

Smart+Connected City Services Cloud-Based Services Infrastructure Enables Transformation of Busan Metropolitan City

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This paper is part of a series of perspectives by the Cisco® Internet Business Solutions Group (IBSG) on urban innovation: the role of technology across key community functions, real estate, utilities, mobility, and community services, and how an interconnected system of stakeholders, technologies, applications, and policies can help cities realize sustainability, resilience, livability, and economic enhancement goals. Upcoming perspectives will provide Smart+Connected Communities stakeholders with further insights into city systems, open data, resource networks, social innovation, clusters, and cross-industry perspectives.

Introduction

The need for cities to balance social, economic, and environmental resources is becoming increasingly critical. Traditional approaches to dealing with urban issues and reducing carbon emissions focused on increasing labor productivity, limiting use of land and urban space, decreasing energy use, boosting usage of alternative energy, and capturing and storing carbon. Advances in technology and Internet-enabled innovations, however, have made it possible for complex systems to be managed—and self-managed—in radically different ways that enable cities to deliver enhanced services to residents, manage traffic flow and operate public transportation more effectively, and make better use of real-estate resources.

A major challenge, however, is in developing governance models and frameworks supported by public-private partnerships that enable government and the IT industry (systems integrators, applications developers, and service providers) to share information and collaborate across a community's ecosystem to transform city operations.

This Cisco IBSG Point of View discusses the opportunities Smart+Connected Communities (S+CC)¹ present in providing a cloud-based Smart City services infrastructure. Such an infrastructure can help city leaders understand the necessary frameworks needed for developing management systems that accelerate information delivery and thereby improve quality of life, achieve urban sustainability and environmental goals, and increase economic efficiency and social inclusion. Busan Metropolitan City,² South Korea, is one of the first cities to adopt an integrated S+CC model.

Opportunity

Cities have an opportunity to use the network as the platform for visualizing and modeling urban infrastructure to provide innovative urban services and manage urban sustainability. Using the network as the *fourth* utility (in addition to electricity, water, and natural gas), cities can integrate multiple systems to deliver on-demand services over an Internet-enabled cloud infrastructure supported by open innovation. Such services and related ecosystems can help cities address

urban challenges by providing citizens with better alternatives to urban living in combination with existing development policies and urban information infrastructures.

Innovative solutions such as intelligent building management systems, intelligent transportation systems, and intelligent energy management systems are enabling cities to implement Smart City solutions. City leaders and private companies are starting to come together to improve infrastructure and create scalable systems and processes for economic growth, social development, and environmental sustainability.

Busan Metropolitan City is one example of a city poised for Smart City development. Busan is South Korea's second-largest metropolis and home to the fifth-largest port in the world.³ It also boasts an established 10GB broadband infrastructure, Busan Information Highway.⁴ As the city continues to grow, it faces the same environmental, economic, and social issues as other metropolitan areas. Because of this, the Busan government is investing in expanding the existing broadband infrastructure to improve urban services and service quality.

Cisco and Cisco IBSG worked with the Busan Metropolitan Government to develop plans for an S+CC model called "u-City"⁵ that will help transform physical communities into Smart+Connected Communities, utilizing the network as the platform for city planning and management, and for connecting, processing, and sharing information efficiently, in real time.

Solution

Everything can be connected by integrating information and communications technology (ICT) and services into existing city infrastructures with pervasive network connectivity. The volume of information running over the ICT infrastructure, and the number of large-scale data centers, are rapidly increasing. Energy-consumption levels within the ICT sector are not far behind. As energy demands rise, ICT centers will require super-efficient energy-saving equipment. This so-called "green ICT" is not enough. We need to think beyond the ICT sector and look at the infinite potential of ICT to enable new, innovative services that will quickly transform existing city and community infrastructures—and the way we live—by allowing public entities, businesses, and individuals to access services using various client devices, wherever and whenever they want. In this way, cities can become "green through ICT."

With advances in broadband, wireless, and smart urban infrastructures, pervasive connectivity is one approach to city transformation. Many innovative cities such as Busan Metropolitan City are now using the network to change the way cities are designed, built, managed, and renewed to achieve sustainable growth.

Busan's Green u-City Blueprint

Busan's "Green u-City" is a combination of green-growth initiatives and ICT infrastructure based on the u-City model. u-City is based on the idea of "ubiquity"—being present everywhere at once—supported by ICT to enable the exchange of information, anywhere, at any time. In u-City, ICT infrastructure, technology, and services are integrated into housing (home automation), economic, transportation, tourism, safety and security, environmental, and other city infrastructures and systems. The result is an intelligent management system that delivers better urban services to increase economic growth and improve quality of life. Green u-City, on the

other hand, takes into account green-growth initiatives not only for achieving intelligent city management, but also for realizing social inclusion and environmental sustainability.

The blueprint defines a pervasive IP-enabled environment offering cloud services that improve the way citizens and businesses interact with city government and public agencies, while achieving carbon-reduction and resource-consumption goals. The blueprint also calls for a combination of free public services (referred to as “freemium”)⁶ and value-added commercial urban services through an open-innovation approach that includes services ideation, development, deployment, distribution, operation, and maintenance.

The blueprint’s ecosystem provides developers (content, applications, and infrastructure) a shared platform and convenient access to municipal data for the creation and delivery of, for example, Personal Life Assistant (PLA) services in the areas of work, energy, and security. Further details are shown in Figure 1.

Figure 1. Busan Green u-City Blueprint.



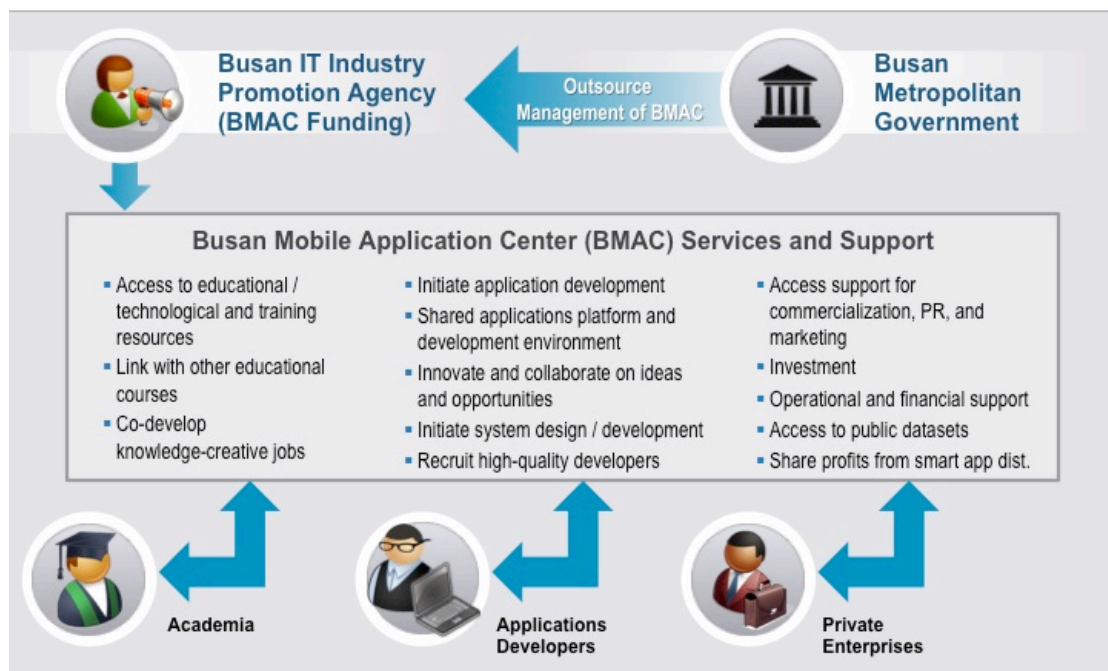
Source: Cisco IBSG, 2011

Within the top layer are five Smart City service categories. The middle layer contains smart and connected services. The bottom two layers consist of the Green u-City Services Cloud Infrastructure and Next-Generation Broadband Infrastructure. The Green u-City Services Cloud Infrastructure contains four main technology components:

1. Busan Mobile Application Center (BMAC): BMAC is a city services innovation center that provides training and resources to individual developers and small and medium-sized businesses for developing and testing Smart City and citizen-centric urban services. It consists of physical workspaces such as project and meeting rooms, application development platforms for Windows and Mac operating systems, an applications library, a consulting center for startups and small office/home office professionals, testing tools, smart devices, application

programming interfaces for access to municipal data, an application developer's forum, and marketing resources (see Figure 2).

Figure 2. BMAC Business Architecture.



Source: "Busan Mobile Application Center Development Plan," Busan Metropolitan Government, October 2010

While the Busan Metropolitan Government funds ICT development, the Busan IT Industry Promotion Agency⁷ provides training and education. In turn, the BMAC creates revenue that goes back to the developers via the Promotion Agency.

2. Application Development Platform (PaaS): The shared development platform (platform as a service, or PaaS) enables developers to build innovative mobile applications through convenient access to municipal data from geographic information/intelligent management systems.

3. Integrated Operation Center (IOC): The IOC is a back-office operations center running an integrated city management system on networked information. IOC aggregates disparate sources of public and private data such as traffic, facilities, office and residential buildings, safety and security, and disaster prevention and emergency management. IOC helps city planners and operation managers:

- Analyze aggregated data and transform it into city management information that can be visualized through a decision-support dashboard
- Share city management information with city leaders and relevant organizations in both static and real-time modes
- Streamline planning and city operations by monitoring and comparing data such as social activities, natural resources consumption, and carbon emissions
- Efficiently manage public and private assets

- Collaborate across government agency and private-sector partner ecosystems to facilitate utilities planning, transportation system enhancements, health and government social services needs, and so on
- Provision new urban PLA services

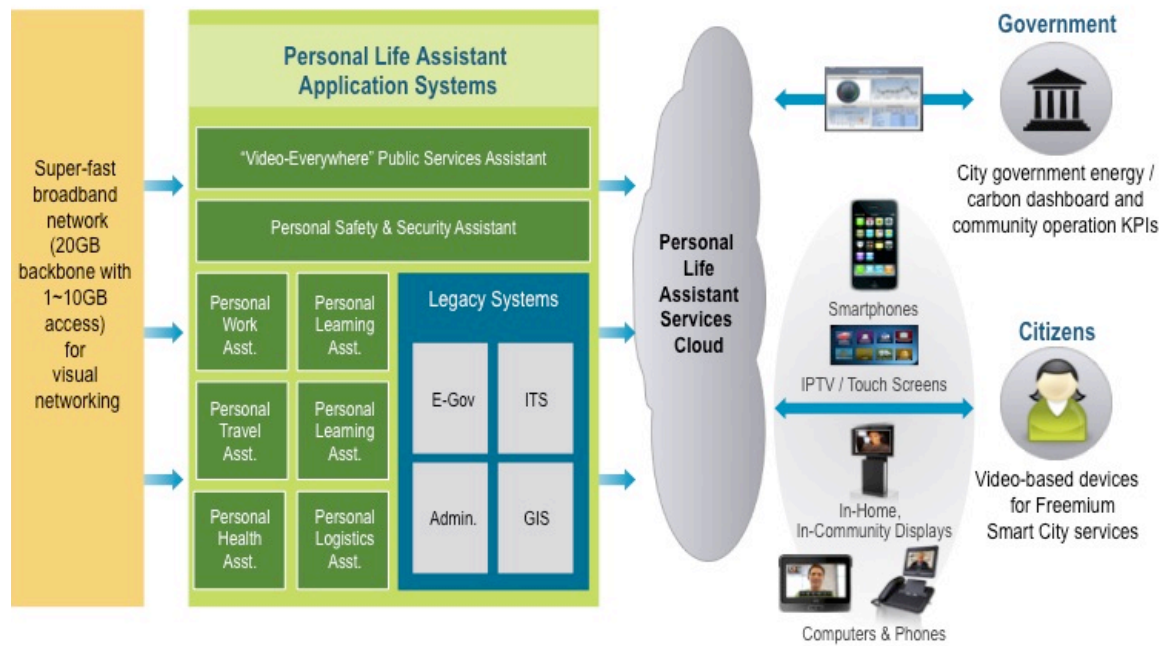
4. Personal Life Assistant Services Platform (SaaS): The services platform operates in the IOC to deliver citizen-centric PLA services. Video-enabled channels that offer new freemium services also improve the city services experience.

Examples of PLA services are:

- **Personal Work Assistant**—allows users to find and reserve the nearest workplace that provides features that meet their needs for:
 - Planning personal and work-related meetings
 - Reserving seats at Smart Work Centers and conferencing capabilities such as telepresence services
 - Using a digital membership card to reserve a space at a Smart Work Center or to pass through a security check, for example
 - Searching and displaying available Smart Work Center locations using augmented reality (AR) technology in combination with geospatial features of smart devices
 - Managing overall carbon impact
- **Personal Travel Assistant (PTA)⁸**—enables users to access real-time transportation information and multimodal transportation routing services to:
 - Schedule personal travel plans and link them with multiple transportation modes
 - Book tickets for transportation services in combination with a smart card for paying for reserved tickets
 - Use mobile AR features to identify the nearest or targeted location and receive guided tour information from current location to destination
 - Manage personal carbon impact from urban mobility
- **Personal Energy Assistant**—provides users better visibility into their energy usage and carbon impact, supported by smart energy devices at home and in public spaces. The service provides:
 - Near-real-time information about energy (electricity and gas) prices and consumption during a given period
 - Personal carbon footprint and waste recycling data by neighborhood type
 - Practical tips on how to reduce a resident's carbon footprint
 - Climate-change information so that public agencies can minimize their carbon impact through an integrated, end-to-end approach to energy generation and management

Green u-City consists of 20 urban services, a city resource planning system, and IOC for city leaders and citizens. Citizens can access PLA services through citywide video interfaces such as smartphones, home televisions, and touch-panel displays at public spaces, any time they want (see Figure 3). The IOC provides city leaders with more intelligence for better decision making. It also puts more power of choice into citizens' hands so that they can select better options for greener ways of living.

Figure 3. PLA Smart City Services on a Network-Enabled Cloud Infrastructure.



Source: Cisco IBSG, 2010

Figure 4 illustrates how these technology components play a role in daily life, and how citizens might use PLA services at different times and for different requirements.

Benefits

Green u-City and PLA cloud services are designed to transform the International and Industrial Logistical City⁹—a 33-square-kilometer greenfield in the Gangseo District¹⁰ of western Busan—into a “logistical hub of East Asia,” an “economic hotspot of southeast Korea,” and a “knowledge-based green-growth city.”¹¹

Figure 4. Day in the Life of a Green u-City Citizen.



Source : Cisco IBSG, 2011

In working with Busan Metropolitan City, Cisco IBSG identified projected benefits of applying the Green u-City blueprint and PLA cloud services. Although individual solutions in the u-City blueprint may appear to have modest impacts, their combined benefits can be substantial to achieving the following objectives:

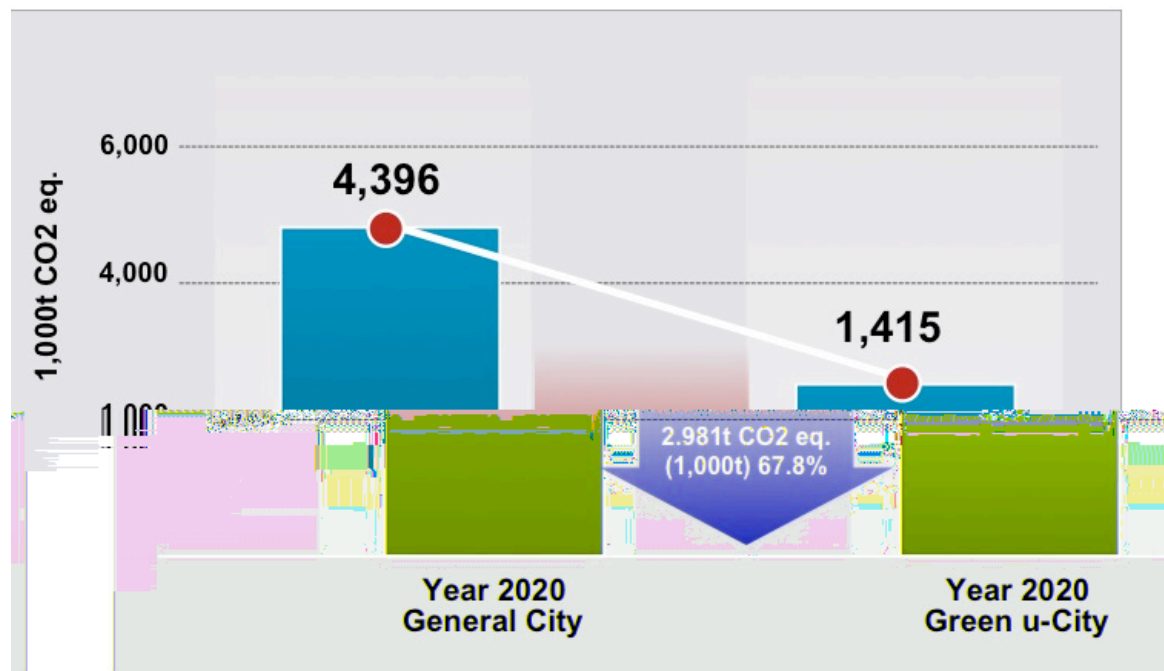
Boost economic development: Co-creation of PLA services and their distribution environment for continuous updates serve to create quality jobs by facilitating creative startups and incubating Smart City applications, content delivery, and a green-growth industry.

Increase revenue: Because a shared development platform provides developers convenient access to municipal data and channels, additional Smart City services can be created. Busan Metropolitan Government plans to establish a Public-Private Collaboration Company (PPCC) to create, deliver, and manage high-quality urban services through innovative applications with real-time updates. Dividends from PPCC will go to the city.

Encourage a greener city environment through increased citizen engagement: PLA services give citizens more power to create a more livable city environment by enabling them to make “green” choices such as using (or living in) green buildings/spaces, taking walk/bike paths and public transportation, and recycling.

Busan Metropolitan City plans to reduce carbon emissions in the Gangseo New City by 67.8 percent (2,981 metric tons) by 2020, compared with other newly developed Korean cities (see Figure 5) that do not have Green u-City services.¹²

Figure 5. Carbon-Reduction Potential of Green u-City and PLA Services (population of 500,000).



Source: "Green u-City Strategic Planning," Busan Metropolitan Government, April 6, 2010

Reduce city operations costs: Green u-City IOC and the city management dashboard provide city leaders with the tools for making better decisions to improve the management of public assets, thereby consuming fewer resources. The result is improved collaboration among city managers, agencies, and private-sector partners.

Increase social inclusion and support brownfield revitalization: Busan plans to develop 53 Smart Work Centers—13 by 2012, and 40 by 2015—across the metropolitan region in conjunction with the Sanbokdoro Renaissance brownfield revitalization program. A Smart Work Center is a neighborhood digital-knowledge hub within close proximity to a residential community. The Smart Work Center consists of event spaces, healthcare facilities, learning centers, child daycare, workplaces, and smart services such as Cisco TelePresence® Exchange, which provides users real-time, interactive communication in the areas of work, distance learning, and remote healthcare. Because the Smart Work Center provides residents a nearby physical work-life and collaborative innovation space, physical travel is reduced and productivity is increased through available services coupled with green mobility options such as walk and bike paths. Through a video as a service (VaaS) cloud, Cisco IBSG believes that Busan can provide better service access to empower disadvantaged groups and multicultural families while reducing its financial expenditure.

Strengthen city operations management and social resiliency: In 2010, with funding from the central government, Busan began rolling out closed-circuit television (CCTV) in multiple phases to implement ubiquitous safety and security solutions. In addition, a citywide video-based service infrastructure with thousands of CCTV installations and an IOC through a build-to-lease public-private partnership project is also being planned. Green u-City IOC provides higher collaboration capabilities, instant communication through video-enabled communications, and safety and security features to help city leaders plan, communicate,

manage, and direct critical phases of disaster situations regardless of physical location. Busan expects that the ability to monitor crime-ridden areas through increased visibility will help lower the city's crime rate 31 percent by 2014 compared to that of 2009, resulting in a cost reduction of US\$676.7 million (KRW 744.4 billion).¹³

Busan Green u-City: Phase I

Busan Metropolitan City plans to implement the Green u-City blueprint and PLA services through a multiphase development approach with a structured roadmap (see Figure 6).

Figure 6. Green u-City Three-Phase Roadmap.

PHASE 1: BMAC—Shared Development Platform (PaaS for developers)	PHASE 2: PLA Smart City Services Platform Pilot (Smart City SaaS for selected users)	PHASE 3: PLA Expanded Rollout (Smart City SaaS for citizens)
▪ Execution planning ▪ PLA service-development cloud —Windows cloud —Macintosh cloud ▪ Incubation and marketing ▪ Portal for developers and administrators	▪ Freemium-based Smart City services delivery platform pilot (services auto provisioning, virtualization, and billing) ▪ Video-based public services infrastructure ▪ Content management system ▪ Digital management system assets (smart apps, developer sources, and documents)	▪ Administrative services, citizen welfare, mobility, safety and security, emergency, education, healthcare, and tour and leisure ▪ Stable cloud-based shared development and services environment that enables continuous collaboration among public sector / business / academia under public-private partnership governance model
June 2010	March 2011	March 2012
		December 2014

Source: "Green u-City Strategic Planning," Busan Metropolitan Government, April 6, 2010

In February 2010, as part of Phase 1, in collaboration with Cisco and the country's leading service provider, KT, Busan launched the BMAC and service portal (<http://bmac.kr>).¹⁴

BMAC will serve as a catalyst for developer communities to take advantage of public data provided by Busan Metropolitan Government, allowing these communities to develop innovative applications that appeal to the general public and provide a new and improved urban service experience. Busan expects that this convenient development environment will also help increase jobs in the ICT industry.

Next Steps

Green u-City, the core of Busan Metropolitan City's green-growth strategy, targets efficient energy and resource use while minimizing greenhouse gas emissions. Twenty Smart City services have been derived from the Green u-City example to take full advantage of a network-enabled cloud infrastructure that monitors and controls information and carbon flows in every city management sector. It will help Busan minimize energy waste and resources to achieve its green-growth goals.

Subsequent activities include detailed management models and designs for a city control system. Phase 2 will see the rollout of SaaS cloud services, delivered by KT and powered by Cisco, such as billing automation, and content/document management by 2012. Phase 3, planned for 2014, will make these services available to all citizens.¹⁵ Based on Green u-City and PLA services, Busan will be able to intelligently manage urban resources, information, and carbon footprints.

Call to Action

Busan u-City is a leading example of how investments in infrastructure can enable numerous choices regarding public service provision, community engagement, public-private collaboration/partnerships, and economic growth. Public institutions (with political responsibilities) and SPs (as primary citizen interfaces) are both central to the delivery of Smart+Connected Community services.

Government

City and metropolitan governments can learn several lessons and garner ideas from Busan's experience and initiatives. Local, regional, and national governments can partner with private businesses to develop multiservice business models. In this way, public organizations can save costs, provide better services, and deliver engagements that fulfill economic prosperity, social inclusion, and environmental leadership objectives.

The potential of public and private cloud-enabled services, infrastructure, and technology platforms should be explored. Furthermore, government should develop the mechanisms that enable small businesses and citizens to participate in civic-service provision, share information, and create new businesses and service models.

Service Providers

Service providers—telco, community facility, or integrated ICT systems providers—can embrace this new multiservice model by collaborating with public-private organizations on new business models that position the private sector as a key delivery agent for networked public services. Demand from both citizens and public agencies for integrated services makes cloud-based shared-services models a high-growth field that requires innovative approaches to incorporate new, connected infrastructures and services. Furthermore, SPs can develop hybrid models, such as Busan u-City, that bridge publicly owned and operated and open-sourced services. Doing so can engender trust across all constituents,

For organizations and community groups engaged in public service provision, initiatives that deliver cross-industry and public-private collaboration partnership models, promote new businesses, and incubate local industry expertise represent an opportunity for enabling economic growth and employment, and for fostering vibrant, inclusive communities.

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Endnotes

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