

CU*ANSWERS HIGH AVAILABILITY PROGRAM REVIEW

EVENT DATE(S): 7/10/2022 – 7/24/2022

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.

As mentioned in [previous reports](#), these rollover events provide the opportunity for performing regular system maintenance to update or replace hardware and software components on production equipment with minimal impact or downtime. During the [Spring 2022 HA rollover](#), a twelve-hour maintenance window was scheduled to power down all equipment in the production data center as part of a remodel project that included the upgrade and relocation of the Emergency Power Off (EPO) safety system. By operating CU*BASE core processing, as well as online and mobile banking applications from the secondary data center, teams were able to complete the remodel project with minimal interruption to credit union and their members.

The rollover detailed in this report was originally scheduled for October 2022 and included a maintenance project to replace the existing PROD and HA servers that store the data and provide the applications for the CU*BASE platform. For reasons noted later in this report, the installation date for the new servers was moved up 90 days, creating the need to conduct the HA rollover event in July.

Server hardware that comprise both PROD and HA are replaced under a lease agreement with IBM on a three-year rotation. In the past, each new server was added to the data replication pool and synchronized with the production hosts. Once completed, a rollover was scheduled to redirect core processing to the new host. This time, the new hardware purchased represents a significant advancement in technology including external disk storage on a SAN appliance for greater performance and capacity requirements. This report highlights the new process for migrating to the new server hardware.

With rigorous planning and testing across multiple teams, the rollover process was completed with minimal impact or issues observed. The new HA host was installed during the week of June 5th at the secondary data center in Yankton, SD, and introduced into production on June 27th. On Sunday, July 10, beginning at 3:00 AM ET, recovery teams initiated the process to redirect core processing to the HA host. By 5:00 AM, CU*BASE was live on the new system.

Attention was shifted to the new PROD host at the primary data center, which was introduced into production on July 17th. On Sunday, July 24th, beginning at 3:00 AM ET, recovery teams initiated the process to redirect CU*BASE core processing back to the primary data center, this time on the new PROD hardware. Once the rollover event was completed and new servers in production, teams began the process of preparing the old server hardware for return to the manufacturer.

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

**All times noted in this report are Eastern Time.*

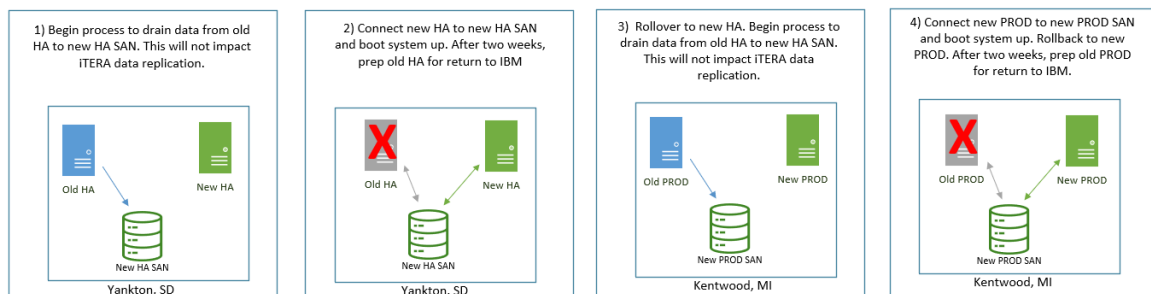
EVENT DETAILS AND TIMELINE

Careful consideration and strategic planning are applied in the design of the data center and the IT infrastructure to allow for flexibility and scalability when planned maintenance is required. This helps to provide an environment where most system and network maintenance projects can be completed during non-peak hours with minimal impact or downtime to users. One of those scheduled system maintenance projects at CU*Answers includes the replacement of the production (PROD) and stand-by (HA) servers, located in data centers 750 miles apart. To remain relevant with current technology and scalable to meet the demand for core processing, server hardware is upgraded on a 36-month lifecycle. Originally scheduled for the fall rollover (October/November), an opportunity to move the date up 90 days presented itself.

The existing server hardware, while considered “state-of-the-art” when purchased in 2019, was put to the test during a period of changes unlike any other. During that time, a global pandemic occurred that required the rapid mobilization of a remote workforce and significantly accelerated the adoption of digital services by credit unions and their members. The amount of traffic generated during multiple stimulus check distributions taxed even the highest performance hardware and network systems across the industry. Also during that time, the amount of data generated and stored grew at an unexpected pace. The server replacement project quickly became a high priority for 2022.

Knowing the supply chain issues that many manufacturers are facing, teams initiated the conversations early to begin detailing the specifications for the new systems. At the same time, with economic forecasts looming based on inflationary fears, the vendor had an incentive to move new product. A deal was reached, and the new hardware acquisition plan was launched with a July installation target. **Identical hardware is installed at both the production and high-availability data centers.*

Process to migrate from Power9 to Power10 system with SAN appliance shown below:



The new hardware represented not only an upgrade from the IBM Power9 to the Power10 platform, but also from an environment with internal DASD to a SAN (Storage Area Network) appliance for the CU*BASE core processing application and database. The process to migrate to the new hardware was also new. Instead of adding the new server to the replication pool and allowing data to synchronize over a period of time, the new process involved moving (aka “draining”) the data from the internal DASD to the SAN appliance and mounting the data volumes with the new servers.

Timeline of events:

Week of June 5th – Teams arrive at the secondary data center in Yankton, SD, to assemble server and SAN components and configure systems. Existing Power9 HA host was attached to the SAN to begin data migration.

June 27th – New Power10 HA host is attached to SAN and mounted to data volumes upon boot up. New HA is now in production and ready for configuration validation and testing before the scheduled HA rollover.

June 28th – Teams return to the primary data center to begin assembling server and SAN components for new PROD.

July 10th – Beginning at 3:00 AM ET, HA rollover procedures are performed to bring CU*BASE core processing live on the new Power10 HA host at the secondary data center. CU*BASE GOLD is back online by 5:00 AM ET.

July 12th – New Power10 PROD is attached to SAN and mounted to data volumes upon boot up.

July 17th – New Power10 PROD is now in production and ready for configuration validation and testing before the scheduled HA rollback.

July 24th - Beginning at 3:00 AM ET, HA rollback procedures are performed to bring CU*BASE core processing live on the new Power10 PROD host at the primary data center. CU*BASE GOLD is back online by 4:40 AM ET.

Beginning the week of **August 1st**, recovery teams will begin the process to securely purge the data on the outgoing servers to prepare them for return to the manufacturer, completing the project.

The scope of this HA rollover was limited to CU*BASE core processing to allow teams to focus on the configuration and installation of the new Power10 server hardware at both data center locations. Previous rollover events have included other applications such as online and mobile banking environments. A two-week rollover period was scheduled to provide adequate time for the assembly and reliability-testing of each system. During HA rollover exercises, a select few products and services are not available from the secondary data center, such as CU*BASE Training Edition (CTE) and data warehouse services. These services would be restored from backup in a true disaster scenario but are not included in the real-time data replication strategy.

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, grouped by the acquisition and installation of the new hardware and the HA rollover process itself.

New IBM Power10 HA/PROD Acquisition and Installation

1. With a 36-month lifecycle, forecasting the performance requirements required on the replacement PROD/HA systems is not as easy as it once was. Historical data was used in the past to predict with a certain level accuracy what resources (CPU, I/O, data capacity, etc.) would be needed.
 - The past two years produced multiple significant events that influenced resource requirements for CU*BASE core processing. These include:
 - Rapid adoption of digital services by members during the prolonged global pandemic.
 - Large mobilization of staff working remotely because of government mandates.
 - Multiple rounds of stimulus check distributions generating 7x spikes in traffic for online/mobile banking applications....just to name a few. These were impossible to predict back in 2019 when the previous systems were installed.
 - Finding the right balance between cost and performance is both an art and skill. Designing a scalable solution that allows for that availability of additional resources only when needed during peak volumes (burstable) has been part of the strategic technology plan for the past several years.
2. A significant amount of planning and coordination was required to track the delivery of each component to the Kentwood, MI, and Yankton, SD, data centers.
 - Although not uncommon with a hardware purchase of this size and complexity, the current global supply chain issues faced by vendors and logistics organizations required an additional margin in our project planning to meet the targeted deadlines.
3. The planned migration path from Power9 to Power10 with SAN required specific configuration of components for compatibility purposes. Some components were shipped with default configurations and interfaces for devices (i.e., 1GB vs 10GB).
 - The project timeline was padded to allow for delays in anticipation of potential challenges. Allowing for extra time to configure the HA host before the rollover provided teams the opportunity to adjust procedures and timelines for the PROD host. This is one of the many benefits of implementing identical equipment at both the primary and secondary data centers.
 - Both SAN appliances were delivered with encryption at rest enabled. The process to configure and manage this environment was not included in the original playbook. Working with the vendor, teams were able to accomplish this on the HA SAN first, then update documentation for the installation of the PROD SAN appliance.

High-Availability Rollover Exercise

4. The procedures for redirecting CU*BASE core processing to and from the HA data center were performed with a relatively minimal impact due in part by the limited scope as mentioned earlier.
 - Even with the additional time required for data integrity checks and system audits on the new hardware, the rollover and rollback were completed within the announced maintenance windows.
 - This is due in part to the technology advancements of the new PROD and HA host and the amount of planning that went into each stage of the project.
5. One issue that did surface while operating from the HA data center was intermittent network latency between the web server pool that hosts **It's Me 247** online banking environment and the new HA host. Reports of application timeouts and login failures were received by support teams during these brief, random periods.

- Teams were able to rule out the new HA hardware and Internet bandwidth capacities. Even at the highest peak, less than 40% of total bandwidth was consumed.
 - The focus shifted to a pair of managed network switches at the Yankton, SD, data center. A maintenance window was announced for the evening of July 21st to reboot a network switch, causing a brief interruption of network traffic at 4:10 AM ET.
 - No additional reports of latency or the related symptoms were reported during the remainder of the HA rollover period.
6. Future HA rollovers may become less like a mirror of production (for lower priority features).
- This challenge was also included in the previous HA rollover report. As new features and services are added to the core processing platform, it is becoming necessary to prioritize those that will be available during a disaster recovery scenario (high priority), and those that will be restored later (low priority).
 - The purpose of performing the HA rollover exercise is to validate procedures and confirm our capabilities to recover should an unplanned disruptive event occur. To properly balance the effort required to minimize downtime and recover less critical features and services, prioritization must occur. That may mean that some services are not available during the brief rollover windows conducted twice each year.
 - Teams will continue discussing methods to optimize this process and find the balance that best meets the corporate goals and objectives.

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 help 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 enables it to reach for new opportunities and serve its owners and client credit unions in innovative ways.

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