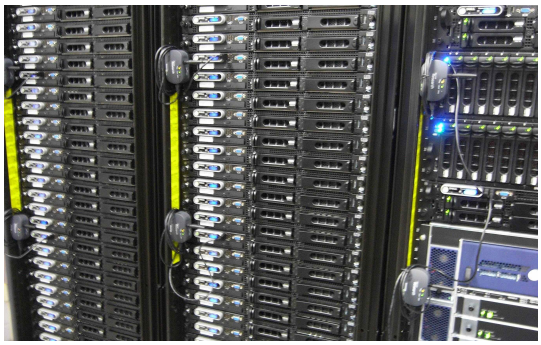

The Data Center (DC) Genome project is a collaborative effort with Microsoft Research . The project goal is to use data-driven and feedback control approaches to monitor, analyze, and improve the efficiency of data center operations and thus minimize their environmental impact.

Data center energy consumption has attracted global attention due to the fast growth of the IT industry and increasing concerns about carbon footprints and climate change. Lack of visibility into the data center's operating conditions is one of the root causes for this low energy efficiency. As conventional wisdom dictates that IT equipment needs abundant cooling to operate reliably, the CRAC systems in many data centers are set to very low temperatures. Furthermore, data center operators tend to further decrease the CRAC's temperature settings when servers issue thermal alarms because they lack the information to accurately diagnose the problem. Thereby, high-fidelity (i.e., with rack-level spatial granularity and sub-minute sampling rate) historical and real-time data about the environmental conditions inside a data center are invaluable not only for diagnosing problems but for improving the data center's efficiency.

As part of the DC Genome, we developed RACNet, a large-scale sensor network for high-fidelity data center environmental monitoring. RACNet runs a high data-rate collection protocol called Wireless Reliable Acquistion Protocol (WRAP).

We have deployed RACNet at a scale of thousands of sensors at Microsoft production data centers. In addition, we have a network of 200 sensors monitoring high-performance scientific clusters in the Bloomberg building at the Johns Hopkins University.

More info:

- Data visualization on the data we have collected at Bloomberg
- Bloomberg server load experiments summary
- CRAC

Publications:

- C.-J. M. Liang, B. Priyantha, J. Liu, A. Terzis, Surviving Wi-Fi Interference in Low Power ZigBee Networks , SenSys 2010
- C.-J. M. Liang, J. Liu, L. Luo, A. Terzis, F. Zhao, RACNet: A High-Fidelity Data Center Sensing Network , SenSys 2009
- J. Liu, F. Zhao, J. O'Reilly, A. Souarez, M. Manos, C.-J. M. Liang, A. Terzis, Project Genome: Wireless Sensor Network for Data Center Cooling
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- C.-J. M. Liang, J. Liu, L. Luo, A. Terzis, Enabling Reliable and High-Fidelity Data Center Sensing , Poster, IPSN 2009
- J. Liu, B. Priyantha, F. Zhao, C.-J. M. Liang, Q. Wang, S. James, Towards Discovering Data Center Genome Using Sensor Nets
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