Internal Cloud vs. External Cloud: A Database Perspective

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176 Database VMs Supported

Each of these “servers” is a VM hosted on our internal cloud.

Over 40 TB of Managed Database space
300 managed database instances, running over 200 different applications.

**Database Instances Supported**

**Applications**

- Oracle
- MySQL Basic
- SQL Server
- MySQL Std
- PostgreSQL

**Number of Applications Hosted**

- Oracle: 70
- MySQL Basic: 40
- SQL Server: 30
- MySQL Std: 20
- PostgreSQL: 10

**Number of Instances Supported**

- Oracle: 160
- SQL Server: 80
- PostgreSQL: 60
- MySQL Std: 60
- MySQL Basic: 40
ServiceNow: Support
AMAZON RDS AT CDL

Debra Bartling, UCCSC 2016
Amazon RDS Supported Databases

MySQL
MySQL Community Edition

MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.

- Supports database size up to 6 TB.
- Instances offer up to 32 vCPUs and 244 GiB Memory.
- Supports automated backup and point-in-time recovery.
- Supports cross-region read replicas.
Standard CDL Configuration

- Every service has its own database instances
  - Development
  - Stage
  - Production
- Multi-AZ configuration for stage and production
- Standard instance types
- Naming conventions (rds-ias-demo-stg)
- Tags: Program, Service, Environment
- Snapshot retention (7-14-35 days)
- Standard/custom VPC security groups
- SNS event notifications
### Instance Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB Engine</td>
<td>mysql</td>
</tr>
<tr>
<td>License Model</td>
<td>general-public-license</td>
</tr>
<tr>
<td>DB Engine Version</td>
<td>5.6.27</td>
</tr>
</tbody>
</table>

- **DB Instance Class**: db.m4.xlarge — 4 vCPU, 16 GiB RAM
- **Multi-AZ Deployment**: Yes
- **Storage Type**: Provisioned IOPS (SSD)
- **Allocated Storage**: 100 GB
- **Provisioned IOPS**: 1000

### Settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB Instance Identifier*</td>
<td>rds-as-demo-stg</td>
</tr>
<tr>
<td>Master Username*</td>
<td>demo</td>
</tr>
<tr>
<td>Master Password*</td>
<td>...............</td>
</tr>
<tr>
<td>Confirm Password*</td>
<td>...............</td>
</tr>
</tbody>
</table>
### Example RDS Instance Types

<table>
<thead>
<tr>
<th>Class</th>
<th>vCPU</th>
<th>Memory</th>
<th>EBS Optimized</th>
<th>Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>db.t2.small</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>Low</td>
</tr>
<tr>
<td>db.t2.medium</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>Moderate</td>
</tr>
<tr>
<td>db.m4.large</td>
<td>2</td>
<td>8</td>
<td>Yes</td>
<td>Moderate</td>
</tr>
<tr>
<td>db.m4.xlarge</td>
<td>4</td>
<td>16</td>
<td>Yes</td>
<td>High</td>
</tr>
<tr>
<td>db.m4.2xlarge</td>
<td>8</td>
<td>32</td>
<td>Yes</td>
<td>High</td>
</tr>
<tr>
<td>db.m4.10xlarge</td>
<td>40</td>
<td>160</td>
<td>Yes</td>
<td>10 Gigabit</td>
</tr>
<tr>
<td>db.r3.large</td>
<td>2</td>
<td>15</td>
<td>-</td>
<td>Moderate</td>
</tr>
<tr>
<td>db.r3.xlarge</td>
<td>4</td>
<td>30.5</td>
<td>Yes</td>
<td>Moderate</td>
</tr>
<tr>
<td>db.r3.2xlarge</td>
<td>8</td>
<td>61</td>
<td>Yes</td>
<td>High</td>
</tr>
<tr>
<td>db.r3.8xlarge</td>
<td>32</td>
<td>244</td>
<td>-</td>
<td>10 Gigabit</td>
</tr>
</tbody>
</table>
RDS Instance Configuration - 2

Network & Security

- **VPC**: Default VPC (vpc-3f21f8f)
- **Subnet Group**: cdl-stg-database-subnets
- **Publicly Accessible**: Yes
- **Availability Zone**: No Preference
- **VPC Security Group(s)**:
  - MySQL custom (web-cdlb-stg) - CDL
  - MySQL from Dev/Stg/UCB/UCOP (VPC)
  - SMTP from UCOP (VPC)
  - VSFTP from UCOP - Dev-Stg-VPC

Database Options

- **Database Name**: 

Note: if no database name is specified then no initial MySQL database will be created on the DB Instance.

- **Database Port**: 3306
- **DB Parameter Group**: ias-default-mysql
- **Option Group**: default.mysql-5-5
- **Copy Tags To Snapshots**: Yes
- **Enable Encryption**: No
RDS Instance Configuration - 3

Backup

Please note that automated backups are currently supported for InnoDB storage engine only. If you are using MyISAM, refer to detail here.

- **Backup Retention Period**: 14 days
- **Backup Window**: Select Window
- **Start Time**: 08:00 UTC
- **Duration**: 0.5 hours

Monitoring

- **Enable Enhanced Monitoring**: Yes
- **Monitoring Role**: Default
- **Granularity**: 60 second(s)

I authorize RDS to create the IAM role rds-monitoring-role.

Maintenance

- **Auto Minor Version Upgrade**: Yes
- **Maintenance Window**: Select Window
- **Start Day**: Sunday
- **Start Time**: 09:00 UTC
- **Duration**: 0.5 hours
Tips

- **Backup/Restore**
  - Snapshot: Restore takes about 20 minutes (regardless of size)
  - Point-in-Time Restore: Takes longer, less data loss

- **Performance monitoring/tuning**
  - Database parameters based on instance type
  - SSD storage/provisioned IOPS

- **Failover testing**

- **No SUPER privilege**

- **Timezone (UTC)**
Considerations

- Availability
- Monitoring
- Latency
- Backup and Data Retention
- Security
- Flexibility
- Migration Strategy
- Staffing
- Existing Data Center Investment
- Integration
- Cost
Availability

Monitoring

Write Operations (Count/Second)

Statistic: Maximum  Time Range: Last 3 Days  Period: 1 Minute
Latency

**Host:** dba-opsc-qa-01.ist  **Service:** net: ping

**4 Hours** 27.06.16 5:14 - 27.06.16 9:14

**Datasource: Round Trip Times**

- **Ping times**
  - RTO
  - 0.03 ms Max
  - 3.70 ms Average

**Datasource: Packets Lost**

- **Packets lost**
  - 0 % Last
  - 0 % Max
  - 0 % Average
  - Warning 80%
  - Critical 100%
# Backup and Data Retention

<table>
<thead>
<tr>
<th>Filter: Owned by Me</th>
<th>Search: htmm</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Snapshot</th>
<th>DB Instance or Cluster</th>
<th>Snapshot Creation Time</th>
<th>Status</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>rds:d2d-htmm-stg-2016-06-14-04-02</td>
<td>rds-d2d-htmm-stg</td>
<td>Jun 13, 2016, 9:02:26 PM</td>
<td>available</td>
<td>Complete</td>
</tr>
</tbody>
</table>

- **DB Snapshot Name:** rds:d2d-htmm-stg-2016-06-14-04-02
- **VPC:** CDL-Dev-Stg-VPC
- **DB Engine:** mysql
- **License Model:** general-public-license
- **Status:** available
- **DB Storage:** 800GB
- **Port:** 3306
- **Snapshot Creation Time:** June 13, 2016 at 9:02:26 PM UTC-7
- **Instance/Cluster Creation:** January 20, 2016 at 8:04:43 AM UTC-8
Minimum Security Standards for Electronic Information (MSSEI)

The following Minimum Security Standards for Electronic Information (MSSEI) are issued under the authority vested in the UC Berkeley Chief Information Officer by the UC Business Finance Bulletin IS-3 Electronic Information Security: "All campuses shall establish an Information Security Program (Program) in conformance with the provisions in this bulletin. In order to achieve a secure information technology environment, the campus Program shall comprise a comprehensive set of strategies that include a range of related technical and non-technical measures." (Section III)

Issue Date: April 23, 2013
Effective Date: July 1, 2014
Responsible Executive: Associate Vice Chancellor for Information Technology and Chief Information Officer
Responsible Office: IT Policy Office
Contact: IT Policy Manager, itpolicy@berkeley.edu

https://security.berkeley.edu/minimum-security-standards-electronic-information
Flexibility
Migration Strategy

Sybase → Customized conversion scripts → MySQL
UC Berkeley Information Services and Technology
Existing Data Center Investment
Integration
RDS Costs

• Amazon Cost Calculator
  • [http://calculator.s3.amazonaws.com/index.html#s=RDS](http://calculator.s3.amazonaws.com/index.html#s=RDS)

• Costs are based on
  • Region
  • Instance type
  • Single-AZ vs. Multi-AZ
  • Data transfer
  • Storage
  • Reserved vs. on-demand

• Example: One-year reservation
  • db.t2.small Single-AZ $195
  • db.m3.2xlarge Multi-AZ $7903
# CDL RDS Cost

<table>
<thead>
<tr>
<th>Instance Type</th>
<th>Cost</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserved Instances (35)</td>
<td>1-year reservation</td>
<td>$36,400</td>
</tr>
<tr>
<td>On-demand Instances</td>
<td>Average monthly $4,226</td>
<td>$50,715</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>$87,115</strong></td>
</tr>
</tbody>
</table>
Cost - UCB Database Service

We offer:
- **Standard Service:**
  - 10 GB Storage
  - Separate development/QA/production environments
  - Firewall configuration
  - 30 day backup retention
  - All database upgrades and patching
  - 4 hours DBA support a year, 8-5 Monday – Friday

Add ons:
- Additional Storage
- Extended Service
  - 44 hours DBA support a year, 24x7
- Dedicated instance
- Dedicated VM
- Replication to SDSC
Summary

• Use RDS for workloads already in AWS
• Consider the entire environment
  • Type of data
  • Security
  • Staffing
  • Custom requirements
• Don’t make a decision based on cost alone
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