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OpenData: Modius Research Highlight

The Science of Measurement

Modius OpenData supports data center management best practice - as highlighted in new research paper "The Science of Measurement"

I. ENERGY CONSUMPTION IN THE DATA CENTER: NEW RESEARCH BY KOOMEY & STANLEY

Over the last several years, dramatic fluctuations in the price of oil have intensified consumer and corporate awareness of all aspects of energy consumption. Companies are increasingly concerned with the costs and environmental impact of their data centers, which house an ever-increasing amount of business critical IT gear.

To address these issues, Dr. Jonathan Koomey, a highly respected expert in the energy and environmental aspects of technology, along with graduate student John Stanley, recently produced a whitepaper entitled, "**The Science of Measurement: Improving Data Center Performance with Continuous Monitoring and Measurement of Site Infrastructure**."

In the paper Koomey notes, "In a data center, measurement is not just an academic exercise; managers collect data so they can make decisions and take action. Data gathering that does not support these activities is a waste of time and money."

PRAGMATIC ADVICE FOR ENERGY-CONSCIOUS EXECUTIVES

As such, "The Science of Measurement" contains a number of pragmatic recommendations on how enterprises can use performance data collected from their data centers to address three interlocking, critical concerns that are now front-and- center issues for executives:

1: The spiraling costs of energy and its environmental impact. An extraordinary amount of energy is required to operate and cool the air in data centers. These functions can easily consume more

than twice as much energy as that which is required to run the equipment housed within, yielding a PUE of 2.0 or even greater.[1]

In the U.S. and abroad, companies and shareholders are increasingly concerned with the environmental impact of high levels of energy consumption. Corporations are intensifying their efforts to conform to carbon emissions guidelines such as those set forth by LEED® or the Green Grid®.

2: The high cost of building new capacity. New capacity to sustain continued server growth, particularly at "five-nines" (99.999%) uptime operational requirements – which equates to about five and a half minutes of unscheduled downtime per year – is very expensive. For example, a 10,000 square foot tier III-IV data center carries a price tag of approximately $50 million – a very large expenditure that can't easily be accelerated if data center space prematurely runs short.

3. A changing IT landscape that packs more computing power – and heat – into an ever-smaller footprint. High-density servers, server virtualization, and compact switches and routers all conspire to generate more heat within the data center. Enterprises are generating a geometric increase in the power load on existing data center facilities, thereby straining existing capacity and capacity management methodologies.

II. RESEARCH HIGHLIGHTS & RECOMMENDATIONS

"The Science of Measurement" explains some of the key considerations surrounding performance monitoring and measurements in data centers. The goal of the report is "to help data center managers (both IT and facilities managers) better understand

1: Power Usage Effectiveness (PUE) is a metric used to determine the energy efficiency of a datacenter. PUE is determined by dividing the amount of power entering a data center by the power used to run the computer infrastructure within it. PUE is therefore expressed as a ratio, with overall efficiency improving as the quotient decreases toward 1. PUE was created by members of the Green Grid, an industry group focused on data center energy efficiency. This metric figures prominently in "The Science of Measurement" paper.

ABOUT THE AUTHORS

Dr. Jonathan Koomey is one of the world's foremost thought leaders on the energy and environmental aspects of technology. With M.S. and PhD degrees from the Energy and Resources Group at the University of California at Berkeley, and a B.A. in History of Science from Harvard, Dr. Koomey is the author or coauthor of eight books and more than one hundred and fifty articles and reports on energy conservation technology, energy economics, energy policy, environmental externalities, and global climate change.

In addition to holding numerous professorships and other positions at institutions including Yale University, Stanford University, Lawrence Berkeley National Laboratory and the Energy and Resources Group at the University of California, Berkeley, Dr. Koomey serves on the Editorial Board of the journal Contemporary Economic Policy. His views on energy and economic issues are frequently featured in a wide range of print, broadcast and online media outlets.

John Stanley holds a Master's degree from the Energy and Resources Group (ERG) at the University of California, Berkeley.

the business value of measuring data center performance characteristics and the considerations that are important to developing a measurement scheme."[2]

According to the authors, the key lessons for data center managers are:

1: Measurement is conducted to inform decisions on actions that can enhance a data center's business value by better accommodating growth, reducing costs, or increasing uptime.

2: There are significant opportunities to improve efficiency through a continuous process of incremental changes, as well as through the more traditional "one shot" project-based approach.

3: The business or strategic objectives of the measurement effort should drive measurement decisions, and having "the right data" is more important than simply having "more data."

4: Data center managers should think carefully before beginning a monitoring program, so that the data collected will be maximally useful for judging operational performance and making decisions.

5: After collecting data, managers should take action based on what they have learned. Managers should then continue collecting data to get feedback on the effectiveness of their actions.

6: When evaluating potential monitoring systems, managers should examine multiple factors, including:

a: Ability to collect data from all desired devices

b: Trending and analysis of data

c: Granularity of data collection

d: User friendliness and ease of integrating data across devices and time scales

e: Scalability for mass deployment and multi-site capability

f: Adaptability to new measurement needs

g: Integration with control systems

h: Ability to detect problems and notify data center operators[3]

The concepts and anecdotes in "TheScience of Measurement" were derived from the authors' work on three case studies in which commercial data center monitoring software was deployed in an operating data center environment. The case studies, which are documented separately in three separate papers that together comprise the authors' "Measurement Series," are:

1: ***Case Study: Power Chain Capacity Expansion***, in which current draw in power distribution units was monitored to enable reliability improvements

2: ***Case Study: Cooling & Chilled Water Efficiency Project***, in which cooling systems were monitored to reduce energy use and improve reliability

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2: "The Science of Measurement: Improving Data Center Performance with Continuous Monitoring and Measurement of Site Infrastructure," John Stanley and Jonathan Koomey.
3: Ibid.

Ł: ***Case Study: Availability Improvements Using Granular Monitoring***, in which monitoring of data center health helped intercept problems before they could cause downtime[1]

III. THE MODIUS OFFERING: DESIGNED TO SUPPORT MEASUREMENT BEST PRACTICES

As articulated by Prof. Koomey and Stanley, a next-generation data center is emerging in which comprehensive and holistic performance data is being used to aggressively modulate power and cooling. This in turn ensures maximum uptime and efficient use of data center space, while reducing energy costs.

Modius uniquely provides a single-pane-of-glass solution that enables real-time, holistic management of data center health and energy performance, across the global enterprise. As such, it is the leading provider of scalable data center telemetry and infrastructure management systems, integrating availability monitoring, capacity analysis, and efficiency performance tracking of multiple facilities.

Delivering both high-level and granular real-time performance information, Modius gives operators the confidence to reduce data center costs and energy consumption. Only Modius can offer Intelligent guidance for real-time resource management, allowing companies to:

1: Defer or eliminate costly CapEx investments in new data center facilities by maximizing data center efficiency under capacity constraints

2: Improve energy performance to reduce power consumption and environmental impact

3: Provide peace of mind in the data center that can only come from a holistic, proactive approach to data center health management

With the Modius data collection system, Modius solves the challenge of integrating performance data from a broad range of site infrastructure devices with demand data from essential IT equipment. Through this single, comprehensive measurement system, Modius allows enterprises to extend the useful life of existing data center sites, significantly lower energy consumption costs, and prevent downtime due to device or system failure.

2: "The Science of Measurement: Improving Data Center Performance with Continuous Monitoring and Measurement of Site Infrastructure," John Stanley and Jonathan Koomey.

3: Ibid.

IV. CONCLUSION: MODIUS DELIVERS INTELLIGENT GUIDANCE

Consistent with the recommendations contained in “The Science of Measurement,” Modius uniquely delivers intelligent guidance that allows data center operations personnel to dynamically adjust capacity on all resources based on real-time input. This data ensures that business continuity is not compromised by IT outages or performance degradation.

Intelligent guidance provides a “just in time” recommendation of the right improvements at the right time, and significant advantage over traditional building management systems or other point solutions. Modius achieves intelligent guidance through the use of computational capabilities not found in other monitoring and measurement products. Called ‘computed points’, this feature allows operators to combine different data points from different devices into algebraic equations. These equations can then calculate metrics that provide insight to make the right changes at the right time, or to send alarms based on specific conditions.

THE SCIENCE OF MEASUREMENT

A research report by Jonathan Koomey and John Stanley, which aims to help data center managers (both IT and facilities managers) better understand the business value of measuring data center performance characteristics and the considerations important to developing a measurement scheme.

Author Jonathan Koomey
Website: ***www.koomey.com***

Download the full-length version of the report at www.modius.com/download-science-measurement-whitepaper/

TECHNICAL SPECIFICATIONS

Modius OpenData is a software application that can be installed on-premise or hosted in the cloud. Some customers choose to run the application within VMWare ESX. Software platform requirements are as follows:

- **Windows Server** - 2008, 2008 R2, 2012
- **Database** - Express, Workgroup (Up to 2012) and MS SQL Server 2008 - 2016

CONTACT YOUR MODIUS REPRESENTATIVE FOR MORE INFORMATION ABOUT HOW OPENDATA CAN FREE UP TRAPPED CAPACITY IN YOUR DATA CENTER, SIGNIFICANTLY REDUCING OPERATING COSTS.

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71 Stevenson Street, Suite 400, San Francisco, CA 94105 USA
sales@modius.com www.modius.com (888) 323-0066