BRIDGEWAYS®
Healthcare IT Monitoring

Monitoring The Symptoms of IT:

Operating IT at Peak Performance to Enable Better Patient Care

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Healthcare IT Monitoring

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Executive Summary

Healthcare organizations are adopting new models to address long-standing challenges care providers face in their day-to-day experiences of delivering patient care. The adoption of IT has improved quality and safety in healthcare. By monitoring the IT infrastructure performance, administrators can proactively help to ensure the delivery of quality patient care by maintaining the peak performance of their systems and applications, including InterSystems Caché and Oracle databases, as well as the VMware environment.

Consistently accurate data collection and effective data sharing are the core of successful delivery of care across the healthcare continuum. Having a reliable IT infrastructure is a foundation in which a healthcare organization can place its quality and reputation. For instance, databases are a critical part of the IT infrastructure; they're the essential repository of patient information for a healthcare organization. When databases fail to accomplish their job, the healthcare industry is burdened with higher financial costs and endangered reputations. Since all data generated by care providers is stored in databases, these databases must be accessible and available at all times. One way to ensure this is to monitor performance and take the necessary actions needed to deal with minor or major problems before they cripple the database.

Microsoft's System Center Operations Manager (SCOM) is used by some health IT administrators to ensure that their infrastructure remains up and operating at peak performance for their Microsoft-related systems and applications. SCOM's proactive alert generation capabilities, alert knowledgebase, graphical dashboards and reports help administrators uncover problem areas, troubleshoot issues, analyze trends, and forecast future resources needed. One of the benefits of holistic IT monitoring is that administrators will find it easier to triage complex issues and make more informed decisions. Not only are they able to monitor their infrastructure with a uniform and convenient view, they are also able to monitor the highest-level of system operation, above individual systems and applications, and understand how, for example, a server failure is causing a database to go down. BridgeWays management packs enable the extension of SCOM monitoring to InterSystems Caché and Oracle database environments, as well as virtualized environments such as VMware. Our cloud-based/SaaS solution Tibanna Plus, which is powered by SCOM, can also be customized to monitor these systems, plus the Microsoft systems and applications that SCOM normally can be customized to monitor.

By proactively monitoring systems and applications' health and performance, administrators will gain the upper hand in responding to issues that may cause either a single database or a broader portion of their IT infrastructure to fail. Overall patient care levels will be improved by the peak performance of the organization's IT infrastructure.

The New Age of Healthcare

With the non-stop advancement and evolution of information technology (IT), and the ever-increasing reliance of people and industries on it, healthcare providers felt the need to reconcile their practices with information technology, and take advantage of the latest advances in that field. Nowadays, healthcare organizations are adopting new models of care delivery to address long-standing challenges care providers face in their day-to-day experiences such as: reducing the cost of healthcare delivery; focusing on the transparency of data and services; enabling patients to make informed decisions about their healthcare; and, enhancing providers' coordination to improve the quality of care. According to a recent brief issued by the Office of the National Coordinator for Health Information Technology, the widespread adoption of IT has, overall, led to an improvement in quality and safety in healthcare.[1] By monitoring the IT infrastructure performance, administrators can proactively help to ensure the delivery of quality patient care by maintaining the peak performance of their systems and applications. In this white paper, you will learn about different aspects of healthcare-IT interplay and about our practical approach to maintaining a reliable IT infrastructure. By leveraging the power of Microsoft's System Center Operations Manager (SCOM) to manage and monitor IT systems and applications including InterSystems Caché and Oracle databases as well as the VMware platform.

How Patients and Providers Benefit from Healthcare-IT Interplay

In the new millennia of the healthcare industry, consistent and accurate data collection as well as effective data sharing are the core of successful delivery of care across the healthcare continuum. This, therefore, dictates the necessity for having a reliable IT infrastructure; a foundation upon which a healthcare organization can place the pillars of its quality and reputation.

For example, in *"The potential for community-based health information exchange systems to reduce hospital readmissions"* the value of Health Information Exchange (HIE) in reducing hospital readmissions and lowering health risks to patients who walk to different providers (e.g. hospitals, doctors) has been examined.[2] The high cost (estimated to be $17 billion each year) and occurrence of hospital readmissions (due to the poor exchange of clinical data after patient discharge) in the U.S, according to the paper, make this area of healthcare an ideal target for betterment of care quality and payment reforms. The paper sheds light on how by facilitating health information exchange hospital readmissions could be shrunk. The decrease in hospital readmissions is a result of improved coordination of care, which also lowers the risk of injury by uninformed care decisions.

[1]DHHS Office of the National Coordinator. (2015, February). Recent Evidence that Health IT Improves Patient Safety {Online]. Available: https://www.healthit.gov/sites/default/files/brief_1_final_feb11t.pdf

[2]J. R. Vest, L. M. Kern, M. D. Silver, R. Kausha. (2014, Aug.) The potential for community-based health information exchange systems to reduce hospital readmissions. Journal of the American Medical Informatics Association [Online]. 435-442 Available: http://www.hiewatch.com/news/study-shows-hie-benefit-readmissions?mkt_tok=3RkMMJWWfF9wsRoguKvMZKXonjHpfsX96%2B4uX6aylMI%2F0ER3fOvrPUfGjI4HSstII%2BSLDwEYGJlv6SgFQ7LHMbpszbgPUhM%3D

The benefits of implementing HIE, which showcases the significance of IT in healthcare, are emphasized in materials at HealthIT.gov.[3] For example, "standardization of data" through HIE has been underlined as a major value of HIE which in turn improves patient care. Well-timed sharing of data is seen as central to the quality of care delivery, which is achieved through the non-stop service of properly constructed and professionally maintained databases.

Having heard and read much about the significance of IT in healthcare, U.S. policy makers are attempting to pass supportive and comprehensive healthcare IT laws. In addition to well-known nationwide acts such as the Health Insurance Portability and Accountability Act (HIPAA) or Health Information Technology for Economic and Clinical Health (HITECH), many U.S. representatives and senators have promoted more modernized and relevant healthcare-related laws. For instance, the importance of HIE has made Connecticut's senators and representatives consider a bill to address a statewide health information exchange system that would make providers share patient clinical data and help prevent unfair practices by the providers.[4]

Prasad Srinivasan, MD, Connecticut Representative in the U.S. House of Representatives, said, "The advantage is there's no redundancy, because I know exactly what the neurologist said, because I see the report right in front of me. I know exactly what the cardiologist said."

Within the realm of healthcare, the concept of quality can be viewed and evaluated differently across a vast range of services, from inpatient or outpatient care deliveries to services offered through pharmacies or labs, may be targeted for evaluations. For example, as a part of the healthcare industry, labs are mandated to provide clinicians with services that are precise, cost-effective, and timely. Among these qualities, timeliness is very important to clinicians.[5] Timeliness expresses itself in Turnaround Time or in short "TAT", and labs define TAT[6] as a major performance indicator of their service. Efficient data sharing—which depends on the operation of databases and applications at peak performance—plays a crucial role in the betterment of TAT and consequently, the quality of service that can be provided.

[3] Office of the National Coordinator for Health Information Technology. (2014, May). What is HIE? [Online]. Available: http://www.healthit.gov/providers-professionals/health-information-exchange/what-hie

[4] Healthcare IT News. (2015, May). Connecticut mulls a statewide HIE. [Online]. Available: http://www.hiewatch.com/news/connecticut-mulls-statewide-hie

[5] R. C. Hawkins. (2007, Nov.) Laboratory Turnaround Time. The Clinical Biochemist Reviews [Online]. 28(4):179-194. Available: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2282400/

[6] Turnaround Time, or TAT has been defined by GD. Lundberg as the time required to finish nine different steps: ordering, collection, identification, transportation, preparation, analysis, reporting, interpretation and action. See: GD Lunburg. (1981, May). Acting on significant laboratory results. Journal of the American Medical Informatics Association. [Online]. 245:1762–1763. Available: http://www.ncbi.nlm.nih.gov/pubmed/7218491

Database Availability – The Cost of Downtime

The existence of a modern, well-constructed, and well-maintained IT infrastructure lays the foundation for a thriving healthcare-IT relationship. Databases, as a critical part of the IT infrastructure, are amongst the main players in the healthcare-IT game. Databases are the engines that drive common healthcare EMR, HIS, and LIS systems. For example, the InterSystems Caché database underlies the EpicCare EMR, while the Oracle database underlies the Cerner® EMR. If databases fail to accomplish their job, the healthcare industry—one that is now tightly engaged with IT—is burdened with higher financial costs and endangered reputations.

In a 2002 study, presented by the Healthcare Information Management Systems Society (HIMSS), the cost of computer system downtime to hospitals, average and large, was highlighted.[7] The study was carried out on an average test hospital and validated with 10 control hospitals. The study attributes the financial cost primarily to salaries paid to employees of the hospital. After a series of calculations, the study states, "…for every minute of system downtime, the average hospital spends 1.425 minutes to perform the required tasks without automation plus the time required to update the computer systems once the system is back up and operating." Each minute of computer system downtime—read database downtime—costs the average hospital $264.32. This number would go up to $1041.32/min for a large multi-facility 1400-bed hospital. Presenter Mark R. Anderson notes, "the concept of downtime has always been a concern of healthcare CIOs."

To have a vivid image of how healthcare providers suffer from database failures, consider the implications of a database outage of one major hospital in a US urban center. In 2009, the Methodist Hospital in Indianapolis experienced a power outage that knocked out its ability to access EHR records, culminating in the hospital having to divert ambulances to other hospitals.[8] Since all data generated by care providers is stored in databases, it is critical that these databases are accessible and available at all times so that new data can be stacked in them, or already stored data can be used for relevant purposes. One way to ensure the accessibility and availability of any database is to monitor its performance and take necessary actions needed to deal with minor or major problems before they cripple the database.

[7] Healthcare Information and Management Systems Society. (2003, January). System Uptime Study for the Healthcare Industry. [Online]. Available: http://www.himss.org/files/HIMSSorg/content/files/proceedings/2003/Sessions/session92_slides.pdf

[8] The Indianapolis Star. (2009, June). Hospital is forced to turn away patients. [Online]. Available: http://www.indystar.com/apps/pbcs.dll/article?AID=/20090603/LOCAL18/906030346

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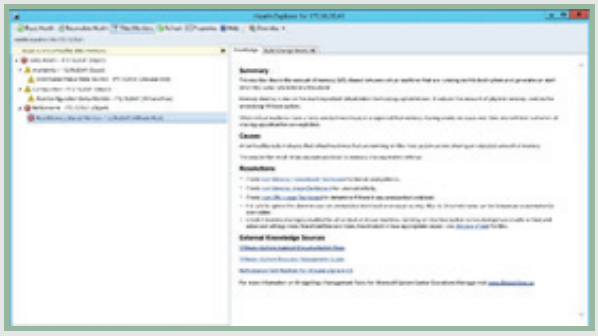
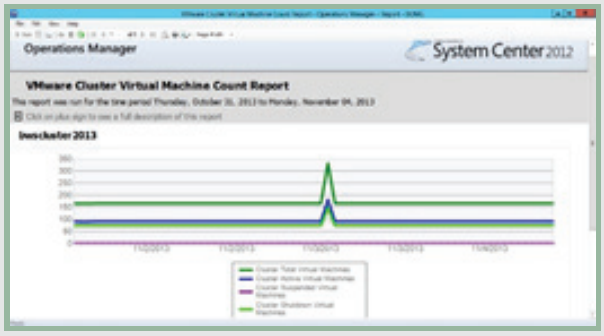
Monitoring the Symptoms of Potential IT Breakdown to Enable Better Patient Care

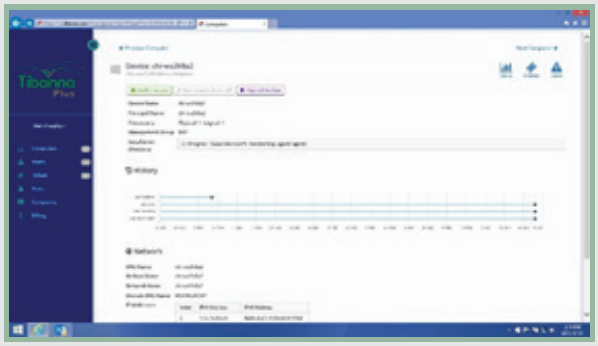
It is now clear that a prosperous healthcare organization owes its success to a dependable IT infrastructure. Microsoft's System Center Operations Manager (SCOM) is used by many Health IT administrators to ensure that their infrastructure remains up and operating at peak performance for their Microsoft-related IT systems and applications. SCOM's proactive alert generation capabilities, alert knowledgebase, graphical dashboards, and reports help administrators uncover problem areas, troubleshoot issues, analyze trends, and forecast resources into the future. BridgeWays management packs enable the extension of SCOM monitoring to InterSystems Caché and Oracle database environments as well as the VMware platform. One of the great benefits of extending SCOM to non-Microsoft systems and applications is that administrators can get a higher-level view, for example, and monitor what is possibly inadvertently impacting the Caché database, such as a failure to a server causing the database to go down, or a router outage that stops traffic from getting to a healthy database. Furthermore, our cloud-based/SaaS solution Tibanna Plus, which is powered by SCOM and can be hosted to meet any regulatory specifications at a HIPAA compliant datacenter, can also be customized to monitor all of these, plus the Microsoft systems and applications that SCOM normally can be customized to monitor.



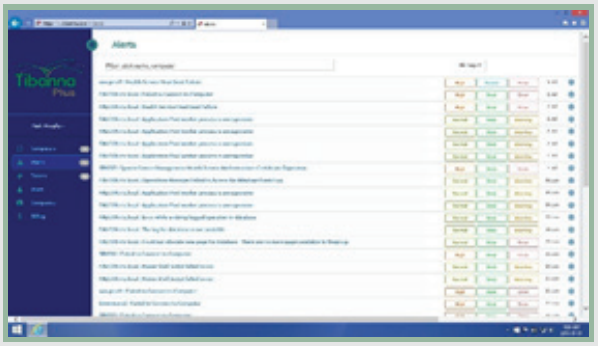
SCOM: Alert knowledgebase, which identifies the alert, the root cause and provides solutions.



SCOM: Sample report.



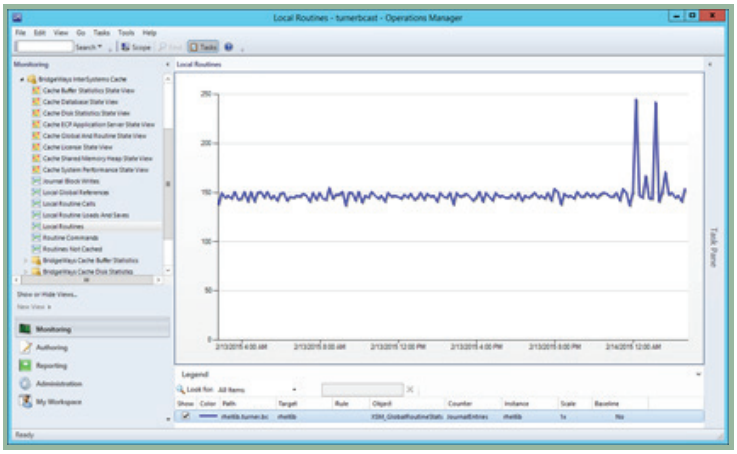
Tibanna Plus: View of individual computer health-state and properties.



Tibanna Plus: Dashboard view of alerts generated across systems and applications monitored.

Monitoring InterSystems Caché Databases

Our InterSystems Caché database monitoring solution leverages SCOM to proactively alert administrators to issues that are about to occur within the Caché environment. Some of these issues include disk storage usage capacity, CPU usage peaks, memory consumption, database availability, and database performance. Plus, administrators can monitor key performance metrics such as global references; cache efficiency; disk writes and reads; logical requests; routing references; shadow operation status; shadow errors; log file alerts and more. Constant monitoring of these metrics provides insight into how the Caché environment is running and enables administrators to oversee what needs to be done to ensure smooth operation of the database. For example, administrators may deem it necessary to upgrade hardware or expand infrastructure, or to locate and identify problematic spots in the Caché environment and deal with them before they cause serious database failure.

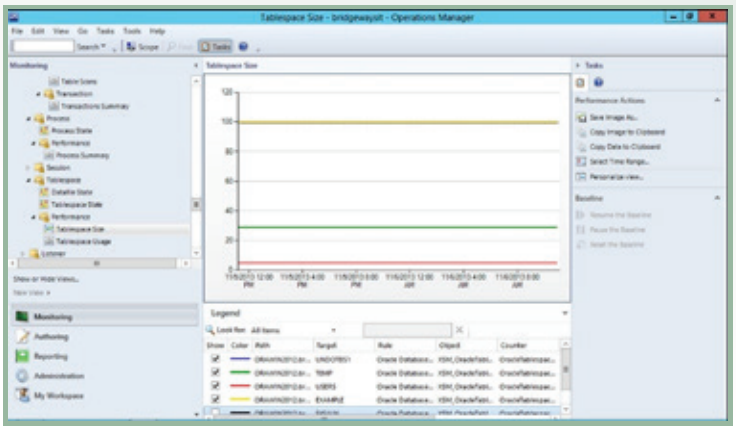


InterSystems Caché: Monitoring local routines within the SCOM console.

Our InterSystems Caché database monitoring solution can be delivered through the on-premise deployment of SCOM via our management pack, or via our cloud-based/SaaS solution, Tibanna Plus.

Monitoring Oracle Databases

Regardless of the purpose of any Oracle database, the challenge is always the same: access and process large amounts of data in an extremely short amount of time. But then there are bottlenecks, server downtime, inactive sessions, limited disk space, hard parses, and not enough table spaces. Our Oracle database monitoring solution leverages SCOM to monitor the database and RAC environment—automatically monitoring all the Oracle instances, no matter how complex the hosts or clusters are configured. Administrators can monitor key health and performance metrics such as data throughput; connection activity; active sessions; memory usage; global cache statistics; GCS/GES message processing time and more. In addition, if you need to establish a baseline, administrators can turn on the Automatic Workload Repository (AWR) function and evaluate expected performance and service levels, maintaining high functionality and reducing operating costs.

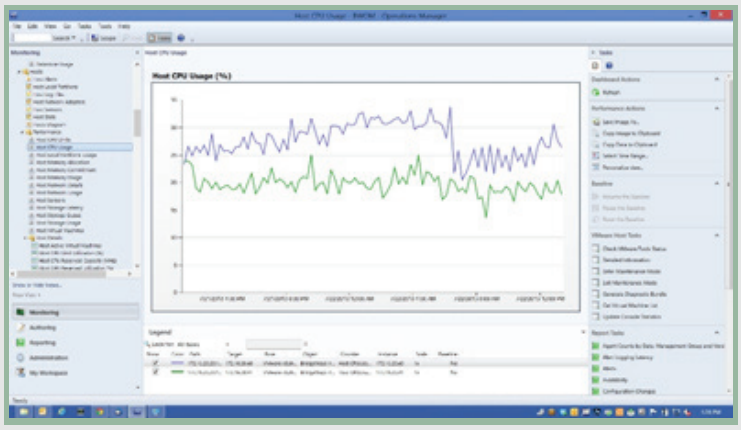


Oracle: Monitoring the table space size within the SCOM console.

Our Oracle database monitoring solution can be delivered through the on-premise deployment of SCOM via our management pack, or via our cloud-based/SaaS solution, Tibanna Plus.

Monitoring VMware Environments

Once a healthcare organization has virtualized its IT infrastructure, they've centralized their resources and instituted greater efficiency of their hardware to handle workloads. With our VMware monitoring solution, administrators can engage in the art of capacity planning as well as proactively monitor their virtualized environment to stop VMware sprawl and gain visibility over their VMware farm. The data collection mechanism is engineered with industry best practices in mind. Administrators can detect and resolve common issues such as CPU starvation; memory contention; network and storage latency; virtual disk usage; VDI connection failures and more. In addition, our VMware monitoring solution will detect and monitor the overall health of key virtualization components from clusters to hosts to the virtual machines.



VMware: Monitoring host CPU usage performance within the SCOM Console

Our VMware monitoring solution can be delivered through the on-premise deployment of SCOM via our management pack, or via our cloud-based/SaaS solution, Tibanna Plus.

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The Benefits of Holistic IT Monitoring

Constant monitoring of key IT metrics from the aforementioned multiple databases and virtualized environment provides insight into how efficiently a healthcare organization's IT infrastructure is operating, and enables administrators to make better—more informed—decisions. For example, suppose a database used by an organization suddenly crashes. What administrators normally do is to first try to find the root cause of the problem. To do this, they need to consider any possible scenario. This IT triage is neither easy nor pleasant work. It involves a lot of guessing, trial and error, confusion and misunderstanding, all of which translate into wasted time, effort, and money. Undoubtedly no one wants this, but it is the outcome if there is no prohibitive measure in place. The prohibitive measure is clearly the effective and productive monitoring of a healthcare organization's IT infrastructure, which allows administrators to not only discover the cause of a failure, but to detect it before systems go down. BridgeWays monitoring solutions pull all the health and performance data into SCOM and by providing analytics and generating alerts, it enables administrators to see trends, find bottlenecks, and pinpoint where the problem is or will occur. Having SCOM—with our management packs installed—open and available, all IT departments and personnel will have the same uniform and convenient views which renders their inter-team communications more simple and confusion-free.

Conclusion

By proactively monitoring systems and applications' health and performance, administrators will gain the upper hand in responding to issues that may cause either a single database or a broader portion of their IT infrastructure to fail—an incident a healthcare organization must avoid at all costs in order to offer the highest standards of patient care. Common issues can be addressed and dealt with in time to ensure the satisfactory performance of systems and applications. In addition, administrators will be able to monitor their IT environment using one monitoring solution, which means separate managing of a variety of systems and applications, as well as triaging complex IT issues will no longer be a concern for an organization's network and administrators. Overall patient care levels will be improved by peak performance of the IT infrastructure.

About BridgeWays Software

BridgeWays Software is an innovative software company that provides Operations Risk Management solutions for business large or small. Our products include Software-as-a-Service (SaaS)/Cloud-based monitoring solutions as well as Microsoft System Center Operations Manager Management Packs for VMware, Oracle Database & RAC, InterSystems Caché, MySQL, IBM DB2, Apache HTTP, Apache Tomcat, WebLogic, WebSphere and Java Attributes. We are the leader in extending System Center Operations Manager to third-party systems and applications and a founding member of the System Center Alliance. We are a Microsoft Gold Certified Partner. Although our solutions cross industries, BridgeWays provides monitoring solutions for commonly deployed systems and applications within the Healthcare industry—our solutions help IT deliver quality patient care.

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