CU*ANSWERS HIGH AVAILABILITY PROGRAM REVIEW

EVENT DATE(S): 4/18/2021 – 5/09/2021

SUMMARY

As part of an ongoing business continuity program, CU*Answers actively maintains a high-availability (HA) core processing environment with near real-time data replication between identical hosts located at two geographically dispersed, state-of-the-art data centers. A minimum of twice each year, live HA rollover events are scheduled to redirect CU*BASE production and operations to the secondary data center (located in Yankton, SD) for a period of one full business week or longer. At the conclusion of the rollover event, core processing is redirected back, and operations resumed at the primary data center (located in Kentwood, MI). These live production HA rollover events are invaluable to validate procedures and ensure the ability to recover CU*BASE GOLD core processing in an effective and timely manner when incidents occur that threaten to disrupt business operations.

One of the many benefits of a mature high-availability program is that it provides the environment for performing regular system maintenance to update or replace hardware and software components on production equipment with minimal impact or downtime. That was demonstrated during this spring rollover exercise that included the replacement of 96 disk drives on the production host as a precautionary measure to ensure future performance.

During the week of April 18th, the HA rollover was performed to bring CU*BASE core processing online at the secondary data center, allowing teams to replace the affected disk drives on PROD while maintaining data replication throughout the event. After allowing the new drives a two-week “break-in” period, the HA rollback process was performed on May 9th to return CU*BASE core processing to the primary data center, ending the event.

Another significant characteristic of this HA rollover is that it incorporated month-end processing on systems at the secondary data center. Typically, rollovers are scheduled during mid-month periods. This extended event allowed teams to successfully validate EOM procedures and capabilities from the corporate Operations Center in Kentwood, MI, running on systems more than 750 miles away, in Yankton, SD.

The rollover was conducted with minimal issues reported including support calls from a select few credit union branch locations that experienced connectivity or network performance issues with the secondary data center. Both were resolved through routing and VPN configuration changes at the credit union. One other issue observed by recovery teams was the continued expansion of time required to conduct the rollover process itself. During the past two years, this window has expanded from 45-60 minutes to 90-120 minutes. This increase is aligned with the growth amount and types of data stored on the host as part of the core processing platform.

During the rollover process, before primary and secondary hosts essentially swap roles, there are a series of audits and checks performed to ensure that every transaction has replicated, and the stand-by system is ready for production. Teams are working with vendors to evaluate options for future rollovers with the goal of reducing the amount of time required, while maintaining the integrity of the data during the process.

The following sections identify challenges observed, lessons learned, and recommendations for consideration related to this event.

EVENT DETAILS

Server hardware that hosts the CU*BASE environment for both PROD and HA is acquired as part of a three-year lease lifecycle to keep ahead of the capacity curve and take advantage of new technology as it evolves. The current systems were installed in October of 2019. During the first year of service, multiple disk drive failures were experienced on the PROD host. The servers are configured with redundant components, including RAID (redundant array of independent disks) technologies. Most of the failed drives were recovered using an available hot spare installed on the system with no interruption of service. In a few instances, the operating system on the server did not handle the disk failures as expected, resulting in system performance degradation until manual intervention was applied.

Throughout this period of disk failures, teams were engaged with the hardware vendor (IBM) to isolate the root cause and determine an appropriate solution. It was discovered that a quality control metric during the manufacturing process of the disk drives reported a higher than normal level of process defects during a specific date range. As a proactive measure, the decision was made to replace the 96 disk drives on the PROD host manufactured during the specific data range. An additional 23 disk drives were identified on the HA host and replaced prior to the rollover event. Both systems are comprised of a mix of solid-state and "spinning" disk drives. Only the "spinning" disk drives were impacted by the manufacturing process defect.

On **Sunday, April 18th**, beginning at 3:00 AM ET, teams began the HA rollover process to bring CU*BASE core processing online at the secondary data center in Yankton, SD. The rollover event completed by 5:20 AM with connectivity to all third-party EFT vendor networks confirmed by 5:30 AM. During each rollover process, all third-party EFT vendors function in "stand-in" mode adhering to predefined settings on transaction types and amounts (set by the credit union). Once all post-roll application testing was completed, the Operations Team performed normal EOD/BOD processing to prepare for the new business day.

All 96 "spinning" disk drives on PROD were replaced, one disk per RAID array at a time, while maintaining data replication with the HA host. Teams worked on multiple shifts during the first week of the rollover, completing disk replacement process on **Friday, April 23rd**. The remaining two weeks allowed the "break-in" period for the new hardware to finish, preparing the disks for production. All original disk drives that were replaced were wiped and destroyed following data security policies.

On **Saturday, May 1st**, the CU*Answers Operations Team performed month-end processing for all online credit unions from the Grand Rapids, MI offices on the HA host in Yankton, SD. EOM processing was completed successfully and on time.

On the morning of **Sunday**, **May 9th**, beginning at 3:00 AM, recovery teams started the process to roll-back CU*BASE production to the primary data center. This was completed by 5:15 AM with all services back online.

CHALLENGES AND CONTINUING EFFORTS

Every rollover event, planned or unplanned, provides an opportunity for a valuable learning experience. Even those that appear relatively smooth on the surface often require decisions to be made and resolutions to apply behind the scenes. Every recovery team member gives their all to minimize the impact to clients and members, while performing their job with an intense focus. Challenges observed during this rollover event include the following:

1. Continued expanding window required for completing the HA rollover for CU*BASE core processing.
    - Over time, the rapid growth in the amount transactions processed and data stored eclipses the benefits of increased speed acquired with new hardware and technology investments. With continuous efforts to shrink downtime, recovery teams must continue to balance the risk when planning and executing a safe and effective rollover exercise.
    - While many exercises are completed within 45-60 minutes, some, as in the case of this rollover, can require 90-120 minutes or more before systems are back online. Scheduling these exercises during non-peak hours (3:00–5:00 AM) helps to mitigate the impact. During periods of downtime, applications like GOLD and **It's Me 247** are offline; however, ATM/Debit transactions are conducted using preconfigured stand-in limits.
    - As a result of this expanding window, Software Development teams are working more closely with the Operations team to better understand and identify data that must be replicated vs. mirroring everything that happens on the production system. This DevOps relationship is instrumental not only for recovery and rollover events but to optimize nightly processing cycles and balance performance with availability.

2. On the morning of the rollover, during testing for the ProDOC application, teams identified an issue where the application did not auto-launch upon GOLD login on a credit union network.
    - Contact was made with a credit union open for business on Sunday to determine if users were experiencing the same issue. They were not. It was initially assumed that credit unions with an in-house eDOC solution would not experience the auto-launch issue.
    - Further investigation revealed that the PCs used for testing had not been used since the previous HA rollover and that a recent CU*BASE configuration change in the GOLD release file did not recognize the test workstation profiles. As a result, the ProDOC logon passthrough process was not performed.
    - The resolution was implemented, and scenario documented for future HA rollover events and application troubleshooting.

3. During the rollover period, a small number of credit unions reported an inability to access CU*BASE GOLD by staff at certain branch locations when connecting to systems at the HA data center.
    - These issues were resolved through routing and firewall configuration changes at the credit union.
    - Multiple announcements are sent to credit unions prior to the rollover, including a requirement to test connectivity to the HA host from GOLD workstations at each branch office location.

4. Midway through the rollover period, one credit union reported slow network connectivity to the HA data center impacting CU*BASE GOLD performance for staff.

- This issue was resolved by making a VPN configuration change between the branch and the secondary data center.
- Announcements during future exercises will include language that encourages credit unions to contact support teams if network performance degradation is experienced. The hardware and network infrastructure strategy in place at the CU*Answers secondary data center is designed to match the performance levels of the production data center, so that the user experience is the same, no matter which host they are connected to. We will communicate these expectations more effectively going forward.

5. Also during the rollover period, Operators observed an increase in data transmission times for large data files originating from the HA environment. During normal production processing, large data files (several gigabytes) are transmitted between hosts within the same data center. When core processing operations are performed from the secondary data center, more than 750 miles from the production data center, additional latency and overhead induced over Internet networks tends to slow the transmission. As more applications utilize large data files, a solution to remedy the performance mismatch will need to be addressed.
    - This issue was also experienced during previous rollover events and anticipated for this event. The Network Services and Operations Programming teams took steps in advance to mitigate the performance issue by implementing multiple controls such as data compression tools and splitting up large files into multiple transmissions throughout the day.
    - Although these measures did provide significant performance gains, teams will continue to engage with vendors to assess and test potential solutions for future rollover events.

CLOSING REMARKS

Whether planned or unexpected, each recovery test and high-availability rollover exercise provides the opportunity to continually improve the process. The value and significance of these exercises are multiplied when we consider the ever-changing threat landscape from hardware component failures, dependency on third-party vendors and supply chains, and the frequency and scope of today's natural disasters including global pandemics.

Just as significant is the ever-changing technology environment that makes up the CU*BASE core-processing platform. Increased complexity in application development, vendor integration, and network infrastructure requires more frequent reviews and assessments of the business continuity strategies in place to meet recovery time objectives and a shrinking tolerance for downtime. Regular rollover exercises helps us measure our progress and adjust accordingly.

The investment made over the past two decades in building and testing its Business Continuity Program has positioned the CUSO to navigate the storms on the horizon and enable it to reach for new opportunities and serve its owners and client credit unions in innovative ways.

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Unless otherwise noted, all times noted in this report are Eastern Time.