End User Experience Monitoring and Management for Hospitals Using Citrix and Cerner

Technical Overview

“We selected Goliath Technologies because their end user experience monitoring & management supports Cerner and identifies systems degrading before end user physicians are impacted. We do over 15,000 Cerner application test launches per day. This early warning system coupled with enhanced performance data and analysis puts us in a better position to identify root cause at the hospital location or collaborate with Cerner to resolve issues.”

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CIO, Universal Health Services (UHS)
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I. Introduction - Proactive End User Experience Monitoring

In this technical overview, we will review the End User Experience Monitoring and Management capabilities of Goliath Performance Monitor as it is used to support Citrix, Cerner and other business applications in a health care setting. We will describe the technical elements that make up the health care IT specific functionality and how to leverage the specific features to ultimately be proactive and stay ahead of end user experience issues.

Creating and maintaining a positive end user experience is a challenge for all organizations, and it is even more so for health care organizations where access to clinical applications is critical to ensuring quality health care is delivered. Goliath Technologies end user experience monitoring and management capabilities provide Health Care IT with complete, real-time visibility from the hospital end point to the datacenter where the electronic health records are hosted.

Goliath Technologies end user experience monitoring and management software is deployed on Citrix servers running Cerner applications, which enable health care organizations to get performance metrics, reports, and analysis on end user experience and application logon times. Goliath monitoring capabilities combined with Cerner’s remote hosting technologies and services provide health care organizations with advance warning of potential end user experience issues and evidence of root cause to prevent future issues.

Our technology has application assurance logons to Cerner that run behind the scenes 24/7 at the hospital location and trigger alerts in advance of a clinician or health care worker experiencing a problem. This is what we call better than real time, or before an issue is actually realized by the end user community.

To be truly proactive, an administrator needs a technology that is better than real time. This means advance warning of performance degradation that could ultimately result in end user experience issues. In the context of a Citrix environment, administrators need advance warning in the three key areas where users most often encounter difficulty: logon initiation, logon process, and session use.

End User Experience Key Failure Points
Goliath Performance Monitor, used at hospitals with Citrix and Cerner, offers complete visibility into user experience from the hospital end point to the datacenter where the electronic health records are hosted. Because of this we are able to:

- Have better than real-time visibility that solves issues before they occur
- Resolve remaining issues that may be experienced faster and more efficiently
- Obtain actionable intelligence that promotes productive collaboration with Cerner

II. Architecture

The deployment architecture includes technology at the Cerner hosted facility and on premise in the remote hospital location. In the datacenter hosting the electronic health record application, intelligent agents are deployed on Citrix servers running Cerner applications. On premise at the hospital, Goliath Performance Monitor is deployed on virtual servers, desktops, tablets, Citrix, and other general IT infrastructure. In addition, Goliath Logon Simulator is deployed at each remote hospital location so that Citrix and Cerner logons can be tested 24/7 from that location to alert IT personnel to potential logon issues.

The Goliath Performance Monitor and Logon Simulator are fully integrated to enable proactive management of the clinicians’ and health care workers’ end user experience. The integration of the technologies is significant because together they can alert you to a logon issue and also determine root cause. The logon simulator replicates actual end user login initiation, logon duration, session launch, and application launch. The performance monitor is monitoring the delivery infrastructure so if there is an issue with say a profile loading or failed logon an alert will be triggered that will identify the element causing the performance problem.

Image Description: Deployment Architecture
A. Components

The complete end user experience monitoring and management capability consists of several components. Collectively, these technologies allow administrators to monitor, identify, and troubleshoot issues in better than real time.

1. Goliath Performance Monitor

Goliath Performance Monitor enables proactive IT performance monitoring for virtual server, virtual desktop, hybrid cloud, and health care environments. Goliath Performance Monitor is the primary engine for delivering visibility, metrics, alerting, reporting, and self-healing capabilities to IT and specifically Cerner and Citrix administrators. In addition, it provides the primary lens into both the internal IT infrastructure as well as the Cerner application delivery servers, allowing for enhanced and more productive collaboration with Cerner.

2. Goliath Intelligent Agent

The Goliath Intelligent Agents deployed on the Citrix XenApp delivery servers at Cerner provide visibility for hospital IT administrators in real time. The agent is incredibly light weight, (1 MB footprint, less than 0.1% CPU, and <16 MB of RAM) more efficient, and provides better data than other agentless tools, such as SNMP.

The power of the agent technology is that it is able to obtain deep diagnostic information about a user’s Citrix and Cerner application session. This information is captured and reported to the Goliath Performance Monitor server in real time, and provides visibility that cannot be achieved with other data collection tools, ranging from ICA/HDX channels to the Cerner applications’ process behavior.

3. Goliath Logon Simulator

Ensuring that applications are always available is the goal of Goliath Logon Simulator. The simulator tests and confirms that applications will launch when end users attempt to access them. By simulating actual logon and application launches in the exact same way that a real end user does, the technology allows for advance discovery of issues. The key benefit is that when an issue is discovered by a simulated user, it can be addressed before end users are ever impacted. In short, Goliath Logon Simulator is leveraged for testing the process of logon availability, logon duration, and application launch to ensure that Cerner applications are available from any hospital, anywhere, in better than real time.
III. Sample Deployment: UHS

UHS is one of the 10 largest for-profit health care organizations in the United States. Today, UHS has Goliath Performance Monitor and Goliath Logon Simulator deployed at their corporate office, 30 acute care hospitals, and within the Cerner datacenter on Citrix servers running Cerner applications.

UHS has configured and scheduled the logon simulators to launch tests to confirm applications are available 24/7/365. Currently approximately 15,000 application test launches occur daily with a real-time alert being triggered if a logon fails or exceeds a logon time threshold. This should alert administrators before the logon difficulty manifests to end users so they have the ability to remediate the issue before clinicians or health care workers are impacted.

Goliath Performance Monitor is deployed in the hosting center and also on premise. The purpose is to monitor end user experience from the end user’s perspective—and this necessitates a view from the remote hospital location. Often, end user experience is measured by monitoring application response times and, while this is a reasonable metric, it doesn’t always correlate to what the end user is experiencing. There are so many other elements that can impact the experience from the on premise IT infrastructure, network connection, or device used to access the applications.

In one example, a clinician was having difficulty using the Cerner application and by using Goliath Performance Monitor, the IT staff at the hospital was able to determine that it had nothing to do with Cerner but rather the WiFi quality at the hospital.

Image Description: UHS Deployment Architecture
IV. End User Experience Monitoring and Management Capabilities

Goliath end user experience monitoring and management products include the Cerner application agent, pre-configured monitoring rules, alerts, dashboards, and reports. This level of visibility provides actionable intelligence for differentiating Cerner application related issues from environmental issues such as network latency, device malfunction, or hospital IT infrastructure.

If application issues take place, for example crashes, as seen in this image a report can be run to identify all of the crash events, as well as additional details on the fault that caused the crash.

Built-in end user simulations, combined with comprehensive monitoring of the logon process empowers IT administrators to discover and resolve problems with session logon initiation, duration, and application launch in advance of lost productivity.

In addition to comprehensive monitoring and end user simulation, Goliath has the ability to send real-time alerts. In this image, you’ll see a screen capture of our alerting dashboard. Highlighted is an end user whose logon duration was significantly higher than the defined threshold triggering an email to be sent to the administrators.
Goliath provides industry-leading visibility into Citrix session performance by breaking down the ICA/HDX protocol and returning precise metrics around individual ICA/HDX channel performance. As seen in the below image, Goliath has the ability to trend ICA Latency for a user session, as well as the 50 ICA/HDX channels, which can help identify performance bottlenecks.

End user experience is often impacted by issues related to application components such as processes or services failing. The self-healing capability enables the IT administrator to resolve issues immediately when they are discovered.

In this image is an example of the self-healing functionality applied to an alert notification. Out-of-the-box, IT staff can monitor their Windows Services and if they are to stop instantly, or for a period of time, Goliath will attempt to restart the service and notify the end user.
This image shows a real historical report on end user experience where logon duration, ICA latency, and client speed are all brought into a single view. As seen below, one can easily identify the users who had poor performance. Overall, Goliath’s deep historical reporting and analytics provide objective data points over a period of time, enhancing the ability to collaborate with Cerner to address and permanently fix complex issues.

**Citrix XenApp End User Experience Report**

<table>
<thead>
<tr>
<th>User Name</th>
<th>App/Desktop Name</th>
<th>Connect Time</th>
<th>Client Address</th>
<th>Fast/Slow</th>
<th>Logon Duration</th>
<th>ICA Latency</th>
<th>Client Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>User 1</td>
<td>ReportRequest P1525W</td>
<td>2016-07-05 11:45:15</td>
<td>Fast</td>
<td>6.67 secs</td>
<td>245.7 ms</td>
<td>6257448 Bps</td>
<td></td>
</tr>
<tr>
<td>User 2</td>
<td>ReportRequest P1525V</td>
<td>2016-07-05 11:45:15</td>
<td>Fast</td>
<td>6.67 secs</td>
<td>245.7 ms</td>
<td>6257448 Bps</td>
<td></td>
</tr>
<tr>
<td>User 3</td>
<td>ReportRequest P1525V</td>
<td>2016-07-05 11:45:15</td>
<td>Fast</td>
<td>6.67 secs</td>
<td>245.7 ms</td>
<td>6257448 Bps</td>
<td></td>
</tr>
</tbody>
</table>

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V. The Goliath Logon Simulator Deployed at Remote Locations

When deployed at remote locations, Goliath Logon Simulator delivers better than real time visibility by launching real logon sessions with simulated users on an automated schedule. This technology provides insight into what an actual end user will experience before they logon to Citrix and launch a Cerner application. Logon failures and slowness related issues are dramatically reduced by knowing about them before end users are impacted.

This image contains a screen capture of the live simulation dashboard which allows administrators to have a complete view of end user experience from a single pane of glass. As you can see here, there is a failure for an application at one of the hospital locations. By having the failures show in red at the top of the page, it makes the identification of the issues easier and puts the necessary information right at IT's fingertips.

The below image is a screen capture of the simulation drill down. To identify the root cause of the failure, administrators can click to drill down and view further detail. As seen here, the logon simulator was unable to confirm that the application launched within the defined 45 second threshold and therefore resulted in a failure. Having the tools for drilling directly into the root cause allows for faster time to resolution.
The Goliath end user experience monitoring and management products, Goliath Performance Monitor and Goliath Logon Simulator, are a complete end-to-end visibility toolset that will empower your organization with advance warning and actionable intelligence, ensuring that your end users have the highest quality user experience possible.

To find out how Goliath Technologies can enhance your end users experience, contact a member of the Goliath Technical Team.

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The team members collaborated to bring together this guide by calling on their past Customer Experiences and Expert Knowledge of End User Performance Troubleshooting. Beyond creating technical documents this team supports Goliath Customers and provides product feature/function guidance to development.