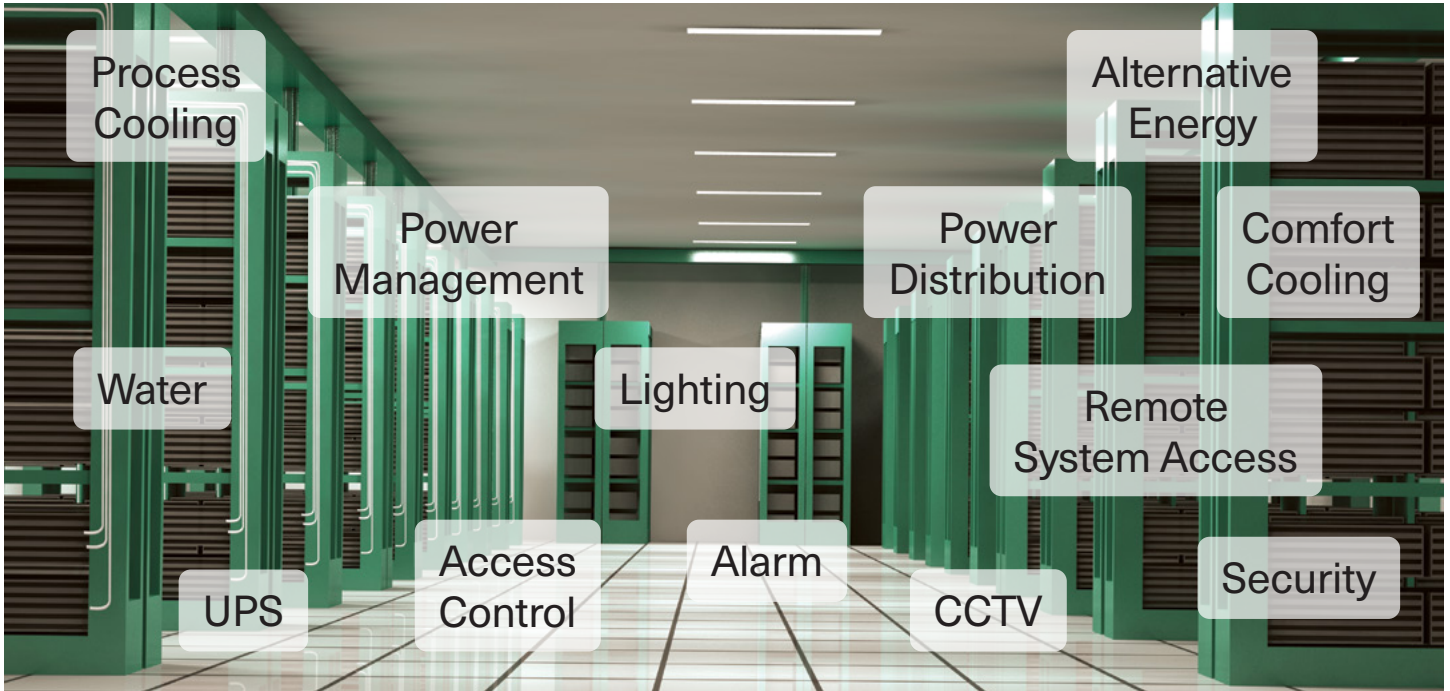# Creating Energy-Efficient, High Performance Data Centers

Trane and GE collaborate to improve operational, energy and environmental performance

Trane and GE collaborate to improve data center performance

Executive summary

Energy consumption has always been a concern for data center managers. But growth in demand for computing capacity coupled with a sluggish economy and rising energy prices has made energy efficiency a top priority for operators of mission essential data centers.

Recognizing their ability to help customers save energy and reduce operating costs, GE and Trane, a leader in indoor comfort systems and services and a brand of Ingersoll Rand, have combined their technical and domain expertise to provide a new solution to improve operational performance in data centers and other industrial settings.

Tracer™ XT is an innovative new software platform that is designed to integrate, manage and optimize critical building systems. Based on Trane's proven Tracer™ building automation technology and GE's Proficy® software platform, Tracer XT is the first new solution to come out of the collaboration between Trane and GE.

Tracer XT was launched in December 2011 and will be released in January 2012. The first application of Tracer XT will be for large, mission-critical data centers where demands to reduce energy and improve operating efficiency are particularly high.

Tracer XT is "inspired by GE's ecomaginationsm" technology to build innovative solutions to solve today's environmental challenges while driving economic growth.

Data center operators look to improve performance, reduce costs

Data centers rank among the most energy-intensive types of facilities, using as much as 100 times the energy per square foot of a typical building, according to the Lawrence Berkley National Laboratory (LBNL). They also have a significant impact on the environment.

Gartner Inc. researchers estimate that energy-related costs account for about 12 percent of data center expenses, which makes energy the single largest cost for many data centers. Some estimates put the total annual energy cost of U.S. data centers as high as $3.3 billion. And the Uptime Institute says energy costs to run a server for four years are about the same as the cost of buying the server in the first place.

"A dynamic data center... requires more sophisticated management tools and a holistic view of the entire ecosystem. It also requires much closer working between facilities and IT professionals, which means the data and tools must be able to work together to optimize the use of power, cooling and IT resources."

Pike Research
From "Green Data Centers," 2010

Operators of mission-critical data centers are being challenged to control energy and operating costs, create bullet-proof security and strive for extremely high levels of uptime performance, all at the same time. Meanwhile, organizations continue to have an almost insatiable appetite for computing capacity and the next IT replacement cycle appears to be just around the corner.

Much of the energy consumed in a data center is used to create an optimal operating environment by powering mission-critical process cooling, filtration, humidification/dehumidification and other building systems. In fact, the LBNL estimates that these systems account for more than half the energy used in a typical data center.

Growing demand for computing capacity, increased centralization and server density and other factors suggest that data centers will become even more energy-intensive places unless operators apply technologies and practices that improve their power utilization effectiveness (PUE), which compares total data center power consumption with the energy used by the IT equipment alone.

Data centers are applying a variety of methods to improve their PUE including choosing energy-efficient IT systems, improving equipment utilization, adopting more efficient cooling strategies and changing physical layouts to reduce cooling requirements. Operators also recognize the enormous opportunity to improve PUE by using integrated controls that can help reduce the percentage of energy consumed by heating, ventilation and air conditioning (HVAC) and other building systems.

Most data center operators already use highly capable automation and control platforms to integrate and optimize their IT hardware and software. They also use advanced building systems that control HVAC and other systems to meet process cooling needs and maintain a safe and comfortable physical environment for data center employees.

What operators have lacked until now is the ability to integrate information from intelligent building systems and sophisticated automation and control platforms. This would enable them to operate a data center as a single integrated system, rather than a collection of standalone subsystems.

Tracer XT takes operating efficiency to the next level

Tracer XT improves data center performance by integrating data from HVAC, power, lighting, safety and other standalone systems into a single user interface. Actionable information is displayed on dashboards that provide a holistic, real-time view of mission-critical building systems. Using the Tracer XT dashboards, operators can monitor, control and troubleshoot discrete systems to improve building efficiency and create an optimum physical environment for operations and occupants. Dashboards can be tailored to meet an organization's particular needs.

Tracer XT enables operators to create high performance data centers by using proven technologies and practices to improve building performance, reduce energy consumption and enable the IT organization to achieve its uptime objectives and increase its contribution to achieving the broader organizational mission.

Using the Proficy platform's data management capabilities, analytical tools and communications capabilities, Tracer XT provides operators with actionable information gathered from a variety of standalone building systems. Tracer XT monitors the performance of individual systems and alerts operators to problems and energy-saving opportunities.
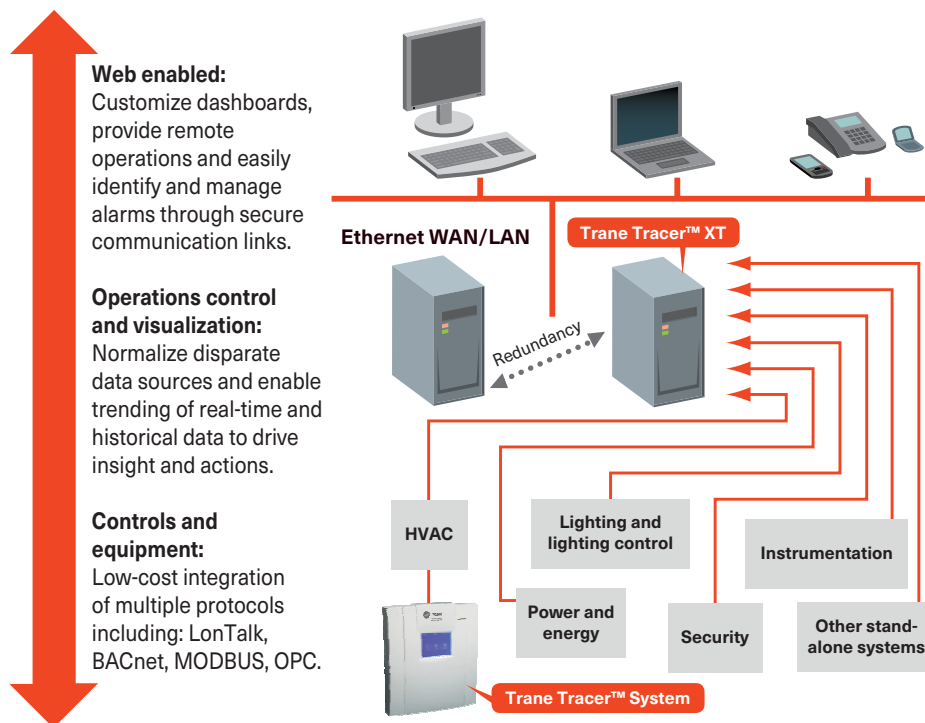
Data is displayed on highly intuitive dashboards that provide a "big picture" view of the entire data center operation so that the operator can manage the center as an integrated system made up of discrete subsystems.

This approach is much more efficient than one in which each system is operated independently, without regard for how it affects other systems or overall data center operations. Tracer XT creates an intelligent approach to building management by using data from any of the discrete systems it controls to optimize the performance of other systems and the data center as a whole.

Unique Tracer XT system architecture enables this systemic approach to building performance:

• Tracer XT efficiently integrates independent systems such as HVAC, power and energy, lighting, security and instrumentation. Tracer XT accelerates the flow of information by collecting real time data from equipment, meters, controls and software systems from throughout the data center. The system supports various data protocols commonly used in building systems, such as BACnet, MODBUS and OPC.

• The system continuously collects, processes, normalizes and archives information from building systems to enable real-time trending and access to historical data. Tracer XT integrates information in a clear and practical way to provide insight and enable fact-based operating decisions. The architecture includes redundant features to ensure security and continuity.

• Real-time information and high-level analytics give the Tracer XT system the ability to display both global and detailed information in an easy-to-understand graphical format on a web-enabled dashboard. Operators can monitor and control building systems and take action based on real-time knowledge of system performance and operational needs. They can consider various options and make decisions that reduce energy consumption. They also can immediately address alarms and potential problems to avert more serious issues and maintain system uptime. Multiple and remote data centers can be accessed from a central location using secure communication links.

System Architecture

Web enabled:
Customize dashboards, provide remote operations and easily identify and manage alarms through secure communication links.

Operations control and visualization:
Normalize disparate data sources and enable trending of real-time and historical data to drive insight and actions.

Controls and equipment:
Low-cost integration of multiple protocols including: LonTalk, BACnet, MODBUS, OPC.

Ethernet WAN/LAN

Trane Tracer™ XT

Redundancy

HVAC

Lighting and lighting control

Instrumentation

Power and energy

Security

Other stand-alone systems

Trane Tracer™ System

Tracer XT offers intelligent tools and information

Tracer XT provides operators with tools and intelligent information to improve data center operations and productivity:

- Real-time data on current system status and performance
- Historical data to compare trends and quickly identify and correct problems
- Comprehensive analytics to recognize trends and measure long-term goals
- Intelligent alarms to provide actionable information
- Scheduling by time-of-day or subsystem
- Data collection to connect hundreds of systems and devices
- Change-based execution architecture to acquire data from field devices, perform database calculations, archive and network data, and run scripts

Processing speed is critical to the effectiveness of the Tracer XT platform. The system uses a high-speed timestamp database that can record and catalog more than 200,000 events per second. Tracer XT also uses an architecture that is open, flexible and scalable to easily accommodate operators' needs as data centers expand to meet an organization's growing demand for more computing capacity.

Tracer XT helps improve energy efficiency by 11 percent at GE data center

Tracer XT is already proving its value in several real-world applications, including at the mission-critical GE data center in Cincinnati. Trane and GE worked together to develop a custom solution for the center, which includes 29,000 square feet of raised floor, more than 3,800 servers and a 2/5 megavolt-ampere (MVA) uninterruptible power supply (UPS). The data center consumes 24 million kWh of electricity each year.

By installing the Tracer XT system, upgrading the Chilled water system and making other changes, GE was able to improve efficiency by 11 percent and reduce water use by 20 percent. Use of chemicals in the chilled water system was cut in half and reliability of the system has improved, reducing the chance of unscheduled system downtime.

Data center system launches Trane, GE Intelligent Platforms collaboration

The Tracer XT software solution for large data center operators is the first product of the collaboration between Trane and GE. The two companies plan to introduce other intelligent offerings that combine Trane's expertise in high performance building systems and services with GE's renowned competency in industrial solutions.

Tracer XT provides a new level of value for data center operators by integrating building control systems, software tools and hardware infrastructure to create a comprehensive intelligent building solution based on the extensive domain expertise of the two companies.

GE Intelligent Platforms is an experienced high-performance technology company and provider of software, control systems, services and expertise in automation and embedded computing. The company is a leading provider of innovative solutions for customers in dozens of industries. GE provides a range of data center solutions including the Total Efficiency™ DC Data Center platform that significantly reduces power loss, water consumption and cooling requirements.

GE data center solutions feature an open, flexible and easily expandable architecture that helps operators improve efficiency by connecting existing hardware and software platforms and providing operators with actionable insight to data center operations.

Tracer XT uses the capabilities of the innovative GE Proficy platform to provide operators with visibility into data center operations and enable real-time decision support, continuous process improvement and improvements in uptime, total cost of ownership and return on investment. Tracer XT expands the Proficy platform's reach to include HVAC and other building systems.

Trane has decades of experience as a provider of reliable, efficient HVAC systems for data centers and other commercial and industrial applications. Trane innovations include the Rapid Restart chiller, which can reduce the possibility of data loss or equipment damage after a power outage by restarting in as little as 43 seconds, while other chillers can take as long as 15 minutes to restart.

Trane has unique expertise in high performance building technologies and practices. High performance buildings reduce energy consumption and lifecycle operating costs, improve performance and occupant productivity, and help organizations achieve their primary mission.

Through its global service and maintenance network, Trane provides intelligent service concepts to improve building performance. The company has extensive experience in managing large energy retrofit projects and in helping its customers achieve energy and environmental performance goals, including certification through the U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) process.

Creating energy-efficient, high performance data centers

Operating a mission-essential data center is no easy task. With IT capabilities more integral to organizational success than ever before, system availability will continue to be the most critical measure of success for data center operators. The pressure is on to expand capacity and improve performance and reliability, but at a cost the organization can afford.

Technologies and practices exist today to help data center operators achieve world-class levels of uptime performance, reduce energy consumption and operating costs, improve environmental performance, give employees the tools they need to perform effectively, and increase the data center's contribution to the organization's bottom line — all at the same time.

With Tracer XT, Trane and GE come together to offer a complete, seamless solution to create the high performance data centers that organizations need to compete in today's global economy and position themselves for future success.

For more information on Tracer XT and Trane data center solutions, visit: www.trane.com/datacenters

For more information on GE Intelligent Platforms for data centers, visit: www.ge-ip.com/datacenters