



Microsoft CityNext

Technical Reference Model Overview

Abstract

Cities, and the people in them, are the hearts and souls of our nations with over 50 percent of the world's population living in urban areas for the first time in history. However, they are facing daunting challenges: from the need to modernize aging infrastructure in older cities to scaling to meet the demand for natural resources and sustaining the health and safety of their citizens. This is unfolding in the midst of an extended global economic downturn and far-reaching austerity programs that have reduced citizen services and limited economic growth. While the need to do more with less is evident, doing New with Less is imperative to deliver both the economic and social opportunities to their citizens. Because at their core, cities are about people.

Microsoft CityNext is a people-first approach to innovation that empowers governments, businesses and citizens to shape the future of their cities. People-first means harnessing all the ideas, energy and expertise of a city's people as they create a healthier, safer, more sustainable place to live. Microsoft is uniquely equipped to enable this people-first approach. No other company offers the broad portfolio of secure consumer to business software, devices and services, our vast network of global partners, and our history of successful education and social programs which, when combined, help cities with what's next. Can you imagine what's next for your city?

In this document, Microsoft provides guidance for City Technical Leadership and Planners who seek to harness a new era of innovation across Mobility, Cloud, Big Data, and Social and to enable a more sustainable city life for all. This reference model presents the Information, Communication and Technology (ICT) capabilities of a next generation city and overviews the Microsoft platform offerings in the context of the challenges faced today by cities large and small around the world.

Intended Audience

The intended audience for this document is technical decision makers and practitioners for Cities—and those that serve Cities. This would include the City Chief Information Officer, the City Chief Innovation Officer, City Technical Architect or a Technical CxO. This also includes the Technical Staff (e.g. Enterprise Architect, Engagement Managers, Services Executives or Technical Delivery Resources) within a third party company (e.g., a Microsoft partner) that serves Cities.

Refer to the companion document entitled [*CityNext: Enabling Real Impact for Better Cities with a People First Approach*](#) for a presentation articulated specifically for civic decision makers including City Mayors, City Managers, City Council Members, City Planners, Local and Regional Government Ministers, and City Departmental Leaders.

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Table of Contents

1	Overview	1
1.1	Introduction	1
1.2	CityNext - Doing New with Less	2
1.3	CityNext Domain Solution Areas	4
2	The CityNext Model: A Foundation for Sustainable Innovation	7
2.1	A Continuous Cycle of Insight and Action	7
2.2	Foundational Principles for Sustainable Innovation	11
3	CityNext Capabilities.....	13
3.1	Infrastructure as a Service	15
3.1.1	Public Cloud.....	16
3.1.2	Private Cloud	18
3.1.3	Hybrid Cloud	19
3.1.4	Automation.....	21
3.1.5	Virtualization Management	22
3.1.6	Resource Management	23
3.2	Platform as a Service	25
3.2.1	Security, Identity and Privacy.....	25
3.2.2	Data Services	30
3.2.3	Big Data Services	34
3.2.4	Workflow / Automation Services.....	36
3.2.5	Integration Services	36
3.3	Software as a Service.....	38
3.3.1	Collaboration Services	38
3.3.2	Messaging and Communication Services	40
3.3.3	Visualization Services	41
3.3.4	CRM/ERP Services	43
3.3.5	Productivity Services	45
3.4	Devices.....	46
3.4.1	Sensors and Embedded Devices	47
3.4.2	Smartphones, Tablets and Personal Computers	49
4	Take That Next Step	53
4.1	Conclusion	53
4.2	Learn more about Microsoft CityNext.....	53
4.3	Reach out to Microsoft or our Partners	53

Table of Figures

Figure 1: Microsoft CityNext	1
Figure 2: CityNext Capabilities across Devices, Domains and Service Layers.....	3
Figure 3: A wealth of city data fuels a continuous cycle of insight and action.....	7
Figure 4: City dashboards help leaders visualize key city performance indicators	9
Figure 5: The Microsoft Platform Enables CityNext Capabilities	13
Figure 6: The Microsoft IaaS Layer.....	15
Figure 7: Hybrid Cloud Deployment	19
Figure 8: Hybrid Cloud Deployment Detail.....	20
Figure 9: The Microsoft PaaS Layer	25
Figure 10: Data Services Require an End-to-End Approach.....	30
Figure 11: Example of visualization capabilities delivered by Power BI.....	33
Figure 12: Microsoft SaaS Layer.....	38
Figure 13: Devices Layer	46

Table of Case Studies

Accessibility in Santiago Chile	51
Advanced Transportation Solutions in Paris, France	48
Air Quality Management in the San Francisco Bay Area, California, U.S.	36
Airports in Bangalore, India.....	52
Airports, Railways & Ports in Hamburg, Germany.....	46
Citizen Service Apps in Miami, Florida, U.S.	17
Desktop Virtualization in Barcelona, Spain.....	22
Emergency Management in Christchurch, New Zealand.....	43
Energy Management & Analytics in Texel, The Netherlands	21
Flexible Deployment in Charlotte, North Carolina, U.S.:.....	12
Geographic Information Systems in Portland, Oregon, U.S.	42
Identity Management at Great River Health Systems.....	28
Intelligence & Analysis in Bangkok, Thailand.....	34
Intelligence & Analysis in Ogden, Utah, U.S.:.....	11
Natural User Interface at Reflexion Health	49
Online Transportation Services in Auckland, New Zealand	10
Primary Care in The Hague	39
Private Cloud Services in Tainan City, Taiwan	18
Secure Device Management in Stockholm, Sweden	29
Secure Device Management in Transportation at Aston Martin	27
Smart Buildings in Seattle, Washington, U.S.:.....	8
Smart Grids in San Diego, California, U.S.:.....	9
Street Lighting in Utrecht, the Netherlands:	16
Tax & Revenue in Buenos Aires, Argentina.....	44
Toll & Fare Management in Tianjin, China	31
Unified Communications in Leicester, England, UK	40
Waste Management in Zaragoza, Spain.....	35

1 Overview

1.1 Introduction

This whitepaper is intended for city IT leaders interested in exploring the technical enablers of Microsoft CityNext for their city. A complementary whitepaper entitled [***CityNext: Enabling Real Impact for Better Cities with a People First Approach***](#) is intended for a broader segment of city leadership. It presents our overall initiative for helping cities lay the foundation for a people-first approach to innovation, now and for the next generation.

A new era of innovation across mobility, cloud, big data and social is enabling city IT leaders to envision new possibilities to better serve the citizens and businesses within their communities. However, many high-profile city innovation projects focus primarily on making infrastructure ‘smart’ by embedding sensors and upgrading networking capabilities. While this is a critical foundational step, limiting the conversation to infrastructure misses an enormous opportunity to unlock the human potential within a city. Truly next-generation cities also empower people in government, businesses and the community through innovation to build a more sustainable city across economic, environmental and social spheres. A people-first approach means harnessing these capabilities to deliver meaningful citizen outcomes such as helping students achieve more through a 1:1 learning experience, giving isolated populations access to needed government services, providing the elderly with high quality healthcare in their homes, supporting entrepreneurs to see their ideas come to fruition faster, getting commuters home sooner, and giving city employees a real-time, one-city view so they can do their jobs better.



Figure 1: Microsoft CityNext

Microsoft CityNext can enable a people-first approach to innovation through our broad portfolio of software, devices and services capabilities that meet a range of needs from the consumer-related demands of citizens to the mission-critical, enterprise demands of city operations; through the experienced network of hundreds of thousands of partners worldwide with relationships in nearly every major city around the globe; and through the history of successful education and training programs, which collectively, propel cities toward what's next.

Together with our partners, we want to work with you to help your city:

- **Transform** operations and infrastructure by improving city functions with innovative partner solutions, leveraging the power of cloud computing to reduce costs and increase efficiencies, empowering employees with enterprise grade devices and apps, and enabling innovation on your terms with modern solutions and a big data platform.
- **Engage** citizens and businesses by delivering personalized services and apps with a people-centric approach, enabling real-time dialogue via social media and spurring city app development and economic growth with open data initiatives.
- **Accelerate** innovation and opportunity through programs, most notably our company-wide global YouthSpark initiative, that empowers youth with 21st century learning and personal development opportunities, expands digital inclusion with access and skills training, and nurtures new businesses and innovators with resources and support to help cities compete in the global marketplace.

Cities are already on their journey towards modernizing today. They face many challenges in preparing for the future – Microsoft CityNext is the bridge to help them get there, now and into the future. Working together, Microsoft, our partners and city leaders can make the most of existing investments and find the right combination of solutions, partnerships and social programs needed to accelerate innovation and create sustainable cities in which people can make a real impact for a better tomorrow.

Imagine what's next for your city.

1.2 CityNext - Doing New with Less

Having worked with many major cities around the world, we know it is no longer enough to do more with less. We must combine the power of innovation with breakthrough ideas to do NEW with less – to connect governments, businesses and citizens with city services through innovation that increases efficiencies, reduces costs and fosters a more sustainable life for all. Microsoft and our partners are helping cities work within their means by building on existing investments and incorporating new innovations at their own pace, ultimately, creating an innovation model that works for today and sustains tomorrow.

This new era of innovation includes:

Mobility - Through mobile devices such as sensors, smartphones, and tablets, citizens can access city services anywhere, on any screen through the device of their choice. Citizen-centric apps enable people to directly engage and interact with their city governments for services that make life safer and more convenient. Enterprise-grade mobile devices also give employees' access to systems remotely from any location, improving productivity and responsiveness.

Cloud - Through a flexible cloud offering, cities can choose public, private or hybrid clouds which protect data sources with the privacy, security and control needed for a city to have effective cross-departmental collaboration and resource sharing. The scalability and cost effectiveness of cloud services drives cities' fiscal responsibility by reducing costs without cutting essential services.

Big Data - With good data and powerful analytics city leaders can more deeply understand historical trends and patterns within the city, predict future situations, model "what-if" scenarios, and gain vital real-time situational awareness from multiple data streams such as traffic cameras, social media and other public channels. Leaders will have better information for decisions, achieve greater efficiencies and respond faster in emergency situations.

Social - Through social engagement such as Twitter, Facebook, Skype and Yammer, cities can open, two-way dialogues with citizens and businesses to better understand their needs. Cities can also form more effective disaster response communications using mobile alerts and social channels.

To fully harness this new era of innovation and accomplish new with less, a next generation city will use shared ICT services that allow leaders to innovate at their own pace across infrastructure, platform, and software services and devices to enable, integrate and interoperate with partner offerings that deliver specific domain solutions. This next generation ICT infrastructure delivers the following capabilities:

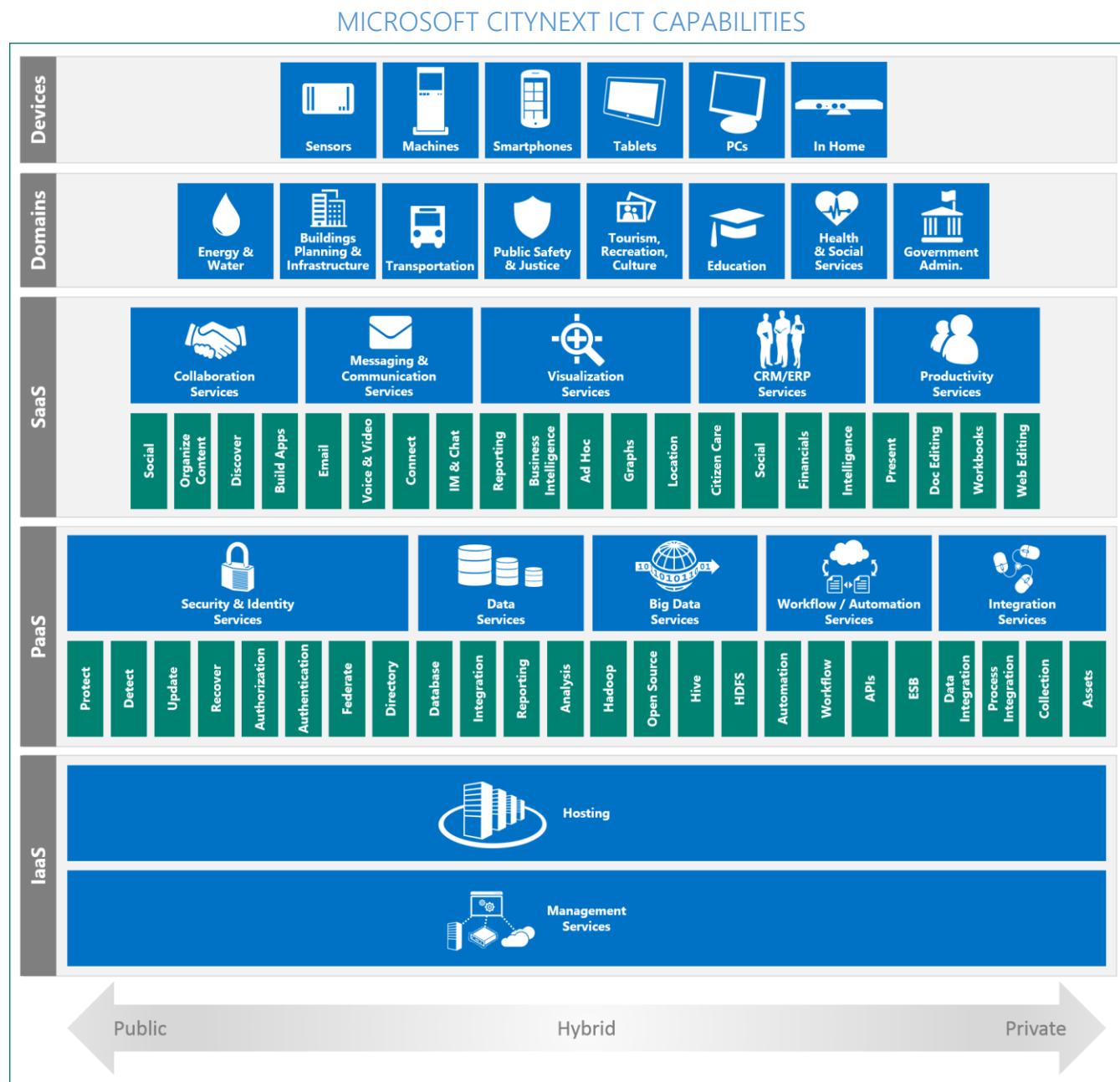


Figure 2: CityNext Capabilities across Devices, Domains and Service Layers

The Microsoft CityNext ICT capabilities delivered by the Microsoft platform do not require cities to adopt a specific sequence of solutions. Instead, the platform provides an enabling set of common services that will lower costs to build and operate solutions addressing complex problems. This approach simplifies innovating on top of existing systems and information by providing data transformation, credential exchange and validation as well as shared discovery services. The platform is as compositional as the city systems it supports. Cities can choose projects that align to their priorities, develop solutions at their pace, and build what they need as they need it.

The Microsoft platform enables a new generation of CityNext solutions and provides multiple benefits:

- it provides a powerful infrastructure on which to build sophisticated solutions within a particular domain
- it can be configured to bring together data from multiple domains, breaking through departmental silos to provide a comprehensive and unified view of the city, enabling new insights and new capabilities that would have been otherwise impossible
- it enables transparency for citizens and government accountability by bringing people into the governance process
- it enables cities to achieve a continuous cycle of insight and action to fuel new city services for citizens

The breadth of and depth of Microsoft CityNext ICT capabilities presented in Figure 2 enable a vast number of solutions that cities can adopt and tailor to meet their unique needs.

1.3 CityNext Domain Solution Areas

Microsoft has established an extensive network of local and global partners who develop, implement and maintain innovative solutions tailored to address specific and unique city requirements. Microsoft and our solution partners are leaders in government, energy, water, buildings and infrastructure, transportation, public safety, healthcare, education, and tourism industries worldwide. The diversity of this partner ecosystem not only makes it easier for cities to find local or global partners who can address unique problems, but also fosters a competitive environment that drives the local economy, increases choice, supports heterogeneity, decreases cost, and helps cities avoid being locked into long-term contracts that limit solution options in the future.

Today, Microsoft and its partners are delivering CityNext solutions that address the most pressing issues. After years of working with city leaders worldwide, we have learned that there are more than 40 solution areas across eight city domains that can help address the majority of the challenges cities face today:



Energy and Water - As populations and commercial activities expand, resource-related issues also increase. Both human and economic health can suffer from a lack of clean, safe, adequate energy and water. CityNext Solutions addressing needs within Energy and Water include:

- Smart Grids
- Water & Wastewater Management
- Energy Management & Analytics
- Carbon Management



Buildings, Infrastructure and Planning - When governments and commercial building owners use software to extract insight from the data produced by a city's built infrastructure, they can reduce energy consumption, maintenance costs, and attract and retain tenants. CityNext Solutions addressing needs within Buildings, Infrastructure and Planning include:

- Smart Buildings
- Street Lighting
- Building Automation Systems

- Waste Management
- Parcel, Zoning and Land Use



Transportation - Cities with a major rise in their human and vehicle populations experience strains on their roads and public transportation networks as well as long commutes, pollution, and wasted energy. CityNext Solutions addressing needs within Transportation include:

- Traffic Management
- Asset & Fleet Management
- Toll & Fare Management
- Parking Management
- Airports, Railways & Ports
- Advanced Transportation Solutions



Public Safety and Justice - Increasingly dense urban environments present various hazards to public safety, from petty crime to homicides to mass-scale terrorism. Threats from natural disasters are real and unpredictable.

CityNext Solutions addressing needs within Public Safety & Justice include:

- Neighborhood Management
- Surveillance Systems
- Emergency Management
- Intelligence and Analysis
- Court & Judicial Management



Tourism, Recreation and Culture - Entertainment, culture, and recreation not only help attract and retain a vibrant city population, they also draw tourists who can drive economic activity and enhance a city's reputation. CityNext Solutions addressing needs within Tourism, Recreation and Culture include:

- Mobile Tourism Apps
- Library Management Systems
- Tourism Portals
- Destination Management Systems



Education - Increasing access to higher quality and more diverse forms of education is expected. Yet most cities struggle to provide affordable education that fosters a highly skilled, creative and employable population. CityNext Solutions addressing needs within Education include:

- Email and Communication Services
- 1:1 Computing Programs
- Education Analytics
- Learning Management Systems
- Institutional Effectiveness for Higher Education



Health and Social Services - Access to timely, affordable, high-quality health services is a key public concern. Non-communicable diseases present challenging new needs, while the potential outbreak of communicable diseases rises. CityNext Solutions addressing needs within Health and Social Services include:

- Population Health Management
- Remote Care & Case Management
- Social Benefits & Administration
- Personal Health & Wellness
- Pandemic Management
- Primary Care



Government Administration - Citizens and businesses want virtually all city services to be accessible electronically and for their city government to increase transparency and accessibility while protecting privacy and security. CityNext Solutions addressing needs within Government Administration include:

- Tax & Revenue
- Social Analytics
- Document & Records Management
- Open Data
- Citizen Service: Portals, Call Centers & Apps
- City Dashboard
- Grants Management
- City Financial Management

Microsoft CityNext enables a people-first approach to sustainable innovation with a broad portfolio of ICT capabilities that enable our experienced network of hundreds of thousands of partners worldwide to deliver solutions and services across critical city domains. In section 2, we describe the model of a continuous cycle of data capture, insight generation and action that the combination of capabilities across the Microsoft devices and services platform can deliver as the foundation for city solutions. In section 3, we describe each individual capability provided by the Microsoft platform in detail.



2 The CityNext Model: A Foundation for Sustainable Innovation

To achieve the promise of transforming infrastructure and operations, engaging citizens and business and accelerating innovation and opportunity, cities need an underlying ICT infrastructure that provides a durable foundation for this vast array of domain solutions. Cities need a modern ICT infrastructure delivering mobility, cloud computing, big data and social engagement services to leverage a city's data to enable a continuous cycle of insight and action that fuels timely, relevant and useful city services.

2.1 A Continuous Cycle of Insight and Action

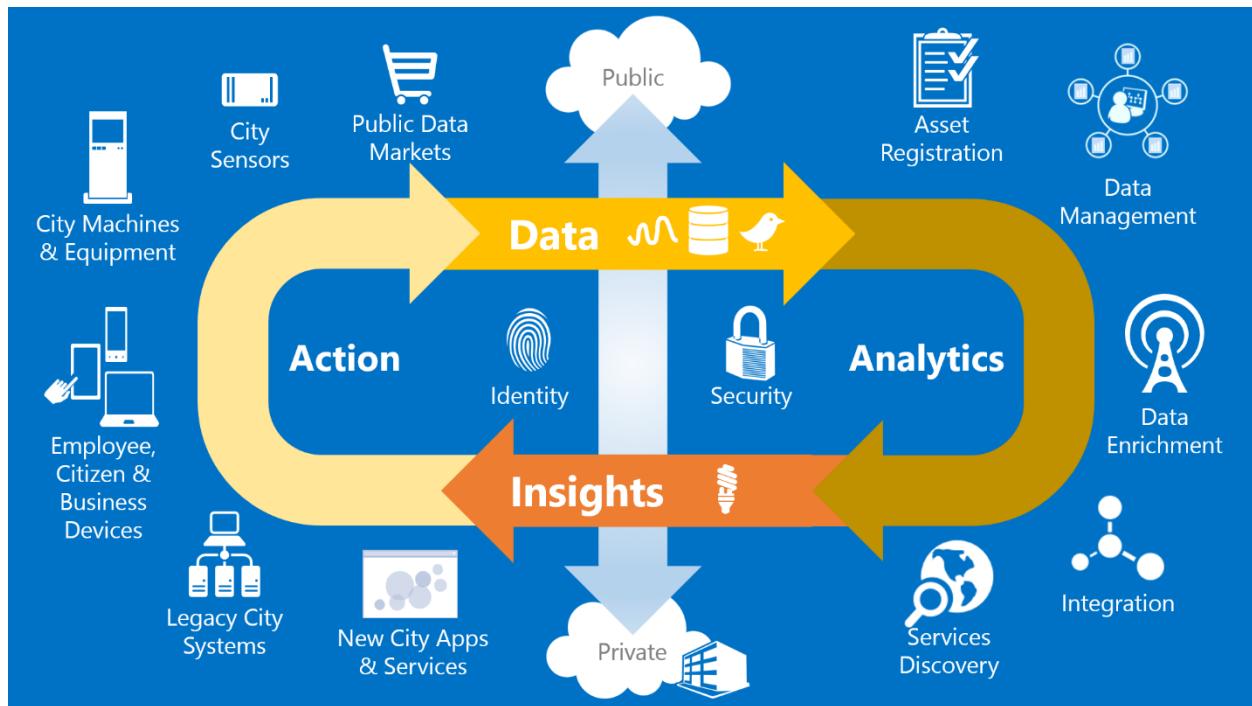


Figure 3: A wealth of city data fuels a continuous cycle of insight and action.

The figure above provides a high-level view of the model for a continuous cycle of data capture, insight generation and action that the Microsoft devices and services platform can deliver as the foundation of solutions within and across city domains.

Discover the Data City data is an asset that can yield great insight and productive action. In many cases, a city's existing data assets are vastly underutilized because they are difficult to discover and access. A city must make better use of its data to improve the efficiency and quality of the services it provides to its citizens and businesses. Cities need solutions that enable data of any variety, volume, or velocity to flow across an infrastructure, from legacy systems, employee, citizen and business devices, machines and

equipment, and sensors to the back-end systems, where that data can be managed, enriched, analyzed and turned into information and insight upon which people and machines can act.

Register Assets Treating data and software like assets requires understanding its metadata – its type, format, size, feeds and speeds, access requirements and ownership, among many other possible attributes. Registering the assets that produce data ensures that the data comes from a source the city recognizes and sanctions, and enables the creation of a citywide Internet of Things – an array of assets that send and receive data that fuels the development of insight across a city's infrastructure and human services systems. The data and integration service capabilities in the Microsoft platform natively provide the features that can be configured to deliver this asset registration capability.

Manage, Enrich and Analyze the Data Turning the raw data into insight requires a combination of ICT capabilities, as well as solution developers, to aggregate, manage, store, enrich, analyze and present the data to end users. From structured data in enterprise LOB solutions such as ERP and CRM, to the ambient data associated with Big Data, and unstructured data associated from social networking, the Microsoft platform helps partners deliver solutions that turn the massive amounts of data flowing through city systems into something meaningful, actionable and valuable. Please see section 3 for details of Microsoft's data services and the embedded systems that enable our Intelligent Systems and personal Business Intelligence (BI) solutions.

Analytics can be developed and used to build urban models, provide real-time and historical analyses, and "what-if" predictive modeling and business intelligence. These analyses can be created through a variety of processing technologies: real-time stream processing engines, self-learning analytics, complex event processing and tools for analyzing large amounts of unstructured data, including Hadoop. Enrich your analysis by adding datasets and applications to city data sources with the world's data through the industry's first public data marketplace – The Windows Azure Marketplace. The Marketplace enables the discovery and consumption of data from trusted public domains and commercial data sources, such as demographics, health, location-based services, real estate, science, transportation, navigation, weather, and finance, etc. Software developers can incorporate this data through a common API into their city solutions, delivering even richer and more relevant services for citizens.

Cities will continue to deploy targeted solutions within a single domain to meet specific needs, and can create adaptors when it becomes beneficial to integrate those solutions across domains over time. Integration requires accommodating a diversity in APIs, protocols, languages, formats, and use of standards in a way that aligns to city requirements. The Microsoft platform provides the data and

Predictive Analytics in Buildings, Infrastructure, Planning



City of Seattle

[Smart Buildings in Seattle, Washington, U.S.](#)

The City of Seattle decided that conserving energy was the most cost-effective and environmentally friendly way to meet its growing energy needs. It worked with Microsoft, Accenture, the municipal electric utility, and a local nonprofit to create a Smart Building solution that aims to reduce downtown power usage by up to 25 percent. The solution uses Windows Azure—the Microsoft cloud services development, hosting, and management environment—to provide unlimited storage capacity for collecting real-time data for an unlimited number of buildings and HVAC devices. It is designed to apply predictive analytics to Seattle's existing building management systems and optimize equipment for energy reduction.

Solution Partner:



High performance. Delivered.

process integration, security, identity, and workflow & automation services, (all detailed in section 3), and supports the standards needed to connect and integrate solutions across domain boundaries to breakdown operational silos and deliver new services. Microsoft partners deliver the expertise to build data-driven solutions and services that create insight from complex, dynamic data feeds.

Make Services Discoverable In order for citizens, businesses and solution developers to use new city services, they need to be able to find them. Services that use city data and adhere to the operating principles of the city, discussed further in section 2.2 below, can be managed by the platform and brokered to end users. Users can access these services through a unified framework or through third party apps. These services can also be accessed through APIs, reducing the time, and cost needed to develop composition services for complex scenarios. Once a city has developed the service discovery capabilities that are possible through the web services in the Microsoft platform, the city IT ecosystem and its partners can build, extend, and collaborate solutions across many domains.

Deliver New City Apps & Services The data, visualization, integration, messaging and communications services provided by the Microsoft platform enable end users to access the information they seek via apps and services they experience on their personal devices – smartphones, tablets, PCs etc. Citizens, businesses, city employees and leaders can receive automatic notifications and alerts, browse portals, review customized operational dashboards and use a host of other apps and services that present timely, relevant information.

As an example of such an application, Microsoft and its partners have been developing customizable dashboards specifically for city governments and citizens to help them visualize and measure the performance of their city against recognized key performance indicators established by organizations such as the [IWA 4](#) or the [Global City Indicators](#)

Facility. The GCIF tracks and monitors progress on a core set of indicators across 20 themes including Education, Civic Engagement, Urban Planning and Social Equity, allowing cities to evaluate their comparative prosperity and economic development.

Integrating Data in Energy and Water



Smart Grids in San Diego, California, U.S.: Even though the University of California at San Diego (UCSD) produced more than 87% of the electricity they consume, they wanted to go further, by adding clean energy resources, additional on-site generation and storage, and implementing demand reduction strategies. UCSD worked with Microsoft partner OSIsoft to develop a state-of-the-art, energy-independent microgrid that utilizes the OSIsoft PI System, which gathers data from hundreds of sensors, serves as a universal translator, and supports UCSD's efforts to create a sustainable environment for learning and innovation. The PI System works with Microsoft Windows Azure, Office 365, Bing Maps, SharePoint 2013, and SQL Server 2012 to integrate hundreds of different data protocols and systems. The solution maximizes the use of least-cost, least-carbon resources by synchronizing and coordinating operations of campus energy assets, and it drives more value from their solar investment by managing their Sanyo smart solar array and smart-charging stations for hybrid electric cars.

Solution Partner: 



Figure 4: City dashboards help leaders visualize key city performance indicators

These solutions, such as that shown in Figure 4 above, use the big data, visualization, and integration services of the Microsoft platform to deliver real time, city-wide dashboards, single portal access, case management and multiple visualization tools to open up city data and increase transparency for city employees and citizens alike. Engaging citizens in this way allows them to see how their leaders are performing, to make choices about where to live, work and move about the city, or how to make the most of the many city services in education, healthcare, job creation and new initiatives.

Support Any Device City employees expect to be able to access line-of-business applications, dashboards, and other work content from nearly anywhere, on virtually any device they choose, at any time. Citizens and businesses expect convenient, instantly responsive ways to access city services online. Both internally and externally, users expect their experiences to be smarter, more automated and more contextual. The Microsoft platform enables city solutions to deliver these services to city leaders, employees, citizens and businesses on the devices of their choosing, whether they are Windows tablets, PCs, phones, or iOS or Android devices (detailed in section 3).

The cycle of insight and action is a continuous one where city employees, citizens and businesses use any device to access city services, and in doing so they create new data for the city to capture and feed into the continuous cycle of insight and action.

New Apps & Services in Transportation

Auckland Transport An Auckland Council Organisation

Online Transportation Services in Auckland, New Zealand:

Auckland, New Zealand, is expecting to double its population by 2040 and wants to be ready. Using Microsoft data center, desktop, and cloud-based software, Auckland Transport is empowering citizens with a wealth of new transportation services. Citizens can use smartphones to post damaged road locations, fill bus cards, get public transportation schedules in real-time, and receive tailored notices of street closures, along with alternatives. Starting with integrating 13 separate transportation IT systems, using new BI tools to analyze 4 terabytes of data, and creating new citizen and employee apps, Auckland Transport has also boosted employee efficiency, as well as made Auckland a better place to live.

Solution Partner:

Microsoft | Services



2.2 Foundational Principles for Sustainable Innovation

To achieve the long-term return on ICT investments made in a continuous cycle of insight and action today, and ensure citizen satisfaction with city services enabled by those investments, cities should consider carefully some additional characteristics of their ICT foundation. While cities will adopt many technology solutions over time, it is important that those solutions acknowledge some important design principles to ensure cities can build on those investments for the future:

Security and Privacy It is about trust. Your citizens and businesses will only use the services you provide and enable if they understand and trust how your solutions adhere to the laws and policies of your city. Responsible data access is a core tenet to any service you offer. Citizens and businesses will expect that the data they choose to share via city services is being treated with proper respect for their security and privacy. Providing this level of security and privacy will earn trust and trust will encourage adoption and engagement. We will describe in detail the industry-leading security and identity services delivered by the Microsoft platform in section 3.2.1, but need to raise the discussion in this context because its importance to the feasibility of the overall model cannot be understated.

Interoperability In an increasingly interconnected computing landscape, enabling interoperability between products from different vendors has become more important than ever. New solutions should build upon and work with a city's existing, and likely diverse, technology investments. City leaders need to choose, develop, and support the applications, languages, and tools that are right to run your city today without imposing limitations on technology options in the future. The Microsoft platform enables interoperability with legacy systems and applications, thus increasing the lifetime of these prior investments. The platform also helps future-proof investments made today by enabling interoperability with other operating environments, development languages, protocols and end user devices used throughout the industry today.

Microsoft has developed a series of alignments within the industry, as part of a long-term strategy that nurtures an open, collaborative approach across the vendor teams that will support cities. To that end, we have adopted groundbreaking inclusiveness of technologies beyond Microsoft, as evidenced in our landmark [partnership with Oracle](#), announced June 24, 2013.

Windows Azure provides support for the Oracle and Linux technologies:

**Legacy Interoperability and Insight
in Public Safety & Justice**

Intelligence & Analysis in Ogden, Utah, U.S.: To begin responding to high-priority calls before an officer is dispatched, the Ogden Police Department (Ogden P.D.) needed improved access to the data in its many systems. The department chose Fusion Core Solution, a web portal based on Microsoft SharePoint Server 2010 and Esri ArcGIS mapping software. Department analysts now can provide important information to officers who are en route to a call, thereby increasing officer safety and effectiveness and reducing call handle times. Other capabilities provided by the solution have improved planning and incident command. Designed to build on IT assets many cities already have, the solution has helped Ogden P.D. improve its ability to protect and serve the community quickly and at a modest cost, leading to a strong, rapid return on investment.

Solution Partners:   Services

- Oracle - Microsoft customers can run Oracle software on Windows Server 2012 Hyper-V and in Windows Azure with full support from Oracle. Windows Server on premises has supported Oracle for years. Oracle provides full license mobility for customers who want to use their existing Oracle licenses to run Oracle software on Windows Azure. This means that customers can virtualize their existing images on Hyper-V with full support from Oracle. Microsoft now offers fully licensed Java, Oracle Database, and WebLogic on a pay-per-use basis in Windows Azure
- Linux Virtualization - Run multiple operating systems, including various flavors of Linux on Windows Server Hyper-V, but with the ability to enforce network isolation with new security and isolation capabilities.

Flexible Deployment Options It should be up to you to decide what you want to deploy in the cloud and when. At Microsoft, we offer a comprehensive range of enterprise cloud offerings, detailed in section 3.1, that span the continuum of public to private, helping you move to the cloud at your pace. It is not just having a deep and broad set of services and platform capabilities across public and private. It is the ability to bridge the two. No matter the location of your applications or data – on-premises or off-premises, hosted or not, legacy or modern, this consistent and comprehensive set of capabilities has commonalities to make it all work together. In addition, it is the best bet for heterogeneous environments as well – working across platforms, tools and hypervisors – to help provide a more unified IT approach that leverages your existing investments.

The overall combination of ICT capabilities delivered across the Microsoft devices & services platform deliver a complete foundation for sustainable innovation for your city. The platform provides the cloud computing, big data analytics, mobility and social engagement capabilities that drive the model for a continuous cycle of insight and action needed to support the next generation of city solutions.

**Flexible Deployment
In Tourism, Recreation and Culture**


CHARLOTTE

Flexible Deployment in Charlotte, North Carolina, U.S.:

When news broke that the US 2012 Democratic National Convention would be held in Charlotte, North Carolina, the city knew immediately that it was time to replace its manual processes for event permitting with software, especially when considering the challenges that such a large influx of people would bring. The City of Charlotte adopted Microsoft Dynamics CRM Online and tailored an event permitting solution to the meet the unique demands of hosting the convention. Dynamics CRM easily connects to services built on Windows Azure, which hosted the citizen-facing event permitting portal where event applications are originated and tracked. This cloud-based event permitting solution automates event request and back-end approval workflows, offers detailed reporting, and enables mobile workforce management of event evaluations and approvals.



3 CityNext Capabilities

There is a significant shift in the industry to focus on services and applications and Microsoft has embraced that shift with our CityNext ICT capabilities. The diagram shown below in Figure 5 presents both citizen-centric and government workforce-centric capabilities that support cities as they grow and compete with a global economy. Microsoft's platform vision supports all layers required by cities and the businesses that cities in turn wish to support and attract. Across infrastructure, platform, software, services and devices, Microsoft and its partners deliver a unique wealth of experience and expertise.

MICROSOFT PLATFORM PRODUCTS ENABLE CITYNEXT ICT CAPABILITIES

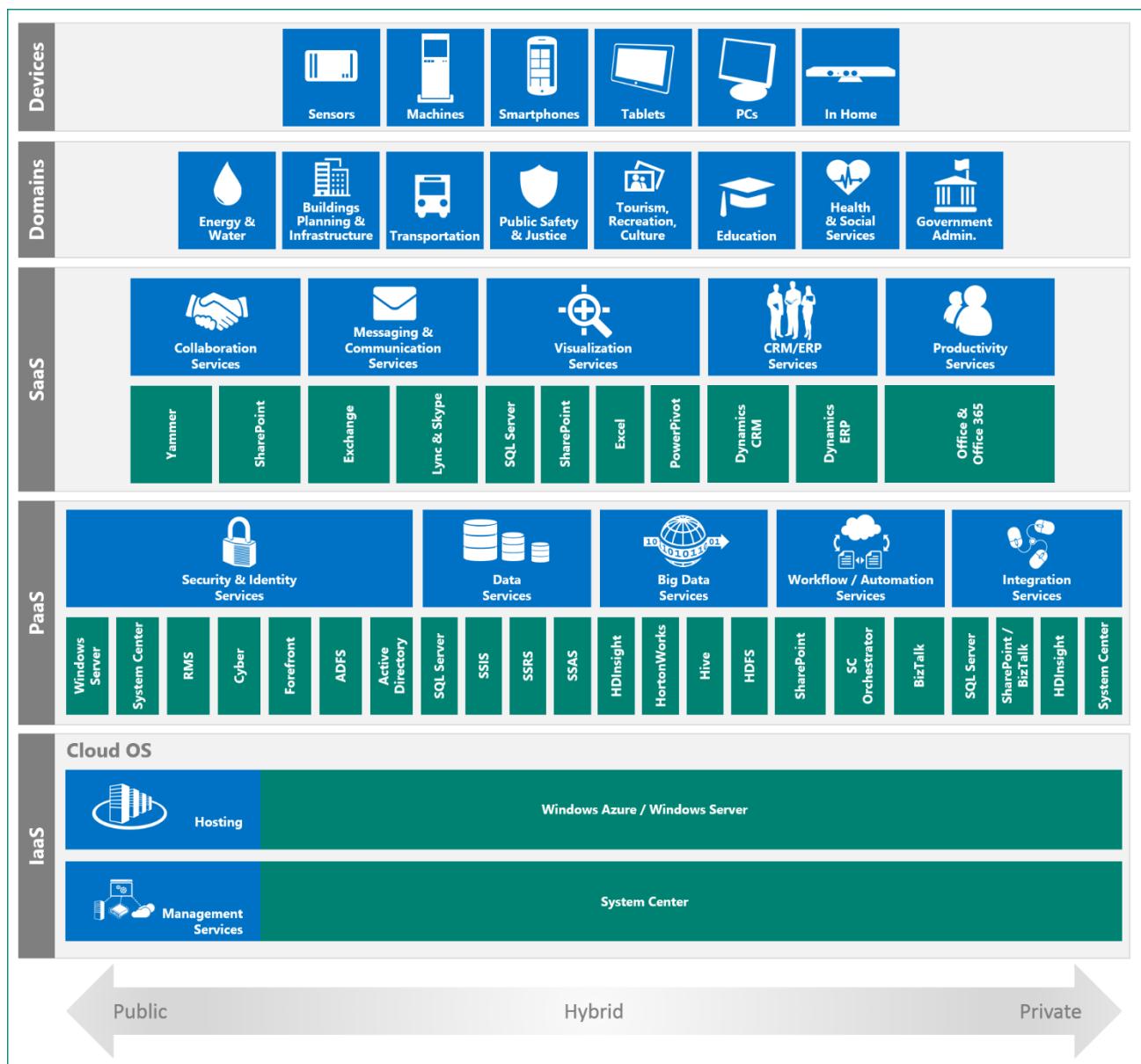


Figure 5: The Microsoft Platform Enables CityNext Capabilities

Trends in Mobility, Cloud computing, Big Data and Social engagement are all rapidly increasing demand for modern IT capabilities in virtualized servers, more storage, and faster networks. This profound and foundational development is at the core of the new era in IT, and requires a new approach to truly realize the potential of transformation. The transformation ahead for cities will be fueled by a redefinition of the operating system, as well as the set of common services in the platform and software layers that will be provided for new applications to consume.

Microsoft is the only company that gives cities the ability to choose from a comprehensive portfolio of infrastructure and platform services, the ability to decide which services in each layer will live in private, hybrid and public clouds, and the ability to select domain specific solutions from a diverse ecosystem of partners that help cities realize their vision for the future.

Infrastructure as a Service - Cities need ultimate flexibility in hosting and managing their hardware, applications and services in the Cloud: Public, Private or Hybrid, allowing for elasticity, redundancy and scalability with greatly reduced costs. Windows Server, Windows Azure and System Center make up the foundation of the Microsoft Cloud OS, which allow city IT departments to be more agile in the deployment of new services across multiple cloud models while managing the entire ecosystem .

Platform as a Service - Cities are able to be more cost efficient by providing the common services between end user software and the infrastructure. These optional services include Microsoft technologies and solutions such as Identity Management, Workflow, Biztalk, SQL Server, and big data services, including Hadoop. Cities are able to take advantage of common services to support identity, security, web applications, and data consolidation without incurring the cost of standing up repetitive services.

Software as a Service - Cities are able to leverage the Microsoft Cloud OS and common services in the platform to provide a flexible deployment model for packaged applications and domain specific applications. Cities no longer have to build silos of IT systems to deploy their applications saving precious resources.

Cities can expand and integrate these infrastructure, platform and software capabilities with existing installations. Using the Microsoft CityNext platform, services can deliver a variety of capabilities through devices of any kind, throughout the workplace, and across all city domains, and beyond them to citizens, tourists, other government entities, and global business partners.

3.1 Infrastructure as a Service

Cities have already made large investments in infrastructure, while over the last few years, the development of applications has leapt ahead into a future of mobile business, continuous communications, complex visualizations and dashboards, ubiquitous and increasing volumes and variety of data. Now more than ever, cities need new levels of strategic and operational functionality, protected by the right governance and security. Cities must get more from their current investments and accelerate deployment of new and innovative solutions and apps, while needing to reduce operational costs at the same time.

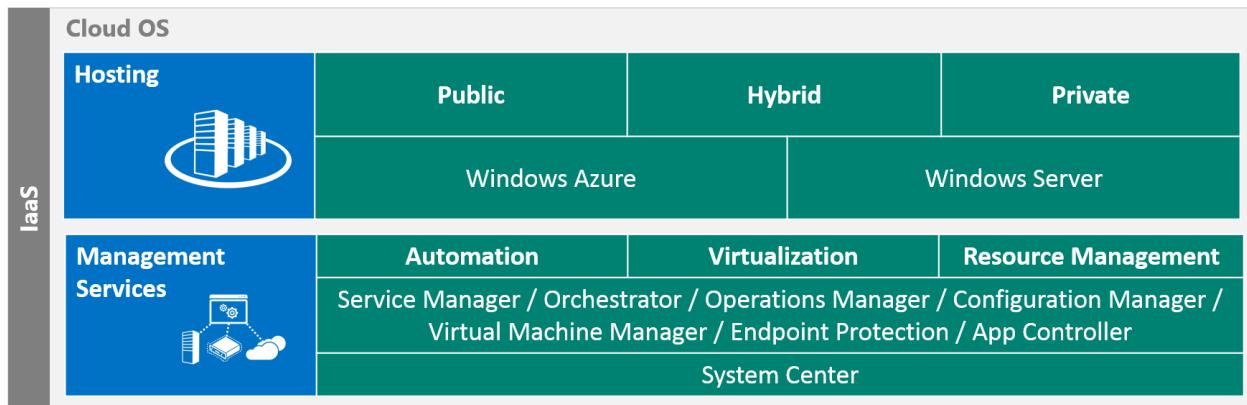


Figure 6: The Microsoft IaaS Layer

Microsoft's Cloud OS delivers a modern Infrastructure as a Service platform that transforms the datacenter, enables new and innovative apps to be developed and enables the ability to unlock insights on any data and empower people-centric IT. As cities deploy new applications and connect to new data sources – on premises or off-premises, hosted or not, legacy or modern – the Microsoft Cloud OS platform makes it all work together.

At the heart of the Cloud OS is Windows Azure for our public cloud service, Windows Server 2012 for private cloud service and System Center 2012 that provides the single pane of glass that enables cities to manage across public, private and hybrid cloud environments. System Center provides a common management experience enabling consistency of services, optimization of performance, monitoring of systems and services, and management and automation of a self-healing IT environment. Microsoft's Cloud OS is the best bet for heterogeneous environments as well as individual environments – working across platforms, tools and hypervisors – to help provide a more unified IT approach that takes advantage of your existing investment.

The Microsoft Cloud OS delivers a consistent and comprehensive set of capabilities that can run in your datacenter, a partner service provider's or Microsoft datacenters. Cities can take advantage of the cloud on their terms, without fear of lock-in. The Microsoft Cloud OS will benefit cities by:

- **Transforming your data center needs** – Cities now have the flexibility and choice to use the public cloud environment based on Windows Azure, private cloud environments based on Windows Server and System Center and most intriguing, the ability to run in a hybrid environment.

- **Unlocking insights on any data** – With the ability to connect on premise data sources with public data sources and take advantage of processing and storage capabilities in the Microsoft Cloud OS environment, cities are able to create new analytics and insights.
- **Empower people centric IT** – The Microsoft Cloud OS creates a foundation for a consistent, reliable and secure work environment that can be managed regardless of location or device. In today's environment, people expect their city's professional technology and resources to be always on and always available.
- **Enable new and innovative modern applications** – The Microsoft Cloud OS provides a consistent platform that empowers cities to build and manage new and innovative applications at the pace and the scale that is needed. Microsoft's platform and tools help cities and their partners build, test and deploy applications faster, connecting new and existing applications, data and services to any devices on any platform.
- **Provide a common identity** – Active Directory serves as a powerful base from which you can extend IT to the cloud and extend apps and data to devices security – all while enabling a single identity per user.
- **Unified management** – Manage your IT environment across data centers, private, hybrid and public clouds, client computers and devices.

3.1.1 Public Cloud

Public Cloud computing can be defined as a set of computers and computer network resources in a data center owned by a service provider who makes resources, such as applications and storage, available to the general public over the Internet. Microsoft Azure public cloud services are offered in flexible licensing models, and can be available in a trial model as well. Applications, storage and other resources can also be made available to the general public by the service provider.

The public cloud model enables cities to take **advantage of dynamically provisioned processing** power and storage, and makes deploying services and capabilities simpler and cheaper, thus allowing your team to focus on developing innovative services instead of the infrastructure environment. Microsoft's Windows Azure is the Microsoft Cloud OS public cloud solution which provides an open and flexible cloud platform hosted by Microsoft, and a rapid application development and deployment environment that can be integrated with your existing IT environment.

**Public Cloud and Devices
in Buildings, Infrastructure, Planning**



Gemeente Utrecht

[Street Lighting in Utrecht, the Netherlands:](#) The fourth largest city in the Netherlands, Utrecht wanted to reduce costs and CO2 emissions by managing street light usage, and also more effectively and safely respond to situations. The city worked with CGI/Logica to implement the IBOR solution which enabled them to integrate and remotely monitor and manage services from one location, such as in the event of an accident, guide emergency vehicles by controlling traffic lights, route ambulances and police around street obstructions, control water pressure if there's a fire, and alert fire fighters to hazards materials. The solution, built on Windows Azure, Microsoft Surface 2.0, Windows 7, and Silverlight, SQL Server is reducing energy costs by 25-40% by decreasing light levels and using dynamic switching. It is increasing safety and mobility in public spaces using a central control room and smart phones, and enabling resources to automatically report energy usage.

Solution Partner: 

Cities that have the following goals may want to take advantage of Public Cloud capabilities:

- Rapid deployment for new applications and lower application lifecycle costs
- Services on demand
- Greater elasticity
- Greater economies of scale
- Reductions in datacenter, resource management and staffing costs
- Improved TCO and margin for differentiated IP

Elasticity and Scalability - Windows Azure gives cities, businesses and citizens ubiquitous, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction. By using the public cloud, cities can reduce physical infrastructure costs in buildings, servers and racks, staff and maintenance and instead allocate those funds to develop the apps and next generation services they envision.

Focus on innovation, not on Operations - Windows Azure is a service that allows developers to create and run applications and store data on servers owned and operated by Microsoft. Windows Azure Connect and SQL Azure synchronization services allow developers to use existing skills and familiar tools to develop applications that can run in a private cloud, or in the public cloud. Windows Azure lets developers focus on delivering new applications for their customers, rather than losing cycles to operational tasks. This lets cities take advantage of virtualization, scalability, Big Data and development services without having to bear the operational costs of running the cloud themselves.

Windows Azure provides a hosting environment that scales to customer demand. IT managers gain access to a new set of resources without adding to the complexity of their core IT infrastructure. New business capabilities can be rapidly developed, tested and provisioned without large capital outlays, whether due to a growth stage, a seasonal burst or a managed retirement.

Provide Services on Demand - Cities and government agencies are seeking flexibility in moving services to the cloud to free up both human and server resources. Redundancy of services is often quoted as one of the most attractive features of on-demand services, as well as the ease and cost savings in relocating proprietary technologies and email services, which are provided by Windows Azure.

**Public Cloud
in Public Safety & Justice**



Citizen Service Apps in Miami, Florida, U.S.: The City of Miami, Florida, even when limited by a tight budget, looks for ways to improve the services it offers citizens. The city wanted to develop an online application to record, track, and report on nonemergency incidents, but the application's sophisticated mapping technology would require significant computing resources. Further constrained by long hardware-procurement cycles, the city needed a cost-effective, scalable solution that would maximize its available resources. The city teamed with Microsoft partner ISC to develop its 311 application on the Windows Azure platform, taking advantage of scalable storage, processing power, and hosting provided by Microsoft. As a result, the city was able to reduce IT costs, improve the services it offers citizens, and deliver those services faster than before. It also now relies on a cost-effective disaster-recovery model, an important benefit in this hurricane-prone region.

Solution Partner:



3.1.2 Private Cloud

Private cloud is typically defined as a cloud infrastructure that is controlled by a single entity, although it may be managed by the city or by a third party, and can be hosted internally or externally. A city would choose a private cloud when data control and security issues are paramount, and when they have the time and resources to manage them.

Microsoft's private cloud using Windows Server is flexible enough to support both of the two core infrastructure approaches: virtual and physical. This configuration is achieved either by deploying both a virtual and physical environment using Windows Server and System Center or by deploying a pre-integrated, certified configuration based on Windows Server and System Center. A pre-integrated certified configuration of Microsoft's private cloud model allows quicker, easier deployment coupled with deeper savings. This offering is called Infrastructure-as-a-Service Transformation from Microsoft Services.

The Microsoft Private Cloud offers the following benefits:

- **Cost Savings** –the ability to extend the use of existing investments in hardware, software and services
- **Physical Isolation** - full control of the IT environment and ensuring the security, integrity and availability of mission critical systems
- **Fully customizable** - your environments are completely customizable

Application Control and Management - Any government entity, including a city, has certain applications and systems that simply must remain under their complete control. Private clouds allow cities to deliver services while allowing them to maintain complete control over their data and processes. For example, cities looking at tax compliance solutions that aggregate and correlate private citizen and financial data containing PII data may elect to run those services in a private cloud. In a private cloud environment, service and application owners need to know that adequate shared resources for running the applications and services have been provided. Once deployed, city services can scale up or down based on demand, allowing IT to manage the provisioning of infrastructure capacity to accommodate potential spikes. Deploying a private cloud provides the absolute control necessary when managing and protecting mission critical data and processes.

Virtualization has enabled a new generation of datacenters and private cloud infrastructure implementations. While some applications and services will continue to run on physical machines that are part of the Private cloud, virtualization makes it possible to run multiple workloads on the same server.

Private Cloud in Education
<p> Tainan City Education Center is responsible for the technology needs of the city's 275 public K-9 schools. Each school has traditionally hosted its own server infrastructure, and the large number and geographic distribution of the schools has made it challenging and costly to provide a consistently high level of IT support. The education center has begun migrating to a new centralized IT infrastructure based on a private cloud model developed in consultation with Microsoft Services Consulting. The education center anticipates that the new infrastructure will save the city US\$344,000 per year in hardware and support costs, and it will reduce the district's carbon emissions by 2,610 tons annually. In addition, teachers can take advantage of cutting-edge technology to improve classroom materials, and students have increased access to educational resources.</p> <p>Solution Partner: </p>

With Windows Server 2012 Hyper-V, it is easier for cities to take advantage of the cost savings of virtualization and make the optimum use of server hardware investments. Cities can use Hyper-V to efficiently run multiple operating systems – Microsoft Windows and various flavors of Linux such as Red Hat, SUSE and CentOS.

Keeping Workloads Separate - A critical requirement for city private cloud computing infrastructures is that they provide a common infrastructure with which to serve multiple groups of end users, while keeping each groups' data private and secure by enforcing full isolation of each service or workload from all other groups' workloads and services. Windows Server 2012 has new security and isolation capabilities through Hyper-V. With Windows Server Hyper-V Extensible Switch, cities can configure the Hyper-V server to enforce network isolation among any set of arbitrary isolation groups, which are typically defined for individual sets of workloads or environments.

3.1.3 Hybrid Cloud

A hybrid cloud, as the name implies, is a combination of two or more distinct cloud infrastructures (private or public) that remain unique entities, but are bound together using technology that enables data and application portability.

Cities that want to take advantage of cloud computing may face various constraints, such as specialized hardware requirements, software licensing requirements, third-party software dependencies, geographic constraints for data hosting and compliance restrictions to name a few. For example, a city app may allow citizens to view and upload usage data, but may need to restrict certain layers of the code and the data stored for legal reasons.

Microsoft's Cloud OS includes the intriguing ability to create a hybrid cloud, using both a Windows Azure Public Cloud and a Windows Server System Center private cloud. The resulting hybrid cloud leverages joint storage, compute, network, resources and services allowing, for example, cloud bursting for load balancing across clouds.

Hybrid clouds built on Windows Azure and Windows Server enable the best of both private and public cloud architecture benefits, including:

- Moving chosen aspects of the existing IT infrastructure to a public cloud environment, while resources under certain constraints remain in the on premise infrastructure
- Ability to mix dedicated and shared resources, including physical and virtual servers
- Balancing cloud services while achieving economies of scale – cities can add new elastic, scalable services to extend existing on premise solutions

There are a number of reasons for moving to the Microsoft Cloud OS hybrid cloud solution. A city might create a hybrid cloud to outsource compute-intensive customer application components to the public cloud while the data remains on premise. A typical candidate for this configuration would be predictive analysis on citizen relocation data using Business Intelligence (BI) tools, where the processing power for

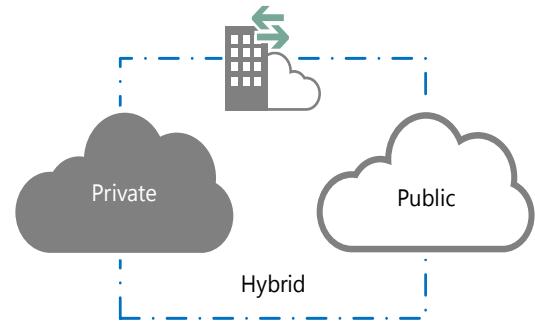


Figure 7: Hybrid Cloud Deployment

analytics is done in the public cloud and the results are then stored on premise and provided to desktop visualizations. Another situation might involve multiple legacy data stores that the city now wants to make available to developers, employees and citizens on the web for use in new decision-making engines. The data can be stored on premise, and Hadoop processing can be done in the public cloud, which also serves the web application.

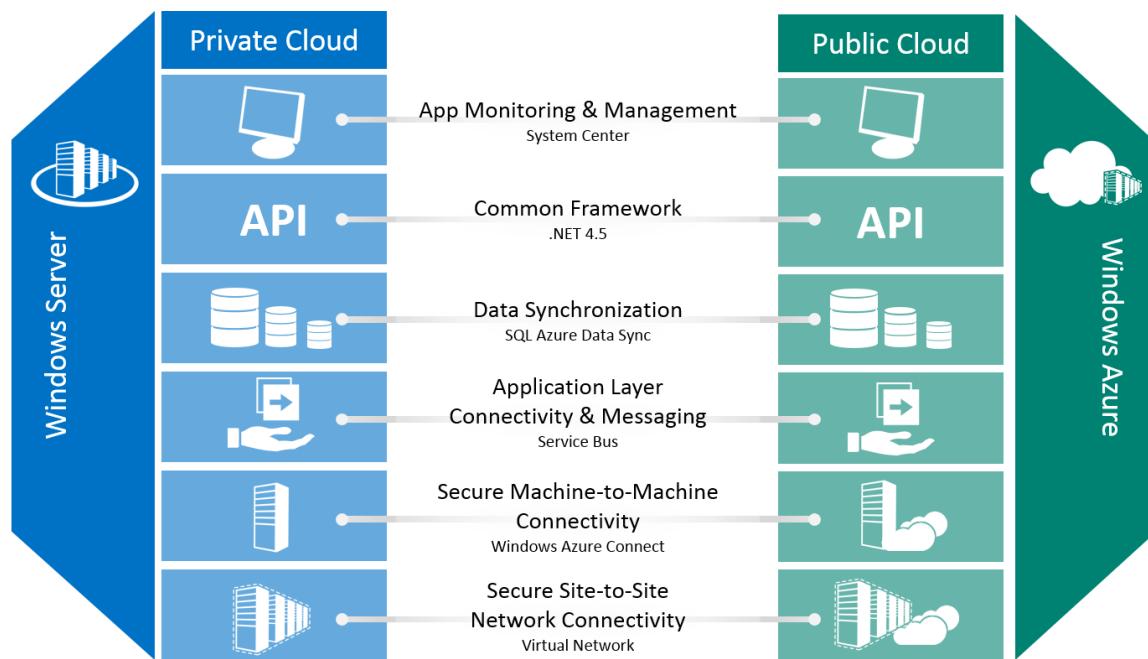


Figure 8: Hybrid Cloud Deployment Detail

Other examples of hybrid scenarios include:

- Application Development, testing and pre-production
- Temporary projects
- Burst capacity extension/datacenter replacement
- Cloud as cost-effective storage
- Backup and recovery, disaster recovery, government continuity management

Flexible Development - The hybrid cloud model enables a flexible adoption of cloud computing, allowing parts of applications (code, data, or output) to reside either on a private or a public cloud and to take advantage of physical hardware or virtualized hardware. For example, application development can be virtualized in cases where the source data is accessed from an on premise legacy solution, but the compute power and results are delivered online.

Applications can be developed, tested and deployed in a hybrid cloud with relatively little investment and disruption. IT can migrate from hybrid cloud to public cloud at its own pace for different applications and services. With the Microsoft Cloud OS, cities have the ability to move chosen processing and infrastructure to Azure and the remainder can reside in Windows Server and System Center. Using current

ISV licenses, a hybrid cloud can enhance rather than replace current infrastructure, reuse development and management tools, and take advantage of proven business processes.

Improved privacy and compliance – Hybrids can satisfy data privacy regulations by maintaining confidential data on premises, which handles Safe Harbor and other compliance requirements.

3.1.4 Automation

Automated systems management is the key to delivering the predictable consistency of service at scale required by employees and citizens. Data center administrators are able to automate the delivery of standardized IT services, in a self-service experience through automation using System Center 2012. IT organizations within a city can enable the repeatable and efficient service delivery that government employees and citizens expect, with System Center 2012 Service Manager and Orchestrator.

System Center Service Manager and Orchestrator allow the city data center administrator to establish standardized offerings by storing descriptions of the information needed to fulfill a request, the source of information, any approvals needed, expected performance levels and then use this information to set up the automation of those services.

Automation capabilities include:

- Automating Key Tasks
- Standardizing Resource Requests
- Creating visualizations of the IT Infrastructure

Automate Key Tasks - Orchestrator executes and manages technical system activities necessary for the fulfillment process via an Orchestrator Runbook. Runbook allows the automation of key private cloud infrastructure tasks such as provisioning new cloud capacity, automatically adding resources as demand thresholds are hit and moving workloads for maintenance purposes. Automation of processes and systems ensures best practices are delivered consistently, operational efficiency is enhanced and compliance to regulations and policies is supported.

Standardize Resource Requests – Service manager allows templates to be created in a forms library to manage service requests within a specified services offering, thus enforcing common rules (for things like creating new users and groups, or assigning AD, SQL server Farm, or SharePoint rights and other administrative tasks) and also enforcing data collection standards across all requests.

Hybrid Cloud and Smart Sensors in Energy & Water



[Energy Management & Analytics in Texel, The Netherlands](#)

The Dutch island of Texel, The Netherlands, located in the North Sea with a population of 14,000, wants to become energy neutral by 2020, by eliminating the need to get energy from the Netherlands mainland. CapGemini created a cloud-based Home Energy Management System, used by Cloud Power communities to collaborate and coordinate the use of energy by households. In addition, a smart lighting grid was deployed that allows city employees to remotely view and control public streetlights from any location with an internet connection. By 2015, this will reduce 37% of energy use by utilizing intelligent switching and dimming, by matching demand and supply, and by identifying and replacing old light bulbs.

Solution Partner:



Visualize the IT Infrastructure - Having an accurate representation of the IT infrastructure, its components and their complex inter-relationship is a challenge for many cities and is a core requirement for consistent service delivery. Service Manager uses connectors to populate the configuration management database (CMDB) to facilitate a single point of reference for IT organizations. There are out-of-the-box connectors for Configuration Manager, Operations Manager, Active Directory, Virtual Machine Manager and Orchestrator to populate the CMDB. Service Manager automatically reconciles this information providing a single point of reference for accurate understanding of the IT services.

3.1.5 Virtualization Management

The infrastructure components layer represents the physical; the bare metal servers, storage, networking and the virtualization layer on top of which the private cloud services are built. System Center 2012 Virtual Machine Manager enables a data center administrator to bring these diverse components under unified management and control.

Virtualization Capabilities include:

- Virtual Machine Resource Management
- Hypervisor Management
- Failover Clustering

Virtual Machine Resource Management - Elasticity and resiliency are key tenants of cloud computing. Both System Center 2012 Virtual Machine Manager (VMM) and Operations Manager provide detailed capacity utilization reports and what-if forecasting to identify growth constraints early enough to allow for new hardware to be provisioned. Using VMM, additional physical resources can be added to the Microsoft private cloud without downtime on the production server.

Hypervisor Management - Data center administrators can take advantage of baseboard management support in VMM to automatically deploy Hyper-V onto bare metal servers, significantly reducing time to deploy either into test or production.

Failover Clustering - Windows Server 2012 allows administrators to run applications across a logical pool of resources rather than racking and stacking more physical boxes. In the event of failure at the primary site, the production virtual machines can be failed over to Hyper-V at the recovery site. During failover, the virtual machines are brought back to a consistent point in time, and within minutes, they can be accessed once again with minimal impact to the service. This provides truly dynamic mobility of virtual machines across a city's private cloud infrastructure.

VMM includes a simple interface to create new Hyper-V clusters and add them to the compute pool. Not only will VMM create the failover cluster, but it will also mask the storage to the servers as necessary. Lastly, VMM has native support for Microsoft Windows Network Load Balancing, hardware load balancers and other network devices from vendors such as Brocade, F5 and Citrix.

**Virtualization
in Government Administration**



Ajuntament
de Barcelona

**Desktop Virtualization
in Barcelona, Spain:**
Although it is steeped in antiquity, the City of Barcelona, Spain, maintains a modern technology infrastructure so that it can deliver quality services to citizens and to the millions of tourists who visit each year. The city decided to upgrade to Windows Server 2012 to take advantage of the desktop virtualization enhancements included in the server platform. The City of Barcelona will be able to expand its use of virtual desktop infrastructure (VDI) from 200 to 1,000 employees and increase remote workers' work flexibility and productivity. The city will gain a VDI infrastructure that performs well and is easy to use and manage.

Solution Partner: 

Virtual machine management is an abstraction of the infrastructure components. Using Microsoft's VMM, data center administrators can deploy many of their existing physical data center assets into their new private cloud and be confident they can take advantage of new technology trends.

3.1.6 Resource Management

Microsoft's private cloud infrastructure allows data center administrators to parcel heterogeneous datacenter resources from a range of physical hardware and virtualization vendors into consistent logical pools. These logical pools are interchangeable throughout the private cloud. It is this mapping of physical resources to logical resource pools that allows System Center 2012 to deliver a truly scalable, elastic, resilient cloud. Using VMM, datacenter administrators can allocate capacity to application owners based on need, application size, or any other requirement and are not limited by the physical resources allocated to that group.



Resource Utilization and Monitoring - City IT departments need to know when there is a problem, identify where the problem is, and figure out what is causing the problem - ideally before the users are affected. One of the goals of Microsoft's cloud models is to enable a highly productive application and service experience to application owners. System Center's data center application and service management and monitoring capabilities significantly help to achieve this.

The System Center 2012 Operations Manager component helps reduce the mean time to recovery (MTTR) for solving problems that exist within an IT environment by providing deep application insight, comprehensive network device management and end-to-end service monitoring which spans both Windows and non-Windows environments, with out-of-the-box monitoring for a number of UNIX and Linux based platforms including many of the non-Windows based applications that run on them, providing a complete end-to-end picture of critical LOB applications. Operations Manager also has a very

strong partner ecosystem allowing the platform to be extended to other non-Microsoft platforms, applications and hardware devices.

System Center 2012 provides a complete application monitoring solution covering both the underlying infrastructure as well as all aspects of running applications. System Center 2012 monitors the performance of applications by tracking the physical and virtual components hosting the application, the execution performance of the application inside the service template, end user experience and a set of synthetic workloads designed to highlight failures in situations that might not otherwise be caught. System Center delivers deep application insight and diagnostics through Operations Manager, allowing performance monitoring and alerts right down to the line of code causing problems.



3.2 Platform as a Service

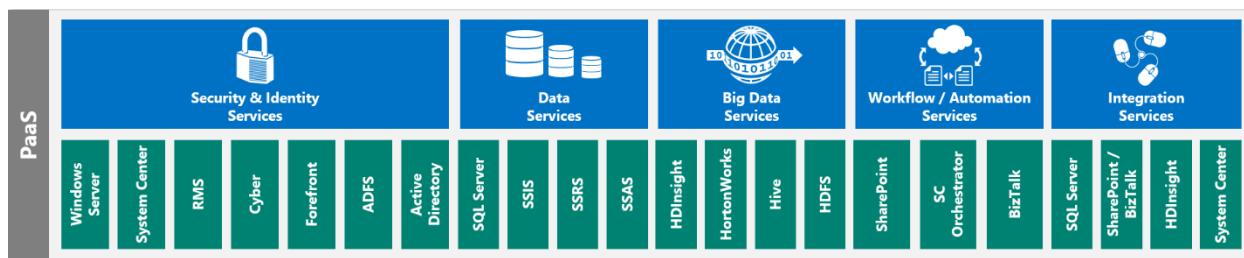


Figure 9: The Microsoft PaaS Layer

Platform as a Service capabilities support the complete lifecycle of delivering applications and services via the cloud. The Microsoft Platform as a Service combines a development platform and computing resources that help in rapid development and deployment of applications, reducing cost, time and complexity of application delivery. Built on a foundation of the Microsoft Cloud OS, cities are able to be elastic and scalable. Citizens and employees want a seamless, consistent experience across their devices. Authentication, discovery and access to data sources – big or small - automation and workflows to lessen manual steps, and integration of systems to provide simplicity are examples of common services that city applications should be able to access.

3.2.1 Security, Identity and Privacy

With increasingly complex requirements, rapidly expanding networks and the increased demand for online applications, cities today face significant security and identity challenges. Whether you host information and services in data centers that are on your premises or in a provider's data center or a public cloud, the same security principles apply. In today's constantly evolving threat landscape, cities face unprecedented challenges in combating persistent, ingenious enemies. The need for a strong, comprehensive strategy for protecting city assets and systems is clear. Cities need a strategic and operational framework for cyber protection, detection, response and recovery, in addition to the technology to carry out that strategy.

Microsoft's protection solutions are found in Windows Server Active Directory, Windows Azure Active Directory (including Password Sync), and Active Directory Federation Services (AD FS). Conditional access policies can be enforced for each user, and each device using Web Application Proxy and AD FS. Configure additional authentication to secure access to on-premises and cloud applications using Windows Azure Multi-Factor Authentication, and provision and manage user identities and groups based on business policies with Forefront Identity Manager. Users can get secure remote access using the Windows Server Remote Access (RRAS) capabilities of DirectAccess and VPN (including automatic VPN connections) and synchronize their work documents with Work Folders.

Security - Whether the attackers' objectives are to steal sensitive data or to disrupt or destroy operations, their tools and techniques are growing increasingly sophisticated. To protect important assets, cities must take these threats seriously and meet them proactively with a system-wide defensive approach employing superior technology. Defense strategies, previously based on putting recovery plans in place that are

triggered in the event of a compromise, are evolving. Cities today should assume compromises will happen, so proactive strategies need to be considered. Those strategies include:

- Protect
 - Deploy hardened applications, devices and services
 - Adopt up-to-date security procedures
- Detect
 - Provide extensive logging
 - Enable complex and intelligent queries (Big Data)
- Contain
 - Identify and rank assets by protection level required
 - Deploy tactics that focus defenses by those levels
- Respond
 - Respond correctly to minimize downtime and maintain business continuity

A solid foundation built around these security fundamentals can help a city balance security risks, thus delivering safer online experiences for improved business outcomes and economic growth. The need to share has proven a valuable goal – however, sharing must still respect the policies and controls of information providers regardless of source environments, infrastructures and technologies. Information and process providers can register default controls which the model then enforces for all or for a qualified subset of requesting systems.



Today, cities have a desire to better collaborate with the social enterprise, to support and integrate with social networks, which all lead to a "Bring Your Own Identity" trend. Employees and citizens increasingly expect applications to allow them to use more universal credentials on any device they choose to use; for instance, existing accounts with social network or popular web identity providers such as Microsoft Accounts (formerly known as Windows Live ID), Google, Facebook, or any Open ID identity provider.

The Microsoft platform can deliver broker and resource manager services between solutions registered within a city domain. It can then expose the federation, integration and routing capabilities in Microsoft products needed to discover and compose solution building blocks from a variety of domain-attached sources. Crucially, it ensures data is handled in accordance with policy and law, as specified by each city.

Access and Identity Control is a challenging aspect of security and has three parts: Trustworthy Identity, Access Policy Management and Information Protection. Microsoft is focusing on innovation and integration in this area to help ensure that users are trustworthy, to help manage policy that dictates which resources each user can access, and to help protect information per retention policies, wherever it is stored.

Microsoft access and information protection services allow you to control access to city data and resources while offering a seamless end-user authentication experience. User identities can be managed and federated across the organization and into the cloud to give employees appropriate access to the resources they need.

Microsoft access and identity services allow you to establish and easily maintain a single, consistent representation of identity across the datacenter and cloud. You can then use that common identity to ensure appropriate access to corporate information and network resources.

- Windows Server Active Directory Domain Services provides a single view of all user information, which you can use to efficiently manage groups, users, computers, devices, printers, applications and other directory-enabled objects.
- Windows Azure Active Directory seamlessly extends your Windows Active Directory to the Windows Azure cloud.
- Active Directory Federation Services enables the corporate Active Directory to communicate with heterogeneous identity stores, allowing for a seamless single sign-on experience for end users.
- New in Windows Server® 2012 R2 Preview. Web Application Proxy provides reverse proxy functionality for web applications inside your corporate network to allow users on any device to access them from outside the corporate network.
- Forefront Identity Manager allows you to easily provision and manage identities and groups based on business policy across heterogeneous systems, lowering IT costs and reducing manual errors.

**Secure Device Management
In Transportation**



ASTON MARTIN

Remote sales and engineering staff keep the Aston Martin luxury sports car brand aligned with corporate directives, so it's important that their laptops, mobile devices, and smartphones are reliable and secure. The IT team uses the Windows Intune cloud-based desktop management solution to monitor these devices, safeguard corporate data stored on them, and support remote staff so they stay productive on the road, working with global dealerships.

- DirectAccess in Windows Server 2012 allows a Windows client device to directly connect to corporate intranet resources. The Routing and Remote Access Service (RRAS) VPN in Windows Server 2012 extends traditional VPN connectivity to unmanaged or cross-platform client computers, while also supporting site-to-site VPN for cross-premises cloud access.
- Forefront Unified Access Gateway adds secure application publishing to a wide range of client devices.
- Dynamic Access Control in Windows Server 2012 allows you to classify and add document rights management protection to important information on your file servers, control who has access to classified information through centralized access policy, and then audit who has accessed the classified information.
- Active Directory Rights Management Services encrypts Office documents and email to prevent corporate data from being shared with unauthorized users—either inside or outside of the organization.
- FIM simplifies identity lifecycle management through automated workflows and business rules and easy integration with heterogeneous platforms. Improve security and compliance with auditing across identities, role-based access control and deep role discovery.
- PhoneFactor offers a suite of phone-based multi-factor authentication methods to secure account logins and financial transactions. By leveraging the user's existing phone, PhoneFactor provides unmatched convenience for users and a cost-effective, secure platform for enterprises, government agencies, healthcare organizations and financial institutions.
- Two-Factor Authentication PhoneFactor (Azure Active Authentication Service) enables City governments of all sizes to secure access to their confidential data and critical systems by adding
 - two-factor authentication to: Remote Access VPNs, Corporate E-Mail, Citrix, Terminal Services, Single Sign-On Systems, RADIUS Applications, Cloud Services and Public Facing Web Portals. This capability will be needed as applications are developed to align with any potential CityNext Enterprise Service Bus functionality.

This robust list of access and identity management tools provides cities the security management which their requirements mandate. It also allows IT to provide the services that City employees and citizens demand, with a transparency that makes those services the most seamless experience possible.

Privacy is a matter of trust; without it, data-driven citizen services will not be adopted at scale. If not in place already, cities should develop identity management and privacy policies or principles to guide decision makers in the design and operation of city services and inform the citizens and businesses who provide and consume data via city services.

**Identity Management
in Health & Social Services**

 Great River Medical Center **Great River Health Systems**, a regional provider of healthcare, sought a better solution for medication management. To improve efficiency and patient care, its hospital replaced manual processes and upgraded its distribution platform with an intelligent system from Microsoft and Omnicell based on Windows Embedded. As a result, Great River has reduced delivery time of patient medication from 1.5 hours to 30 minutes, cut \$400,000 in inventory costs, and expects rapid ROI and ongoing annual savings of \$300,000.

Solution Partner: 

Microsoft has a longstanding commitment to privacy, which is an integral part of our product and service lifecycle. We work to be transparent in our privacy practices, offer customers meaningful privacy choices and responsibly manage the data we store.

Independent Verification - Microsoft is committed to not just meeting industry standards but to ensuring our customers can have confidence in our capabilities by subjecting them to independent verification. Each year, we undergo third-party audits by internationally recognized auditors to validate that we have independent attestation of compliance with our policies and procedures for security, privacy, continuity, and compliance.

We invest heavily in ensuring that our products comply with best-in-class security practices and standards. One result of these efforts is that Office 365 is able to transfer data outside of the European Union through the U.S.-EU Safe Harbor Framework and the EU Model Clauses. We were the first cloud vendor to make model clauses available to our customers when we implemented them three years ago. This willingness and ability to offer EU-level protection to customer data attests to our commitment in this area.

Office 365 and Microsoft's Global Foundation Services platform underlying all of our cloud services implements the rigorous physical, logical, process, and management controls defined by ISO 27001, which is one of the best security benchmarks in the world. Office 365 also has obtained SSAE16 SOC 1 (Type I and II) certifications; has received FISMA-Moderate Authority to Operate from multiple federal agencies, as well as accreditation to store and communicate data securely up to the UK Government's Impact Level 2 classification; and has disclosed security measures through the Cloud Security Alliance's public registry. The Office 365 for Government cloud service can satisfy strict federal Criminal Justice Information Systems (CJIS) requirements, as well. Indeed, in the U.S. the state of Texas Department of Information Resources recently chose to migrate to the cloud with Office 365 for its more than 100,000 employees—a decision based in part on our ability to meet CJIS, HIPAA and other regulatory requirements for security and privacy.

At Microsoft, best-in-class security is a core consideration at every stage of development and deployment because we know our customers need and expect that level of commitment.

Secure Device Management in Health & Social Services



Stockholm, Sweden: Keeping track of 50,000 PCs, tablets, phones, and other devices isn't easy. That is how many devices the Stockholm (Sweden)

County Council managed, primarily to support an extensive healthcare delivery system. IP address and network management had to result in a system that was secure, highly available, easily managed and flexible enough to support new devices and solutions. After having concerns about its third-party IP address technology, the Council worked with Microsoft Services to migrate to a Microsoft-based solution and adopted the IP Address Management (IPAM) solution in Windows Server 2012 even before its formal release in September 2012. The Council says it will use IPAM in Windows Server 2012 to gain the security and near-total availability that it needs, reduce the time spent managing the address space, and adopt new devices and solutions as it's ready to do so.

Solution Partner:  Microsoft | Services

3.2.2 Data Services

City ecosystems are creating more data than ever. Cities need to manage and use different types of data; from traditional LOB data in relational databases, file systems, to Open Data sites, web data and new Big Data sources such as sensors and social media. The volume of data is exploding, the variety of data is expanding, the velocity of data generation and delivery is intensifying the pace at which information becomes available for decision and action. Microsoft offers a comprehensive data platform to manage all types of data, capabilities to connect, integrate and enrich those sources of data. There is valuable insight hidden in the data, and that insight that can be used to analyze the past, optimize the present and predict the future using new tools to make sense of it all and take impactful action. Microsoft and its partners can help cities retrieve, organize, analyze and find the insights in all of your data.

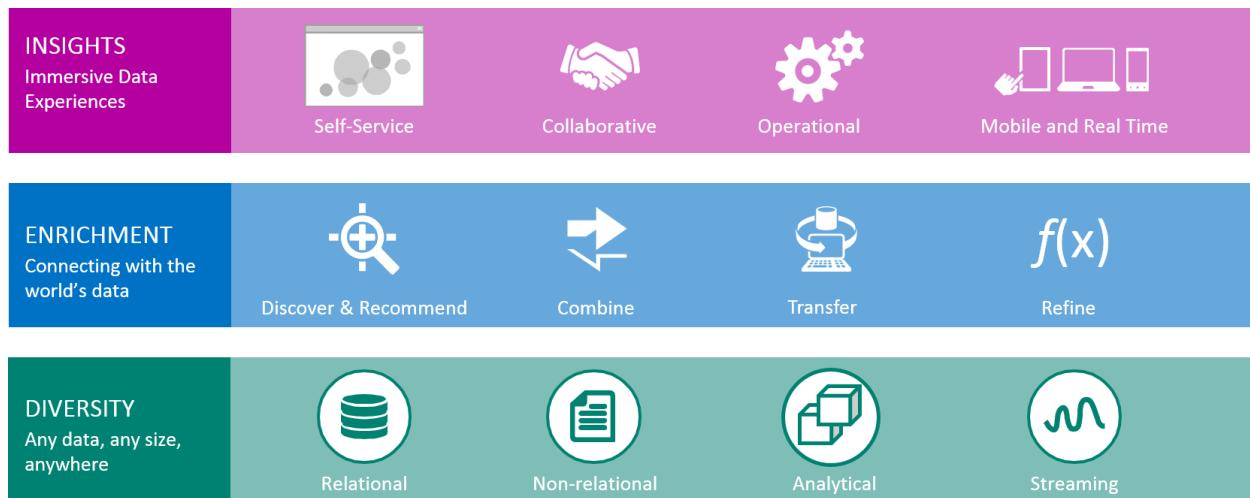


Figure 10: Data Services Require an End-to-End Approach

Plummeting storage costs have made it feasible to save and analyze large quantities of data in ways that were unthinkable a few years ago. To gain the full value of data, cities need a modern data platform that manages data of any type, whether structured or unstructured, from any source, be it social media, web analysis, sensors, embedded devices, enterprise systems or phones, tablets and PCs, and of any size – from gigabytes to exabytes. By connecting to data from any source agency or department, you can begin to answer new types of questions and deliver new value in ways that previously were not possible.

A city's data strategy needs to include managing data from a live system environment as well as legacy systems, and covering both structured and unstructured data. Cities need to manage the entire life cycle of all this information, from creation to final destruction, and ensure that the process is compliant with legal retention requirements.

Microsoft offers city governments BI tools with capabilities to reach into data repositories in hybrid, private or public clouds and deliver increased visibility and insights. Microsoft's comprehensive data platform enables cities to obtain valuable understanding from large quantities (petabytes and even exabytes) of structured, unstructured and fast-moving data. As a result, cities have a richer variety of data to inform them, along with analysis tools that can help increase intelligence into opportunities,

performance of processes and initiatives. Microsoft and our partners can work with cities to find unified and intuitive approaches to discovering, gathering, storing, indexing, exploring, analyzing and performing self-service visualization of significant and previously untouched data sources.

Figure 10 above depicts Microsoft's end-to-end approach to data services.

- **Insights** – Provide insights to all users and enable decision making through familiar tools that offer self-service capabilities, better collaboration, and predictive analysis in real time
- **Data Enrichment** – Enhance your data through discovery, transformation, sharing and governance. Connect to external data sources, answer new types of questions and deliver new value in ways that were previously not possible.
- **Data Spectrum** – Support all data types – structured, semi-structured, and unstructured data, either at rest or in motion. Get the advantage of a modern data platform that manages diverse data, whether relational, non-relational, analytical or streaming – and perform analysis functions on-premises, in the cloud or by using a hybrid approach.

3.2.2.1 Relational Data Services

As a key component of Microsoft's modern data platform, SQL Server helps cities gain mission critical confidence while quickly building solutions and extending data across private, hybrid and public cloud to unlock breakthrough insights.

With SQL Server, organizations can experience next-generation performance with xVelocity in-memory technologies for both Data Warehousing and Business Intelligence. xVelocity technologies include a new index for data warehouses that provide dramatic performance gains. It is also an in-memory analytics engine with a generational leap in performance for BI projects, and gives users the ability to interact with an unprecedented amount of data at the speed of thought.

With SQL Server Integration Services, Master Data Services, Data Quality Services, Analysis Services and Reporting Services cities can easily bring together data from all across a city's enterprise, use the data quality and governance rules to create a reliable, trusted source of data for analysis and reporting.

**Data Integration
in Transportation**

 **臺南市資訊中心**
Information Center, Bureau of Education, Tainan City Government

**Toll & Fare
Management in
Tianjin, China:**

Tianjin Expressway Group Company sought to help the City of Tianjin in northern China automate highway toll collection and improve traffic flow, so it implemented an electronic toll-collection system based on Microsoft SQL Server 2008 R2 data management software and Windows Communication Foundation. Deployed within three months, with help from Huajian Warmstar, a local Microsoft partner based in Beijing, the solution links three separate sites and connects applications from road companies, service providers, and a bank. The company has improved data management and traffic flow, and it now can collect tolls from a moving vehicle in less than three seconds. It also gained benefits such as zero downtime and easy maintenance. The increased efficiency and cost reductions are making it possible for Tianjin Expressway to invest more resources in enhancing its transportation network.

Solution Partner: 

SQL Server Integration Services is a platform for building enterprise-level data integration and data transformation solutions. Integration Services can extract and transform data from a wide variety of heterogeneous and disparate sources, apply a rich and powerful set of data transformations, normalize and cleanse the data, and then load the data into one or more destinations.

SQL Server Master Data Services is a master data management solution that enables organizations to establish and maintain governance over their data. MDS can serve both as a system of entry for creating and updating master data and as a system of record for making authoritative data available to other applications.

SQL Server Data Quality Services is used for managing data accuracy and duplication and helps ensure the accuracy of data across a city's enterprise.

SQL Server Reporting Services provides a complete enterprise reporting solution that can support thousands of users by providing them with the reports that they need when and where they need them. The reports can bring together data from many different data sources and deliver them in rich rendering formats to users across the city.

SQL Server Analysis Services provides a complete data mining platform that cities can use to infuse insight and prediction into organizational and city decisions. Cities are able to increase agility and create competitive advantage through the predictive analysis capabilities in SQL Server.

SQL Server StreamInsight is a complex event processing engine that provides the ability to build rich temporal data processing application over real-time event streams. StreamInsight offers rich temporal semantics, event-driven, near real-time processing, support for both online and historic data processing, and the ability to easily embed inside other applications.

For cities with the most demanding data warehouses, Parallel Data Warehouse offers massive scalability to hundreds of terabytes and even exabytes and high performance. Microsoft SQL Server Parallel Data Warehouse provides both a high-end parallel processing appliance that can improve city query response times up to 100x greater than legacy solutions. PDW offers flexibility and choice with leading hardware vendors and a complete data warehouse platform with a complementary toolset for ETL (extract, transform, and load), BI, master data management and real-time data warehousing and works seamlessly with SAP, Informatica, Microstrategy and Hadoop.

3.2.2.2 Open Data Services

Cities of all sizes around the world are using data to meet citizen demand for more efficient and responsive service. Cities worldwide are paying close attention to the sustained momentum of the Open Data movement and are taking steps to launch transparency initiatives with the goal of improving access to public data and increasing opportunities for citizen participation and collaboration in decision-making. The Open Data movement enables cities to:

- Be Transparent - make data and operations more open to enable greater accountability and efficiency
- Enable Participation - drive greater and more diverse expertise in decision making
- Drive Collaboration - foster cooperation across the city for problem solving

Microsoft promotes the use of open data by enabling its accessibility and re-use via Windows Azure based solutions. Open data is public information, such as government records that are shared with the public digitally in a way that promotes analysis and reuse. From all types of open data, cities can find examples where sharing the data with the public has had a significant effect on advances in everyday life, promoting the economy and making citizen's lives safer. Microsoft has partnered with Socrata and CKAN, two of the leading Open Data solution providers to help give citizens and businesses access to government data and streamline publishing data from government systems. The Open Data movement will provide government transparency and openness by allowing anyone in the public to view and analyze government data. These efforts by Microsoft and our partners are helping empower city leaders to engage in data-driven strategic thinking.

For more information, please see the following links:

- [Socrata and Microsoft partnership](#)
- [Windows Azure teams up with CKAN](#)

3.2.2.3 Power BI for Office 365

Power BI is a self-service business intelligence solution delivered through Excel and Office 365 which provides users with data analysis and visualization capabilities to identify deeper business insights either in a private, hybrid or public cloud model. With Power BI, cities get a collection of features and services that make self-service BI intuitive, collaborative and holistic. Combining the power and familiarity of Excel with the collaboration and cloud-based infrastructure of Office 365, extends a city's reach and amplifies the impact of what you can find, analyze and visualize. With Power BI, cities can connect to their data sources and quickly build and deploy self-service BI solutions. The Power BI features, Power Query, Power Pivot, Power View and Power Map, in Excel 2013 make discovering and visualizing data easy and work seamlessly together.

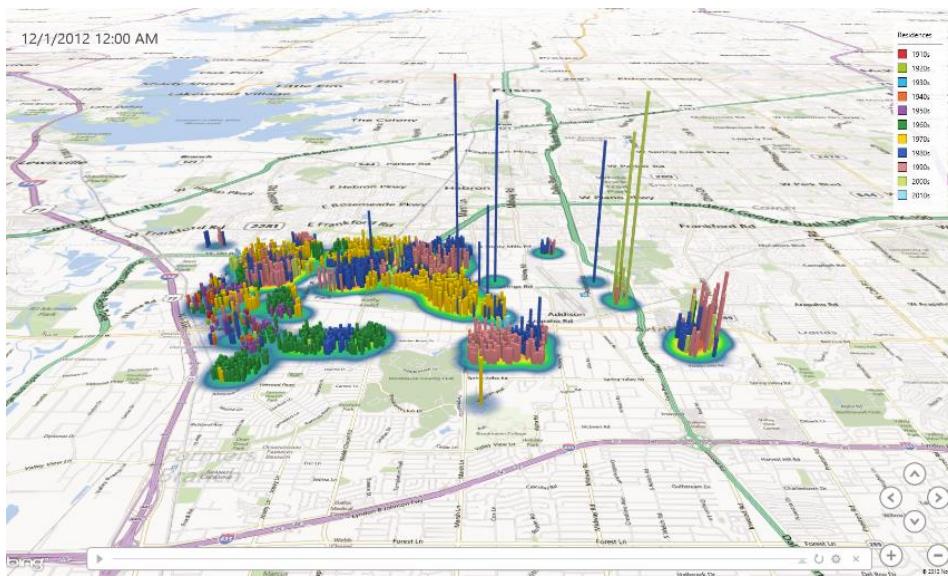


Figure 11: Example of visualization capabilities delivered by Power BI

Power Query - easily discover and connect to data from public and corporate data sources. This includes new data search capabilities, as well as capabilities to easily transport and merge data from multiple data sources so that you can continue to analyze it in Excel.

Power Pivot - continue to create sophisticated data models with that data in Excel by creating relationships, customer measures, hierarchies, and KPI's. Power Pivot models run in-memory so that users can analyze 100's of millions of rows of data with lightning fast performance.

Power View - easily create reports and analytical views through interactive charts and graphs that help you explore and present your data visually in Excel.

Power Map - explore and navigate geospatial data on a 3D map experience in Excel.

Insights and visualizations are better when shared. Power BI excels at making insights available to everyone who should see them, securing the reports and enabling them to be seen from anywhere.

3.2.3 Big Data Services

Big Data can aid city governments as they work to provide exceptional service with limited resources. Using Big Data, cities can more easily perform key tasks, such as mapping disease outbreaks, spotting crime trends, identifying patterns in social service needs, or proactively anticipating systems outages.

Polybase is a federated query processor in SQL Server 2012 Parallel Data Warehouse. Polybase seamlessly combines relational and non-relational data and represents a breakthrough innovation from traditional query processing to join structured and unstructured data from Hadoop. It reduces the learning curve since DBAs do not have to learn to write any MapReduce code.

Windows Server 2012, in partnership with Hortonworks, now supports Hadoop distribution. Microsoft also offers HDInsight Service, which is an enterprise-ready Hadoop service that runs in the cloud with Windows Azure, and supports easy scale-out clusters of Hadoop nodes to meet expanding volume and data processing needs.

**Big Data Analytics
in Public Safety & Justice**



Intelligence & Analysis in Bangkok, Thailand: The Department of Special Investigation (DSI) in Thailand needed better tools for mining large sets of structured and unstructured data to improve investigation processes and reduce manual procedures. So DSI teamed up with Betimes Solutions to implement a solution based on Microsoft SQL Server 2012 and Apache Hadoop software to give investigating officers self-service business intelligence tools and data-management capabilities. With them, DSI has improved accuracy and shortened criminal case investigation time from two years to 15 days. DSI plans to implement its own private cloud to manage the security of confidential data.

Solution Partner: 

Microsoft gives cities the flexibility to manage Big Data and Hadoop in a manner that best suits their cost and security requirements. Hadoop can be deployed in a local on premises Windows Server platform, or it may take advantage of low-cost storage, rapid deployment, and turnkey scalability available in the

cloud. Microsoft, through partnership with industry renowned and key open source contributor Hortonworks, offers the tools and expertise to help cities find and build the best solution possible.

For sensitive data that must remain on premises, Windows Server 2012 supports a full open-source Hadoop distribution. Coupled with familiar tools, including Office, SharePoint, and SQL Server, cities can implement a comprehensive, cost-efficient data analytics platform that brings all types of data together and provides rich insight.

Cities may want to integrate existing system data within a new Big Data solution to produce enterprise data analytics. With this approach, a city can incorporate new tools such as Power BI and open source Hive into an overall infrastructure that brings out insight from ALL the city's data.

Some cities may find that a public cloud model suits their needs better. Using Microsoft Windows Azure HDInsight, cities can deploy enterprise-ready Hadoop clusters, on the Hortonworks Data Platform giving cities the ability to uncover and unlock new insights with the ability to scale up rapidly and keep costs low. HDInsight helps cities quickly build, deploy and manage Big Data applications across a global network of Microsoft-managed datacenters.

Microsoft is ready to help cities discover the power of data our modern data platform. Windows Azure HDInsight Service, Windows Server 2012, SQL Server 2012 including xVelocity in-memory analytics, StreamInsight, and Parallel Data Warehouse coupled with Polybase will provide cities the performance, flexibility, reliability, and security needed to fully embrace the world of Big Data, Open Data and Relational Data.

Organizations including cities are collecting and analyzing massive amounts of data in a way that most were unable to do ten years ago. Pattern recognition, non-obvious relationship detection, graph analysis, predictive processing and other analytical approaches are enabling cities to turn oceans of data into knowledge, allowing them to make the best use of the data they have. At the same time, there exists an ever-growing concern around the security and protection of the information we are analyzing. The explosive growth of data that cities are processing from multiple disparate data sources brings challenges

Big Data and Sensor Integration in Buildings, Infrastructure, Planning



Waste Management in Zaragoza, Spain: Turn the

grounds of a former barracks into an environmentally sustainable city with integrated bioclimatic management systems for Valdespartera's urban operations. The city implemented Invensys' real-time Wonderware solution, running on Windows Server and SQL Server, to capture, manage and centralize data from a breadth of urban operations, including drinking water supply, sewage and rainwater treatment, water systems, electrical and gas supplies, street lighting, pneumatic waste collection, energy consumption in homes, and even watering of green areas. The solution delivered increased energy efficiency, improved use of natural resource, and reduced waste and emissions. It integrated and consolidated data from a multitude of instrumentation devices tied to city's breadth of systems, and ensured adherence to Kyoto Protocol environmental sustainability objectives.

Solution Partner:

 invensys™

related to data management, security and privacy. Although security and privacy issues related to Big Data are starting to get more attention, the issues are not new. The Microsoft Security and identity solutions addressed in section 3.2.1 apply to Microsoft's data services as cities face cyber security threats, growing citizen security and privacy concerns, insider attacks and legal and regulatory requirements as they discover, consume and analyze all types of data.

3.2.4 Workflow / Automation Services

Applications for real world scenarios need to support extremely fast transactions and extremely slow, long running processes. They need to execute with a common infrastructure to name, discover, expose, secure, and orchestrate services... Workflow and automation services provide this common support for rich messaging patterns while guaranteeing on premises and cloud symmetry.

Service Bus and Workflow for Windows Server enable highly scalable workflows based on long running scenarios. Combine these with the ability of SharePoint 15 to span workflow logic across Azure and on premises Windows server implementations and you have a truly automated workflow environment. Cities leveraging workflow and automation services can expect reduced automation costs through increased reuse as well as greater compliance to regulations and law.

3.2.5 Integration Services

As modern cities work to transform their infrastructure and operations, they must have a means to use integration capabilities that extend on premises applications to the cloud. They need services that provide rich messaging endpoints on the cloud to process and transform data and messages between enterprise entities and helps the city integrate its disparate applications. The ability to bridge disparate applications falls into two distinct but related categories: Enterprise Application Integration (EAI) and Electronic Data Interchange (EDI). Microsoft's focus and experience in EAI and EDI helps city software engineers integrate existing applications at a sensible costs, so that they can easily implement and evolve business processes.

Integration Services includes these capabilities:

- Business process management through roles and rules

**Workflow & Collaboration
In Energy & Water**



**Air Quality Management
in the San Francisco Bay
Area, California, U.S.:**

Over the last 55 years, Bay Area Air Quality Management District (the Air District) has closely regulated stationary sources of air pollution in the San Francisco Bay Area. Regulatory oversight for a diverse set of 25,000 businesses has required the Air District to make its business processes smart, efficient and automated. The Air District worked with Microsoft Services and Microsoft Gold Certified Partner Vertigo Software to implement Microsoft SharePoint Server 2010 as the foundation for an automated, online permitting and inspection system that will replace a mainframe computer and manual, paper-based processes. It expects the solution to help it cut permit processing time from 45 days to a matter of minutes for simpler applications. Engineers and inspectors will be able to focus more time on significant sources of pollution and increase the number of inspections they perform annually, and permit applicants will experience less bureaucracy and lower costs.

Solution Partners: **Vertigo Microsoft** | Services

- Composite apps that encapsulate functionality
- Visualization dashboards that present information based on the user's role

Microsoft provides these integration capabilities through the Host Integration Server, BizTalk Services, SharePoint and SQL Server Integration Services. By providing the full stack of integration services, Microsoft provides a city the means to validate and transform messages in the cloud while still leveraging their existing investment in on premises processing and storage.



3.3 Software as a Service

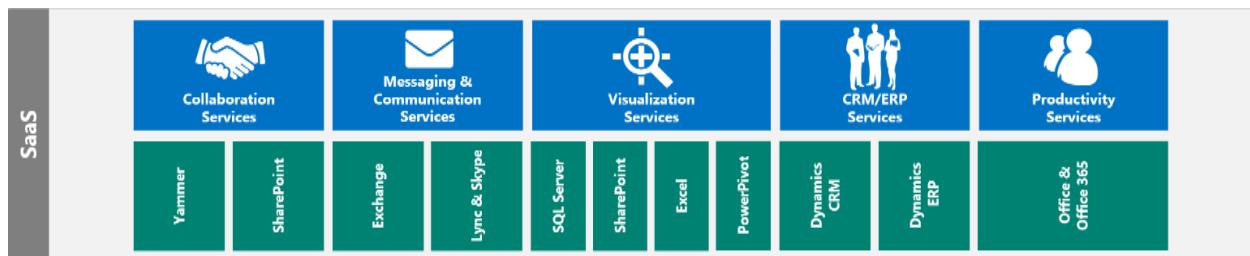


Figure 12: Microsoft SaaS Layer

Applications and software are the face of cloud computing to your users. The SaaS layer provides common and specific city applications with which employees, businesses and citizens can interact. These city applications will have full use of the common services from the Platform as a Service layer, increasing the ability to gain insights, connect systems, integrate sources and develop new innovative applications. City solutions can leverage collaboration, messaging and communication, visualization and location, productivity and xRM services from the SaaS layer.

Cities can start to innovate new citizen services like emergency management solutions that reach into transportation systems to determine the best evacuation routes, or health systems for hospitals with specific disease control expertise, and real time eyewitness accounts from social media flowing on to police dispatch systems. Cities can provide consistency to end users with managed updates to enterprise applications. By transferring operational responsibilities to Microsoft, the IT department of an institution can focus more on high-value activities that align with and support the goals of the city. The IT organization can function more effectively as technology strategists

The increased functionality that a SaaS application offers, such as faster deployment, ease of configurability, scalability, and freedom from maintenance and support, greatly lessens the burden on the city's IT department. This allows employees to focus on innovation and providing training services to end users rather than worrying about IT infrastructure and system stability.

3.3.1 Collaboration Services

Open and interoperable collaboration solutions from Microsoft make it faster and easier for people within and outside the city organization to connect, access and share information. Using the familiar, intuitive tools these solutions provide, employees, businesses and citizens an effective way to communicate and collaborate with each other in a timely, access-controlled, with lowered costs. Cities are increasingly recognizing the importance of collaboration within their organizations and with businesses and citizens as a means of creating efficiencies, empowering employees and gaining a competitive advantage in the global economy.

Collaboration capabilities include:

- Single Sign-on to data, content and business analytics and applications
- Employee enablement that can be maximized through personalization based on role

- Enterprise-wide real-time involvement in data driven decisions and business processes
- Maximizing social networking behavior in the business context

It is essential that cities embrace services to create a highly collaborative environment. For example, health care workers need access to collect information, collaborate around the results and meaning of that information and need to be able to connect with the right people to improve the quality of care and services they provide.

Microsoft SharePoint gives you freedom of choice. You can leverage your existing investments to move to the cloud with the option of an on-premises software solution or a private/public cloud services solution in any combination that works best for your city. SharePoint automates processes to let content owners quickly author, publish and manage their information and the technology supports self-service features for users. City employees, businesses and citizens can easily search for documents and people in the city organization and can work on documents from almost anywhere. SharePoint had flexible records management support that includes policies, classifications and auditing to help cities adhere to records and retention policies. SharePoint is completely integrated with Microsoft Office, Microsoft Exchange, and Microsoft Lync to help employees, businesses and citizens collaborate no matter where they are located or what device they chose to use.

SharePoint collaboration services can be deployed across all types of sites—as part of your intranet, extranet, or Internet—your city's IT department can realize significant cost savings by using a single platform to address your agency's diverse needs.

Social networking is clearly a part of the new workplace as a tool for employee collaboration. Future citizens will be following trends, each other and the flow of information in many forms. Yammer is part of the increase in openness and transparency which can transform the way cities operate, making them more nimble to employee, business and citizen interaction and more competitive in a global environment.

A whole new culture and set of modern social capabilities is emerging as employees, businesses and citizens are talking and collaborating with each other, sharing information, and influencing decision-making. There is a growing imperative for cities to be savvy about influential citizens and businesses. City employees want to be able to find each other, talk, share information, and build new value together.

The ability for cities to use collaboration services like SharePoint, Yammer and Office to harness social insights to drive government processes and decisions—and to deliver ever more engaging citizen

**Collaboration
in Health & Social Services**

Florence ***Primary Care in The Hague:** To improve collaboration and communication among inpatient and outpatient staff, care provider Florence worked with Microsoft partner Rapid Circle deployed a modern platform based on Microsoft Office 365. Its staff members now have access to personal mailboxes and a more user-friendly, dynamic intranet portal that is easy for the care provider to maintain. Florence has taken the first step toward the "New World of Work" within the care sector. Staff members already extensively use the portal and its integrated search functionalities, and Florence expects its new cloud-based portal to develop into a hub where staff communicate, share knowledge, and manage collaborative projects.*

Solution Partner: 

experience—will transform government, creating significant opportunities for differentiation and innovations. When social information becomes embedded in everyday tools and processes, cities become a fully connected and engaged enterprise.

3.3.2 Messaging and Communication Services

City budgets today face unprecedented pressure in the current fiscal environment, forcing continual analysis for cost savings particularly in Telecommunications. Cities are able improve lifestyle quality for citizens and strengthen existing relationships with businesses and citizens—by helping constituents streamline communications and enhance collaboration.

Microsoft Unified Communications allows cities to instantly answer concerns from citizens, broadcast health alerts, hold virtual town hall meetings, and send emergency directions to citizens, businesses, and other scenarios. Microsoft Unified Communications technologies use the power of software to streamline communications between people and organizations, regardless of medium, platform, device or location. Find the right person quickly and easily, and simply click to communicate by e-mail, phone, VoIP or instant messaging – or even schedule a video meeting or Web conference allowing:

- People to find and collaborate with co-workers quickly and easily
- Communications from almost anywhere and on a wide range of devices
- Presence awareness within desktop and line-of-business applications
- Enterprise-grade security, reliability and availability in a trustworthy platform

Microsoft Unified Communications, powered by Exchange 2013 Server, Lync 2013 Server, Skype and Office 365, can be deployed on an on premises server, partner hosted services, and Microsoft hosted services.

Microsoft Unified Communications capabilities include:

- Messaging provides access to e-mail, voicemail, fax, calendars and contacts in a unified inbox from a variety of clients and devices.
- Presence enables real-time availability status of employees to be displayed to enable users to contact the right person the first time using the best communication method.

Unified Communications in Government Administration



Leicester
City Council

Leicester, England, UK: Faced with the challenge of funding cuts, rising customer expectations, and having to move premises, Leicester City Council embarked on a business transformation strategy. It needed to take control of its data, enhance customer experience, and modernize its infrastructure to support flexible, collaborative working. As part of this modernization program, the council looked to replace its Novell email, diary and file and print solution, along with its existing private branch exchange (PBX) telephone system, supporting more than 8,000 unique numbers. With systems integration support from Microsoft Gold Partner Risual, Microsoft offered a complete solution, including Microsoft Lync 2010 for instant messaging, voice, and video, Microsoft Exchange Server 2010 for email and unified communications, and Active Directory services. As a result, the council is reducing its costs and carbon footprint by giving employees better functionality.

Solution Partner:



- Enterprise Instant Messaging is the capability to transfer text messages in real time over the Internet or a corporate network.
- Conferencing provides a virtual meeting experience allowing groups of people in diverse locations to interact and collaborate, whether ad-hoc or pre-scheduled.
- Software-powered VoIP is the next generation of voice communications that help reduce operational costs by enabling communications over an IP network.

Microsoft can help cities work fluidly and productively with the combination of Lync and Skype. Lync has been built from the ground up as an enterprise platform for unified communications, and with that comes the richness of capabilities such as administration with Active Directory, archiving and compliance tools, integration with Microsoft Office and Office 365, extensibility from public APIs based on industry-standard technology, and interoperability with other systems and devices. Lync provides users with a consistent, single client experience for presence, instant messaging, voice, video and a great meeting experience. Lync federation scenarios bridge business networks, increasing the potential for cities to communicate with each other, businesses, partners and citizens in new ways and in real-time. While Skype is best known for calling, users are also able to chat, use video, and share files and screens. By enabling Lync and Skype to connect to one another, IT can continue to manage a unified communications infrastructure without constraining the reach of end users.



3.3.3 Visualization Services

With visual representations of information, cities can display complex information in a concise visual flow, and help decision makers identify patterns and relationships. Visualization features enable city leaders, employees, businesses and citizens to interact with data and analytics, exploring results and refining

analysis. City applications that lend themselves to visualization services may include representing traffic or utility data, monitoring datacenter systems, visual analysis of citizen behavior, and performance analytics on maintenance costs.

Visualization capabilities include:

- Predictive analytics fueled by real-time data
- Semantic modeling over physical, business, IT and human systems
- Interactive charts and graphs that city teams can create in a self-service model

Today, more and more cities are being tasked with finding data to help support or drive their decisions. By providing employees and leaders with enterprise-class tools with which they are familiar, on familiar devices, and with data access at speeds that are faster than ever before, the right predictive analytics solution can help drive more accurate and timely decisions and enable a natural data-driven culture, while remaining compliant with data and privacy policies.

With this capability, cities can continue to improve processes, and apply intelligence and actionable tasks to achieve objectives, use semantic modeling across your city including physical infrastructure, business community, environmental systems, and citizens providing a single & accurate view across the city.

Power BI for Office 365 is a new self-service business intelligence solution delivered through Excel and Office 365 which provides employees, businesses and citizens with data analysis and visualization capabilities to identify deeper business insights from on premise and cloud data, in conjunction with Excel, SharePoint, xRM, and SQL Server enable Reporting and Analytic insights.

One way Microsoft solutions create insight is to combine business intelligence with web mapping platforms like Bing Maps, providing intuitive and cost effective data visualization capabilities. This can be enabled by using familiar reports (with embedded maps), tools (e.g. Spreadsheets), and websites to allow any users to access business insights in an intuitive manner. Microsoft solutions can provide a single view of complex information and data sets across multiple roles, locations, and user interfaces so that city teams can:

- Improve city communication, collaboration, and decision-making to increase the success of essential initiatives.
- Align IT and business to embed document and records management best practices into day-to-day processes and workflows.

**Visualization
in Energy & Water**

 **NW Natural®** *Geographic
Information Systems in*

Portland, Oregon, U.S.: The GIS platform developed by NW Natural for data modeling, customized programs, and tools for handling day-to-day processes required substantial time and resources to operate and maintain. They worked with Microsoft partner Schneider Electric to implement the open architecture ArcFM™ Enterprise GIS system, that was paired with existing GIS technology, and is highly configurable, customizable to accommodate multiple users, and enables NW Natural to leverage standard data models. Built on Microsoft SQL Server, Silverlight and the .NET Framework, the solution increased accuracy of information and smarter business decisions, improved efficiencies, and increased safety.

Solution Partner: 

- Facilitate transparency, responsible governance, and compliance.
- Embed risk analytics and reporting best practices into everyday activities.
- Coordinate responses to crisis and emergency management situations.

Cities need a holistic approach to enterprise risk, compliance, and oversight to help create a single, integrated way for all stakeholders, including citizens, to monitor and report conformance to agency and regulatory policies. With an enterprise-wide view of complex information and data sets across multiple roles, locations, and user interfaces, you can streamline processes and workflow, as well as improve collaboration and enhance analysis and reporting.

3.3.4 CRM/ERP Services

Microsoft Dynamics CRM Online is a flexible solution that helps cities increase productivity and strengthen relationships across customer service, case management, 311 services, tax compliance, crime prevention, permitting as well as other lines of business. With familiar Microsoft Office applications and easy-to-use tools, city employees are empowered to make connections across people, processes, and ecosystems resulting in a more productive and collaborative organization.

Microsoft Dynamics CRM Online equips cities with access to citizen and business information through a familiar Microsoft Outlook experience to help ensure rapid user adoption and fast results through a customer relationship management (CRM) solution that offers the following capabilities:

- **Citizen Care** - flexible segmentation tools, simplified campaign management capabilities, intuitive response tracking, and insightful analytics.
- **Investigative** - full contact (citizen/other) visibility, contact and issue tracking, streamlined approvals, and real-time forecasts.
- **Customer Service** - tools that simplify case management, streamline escalations, improve knowledge sharing, and enable more effective account management.
- **Extended CRM** - a flexible framework that helps organizations create custom business applications and industry solutions.
- **Social capabilities** - connect citizens, employees, partners, and customers through social networks and a variety of other communication and collaboration channels. Examples include Yammer, Skype, Lync and SharePoint in addition to seamless integration with Twitter and Facebook.
- **Innovations** - Dynamics CRM can be the easiest and fastest way to build new line of business applications that can be delivered through cloud, on premises, or hybrid deployment models.

**Visualization
in Public Safety & Justice**

Stronger Christchurch
Infrastructure Rebuild Team

Emergency Management in Christchurch, New Zealand: The Stronger Christchurch Infrastructure Rebuild Team (SCIRT) needed to harness the vast amount of data involved in coordinating re-build operations in Christchurch following the devastating earthquakes of 2010 and 2011. SCIRT worked with Microsoft Gold Competency IT consultancies Theta and Intergen to develop a single-portal, public cloud-based BI solution using tools supported by Microsoft SQL Server and SharePoint Server. The organization can now view and share detailed data analysis quickly and easily, as well as manage, digest and present the vast amounts of data collected each week.

Solution Partners:  

- **Enhancements in CRM BI** - harness the full Microsoft business Intelligence platform, unlocking new insights from CRM, social networks, cloud data and services.

The role-tailored experience of **Microsoft Dynamics ERP** gives your city employees access to the right information when they need it. When your employees can get their hands on data specific to their day-to-day jobs, they can be more productive. Microsoft Dynamics ERP is software that allows cities to manage their entire organization, including supply chain, procurement, human resources, financials, and projects. For example, the city's department of public works has quite a few materials that need to be counted and tracked so they can function. Because this solution touches so many pieces of a business, these ERP solutions collect data to provide you with insights into where you can gain efficiencies, cut costs, or make additional investments.

By deploying Microsoft Dynamics GP and NAV into Windows Azure, cities can take advantage of easy to use, quick to implement business solutions from Microsoft with the added benefit of knowing their solution is hosted on a secure, enterprise-class cloud infrastructure from a trusted provider. This means cities can now run Dynamics CRM and ERP applications hosted in a secure, private cloud or on a Windows Azure Virtual Machine. Microsoft Dynamics CRM gives cities the flexibility to decide the deployment model — with Dynamics CRM Online, you get the same powerful CRM software delivered as a cloud service from Microsoft, enabling instant-on anywhere access. End users can access CRM and ERP services using Web or desktop clients, either from the office or on the go using mobile devices. As an online service, the solution also delivers the additional benefits of:

- **Rapid time to value** - deploy solutions quickly and add users at a moment's notice.
- **Quality of service** - guaranteed uptime backed by a 99.9 percent service level agreement and online and phone support.
- **Cost predictability** - pay-as-you-go pricing that allows you to change capital expenditures into predictable operating expenses.
- **Management simplicity** - ongoing application monitoring and maintenance, and software upgrades.
- **Flexibility** - scale the number of users up or down, or change deployment type based on your needs.

Streamlining Processes in Government Administration



Buenos Aires
Gobierno de la Ciudad

Tax & Revenue in
Buenos Aires.

Argentina: Following a change in the city government of Buenos Aires, Argentina, officials created a new department dedicated to working with businesses that want to locate or relocate in the city. To support the department's operations, the city worked with Microsoft partner Accendo to deploy a custom solution based on Microsoft Dynamics CRM. With this solution, the department has streamlined processes, reducing the time needed for a project to meet formal requirements by more than 65 percent, and created a more transparent working environment. This eases the way for developments that generate jobs for citizens, boost tax revenues, and revitalize neighborhoods.

Solution Partner:





3.3.5 Productivity Services

The Microsoft devices and services platform enables city employees with the tools to make every minute count by getting more done every day no matter where they are located and what device they are using. Employees want help with simplifying tasks, connecting with others, and making smarter decisions, so they can get more done in less time. Cities are seeing the need for a new breed of business productivity applications that are very flexible and can quickly be tailored to address very specific city requirements.

Productivity is about being able to get stuff done from anywhere and on any device. You want to stay productive and connected to your business, documents & people with the device of your choice: PC, smartphone or tablet. For city employees to be truly productive, Microsoft productivity services encompasses collaboration, unified communication, office productivity and CRM and ERP services.

Examples of how these productivity services can be incorporated into a city are:

- **Healthcare** - Give health professionals virtually anywhere, anytime access to critical information, shared documents, and Microsoft Office applications, optimized for the best experiences across PCs, Macs, tablets, and smartphones.
- **Collaboration** - colleagues can work together in real time through voice and video calls, online meetings, presence and instant messaging, and HD videoconferencing. All to help speed decision making, reduce costs, and improve quality of lifestyle.
- **Critical operations** - Improving the difficult and inefficient process for managing variations to the outage management work schedule
- **Utilities and Services** - Improving customer service and compliance tracking for residential and commercial customers
- **Customer Service delivery** - Monitoring the quality of citizen service requests from a 311-type of service
- **Efficacy tracking** - Managing campaigns and effectiveness of customer energy conservation programs

Today Microsoft Office is already available across multiple devices, and we are taking it to the next level with the new Office, particularly on touch-enabled devices. This can allow government field workers and citizens to easily integrate and collaborate throughout the city jurisdiction. Part of having a great productivity experience is the ability to work whether you are online or offline, so you always have access to your inbox and documents in case you lose internet connectivity.

Due to our best of breed Office solutions, we have been recognized as an industry leader, by recognized industry analysts like Gartner.

Cloud is a transformational aspect for the new Office, as the new Office was re-architected for the cloud. This means that Office is now a service – available on-demand, it roams with you and is always up-to-date. The Office apps are now streamed from Office 365 to your Windows device (Windows 7 and higher) in real time, so you can start using the new Office in a few moments. You are able to split users or workloads between on premises and the cloud, so you can decide on the best migration path and pace, for your business. The new Office is always logged-in and saves to the cloud by default. When you sign into Office, you get roaming settings and quick access to your documents stored in SkyDrive, SkyDrive Pro & SharePoint online.

Last but not least, Office 365 is an enterprise-grade cloud productivity solution with robust security, guaranteed reliability and compliant with world-class industry standards, including ISO-27001, EU Model clauses, HIPAA and FISMA. Microsoft Office 365 provides anywhere access to your familiar Office applications, email, calendar, video conferencing, and most up to date documents across your devices.

3.4 Devices



Figure 13: Devices Layer

City solutions that leverage the capabilities of the Microsoft platform can address the need to be always available and device appropriate. The ecosystem of devices is vast and growing but can be divided into two distinct categories; those that are intended to be machine interfaces to other machines and those providing direct support to people. Many, if not most modern sensors embody both to some degree. Even GPS devices frequently have "smart" management integration. People - the most sophisticated

**Increased Productivity
in Transportation**

Airports, Railways & Ports in Hamburg, Germany:

Hamburg Port Authority (HPA) manages the largest port in Germany, which is the second largest in Europe. HPA wanted to take advantage of new devices and form factors to boost employee mobility and remove issues that could impede the effectiveness of employees working outside the office. HPA worked with Microsoft and its IT consulting partner, Blue Communications Software to upgrade to Microsoft Office 365 ProPlus to provide employees the ability to be productive on virtually any device from anywhere in the port. Moreover, by using the new deployment capabilities in Office 365 ProPlus, the IT staff mitigated the risk of compatibility issues disrupting the business and reduced by 75 percent the time administrators spent managing the Office deployment.

Solution Partner:

 Blue Communications Software®

sensor of all – who are usually consumers of information, have in recent years been generating huge volumes of raw data, by equipping themselves with devices that track their health, fitness, location, and activities.

3.4.1 Sensors and Embedded Devices

We are in the midst of an explosion of connected devices that generate and receive massive amounts of data. This trend is often referred to as the Internet of Things, and it is a key driver of the need for cloud and big data analytics services in the smart city market. These devices are not just PCs and mobile computing devices; a myriad of new device types are connecting, including powerful and low-cost sensors, controls and other devices deployed throughout buildings, power grids, water systems, and transportation systems. These connected devices can monitor various aspects of a city – air pollution, noise, traffic flow, weather information, radiation, both energy and water consumption, providing a live, digital representation of a city at any point in time.



Machine-to-machine (M2M) sensors include those that both produce and consume information. For example, building HVAC systems have sensors for temperature, humidity, and airflow, even parking sensors. Sensor information is sent to the computing application, whose algorithms can then adjust the levels of fuels, supplies, and processing rates. The Microsoft platform provides a means to onboard and manage M2M devices. Sensor networks can rely on the platform to route their information to identified storage, data analytics, and transactional systems in near real time.

Internet-enabled devices generate tremendous amounts of valuable data, transforming decision making for enterprises and revolutionizing the customer experience. Self-contained industry devices are being replaced by end-to-end solutions that transmit vast amounts of data to back-end analysis systems. These Intelligent systems are helping to realize the potential of the Internet of Things by optimizing business

intelligence with anywhere, anytime access to critical information. Together with the power and resources of the cloud, intelligent systems with edge devices running on Windows Embedded span companies, communities and countries within the Internet of Things.

Windows Embedded - Intelligent systems are revolutionizing organizational performance and Microsoft is focused on driving innovation in retail and hospitality, healthcare, manufacturing, and automotive industries. Customized solutions built with Windows Embedded harness Microsoft technologies to address specific industry needs by connecting devices on the edge of enterprise networks with existing IT infrastructures—on a single platform.

Whether digital signs or point-of-service terminals in a store environment, handheld devices, robots on the manufacturing floor, or thin client devices in hospitals, Microsoft-based industry devices transform business intelligence to actionable intelligence. Cities gain the ability to translate data into new insights that can be used to grow, expand and streamline operations, and improve interactions with employees, citizens and businesses.

Windows Embedded minimizes risk and complexity by providing one trusted platform with which to build solutions and broaden business opportunity. Windows Embedded fits with your needs, connecting data across a diverse set of technologies, providing compatibility across your existing and future systems, and enabling customization through a worldwide network of partners, to increase ease of use and drive efficiency. In addition, a Microsoft solution extends the intelligence of your organization, increasing opportunities for your workforce to act on data and insights that would otherwise be out of reach.

Kinect for Windows gives computers the ability to see and hear, and the capacity to take action from that input. With Kinect for Windows, thousands of businesses and developers are creating applications that put people first—allowing their customers to interact naturally with computers by simply gesturing and speaking.

Kinect for Xbox 360 changed the way people play games and experience entertainment. Now, Kinect for Windows is transforming how people interact with computers, kiosks, and other motion-controlled devices. From healthcare and physical therapy to retail, education and training, Kinect for Windows is making it possible for computers to work for us instead of the other way around.

**Embedded Intelligence
in Transportation**



Advanced Transportation Solutions in Paris, France: Syndicat Mixte Autolib' is an electric car-sharing program established by the city of Paris and 46 surrounding municipalities to relieve traffic congestion, reduce noise and air pollution, and provide people with more flexible transit options. Implemented by logistics company IER, the intelligent system based on Windows Embedded provides connectivity between the in-car system, registration and rental kiosks, charging stations and a central management system. Available around the clock, the solution has reduced carbon dioxide emissions by 1.5 metric tons annually and replaced 25,000 privately owned gas vehicles. By using Autolib', former car owners have cut their transportation costs by approximately 90 percent annually. Autolib' subscribers also enjoy an enhanced driving experience with GPS navigation, free parking and personalized settings. The flexible solution also simplifies implementation and minimizes deployment risk, which makes it easier for Autolib' to implement new features and services.

The Kinect for Windows SDK and toolkit contain drivers, tools, APIs, device interfaces, and code samples to simplify development of applications for commercial deployment. The SDK provides the tools that allow developers to create solutions using skeletal and facial tracking, and gesture recognition. Voice recognition adds an additional dimension of human comprehension. The SDK exposes an array of sensor data and provides developers with effective tools to optimize their use of that data: developers can access extended depth data and the sensor's IR emitter, and can control the custom color camera settings. Kinect Studio, a record and playback tool, enables developers to optimize the controls for a fine-tuned application.

The latest update to the Kinect for Windows SDK adds new Kinect Interactions that comprehend natural gestures such as "grip" and "push", and includes Kinect Fusion, a tool that creates 3-D reconstructions of people and objects in real time. In addition, resources such as the Human Interface Guidelines, and new samples—such as OpenCV and MATLAB—help developers build advanced Kinect for Windows applications by using industry standard libraries.

3.4.2 Smartphones, Tablets and Personal Computers

An increasing percentage of the world's population now possesses mobile devices such as cellphones, smartphones and tablets, which can be used to both deliver information to citizens and draw information from them.

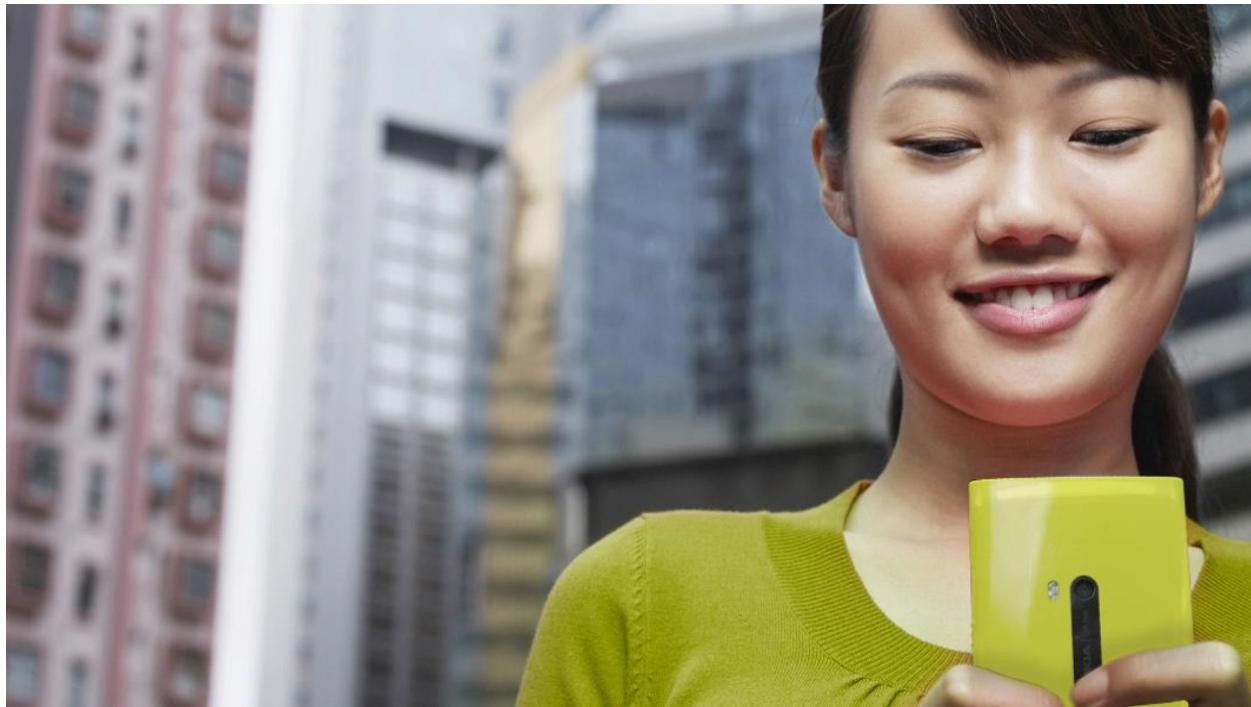
As technology plays an increasingly important role in people's personal lives, it is having a profound effect on their expectations for and use of technology in their work lives. People have access to powerful and affordable PCs and laptops, they are using mobile devices more and more, they expect "always on" connectivity, and they're connecting with each other in new ways using social networks. Ultimately, they have more choice, more options, and more flexibility in the technology they use every day, and as that technology spills over into their professional lives, the line between personal and professional is blurring. People want to be able to choose what technology they use at work, and they increasingly want to use that same technology in all aspects of their lives, not just at work.

For IT, it is about striking a balance between user expectations and organizational requirements. Consumer technology without a doubt poses some risks to the government and health organizations—such as to security, privacy and compliance. However, there are also many benefits. People love their consumer technology because it makes it easier for them to connect with each other, access and share information, and collaborate. To achieve the right balance—to minimize the risks and maximize the benefits—may mean embracing certain consumer technologies into the workplace and in others, it may mean providing enterprise alternatives that will keep both users and regulators happy.

Natural User Interface in Health & Social Services



Reflexion Health is on a medical mission to make physical therapy more effective for patients—and more measurable for clinicians. It paired Kinect for Windows sensor technology and software development kit (SDK) with its proprietary software to deliver an interactive solution that could help patients and physicians improve physical therapy results. The technology, which went into clinical trials in October 2012, makes physical therapy come alive by using the Kinect for Windows sensor and SDK to delivery customized therapy plans to patients.



Windows-based devices. As the devices continue to evolve and change so does the way that individuals interact with those devices. New scenarios are created at home and at work. The challenge for IT is to have the flexibility to evolve their scenarios to meet the needs of the way people interact with devices without compromising control and security. With a diverse range of devices based on the Windows platform, you can meet your enterprise requirements while delivering an experience that your employees will love.

Security and management. Our philosophy for our security and management platform is to help you manage this proliferation of devices with a single pane of glass, whether from management tools in your own infrastructure or from cloud services. We are expanding our management capabilities beyond Windows to the other platforms in use in your organization to help you protect your organization.

Application development. Application development is as important as ever. Moreover, as the technology industry moves to address this with next-generation applications, we are investing in tools that will simplify and enrich the developer experience within their familiar development environment.

Accessibility Microsoft leads the industry in computer accessibility innovation, which is particularly important for people who experience visual difficulties, pain in the hands or arms, hearing loss, and speech or cognitive challenges. For many citizens who have particular accessibility requirements, the chance to personalize their devices to meet their individual needs not only makes computer use possible, it improves their ability to participate in public discourse and take advantage of city services and educational opportunities.

Form Factor. Today's employees have tremendous choice in the devices they use to do their job. Hardware innovations are making devices smaller, lighter, faster and more secure than ever. There are thin, light tablets and ultra-portables that start and run faster than today's PCs. Smartphones will equal

PCs for diversity of design. Many of these devices will be optimized for touch, making computing more natural, engaging, and easy to use on the go. What does this mean for your organization?

Supporting organizational use of these new devices—whether personal or companion devices—will mean your employees can work on the devices they really want to use. For your field employees in particular, you can provide small notebook computers, tablets and smartphones so that people can access their information from anywhere, at any time, and perform day-to-day business tasks without having to return to the office or a workstation.

A full range of exciting new business-ready devices and form factors have been delivered to market this year with Windows 8. With Windows 8 tablets (specifically x86 tablets), users will no longer have to choose between convenience and productivity. Windows 8 is designed for touch, but a mouse and keyboard will still work great. Users can have the convenience and mobility of a tablet along with the power and familiar experience of a full PC and move effortlessly between work and personal activities. They can also have a connected experience with apps from the Windows Store while continuing to use the desktop LOB and productivity apps that they use today with Windows 7.

Furthermore, Windows 8 introduces new possibilities in mobile productivity. With Windows To Go, users can have a fully managed corporate Windows 8 desktop with them on a USB stick wherever they go. With DirectAccess, users can access the city network without a virtual private network (VPN) [now with easier deployment for IT]; and built-in mobile broadband in Windows 8 will help mobile employees get connected to the Internet more quickly.

In addition, Windows 8 offers the enterprise:

- Enhanced end-to-end security. From client device to network to back-end infrastructure, and from the moment you power on to the time you shut down, Windows 8 offers features to help improve the security and reliability of the systems in your organization.
- Management and virtualization advancements. Windows 8 includes enhancements to manageability and virtualization features to help IT administrators manage their client PCs.

Enterprise-ready smartphones will complement the new devices powered by Windows 8. Windows Phone 8 is not just a great phone; it is an extension of the Windows ecosystem and an integrated part of a Microsoft-wide mobile computing story. It is easy to deploy and manage in a Windows infrastructure so employees can communicate and contribute right out of the box. With support for on premises Windows Server, Exchange Server, SharePoint, and System Center Configuration Manager as well as Office 365 and Windows Azure, Windows Phone 8 fits well with what you already have and know. It is built on the same

Accessibility in Education



Santiago Chile: The Colegio San Benito primary-level school in Santiago, Chile, helped one of its students, who is blind, reach the top of her class by adopting accessible software from Microsoft. Instead of the specialized Braille typewriter the student previously used to complete her school assignments, she now uses accessibility programs in the Windows operating system, built-in tools in Microsoft Office applications, and compatible screen-reading software to participate fully in classroom activities and maintain a near-perfect grade point average.

trusted core as Windows 8 and has a built-in Office Hub, which means that your employees will have a consistent productivity experience across device types. You can also expect the same robust security technologies—such as trusted boot, full device encryption, information rights management and application sandboxing—on Windows Phone 8 devices to help you protect your data.

Surface Pro 2 and Surface 2 devices round out the user experience. Government, health and healthcare users will also love to use Surface devices. Surface devices feature long battery life; thin, sleek and light industrial design; and a high quality and predictable experience over time. The real advantage of Surface as a companion device for your users is that it shares a common base with Windows 8, so your people get a consistent experience with their primary Windows 8 PC. Surface also includes Office applications pre-installed—and you get commercial rights for use automatically if you already have Office licensed through Software Assurance for a primary device. You have the option to build your own LOB apps that run on both Windows 8 and Surface (which can be side-loaded to avoid making them public through the Windows Store), and Surface comes complete with support for VPNs and virtual smartcards, so you can enable access to the network.

Device Choice and Integration in Transportation



Airports in Bangalore, India:

Bangalore International Airport Limited (BIAL) deploys the latest technology and encourages employees to use state-of-the-art devices in the field. To integrate all those devices—irrespective of the form factor—with its applications, BIAL worked with Microsoft partner UFIS Airport Solutions to upgrade its operating system to Windows 8 Enterprise, which works well on touch and non-touch devices and helps increase productivity by 10 percent. BIAL also created a Windows 8 Enterprise-based business-to-consumer application that provides up-to-date information on flights and other services, such as parking and retail facilities at the airport, to help people with their travel plans. BIAL is developing additional apps for airport and flight operations and passenger services, which will integrate with any Windows device and allow employees to stay connected wherever they are.



4 Take That Next Step

4.1 Conclusion

Achieving your CityNext is about putting People First. The people and businesses who call a city home, and the people who visit, represent an integral part of the engine that makes a city function effectively. Citizens and businesses will be important innovators in the 21st century city. Giving citizens the tools to not only provide feedback, but also actively participate in the governance and development of services that evolve our cities will fuel sustainable competitiveness and prosperity.

City leaders are focusing on enabling sustained innovation for long-term competitiveness, not simply on making their cities "smarter." By making the most of their current IT investments, embracing flexible new technologies, and investing in their city's most valuable resource—its people—city leaders can empower government employees, citizens, and businesses to help shape a more vibrant future for their communities. This does not come by accident. It requires a holistic, strategic view and a clear roadmap outlining the logical, incremental steps city leaders can take to achieve their vision.

With a People-First approach and strategic partnerships, cities can enable self-sustaining cycles of innovation, opportunity, and progress for years to come. Microsoft and our global partner ecosystem is uniquely positioned to deliver the end to end devices and services capabilities that a city needs to span the consumer type demands of citizens through to the mission critical enterprise type demands of city operations. The result is a city that can compete on the world stage as a best place to live, work and play. What's next for your city?

4.2 Learn more about Microsoft CityNext

- Visit www.microsoft.com/citynext to learn more from the strategies, case studies, solutions, and other resources available there.
- Understand the overall Microsoft CityNext initiative by reading a complimentary whitepaper entitled [*CityNext: Enabling Real Impact for Better Cities with a People First Approach*](#).

4.3 Reach out to Microsoft or our Partners

- Engage experts within the extended CityNext community for guidance on technical and non-technical considerations, and for planning considerations.
- Ask for help from Microsoft and/or a CityNext partner. Solution experts from both Microsoft and our Partners are available to discuss how CityNext solutions can help address your priority challenges. They can conduct assessments to identify your current position relative to your goals, review proofs of concept, and help identify logical next steps that align with your unique needs.