



# UHS TROUBLESHOOTS END-USER EXPERIENCE ISSUES AT THEIR HOSPITALS

## Organization

Universal Health Services, Inc. (UHS)

## Infrastructure

Citrix XenApp, Citrix XenServer and VMware

## Performance Monitoring Products

Goliath Performance Monitor for Hospitals Using Cerner, Goliath Application Availability Monitor



My experience with Goliath Technologies goes back several years from my time at UHS. They have the only solution that combines the ability to preemptively alert us if clinicians will have difficulty when attempting to access Citrix and Cerner. This provides us with an early warning system that is better than real time and is one of the reasons we selected Goliath as a partner.

**Justin Monnig, General Manager of Crossings Healthcare Solutions**



## The Challenge

UHS, one of the largest healthcare management organizations in the United States, was faced with session performance related issues when physicians and healthcare workers used XenApp delivered applications hosted by Cerner.

Due to the factors detailed below, pinpointing and resolving their issues was especially challenging:

1. There were no real-time performance metrics accessible from the underlying Citrix XenApp delivery infrastructure components.
2. Limitations in visibility were not isolated to just the XenApp servers. There was a significant lack of insight into Citrix ICA/HDX sessions.

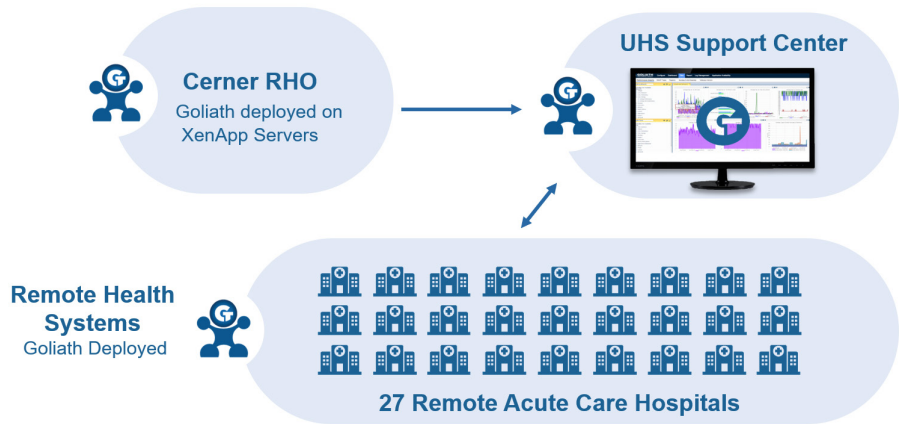
These issues presented barriers to UHS solving their end-user experience challenges. The fact that Cerner was seeing everything performing correctly from an application standpoint meant that the issue was occurring somewhere between the application and the user. Without having visibility directly into sessions or ICA/HDX, it was difficult for the UHS IT team to ascertain whether the issues were symptoms of network related problems. They also lacked visibility into the XenApp servers, which limited the extent of their insight into the delivery infrastructure. In short, they were blind to the entire scope of where the root cause would be found.

## The Solution

Goliath Technologies had been used by UHS Corporate to monitor and manage their Citrix environment for several years, so the Cerner team at UHS quickly identified Goliath Technologies as the vendor to help them overcome their challenges. They knew Goliath's suite of technologies provides complete end-to-end visibility to the entire Citrix user experience from the connection through the whole delivery infrastructure. While the data and metrics provided by Goliath's technology alone set it apart from other tools, the major differentiator for UHS was that the Intelligent Agent could be deployed on the XenApp servers hosted at Cerner's Kansas City datacenter. Then, the [Goliath Application Availability Monitor](#) was configured at each remote hospital location to test and confirm applications would launch. This meant for the first time, the entire Citrix workflow could be analyzed end-to-end. Furthermore, the data and metrics gathered could be used for proactive alerts and historical reporting.

By having Goliath installed across their entire environment's XenApp infrastructure and hospital locations, administrators were furnished with the actionable intelligence they needed to accomplish the following:

- Identify users who may be experiencing poor performance by analyzing ICA latency, ICA/HDX channel performance, network latency, round trip time (RTT), and connection speed/performance.
- Identify server and application performance bottlenecks which could impact end-user performance.
- Have a real-time view of the entire delivery infrastructure from a single pane of glass to pinpoint and correlate root cause.



*UHS & Goliath Proactive Deployment Architecture: End-to-End Visibility*

## ICA/HDX Performance

Goliath Performance Monitor allowed administrators to view user sessions in real time and historically. The session view provided critical information for identifying if session performance issues were network related or session related. This is done by differentiating network latency from ICA latency, and then correlating the metrics to ICA round trip time. Also, by drilling deeper into each session, the UHS team was also able to view the activity of each session and see how each of the 50 individual HDX channels impacted user sessions.

These capabilities proved to be invaluable as many of the session performance issues were related to network problems on the UHS side. This data pinpointed the exact cause and provided UHS with the data needed to resolve them quickly.

User Account	XA Server Name	Session	State	Client Name	Client Address	Version	Logon	ICA Latency	App. ICA Lat.	App Name	Connected
AGI-CTXPW005	AGI-CTXPW005	HDX - Desktop	Active	192.168.1.5	14.12.0.18020	11.4e	237ms	1141ms			2019-10-01 06:24:49
AGI-CTXPW005	AGI-CTXPW005	HDX - Desktop	Active	127.0.0.1	14.9.4000.9	0e	280ms	836ms			2019-10-01 04:39:55
AGI-CTXPW005	AGI-CTXPW005	HDX - Desktop	Active	223.181.193.3	14.12.0.18020	58.4e	329ms	629ms			2019-10-01 03:31:43
AGI-CTXPW005	AGI-CTXPW005	HDX - Desktop	Active	10.249.138.29	14.9.4000.9	11.3e	446ms	533ms			2019-10-01 06:17:18
AGI-CTXPW005	AGI-CTXPW005	HDX - Desktop	Active	192.168.1.37	14.12.0.18020	79.2e	263ms	531ms			2019-10-01 03:11:29
AGI-CTXPW047	AGI-CTXPW047	HDX - Desktop	Active	192.168.43.7	14.8.0.1010	42.3e	440ms	529ms			2019-10-01 03:52:20
AGI-CTXPW450	AGI-CTXPW450	HDX - Desktop	Active	10.6.108.146	14.12.0.18020	11.9e	276ms	485ms			2019-10-01 06:56:07
AGI-CTXPW023	AGI-CTXPW023	HDX - Desktop	Active	10.6.104.144	14.9.4000.9	12.7e	275ms	452ms			2019-10-01 06:32:49
AGI-CTXPW013	AGI-CTXPW013	HDX - Desktop	Active	192.168.0.31	14.9.4000.9	23.4e	193ms	418ms			2019-10-01 06:49:14
AGI-CTXPW006	AGI-CTXPW006	HDX - Desktop	Active	192.168.1.2	14.12.0.18020	0e	279ms	417ms			2019-10-01 06:02:18
AGI-CTXPW006	AGI-CTXPW006	HDX - Desktop	Active			0e	397ms	395ms			2019-10-01 04:51:57
AGI-CTXPW008	AGI-CTXPW008	HDX - Desktop	Active			0e	341ms	352ms			2019-10-01 06:33:19
AGI-CTXPW042	AGI-CTXPW042	HDX - Desktop	Active			73.6e	588ms	388ms			2019-10-01 03:38:49
AGI-CTXPW007	AGI-CTXPW007	HDX - Desktop	Active	192.168.1.9	14.1.0.0	0e	325ms	380ms			2019-10-01 06:32:56
AGI-CTXPW049	AGI-CTXPW049	HDX - Desktop	Active	192.168.43.7	14.8.0.1010	25.5e	375ms	378ms			2019-10-01 05:13:00

Identify Citrix users with a poor end user experience

Click to drill into user sessions for additional details

Real-time alerts on breached Citrix thresholds

Identify users experiencing session slowness by analyzing ICA latency and slow logon times. Alert notifications via email, text message or integration into other tools can notify admins to problems before the end user reports it. Admins can also drill down through the dashboard to identify root cause in infrastructure configuration, user behavior or resource utilization.

*Goliath user session display used for troubleshooting session performance issues.*

## XenApp Server Performance & Errors

By leveraging the Goliath Intelligent Agent on the Cerner XenApp servers, the UHS team gained both real-time and historical insight into server performance and activity. This provided them with the ability to see and understand when server-side issues occurred.

After gaining an understanding of what conditions impacted user experience and how each correlated to problems, the UHS team used their observations to create threshold-based alerts. The alerts enabled them to become aware of server-side issues before the userLog community was impacted.

In addition to being leveraged for creating alerts, the server metrics gathered by Goliath were also put to work in the form of historical reports. These reports proved to be invaluable as the information could then be used for collaborating with application owners to address root cause.

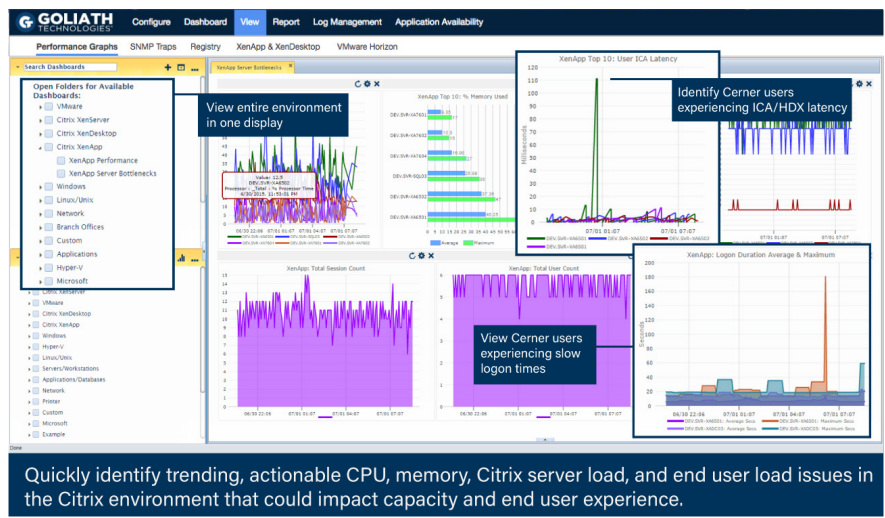
## XenApp Server Error Report

The final piece to having a complete solution was a single view of the entire delivery infrastructure.

The goal was to have complete perspective for identifying session issues and correlating them to the network, infrastructure, or XenApp server immediately upon receiving notification. This was accomplished by leveraging the real-time performance graphs available out-of-the-box in Goliath Performance Monitor.

Log Type	Server/Workstation	Event ID	User Name	Source	Category	Date/Time	Count	Event Description
Api E	server/Workstation	1000		Application Crashing Events	Application Crashing Events	06/10/2016 18:18:35	22	Faulting application name: Powerchart.exe, version: 2015.6.1.44, time stamp: 0x558a769f... Faulting process id: 0x7854... Faulting application start time: 0x01d1c351c6e6d8a... Faulting module path: C:\Program Files\Cerner\Powerchart.exe... Faulting module path: C:\Windows\Microsoft.NET\Framework64\v4.0.30319\clr.dll... Report id: 459bd901-259-11e6-871...
Api E	server/Workstation	1000		Application Error	Application Crashing Events	06/10/2016 09:35:31	7	Faulting application name: Powerchart.exe, version: 2015.6.1.44, time stamp: 0x558a769f... Faulting process id: 0x7854... Faulting application start time: 0x01d1c351c6e6d8a... Faulting module path: C:\Program Files\Cerner\Powerchart.exe... Faulting module path: C:\Program Files\Cerner\Powerchart.exe... Report id: 3345a78a-210-11e6-9ad4-0050568467b4
Api E	server/Workstation	1000		Application Error	Application Crashing Events	06/07/2016 10:25:27	3	Faulting application name: Enturgnat.exe, version: 2015.6.1.44, time stamp: 0x558a769f... Faulting process id: 0xb0e4... Faulting application start time: 0x01d1c171193750e... Faulting module path: C:\Program Files\Cerner\Enturgnat.exe... Faulting module path: C:\Windows\Microsoft.NET\Framework64\v4.0.30319\clr.dll... Report id: 01dadae-c065-11e6-9007-0050568467b4
Api E	server/Workstation	1000		Application Crashing Events	Application Crashing Events	06/10/2016 10:17:33	4	Faulting application name: SchTools.exe, version: 2015.6.1.56, time stamp: 0x558b0728... Faulting process id: 0xb0e4... Faulting application start time: 0x01d1c32820923ae... Faulting module path: C:\Program Files\Cerner\SchTools.exe... Faulting module path: C:\Windows\system32\ntoskrnl.exe... Report id: 121a7d22-2916-11e6-9c73-0050568467b4
Api E	server/Workstation	1000		Application Error	Application Crashing Events	06/10/2016 16:22:38	19	Faulting application name: Enturgnat.exe, version: 2015.6.1.44, time stamp: 0x558a769f... Faulting process id: 0x7854... Faulting application start time: 0x01d1c32820923ae... Faulting module path: C:\Program Files\Cerner\Enturgnat.exe... Faulting module path: C:\Windows\system32\ntoskrnl.exe... Report id: b09e407-3265-11e6-9c03-0050568467b4
Api E	server/Workstation	1000		Application Crashing Events	Application Crashing Events	06/09/2016 17:31:47	20	Faulting application name: Powerchart.exe, version: 2015.6.1.44, time stamp: 0x558a769f... Faulting process id: 0xb0e4... Faulting application start time: 0x01d1c296171094a... Faulting module path: C:\Program Files\Cerner\Powerchart.exe... Faulting module path: C:\Windows\system32\ntoskrnl.exe... Report id: 919c2-2689-11e6-99a6-0050568467b4

The UHS team configured a fully customized dashboard to view the entire delivery infrastructure end-to-end. Logon, statistics, ICA latency, server performance, and application load could all be viewed on one screen, empowering the support team to quickly identify and drill into the root cause of session problems as they occurred.



Quickly identify trending, actionable CPU, memory, Citrix server load, and end user load issues in the Citrix environment that could impact capacity and end user experience.

## The Summary

Goliath Performance Monitor for Hospitals with Cerner gave UHS insight into the delivery infrastructure that was needed to not only resolve end-user session challenges, it gave them the ability to proactively identify and address the issues before they impacted productivity. This was accomplished by leveraging network and ICA channel visibility, proactive alerting, historical reporting, and real-time dashboards.

Above is an example of the real-time dashboard configured by UHS.