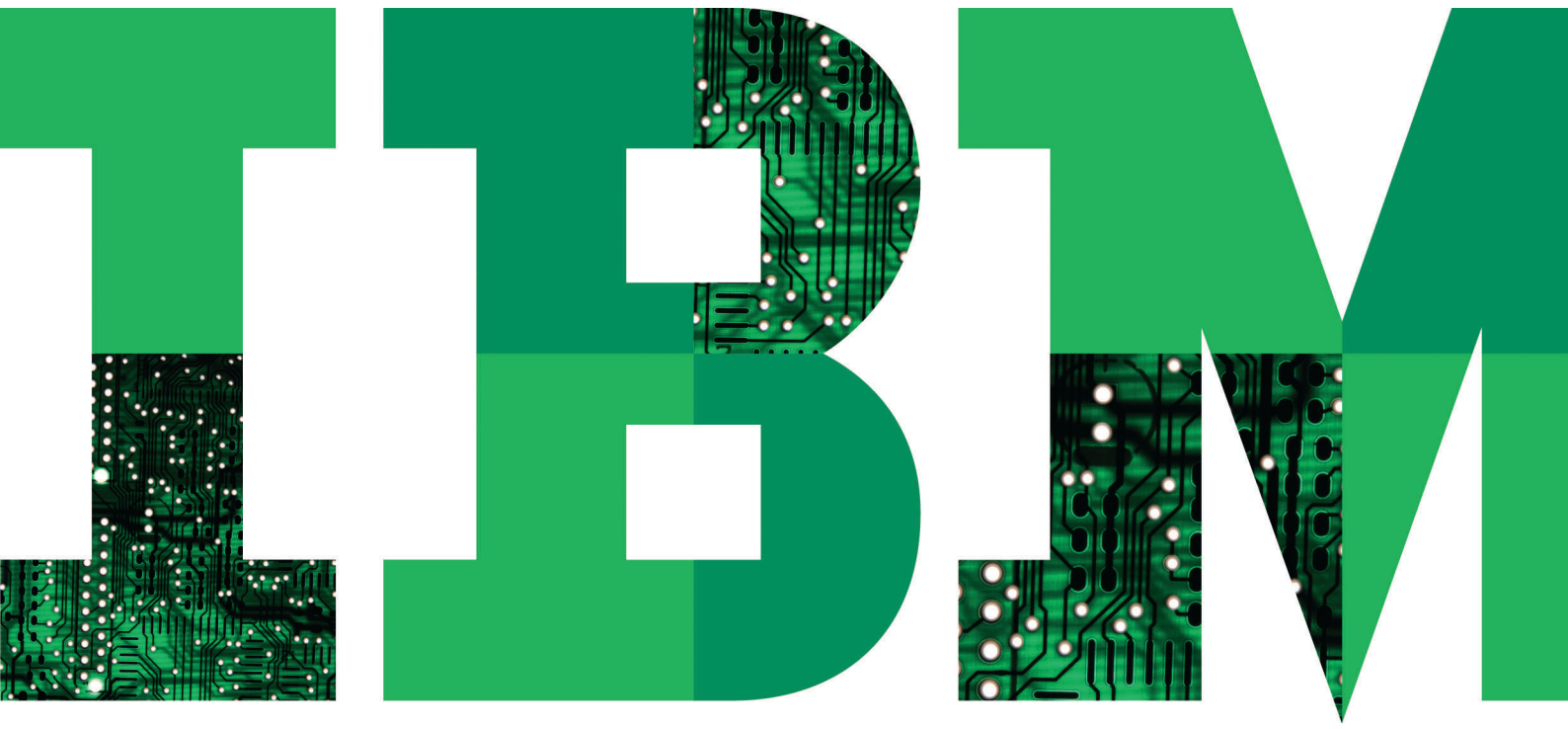


# Intelligent Building Management

*for the IBM Software Executive Briefing Center - Rome*



## **Smarter Building - An Implementation Experience**

Buildings as facilities can be seen as a system with multiple and varied subsystems. Not only are the facilities assets of significant value, their operational demands can also be a large portion of operating expenses on any company's income statement and balance sheet. The National Science and Technology Council in the US estimates that commercial and residential buildings consume 1/3 of the world's energy. In North America, for example this translates to 72% of the electricity generation, 12% of the water use, and 60% of non-industrial waste.

While green buildings are constructed using sustainable materials, smarter buildings are designed to run more efficiently and, more importantly, communicate with and about their various systems. With the unprecedented proliferation of sensors and control systems over the last decade, many buildings have the ability to measure, sense and see the exact condition of practically everything in them. This has made intelligent building management, which is an integration of building, infrastructure, and enterprise systems to promote sustainable and cost-effective operations, a reality for today.

IBM collaborates with IBM Alliance Partners who have complementary expertise and solutions in building management.

### **A unique world-class facility provides the backdrop for a customized Smarter Building implementation**

The IBM Software Executive Briefing Program is designed to provide professionally facilitated events to ensure the highest value for the time our clients spend with us. Briefings are usually full day events where client executives and key technical leaders are provided with a fully "orchestrated", client tailored agenda where specific topics of interest are covered by IBM subject matter experts and participating executives. As we listen, discuss and illustrate how IBM's latest technologies can assist in solving their business and technical challenges, a briefing is a fundamental demonstration of IBM's key value where our clients are first and is the pinnacle of any long term partnership.

The Rome Software Executive Briefing Center (EBC) is one of Europe's premier location and is co-located with the Rome Software Lab which is a 30 year old world class IBM software development lab with a long standing heritage of Tivoli Software product portfolio. This close proximity ensures that the EBC is supported by a wealth of technology and expertise making it a special place to deep dive into new challenges. With Tivoli's mission in systems management, and therefore, an important contributor to software solutions for IBM Smarter Building initiative, it was a natural step for the EBC to implement an intelligent building management solution and be a live showcase to customers.

### **Integrating the Rome Software Executive Briefing Center with IBM Intelligent Building Management**

The professionally facilitated events are hosted in the Rome EBC's facilities. The entire area has been designed and implemented with state of the art IT and multimedia functionality in order to provide customers with a seamless technological experience that supports the specific topics at hand.

Think of it as being the backstage of a world class Broadway production or as the infrastructure and operational challenges in running a daily mission to Mars. There are significant investments, resources must be optimized, but nonetheless every single function must be in a known operational status, energy resources must be efficient, and proactive management capabilities must be automated and fully integrated into visualized controls.

These aspects, while in some ways specific to an EBC type facility, are part of the same capabilities that is provided by IBM's solution in Smarter Building Management. This white paper illustrates how a specific project within the scope of IBM intelligent Building Management has been designed, how it has been integrated into the new Rome EBC, and how it will deliver on the organization ability to manage the facilities and functions efficiently.

*“Using our own (IBM) solutions to better manage our facilities and infrastructure at the Rome Executive Briefing Center helps us to demonstrate IBM’s Smarter Building strategy. In today’s world of limited resources and rising demands, these are business solutions that make ROI truly tangible.”*

—Thepadol Dardarananda, Manager of Rome Software Executive Briefing Center, IBM



### Pursuing a smarter project

In 2010 the Software Executive Briefing Center in Rome was renovated to provide a significantly larger space at 1100 sqm and to incorporate the latest IT and multimedia infrastructure. This renovation provided an opportunity to consider making the new EBC an example of how IBM Smarter Planet initiative for Smarter Buildings could be applied. Clearly the advantage was the possibility to install sensors and related infrastructure for appropriate instrumentation as part of the physical build. Secondly the implementation would not only provide typical controls on power and air quality, but additional aspects important to an EBC type facility, such as green plants, display and projection readiness, asset location, could all be considered.

### From architecture to implementation

The solution implements the architecture reference model in a set of layers:

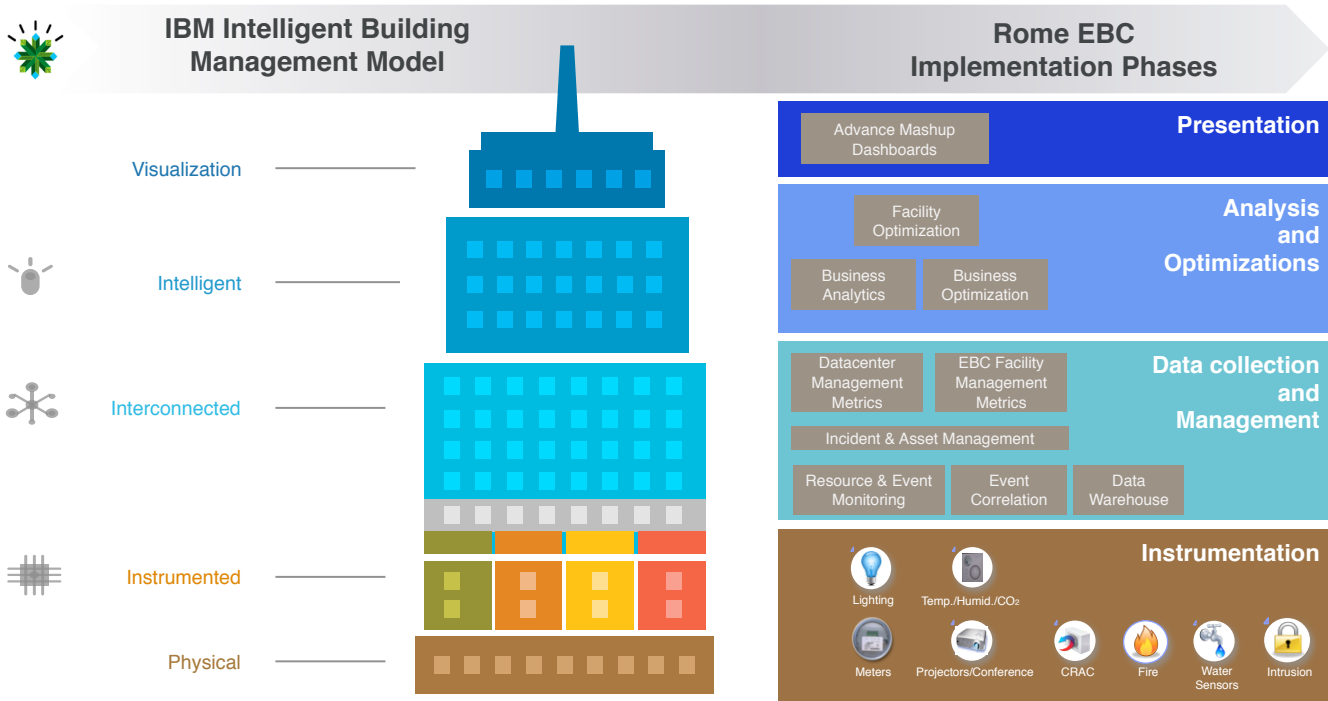


Figure 1: Rome EBC implementation model based on IBM Intelligent Building Management reference architecture model

### Instrumentation Layer

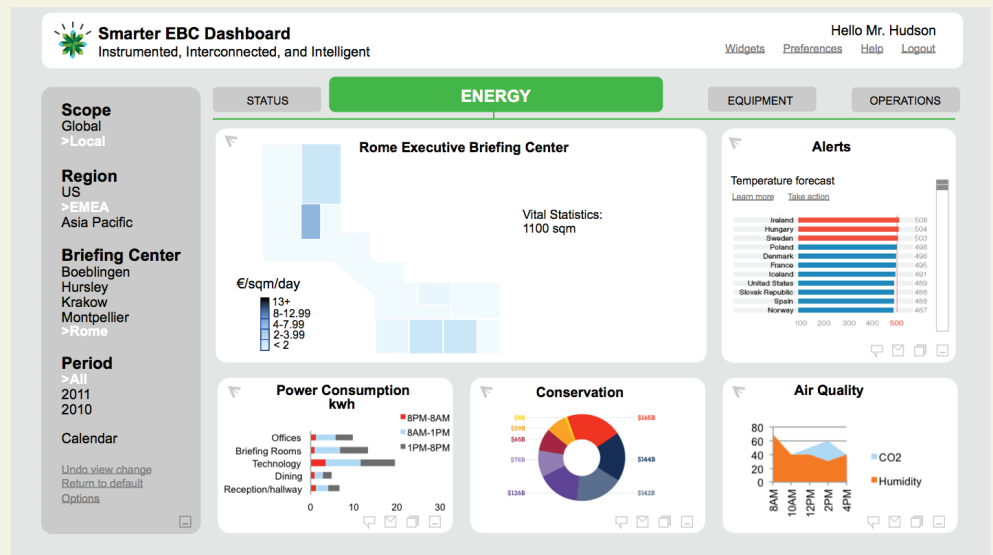
The first phase which corresponds to the instrumented/physical layers of the architecture model, defines what, where, and how sensors are installed thereby setting the scope and level of details that data can be collected for subsequent analysis. The instrumentation is typically provided by IBM partners who have specialized sensor and metering products.

### Energy consumption

Metering devices and systems that instrument typical AC voltage and current levels. The EBC IT datacenter, located in the technology showcase area, has four intelligent equipment/server racks that have two dedicated InRows water supplied cooling systems. The racks have been instrumented with:

- 8 intelligent PDUs, two for each rack, to collect data about energy request and consumption,

*As defined in the reference model, the presentation layer integrates the relevant dashboard and reporting results from the business analytics tools to give management an immediate, easy to use graphical view of the operational status, health status and, more importantly, access to the facility's energy and resource usage information. This is also the entry point that permits a further review of underlying information enabling the analysis of possible choices that can improve controls and to understand changes to further reduce costs or increase efficiencies.*



- one dedicated module to collect environmental data (temperature and humidity) in the space area surrounding the equipment racks,
- one security module to signal physical access to racks (through sensors attached into the rack doors) and to detect possible human intrusion to the datacenter room (through two cameras monitoring the room entrance).

### Environmental quality

Sensors for temperature, humidity, and CO<sub>2</sub> levels. The devices have been installed all over the facility to monitor the main business areas (briefing rooms, technology showcase areas, dining/catering areas). All this equipment is provided together with its native management software that collects the primary format data and returns it to the up-level software modules.

### Multimedia Equipment

The multimedia infrastructure providing video and audio delivery, including high definition video conferencing, is controlled by industry typical control systems provided by AMX which has integrated wireless remote controllers and communication gateways.

This provides the base instrumentation and interface in order to manage and remotely control devices according to specific needs and policies such as lights, projectors and video screens. They have been supplied with their management software tool. All of them can be considered the bridge between the physical layer and the next one, which is the data collection layer, for all the monitored and controlled environments data. This layer provides the set of primitive data to be used by the next level.

### Data Collection and Management Layer

The raw data, in multiple and diverse format, which is available from the sensors implemented in the instrumentation layer, is collected and transformed into a set of aggregate data making it suitable for software analysis. If the Building Mgmt System detects a variance or an asset is performing outside the specifications, the management layer automatically correlate the information from different sources and generates a service request, EBC personnel will then be notified. Each service request will provide the necessary details regarding the malfunction, the asset's maintenance history, warranty information and other important asset information. Work orders will then be prioritized based on the severity of the issue and

the impact on EBC business and building tenants. Data manipulation and preparation activity is the fundamental function of the Interconnect layer of the architecture model. In order to render the data meaningful, a set of core operational software functions is implemented:

**Asset Management System**

This combines facility and datacenter management. Through these tools a complete asset management is realized for all those resources that the EBC requires to successfully execute its job, with the possibility to understand the space utilization rate, to analyze the health status of the briefing rooms, of the conference equipment and/or of the supporting cloud based IT infrastructure, to understand resource availability for business activities and supplied services on a real time base, to define and track all the activities needed to manage the internal assets during their lifecycle, to define KPIs, thresholds and relative alerts.

<b>Solution Components</b>	
<b>Layer Model</b>	<b>Products</b>
Presentation	IBM Mashup Tivoli Business Service Mgmt
Analysis and Optimization	IBM Cognos Suite
Data Collection and Management	Netcool/Omnibus Tivoli Monitoring for Energy Mgmt Maximo Asset Mgmt Maximo Asset Mgmt for Energy Optimization Tivoli Business Service Manager Maximo Space for Facility Mgmt Maximo Data Center Infrastructure Mgmt Tivoli Service Request Manager Netcool/Impact
Instrumentation	Johnson Control Metasys APC InfrastruXure Johnson Control sensors and meters APC Scalable Modular Data Center AMX touchpad and controllers

**Incident Management**

That lets operation people have an immediate overview of the open issues, their solving status and the incident rate of particular type of asset. This interacts directly with lower layer software modules, the event management system in particular, implementing the automatic incident signaling and relative ticket creation for those critical events that exceed the defined thresholds or for situations discovered by event correlation.

**Analysis and Optimization Layer**

In the previous layer data fed from sensors is formatted for operational software tools. Tools such as asset management and monitoring enable views of specific incidents and historical perspectives. The use of business analytic tools adds an entirely different dimension and is used to obtain a full picture of the health status of the organization in all its critical business parameters and provide future recommendations and optimizations. This includes room quality analysis (parameters like temperature, humidity and CO2), equipment availability (incident rates, mean time to repair, mean down time), energy consumption analysis and optimization (fixed costs, service generated costs), and service level fulfillment analysis. These tools allow for a detailed energy efficiency management through consumption analysis and forecasting. There are in fact different type of devices influencing the EBC Energy balance and they belong to different categories: Infrastructure Technology of the EBC Datacenter (servers, racks, storage, PDU etc), lights in the meeting rooms, projectors and audio/video conference systems, plasma/LCD for IBM marketing campaign and advertising. All of them can differently influence the total Energy consumption. A detailed analysis demonstrates there are opportunities for improvement and better energy usage control across the overall EBC facility. Energy savings is important, but maintaining high reliability and uptime of our critical spaces is our first priority. These tools support very well all the decisions of Operation and Facility management team through incident identification or predicting problems before EBC performance and occupants are affected. This implements the Intelligent layer of the



Figure 2: Integration of sensors and meters during renovation

reference model and the information is provided through reporting functions and dashboards to facilitate management decisions on where changes would further improve operations and business results.

### Presentation Layer

Having applied business analytics to a diverse set of information, the presentation layer, which corresponds to the visualization layer of the reference model, uses tools provide a user friendly graphical interface that gives a full picture of the business health and performance. The final goal is to obtain an aggregated dashboard that lets decision makers to quickly find the desired data and analysis, compare them among several similar realities, understand the relations between the physical environment and the business execution results and take the most convenient decision for business performance improvement. Here energy consumption can be directly related to space utilization rates, to service deliverables quality, to asset maintenance and management costs, to facility management costs. The result is an aggregated overview of dashboard, reports and comparative charts that guide decision makers to take the right decision.

### Choices and Challenges

The project originally started as a concept for a green datacenter showcase by using the EBC IT infrastructure as the base system. As the project scope and details evolved, it became clear that the characteristics of a green datacenter were merely a subset of the larger Smarter Building concept that IBM was using as part of the

overall Smarter Planet strategy. A small team of consultants and specialists was put together to help the Rome EBC defining a suitable project scope to its characteristics. The implementation plan was based on the IBM Intelligent Building Management reference architecture being adapted to the space characteristics to incorporate unique control areas, and an up-front collaboration with IBM partners to ensure that the prerequisite sensor and meters would be properly installed. Planning for the sensor and metering instrumentation in the new EBC design was a classic exercise in finding physical solutions that would minimize impact. The unique architectural qualities of the EBC meant that every and any type of instrumentation to be placed had to be as unobtrusive as possible or aesthetically balanced. It was also a challenge to provide a sufficient level of instrumentation within budget constraints and with time schedules to maintain. As the renovation project progressed it became clearer that this project would be a significant innovation to how the Rome EBC could better manage its resources, ensure the availability of a significantly more complex environment due the increased space and a complex multimedia infrastructure ranging from digital signage to integrated audio/video/projection systems, and to be able to understand how the environmental quality standards are being met for overall customer perception.

### Conclusions

This project demonstrates that implementing an intelligent building management system can be an incremental thing, without a need for a total rebuilding of a facility nor that size matters. Single parts of a complex enterprise can use the reference architecture and select the steps that are the most appropriate to start a transformation that will improve the daily job, reduce operational costs and provide a level of visibility that sometime is hidden to the rest of the organization.

The Rome EBC is now able to pro-actively manage its facilities and services with supporting data and the integrated software makes for an integrated view. Future enhancements are simplified as the software infrastructure is already in place.



The reception area of the Rome Executive Briefing Center



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