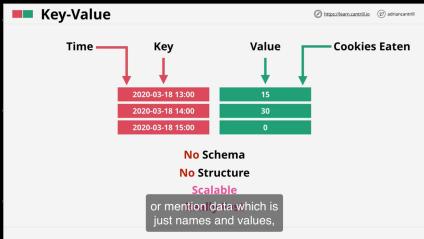


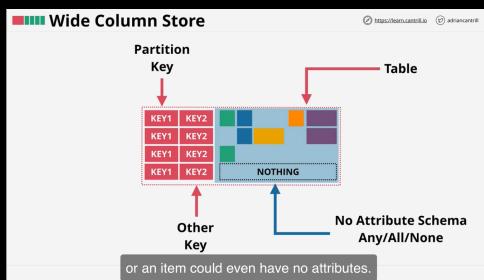
## Relational database RDBMS

① key-value db  
unique key | value can be same



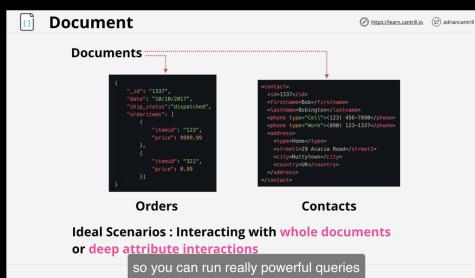
Really Fast

② wide column store -



- Every item has to use key structure
- ex. DynamoDB

- Document



Row Store MySQL  
Row based databases are also called as OLTP (Online Transaction processing)

If you want to read the content from row you have to read the

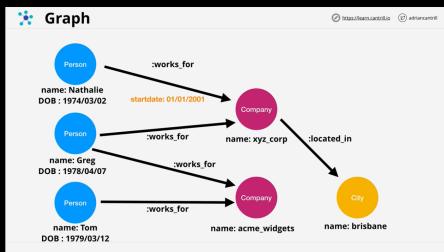
whole now

## column store (Redshift) -

- inefficient for transaction

(specific)

## Graph Databases -



## • Transaction Model's

### ACID vs Base

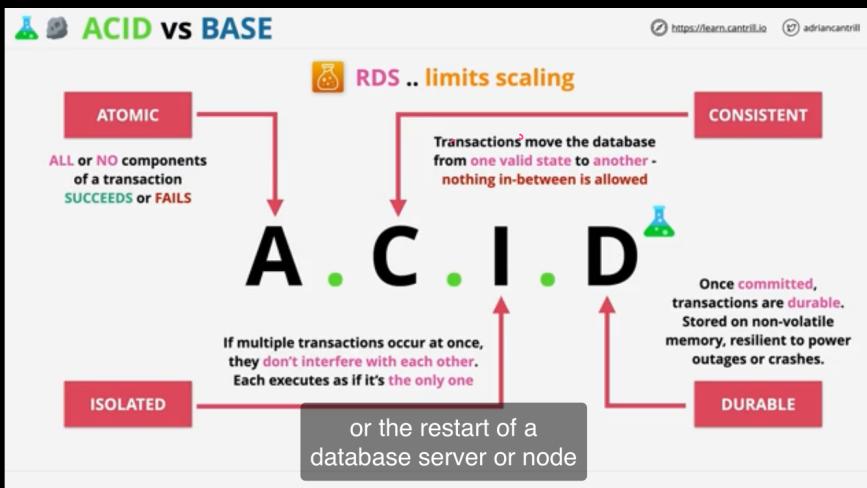
• ACID and BASE are DB transaction models

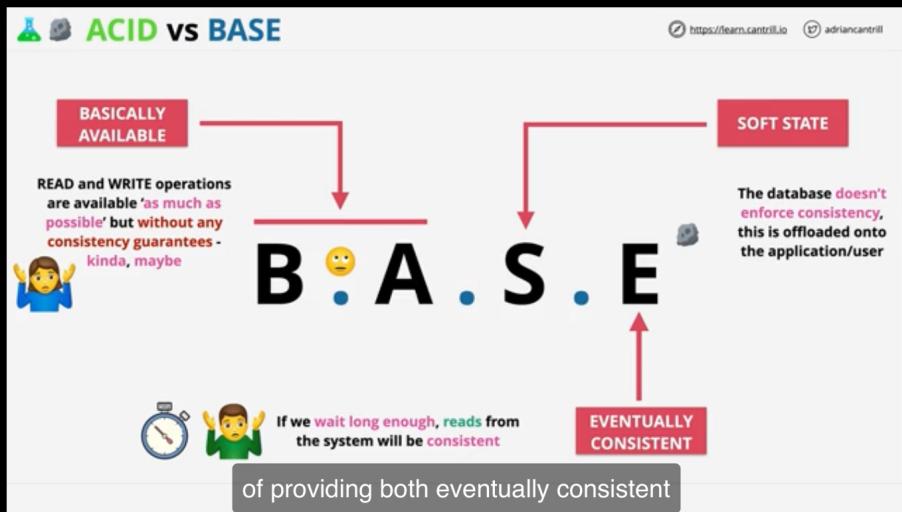
• CAP Theorem - Consistency, Availability, Partition Tolerant (resilience) - Choose 2

• ACID = Consistency

• BASE = Availability

Now there is some nuance here and some additional detail,





DynamoDB is an example of BASE Transaction property

bad idea Databases on EC2

Why you might need EC2 hosted DB = Actually its bad idea

**Why might you do it...**

- Access to the DB Instance OS
- Advanced DB Option tuning ... (DBROOT)
- ... Vendor demands.. 😐
- DB or DB Version AWS don't provide..
- Specific OS/DB Combination AWS don't provide
- Architecture AWS don't provide (replication/resilience)
- Decision makers who 'just want it'

Demo

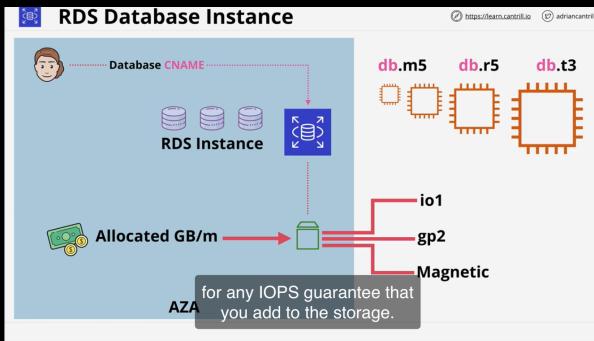
RDS —

**Relational Database Service (RDS)**

- Database-as-a-service (DBaaS)
- .. DatabaseServer-as-a-service
- Managed Database Instance (1+ Databases)
- Multiple engines MySQL, MariaDB, PostgreSQL, Oracle, Microsoft SQL Server..
- .. Amazon Aurora

It's a database engine which AWS have created,

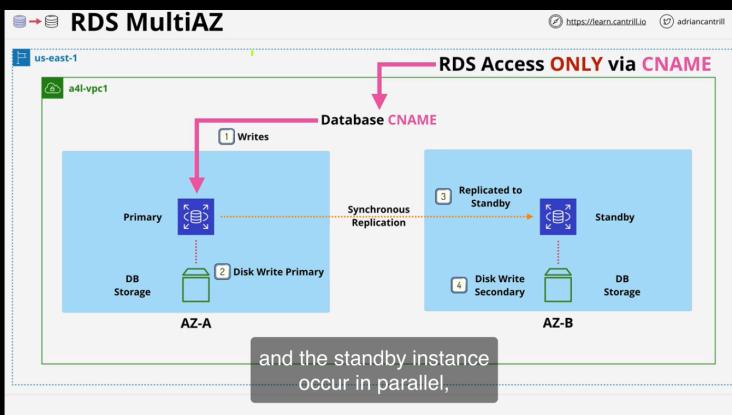
Allocated 4GB/m



↓ Demo – migrate wp db to RDS  
Didn't understand watch again

## RDS Multi AZ

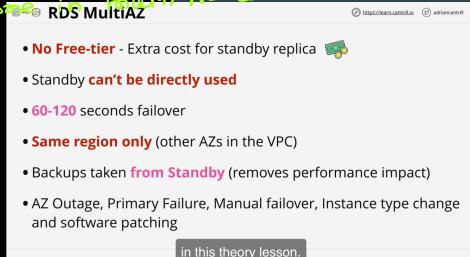
only able to access to DB using CNAME.



Works in synchronous and data is transferred at the same time.

If one fail it will automatically switch the AZ user may experience small disruption

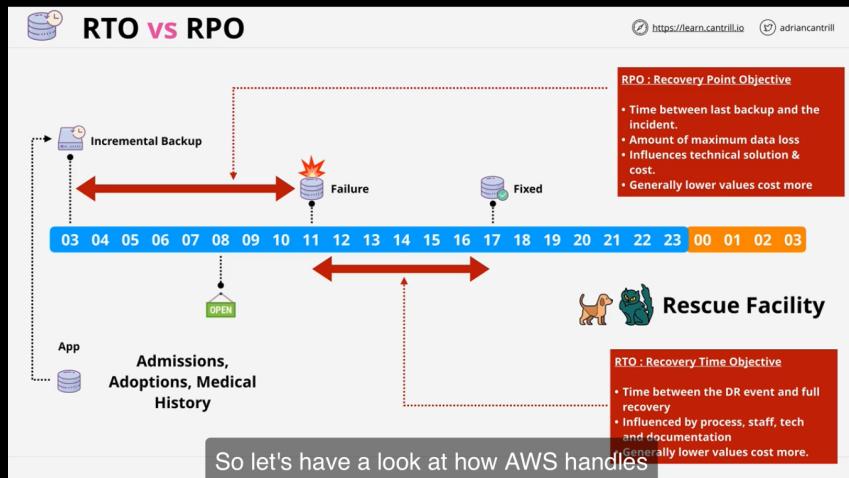
- Not Available for free tier
- standby server is only accessible in case of fault
- can only be done in multi AZ within same region



Multi AZ RDS is only useful for High Availability  
Not for Scalability.

## RDS Backups and Restores

### RTO vs RPO



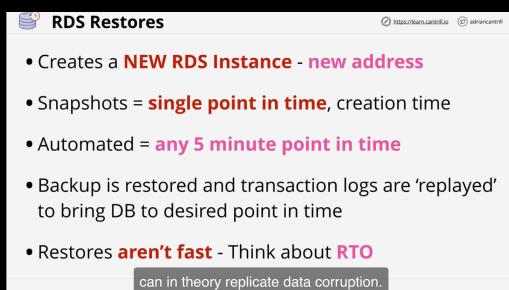
- Manual snapshot don't expire.
- Delete RDS Manual DB snapshot will be there.
  - can configure automatic backup.

Transaction log -

Retention - 0 to 35 days

Power up.

restore happens  
↓  
when performed creates new EC2  
slow process to restore snapshot  
restore time has to be considered.



To protect from data corruption always take snapshots rather than

replications.

RDS is capable of performing Manual Snapshots and Automatic backups

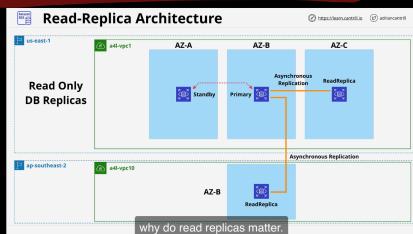
Manual snapshots are performed manually and live past the termination of an RDS instance

Automatic backups can be taken of an RDS instance with a 0 (Disabled) to 35 Day retention.

Automatic backups also use S3 for storing transaction logs every 5 minutes - allowing for point in time recovery.

Snapshots can be restored .. or create a new RDS instance.

### Read Replicas = Asynchronous



5x direct read - replicas per DB

- 5x direct read-replicas per DB instance
- Each providing an additional instance of read performance
- Read-Replicas can have read-replicas - but lag starts to be a problem.
- Global performance improvements

across an application database

one read replicas are promoted to read 4 write  
that is not reversible you have to delete and  
create new replica

- Snapshots & Backups Improve RPO
- RTO's are a problem
- RR's offer nr. 0 RPO
- RR's can be promoted quickly - low RTO
- Failure only - watch for data corruption
- Read only - until promoted
- Global availability improvements ... global resilience

you can promote that read-replica

5 direct per primary instance

they don't help with data corruption  
as the corruption will be replicated.

um Demo um

### Amazon RDS security

SSL/TLS (in transit) is available for RDS, can be mandatory

RDS supports EBS volume encryption - KMS

Handled by HOST/EBS

AWS or Customer Managed CMK generates data keys.

Data keys used for encryption operations

Storage, Logs, Snapshots & replicas are encrypted

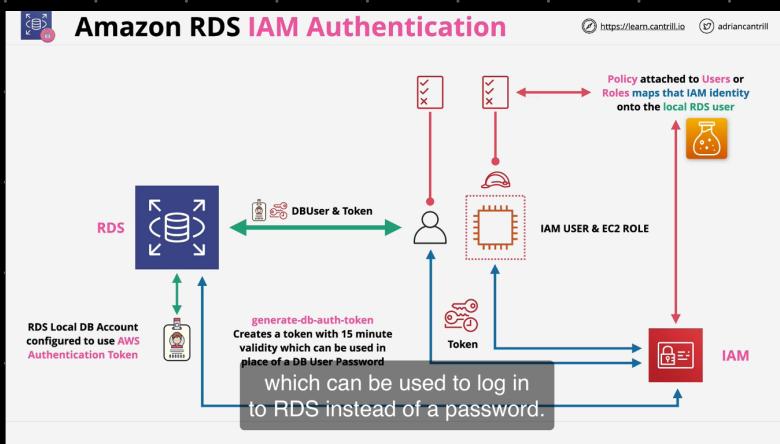
.....encryption can't be removed

In addition to KMS, EBS-based encryption.

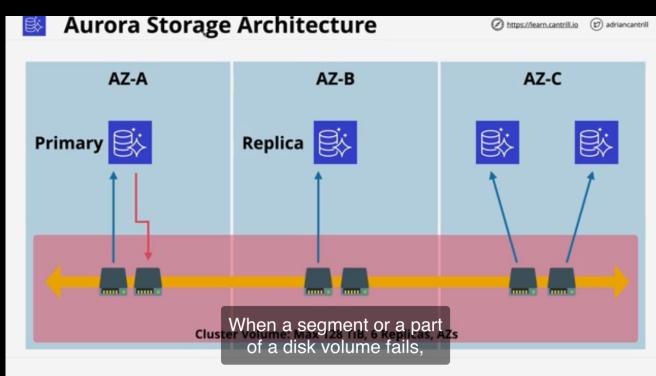
**Amazon RDS Security**

- RDS **MSSQL** and RDS **Oracle** Support **TDE**
- ... **Transparent Data Encryption**
- Encryption handled **within the DB engine**
- RDS **Oracle** supports integration with **CloudHSM**
- Much stronger key controls (even from AWS)
  - whether it's no trust chain, which involves AWS,

## • RDS IAM Authentication



Amazon Aurora!!



if corruption then Aurora repairs the corrupted part

- 6 Backups of data
- SSD's - max 128TB
- can create upto 15 replicas and anyone

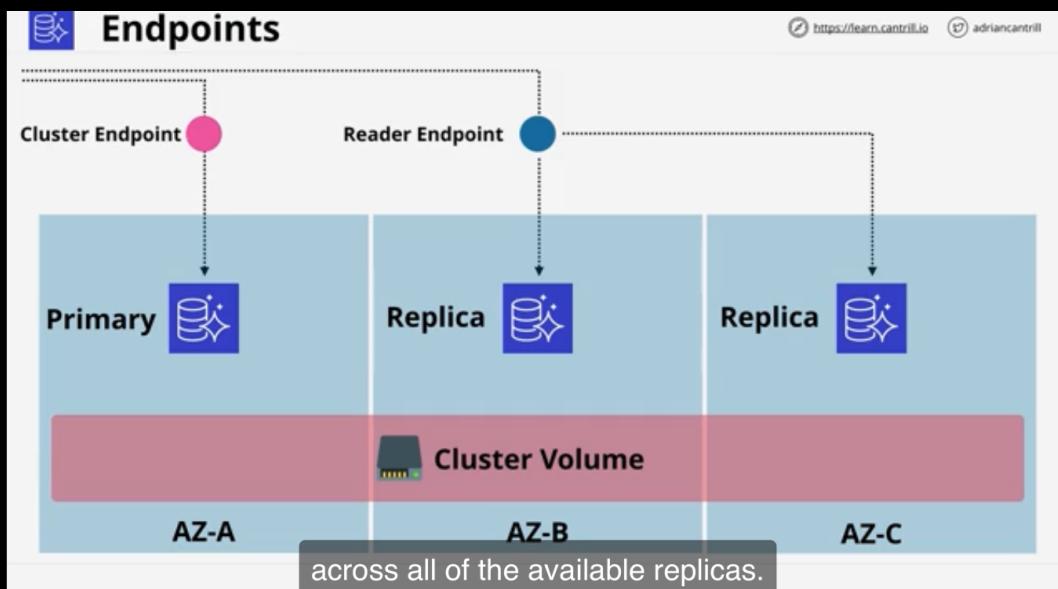
can be a fail over DB  
+ much quicker!

most used  
space so far  
→ no longer applicable

## Aurora Storage Architecture

- All SSD Based - **high IOPS, low latency**
- Storage is billed based on **what's used**
- **High water mark** - billed for the most used
- Storage which is freed up can be re-used
- Replicas can be added and removed without requiring storage provisioning.

Having this cluster architecture





## Cost



<https://learn.cantrill.io>



adriancantrill

- **No free-tier option**
- Aurora doesn't support Micro Instances
- Beyond RDS singleAZ (micro) Aurora offers better value
- Compute - hourly charge, per second, 10 minute minimum
- Storage - GB-Month consumed, IO cost per request
- 100% DB Size in backups are included

then you're given 100 GiB of storage



## Aurora Restore, Clone & Backtrack



<https://learn.cantrill.io>



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- Backups in Aurora work in the same way as RDS
- Restores create a **new cluster**
- Backtrack can be used which allow **in-place rewinds** to a previous point in time
- Fast clones make a new database MUCH faster than copying all the data - **copy-on-write**