# IoE-Based Rio Operations Center Improves Safety, Traffic Flow, Emergency Response Capabilities



## EXECUTIVE SUMMARY

### Objective

- Improve safety and incident response
- Coordinate/integrate operations of multiple agencies

### Strategy

- 1) Collect information from sensors such as rain gauges, radar sensors, bus GPS systems, images, social networks, and other sources; 2) analyze information to make operational decisions; 3) disseminate information to the population, alerting citizens of disasters or other problems

### Solution

- Rio Operations Center integrates information from multiple government agencies and private sources to improve city safety and incident response
- Center uses social media, news outlets, and sirens to give emergency instructions. Also provides routine information services such as traffic flow and vehicle accident information, as well as updated commuter wait times.

### Impact

- More than 50 city agencies connected, with integration of agencies' pertinent data. Result: more cooperative and efficient relationships among city agencies.
- Faster dissemination of traffic and transit information to commuters, buses, and taxis. Result: smoother traffic flow and better travel experience for commuters and users of public transportation.

## Background

In January 2014, Cisco released the results of an in-depth analysis of the economic benefits of the Internet of Everything (IoE) for the public sector. Cisco's model revealed that some $4.6 trillion in "Value at Stake" would result from the adoption of IoE capabilities across 40 key public sector use cases over the next 10 years, including smart water, smart buildings, smart energy, smart parking, and more (http://bit.ly/1aSGlzn).

As a next phase of its analysis, Cisco engaged Cicero Group, a leading data-driven strategy consulting and research firm, to undertake a global study of IoE capabilities across these 40 use cases — how the best public sector organizations are "connecting the unconnected," as Cisco terms it. To that end, Cicero Group conducted interviews with dozens of leading public sector jurisdictions — federal, state, and local governments; healthcare organizations; educational institutions; and non-governmental organizations (NGOs) — to explore how these global leaders are leveraging IoE today.

The research examined real-world projects that are operational today, are being delivered at scale (or through pilots with obvious potential to scale), and that represent the cutting edge of public sector IoE readiness and maturity. The aim of the research was to understand what has changed in terms of the jurisdictions' people, processes, data, and things, and how other public sector organizations can learn from (and replicate) the trail blazed by these global IoE leaders. In many cases, these jurisdictions are Cisco customers; in others, they are not. The focus of these jurisdictional profiles, therefore, is not to tout Cisco's role in these organizations' success, but rather to document IoE excellence, how public sector entities are putting IoE into practice today, and to inform a roadmap for change that will enable the public sector to address pressing challenges on multiple fronts by drawing on best practices from around the globe.

 

## About the Rio Operations Center

Establishment of the Rio Operations Center grew out of catastrophic flooding and landslides that occurred in Rio de Janeiro, Brazil, in 2010. The Center's job is to integrate information from multiple government agencies and private sources to improve city safety and incident response. Incidents that it manages range from public utility problems and public transit issues to emergencies and disasters. It also acts as an operational hub for coordinating safety and security at large events, such as Carnival, the 2014 World Cup, and the upcoming 2016 Summer Olympics.

Connecting agencies centrally allows Rio to coordinate communications and actions to events that affect the public. It uses social media, news outlets, and sirens located throughout the city to give emergency instructions. It also provides routine information services such as traffic flow and vehicle accident information, as well as updated commuter wait times.

Alexandre Cardeman is executive director for the Technology Department at the Centro de Operações Rio (Rio Operations Center). Previously, Mr. Cardeman was vice president at IPLANRIO. He has 32 years of experience in the public sector, working as a coordinator for the Pan-American Games and for the Brazilian Olympic Committee. He earned a master's degree in computing networks and another master's in public policy.

Thompson L. Pacheco is an IT manager for IPLANRIO, the city-owned IT company that works in association with the Rio Operations Center.

Begun in 2010, the initiative is based on three pillars: 1) collection of information from sensors such as rain gauges, radar sensors, bus GPS systems, images, social networks, and other sources; 2) analysis of information to make operational decisions; and 3) dissemination of information to the population, alerting citizens of diasters and other problems.

## Objectives

Following the floods, landslides, and avalanches that caused the deaths of more than 300 people in 2010, Rio Mayor Eduardo Paes decided that the city needed a center of operations to coordinate efforts to improve city safety and incident response. "He wanted to create a center where several agents would be present, and their efforts would be coordinated in a unified and integrated way," Mr. Cardeman explained. "This required connections to bring data from the outside sensors into the operations center, and it also required that information be sent from the center to reach the population."

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The mayor asked that the Center be completed in advance of 2014 World Cup, so that it could be used during that event as well as the upcoming 2016 Olympic Games.

Rio Operations Center developed an "information architecture" by gathering existing information – both from the private and the public sectors – that was relevant to crisis and risk management. This information included databases, images, transit

 

mapping, transformer locations from electric power providers, and information from providers of special roads, the metro, and buses. “There was information about different events scattered in different offices,” Mr. Cardeman explained. “When we started ... there was the metro system, businesses, the railway, all the concessions that provide public service in Rio, and they all started sending information. But they were all isolated from each other. When we started the Center three years ago, we had about 20-30 layers, and today we have more than 250.”

Since its inception, the Center has managed events such as World Youth Day, Military Games, Rock in Rio, Carnival, and planning for the World Cup. “It is constantly being updated because every day new information comes: new needs, new sources, new ways to disseminate the information to social networks, TV, SMS, Otape, new technologies, and so on,” said Mr. Cardeman. “There will always be the need to adjust to these new technologies, to seek innovation, and to remain up to date.”

This media and Operations Center outreach means that citizens of Rio de Janeiro can see the direct, day-to-day impact of the Center on their own lives, both from an emergency response perspective and as a tool to aid travel within the city.

## Strategy

The Rio Operations Center has a mission to keep the citizenry informed at all times – 24 hours a day, 7 days a week. Radio stations transmit directly from the Center, and the Center has a Twitter handle to disseminate pertinent incident information in real time. Citizens can also Tweet requests for information from the Center. All final information is made publicly available. This media and Operations Center outreach means that citizens of Rio de Janeiro can see the direct, day-to-day impact of the Center on their own lives, both from an emergency response perspective and as a tool to aid travel within the city.

The city of Rio de Janeiro manages the Rio Operations Center, while the Center itself is responsible for day-to-day operations and coordination with city and state agencies. IPLANRIO is a technology company owned by the city that provides IT to all government agencies.

Rio de Janeiro’s city government funded the Rio Operations Center. The assets are now owned by the Operations Center, under control of the city government’s executive branch.

Most of the public relations for the Rio Operations Center developed organically, due to the press’s curiosity about the Center. After a Brazilian television network did stories on the Center, national radio and foreign press gained interest, and Mr. Cardeman says they “left with a good impression and started spreading the news. The exposure increased during these three years to where we are now.”

According to Mr. Pacheco, “The Center turned into a meeting point for the media .... It resulted from the interest of the media in the information we have available. So all the media – the press, social media, TV, radio, and so forth – started meeting at the Operations Center. All this resulted in publicity without any previous planning.”

 

## Solution

The Operations Center collects layers of data from multiple sources to monitor events in the city. Sources of incoming data include security cameras, water and rain gauges, private maps, traffic signal data, the electricity grid, traffic controls, public transit vehicles, and social media feeds such as Twitter and Waze. The Center employs more than 400 staff, and operates 24 hours a day, 7 days a week.

To date, there are about 600 cameras installed throughout the city. Some are connected through fiber-optic cables, while about 200 deliver images wirelessly. More than 10,000 collective and municipal vehicles are monitored by GPS.

"We also have a network of rain gauges, scattered all over the city, that send information to the Center through a telemetry system. We have mapped landslide areas – that is, populated places that are at risk for landslides – so there is a relationship between the level of rainfall in millimeters and the risks. So, we have rain gauges and sirens that are triggered from the Operations Center to alert the population to leave their homes and go to already-mapped secure places."

Alexandre Cardeman,
Exective Director, Technology Department,
Rio Operations Center

The Rio Operations Center itself has 80 screens that display data in real time. The Center uses a system called Geo Portal, a geo-referenced system that helps map the various data sources collected by the Center. Geo Portal also allows the Center to aggregate and view information from different city areas in new ways. There are currently 250 different layers that can be used.

"It is a large information panel with a Google map, and all these assets and objects are already mapped," said Mr. Cardeman. "When you are able to map layers, you can better understand the situation in an incident area. This allows you to make strategic decisions, to coordinate, to make operational plans, contingency plans, and risk analysis, with the observed area in mind."

To prepare for rain- and water-based natural disasters, sensors or cameras at key waterways monitor water levels. "When it rains, we find the balance between the level of rainfall and the water level of the rivers," Mr. Cardeman explained. "There are some critical places in the city where we installed cameras with a visual gauge that monitors how many meters the water will rise from the road and what roads need to be open or closed so people can circulate." Data from the sensors is transmitted through a 3G network.

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Buses, taxis, and metro rail are equipped with GPS sensors that allow the Operations Center to monitor movements and locations. If a problem occurs in a metro station, the Center can locate taxis and buses available to compensate for the metro stoppage. The city is planning on constructing its own network for telemetry traffic control, in addition to radio communication.

Other information layers include location information on schools, hospitals, and police station locations.

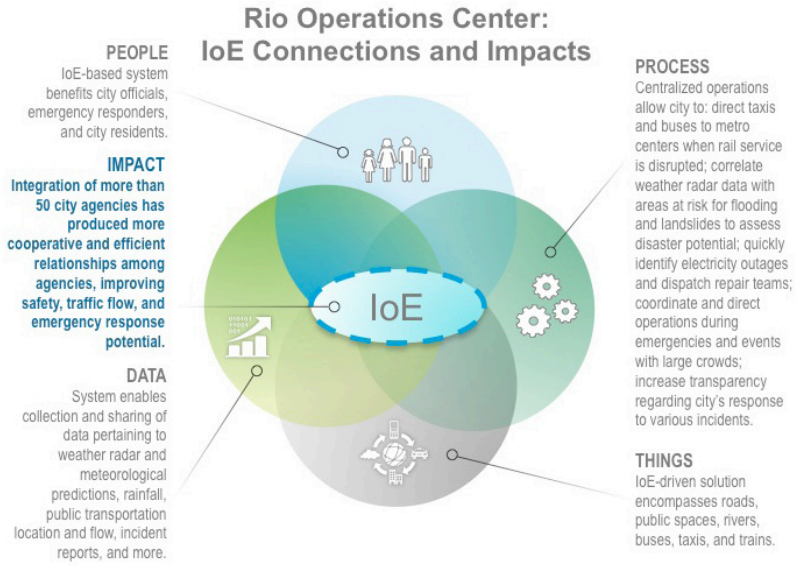
 

Rio has three telepresence systems, which have been used during crisis management situations. One telepresence system is installed in the Operations Center and two are installed externally – one for the municipal civil defense secretary, and one in the mayor's personal residence.

Rio Operations Center uses a LAN network in the building, both cabled and wireless, along with a "coy" and a 4507 Distribution Switch with five segments of 10 gigabytes. The data processing is handled at IPLANRIO's data center, which has a 20-gigabyte fiber-optic connection.

More than 50 city agencies have been connected, and pertinent data from the agencies integrated, due to the Operations Center. This allows more cooperative and efficient relationships among city agencies.

**Figure 1.** Rio: New and Better Connections.




Source: Cisco Consulting Services, 2014

## Impact

More than 50 city agencies have been connected, and pertinent data from the agencies integrated, due to the Operations Center. This allows more cooperative and efficient relationships among city agencies. The Center has also connected the city to commuters in new ways. Because of the center's relationship with the press, traffic and transit information can be disseminated quickly. Commuters can also access real-time updates via social media, and the city can respond to metro train delays by alerting buses and taxis in affected areas to converge on locations to pick up commuters.

"Citizens today have access to accurate information of what is happening in the city," Mr. Pacheco said. "It could be a simple traffic accident or a catastrophe, and the evolution of all this is what really matters." An unintended benefit is that the center has also connected media outlets to the city government, creating transparency and an ease of releasing information. "It is interesting that the Rio Operations Center also turned into a media or journalism center because all the information that reaches the Center. We see it as information to the public. There is

a study about what takes place at the Center, like print journalism, social media, TV and radio .... These journalists are very important in disseminating the information."

## Lessons Learned / Next Steps

Implementation of the Rio Operations Center was a lesson in patience. "You need to develop an internal policy to obtain data and information, and that doesn't come right away," said Mr. Cardeman. "Things don't happen in the short term, but over time through maturity, processes, and achievements .... It took us three years to get here." He says obstacles from dealing with government agencies, information, and masses of data require careful planning. It is integral to have an up-front agreement about duties and how agencies will perform. "You need to define a responsibility matrix because when you combine all of the agencies, everything needs to be transparent. Otherwise, you will be dealing with conflicts the whole time – management and/or responsibility conflicts."

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The support of the executive branch was vital for Rio Operations Center. This top-down effort allowed proper oversight and diligence to ensure project support and completion. "Our mayor ... had meetings almost every day, wanting to know every detail about the Operations Center," said Mr. Cardeman.

Mr. Pacheco says the executive branch must be aware that considerable investment is necessary to properly complete the project. "The lack of an investment plan – not only the initial investment at the inauguration, [but a] plan to update technology and processes – might result in the loss of the initial investment."

Rio Operations Center is in the midst of gathering performance indicators to pinpoint what is succeeding and what can be improved. In addition, the Center recently hired business intelligence analysts to study city behavior in hopes of making improvements in that field. The Center is working on city and environmental management plans, and wants to partner with NASA to exchange information about climate change. "We want to grow our base of analysis," Mr. Cardeman said. "We are creating development research, trying a partnership with Google using Google Glass on the streets."

Rio Operations Center is also creating an open-data policy, so that all information of benefit will be available to the population for personal or commercial use (such as application developers). For this project, layers of APIs and data dictionaries are being used so that information can be easily searched.

## More Information

For more information, visit http://www.rio.rj.gov.br/web/corio

 

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