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Migrating Your Databases to AWS: Deep Dive on Amazon RDS and AWS Database Migration Service

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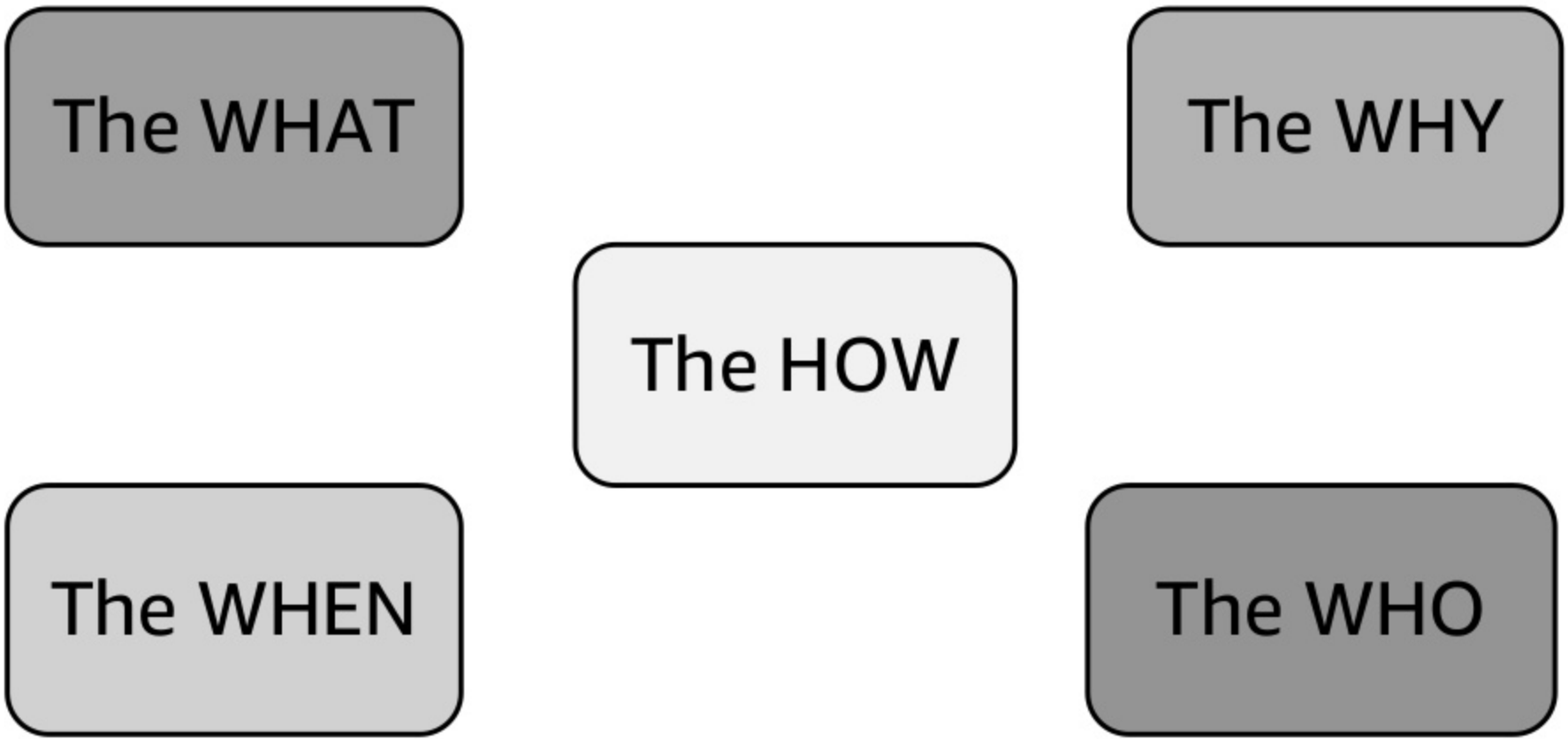
Agenda



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The What :
Amazon Relational Database Service

Amazon RDS

Managed relational database service with a choice of popular database engines

Amazon Aurora | MySQL | PostgreSQL | MariaDB | Microsoft SQL Server | ORACLE

Easy to administer

No need to provision infrastructure, install, and maintain DB software

Available & durable

Automatic Multi-AZ data replication; automated backup, snapshots, and failover

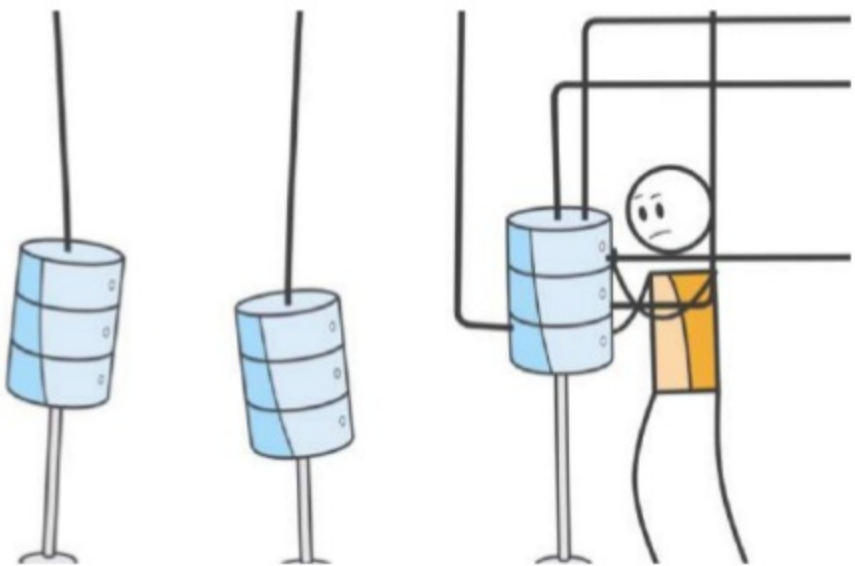
Highly scalable

Scale DB compute and storage with a few clicks; minimal downtime for your application

Fast & secure

SSD storage and guaranteed provisioned I/O; data encryption at rest and in transit

Key Insight: Relational Databases are Complex



Our experience running Amazon.com taught us that relational databases can be a pain to manage and operate with high availability

It's expensive and complex to manage administrative functions including regular patching cycles, performance optimization, and backup and disaster recovery – all for constantly changing applications

We Made Things Cheaper, Easier, and Better

Lower TCO because we manage critical administrative functions

- ✓ Automated hardware provisioning, database setup, patching, & backups
- ✓ Get more leverage from your teams
- ✓ Focus on the things that differentiate you

Built-in high availability and cross-region replication across multiple data centers

- ✓ Available on Aurora MySQL, Amazon RDS for MySQL, Amazon RDS for MariaDB, and Amazon RDS for PostgreSQL engines

Now, even a small startup can leverage enterprise-level availability, durability, and scalability with a single API call or click of a console button

Amazon RDS Engines

Aurora

Open source

Commercial

Microsoft SQL Server

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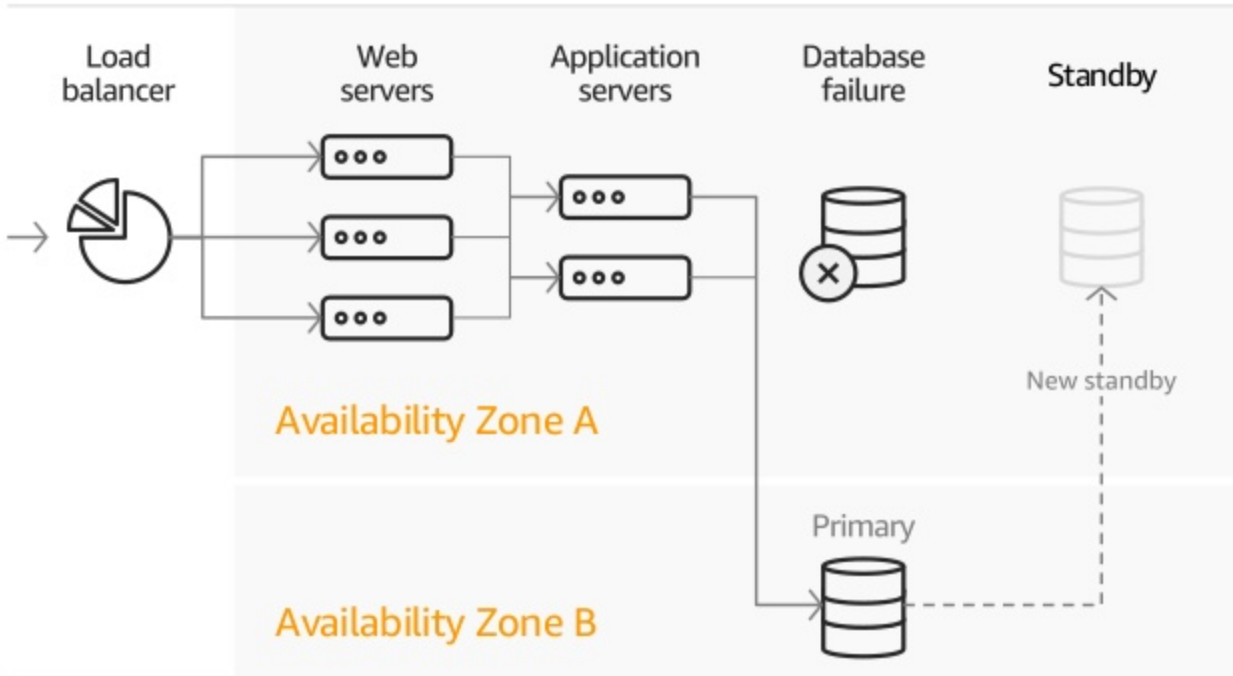
Why: Amazon Relational Database Service

High Availability Multi-AZ Deployments

Enterprise-grade fault tolerance solution for production databases

- ✓ Automatic failover
- ✓ Synchronous replication
- ✓ Inexpensive and enabled with one click



Flexible Scaling

Scale compute/
memory or storage/IO
vertically up or down

Handle higher load
to grow over time

Lower usage to
control costs

Read Replicas

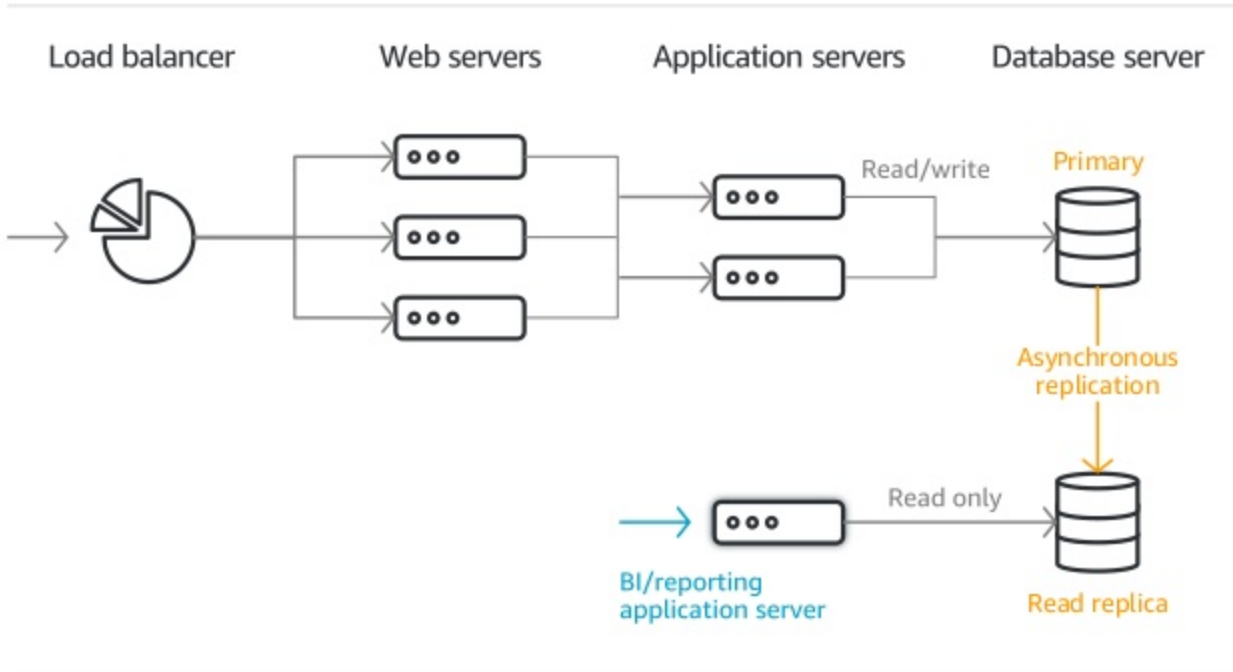
Performance and disaster recovery

Relieve pressure on your master node with additional read capacity

Bring data close to your applications in different regions

Promote a read replica to a master for faster recovery in the event of disaster

Supported for Amazon Aurora & Amazon RDS for MySQL, MariaDB, PostgreSQL



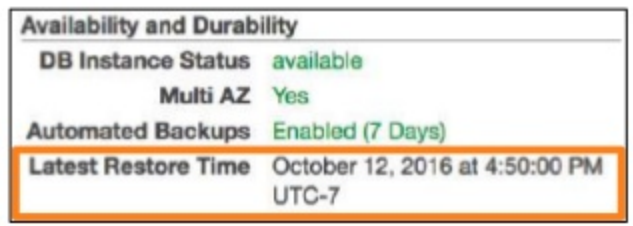
Automated Backups

Amazon RDS for MySQL, PostgreSQL, MariaDB, Oracle, and SQL Server

- ✓ Scheduled daily volume backup of entire instance
- ✓ Archive database change logs
- ✓ 35-day maximum retention
- ✓ Minimal impact on database performance
- ✓ Taken from standby when running Multi-AZ

Amazon Aurora

- ✓ Automatic, continuous, incremental backups
- ✓ No impact on database performance
- ✓ 35-day maximum retention



Every day during your backup window, Amazon RDS creates a storage volume snapshot of your database

Every five minutes, Amazon RDS backs up the transaction logs of your database

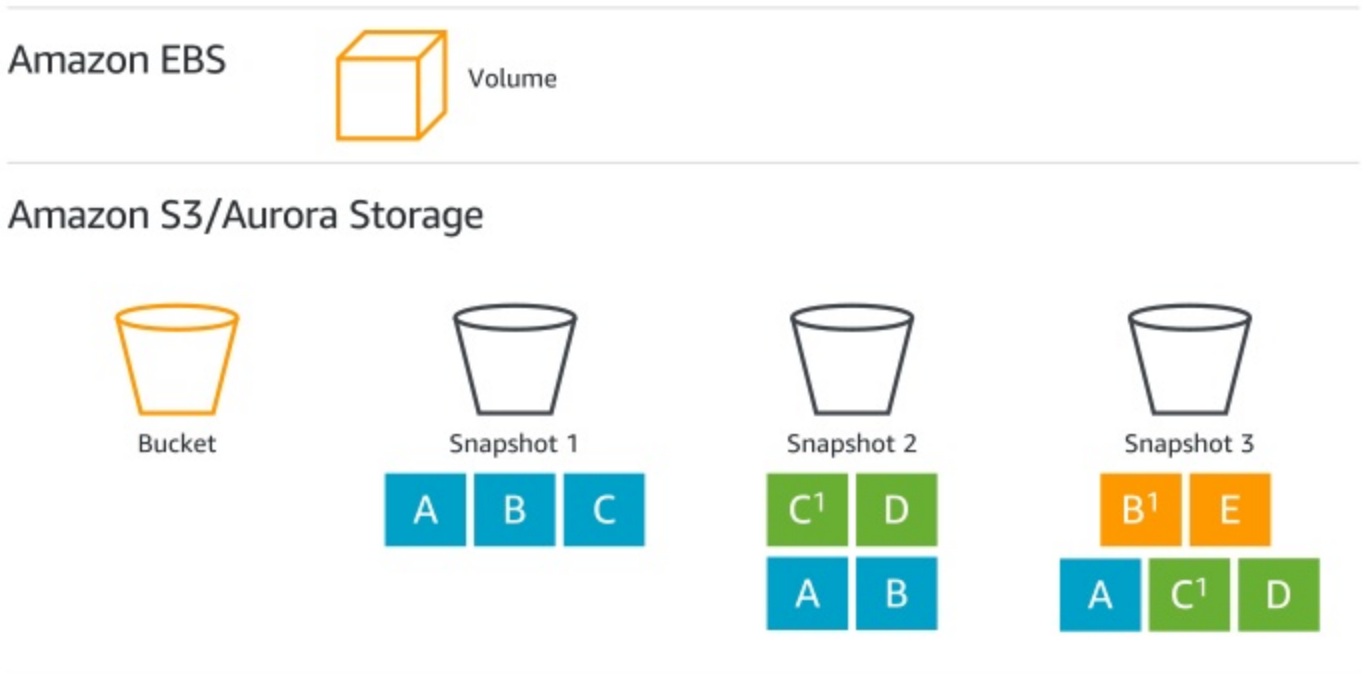
Database Snapshots

Always incremental

Amazon S3 → 99.999999999% durability

Inherit encryption

Copy across accounts, across regions



Security and Compliance

Network isolation via Virtual Private Cloud (VPC)

Security groups

AWS IAM-based resource-level role permission controls

Encryption at rest using AWS KMS or Oracle/Microsoft TDE

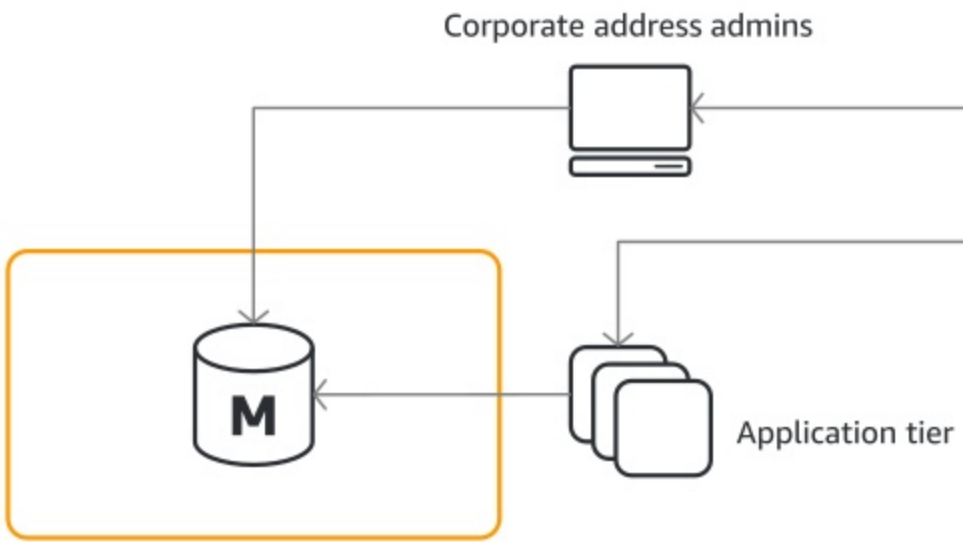
SSL protection for data in transit

Assurance programs for finance, healthcare, government, and more

✓ HIPAA eligibility under a Business Associate Agreement (BAA) with AWS

Security Groups

Specify network access rules for your database



Protocol	Port range	Source
TCP	3306	172.31.0.0/16
TCP	3306	“Application security group”

Identity and Access Management (IAM)

Governed access: use IAM to control who can perform actions with Aurora MySQL and Amazon RDS for MySQL


```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "AllowCreateDBInstanceOnly",
            "Effect": "Allow",
            "Action": [
                "rds:CreateDBInstance"
            ],
            "Resource": [
                "arn:aws:rds:*:123456789012:db:test*",
                "arn:aws:rds:*:123456789012:og:default*",
                "arn:aws:rds:*:123456789012:pg:default*",
                "arn:aws:rds:*:123456789012:subgrp:default"
            ],
            "Condition": {
                "StringEquals": {
                    "rds:DatabaseEngine": "mysql",
                    "rds:DatabaseClass": "db.t2.micro"
                }
            }
        }
    ]
}
```

At Rest Encryption for All Amazon RDS Engines

AWS Key Management Service (AWS KMS)

Two-tiered key hierarchy using envelope encryption

Unique data key encrypts customer data

AWS KMS master keys encrypt data keys

Available for all Amazon RDS engines

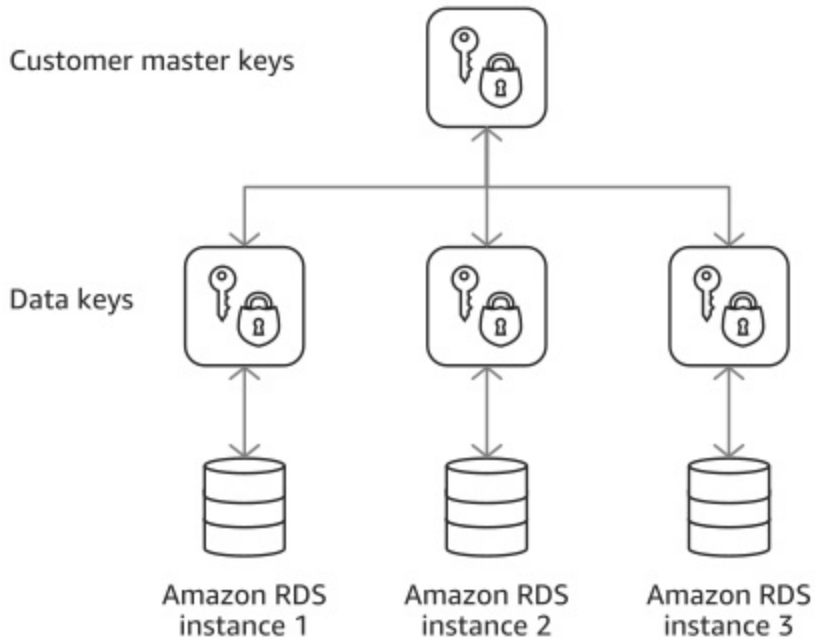
Benefits

Limits risk of compromised data key

Better performance for encrypting large data

Easier to manage small number of master keys than millions of data keys

Centralized access and audit of key activity



Amazon Aurora

MySQL and PostgreSQL-compatible relational database built for the cloud

Performance and availability of commercial-grade databases at 1/10th the cost

Performance & scalability

5x throughput of standard MySQL and 3x of standard PostgreSQL; scale-out up to 15 read replicas

Availability & durability

Fault-tolerant, self-healing storage. Six copies of data across three AZs. Continuous backup to Amazon S3

Highly secure

Network isolation, encryption at rest and in transit

Fully managed

Managed by Amazon RDS: no hardware provisioning, software patching, setup, configuration, or backups

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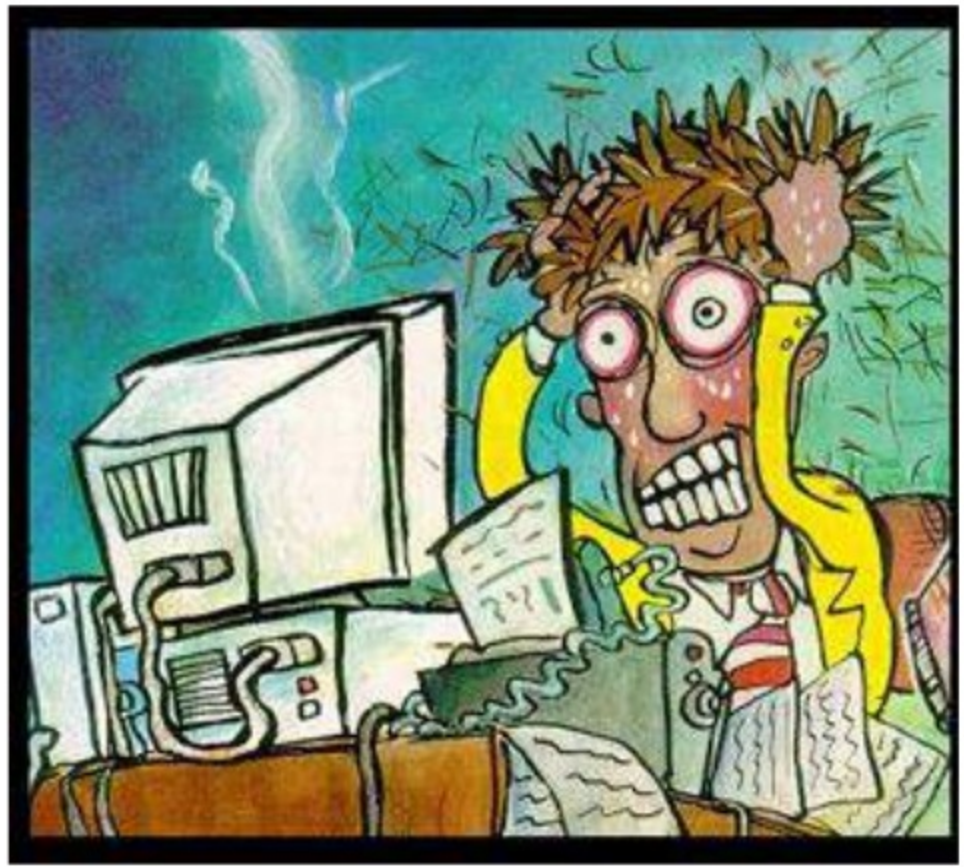
The How:
Getting onto Amazon Relational Database Service

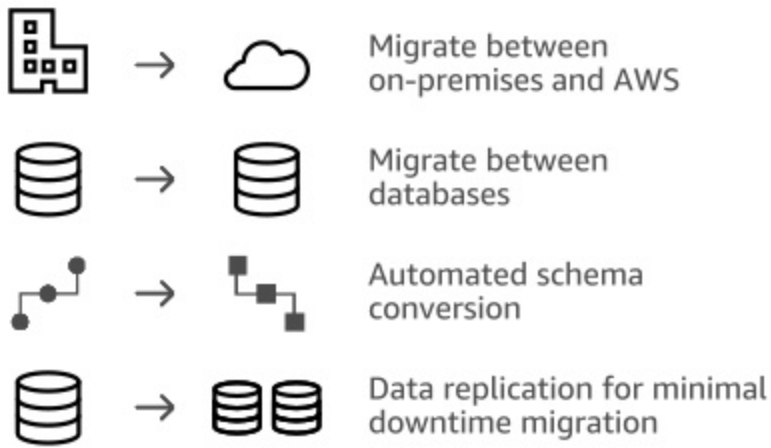
Database Migrations ??



AWS Database Migration Service

Migrating databases to AWS

50,000+
databases migrated



What are DMS and SCT?

AWS Database Migration Service (DMS) quickly and securely migrates or replicates your databases & data warehouses to AWS

AWS Schema Conversion Tool (SCT) converts your database and data warehouse schemas to open-source engines or AWS-native services (Aurora and Amazon Redshift)

We've migrated over 50,000 unique databases, and counting.

DMS & AWS Snowball

Got huge migration tasks?

Skip the network. Do a physical move with Snowball.

- Migrate large databases (over 5 TB)
- Migrate many databases at once
- Avoid migrations over slow network
- Push model instead of pull model

Migration Was Costly, Complex, & Slow

- ✗ Required commercial migration & replication software

- ✗ Caused long application downtime

- ✗ Was complex to set up & manage

- ✗ Required DB-specific application code

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When: AWS Database Migration Service

Database Migration Use Cases

Modernize

- **Convert** and extract data from old database engines
- **Update** associated application code

Migrate

- **Migrate** business apps to Amazon RDS
- **Migrate** data warehouses to Amazon Redshift
- **Upgrade, consolidate & archive** your databases

Replicate

- **Create** cross-region Read Replicas
- **Run** analytics in the cloud
- **Keep** dev/test and production in sync

Migration & Replication with DMS

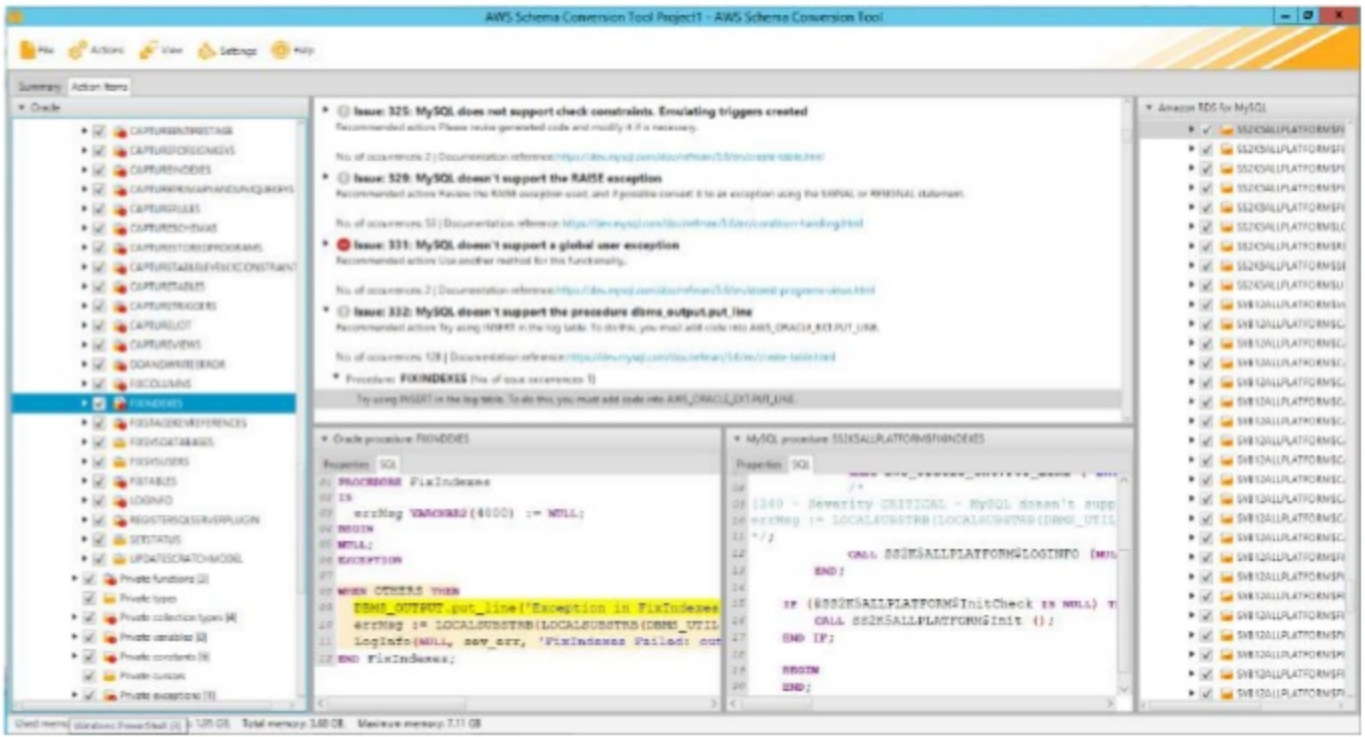
Homogeneous or heterogeneous

Schema Conversion with SCT

Modernize your database tier

Modernize and Migrate your data warehouse to Amazon Redshift

SCT Helps with Converting Tables, Views, & Code



- Sequences
- User-defined types
- Synonyms
- Packages
- Stored procedures
- Functions
- Triggers
- Schemas
- Tables
- Indexes
- Views
- Sort and distribution keys

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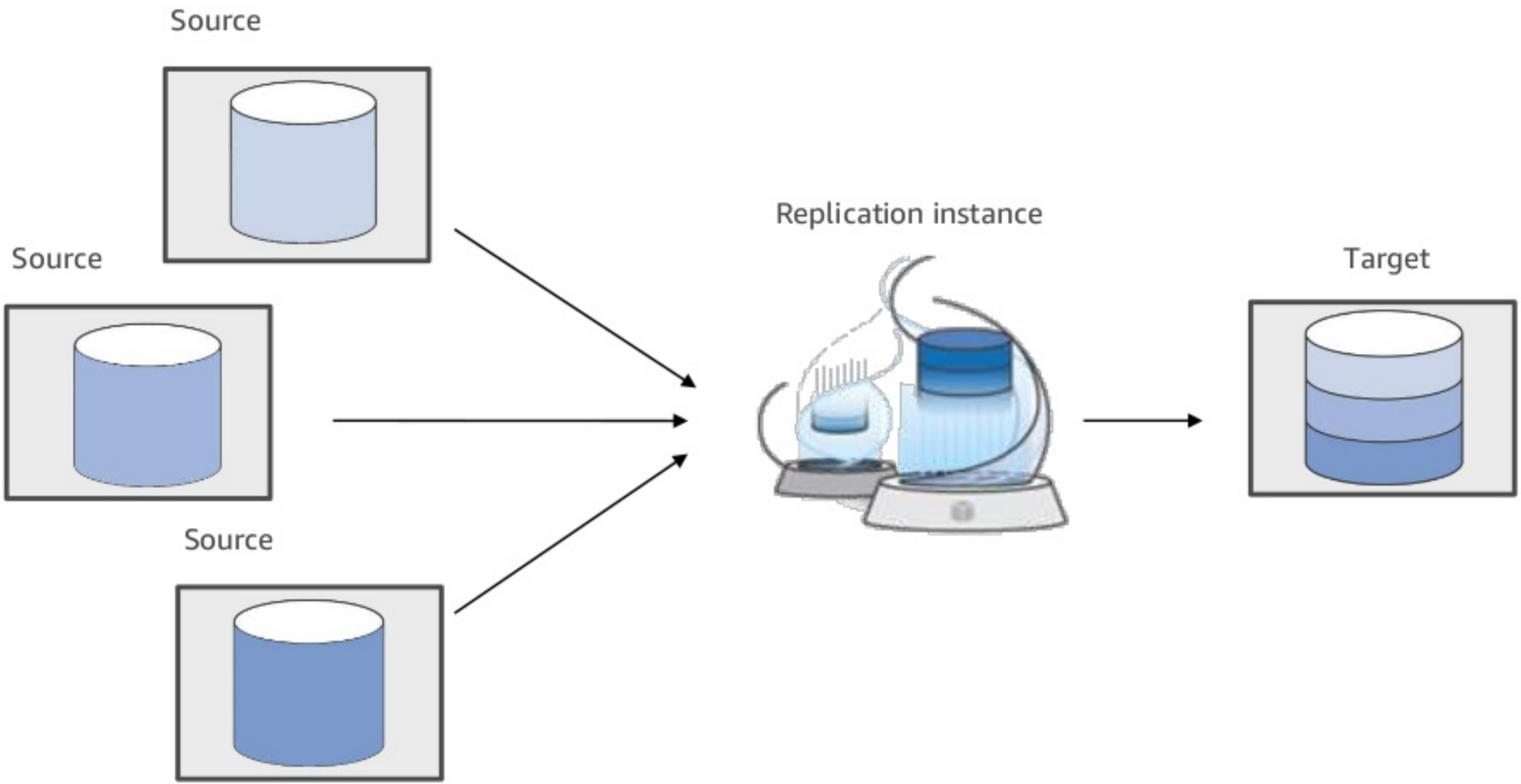
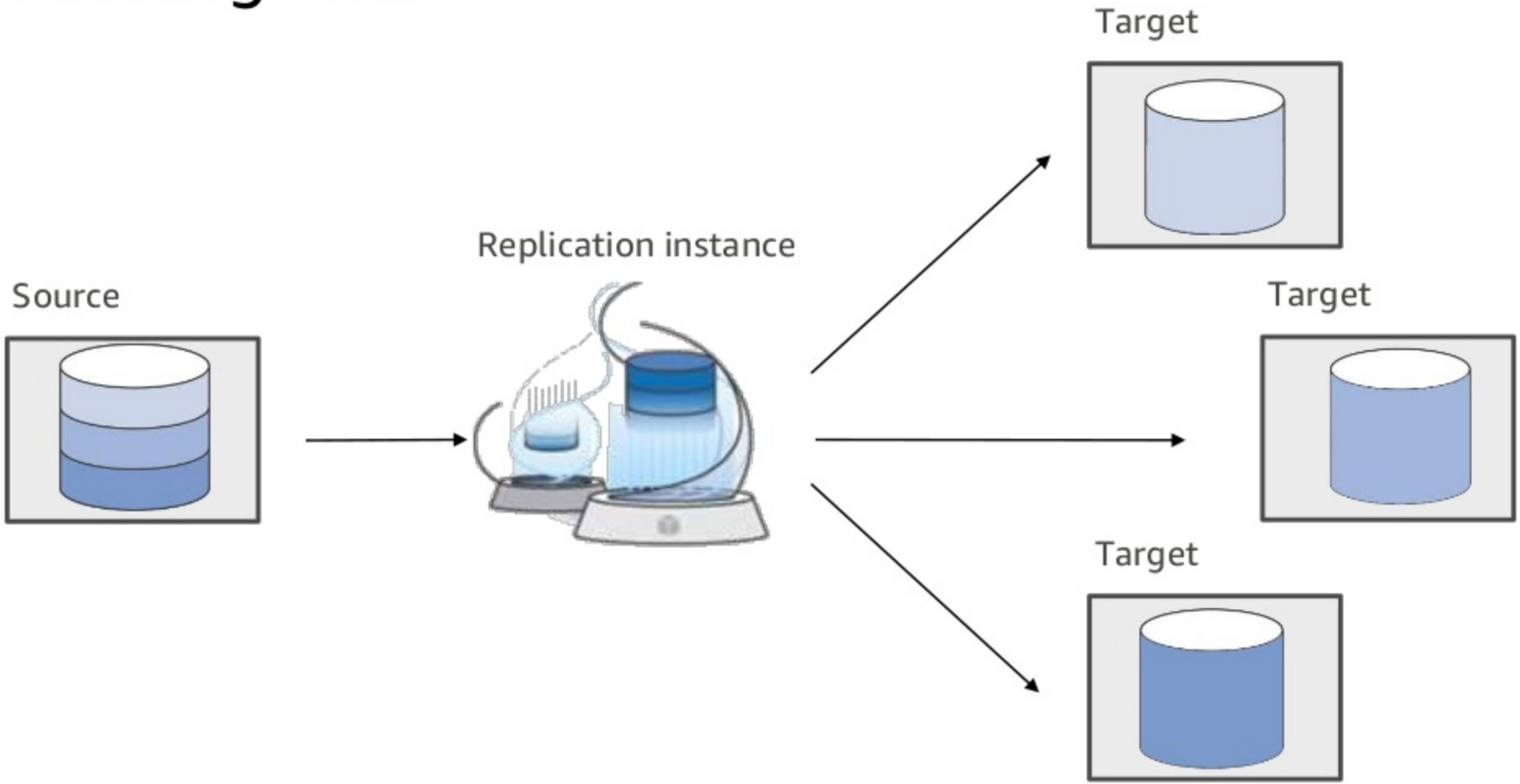
…. But there’s more!

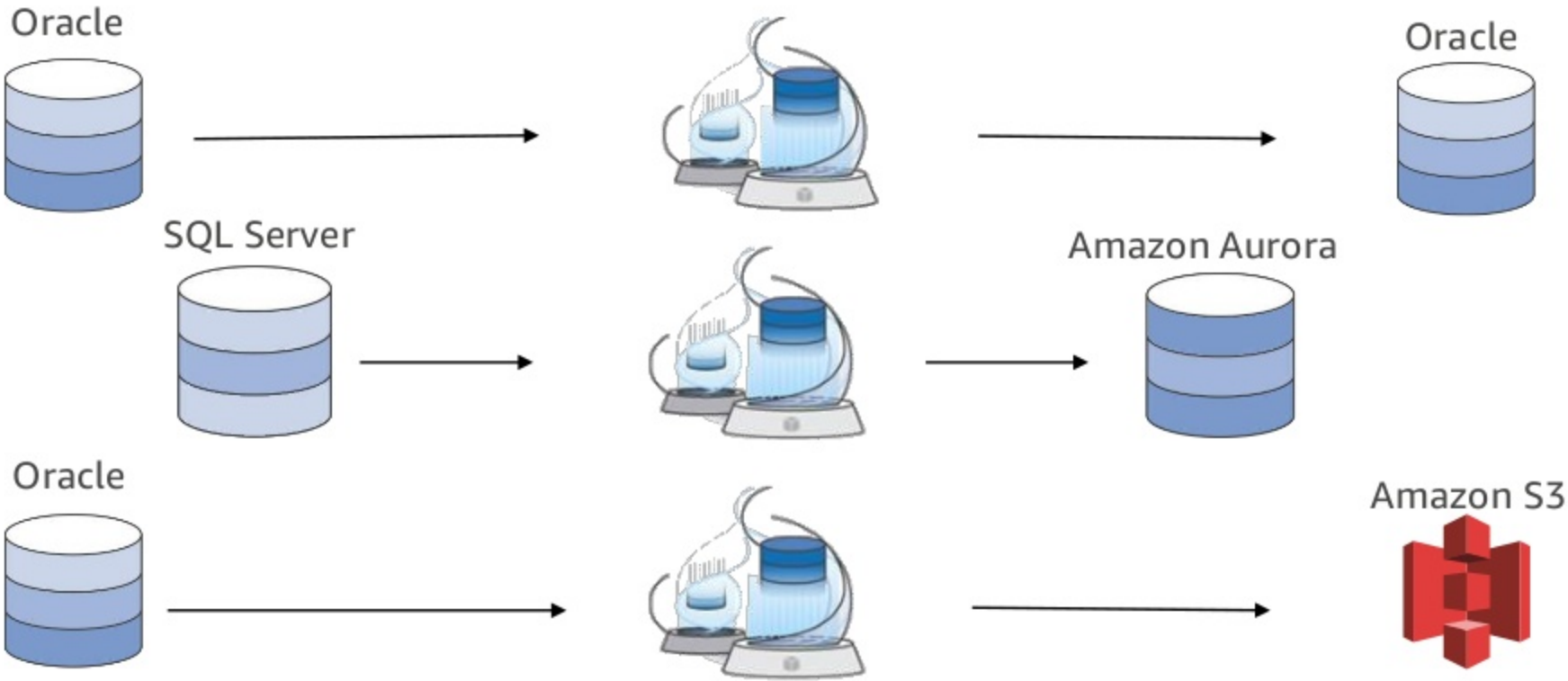
Fanning-In



Fanning-Out



Homogenous or heterogeneous



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Why: AWS Database Migration Service

Key benefits of migrating with DMS

Get off expensive commercial databases & data warehouses

Avoid high fees and restrictive licenses! Switch to open-source based, pay-as-you-go services

Keep your applications running during the migration

Load and sync the target database, then switch over at your convenience

Low cost: pay only for the migration resources you use

Free DMS is available for 6 months when migrating to Aurora, Amazon Redshift, or Amazon DynamoDB

Other migrations are as low as $3 per terabyte

Migration in both directions avoids lock-in

Migrate either in or out of AWS. Replicate your data to keep AWS and on-premises databases in sync.

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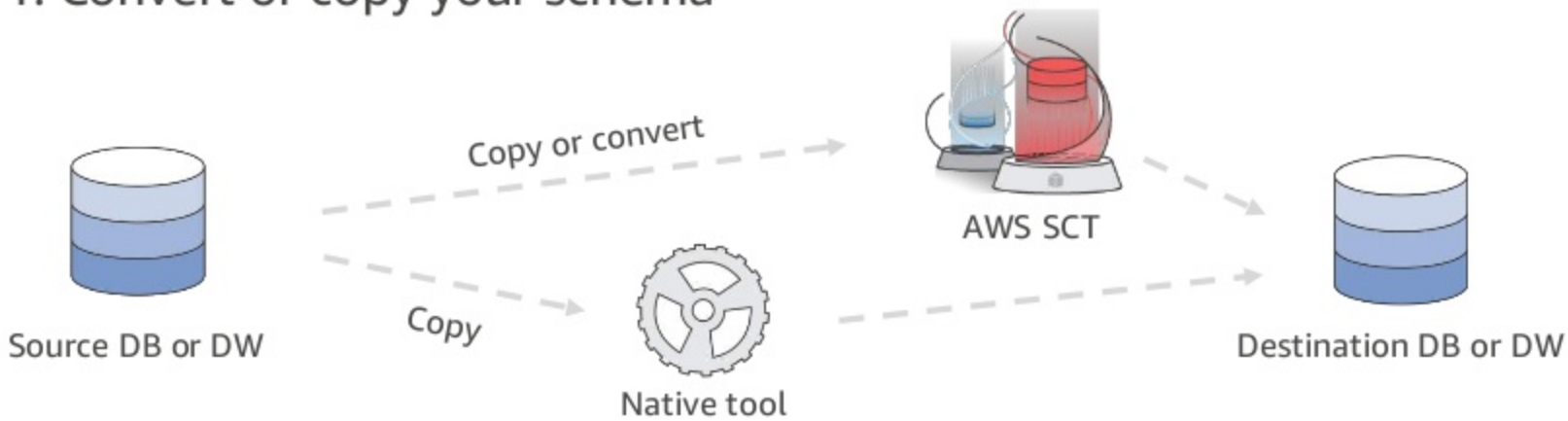
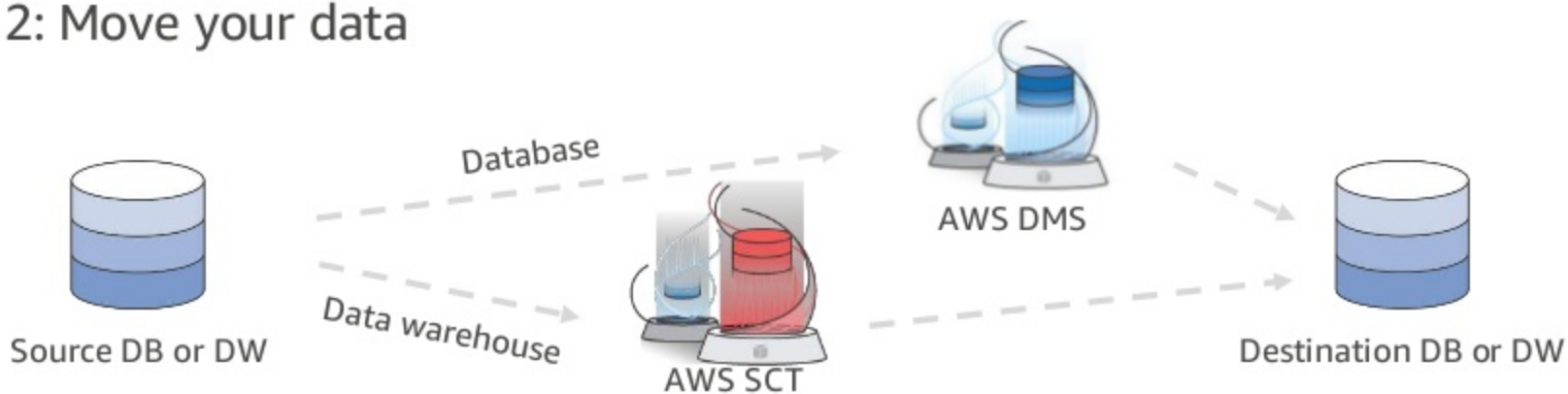
How: AWS Database Migration Service works

Database Migration the Easier Way

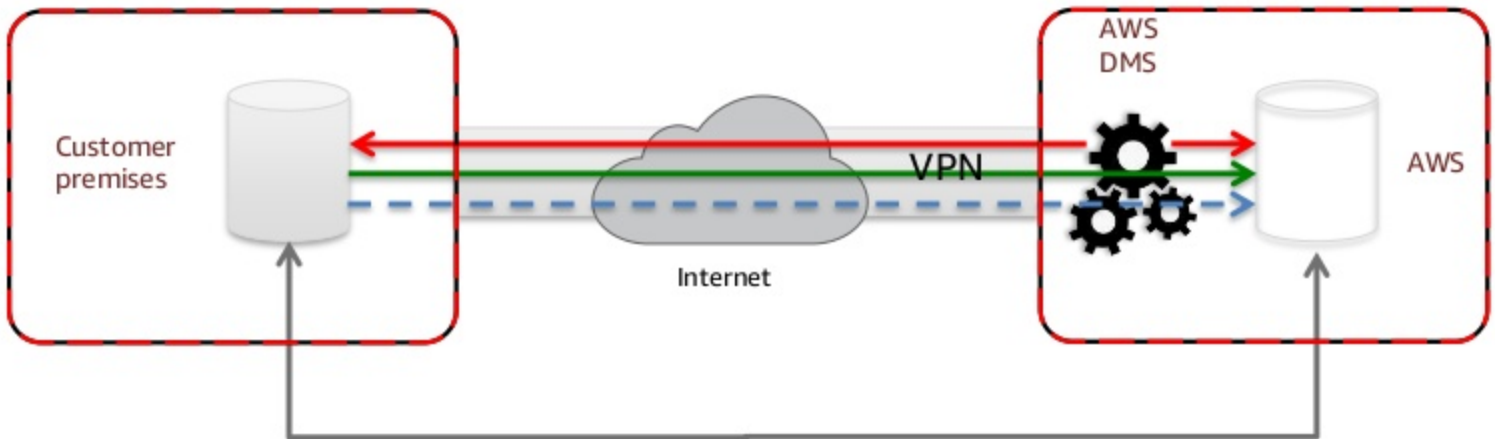
Step 1: Convert or copy your schema



Step 2: Move your data



Keep your apps running during the migration



Start a replication instance

Connect to source and target databases

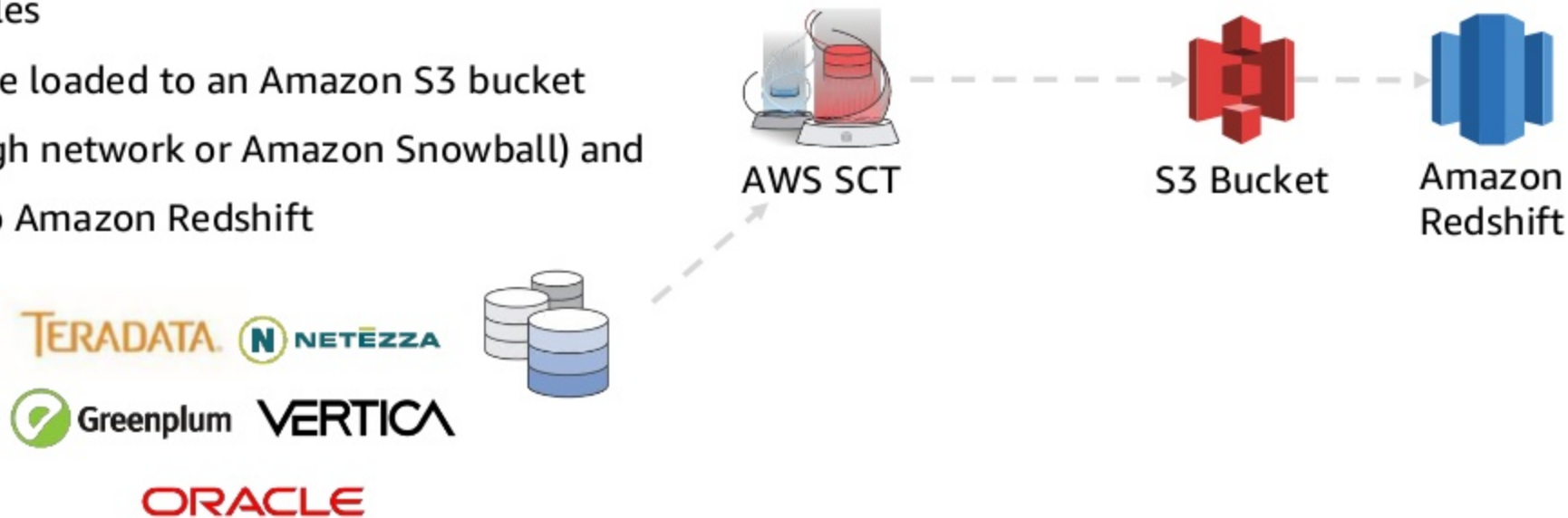
Select tables, schemas, or databases

- Let AWS DMS create tables, load data, and keep them in sync
- Switch applications over to the target at your convenience

SCT data extractors

Extract Data from your data warehouse and migrate to Amazon Redshift

- Extracts through local migration agents
- Data is optimized for Redshift and Saved in local files
- Files are loaded to an Amazon S3 bucket (through network or Amazon Snowball) and then to Amazon Redshift



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Who: Customer Use Cases

>50,000 Databases Migrated with DMS

Expedia migrated from SQL Server to AWS

Needed real-time analysis of lodging market pricing

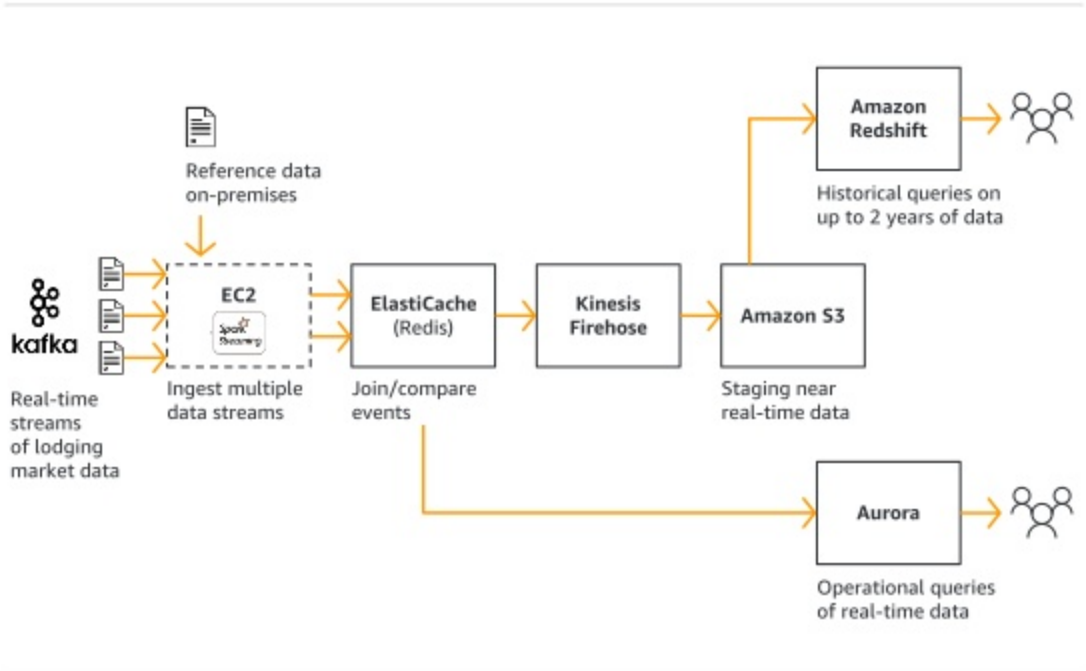
Migrated from Microsoft SQL Server

Use Amazon Aurora, Amazon Redshift, Kinesis, and ElastiCache

Process high-volume pricing and availability data

Query execution times reduced 80%–95%

Database has >15B rows and continues to grow



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Wrapping up

Recap

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No Operational Overhead

Reliable, Scalable and Secure deployments

Fast and Easy Migrations

AWS database migration partners

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Thank you!

aws.amazon.com/dms

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