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2023/Q4 ARCOS Platform Disaster Recovery Test
Results

December 7, 2023

To whom it may concern:

In accordance with the ARCOS Disaster Recovery policy, the ARCOS Cloud Operations team conducted the scheduled annual DR drill on Thursday, December 7, 2023. Procedure testing is a critical element of a viable recovery plan. Testing enables plan deficiencies to be identified and addressed and helps staff to better understand their roles in the process. ARCOS LLC tests our recovery procedures at least annually across the ARCOS platform.

During the latest drill, the following items were tested:

Item 1: Performed Validation of Standby Infrastructure.
Purpose: Test ARCOS Platform for stability and functionality.

Item 2: Performed test with key personnel observing only.
Purpose: To ensure all personnel who would potentially be involved in a DR response understand DR procedures and can perform them accurately.

Item 3: Train additional personnel on database procedures prior to DR test.
Purpose: To ensure that database knowledge and procedures are understood in the event of unavailability of database administrator(s).

Item 4: Update internal documentation for any changes to scripts or procedures.
Purpose: To ensure that anyone new to the CloudOps team has clear documentation on how to perform DR.

Documentation:
- JIRA Ticket: CO-5808

Objectives and Procedures

Objectives

- Test ARCOS Platform for stability and functionality.
- Training for contingencies when only certain personnel are available.
- Validate accuracy of all Disaster Recovery Procedures.
- Complete Disaster Recovery Test within Recovery Time Objective (4 hours) and Recovery Point Objective (Real-Time to no longer than 20 minutes).

Procedure and Timeline

Start Time	Task
11:04am	DR Test Window Begins
11:05am	Take DB out of stand-by Standby became primary 2023-12-07T11:10:55
11:11am	Isolate DR from primary online and purge active data from database
11:47am	Remove FreeSWITCH server from Production Environment
11:51am	Validate Proxy server configuration
12:01pm	Place Tomcat online in DR App server
12:02pm	Place FSW server in DR group
12:08am	Remove active Prod FreeSWITCH servers from DR Environment
12:16pm	Enable inbound calls for FSW
12:17pm	Place ARCOS service online on DR App Server
12:19pm	QA Testing and Validation Begins
12:45pm	QA Testing and Validation Complete Data Recovered To: 12/7/2023 10:10:30.000000000 AM Environment Approved and Released to Client
12:46pm	Take App server Out-Of-Service
12:48pm	Place DB in Stand-by and validate Production replication successful
12:59pm	Place FSW Server back into Production service
1:04pm	DR Test complete

ARCOS Platform Disaster Recovery Test Result

ARCOS Platform disaster recovery test completed without error, within required RTO (recovery time objective), and passed QA Validation. However, the Recovery Point Objective was NOT met. During validation, it was noted that the recovered data was to 12/7/2023 10:10:30 AM and the failover occurred at 12/7/2023 11:10:56. Therefore, approximately 60 minutes of data was lost, which is outside the 40-minute maximum Recovery Point Objective.

Root Cause Analysis

- The database recovery procedures do not have a step for validating the data recovery point.

  - Current process: If the database converts from standby to live primary successfully, the database is released for application startup.

- Replication from the primary Ohio database to the standby DR database in Oregon was lagging.

- "Real Time Apply" was failing in the replication process.

  - Managed Standby Recovery not using Real Time Apply
  - No SRLs available for T-1

- Therefore, transactions from the primary database were only being applied to the DR database until the transactions logs were archived, and not as the transactions were being committed.

- Cause of failure for "Real Time Apply" has been identified as changes to the Online Redo Logs at the primary database, during previous SEV1 remediation, were not applied to the Standby Redo Logs at the Disaster Recovery database.

Corrective Actions

- Steps have been added in the Disaster Recovery Database Procedures for data recovery point validation and additional steps if the data is not within the Recovery Point Objective. (CO-6028)

- Enhance monitoring of the replication process to ensure Real Time Apply is active and to monitor for the time lag of the replication stream. (CO-6029)

- To ensure the maximum recovery point objective is met, the primary database transaction logs must be archived and copied to AWS S3 every 15 minutes. (CO-6030)

- Correct size differences between Primary DB online logs and DR standby redo logs. (CO-6032)

ARCOS confirms that the above results are accurate. Please let us know if ARCOS can be of any further assistance regarding our Disaster Recovery policy and procedures, or these Disaster Recovery test results.

Sincerely,

Dave Campbell   Rob Evans
Chief Technology Officer   Director, Cloud Operations