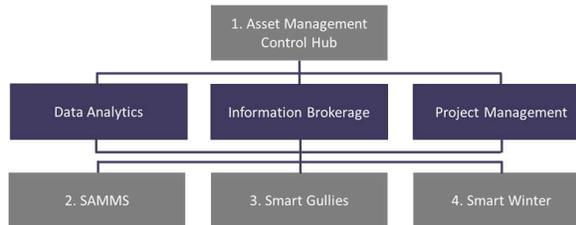


Live lab title	'Local Highways Asset Management Technology Incubator'
Lead authority	Kent County Council
Owner & champion	Simon Jones – Director of Highways Transportation & Waste, KCC David Ogden – Business Director, Amey
Location(s)	Kent County Council
Elevator pitch	<p>This project provides answers two key needs within innovation and asset management on the local network:</p> <p>Firstly, the creation and management of a centralised digital hub for all asset management data, presented within a unified dashboard, with the resource and software to analyse linkages and broker information between co-operating parties. Secondly the incubation and scale of data-led service re-design, combining dynamic network sensors, with the central hub to provide commercially viable alternatives to cyclical and reactive maintenance.</p>
Short form proposal	<p><b>I. Background:</b></p> <p>Infrastructure is on the precipice of a digitalisation revolution, with data-led solutions and outcomes seen as the future. However, the local highways market in particular has struggled to scale innovation over the last decade, with services still delivered reactively, with the sector struggling to develop sound commercial models to support technology led service changes towards asset management. Despite a move towards asset management principles within local government funding initiatives, the business case for a centralised digital asset management system has yet to be made, despite the obvious benefits and opportunities this holds.</p> <p><b>II. The needs to be addressed:</b></p> <ol style="list-style-type: none"> <li>1. No clear and co-ordinated central asset management dashboard for highways maintenance and management.</li> <li>2. Pace of service change towards asset management-led principles and technology investment stifled by difficulty in proving longer term benefits and use cases.</li> <li>3. Lack of extensive data for asset monitoring of road infrastructure, outside of expensive LiDAR techniques which also do not provide real-time data.</li> <li>4. Requirement for savings and alternative operating models across cyclical and reactive maintenance programs</li> <li>5. Well-managed Highways Infrastructure - The Code promotes the adoption of new and emerging technologies as part of highway service delivery. In an industry that is constantly changing and developing, the adoption of new ideas, methods of working and innovation can driver greater efficiency. Through effective working with our delivery partners, industry working groups and other authorities, opportunities for improvement can be identified and maximised for the future benefit of the County.</li> </ol> <p><b>III. High Level</b></p> <p>Key Deliverables:</p> <ul style="list-style-type: none"> <li>- <b>D1:</b> Project plan</li> <li>- <b>D2:</b> Requirements</li> <li>- <b>D3:</b> Solution architecture</li> <li>- <b>D4:</b> Solution creation + completion</li> <li>- <b>D5:</b> Successful operation against defined KPIs</li> <li>- <b>D6:</b> Defined and successful customer management/integration</li> <li>- <b>D7:</b> Data integration</li> <li>- <b>D8:</b> Front facing dashboard</li> <li>- <b>D9:</b> Ongoing monitoring + evaluation</li> <li>- <b>D10:</b> Final Report</li> </ul>

#### IV. Key Elements

##### 1. Asset Management Control Hub

The project is underpinned by the development and operation of an asset management control hub, situated within Room (OCR) of Control Hub will data sources including sensors, operational



the Operational Control Kent CC highways. The provide a conduit for all within on the network weather, satellite, routing.

The control hub will be governed by an intelligent dashboard, presenting a live view of the network. The hub will be responsible for collecting all data and providing intelligent analysis, both through software automation and consultancy form.

Figure 1: Asset management hub solution Overview

The key responsibilities for the hub are:

- Presenting a live GIS mapping dashboard of the network
- Collecting and sanitising all data sources
- Brokering information between 1<sup>st</sup> and 3<sup>rd</sup> parties
- Data analysis and support around service changes using the data provided

The hub will be fed initially by three new sets of sensors on the network: SAMMS, Smart Drainage and Smart Winter. Once operational, the hub will be open to third parties to test and operate software and hardware, with a focus on SME development in the local highways sector.

##### 2. SAMMS

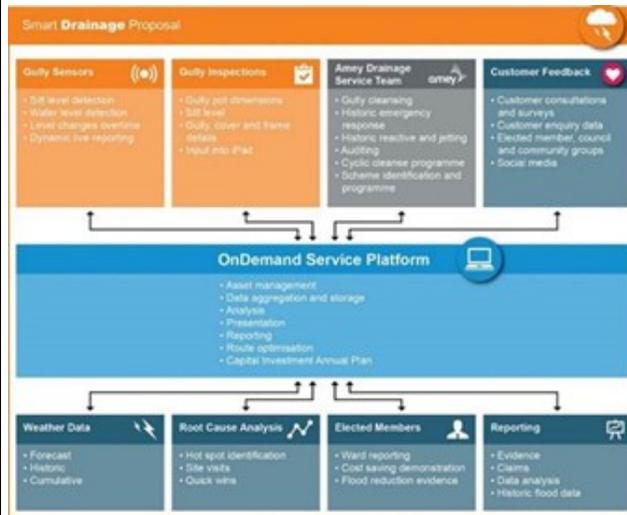
Using a combination of strategically placed network sensors, satellite data alongside other data sets, SAMMS provides the capability to predict areas of high risk terrain degradation whereby transport, energy and urban systems will be disrupted. Fed into the data hub dashboard, will be the ability to remotely and accurately monitor and assess the factors that affect the condition and long term stability of the Kent network.

Maintenance activities consider typical usage; however, landscape hazards (i.e. terrain motion, flooding) are not typically monitored by asset managers. To mitigate the consequences of routine usage, system managers use technologies to monitor asset condition (e.g. road surface, cuttings and embankments) and rates of change.

Current expensive state-of-the-art techniques for monitoring infrastructure include LiDAR, aerial imagery, tilt metres, traditional in-situ ground instrumentation and distributed acoustic sensing combined with weather forecasting. The proposed solution addresses this problem by exploiting the synergies of well targeted ground based sensors providing continuous accurate data at specific points and the new satellite data from the ESA's Sentinel series, which provides greater spatial data, but at less regular intervals, thereby creating an enhanced/more powerful combined data set.

The technological challenge focusses on combining the two different data sets to detect changes in the landscape and validate the results. The cost of traditional monitoring exercises range between £1500 (small inspection) to £100,000+ (major inspection, LiDAR Monitoring etc.), thus presenting an opportunity for savings through a remote sensing and satellite solution. The wider economic, social & environmental

drivers are as follows: Project end-user and proxy for a 'system', Kent County Council has a specific business challenge to satisfy internal and central parties and the public with improvements to the cost, quality and understanding of its assets, and, against a background of ever increasing traffic volume and 24-hour demand and is looking at new technologies to achieve this.



Through this innovative application of sensor data combined with satellite data, namely ESA's Sentinel data, a scalable approach will highlight areas of change across large areas to direct more detailed investigation. The deployment of low cost sensors in areas identified as high risk based on pre-existing data sets provides a live view of the status of the asset and differentiates the project from other ESA funded projects which use satellite data alone.

### 3. Map16 – SmartDrainage

SmartDrainage is the second sensor based service that will be feeding back into the control hub. This provides an innovative

IoT solution to improve the management and maintenance of the highways drainage network. It adopts an inspection-led and risk-based approach to asset management and service delivery. The resultant focus on essential activity reduces waste and cost and improves the service outcomes.

The demand for SmartDrainage is driven by the need to adopt a risk-based approach to asset management as per the UKRLG Code of Practice for Well-Managed Highway Infrastructure, the requirements of the HMEP Guidance on the Management of Drainage Assets – 2012. It also responds to the key drainage-related findings of the 2014 Transport Resilience Report

The imperative to change has been compounded by the demands on UK highway authorities to make routine expenditure savings. There is also now the added imperative to evidence a band 3 rating for drainage to achieve a full allocation of the Capital-Incentive Fund.

#### The benefits from implementing this service include:

- Detailed inspection-led methodology to provide a complete and **trusted inventory** of the highways drainage including accurate location data and condition assessment
- **Accurate condition forecasting** using inspection, silt-level records, analytical modelling, including use of weather, tree, topography, traffic and other external data-sets
- **Live data feeds** from sensors give real-time gully performance including flood alerts
- Enable an **evidence-backed, risk-based approach** to drainage maintenance, reduce the wasted effort and target resources on the areas of most need
- Ability to actively manage the highway gully asset **targeting hotspots** and providing robust **evidence for improvement** schemes
- **Reduced contaminated waste, reduction in carbon and water usage** and calculation of contaminants in the waste generated
- **Reduction in number of emergency call-outs and reduced complaints**
- **Reduced resource requirements** (plant, people, traffic management etc)
- **Improved customer service and end to end journey of enquiries.**

**SmartDrainage** delivers a high-performing highway asset with: improved safety; reduced flood risk on the carriageway and adjacent land; and, reduced risk of damage to carriageway/footway as a result of flooding and water ingress. **SmartDrainage** also enables reduce the cost of gully asset management.

#### 4. Smart Winter

Smart Winter aims to help the Council ‘smarten’ their winter services, by installing 120 road surface temperature sensors (RST) on the network, delivering real time RST data back into control hub. This data will then be layered into the GIS mapping tool, with the hub providing intelligent and proactive gritting routes during winter, providing savings on unnecessary gritting routes, as well as safer roads due to the dynamic nature of deployment.

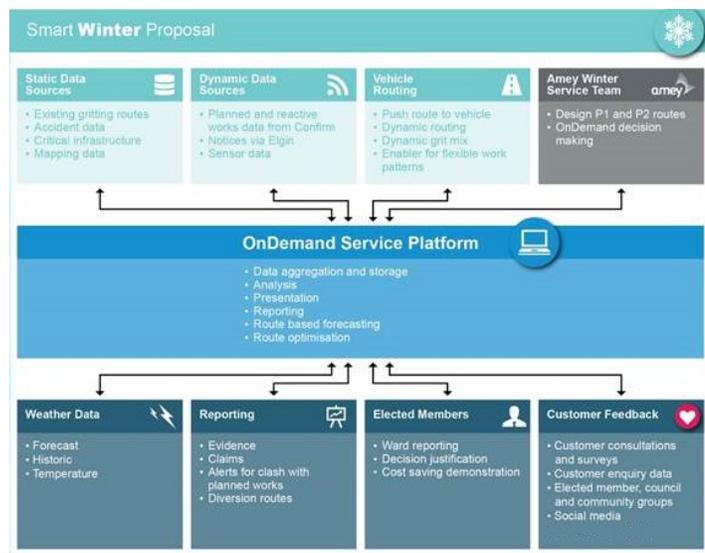
Efficiencies can be achieved through:

- Route optimisation of pre-salting routes for greater efficiency of resources with improved service levels.
- Improved understanding of weather domains and micro climates.
- Targeted gritting – rather than gritting a whole route, only gritting the parts which are likely to freeze (RBF) and using lower levels of salt in the wet mixes.
- Dynamic routeing may also mean that fewer gritters/drivers are required on any single night
- Less lost time costs (i.e. where drivers are held on standby). Whilst drivers may be salaried, being held on standby at the depot then meant they weren’t available for work the following day having been up through the night.

The Diagram to the right details how a the solution would fit into the lab.

The average cost of gritting per night is £20,000, with previous analysis showing 13 out of 59 nights could have had savings made in some form.

The DfT estimates £280m is lost through disruption from snow and ice DAILY – so ‘savings’ (from the national economy perspective) can equally be made by reducing this figure.

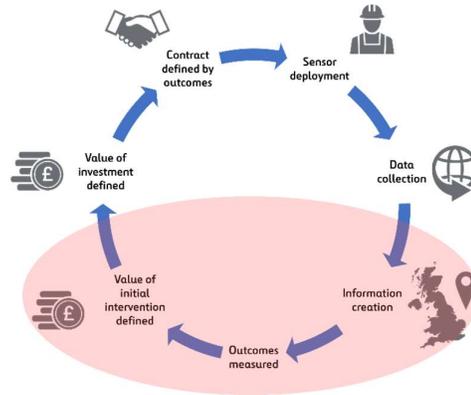


#### 5. Late-stage SME smart technology scale up

The final element of project, will be to open up the ‘live lab’ to third parties to test both software and hardware solutions. One of the key outputs from the lab will be to assist in validating technology hypotheses, through the analysis of outcomes from data led services. Amey and Kent recognise the difficulty in scaling technological solutions and as part of the project, will look to assist and incubate innovative solutions from smaller providers.

Amey will provide an expert steering committee alongside Kent CC who will review and curate incoming opportunities. The focus for this live lab will be ‘proven technology, without proven commercial viability’. While remaining flexible to new ideas, the live lab will focus on mature solutions which are struggling to scale effectively.

The diagram below gives an example of where we see the value chain of technology investment bottlenecking and therefore where our solution will be targeted.



Amey will provide consultancy and project management to assist Kent CC in defining alternative ways of working based on the technology within the lab, towards a data-led 'on-demand' way of working. The output after 2-years is to present valid technology, with combined demonstrated effects of efficiency and productivity, feeding alternative methodologies in service delivery.

Once effectively scaled, new solutions can be adopted around the ADEPT network safely, with clearer value proposition.

Within the project, service methodologies developed through the lab will be evaluated for their application to other services within Kent. For example, dynamic grass cutting.

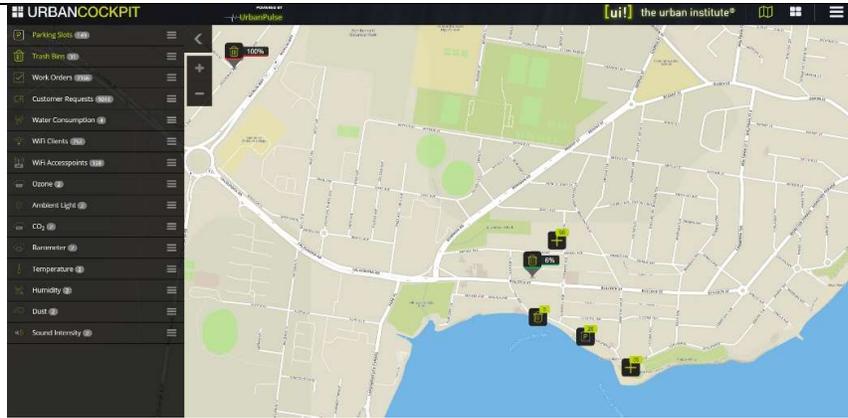
All solutions and services developed within the lab will be open and accessible to other ADEPT members with the key output being to break the innovation scaling bottleneck in Highways and promote dynamic service delivery.

The diagram to the right details a proposed 'on-demand' methodology that will be promoted within the lab, with the potential to scale to all services delivered on our roads.



Term contractor partner	Amey
Educational/academic partners	Birmingham University – currently working on winter sensors. Also seeking Kent based suitable partner.
Other partners	Map16, UI (Dashboard + APIs), Rezatec (SME satellite data analysts),
Indication of scale	<ul style="list-style-type: none"> <li>- <b>WP1:</b> Project management £200k</li> <li>- <b>WP2:</b> Requirements + operating model definition £50k</li> </ul>

	<ul style="list-style-type: none"> <li>- <b>WP3:</b> Solution design £150k</li> <li>- <b>WP4:</b> Solution build £1m</li> <li>- <b>WP5:</b> Solution launch + operation £2.5m</li> <li>- <b>WP6:</b> Evaluation + final report £50k</li> </ul>
<p>Funding package, leverage etc.</p>	<p>The ADEPT funding will leverage c£1m of Amey benefit in kind funding, as well open up the possibility for broader Ferrovial investment.</p>
<p>Data analysis and testing regime</p>	<p>The Hub will utilise [ui!] UrbanPulse is an open smart data platform that presents data internally and externally in both real time and forecast for powerful data analytics &amp; reporting. [ui!] UrbanPulse has an existing library of over 60 connectors/API's for data sources ranging from Siemens &amp; SWARCO TMS to FLIR Flux (Traffic Camera Server System) which can be easily extended to new devices &amp; systems. [ui!] UrbanPulse will be responsible for creating and managing the APIs for current and new data sources throughout the 2-year period. MS Azure will be the hosting platform for both [ui!] UrbanPulse and Amey Asset Management software enabling easy integration, fast scaling and robust service levels.</p> <p>[ui!] UrbanPulse – Map View</p>  <p>[ui!] UrbanPulse – Map View</p> <p>[ui!] UrbanPulse will integrate with an in-house Amey asset management system and team, who will be responsible for information brokerage.</p> <p>The key analyses under-taken will be around before and after states on the network, with the first few months of the lab being based around understanding baselines for all relevant data sets and processes.</p>



Approach to knowledge sharing

Where possible, Kent CC and Amey will actively promote the dispersal of ideas and strategies throughout their respective networks and beyond. Amey will take a leadership role in managing it's supply chain and passing on the learnings from the lab. The lab will build on existing relationships that exist between Kent CC, Amey and the local business community and work to create new opportunities and learning through monthly strategy meeting with local stakeholders.

Kent and Amey see the lab having greatest effect if the information gained is shared throughout the ADEPT community and will look to take pride in the outputs rather than be locked away. A key blocker within the scale up process is an over-abundance of bureaucracy around NDA and IP, while the project team accepts these will exist, the strategic direction of the lab will be around open data and learning.

Approach to commercialisation

The incubator will become an innovative and entrepreneurial space that offers the tools and vision to scale qualified technologies and services from pilot into full-blown solution. The solutions, services and technologies that exit the lab successfully will have had the preparation to be applied across the ADEPT network, ready to change the way we deliver services every day.

The team within the lab will be involved in actively reviewing the service structure for the current delivery of a given technological solution and will provide knowledge, impetus and governance on how to effectively scale and leave lab with a commercially viable service.

**Commercialisation support will centre around:**

- Shared services
- Investments
- Selling services
- Pricing analysis
- Fitness of traded services
- Consideration of concessions
- Better contract management
- Continuous improvement in procurement

**Objectives for commercialisation:**

- Help enable SMEs to develop projects that least cover all their costs including overheads (and potential opportunity cost) in order to reduce future risk of scaling problems, and be profit generating in the future
- Attract alternative investment models to support service delivery e.g. through social investment
- Invest and use our financial strengths to deliver a financial return
- Ensure that outcomes in the local community are delivered on a sustainable basis
- Strengthen our reputation with residents, local businesses, the Local Government sector, staff, other customers, partners, and stakeholders in general
- Become a services provider to new and existing customers both from within the local authority environment and beyond, particularly where we are uniquely placed to do so

	<ul style="list-style-type: none"><li>- Use the commercial knowledge acquired through this programme to gain a competitive advantage</li></ul>
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