
AWS
re:Invent

DAT306

Beyond caching: Advanced design patterns in Redis

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AWS

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Agenda

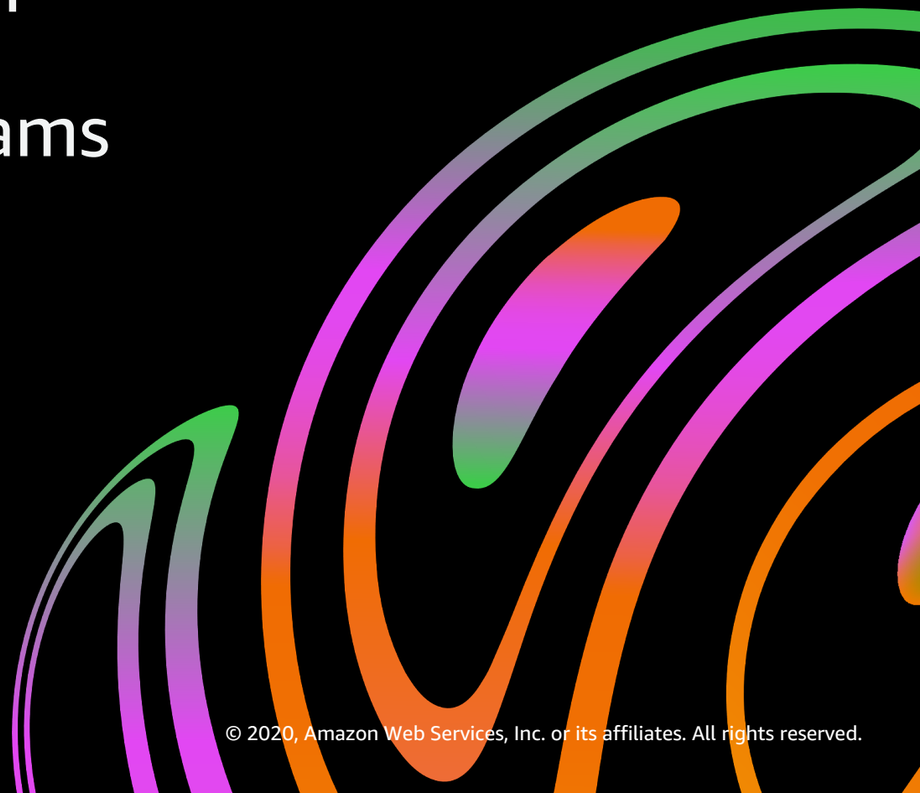
Introduction to in-memory databases

Live leaderboards with sorted sets

Enhancing your data with geospatial information

Real-time data ingestion and analytics with streams

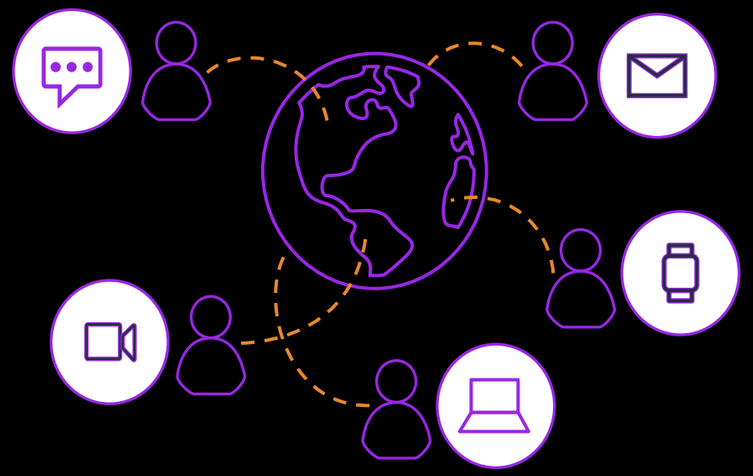
Use case demo



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Modern application requirements

REQUIRES MORE PERFORMANCE, SCALE, AND AVAILABILITY





E-commerce



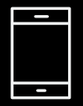
Media streaming



Social media



Online gaming



Shared economy

Users	1M+
Data volume	Terabytes – petabytes
Locality	Global
Performance	Microsecond latency
Request rate	Millions per second
Access	Mobile, IoT, devices
Scale	Up-down-out-in
Economics	Pay-as-you-go
Developer access	Open API

Amazon ElastiCache

MANAGED, REDIS OR MEMCACHED-COMPATIBLE IN-MEMORY DATA STORE



Scalable

Read scaling with replicas. Write and memory scaling with sharding. Non disruptive scaling



Extreme performance

In-memory data store and cache for sub-millisecond response times

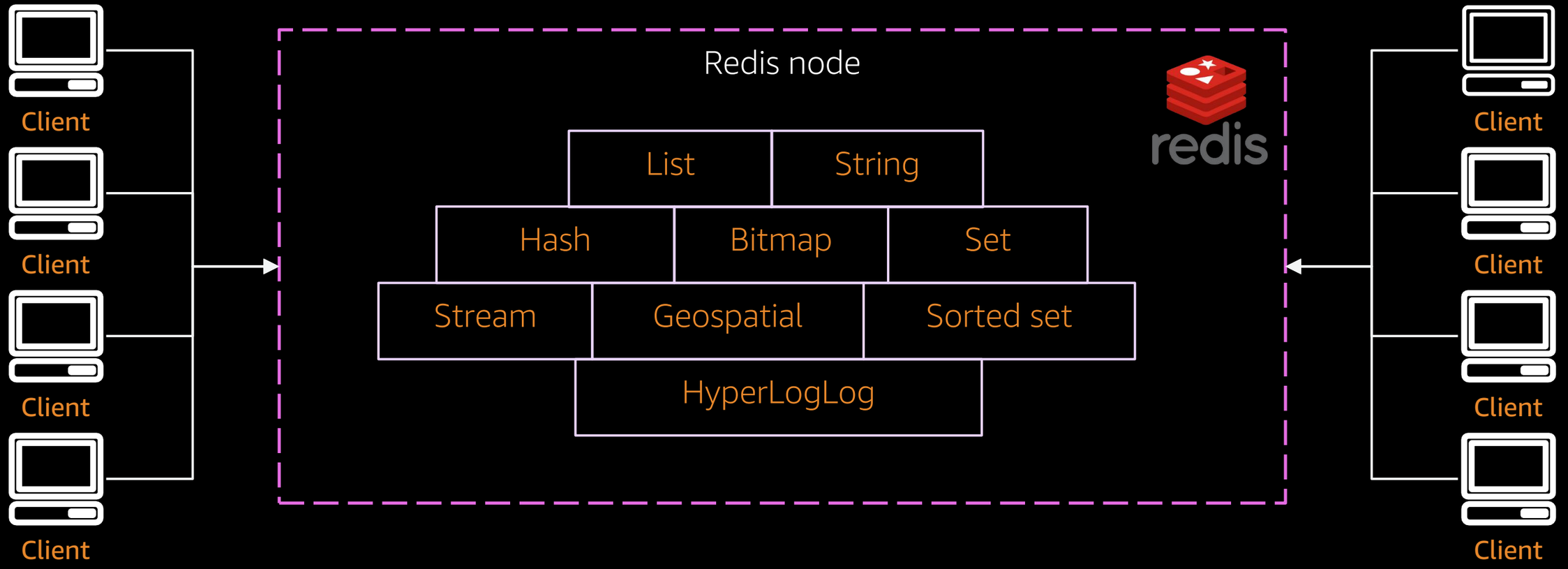


Fully managed

AWS manages all hardware and software setup, configuration, monitoring

Redis - REmote DIctionary Server

DISTRIBUTED, IN-MEMORY DATA STORE



Why Redis? The #1 in-memory data store and most loved database

Rank			DBMS	Database Model	Score		
Sep 2020	Aug 2020	Sep 2019			Sep 2020	Aug 2020	Sep 2019
1.	1.	1.	Redis	Key-value, Multi-model	151.86	-1.02	+9.95
2.	2.	2.	Amazon DynamoDB	Multi-model	66.18	+1.43	+8.36
3.	3.	3.	Microsoft Azure Cosmos DB	Multi-model	31.67	+0.94	+0.80
4.	4.	4.	Memcached	Key-value	26.34	+0.38	-0.12

https://db-engines.com/en/ranking/key-value+store

Developers love it because it is:

1. Fast
2. Versatile
3. Feature-rich and easy to use



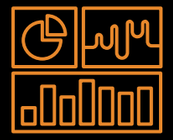
Redis data structures

String	"Hi there! My name is Amazon ElastiCache for Redis!"
Bitmap (string)	00110111000100010011011101
Bitfield (string)	{112345569}{2334}{2334}{655567}
Hash	{ A:"hello", B:"wonderful", C:"world" }
List	[A -> B -> C -> D -> E]
Set	{ A, C, E, D, B }
Sorted set	{ A:1, B:2, C:3, D:4, E:5 }
Geospatial	{ A:(32.1,34.7), B:(51.5,0.12) }
HyperLogLog	01101110 00100010 01101101
Stream	… msg1 … msg2 … msg3
PubSub	… msg1 … msg2 … msg3

In-memory data store use cases



Caching



Real-time analytics



Gaming leaderboards



Geospatial



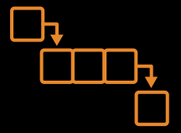
Media streaming



Session store



Chat apps



Message queues



Machine learning

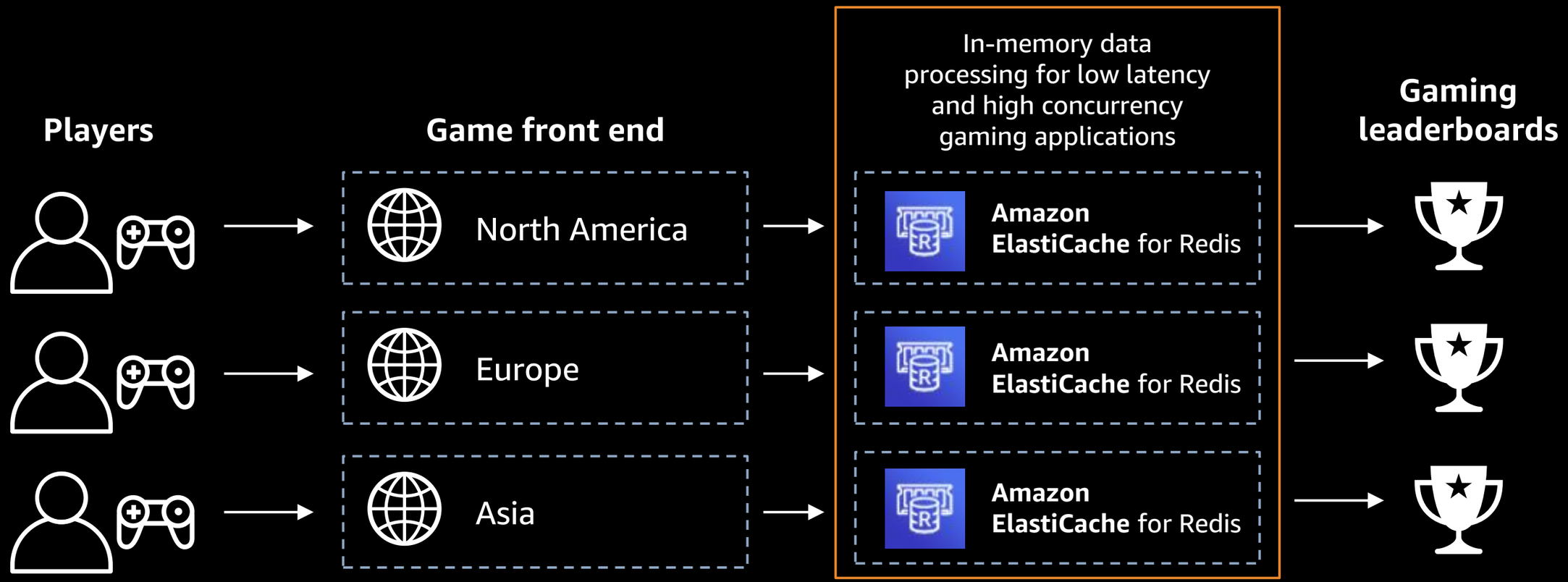
Design pattern: Leaderboards



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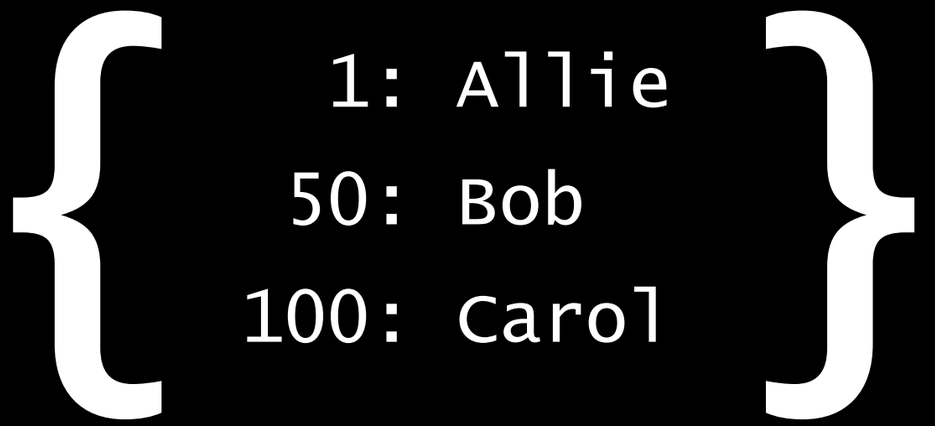
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Leaderboards



Redis data types: Sorted set

- Collection of unique items, ordered by a score
- Allows for typical set operations plus range queries based on score



Redis data types: Sorted set (commands)

BZPOPMAX
BZPOPMIN
ZADD
ZCARD
ZCOUNT
ZINCRBY
ZINTER
ZINTERSTORE
ZLEXCOUNT
ZMSCORE
ZPOPMAX
ZPOPMIN
ZRANGE
ZRANGEBYLEX
ZRANGEBYSCORE
ZRANK
ZREM
ZREMRANGEBYLEX
ZREMRANGEBYRANK
ZREMRANGEBYSCORE
ZREVRANGE
ZREVRANGEBYLEX
ZREVRANGEBYSCORE
ZREVRANK
ZSCAN
ZSCORE
ZUNION
ZUNIONSTORE

Redis data types: Sorted set






```
> ZADD game:1 50 mike 123 luke 75 dan 350 lina 79 emma
(integer) 5
> ZREVRANGE game:1 0 2 WITHSCORES
1) "lina"
2) "350"
3) "luke"
4) "123"
5) "emma"
6) "79"
```

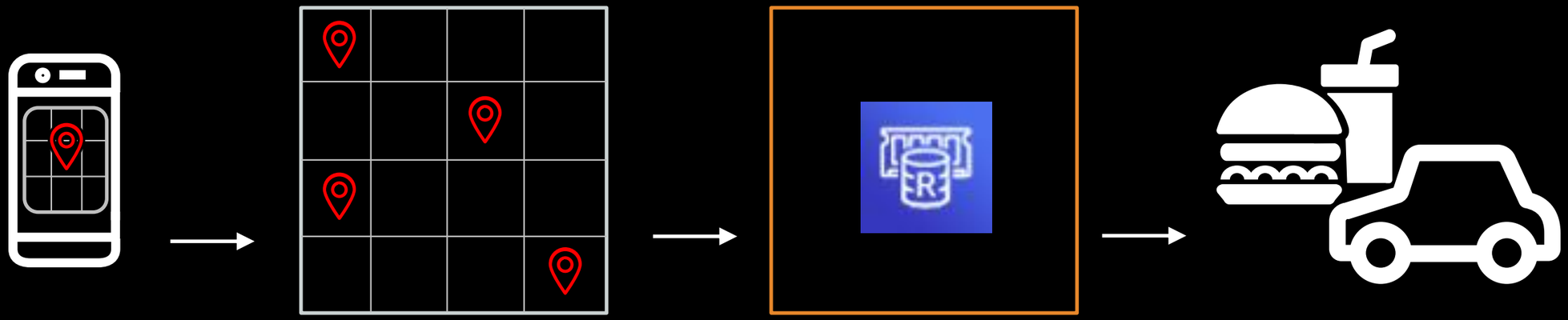
Design pattern: Geospatial



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Geospatial



Clients

Geospatial applications

Amazon ElastiCache for Redis

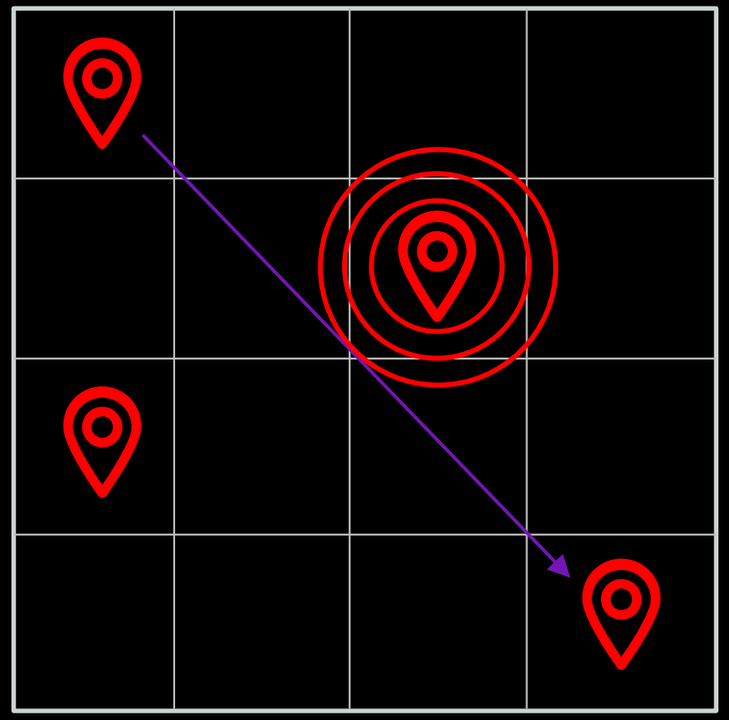
Location-based recommendations

End user requests location-based information

Location-based applications such as ride-hailing, restaurant recommendations, points of interest

Use Redis for fast, in-memory geospatial processing

Redis data types: Geospatial



- Compute distance between members
- Find all members within a radius

Redis data types: Geospatial (commands)

GEOADD	GEOPOS
GEODIST	GEORADIUS
GEOHASH	GEORADIUSBYMEMBER

Redis data types: Geospatial

```
> GEOADD cities 87.6298 41.8781 Chicago
(integer) 1
> GEOADD cities 122.3321 47.6062 Seattle
(integer) 1
> ZRANGE cities 0 -1
1) "Chicago"
2) "Seattle"
> GEODIST cities Chicago Seattle mi
"1733.4089"
> GEORADIUS cities 122.4194 37.7749 1000 mi WITHDIST
1) 1)"Seattle"
   2)"679.4848"
```

Design pattern: Data streaming



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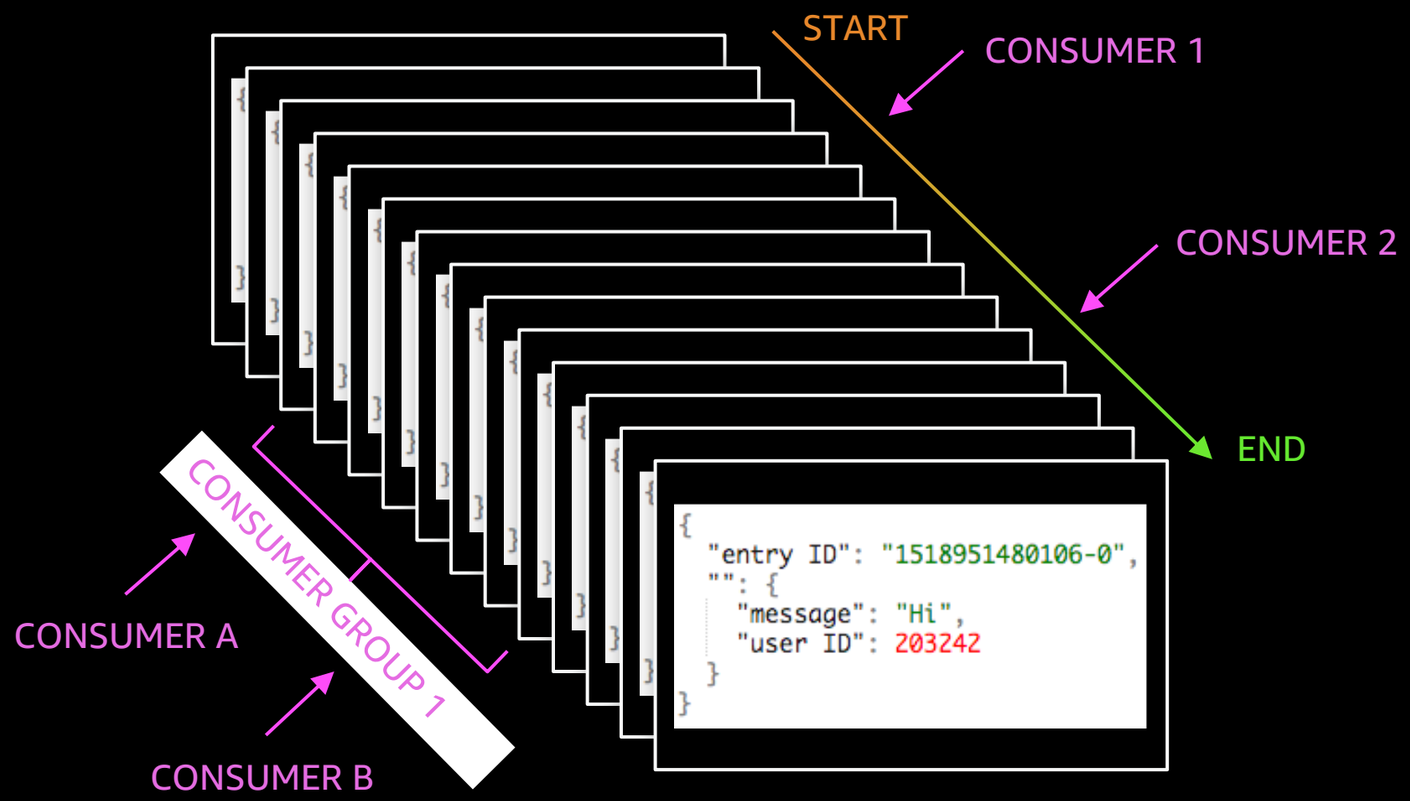
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Real-time streaming and analytics store



Redis data type: Streams

- Ordered collection of data
- Efficient for consuming from the tail
- Supports multiple consumers of the same stream



Redis data types: Streams (commands)

XACK
XADD
XCLAIM
XDEL
XGROUP
XINFO
XLEN
XPENDING
XRANGE
XREAD
XREADGROUP
XREVRANGE
XTRIM

Redis data types: Streams

Producer

```
> XADD server:a * fan:4:rpm 1500 fan:5:rpm 2000
"1601852699992-0"
> XADD server:b * fan:4:rpm 2500 fan:5:rpm 3000
"1601852701521-0"
```

Consumer 1

```
> XREAD BLOCK 0 STREAMS server:b $
1) 1) "server:b"
   2) 1) 1) "1601852701521-0"
         2) 1) "fan:4:rpm"
            2) "2500"
            3) "fan:5:rpm"
            4) "3000"
```

Consumer 2

```
> XRANGE server:a - +
1) 1) "1601852699992-0"
   2) 1) "fan:4:rpm"
      2) "1500"
      3) "fan:5:rpm"
      4) "2000"
```

Amazon ElastiCache for Redis



Extreme performance

In-memory data store
for sub-millisecond
response times



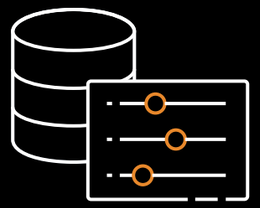
Secure

Role-based Access Control (RBAC),
HIPAA eligible, PCI compliant, FedRAMP,
Encryption at rest, in-transit, Amazon VPC



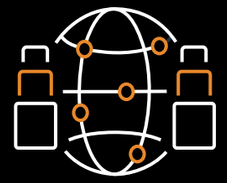
Fully managed

Hardware provisioning and software
patching, configuration, monitoring,
failure recovery, and backups



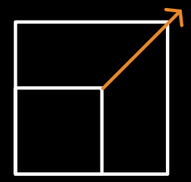
Redis-compatible

Supports Redis 6,
maintains compatibility
with open source Redis, Redis
APIs, works with Redis clients



Highly available, reliable

Supports Redis cluster and
non-cluster modes,
automatic failover,
cross-region replication, multi-AZ



Easily scalable

Non-disruptive scaling up to 500
nodes and 500 shards, read
scaling with replicas,
write scaling with sharding

Amazon ElastiCache resources

FAQ

aws.amazon.com/elasticache/faqs

Blog

aws.amazon.com/blogs/database/tag/elasticache

Developer forum

forums.aws.amazon.com

> Amazon Web Services > Database > ElastiCache

Related session

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What's New in Amazon ElastiCache

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Thank you!

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