Medical Marijuana System Outage Report (2/19/2014 – 8/4/2014)

Overview

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Medical Marijuana System Outage Incident – August 4, 2014

Summary: Medical Marijuana application system became unresponsive after 3PM on August 4, 2014 affecting external customer operations and internal operations.

Start Time: 3PM August 4, 2014

End Time: 8PM August 4, 2014

Severity: Severity 1 - Production application or other mission critical system(s) are down and no workaround was immediately available. Reference: Oracle Service Request number 3-8980044411

Background: Oracle patches come out quarterly and are a critical part of database administration. The patches resolve bugs and vulnerable security related issues. To ensure we are always in compliance, as per our agreements with Oracle, their patch team engineers handle all Exadata patching where Medical Marijuana systems reside. Pre-planned quarterly patching began as scheduled on Sunday 8/3 at 1am Arizona time. This is a "rolling" patch facilitated entirely by Oracle Engineer teams. Completion was estimated at 24 hours or less and in the past has completed in as little as 12 hours. "Rolling" patch means each individual component in the server is patched separately while the servers, databases and application systems stay up. This redundancy is one of the main features of the Exadata investment and no downtime was anticipated.

Cause: 8 hours into the patching the engineers encountered an issue, during IB Switch Patching, only one IB switch got upgraded and unexpectedly all the services on the database nodes and cell servers went down. Also, services were not coming up. Their problem summary was: Hung when opatch command was executed by patchmgr.

Our Database Administration (DBA) staff monitored while they went through 3 shifts of engineers trying to get it resolved. The call was escalated as severity 1 with Oracle. Oracle did not anticipate any impact and almost 24 hours after the issue began, it was resolved and patching continued Monday morning and during the day. It was too late to stop the patch at that point and hence the recommendation was to keep it running through to completion.

At 3pm during the final stages and patching of the main communication hardware, the Infiniband Switches (IB Switch), an issue between the secondary IB Switch and the Master IB Switch was noticed that a specific step was missed causing the final patch to bring down both IB switches effectively cutting off all communication between the databases, storage and the network, impacting the application availability.

Resolution / Corrective actions: Service call to Oracle was immediately escalated as severity 1 and after 3 hours of multiple Oracle engineers trying many different steps, they brought in an IB Switch expert and he had both IB switches back up in minutes. Once communication was restored, all Databases were brought back online and service was restored. Patching was completed successfully by the senior IB Switch engineer while our DBA staff stayed on the call and the resolution process throughout. Moving forward, risk mitigation will be of the upmost importance. The length of time a patch takes to implement should be relatively irrelevant if there is a chance of a service interruption. Secondly, any scheduled changes to this application, its servers/databases will only be performed after hours only after ensuring that there is adequate time for regression testing and time for rolling back the change.

Summary of Medical Marijuana System Outages Encountered since the Arizona Medical Marijuana Collaborative Meeting held on February 19, 2014

1.   **Start Time:** Monday, 08/04/2014 3:02 PM
End Time: Monday, 08/04/2014 8:11 PM
Duration: approximately 5 hours.
Cause: Connection to the database was lost. Oracle engineers were applying scheduled maintenance patches to the server on Sunday. Due to unforeseen issues, patching continued into Monday with no anticipated impact to production. It was successful until a step in the patching process failed at 3PM bringing down the database.
Resolution / Corrective Actions: ADHS staff worked closely with Oracle engineers to restore services. A piece of hardware was identified as being the failure and was rebooted and services were restored.

2.   **Start Time:** Tuesday, 07/01/2014 12:19 PM
End Time: Tuesday, 07/01/2014 12:45 PM
Duration: approximately 26 minutes.
Cause: AppFabric caching server experienced problems and was restarted.

3.   **Start Time:** Monday, 06/30/2014 10:03 AM
End Time: Monday, 06/30/2014 10:15 AM
Duration: approximately 12 minutes.
Cause: Web Server Application Pool went down. Reason not identified.

4.   **Start Time:** Friday, 06/27/2014 4:26 PM
End Time: Friday, 06/27/2014 5:03 AM

Duration: approximately 30 minutes.
Cause: AppFabric caching server experienced problems and was restarted.

5.   **Start Time:** Exact Start time unknown. ADOA Notification Thursday, 06/26/2014 10:20 AM
End Time: Thursday, 06/26/2014 10:29 AM
Duration: approximately 9 - 20 minutes.
Cause: Web Server Application Pool went down. During that time the system was unavailable.

6.   **Start Time:** Friday, 06/20/2014 10:27 AM
End Time: Friday, 06/20/2014 11:03 AM
Duration: approximately 30 minutes.
Cause: Database access to the NFS file system failed.

Measures for Increasing Efficiency and Ensuring High Availability of the Medical Marijuana System

During the last 12 months the Medical Marijuana systems experienced problems and became partially or completely unavailable several times. These outages were caused by a variety of different factors and the downtime ranged from a few minutes to several hours. In one instance it took two days to resolve the issue. The Department since then has identified factors leading to these problems and has put a comprehensive plan in place to address each group of problems and provide solutions that will ensure high availability, stability and better performance for the Medical Marijuana systems. The following are the measures taken for increasing the efficiency and ensuring high availability of the ADHS Medical Marijuana systems:

1.   Establish a Disaster Recovery Site at Tucson to guarantee continuity of operations.

- The main purpose of this site is to allow all critical services to be replicated and to be made available in case of a disaster or a total failure of Medical Marijuana system at the primary data center in Phoenix. The project is expected to be fully completed by the end of December 2014.

2.   Create redundancy for all critical services in the primary data center.

- Establish the necessary level of redundancy for all tiers of the Medical Marijuana systems. This architecture will allow seamless failover of services from one server to another in case of a failure. It is expected to be fully implemented by October 2014.
- The new web server environment will be available in our production system by end of October 2014.
- The systems distributed caching and locking servers are now operating in a high-availability cluster with automatic failover. This solution is fully implemented.

3.   Improve the communication process between the users reporting a problem, the Help Desk and the support team.

- The Department has made a significant effort to design and execute a troubleshooting process that allows us to keep the downtime to a minimum in a case of failure. After a problem was properly reported to the main help line, a ticket was immediately created and the support teams were notified by phone and email within 1 -2 minutes. This is one of the main contributing factors for being able to bring the system back up within 9 – 37 minutes in recent cases, with the exception of the August 4, 2014 event. Another parallel effort is on the way to introduce a new Help Desk service exclusively for the ADHS Medical Marijuana Verification System. This service will be made available by end of September 2014 or early October 2014.

4. Implement measures to ensure early problem identification.

- Another important initiative that is already implemented is the Application Availability System. The Information Technology Services department has implemented a system for early problem identification and notification which alerts all teams involved in troubleshooting and support seconds after a problem has occurred.

5. Improve the logistics of deployment procedures.

- Based on requests from dispensaries, ADHS deployments are never done on Friday or Saturday to ensure that any newly deployed version will not negatively impact the dispensaries during the busy weekend times. Deployments of enhancements and corrections are always performed after 10 PM to avoid any disruption during work hours.
- A new Quality Assurance (QA) environment is being created. This environment will mirror the production environment and will allow any new deployment to be carefully tested by deploying to this environment first. The new QA environment will be fully completed by the end of October 2014.
- Information Technology Services (ITS) department has identified ways to maintain the Card Search and Transaction Reporting functionality of the Verification System even during scheduled and emergency maintenance. It has already been successfully used multiple times; however, this approach cannot be used during statewide network and equipment maintenance, but it still provides a much better level of flexibility and allows ITS to avoid or shorten system downtimes.
- Moving forward, risk mitigation will be of the upmost importance. The length of time a patch takes to implement should be relatively irrelevant if there is a chance of a service interruption. Secondly, any scheduled changes to this application, its servers/databases will only be performed after hours only when there is adequate time for regression testing and time for rolling back the change.

6. Software improvements

- The ITS team responsible for the development and support of the Medical Marijuana system has introduced multiple enhancements based on internal analysis, user feedback and Medical Marijuana Program observations. Multiple problems have also been identified and corrected.

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All of these changes have significantly improved the performance and reliability of the system. The number of complaints for improperly working features has significantly decreased in the last several months. The number of individual users experiencing and reporting problems is also very low. The ITS team is continuously working on multiple new enhancements that will make the system more efficient and user-friendly.