CASEY.VIC.GOV.AU

SMART CITY TOOLKIT

FOR RESIDENTIAL AND COMMERCIAL DEVELOPERS

IMPLEMENTATION

City of Casey

STATEMENT OF ACKNOWLEDGEMENT

The City of Casey proudly acknowledges the traditional owners, Casey's Aboriginal communities and their rich culture and pays respect to their Elders past, present and future. We acknowledge Aboriginal people as Australia's first peoples and as the traditional owners and custodians of the land on which we work and live.

DIVERSITY STATEMENT

The City of Casey is home to a remarkable diversity of cultures, languages, faiths, identities, landscapes, and stories. From our first Australians to our most recent arrivals and every wave between, the City of Casey welcomes and represents all community members and their respective ambitions to live healthy, rewarding, and happy lives. These intersecting and overlapping community stories form Casey's collective identity and contribute to its evolving, rich history. We recognise this diversity as our strength and we aim to share, nurture, and celebrate it.

Interpreter

TIS: 131450 (Translating and Interpreting Service)

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WHAT IS A SMART CITY?

"Smart City" is a globally used term to described a city that uses Information and Communications Technology (ICT) to enhance its livability, workability and sustainability.

It does this by collecting information using sensors and other technology, communicating the data via networks and analysing it to understand current and future trends in order to facilitate better decision making.[1]

For the City of Casey, a Smart City is a city that puts its community first, adjusting to serve them and their growing needs.

It applies digital technology, data, and innovative practices to improve liveability, sustainability, collaboration, and economic opportunities.

As Casey is a growth corridor expected to reach over 500 000 residents by 2040, the City of Casey has a priority to create future ready communities. Smart infrastructure will play an important role in this, and the Council will invest in smart technology and innovation to support the future state.

The following are elements that make the City of Casey a smart city:

Engage and consult with **community** using digital and physical channels

Gather, analyse and share **data** to benefit both Council and community

Facilitate **innovation** and collaboration through experimentation and collective learning

Encourage **diverse** involvement, access and inclusion

SMART CITIES MAKES SPACES MORE **ATTRACTIVE, ECONOMICALLY VIABLE** AND **RESILIENT**

1. Smart Cities Council, Smart City Readiness Guide

SMART CITY ENABLING INFRASTRUCTURE

In order to enable the City of Casey to achieve its goal in becoming a smart city, four layers of infrastructure must be considered.

At the core of the smart city environment, the Network Hardware layer sets up the base connectivity for Internet of Things (IoT) devices and sensors to communicate through networks such as LoRaWAN, 4G/5G, Wi-Fi and Bluetooth.

The Sensory Layer consists of IoT sensors and devices that are positioned in the urban area to collect data about various aspects of the physical environment and then transmit that across the underlying network.

Data Integration includes the ingestion, storage, organization, management and manipulation of data. Data is normally stored in a cloud-based data warehouse where specific software, artificial intelligence, and predictive modelling tools can be applied to it in order to enable reporting and analysis so that it becomes meaningful.

Applications and Services describe the ways in which Council staff, the community and other users interact with the smart technology and data in order to create tangible value. Data at this stage may be converted to a visual format that can be called upon in real time, or it may be fed into service delivery or insights to guide decision making.

SMART CITY ENABLING INFRASTRUCTURE STACK

Data Layer

Applications and Services

Data Integration

Physical Layer

Sensory Layer

Network Hardware

SMART CASEY IN ACTION

There are many ways in which smart city infrastructure including IoT sensors and devices can be implemented in a city in order to solve challenges and help better decision making.

In the context of housing developments, the City of Casey identified the following priority areas to consider where smart city infrastructure may be of benefit:

LEISURE AND OPEN SPACES

ENVIRONMENTAL MANAGEMENT

MOBILITY AND GETTING AROUND

COMMUNITY HUBS AND FACILITIES

The following pages provide an snapshot of technologies in these areas, as well as real-life examples of where these technologies were implemented by the City of Casey. There are of course an endless number of additional opporuntites that could be explored across the City of Casey.

A **MORE CONNECTED, BOLD** AND **RESILIENT COMMUNITY.**

LEISURE AND OPEN SPACES

OVERVIEW

Soil sensors

- Smart soil sensors collect information on soil moisture levels, soil temperature, air temperature and humidity.
- The data collected can be used to inform automated irrigation systems so that watering schedules can be skipped when not required.

Smart Bins

- Smart bins come in various types, such as those equipped with solar powered compactors which can compact waste to seven times the normal amount, or sensors that can detect fill levels.
- Data can be sent from the sensors to waste contractors to inform whether or not the bin requires collection, which can enable pick-up route optimisation and efficiencies.

Smart Benches

- Smart benches and smart street furniture provides community members with a place to recharge devices and access free internet on-the-go via public wifi access points.

BENEFITS

- Increased efficiency in water usage
- Real-time information

- Increased bin capacity by compacting waste
- More optimised bin pickup route schedules

- Increased digital inclusivity and internet accessibility for all community members
- Increased utilisation of the outdoor spaces

CASE STUDIES

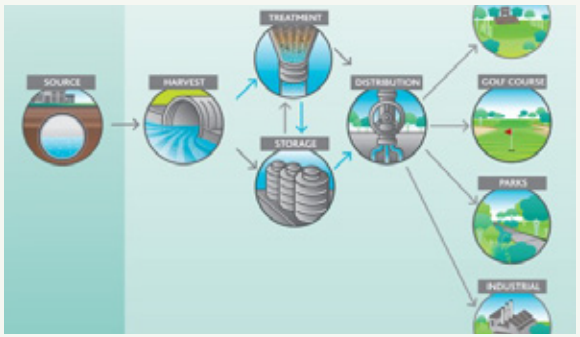
- **City of Geelong: smart parks and gardens**

- **Waste innovation comes to Casey**

- **Get digitally connected with City of Casey**
- **Street Furniture projects – parks and streets**

ENVIRONMENTAL MANAGEMENT

	Micro-climate sensors	Stormwater harvesting	Flood Management
OVERVIEW	> Micro-climate sensors collect data around temperature, humidity and air quality in urban areas and facilitate the tracking of the heat island effect. > The data collected can help inform future planning decisions for urban areas.	> Stormwater harvesting involves the collection of stormwater which would otherwise go down the stormwater drain. The water is then cleansed and used for garden irrigation.	> Early detection of flooding and stormwater blocks to reduce impact of floods on local infrastructure and community.
BENEFITS	> Accurate and real time data collection > Improved decision making for future planning decisions	> Reduced water wastage > Decreased irrigation costs	> Increased stormwater infrastructure management and early detection messaging to increase public safety.
CASE STUDIES	> **City of Melbourne: smart city build** > **City of Melbourne: 5G and IoT testbed**	> **City of Melbourne: stormwater and rainwater harvesting**	> **Yarra Ranges Council: smart drains**



MOBILITY AND GETTING AROUND

e-Scooters

OVERVIEW

- Electric scooters (e-scooters) are a cost effective solution of offering an alternate mode of transport for getting around the community.
- It reduces the need for cars on the road whilst enabling people to explore and connect with their local community.

BENEFITS

- Decreased greenhouse gas emissions and zero air pollution
- Reduced operating cost
- Reduced traffic congestion on roads

CASE STUDIES

- **Vic councils green-light e-scooter hire trial**
- **Shared e-scooters in Canberra**

Smart Parking

OVERVIEW

- Smart parking involves in-ground or above-ground sensors tracking the utilisation of car spots.
- A mobile app communicates to the user in real time which spots are available, as well as different parking and mobility zones through a map interface.

BENEFITS

- Real-time data
- Reduced car park congestion
- Enhanced community experience
- Increased parking efficiency

CASE STUDIES

- **Smart car parks in the City of Casey**

Electric Vehicle Charging

OVERVIEW

- Charging stations provide the community with the opportunity to recharge their Electric Vehicle (EV) for free.
- This can help raise the awareness of EVs and encourage the community to consider more environmentally friendly means of transportation.

BENEFITS

- Increased awareness of EVs as an alternate means of transport
- Increase business in the area by making the destination a focal point for the EV community

CASE STUDIES

- **Why smart city planners should install EV charging stations**

COMMUNITY HUBS AND FACILITIES

OVERVIEW

Smart Lighting

- Smart street lighting is solar powered and only turns on when people movements is detected. It can be dimmed if full illumination is not required, and can also alert when maintenance is required.
- Some smart lighting products are neutral hosts which mean they incorporate 5G stations, free wi-fi and can also have microclimate sensors.

- Reduce lighting cost and CO^2 emissions
- Increased feeling of safety by residents
- Increased functionality with internet hosting

- **City of Perth – LoRaWAN IoT smart lighting**

Smart BBQ

- Smart BBQ is solar powered, equipped with sensors to detect issues or maintenance requirements, and the ability to manage power or heat settings remotely.

- Increased efficiency in maintenance and cleaning
- Faster response times and increased uptime
- Reduced power costs and CO^2 emissions

- **Berwick Springs smart BBQ**
- **St Clair recreation precinct**

People Counting Sensors

- People counting sensors monitor pedestrian movements and collect data on movement in a given space.
- The data can be visualised into dashboards which enable us to better understand the usage of public spaces and provide us with data to make more informed decisions.

- Accurate and real time data collection
- Increased effectiveness in strategic decision making regarding the space/facility with the availability of data analytics

- **City of Casey "Sensing our City" Dashboards**

CASE STUDIES

PEOPLE COUNTING SENSORS

Community challenge

How could we enable people to feel COVID safe by avoiding crowds at peak times?

Solution

Installation of 33 people counting sensors across three outdoor dining precincts in Casey to track density and pedestrian traffic flow. The sensors are a mix of mobile device tracking beacons and Infrared sensors, have over 90% accuracy and do not capture any personally identifiable data. Visual dashboards and heatmaps were created to show peak pedestrian periods and data trends.

Benefits

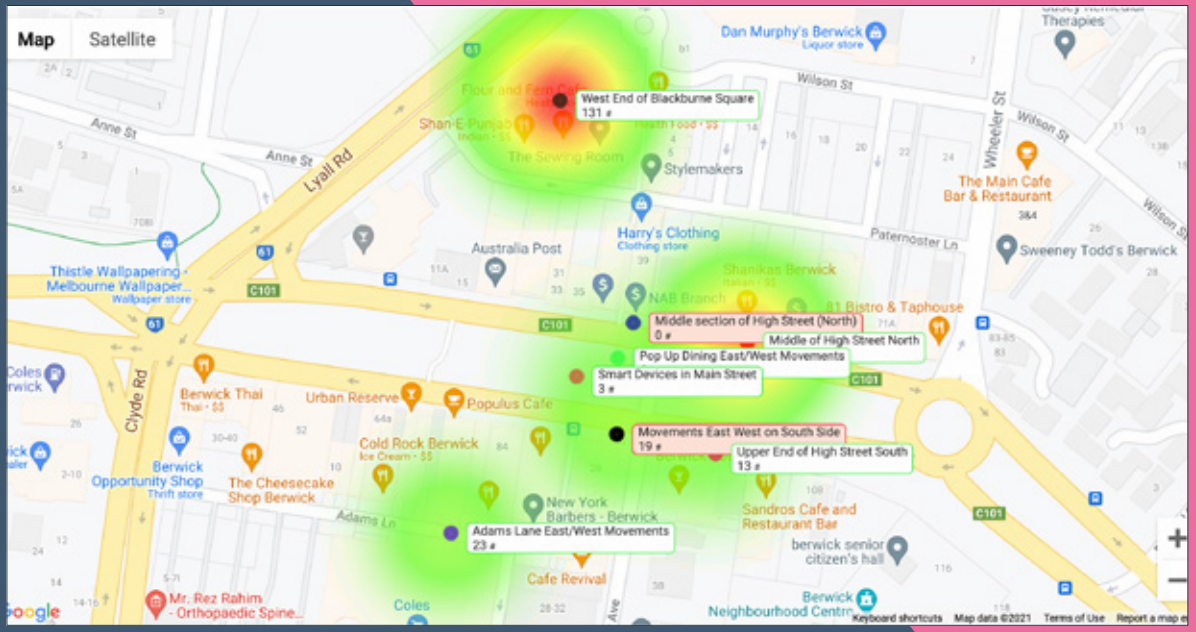
Community members felt safe leaving the house after COVID lockdowns eased. Council staff could better manage cleaning schedules for outdoor dining. Businesses could make decisions based on the data to improve operations.

Network dependencies

LoRaWAN or 4G/5G depending on coverage.

Data integration

Work with Council to streamline data into Azure data lake.



Delivery timelines and cost estimates can be discussed with Council Smart City and Innovation team.

SOLAR BBQS IN BERWICK SPRINGS

Community challenge

How can we increase usage and lower costs of recreational services within park facilities?

Solution

The installation of a solar powered smart barbeque at Berwick Springs, which was able to provide insights into its usage and informed Council when it required to be cleaned or if there was a maintenance issue that needs be fixed. This allowed Council to resolve maintenance issues in a proactive manner, providing quicker response times rather than the legacy method of waiting for a fault to be reported.

Benefits

Quicker response times and proactive maintenance, resulting in increased and more satisfied users. Lower costs due to running on solar.

Network dependencies

Runs on the LoRaWAN or 4G telecommunications networks.

Data integration

Data is integrated into the Smart BBQ Cloud app and displayed on a vendor provided dashboard.

Delivery timelines and cost estimates can be discussed with Council Smart City and Innovation team.

SMART BINS WITH SENSORS AND SOLAR COMPACTORS

Community challenge

How might we improve waste management in order to save time and optimize resources?

Solution

Multiple Smart Bin have been deployed across various Casey sites. Some Smart Bins solar compactors so they can hold up to 7 times more waste and a sensor that sends a message when the bin is reaching capacity. Additionally, 25 standalone sensors have been deployed to regular waste cage bins to track fill level and alert the waste management contractors when they are to be emptied. Waste contractors are provided access to a dashboard and request management system to better manage waste collection.

Benefits

Route optimisation with bin pick ups and increased bin capacity reducing overflow.

Network dependencies

The bin sensors communicate via Casey's LoRaWAN network.

Data integration

Data is integrated into a vendor provided dashboard and request management system, and Council are exploring opportunities to incorporate data into its Open Data platform in order to provide even further insights and opportunities.

Delivery timelines and cost estimates can be discussed with Council Smart City and Innovation team.

SMART BENCH AT THE ABORIGINAL GATHERING PLACE

Community challenge

How can we increase internet accessibility for our community members who visit this facility?

Solution

Council installed a smart connected street bench at the facility, which was the first initiative of this kind in the municipality.

Benefits

The bench provided free public wifi access for community members in addition to device charging points. There was also a significant increase of outdoor activity in the area.

Network dependencies

Members of the public were able to access free public wifi, thus increasing digital equity in the community.

Data integration

No data is collected within this solution. Acceptance of terms and conditions is required at the initiation of the wifi session. Data points for device charging are compatible with the most common mobile devices.

Delivery timelines and cost estimates can be discussed with Council Smart City and Innovation team.

FREE PUBLIC LoRaWAN

Community challenge

How can we provide the community with access to advanced technologies such as internet of things (IoT)?

Solution

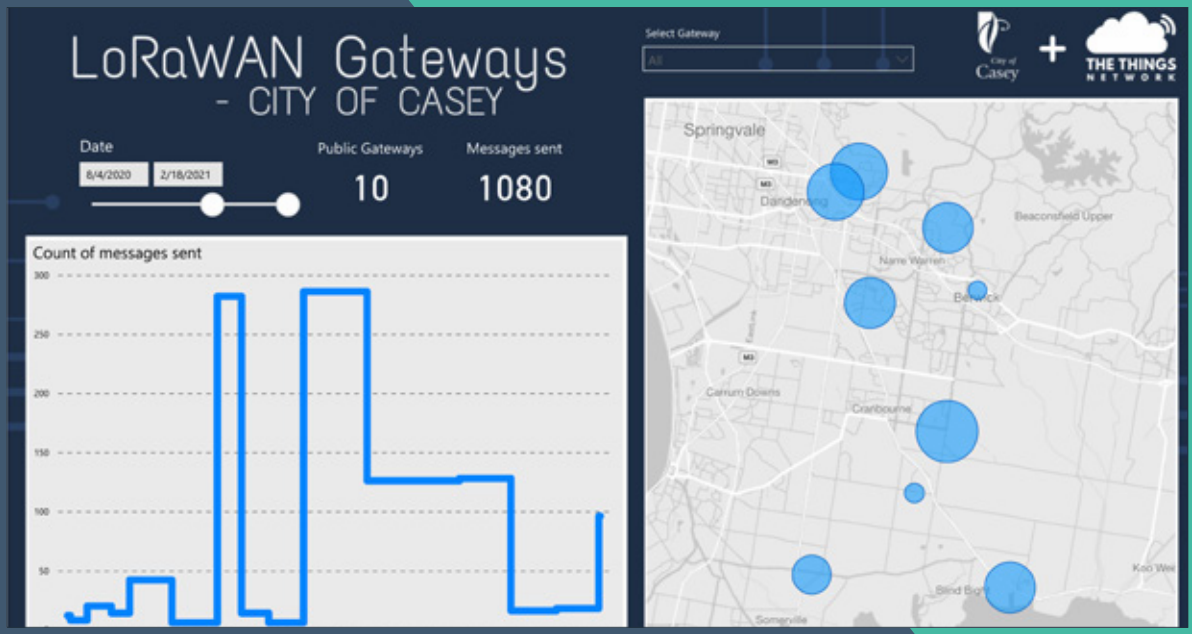
The creation and implementation of a Casey wide data communications (LoRaWAN) network that supports the connectivity of these devices, with no further direct cost to the community or local businesses. The network has 80% coverage across Casey and supports the local community and businesses in the adoption and use of modern technology and IoT devices.

Benefits

The technology supports smart (IoT) devices to send and receive data for free, allowing users to remotely turn on and off an array of items such as lighting systems and sprinkler systems. The implementation of the network will also support future expansion of smart sensors across Casey, enabling greater levels of data insight.

Network dependencies

11 LoRaWAN gateways have been deployed across Casey, currently running on The Things Network (TTN).



Delivery timelines and cost estimates can be discussed with Council Smart City and Innovation team.

SMART PARKING

Community challenge

How can we improve parking facilities for our community so that they can quickly and easily find a free car spot?

Solution

In-ground sensors installed at Bunjil Place and Casey ARC carparks that track the utilisation of car spots.

Benefits

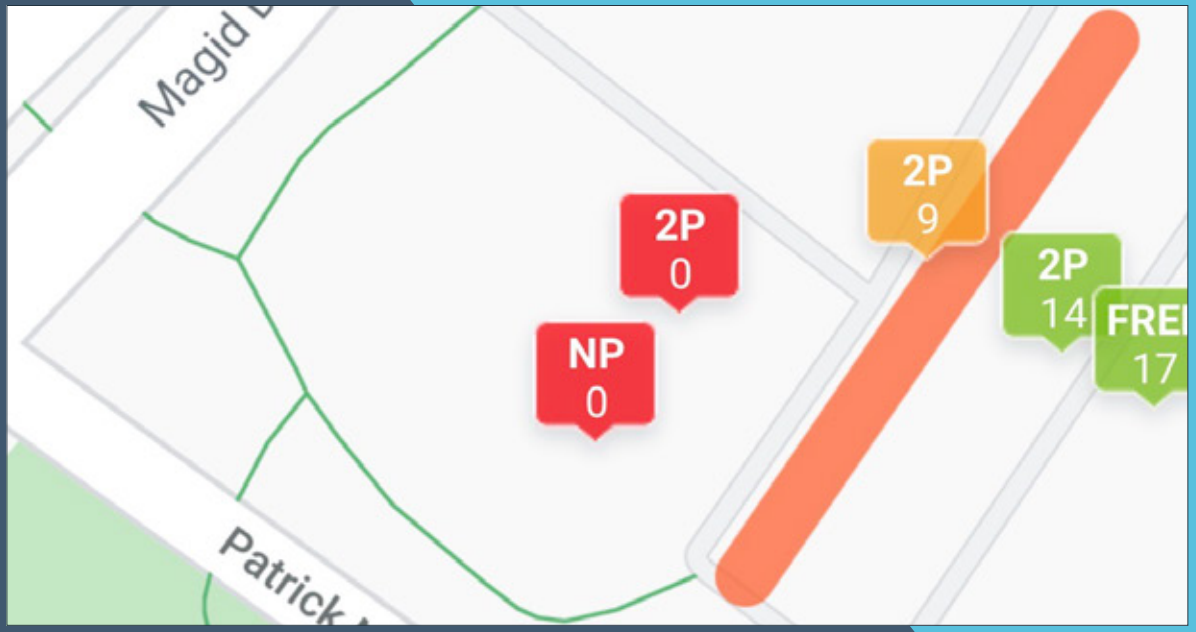
There is reduced congestion in carparks, increased parking efficiency, enhanced community experience, lower carbon emissions and greater visibility of carpark utilisation for Council officers. Members of the public can view data on a mobile app to show them where the free spots are, as well a map of the different parking zones..

Network dependencies

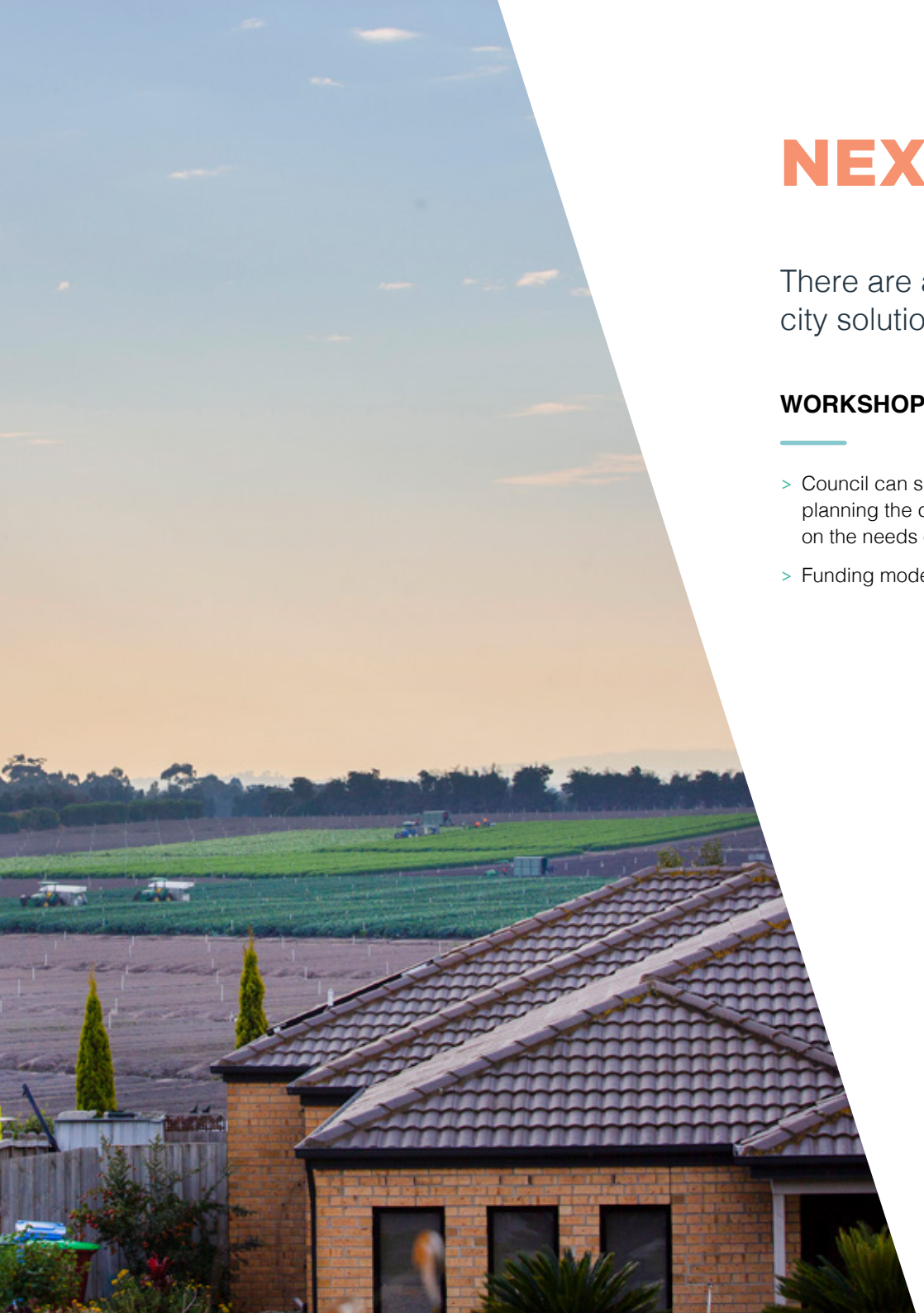
Runs on Telstra's 4G mobile network.

Data integration

SmartSpot Gateways connect to Telstra's mobile network and act as the central communication unit that collects data from the sensors via wireless communication and transmits it to the SmartCloud parking services system.[2]



2. https://www.smartparking.com/news/bringing-io-t-technology-to-one-city-at-a-time-smart-car-parks-in-the-city-of-casey
Delivery timelines and cost estimates can be discussed with Council Smart City and Innovation team.



NEXT STEPS

There are a range of ways Council can support the delivery of smart city solutions.

WORKSHOPS AND PLANNING

- Council can support with scoping, designing and planning the delivery of smart city solutions based on the needs of the Development and community.
- Funding models can be discussed with Council.

TRAINING AND INSIGHTS

- Council can provide smart city training and workshops to build capability in teams.
- Council's **Open Data platform** provides open access to insightful datasets which may be useful to Developers.
- Join the **Smart Casey Launchpad Community Hub** to stay in the loop.

APPENDICIES

INTEGRATION & TECHNICAL REQUIREMENTS

Sensors should be compatible with existing and future planned infrastructure (e.g. Casey's free LoRaWAN Network and gateways) as defined in our technical specifications.

Council would work in collaboration with you to install the IoT device and test and ensure that there is appropriate coverage.

Some sensors and IoT devices are also compatible with 4G or 5G networks and these may provide an alternative option, albeit this may come at an additional cost.

All data collected from smart devices or sensors will be the sole ownership of the City of Casey and should be able to be integrated into Casey's Azure cloud via an open API integration. Data should be real-time, and must abide by the Australian Privacy Principles.

The following provides further details on these technical requirements.

Cost effective	The requirement is to have an accurate and cost-effective solution which has been market tested and is easy to implement within the specified timeframe.
Integration	Council is technology agnostic, but the solution must integrate through APIs to Casey's Business Intelligence platform that will be created in project implementation phase. Council welcomes innovation to meet the objectives e.g., a range of sensors/technology that enable measures aligned to those stated below.
Privacy	Council has strict privacy compliance requirements, and therefore the vendor must assure that the proposed solution does not capture or share any Personally Identifiable Information (PII).
Data ownership	The successful solution must also generate easy to understand data for both internal and external stakeholders. Casey should have the sole ownership of the data gathered by the devices deployed as a part of this project. Data gathered by the devices should get ingested on real time/near-real time basis in the Casey's Azure Cloud infrastructure so that council should be able to access the data 24x7. Data should only be stored onshore within Australia. Vendor should be compliant with the appropriate data and ISO standards.
Sustainability	As sustainability is a key principle in the Smart City Program, quotes should identify any sustainable practices (e.g., recycled material or circular design for sensors, low energy usage, company standards) employed by the company to manage emissions and waste through the product development.

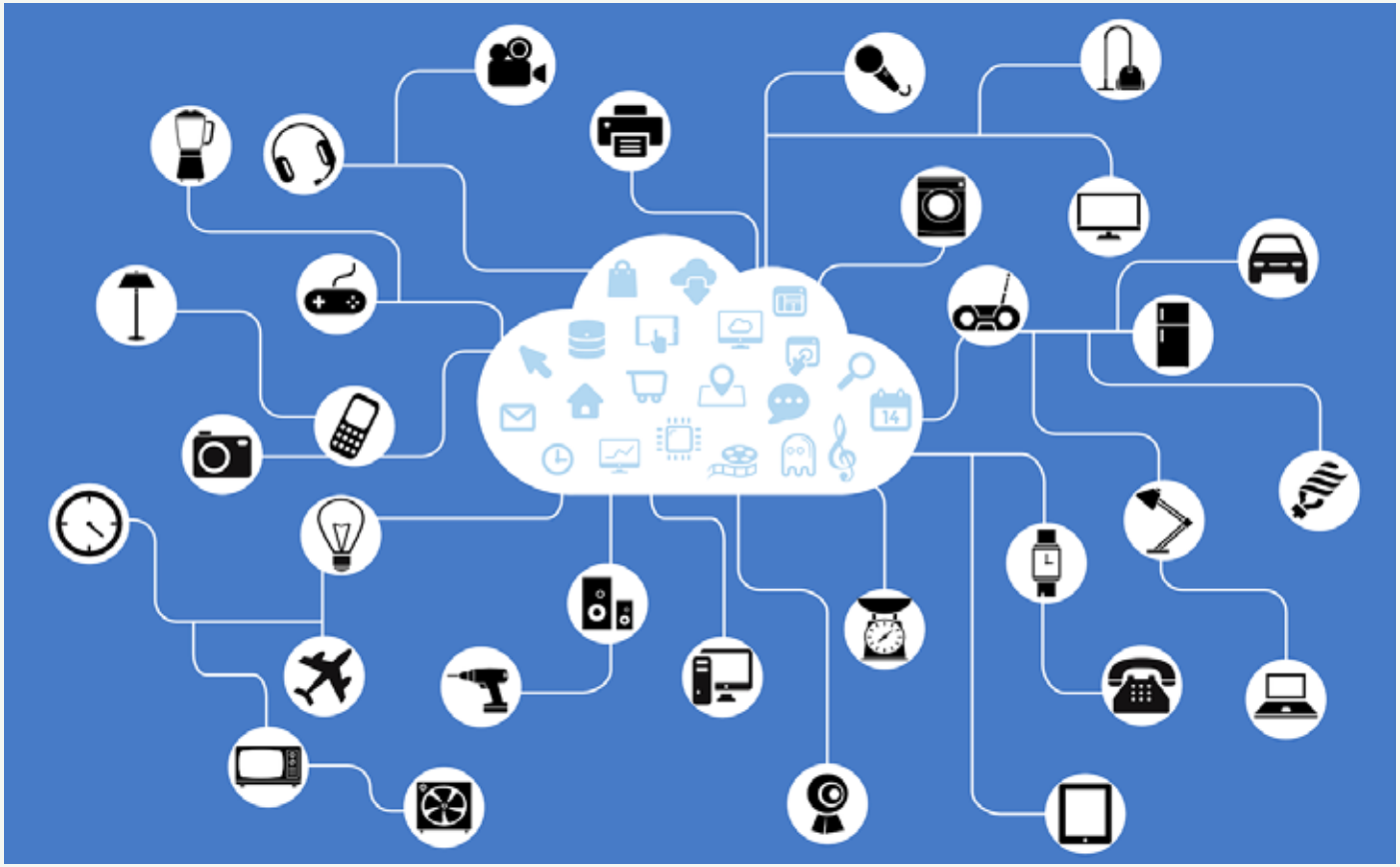
UNDERSTANDING THE INTERNET OF THINGS (IoT)

The Internet of Things (IoT) describes the network of physical objects –"things" – that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.[3]

Modern technologies like the Internet of Things (IoT) are creating greater ability for businesses and the community to make evidence-based decisions using connected devices.

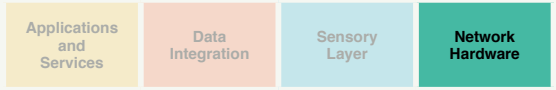
These technologies are beginning to be utilised by advanced businesses and are becoming a great potential for economic development, competitive advantage and being more efficient and effective.

The Things Network is a world-wide, crowdsourced, open, free and decentralized internet of things network. The network enables objects to link to the internet using little power and small data packets. This approach unlocks data and potential use cases never possible before. It makes use of LoRa technology which is non-cellular long range and low power wireless technology. Much like the interconnectivity of computers and smart phones via the internet, sensors require a wireless network to transmit the sensory information.



3. https://www.oracle.com/au/internet-of-things/what-is-iot/

CASEY'S LoRaWAN NETWORK



WHAT IS LoRaWAN?

LoRaWAN is a low power, long range wireless telecommunication network that enables the sending and receiving of small packets of data between sensors/Internet of Things (IoT) and data warehouses.

The City of Casey is committed to supporting the local community and businesses in the adoption and use of modern technology and IoT devices, enabling a simpler path for piloting and experimenting with these technologies.

This has been done through the creation of a Casey wide data communications (LoRaWAN) network that will support the connectivity of these devices – with no further direct cost to the community or business.

LoRaWAN is the underlying network infrastructure that enables the scale up and deployment of a range of IoT sensors, without the need for having an established 4G/5G telecommunication infrastructure, although many sensors are also compatible with 4G/5G.

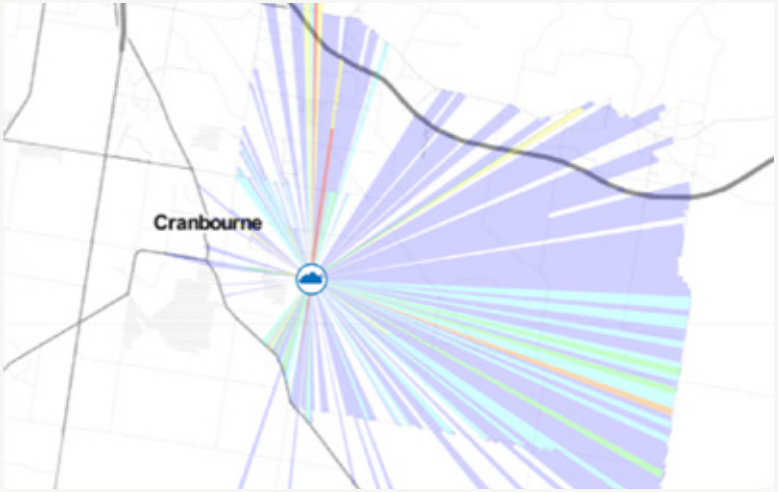
BENEFITS OF LoRaWAN

Long-range: The operating range of LoRa technology varies from a few kilometres in urban areas to over 10 km in rural settings. It can also enable effective data communication in previously infeasible indoor and underground locations.

Low power: Optimised for power consumption, LoRa transceivers can run on small, inexpensive batteries for up to 20 years.

Low cost: LoRaWAN's simplified, lightweight protocols reduce complexity in hardware design and lower device costs. It is long-range combined with a star topology reduce expensive infrastructure requirements, and the use of license-free or licensed bands minimise network costs.

Lora has been designed to serve distinct use cases such as the prototypical battery-operated devices that transmits several bytes of data at intervals of 15-60 minutes and required to last for 10+ years without wires and high communication ranges. Generally, LoRa will focus on simple IoT sensor transmission.



LoRaWAN OR 5G?

USE-CASES FOR 5G OVER LoRaWAN TO CONNECT IoT DEVICES

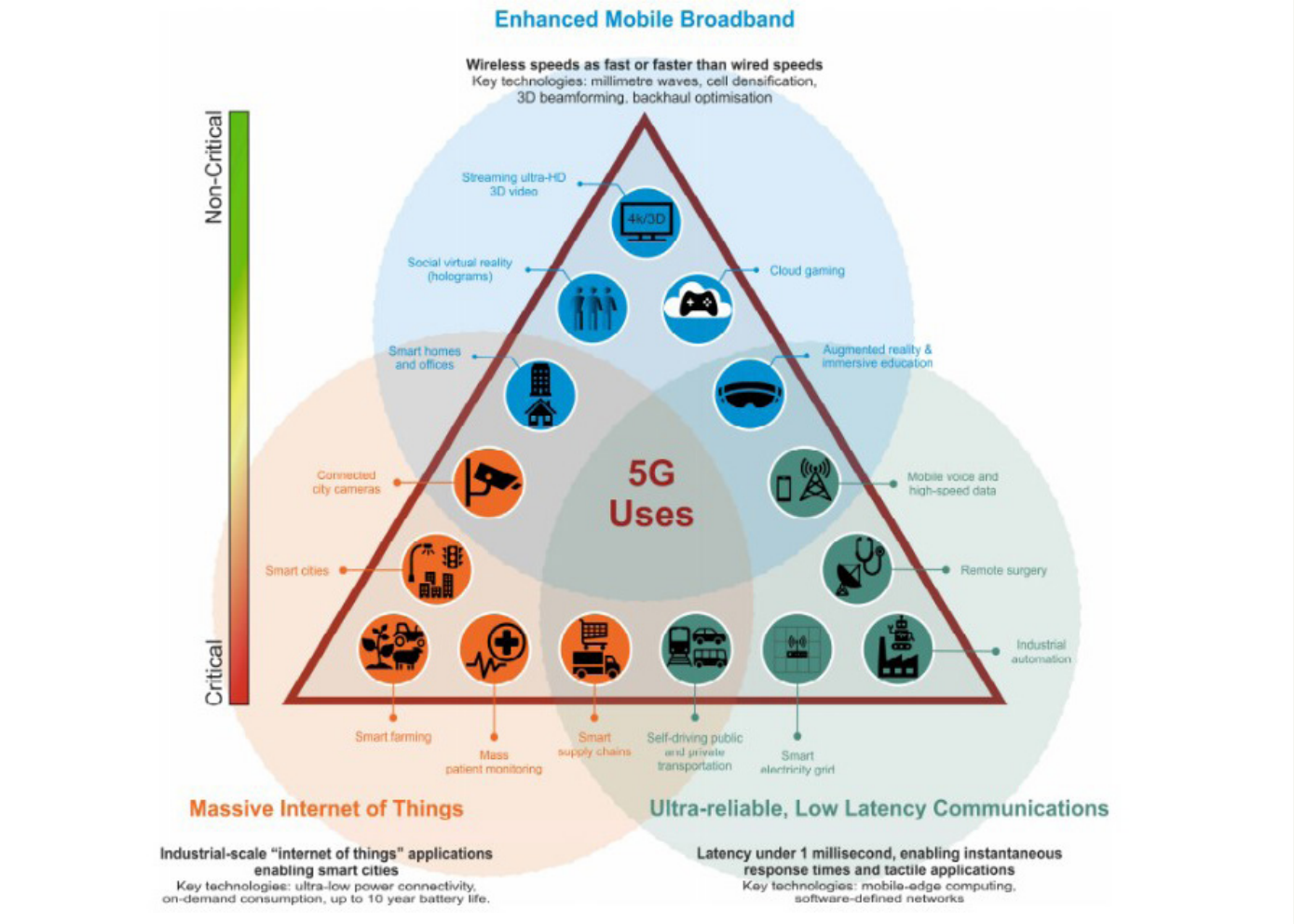
The emergence of new technologies, particularly 5G, will play a major role in scaling IoT opportunities. 5G will play a key role where there are heavy data requirements such as 3D video and Augmented Reality that a LoRaWAN cannot manage.

To assist in organising its capabilities 5G is segmented into three main use cases:

1. Enhanced Mobile Broadband (eMBB), for example 3D video and UHD screens;
2. Massive Machine Type Communication (mMTC); and
3. Massive IoT for example Smart City operations, as highlighted above.

The complexity and breadth of supported use cases highlighted above mean that some will be inappropriate due to 5G being overengineered for what is required. This allows for a “right-size” technology approach to support these particular use cases.

5G will continue to transform the deployment and use cases of more complex Smart City enabling infrastructure, whereas LoRa will focus on simple IoT sensor transmission. It is important to have a tapestry of network infrastructure to ensure interoperability.



City of Casey

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