

## Root Cause Analysis – March 2018 Outage

Affected Region	US-EAST-1
Outage Start Time	03/03/2018 04:10 AM EST
Outage End Time	03/05/2018 04:04 PM EST

### 1. Outage Summary

Between 03/03/2018 04:10 AM EST and 03/05/2018 04:04 PM EST, the Amazon Web Services Multi-AZ RDS Postgres database instance hosting the Ally database was unavailable to client connections after a hardware failure.

Blackboard Ally uses a redundant database strategy, including a permanent hot database standby and full daily database backups. However, because of an internal AWS communication error, a failover was incorrectly triggered to the database instance exhibiting hardware failures, causing the database redundancy strategies used by Blackboard Ally to fail and the application to be unavailable.

The Blackboard Ally and Amazon Web Services teams then worked together closely to restore access to the application as quickly as possible.

### 2. Amazon Web Services Actions

Amazon is taking several steps to prevent recurrence of this issue:

1. Amazon has improved the internal documentation and standard operating procedures to help eliminate human error in generating remediation actions. This effort was completed on 03/09/2018.
2. Amazon is investigating automation to prevent a multi-AZ failover to a secondary which is exhibiting a hardware failure. AWS is working to complete effort towards ETA of Q2 2018.

3. Amazon is investigating improving error detection mechanisms and automating the hardware vetting process, particularly during failover actions. AWS is working on the ETA.

## 3. Blackboard Actions

Blackboard has taken several steps to prevent recurrence of this issue and further improve overall redundancy of the database architecture:

1. Blackboard increased the RDS database backup retention policy to maximum retention period allowed by Amazon Web Services. This effort was completed on 03/05/2018.
2. Blackboard has implemented an additional automated backup validation strategy. This entails automatically validating each database backup by restoring it into a new database instance and running multiple validation queries. This effort was completed on 04/01/2018.
3. Blackboard has implemented additional backup storage strategies outside of the AWS-provided automated RDS backups. This entails taking a full database dump of each (validated) database backup and storing it inside of Amazon S3. This effort was completed on 04/01/2018.