

A Measurement-Management Technology for Improving Energy

Development and field testing of Information & Communications Technology (ICT) facility management tools to reduce power consumption from cooling components.

Introduction

Using real-time temperature, humidity, hot-spot management, air-leakage measurement, and corrosion monitoring, this tool will optimize air-conditioning systems and the use of outside air in computing facilities. This software has the potential to save over 10% of average total ICT center energy requirements.

This project entails the field evaluation at multiple sites of Measurement – Management Technology (MMT 2.0) software. The software yields specific recommendations and can control equipment energy consumption while providing quantitative measurements of IT reliability and energy savings. The technology is based on open standards, is vendor agnostic, and is readily integrable with other solutions.

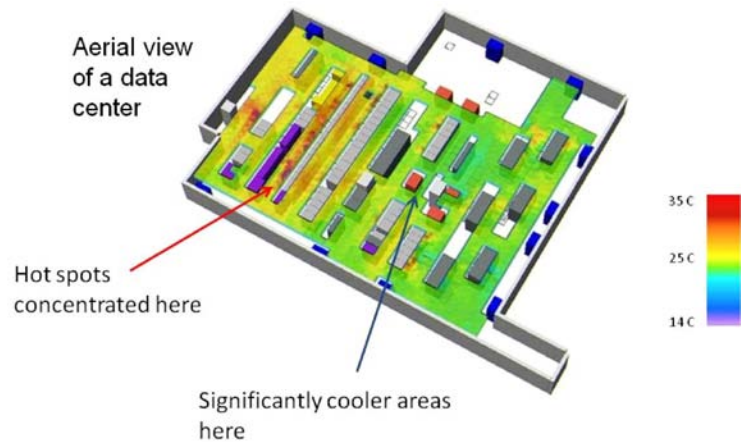
Benefits for Our Industry and Our Nation

ICT facilities consume more than 3% of our nation's electricity. This electricity consumption is projected to grow significantly for at least the next decade, possibly doubling every five years under current trends. The use of whole-systems planning and active management tools similar to those tested in this project will significantly reduce the energy requirements of ICT facilities. This project will result in a system that can improve Power Usage Effectiveness (PUE or Total Facility Power / IT Equipment Power) from 1.8 to 1.35 for a representative data center.

Additionally, MMT 2.0 is designed to paybacks of less than two years for an average facility. This attractive rate of return is critical in order to scale and deploy the technology more broadly.

Applications in Our Nation's Industry

This technology will be most useful to organizations that utilize medium- to large-scale ICT facilities. In particular, facilities with integration-ready automated asset and systems-management tools will obtain the most optimal results. The control systems identified in this project will be used by or require the services of many industries, the most significant being the following:



MMT 2.0 will address examples, such as the one shown above, of uneven heat and cooling distribution in the computing facility.

Illustration courtesy of IBM.

- ICT facility owners, operators, rack equipment manufacturers, and construction and development companies
- Developers and distributors of building and data center/IT management software
- Manufacturers and resellers of facility cooling and power-distribution equipment

Project Description

The MMT 2.0 software that has been further developed and is being evaluated in this project provides the following:

- On-demand, comprehensive facility assessment data
- Real-time data from distributed sensor networks (temperature, humidity, pressure, air flow, power, corrosion rates etc.)
- Sensor data from IT equipment (power and temperature data gathered from the IT equipment)
- Data from IT facilities (gathered via interfaces from a building-management system)
- Asset information

The MMT 2.0 software provides real-time 3-D temperature and humidity distributions, hot-spot management, real-time air leakage measurements, continued best practices advice (including layout recommendations), and corrosion monitoring. It can also control the facility's energy efficiency by optimizing outside-air exchange cooling, improving set points of the chiller systems, reducing fan speeds within the air conditioning units (ACUs), increasing ACU utilization, and improving power management. This software can run as a standalone application or be integrated with other asset-monitoring and/or management software.

This project's primary goal is to field test a pre-commercial version of MMT 2.0 in order to validate anticipated savings. MMT 2.0 will be applied to different types of data facilities to show that even though each site's technology requirements may vary, high cooling energy savings rates can be repeatedly and reliably accomplished.

Barriers

The main inhibitor for reducing facility energy consumption is often a lack of knowledge and insight on how to use available technologies, rather than a lack of commercial components and best practices. Current technologies do not provide timely information on energy use, nor do they allow the manageability of component power to enable operators to increase energy efficiency without compromising equipment reliability.

Pathways

First, more advanced software will be developed using the MMT 1.0 version of the system. The project goal is to successfully demonstrate the effectiveness and applicability of this technology to various types of facilities (including variously sized data centers, central offices, video hub offices, and mobile switching centers).

Milestones

- Conduct field experiments at six different types of ICT facilities
- Completion of power distribution unit sensors and corrosion detection sensors (Completed)
- Adaptation of measurement models for telecommunications central offices and other telecommunications facilities
- Enhancement of modeling, control, and provisioning software and interfaces

Commercialization

The base technology (MMT 1.0) used to establish the foundation for this project has been used in more than 80 data centers and was found to improve the average energy efficiency of a data center by more than 10%. Commercialization efforts during this project include the following:

- Deployment of MMT 2.0
- Establishing partnerships for service and sensor-related commercialization opportunities

- Building detailed business plans for commercialization, including the worldwide deployment of MMT 2.0 internally in IBM, AT&T, and other large customers
- Partnering with utility providers to further channel and market the technology

Project Partners

IBM T.J. Watson Research Center
Yorktown, NY
Principal Investigator: David Seeger
E-mail: seeger@us.ibm.com

IBM Corporation
Research Triangle Park, NC

IBM Corporation
Rochester, MN

AT&T
Dallas, TX

Georgia Institute of Technology
Atlanta, GA

Vette Corporation
Portsmouth, NH

For additional information, please contact

Gideon Varga
Technology Manager
U.S. Department of Energy
Industrial Technologies Program
Phone: (202) 586-0082
E-mail: Gideon.Varga@ee.doe.gov

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