AT Technology Strategy

June 2016

Introduction

Auckland Transport (AT) is responsible for delivering the transport system that best meets the needs of a range of transport network users and enables the Auckland Plan's vision for Auckland to become the world's most liveable city. The Plan aims to improve the integration of the transport network using an integrated single-system approach, encompassing public transport, roads, footpaths, other modes of transport and cycle ways. This will effect a transformational shift to double the number of public transport trips from 70 million per year in 2012 to 140 million in 2022, while enabling all other transport modes, such as commercial, to become more efficient.

Technology is a key enabler for this to happen. A modern transport system requires technological "glue" to collect, process and utilise data to provide operational effectiveness, efficiency, safety and resilience across all transportation modes and services. Future modes such as semi or fully autonomous vehicles ("driverless cars"), freight drones, and mobility as a service (such as carpooling or car/bike sharing), will be totally reliant on digital technology. Popular digital businesses are changing customer expectations and have conditioned people to expect dramatically improved levels of service, rolled out quickly, with a greater availability of information and personalised experiences via digital channels – not just from Internet-based organisations like Apple and Amazon, but from all businesses and all branches of government.

This Technology Strategy documents some long-term strategic visions for technology as well as a focussed short (24 month) horizon strategy, goals, principles and actions for AT's digital, ITS and BT programmes. It is not intended to be a detailed and prescriptive plan but an outline of the key themes, areas of focus and some high level actions. The very nature of a digital programme precludes traditional, detailed, bottom-up, technology planning because successful digital programmes are customer-led and human-centred and change quickly according to the environmental factors that it operates in. A digital approach focusses on customer outcomes which are agile and iterative, so while the top line goals are understood and some basic principles are agreed, the exact outcomes and the means by which they will be achieved are delivered as part of the digital "sprint".

The purpose of this document is to:

- Describe AT's strategic vision for technology, including digital, ITS and traditional IT components
- Articulate how our customers will benefit from this technology strategy
- Establish the context and approach for AT's technology programmes for the next 24 months
- Outline how they serve AT's strategic goals – and those of its partners and stakeholders, and
- Outline how the digital programme, ITS and BT will align to support those goals

Strategic Vision for Technology

Context and Strategy Alignments

AT's Technology Strategy needs to align and interface closely with the corresponding strategies of our most significant partners and stakeholders, who have similar goals. Their key business drivers and outcomes have been identified, and AT's own strategic themes have been aligned with these:

Document	ATAP Foundation Report	NZTA ISSP (draft)	MoT ITS Action Plan 2014-2018	AT Strategic Themes
Strategic Goals / Themes	1. Improve access to employment and labour 2. Improve congestion results 3. Increase public transport mode share 4. Deliver net user benefits from investment 5. Ensure value for money	1. Make it easy for customers to do business with us 2. Journey times are more predictable for urban customers 3. Integrated road and rail 4. Vehicles travelling at safer speeds 5. Smart road maintenance 6. Make urban cycling safer and more attractive	1. Effective – move people and freight where they need to go in a timely manner 2. Efficient – deliver the right infrastructure and services to the right level at the best cost 3. Resilient – meet future needs and endure shocks 4. Safe and responsible – reduce the harms caused by transport	1. Prioritise rapid, high-frequency public transport 2. Transform and elevate customer focus and experience 3. Build network optimisation and resilience 4. Ensure a sustainable funding model 5. Develop creative, adaptive, innovative implementation

This Technology Strategy has been developed to support and enable Auckland Transport's Strategic Themes and Behaviours:

Prioritise rapid, high frequency public transport

- RTN and FTN routes/innovation
- LRT Programme
- Road hierarchy programme
- Integrate active modes

- Better route planning and timetabling due to better information
- Integration of all transport modes through innovation

Transform and elevate customer experience

- Branded services
- Customer centric culture
- Digital information
- Way-finding
- Facilities and placemaking
- Modal choices
- Integration of transport for customer experience
- HOP enhancement
- Loyalty recognition

- Increased availability of information
- Customer-centric mind-set and user-friendly tools
- Provide customers with timely and accurate information
- Provide electronic wayfinding on mobile apps
- Provide applications that enable multi-modal transport choices

Build network optimisation and resilience

- One network/system
- Commercial Productivity
- Route optimisation
- Network options
- Transport development
- Real time information
- Congestion management
- Network resilience/reliability
- Integrate active transport

- Multi-modal real time information through fast development
- Information regarding congestion is made available and utilised to support mode choices and allow customers to self-optimise
- Integrated real time planning and incident management of the network integrated into outbound customer channels

Ensure a sustainable funding model

- Commercial partnering
- Business improvements
- Diversified revenue sources
- Asset optimisation/AMP
- Disposal/usage/development of surplus assets
- Internal costing
- Procurement models
- Legislative issues

- Third party innovation and partnering through digital
- Reduced cost of delivery
- Improved operational effectiveness
- Better management of assets through digital channels and customer engagement
- Improved business processes as a result of digital reinvention

Develop creative, adaptive, innovative implementation

- Technology partnerships
- Digital data experience
- Shared facility plan
- Innovation HUB
- Academic partners
- Innovative cities mix

- Digital delivery partnerships
- Structured, managed approach to digital
- Lean, fail fast, agile mind-set embedded
- Progression towards becoming a "Smart City"

On board

- We are positive
- We are proud of our work and workplace
- We recognise and acknowledge achievements.

- Recognising innovation and ideas from within the business and acting on them
- Celebrating delivery of customer outcomes, and changing the way people and goods get from A to B

One team

- We work together as effective teams
- We help support others
- We build positive relationships

- Building cross-functional teams
- Supporting initiatives that deliver customer outcomes across the organisation
- Building internal relationships

Take action
- We take ownership and accountability
- We use good judgement and make decisions
- We try new things

- Empowering staff through autonomy and fast paced delivery
- Increasing transparency of, and accountability for, decision-making and delivery progress

The goals, principles and actions outlined in this strategy support the projects and actions outlined in Auckland Transport's Sustainability Framework (March 2016) Focus Area 6: Innovation and Technology.

Strategy

1. Be Led by Customers

To succeed, our Technology Strategy must have people and businesses at its heart, making them part of the change, helping the city to function better and to better meet the needs of citizens and transport users.

We will:

- Actively engage with Aucklanders and visitors, using new methodologies, understanding and delivering the most valued projects that they need, within constraints of funding and resource, thereby gaining positive ongoing engagement from them.
- Use technology as a vehicle and mechanism to engage with end users, thereby meeting the diverse transport related needs of all users.
- Maximise the use of qualitative and quantitative data to guide the planning and design of AT services and processes both internally and externally.

2. Open Data

AT is already making data available via its open API hub. We will build on this and engage the developer community (both locally and internationally) to build applications and services to better inform users and help the city function better. We will identify and publish data that supports this and addresses growth challenges and increases transparency and accountability.

We will:

- Identify and prioritise making available the data needed to address growth challenges and citizen and visitor information needs.
- Work with government and private sector organisations and the community to create, maintain and utilise data more effectively.

- Work with other local and central government organisations to develop common standards aligned internationally with common platforms to increase the market for developers and support the co-creation of services to meet Auckland's needs.

3. Leverage Auckland's Technology and Creative Talent

Auckland is home to substantial creative, technological and innovation communities. We will need to leverage Auckland's energy and world class talent to solve Auckland's challenges, create new market opportunities and export our innovations to other cities in New Zealand and across the world.

We will:

- Engage businesses, third parties and the community to develop solutions that will help solve Auckland's transport problems.
- Support and showcase innovation and export Auckland Transport solutions across New Zealand and the rest of the world.

4. Build Networks

Due to its size and scale and the number of public and private organisations and individuals involved, Auckland is a complex ecosystem. There is considerable energy and many initiatives underway, and while they are focussed on common goals, they are not always well co-ordinated. To achieve its technology vision, AT has a critical leadership role to play in order to align transport-related activities and create the focus required to achieve the transformative change that is needed to address Auckland's growth challenges.

We will:

- Provide leadership by working with public and private organisations and individuals to develop a more integrated approach to solving Auckland's transport challenges.

5. Enable Auckland to Adapt and Grow

Continued growth is putting considerable strain on Auckland's transport infrastructure. Auckland will need to adopt new digitally enabled approaches to cope with its projected population growth of an additional one million people over the next 30 years.

We will:

- Use technology to collect and process data to provide operational effectiveness, efficiency, safety and resilience across all transportation modes and services.
- Provide technology to enable efficient future modes such as semi or fully autonomous vehicles and mobility as a service.
- Ensure transport network users have the information they need to support individual transport mode choices and route optimisation.

6. Offer a Better Auckland Experience

Digital thinking and technology can make significant changes to the way we experience the city from traffic lights adapting to congestion, to knowing what time your bus will arrive, where available car parks are located, and how to pay for services. New technology and data will be harnessed so that businesses, citizens and visitors experience the city in a better way, with minimal processes and congestion.

We will:

- Help citizens and visitors to seamlessly navigate the city, being informed at every step of their journey, with easy ways to pay for transport services.
- Engage customers and citizens to provide feedback on, and shape, the Auckland experience provided by AT.

What we've already got underway

- Consolidated AT websites to centralise and standardise information and services
- Redeveloped AT.govt.nz as an adaptive website that works on any device
- Conducted substantial qualitative and quantitative research
- Begun engagement with customers in solution development and testing
- Developed customer personas and mapped customer journeys
- Developed MyAT to enable personalised services
- Ongoing improvements to the AT HOP card
- AT Metro Track My Bus and AT Public Transport mobile apps
- Train and bus information available via SMS
- Open data shared via the AT City Information Hub API and GITHUB
- Held AT's first community co-development tech event, hackakl2014
- Data sharing with other agencies, including the NZ Transport Agency
- Participation in the Digital Auckland programme with Auckland Council and other CCOs
- Ongoing early adopter partnerships with HP Enterprise and Microsoft

The Short Term Future (24 Months)

The following section describes and discusses the strategy, goals, principles and actions for AT's digital, ITS and BT programmes over the next few years.

What is "Digital"?

Many think of digital as being about technology. For others, it's a new way of engaging with customers. And for others still, it represents an entirely new way of doing business. All of these are correct, but such diverse perspectives often trip up leadership teams because they create different, often divergent, visions and expectations. This can in turn lead to disjointed

initiatives or misguided efforts that then lead to missed opportunities, poor delivery performance, or outright failure. To be meaningful and sustainable, digital should be considered less *a thing* and more *a way of doing things*.

AT is relatively new to the digital approach, having undertaken several pilot projects and now starting on its own dedicated digital approach. According to the IDC framework, AT is currently a Digital Explorer, moving towards becoming a Digital Player over the next 12 months.

(IDC, 2016)

To do things successfully "the digital way", AT will:

- o Take an end-to-end, customer-centred view of problems and opportunities and focus on ways to enhance customer* experiences (CX) – the impact should be evaluated using both financial and non-financial (e.g. CX) measures
- o Consider digital transformation as being the journey, not the destination – Digital is a way of doing business, not a one-off project
- o Be led by the AT Executive Leadership Team with top down sponsorship to ensure buy-in by the whole organisation and break down any existing silos in order to build viable, effective cross-functional teams.
- o Deliver value to customers, quickly, in collaboration and co-creation with internal and external customers and partners with rapid delivery (succeed or fail – fast)

As a result of digital, experience has shown that the internal business operations as well as customer experience at the front end will change.

*the term "customer" in this context refers equally to external and internal "customers"

Digital vs BT vs ITS

While digital is *a way of doing things*, then *the things we do digitally* are implemented and supported using BT (Business Technology) systems and ITS (Intelligent Transport Systems). These are all interlinked as depicted in the following context diagram:
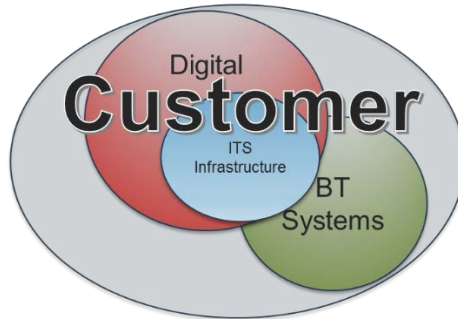
BT is AT's internal Information Technology business unit which delivers and operates AT's enterprise and line of business systems (e.g. SAP), supporting back end infrastructure (datacentres, servers and storage), voice and data networks, end user infrastructure (desktops / laptops, phones, etc.), and personal productivity tools (e.g. Microsoft Office suite and email). The following infographic gives a sense of BT's scope and scale:
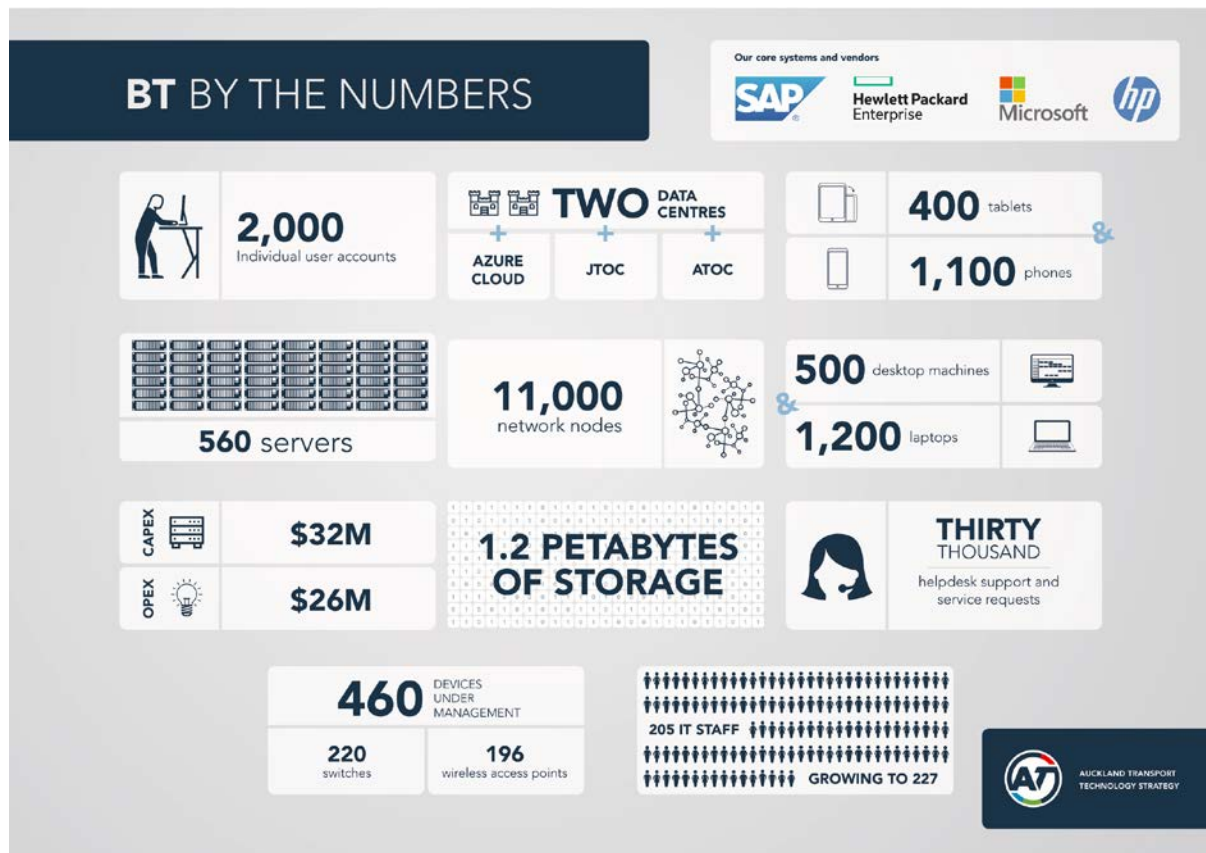
BT and the services it delivers must align to the overall AT business strategy and business unit plans. These are then aligned with the BT Strategy and executed in partnership per the following illustration:
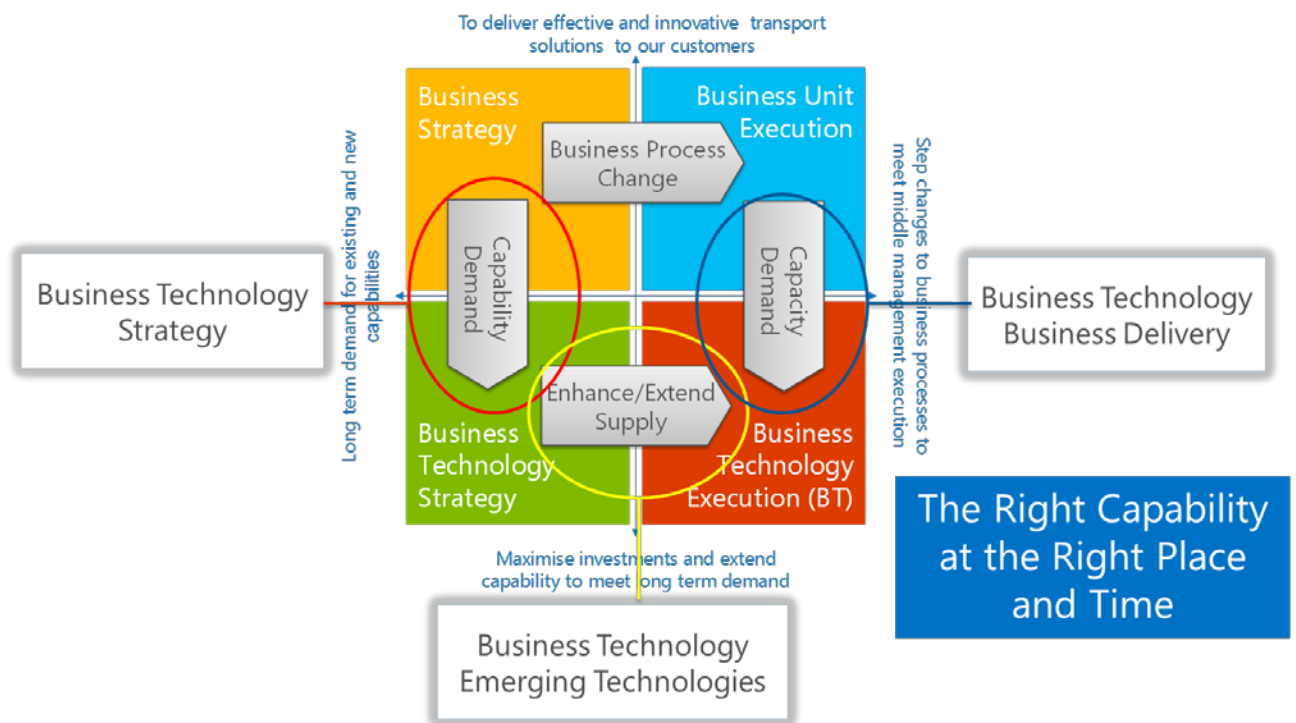

ITS is a transport-specific subset of information technology which can be applied to vehicles (including trains, aircraft, ships, cars and bicycles) and even pedestrians to provide benefits for transport operators and service users. It overlaps with, and leverages, BT capabilities but extends into the realm of smart sensors in vehicles and road/rail/air infrastructure, connected and autonomous vehicles and control systems that enable greater effectiveness, efficiency, resilience and safety in our transport systems. Some ITS-provided systems, such as real-time network route information signage, are exposed to customers directly. In other cases, data collected from ITS' sensor network will be exposed to customers via websites and apps delivered through the digital programme.

It is worth noting that definitions of ITS vary, as do the technology standards that apply to ITS solutions deployed in different countries. The International Standards Organisation (ISO) defines ITS as:

> *The application of information technology, communications technology, and sensor technology, including the Internet (both wired and wireless), to the general challenges and opportunities of surface transportation.*

In the New Zealand context, the Ministry of Transport extends this definition to include air. AT applies the broadest possible definition and, because of their critical role in the urban transport ecosystem, extends the Ministry's definition to also include cyclists and pedestrians.

The Internet of Things (IoT) will play a key role in the foreseeable future with AT playing a pivotal role in leveraging ITS and IoT technologies and providing information and the infrastructure to connect people and devices and providing core datasets and processing capability.
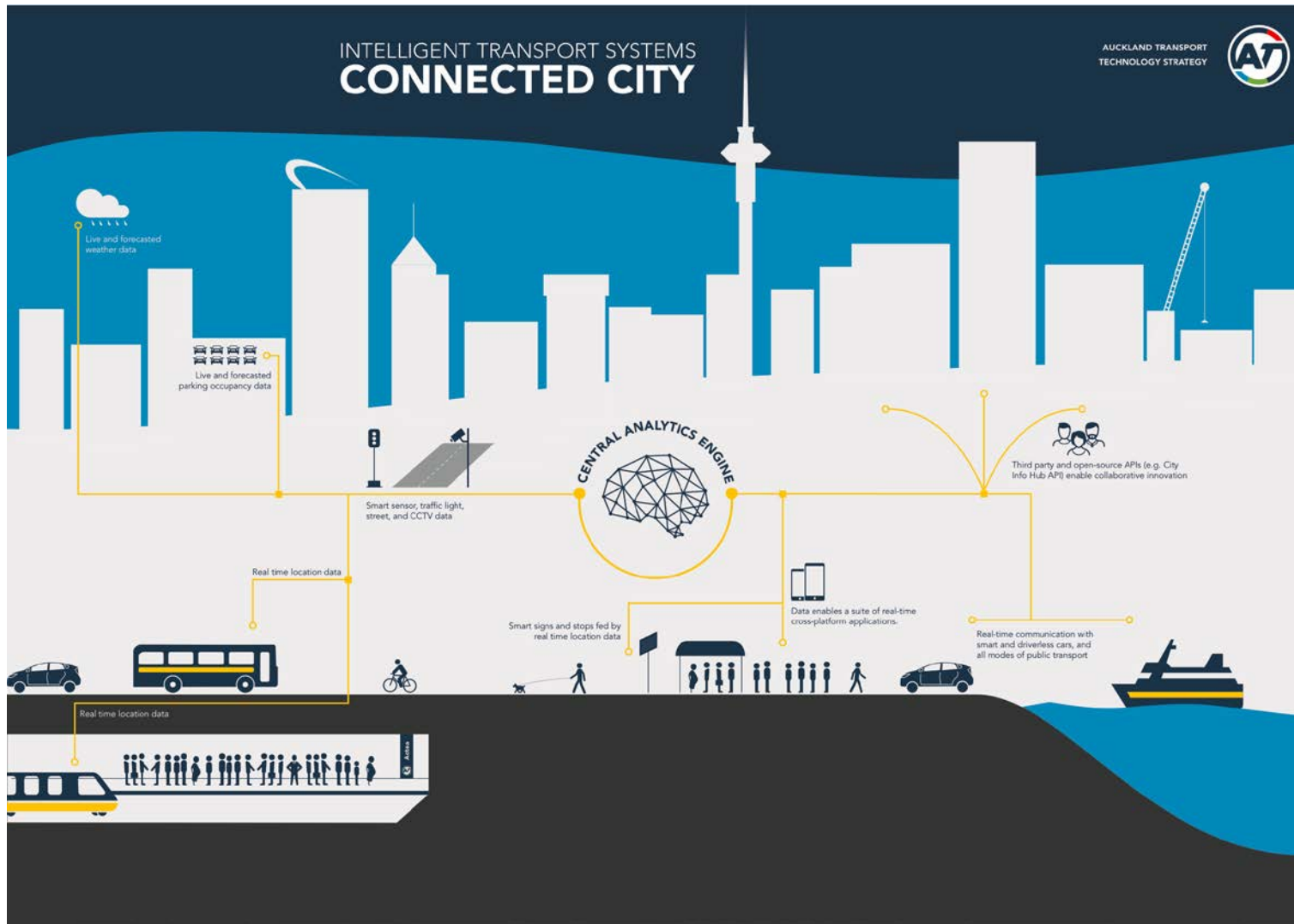
BT's role in the digital world

Historically, BT has provided services through delivering projects, often spanning multiple years, using very traditional, heavily structured, "waterfall" delivery methods. This works well for large, traditional IT projects such as SAP and real time implementations where the business requirements can be clearly defined up front and don't change much during the project. It doesn't work for digital delivery where the requirements aren't always clearly understood at the outset but tangible customer value must be delivered in short "sprints", ideally of no longer than two to six weeks duration. Provisioning technology to meet such short timelines is very challenging for traditional IT shops.

AT will establish "bimodal IT" capability, where it will leverage its current processes to deliver projects that do not suit a digital approach, and shift the majority of its projects (over a period of 2 years) to a digital approach, in order to deliver AT's digital programme.

Key Initiatives for 2016-18

Digital

The key focus for the next six months will be setting up and running a pilot digital programme which will define the core structures, processes and resources for digital success by delivering:

- A Customer Central innovation hub
- A customer testing toolkit
- A new procurement and partnership model
- Organisation policies and structures to support a digital product ownership and delivery model
- Working cross-functional team(s) to work on discrete sets of high-priority, high-value, customer-facing initiatives:
    - Open Data – more available data for third parties to consume
    - Voice of the Customer – surveys to monitor customer engagement and obtain feedback
    - Social Media – implementation of social media channels and sentiment analysis
    - Field Work Management – the ability for our staff and third parties to interact with our systems to fix reported faults in the field faster
    - Cloud Strategy – define AT's future data platforms and datacentres

AT's customer principles, as identified by PwC, are as follows:

- *"I want to be informed, now"* – reliable and accurate information distributed across channels in real time
- *"My transport is reliable, and frequent"* – options are available when I need them
- *"My journeys are pleasant"* – less congestion issues, travel environment is clean and safe
- *"I need to manage costs"* – getting from A to B at a fair cost, having control over cost

These customer principles were determined by PwC's analysis of AT's customer research, which included focus groups, commissioned research and customer interviews regarding multiple projects, and were validated with AT business representatives over three pilot innovation sessions. As these principles emerged as the most critical, priority will be given to piloting initiatives that deliver customers the right information at the right time, and those that provide channels for feedback to inform and validate solutions.

The six-month digital programme pilot will establish a framework for ongoing prioritisation and delivery of digital projects against established AT business priorities, and implement measurements of success with a view to proving value and securing ongoing commitment to AT's digital programme approach as a way to enabling AT's business strategies and objectives.

Subsequent phases will leverage the learnings and successes of the pilot, broadening the digital programme's mandate for change and starting a wider shift in the culture and ways of working at AT.

Partnerships

AT does not retain or build full stack software or web development capability in-house – and has no plans to do so in future – so will continue to engage third party resource to provide non-core capabilities required by the digital programme.

Where appropriate, AT will go fully external and partner with third parties to deliver applications and information to customers via the digital and ITS channels. The nature of such partnerships may range between entering into commercial, revenue-generating joint ventures through to simply providing data to third parties and allowing them to develop services which they monetise.

A further option will be to make data openly available to the community via public APIs, then encourage community participation through hackathons and the use of GitHubs to share projects and development.

Delivery and Governance the Digital Way

To be successful, digital delivery needs a new approach to project delivery and governance.

Traditional, heavily governed and gated, "get it all figured out first" delivery approaches are too slow for digital delivery. A typical digital approach uses a combination of human-centred design, Design Thinking, Lean and Agile to deliver value in short iterations or sprints of days or weeks durations not months.

Google and Netflix release hundreds, sometimes thousands of updates every day. They release early and often, get customer feedback, learn and iterate – or if what they're doing doesn't work, they pivot and do something different. Each iteration is short, the amount of work being delivered is small and therefore low risk. If something doesn't work, it can be fixed in the next iteration, so you don't have to wait six months for the next major release.

Accelerated delivery model
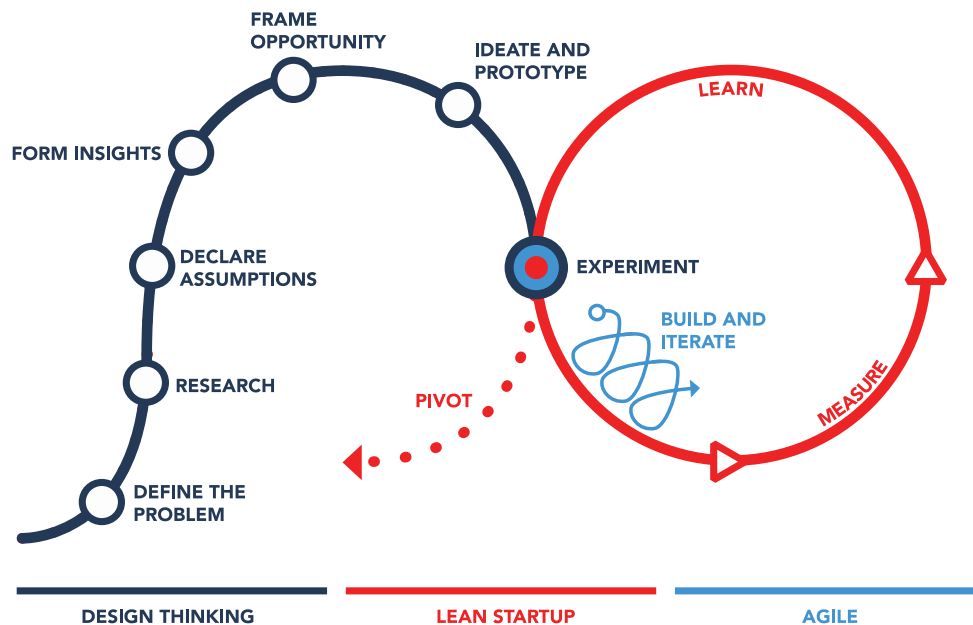
BT will be moving to this type of delivery model with its digital approach. With a digital approach, the least helpful output/deliverable is a document, because documents don't solve customer problems – good products or improved processes do.

Intelligent Transport Systems (ITS)

ITS actions have been planned in five streams: Open Source Data, Focus on the Customer, Efficient and Agile Network, Future Transport, and Focus on Safety. Some actions (e.g. "Improve MyAT functionality") support initiatives planned under the digital programme so they are dependencies for the digital programme rather than delivering end customer outcomes in their own right.

Open Data
Many of the digital programme initiatives are potential candidates for being delivered by AT partners, in association with third parties or by making data openly available to the community. To support this, AT data needs to be available through stable, open, well supported means.

This will be delivered by:
- Updating AT's information sharing and open source data policy(s)
- Extending the range of open APIs for internal and third party consumption including:
  - Parking capacity and occupancy data
  - Ferry and rail real time data
  - Forward Works Planner information
  - Congestion data

- o Traffic light data
- o Incident and event management information

Focus on the Customer
Delivering customers the right information at the right time is the primary focus of the digital programme. To achieve this:

- MyAT functionality will be extended with new service catalogues
- Integration of external data sources such as weather, tides, and holidays will be integrated to support better modal choices decision making
- Expand the network of route, wayfinding and travel information signs
- Information regarding additional modes of transport such as taxis and intercity busses will be integrated into the journey planner, giving customers a complete journey-planning experience by integrating the first and last mile of their journeys

Efficient and Agile Network
Management and operation of the city, across all modes, on a day to day basis is currently performed in conjunction with the NZ Transport Agency using the TOCs. Management of events and incidents, and pushing information about them to end users is critical to network efficiency by supporting mode/route decision-making. There are significant traffic management issues expected in the coming years due to construction projects (including the City Rail Link) and major roading repair works in the central city. To address this AT will:

- Increase CCTV coverage on the whole transport network, especially in the CBD area
- Implement an incident and emergency management system
- Implement an integrated event management system
- Instigate two-way information-sharing with commercial operators (i.e. taxis, tour operators, car sharing)
- Implement dynamic laning on roads
- Implement a new planning and predictive traffic management system
- Implement automated bus and cycle lane enforcement using CCTV capabilities

Future Transport
Connected and autonomous vehicles, electric vehicles, including airborne drones, will provide opportunities for improving transport safety and efficiency but will require significantly more sensing, analytics and communications capability. Self-optimising dynamic traffic management capabilities will benefit all road users through improved traffic flows and reduced congestion.
AT will;
- Trial ITS new and emerging infrastructure sensors, CCTV and analytics
- Extend the current coverage and range or sensors, CCTV and infrastructure equipment
- Pilot infrastructure to vehicle communications
- Implement intelligent traffic management systems based on the current state of the network, historical patterns and real time environmental and network incidents

- Pilot improved real time traffic management systems to improve the efficiency of the network by use of new intelligent lane and traffic light management
- Enable sustainable autonomous and electric vehicle trials and implementations
- Work with commercial operators to improve data exchange of information

Focus on Safety

The travelling public needs to feel safe, therefore AT must increase its monitoring and responsiveness to identify and mitigate threats, and deal with safety-related incidents. In order to do this, AT will:

- Increase CCTV cover, including real time analytics, on PT, parking, cycle and pedestrian networks
- Pilot and implement CCTV installations and analytics to detect red light running, and identify cycle movement at intersections to activate the traffic lights

Specific strategies and guidelines will be written to underpin a number of these initiatives; those identified to date include:
- CCTV guidelines for the road corridor and intersections
- ITS guidelines for the roading manual
- A Connected and Autonomous Vehicle Strategy
- An ITS Communication Strategy

Business Technology (BT)

BT has ongoing accountability for the day to day operation and maintenance of AT's core IT infrastructure and services. In addition to this, BT will undertake a variety of key strategic initiatives that support digital and ITS and other transport initiatives that involve or require technology.

Operational Excellence

With the implementation of the digital accelerator pilot and planned ITS initiatives there will be increased demand on BT to deliver infrastructure and services at a greater speed and scale than ever before. A key initiative for BT will be transforming its delivery and operational capabilities by incorporating bimodal IT disciplines such as Lean, Agile, DevOps, and Continuous Integration/Delivery into its ways of working so it can simultaneously support both high-velocity digital delivery and more traditional IT delivery models.

Big Data
The four digital enablers are Big Data, cloud, social and mobile, with Big Data being the most critical. The volume of AT and third party data that AT has access to is not currently well utilised, and only a very small proportion of it is available as useful information to internal and external users. AT has a traditional Enterprise Data Warehouse (EDW) which supports Business Intelligence and transactional level reporting, and an HP SAS Grid Computing solution for managing unstructured and real time data. Key deliverables for BT will be:

- Extending the Grid platform to further support Big Data and analytics at AT
- Providing AT acquired data to partners and the public via open APIs (in conjunction with the NZ Transport Agency Info Hub)

Enterprise Asset Management
AT currently has multiple Enterprise Asset Management (EAM) solutions. Considerable savings and operational efficiencies could be gained through rationalising and consolidating these onto a single platform. The Auckland Regional Council (ARC) utilised SAP for their EAM functions, and AT has retained ARC's IP and configuration. AT currently has a project underway to investigate and roadmap the AT EAM requirements, roadmap and possible solutions taking into account both the spatial and GIS components and other agencies directions such as NZTA and AC. This will be developed into a strategy and business case by the end of 2016.

Spatial
Construction drawings for all major AT works are now being provided as Building Information Management (BIM) files. This enables a whole-of-life approach to managing asset information, from the conceptual 3D fly-through of a project to the ongoing lifetime maintenance of individual assets that were built by the project. AT will move to support BIM, both internally and in its interactions with service providers, and will incorporate BIM support into its Financial and EAM systems to enable full lifecycle cost visibility and management.
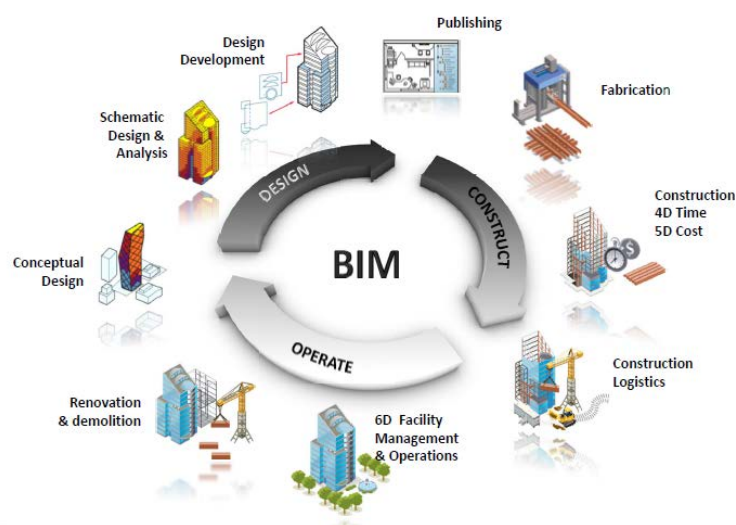
Traditional Geospatial Information System (GIS) data and systems will continue to be used to support spatial analysis and planning co-ordination and to provide spatial context for the

analysis of other data sets e.g. traffic patterns. Forward planning tools will be integrated to provide a seamless view of forward land use, forwards works and AT assets. The Forward Works Viewer will support more efficient management of Road Corridor Access Requests and AT will continue to build on work already done for Christchurch by LINZ incorporating Auckland into a future single national system.

The GIS and BIM spatial systems will be fully integrated and information contained within them made available to cross council planning teams and the citizens via the API Manager.

SAP

AT's SAP platform has not been significantly extended to date, however a review is underway to refine and redefine its role within AT's enterprise application landscape to ensure AT is aligned with current initiatives around asset management, forecasting and modelling of financials, and the need to migrate on-premises SAP to the cloud by 2025.

HOP

The infrastructure which supports HOP is now five years old and is due for an equipment refresh. The HOP operations contract has five years remaining, with an option for a further five years. Given the ongoing investment in gating and other equipment assets, AT will continue to utilise the current system through to the end of its service life.

AT will look to provide online services for the HOP system including the ability to top up, or use the HOP card electronically on smart devices. The HOP system will be integrated into the new AT Parking solutions to enable seamless payment options across transport modes.

Data and Voice Network

AT's network strategy is constantly evolving as the various providers' networks grow and evolve and the marketplace matures. AT is currently at the leading edge in their use of Software Defined Networks (SDN) to provide security and control of the data and end points of its networks. Traditional network security proved inadequate for AT given the amount of CCTV traffic that it carries. During 2015/16 SDN was implemented across a significant portion of the AT network. This will be extended during 2016/17 and will also include intelligent real time analysis of network activity.
AT will continue to use VoIP solutions for its telephony and Video Conferencing.

Radio Communications Network

AT currently uses a radio network operated by Kordia for its day-to-day and emergency communications, but this service is potentially under threat of being shut down or sold off due to low uptake/utilisation. BT is currently working with Kordia and other critical infrastructure providers to either secure the continuity of this critical service or align with partners for alternative solutions.

Move to Cloud

In addition to the two datacentres it operates in Auckland, AT has some services (e.g. websites and email) already hosted in the cloud and will apply a "Cloud First" principle for new solutions and platform refreshes as opportunities arise. On-premises infrastructure will continue to be preferred where solutions require the frequent movement of large volumes

of data or if there is sensitivity to latency, but cloud options between Infrastructure as a Service through to full Software as a Service will be evaluated in all other situations. AT will investigate and trial the latest AZURE on premises offering this year which offers the full cloud capability and resilience whilst keeping data on premises for performance and sovereignty requirements.

Combined Operations Centre
Combining the current Transport Operations Centres (ATOC and JTOC) would increase operating efficiency and effectiveness. Other alliances with the city and emergency services will follow over time given the closer integration of systems and greater information sharing opportunities. Taking the CRL and LRT operations areas into consideration, a single large combined Operations Centre may be beneficial and BT will assist with the investigation and implementation of these options.

Technology Partners
BT has strong, trusted partner relationships with a small number of large technology vendors – primarily SAP, Microsoft, HP Enterprise and HP Inc.

- SAP is AT's core Financials and Human Capital system and, assuming it meets AT requirements, is a strong candidate for AT's consolidated Enterprise Asset Management solution.
- Microsoft products run AT's desktops and datacentres. AT's footprint on Microsoft's Azure cloud platform is growing as services are migrated off-premises and into the cloud. AT also uses Microsoft's Customer Relationship Management (CRM) system and AT's Fulcrum document management system is built using Microsoft SharePoint.
- AT's physical infrastructure utilises HP server, storage and HP Enterprise network hardware, security and management software. HP hardware has the longest support life and offers the best total cost of ownership.

BT's procurement and sourcing strategy is to provide AT with the technology and services it needs at the lowest total cost of ownership. One of the key pillars of this strategy is to keep the number of vendors to a minimum. Working with the smallest possible group of large vendors offers numerous advantages aside from reducing vendor management overhead. A homogeneous hardware environment enables a single management toolset to be used and reduces training and support costs. The major vendors have extensive global and local partner networks and provide support for AT to be an early adopter, enabling maximum benefit from new technologies and positioning AT at the leading edge of security technology.

Digital Content Management (DCM)
AT needs to manage digital assets, including the storing, scheduling and distribution to various digital end points going forward, and needs a Digital Content Management system to do this.

End User Computing

To encourage mobility, AT will continue to migrate the majority of its users to laptops and will provide a standard, device-independent dock, screen, keyboard and mouse at all desks. Microsoft Windows is the standard end user operating system. Windows 10 will be introduced during 2016/17 and, among other improvements, will allow users to move seamlessly between desktops/laptops, tablets, phones and other devices. This seamless interaction across different Windows 10 supported devices will enable some AT field users to utilise a phone or tablet as their sole device.

Parking

The Parking team is currently selecting new on/off street systems for implementation in 2016/17. Once in place they will provide or support future ITS and digital initiatives to optimise parking and improve customer experience through initiatives such as:

- Online applications and management of parking permits
- Visibility of availability and occupancy of parking spaces
- Streamlined charging and payment options – integration with HOP

Customer Relationship Management (CRM)

AT's Microsoft CRM already has all customer data from HOP, customer interactions, LOGOIMAS, correspondence, Iwi consultations, Total Mobility, parking permits and leases. AT will continue to develop CRM as AT's "single source of truth" for customer data and:

- Expand usage and uptake of CRM across the business
- Integrate parking and other customer-facing applications
- Build a customer-facing services catalogue, made available via MyAT
- Add customer surveys and Voice of the Customer (by the end of CY2016)

In addition, AT's Microsoft CRM instance is currently hosted on premises and is a candidate for migration to the cloud when appropriate.

Appendix 1 – Glossary of Technical Terms

Term	Definition
Agile	A delivery method (usually applied to software but which can also be applied to physical product development) which involves dividing product design and development into short phases of work with frequent reassessment and adaptation of plans. Agile differs from traditional "waterfall" methods in that user requirements are not all elaborated and agreed before building starts so functions and features are designed, built and tested in iterations rather than delivered in a "big bang". If done correctly, Agile provides a much lower risk, faster to market, approach to developing products.
API	Application Programming Interface – a set of routines, protocols and tools for writing software applications. To help visualise this concept, imagine an API as the middleman between a programmer and an application. In the case described in this strategy, the application is the AT City Information Hub and the programmer is wanting to access AT data to consume in their own app. This middleman accepts requests and, if that request is allowed, returns the data. The middleman also informs programmers about everything they can request, exactly how to ask for it and how to receive it.
Design Thinking	Design Thinking is a structured problem-solving process. Unlike analytical thinking, design thinking involves a collaborative development of ideas with few limits on breadth or feasibility in the initial stages. A typical approach has several stages such as: define (the problem), research, declare assumptions, form insights, frame opportunities, brainstorm ideas, then finally, choose ideas to test through (usually Agile) implementation. There are a number of Design Thinking methods but these all share a common set of traits, mainly: creativity, ambidextrous thinking, teamwork, user-centeredness (empathy), curiosity and optimism.
DevOps	Compound of Development and Operations. A culture or practice that emphasises empathy and collaboration between software developers and IT operations to automate and speed up the process of software delivery with a view to supporting the goals of Agile development i.e. getting new features in front of customers as quickly as possible.

GitHub	GitHub can be thought of as a social networking site for software developers. Git is used to store the source code (and other files) for a project and track the complete history of all changes. It allows developers to collaborate on a project by providing tools for managing possibly conflicting changes from multiple developers. It also facilitates social coding.
HP	The term "HP" is used generically to either HP Enterprise (enterprise class products such as servers, storage and networking) or HP, Inc. (desktop computers, laptops and printers).
HP SAS Grid	Proprietary term for an HP hardware and software solution that provides large amounts of computer power, access to large data sources and the execution and management of a large number of concurrent jobs. Commonly used for business intelligence, data integration and analytics. The SAS acronym stands for Statistical Analysis System which is data management and analytics software developed by US software company, SAS institute.
Lean	Rooted in manufacturing but applicable to all business processes the core principle behind Lean is to maximise customer value while minimising waste and consuming fewer resources. Key to success is understanding what customer value is i.e. being customer-led and focusing resources to deliver it.
SAP	A German software company known for its Enterprise Resource Planning (ERP) and other enterprise software. The actual acronym SAP stands for Systems, Applications and Products in Data Processing.

Appendix 2
– Digital Programme Personas / User Stories as at July 2016

TRADE IN A TRUCK

User story

Commercial workers performing business in the city keep the city moving and working by building and maintaining infrastructure, property and company operations.

A commercial person normally has clients in and around the city that need help on either an ad-hoc or regular basis. The ability to make appointments and keep to time is essential; booking eight appointments and only being able to make six because of parking, roading, or congestion issues is costly to both the service person and the end client, and it drives frustration levels up for all concerned.

A commercial person needs to operate with relative certainty about the time and cost of the transport related components of their businesses. Likewise, end users need to be able to travel to or be available for these appointments with reasonable certainty that the service personnel will turn up in a timely fashion.

Future vision

Receives a task via a workflow app, and selects the 'go' option which calls the AT commercial API.

The API provides a 'best journey' route as well as timing based on projected traffic, and an ideal park.

A park is booked

As the job runs over time, the contractor increases loading zone parking by an hour, via an app.

Receives notifications on the job about increasing traffic en-route to the next task. Route is readjusted.

HOUSEHOLD SHOPPERS

User story

A person needs to commute to shop at physical stores, and the transport choice for that can be one - or a combination - of many choices. For some shopping it has to be accepted that carrying packages or goods to and from locations is required.

Traditionally in New Zealand, that has been via a private car or, more recently, taxi services. However, for those in a vehicle the ability to know travel times and best parking locations based on historical and real time information is important and has the potential to reduce total travel time by 30% (time spent looking for a park).

Future vision

En-route to the shopping centre, options for likely and close parks are provided. These update in real-time.

Once on-site, app navigation finds an empty park. One swipe accepts the spot and a new parking session begins.

While shopping, integrated loyalty systems reduce the cost of the active parking session. Notification received. A parking extension is purchased via the app with another swipe.

Back in the car, one swipe completes the parking session, and the balance due is paid from an AT account.

Later, the process is repeated with an on-street park

THE DAILY COMMUTER

User story

Aucklanders (and/or their children) need to commute from their place of residence to their place of work, study or recreation. Most weekday commuting takes place during the morning and evening rush hours when the roads are congested and public transport is crowded. On the weekends in some parts of Auckland, the rush 'hour' lasts all day.

Commuters have transport mode decisions to make. Should they take their car, the bus, the train, cycle, or walk? This could depend on the weather, road congestion, public transport timeliness and loading and, of course, any incidents or planned works or events that might affect their trip. Because of the geography of Auckland, one incident can cause massive delays.
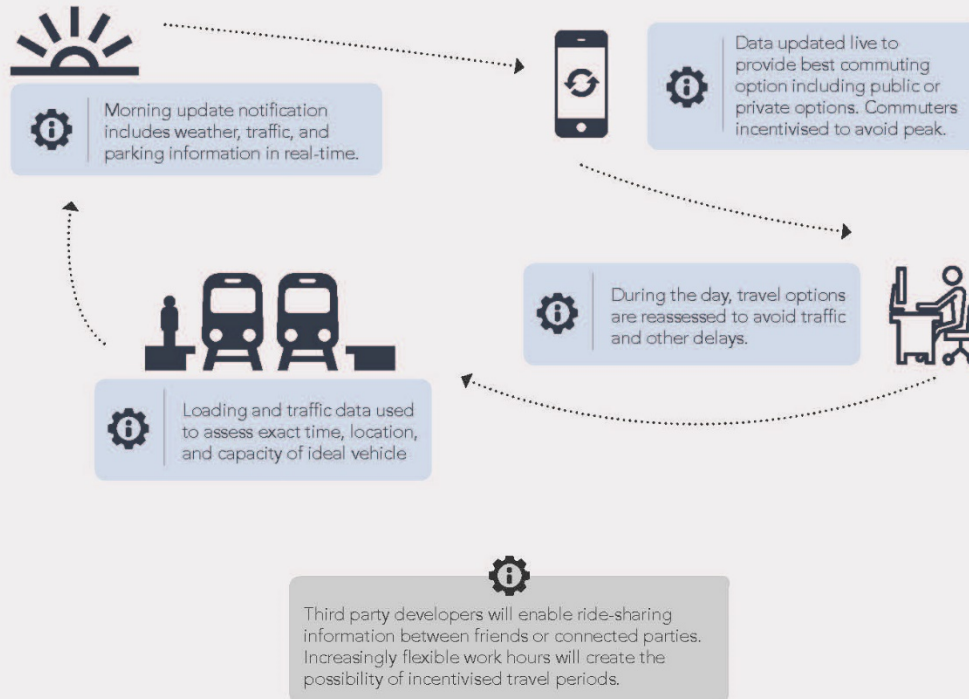
Commuting consumes thousands of hours of productivity daily and causes immeasurable stress. Smoothing public transport and road network utilization usage will enable more efficient people movement and reduce congestion, loss of productivity, and stress.

Future vision

Morning update notification includes weather, traffic, and parking information in real-time.

Data updated live to provide best commuting option including public or private options. Commuters incentivised to avoid peak.

During the day, travel options are reassessed to avoid traffic and other delays.

Loading and traffic data used to assess exact time, location, and capacity of ideal vehicle

Third party developers will enable ride-sharing information between friends or connected parties. Increasingly flexible work hours will create the possibility of incentivised travel periods.

PARKING

User story

Parking is one of the most important considerations for commercial operators and private citizens alike. The ability for commercial operators to be able to utilise a parking space close to their clients in a timely manner contributes to both time and environmental savings.

Apart from the ability to find and pay for a general park, the ability for commercial operators to find and operate spaces reserved for commercial operators becomes increasingly more essential as the city becomes more congested.

Future vision

Commercial park allocations allow colour sensors to display availability, and enable pre-booking of parks.
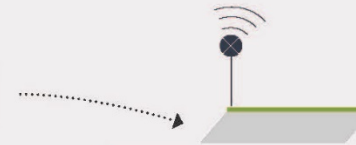
These smart parks enable the management of clearways and loading zones as time periods change. Notification enabled.

Smart resident parking gives locals easy access to off-street parking, and the ability to allocate visitor parks and new residents via an app.
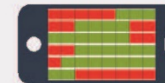
Allocated parking and booking system allows stress-free parking to be solved before a journey or event.

Appendix 3
– Draft Auckland Transport Technology Plan, 2016 to 2019

Draft Auckland Transport Technology Plan 2016 to 2019

Ref	Project/Action	Timing	Strategy Alignment	Deliverables	Budgeted 2016/2017	Budgeted 2017/2018
Efficient and Agile Network						
1.1	Increase CCTV roll-out on the roading network			Develop and obtain funding for the Programme	Yes	
				Develop CCTV Intersection & Traffic Count Analysis	Yes	
				Develop CCTV for route congestion collection	No	Yes
				Rollout of new CCTV installations to met strategy	No	Yes
1.2	Implement an incident and emergency management system			Implement Incident and Event management system based on HPE products	Partially	Partially
				Integrate with national systems	Partially	Partially
1.3	Integrate information into AT Journey planning and ITS management systems from other sources (taxis, tourist operators, car pooling, Telcos, car systems etc.)			Develop partnerships with and integrate taxis, car sharing, carpooling, commercial operators, tourist operators, intercity operators, commercial fleet data and information (for both planning and journey planning)	No	Partially
1.4	Implement dynamic laning			Investigate at least three routes and implement two	Yes	
1.5	Implement a planning and predictive traffic management system			Implement a planning and prediction traffic management predictive toolset based on real time sensors and public feeds	Partially	Partially
1.6	Automate lane enforcement (bus, cycle)			Investigate and pilot CCTV for automating lane enforcement	Yes	N/A
				Implement automated/ remote lane enforcement	No	Yes
Open Source Data						
2.1	Parking capacity and information made available			Trial technology to collect occupancy data	Yes	N/A
				Build an interface (API) for internal and third party development of occupancy and parking data	Yes	N/A
2.2	Ferry and Rail real time data made available			Publish the interface (API) for internal and third party development	Yes	N/A
				Build an AT-specific application (including devices)	Partially	Yes
2.3	New Forward Works Planner implemented and information made available			New Forward Works Planner based on CHCH Linz	Yes	N/A
				Build a software interface (API) for internal and third party development	No	Yes
				CAR interface for improved management and visibility of Road works in Forward Works Planner	Yes	N/A
2.4	Provide new and innovative ways of data sharing			New GitHub deployed and active contributions by developers to new mobile applications	Yes	Yes
				Establish Innovation spaces for trialling new technology	No	Yes
Focus on the Customer						
3.1	Improve personalised customer interactions using MyAT and other communicaiton channels to enhance infromation to customers			Expand on the current favourite journey to include individual alerts on routes and trips	No	Yes
				Investigate other catalogue items that could be implemented - parking, leases, congestion alerts and include new channels such as twitter, sms for customised information	Partially	Partially
3.2	Integrate external data sources into ITS systems and AT open data to support improved travel choice (i.e. weather, tides, holidays)			Include weather, tides, school and public holiday information - deliver as part of Niems project	No	Yes
3.3	Collect and Provide Congestion Data			develop data sources from Vodafone, TomTom, Eroads and other sources	Yes	Yes
3.4	Increase the network of route, wayfinding and travel information signs			Implement digital content management	Yes	Yes
				Implement digital information signs and wayfinding apps	Partially	Yes
3.5	Integrate more modes of transport information into journey planner (taxi, intercity bus)			Source feeds such as cityhop, taxi and uber and integrate into journey planner	No	Yes
3.6	Implementation of WIFI and customer experience on PT			Implementation of WIFI on PT vehicles	Partially	No
				Research on customer on board interaction options	Yes	N/A
Future Transport						
4.1	Implment trials to inform future roading ITS infrastructure programmes (CCTV, analytics and sensors)			Develop templates and configuration for ITS technology and sensors	Yes	N/A
4.2	Pilot Infrastructure to vehicle communications			Enable traffic signals and other roading information to communicate with vehicles and vice versa	No	Yes
				Pilot bi-directional communication with commercial fleets and vehicle devices	No	Yes
4.3	Investigate future requirements and emerging technologies for improved traffic signal management			Review Scats, Scats controllers and Scats activators in light of technological and software developments	Partially	Partially
				Plan the future of traffic signal management	Yes	N/A
				Upgrade SCATS	No	No

Draft Auckland Transport Technology Plan 2016 to 2019

Ref	Project/Action	Timing	Strategy Alignment	Deliverables	Budgeted 2016/2017	Budgeted 2017/2018
4.4	Pilot real time traffic management systems			Deliver congestion software monitoring trial using CCTV and other technology	Yes	N/A
4.5	Develop programme pipeline of trials to test ITS infrastructure on the roading network			Implement trials	Partially	Partially
4.6	Develop strategic partnerships with 3rd party organisations to deliver innovative ITS outcomes			Identify organisations to partner with and develop the relationships	Yes	Yes
				New Pilots and Trials	Partially	Partially
Safety						
5.1	Increase CCTV coverage on the Public Transport network			Prepare strategy and guidelines for CCTV and other safety points on the network	Yes	Yes
				Additional cameras outside of CIO and Road Safety	Partially	Partially
5.2	Increase safety of public across the multi modal transport network including walking and cycling areas			Integrate other Council and local board CCTV cameras to AT providing single view of all city cameras	No	No
5.3	Increase the coverage of automated red light running enforcement			Investigate the use of CCTV for Red Light running detection, reporting and enforcement	Yes	No
				Implement red light enforcement programme	No	No
5.4	Customer Safety			Implement help points for ferry infrastructure	Yes	N/A
Digital						
6.1	Implement a pilot digital accelerator programme			Set up a Customer Central innovation hub including a testing toolkit environment	Partially	Yes
				Design and implement a new procurement and supplier delivery partnership model to support digital	Yes	Yes
				Pilot programme of 5 initiatives leading to ongoing Digital initiatives and Bi-Modal IT delivery within BT	Yes	N/A
6.2	Enable Digital Content			Digital content management system available to manage bus, ferry, rail and all other digital assets	Yes	Yes
				Digital Library available for external use	Yes	Yes
6.3	Single View of Customer			Continue to use CRM as the single source of customer interaction information	Yes	Yes
6.4	Improve harbour master interactions with public			Implement new infringement system aligned to parking	Yes	N/A
				Complete mooring registration database	Yes	N/A
6.5	ITS Metro			Establish Interchange system for buses and also rail to bus at interchanges	Partially	N/A
				Implement Digital Wayfinding Side Screens on buses	No	No
				Smart Bus Shelter rollout	Partially	Partially
AT HOP						
7.1	Developing HOP Mobile			Introduce mobile top up	No	No
				Investigate integration of HOP top up into EFTPOS network	Yes	N/A
7.2	Expanding HOP			Supporting new infrastructure developments on the network	Yes	Yes
				Integration with Parking	No	Yes
7.3	Developing HOP Future			Development of HOP Strategy for expansion	Yes	Yes
				Research on customer experience, tertiary management, paper or Q code ticket options etc.	Yes	No
				Assisting with National Ticketing Options	Yes	Yes
7.4	Customer Self Service			Continue rollout of Self Service Forms	Yes	Yes
				Implement internal staff self service	Yes	Yes
				Improve customer and internal websites	Yes	Yes
Business Technology						
8.1	Implement Big Data and Analytics software platforms			Continue to develop Data Grids and real time computing to support AT's future Big Data storage and analytic requirements	Yes	Partially
				Enable third parties access to data	Yes	Yes
8.2	Continue to develop GIS, BIM and spatial systems			Develop GIS and Spatial Strategy	Yes	Yes
				Implement more spatial visibility of information such as parking availability, bus stop plans, roadworks, planned works	Partially	Partially
8.3	Implement a new Enterprise Asset Management Solution			Develop Enterprise Asset Management strategy	Yes	N/A
				Implement Asset Management Strategy	No	Partially
8.4	Incorporate Building Information Management (BIM) Files into AT systems			Implement BIM support into AT financial and EAM systems and field devices	No	No
8.5	Secure the continuity of Radio Communication Network used by AT			Ensure that AT has a Radio Communication Network to support rail, parking and events post current contracts	No	No
8.6	Cloud and Data Centre			Prepared Strategy, pilot on premises cloud options	Yes	N/A

Strategy Alignment column headers: Prioritise rapid, high frequency public; Transform and elevate customer focus; Build network optimisation and resilience; Ensure a sustainable funding model; Develop creative, adaptive, innovative; Supports AC Smart Cities - Transport; Supports MOT ITS action plan; Supports NZTA ITS responding to the

Timing columns: Year 1, Year 2, Year 3

Draft Auckland Transport Technology Plan 2016 to 2019

Ref	Project/Action	Timing			Strategy Alignment								Deliverables	Budgeted	
		Year 1	Year 2	Year 3	Prioritise rapid, high frequency publi	Transform and elevate customer foc	Build network optimisation and resil	Ensure a sustainable funding model	Develop creative, adaptive, innovati	Supports AC Smart Cities - Transpor	Supports MOT ITS action plan	Supports NZTA ITS responding to th		2016/2017	2017/2018
8.7	Documents Management	→					●						Continue on rollout out of document management systems for compliance	Yes	Yes
8.8	Security on the network	→					●						Continue on rollout out network security solutions	Yes	Yes
8.9	PMO Project Management	→						●	●				Review of Enterprise PMO requirements and implement recommendations	Yes	Yes
	Health and Safety														
9.1	Ensuring a safe working and travelling environment	→						●					Continuation of Health and Safety solution implementations	Yes	Yes
													Develop Enterprise reporting for health and safety, including all service providers	Yes	Yes