



TIS Trane
Intelligent
Services



Realizing the full potential of high performance buildings

Trane Intelligent Services delivers sustainable
performance improvements

By Paul McMurphy and Leon Surbaugh
Trane Intelligent Services



transform



results



innovate



activate



integrate



Trane Intelligent Services delivers sustainable performance improvements

Executive summary

Technology advancements and the ability to turn raw building system data into usable information have enabled a step-change improvement in the way that commercial buildings are operated and maintained. Building owners and operators can now use real-time information to make data-based decisions. The result is a better performing building that helps an organization achieve its mission and accomplish its most critical operational and financial goals.

Trane, a leading global provider of indoor comfort systems and services and a brand of Ingersoll Rand, has developed analytical operating concepts that help organizations identify and realize the value of their investments in building assets.

Trane Intelligent Services combines technology, proprietary analytics and industry-leading heating, ventilating and air conditioning (HVAC) expertise to continuously collect, interpret and act upon data from building systems and controls to optimize operational performance. With Trane Intelligent Services, building owners and operators have the tools they need to manage energy consumption and operating costs, minimize their environmental impact, improve building system reliability and uptime, and resolve more problems quickly and efficiently.

Levels of service include:

- **Alarm Notification** – Trane monitors building performance and notifies staff of any exceptions to predetermined operating parameters;
- **Active Monitoring** – Trane responds when critical alarms signal operating exceptions or performance outside established parameters;
- **Building Performance** – Trane proactively diagnoses operating anomalies and responds to preempt failures, incidents and performance deterioration.

Adopting advanced service concepts such as Trane Intelligent Services is essential to reaching optimal levels of performance and maintaining them throughout a building's decades-long occupied life.

Information-based services are most cost-effective

Outcome-based approaches to building services, like the one Trane Intelligent Services enables, tend to be more cost-effective than traditional task-based reactive and preventive strategies, according to studies by the Federal Energy Management Program (FEMP). Following are highlights of commonly used maintenance approaches:

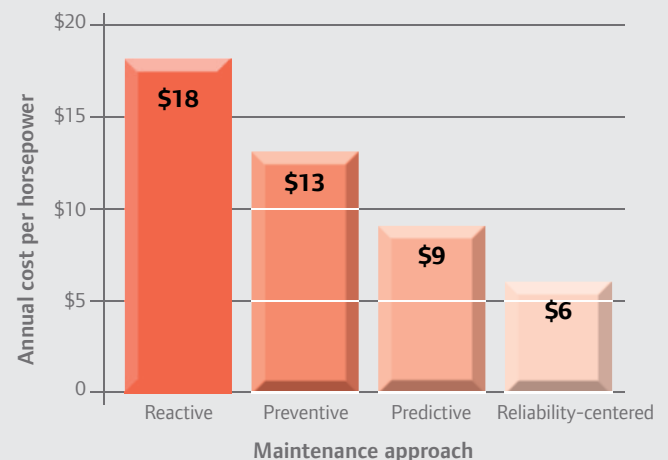
Reactive maintenance – Reactive maintenance was the predominant HVAC system service model for many years. Often called “run-to-fail,” the reactive approach relies on the use of in-house facilities professionals or third-party service contractors to repair equipment after it breaks down.

Preventive maintenance – In a preventive maintenance model, building operators follow industry and manufacturers' service recommendations. They schedule routine maintenance and equipment inspections at established intervals, monitor and troubleshoot system performance, and develop contingency plans to mitigate operational problems. Preventive maintenance requires a leap of faith for operators, who are unable to validate that their maintenance spending actually contributes to performance improvements.

Predictive maintenance – For a predictive maintenance strategy, building operators and their service partners collect, analyze and act on information to anticipate system problems and determine when equipment actually needs to be serviced. For example, sensors can monitor the performance of an HVAC fan motor and alert operators if vibration levels exceed the norm, which may foreshadow an impending unit failure; maintenance workers can change filters based on airflow and air quality readings rather than on an established schedule.

Reliability-centered maintenance – Reliability-centered maintenance makes heavy use of predictive capabilities, but takes them a step further by aligning the maintenance approach with the organization and building mission, objectives and resources. It recognizes that all building systems are not of equal importance. Building owners and operators usually seek the help of third-party experts to implement predictive and reliability-centered strategies.

Following is a comparison of costs of various maintenance approaches based on FEMP data:



Source: FEMP O&M Maintenance Guide, Release 3.0, August 2010

Trane Intelligent Services at a glance

- Drives high performance building benefits
- Optimizes building performance
- Reduces energy use and environmental footprint
- Delivers sustainable operational optimization
- Improves system reliability and uptime
- Provides 24/7/365 monitoring, detection and notification
- Enables remote troubleshooting and repairs
- Provides real-time, actionable information

Effective service strategy enables high performance building benefits

According to the National Institute of Building Sciences (NIBS), operating and maintenance expenses account for 65–80 percent of a typical building’s total lifecycle costs. This validates the significant economic advantages of taking a total cost of ownership approach to designing and constructing new buildings and continuously improving the performance of existing structures.

Case study: ARRIS Group

ARRIS Group, a global communications technology company based in Suwanee, Ga., needs a highly reliable HVAC system to keep its mission-critical data center operating at peak efficiency.

Challenge

ARRIS Group requires 99 percent or better uptime to deliver unmatched reliability for its customers. The company implemented Trane Intelligent Services to achieve and maintain that level of performance.

Solution

A Trane performance-based agreement with active monitoring provides 24/7/365 monitoring of 69 mission-critical alarm and event points at the data center, enabled by an automated Trane Tracer™ central control system. Under the agreement, Trane technical specialists respond immediately and remotely to any fault alarm, interrogate the system and perform system diagnostics. Forty percent of alarms can be resolved remotely without a service call. If on-site service is required, the system provides technicians with the information they need to solve the problem quickly and efficiently.

Results

With Trane Intelligent Services, the ARRIS Group data center consistently

Keeping buildings operating at their original design performance (ODP) levels is a formidable task, according to the Lawrence Berkley National Laboratories (LBNL). LBNL researchers found that many buildings fail to live up to their designer’s performance expectations, even when new. In addition, they note that “... most buildings drift, often ‘invisibly,’ to lower performance over time, indicating a need for ongoing performance monitoring and fault detection and diagnosis during routine operation.” Additions, modifications and changes in building mission, function and occupancy levels also occur over time, further underscoring the value of restoring ODP levels and optimizing building performance.

Trane develops unique approach to intelligent building services

After extensive market analysis and voice of the customer research, Trane developed specialized applications that capitalize upon its industry-leading domain expertise in HVAC systems, automated building controls and other essential enabling technologies to meet its customers’ evolving operational needs.

Today’s building owners and operators are under tremendous pressure to reduce costs, improve efficiency and wring value from their organizations’ enormous investments in physical assets, including government, school, healthcare, multi-unit residential and commercial buildings. To a great extent, organizations continue to view and operate buildings as “costs” rather than

achieves its reliability objectives, with 99 percent uptime and a 60 percent reduction in unscheduled downtime since choosing Trane as its service partner. Service truck rolls are down by about 50 percent and most problems are resolved remotely, with an average resolution time of 39 minutes.

“With Trane central monitoring we’ve been able to maintain a 99 percent uptime commitment to our customers. Trane central monitoring is a critical tool in our business process to ensure we meet our business demands. With my local Trane account manager I always know I am in good hands and that tasks will be done 100 percent of the time.”

—Mark Manning, Facilities & Security Manager, ARRIS



“productive assets” that can contribute to their success. Finally, organizations need proof that their investments—including spending on service and maintenance—are providing an attractive rate of return.

Trane Intelligent Services is distinctive in several ways:

1. Trane’s unique perspective on systems’ operational performance creates deep domain expertise in strategies to achieve and sustain optimized performance. This expertise includes building-modeling capabilities, embodied in the proprietary Trace™ 700 software, data-driven analytics and other essential disciplines.
2. The Trane Intelligent Services Center is staffed by highly qualified optimization engineers and field service experts with the knowledge and expertise to respond and diagnose building conditions quickly and effectively.
3. Local Trane technicians are skilled, knowledgeable and factory-trained, providing customers with industry-leading onsite service capabilities.

Trane Intelligent Services takes predictive maintenance to a new level

Trane Intelligent Services continuously collects and analyzes data from various building systems and either automatically responds or provides specific recommendations to keep the building operating at performance levels chosen by the operator.

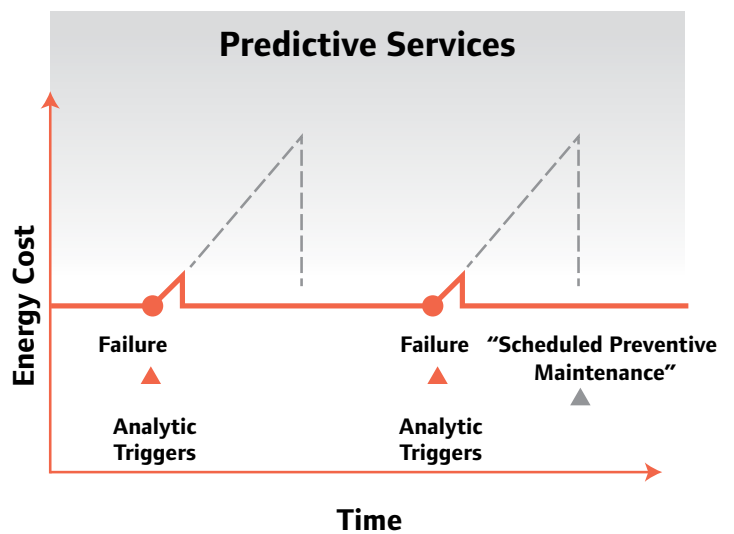
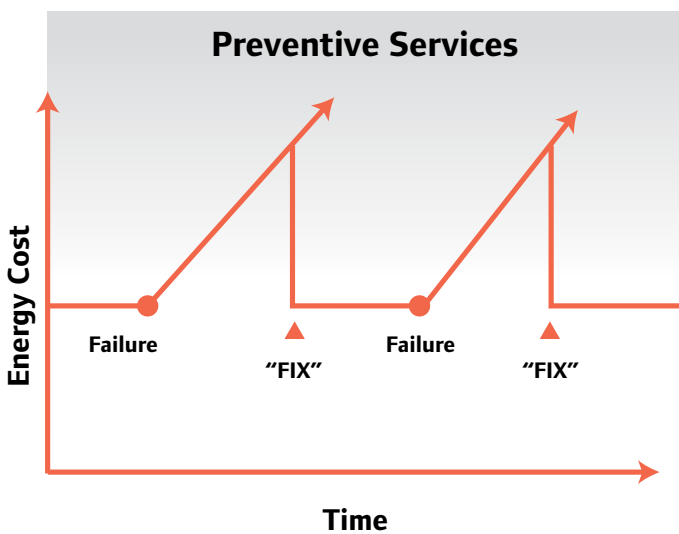
For example, a hospital might set air quality, temperature,

humidity and air pressure standards for different hospital units to support its infection control program. Trane Intelligent Services can continuously monitor multiple locations in the facility and automatically adjust settings to maintain stable pressure differentials, humidity levels and temperature conditions for each specific location and critical area.

An office building can identify a key piece of HVAC equipment, such as a chilled water system, as mission-essential because its failure would severely disrupt tenant service and off-hour business needs. Trane Intelligent Services can use analytical fault detection and diagnostic tools to monitor the system’s operation and alert technicians if a potential problem is detected.

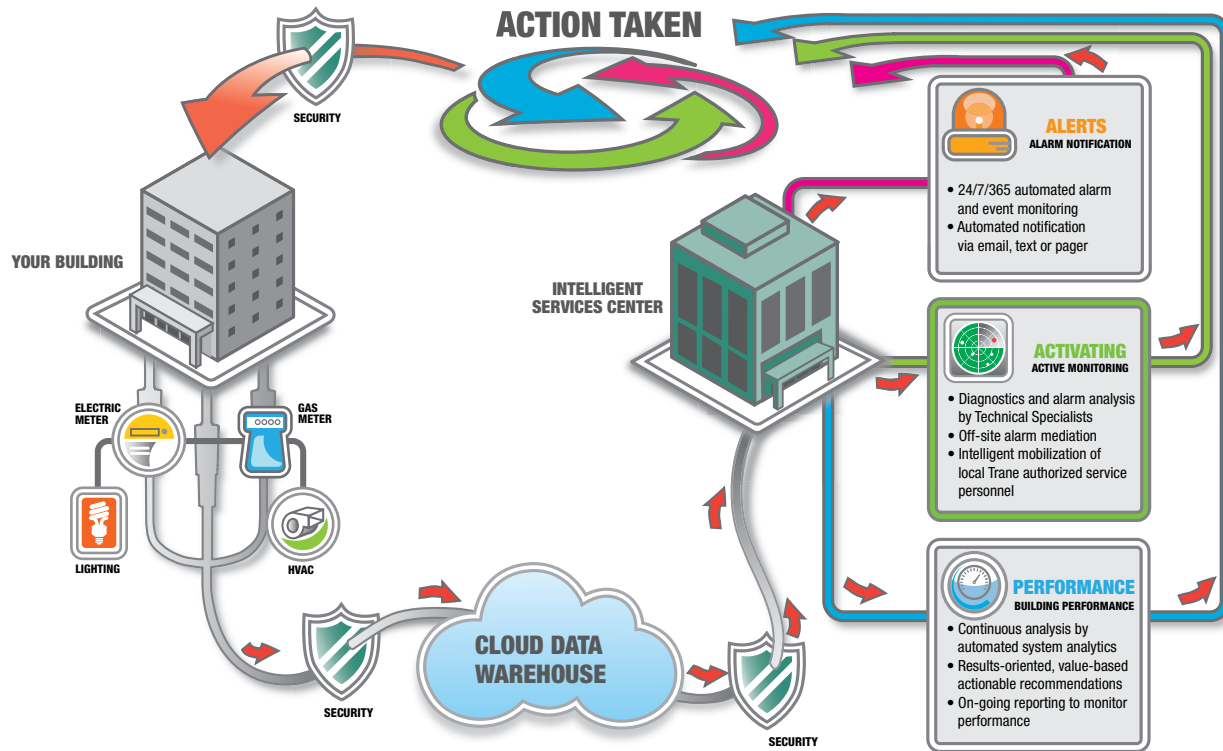
A typical commercial building’s variable air volume (VAV) terminal units are commissioned and calibrated when they are first installed in a new building. Even the most comprehensive service agreements call for randomly inspecting only a small portion of the VAV boxes each year, creating an opportunity for inefficiencies to creep into the system. Trane Intelligent Services technology is capable of inspecting and continuously commissioning each unit to maintain original design performance levels.

The LBNL advocates periodic re-commissioning to return buildings to their original design performance specifications, which the laboratory says could yield 10-20 percent in energy cost recovery. Trane Intelligent Services can improve building performance through a continuous-commissioning process in which variations are detected and corrected quickly. (See figure below)



Traditional preventative maintenance practices can create an “alligator tooth” performance cycle (left), in which failures occur and building efficiency deteriorates until building systems are brought back to their original design performance levels at the next scheduled maintenance interval. In a predictive services model, critical building systems are continuously monitored and problems analyzed so that they can be addressed in real time. The result is a better-performing, more reliable and more energy-efficient building.

Trane Intelligent Services platforms at work



Trane offers three intelligent services platforms

Trane uses three customer platforms to deliver the benefits of Trane Intelligent Services.

Alarm Notification – Building owners and operators with Trane Tracer™ series building automation systems and a Trane Service Agreement can take advantage of Alarm Notification.

With Alarm Notification, buildings are monitored around-the-clock and users can interface with the Trane Intelligent Services remote service facility, day or night. Building operators are notified immediately if a critical event occurs, via means chosen by the customer. Critical event histories are archived and available for review upon request.

Active Monitoring – Active monitoring also provides users with 24/7/365 system monitoring and immediate notification when a critical event occurs. Additionally, when an event occurs, technical specialists at the Trane Intelligent Services center analyze trends and real-time data to identify and, when possible, fix the problem remotely. As many as 40 percent of problems are resolved in 30 minutes or less.

If the event requires onsite intervention, a Trane technical specialist will contact the local service office with specific details and recommendations, enabling the tech to anticipate and prepare for the service call. Active Monitoring customers often notice significant reductions in truck rolls, maintenance and labor costs

and an increase in the number of problems that are cost-effectively resolved in one visit or remotely.

Active Monitoring customers receive regular event reports to help them make better decisions and plan for repairs, upgrades and replacements.

Building Performance – The Building Performance platform represents the current state of the art in intelligent services, using the best available analytics, diagnostics and human expertise to optimize building performance.

The package begins with a thorough building audit to assess the performance of critical systems, identify potential problems, assess how and where energy is currently being used and establish operating standards aligned with the building's mission and purpose. Standards are typically set in such categories as energy and water use, environmental performance, occupant health and comfort, and system reliability.

Once operating standards are set, Trane Intelligent Services uses continuous monitoring, diagnostics and analytics to keep the building operating within the established tolerances. Reports can be generated at any time and Trane technical specialists are always available to help interpret performance data and identify and recommend potential improvements.

Case study: Lewis-Gale Medical Center

Lewis-Gale Medical Center is a 521-bed medical center in Salem, Va., that needs a highly reliable HVAC system to maintain the best possible physical environment of care.

Challenge

HVAC system reliability is critical to achieving the medical center's patient-care mission. Since the hospital's cooling plant does not have 100 percent backup, immediate response to any problem is critical to achieving uptime objectives and avoiding risk of a system failure, so hospital officials chose the Trane Intelligent Services solution.

Solution

The Trane scheduled service agreement with active monitoring service provides 24/7/365 monitoring and alarm routing, enabled by a Trane Tracer™ Summit control system. The system alerts technical specialists in the Trane service center of any critical events. Technicians respond immediately to interrogate the system and perform fault diagnostics, which helps them resolve as many as 40 percent of alarms without dispatching a service truck. Trane technicians are ready to respond if onsite service is required; they also perform prescribed service to maintain peak performance.

Results

System reliability has improved significantly since Lewis-Gale contracted with Trane Intelligent Services. The hospital has achieved a 30 percent reduction in service truck rolls, reducing its operating costs. On average, Trane technical specialists respond to alarms in six minutes and are able to resolve problems in 67 minutes.

"The Trane central monitoring service has significantly reduced system downtime, cut operational costs and improved the comfort of our patients and staff. Trane central monitoring detects critical system alarms and responds to remedy a fault before we even realize there's a problem in many cases. In instances where the fault cannot be resolved remotely, Trane mobilizes a technician who comes prepared to fix it right the first time."

—Larry Doyle, Director of Engineering and Planning, Lewis-Gale Medical Center



Intelligent services enable high performance buildings, improve efficiency and reduce costs

There are some big numbers associated with improving building performance. The U.S. Department of Energy estimates that commercial buildings account for 40 percent of the country's total energy consumption and that most existing buildings could be 30-50 percent more energy efficient than they are today.

Meanwhile, McKinsey and Company research concludes that the U.S. could reduce its annual non-transportation energy use by about 23 percent with improved energy efficiency. This would eliminate more than \$1.2 trillion in wasted spending and reduce annual greenhouse gas emissions by 1.1 gigatons, which is the equivalent of taking every passenger vehicle and light truck off U.S. roadways.

Organizational leaders are starting to recognize the huge potential of better building performance. A survey of corporate executives sponsored by Ingersoll Rand and conducted by the Economist Intelligence Unit found that 82 percent of senior leaders consider energy efficiency an important strategy for their organization and more than three-fourths believe sustainability will become even more important to them in the coming years.





As more organizations embrace high performance building technologies and practices, it is impossible to overstate the importance of sound operating, maintenance and building services practices in realizing the full potential of their investment.

The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) has gone so far as to conclude that a poorly designed building operated and maintained effectively will usually outperform a well-designed building with poor operating and maintenance practices.

The availability of actionable information—in the right place, at the right time and in the right hands—can mean the difference between an efficient, reliable building and one that uses too much energy, costs too much to operate and puts the organization’s mission at risk.

Trane Intelligent Services represents an evolutionary step forward in the use of technology, proprietary analytics and human knowledge to continuously collect, interpret and act on data from building equipment and controls to optimize building performance and help organizations achieve their most critical objectives.

About the Authors

Paul McMurphy is Remote Services Offer Development Leader for Trane Intelligent Services. He currently leads a team developing innovative ways to combine traditional services and technology to better meet the needs of commercial building owners and operators. McMurphy has more than 20 years of technology development and application experience.

Leon Surbaugh is Global Service Program Manager for Trane Intelligent Services. In his current role, he develops and implements smart service solutions that are tailored to meet the specific needs of Trane customers. Surbaugh has more than 30 years of experience in the heating, ventilating and air conditioning (HVAC) services industry.

Trane is a leading global provider of indoor comfort systems and services and a brand of Ingersoll Rand.

For more information visit www.trane.com/commercial or contact your local Trane service representative www.trane.com/Commercial/AboutTrane/ContactUs.



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