

An aerial photograph of a city skyline, likely Dubai, featuring several prominent skyscrapers and a multi-lane highway with traffic. The image is used as a background for the whitepaper cover.

WHITEPAPER



How Better Public Transport Can Transform Great Cities Into Smart Cities

The Smart City as a concept has been around since the early 1900's, when urban planners began to explore how modern technology and industries could influence the 'cities of tomorrow' and make them more resilient and adaptable in the face of change.

Today, Smart Cities are still a hot topic as cities become denser and the burden on infrastructure grows. There is no getting away from urbanisation and its pressures: the [United Nations](#) found that in 1970, just **30%** of the world's population resided in urban areas. By 2014, it was **54%**, with projections that **two-thirds of humanity** will live in urban centres by 2050.

The impact of this growth on existing infrastructure, quality of life and nature is considerable. 50 years ago, a [megacity](#) was one with more than 10 million inhabitants—today Mumbai is home to 42 million people and New Delhi has a population of 36 million. Cities may only cover **2% of the Earth's** surface area, but more than half of the human race now dwells in them.

Urbanisation is hailed as a [powerhouse engine](#) for development and a stimulus for trade and growth—80% of the planet's Gross Domestic Product or GDP is produced in cities—but rapid population growth also presents [formidable challenges](#): congestion,

social tensions and pollution to name a few. (This assumes, of course, that people can get to and from work and goods can move around the city to fuel this economic engine.)

[Thangavel Palanivel](#), Deputy Director of the United Nations Development Programme's Human Development Report Office, wrote:

“Not all urbanisation is positive, especially if it is unplanned. Poor urban infrastructure—such as unreliable power systems, congested roads and poor public transport, inefficient ports and inadequate schools—reduces cities’ competitiveness and economic prospects.”

Even in relatively sparsely-populated Australia, dire warnings have been issued: Infrastructure Australia makes it

clear in [this report](#) that if we want to avoid “a future of congestion and constraint” with “increasing bottlenecks and costly delays”, reform is a **necessity**—not a nice-to-have.

Smart Cities are seen as the way to deal with these issues.

What is a Smart City?

According to [Smart Cities Council Australia New Zealand](#) (SCC ANZ), a Smart City is one that “uses technology, data and intelligent design as tools and processes to enhance the city’s liveability, workability and sustainability.”

Essentially, it is a city where information and communication technology (ICT) is used to improve the citizens’ quality of life and increase economic and environmental sustainability.

Smart Cities are also sometimes called Digital Cities or Sustainable Cities.

Smart City initiatives cover a wide range of applications, from energy efficiency to healthcare monitoring to waste management. However, as public transport professionals, our focus is on public transport networks. So what are the technology solutions that transport authorities can use to make our cities smarter?

THE ROLE OF PUBLIC TRANSPORT AUTHORITIES

Transport and mobility are commonly considered **key challenges** for the cities of tomorrow. It is therefore no surprise that most would-be Smart Cities are eager for innovation and progress in reducing traffic jams and increasing the efficiency and attractiveness of their transport networks.

Bernard Tabary, the International CEO of mobility giant Keolis, believes smarter public transport is the key to tackling the issues making cities less liveable: congestion and pollution.

“Mass transit is the best solution to provide the necessary capacity, frequency and fluidity to handle urban growth and passenger demands. It is also one of the best ways to meet today’s—and tomorrow’s—environmental challenges,” Tabary told **Tramways & Urban Transit magazine**.

Encouraging a modal shift to public transport and active transport is a no-brainer for any aspiring Smart City: besides getting people out of private cars, cutting fossil fuel consumption and reducing carbon emissions in one fell swoop, it has a **proven positive impact** on population health and quality of life—two more **performance indicators** for Smart City success.

This is where transport authorities come in.

“Smart mobility is obviously a key pillar of the smart city.”

—Mattar Al Tayer, Director General, Dubai Roads and Transport Authority (RTA)

Significantly, **‘access to public transport’** is a key measure of liveability and sustainability under the Australian Government’s **Smart City performance framework**.

The consequences of poor accessibility go beyond inconveniencing residents: research in Sydney comparing joblessness in the Northern Beaches and the South West show that it adds to inherent employment disparities.

The Australian Government has indicated in its **Smart Cities Plan** (launched in 2016) that it wants to see tightly integrated, efficient and intelligent public transport systems that offer commuters a real alternative to private cars. It is now up to the various state transport authorities to determine the most optimal technologies to accomplish this and then implement them.

With backing from the federal government from a policy and funding perspective, **there is no better time to ‘get smart’ than the present**. In Australia, **26% of local governments** are running smart pilots or rolling out new smart projects. WiFi, lighting and smart infrastructure are the most common initiatives, with mobility projects only coming in at 6th place. Given the huge potential of public transport to drive a Smart City, this shows that there is much more to be done in the transportation space.

Adam Beck, Executive Director of SCC ANZ, said Australia has the advantage of being able to learn from the first wave of Smart City developments in North America, Europe and Asia, and ‘take its pick of tested strategies and models’:

“Australia has the benefit of a national Smart Cities Plan which provides some good context from a policy perspective but also funding.”

“We’re in a very beneficial position as three other major regions around the world have already gone down this path.”

With this in mind, let’s review the latest tools available to transport authorities looking to contribute to Smart City efforts.

AUTONOMOUS VEHICLES

Autonomous vehicle trials are taking place all over the world as transport authorities scramble to figure out **how driverless buses and shuttles fit** into their existing operating paradigms. Some of these are now moving from the trial stage: recently, Schaffhausen’s transport authority working with Trapeze Group announced they had successfully **integrated an autonomous bus** into their operations control system in a world first. **Other cities** are not far behind.

Dubai in particular has wholeheartedly embraced **futuristic transportation technologies** as part of its quest to become the happiest Smart City in the world, including autonomous pods, self-driving buses and flying taxis. The emirate has an ambitious goal to lead the Arab world in innovation, with a key objective being the **automation of no less than 25% of Dubai’s transport system** by 2030.

Not standing by and watching, the Dubai Roads and Transport Authority (RTA) launched 29 smart transport projects over 3 years in support of Dubai’s wider Smart City initiative. They plan to roll out another 34 under their current **5-year strategy** for 2017—2021.

Ahmad Hashem Behroozian, CEO of the Dubai RTA’s Licensing Agency, said they are committed to **laying the foundations** for the technology of the future:



Did you know?

Dubai was **recently awarded** the prestigious City Project Award at the 7th Smart Cities Expo & World Congress for its progress in adopting blockchain technology.

*“Most of the autonomous technologies across the world are in a trial phase now and nobody is sure when these can be put into practice. So, what we are trying to do is to make the city ready for **all** future technologies by developing **safety standards**, introducing relevant **legislations** as well as building the required **infrastructure**.”*

VEHICLE-TO-VEHICLE CONNECTIVITY

The new generation of intelligent and/or autonomous vehicles capable of ‘talking’ to each other gives rise to some interesting possibilities for Smart Cities. In America, there are calls to make vehicle-to-vehicle (V2V) communication capability mandatory in all new vehicles, giving rise to speculation that all new cars could have **V2V connectivity by 2023**.

The **anticipated benefits of V2V** include cutting fuel consumption, easing congestion by platooning and reducing collisions by sharing information on

speed, braking ability, road conditions and even the weather. For example, if a car needs to brake hard, the vehicles following would receive an alert. This allows them to slow down or change lanes in time to avoid a collision.

Platooning offers fuel savings and better use of infrastructure. **Once considered impractical**, advancements in autonomous trucks and V2V connectivity are now making it possible for vehicles to drive in platoon formation safely.

Historically, platooning was mostly discussed in the context of trucking or freight applications, but a fleet of public transport buses travelling in dedicated lanes or busways would experience the same **benefits** of reduced drag, lower fuel consumption and increased safety. Singapore is the city to watch in this space, with their 3-year **autonomous truck platoon trial** with Scania and Toyota currently underway.

VEHICLE-TO-INFRASTRUCTURE CONNECTIVITY

The same technology that enables V2V capability can also be used to connect vehicles to infrastructure (V2I) such as streetlamps, traffic lights and build-

ings. V2I has similar benefits as V2V in terms of improving safety, but has **additional possibilities**: for instance, they could integrate with parking meters or tollgate systems to facilitate automatic payment.

At the moment, most traffic systems do not have the right connectivity features to enable V2I even if the vehicles are equipped; however, **trials in Sydney** show that this is changing day by day.

It is in the interests of transport authorities to champion V2X (a combination of V2V and V2I) technology to spur the development of applications for public transport. These may include:

- A bus running late could communicate to the traffic system to get **green light priority** until it catches up to its schedule.
- Smart bus stops could communicate with vehicles and each other to provide **laser-accurate passenger information**.
- Connected bus stops might be able to tell buses if there are passengers waiting. This is a key point in operating **driverless buses**.
- Information on operational services may be communicated to other connecting services to keep passengers informed if the **connection** is going to be made or of their **options** if the connection is going to be missed.
- Control centres can **respond to incidents** such as accidents or road obstructions more efficiently, as the incidents can be automatically and immediately communicated by the closest vehicle or infrastructure without any need for human intervention.

INTERMODAL TRANSPORT CONTROL SYSTEMS (ITCS)

An ITCS is an integrated solution comprising equipment and software which allows transport authorities to track vehicles and communicate with drivers for operations control and management. The data collected and stored

Did you know?

Southern Nevada led the way in using V2I technology for Smart City transportation, partnering with Audi in 2016 to roll out the first V2I in America. The **Regional Transportation Commission** (RTC) said the technology would help cut down on congestion and enhance mobility for the community.

by it can also be **used** for real-time passenger information and data analysis for improving services.

More than just a vehicle tracking solution, ITCS are designed to operate across multiple modes of transport. This is greatly advantageous in an era of changing customer expectations, where **historical divides** between different modes are handicapping the traditional public transport industry and hindering their ability to adapt alongside newer commuting alternatives like ridesharing.

Passengers are unaware of or do not care about the operational siloes that train, bus, tram and ferry services function within. They see their trips across modes to get from A to Z as one personal journey, making it vital that public transport professionals do too in order to deliver a consistent, satisfying customer experience.

An ITCS can help transport authorities establish operational cohesion across the public transport ecosys-

tem, delivering multimodal visibility, connectivity and information. It can not only integrate traditional transit modes like bus, rail and ferry, but also autonomous vehicles, V2X technology and the relevant Smart City infrastructure to provide true smart mobility for commuters.

Effective ITCS solutions are not built overnight. They build on core tracking and communication principles, with years of ongoing advancements in algorithm sophistication, processing power and sensor technology. They give transport authorities real-time information at their fingertips, enabling them to work around disruptions such as traffic accidents to minimise deviations from the timetable and establish connection protection for commuters on late-running services.

They are also a key source for large public transport data sets (big data). When matched with associated systems like ticketing, they provide unrivalled insights for transport planning

purposes. For example, Singapore's Land Transport Authority (LTA) uses anonymised data from fare cards, Trapeze-supplied real-time vehicle location data and bus arrival times to meet demand, improve the passenger experience and inform policy. **The results speak for themselves:**

- The **average wait time** on popular services has been cut by **3–7 minutes**.
- There has been a **92% reduction in overcrowding** despite an uptick in ridership.

Building on their success with ITCS data, the LTA is also planning to develop a **Fusion AnalyticS for public Transport Emergency Response (FASTER) system** that combines data from various sources including ticketing, video and telecommunications systems to visualise commuters' travel patterns, predict the impact of public transport incidents and trigger alerts of crowd surges.

CONCLUSION

As road congestion, public transport accessibility and mobility challenges intensify because of the urban population explosion, good cities need to become great cities by using technology. Public transport authorities have a sizeable role to play in delivering this vision.

There are a range of emerging technologies that the public transport industry can use to support this thrust, including autonomous vehicles, vehicle-to-vehicle communications and vehicle-to-infrastructure communications. Powerful **automatic vehicle location and control (AVLC) systems** help combine the public transport fleet across all modes and deliver passengers the information they expect if they are to shift modes.

The big data generated and captured by these systems can then be analysed to further drive improvements in planning, operations and service delivery.

Building a Smart City requires leadership, vision and technology. We are seeing real examples of all three coming together in exciting ways in Dubai, Singapore and other leading cities around the world.

The public transport sector is arguably ready to make the largest contribution to this progress. It is now up to the leaders of our Smart Cities to ensure that public transport authorities get the support they need to implement ITCS systems, incorporate driverless buses across the network,



Did you know?

Singapore is considered the *world's Smartest City*. *ABI Research* applauded Singapore's success in addressing high-density living challenges, saying it has excelled in leveraging "next-generation technologies and disruptive smart city paradigms as structural solutions for hard problems."

make use of V2X technology and continue uncovering opportunities for efficiencies through big data.

With the right leadership, public transport will drive the change in transforming good cities into Smart Cities—and we will all be the better for it.



If you have questions about ITCS, AVLC or other Smart City technology, or would like someone from Trapeze to provide consultation on your organisation's options for intelligent transport solutions, please contact info@trapezegrup.com.au

Trapeze Group works with public transport organisations and their communities to develop and deliver smarter, more effective public transport solutions. For more than 25 years we have been Here for the Journey, evolving with our customers around the world to helping them move people from point A to Z, and everywhere in between.