Building Data the New Deliverable

Our Building Automation industry has become Data Driven

Speakers - Jim Sinopoli Consultant

Brad White Consultant

& Ken Sinclair AutomatedBuildings.com

Smart Buildings Founder, Jim Sinopoli

Brad White Principal SES

A discussion of how two consultant are coping with Community, Convergence, & Collaboration from Cloud Data and Retro commissioning programs and the opportunities within.

We also discuss the power of data modeling and the blizzard of evolving data standards.

Trends That are Driving Industry

Sites		Rules	Cost	Dur	Timelines		Targets	
Gaithersburg 11 sparks	○	ⓘ KW Exceeds Target		6hr		1st 3rd 5th 7th 9th 11th 13th 15th 17th 19th 21st 23rd 25th 27th 29th 31s	ⓘ ElecMeter–Main	○
Headquarters 20 sparks	○	ⓘ KW Exceeds Target		94.5hr		1st 3rd 5th 7th 9th 11th 13th 15th 17th 19th 21st 23rd 25th 27th 29th 31s	ⓘ ElecMeter–Main	○
Short Pump 9 sparks	○	ⓘ KW Exceeds Target		6hr		1st 3rd 5th 7th 9th 11th 13th 15th 17th 19th 21st 23rd 25th 27th 29th 31s	ⓘ ElecMeter–Main	○

This Month

Tuesday, Nov 12, 2013, 08:00 AM
Today – Prediction Day: **119.60 kW**
Meter1 – Real Power: **118.24 kW**

5:00 AM   06:00 AM   07:00 AM   08:00 AM   09:00 AM   10:00 AM   11:00 AM   12:00 PM

Integrating Asset Management and Analytics

and a work order is automatically generated:

How to Optimize a Building

Collect Data

Analyse Data

Apply Fixes
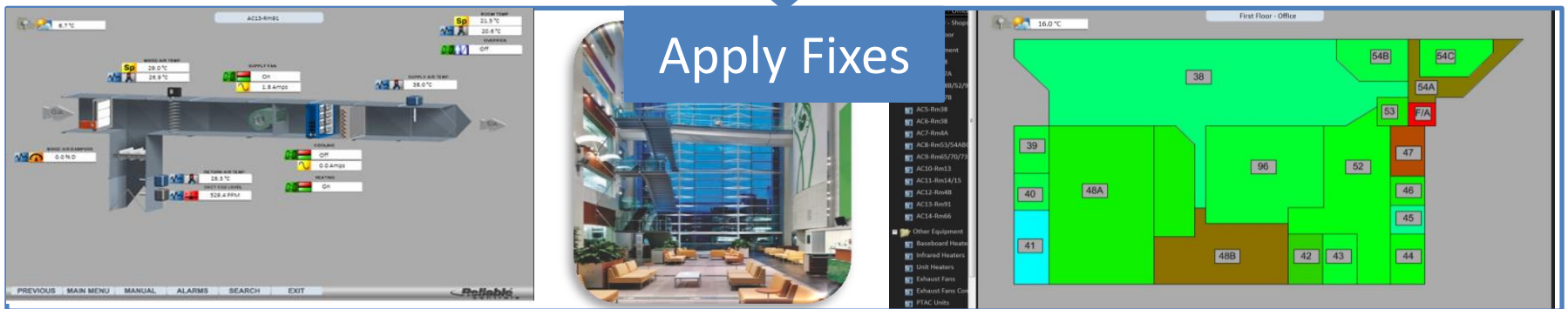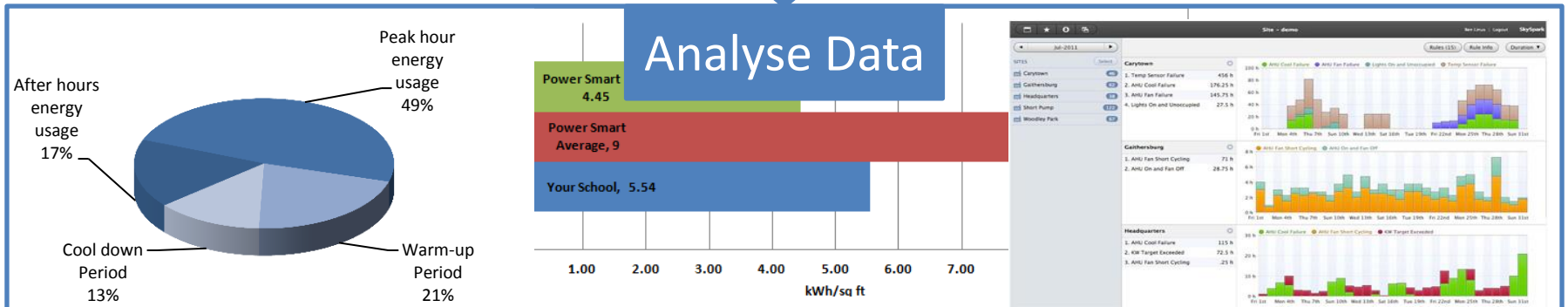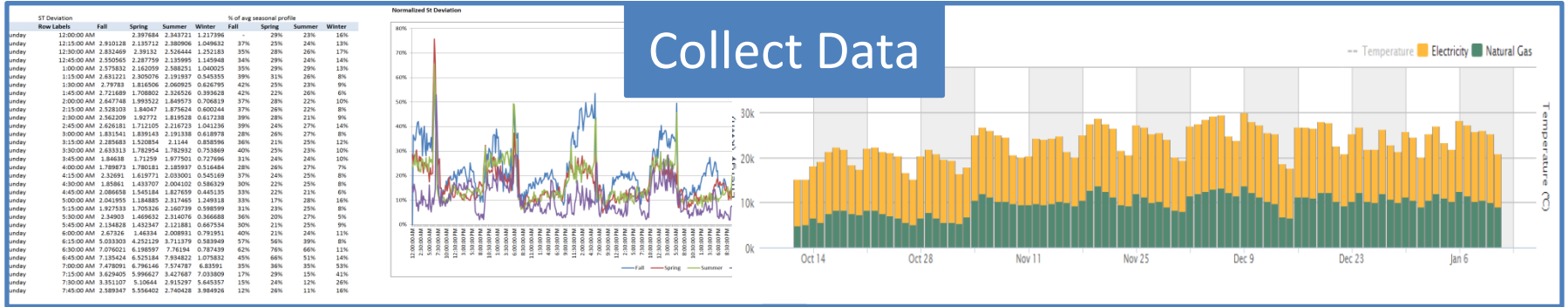
Big Data at Work

Building Electricity Usage vs Outside Air Temp
(15 min interval data)

Cooling while unoccupied!

◆ Occupied Hours   ■ Unoccupied Hours
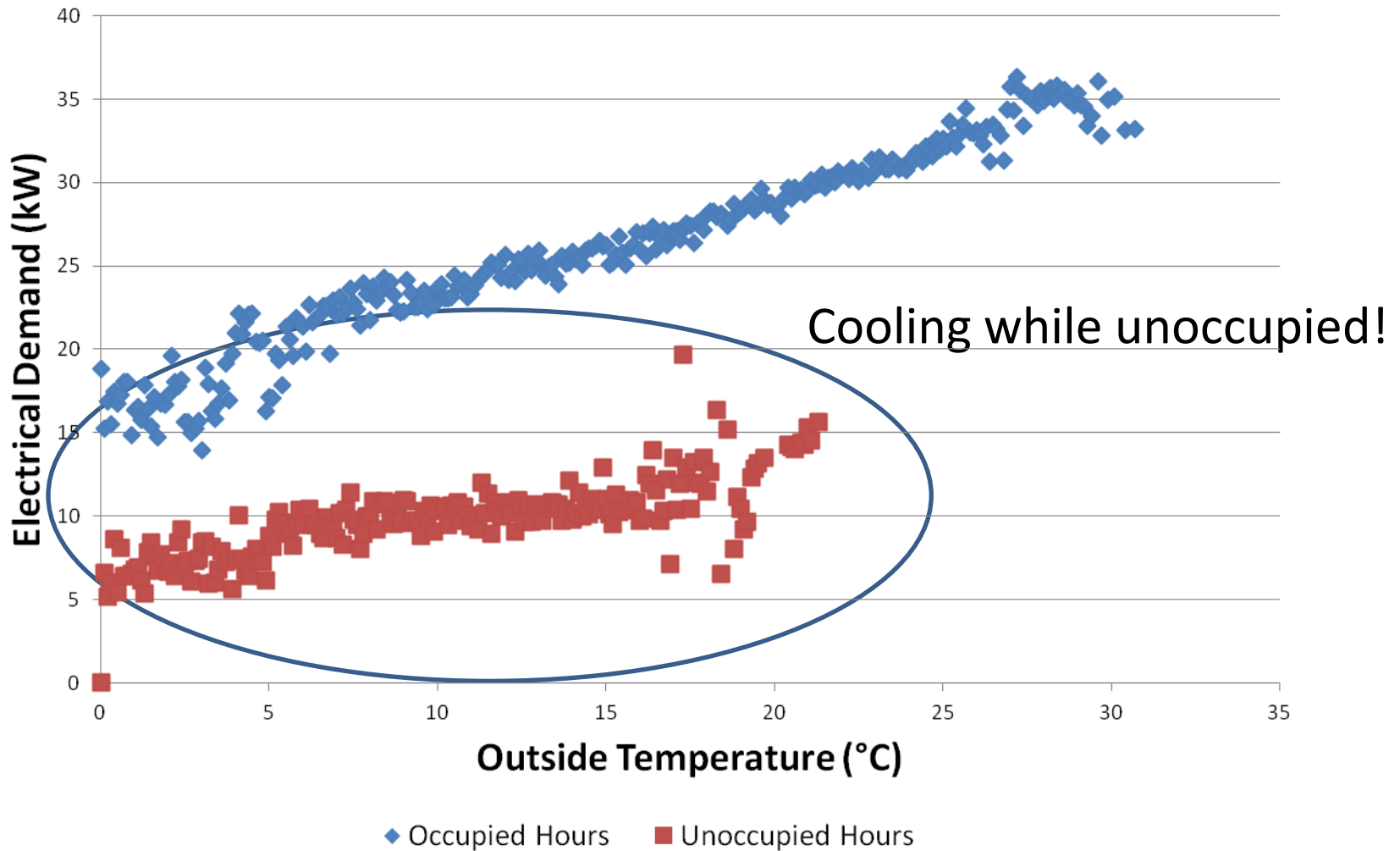
Jim can you give a bit a history about the Microsoft ROC success story

The message to me and what we need to convey to our audience is the amount of time required to get from here to there

2009 wow that is like 16 web years ago....smile

Gap analysis would love you to chat about that

Smith: Our HQ campus in Redmond, Washington has the same scale of a small city. The Campus consist of 15 Million square feet, 125 buildings and 58,000 housed personnel. We are connected to two million data "points" across 35,000 building assets, and over a 24 hour period, we collect 500 Million data transactions every day. Historically we have not had the ability to leverage this "Big Data" to optimize our Campus.

- Smith: When I first started my research in this area in 2009, my concern was the solutions on the market were not mature enough and we would need to pause our procurement process until the market matured. After completing our gap analysis with Smart Buildings Inc

Microsoft

- Redmond Campus
- Corporate mandate of energy management
- FDD Deployment
- Discover faults and aspects of their HVAC system they were not aware of

Microsoft Results - FDD

- Engineers saved significant time in addressing operational issues.

- Tool provided information for a remedy and corrective action of fault

- Faults were "monetized".

- Microsoft's typical 5-year retro-commissioning cycle accomplished in just one year.

- Annual energy cost savings for Microsoft exceeded $1 million.

Quote from Microsoft:

"demonstrates that a smart building solution can be established with an upfront investment of less than 10 percent of annual energy expenditure, with an expected payback period of less than two years"

Monetizing the Fault

			Reference
1	Economizer Disable Set Point =	68 degrees	EMS
2	Average Occupied hours OAT > Economizer Disable	1561	(DOE weather file)
3	Occupied Hours =	0800 - 2000	
4	Average OAT during occupied hours	74.5 degrees	(DOE weather file)
5	Minimum outside air ratio	15%	Code minimum
6	Fault is triggered and calculated only when calculated OA ratio exceeds minimum 10%		
7	Average Detected OA Ratio	60%	
8	Design CFM	22500	
9	Average VFD speed	62%	
10	Average CFM	13950	
11	Extra cooling load:	68790226 BTU/cooling season	
12	Seer	12	
13	Extra compressor energy:	5732.5 kwh/cooling season	
14	Electricity Cost	$0.08/kwh	
Annual Extra Cooling Cost		**$458.60**	

MICROSOFT

Illustrative example of fault detection and diagnosis output (simplified)

Building	Bldg. Cluster	Equipment	Fault and Diagnosis	Priority	Estimated Savings*
Bldg 58	Cluster E	AHU - 012	Leaking chilled water value	High	$11,291
Bldg 58	Cluster E	AHU - 003	Damper position fault	High	$4,782
Bldg 53	Cluster E	VAV - 022	Over cooling	Hign	$2,235
Bldg 58	Cluster E	CHI - 002	Changes to set points	Medim	$895

* Estimated savings potential, expressed an annual cost of wasted energy if not fixed.

Other Organizations

- Study on monitoring-based commissioning

- Established an average energy savings of 10% to 25%

- Use FDD tool supporting the commissioning of buildings

- Tool generates reports for LEED Online including diagnostic and faults during the building's performance period

Why We Needed to Define a Smart Building?

Jim Sinopoli, PE, RCDD, Leed AP
Managing Principal
Smart Buildings LLC

"Nice. Not thrilling, But Nice."
IBM

"Smarter buildings are well managed, integrated physical and digital infrastructures that provide optimal occupancy services in a reliable, cost effective, and sustainable manner. Smarter buildings help their owners, operators and facility managers improve asset reliability and performance that in turn reduces energy use, optimizes how space is used and minimizes the environmental impact of their buildings."

"Classic Tech-Speak."
Cisco

Smart building development focuses on "Identifying <u>responsible practices </u>in site location and materials selection for new construction; Defining and incorporating intelligent information infrastructure into the building architecture; <u>Developing simple, flexible, and scalable network systems for buildings</u>; Incorporating power-management for network systems."

"Yawn."

Accenture

Describes its own smart-building solution as one that "leverages an existing building's systems information infrastructure to enable energy and operational savings through continuous, data-driven analytics and remote implementation."

"Please, Make It Stop."
European Commission

"Smart buildings means buildings empowered by ICT (information and communication technologies) in the context of the <u>merging Ubiquitous Computing and the Internet of Things</u>: the generalization in instrumenting buildings with sensors, actuators, micro-chips, micro- and <u>nano-embedded systems</u> will allow to collect, filter and produce more and more information locally, to be further consolidated and managed globally according to business functions and services."

"Finally, An Elegant Vision."
Siemens

In terms of building structures that will work well for us in the future, Siemens says in its sharp YouTube video that, "only solutions which create the greatest synergies between energy efficiency, comfort and safety and security will be sustainable over the long term … solutions that turn buildings into living organisms: networked, intelligent, sensitive and adaptable."

"The Human Touch."
GSA

Technology alone won't do it. The GSA realizes that the smartest part of smart buildings is people and wants to engage them. Providing feedback and information through a dashboard is a good start. With smart technology, we can learn anything we want about a building and optimize its performance. But real performance means happier, more productive tenants. And that requires insights into the hearts and minds of the people inside. What a dashboard can really do is enable better decisions, inspire participation, spread knowledge and best practices, communicate at a human scale and propagate new norms in how we use our buildings."

Data Management

Answer: a little forethought and a lot of afterthought.

QUESTION: HOW MUCH FORETHOUGHT IS GIVEN TO ALL THE DATA AND INFORMATION NEEDED TO MANAGE A BUILDING?

How Easy Is It To Find As-built Control Drawings?

Data Repositories

- Building management systems
- Independent control systems
- Facility management systems
- Business systems
- BIM data
- Data in the hands of third-party contractors that install, service and maintain building equipment.
- Smart Grid

The Role of a Facility Data Manager

- Data is an asset
- We need data management during every building phase; design, construction and operations.

The <u>benefits</u> of a unified database architecture and standard methodologies to manage the data.

- Data more widely available and sharable
- Data more easily accessible
- Improve the archiving, preservation and retention of data for the long-term
- Improve the integrity of the data
- Streamlining data
- Improving overall efficiency

People Involved with Building Data Management

- Data Collectors during design and construction:
  - LEED Consultant
  - BIM
  - Architect, Engineers

- Data Management after handover?

Sample of International projects

King Abdullah University of Science and Technology

Cleveland Clinic Abu Dhabi

Uganda Revenue Authority

Saudi Arabia Ministry Of Higher Education

El Salvador World Trade Center