ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   **Smart City Framework & Smart City Implementation Program**
Appendix A   **Smart City Framework (complete)**

App A

SMART CITY FRAMEWORK

**Prepared for Sunshine Coast
Council by Telstra & Cisco
Consulting Services**

January 2015

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   **Smart City Framework & Smart City Implementation Program**
Appendix A   **Smart City Framework (complete)**

App A

Conditions of use

The contents of this document and any other documents (collectively, these documents) provided to you as part of this engagement are the commercially valuable confidential information of Telstra and Cisco and may only be used by you for the purpose of your Smart City program.

Telstra and Cisco make no representations or warranties as to the accuracy or completeness of any information provided to you as part of this project. You must make your own assessment of the information and satisfy yourself as to its accuracy and completeness.

App A

Document history

Version	Date	Author	Status	Notes
0.1	Oct 15, 2014	Harley Young	Draft	Creation of document outline
0.2	Nov 20, 2014	Harley Young	Draft	Development of content
0.3	Dec 22,2014	Harley Young	Draft	Incorporating feedback from Telstra and Cisco teams
0.4	Jan 2, 2015	Harley Young	Draft	QA review, development of recommendations and next steps
0.5	Jan 3, 2015	Harley Young	Draft	Development of executive summary and draft finalisation
0.6	Jan 8, 2015	Harley Young	Draft	Draft incorporating feedback from Council meeting
0.7	Jan 9, 2015	Harley Young	Draft	Draft incorporating PDA and Enterprise Corridor diagrams
0.8	Jan 9, 2015	Harley Young	Draft	Draft incorporating feedback from Council
1.0	Jan 15, 2015	Harley Young	Final	Final v1 submission, incorporating all remaining feedback

ORDINARY MEETING   8 DECEMBER 2016
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

Table of contents

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   **Smart City Framework & Smart City Implementation Program**
Appendix A   **Smart City Framework (complete)**

App A

ORDINARY MEETING   8 DECEMBER 2016
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

Table of figures

App A

ORDINARY MEETING　　　　　　　　　　　　　　　　　　　**8 DECEMBER 2016**
Item 8.2.1　　　Smart City Framework & Smart City Implementation Program
Appendix A　　Smart City Framework (complete)

App A

Executive summary

The Sunshine Coast Regional Economic Development Strategy 2013-2033 identified the new Maroochydore City Centre Priority Development Area (PDA) as a game-changing project that will contribute to reshaping the region's economy in the decades to come. When combined with investments elsewhere along the Enterprise Corridor, and a population set to grow by more than 40% over the next two decades, Smart City investments can help advance Council's five corporate-plan goals and make the region an even better place to work, play, live and learn.

Notwithstanding its ambition, as the Sunshine Coast Council moves forward, it must contend with real challenges: limited revenue growth, environmental impacts of development (locally and elsewhere), aging infrastructure, growing international competition, and expectations of citizens for 'Google-like' services. In short, people expect their governments to provide better service, at lower costs, and to respond to them through multiple channels.

Using traditional approaches, governments will be unable to meet their responsibilities

Governments can no longer rely on traditional approaches to meet their responsibilities for the built environment, energy, telecommunications, transportation, water and waste management, health and human service, public safety and payments and finance. Fortunately, the Smart Cities Framework offers municipalities a way to think differently about how services can be delivered. A Smart City Framework guides the creation of a Smart City and Smart Region by identifying the elements necessary to achieve a successful and integrated program of smart and connected services.

What is a Smart City and what benefits does it offer?

The banner **Smart City** describes the portfolio of services that can be implemented to transform and improve the way residents, visitors, businesses and governments interact with their environment in the course of their lives. Smart Cities uses information and communications technology to connect people, processes, data and things in ways that make cities more…

Liveable	Workable	Sustainable
A better quality of life for city residents	Accelerated economic development	Responsible resource use, in harmony with the environment

Cities pursuing Smart City services embark on their journey from many different places, but do so with the aim of capturing some of the tangible benefits Smart Cities offer:

- Reducing carbon emissions, and energy consumption by 25% and 50% respectively
- Revolutionizing the government's relationship to people
- Enabling real-time alerts and real-time monitoring to create citywide situational awareness
- Reducing costs through platform development and infrastructure sharing

- Reducing crime by 20%
- Enabling better financial forecasting
- Simulating and visualising designs to enable more precise planning
- Creating world-class infrastructure
- Extracting the maximum value from city assets

- Reducing traffic jams by 20%
- Attracting new business investment
- Supporting skills development
- Unleashing innovation
- Creating a "recruiting tool" for attracting talent and jobs
- Reducing resource use through optimization
- Increasing economies of scale

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1 Smart City Framework & Smart City Implementation Program
Appendix A Smart City Framework (complete)

App A

Songdo, Chicago, London, Amsterdam and Barcelona have all attracted international attention for their Smart City projects, but hundreds of other regions like the Sunshine Coast are also using Smart City services to diversify their economies, attract new businesses and visitors, and improve the quality of life for residents. What they all have in common is that they began with a critical examination of the capabilities Smart Cities could deliver. By linking those capabilities to their own goals and desires, each region was able to create a solution fit for their particular needs.

App A

Approach and methodology

As noted above, Smart Cities can take many shapes, and not all solutions make sense in all districts. Using a framework helps municipalities understand how to deliver the greatest impact per dollar invested, and makes Smart Cities more sustainable, viable and robust. The Sunshine Coast Smart City Framework was co-created by the Telstra, Cisco and Sunshine Coast Council teams based on a methodology that Cisco developed and refined through numerous global projects.

1	2	3	4	5
Elicit requirements through document review and stakeholder interviews	Review Smart City service catalogue to select relevant solutions	Review portfolio and prioritise based on value drivers and expertise	Develop high-level technical, operating and financial models	Prepare solution roadmap and develop final report for Council

By engaging more than 20 stakeholder groups on the Sunshine Coast, the team was able to develop a phase-based portfolio of Smart City services for the Maroochydore PDA, and the Sunshine Coast Enterprise Corridor. Although these two districts were the focus of this project, the findings, recommendations, and the process employed provide reusable assets that **readily support extending the analysis and the associated benefits to the broader Sunshine Coast region.**

The Smart City Framework

Regions that deploy Smart City solutions according to a strategic framework achieve the greatest benefit per dollar invested, and avoid creating a new series of digital silos that are difficult to integrate, manage and evolve. Informed by the input of stakeholders, and guided by the Sunshine Coast vision and corporate-plan goals, the team designed a framework that delivers tangible benefits during every phase, and allowing sufficient time for everyone to adopt the new solutions, learn along the way, and extract maximum value from the Smart City investments.

The Smart City Framework is represented by a portfolio of 13 value-added services that are supported by two core layers: a Smart Region Management Platform, and a communications layer provided by Foundational Fibre-optic and Other Telecom (wireless) Networks. Together, the services that comprise the Smart City Framework provide the capability to build and support the economy, develop a stronger community, improve services to residents, businesses and visitors, and credibly claim leadership as Australia's most sustainable region.

Each of the Smart City services in the Framework offers key benefits to the Sunshine Coast, and, based on Cisco research and global experience with other municipalities, can make substantive direct and indirect contributions to the region. Cisco's research related to Smart Cities suggests that regions delivering a fully-integrated program can earn **premiums as high as $13/m^2**. Further, Cisco's economic analysis estimates a value at stake[1] of US$14.4 trillion for the private sector and US$4.6 trillion for the public sector globally, with investments generally returning $3.30 for every $1 contributed. Between business attraction, revenue generation, cost avoidance, environmental protection, and quality of life improvement, **this represents a $755 million opportunity for the Sunshine Coast.**

There are a number of key drivers that influence the benefits delivered by Smart City services. For example, the scale, phasing and timing of the deployments; the sophistication and maturity

---

[1] Value at stake includes benefits for businesses, employees, and citizens; quantified citizen outcomes (such as reduced traffic congestion, crime etc.); hard cost savings, increased revenues, and productivity gains; and allowances for implementation and operational costs.

App A

of the service providers and the service-delivery ecosystem; and, adoption rates by consumers and businesses all directly impact the magnitude and timing of benefits. In order to help the Sunshine Coast refine the estimated benefits realised by implementing Smart City services, we have modelled a 10-year view of the potential macro-economic benefit for the services. The range of potential benefits is based on a number of assumptions based on our global experience, a number of Australian and Sunshine Coast data sources, and interviews with Sunshine Coast Council representatives.

It should be noted that these numbers are indicative and are provided to demonstrate the relative financial benefits achievable based on our global experience and the assumptions outlined in Appendix E. Further work will be required by the Sunshine Coast Council and its partners to validate and test the assumptions, develop specific requirements, understand supplier capabilities and costs, and agree operating model constructs.

Key Benefits of Smart City Service	10-Year Macro-economic Benefit
Foundational Fibre-optic Network—Key Benefits • Enables convergence of all networked services (voice, video, data, machine, etc.) on to a single network, reducing infrastructure duplication and cost • Can accelerate innovation due to the ability to obtain high-speed access to network assets	Essential enabling technology core to delivering and creating value from other Smart City services
Smart Region Management Platform—Key Benefits • Simplifies management of municipal services, consolidates control into one place • Facilitates integration of multi-vendor Smart City solutions, and enables analytics that can enable data-driven decision making and planning	Essential enabling technology core to delivering and creating value from other Smart City services
Smart Lighting—Key Benefits • Lowers electricity and maintenance expenses 60+% freeing funds for other investments • Improved lighting can yield a 20% reduction in crime	**$57M-$99M** Due to reductions in electrical expenses, improved employee productivity, a smaller maintenance vehicle fleet, lower crime and higher property values
Smart City WiFi—Key Benefits • Provides a platform for efficient delivery of other services (public safety, municipal services) • Helps lower IT costs through infrastructure rationalisation • Delivers a services that residents and visitors are coming to expect in city centres	**$6M-$15M** Based on travel avoidance, time saved by people, increased people engagement, and the ability to collect people flow analytics from the solution and drive better investment decisions
Smart Sight, Sound and Sense—Key Benefits (audio-equipped IP cameras, and sensors) • Improves public safety, and allows monitoring in conditions where it may not be practical/safe for people, and longitudinal study of environmental conditions, which supports future prediction and response • Can reduce municipal maintenance costs by allowing remote diagnosis before a truck roll, and lower environmental impact by tailoring resource consumption (e.g., water) based on needs rather than a fixed schedule	**$35M-$55M** Due to at least a 2% reduction in crime, improvements to resource use (e.g., park consumables, water), productivity improvements to the police force, Council staff, and other maintenance staff, and a reduction in the vehicle fleet

App A

Key Benefits of Smart City Service	10-Year Macro-economic Benefit
Smart Waste Management—Key Benefits • Lowers cost of waste management through collection-point consolidation and reduced fleet size • Provides a convenient amenity to visitors and tenants • Contributes to greater urban cleanliness and creates a point of distinction by mirroring solutions embraced by sustainability leaders	**$2M-$3M** Based on adoption only in the Maroochydore PDA, with contributions due to productivity improvements, reduction in maintenance fleet size, and optimised routing/collection
Smart Water—Key Benefits • Can accelerate identification and repair of leaks, lowering water loss (which can reach 30% in some regions) • Reduces treatment costs leading to better water being delivered to residents and fewer chemicals entering the environment • Helps people and businesses make informed choices about how they consume water (often reducing consumption by up to 10%) • Reduces manual meter reading improving workforce efficiency and reducing carbon emissions from vehicles	**$1.5M-$80M** Lower range is related to rollout of Smart Water meters to the Maroochydore PDA and sensors to the Sunshine Coast, a 10% reduction in water use by residents, and fewer maintenance employees and vehicles to read meters. Higher figure depends on rollout of Smart Water meters to the whole Sunshine Coast Region
Smart Power—Key Benefits • Helps people and businesses make informed choices about how they consume electricity (often reducing consumption by up to 10%) • Supports tracking and visualising consumption patterns to help identify anomalies • Reduces manual meter reading improving workforce efficiency and reducing carbon emissions from vehicles	**$2.2M-$150M** Lower range is related to rollout of Smart Power meters to the Maroochydore, a 10% reduction in power use by residents, and fewer maintenance employees and vehicles to read meters. Higher figure depends on rollout of Smart Power meters to the whole Sunshine Coast Region
Smart Parking—Key Benefits • Reduces time spent searching for a spot, thereby lowering carbon emissions and reducing congestion • Improves municipal finances by simplifying payment and maintenance, and improving enforcement	**$36M-$40M** Due to optimised parking infrastructure, improved revenue from collections, higher enforcement, and less time by drivers spent looking for parking spots
Smart Transport—Key Benefits • Real-time tracking and in-bus services improve travel experience, which can help increase ridership • Route optimisation can lower operating costs	**$8M-$10M** Due to improved infrastructure investments given traffic analytics, higher bus ridership (higher revenues), lower wait times for riders and the emergence of supplemental private-public transportation services (e.g., Bridj.com)
Smart Citizen Services—Key Benefits • Provides convenient access through smartphones and the web to Council information and services • Reduces cost to serve, improves citizen engagement, simplifies interaction with government • Produces (and supplies) data that supports information-driven decisions	**$30M-$40M** Based on employee productivity improvements, time saved by residents in dealing with government, and reduction in administrative costs associated with managing simple in-person requests
Smart Signage—Key Benefits • Artistic campaigns can create a 'Wow!' factor • Digital canvas provides a platform to sell advertising space that can be centrally controlled and personalised based on location, and (potentially) triggered by individual behaviour	**$5M-$7M** Due to revenue from advertising, improvements in way-finding for residents and visitors, and increased tourist spending as a result of more efficient navigation
Smart Health—Key Benefits • Collaboration between the health and education sectors can help create a 'Competency Cluster' in the region focused on high-value industries of education and healthcare • Can provides citizens a higher-quality, independent life by facilitating a focus on predictive medicine, significantly lowering costs of health care, and improving treatment outcomes	**$8M-$12M** Due to improved health outcomes, better management of chronic conditions, and reduced travel time for patients and physicians

Sunshine Coast Council—Smart City Framework   5

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   **Smart City Framework & Smart City Implementation Program**
Appendix A   **Smart City Framework (complete)**

App A

Key Benefits of Smart City Service	10-Year Macro-economic Benefit
Smart Education—Key Benefits • Capitalises on Deloitte's prediction that International Education is one of the new growth sectors for Australia by combining multiple strengths and recognising regional advantages • Supports development of an Education+Health competency cluster focused on bio-informatics, wearables and aged care	**$13M-$18M** Due to improved educational experiences, greater attraction of foreign students, and ability to retain students in the area after graduation
Smart Lab & Hub—Key Benefits • Allows Council to showcase some of the hidden and visible elements of the Smart City to foster support for the vision • Provides a space to evaluate new ideas, enable attraction of high-value talent through the concept of a Digital Work Hub, and double as a site for emergency / disaster response	**$5M-$8M** Based on reduction in travel due to Digital Work hub, improved investment attraction in employees and reduced maintenance fleet size, and optimised routing for remaining fleet

There is often a temptation to do everything quickly, but doing so foregoes the opportunity to take advantage of both falling costs, and regular technological advances (e.g., during the previous 24 months, LED prices have fallen by approximately 50%, and the lights have gotten much brighter). Moreover, rapid deployment of Smart City solutions can eclipse the capacity of councils to effectively support them, and of residents to embrace them. Accordingly, the implementation roadmap is based on delivering a set of capabilities over time—expanding from early-stage cost savings and revenue-generating services to those that enrich the lives of citizens, attract and enable businesses and provide a platform for ongoing evolution of the Smart City.

THE SMART CITY PROGRAM BEGINS HERE

Phase 0 (in-flight or planned)

Phase 0 activities represent in-flight and planned ICT initiatives that align with or are supportive of the Smart City Framework, and which may feed in or transition to become part of the Smart City program.

However, many of these initiatives were beyond the scope of the engagement, and were not assessed by Telstra and Cisco. Therefore, they are being presented in grey to capture their role, but without consideration for priority, sequence, dependence or location.

Phase 1

Phase 2

Phase 3

Phase 4

Phase 5

Evaluate, refine, learn and share

Smart City Service Implementation (Maroochydore PDA)

- Citizen Self-Service
- Analytics, Visualisation & Reporting
- Community Collaboration
- Internet of Things/Sensor Networks
- Open Data & Location-based Services

In-ground Infrastructure for Smart City Services, Smart Water, Smart Power, Smart Signage

Foundational Fibre-Optic Network

Smart Lighting

Smart Parking

Smart City WiFi

Smart Sight, Sound & Sense

Smart Waste Management

Smart Water

Smart Power

Smart Signage

Smart Lab & Hub

Smart City Service Implementation (Shared)

Smart Region Management Platform

Smart Transport

Smart Citizen Services

Data from all Smart City Services flows into the Smart Region Management Platform and is made available to Council and others through Smart Citizen Services

Smart Health & Education

Health + Education Competency Cluster

Smart City Service Implementation (Enterprise Corridor)

Smart Parking

Smart Lighting

Smart City WiFi

Smart Sight, Sound & Sense

Smart Water

Smart Signage

Smart Lab & Hub

Sunshine Coast Council—Smart City Framework

7

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

As noted earlier, not all services should be introduced to all areas, so the framework-development team weighed the benefits and costs of deploying each solution in various jurisdictions. The recommended deployment sequence is illustrated by the Smart City services roadmap above, and summarised in the deployment-jurisdictions table below. Although not included in the scope of this project, we have also included the broader Sunshine Coast region to demonstrate where Smart City service can be extended beyond the initial zones to deliver greater value.

Smart City Solution	Maroochydore PDA	Enterprise Corridor	Broader Region
Foundational Fibre-optic Network	●	○	○
Smart Region Management Platform	One Platform		
Smart Lighting	●	●	●
Smart City WiFi	●	◒	◒
Smart Sight, Sound and Sense	●	◒	◒
Smart Waste Management	●	○	○
Smart Water	●	◒	◒
Smart Power	●	○	○
Smart Parking	●	◒	◒
Smart Transport	Smart Buses & Data		
Smart Citizen Services	Mobile Apps & Open Data		
Smart Signage	●	◒	◒
Smart Health	Sensor-driven & Remote Health		
Smart Education	Connected & Flexible Education		
Smart Lab & Hub	●	◒	◒

Legend	● Deploy in Area	◒ Deploy Selectively in Area	○ Consider for Future Deployment	▬ Deploy Across Areas	▭ Deploy Selectively Across Areas

Recommendations and next steps

The economic, environmental, demographic and contextual challenges faced by cities in the 21st century are significant. For city leaders, building their economies and communities, delivering services aligned with the new patterns of behaviour, and being good custodians of the environment can seem overwhelming—especially when competition for many high-value, information-centric jobs is not limited to neighbouring communities. While there are various

ORDINARY MEETING   8 DECEMBER 2016
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

paths to success, governments focused on traditional approaches will not be able to meet their responsibilities to the people they serve.

Innovation-driven approaches to problem solving have helped companies such as Amazon change retailing, Square change mobile payments, Zipcar change automotive, and AirBnB change accommodation. Organisations that employ more types of innovation are consistently able to outperform their peers. At the heart of many types of innovation—especially those exploited by firms mentioned earlier—is information and communications technology. Cloud, social and mobile technologies can help cities transform urban centres into sustainable Smart Cities. However, Smart City transformation is not about implementing the latest smart grid, or building an operations centre to rival Rio de Janeiro's. It is focused on responding to a changing context, and using technology to evolve the way services are delivered to improve the liveability, workability, and sustainability of cities.

Developing the Sunshine Coast Smart City Framework meant listening to and incorporating feedback from a diverse team representing different areas of Council responsibility. From a catalogue of options, the team then identified Smart City services that make sense for the Sunshine Coast. The prioritisation and sequencing of these solutions builds progressive capability maturity as part of the Smart City journey, and does so in a way that is financially sustainable, and paced to allow Council and residents to learn how to fully benefit from these innovations.

As cities around the world—and those just down the road—move to deliver their Smart City visions, a desire to lead should encourage Sunshine Coast Council to take six pragmatic steps to capture the value of Smart Cities, and realise its vision of being Australia's most sustainable region. After socialising the Smart City Framework with Council and obtaining their crucial support, you should:

- Establish an internal governance and operating model

- Conduct detailed portfolio analysis to refine the services and better develop benefits and costs

- Define an external governance and operating model

- Define and build the Smart Region Management Platform to support aggregation and analysis of data

- Engage the broader stakeholder community to build support for the program, and interest from partners

- Start the first Smart City projects

The Smart City is more a journey than a destination, and embarking requires conviction to develop the necessary foundations that demonstrate benefits, and to build support for the next step. Nonetheless, for those who chose to lead, Smart Cities provide real opportunities to build a new economy, develop a stronger community, improve services to residents, businesses and visitors, and credibly claim leadership in the areas of sustainability, and public-sector policy and execution.

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

1   Introduction and strategic context

The Sunshine Coast Regional Economic Development Strategy 2013-2033 identified the new Maroochydore City Centre Priority Development Area (PDA) as a game-changing project that will contribute to reshaping the region's economy in the decades to come. When combined with investments elsewhere along the Enterprise Corridor, and a population set to grow by more than 40% over the next two decades, Smart City investments will help advance the five corporate-plan goals and make the region an even better place to work, play, live and learn.

The Sunshine Coast corporate plan is built around five themes:

- A new economy
- A strong community
- An enviable lifestyle and environment
- Service excellence
- Public-sector leadership

Notwithstanding its ambition, as the Sunshine Coast Council moves forward, it must contend with real challenges: economic pressures created by limited revenue growth, the environmental load created by human activity, aging infrastructure, growing international competition, and the service-design expectations of residents, visitors and businesses whose demands are being shaped by companies such as Google, Apple, and Facebook. In short, people expect their governments to provide better service, at lower costs, and to respond to them through multiple channels.

Using traditional approaches, governments will be unable to meet their responsibilities

Using traditional approaches, governments will not be able to meet their responsibilities for the built environment, energy, telecommunications, transportation, water and waste management, health and human service, public safety and payments and finance. Having to choose between two alternatives—raising rates or cutting services—is appealing to no one. Thinking differently about how services can be delivered by leveraging the cloud, social and mobile technologies used by companies in the *Sharing Economy*[2] offers councils a real opportunity to avoid that choice.

The remainder of this document is broken into sections, each with a specific purpose.

- **What is a Smart City?** Explains what constitutes a Smart City, identifies the value-delivery mechanism, and offers two relevant case studies.

- **Approach and methodology.** Explains the process the team followed in order to develop the Smart City Framework.

- **Sunshine Coast Smart City Framework.** Explains each of the components of the Smart City Framework co-developed by Sunshine Coast Council, Telstra and Cisco, links them to your vision and corporate plan goals, and illustrates how they can improve the lives of residents. The section then identifies which Smart City services can deliver the greatest value in particular locations (Maroochydore PDA, Enterprise Corridor, Region), sequences services for deployment across regions, and offers high-level financial information related to the benefits and costs of each service.

---

[2] The Sharing Economy is a socio-economic ecosystem built around the sharing of human and physical resources. It includes the shared creation, production, distribution, trade and consumption of goods and services by different people and organisations. cf. http://goo.gl/U5EQEV

App A

- **Enabling the Smart City.** Provides a high-level overview of the architecture, guidelines for interoperability, and network considerations to support each of the Smart City services.

- **Operating the Smart City.** Identifies internal and external operating models to consider for providing the governance required to design, build and manage the Smart City services to extract maximum value from them.

- **Recommendations and next steps.** Concludes the document and offers next steps for Sunshine Coast Council to pursue as part of its Smart City journey.

App A

2   What is a Smart City?

The idea of embedding sensors more deeply into our environment (and sometimes into ourselves), and connecting this array of sensors, devices, and machines has been assigned many different names, but the banner **Smart City** describes the portfolio of services that can be implemented to transform and improve the way residents, visitors, businesses and governments interact with their environment in the course of their lives. Smart Cities uses information and communications technology to connect people, processes, data and things in ways that make cities more…

Liveable

A better quality of life for city residents.

Smart Cities provide people access to a healthy, safe, engaged, and clean lifestyle. The outcomes align with the Sunshine Coast goals of a strong community, and an enviable lifestyle and environment.

Workable

Accelerated economic development.

Smart Cities help create more and better jobs and raise local GDP. But Smart Cities don't simply create jobs; they establish a platform for innovation and prosperity, and provide elements that help cities develop a robust, diversified economy and compete in the global economy.

Sustainable

Responsible resource use, in harmony with the environment.

Smart Cities enable the efficient use of fiscal, human and environmental resources by using technology to help investments produce more value, last longer (through predictive maintenance, for example), and cost less over their productive lives.

Smart Cities can take many forms, and the solutions deployed in each area are driven by the needs, wants and desires of a region. The Approach and Methodology section of this document explains the process followed to create a Smart City Framework that supports responsible economic development along five pathways[3], while helping to make the Sunshine Coast Australia's most sustainable region: vibrant, green and diverse.

2.1   How does a Smart City deliver benefits?

A review of the literature related to Smart Cities reveals many claims of their benefits:

- Reducing carbon emissions, and energy consumption by 25% and 50% respectively[4]
- Revolutionizing the government's relationship to people
- Enabling real-time alerts and real-time monitoring to create citywide situational awareness
- Reducing duplicate efforts
- Reducing costs through platform development and infrastructure sharing

- Reducing crime by 20%[5]
- Enabling better financial forecasting
- Simulating and visualising designs to enable more precise planning
- Creating world-class infrastructure
- Extracting the maximum value from city assets

- Reducing traffic jams by 20%[6]
- Attracting new business investment
- Supporting skills development
- Unleashing innovation
- Creating a "recruiting tool" for attracting talent and jobs
- Reducing resource use through optimization
- Increasing economies of scale

_____

[3] The Regional Economic Development Strategy 2013-2033 identified five primary pathways to support the development goals for the region: leadership, collaboration and identity; capital investment; high-value industries; local-to-global connections and investment in talent and skills.

[4] Philip Carter, Bill Rojas and Mayur Sahni. _Delivering Next-Generation Citizen Services: assessing the environmental, Social and Economic Impact of Intelligent X on Future Cities and Communities._ IDC Research. p5. June 2011.

[5] Ibid, p5.

[6] Ibid, p5.

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

Many of the benefits listed above—each of which create a more liveable, workable and sustainable city—accrue individually, or organisationally as a result of improvement to and acceleration of decision-making through a four-step value-delivery process illustrated in Figure 1.
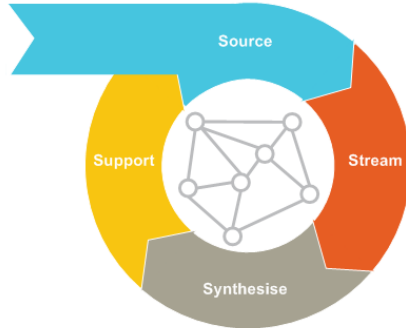
Figure 1: Smart City value-delivery process

Source	Smart City technology is deployed at various points throughout the city, and these distributed components *source* (i.e., collect) measurement and monitoring data such as people density, air and water quality, traffic velocity and flow rates, and parking availability. Naturally, the data collected depends on the solutions deployed.
Stream	When the Smart City technology has sourced data, it *streams* it back to a central location. In the future, the concept of Fog Computing[7] will make distributed processing and decision making more common, but for the time being, real-time and batch processing of data will remain common. Because of the distributed nature of Smart City technology, most regions mix a variety of wired and wireless technologies to support data streaming with the ultimate goal being the delivery of ubiquitous connectivity: all people, all places, all devices.
Synthesise	When data has been streamed back from the distributed Smart City technology, it can be *synthesised* (cleaned, filtered, consolidated) in order to produce a rich set of information for Council analysis, and for moderated syndication the public as part of an open data initiative.
Support	With the synthesised data available for use, it will *support* improved decisions both simple and complex. For example, it can support trip planning based on real-time bus location, and support conservation by optimising watering schedules based on ambient temperature and soil humidity. When examined longitudinally, data can support predictive maintenance for municipal assets, or allow Council to determine increasing evening lighting in a precinct which generates incremental economic activity to justify the higher energy cost.

2.2   Where have Smart City solutions delivered benefits?

Given the hyperbole surrounding many new technologies, it's right to be sceptical of a long list of benefits without supporting evidence. When embarking on their own Smart City journey, other regions have recognised that transformation of a city is a journey requiring planned, incremental investment. Demonstrating benefits helps gain sanction, approval and support for the next step, which is essential because long-term success with Smart Cities depends on the support of the community far more than on the specific feature or functionality of a technology.

Notwithstanding the hype surrounding Smart Cities, thoughtful deployment of Smart City technologies can produce real benefits to businesses, residents and visitors. Numerous case studies from cities such as Barcelona, Amsterdam and Nice illustrate the potential of Smart Cities, but are not especially pertinent to the Sunshine Coast. Therefore, three case studies have been selected from comparable regions to help make the achievements more relevant.

---

[7] Fog computing is a paradigm that extends cloud computing and services to the edge of the network. Similar to cloud, fog provides data, compute, storage, and application services to end-users. The distinguishing fog characteristics are the proximity to end-users, its geographical distribution, and its support for mobility. cf. http://goo.gl/GhkLrV

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

City: Cambridge, USA. Pop. 100K

Challenge: With thousands of older lights in service, and a goal of leading by example on sustainability issues important to residents, Cambridge set out to find new ways to reduce its environmental load and financial expense.

Solution: The city implemented a Smart Lighting system that allowed wireless management of lighting infrastructure. Replacement of more than 5,000 lights set the stage for expanded adoption of the technology.

Outcome: 75% reduction in power use, reductions in power bills of more than $350K annually, and greater control over the lighting infrastructure.

City: Saskatoon, CAN. Pop. 202K

Challenge: Older meters were providing inaccurate readings, with billings often estimated. During periods of peak consumption, residents were often left surprised by large 'catch-up' bills. Manual reading also resulted in 35 tonnes of annual carbon emissions due to vehicle travel.

Solution: The city is currently replacing more than 70,000 electricity and water meters with smart meters that support wireless reading and monitoring, and will activate the system in 2015.

Outcome: 20-year projected savings of $76.1 million, project payback in about a decade with project rate of return of 11%.

City: Milton Keynes, UK. Pop. 230K

Challenge: With growing demand for parking and as many as 7,000 spaces empty, but difficult to locate, Milton Keynes sought a way to optimise use of parking infrastructure and to avoiding simply building more spaces.

Solution: The city added in-ground sensors to detect vehicle presence and transmit the information to Council where it is combined with Google maps. The results are made available online, allowing residents and visitors to quickly navigate to a spot and then get on with their day.

Outcome: Avoidance of up to $170M in new parking-bay construction, lower user frustration while trying to locate a free spot, and significant reductions in fuel consumption and carbon emissions.

Establishing the Maroochydore City Centre PDA as a Smart City can deliver tangible economic, and lifestyle advantages for residential, business, civic, cultural and environmental activity. Extending specific elements of the Smart City into other focused areas can also create durable and lasting economic, community and environmental benefits across the Sunshine Coast region.

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

3   Approach and methodology

The Sunshine Coast Smart City Framework is a co-designed solution that includes extensive consultation with Sunshine Coast stakeholder groups, and the local and global expertise of Telstra and Cisco. Our co-design approach helps aligns Smart City solutions with the vision and goals of our clients, and is based on Cisco's five-step methodology outlined in Figure 2.

Figure 2: Smart City Framework project methodology

3.1   *Elicit requirements*

As a way to help promote the Smart City Framework and elicit requirements related to various city responsibilities, the team worked with Sunshine Coast Council to identify workshop participants from across various stakeholder populations.[8] The Sunshine Coast Council, Telstra and Cisco team then held collaborative working sessions with **more than 20 stakeholder groups** to help explain the objectives of the Smart City Framework project, and determine how capabilities might support greater efficiency and effectiveness across various areas of city responsibility.

Figure 3: Stakeholder coverage model

As the team worked with the various stakeholder groups, Cisco's Smart City Model Framework[9] helped to guide the conversation. As illustrated by Figure 3, engaging a number of stakeholder populations units in the requirements elicitation process can provide excellent coverage of all Smart City requirements. As a result of the stakeholder consultation, the team developed a set of themes and patterns important to the Smart Cities initiative (Figure 4).

Figure 4: Smart Cities stakeholder interview themes

---

[8] The complete list of stakeholder consultation is provided in Appendix B.

[9] The Smart City Model Framework is presented in Appendix C, and encourages cities to think holistically as they embark on their smart city journey. In doing so, the Smart City Model Framework helps to increase the likelihood a city will be successful with its program.

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

Although Figure 4 doesn't provide a comprehensive view of needs, it serves to highlight themes such as people-centricity, smart management of municipal infrastructure, the need for connectivity (traditional telecom and WiFi), and concern about the potential spread of paid parking. Although requirements captured during the first stage of the project are detailed and extensive, new requirements will emerge during the Smart City program delivery, and they can be addressed as part of a regular roadmap refresh that evaluates new requirements and allows the Sunshine Coast to take advantage of the continually evolving portfolio of solutions.

3.2   Review of the Smart Cities service catalogue

With requirements gathered and consolidated, the team combined them with the Sunshine Coast Corporate Plan goals, and ideas from the five essential economic development pathways to create a compendium of requirements. The combined set of requirements were then reviewed against a portfolio of Smart City solutions (Figure 5) which was augmented by the latest thinking from a team of policy specialists and professionals leading the design and delivery of Smart Cities projects around the world. During this stage, the team set out to answer one key question: when a Smart City *could* take any number of shapes and incorporate any of a vast array of services (Figure 6) what *should* the Sunshine Coast Smart City deliver?
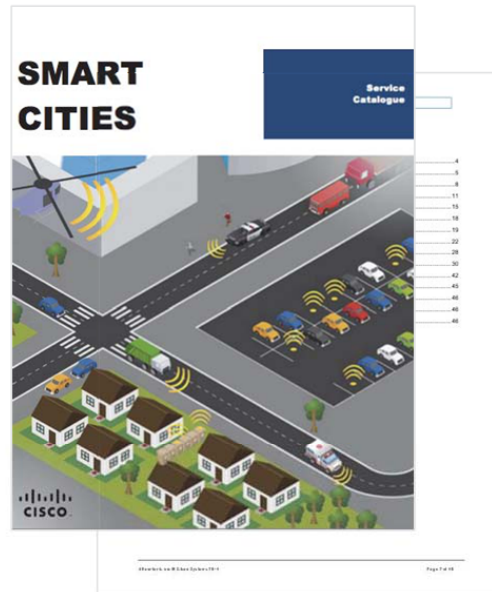

Figure 5: Smart Cities service catalogue

Figure 6: Potential elements of a Smart City

3.3   Prioritise solutions based on value drivers and expertise

Given the input of stakeholders, many different Smart City solutions identified through the review are relevant and have merit. As noted earlier, however, success depends upon being thoughtful about choices and about sequencing the introduction of solutions to gradually weave together a Smart City fabric. Although it is important to experiment with new ideas, and to move quickly from concept into delivery, *it is essential to remember that many people change much more slowly than technology does.* If Smart City service implementations are aligned with the capacity of stakeholders to adopt them, Smart Cities will better satisfy the wants, needs and goals of the populations they serve.

In order to prioritise the solutions, and in recognition of the different priorities of the Maroochydore PDA, the Enterprise Corridor and the remaining coastal region, the team developed and weighted a prioritisation model based on five value drivers:

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

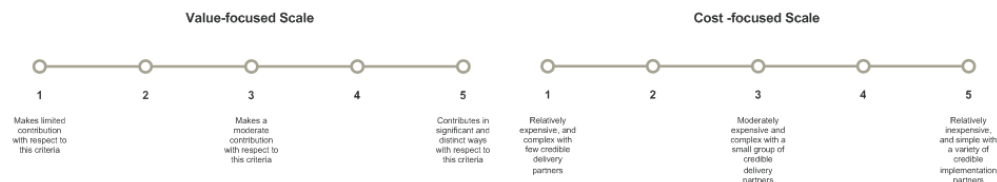| Value Driver[10]	Maroochydore PDA Weighting	Enterprise Corridor Weighting	Broader Region Weighting
Brand Equity *Ability to attract investment and immigration based on concepts of sustainability, innovation, and creating elements of distinction—'wow factor'*	25%	5%	5%
Optimisation *Performs a similar service/delivers a similar capability for lower cost, and/or supports efficiency elsewhere in the system*	30%	50%	50%
Monetisation Potential *Provides monetary benefit to the area through transaction fees, an ability to licence, or the generation of data that could be sold*	20%	15%	15%
Quality of Life *Unlikely to reduce costs or generate revenues, but would enrich the lives of citizens, and (potentially) build support for future investments in the Smart City program*	15%	20%	20%
Implementation Cost, Complexity & Maintenance *Relates to the cost of designing, and implementing this service, the availability of partners and the practicality of ongoing maintenance*	10%	10%	10%

Sliding scales[11] were used to assess the contribution of each of the identified Smart City solutions against these value drivers. Combined with insights gained through participation in other Smart City engagements, and knowledge of dependencies between solutions, this prioritisation helped determine the deployment sequence of the various Smart City solutions.

3.4 Create the technical, operating and financial model

In order to maximise the benefit of Smart City solutions, the portfolio must integrate into a cogent and extensible technical architecture that adheres to existing IT standards and—to the

---

[10] Value drivers provide an essential input into the prioritisation and sequencing of the Smart City solutions. The value drivers here align with the five goals in the Sunshine Coast Council corporate plan, and were reviewed and ratified with Sunshine Coast Council stakeholders. Sub-criteria for each value driver, and the aggregate scores of each Smart City solution are provided in Appendix D.

[11] Sliding scales (shown below) were used to assess the degree to which each of the Smart City solutions supported the value drivers. Two scales were used to recognize the difference between the first four drivers (mainly value focused) and the final driver (mainly cost focused).

Value-focused Scale   **Cost -focused Scale**

1	2	3	4	5	1	2	3	4	5
Makes limited contribution with respect to this criteria		Makes a moderate contribution with respect to this criteria		Contributes in significant and distinct ways with respect to this criteria	Relatively expensive, and complex with few credible delivery partners		Moderately expensive and complex with a small group of credible delivery partners		Relatively inexpensive, and simple with a variety of credible implementation partners

Sunshine Coast Council—Smart City Framework   9

extent possible—leverages existing investments. Therefore, the team developed a high-level technical architecture for the Smart City solution, and developed guiding principles for topics such as interoperability.

Evolution and adaptation of the Smart City Framework and its underlying technology fabric must be managed through a new operating model that can support the iterative, agile testing of solutions. With various public sector and commercial partners involved in the Smart City market, the operating models developed by the team provide several options that Sunshine Coast Council can consider for adoption as the region progresses on its Smart City journey.

Finally, because one of the most significant barriers to Smart Cities is funding, understanding the financial / revenue models for the various solutions in the portfolio provides an important input to the sequencing of the Smart City solutions. Accordingly, the team developed high-level financial information (costs and benefits) for elements of the portfolio to support the long-term evolution of digital Sunshine Coast.

3.5   Develop a Smart City roadmap and Council presentation

The final step of the project was development of this document, and the summary presentation that accompanies it. These two deliverables represent the combined efforts of the Sunshine Coast Council, Telstra and Cisco teams and provides a pragmatic and realistic framework on which to base the implementation of Smart City Solutions in the Maroochydore PDA, the Enterprise Corridor and the broader Coastal region.

The next section of this document presents the Smart City Framework, recommends regions for deployment of specific solutions, and presents the technical, operating and financial models of the Smart City solution.

ORDINARY MEETING   8 DECEMBER 2016
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

4   Sunshine Coast Smart City Framework

Although some Smart City solutions offer benefits in isolation, regions that deploy Smart City solutions according to a strategic vision achieve the greatest benefit per dollar invested, and avoid creating a new series of digital silos that are difficult to integrate, manage and evolve. With its development of the Maroochydore PDA, combined with the other capital projects underway in the region (e.g., Sunshine Coast University Public Hospital), the Sunshine Coast has a unique opportunity to look holistically at its investments in Smart City solutions to help advance the vision of being Australia's most sustainable region.

Through stakeholder consultation, and a mapping of needs, wants and motivations to the capabilities of various Smart City solutions, the Telstra and Cisco team worked with representatives of Sunshine Coast Council to co-develop a Smart City Framework. The result, summarised by Figure 7, has a portfolio of 13 value-added services supported by two core layers: a Smart Region Management Platform, and a base communications layer provided by a Foundational Fibre-optic Network and Other Telecom Networks.
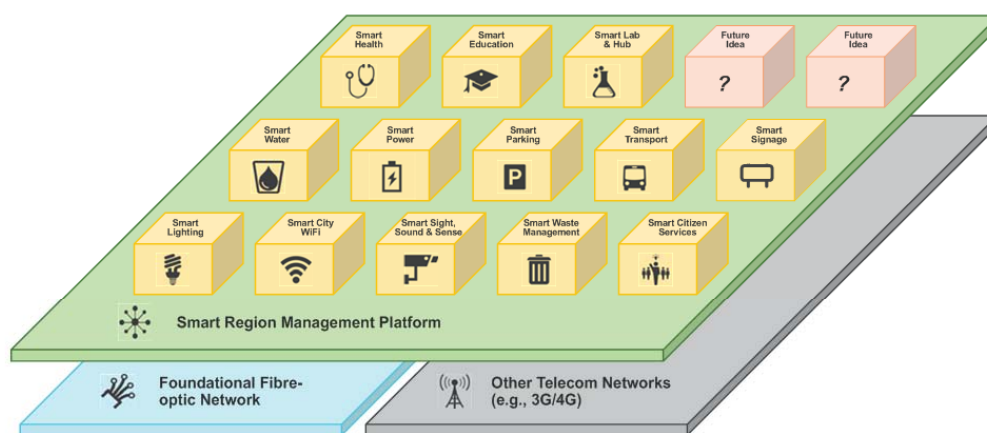

Figure 7: Smart City Framework

The remainder of this section is broken into three sub-sections focused on:

1. **Defining Smart City solutions** in Figure 7, and linking them to Council's vision and corporate plan themes.
2. **Focusing and implementing Smart City solutions** by identifying where deployment of particular Smart City solutions can deliver the greatest invested benefit, and illustrating the deployment sequence of each solution across the Sunshine Coast.
3. **Articulating the benefits and costs** of the program by providing high-level guidance on the financial elements of each Smart City solution.

4.1   Defining Smart City solutions

As each of Smart City components in Figure 7 is defined and the associated benefits identified, connecting them to the Sunshine Coast corporate plan goals helps more clearly identify why each was selected for inclusion in the Smart City Framework. Later sections of this document examine prioritisation and sequencing of the various Smart City services with a focus on progressive capacity building.

App A

Description of Smart City Service	Corporate Plan Goal Mapping				
	A new economy	A strong community	An enviable lifestyle and environment	Service excellence	Public-sector leadership
Foundational Fibre-optic Network • Sits at the foundation of many other smart city services. Although this network may provide the foundation within the Maroochydore PDA, it will be augmented there by other telecommunication networks (e.g., 3G/4G), which feature predominantly in the Enterprise Corridor • Supports high-bandwidth connectivity between sites, and from sites to the internet • Provides a single management network for all Smart City services • Could provide the ability for council to become a carrier • Allows Council (or partners and vendors) to design and deliver value-added services to inhabitants **KEY BENEFITS** • Enables convergence of all networked services (voice, video, data, machine, etc.) on to a single network, reducing infrastructure duplication and cost • Can accelerate innovation due to the ability to obtain high-speed access to network assets	✓	✓	✓	✓	✓
Smart Region Management Platform • Consolidates monitoring and control capabilities from all Smart City services into a single management interface / system • Allows aggregation and syndication/distribution of data to other agencies and entities (including private sector) that operate smart buildings, utilities and citizen-centric applications • Allows municipalities to 'connect the dots' between events, use simulation software to predict the impact of changes, and improve decision-making • Supports development of an abstraction and integration framework that permits the Platform to grow over time and adapt to changes in the Smart City **KEY BENEFITS** • Simplifies management of municipal services, consolidates control into one place • Facilitates integration of multi-vendor Smart City solutions, and enables analytics that can enable data-driven decision making and planning		✓	✓	✓	✓
Smart Lighting • Connects city lighting (streets, stadiums, parks, etc.) to the Smart Region Management Platform, and uses algorithms and sensors to control on, off and dimming cycles • Use of LEDs and algorithms lower power consumption (up to 70%), and reduce maintenance (bulb life of 10-15 years), which reduces the need for maintenance vehicles and workers • Supports Council's goal of making Sunshine Coast the country's most sustainable region through reduced electrical use and fewer maintenance vehicle operating hours • Enhancing networking capabilities during refitting allows cities to create a 'smart canopy' comprised of lighting and other services such as Smart Lighting and Smart Sight, Sound & Sense below **KEY BENEFITS** • Lowers electricity and maintenance expenses 60+% freeing funds for other investments • Improved lighting can yield a 20% reduction in crime	✓	✓	✓	✓	

App A

Description of Smart City Service	Corporate Plan Goal Mapping				
	A new economy	A strong community	An enviable lifestyle and environment	Service excellence	Public-sector leadership
Smart City WiFi	✓	✓	✓	✓	
Smart Sight, Sound and Sense	✓	✓	✓	✓	
Smart Waste Management		✓	✓	✓	

Smart City WiFi

- Provides pervasive WiFi that gives always-available network access to residents, visitors and city workers
- Establishes a converged communication fabric for public, institutional and machine-to-machine communication (for selective uses)
- Can help determine space utilisation and track the movement of tagged assets when combined with tracking technology and/or RFID sensors
- Supports digital inclusion and economic development by enabling connectivity, social sharing and targeted messaging during marquis events such as Tough Mudder

KEY BENEFITS

- Provides a platform for efficient delivery of other services (public safety, municipal services)
- Helps lower IT costs through infrastructure rationalisation
- Delivers a services that residents and visitors are coming to expect in city centres

Smart Sight, Sound and Sense
(audio-equipped IP cameras, and sensors)

- Connects cameras—some with pan/tilt/zoom and audio capabilities—to support enhanced public safety and emergency management
- Combined with image and audio processing software, can deliver additional services such as traffic management (e.g., flow control, and parking)
- Sensors connected to this network could monitor environmental conditions such as soil humidity and send data to irrigation control systems to optimise watering schedules

KEY BENEFITS

- Improves public safety, and allows monitoring in conditions where it may not be practical/safe for people, and allows longitudinal study of environmental conditions, to support future prediction and response thereby supporting a **Smart Environment**
- Can reduce municipal maintenance costs by allowing remote analysis of assets (e.g., park, roads, vehicles, lighting, animal traps, rubbish-bag dispenser, etc.) before a truck roll, and lower environmental impact by tailoring resource consumption (e.g., water) based on needs rather than a fixed schedule

Smart Waste Management

- Connects sensors to above-ground waste-management infrastructure to monitor bin volume
- Full bins send a message requesting service, which reduce overflows and can be combined with route-planning software to optimisation collection paths of trucks
- Reduces the number of workers and trucks required to support an area
- May employ sub-surface waste-management infrastructure to consolidate collection points, reducing fleet size, and vehicle miles travelled

KEY BENEFITS

- Lowers cost of waste management through collection-point consolidation and reduced fleet size
- Provides a convenient amenity to visitors and tenants
- Contributes to greater urban cleanliness and creates a point of distinction by mirroring solutions embraced by sustainability leaders

App A

Description of Smart City Service	Corporate Plan Goal Mapping				
	A new economy	A strong community	An enviable lifestyle and environment	Service excellence	Public-sector leadership
Smart Water • Smart meters in homes and businesses demonstrate real-time consumption and by benchmark utilisation against others, can encourage awareness and responsible use which reduces consumption of scarce resources, lowers use of chemicals during pre-consumption treatment, and reduces load on both sewer infrastructure and sewage treatment • Sensors deployed along water and wastewater management infrastructure help monitor system health (i.e., leaks, ruptures) • Sensors in water source monitor levels of sediment / bacteria to moderate use of treatment chemicals **KEY BENEFITS** • Can accelerate identification and repair of leaks, lowering water loss (which can reach 30% in some regions) • Reduces treatment costs leading to better water being delivered to residents and fewer chemicals entering the environment • Helps people and businesses make informed choices about how they consume water (often reducing consumption by up to 10%) • Reduces manual meter reading improving workforce efficiency and reducing carbon emissions from vehicles		✓	✓	✓	
Smart Power • Smart meters can allow people and businesses to observe electrical consumption and benchmark against others to encourage awareness and economical use • Collaborates with other Smart City services such as the Smart Lab & Hub to support innovation in the energy sector (e.g., solar) • Established a foundation for installation of electrical vehicle charging stations and real-time pricing and metering for vehicle charging **KEY BENEFITS** • Helps people and businesses make informed choices about how they consume electricity (often reducing consumption by up to 10%) • Supports tracking and visualising consumption patterns to help identify anomalies • Reduces manual meter reading improving workforce efficiency and reducing carbon emissions from vehicles	✓	✓	✓	✓	

ORDINARY MEETING
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

8 DECEMBER 2016

App A

Description of Smart City Service	Corporate Plan Goal Mapping				
	A new economy	A strong community	An enviable lifestyle and environment	Service excellence	Public-sector leadership
Smart Parking • Allows central control of pricing, and automates notification of equipment failures • Simplifies parking enforcement by notifying staff of overstays and (potentially) automating ticketing • Allows cities to recoup the cost of providing on-street, garage and surface parking lots • Reduces on-street traffic congestion, potentially by more than 30%[12] • Guides visitors to a spot through a mobile application for surface parking, and via smart signage within parking structures • Simplifies payment by providing multiple payment options (cards, cash, mobile) and quickly delivering revenue to the city **KEY BENEFITS** • Reduces time spent searching for a spot, thereby lowering carbon emissions and reducing congestion • Improves municipal finances by simplifying payment and maintenance, and improving enforcement	✓		✓	✓	✓
Smart Transport • Automated vehicle location technology allows operator and riders to retrieve real-time location information to improve trip planning (cf. Nextbus) by supporting mobile applications • Provides richer information that can help support route optimisation, and improve maintenance planning • Facilitates extension of in-vehicle services such as WiFi, and Smart Digital Signage • In-ground and camera-based traffic analysis helps optimise traffic signalling at a system-level, and helps improve infrastructure investments **KEY BENEFITS** • Real-time tracking and in-bus services improve travel experience, which can help increase ridership • Route optimisation can lower operating costs	✓	✓	✓	✓	

---

[12] Donald Shoup. *Cruising for Parking*. Access. Number 30. Spring 2007. cf. http://goo.gl/4diJOl

Sunshine Coast Council—Smart City Framework

15

App A

Description of Smart City Service	Corporate Plan Goal Mapping				
	A new economy	A strong community	An enviable lifestyle and environment	Service excellence	Public-sector leadership
Smart Citizen Services • A mobile-first approach to development of content, web sites and applications, and adoption of a set of Digital Business guiding principles[13] • Migration of all civic processes and interactions to online solutions with a focus on self-service, automation and exception reporting • Adoption of Open Data standards and an embrace of open source tools to foster /community engagement and development • Delivery of ideation, collaboration and payment platforms to support crowd-sourcing of ideas, co-development of policy **KEY BENEFITS** • Provides convenient access through smartphones and the web to Council information and services • Reduces cost to serve, improves citizen engagement, simplifies interaction with government • Produces (and supplies) data that supports information-driven decisions	✓	✓	✓	✓	✓
Smart Signage • Smart signing includes all types of digital displays from large-format billboards, indoor signage using TV panels, and ornamental / decorative illumination • Can incorporate sensors that track user behaviour and tailor experiences accordingly • Signs my also offer services (USB charging) and be integrated with the Smart City WiFi program (cf. recent NYC announcement) • May be extended to support alerting or warning in times of emergency **KEY BENEFITS** • Artistic campaigns can create a 'Wow!" factor • Digital canvas provides a platform to sell advertising space that can be centrally controlled and personalised based on location, and (potentially) triggered by individual behaviour	✓	✓		✓	

---

[13] Sunshine Coast Council IT staff have already made progress toward developing such a framework through 12 digital-business guiding principles:

• Citizen centric	• New business models	• Inclusive	• Interoperable
• Digital first	• Synergistic	• Agile	• Sustainable
• Digital automation	• Engaging	• Scalable	

These principles can form an important component of Council's digital strategy and Smart City governance.

App A

Description of Smart City Service	Corporate Plan Goal Mapping				
	A new economy	A strong community	An enviable lifestyle and environment	Service excellence	Public-sector leadership
Smart Health	✓	✓	✓	✓	✓
• Allows people in remote areas (e.g., Kenilworth) get access to medical specialists without having to travel by using Connected Health solutions that combine HD video conferencing with specialised tools that allow remote physicians to read blood-pressure, blood oxygen and hear the breathing					
• Encourages use of connected solutions to provide specialised health services in the community by remote experts					
• Fosters collaboration and partnership with other institutions (e.g., universities) in order to develop and deploy solutions that improve quality of life, help support emergency management (e.g., outbreaks) or specialise in research based on the Sunshine Coast demographics (elder skewed)					
KEY BENEFITS					
• Collaboration between the health and education sectors can help create a 'Competency Cluster' in the region focused on high-value industries of education and healthcare					
• Can provides citizens a higher-quality, independent life by facilitating a focus on predictive medicine, significantly lowering costs of health care, and improving treatment outcomes					
Smart Education	✓	✓		✓	
• Brings the best and brightest ideas into the Sunshine Coast region by supplementing the concept of massively open online courses (MOOCs) offered by using 'flipped classroom' collaborative co-development and learning					
• Leverages trends in flexible learning					
• Partners with other high-value industries (e.g., healthcare, clean technology) to help establish 'Competency Clusters'					
KEY BENEFITS					
• Capitalises on Deloitte's prediction that International Education is one of the new growth sectors for Australia by combining multiple strengths and recognising regional advantages					
• Supports development of an Education+Health competency cluster focused on bio-informatics, wearables and aged care					
Smart Lab & Hub	✓	✓	✓	✓	✓
• A showcase facility for Smart City solutions, and a laboratory for experimenting, and testing ideas whether physical (e.g., smart water/gas/electric meters), or virtual (e.g., mobile payments, child/elderly locator)					
• A multi-purpose space offering secure connections to city infrastructure and communication capabilities for use as a Digital Work Hub, and in case of emergency or disaster					
• Provides a co-working space that encourages collaboration between creative professionals as in Noosa (e.g., NoosaBoardroom, Loft Project), the Gold Coast (e.g., Silicon Lakes, Work Club) and larger co-working spaces in Brisbane.					
KEY BENEFITS					
• Allows Council to showcase some of the hidden and visible elements of the Smart City to foster support for the vision					
• Provides a space to evaluate new ideas, enable attraction of high-value talent through the concept of a Digital Work Hub, and double as a site for emergency / disaster response					

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

4.2   What Smart Cities mean for residents, visitors and business owners

Various people benefit from the Smart City in different ways. Imagining the Smart City experience from the perspective of three different personas[14] helps to illustrate how Smart City solutions yield real improvements for residents, visitors, business owners, and Council.

Derek is…	Lucy is…	Ivy is…
…a council employee leading a team that develops and manages the technology that supports the Smart City, and helps use data to inform policy and budgets based on system data. Derek is married to Wendy - a doctor by profession, who has just started a wearable technology company that helps seniors safely enjoy independent lives in their own homes. She is leading a collaborative research initiative between the Sunshine Coast University Public Hospital and the University of the Sunshine Coast. Derek and his partner live near the university in Buderim.	…an entrepreneur running a growing digital agency in Caloundra. The firm specialises in public sector service and experience design. Lucy and her team deal frequently with state government clients in Australia, and are growing their international client-base through opportunities in Asia. To succeed, Lucy's company relies heavily on advanced distributed collaboration technologies.	…a lawyer working and living in the Maroochydore PDA. She has a 7-year old son, Fitzgerald, and a tradie husband, Stuart, who works in Brisbane four days a week. Ivy and her husband both drive to work, and use their smartphones to co-ordinate schedules. They're both avid paddle boarders, and moved to the Sunshine Coast from Sydney for the sustainable lifestyle.
It's Monday and Derek has a big week ahead of him. His morning starts with a meeting in Nambour, and as he slides into his car, he places his smartphone into a dash-mounted sheath where he can clearly hear his phone read the briefing notes for this morning's meeting. Approaching Nambour, his Sunshine Coast application, fed by Smart Transport and Sight, Sound and Sense services, receives notice of fire in the area. Derek's phone directs him to take a slightly different route to his meeting. As he approaches his destination, a Smart Parking application finds an available parking spot nearby. He pulls in to the spot, steps out of his car and pays from his smartphone while walking to his meeting. Derek is meeting with Council members to review use of park facilities in Alexandra Headland based on data collected from WiFi hotspots that have been deployed in the various parks. Increased traffic has caused contention for covered shelters, and Council is considering building more of them, or setting up an online reservation system.	Lucy started her own design agency two years ago, and it has been growing quickly since. In the last year, her team has been focused on experience design and production for the interactive Smart Signage that has emerged on the Sunshine Coast. The Sunshine Coast application and the opt-in personalisation has allowed Lucy and her team to build some engaging digital signs that help visitors quickly find their way around the Maroochydore PDA, and offer personalised enticements that help visitors save time while encouraging them to explore more of the Sunshine Coast area. Lucy and her team are currently working on a new smartphone application that flips loyalty programs around, and rewards users for <u>not</u> going to the same place, instead helping cultivate a retail ecosystem. Some of her team are overseas, but many of them float between the Smart Hub in Maroochydore and another co-working space in Mooloolaba that is popular with creative technologists. The team really appreciates the serendipity of co-	Ivy wakes with a start as the fitness tracker on her wrist vibrates. It's 6:30am, and she has half an hour to herself before her son wakes up. She stretches her legs, which are stiff from last night's run—part of her training program for the upcoming Queensland Paddle Boarding Championships at Caloundra. As a working mother, Ivy struggled to find opportunities to train during daylight hours, and dreaded using a treadmill. With the City Safe solution that incorporates Smart Lighting and the Sight, Sound and Sense capabilities of the Smart City, Ivy can rely on her smartphone to chart the safest running paths based on public safety infrastructure and crime data sourced from the Open Data portal. Ivy and Stuart were drawn to the Sunshine Coast by their love of outdoors, and especially the ocean. They wanted their son to experience nature and all it has to offer so decided two years ago to make the move to the Sunshine Coast. Thanks to the development of the Maroochydore PDA, they were able to find a great apartment

---

[14] Personas represent archetypes of people who currently live on the Sunshine Coast, and those who may aspire to do so.

ORDINARY MEETING   8 DECEMBER 2016
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

Derek's team has the data to help Council make informed choices.

After his meeting wraps up, Derek meets his wife for lunch. While they're eating, Wendy tells Derek about a new software release for the wearable band she's developed with a team from the university. The band is using technology developed by a team at CSIRO that uses a watch or fashionable bracelet to monitor vital statistics such as blood pressure, blood oxygen level, pulse, and movement. The devices then share data with clinicians who use it to predict when negative events such as falls. The devices are being trialled with 12 seniors in Kenilworth. The data Wendy's team is receiving is really helping patients live longer, higher quality independent lives.

As they finish lunch, Wendy gets a reminder on her smartphone that her parking is about to expire. She opens the Smart Parking application and adds another $1 to the 'meter'.

working spaces, and the available high-speed broadband makes the small monthly fee a good investment.

Some of Lucy's team have expressed a desire to learn more about project management and the financial side of the agency business. Understanding that growing a new generation of leaders is essential to her own success, Lucy starts thinking about a management-training program for her team. She reviews a Software Management Training Program blog entry from Joel on Software to get some book ideas, and then picks a set of appropriate courses from the University of the Sunshine Coast: the university's combination of online and in-person courses provides her team with the flexibility they need and the deeply social experience of personal collaboration.

With the progressive deployment of Smart City solutions in the Sunshine Coast during the last five years, Lucy feels like she has more time for her family and spends less time driving around, finding parking spaces, and visiting Council offices to deal with business issues. Through the Smart Citizen Services apps Council and developers have built, Lucy really feels like her local government is working hard to help improve her life.
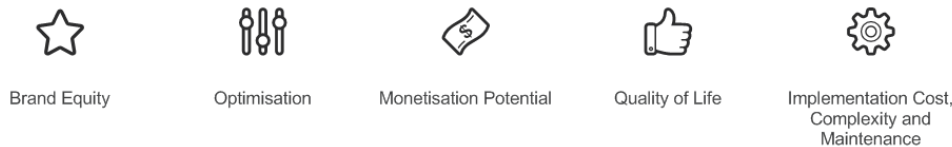
with easy access to all the facilities they enjoy, and close proximity to the beach.

At 'maker meet-up' held at the Smart Lab & Hub one night, Stuart and Fitzgerald bumped into Derek, who was presenting on Open Data and a new app that some of his team have built for the Council to allow smartphones to source data from smart meters. Stuart had been taking a web-programming course through the university in order to build a small application for helping him estimate construction jobs. His mind jumped to the idea of gamification, which he'd been reading about in some of his course materials. He thought about extending the Council's smart meter app to publish data to social networks. Fitzgerald drew a cool icon for the app on his tablet and Stuart was able to build that into a new app called Sunshine Saver. Fitzgerald presented the app at a 'show and tell' at school and soon other families in the community got on board with this friendly competition about water and power usage.

Ivy loved the idea of competing to save resources (and lower their utility bills), but wasn't thrilled that Fitzgerald was using it as an excuse for why he couldn't shower!

4.3   Focusing and implementing Smart City solutions

Supporting the five goals identified in the corporate plan is important, but the specific goals of a precinct are not always reflected in a general corporate plan; therefore, in order to focus the Smart City solutions, and to identify the ideal sequence for deployment, the team considered a set of five value drivers, identified earlier:

| Brand Equity | Optimisation | Monetisation Potential | Quality of Life | Implementation Cost, Complexity and Maintenance |

The Maroochydore PDA, the Enterprise Corridor and the broader Sunshine Coast region each has distinct characteristics that inform the deployment sequence of the Smart City solutions—not all solutions make sense in all places. Therefore, the ranking and sequencing of solutions examines how to make the most efficient use of invested dollars. The recommended deployment and sequencing is tempered by analysis of inter-service dependencies and the collective global experience gained from delivering Smart City solutions in other municipalities.

Based on our assessment, we recommend selective deployment of Smart City solutions across the various geographies as outlined below, and according to the implementation roadmap in Figure 8. Explanation related to these recommendations is provided in the phase-based delivery sections that follow the implementation roadmap (Figure 8).

App A

Smart City Solution	Maroochydore PDA	Enterprise Corridor	Broader Region
Foundational Fibre-optic Network	●	◌	◌
Smart Region Management Platform	One Platform		
Smart Lighting	●	●	●
Smart City WiFi	●	◓	◓
Smart Sight, Sound and Sense	●	◓	◓
Smart Waste Management	●	◌	◌
Smart Water	●	◓	◓
Smart Power	●	◌	◌
Smart Parking	●	◓	◓
Smart Transport	Smart Buses & Data		
Smart Citizen Services	Mobile Apps & Open Data		
Smart Signage	●	◓	◓
Smart Health	Sensor-driven & Remote Health		
Smart Education	Connected & Flexible Education		
Smart Lab & Hub	●	◓	◓

Legend	●	◓	◌	▬	┅
	Deploy in Area	Deploy Selectively in Area	Consider for Future Deployment	Deploy Across Areas	Deploy Selectively Across Areas

ORDINARY MEETING
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

8 DECEMBER 2016

App A

Building a Smart City is a journey that requires commitment to the vision, and the willingness to keep moving forward in small steps that build incremental capacity. There is often a temptation to do everything quickly, but doing so foregoes the opportunity to take advantage of both falling costs, and regular technological advances (e.g., during the previous 24 months, LED prices have fallen by approximately 50%, and the lights have gotten much brighter). Moreover, rapid deployment of Smart City solutions can eclipse the capacity of councils to effectively support them, and of residents to embrace them. Accordingly, the implementation roadmap is based on delivering a set of capabilities over time—expanding from early-stage cost savings and revenue-generating services to those that enrich the lives of citizens, attract and enable businesses and provide a platform for ongoing evolution of the Smart City.

Figure 8: Smart City service implementation roadmap

Sunshine Coast Council—Smart City Framework

App A

The following sections of the document explain the high-level roadmap in greater detail, breaking the illustration down into its component phases, and explaining the reasoning for introducing Smart City services in the sequence illustrated in Figure 8.

4.3.1   Phase 0
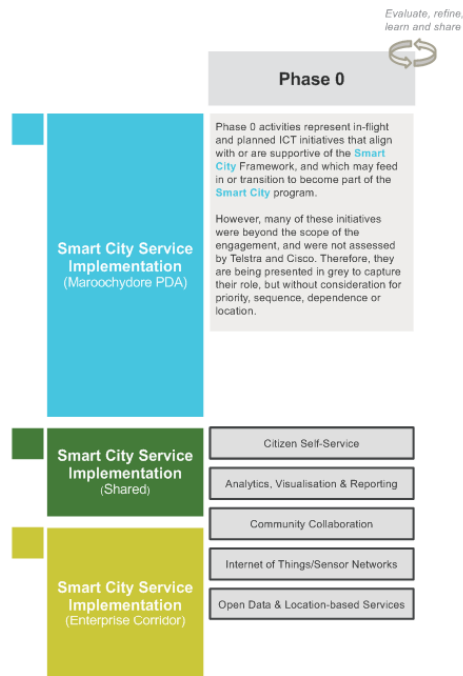
Phase 0 represents the existing portfolio of IT projects (in-flight and planned) that support the Smart City goals. Although many of these work-streams began prior to inception of the Smart City program, including them recognises the work that has already gone into related initiatives.

As many of the in-flight and planned programs will pilot solutions that will be integrated into the Smart City, two steps are important:

Start defining the platform. As illustrated in the Smart City Framework (Figure 7), all Smart City services interact with the Smart Region Management Platform. This tier enables the data aggregation and information brokerage that is the essential 'smarts' of the system. Using pilot projects to establish data standards, and understand the necessary components of the platform will provide the foundations upon which future phases can build.

Start building support structures. Critical to the success of Smart City projects is the ability to collaborate across organisational boundaries, to elicit and incorporate input from a diverse stakeholder population, to achieve consensus among sponsors, and to identify enabling vendors and partners. During the Phase 0 projects, Sunshine Coast should work to understand what capabilities would be needed to support the broader introduction of Smart City services during subsequent phases.

ORDINARY MEETING   8 DECEMBER 2016
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

4.3.2   Phase 1
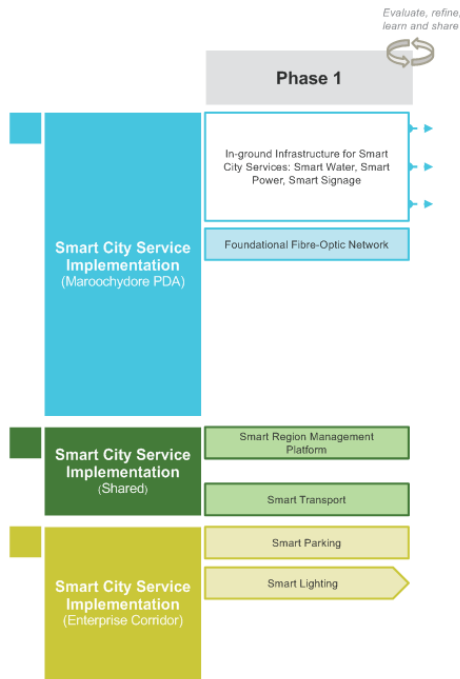
In Phase 1,[15] the in-ground infrastructure that supports Smart City services such as Smart Water, Smart Power and Smart Signage will be installed along with **Foundational Fibre-optic Network** in the ■Maroochydore PDA. Ownership of the **Foundational Fibre-optic Network** requires evaluation by Council of the economics, licencing and capabilities necessary to operate a carrier-class telecommunications network. In our experience larger centres such as Barcelona operate their own fibre optic network, while smaller regions tend to partner with existing carriers to meet requirements. More details about alternative operating models are available in the *Operating models* section later in this document. But regardless of how this service is implemented, a recent Tweet from the founder and CEO of O'Reilly Media helps to illustrate why it is so important in a connected world.

Two ■Shared services are also introduced during Phase 1. The **Smart Region Management Platform** is deployed to aggregate data from other Smart City services, to support management of those solutions, and to provide a source to the Council's Open Data portal (part of the Phase 0 works). **Smart Transport** is deployed to connect buses and aggregate their data into the Smart Region Management Platform. Connected buses provide more transparent travel information to riders, thereby helping to increase ridership. Moreover, the data collected from the buses can provide enterprising developers with information needed to develop new mobile applications, and (especially when combined with ridership data) allow regions to optimise transit routes.

Within the ■Enterprise Corridor, two services provide the financial support for subsequent phase services. **Smart Lighting** helps dramatically reduce energy and lighting-maintenance costs,[16] and, because of the significant reduction in maintenance vehicle activity, also helps reduce carbon emissions. **Smart Parking** helps drivers locate available spaces more quickly thereby reducing vehicle traffic and carbon emissions. Additional revenue contributions (subject

---

[15] As Phases 1-5 are considered across the three work streams (Maroochydore PDA, Shared and Enterprise Corridor) it is important to understand that, in spite of some Smart City services appearing in multiple regions, each work stream is largely independent. For example, a Foundational Fibre-optic Network is recommended for the Maroochydore PDA, but the associated work package need not conclude prior to starting a Smart City WiFi project in the part of the Enterprise Corridor.

[16] Details of indicative costs and revenues, along with the underlying assumptions are provided in the next section of the document.

App A

to Council policy) and simplified overstay enforcement helps defray the expense of installing and maintaining on-street parking.

4.3.3   Phase 2
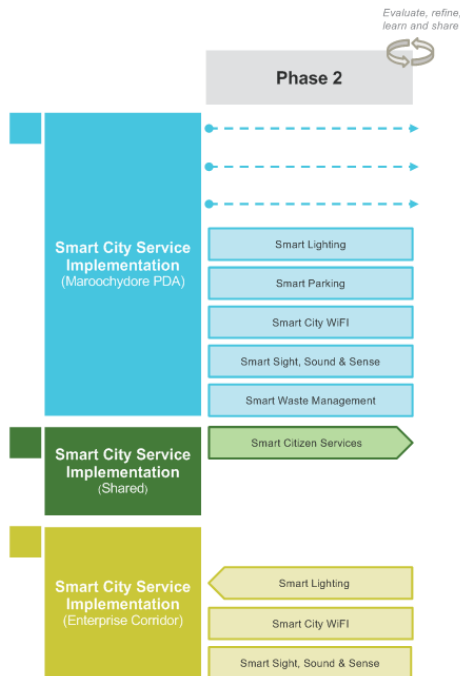
In Phase 2, the services deployed in the Enterprise Corridor will be extended to the ■Maroochydore PDA: **Smart Lighting** and **Smart Parking**. Services such as Smart Lighting would be extended beyond street lighting to include similar solutions for public spaces: walking paths, parks, décor. Similarly, **Smart Parking** solutions would be extended to include capabilities specific to parking structures (e.g., spot reservation, connected signage).

Using savings and revenues from Smart Lighting and Parking, **Smart City WiFi**[17] would provide the PDA with blanket wireless coverage that supports visitor connectivity, encourages collaboration, and creates a 'communications canopy' that support Smart City services (such as Smart Signage).

Within both the ■Maroochydore PDA and the ■Enterprise Corridor, **Smart Sight, Sound and Sense** solutions will provide additional public safety with video and selective audio feeds that enable Council and/or law-enforcement partners to monitor the environment, reduce crime and potentially defuse in-processes conflict. The **Sense** components of this solution would extend the **Smart Water** management capabilities discussed earlier to include flood sensors, water quality, and other environmental sensing technologies that could measure climate variables such as temperature, UV load, wind and airborne particulates. Similarly, **Sense** would expand on **Smart Transport** capabilities to collect additional information about traffic flow. The data could be combined with WiFi tracking details to understand the flow of people and vehicles around the region.

Additional cost savings can be captured in the ■Maroochydore PDA through **Smart Waste Management** where connected rubbish bins and an underground pneumatic waste management solution help optimise collection, reduce vehicular noise and carbon emissions and produce fewer trash overflows that result in waste escaping into the environment.

As additional Smart City services come online, ■Shared **Smart Citizen Services** will emerge through Council encouragement and collaboration[18], and organic development by community

---

[17] Besides providing useful Internet connectivity to businesses, residents and visitors, Smart City WiFi could provide location data about people (e.g., how many people visited a park) by using smartphone WiFi connection requests and thus help inform policy about municipal services. Furthermore, the Smart City WiFi can provide an alternative communications platform for services such as Smart Lighting and Smart Parking (and others), offloading traffic from the mobile phone networks and reducing monthly service-provider fees.

[18] Working with other regional councils—many of which will be working to address similar challenges—to develop standards for data and software can help defray costs of building applications, and make the ecosystem more attractive for third-party/commercial software developers. Similarly, running regional 'hackathons' allows cities to pool resources to attract developer interest and to avoid saturating the community with too many contests.

members. Given the Phase 0 activity to evaluate Open Data solutions, and the production of data from Smart Transport, Smart Lighting and Smart Parking in the Enterprise Corridor, software developers could build a mobile application that allows a reader to reserve library books, and then offer bus riders a 'bounty' for picking up the book and delivering using public transit. Additionally, analysis of data from the platform would help Council determine the right prices for street parking in a precinct in order to ensure some spots were available (either by encouraging drivers to park elsewhere or use alternative transport), thus reducing on-street traffic and pollution.

Within the ■Enterprise Corridor, Phase 2 will see completion of the **Smart Lighting** project, and focused deployment of **Smart City WiFi** based on more comprehensive assessment of Council goals, available funds and resident expectations.

4.3.4   Phase 3
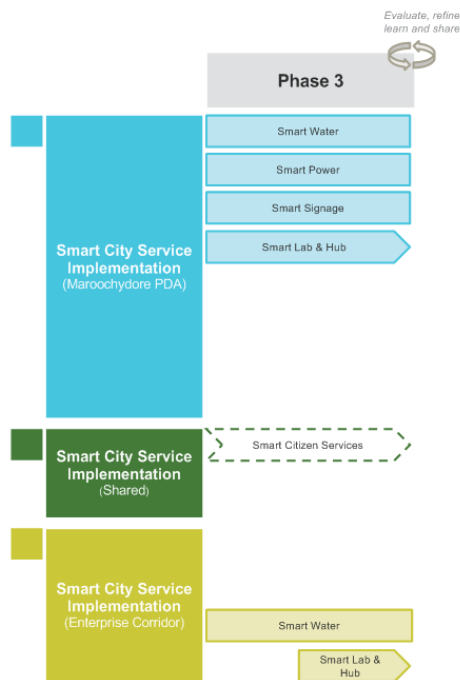
Services deployed in Phase 3 build on the momentum created by cost-saving and revenue producing services introduced in earlier phases, and deliver additional Smart City capabilities to help make the ■Maroochydore PDA a truly distinct place to work, play, live and learn.

Within the ■Maroochydore PDA **Smart Water** and **Power** solutions would be introduced and included in new construction within the PDA to allow businesses and residents transparent and real-time access to power and water consumption. Moreover, feeding this data back into the Smart Region Management Platform would enable growth of ■Shared **Smart Citizen Services** that might allow residents to enter some general data into an application and permit benchmarking against similar businesses or families.[19] As **Smart Water** solutions (e.g., in-ground sensors) are added and the **Smart Water** services extended to the ■Enterprise Corridor technology would also be connected to municipal irrigation systems to intelligently allocate water based on information such as soil humidity and weather forecasts drawn from the Smart Region Management Platform. Installing **Smart Water** and **Smart Power** meters and monitoring beyond the PDA is complex due to jurisdictional issues and the substantial costs and social collaboration required (cf. smart meters deployment in Victoria). Nonetheless, effective stakeholder engagement and collaboration with Energex and Unitywater could see **Smart Power** and **Smart Water** solutions include leak/theft-detection, or even regional smart meters that can help significantly reduce resource consumption.

Within the ■Maroochydore PDA, a **Smart Lab & Hub** would be introduced, providing the Sunshine Coast with a flexible co-working space (a Digital Hub) that would encourage

---

[19] Gamification of resource utilisation is part of helping shape behaviour and lowering consumption, often by 6-10% in our experience. Similar benchmarking is offered in the financial services space by UBank which allows people to compare their own spending to similar individuals with its PeopleLikeU application: http://peoplelikeu.com.au/

App A

collaboration among professionals, enable remote work by professionals who might otherwise travel to Brisbane, and provide an emergency meeting space for Council that could be used to support emergency / disaster management. This facility would also provide a 'lab' that features all the Smart City technology being deployed and considered. This 'lab' capability would enable vendors, partners and Council staff to assess and evaluate Smart City technology in a realistic environment, and learn from experimentation what might work in the field.

Smart Signage would also be introduced to the ■Maroochydore PDA to support way finding, inform visitors of events in the area, and potentially of integrating beacons and precision WiFi to enable targeted messaging to be delivered based on specific visitors to the area. **Smart Signage** could also be extended to include marquis digital experiences (interactive and informative billboards) that serve as precinct showcases and entertainment platforms.

Later in this Phase 3, smaller **Lab & Hub** facilities would be introduced in the ■Enterprise Corridor to capitalise on the specific capabilities in the area (e.g., the solar farm); however, diffusion of professional into many separate facilities risks losing some of the innovation that emerges through serendipitous connections, so 'hub' facilities should be concentrated.

4.3.5   Phase 4 and beyond
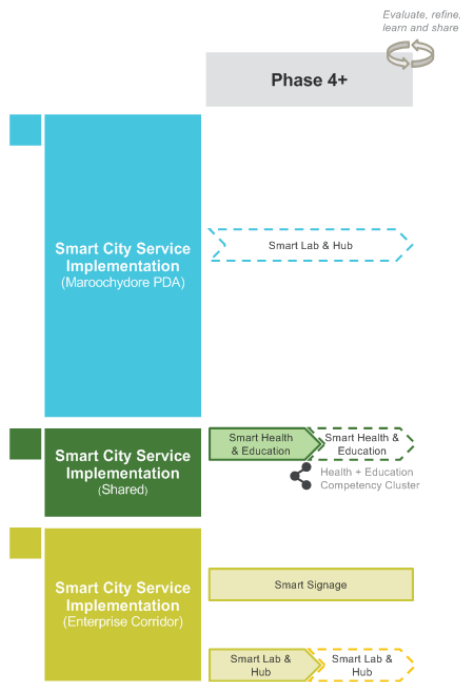
In Phase 4 and beyond, many Smart City solutions move into the evolution stage, where Council and residents have developed a keen grasp of how the various services work, and what could be done to improve them. Within both the ■Maroochydore PDA and the ■Enterprise Corridor, the **Smart Lab & Hubs** change to meet the dynamic needs of a growing region.

During these phases, **Smart Signage** would be introduced to the ■Enterprise Corridor helping deliver improved way-finding at venues such as the Kawana Sports Precinct, and engaging in personalised messaging in other business districts.

The ■Shared **Smart Citizen Services** would draw on an increasingly deep pool of data from the Smart Region Management Platform in order to satisfy more sophisticated demands from users. There are many ideas for Smart Citizen Services that can be delivered though mobile devices, and the benefit of working to make sure as much data as possible is readily accessible through the Smart Region Management Platform ensures that the needs of small populations can be met though collaborative effort among the Council, commercial developers and generous social citizens. Although it remains difficult to accurately predict what people might want to do online (and especially on mobile devices), that users are embracing the mobile channel is clear.

App A

Figure 9: User embracing the mobile channel

Lastly, we introduce **Smart Health** and **Smart Education** as ■Shared capabilities. The first of these services capitalises on the ongoing deployment of high-speed network connections, and the persistent challenge smaller regions have in attracting specialist medical care. Advances in Smart Health technology have not completely obviated the need for medical related travel, but they have reduced it, and can spare much time, inconvenience (and risk) associated with travelling long distances to see a doctor. Smart Education builds on the trend toward distance education, flexible learning, and tale-presence lectures and allows education providers to attract a more diverse portfolio of lecturers, and attract a larger cadre of international students[20].

Despite the many individual benefits that can be delivered by Smart Health and Smart Education, these two services have been sequenced in later phases for two reasons:

1. **The process is complex.** Making these solutions work properly isn't simply a technology problem. Getting people to embrace remote diagnosis and treatment requires empathetic conversations with potential patients and consultations with doctors and nurses. The service design needs to be conceived and details such as prescription-management and billing need to be ratified.
2. **There are many parties involved.** Transforming mature institutions requires the support of labour unions, government and an array of independent stakeholders. This engagement, ideation and consensus building can be rewarding, but it is time consuming, and early in the Smart City journey, would delay wins that will generate savings and help catalyse broader support for the program.

Although hurdles must be overcome, Smart Health and Smart Education together offer the Sunshine Coast an opportunity to attract high-value industries, capitalise on the irreversible trend of an older population, and develop itself as a national (if not international) leader in the space of wearable solutions focused on aged care, and the analysis of data to support preventive treatment that extends health outcomes and improves the independent lives of Australian seniors.

---

[20] In its recent report *Positioning for prosperity? Catching the next wave*, Deloitte identified International Education as one of the 'Fantastic Five' sectors that will fuel Australia's growth beyond the mining boom.

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

4.4   Articulating the benefits and costs of Smart City solutions

Earlier sections of this document explained the set of Smart City services, identified the criteria and mechanisms used to prioritise them for the Sunshine Coast, and illustrated and explained the sequencing of the services through five phases. Each of the identified phases serves as a portfolio of solutions that deliver new (or expanded) capabilities to the Sunshine Coast, with the aim of making an ever more attractive place to grow a business, expand one's skills, build a family and lead a productive, fulfilling life. The progressive introduction of capabilities helps build the Smart City maturity by capitalising on lessons learned in earlier phases, and by leveraging the continuous evolution of technology.

While 'smarts' do not make a city on their own, the right systems, built progressively, can help a government do a better job of serving the people, help support people as they pursue their own goals, and—according to Cisco research—produce incremental returns for developers as high as $13/m^2$ (Figure 10).
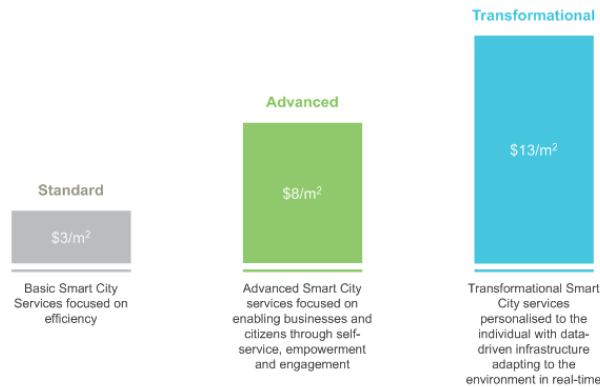
Figure 10: Incremental returns of progressive Smart City maturity

This section of the document presents the phase-aligned portfolios, offers key issues to consider, and provides high-level ranges for initial capital cost, annual operating costs and annual savings or revenue. Additionally, the macro-economic benefits of many services are estimated by drawing on Cisco's economic modelling of the global value at stake[21] from investing in the Internet of Everything (IoE),[22] which Cisco believes presents a global opportunity of $14.4 trillion for the private sector and $4.6 trillion for the public sector,[23] generally returning $3.30 for every $1 invested. Between business attraction, revenue generation, cost avoidance, environmental protection, and quality of life improvement, **this represents a $755 million opportunity for the Sunshine Coast.**

Based on the select uses cases considered, Cisco's Value at Stake assessment from other regions was scaled, and used to provide high-level macro economic benefits that represent the net present value of 10 years of system-level returns from investing in a specific solution.

---

[21] Value at stake includes benefits for businesses, employees, and citizens; quantified citizen outcomes (such as reduced traffic congestion, crime, etc.); hard cost savings, increased revenues, and productivity gains; and allowances for implementation and operational costs.

[22] The Internet of Everything (IoE) expands on the concept of the Internet of Things to include people, processes and data and to imagine the possibilities of a world in 2023 where we have connected more than 50 billion devices to the Internet.

[23] Joseph Bradley, Christopher Reberger, Amitabh Dixit, and Vishal Gupta. *Internet of Everything: A $4.6 Trillion Public Sector Opportunity*. Cisco. 2013. cf. http://goo.gl/uYZ0Xb and Joseph Bradley, Joel Barbier, and Doug Handler. *Embracing the Internet of Everything to Capture Your Share of $14.4 Trillion*. Cisco. 2013. cf. http://goo.gl/HQAfqR

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   **Smart City Framework & Smart City Implementation Program**
Appendix A   **Smart City Framework (complete)**

App A

Figures in this section represent the technology portion of Smart City services only, and exclude the cost of underlying infrastructure, installation labour, and ongoing labour for monitoring and management. By way of illustration: figures for Smart Parking represent the cost of the hardware and software used to control parking only, and exclude the cost of land, training, and enforcement staff. Furthermore, there are a number of key drivers that influence the benefits delivered by Smart City services. For example, the scale, phasing and timing of the deployments; the sophistication and maturity of the service providers and the service-delivery ecosystem; and, adoption rates by consumers and businesses all directly impact the magnitude and timing of benefits.

This engagement focused on high-level financial guidance, and not detailed modelling based specific vendor hardware and software; therefore, prior to deployment of any solution, **Sunshine Coast Council will be required to validate and test the assumptions, develop specific requirements, understand supplier capabilities solicit precise financial estimates for each solution.** Nonetheless, where assumptions have been made to develop the cost and revenue range estimates, they have been documented in Appendix E.

Portfolio Components	Key Considerations	10-Year Macro-economic Benefit Based on Value at Stake (10-year NPV)	Capital Cost Range	Annual Operating Cost Range	Benefits / Annual Savings / Gross Revenue Range
Phase 1					
■ Foundational Fibre-optic Network	• Legislative requirements may dictate installation of specific infrastructure, and meetings with related entities are required before proceeding • Telecom and other service providers should be included in the planning (especially) for smaller municipalities which may retain ownership, but may lack the capital and expertise to operate a solution which underpins core city services • Carrier licencing may be required in order to support ownership and construction of a private fibre-optic network, and internal and external operating models must be defined to support Council goals	Essential enabling technology core to delivering and creating value from other Smart City services	$920K-$1.5M	$120K-$190K	None, foundational infrastructure

App A

Portfolio Components	Key Considerations	10-Year Macro-economic Benefit Based on Value at Stake (10-Year NPV)	Capital Cost Range	Annual Operating Cost Range	Benefits / Annual Savings / Gross Revenue Range
■ Smart Region Management Platform	• Will be comprised of a mixture of custom, commercial and open source software design to meet the requirements of Council • Platform will evolve with the maturity of the Council, and will serve the aggregation and reporting needs of Council, and serve as the platform for all external subscription to external data consumers (application builders) • Data provided by Smart City solutions will inform decision-making, and provide the ability to correlate events. The value of the data will make it very attractive to suppliers, and Council must establish ownership rules and data standards • Open Data and the creation of external interfaces / APIs will be essential to partnering with the developer community to create Smart Citizen Services • All or part of the Smart Region Management Platform could be hosted in the cloud, so having the skills and a clear cloud strategy is important • Developing a data-retention and privacy policy is essential to being able to store and manage the incoming data over the long-term	Essential enabling technology core to delivering and creating value from other Smart City services	$1.5M-$2.5M	$190K-$320K	None, but potential to monetise data in the future and supports data-driven policy and investments by Council
■ Smart Transport	• Effective integration of these Smart Transport solutions will require collaboration with other stakeholders—especially the Queensland government—in order to control resources (lights) or access real-time data (buses)	$8M-$10M Due to improved infrastructure investments given traffic analytics, higher bus ridership (higher revenues), lower wait times for riders and the emergence of supplemental private-public transportation services such as the emerging Bridj[24]	$380K-$640K	$50K-$80K	None, but future potential to use data to lower infrastructure design costs

[24] Bridj is a transportation system that adapts in real-time to where people live, work, and play. Powered by data, Bridj uses a network of express shuttles that offer efficient and flexible trips that are dynamic. cf. http://goo.gl/RzY3jz

Sunshine Coast Council—Smart City Framework

30

Portfolio Components	Key Considerations	10-Year Macro-economic Benefit Based on Value at Stake (10-Year NPV)	Capital Cost Range	Annual Operating Cost Range	Benefits / Annual Savings / Gross Revenue Range
Smart Parking	• Smart Parking can begin on 3G/4G networks and transition to other networks (Bluetooth, 6LoWPAN, WiFi) depending on the evolution of alternatives • Revenue would ramp up as paid spots are introduced up to the 1000 spaces used for this model • Change management activities will be essential. Paid-parking represents a big change, and based on feedback from Stockland regarding their experience at the hospital, people are likely to resist introduction of something that can be perceived a 'cash grab' • Revenue figures do not include fees from enforcement • Capital costs range is large due to price difference for owned vs. 'hosted' solutions	$38M-$40M Due to optimised parking infrastructure, improved revenue from collections, higher enforcement, and less time by drivers spent looking for parking spots	$500K-$4M	$240K-$500K	$2.3M-$3.8M in meter revenue + 60%+ improvements in enforcement revenue
Smart Lighting	• Smart Lighting can begin on 3G/4G networks transition to other networks (Bluetooth, 6LoWPAN, WiFi) depending on the evolution of alternatives • Solution-as-a-service offerings can be attractive, but should be evaluated to ensure that controller systems integrate with a variety of Smart City platforms and can make use of various different communication protocols (3G/4G, WiFi, etc.) • Ownership and access to both infrastructure (light masts) and data are topics that must be resolved prior to implementation, especially if solution-as-a-service offerings are being considered	See macro-economic benefit of Smart Lighting below representing regional contribution	$770K-$1.3M	$115K-$191K	50%+ reduction in electrical and maintenance costs
Phase 2					
Smart Parking	• Extends Smart Parking solution begun in Phase 1 with learnings and expands from Enterprise Corridor into the Maroochydore PDA • Revenue could be expanded by growing the parking allotment beyond 1000 spaces used for these figures • Capital investment, operating costs, and revenue are all incremental beyond those achieved during Phase 1	See macro-economic benefit of Smart Parking above representing regional contribution	$500K-$4M	$240K-$500K	$2.3M-$3.8M in meter revenue and 60%+ growth in enforcement revenue

App A

Portfolio Components	Key Considerations	10-Year Macro-economic Benefit Based on Value at Stake (10-Year NPV)	Capital Cost Range	Annual Operating Cost Range	Benefits / Annual Savings / Gross Revenue Range
Smart Lighting	• Smart Lighting projects would take effect in the PDA and continue with the Phase 1 project in the Enterprise Corridor • Capital investment, operating costs and savings are all incremental beyond those achieved during Phase 1	$57M-$99M Due to reductions in electrical expenses, improved employee productivity, a smaller maintenance vehicle fleet, lower crime and higher property values (and thus rates)	$770K-$1.3M **PDA Only** **$153K-$255K**	$115K-$191K **PDA Only** **$23K-$38K**	50%+ reduction in electrical and maintenance fees
Smart City WiFi	• WiFi can use be used to support public access in the Maroochydore PDA in order to attract visitors, and can later serve as a platform for many other services such as Smart Signage, Smart Waste Management, and Smart Parking • The initial deployment would cover the Maroochydore PDA and smaller areas in other business precincts such as Caloundra • Wider deployment of WiFi will require site surveys, and may require community consultation to assuage concerns about broader WiFi deployment	$6M-$15M Based on travel avoidance, time saved by people, increased people engagement, and the ability to collect people flow analytics from the solution and drive better investment decisions	$440K-$730K	$60K-$100K	None, but future potential to monetise data
Smart Sight, Sound & Sense	• Day and night vision cameras, selectively equipped with bi-directional audio capabilities can help stop crime-in progress • Monitoring so many cameras requires complex software and many people. Although it can reduce the size of the police force, it may do so by replacing a highly-paid police job with several lower-paid video reviewer jobs—an outcome that may not be politically popular	$35M-$55M Due to at least a 2% reduction in crime, improvements to resource use (e.g., park consumables, water), productivity improvements to the police force, Council staff, and other maintenance staff, and a reduction in the vehicle fleet	$800K-$1.3M	$100K-$170K	At least 2% reduction in crime
Smart Waste Management	• Connected waste bins augment sub-surface/pneumatic waste management solutions, and help ensure the Maroochydore PDA remains inviting and clean • Bin sensors supply software that supports dynamic pick-up scheduling and helps operations staff better position rubbish bins	$2M-$3M Based on adoption only in the Maroochydore PDA, with contributions due to productivity improvements, reduction in maintenance fleet size, and optimised routing/collection	$150K-$250K	$20K-$40K	Up to 30% reduction in collection-related costs

Sunshine Coast Council—Smart City Framework

32

Portfolio Components	Key Considerations	10-Year Macro-economic Benefit Based on Value at Stake (10-Year NPV)	Capital Cost Range	Annual Operating Cost Range	Benefits / Annual Savings / Gross Revenue Range
■ Smart Citizen Services	• Smart Citizen Services blend a mix of Council-developed applications and Open Data services with community-developed/commercially-developed applications • Success with crowd-sourced development requires an open data portal, data aggregation and publishing mechanism, and a mobile strategy	$30M-$40M Based on employee productivity improvements, time saved by residents in dealing with government, and reduction in administrative costs associated with managing simple in-person requests	$960K-$1.6M	$120K-$200K	Up to 10% reduction in administrative costs by automating key services
Phase 3					
■ Smart Lab & Hub	• The location and rental fees for the Smart Lab & Hub will have to be determined in collaboration with commercial real estate professionals • Based on Cisco's Smart City research, worker productivity through collaboration and remote working (in the Hub and elsewhere) represents the largest contributor to the value at stake	$5M-$8M Based on reduction in travel due to Digital Work hub, improved investment attraction in employees and reduced maintenance fleet size, and optimised routing for remaining fleet	$720K-$1.2M	$90K-$150K	Remote working leads to at least 10% improvements in productivity
■ Smart Water	• Smart Water meters would be deployed in the Maroochydore PDA where they could be installed during construction and funded via a benefited area levy • Smart Water monitoring (humidity sensors) would be deployed more broadly to manage irrigation, and flood detection • Smart Water meters could be extended more broadly across the Sunshine Coast (including through a combined water and electrical metering infrastructure) by working with Unitywater and Energex, but may face resistance due to the reduction in resource consumption (and thus revenue)	$1.5M-$80M Lower range is related to rollout of Smart Water meters to the Maroochydore PDA and sensors to the Sunshine Coast, a 10% reduction in water use by residents, and fewer maintenance employees and vehicles to read meters. Higher figure depends on rollout of Smart Water meters to the whole Sunshine Coast Region	$1.2M-$2M	$150K-$250K	Up to 10% reduction in consumption

Sunshine Coast Council—Smart City Framework

33

App A

Portfolio Components	Key Considerations	10-Year Macro-economic Benefit Based on Value at Stake (10-Year NPV)	Capital Cost Range	Annual Operating Cost Range	Benefits / Annual Savings / Gross Revenue Range
■ Smart Power	• Smart Power meters would be deployed in the Maroochydore PDA where they could be installed during construction and funded via a benefited area levy • Smart Power meters could be extended more broadly across the Sunshine Coast (including through a combined water and electrical metering infrastructure) by working with Unitywater and Energex, but may face resistance due to the reduction in resource consumption (and thus revenue)	$2.2M–$150M Lower range is related to rollout of Smart Power meters to the Maroochydore, a 10% reduction in power use by residents, and fewer maintenance employees and vehicles to read meters. Higher figure depends on rollout of Smart Power meters to the whole Sunshine Coast Region	$1.1M–$1.8M	$140K–$230K	Up to 10% reduction in consumption
■ Smart Signage	• Signs with location tracking and personalisation features may raise privacy concerns among citizens, especially among parents with children who carry smartphones (the mechanism that signs use for tracking) • Operating a network of Smart Signage (including interactive kiosks) that offers more than automated feeds (e.g., bus locations) and maps requires a design and content production team, and an advertising sales organisation	$5M–$7M Due to revenue from advertising, improvements in way-finding for residents and visitors, and increased tourist spending as a result of more efficient navigation	$210K–$340K	$30K–$50K	$140K–$225K
■ Smart Citizen Services	• As additional data arrives in the Smart Region Management Platform, new opportunities will emerge. Ongoing success in developing Smart Citizen Services depends on an effective ideation platform to elicit input from citizens, and to be able to help focus development efforts	Financial details unchanged from Phase 2			
Phase 4+					
■ Smart Lab & Hub	• Growth to support server additions to the 'lab' will see new facilities emerge • Concentration of the co-working portion in the Maroochydore PDA will help the space succeed (most take about 2 years to generate a loyal and regular set of community members), and premature expansion to other locations can diffuse benefits and threaten the model	Financial details unchanged from Phase 3			

Sunshine Coast Council—Smart City Framework

34

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

Portfolio Components	Key Considerations	10-Year Macro-economic Benefit Based on Value at Stake (10-Year NPV)	Capital Cost Range	Annual Operating Cost Range	Benefits / Annual Savings / Gross Revenue Range
Smart Citizen Services	• As additional data arrives in the Smart Region Management Platform, new opportunities will emerge. Ongoing success in developing Smart Citizen Services depends on an effective ideation platform to elicit input from citizens, and to be able to help focus development efforts	Financial details unchanged from Phase 3			
Smart Health	• Begins with a remote health deployment serving four health centres to provide access to specialist medical resources without travel • Provide access to remote communities that are traditionally underserved, and improves health outcomes by 50% • Provides a foundation for establishing a bio-informatics competency cluster in collaboration between the Sunshine Coast University and Hospital	$8M–$12M Due to improved health outcomes, better management of chronic conditions, and reduced travel time for patients and physicians	$130K–$210K	$20K–$30K	50%+ improvement in health outcomes
Smart Education	• Greater collaboration opens up new opportunities and supports the need to provide higher-skilled workers to the local job market • Improved tools result in greater participation in education, higher graduation rates and higher-paying careers • Improved education provides system-level benefits that are difficult to precisely quantify, but generally lead to higher GDP and lower rates of all types of crime	$13M–$18M Due to improved educational experiences, greater attraction of foreign students, and ability to retain students in the area after graduation	$230K–$380K	$30K–$50K	25% improvement in graduation rates
Smart Signage	• In Phase 4+, Smart Signage is extended to the Enterprise Corridor • Capital investment, operating costs and revenues are all incremental beyond those achieved in Phase 3	See macro-economic benefit of Smart Signage above representing regional contribution	$210K–$340K	$30K–$50K	$140K–$225K

Deployment Legend

Maroochydore PDA   Shared   Enterprise Corridor

With the Smart City services defined and sequenced into a set of progressive investment and capability portfolios, it is important to understand how everything operates together. The next section provides guidance with respect to solution architecture and interoperability.

Sunshine Coast Council—Smart City Framework

35

App A

5   Enabling the Smart City

Fitting together the components of a Smart City in a scalable manner requires definition of a solution architecture, and development of standards. Although solution architecture and standards development remains outside the scope of this engagement, a conceptual architecture and a summary of the desirable characteristics of a network infrastructure provider, and IP network will provide helpful guidance as Council moves forward with its Smart City vision.

5.1   Smart City architecture

As each of the Smart City components is defined, Council staff will have to consider each solution according to the conceptual architecture in Figure 11.
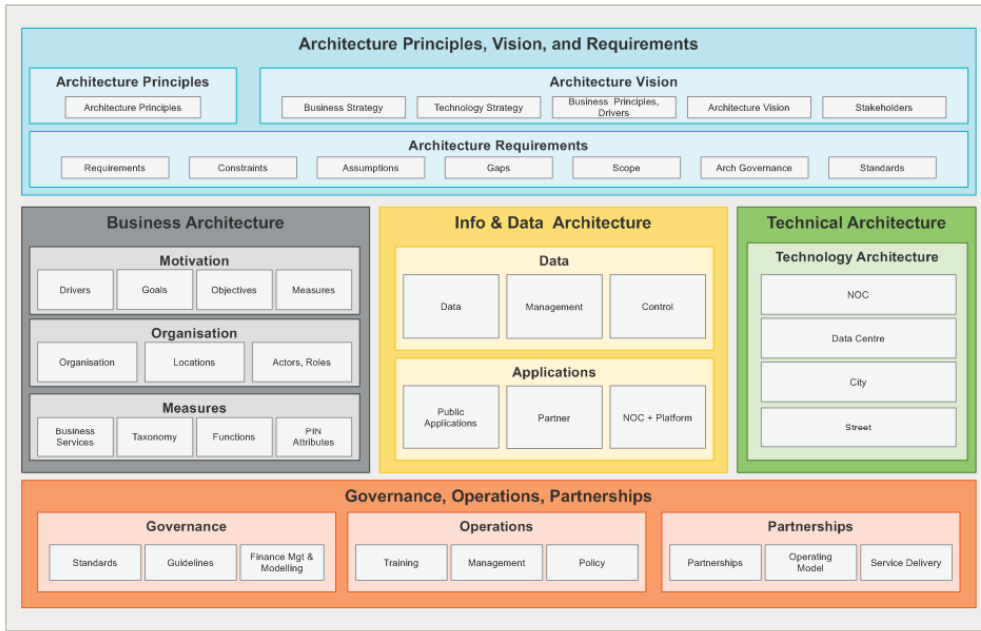
Figure 11: Smart Cities Level 1 conceptual architecture

The Technical Architecture building block in Figure 11 can then be expressed though a logical reference architecture, which provides guidance on implementation design for the NOC, Data Centre, City and Street level elements of the Smart City solution. The logical reference architecture is presented in Figure 12.

App A
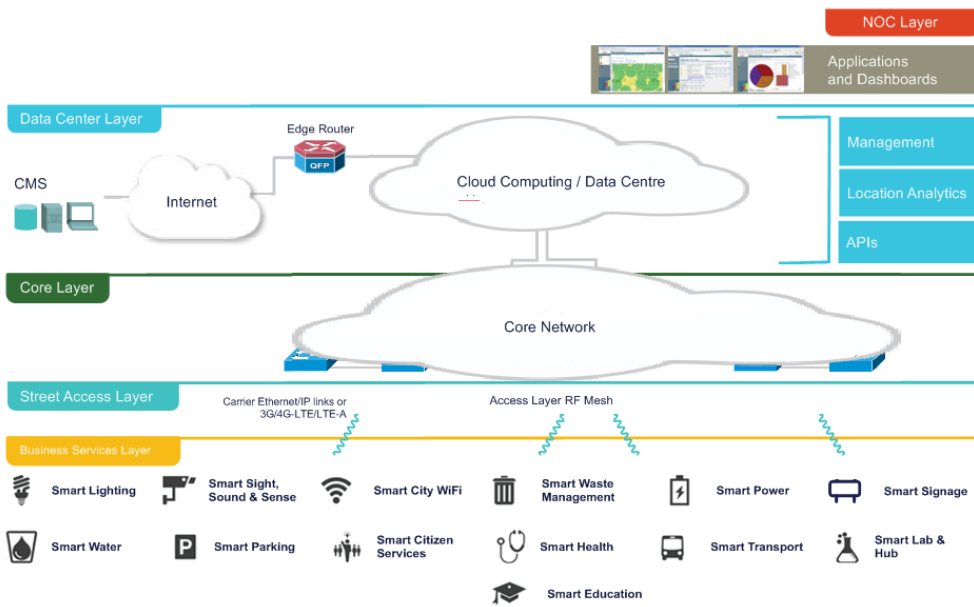
Figure 12: Smart City logical reference architecture

Each of the layers in Figure 12 is explained below.

Smart City layer	Description	Components
NOC	The Network Operations Centre houses the Smart Region Management Platform which includes the applications and dashboards for region-wide management of Smart City services	• Physical Security • Compute, storage, security • WAN/Internet access/VPN • Access to Applications and Dashboard apps including management, analytics and custom apps
Data centre (including cloud)	The Data Centre houses the DC layer infrastructure, which hosts the SCC management applications, location analytics, and APIs	• Physical Security • Compute, storage, security • Virtualisation • Hosting for management and analytics applications • APIs for custom applications
Core layer	This layer includes the core router/switches and aggregation switches. This layer is typically a foundational fibre optic network	WAN links, routing, QoS
Street	The street access layer creates the 'smart things' network via a combination of wired and wireless network technologies and the backhaul to the MPA/Region layer. The SCC business services are delivered via low-power low data rate wireless area network technologies with wireless backhaul or higher data rate wired technology	**Aggregation** • 3G/4G-LTE/LTE-A/5G • Fibre ports, L2/L3 services, QoS **Wireless** • WiFi 802.11 access • WiFi 802.11p WAVE • IEEE 802.15.4-based RF Mesh (e.g., 6LoWPAN or ZigBee) • Location Services

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

Smart City layer	Description	Components
		Wireless • Carrier Ethernet/IP links • Ethernet fibre port, L2/L3 services • Smart Ports • Location Services • Wired to Wireless bridge
Business Services	There are 13 SCC smart business services currently defined	• People, processes and technology • Service Management and analytics • Smart and mobile applications

Using the architectural framework described above, the remainder of this document examines four domains:

1. Guiding principles
2. Operations management and interoperability
3. IP network conceptual design
4. High-level implementation scenarios

Subsequent phases of the Smart City program will have to incorporate high-level and low-level design to complete designs based on more detailed solution definition, and product specification.

5.2 Guiding principles

As Sunshine Coast Council progresses its Smart City program, a set of guiding principles will shape design decisions and may inform operating models for the network that supports the various value-added services (e.g., Smart Parking, Smart Citizen Services, etc.).

* A network infrastructure provider will provide the underlying carrier-grade network[25]
* A carrier grade core technology such as IP MPLS core should be used
* A minimum 10Gbps is suggested in the core
* The network shall be designed with redundancy, resiliency and fault tolerance at the NOC, data centre, core and street layers
* Network designs should support defined services, and be flexible enough to adapt to future services and applications
* The network design should support competitive delivery of triple play (voice, internet, TV) services to residential and business customers
* A mix of wireless and wired technologies should be used to deliver the business services based on bandwidth and performance requirements of the target business service or application

5.3 Operations management and interoperability

Cities such as Rio de Janeiro (pop. 6.32 million) have used catalysing events such as the Olympic Games and the World Cup to support development of expansive Smart City operations centres that provide staff the ability to monitor and manage the city environment (Figure 13).

---

[25] SCC may elect to form a new carrier business and build its own infrastructure; however, such arrangements are relatively uncommon among Smart City developments because network operation is not typically a core competency of municipalities, and most Councils are reluctant to take on the burden of building the necessary data centres and increasing resource headcount to support data centre requirements.

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

Figure 13: Rio de Janeiro's Smart City operations centre

To support its Smart City program, Sunshine Coast <u>does not</u> require such a vast physical space, but five essential capabilities must be developed. Larger cities especially tend to bring these capabilities together to support improved collaboration in diagnosing and resolving problems, and to enable focused investment in the systems and tools used by the team; however, they can be provided by distributed teams.

Capability	Description
Collect Input	This means collecting everything you want to see such as sensor data, map data, video data and other forms of telemetry
Transmit/Distribute	Transmission and distribution of content must maximise bandwidth efficiency therefore bandwidth optimisation technologies play an important role
Display/Operate	An IP-based Video Wall which allows a flexible view and layout creation for greater efficiency and operator productivity
Create Contents	Ability to present multiple device and sensor types on a single map and easily customise the system to suite various workflows and the flexible uploading of maps
Monitor/Control	An integrated control environment which provides advanced rendering and presentation capability allowing hierarchical information presentation e.g., from the City to the Building to the Floor and to the room, through visual navigation
Maintenance	Integrated data processing on a single layout (single pane of glass) improves effectiveness and reduces monitoring operational expense thus lowering TCO

At the heart of the operations centre is the Smart Region Management Platform (Figure 14). As explained in an earlier section of the document, that platform provides the essential feature of connecting the Smart City services, aggregating the data they provide, helping synthesise it to support decision making—both automated decisions that the Smart City implement according to codified rules, or municipal decisions made using Smart City to inform policy.

App A
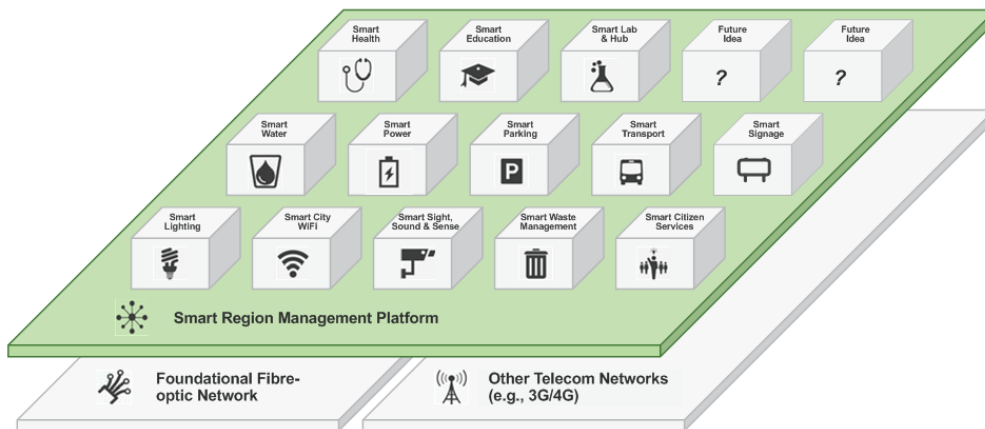
Figure 14: Smart Region Management Platform in a NOC context

Through its management interfaces, the Smart Region Management Platform reports and visualises key insights about the city, and offers a unified interface through which Council staff can interact with and manage the Smart City services.

The technology that supports the Smart City should integrate with (and extend) Council's existing IT strategy, service-oriented architecture and other initiatives related to information and integration management. However, the Smart City extends the perimeter of the organisation, and invites many more stakeholders into a participative ecosystem through Open Data initiatives that syndicate municipal data. Therefore, the Smart City operating group/division will need to establish standards for:

- Data formats (e.g., JSON, XML, CSV, ODF)
- APIs and API version management (e.g., REST)
- Documentation and collaborative repositories (e.g., wikis, Github)
- Privacy (e.g., retention periods, population minimums for aggregation)
- Security (e.g., confidentiality, integrity and availability)
- Identity management, authentication and authorisation (e.g., anonymous, certificates, oAuth)

The aim of establishing standards for interoperability is to enable a multi-channel ecosystem that enables communication among devices, applications, and services as illustrated in (Figure 15). Loosely coupled solutions that abstract the implementation specifics of applications through an application programming interface (API) layer, and manage those services using API management tool provide key benefits: new services can be introduced, existing services updated, and individual components replaced without disruption and without requiring changes to other solution components. For example, using abstracted design and implementing and enforcing standards for data exchange, systems that might be used for Smart Parking could be completely replaced in the future without disrupting systems that consume parking-related data. As long as the new solution respects service contracts with the Smart Region Management Platform, and as long as it delivers data in the same format, all other systems that use the parking-related data could continue without interruption and be unaware of any change to the Smart Parking solution infrastructure.

ORDINARY MEETING
    8 DECEMBER 2016
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A
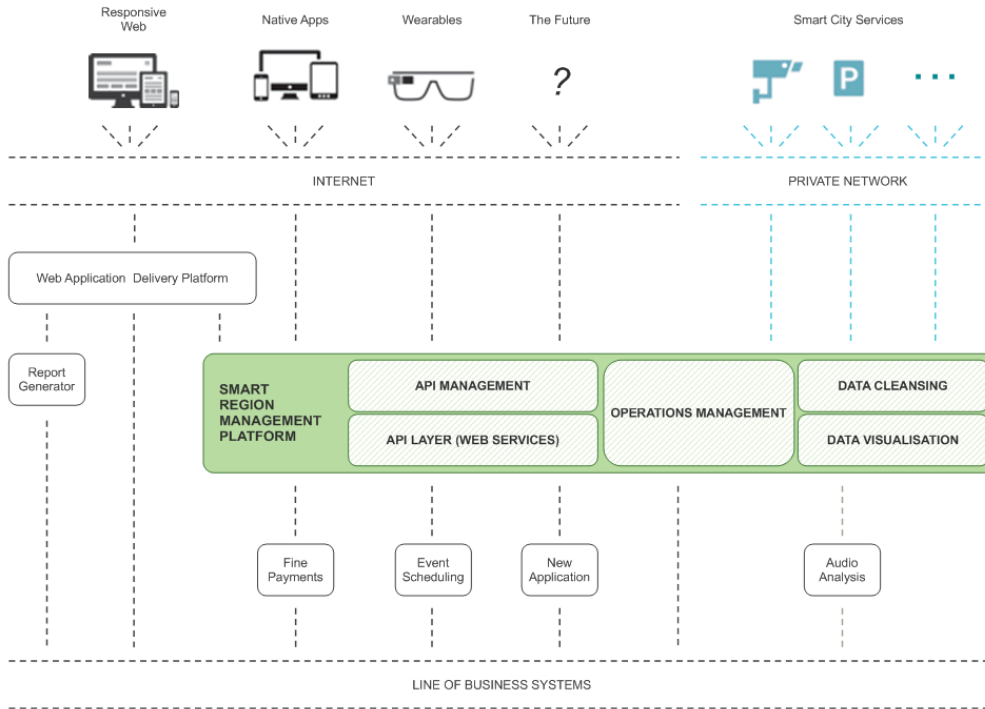
Figure 15: Service abstraction through Application Programming Interfaces (APIs)

5.4 IP network conceptual design

Figure 16 shows one example of how multiple parties might interoperate to deliver Smart City and value added services to end users.
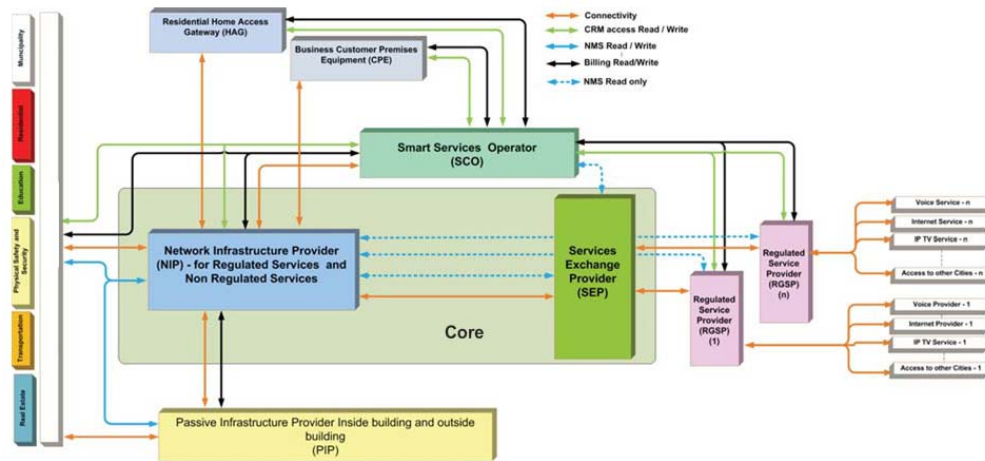
Figure 16: Smart City logical network architecture

The IP network that links together the participating entities shown in Figure 16 is based on a carrier network hierarchical model of infrastructure layers designed to support segmentation, competition and a variety of choices when defining the external operating model.

- **Core/distribution layer.** A resilient fibre-optic core network that interconnects core/distribution network routers at 10 Gbps in a full mesh to provide the highest throughput and availability. An IP MPLS core provides the foundation for a wider range of technology services such as Layer 2 wire services, traffic engineering and MPLS VPNs.

- **Aggregation layer.** Provides the logical demarcation between transport and data-link traffic for Smart City services. The traffic is delivered from access clients (home users, business subscribers, etc.) through the aggregation network to the intelligent edge. The access traffic from different types of end customers is separated using 802.1Q VLANs, Q-in-Q or other functionality so that customer privacy is maintained.

- **Access Layer.** The Access layer is the demarcation point between the subscriber and the service-provider network. It is the access layer to which Smart City services will generally connect with physical connectivity taking different forms depending on the service:
  - **Fibre Ethernet (E-FTTx):** Between service provider points of presence and subscriber plot line; E-FTTx connections can range up to 10 kilometres
  - **WiFi:** For indoor wireless access in buildings and in contained outdoor areas
  - **WiMESH:** For community-wide outdoor wireless access (e.g., IEEE 802.11p standard for Wireless Access in Vehicular Environments (WAVE))
  - **RF Sensor Mesh:** Low power, low data rate, cost-effective sensor network based on a mesh or peer-to-peer topology using open standards such as IEEE 802.15.4 (e.g., 6LoWPAN, ZigBee)

5.5   High-level implementation designs

Illustrating how the various Smart City services can be connected to the network and the Smart Region Management Platform provides a deeper understanding of the system. The section below steps through each of the Smart City services and demonstrates how it might be deployed in practice.

5.5.1   Smart Lighting

Figure 17 shows a street-layer access scenario wherein light standards participate in an RF sensor mesh or peer-to-peer network topology. Each pole extends its communications reach (lighting control and telemetry data) through to the segment controller via multi-hop communication. Within the PDA, the segment controller could use a wireless 3G/4G-LTE/LTE-A/5G link to transport lighting control and telemetry data. When the traffic reaches an aggregation point, it then traverses the core network, is processed in the data centre and can be viewed and managed in the operations centre (in the NOC layer).

App A
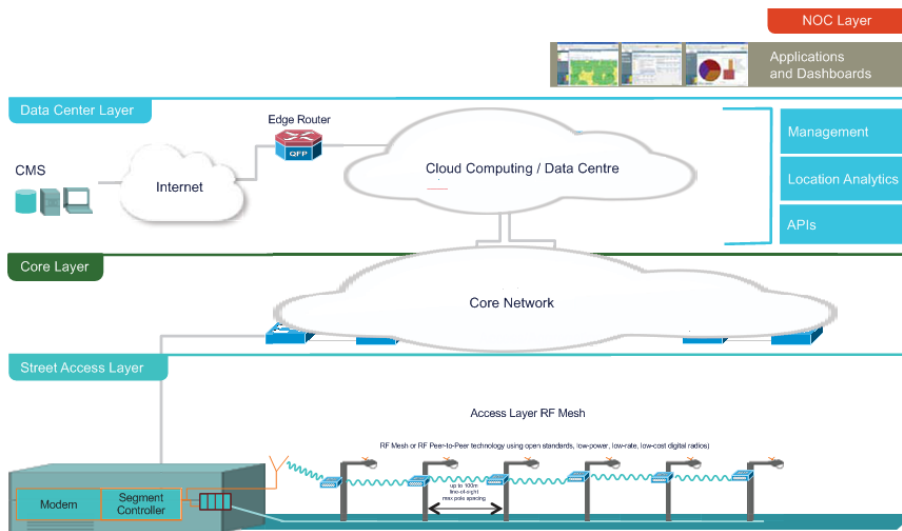
Figure 17: Smart Lighting conceptual network design

5.5.2   Smart Sight, Sound and Sense

Figure 18 illustrates audio-equipped and sensor-enabled IP cameras for public safety and emergency management located on dedicated and shared standards. Similar to the Smart Lighting situation, cameras could leverage a Wi-Fi RF mesh or a wired fibre-optic link in order to connect to the street-layer aggregation point. From there, the devices connect to the core network, where the information is processed and available in the operations centre. Because rich media is being captured, higher networks loads must be factored into the detailed design.
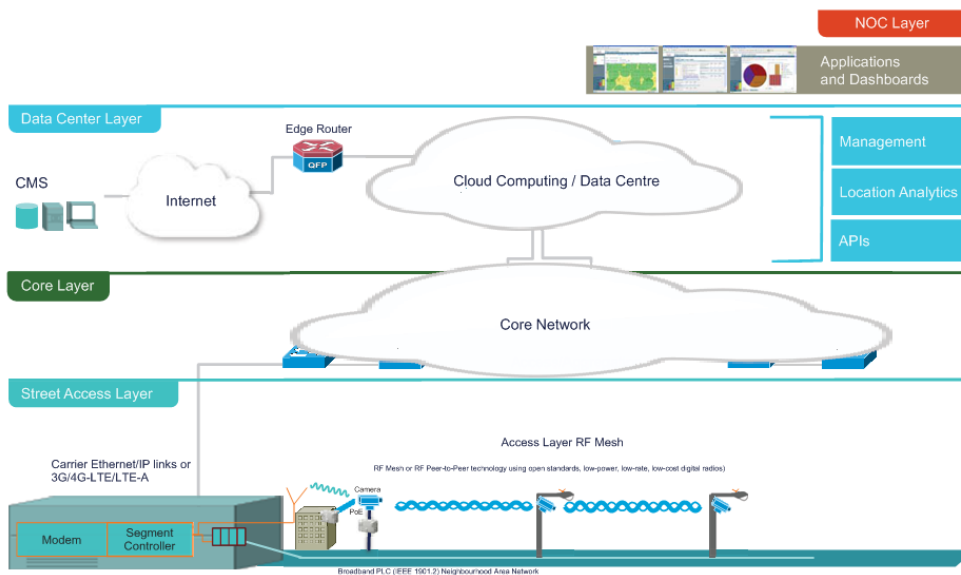
Figure 18: Smart Sight, Sound and Sense conceptual network design

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

5.5.3   Smart Transport—Buses

Figure 19 shows a bus enabled with automated vehicle location technology and (potentially) in-vehicle services such as public WiFi and Smart Signage. Operators and riders are able to retrieve real-time location information to help with trip planning, maintenance etc. The GPS telemetry must integrate into the SCC core network in order to be incorporated into the Smart Region Management Platform.
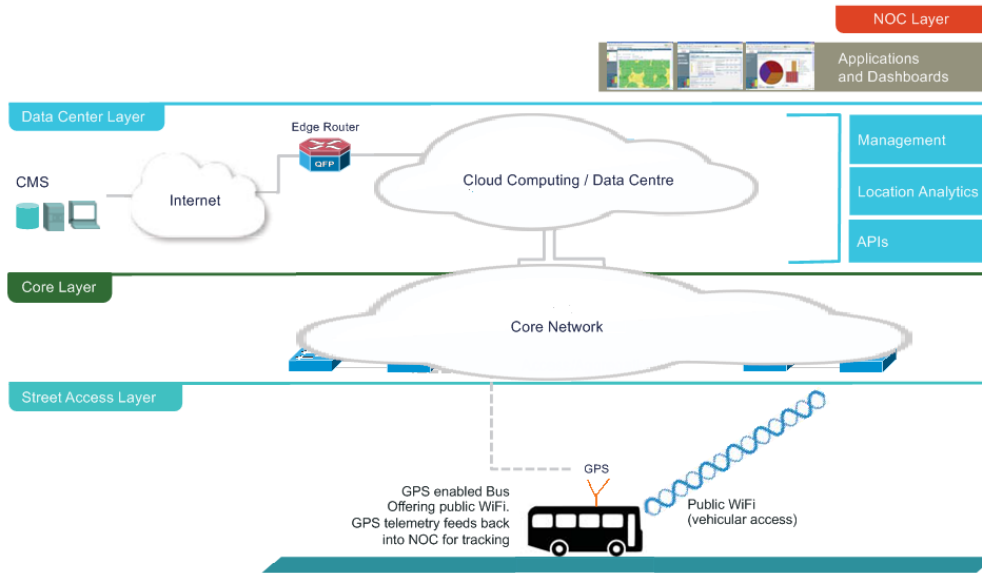
Figure 19: Smart Transport (buses) conceptual network design

5.5.4   Smart Transport—Traffic management

Figure 20 provides an example of a Smart Transport solution focused on traffic management. The available video cameras can be used by Council to verify traffic incidents, while in-ground sensors detect live traffic conditions and that stream of data is continuously analysed. Although some of this in-ground infrastructure is in place today, Council must work with the State Government in order to receive the generated data in real time (or near) in order to use it for incident response within the operations centre.

Sunshine Coast Council—Smart City Framework   44

App A
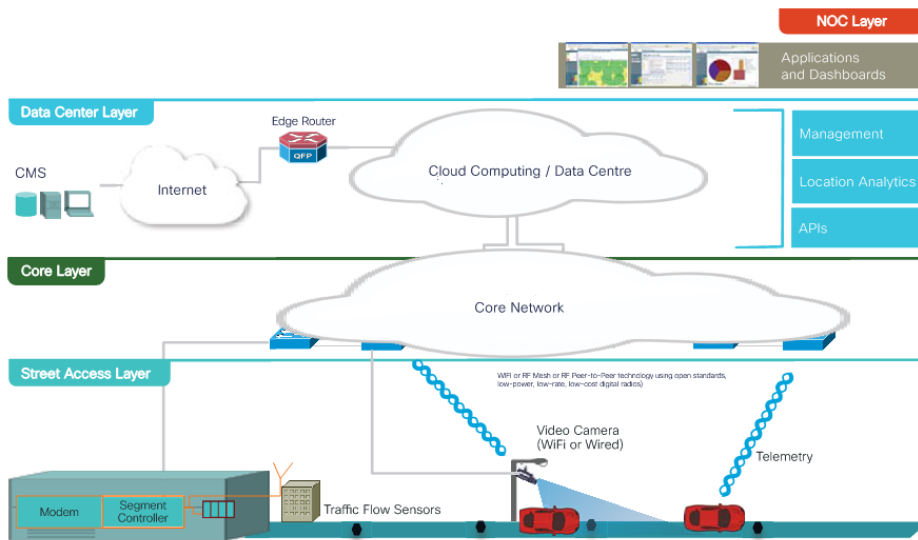
Figure 20: Smart Transport (traffic management) conceptual network design

5.5.5   Smart Waste Management

Figure 21 shows an example of waste management where two (sub-surface) waste bins have their waste pulled to a centralised waste management collection point. The central bin is sensor-enabled and sends bin volume telemetry to above-ground infrastructure to minimise overflows and support collection optimization. The waste truck fleet is GPS and RF enabled allowing their location to be tracked and vehicle health telemetry to be forwarded for maintenance purposes.
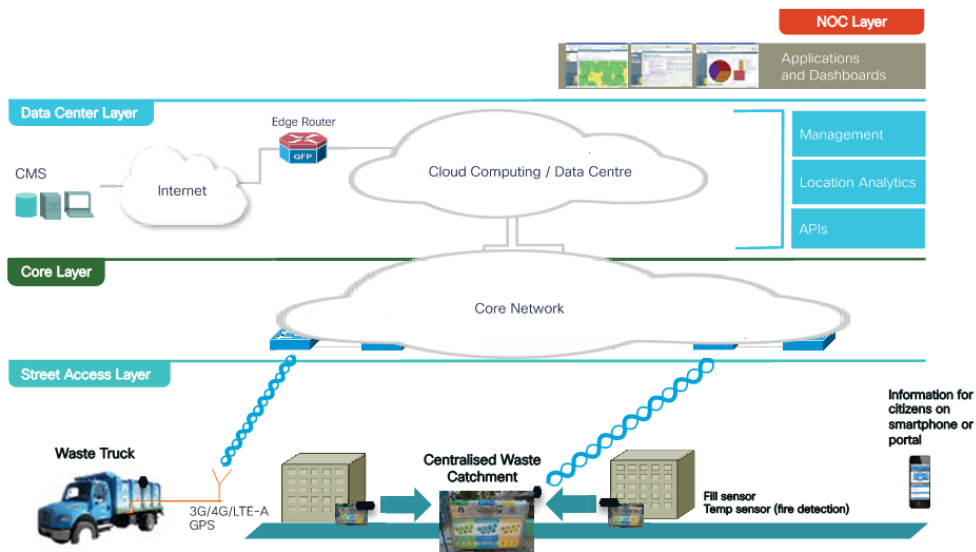
Figure 21: Smart Waste Management conceptual network design

App A

5.5.6   Smart City WiFi

Figure 22 shows pervasive Smart City WiFi for public, institutional and machine-to-machine communication. Experience with Smart Cities elsewhere shows that cities rarely offer broadband WiFi themselves, and instead partner with service providers which deliver (and may monetise) these services. Nonetheless, even when a third party offers public WiFi, it must integrate into the Sunshine Coast network in order to support goals such as digital inclusion, economic development and data ownership. Integration of WiFi access data into the Smart Region Management will offer new insights offer the community a platform for the delivery other services. The community will be able to access a range of services via smartphone and mobile applications. The street layer access can be provided via a citywide mesh, peer-to-peer or a tree structure of wireless hotspots.
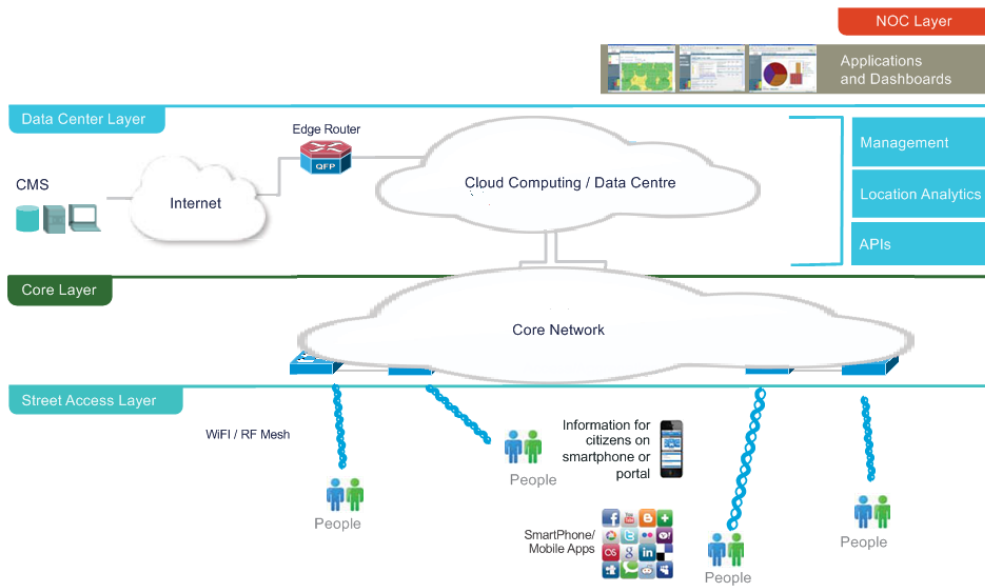
Figure 22: Smart City WiFi conceptual network design

5.5.7   Smart Signage

The Smart Signage illustrated in Figure 23 provides a service allowing a range of smart digital displays to be connected into the Smart City network. Depending on the content being displayed, the devices may require Ethernet connectivity via a carrier Ethernet/IP link. As noted earlier in the document, Smart Signage may also be connected into the Smart City WiFi program and incorporate sensors that track user behaviour.

App A
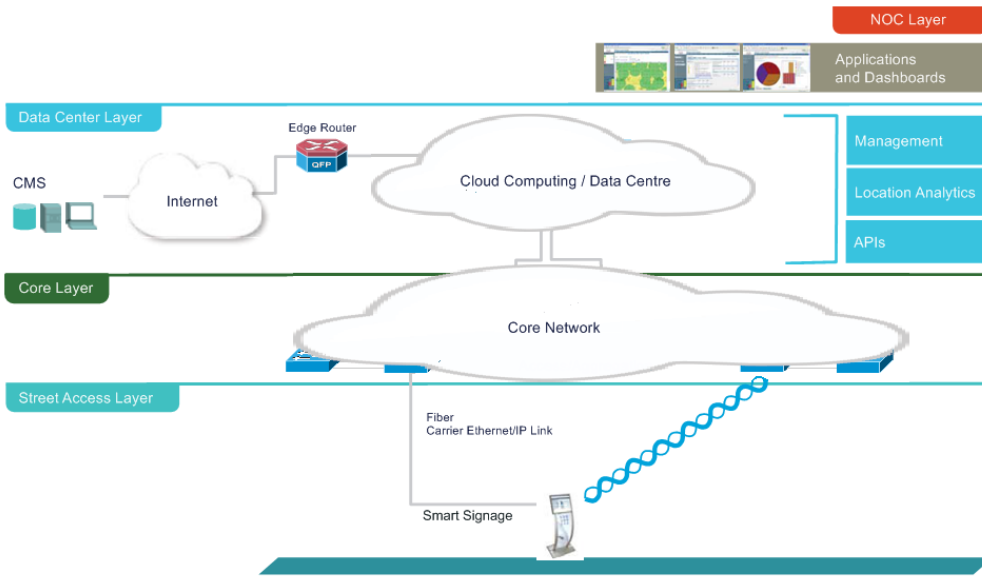
Figure 23: Smart Signage conceptual network design

5.5.8   Smart Citizen Services

Figure 24 shows a similar street layer access to Smart City WiFi with community members accessing the services via wireless hotspots or using 3G/4G/LTE. However this business service is focused on the delivery of intelligent smartphone and other self-service applications related to civic interactions. Although the data supporting the application is ultimately sourced from the Smart Region Management Platform, the Open Data initiative is likely to encourage other developers to build applications that residents may come to embrace and depend upon.
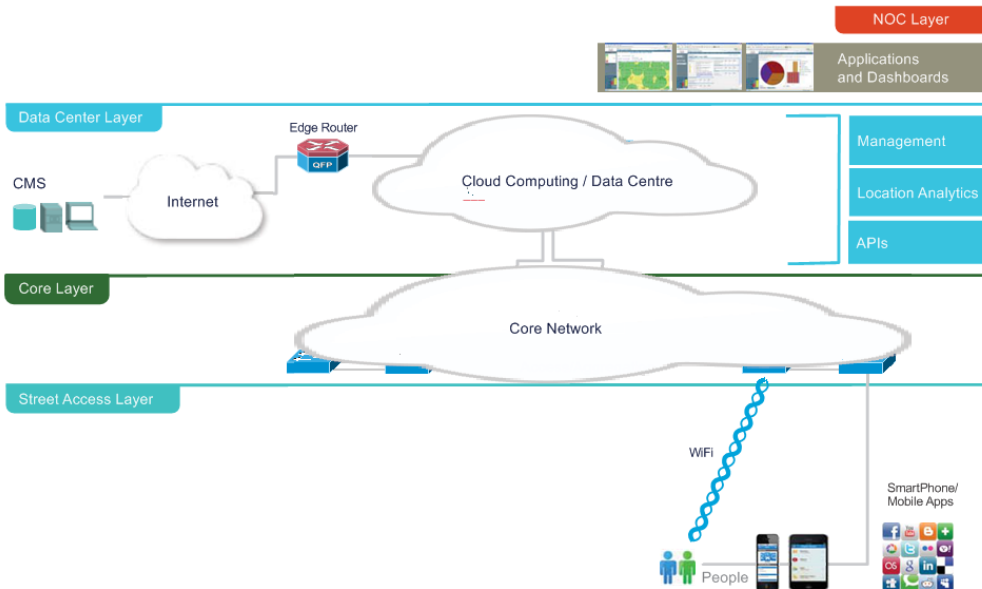
Figure 24: Smart Citizen Services conceptual network design

Sunshine Coast Council—Smart City Framework   47

App A

5.5.9 Smart Health

Figure 25 shows the Smart Health service, encouraging the use of smart connected health solutions to provide specialized health services by remote experts. The illustration features two types of connected health service:

- A low-data-volume service providing telemetry service such as remote heart-rate monitoring to create a "hospital-in-the-home" scenario
- A high-data-volume service supporting voice, video and data communications that permits a doctor located in Brisbane to check the progress of a Kenilworth patient recovering from a respiratory infection using a connected health solution
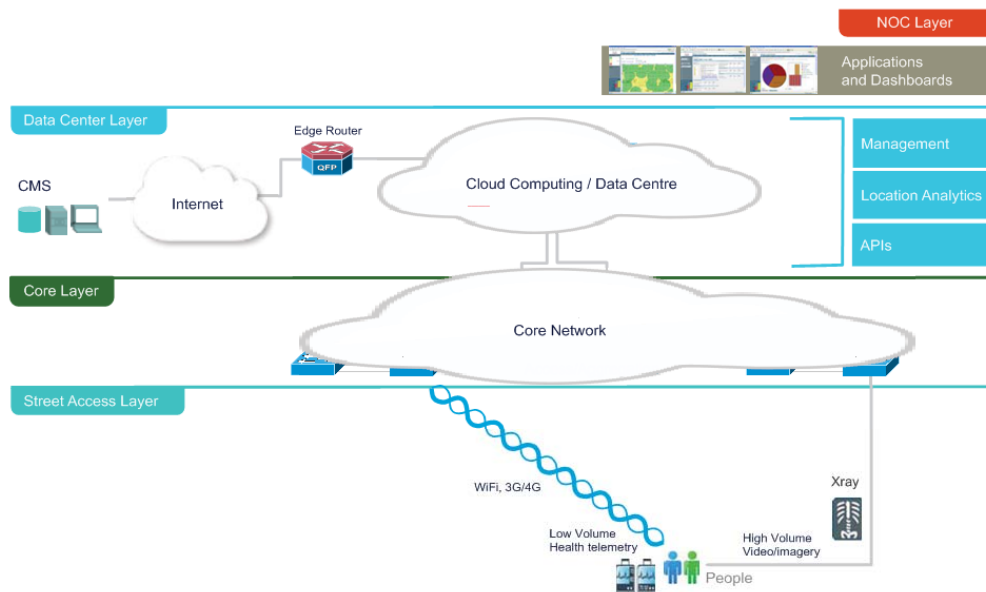
Figure 25: Smart Health conceptual network design

5.5.10 Smart Education

Figure 26 shows smart city WiFi, 3G/4G mobile access and Carrier Ethernet/IP links as enablers to smart education. High bandwidth offered by the latter may be required for use cases where high-volume web/rich media and unified communications may be embraced. High-speed access layer technologies and a high-speed core network support the concept of Massive Online Open Courses (MOOCs), flexible learning methods, and the ability to partner with other high-value industries to help establish "competency clusters".

App A
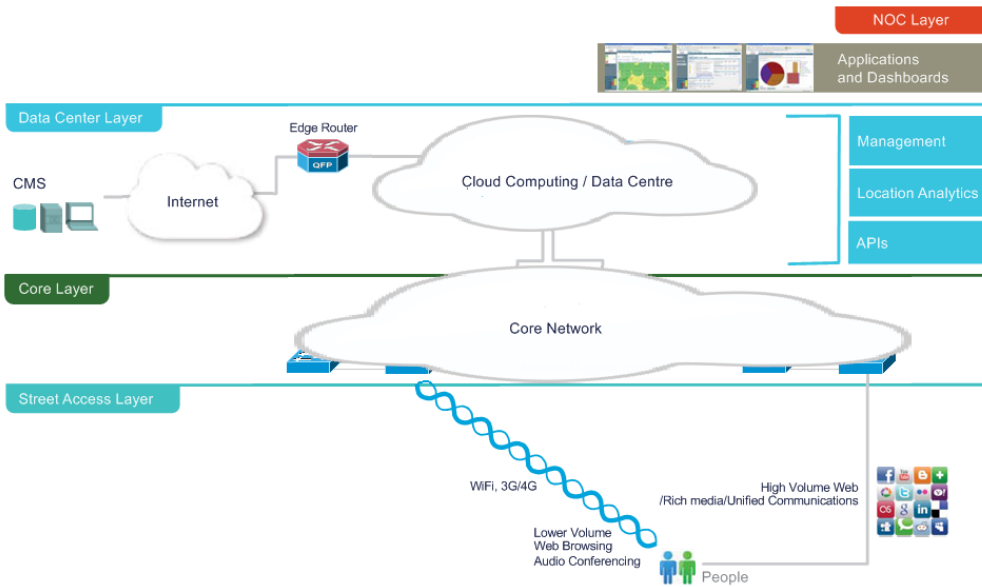
Figure 26: Smart Education conceptual network design

5.5.11   Smart Power Management

Figure 27 shows Smart Power management where smart meters allow people and businesses make better decisions related to their electricity consumption. Smart meters may be connected via carrier Ethernet/IP link, leverage Smart City WiFi, or rely on mobile broadband services.
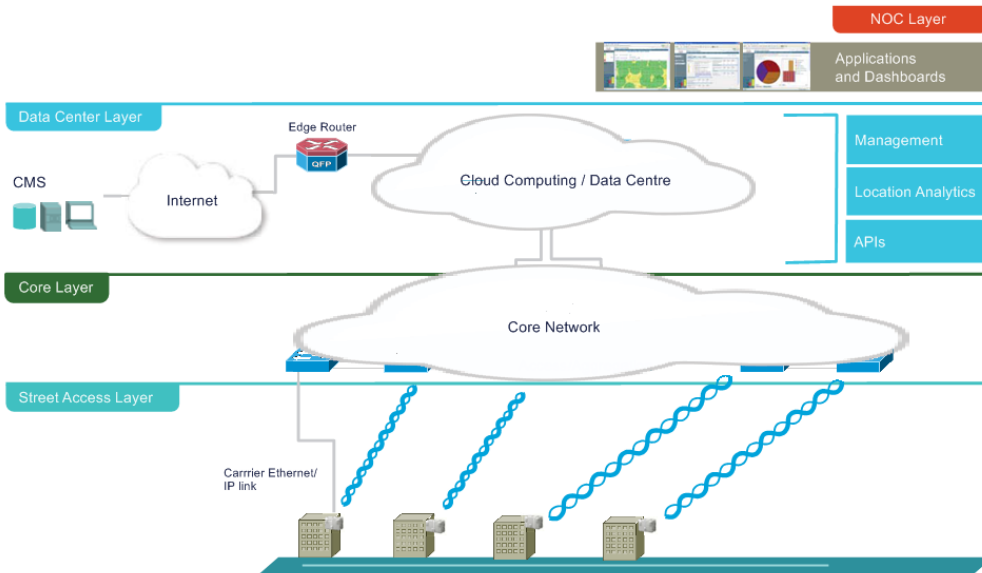
Figure 27: Smart Power conceptual network design

Sunshine Coast Council—Smart City Framework   49

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

5.5.12   Smart Water Management

Smart Water (smart meters) would rely on the same design patterns as illustrated in Figure 27 for Smart Power. Figure 28 shows a second aspect of the Smart Waters solution where sensors deployed along water and wastewater management infrastructure to help monitor system and water health, and where other sensors might assess soil moisture and use that to manage irrigation. All the Smart Water technology would leverage Carrier Ethernet/IP links, Smart City WiFi, or mobile broadband links.
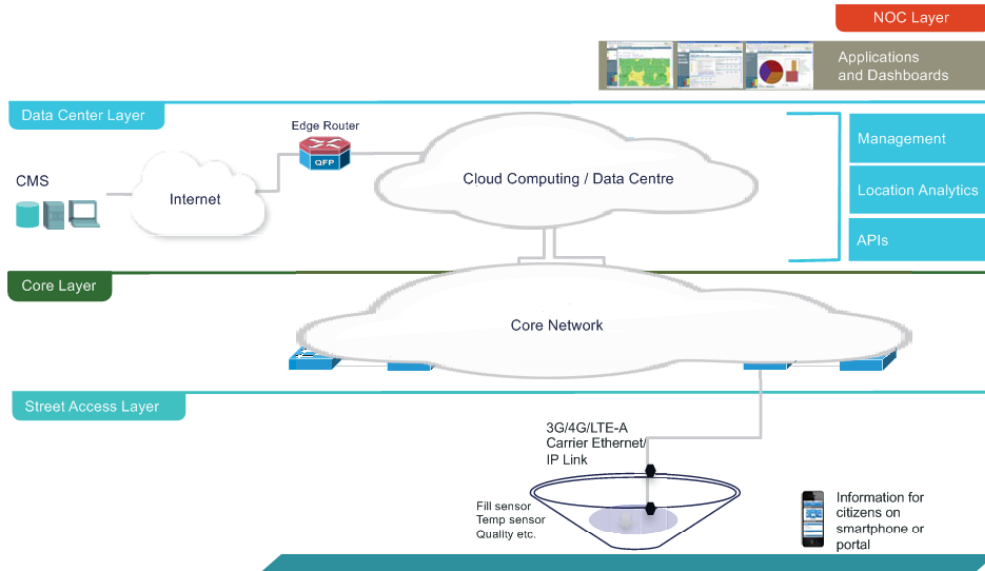
Figure 28: Smart Water conceptual network design

Figure 11 provided an architectural framework for thinking about Technology Enabler elements of Smart City Model Framework, and its Technical Architecture block (Figure 29), was used to define Street, Core, Data Centre and NOC patterns for each of the services in the Smart City Framework. However, as illustrated in Figure 11, successful operation of the Smart City requires more than just technology: it requires internal and external governance, which is covered in the next section of this document.

Figure 29: Technical architecture building block

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

6   Operating the Smart City

A Smart City operating model is a structured approach to governing and adapting to organisational, regulatory and operational themes related to the delivery of 'smart' services. For Smart Cities, there are generally two operating models:

1. **Internal.** An internal operating model governs the vision and goals of the Smart City, establishes the standards and patterns used by the External Entity, and is charged with soliciting participation, generating enthusiasm and building partnerships within organisations that can often be independent and siloed.

2. **External.** An external operating model governs partnerships and collaboration with vendors, often in the context of a special purpose vehicle (i.e., a separate operating entity) that is in charge of the operations of, financial management of and evolution of the Smart City interface with its users: residents, visitors and business people.

Broadly, the Internal operating model is designed to foster collaboration across the organisation in pursuit of a shared strategy. The External operating model is designed to increase competitiveness of the community, to ensure reliable and sustainable operations of the infrastructure and services that constitute the Smart City, and to provide a mechanism for engagement with various stakeholder groups so as to enable adaptation of the city to continue meeting the evolving needs of the community.

6.1   Internal operating model

When organisations seek to establish an internal operating model for the Smart City, they must consider the various operational and management responsibilities (Figure 30).
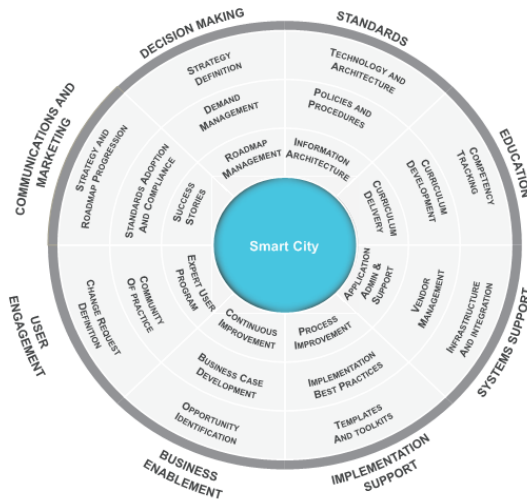
Figure 30: Smart City operating responsibilities

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

When considering how to fulfil these obligations, municipalities have several options (Figure 31).
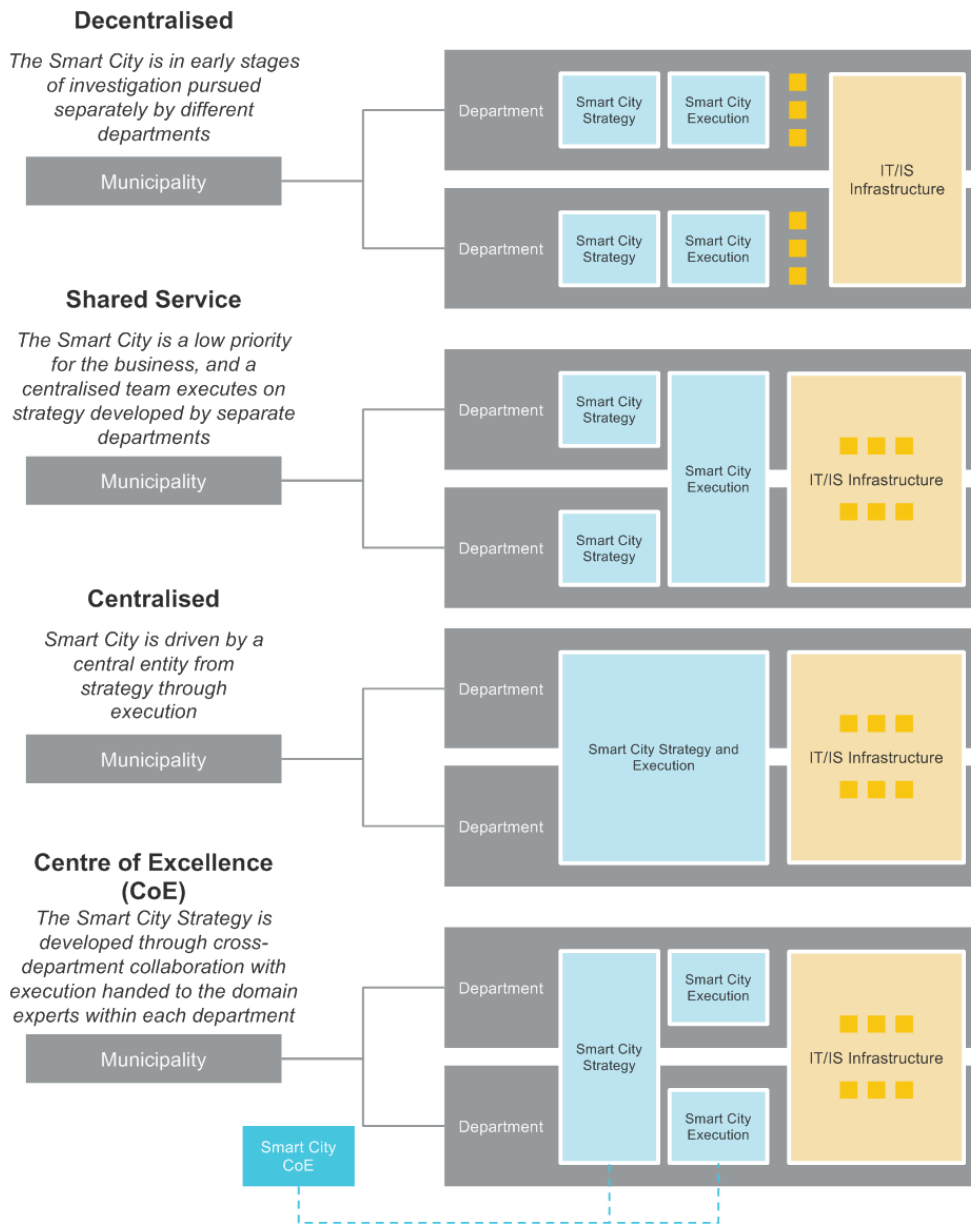
Figure 31: Internal operating model alternatives

The Centre of Excellence model is ideally suited to organisations with deep domain expertise that is needed to assess competing solutions for a particular problem (e.g., how to effectively deploy Smart Lighting), but that would benefit from collaboration with respect to the overall vision of individual projects.

App A

Many regions establish Smart City Centres of Excellence[26] because, as illustrated previously, one of the foundational components of the Smart City is the Smart Region Management Platform. This Platform depends on receiving data from various sources for its ability to fulfil its obligation to **Synthesise** data and **Support** improved decision-making by residents, businesses and Council.

Operating Model	Benefits	Drawbacks
Decentralised	• Maximum flexibility with respect to strategy setting and execution • Allows innovators / skilled staff within departments to test and implement ideas quickly	• Duplication of effort with respect to plan development and execution • Can result in redundant purchases of technology that may not be compatible
Shared Service	• Lower costs through standardising execution of projects across departments • Delivers a consistent solution during execution	• Can create a perception that projects are being delivered by people who lack both expertise, and a real connection to users • A consistent solution is not always appropriate for all use cases
Centralised	• Lowest costs through maximum control of strategy and execution • Provides consistent strategy and execution for everyone	• Rigid control can frustrate innovators • May fail to capitalise on innovation because centralisation creates bureaucracy that slows response to both population demands, and technological advances
Centre of Excellence (CoE)	• Provides departments flexibility vis-à-vis execution against a shared vision • Captures lessons-learned across projects and feeds them back into the capabilities the CoE offers to everyone	• Can result in more IT complexity as domain-specific tools are adopted by departments • Matrix structure can be difficult for some organisations to adopt

Given Sunshine Coast Council's departmental structure, the in-flight capital projects, and the geographic scope of the region, a **Centre-of-Excellence-based Smart City operating model will best enable** the development of a **Smart City strategy** that supports **focused execution** of a portfolio of Smart City initiatives.
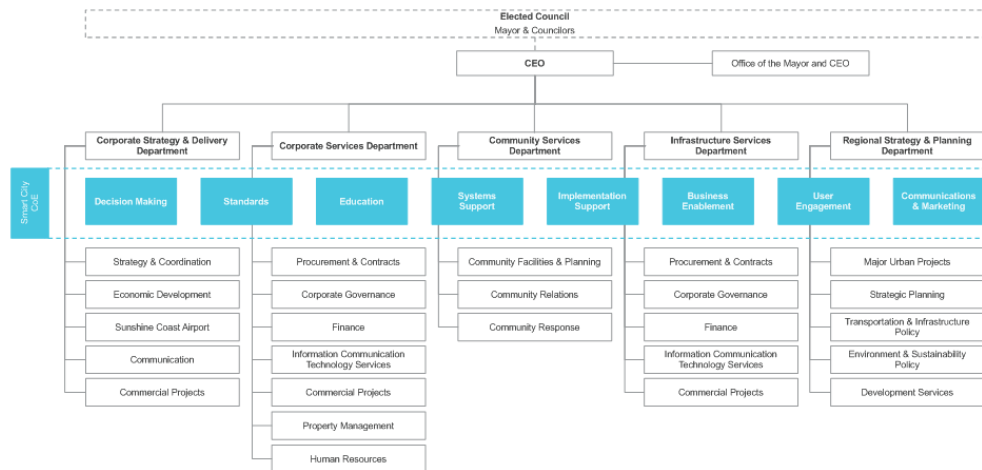
Figure 32: Smart City operating model organisational structure

---

[26] To champion and govern its Smart City program, Barcelona established a new department called Urban Habitat empowered by strong political sponsorship. cf. http://goo.gl/JLTs7v

---

Sunshine Coast Council—Smart City Framework   53

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

Accordingly, a new Smart City Centre of Excellence (CoE) is recommended (Figure 32). The new Smart City CoE need not be instantiated as a new city department. Instead, the CoE can begin as a virtual business groups with most roles filled by part-time allocation of staff the requirements of the Smart City program. As the Smart City program matures, however, Council may be required to formalise the CoE as an independent group responsible for fulfilling the various functions associated with managing a Smart City. Although Figure 32 offers one perspective on the organisation structure, there are various constructs that could be used to achieve the desired outcomes. Regardless of the organisational design, the CoE needs to ensure the Smart Cities program has alignment with Council executive and Councillors.

6.2   External operating model

In addition to the internal operational aspects of the Smart City, Council will need an effective way to engage and collaborate with external firms, especially in the event that Council elects to pursue a licence to become a telecommunications carrier.

During the last century, telecommunications firms have evolved from single-organization enterprises based on a regulated public utility to distributed multiple-entity enterprise. Today, firms operating in the telecommunications space take many forms (Figure 33).

* RSP: Retail Service Provider; ** Op Co in this context refers to OP Co as a service provider; ***PPP: Public Private Partnership
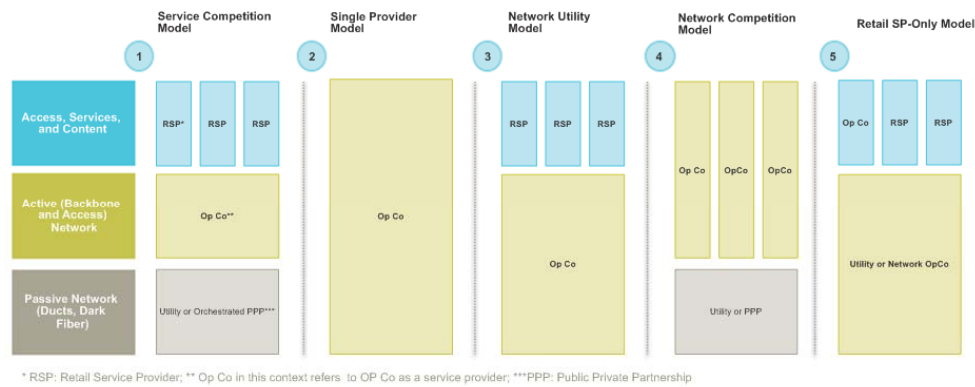
Figure 33: External operating model alternatives

Each of these five alternatives offers its own benefits and drawbacks.

Operating Model	Benefits	Drawbacks
Service Competition	• High revenues • No capital expenses or operating expenses for passive network	• Incomplete ownership • Passive network provider dependence • Lack of control of end customers
Single Provider	• Maximize client revenues • Total client ownership • Leverage market leadership	• High costs reducing margins • No competition • Reduced service portfolio
Network Utility	• Better ability to control prices • High profitability and margin • Improved infrastructure control	• High network operation cost • No communication with end users • High capital expenses
Network Competition	• Ability to maximize revenue in own vertical • Client high ownership • Ability to leverage cooperation portfolio •	• High cost • Infrastructure duplication

App A

Operating Model	Benefits	Drawbacks
Retail SP Only	• No technical network build capabilities required • Priority is offering services to targeted end users	• Limited network operations control • Presence of other RSPs limit wallet share • Margins squeezed by network operator(s) if not regulated

Selecting the external operating model for a Smart City program is typically driven by choices that are made with respect to Smart City services portfolio, and the program and policy objectives of the region. Without understanding the portfolio of Smart City projects that will be adopted and taken forward, it is difficult to propose a suitable model. Nonetheless, establishing an internal operating model is a great first step. The internal operating group will create the essential governance and standards required to establish a minimal viable ecosystem that will comprise the external operating model. As it builds its ecosystem of educational and government institutions, service providers and vendors, Sunshine Coast will be well positioned to advance its Smart City program.

The final section of this document spells out some clear next steps that can help Sunshine Coast Council begin development of its internal operating model, initiate its first Smart City programs, and work toward defining its external operating model.

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

7   Recommendations and next steps

The economic, environmental, demographic and contextual challenges faced by cities in the 21st century are significant. For city leaders, building their economies and communities, delivering services aligned with the new patterns of behaviour, and being good custodians of the environment can seem overwhelming—especially when competition for many high-value, information-centric jobs is not limited to just neighbouring communities. While there are various paths to success, governments focused on traditional approaches will not be able to meet their responsibilities to the people they serve.

Innovation-driven approaches to problem solving have helped companies such as Amazon change retailing, Square change mobile payments, Zipcar change automotive, and AirBnB change accommodation. Organisations that employ more types of innovation (Figure 34)[27] are consistently able to outperform their peers.[28]

Figure 34: Ten types of innovation

Fortunately, techniques and processes for innovation are not limited to multinational corporations. Cities can employ the same tools that helped those at the vanguard disrupt industries, or defend dominant positions. At the heart of many types of innovation—especially those exploited by firms mentioned earlier—is information and communications technology. Cloud, social and mobile technologies can help cities transform urban centres into sustainable Smart Cities. However, Smart City transformation is not about implementing the latest smart grid, or (as mentioned earlier) building an operations centre to rival Rio de Janeiro's. It is focused on responding to a changing context, and using technology to evolve the way services are delivered to improve the liveability, workability, and sustainability of cities.

Developing the Smart City Framework meant listening to and incorporating feedback from a diverse group of internal and external stakeholders representing different areas of Council responsibility, and, from a portfolio of options, identifying Smart City services that make sense for the Sunshine Coast. The prioritisation and sequencing of these solutions builds progressive capability maturity (Figure 35) as part of the Smart City journey, and does so in a way that is financially sustainable, and paced to allow Council and residents to learn how to fully benefit from these innovations.

---

[27] Doblin Group/Deloitte. cf. http://goo.gl/nZ3iV3

[28] Cisco cultivates innovation capability globally through a blend of top-down strategic alignment and bottom-up energy and creativity. This structured approach, and the company's innovation maturity framework has been recognized by the McKinsey / Harvard Business Review M-Prize, and the company's recent celebration of 30-years as a leader in an industry synonymous with creative destruction. cf. http://goo.gl/6zAT3Y

App A
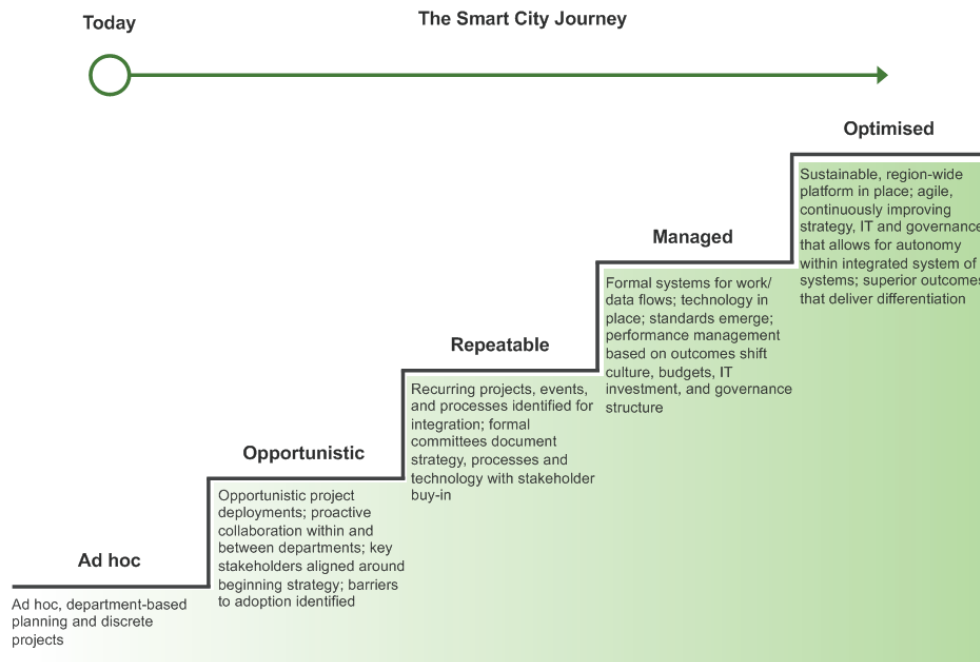
Figure 35: Smart City journey and capability maturity model

After socialising the Smart City Framework with Council and obtaining their crucial support, to move forward with its Smart City vision, you should take six pragmatic steps:

- Establish an internal governance and operating model

- Conduct detailed portfolio analysis

- Define an external governance and operating model

- Define and build the Smart Region Management Platform

- Engage the broader stakeholder community

- Start the first Smart City projects

7.1   Establish an internal governance and operating model

As discussed earlier in this document, the value-delivery process of the Smart City is based on four stages—Sourcing, Streaming, Synthesising and Supporting [improved decision making]—that enhance the liveability, workability and sustainability of a region. In order for that value-delivery process to function correctly, municipalities must be able to govern, if not control, each stage and serve as custodians of the data streamed from each Smart City service. Enabling rapid synthesis of the data, and ensuring interoperability of the various software and hardware components requires standards. To be effective, standards should focus on describing service interface contracts (the boundary between two services, or between a service and the Smart

App A

Region Management Platform), IT components, and data standards rather than describing exactly how a service must function.

Standards are essential, but as discussed in the *Operating the Smart City* section of this document, they're only one component of the governance provided by the Smart City Centre of Excellence. Also required are roles related to decision-making, education, systems support, implementation support, business enablement, user engagement, and communication and marketing. The internal governance body will support design of the external governance body, and help manage RFPs, RFQs and RFIs related to Smart City solutions. Without proper governance, municipalities risk digitising existing processes rather than capitalising on digital technologies to transform the way services are delivered.

With various ad-hoc smart City initiatives in planning and underway, the importance of governance is difficult to overstate. Therefore, we believe establishing an internal governance and operating entity is the first activity that Sunshine Coast Council should undertake. A four-stage process (Figure 36) illustrates the immediate next steps.

Finalise Requirements	**Establish Operating Routines**	**Fill Roles**	**Manage Change**
• Determine ideal structure • Define roles and responsibilities • Define engagement model (i.e., how other entities will engage the governance body) • Coordinate governance efforts with Smart City delivery program roadmap	• Create agenda templates and calendar cycles • Determine meeting attendees • Determine process for updating internal and external communications	• Define members of the governing body • Finalize role descriptions and required skills • Determine hiring strategy (internal, external) and intensity (part-time, full-time) • Recruit and on-board new roles	• Develop detailed change management plan • Design, develop and maintain Smart City CoE online presence (intranet) • Develop relevant communication and training materials • Develop a plan to roll-out new service offerings as they are available

Figure 36: Steps involved in establishing an internal governing and operating entity

When the internal governing entity is established, two of the first activities it should complete are detailed portfolio analysis (i.e., collecting detailed requirements for Smart City solutions and developing supporting business cases), and establishing the external governance and operating entity.

7.2   Conduct detailed portfolio analysis

By engaging a broad set of stakeholders, this project identified key services that will add value to the Sunshine Coast by reducing costs, delivering new revenues and improving the region for residents, visitors and businesses. However, each of the identified services can be delivered in various ways using many different technologies. This engagement was charged with creating a Smart City Framework; therefore, it did not complete requirements gathering for each Smart City solution, nor did it involve the type of solution design necessary to specify hardware and software solutions. To understand the return on investment of each solution, Sunshine Coast Council should complete requirements specification for each of the Smart City services in the first 3 phases of the roadmap (Figure 37).

App A
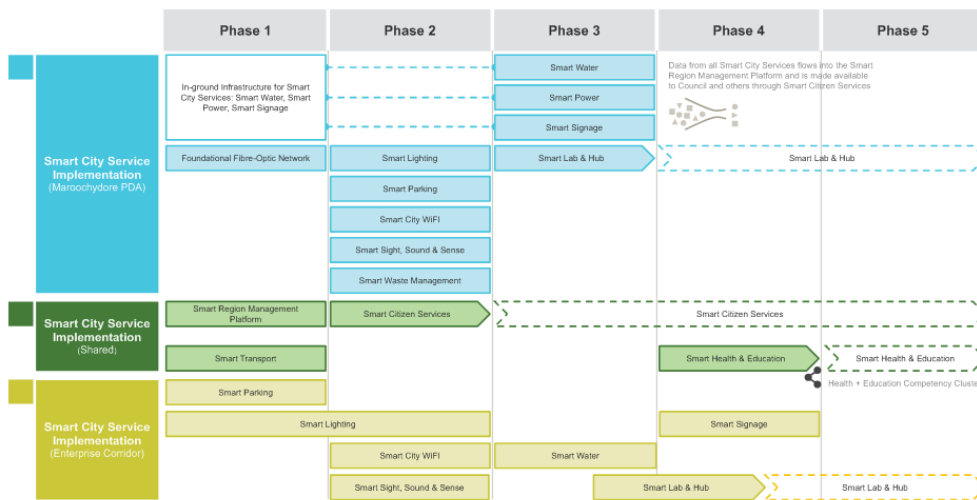
Figure 37: Smart City service implementation roadmap

For each of the services in Phases 1-3, Sunshine Coast Council should work with the new internal governing and operating group in order to engage a broader stakeholder group in order to elicit business, functional and non-functional requirements for the solutions, and complete detailed economic modelling (including RFIs, RFQs) in order to determine the benefits and costs for each of the solutions. As each solution is considered, it is essential to incorporate project and change management (i.e., minimally stakeholder engagement, consensus building, training,) into the business cases. While project management might be straightforward, overcoming resistance to change and successfully deploying some Smart City solutions can be time-consuming.

While developing more detailed economic models, Sunshine Coast Council should pay particular attention to the longer-term impacts of particular solution alternatives. Working with *-as-a-Service[29] vendors may reduce capital investments and create predictable operating expenses, but it can do so at the risk of turning over custody of the data to vendors. Data, and specifically the ability to combine data from multiple sources to draw insights and improve decisions is key to the value proposition of Smart Cities. Handing that data over to vendors can erode the value of solutions, so if cloud-based solutions are considered, it is important to understand how to automate the consolidation of cloud-based data into the Smart Region Management Platform.

7.3   Define an external governance and operating model

With business cases built for a portfolio of Smart City solutions, Sunshine Coast Council will have a good idea about how it will implement the services defined in the initial phases of its Smart City journey, and the value each will deliver to the region. Armed with this insight, Council will be in a clearer position to achieve two important activities:

1.   Establish a minimum viable ecosystem of partners, vendors, and government entities (local and state) that can help develop, support, operate, and fund Smart City services.

---

[29] By *-as-a-Service, we mean Smart City services delivered and managed by vendors (e.g., Smart Parking managed inside a vendor cloud solution). There is nothing inherently wrong with such solutions, indeed they can accelerate and simplify Smart City programs; however, during negotiation, it is important that municipalities are able to maintain custody over the data generated by the system (even if it is also shared with the solution vendor).

App A

2. Define the objectives and structure of its external governance and operating entity based on alternatives proposed earlier in this document.

7.4   Define and build the Smart Region Management Platform

Throughout this document, we have highlighted the importance of data to the value-delivery process of the Smart City. Essential to this process is the platform that will consolidate data from all the Smart City services, and make it available to consumers: analysts and planners with Council, and (selectively) external application developers who are using the data to create applications that improve citizen services.

Although the name might suggest a single tool would provide all the features needed by a municipality developing a Smart City, the Smart Region Management Platform is more likely to be a collection of tools that work together to consolidate, cleanse, standardise and store data from Smart City services. Tools such as data virtualisation, visualisation and management portals will all play essential roles here. As Smart City maturity improves, the capabilities of the Smart Region Management Platform will have to be enhanced to support the addition of new services. Nonetheless, to create a sustainable solution, the internal governance and operating entity will need to establish standards (including those noted in section 5.3) and work with vendors who are engaged in Phase 0 initiatives to ensure the foundations of the Smart Region Management Platform begin to take shape.

7.5   Engage the broader stakeholder community

Although consultation with stakeholders is an essential part of the requirements-elicitation process, it is not sufficient. The stakeholders selected to provide requirements for each of the solutions will be a small subset of those who must be engaged in order to support successful introduction of Smart City solutions into a community. While some Smart City solutions will be perceived as relatively benign (e.g., Smart Lighting), other Smart City solutions are more likely to lead to objections by residents due to perceptions of new fees and fines (e.g., Smart Parking) and privacy (e.g., Smart City WiFi and Smart Citizen Services). Adopting a mechanism for fielding concerns and responding to them in thoughtful ways that are supported by most of the community is essential, and Council may contemplate adding specific external stakeholders to both internal and external operating entities in order to take advantage of leading thinking by vendors and partners.

Because Council will not be able to service all the demands for applications and services, engagement with the software developer community is crucial. Providing a stable platform for access to data will allow others to help support Council's goal of building Smart City services that enhance the region for everyone. However, as new applications are created, Council should monitor their adoption and be clear about terms of service to help users understand who operates the service. For example, citizens may come to rely on an application such as Recollect[30] to remind of them their rubbish collection day. Because the service uses Council data and is associated with the municipal service of waste management, if the terms of service are not clear, citizens may assign blame to Council if Recollect decides to shutter its service in order to pursue other goals.

_____

[30] Recollect's current focus is on waste-management—reminding users when their rubbish will be collected, helping them sort waste into the correct bin, educating residents about waste—but their broader mandate is to help organizations re-imagine services in ways that are citizen-centric, easy to use for both city staff and residents, and incredibly affordable.

ORDINARY MEETING   8 DECEMBER 2016
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

Finally, some of the Smart City services in Phase 3 and beyond become much more valuable when they are more broadly adopted (e.g., Smart Power, Smart Water, Smart Health, Smart Education). Therefore, deep engagement with ecosystem partners such as Energex, Unitywater, University of the Sunshine Coast, Sunshine Coast University Hospital(s), and the Queensland Government is encouraged.

7.6   Start the first Smart City projects

In section 4.3.1, this document identified in-flight and planned projects related to Smart City services. Getting started and building momentum is exciting. As the Sunshine Coast Council embarks on its first Smart City projects, the emerging internal governance and operating entity, and the developing Smart Region Management Platform should coalesce into the foundations for a new Sunshine Coast. These first projects will provide lessons on what works well, and what could be improved as the Maroochydore PDA advances and invites the installation of the Foundational Fibre-optic Network, and its first set of Smart City services.

Investing time and effort in the design of the Smart Region Management Platform will help support the digital business guiding principles articulated earlier (cf. footnote 13). Having a platform enables agile delivery of Smart Citizen services, and interoperation of multi-vendor solutions encourages co-development of solutions, and rapid delivery of benefits. 'Experiments' that are successful can be extended, while those that are less widely embraced can be retired or revised. There will always exist a temptation to spend more time analysing solutions, but continued assessment and reassessment of options can result in opportunities slipping away. Diligence is important, but equally important is a willingness to develop a foundation upon which trials can be run, success celebrated, and failure treated as instructive inspiration.

7.7   Conclusions

This project sought to create a framework that can guide the creation of a Smart City and Smart Region by identifying the elements necessary to achieve a successful and integrated program of smart and connected technologies. Buttressing those technologies with internal and external operating and governance entities supports their ongoing evolution to ensure alignment with advances in technology and the shifting needs and aspirations of the Sunshine Coast region.

In order to meet those requirements, this document:

* Explained what constitutes a Smart City, identified the value-delivery mechanism, and offered relevant case studies
* Described the process followed to develop the Smart City Framework
* Provided a Smart City Framework linked to your vision and corporate plan goals, with Smart City services prioritised and sequenced solutions across regions, and accompanied by high-level benefits and costs
* Defined a high-level technology architecture, and offered guidelines for interoperability, and network considerations for each Smart City solution
* Identified internal and external operating models to consider for governing, designing, building, managing and extracting maximum value from Smart City services
* Provided future-looking stories based on a series of resident, visitor and business archetypes that illustrate how Smart City solutions can improve lives
* Recommended next steps to pursue in your Smart City journey

App A

Through these actions, this document has met the goals of the Smart City Framework project brief, and provides Sunshine Coast Council a structured portfolio of options to consider, and a framework to use when evaluating new solutions in the future.

The Smart City is more a journey than a destination, and embarking requires conviction to develop the necessary foundations that demonstrate benefits, and build support for the next step. Nonetheless, for those who chose to lead, Smart Cities provide real opportunities to build a new economy, develop a stronger community, improve services to residents, businesses and visitors, and credibly claim leadership in the areas of sustainability, and public-sector policy and execution.

App A

8   Appendix A: Map of Maroochydore PDA and Enterprise Corridor

The diagrams below provide two perspectives on what we mean in this report by the Maroochydore PDA and the Sunshine Coast Enterprise Corridor. Additional details related to plans for Maroochydore PDA are available on the Sunshine Coast Council web site.

App A
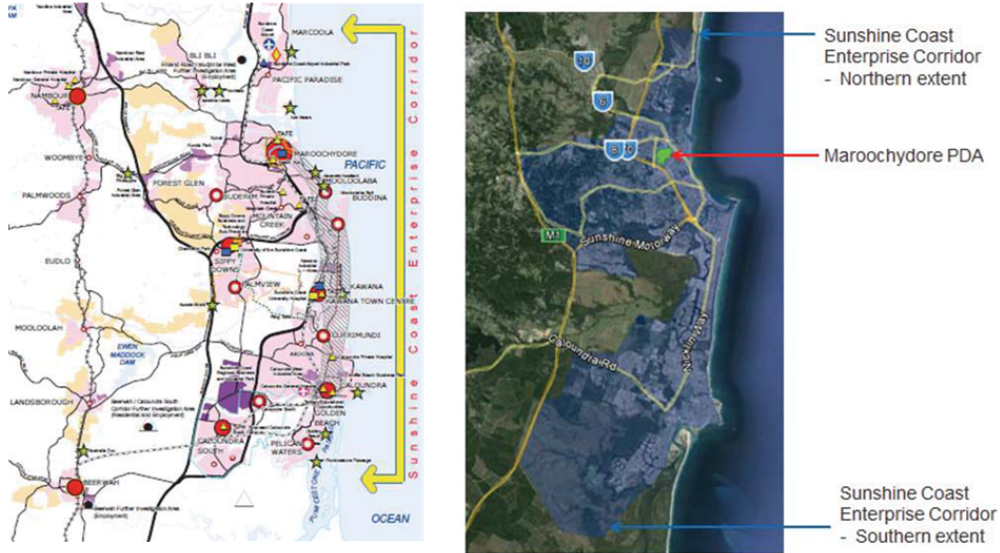
9   Appendix B: Stakeholder group participation

Paul Martins, Mark Salmon and Michael Whereat provided advice and guidance throughout the Smart City Framework project. In order to understand the needs and goals of the region, the team engaged in interviews and consultation with the following people representing various departments and subject-matter domains.

Consultation Date	Representative Domain	Participants & Comments
13/10/2014	Engagement Kickoff	Mark Salmon, Michael Whereat, Brian Beswick, Simon Kay, Paul Martins
16/10/2014	Sunshine Coast Council IT	Michael Whereat, Brian Beswick, Ann Yardley
16/10/2014	Maroochydore PDA	Mark Salmon
20/10/2014	Tourism, Sport & Leisure / Major Events	Geoffrey Peters
28/10/2014	Tourism, Sport & Leisure / Major Events	David Hopper
29/10/2014	Health & Wellness	Kerrie De Clara, Mark McMahon (Stockland), Bronwyn Zorgdrager (Stockland), Walis Westbrook (UC Health), Terrance Seymore (UC Health), Mark (Innovation Centre)
29/10/2014	Smart Lighting	Adam Carey (Citelum)
29/10/2014	Sunshine Coast Council IT	Peter Grant (performing strategic IT review)
30/10/2014	Aviation	Anthony Edgar
30/10/2014	Real Estate	Brendan Robins, Rem Rafter (CBRE)
30/10/2014	Real Estate	Nick Dowling (Colliers)
4/11/2014	Education and Research	Kellie Holdsworth
5/11/2014	Municipal Communities	Grantley Switzer, Di Papas, Elysha Lamb
5/11/2014	Real Estate	Jerry O'Reilly (Savills), Dustin Welch (Savills)
5/11/2014	Aviation	Peter Pallot
12/11/2014	Marketing & Branding	EMS Creative
13/11/2014	Education and Research	Brian Anker
13/11/2014	Underground Waste Management	Alex Patissier
13/11/2014	Libraries	Louise Bauer, Celia Donnellan, Clare Fry
20/11/2014	Transportation	George Pegoraro, Peter Duffy, Guy Boughton

App A

10 Appendix C: Smart City model framework

Building a Smart City requires thinking about more than just one specific technology solutions. Successful Smart Cities look at solutions across eight areas of city responsibility, and do so through the lens of seven technology enablers. By looking at solutions holistically, and balancing excitement with pragmatism, cities can establish the foundations for a successful Smart City journey.

App A

11 Appendix D: Smart City solution prioritisation based on weighted value drivers

Lever Weighting by Region

	Brand Equity	Optimization	Monetization Potential	Quality of Life	Implementation			
Maroochydore PDA	25%	30%	20%	15%	10%			
Enterprise Corridor	15%	40%	15%	20%	10%			
Regions	15%	35%	15%	25%	10%			

Smart City Services	Sustainbility	Innovation	Investment attraction	Wow factor	Reduces operating costs	Improves service	Delivers new services	Provides platform for growth	Drives demand / attracts tenants	Provides revenue opportunities	New job opportunities	Promotes environment / diversity / culture	Safe, secure environmnet	Real-time community information	Healthy lifestyle	Hardware and software costs	Available partners	Ease (inv. complexity)	Ongoing maintenance	Total Score Maroochydore PDA	Total Score Enterprise Corridor	Total Score Regions
Foundational Fibre Optic Network	2	5	5	3	2	3	4	5	3	2	1	1	1		1	2	2	2	4	10.95	10.75	10.25
Smart Region Management Platform	2	2	2	3	5	4	3	5	1	3	2	3	2	2	2	2	4	4	3	10.40	11.15	10.85
Smart Lighting	5	1	1	3	5	3	3	2	3	1	2	3	3	1	2	2	2	2	4	8.75	9.40	9.25
Smart City WiFi	1	3	3	1	1	3	4	5	2	2	2	1	1	2	1	3	4	1	4	9.75	9.95	9.55
Smart Sight, Sound & Sense (audio-equipped IP cameras, and sensors)	3	1	2	2	3	2	2	3	2	1	1	2	4	3	2	2	3	2	4	8.00	8.80	8.85
Smart Waste Management	3	2	1	1	2	3	1	1	1	1	1	3	2	1	1	5	2	4	2	7.40	7.50	7.55
Smart Water	3	2	1	1	2	2	1	1	1	1	1	3	2	1	2	2	2	4	5	6.50	6.60	6.65
Smart Power	3	2	2	3	2	3	2	3	2	4	4	3	3	3	1	2	2	4	5	6.50	6.60	6.65
Smart Parking	3	3	1	1	3	3	2	4	2	2	1	3	3	3	2	3	3	2	3	9.35	9.45	9.40
Smart Transport	3	3	3	3	3	3	3	5	2	3	3	3	3	5	5	3	4	3	2	9.45	10.15	10.10
Smart Citizen Services	2	2	1	1	2	2	2	2	2	3	2	2	2	3	1	4	4	4	4	12.25	12.80	12.85
Smart Signage	1	3	1	2	2	2	4	4	1	3	2	2	2	1	4	2	2	2	4	7.65	8.05	8.05
Smart Health	1	1	1	3	2	2	2	4	3	1	2	2	2	2	4	2	2	2	2	8.90	9.50	9.35
Smart Education	1	3	3	2	2	2	4	4	1	3	2	2	2	1	1	2	2	1	1	8.05	8.55	8.25
Smart Lab & Hub	2	5	2	3	2	2	3	5	2	2	2	3	2	3	2	2	2	2	2	9.50	9.50	9.50

Cost-focused Scale

1 — Relatively expensive and complex with a few credible delivery partners

2

3 — Moderately expensive and complex with a small group of credible delivery partners

4

5 — Relatively inexpensive, and simple with a variety of credible implementation partners

Value-focused Scale

1 — Makes limited contribution with respect to this criteria

2

3 — Makes a moderate contribution with respect to this criteria

4

5 — Contributes in significant and distinct ways with respect to this criteria

Sunshine Coast Council—Smart City Framework

66

App A

12 Appendix E: Estimating assumptions

In order to produce scaled assumptions for the Sunshine Coast, we used demographic, geographic, and economic data available on the profile.id, atlas.id and economy.id sites, respectively. 2014-2015 budget figures available on the Council's web site were used to support scaling. Additional estimating assumptions are provided below.

Smart City Service	Financial Estimating Assumptions
Foundational Fibre-optic Network	• Cost for dual ring backbone using no more than 1600m per ring • Benefits and costs scaled based on work with other regions
Smart Region Management Platform	• Benefits and costs scaled based on work with other regions
Smart Lighting	• Estimates based on 25K lights distributed throughout the region • Benefits and costs scaled based on work with other regions
Smart City WiFi	• Based on total coverage area of $1km^2$ • Benefits and costs scaled based on work with other regions
Smart Sight, Sound and Sense	• Based on assumption of 200 cameras with a mixture of day and night vision and pan/tilt/zoom capable • Approximately 280,000 residents in Sunshine Coast • $36 billion cost of crime in Australia[31] • Benefits and costs scaled based on work with other regions
Smart Waste Management	• Based on 100 sensor-enabled trash bins • Benefits and costs scaled based on work with other regions
Smart Water	• Estimates based on deployment of 2000 smart meters (businesses, apartments, etc.) in the PDA and up to 200 sensors within Sunshine Coast • Approximately 103,000 households • Benefits and costs scaled based on work with other regions
Smart Power	• Estimates based on deployment of 2000 smart meters (businesses, apartments, etc.) in the PDA • Approximately 103,000 households • Benefits and costs scaled based on work with other regions
Smart Parking	• Estimates based on 1000 on-street parking spots • Paid parking 6 days a week with spots occupied 20% of a day (4.8 hour/day) • Average charge of $2/hour • Benefits and costs scaled based on work with other regions
Smart Transport	• Assumed bus-tracking enabled and paid for by Queensland Government • Additional technology aimed at traffic flow management has been scaled based on work with other regions
Smart Citizen Services	• Selection of responsive web sites, and mobile applications built by council • Assume 1 web site redesign and 2 simple mobile applications • Benefits and costs scaled based on work with other regions
Smart Signage	• Assumed deployment of 20 signs in the PDA and 20 in the Enterprise Corridor • Benefits and costs scaled based on work with other regions
Smart Health	• Assumes initial deployment of remote-doctor services using high-definition video and auditory device connectivity at 4 remote sites and 1 central site • Benefits and costs scaled based on work with other regions
Smart Education	• Assumes use of tale-presence and collaboration technology deployed in 10 locations • Assumed Smart Education improves school graduation by 25% • Benefits and costs scaled based on work with other regions

---

[31] Australian Institute of Criminology cf. http://goo.gl/YxPjvS

Sunshine Coast Council—Smart City Framework   67

App A

Smart City Service	Financial Estimating Assumptions
Smart Lab & Hub	• Assumes collaborative and connected working space for up to 20 people with attendant 'lab' environment and its relevant technology • Benefits and costs scaled based on work with other regions

ORDINARY MEETING   8 DECEMBER 2016
Item 8.2.1   Smart City Framework & Smart City Implementation Program
Appendix A   Smart City Framework (complete)

App A

13 Appendix F: References and attributions

13.1 Referenced works

Delivering the Smart City: Governing the City in the Digital Age. University College London, ARUP.

Pew Research Center. *Killer Apps in the Gigabit Age.* October 2014.

Smart Cities Council. *Smart Cities Readiness Guide.*

Sunshine Coast Council. *Draft Digital Action Plan: Digital Sunshine Coast—Smart Region, Smart City.*

Sunshine Coast Council. *Maroochydore City Centre Priority Development Area: Development Scheme.*

Sunshine Coast Council. *Sunshine Coast Council Economic Development Strategy: 2010-2014.*

Sunshine Coast Council. *Regional Economic Development Strategy: 2013-2033.*

Sunshine Coast Council. *Sunshine Coast Tourism Opportunity Plan: 2009-2017.*

Sunshine Coast Council. *Sunshine Coast Destination Limited Annual Report: 2012-2013.*

Sunshine Coast Council. *Corporate Plan: 2009-2014.*

Tim O'Reilly. [@timoreilly]. 10 Nov 2014, 19:41 UTC. Tweet.

The Digital Workhub Project. *Digital Work Hubs: An Activation Framework for South East Queensland.* December 2013.

13.2 Creative asset attribution

The iconography used throughout this document is used under Creative Commons or Public Domain license. Imagery for

- Smart Cube from Wikimedia Commons
- Cambridge from Wikipedia
- Saskatoon from Wikipedia

The icons used within this document can be obtained online from The Noun Project (http://thenounproject.com/).

- Running with dog by Claire Jones
- Briefcase by Stephanie Szemetylo
- Growing plant by Rick Pollock
- WiFi by Mourad Mokrane
- Forklift by Edward Boatman
- House by Samuel Q. Green
- Institution by Diego Naive
- Business by Pieter J. Smits
- Binoculars by Ben Fausone
- Light bulb by Nicholas Menghini

ORDINARY MEETING   **8 DECEMBER 2016**
Item 8.2.1   **Smart City Framework & Smart City Implementation Program**
Appendix A   **Smart City Framework (complete)**

App A

- Surveillance camera by Mister Pixel
- Raindrop by Monika Ciapala
- Power plug by Edward Boatman
- Water by Paulo Volkova
- Battery by Hello Many
- Garbage can by José Campos
- Parking by Thomas Le Bas
- Bus by Pierre-Luc Auclair
- Stethoscope by Stephen JB Thomas
- Graduate cap by Marc Haumann
- People by Wilson Joseph
- Lab by Emily van den Heever
- Integration by Anisha Varghese
- Fibre optics by David Waschbüsch
- Persona icons by Lil Squid

App A

14 Trademarks and Disclaimers

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS DOCUMENT ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS DOCUMENT ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY INFORMATION.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT CONTENTS AND CONTENTS OF THIRD PARTY SUPPLIERS ARE PROVIDED "AS IS" WITH ALL FAULTS. CISCO AND THIRD PARTY SUPPLIERS DISCLAIM ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Cisco and the Cisco Logo are trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and other countries. A listing of Cisco's trademarks can be found at www.cisco.com/go/trademarks. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company.

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

©2014 Cisco Systems, Inc. All rights reserved.