NICTA Comments on the Draft NSW Freight and Ports Strategy

Dear Transport for NSW

NICTA thanks the NSW Government for the opportunity to comment on the Draft NSW Freight and Ports Strategy (“the Draft Strategy”). This response builds on NICTA’s earlier input to the NSW Draft Long Term Transport Master Plan, and strengthens our ongoing relationships with the NSW Government, Roads and Maritime Services, Transport Management Centre and many related agencies.

As Australia’s largest ICT\(^1\) research organisation, and headquartered in NSW, NICTA’s mission is developing and applying ICT for the benefit of the people of NSW and Australia.

By applying appropriate technology and techniques NSW can build a data-driven, connected, and aware transport system in which freight has maximised capacity, operates at higher efficiency and safety, and is harmonised with other transport modes. At the same time, richer input can be provided for planning.

NICTA has a record of working with government at all levels; our Infrastructure, Transport and Logistics group is focussed specifically on how technology and underpinning research can help NSW realise a more productive future.

We look forward to working with NSW Transport to further develop the Draft NSW Freight Strategy and assist in its implementation.

Summary

The Draft Strategy provides a clear and structured response to freight challenges facing NSW during the next 20 years. ICT is fundamental and pervasive in enabling NSW to identify, quantify, analyse and optimise outcomes for these challenges; NICTA’s expertise should be leveraged to help NSW create a freight future that makes more productive use of existing infrastructure and enables increasingly efficient planning to accommodate forecast growth in demand.

ICT has a foundational role to play in the three Strategic action areas identified in the Draft Strategy:

1. **Network efficiency** – through the use of Intelligent Transport Systems (ITS) technologies to manage congestion and to enable trade-offs between passenger and freight networks; advanced optimisation applied to fleet logistics; real time traffic information conveyed to all road users and intelligent pricing strategies to reduce peak demand; and system wide optimisation applied to the port-rail-road system. ITS can also be used to improve motorway performance through intelligent ramp metering technology, as well as ensure freight vehicles keep to designated routes on public roads.

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\(^1\) Information and Communications Technology
2. **Network capacity** – through using planning tools based on data driven models of the total transport system to predict demand and guide capacity upgrade priorities; fusion of data from different sources to build a clearer view of network performance; both local and system wide optimisations to unlock latent capacity (especially at inter-model intermodal interfaces) and automation and safety technology which will ultimately allow much safer use of High Productivity Vehicles (HPVs).

3. **Network sustainability** – through the use of new technology such as Cooperative ITS (C-ITS) and collision avoidance technologies, culminating in autonomous freight vehicles as envisaged in overseas jurisdictions such as California and Florida, and locally in Victoria. Environmental, noise and congestion management dividends will flow from ITS applied to improve overall network efficiency.

NICTA has active engagements in many of the areas where ICT can improve freight transport outcomes. Each of these projects is either already demonstrating, or developing techniques which will contribute to, improved network efficiency, capacity and sustainability. Table 1 illustrates the NICTA projects relevant to transport and maps them to components of the Draft Strategy. These projects build on a decade of close involvement with NSW, Australian and global transport innovation initiatives.

<table>
<thead>
<tr>
<th>NICTA Project</th>
<th>Benefit</th>
<th>Strategic Action Area / Actions</th>
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<tbody>
<tr>
<td>Intelligent Fleet Logistics</td>
<td>15% savings in distribution costs through optimised routing</td>
<td>Efficiency, Task 1A-5</td>
</tr>
<tr>
<td>Container control</td>
<td>ICT to match empty containers to exporter needs – will reduce 470,000 container moves p.a.</td>
<td>Efficiency, Capacity, Task 1A-4</td>
</tr>
<tr>
<td>Truck On</td>
<td>Over height vehicle detection using wireless C-ITS – reduce trucks blocking tunnels &amp; underpasses</td>
<td>Efficiency, Sustainability Action 3C</td>
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<tr>
<td>Cooperative Traffic Signal Control</td>
<td>Reducing stopping at intersections by 17%</td>
<td>Efficiency, Capacity Task 1A-5, Sustainability 3B</td>
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<tr>
<td>Cooperative Intelligent Transport Systems (C-ITS)</td>
<td>World first freight testbed with 3 intersections, 30 trucks, 42km of highway in Illawara</td>
<td>Efficiency, Capacity Action 2C, Sustainability 3B</td>
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<tr>
<td>Shortest Path in Transit networks</td>
<td>1000 times faster calculations for complex travel optimisation</td>
<td>Efficiency Task 1A-5, sustainability Action 3C</td>
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<tr>
<td>Driver Mental state monitoring</td>
<td>Truck and train driver safety, input to policy</td>
<td>Sustainability Action 3C</td>
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<tr>
<td>Making Sense of Traffic Data</td>
<td>Resilience reduce impact of incidents</td>
<td>Efficiency Task 1A-5, Sustainability Action 3C</td>
</tr>
<tr>
<td>Informed Structures</td>
<td>Monitoring critical transport infrastructure like the Harbour Bridge to reduce downtime</td>
<td>Efficiency, Sustainability Action 3C</td>
</tr>
<tr>
<td>Ship Scheduling with Time-varying draft</td>
<td>Increasing bulk port capacity by 1.37% a day</td>
<td>Capacity Action 2D</td>
</tr>
<tr>
<td>Total Port Optimisation</td>
<td>Exploratory project to optimise “ship to shop” operations.</td>
<td>Efficiency Action 1B, Capacity Action 2D</td>
</tr>
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**Table 1 – NICTA projects relevant to freight in NSW.**
We would like to assist Transport for NSW in further refining the Draft Strategy so NSW will benefit from the latest developments in Intelligent Transport Systems (including Cooperative ITS), fusion of data from multiple sources, data-driven modelling, and network optimisation.

**NICTA and Transport**

Over the last six years, NICTA has worked extensively with both Federal and NSW government agencies and NSW RMS (formerly NSW RTA). NICTA has considerable research expertise and practical experience in transport. Our technology and research has been deployed in joint projects including video traffic detection, roundabout metering and signal control, over-height vehicle detection (Truck On), structural health monitoring for the Sydney Harbour Bridge and, in conjunction with the NSW Transport Management Centre, incident management. All these areas can benefit the freight network and port operation, and some are shown in Table 1.

In the freight area NICTA has developed and deployed world-leading logistics tools which could potentially improve fleet efficiency by 10% over state-of-the-art and could add $1 billion to NSW GSP over the next decade\(^2\) with parallel benefits in reduced freight congestion and pollution. We also established the world’s first Future Logistics Living Laboratory here in NSW working with Australia’s most important freight stakeholders. NICTA is exploring optimisation of Port Botany (especially the interface with rail), future Air Traffic Management and is in discussion with CSIRO on a pilot project to quantify the benefits of smart transport technology in Australian urban areas.

At a national level NICTA holds a seat on the board of ITS Australia and contributes fundamentally to developing an ITS framework designed for Australia. We are also members of the National Managed Motorways Working Group and are working with AURIN\(^3\) on a project to harmonise Australian Household Travel Survey techniques. Internationally we are active in the EU’s development of cooperative traffic management systems and global transport forums, and we work closely with Germany’s Fraunhofer Institute on a wide range of transport-related initiatives.

**Specific Comments**

We have a number of quite specific suggestions to make on the Draft Strategy.

**ACTION1A - Identify freight movements and network demand**

NICTA supports the basic tenets and goals of this section. NICTA has technologies that:
- support the sharing of data sets across organisations;
- use all the available data for decision making (with resorting to ‘guesstimates’);
- assist effective designs and decisions even when data is incomplete.

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\(^2\) Deloitte’s Access Economics

\(^3\) Australian Urban Research infrastructure Network
Task 1A-4 Develop the Sydney Metropolitan Cargo Movement Model.

NICTA strongly supports this approach. Modelling and simulation should take a holistic approach and incorporate all transportation (people and freight) on Sydney’s shared infrastructure network.

However, this should not be limited to container movements and it applies to all other Strategic Actions Areas: Network Efficiency, Network Capacity and Network Sustainability. Network modelling will benefit any ACTION where network analysis, planning and network redesign are being required such as ACTIONS 1A, 1C, 1F, 2B, 2D, 2F, 3A, 3B.

p122 ACTION 3C - Prioritise safety of freight transport

Improving safety of freight transport

This section lacks acknowledgement of the central role that technology is playing and will play in enabling safety systems of the future. In fact technology does not get mentioned.

In particular Task 3C-2 Improve heavy vehicle safety will rely heavily on technology to ensure that vehicles and drivers are safer and compliant with regulations. These technologies include collision avoidance, over-head collision prevention, over-weight truck prevention, speed compliance, near-miss detection, lane keeping, driver fatigue detection, driver mental state monitoring, driver aptitude measurement, driver training/education and feedback, prohibited substance detection, electronic driver diaries, vehicle loading, vehicle wear and tear, traffic warnings, incident warnings, road condition warnings.

Note: We believe that technology can play an important role in the acceptance of High Productivity Vehicles by the public. For example, properly equipped HPVs should be demonstrably safer than older-style smaller trucks.

We suggest adding this or similar sentiments to each task in this section:

“Safety Technology Roadmap”

Rapid developments in safety technologies will have a significant impact on effective safety strategy for this Task. Regulation and Policy must factor in these developments and encourage the adoption of technologies that achieve maximum benefit. A technology roadmap will be developed to inform this task of the preferred use and impact of safety-related technology.”

Air Freight

No mention is made of air freight. Air freight is predicted to double by 2033 (very similar growth figures to sea freight).

p128 6.2 Prioritisation

• p128: 2nd paragraph Action 1A has task numbering errors.
• p128: Figure 33 Action 1A has task numbering errors.

There are some areas not detailed in the Draft Strategy which we believe are important to emphasise:

1. While attention is given to the tension between passenger and freight traffic in the rail network, the same tension is evident in the road network between passenger and freight traffic. Intelligent transport system technologies both in vehicle and in road
infrastructure can help alleviate this tension and provide a policy lever to implement trade-offs between different classes of road user. Further, ITS and advanced signalling systems can also improve coordination between rail and road transport modes (for example, at a railway level crossing).

2. The strategy rightly concentrates on the freight component of the transport network; we suggest that more thought needs to be given to optimising freight within the context of the wider transport system across modes, for example, taking into account the interplay between passenger and freight road vehicles, or between road and air transport.

3. The role of regulation in uptake of safety and efficiency technology could be given more emphasis. Active safety systems for road vehicles are improving rapidly and many advanced features such as radar assisted braking and collision avoidance are becoming available commercially. Features such as automatic stability control are now required in some jurisdictions. These systems can compensate for driver errors, and even drive vehicles autonomously. We believe consideration could be given to mandating such technology in future vehicles and investigating which safety technology may be retrofitted to existing vehicles. The goal in freight should be to implement technology aimed at zero injury crashes. We think that fully autonomous vehicles will hit the market sooner than originally anticipated and within the time span of the strategy.

4. Real-time dashboards. The Draft Strategy mentions KPIs measured quarterly. Technology can provide continuous real time performance measures. We think the ability to visualise the state of the network and derive insights in real time would augment quarterly KPI reporting, and importantly, allow “forward-looking” metrics and real-time optimization - leveraging predictive capabilities of machine learning analytic tools - rather than relying on KPIs, which are, by definition, historical.

5. Through NICTA’s work in next generation Air Traffic Management, we are aware that air traffic through Sydney airport will double over the period the strategy addresses. Sydney airport generates its own, relatively low volume but very high value, freight movements as well as adding to passenger traffic congestion which affects airport efficiency and has knock on effects for Port Botany. Similarly freight on the road transport network around Port Botany causes inefficiencies for Sydney Airport. Improving this situation requires more attention in the Strategy. NICTA has modelling and optimisation techniques which can effectively integrate multiple data sources, and produce a model of the airport and port precinct and evaluate alternative strategies for improving performance.

6. Simulation should play a key supporting role in many aspects of the implementation of the Strategy. Simulation can provide support at many levels:

- **Prioritisation.** Simulation can provide the analysis required to identify priority projects and hidden dependencies. For instance, an intermodal container terminal may provide a significant boost to productivity, but if changes are not made to dependent road infrastructure, much of the gain may be lost. Simulation can provide guidance on making sure linked projects stay in step.

- **Stake-holder education.** Raw analysis can sometimes be difficult for stakeholders to understand and accept. Simulation can show the effect of change more intuitively. For example, a change of work practice may be able to increase productivity in a particular area by a significant percentage, but convincing all
parties of the effectiveness may be a difficult task. Having a simulation system that allows all parties to see the effect of proposed changes can be a useful tool in gaining acceptance.

- **Independent verification.** An independent simulation system can be a very useful tool in validating expectations for infrastructure enhancements. This will help ensure that any new infrastructure or new practices will deliver the forecast returns.

Simulation should be used as a tool in the implementation of several tasks within the Strategy, including Tasks 1D-2, 1F-1, 2B-2, 2C-1, 2D-1, 2D-2 and 2D-3. NICTA is developing significant expertise in simulation methods, and is developing simulation systems across a range of projects. We are well placed to provide simulation services to the NSW Government.

7) The Strategy will provide many opportunities for the use of Optimisation techniques to improve outcomes. Tasks 1F-1 in particular, envisions a role for the NSW Cargo Movement Coordinator in day-to-day planning and scheduling. These are technically very challenging problems, requiring a deep understanding of the ICT and optimisation challenges to be faced. They are areas where optimisation techniques have played a key role in improving efficiency in many logistics systems. Opportunities for employing state-of-the-art technologies in this area should be examined closely. This is again an area where NICTA has applicable expertise.

**General Comments**

By applying appropriate technology and techniques NSW can build a data-driven, connected, and aware transport system in which freight has maximised useable capacity, operates at higher efficiency and safety, and is harmonised with other transport modes. In so doing, richer input can be provided for ongoing planning for new investment.

**Steps to improve freight and port efficiency, capacity and safety through ICT**

Key steps in realising this vision are to:

- Make better use of data by fusing together data from existing sources including data from new sources such as cooperative ITS, traffic cameras and mobile phones (GPS and triangulation from cell towers), user generated content and in-vehicle GPS devices.
- Make the data available in real time, and in a form actionable over the internet to all parties at no or minimal cost as a matter of policy to encourage an innovation ecosystem around more efficient freight and port operations
- Apply optimisation, data mining and machine learning techniques to the fused data to improve planning, operations and safety
- Ensure that all freight (and other) transport infrastructure is networked with high capacity broadband and ICT-enabled with appropriate sensors

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4 Machine learning is a technique where software can be trained to recognise patterns in data and then use this training to accurately predict future patterns.
• Encourage implementation of the latest ITS in infrastructure and freight vehicles to improve both efficiency, safety and sustainability
• Inform freight and ports stakeholders in real time about the performance of the relevant part of the transport system and use this to help with demand management, both direct (possibly through pricing) and indirect through targeted, individually relevant information.
• Encourage using telework to reduce overall demand on the transport infrastructure
• Encourage the deployment of the latest fleet logistics solutions to make better use of the available capacity of the transport network.

NICTA has expertise and proven experience which can be applied in each of these areas for the benefit of NSW.

Outcomes from the use of ICT in Transport

There are several outcomes directly corresponding to Strategic action areas which are enabled or supported by ICT, and which apply across all transport modes, public and private:

• Data-driven Planning and operations
• Increased efficiency of transport infrastructure
• Stakeholder Focus
• Safety Technology
• Reducing and managing demand

We discuss each in turn.

Data-driven Planning and Operations – ACTIONS 1A, 2A and 3A

A large amount of real-time and other data is gathered across the transport system second by second and on longer time-scales. For roads, data is collected from inductive loops, and at toll gates. Quantitative traffic measurements can also be derived from analysis of video from cameras. With triangulation, or through cell tower associations, mobile phones can provide passive indications of vehicle and people movement in mass. Smart phones and satellite navigation systems provide precise records of person and vehicle movements through special applications and movement logs respectively, giving direct insight into potentially millions of origin-destination travel pairs across all travel modes. Sydney buses and trains are equipped with GPS units and their precise location is known at all times. Air traffic movements are known precisely. Data feeds from social media such as Twitter can be analysed to identify acute problems or to understand customer sentiment.

Taken together, there is a vast amount of information than can give insight into how to better operate the integrated transport system minute by minute, and to predict future behaviour. In particular, by fusing data across several sources, we can answer questions such as where capacity constraints will emerge in future, how responsive drivers and freight operators will be to demand management strategies, how to balance demand between commuters and freight operators, how to better adapt traffic control signals to actual demand, or gain insights into how to improve safety or respond better to incidents. NICTA has world-leading expertise in how to fuse and interpret data to provide both analytical insight and predictive ability. NICTA
has used these techniques in areas as diverse as traffic incident management, exploration of geothermal power, and determination of maintenance priorities for water mains.

**Increased efficiency of transport infrastructure – ACTION1A**

For Strategic action area 1 (Network Efficiency) ICT should be at the heart of policy. For road efficiency, this may include better control of traffic signals, optimised adaptive speed limits, ramp metering, dynamic pricing to manage demand, control of freight paths using GPS, and the provision of real-time traffic information which may be acted on by humans or machines to choose better paths, different transport modes, or to voluntarily change trip times to avoid congestion and reduce peak demand. Cooperative ITS allows vehicles, humans and infrastructure to signal location, movement and hazards in real time using DSRC technology. While primarily promoted as a safety technology, there are efficiency benefits to be gained through more rapid response to incidents, the improved ability for traffic signals to respond to individual vehicles, and a general platform for tolling. C-ITS could be used to coordinate road and rail intersections, and inform and manage broader multimodal interdependencies.

In a simple example for road, NICTA developed better algorithms for traffic light control at a complex roundabout in Albion Park in conjunction with the then RTA, with simulations showing an 8% improvement in performance. This kind of efficiency increase, applied state-wide, could add billions of dollars to GSP through better congestion management. Any improvement in efficiency translates into an environmental benefit as well through reduced emissions and improved efficiency for both freight and passenger road users.

For freight and passenger rail, advanced signalling systems, driverless trains and ITS concepts analogous to those used in roads may also be used to drive improved efficiency and to balance the needs of both freight and passenger users.

ICT improves the efficiency of vital inter-modal terminals through advanced optimisation techniques. NICTA is exploring a project of this kind aimed at optimising the operation of Port Botany and its interactions with the rest of the transport network, beginning with the rail interface. Similar principles could be applied to Sydney Airport which, as the Draft Strategy notes, places ever increasing transport demands on the network.

Traffic signal control is of special significance in NSW. The NSW Department of Motor Transport (the lineal ancestor of the current RMS) pioneered perhaps the world’s leading adaptive traffic signal control system, SCATS, in the early 1970s. This system has been reducing trip times, managing congestion and minimising stop/starts for around four decades. Since that time there have been orders of magnitude improvements in computational power, network bandwidth, sensor technology, numerical techniques for optimisation, and in predictive techniques such as machine learning. In addition, Cooperative ITS technology using DSRC is being deployed and standardised in major markets. DSRC provides additional and useful inputs for optimising both the performance and safety of signalized junctions.

Given these advances, NICTA believes there is significant scope for enhancing SCATS through the use of video and other sensors to measure traffic queues and vehicle speeds; and the use of DSRC to both tune traffic signals and provide information to approaching vehicles.

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5 Dedicated Short Range Communications
vehicles. These systems can also distinguish between passenger and freight traffic on roads and allocate policy driven priorities. The better management of congestion achievable by such enhancements could add billions of dollars to GSP. NSW might also take a leadership position in encouraging the uptake of DSRC in its own fleet of vehicles, or more boldly, in introducing legislation to mandate it in new vehicles, as California does.

In addition to making the transport network more efficient, ICT can also make more efficient use of the existing network. As noted earlier, NICTA’s Intelligent Fleet Logistics software, Indigo, has been shown to lead to efficiency improvements in excess of 10% in practice, and such approaches applied state-wide would add billions to GSP in improved efficiency. It is especially important to encourage the large number of small freight operators in NSW to begin using this kind of technology.

Stakeholder focus

Freight stakeholders crave information about transport that allows them to make good decisions regarding travel. Good transport information is critical to freight performance. A good decision may be to delay a trip because the transport system is simply too busy. Uncertainty about traffic conditions, incidents, and maintenance all cause inefficiency and make it hard to manage demand.

Much of the data needed to make good decisions already exists, and vastly more will become available from DSRC, mobile phones and computer vision applied to video from traffic cameras. Data from several sources can be fused together provide a clear view of the performance of freight transport network and port operations.

ICT such as smart phones, intelligent signage, or GPS systems in trucks can all be used to as channels to provide freight operators with information to optimise their operations.

To be most valuable this information needs to be delivered when it is needed and where it is needed (e.g. to your truck when you are deciding which route to take and when).

It is important that government provide such services, but equally important that the raw, real-time information is made freely available to the innovative community of entrepreneurs who are expert at delivering new services on mobile devices.

Feedback from community and stakeholders is important and, increasingly, social media can be used to gauge public and can be used as tools to improve community engagement. NICTA’s Opinionwatch and Eventwatch have been designed to help understand public sentiment of topics using material posted on the web or on Twitter.

Safety Technology — ACTION 3C

ICT can improve transport safety in two main ways. First, by improving the active safety of vehicles and infrastructure, and second by improved insight from data analysis of crash and incident patterns,
Active Safety

It is well recognised that there is very little that vehicle manufacturers can do to further reduce the risk of injury to vehicle occupants due to a collision, hence technology is now focussing on avoiding collisions. Seat belts, airbags, electronic stability control and ABS have all contributed to reducing both the crash rate and the severity of injuries and the number of deaths due to traffic crashes. Developments by NICTA and others creating significantly low cost “radar on a chip technology” will take the issue of cost out of the hands of automobile manufacturers as they seek to achieve “zero fatality” and zero incident targets.

The next leap in vehicle safety will be reducing the probability of collisions and their severity when they do occur, through the use of low-latency vehicle-to-vehicle communications (DSRC) which will warn vehicles of impending collisions and systems which will assist the driver to safely take evasive action through to autonomous systems ultimately leading to self-driving vehicles.

DSRC is the cornerstone of Co-operative ITS (C-ITS), aimed at improving the efficiency, safety and sustainability of the transport system beyond the levels obtainable with standalone systems. With the huge increase in the use of smart devices it is evident that C-ITS technologies will be pervasive in the next few years.

NICTA has already demonstrated a DSRC safety system in collaboration with NSW RTA: TruckOn. TruckOn used a simple vehicle height detection system coupled to DSRC radios to communicate warnings to over-height vehicles. Such a system, if deployed before tunnel entrances and low bridges could save millions of dollars per year in maintenance costs and lost time due to induced traffic congestion when a truck blocks an underpass or tunnel. Extensions to other situations such as rail level crossings are self-evident.

Safety Insights from data

Detailed analysis and data fusion of cell phone, loop, GPS and other data is likely to yield insights in many critical aspects of road transport performance and safety.

NICTA is exploring this type of analysis with the NSW RMS. Such analysis may allow us to predict the time it takes to clear a traffic incident, provide earlier warning that an incident has occurred and also gain insight into how congestion propagates outwards from the incident and which are the key links and intersections sensitive to the effects of a particular incident.

We can also improve our understanding of travel times by understanding the impact of incidents on travel time, developing a more detailed and comprehensive insight into daily travel patterns and also determining the reliability and utility of new data sources such as cell phone and floating vehicle data. The results of such analysis can then be used to improve traffic management and safety.

Reducing and managing demand – TASK 1B-2

Increasing demand, and especially peak demand, is the root cause of degraded performance in the transport network across all modes. Improved efficiency (most economically attained through the use of ICT) in each mode assists in dealing with the problem as does ensuring
Each transport mode is used to its fullest capacity – for example, shifting load from road use to trains.

At some point peak demand will exceed capacity and the only possible response to avoid degraded performance is to either increase capacity, or reduce the peak demand.

Increasing capacity is expensive as it requires capital works, and in Sydney, often requires even more expensive tunnelling. Consequently, reducing peak demand across the transport system is critically important in helping NSW meet its future transport needs.

There are three approaches to reducing peak demand that can be enabled by ICT.

The bluntest approach is to use variable pricing mechanisms to alleviate peak demand. The mechanisms to support this are enabled by ticketing technology, DSRC, tolling technology, and video analysis of number plates. In the road system NSW already employs variable tolling on the Sydney Harbour Bridge, and cities such as London charge a “Congestion tax” (though conceptually it is actually a peak road rental charge). On the rail passenger network the concept of peak versus off-peak fares is well accepted. NICTA can assist in this area by fusing together transport data so it may be visualised and analysed to see where and when peaks are forming and will be forming. We can also explore optimal solutions for spreading the peak demand.

An indirect approach, but one which may have potentially large impact is to give travellers targeted and relevant real-time information so they can choose best mode or time to travel. Some of this information is available on Google Maps for road users and there is some information from government sources. However it could be improved by being closer to real time, ensuring it is delivered in an easy to use and rapid way (e.g. optimised smartphone apps with minimal keystrokes), and, most importantly personalised an relevant (i.e., what is my next train and how full is it? Or how busy are the roads on my journey?). NICTA has the capability to fuse data from multiple sources, use machine learning to derive predictive patterns and to help make personalised and relevant information.

Demand can also be reduced by encouraging working from home, or at a suburban “telehub” one or two days per week. This is increasingly viable as high-quality, two-way video and pervasive broadband make large scale teleworking possible. NICTA is actively exploring such ideas through its investment in the Australian Centre for Broadband Innovation.
Conclusions

By applying appropriate technology and techniques NSW can build a data-driven, connected, and aware transport system in which the freight network that maximises useable capacity, operates at higher efficiency and safety, and is harmonised with other transport modes. At the same time, better input can be provided for planning.

NICTA, as Australia’s national ICT research institution has deep expertise and a track record of collaboration and engagement with industry in the transport, infrastructure and logistics sector. NICTA is interested in exploring with Government how to ensure that maximum productivity and efficiency is gained from the implementation of this policy vision.

NICTA looks forward to working with Transport for NSW to achieve this vision.

NICTA, March 14, 2013.

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Attachment
NICTA projects in transport relevant to improving freight and ports