



Healthcare IT and Imaging Applications Monitoring

Bridging Gaps Between
Understanding Infrastructure,
Applications, and End-User
Workflows

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Macro Trends

Ignited by the Affordable Care Act of 2010, U.S. healthcare provider organizations have undergone a torrent of merger and acquisition activity. While the legacy data silos often remain in place, IT resources are frequently consolidated within the post-merger enterprise and inherit responsibility for managing all the clinical applications, systems, and IT infrastructure across the organization. Compounding these technology challenges, health systems are struggling with chronic shortages of clinical and technical IT staff.

Medical imaging was traditionally the exclusive domain of the Radiology and Cardiology service lines that now proliferate throughout healthcare enterprises. Recent technological innovations like point-of-care ultrasound systems (POCUS), 3D Tomo., digital pathology, and 512 slice CT are increasing demand for image storage and access. This data explosion, combined with a higher number of clinical users who expect immediate access to their patients' images, is squeezing an already stressed clinical imaging IT infrastructure.

Moreover, hospitals and health systems are implementing hybrid cloud environments for their IT infrastructure. New challenges are emerging for technology vendors as organizations demonstrate their preference to only pay for services and capabilities that directly address their needs.

Health systems are struggling with chronic shortages of clinical and technical IT staff, compounding challenges from the imaging data explosion and IT infrastructure segmentation.

These trends toward sprawling networks, larger datasets, scarce resources, higher demand, and strained infrastructures require healthcare institutions to adopt end-to-end monitoring and analytics tools to manage this complexity and support their clinical users and patients. Comprehensive software, combined with access to domain experts, can help operations leaders and IT professionals understand and protect their burgeoning enterprise imaging systems.

Limitations and Lessons

Most IT system monitoring and analytics packages do not include IT hardware and network monitoring, applications monitoring, and end-user workflow monitoring, which is necessary to describe whether shared hardware services are meeting the needs of the specific clinical applications and end user workflows. Typically, enterprise systems monitoring software by itself does not provide sufficient detail to support the running of the entire healthcare business, and hardware performance monitoring information needs analytics that provide the context about how the performance is affecting the delivery of clinical care. This combination of capabilities is required to understand whether shared hardware and software services are meeting the needs of the clinical applications and end-user workflows.

Most software applications monitoring packages only monitor the software designed by the manufacturer, and they only monitor the performance of their own application. They seldom monitor and analyze the performance of the overall system architecture, including the IT infrastructure or backend applications, which is required to support a specific end-user software platform.

Comprehensive Needs

Healthcare IT leaders need to obtain insights into historical clinical workflow patterns. This enables them to understand how end-user behavior and workflow patterns must change to improve the efficiency of the organization and the delivery of care. These IT leaders have the following comprehensive needs:

- 1 Monitoring and analytics solutions that can track system performance realized by the end user.
- 2 Software monitoring tools that provide insights about the performance of the overall system architecture that is required to support a specific clinical software platform.
- 3 Knowledgeable human resources and time to manage and monitor an analytics software package.
- 4 Integration of hardware event monitoring with application usage monitoring.
- 5 A mechanism to understand the quality of the data, to ensure variations in data quality do not adversely affect the decision-making process.

Resultant Functional Gaps

Unfortunately, monitoring tools designed for specific clinical applications such as imaging IT typically do not have sight lines to collect data from software and hardware infrastructure IT systems. Conversely, the purview of many enterprise IT monitoring solutions excludes the underlying processes within the clinical IT applications.

This results in significant gaps in the ability to effectively gather IT infrastructure, technical application, and workflow statistics from across the entire IT stack and limits the ability to get a unified view of what is happening in all enterprise imaging applications. This can:

- 1 Limit the organization’s ability to pinpoint the source (root cause) of a workflow problem (network vs. server vs. application), across the entire IT stack.
- 2 Increase the likelihood of systems administrators suffering from alert fatigue as a result of excessive email and text alerts coming from these various IT systems.

It can also enable monitoring software to identify variances against historical trends and expectations to help identify their root causes.

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The AI Opportunity

Artificial intelligence provides opportunities to take enterprise and clinical systems monitoring to the next level by enabling predictive and behavioral analytics. AI can enable analytics to learn from the infrastructure, applications, and end-user workflows and understand whether (and how) monitored trends are changing.

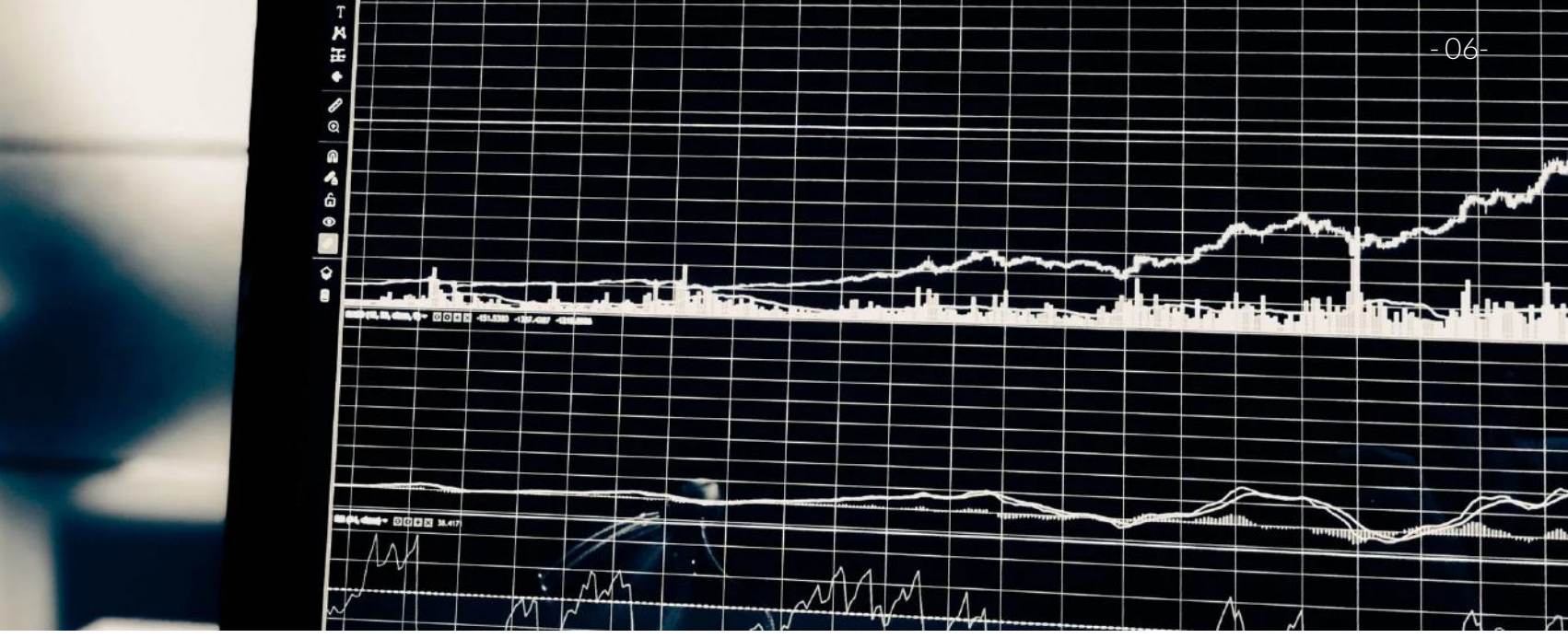
Examples:

- 1 AI can learn what a specific monitored value should be under an expected set of circumstances and can watch for changes in incoming data that might indicate the need to alter the point at which an alert is triggered. This can help identify opportunities to improve workflow efficiency and be more proactive when making decisions to improve the business.

Benefits include:

- Identify and resolve IT problems before they are realized by the end users
- Identify root causes of problems more quickly
- Alert staff sooner

- AI can control what actions to take when a KPI is achieved by throttling the urgency and frequency of alerts. AI can perform additional analysis about the root cause of an initial alert event and only alert the end user once there is a broader understanding of the root cause.



Value of Analytics as a Managed Service

Typically, analytics and monitoring dashboards have been touted as “self-service” to one degree or another. Realistically, though, dedicated and knowledgeable resources are usually required for managing such tools. In addition, these folks typically do not comprehend the business needs and challenges that must be understood by these tools, as well as their impact.

Leveraging enterprise analytics and monitoring as a managed service creates many new opportunities to understand and act upon the data being presented across the healthcare organization. It enables the full force of the service providers’ analytics experts to leverage their experience with the software and the processes necessary to unlock greater understanding.

The benefits of this new approach can include:

- 1 Fully understanding the information presented in the analytics, including the predictive analytics.
- 2 Gain deeper insights into potential future degradations of services that could affect end-user performance.
- 3 Understand root causes and more readily resolve problems that may span multiple software vendors.
- 4 Easily engage in the detailed conversations necessary to understand root causes and make long term improvements.
- 5 Eliminate the risk of a site spinning their wheels and never understanding the root cause of a problem.
- 6 Facilitate reassignment of internal resources that have historically spent time troubleshooting problems.



Real World Examples



With 26 hospitals across Wisconsin and Illinois, Advocate Aurora Health was created by the merger of two large health systems. As a large Integrated Delivery Network (IDN), it is trying to consolidate its IT infrastructure and bridge the many disparate clinical IT systems that exist across multiple occasions. As Timothy J. Heniadis, Director – Enterprise Imaging, Imaging Services, Health Informatics and Technology, points out, “The complexity of our technology stack is only increasing and there is a lot of complexity and specialization amongst the clinical IT systems that must be woven together.” Heniadis believes the consumerism of healthcare is driving providers to only want to pay for what they use and what meets their needs. He adds, “The historical model of purchasing an enterprise product that performs a whole range of functions, some of which will never be used, is falling out of favor.”

Solution Implemented: Strings

How Used:

Advocate Aurora adopted the Strings Managed Service to interpret data coming from existing monitoring systems across the imaging service line. It is a core product that sits at the top of their technology stack. Strings is generating new actionable information about their Vendor Neutral Archive (VNA) that runs in a multi-data center configuration. Strings provides consistency, even though components further down in their technology stack may change. “This gives us the ability to compare performance after changes in the technology stack are made, which helps us understand whether we are doing better or worse after changes are implemented,” notes Heniadis.

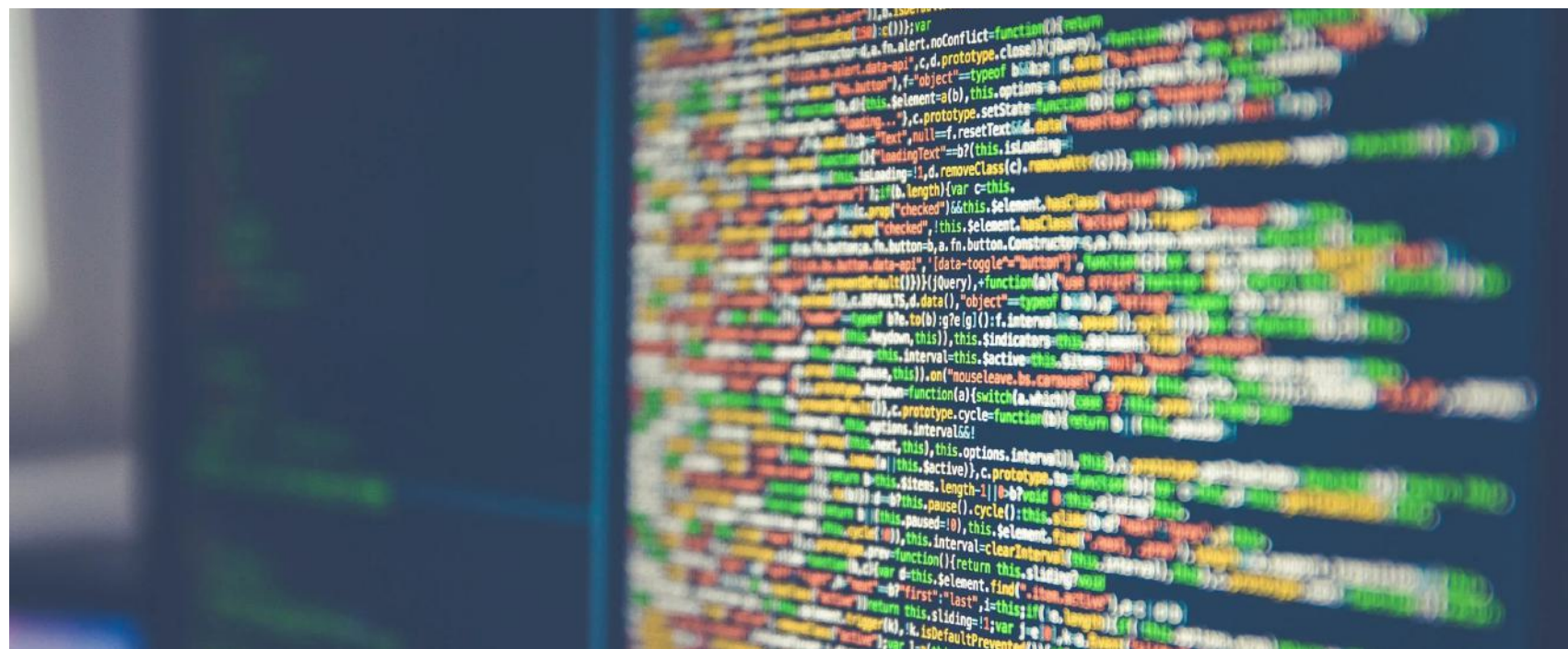
Benefits Realized



- Helps manage behavioral change by providing the insights necessary to drive human behavioral changes.
- Helps management communicate to the technology team why specific performance numbers do not support the clinical workflow needs. Strings provides information about why they may need a better network or hardware to support their clinical workflow requirements.
 - Example: Strings can help identify if one clinical application needs higher priority over another, or if it needs more bandwidth or CPU power to ensure adequate end-user workflow performance.
- Eases the transition to the cloud, because it helps understand resource requirements.
 - Example: Strings provides the clinical support teams with insights about how their applications consume shared hardware resources. It articulates their performance requirements and whether they are being satisfied by existing onsite or cloud-based resources.
- Enables clinical service line managers to better articulate the IT services they need to run their applications, understand what functions are being used the most, and which functions are not being used. The so-called “technology gap.”
- Enables information from multiple sources to be integrated, thus leveraging various degrees of detail depending on how current or old the data is.
 - Example: It helps them understand whether their VNA (that runs in a multi-data center environment) in a mirrored configuration runs better at one data center or the other, and if so, why?

“The Strings services enabled us to engage in the detailed conversations that were necessary to understand root causes and make long term improvements.”

Timothy J. Heniadis
 Director – Enterprise Imaging, Imaging Services, Health Informatics and Technology
 Advocate Aurora Health





Real World Examples



At Sentara Healthcare, the quantity of medical imaging data has been increasing dramatically over the years. In particular, this expansion is driven by 3D Tomo., 256 & 512 slice CT scanners, and new 3D MRI studies. In addition, Sentara finds the consumer also expects information to be available on demand and at the highest resolution. The convergence of these two trends has put them on an unsustainable path that is not solved by merely deleting old imaging studies. Per Trent Conwell, Director of IT over Imaging Services, “Our biggest pain point in IT is managing and achieving end-user performance expectations despite these trends.”

Several years ago, Sentara initiated an effort to reduce costs through centralization and standardization and began consolidating their five PACS into a single enterprise VNA solution. The goal was to achieve this by reducing the number of copies of a study they needed to keep while maintaining performance across all their sites. This required having monitoring software that provides insights into the system performance—so they could ensure keeping only two copies of every study would still meet site-specific performance needs. Since all imaging departments are dumping their studies into the VNA, Sentara IT has to monitor VNA performance as it impacts all imaging departments.

Solution Implemented: Strings

How Used:

Troubleshoot system performance issues that accompanied the rollout of their new VNA.

Example: End-user experience was poor, yet they could not identify specific issues with their IT infrastructure. Strings enabled mapping of system performance across each step in the data journey, which enabled IT to identify that existing security policies were hurting the end-user experience—and not the network or servers.

Benefits Realized



- Enable Sentara to move to a hybrid cloud architecture and maintain end-user performance.
- Provide the detailed information and analytics necessary for imaging IT to (internally) sell the need for a one-off infrastructure design change necessary to meet the needs of imaging.
- Provided the information required to create internal buy-in across the organization.
- Understand that the problem was at the workflow perspective and provided insights into the software and IT infrastructure buckets.

“Strings improved our ability to understand and troubleshoot problems, which enabled Sentara IT to improve end-user productivity and overall department efficiency,” shares Conwell. “The ability to understand root causes and eliminate them contributed significantly to this goal.”

“Improving our ability to understand and troubleshoot problems enabled Sentara IT to improve end-user productivity and overall department efficiency. Our ability to understand root causes and eliminate them contributed even further to this goal.”

Trent Conwell -
Director of IT over Imaging
Services
Sentara Healthcare



Summary

The clinical IT staff who manage medical imaging IT systems are under tremendous pressure to ensure they meet the evolving clinical and end-user workflow needs, despite these forces. This requires a new generation of enterprise monitoring and analytics software and services that incorporate AI and span the enterprise IT infrastructure, applications, and end-user workflows.

It is no longer adequate to rely upon a patchwork of vendor and application-specific monitoring tools that only tell part of the story. In addition, the value of Analytics as a Service is no longer an option for understanding the root cause of what are often very challenging problems. Strings is such an offering and can provide the key benefits healthcare IT organizations need to succeed in this difficult environment.

The following powerful forces have been impacting medical imaging IT over the past 5-10 years:

1. Effects of health system consolidation
Dramatic increases in the volume of medical imaging data produced by health systems
Consumerism of healthcare
Transition to hybrid-cloud IT infrastructures
Workforce shortages

