SITE-FOUR HIGH AVAILABILITY PROGRAM REVIEW

EVENT DATE(S): 05/07/2017 – 05/10/2017

SUMMARY:

As part of an ongoing business continuity program, Site-Four, LLC actively maintains a high-availability (HA) core-processing environment with real-time CU*Base/GOLD data replication between identical servers located at two geographically dispersed, state-of-the-art datacenters. Regular HA rollover events are scheduled to redirect core-processing and operations to the secondary/backup datacenter (located in Kentwood, MI) for up to 7 business days. At the completion of each event, core-processing is redirected back to the primary location (located in Yankton, SD). These rollover exercises are invaluable to validate procedures and ensure the ability of recovering CU*Base/GOLD core processing in an effective and timely manner.

This was the fourth HA rollover performed since relocating the Site-Four HA environment in 2014 from Liberty Lake, WA to Kentwood, MI, as part of a colocation agreement with CU*Answers. A significant benefit of that agreement includes the collaboration of both parties to provide assistance and support in each rollover effort, whether planned or unplanned.

The rollover event was scheduled for Sunday, May 7 through Wednesday, May 10. As a proactive measure to minimize downtime, a communications campaign was performed to announce the planned event and encourage credit unions to test connectivity to the secondary data center from each branch location.

On the morning of May 7, beginning at 5:00 AM CT, recovery teams brought CU*BASE/GOLD offline and began the role swap process, bringing core-processing online at the Kentwood datacenter by 7:05 AM. Post-roll application tests were completed successfully and any issues that surfaced were resolved by 8:33 AM.

To expand the scope of this rollover event, the CU*Answers Operations Team performed ACH processing for credit unions on the Site-Four host (under the supervision of the Site-Four Operations Team) on Tuesday, May 9. In addition, the CU*Answers Operations Team also performed normal EOD/BOD processing as part of the shift stand-in arrangement.

On the evening of May 10, beginning at 11:00 PM CT, the roll-back process was initiated. By 12:46 AM, core-processing was once again online at the primary data center.

Notable characteristics regarding this rollover event include:

- This rollover event was performed following a January HA host recovery effort due to a hardware failure requiring a complete reinstall of the server operating system, core-processing applications, and member data libraries.
- The previous HA rollover event (December 2016) was performed with on-site CU*Answers iSeries Admin support to assist with scheduled system maintenance. This rollover event was performed with CU*Answers iSeries support provided remotely. No system maintenance was performed during this event.
- Also during the December 2016 event, significant network and firewall changes were required to resolve issues with network connectivity to third-party EFT vendors. The success of this rollover event provided the opportunity to validate and confirm those changes.
- The planning and execution of this rollover event included remote support by Todd Wolcott (CU*Answers IBMi Administrator) and multiple remote support personnel from CU*Answers, CU*NorthWest and CU*South including Operations, Programming, and Network Services.

Site-Four and CU*Answers maintain a reciprocated colocation agreement that not only includes shared facility space within a state-of-the-art data center, but also network and operations support throughout the rollover event. The end goal in this

agreement is to provide seamless support and a level of readiness that allows the party experiencing the disaster time to focus on recovery and resumption while the unaffected party oversees daily operations from the high-availability data center.

The following sections identify other details, challenges observed, lessons learned, and recommendations for consideration.

EVENT DETAILS:

As identified in the SUMMARY section above, the planned HA rollover began on Sunday morning, May 7th, at 5:00 AM CT. During the role-swap process, the data replication software determined that an additional audit was required and launched a job that delayed the rollover process by approximately an hour. By 7:05, the rollover process had completed. Recovery teams began testing applications and troubleshooting issues that surfaced, including host-based firewall configuration that was preventing external users from authenticating on the CU*BASE/GOLD application. All issues were resolved by 8:33 AM with the exception of one third-party EFT vendor (CUSC-Acquirer office closed until the following morning. Once CUSC recycled services on their hosts, connectivity was restored.). A "splash-page" was presented to all home banking users to inform members of required maintenance window.

On Tuesday, May 9th, ACH processing was performed by the CU*Answers Operation Team to confirm the ability to stand-in, should the Site-Four Operations Team not be available. At 3:00 PM, CU*Answers successfully received and processed the ACH A&B files for credit unions on the Site-Four host. However, the overnight ACH file download process was performed by a Site-Four Operations Team member due to the delayed availability of the morning file to the CU*Answers Operators from the Federal Reserve. This would have generated a delay in the ACH posting that did not meet the parameters of the test.

Also on the evening of Tuesday, May 9th, CU*Answers Operations Team members successfully performed the tasks of the Site-Four third shift, including EOD/BOD processing, from the HA datacenter in Kentwood, MI.

On Wednesday, May 10th, beginning at 11:00 PM CT, recovery teams initiated the process to roll-back CU*BASE core processing to the production data center in Yankton, SD. By 12:46 AM, CU*BASE/GOLD, third-party EFT vendor networks and online/mobile banking applications were back online.

CHALLENGES:

As we continue to expand and improve our products and services to a growing client network, systems and environments experience an increased number of changes at a very rapid pace. Performing these rollover exercises in a planned, controlled setting during non-peak business hours is a small investment to better prepare for a situation that is less ideal.

Maintenance windows necessary to perform these rollover exercises continue to shrink as more routine tasks are required of system operators and users of the system. It is important that we continuously seek ways to improve processing efficiency through automated and managed productivity, while at the same time becoming more creative in testing our operational resilience.

Due to the nature of the rollover exercise (redirecting live production traffic from 76+ credit union locations to our HA/DR location), some challenges are to be expected. For this event, these challenges included the following:

- Prior to the rollover event, there were a limited number of credit union branches unable to communicate with the HA environment using command-line tools (PING/TELNET) on GOLD workstations.
    - By identifying those locations unable to communicate ahead of the rollover event, support teams were able to resolve the connectivity issues in advance and minimize downtime. There were no reported issues with connectivity on the morning following the rollover.
- On Sunday morning, immediately following the HA rollover, logins were not able to authenticate on CU*BASE/GOLD.
    - This was the result of a host restoration effort on the HA server performed prior to the rollover event. The issue was resolved prior to the opening of the business day for those credit unions with Sunday hours. This issue did not affect home/mobile banking users.

- As this is the first rollover performed after a full rebuild of the HA host, critical systems were tested to verify there were no ongoing issues post-rebuild.
    - One utility application (QShell ZIP) was found to be missing and immediately resolved by the iSeries team.
    - It was discovered that the default replication process did not include the ROBOTLIB Library at the recommendation of HelpSystems. Additional research is being done regarding what can be safely replicated.
- During pre-roll checks, iTERA was in the process of auditing 6000+ spool files that delayed the role-swap. The iSeries Team confirmed the files had already been replicated and delayed the audits to allow rollover to start.
    - Future rollovers will delay the schedule of the rollover to compensate for the audit schedule or change the audit schedule to accommodate the rollover.
- During the roll-over process, the CUSC (CO-OP Shared Branching) Acquirer subsystem failed to come back online.
    - Multiple attempts were made throughout the day on Sunday to contact CO-OP after-hours network support team (they are closed on Sunday) with no return calls to resolve the issue. The Customer Service Center at CO-OP was contacted immediately upon opening on Monday morning but there were difficulties getting through to their Network Support team. Once we finally made the connection with the CO-OP Network Support team the circuit was immediately brought online.
- During the roll-back process, after the DNS changes were performed for PROD.SITE-FOUR.COM, it was discovered that the CU*Answers DNS servers continued to receive outdated updates from the authoritative host DNS servers used by Site-Four. This caused connectivity issues from CU*Answers hosted servers and users utilizing CU*Answers DNS servers.
    - Temporarily increasing the TTL value stopped the IP updates from bouncing between hosts. Once DNS stabilized, continuation of EOD processing was delayed by and addition 15 minutes to confirm stability. The Site-Four hosted DNS provider was contacted and the issue is being investigated by their network support.
- During the roll-back process, an issue with no traffic on one of the ELAN subsystems was resolved by contacting the ELAN data monitoring center and having them recycle the circuit on their side at 12:39AM CT.
    - Due to the nature of the connections to ELAN/US BANK, the circuits frequently require a connection reset from ELAN after cycling the subsystems.

CONTINUING EFFORTS AND RECOMMENDATIONS:

Each recovery test and high-availability rollover exercise provides us the opportunity to continually improve the process and adjust the needed procedures accordingly. The best way to accomplish this is to “Practice. Learn. Document. Repeat”. The following is a list of action items and projects that we are pursuing to get us closer to that goal:

1. Retesting challenges faced during this event (i.e. third-party DNS and CU*BASE/GOLD authentication) will be included in the next HA rollover event.
2. Continued testing of third-party EFT connections will be performed between rollover events to expand the scope of future rollover events.

Respectfully,

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