise										
Innovative & Productive Partnerships	Establish partnerships governance group										
	Develop scorecard, strategy and plan										
Domain Strategies	Develop supporting capabilities										
	Customer Facing Technology Strategy		ERP Strategy		Core Technology Strategy						
	Telecommunications & Data Networks Strategy		Service Operations Strategy		Command and Control Systems Strategy						
	Asset Mgmt Information maturity assessments		Asset Mgmt Information Improvement plans								

APPENDIX I

Financials

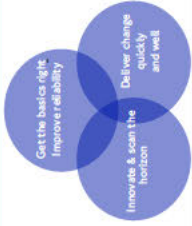
This section will incorporate the savings plans committed to across technology and data functions. This will be finalised as part of the Business and Finance Review in April 2016.

All figures £m

Lever	FY 16/17		FY 17/18		FY 18/19		FY 19/20		FY 20/21		TOTAL	
	Cost	Savings	Cost	Savings	Cost	Savings	Cost	Savings	Cost	Savings	Cost	Savings
1 Delaying	-	-	-	-	-	-	-	-	-	-	-	-
2a Projects stopping	-	-	-	-	-	-	-	-	-	-	-	-
2b Project delivery optimisation	-	-	-	-	-	-	-	-	-	-	-	-
3 NPL reduction/ conversion	-	-	-	-	-	-	-	-	-	-	-	-
4 Application rationalisation	-	-	-	-	-	-	-	-	-	-	-	-
5a Hosting complexity reduction	-	-	-	-	-	-	-	-	-	-	-	-
5b DC cost reduction	-	-	-	-	-	-	-	-	-	-	-	-
5c Network optimisation	-	-	-	-	-	-	-	-	-	-	-	-
6a Tactical sourcing (CICT)	-	-	-	-	-	-	-	-	-	-	-	-
6b Strategic sourcing (CICT)	-	-	-	-	-	-	-	-	-	-	-	-
6c Sourcing opt. other T&D	-	-	-	-	-	-	-	-	-	-	-	-
7 ERP	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX 2

Our technology and data strategy on a page

Our Technology and Data Strategy		Technology and data underpin everything we do – they drive all aspects of our business	
Our vision	The opportunity	Our goals	
<p>Better and faster results to:</p> <ul style="list-style-type: none"> Deliver new products and services for our customers and users Improve operational safety and reliability Increase capacity from our transport networks Enable our people Reduce costs and generate income 	<p>£1.25bn spend p.a. ~850 projects 2000 people</p> <p>We must do better, we will:</p> <ul style="list-style-type: none"> Understand our total costs Improve our relationships with suppliers Minimise duplication and wasted efforts and deliver quicker 	 <ul style="list-style-type: none"> Reduce costs Avoid duplication and siloed solutions Demonstrate value of investment Provide our staff with the right tools Build our internal capability Champion open data and innovative partnerships 	
Our priorities			
Commercial outlook – cost/ revenue/contracts	Simplified business processes	Highly capable and accountable people	Innovative and productive partnerships
<p>What's our project's commercial case? Could we get a better deal if we thought differently?</p> <ul style="list-style-type: none"> Manage the Total Cost of Ownership (TCO) of our technology Manage supplier contracts and relationships rigorously Invest in and contract scalable services When building systems and capability identify opportunities for commercialisation Reduce the procurement of standalone systems and duplicated contracts Rationalise duplicated systems on our estate <p>WE WILL..</p> <ul style="list-style-type: none"> Adopt the accounts principles used for the Networks Strategy Implement Portfolio Management Rationalise contracts and spend less 	<p>What are we trying to achieve? Could we reuse what we have already bought?</p> <ul style="list-style-type: none"> Define our business outcomes at the start Reuse the products and services we have on our estate Avoid customisation of off-the-shelf products Change our business processes Measure our benefits to reduce the cost of our technology <p>WE WILL..</p> <ul style="list-style-type: none"> Adopt 'Patent Office' approach that informs us of tools on our estate Implement user story templates Review assumptions about our business processes in project lifecycle Rationalise and continually review our projects portfolio 	<p>Do we have enough of the right technology skills?</p> <ul style="list-style-type: none"> Build a robust capability for sponsorship/ ownership for technology and data Take a pan-TfL perspective when making decisions on technology and data Ensure that our HR framework is fit for purpose Ensure our work environment meets the needs of our technology and data communities <p>WE WILL..</p> <ul style="list-style-type: none"> Do a gap analysis of our sponsorship/ technical capabilities Change our HR framework to meet the technical skills we need Get ideas from our technology teams about how we might improve our office environment/ ways of working to bring out the best in people Build communities of interest 	<p>What areas are suitable for transformation? How might we innovate to radically improve? What could we try to prove this would work?</p> <ul style="list-style-type: none"> Do proof of concepts (PoCs) to test new ideas quickly Adopt agile delivery models providing support and guidance where needed Create partnerships with the external technology community Champion open data, sharing valuable data across our organisation Be prepared to take risks where appropriate <p>WE WILL..</p> <ul style="list-style-type: none"> Create a register of PoC case studies for review by the T&D Group Develop and ratify partnership principles Prepare TfL agile guidance for technology and data teams Build communities of skills and knowledge, internally and externally
<p>OUTCOMES</p> <p>Reduced number of contracts and TCO</p>	<p>Recorded and tracked benefits</p>	<p>The right people in the right roles</p>	<p>Faster delivery</p>
Reduced costs		Reduced costs	





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