SMART CITY:

EMERGING MODELS & IMPLEMENTATION FRAMEWORK

WHITE PAPER

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PREFACE

Cities are a primary driver of economic growth, innovation and opportunity. Cities are powerful magnets for highly skilled and educated workers and gateways for new immigrants. They are the centers of business, generators, suppliers and attractors of financial capital. They are important trade hubs for both goods and services, and the focal points of global commerce. They house substantial infrastructure assets and major institutions that power regional prosperity and the nation's quality of life. These critical characteristics make cities strategic leverage points for strengthening the national economy and competitiveness. However, the scale and pace of urbanization is transforming our world.[i]

Major technological, economic and environmental changes in the 21st century have generated interest in Smart Cities, including climate change, economic restructuring, ageing populations, the move to online retail and entertainment, and pressures on public finances.[ii]

This white paper describes key drivers and emerging models of the modern Smart City. The paper also delineates important elements of Smart City design and architecture, and provides an overarching framework for implementation that is technology agnostic and scalable, touching on mobility, urban planning, information technology, cyber security, sustainability, and resource management.

An effective Smart City implementation can result in a secured intelligent infrastructure, leading to delivering enhanced public services, business and job growth, foreign investment and public safety. An effective Smart City implementation requires a careful business model and public-private partnership (P3).

The Planet Defense Team is thus pleased to offer this White Paper in the hope that our collective thinking will contribute to greater awareness regarding all aspects of Smart Cities. Our team will continue to develop ways and means to assist our worldwide clients on Smart and Safe Cities.

This White Paper is the result of efforts made by Planet Defense Team and so I wish to thank the outstanding Smart City professionals who contributed their vast expertise to this report. The following individuals deserve special mentioning: Dr. Joseph Pelton, Dr. Michael Oehler, John Bone, Vic Chauhan, Larry Fetzer, Mira Singh, Dave Sapio, Marty Johnson raghav Sadekar.

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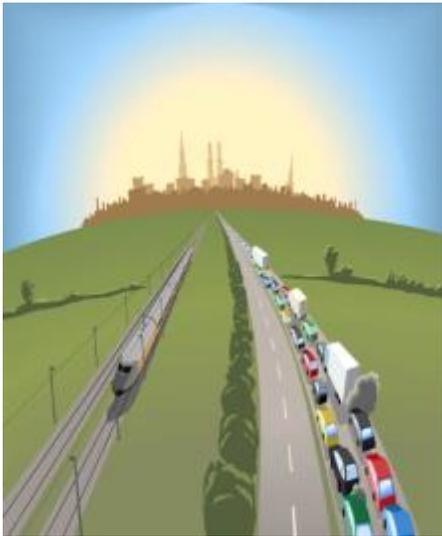
BACKGROUND

The "Future Cities" will likely be shaped primarily by forces that include: climate change, population growth, super urbanization, and global terrorism. They will likely have a profound and dramatic impact on the world economy and at the local level as well. These forces could reshape the direction of technological development; revamp economic and regulatory systems; refine business, social, health, education and training needs; and both complicate and restructure the need for security at the local, national and global level. Cities may face a time of turmoil while monitoring the pathways and vectors of these drivers and their interactions, and the coming years may prove a complex and difficult time in human history. Additionally, future cities could experience a period of "future compression" where change occurs at an accelerating pace and social, economic, technical and political responses will likely seem slow and sometimes ineffective. How can we possibly ebb the negative consequences of these change drivers? Albert Einstein once said that when it came to problem solving, determining the right questions were the hard part. We believe the Smart City conceptualization should begin by asking the right questions, with a focus on the future compression of the four key drivers.

Changes are all around us and many cities around the world are in the midst of transformation. Many cities have embarked on modernization plans to forge public-private partnership focused on social and economic development, where citizens can enjoy a modern, secured, connected, and enhanced lifestyle.

City-states such as Singapore and Dubai had early starts, and are now committed to building *global digital cities* for the twenty-first century. Others such as Kuala Lumpur, Malaysia; Seoul, South Korea; and Edinburgh, U.K. to name a few, are reexamining their next stage of growth and development, having achieved some degree of advanced information infrastructure.

The Indian and Chinese Governments have embarked on developing "Smart Cities" across their countries, while New York City and London have strengthened city safety and security in view of global terrorism, and have been actively engaged in integrating intelligent technologies for the purpose of improving public safety and security.

All of these cities have one common theme — ***a vision.***

However, their techno-economic models are different given distinctive starting conditions and drivers. Meanwhile, countries like Saudi Arabia and the United Arab Emirates are beginning to plan future Smart Cities, and many other cities are incorporating more small-scale Smart City concepts than ever before. The advent of the Smart City is becoming a reality in the twenty first century.

Far from being an end-state or driver for a Smart City, Information and Communication Technology (ICT) is merely a facilitator; therefore any technology employed must carefully match requirements to balance social, commercial, government and sustainability needs. An effective Smart City framework should integrate a tailored array of software, infrastructure, and visualization/situational awareness tools to meet emerging needs, while employing ICT to support overall business and security solutions. The framework must be broad enough to support plug and play modules of ICT at a product level, integrating them to combine software, infrastructure, and visualization/situational awareness tools to perform a myriad of public-private-government functions. To fully expand current implementations, a paradigm shift is needed to integrate these discrete Smart City modules and byproducts and manage them into an overarching framework. We propose such a framework in this White Paper.

WHAT IS A SMART CITY?

At its core, a Smart City is a socio-economic concept to improve quality of life and economic vitality through application of Information and Communications Technology (ICT), and is built on the following four pillars:

- **Sustainability** – managing climate change, urbanization and population growth.
- **Strategic Positioning** – improving the city's competitiveness and creating jobs.
- **Resource Management** – delivering enhanced public services to citizens and businesses.
- **Security** – enhancing public safety, protecting key infrastructure and offering cyber security.

As such, Smart Cities are created to meet new global challenges in terms of sustainability, employment opportunities, global competitiveness, and security for citizens in the wake of global terrorism and crime. And the investment to date has not been small. In fact, between 2010 and 2020, the investment in Smart City technology infrastructure is estimated to total $108 billion, and annual spending is anticipated to reach nearly $16 billion.[iii] However, the industry is still in its infancy, for there is no fully operating, large-scale Smart City, with exceptions of Singapore and perhaps Dubai. Indeed, the present trend is to *not* implement a broad solution, but rather choose from a menu of components. Small-scale solutions have become the norm due to:

- Insufficient funding
- Lack of a careful long-term strategy, resulting from a short-term focus
- A perception of difficulty in implementation or stakeholder buy-in
- Policy emphasis on quick results
- A stove piped current state of infrastructure and
- Lack of a Smart City governance structure

But, with a better Smart City framework and long-term vision, these issues or mindsets can be addressed by setting short-term milestones tied to patient, paced expenditures, whose gradual integration aggregates in a long-term business solution and favorable Return on Investment (ROI).

SMART CITY CONCEPT

- Smart City is not a technology concept. It is an economic development concept.
- Smart City is not a long-term project. It is a short-term project with long-term vision.
- Smart City is not a single sector Concept. It is a multi-dimensional, multi-sector concept.
- Smart City is not an infrastructure-driven concept. It is a service-driven concept.
- Smart City is not a local phenomenon. It is a global movement with striking results.
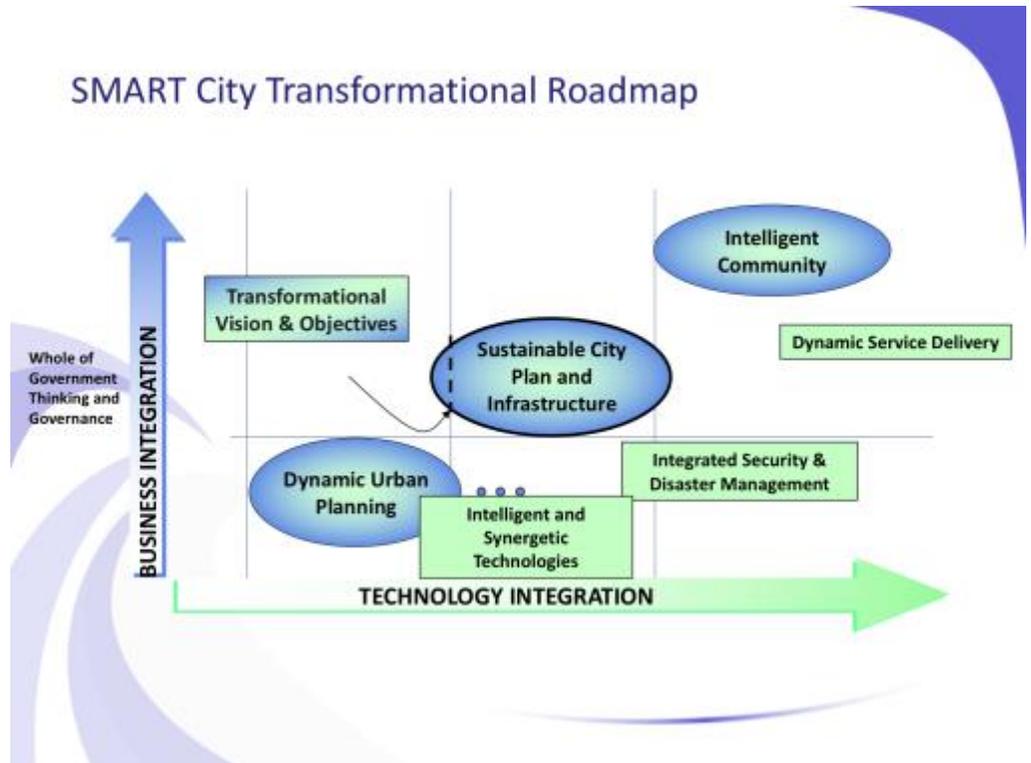

Figure 1: Smart City Vision

The success of a Smart City project is not determined by technology or capital. **Success is dependent on vision, leadership and inter-group coordination.**

SMART CITY KEY DRIVERS

The public, government, and industry all have drivers that can push towards a Smart City framework that can be mapped into the pillars laid out in the previous section, namely: sustainability, strategic positioning, resource management, and security. However, because many of the drivers are interlinked and do not map one to one, it may be better to treat them as a set, rather than individually.

Smart City implementation is an integrated approach although ad hoc implementation of Smart City functionalities has become a norm. As long as an integrated vision and plan are developed at the outset, piecemeal implementation of Smart City projects becomes a solid tactical approach.

The following drivers, in aggregate, are therefore the primary forcing function towards a *convergent* Smart City solution:

POPULATION DEMOGRAPHICS

Between 2009 and 2050, the world population is on pace to increase by 2.3 billion, reaching 9.1 billion people. Over the same period of time, the population living in urban areas is projected to grow by 2.9 billion, reaching 6.3 billion people (nearly 70% of the world's population will be urban at this time).[iv] The least developed countries in the world are in fact experiencing some of the most dramatic degree of population growth and urbanization, so it may serve their interest to turn towards the Smart City concept so that resources and services can be leveraged within these centers of rapid growth, while also delivering jobs to its citizenry.[v] At the same time in more developed countries (Western hemisphere and Asia), populations are ageing—this will likely require new, more intelligent methods of delivering necessary services to an increasingly dependent citizenry.

SUPER URBANIZATION

A city only has a finite amount of resources for sustainment, whether in terms of time, money, or raw material, so it should administer, distribute, and increase these resources effectively and efficiently. A Smart City should be able to effectively manage living within its means with respect to a tax, investment, and debt base, while attracting outside investments and new business into the city to increase its revenue and resource base. From a governance aspect, city officials, businesses, and constituents alike require efficient and transparent governance that increase the ease

of doing business, the access and administration of services, as well as communication with the citizenry, solicit and receive feedback, and allow city management to access frameworks to more effectively manage projects and balance competing objectives and resources.

CLIMATE CHANGE

People demand that both government and industry consider environmental impact, and therefore communities strive to create a lower the carbon footprint, utilize smart grid technology to efficiently transport and dispense energy, employ renewable resources to the extent possible, provide protection against the vagaries of natural disaster, and help manage emergencies caused by ensuing climate change.

SAFETY AND SECURITY

Public and corporate safety and security lay at the heart of a Smart City, leading to increased global competitiveness and economic well-being. An effective Safe City (a sub-component of a Smart City) organizes and consolidates physical access, control and monitoring systems, and secures high-value business applications, critical infrastructure installations, defense and intelligence infrastructure, and monitors accesses to critical applications, while keeping in mind cyber security solutions from the beginning This construct incorporates management of emergency response time (to include emergency and disaster management), the ability to secure and control mass events, secure public administration transactions workflows, provide cyber security, and provide surveillance of public places.[vi]

Some of the key drivers for a Smart City are shown in Figure 2. When combined with new and innovative technology and solutions, it will lead to the creation of a smart and prosperous community.
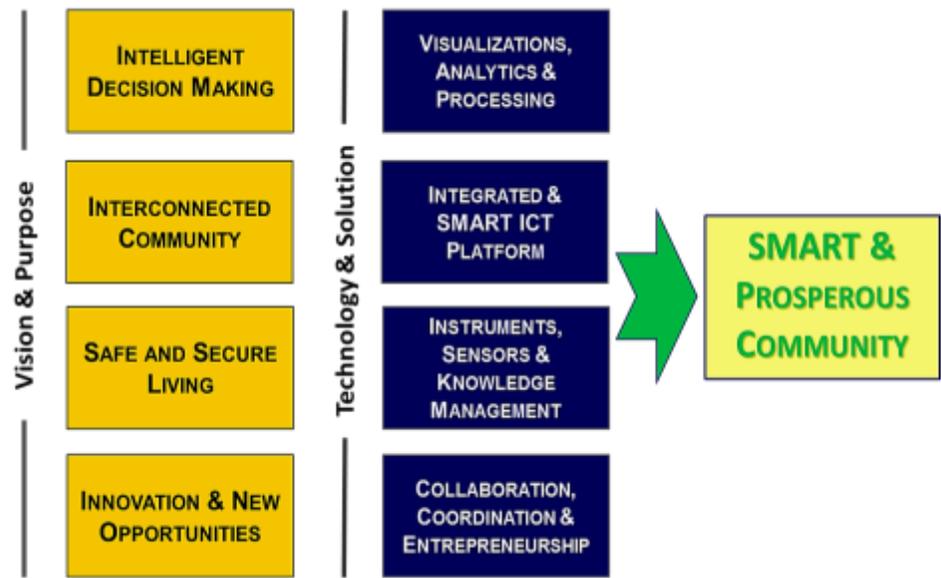
Figure 2: Key Drivers for Smart City

EMERGING SMART CITY MODELS

Many flavors of Smart Cities are globally implemented, but each generally only captures a subset of the full vision. This is because there is not yet a one size fits all answer, and cities have typically implemented a solution with their own starting conditions in mind.

In order to lay the framework and architecture for a Smart City, it is pertinent to know what models have worked, even though most have been fragmentally implemented. Emerging Smart City models, many incorporating elements of public-private partnership and innovation in service and security, are depicted in Figure 3.
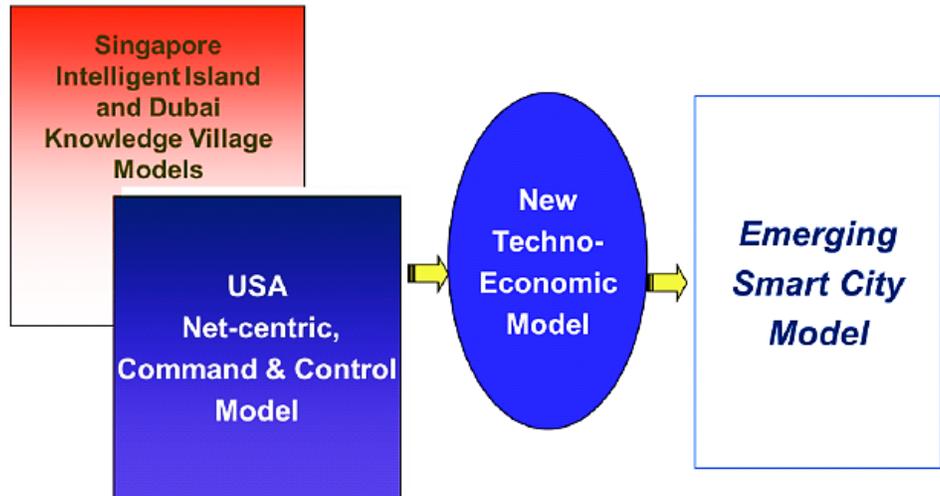
Figure 3: Emerging Smart City Models.[vii]

SINGAPORE MODEL

This model is driven predominantly by a national economic objective, as defined by the pillars of sustainability and strategic positioning. The Singapore Smart City Model is designed to integrate new ICT solutions to achieve a regional economic competitive advantage. In a public-private partnership, Singapore will likely continue this work and also extend its objective to include resource management specification. Several agencies, including the Economic Development Board (EDB) and the Land Transport Authority (LTA,) work with industry to develop decision support tools to help Singapore more effectively manage its resources, while driving research in collaboration with local research institutions and universities. LTA has focused on smarter transportation to mitigate traffic congestion, based on industry traffic prediction research for improved traffic management, in conjunction with the Singapore Urban Transport Solution (STARS) program, launched in 2008.[viii] Singapore has many similar initiatives in other economic sectors. The root of the Singapore Smart City begun with the project "Intelligent Island" and then continued by the Intelligent Nation 2015 Master Plan (iN2015).

DUBAI MODEL

The Dubai model stands for an integrated economic and technological vision under the construct of the dual objectives of strategic positioning and resource management, making Dubai attractive for foreign investment and increasing government-wide efficiency in delivering commercial and government services. Dubai's Smart City is built on a business park conglomerate with the vision of creating a global network of self-sustained business townships to foster the knowledge economy. It is a global network of self-sustained townships for knowledge-based industries based on the following successful models:[ix]

1. **Dubai Internet City (DIC)** – one of the largest ICT clusters in the Middle East, founded on a public-private partnership with a leading Networking company to set up video, computer and telephony capabilities, housing a wide range of major technology corporations.[x]

2. **Dubai Media City (DMC)** – a business community hosting both global and regional media companies ranging from publishing and printing, to music, to film, to media and marketing services, which promotes entrepreneurship while providing free economic zone benefits.[xi]

3. **Dubai Knowledge Village (DKV)** – the world's only free zone area dedicated to Human Resource Management and learning excellence, begun to develop the region's talent pool and establish the UAE as a knowledge-based economy.[xii]

4. **Dubai Health City (DHC)** – a city dedicated to healthcare excellence and patient care, offering knowledge across specialties, with over 90 medical facilities and 2,000 healthcare professionals.[xiii]

U.S. MODEL

Driven primarily by safety and security considerations, and implemented through the integration of logical and physical security to provide a high level of national and local security. The US Model is based on net-centricity and Command & Control (C&C) principles. This is demonstrated at a micro level by the NYPD, whose siloed crime data systems were integrated to have a more holistic view of information so that police and emergency responder forces could deploy more rapidly. A net-centric architecture and a broad C&C center allowed the NYPD to see crime trends in real-time, therefore more efficiently using NYPD resources and saving tax-payer money, while improving quality of life, overall data integrity and speed of data access to specify decision making.[xiv] New York City has built knowledge databases and developed other applications for monitoring day-to-day terrorism threats and disseminating applicable information to government agencies and the public in emergency situations. These databases and the use of ICT are designed to create a proactive environment for managing city needs and supporting Smart City key drivers.

There are other Smart City models, but the three models described above cover most of the activities in Smart City development. Each of these models provides several positive elements for a given city to develop its own Smart City Model by customizing a new *Techno-Economic Model* to meet its requirements.[xv] On a smaller level, other public-private partnerships have occurred, but more on a project or initiative level and not at a city-wide vision level. They represent a subset, and in some cases a hybrid, of the three models presented above, mapping to the pillars presented in the Smart City definition section:

- **Parades, Portugal, and leading technology provider** – have begun testing smart building infrastructure with intelligent remote sensors

built into the fabric of the city's buildings. Computers monitor and adjust for efficiency. Cloud computing is used so data can be gathered and acted on from anywhere.[xvi] This falls in line with resource management as the main pillar.

- **Rio de Janeiro and systems provider** – focuses on an integrated informational view across city departments, combining analytics from current projects to gather, analyze, and act on information about city systems and services in a real-time collaborative manner. The goal is to bring in information from different domains (energy, health, public works, public safety, transportation, water, etc.).[xvii] In this case, the U.S. model of C&C is followed more closely.

- **Edinburgh, Scotland, and leading telecom provider** – Edinburgh's Smart City vision is about how customers connect with the Edinburgh Council by employing ICT to change the way the council organizes and delivers its services to customers to increase governance efficiency. The initiative does this by aligning decisions to business requirements to increase holistic value, and managing information, securely, as a corporate asset. Information architecture and ICT structure is simplified, standardized, and reused when possible, customization is reduced, and integration and connectivity is widespread.[xviii] Edinburgh is focused on resource management and improving governance.

The ultimate goal of a Smart City is transformational—to achieve enhanced quality of life for citizens and deliver tangible benefits at national, provincial and municipal levels while leveraging natural resources judiciously. This journey is completely dependent on the maturity status of the city and the material pain points it is experiencing.

As shown in Figure 4, different cities have different needs and these needs present themselves at different occasions. Some cities are in a growth phase and require ongoing expansion and new infrastructure, which many cities struggle to achieve. Other cities have reached a stage of maturity in which aging infrastructure requires repairs and upgrades, and where high value-added services need to be provided to residents. These differences make it important to look at cities in terms of their lifecycles, and to manage urban development appropriately by taking a long-term approach.

Cities can be classified into *three main types*: the legacy city, the new city, and the transitioning city.[xix]

Figure 4: Three Types of Cities with Different Needs

TECHNOLOGY VISION FOR A SMART CITY

The Smart City approach is technology and vendor agnostic, with a focus on the integration fabric. For example, any vendor's ICT module can plug and play to serve a particular need (smart buildings, smart grid, etc.), while the byproducts from that particular module would still roll-up through the architecture. The framework therefore offers a menu of options to a city, where the city can implement only those modules that match its own key drivers while emphasizing a convergence of ICT. Several technologies buttress the Smart City Framework, and are incorporated into Collaborative Situation Awareness & Decision Making (Command and Control) framework to allow plug and play of ICT:[xx]

CLOUD COMPUTING

Allows applications to share fewer resources, leading to increased flexibility for enterprises looking to reduce cost but keep capability. Especially with the onset of Software as a Service (SaaS) and Infrastructure as a Service (IaaS), the cloud has become more viable for virtual data centers, even from security and availability standpoints. This construct also allows integration of heterogeneous data mashups across requirements by offering a virtualized data services and infrastructure layer.[xxi]

INTEGRATED NETWORKS AND COMMUNICATION INFRASTRUCTURE

A communications backbone to support data collection and transfer is the backbone of a Smart City. Ubiquitous broadband access is therefore of importance, so investment in networking and telecom infrastructure, often starting with Wi-Fi, is necessary. Another network element is the foundation for a smart electrical/utility grid. Radio Frequency Identification (RFID), sensors, and video surveillance technologies that leverage the broadband backbone can deliver real-time data for transportation, public safety initiatives, education and training, etc.

MIDDLEWARE INFRASTRUCTURE

Middleware links physical asset monitoring with databases and analytical engines, and span identity/access management from applications and web portals, to integration software and real-time updates of information across systems. Additionally, content management software allows the coordination and refresh of content across multiple city administration websites, both internal and external.

SOLUTION INNOVATION AND SERVICE INTEGRATION

Virtually all technology components come together in sector-specific solutions addressing a particular piece of the Smart City puzzle, but in a manner, that should be integrated regardless of technology or vendor.

SMART CITY DASHBOARD AND GOVERNANCE

Manages a system of sector-specific applications by coupling recognized sector-specific solutions with the tools to manage them, including a real-time dashboard. Planet Defense can design a Smart City governance business-process, supported by technology enablers, through data and systems integration, while incorporating Command and Control as a roll-up visualization framework.

SOCIAL COMPUTING AND SOCIAL MEDIA

Rich trails of preferences, opinions, and behaviors are left behind in a form of "digital exhaust," and can be mined, providing insight on positioning and citizen sentiment from both public feedback portals and social platforms alike. By applying search, pattern matching and sophisticated analytics to these structured and unstructured reservoirs of social data, government can position themselves to better understand their constituents' perceptions and the problems that should be demanding attention. A results-centric and business-led approach, focusing on specific issues and tribes, soliciting membership and creating platforms for content, collaboration and transactional support, is an important principle to incorporate into the Smart City framework. Similarly, social network analysis allows for real-time modeling of behavior across the entire network – leading to better understanding and the ability to explore and manipulate data in the Command and Control solution. Finally,

incorporating social media, such as video, pictures, and electronic documents are essential communication tools to reach the next generation. The shift to digital content created via dis-intermediated channels represents a crucial element of social computing today.[xxii]

SMART CITY DESIGN AND ARCHITECTURE

While designing a Smart City, it is important to understand the initial conditions and level of end-state functionality a city wishes to achieve. Further, the Smart City concept design and architecture are linked with the Smart City models discussed earlier. Once the Smart City vision and strategy are established, the concept design and architecture development begins. The Smart City architecture, driven by Command & Control concept, is the central part of Smart City technical architecture.

The following diagrams (Figure 5: Smart City Concept Design Approach and Figure 6: Smart City Concept Design Mapping to Reference Technical Architecture) depict Smart City Conceptual Design Approach and the integration of concept design and Reference Model:[xxiii]
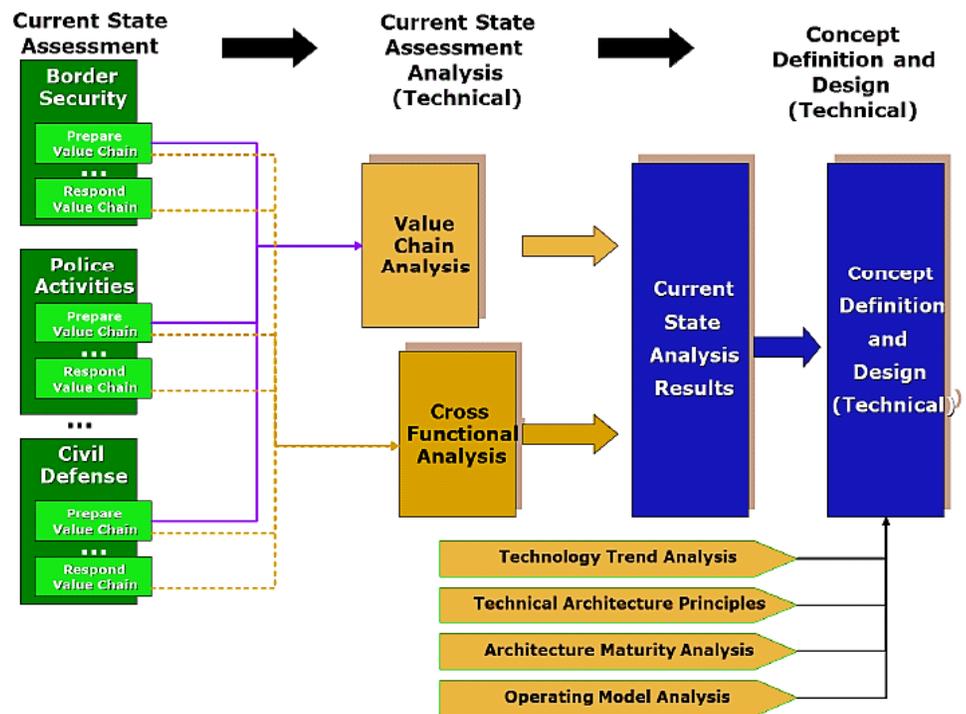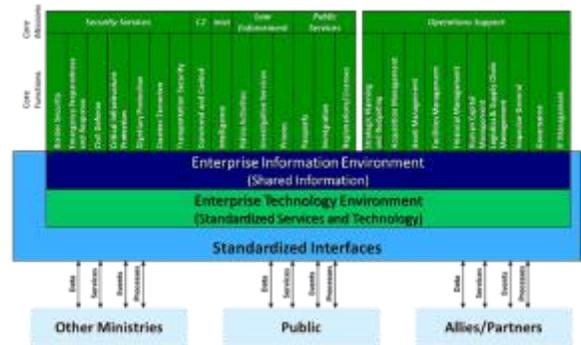

Figure 5: Smart City Concept Design Approach

Smart City Concept Design
- Mission-Driven
- Focus on Command & Control (Information- Centric)

Technical Architecture Framework
- Consistent framework for discussing technology
  - Enterprise-level
  - Directorate-level
  - Solution-level

**Figure 6: Smart City Concept Design Mapping
to Reference Technical Architecture**

Supporting the Smart City vision, the architecture of the integrated Smart City Framework encompasses the following principles:

- **Central repository** – while the decision to centralize or decentralize data and infrastructure should be tailored, aggregating data into a central repository (that still can live in multiple places for purposes of backup or access) can be a one-size-fits-all solution. With a single data repository where some data is rationalized and synced, data can be analyzed for patterns and anomalies, allowing city officials to see trends that might not otherwise have been captured at a local level only.[xxiv]

- **Open-standards** – a published, open-standards architecture is required that accepts various technologies upon integration, and centralized the display of network assets.

- **Centralized situational awareness** – Command and Control integrates individual modules into a system of systems across function and application silos helping city officials take action with lower latency based on event pattern derived from independent applications into a centralized roll-up display.[xxv]

- **Shared enterprise applications, and community collaboration tools** – couple business-oriented objectives with tools to effectively monitor them and mirror these objectives. Enterprise Asset Management (EAM) can establish a uniform business process to monitor work orders, inventory, daily tasks, and asset management. This can be accomplished with Enterprise Resource Management (ERM) and Customer Relationship Management (CRM), with a focus on smart governance based on shared or cloud-based service options facilitating adoption.[xxvi] For example, connections with customer and business communities can be fostered via shared community collaboration tools to support initiatives such as market research, product development, and product feedback.[xxvii]

- **Integrated reporting** – integration of information and services, and provided external access to citizens, facilitate internal governance and government transparency. Just as enterprises develop annual reports with online access and navigation through the data, cities should also expose their performance statistics, and raw data, metrics, and results.[xxviii]

- **Cyber security** – the very heart of a Smart City is a network of integrated and interconnected devices that produces unidentified risks. Personal information, including financial information can become exposed in a Smart City. Increasing numbers and sophistication of cybercrimes will likely challenge current security controls, especially in the wake of a new age leveraging cloud-based social media services. Therefore cyber security countermeasures should be built directly into the Smart City fabric, and a team must be established to continually monitor and update policies and processes for vulnerabilities.[xxix]

- **Mobility** – the world is ever moving towards mobile solutions. Therefore, the Smart City framework incorporates the mobility with a rolled-up view, while still allowing non-mobility-based applications and solutions to plug into the Smart City Fabric at an ICT level. eGovernment is a start, but cities should go further by taking advantage of social media/networking to not only communicate but solicit feedback and development for new projects via crowdsourcing.

- **Business Intelligence (BI)** – insight can be gained from real-time analytics, monitoring data quality and other services, incorporating outputs from both government systems and social media alike. BI can support principles such as: 1) automation – synchronization of independent components and automatic discovery; 2) pervasiveness – BI integrated with processes and applications; 3) unification –

differing process/data views unified to present a complete system picture; 4) borderless – ubiquitous exploration and analysis of system resources; 5) agility – BI architecture broad enough to handle integrated metadata and exploration technologies, and; 6) self-service—differing levels of users.[xxx]

APPROACH FOR IMPLEMENTING SMART CITY

Smart City implementation approach consists of planning, program management and decision-making components. The planning and program management component is aided by the Service Enabled Business framework. This framework supports enhanced mission agility through extending the concept of agility to include vision, strategies, processes, capabilities, sourcing, organization, and people. The framework is flexible, adaptable, and extensive as a holistic approach. It addresses more than just technology.

The decision-making component is addressed by the Command and Control framework, which provides an integrated and far-reaching solution supporting perception, comprehension, and collaboration to solve business problems, as described in Table 1: Command and Control Core Functional Foundation.

The value propositions of the Smart City Command and Control Framework similarly are:

- **Improved mission effectiveness** – combining and integrating Command and Control capabilities provides an end-to-end solution that deals broadly with mission challenges.

- **Tested and production ready** – the Command and Control components have been tested and are running in global, mission-critical systems.

- **Faster to implement** – by leveraging standards-based, Consumer Off the Shelf (COTS) software built on the latest Web 2.0 technologies, Command and Control reduces development and deployment time.

- **Configure to fit** – configurable Command and Control components allow configuration changes to fit to ever-changing mission requirements.

- **Lower cost and risk to implement** – by using tested products, the Command and Control solution substantially reduces development and deployment costs, as well as implementation risks.
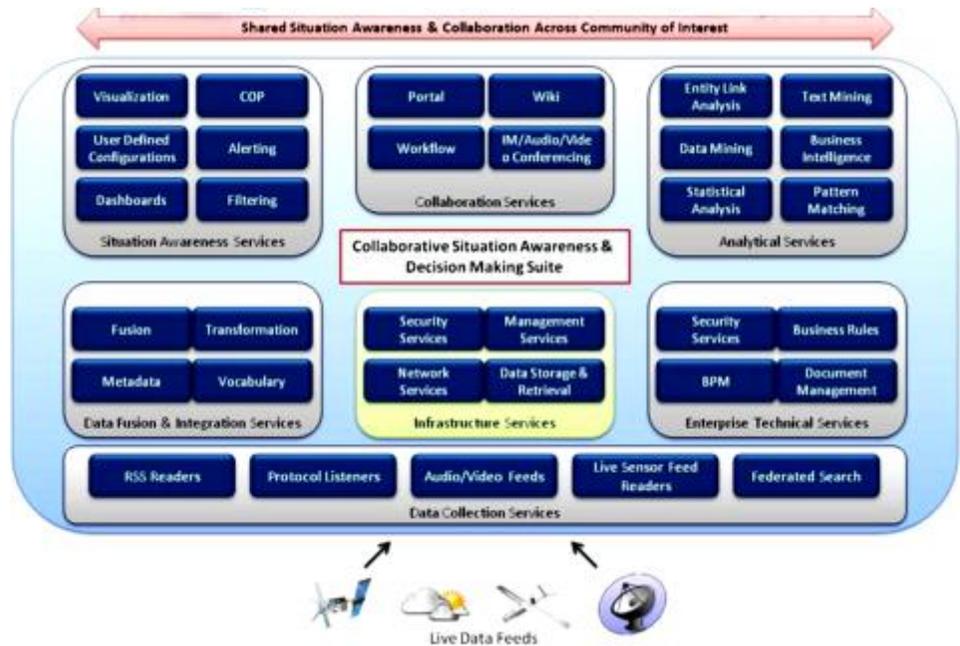
Figure 7: Collaborative Situational Awareness

To implement such a framework, various nodes and sensors should be emplaced throughout the infrastructure in order to determine the present state of each node. Then, the sensors would be connected in a net-centric manner and rolled up to a monitoring station, where the information would be displayed to the applicable official Command and Control, as shown in Figure 7.

By exposing program interfaces and publishing Application Programming Interfaces (APIs), systems become designed to receive messages, allowing third-party developers to provide additional applications to capture community feedback, where intelligence can be filtered back into government systems and applications via defined interfaces. In this way cities can increasingly provide data to citizens through open data initiatives that can increase government transparency. Such cloud-based and crowd-sourced applications can be used as endpoints into the feedback systems. Coupled with mobility as a key driver, the implementation architecture solution allows increased participation from both government officials, businesses and the general citizenry by making it available in a manner that will allow usage.[xxxi]

PLANET DEFENSE SMART CITY COMPETENCIES

SMART CITY FUNCTIONAL CAPABILITIES

Today's complexities require a broader range of integrated skills.

- Safety & Security: Security Modernization, Disaster Management, Integrated Response Center
- Smart Grid: e.g. Cyber Security, Regulatory Environment
- Real Estate/ Energy / CO2 Footprint Optimization
- Track Record and Supporting Large Events

SMART CITY ENABLING CAPABILITIES

- SMART City Vision, Strategy and Implementation Plan
- Integrated Business and Financial Model Development
- Intelligent Infrastructure and Smart Data
- Financial Structuring; Government Incentives
- Capital Projects Management
- Business Case Development; Risk Management
- Program Management, Stakeholder Alignment and Change Management
- SMART City Implementation
- Planet Defense as an Innovation Leader

SMART CITY MARKET ACCESS

- Global Reach
- Dedicated Technology and Marketing Teams
- Deep Relationship with Cities and Governments
- Relationship with Leading Vendors
- Strategic and Investment Partnerships

CONCLUSION

The foundation of the Smart City Framework is an integrated and shared city infrastructure, where segment and department-specific modules are plugged into its fabric. Data aggregation and intelligence layers sit atop service-specific modules, and work with metadata analysis that provides value added to service recipients. Command and Control framework has wide applicability in domains such as public security and emergency management. The Command and Control framework combines real-time situation awareness with collaboration tools that can work both within and across organizations. It also allows creation of a knowledge base where the assets and artifacts of scenario execution can be stored, cataloged, referenced and analyzed to further improve mission effectiveness. Bringing it together is a visualization view, in the Command and Control framework, where city officials can see key performance indicators (KPIs) and other critical information about the current infrastructure state in a

dashboard, and which also includes reports, analysis, and data collected from the citizenry via web and mobility portals, as well as relevant social networking constructs that encourage interaction with the government.[xxxii]

In summary, the **technology is readily available**, and the **architecture is demonstrable;** the framework is a flexible, broad and holistic approach that is not limited to specific proprietary technology or applications at the service-solution level, but rather a solution that can be tailored to a specific city's requirements.

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