Ajuntament de Barcelona

City Deploys Big Data BI Solution to Improve Lives and Create a Smart-City Template

Overview

Customer: City of Barcelona
Customer Website:
http://www.bcn.cat/en/
Country or Region: Spain
Industry: Government

Customer Profile
Founded in the third century B.C., Barcelona is the second-largest city in Spain with 1.6 million residents and approximately 14,000 employees.

Business Situation
Barcelona needed to be able to store and analyze Big Data to understand the needs of citizens and businesses. The city also wanted to provide a model Big Data and BI solution for other global cities.

Solution
The city engaged Microsoft partner Bismart to create a storage solution that runs in a hybrid cloud. Based on Windows Azure, Windows Azure HDInsight Service, and SQL Server 2012, the solution collects and examines Big Data from city and public sources.

Benefits
- Gains scalable Big Data tools and near-real-time BI
- Delivers anytime, anywhere access
- Improves quality of life
- Increases public safety and health
- Provides a model that can enhance global collaboration

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Barcelona, Spain, wanted better insight into government effectiveness. To achieve this, it needed a solution that could collect and analyze data from its systems and new public sources such as social media, software log files, and GPS signals. Working with Microsoft partner Bismart, the city built a hybrid cloud to store and analyze Big Data using business intelligence (BI) and data services based on Windows Azure, Windows Azure HDInsight Service, Microsoft SQL Server 2012, and Microsoft Excel 2010. Still in its pilot phase, the solution provides near-real-time insight into structured and unstructured data, and BI access using any Internet-connected device that can enhance services and business opportunities, improve safety, and boost collaboration between Barcelona, its citizens, and businesses. The solution also provides a smart-city template that might be used by other global cities.

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Power your business

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Director of Information, Municipal
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Situation

Considered a global innovator in trade, tourism, IT, and architecture, the city of Barcelona actively works to help shape its future success—and that of other cities— with technology. A host of the world's Smart City Expo, Barcelona is also establishing a repeatable, smart-city infrastructure that may be used to streamline civic planning, spur economic growth, and improve the quality of life for people around the globe.

Each of Barcelona's agencies uses a different system and third-party tools to manage processes including business intelligence (BI). Before 2013, this meant that staff had to manually compile disparate data to create insight into city services including transportation and emergency-response teams. Not only did these manual processes slow efficiency, but they also inflated costs. Similarly, citizens and business owners had to perform extensive research to understand which neighborhoods would be the best to live or invest in, based on indicators such as school performance and economic growth.

With the emergence of social media and other new technologies, huge volumes of public data had become available but were untapped by city personnel and citizens. This included unstructured information from services such as Twitter and log files from the city's website and mobile apps. Such data sources provide valuable insight into the services people require. Geo-positioning signals (GPS) recorded by Twitter and mobile apps reveal how people move about the city. "Using information from social networks and mobile apps is important to understand the needs and traffic patterns of people including tourists," says Albert Isern, CEO of Bismart. "This includes knowing where to place more public bike stations and security cameras, or which corners of the city need more restaurants and ATMs."

Collecting feeds from social media was not feasible with the city's existing IT infrastructure, because it was not flexible or scalable enough to manage input from large numbers of public, unstructured sources. In addition, the city's BI solutions could not automatically combine and analyze structured and unstructured data.

To facilitate progress, Barcelona decided to create an affordable, easy-to-use Big Data solution in a cloud. The city wanted it to accommodate unlimited amounts of structured and unstructured data and support any number of users and device types. "We are preparing for a new era where we can use Big Data to improve the quality of life for people through better services and economic growth," says Lluis Sanz Marco, Director of Information at the Municipal Institute of Information at the City of Barcelona.

Solution

After reviewing cloud technologies, Barcelona decided to build a pilot Big Data solution on the Microsoft platform. The solution uses Windows Azure, Windows Azure HDInsight Service, and Microsoft SQL Server 2012 Enterprise Edition software—as well as the Windows 8 operating system and Microsoft Excel 2010 spreadsheet software.

Commenting on why Barcelona chose to create and test a Big Data solution using Microsoft technologies, Marco says, "We've been working closely with Microsoft for more than 20 years, and so it made sense to use Windows Azure. And, we can analyze big and complex data at a reasonable cost in comparison with other massively parallel processing technologies using Windows Azure HDInsight." To help design and deploy its pilot Big Data solution, the city engaged Bismart, a Microsoft Big Data Partner and Microsoft Business Intelligence Partner of the Year.

In 2011, a team of engineers from Bismart and the city created a hybrid cloud, moving

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some departmental systems to Windows Azure, while keeping others in the city's private network. Barcelona also worked with Bismart to create three new services: Open Data, bigov Better City Indicators, and La Mercé. All three of these services, which are currently in pilot test, can help the city achieve its goals in providing better services and government transparency.

Open Data
To improve customer service and facilitate business opportunities using public data, the city worked with Bismart to create two Open Data services: one uses the Open Data Protocol and the other uses the Simple Protocol and RDF Query Language (SPARQL). The Open Data services collect all public information from Barcelona's City Hall systems in Windows Azure SQL Database. The data includes street maps and details about public facilities, population, contractor profiles, city calendars, the economy, businesses, and election results. In the future, engineers can configure Barcelona's website to use the services so that people can have a single source for government information. However, the city has already published the pilot versions of its Open Data Services on the Windows Azure Marketplace so that people can use them to create new mobile apps or other innovative, online services.

Bigov Better City Indicators
To increase government transparency, the city worked with Bismart to create a dashboard known as bigov Better City Indicators. Designed for use by government staff and citizens, the dashboard provides near-real-time views of 120 key performance indicators (KPIs) that measure data about topics such as administrative procedures; city services including public bike usage and the number of people using each bus route; the economy; and population demographics. To calculate the KPIs, engineers configured a database in Windows Azure that runs SQL Server 2012. It uses Microsoft SQL Server 2012 Analysis Services to analyze data from 100

systems—some in Windows Azure and some in the city's private network—using a tabular model. Engineers developed the dashboard using SQL Server 2012 Analysis Services and Microsoft SQL Server 2012 Power View. People can access the dashboard with a Windows 8 app and from the city's website (which runs on Microsoft SharePoint Server 2010). Bismart developed the Windows 8 app using Microsoft Visual Studio 2010 Premium development system, the Microsoft .NET Framework 4, and HTML5.

La Mercé
To streamline the planning of Spain's largest annual festival, La Mercé, and to test the feasibility of using Big Data, Barcelona worked with Bismart to create the La Mercé service. It can give government staff insight into structured and unstructured data related to the festival so that the city can improve the services that it provides and facilitate greater attendance. Collected data relates to the festival's entertainment and food venues, citizen interest and satisfaction, people mobility, and incident detection. The information can include feeds from social media such as pictures and tweets that people send about which events they like as well as issues that they have with parking or other services. Other data sources provide insight into credit card transactions, web site visits, customer service inquiries, GPS data, traffic status, weather data, and parking. The city can also gain insight into the number of people who entered the festival through a particular gate and statistics about medical emergencies and crime.

To manage large numbers of real-time feeds and petabytes of data, engineers used the Windows Azure HDInsight Service dashboard to set up Windows Azure binary large object (BLOB) storage, which runs on Apache Hadoop clusters. Currently, feeds are only from Twitter. However, Barcelona plans to add signals from other sources including Facebook, Pinterest, anonymous GPS data from cell phone providers, and

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generic information about bank transactions such as the time and location of ATM withdrawals. Engineers also used Windows Azure HDInsight to create a Hive data warehouse to compile subsets of data to streamline analysis.

To mine the data, engineers created MapReduce processes using HDInsight and JavaScript. The resulting BI is stored in a tabular database supported by SQL Server Analysis Services. Users can view the static BI and create custom BI with the data in the Hive warehouse from a workstation using Microsoft SQL Server 2012 PowerPivot for Excel, or from the city's internal website (which also runs on SharePoint Server 2010) using Power View. The BI can also be used to support mobile apps.

Benefits

By taking advantage of Microsoft technologies, Barcelona has created a pilot Big Data solution that can provide useful insight into petabytes of data anytime and anywhere to improve citizens' quality of life, uncover investment opportunities, promote public safety and health, and provide a possible smart-city template for other areas.

Gains Scalable Big Data Tools and Near-Real-Time BI

Barcelona now has an affordable Big Data solution that it can use to mash up information from its systems and new public sources, without worrying about running out of server capacity or slowing performance. "By using Windows Azure, HDInsight, and SQL Server 2012, we can collect, analyze, and generate near-real-time BI with Big Data collected from social media feeds, GPS signals, and data from government systems," says Marco. "As a result, we can better meet the BI needs of all of our departments and citizens today and gain the flexibility to add new data sources in the future." Not only can the city provide citizens with a more open and transparent government, but also

employees can work and manage city data more efficiently.

Delivers Anytime, Anywhere Access and Boosts Efficiency

With the Microsoft solution, employees can access the information they need faster, from any location. Marco explains, "We can significantly boost the productivity of our staff in offices and in the field with our new Big Data solution. People can use Power View, SQL Server PowerPivot, and Windows 8 mobile apps to explore all kinds of data and gain instant access to BI including the bigov dashboard, using any device." Citizens can also find the services that they need or entertainment that they seek faster through the city's website and mobile apps it they use the Open Data service.

Improves Quality of Life and Business Opportunities

Delivering the free Open Data services also provides opportunities for companies to create new apps and online services. In addition, being able to make sense of Big Data significantly improves the services the city can provide because staff can better identify the needs of people based on records in government systems, social media, and GPS signals that reveal how people move about the city.

For example, Barcelona can use its increased data insight to improve its public bike rental stations, a program known as 'bicing.' As Lluis Sanz Marco says, "One of the problems in the big cities like Barcelona is transportation. We follow the tracking of the buses, but also we follow the tracking of other transportation like bicing. By processing the data, we know we can gain the insight needed to distribute bicycles in a different way so that people can use them to connect with other forms of transportation such as busses and trains. In addition, we can give people more options for public transportation and so create a more sustainable model."

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With the increased insight, users can also more easily recognize potential investment opportunities. For example, an area with heavy congestion during lunch may need more fast-food restaurants. All of these insights ultimately foster better lifestyles for citizens and economic prosperity.

City personnel can also use the La Mercé BI service to make future festivals better by mining the data from last year's festival and identifying attendees' movement patterns and opinions about entertainment venues, sanitation, transportation, restaurants, and even banking. Marco explains, "We're trying to understand where people might need public busses or bikes around-the-clock or where we need to add more parking by analyzing Big Data with Windows Azure HDInsight. We can also pinpoint which musical groups people would like to see at La Mercé by examining social media comments and the number and type of music downloads."

Increases Public Safety and Health
By looking at more data from more sources, the city can modify how it staffs and positions police, fire, and medical resources to meet day-to-day requirements and what resources are needed to manage emergencies. City employees can also respond to emergencies faster and gain the ability to immediately increase public transportation services, especially during city festivals, based on the near-real-time insight gained with the new solution. As Marco explains, "We can use Windows Azure and SQL Server 2012 to evaluate city processes and make them more efficient. We can also scrutinize the resiliency of our city in responding to unpredictable situations and streamline our procedures so that we can address problems in the shortest time possible."

Provides a Model That Can Boost Global Collaboration
With its new Big Data solution, Barcelona can facilitate greater collaboration with citizens, business owners, and tourists. The city is also sharing its solution infrastructure with the City Protocol Society as a possible Big Data BI template that other cities can adopt. If the solution is adopted by the society, other member cities can use the same KPIs to evaluate services, making it possible for people to compare areas around the world using the same tools for calculating metrics about categories such as economy, health, education, culture, entrepreneurship and opportunity, environment and energy, governance, transportation, social capital, and public safety. "Our Windows Azure Big Data and BI solutions are really international projects," says Marco. "Along with helping our city, they could be the foundation for a smart-city infrastructure proposed by the City Protocol Society. If accepted, other cities could use the framework to improve services and help people around the globe determine where they want to live and invest by drawing comparisons between locations."

Unlock insights on any data

Microsoft business intelligence (BI) solutions simplify access to virtually any type of data, whether it resides in the business or the cloud. Powered by Microsoft SQL Server, and built into familiar programs such as Microsoft Excel, BI tools speed insight into data from multiple sources, including business applications, blogs, and sensors.

For more information about unlocking insights on any data, go to:
www.microsoft.com/en-us/server-cloud/data-insights

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For more information about Bismart products and services, call +34 931786880 or visit the website at:
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