

Patient Healthcare Impact Avoided as nGeniusONE Identifies Source of PACS Latency

Physicians and diagnosticians require immediate access to high-quality images for viewing and analysis for swift diagnosis and patient treatment. Picture Archiving and Communications Systems (PACS) has been the standard approach for digital image sharing. Issues with any one of the four elements that make up the PACS service can impact performance and user experience with the imaging service, including:

- **Imaging modalities** – the equipment used to create the image, such as X-rays, computed tomography (CT), and magnetic resonance imaging (MRI), and issues with the modalities themselves can impact user experience.
- **Network** – the secure, multi-vendor environment for transmitting the images between the hospital, medical buildings, data centers, public and private clouds. Any part of the network that is impaired can degrade the overall performance of the imaging application. Note that the modalities, workstations, and archives / storage are all attached to this network.
- **Workstations** – that are used for viewing and analyzing the patient images and require reliable performance throughout the network.
- **Archives** – for storage, retention, and quick retrieval of the patient images, which, to meet regulatory requirements, can be extensive, including both short- and long-term storage strategies.

Combined, the elements that make up the PACS application need to operate flawlessly, without impairment to ensure quick access to and viewing of patient images. Overall operation of imaging services relies on several key protocols and applications to work in concert to perform critical steps in taking, transporting images, storing them, and retrieving them — should one of those protocols fail or degrade, it will impact image viewing and retrieval. Such degradations will be felt by those reviewing and analyzing the images for diagnosis and treatment.

Performance Issue

Recently, one healthcare organization was experiencing an issue with their PACS application. The users, doctors, nurses, clinicians, and diagnosticians were complaining of latency and degraded performance accessing their PACS imaging service. Regardless of where on the hospital campus the users were located, as they tried to retrieve and review X-Rays, MRIs, and CTs, they were all experiencing slowdowns.

Impact

Delays and difficulties in reviewing images impacted the time to diagnose medical conditions and determine treatment plans. Not only was this a patient impacting issue, but it was also a staff productivity problem, as well. Over the course of a couple of days, as the problems increased, they presented additional concerns and challenges, leading the hospital to consider a drastic measure of diverting and rescheduling medical procedures, including surgeries.

Troubleshooting

The healthcare organization was a long-time user of NETSCOUT's nGeniusONE® Service Assurance solution. With InfiniStreamNG® appliances strategically deployed at the hospital campus and throughout the PACS imaging ecosystem, packet-based data was already being collected and analyzed in real time. The organization also had contracted for a NETSCOUT® Premium Services Engineer (PSE) who has expertise in using the nGeniusONE and ISNG data to reduce the time to investigate and pinpoint problems in the healthcare environment.

A key hospital IT architect contacted the NETSCOUT PSE to troubleshoot the PACS latency problem. Starting with a dashboard in nGeniusONE that included all the protocols and applications in the PACS ecosystem, the PSE noticed performance indicators with the Server Message Block (SMB) protocol used for network file sharing for the PACS service.

Response Time Distribution analysis (Figure 1) revealed that over the last several days poor response time issues had impacted the hospital. Slow, degraded, and timeout situations were experienced for the SMB protocol much of November 30th. For the current day, December 2nd, the spikes in poor response time resulted in unacceptably slow performance to the users.

Following the troubleshooting workflow, the PSE used the universal service monitor view for details on the SMB protocol. This drilldown into the individual SMB servers revealed that there were some servers with higher latency and client retransmissions than many of the other servers. (Figure 2) This enabled the PSE to pinpoint the root cause of the PACS latency to a suspected connector card issue in the hospital's Storage system. The PSE provided the evidence and source IP addresses for the hospital's IT staff to further address the problem.

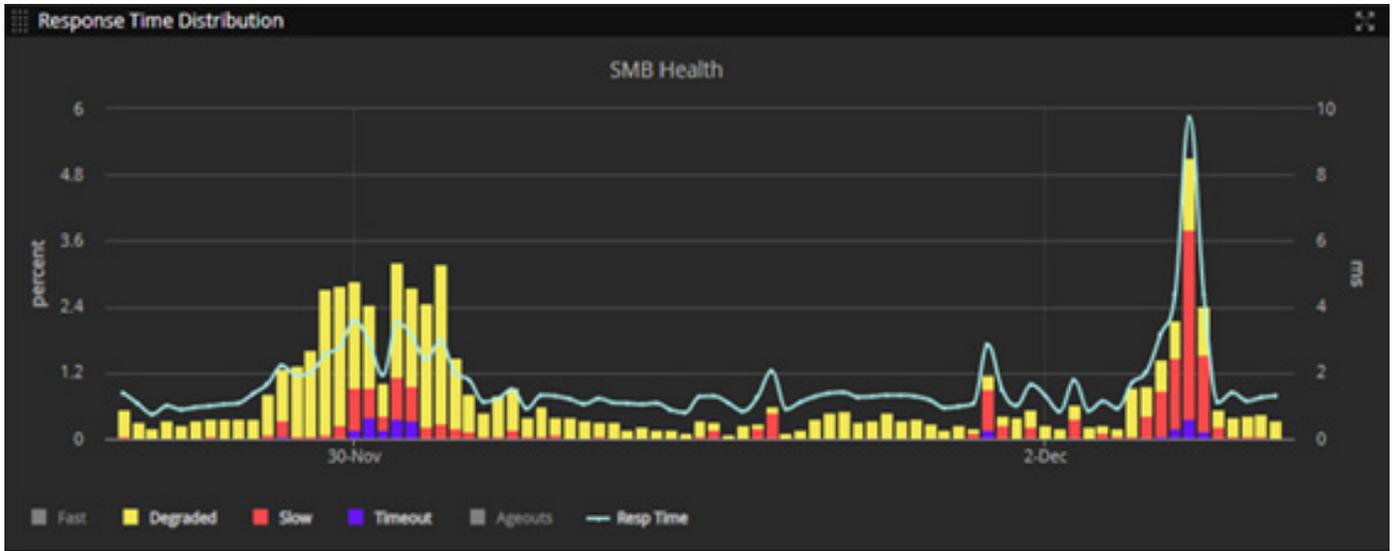


Figure 1: The Dashboard view in nGeniusONE was able to reveal the performance of the SMB protocol, showing the slow and degraded response times being experienced by hospital personnel using their PACS application.

	ME Name	Application	Server Name	Server Load			Application Failures			(Network and Application) Latency				Timeout	TCP Retransmission			
				New Sessions	Peak Active Se	% Successful	Requests	Application Err	% Failure	TCP RTT (ms)	Avg RT (ms)	Peak RT (ms)	Avg App R.		Retrans %	Server Retrans %	Client Retrans %	
1	<input checked="" type="checkbox"/>	vSTREAM 5 #3	SMB Health	10.116.3.162	7	1	81.14	32,338	5,829	18.03	0.72	22.18	398.8	21.58	269	0.67	0.20	3.21
2	<input type="checkbox"/>	vSTREAM 4 #3	SMB Health	10.116.3.162	25	3	82.98	98,789	16,203	16.40	0.85	16.68	399.9	16.09	615	2.45	0.04	9.26
3	<input type="checkbox"/>	vSTREAM 5 #3	SMB Health	10.115.3.155	10	1	81.78	50,995	9,064	17.77	0.72	16.07	399.7	15.47	227	0.25	0.12	1.14
4	<input type="checkbox"/>	vSTREAM 2 #3	SMB Health	10.116.3.162	9	1	73.33	14,067	3,741	26.59	0.15	5.90	365.88	5.62	11	0.07	0.04	0.34
5	<input type="checkbox"/>	vSTREAM 4 #3	SMB Health	10.115.3.155	25	3	84.23	173,327	26,985	15.57	0.90	6.41	399.96	5.81	353	0.22	0.08	0.76
6	<input type="checkbox"/>	vSTREAM 6 #3	SMB Health	10.116.3.162	27	10	75.46	5,215	1,279	24.53	0.81	4.79	368.97	4.16	1	0.13	0.03	1.19
7	<input type="checkbox"/>	vSTREAM 6 #3	SMB Health	10.115.3.155	39	16	76.84	5,431	1,258	23.16	0.84	4.38	204.34	3.78	0	0.10	0.02	0.91
8	<input type="checkbox"/>	vSTREAM 7 #3	SMB Health	10.116.3.160	4	1	16.57	175	146	83.43	0.71	4.17	52.77	3.55	0	0.52	1.05	0.60
9	<input type="checkbox"/>	vSTREAM 6 #3	SMB Health	10.115.3.153	22	6	77.87	1,690	374	22.03	0.79	4.10	111.63	3.51	0	0.02	0.02	0.04
10	<input type="checkbox"/>	vSTREAM 7 #3	SMB Health	10.116.3.166	6	1	14.29	336	286	85.71	0.72	3.80	111.56	3.19	0	0.00	0.00	0.00
11	<input type="checkbox"/>	vSTREAM 6 #3	SMB Health	10.115.3.151	13	2	77.50	1,771	397	22.42	0.90	3.65	119.83	3.07	0	0.03	0.03	0.04

Figure 2: Drilling down into the SMB protocol using Universal Service Monitor, nGeniusONE provided the details to pinpoint specific SMB servers as the cause of the latency.

Remediation

The NETSCOUT PSE provided the hospital's IT architect with the evidence uncovered during the nGeniusONE troubleshooting analysis. From a remediation perspective, fixing the connector card issue or taking the server out of service would eliminate the latency being felt by medical professionals at the hospital and return the PACS service to the level of responsiveness and quality performance the staff typically experienced.

Summary

Deferring medical procedures and surgeries is a drastic move for any hospital to make. It delays patient treatment and care, and limits doctors, nurses, and clinicians trying to help their patients best battle and recover from their injuries and ailments. The NETSCOUT PSE used both the nGeniusONE expertise and familiarity with the hospital network and applications to follow a logical, contextual workflow from dashboard to service monitor analysis to quickly pinpoint the SMB slowdown to the particular storage servers. The IT fix for the servers immediately improved response times to the hospital staff, ultimately eliminating the need to suspend medical procedures, and enabled services to continue uninterrupted, thereby avoiding additional patient impact.



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