



Research Report

IBM's Smarter City Initiative

Introduction

For the past 16 years *Clabby Analytics* has presented technical educational seminars on a wide variety of computer related topics at eGovernment events in Dubai, UAE. In the 1990s we taught government departments and agencies about communications and networking, file and print serving, systems and servers, the Internet, and databases. As the years progressed, we taught attendees about service-oriented architecture and Web services (program-to-program communications), infrastructure, applications, and security. And this year, our focus will be on virtualization and cloud architecture — and on a new concept in the region: “*smarter cities*”.

This smarter cities concept is extremely important to city governments in the Middle East — and to city governments all around the world. Thanks to the worldwide economic downturn of 2008, city governments have been strapped for cash — and have sought to overcome budget shortfalls by discontinuing services, by charging fees for certain services, through layoffs, and by increasing taxes. The smarter city initiative is about finding innovative ways to more efficiently deliver services as well as contain costs. Its very essence is about managing data more efficiently and analyzing that data automatically — and by so doing, cities can reduce operating costs while improving service levels for citizens. It does this by integrating data across city departments, and thus delivering a shared view of that data.

At the heart of the smarter cities discussion is data capture, pattern detection, and analytics. Using smarter city technologies, city officials can capture data relevant to their specific job functions (for instance traffic control), identify changes in patterns (such as traffic congestion), and then take action to return the city to its status quo (for instance, routing traffic around a congested area). This data capture/pattern detection/analytics technology can be used to streamline numerous city government activities, including water management, public safety, building, energy management, and transportation.

IBM is the creator of the smarter cities initiative. With over 2,000 services engagements IBM has found repeatable patterns in many of these engagements and have begun to bundle them into standard software offerings. The first of these offerings is the Intelligent Operations Center. IBM also plans added offerings, beginning with managing city transportation, public safety and water. These offerings will plug into the Intelligent Operations Center.

What IBM has done is it has architected a dashboard-driven command center that can gather data from multiple sources, analyze that data, issue alerts, and create and track workflows until a given situation is resolved. At present, IBM has twenty-five different city use cases that it can manage — and more use cases are on the way. The name of this command center is *IBM's Intelligent Operations Center for Smarter Cities*. The remainder of this *Research Report* describes this command center in greater detail and demonstrates why cities should strongly consider adopting smarter cities solutions to help drive down costs while improving service delivery.

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Why Build a "Smarter City"?

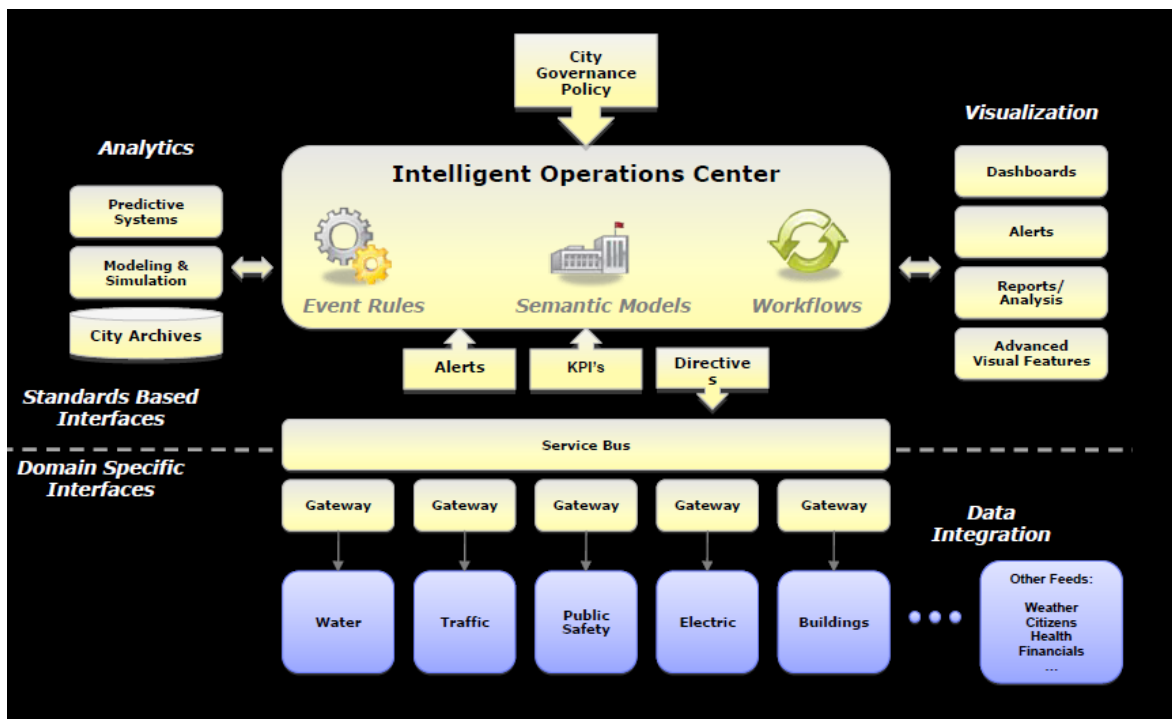
Cities around the world are growing. More and more people are moving into metropolitan areas — increasing the strain on existing city infrastructures. And as the population increases, demand for services increases. And as demand for services increases, operational costs rise (for instance, increased population requires expanded police and fire support — and more healthcare support). To pay for these services, cities need to raise money — and they do so by charging fees for services, and by through taxes. And sometimes, when budget shortfalls occur, cities actually cut back on services, eliminating some services altogether, and/or cutting headcount through layoffs.

IBM's smarter city initiative can help cities cope with increased demand for services by helping cities operate more efficiently. IBM information systems combined with IBM software products and best practice policies and procedures can help city managers leverage information, anticipate problems, and coordinate resources. And this leads to greater operating efficiency and lower operating costs.

How Does IBM's Intelligent Operations Center Work?

Figure 1 shows a schematic that diagrams how IBM's Intelligent Operations Center for Smarter Cities works.

Figure 1: IBM's Intelligent Operations Center for Smarter Cities



Source: IBM Corporation — June, 2011

To understand how this product works, start at the bottom. Data can be captured from numerous sources, including from instruments (such as water meters or traffic lights), from archived data bases (such as those that contain building information), from Internet social media, from third-party feeds (such as weather feeds) — and more. This data can also be found in numerous forms — such as traditional organized databases, written reports, voice,

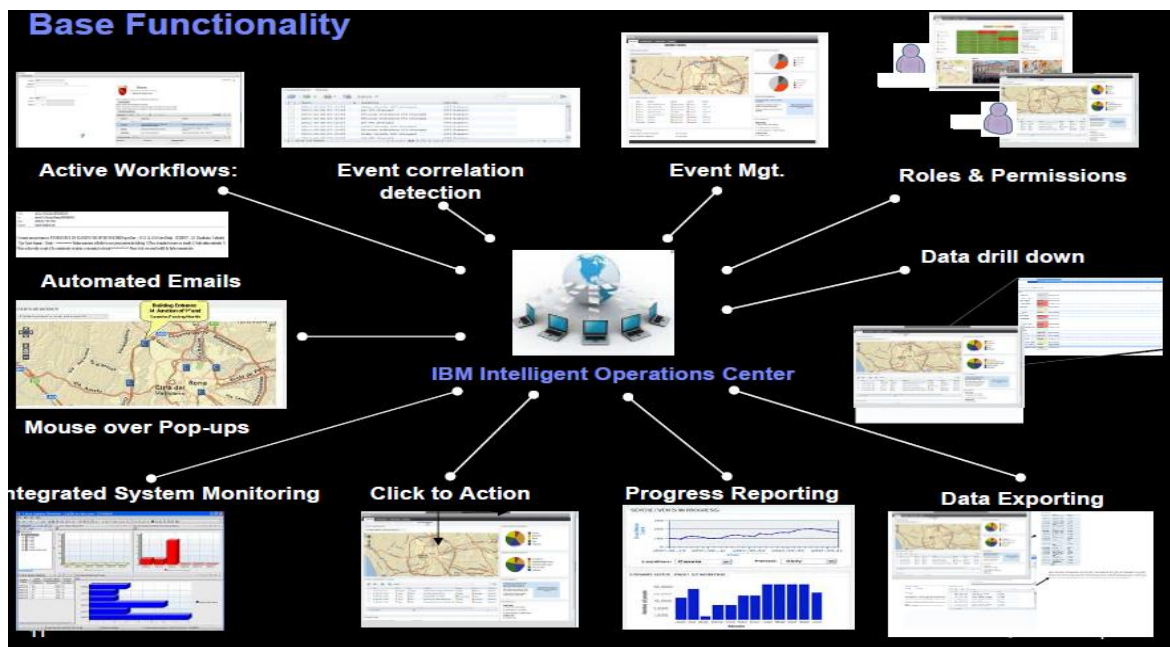
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video, and streamed data formats. IBM's DB2 database can be used to organize this data in various IBM and analysis tools (including products such as Cognos and SPSS) can be used to analyze this data. IBM middleware products such as WebSphere can be used to help build service bus (shown in the middle of the diagram) that enables this data to be shared across departments or across agencies (provided proper permissions are obtained). Above the service bus is IBM's Intelligent Operations Center for Smarter Cities — the product that keeps event rules (and can identify changes in patterns), semantic models (for dealing with different types of data), and that practice workflows from initiation through completion. The operations center makes use of analysis products (shown on the top left) to detect pattern changes — and can then issue alerts, track workflows, issue reports, and provide advanced visual features (shown on the right) in dashboard form to managers and administrators.

What is really important to understand about the way that this product is architected is that IBM may be the only company in the world capable of building an integrated data gathering/analysis system such as this. IBM is a leader in database technology; has unique and patented streaming technologies (for capturing real-time data streams and parsing out only the relevant information needed by users); IBM is the market leader in middleware; and IBM has invested heavily in business analytics software (to the tune of over \$4 billion over the past four years). Add to this the fact that IBM has technology for tracking workloads, and for managing assets — and add the fact that IBM has deep experience in serving the public sector (and understands public-sector workflows) — and you may come to the same conclusion that Clabby Analytics is come to: no other vendor has the products and technologies needed to build as advanced a data management/analysis system as IBM.

Figure 2 describes the base functionality that can be found in IBM's Intelligent Operations Center. Note that all of this functionality is highly integrated, making it straightforward to manage and analyze data — and to share that data with other organizations that may benefit from it.

Figure 2 — Base IBM Intelligent Operations Center for Smarter Cities



Source: IBM Corporation — June, 2011

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Use Cases

In the previous section we described how IBM's Intelligent Operations Center for Smarter Cities works. In this section we describe how some cities are making use of this product to manage emergency services, to manage water supplies, and to manage social services. Rio was one of our early services customers that we used to build IOC. Rio has not shifted over to the IOC code bundle. Alameda is one of our social services smarter cities services engagements. What we learn from Alameda may become a social services bundle that would link into the IOC. DC Water is a water management services engagement. What we learned from DC Water will become a water management bundle that will link into the IOC.)

Rio de Janeiro (Soon to Host the Olympics and World Cup)

Over the past few years, Brazil's Rio de Janeiro torrential downpours and flooding. These natural events made it difficult to deliver public safety services. And soon, Rio will host two major sporting events — the 2016 Olympics, and the 2014 FIFA World Cup. Rio government officials know that they can ill afford to have a breakdown in public safety systems when hundreds of thousands of visitors make their way to Rio for these events. Accordingly, Rio is very interested in any technologies that can automate and streamline the provisioning of services to citizens and visitors.

Rio city officials use IBM's smarter cities technologies to track weather conditions and to deploy safety services. Granular information on storms is gathered (using IBM weathering technology and third-party data feeds) to predict the path of storms. Sensor technologies, citizen reports, public safety reports, and other sources of information are fed into IBM's operations center — where patterns are analyzed. Analysis tools isolate problems, issue alerts, set up workflow tracking, and help operators get resources and assets where they are needed. Predictive analysis can also be used to initiate evacuation procedures. Using IBM's operations center, city officials can now predict with a high degree of accuracy where problems will occur — and can respond more quickly than ever before to emergency situations.

Alameda County, California

Alameda County (located near San Francisco) was having difficulty managing and analyzing vast amounts of information pertaining to social services. Its social services organization had 1200 caseworkers — each with about 600 clients. These workers were responsible for setting up the distribution of food stamps, welfare checks, foster care and other programs. From a performance perspective, Alameda County was ranked last in the state.

Part of the problem that Alameda County faced was that its social workers were manually sharing data between multiple departments — they did not have a holistic view of the clients it served. And because they did not have a holistic view of clients, overpayments were being made.

By installing IBM's Intelligent Operations Center for Smarter Cities, Alameda County was able to gather information from numerous sources, create a holistic view of its clients, and

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eliminate overpayments. The way that they did this was to search for patterns such as redundant Social Security numbers. Analysis could then be performed on whether a particular person qualified for certain benefits, or whether a particular person was being overpaid. By using this system, Alameda County has been able to save \$25,000,000 (and the return on its investment in IBM's operation center was measured in a few months).

DC Water and Sewage Authority

Clabby Analytics had the pleasure of listening to an executive from the DC Water and Sewage Authority speak at IBM's information on demand conference last year. He described staggering size of water infrastructure in Washington DC — noting that the city had pipes dating back to the 1800s still in place. The big problem that this water authority constantly faces is how to get information on the age, status, and condition of this water infrastructure.

The DC Water and Sewage Authority makes use of sensors and instruments to monitor water flow and condition. When a problem is identified, the crew can be dispatched to quickly remedy that problem. Again, what IBM's Intelligent Operations Center for Smarter Cities is doing is looking for patterns changes (variations from the norm) such as constricted water flow. Alerts are sent to operators — and were crews are dispatched. Additionally, the system that DC water uses will let the crews know if there are any tier 2 or three problems in the area — so that other customers can be served when a tier 1 problem has been addressed.

Clabby Analytics also had the pleasure of listening to officials from the city of Malta as they described how they use smarter city sensors and monitors to distribute water throughout Malta. Again, the story was similar to DC Water and Sewage — data was gathered from sensors and monitoring devices, and pattern analysis showed where problems were occurring — and resources were dispatched rapidly to address those problems.

We also journeyed to Riyadh, Saudi Arabia, where government officials described how they were using smarter city technologies to modernize cities and to improve service delivery. IBM claims to have over 2000 smarter city deployments at present.

Deployment and Cost

IBM provides its customers with three deployment options for its operations center:

1. On premise;
2. shared services (multiple agencies sharing multitenant will like environment); and,
3. cloud delivery (run and managed by IBM for customers cities).

IBM's on premise option is for customers who want to run their own operations center. IBM helps them standardize their infrastructure, gather data, put analytics tools in place, and do any customization that the customer may require. For example, the IOC has open APIs for existing data that cities want to integrate.

IBM's shared services implementation helps IBM customers defray costs by joining together to use smarter city technologies (a shared tenant arrangement). To exemplify this

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concept, IBM used the Sonoma County Water Authority as an example. Sonoma County is known for winemaking — and winemaking utilizes a lot of water. IBM offered its smarter city technologies to nine communities within Sonoma County — and greatly improved water resource usage and water management accordingly.

IBM's smarter city cloud service offers customers the ability to offload certain city management services to IBM using a hosted services model.

When considering smarter city technologies, IBM recommends city managers build a top-down strategy by taking the following steps:

1. Determine top goals and objectives;
1. Understand systems relationships;
2. Compare a city's performance to other cities (to establish a benchmark);
3. Evaluate operational maturity (make sure that workers buy-into the deployment of new technologies that will help them); and,
4. Develop actionable roadmaps (create a specific set of projects).

As for cost, IBM offers different pricing structures. For instance, if the customer uses a hosted service, the fee could be based on what's running in a particular environment (for instance, the number of pipes being monitored). Or, the fee could be based on the number of users and size of the environment.

Summary Observations

Smarter city technology enables cities to find and isolate problems using analytics tools — and associated workflow technologies enable those problems to be tracked till resolution. In discussions with smarter city customers, as well as in use cases shared by IBM with *Clabby Analytics*, we note a familiar pattern:

1. Cities rationalize their databases and establish feeds (this makes data easier to manage);
2. Problems are identified when a pattern changes.
3. Analytics tools pick up on that pattern change and initiate alerts.
4. Workflow software kicks in to track progress and problem resolution.
5. Cities return to normal operations upon problem resolution — until another pattern change takes place...

What IBM is doing is it has built a highly integrated system environment that is capable of automating these five steps. IBM has deep domain expertise in the public sector — and is developing 25 city solutions that solve challenging problems within the city's infrastructure. These integrated solutions have the net effect of driving down city's

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operational costs — while at the same time improving city service delivery. IBM's deployment and cost models make it possible for cash strapped cities to afford smarter city technology. For cities of all sizes that are looking for ways to deal with funding problems, IBM's smarter cities technologies represents a way to reduce costs while improving services.

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