

IBM **"INNOVATION" STAR OF ENERGY EFFICIENCY NOMINATION FOR IBM CORPORATION**
MOBILE MONITORING TECHNOLOGY FOR DATA CENTER ENERGY EFFICIENCY ASSESSMENTS

Historically, datacenter operators have not been concerned about the energy use of the IT and facilities equipment, as it represented a small percentage of the total cost of ownership of the data center. In recent years, rising energy prices, space constraints, and the power and cooling demands of new generation IT equipment have increased dramatically, forcing companies to address their growing data center energy consumption and to meet their climate protection objectives. To assist data center operators in optimizing their power and cooling resources in this new, more energy dense environment, IBM Researchers and Data Center professionals have developed a Mobile Measurement Technology (MMT) system, which analyzes the thermal profile of an operating data center and provides recommendations to optimize the thermal profile of the data center and reduce energy use.

The MMT system is housed on a 2'x2'x8' mobile rack which has over 120 sensors for measuring and collecting the thermal and air flow characteristics in an operating data center. The cart is completely networked, continuously collecting and storing location and sensor data as it is moved through a data center, collecting data on up to 5000 square feet of space per hour. The collected data is processed in a specialized modeling tool to develop a 3 dimensional rendition of the thermal and flow characteristics of the data center. The results of the model are used to calculate 6 key data center energy efficiency metrics: horizontal and vertical hotspots, non-targeted air flow, temperature variations in computer room air conditioning (CRAC) units or plenum discharges, and flow blockage. The metrics provide quantitative insights into the opportunities to improve energy utilization in the data center. Each metric has a corresponding set of improvements which can be easily implemented to improve performance, often with minimal investment. Recommendations, which can typically be implemented within 2 to 3 months, include reconfiguring open floor tiles and installing flow management devices to deliver cold air only where it is needed and prevent the mixing of cold air with hot exhaust air, shutting down air conditioning units, and increasing the set point temperature of the cooled air delivered to the data center.

IBM demonstrated the capabilities of the MMT during the second half of 2007 in 4 data centers with a total raised floor area of 238,000 square feet and pre-project power demand of 13.3 mega-watts (MW). The MMT tool identified opportunities for 0.76 MW (6% capacity reduction) demand reduction and a corresponding use reduction of 7553 megawatt-hours (MWH) per year (11% use reduction). Using eGrid and WRI electrical CO2 emission factors for the four locations, this corresponds to the avoidance of 4588 tons of CO2 emissions annually. The MMT system enabled an efficient, non-intrusive assessment of the data center thermal environment and delivered simple, tangible recommendations which were easy to implement to optimize power use and cooling delivery. In addition to the immediate energy use reductions, a MMT assessment demonstrates the savings and efficiencies that can be gained by maintaining the proper thermal balance in the data center. These results provide a clear demonstration of the value a data center operator can achieve by establishing and maintaining governance procedures which incorporate thermal and space planning and/or regular thermal re-evaluation into the normal routine of removing and adding IT equipment. Improved governance procedures and their consistent execution can embed these efficiencies into the data center operating environment.

Projects are currently underway or planned at more than 11 additional data centers both inside and outside of IBM. IBM is performing MMT assessments at 7 of its strategic datacenters in 2008, representing over 150,000 MWH of electrical use. Based on the results of the initial assessments performed in 2007, it is expected that over 17,000 MWH of electricity, representing 10,540 tons of indirect CO2 emissions, will be saved annually through the actions identified by the assessments. IBM is also developing a plan to deploy MMT assessments into its global datacenter portfolio and is offering the MMT assessment as a service to its clients – with several engagements already completed in 2008.

The MMT system is an innovative solution for assessing the thermal health of an operating data center as it is portable, does not require any sophisticated instrumentation of the data center space, and can be readily adapted to evaluate any data center configuration. This technology is readily accessible to any data center owner, providing the significant business and environmental benefits offered by this technology. This system is unique in the industry, providing a detailed thermal assessment with a minimal investment. It delivers a direct business benefit, reduced energy use and operating costs, and an environmental benefit, reducing the CO2 emissions associated with the data center operation.
