Home of Redis

Redis Labs Introduction

Who We Are

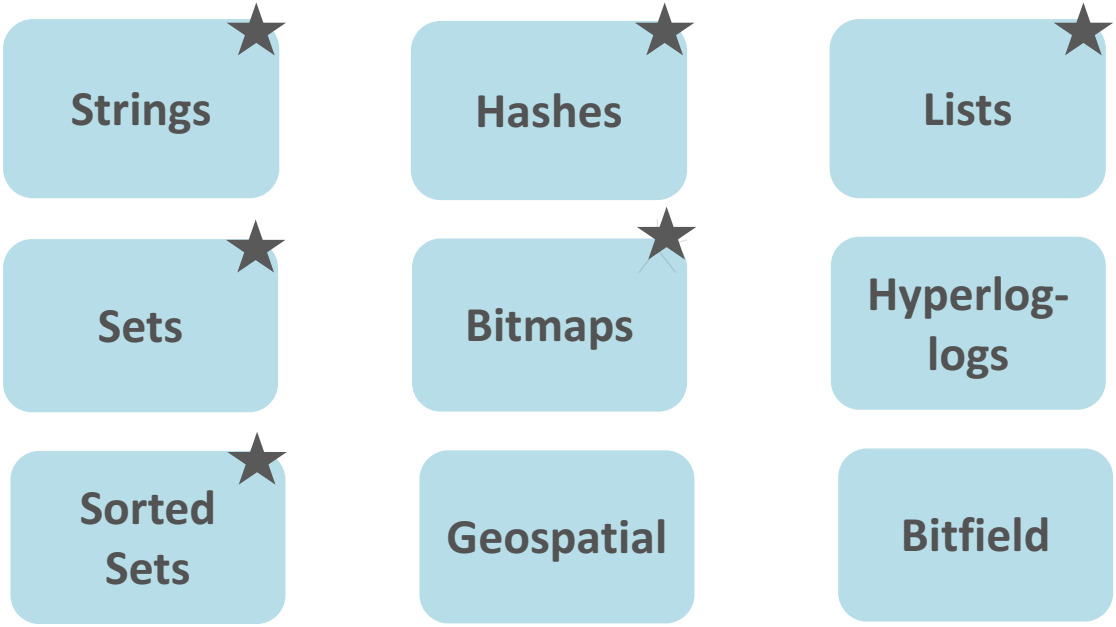
Open source. The leading **in-memory database platform**, supporting any high performance operational, analytics or hybrid use case.

The open source home and commercial provider of **Redis Enterprise (Redis^{e})** technology, platform, products & services.

What is Redis?

- Redis – (**RE**mote **DI**ctionary **S**erver)
- Open source.
- The leading **in-memory database platform**
- Created in 2009 by Salvatore Sanfilippo (a.k.a @antirez)
- Source: https://github.com/antirez/redis
- Website: http://redis.io

REmote DIctionary Server



Redis Tops Database Popularity Rankings

.....#1 database technology on AWS

.....#1 database used by Node.js developers

.....#1 NoSQL in User Satisfaction

.....#1 NoSQL among Top 10 Data Stores

.....#1 database on Docker

#1 NoSQL database deployed in containers

.....#1 in growth among top 3 NoSQL databases

.....#1 database in skill demand

.....# 1 database in Top Paying Technologies

The Redis Community

162

CLIENTS IN 48 LANGUAGES

100+

HIGHER LEVEL LIBRARIES AND TOOLS

219

CONTRIBUTORS

6K+

GITHUB COMMITS

21.5K

REDIS GITHUB STARS (#75)

39K+

STACK OVERFLOW QUESTIONS

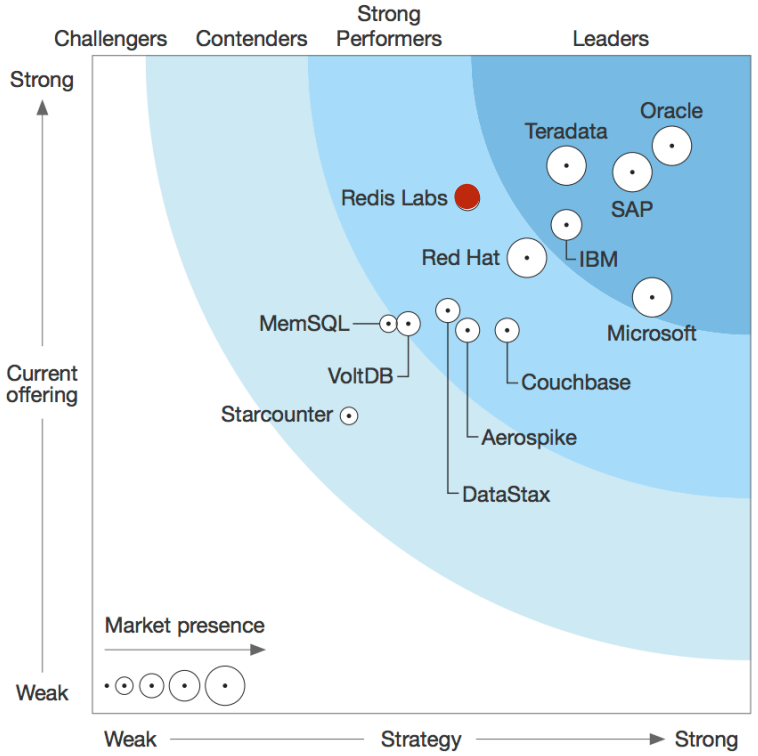
Industry Recognition

Gartner®

Figure 1. Magic Quadrant for Operational Database Management Systems

Source: Gartner (October 2016)

FORRESTER®



Redis Labs Products

SERVICES — redis^{e} — SOFTWARE

Redis^{e} Cloud

Fully managed Redis^{e} service on hosted servers within AWS, MS Azure, GCP, IBM Softlayer, Heroku, CF & OpenShift

RAM

Redis^{e} Cloud Private

Fully managed Redis^{e} service in VPCs within AWS, MS Azure, GCP & IBM Softlayer

RAM or Flash

Redis^{e} Pack

Downloadable Redis^{e} software for any enterprise datacenter or cloud environment

RAM or Flash

Redis^{e} Pack Managed

Fully managed Redis^{e} Pack in private data centers

RAM or Flash

Redis[e] Cloud - Offered Over IaaS and PaaS

4 Clouds, 45 data centers across the world

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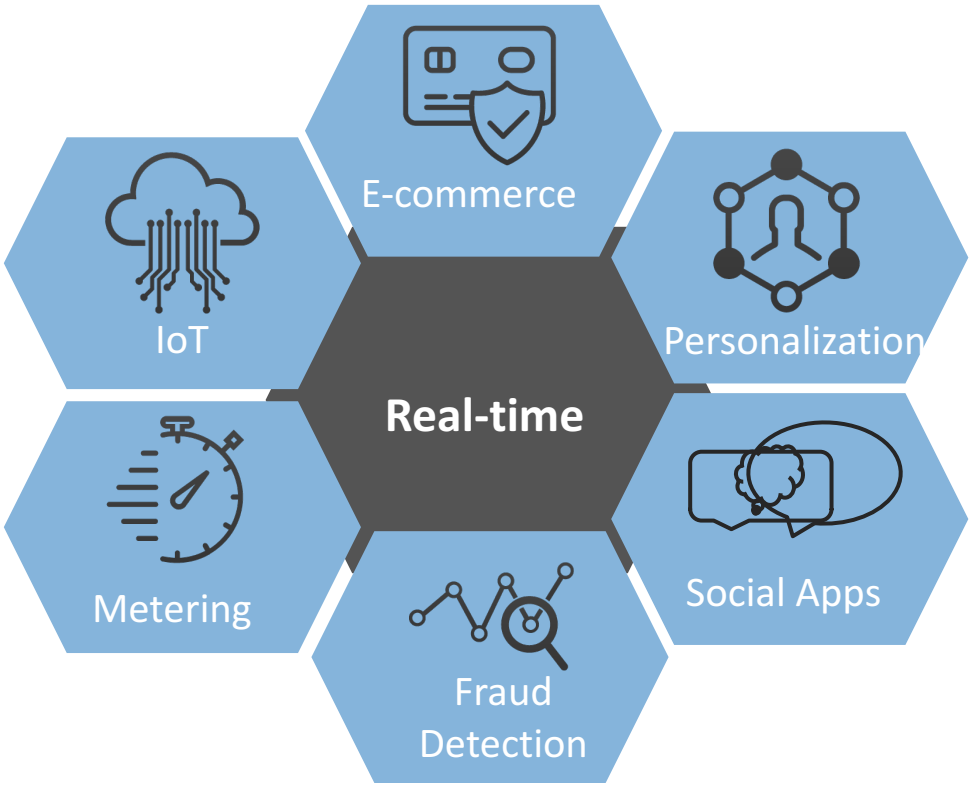
Home of Redis

Why Redis

Redis Powers a Range of Solutions



…AND MANY MORE

Redis Uniquely Suited To Modern Apps

A full range of capabilities that simplify and accelerate next generation applications

Redis Uses Span Many Verticals

Telco

Billing (CDRs, SDRs)

Finance

High speed delivery of prices / transactions

Business Services

CRM, ERP

Retail / E-Commerce

Items Viewed, Similar Purchases, Top trends

Technology

High-Speed Operations

Advertising

Real-time ad placements, personalization

Travel

Recommendations, Ordering

Media

Notifications, Recommendations, Caching

Education

Subjects, Classes Classification

Social

Timeline, social graph, top followers, following

Gaming

Real time analytics for leaderboards, dashboards, messaging

Real-Time Transactions are Needed in….

Retail

Payment processing

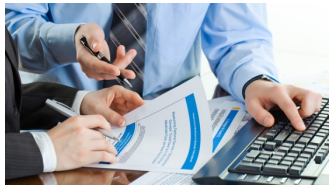
Inventory management

Supply chain management

Finance

Real-Time trading

Money transfer
and disbursement



Loan management

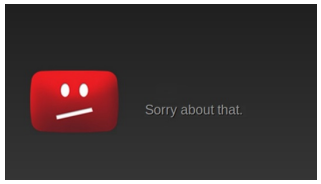
E-Commerce

Order processing

Order fulfillment

Online Payments

Entertainment



Digital rights management

Digital asset management

Ticketing

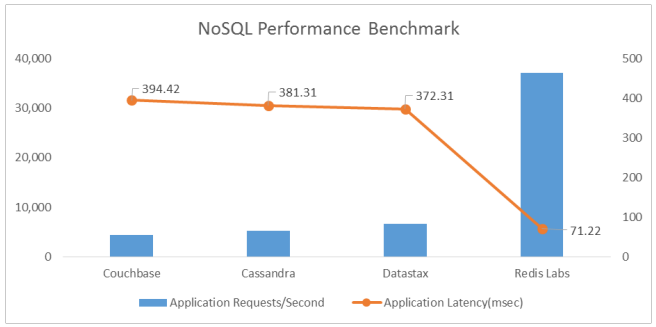
Travel and Leisure

Reservations

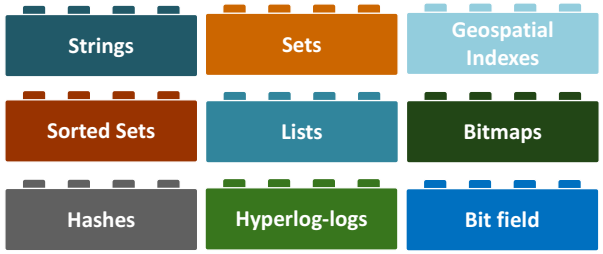
Inventory management

Real-time dispatching

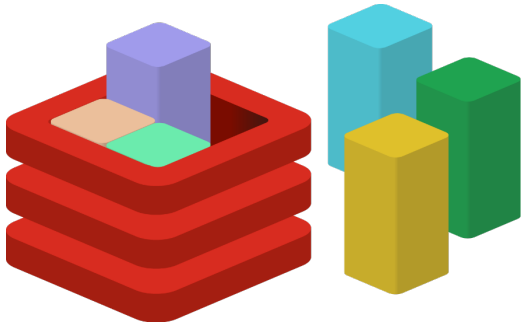
Redis is a Game Changer



Performance



Simplicity
(through Data Structures)



Extensibility
(through Redis Modules)

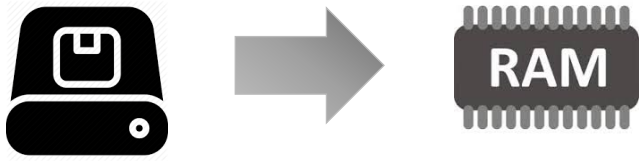
Redis is Effective in OLTP and OLAP

OLTP

The 100 msec de-facto standard for end-to-end app response time requires <1msec DB response time.

Redis is the only database that can support this under heavy load.

OLAP



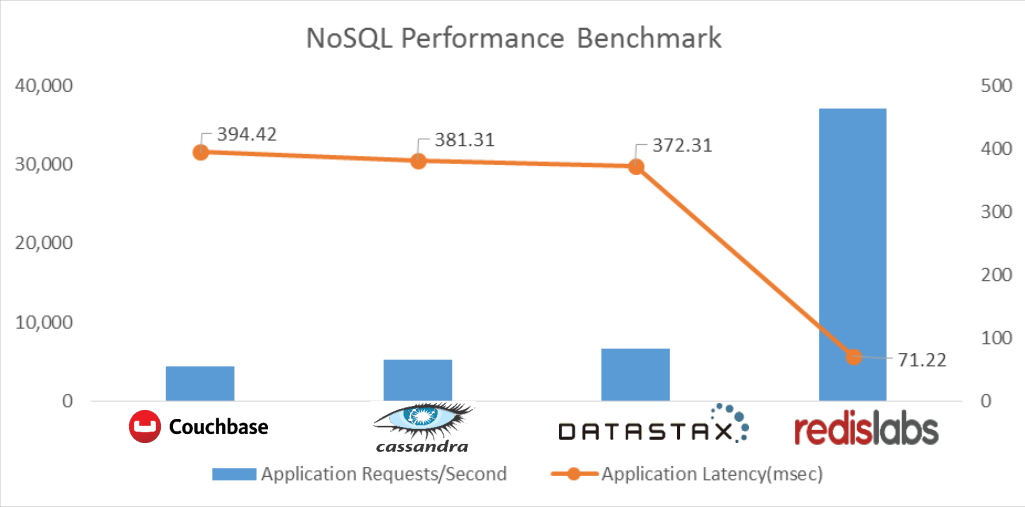
Disk-based

Query time: Days/Hours

RAM-based

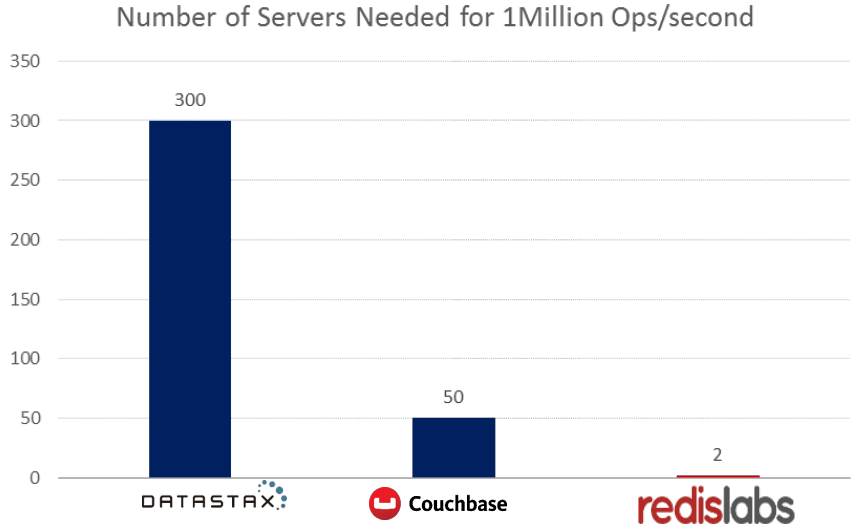
Query time: Minutes/Seconds

Performance: The Most Powerful Database



Highest Throughput at Lowest Latency in High Volume of Writes Scenario

Benchmarks performed by Avalon Consulting Group



Lowest number of servers needed to deliver 1 Million writes/second

Benchmarks published in the Google blog

Redis – Purpose Built For Performance

Optimized Architecture

Written in C

Served entirely from memory

Single threaded lock free

Advanced Processing

Most commands are executed with O(1) complexity

Access to discrete elements within objects

Reduced bandwidth/overhead requirements

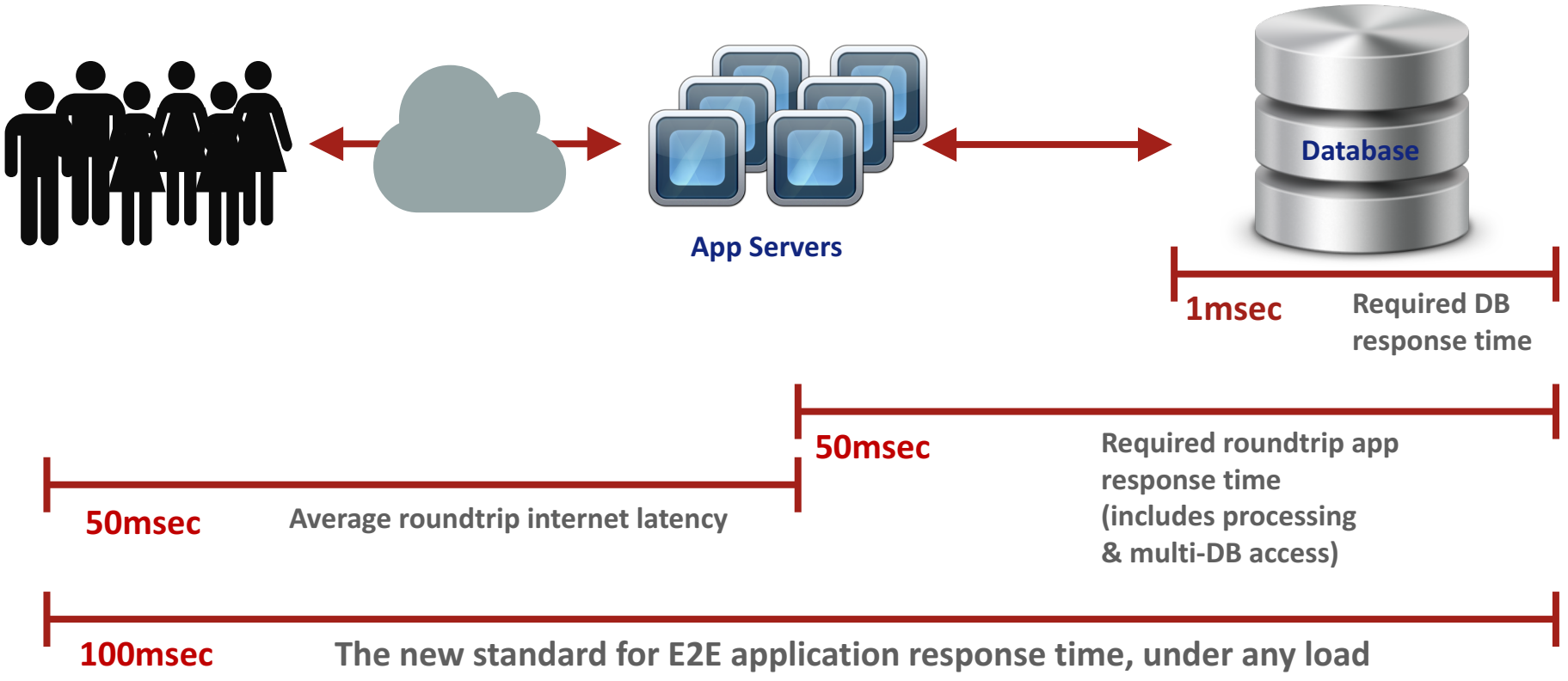
Efficient Operation

Easy to parse networking protocol

Pipelining for reduced network overhead

Connection pooling

Why Use Redis as an Operational DBMS ?

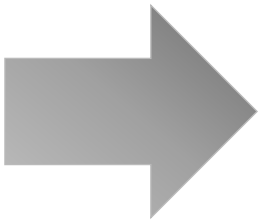


Why Use Redis as an Analytics DBMS ?

Query time:

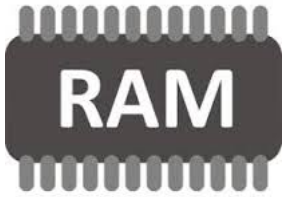
Days/Hours

Disk-based



Query time:

Minutes/Seconds



RAM-based

More on Redis in Analytics

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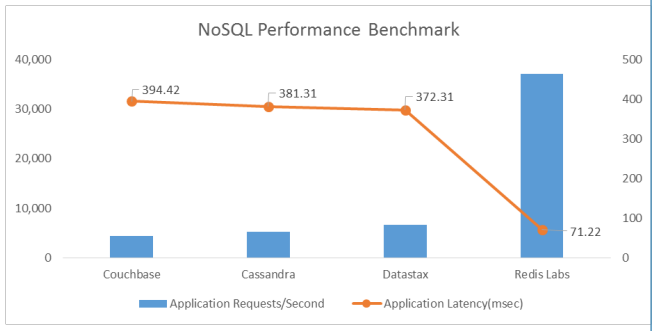
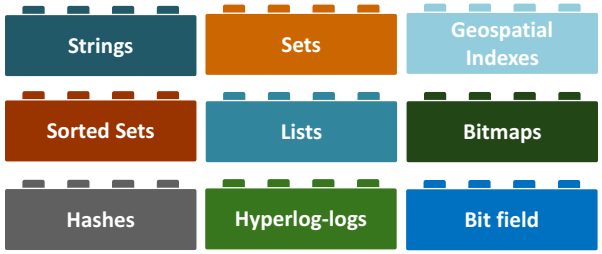
Redis Key/Value Data Structures

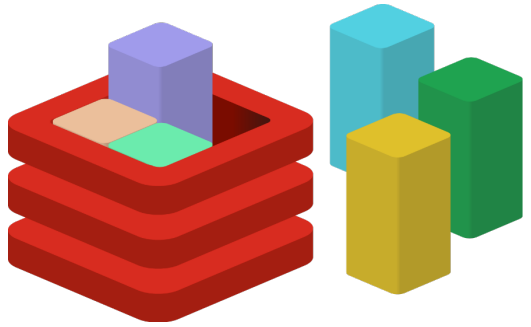
Redis is a Game Changer



Performance

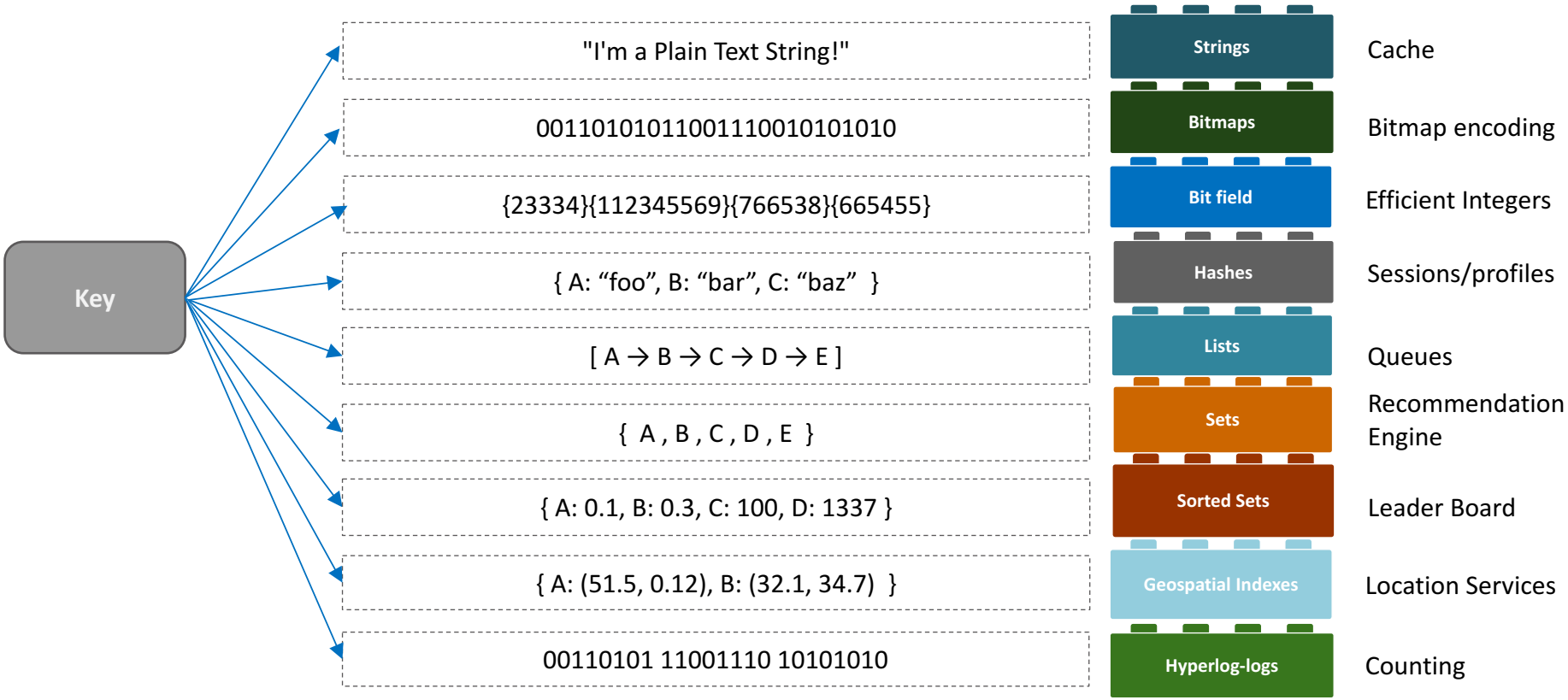


Simplicity
(through Data Structures)



Extensibility
(through Redis Modules)

Data Structure Store: Lego For Your App



What Can You Do With Redis?

Use as in-memory database, cache or message broker

Common Uses

- Cache
- Message Brokers/Queues
- User Sessions
- Real-time Recommendation Engine
- Leaderboards
- …More…..much, MUCH more!!!

Simple Cache

The Problem

- Multiple database calls create impossibly slow web page response times

Why Redis Rocks

- **Strings** are perfect for this!
- SET lets you save session variables as key/value pairs
- GET to retrieve values

Redis Strings for Simple Cache

- Strings store text, which might be made from the results of multiple database queries and HTML
- Can have expiry
- You can register to listen for changes on keys and operations
- Multiple eviction policies supported

```
$ SET userid:1 “8754”
$ GET userid:1
$ EXPIRE userid:1 60
$ DEL userid:1
```

```
jedis.set("userid:1", "8754");
jedis.get("userid:1");
jedis.expire("userid:1", 60);
jedis.del("userid:1");
```

User Sessions

The Problem

- Maintain session state across multiple servers
- Multiple session variables
- High speed/low latency required

Why Redis Rocks

- **Hashes** are perfect for this!
- HMSET lets you save session variables as key/value pairs
- HMGET to retrieve values
- HINCRBY to increment any field within the hash structure
- HDEL to delete one field/value

Redis Hashes for User Sessions

hash key: usersession:1

userid	8754
name	dave
ip	10:20:104:31
hits	1
lastpage	home

```
$ HMSET usersession:1 userid 8754 name dave ip 10:20:104:31 hits 1
$ HMGET usersession:1 userid name ip hits
$ HINCRBY usersession:1 hits 1
```

```
$ HSET usersession:1 lastpage “home”
$ HGET usersession:1 lastpage
$ HDEL usersession:1 lastpage
```

```
$ DEL usersession:1
```

Hashes store a mapping of keys to values – like a dictionary or associative array – but faster

Redis Hashes for User Sessions

```
Map<String, String> userSession = new HashMap<>();
userSession.put("userid", "8754");
userSession.put("name", "dave");
userSession.put("ip", "10:20:104:31");
userSession.put("hits", "1")
jedis.hmset("usersession:1", userSession);

jedis.hmget("usersession:1", "userid", "name","ip" ,"hits");
jedis.hincrBy("usersession:1", "hits", 1);
jedis.hset("usersession:1", "lastpage", "home");
jedis.hget("usersession:1", "lastpage");
jedis.hdel("usersession:1", "lastpage");
```

Managing Queues of Work

The Problem

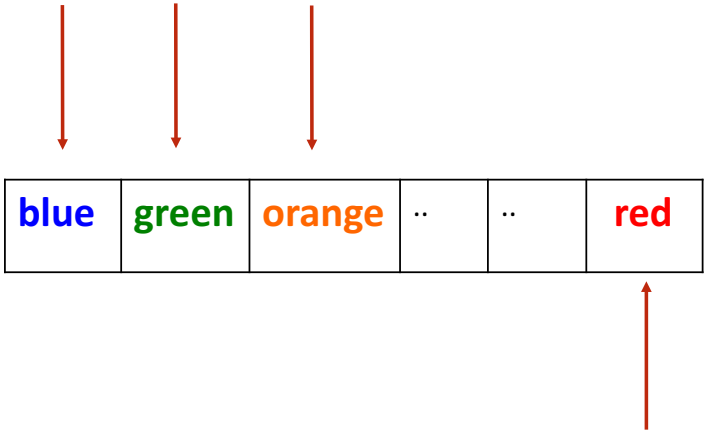
- Tasks need to be worked on asynch to reduce block/wait times
- Lots of items to be worked on
- Assign items to worker process and remove from queue at the same time
- Similar to buffering high speed data-ingestion

Why Redis Rocks

- **Lists** are perfect for this!
- LPUSH, RPUSH add values at beginning or end of queue
- RPOPLPUSH – pops an item from one queue and pushes it to another queue

Redis Lists for Managing Queues

LPUSH adds values to head of list



RPUSH adds value to tail of list

```
$ LPUSH queue1 orange
$ LPUSH queue1 green
$ LPUSH queue1 blue
$ RPUSH queue1 red
```

Redis Lists for Managing Queues

```
$ LPUSH queue1 orange
$ LPUSH queue1 green
$ LPUSH queue1 blue
$ RPUSH queue1 red
```


```
$ RPOPLPUSH queue1 queue2
```

RPOPLPUSH pops a value from one list and pushes it to another list

Redis Lists for Managing Queues

```
jedis.lpush("queue1", "orange");
jedis.lpush("queue1", "green");
jedis.lpush("queue1", "blue");
jedis.rpush("queue1", "red")

jedis.rpoplpush("queue1", "queue2");
```

Real-time Recommendation Engine

The Problem

- People who read this article also read these other articles
- Want real time not data mining

Also used for:

- Recommending Similar Purchases
- Identifying Fraud

Why Redis Rocks

- **SETS** are unique collections of strings
- SADD to add tags to each article
- SISMEMBER to check if an article has a given tag
- SMEMBERS to get all the tags for an article
- use SINTER to find similar articles tagged with the same tags

Redis Sets for Recommendations

Set: tag:1

article 1	**article 3**	….		

Set: tag:2

article 3	article 14	Article 22	..	

Set: tag:3

article 2	**article 3**	article 9	..	

Add values (articles) to Sets (tags)

```
$ SADD tag:1 article:3 article:1
$ SADD tag:2 article:22 article:14 article:3
$ SADD tag:3 article:9 article:3 article:2
```

Confirm the values have been added

```
$ SMEMBERS tag:3      (also tag:1 & tag:2)
```

```
1) "article:3"
2) "article:2"
3) "article:9"
```

Find values that exist in all three Sets

```
$ SINTER tag:1 tag:2 tag:3
```

```
1) "article:3"
```

Redis Sets for Recommendations

```
jedis.sadd("tag:1", "article:3" ,"article:1");
jedis.sadd("tag:2", "article:22","article:14", "article:3");
jedis.sadd("tag:3", "article:9", "article:3", "article:2");

jedis.smembers("tag:1")
jedis.sinter("tag:1", "tag:2", "tag:3");
```

Example : Redis For Bid Management

The Application Problem

- Many users bidding on items
- Need to instantly show who's leading, in what order and by how much
- May also need to display analytics like how many users are bidding in what range
- Disk-based DBMS-es are too slow for real-time, high scale calculations

Why Redis Rocks This

- Sorted sets automatically keep list of users and scores updated and in order (ZADD)
- ZRANGE, ZREVRANGE will get your top users
- ZRANK will get any users rank instantaneously
- ZCOUNT will return a count of users in a range
- ZRANGEBYSCORE will return all the users in a range by their bids

Redis Sorted Sets

Item: 1	
id:3	44000
id:4	35000
id:1	21000
id:2	10000

```
ZADD item:1 10000 id:2 21000 id: 1
ZADD item:1 34000 id:3 35000 id 4
ZINCRBY item:1 10000 id:3
```

```
ZREVRANGE item:1 0 0
id:3
```

```
jedis.zadd("item:1" , 10000 ,"id:2" );
jedis.zadd("item:1" , 21000 ,"id:1" );
jedis.zadd("item:1" , 34000 ,"id:3" );
jedis.zadd("item:1" , 35000 ,"id:4" );
jedis.zincrby("item:1",10000, "id:3");

jedis.zrevrange("item:1", 0,0);
```

Sorted Sets for Leaderboards

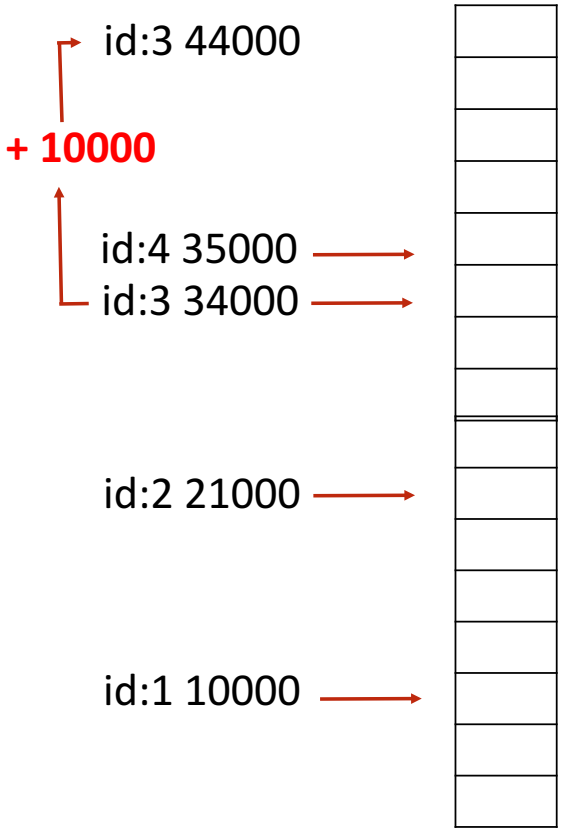
The Problem

- MANY users playing a game or collecting points
- Display real-time leaderboard.
- Who is your nearest competition
- Disk-based DB is too slow

Why Redis Rocks

- **Sorted Sets** are perfect!
- Automatically keeps list of users sorted by score
- ZADD to add/update
- ZRANGE, ZREVRANGE to get user
- ZRANK will get any users rank instantaneously

Redis Sorted Sets




```
$ ZADD game:1 10000 id:1
$ ZADD game:1 21000 id:2
$ ZADD game:1 34000 id:3
$ ZADD game:1 35000 id:4
$ ZINCRBY game:1 10000 id:3
```

Get the Leader Board

```
$ ZREVRANGE game:1 0 0
$ ZREVRANGE game:1 0 1 WITHSCORES
```

Redis Sorted Sets

```
jedis.zadd("game:1", 10000, "id:1" );
jedis.zadd("game:1", 21000, "id:2");
jedis.zadd("game:1", 34000, "id:3" );
jedis.zadd("game:1", 35000, "id:4");

jedis.zincrby("game:1", 10000,"id:3");

jedis.zrevrange("game:1", 0,0);
jedis.zrevrangeWithScores("game:1", 0,1);
```

Search by Location

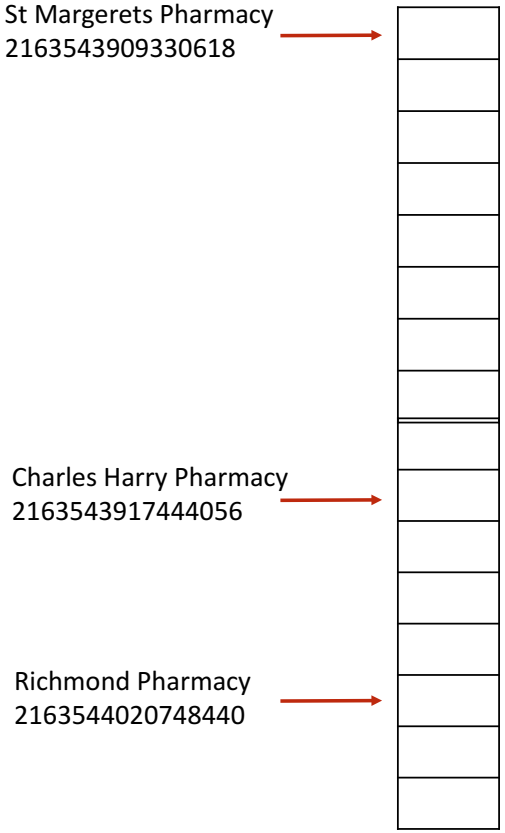
The Problem

- Give me all the pharmacies in 2 km radius
- How far am I from the hospital

Why Redis Rocks

- **GeoSet** is perfect!
- Stores location as Geohash
- GEOADD to add a location
- GEODIST to get distance
- GEORADIUS to get locations in radius

Search By Location




```
GEOADD pharmacies -0.310392 51.456454  "Charles Harry
Pharmacy”
GEOADD pharmacies -0.296402 51.462069 "Richmond Pharmacy”
GEOADD pharmacies -0.318604 51.455338 "St Margerets Pharmacy”
```

```
GEORADIUS pharmacies -0.30566239999996014 51.452921 600  m
WITHDIST WITHCOORD ASC
1) 1) "Charles Harry Pharmacy"
   2) "511.6979"
   3) 1) "-0.3103932738304138 2"
   2) "51.4564528845986330 9"
```

Search By Location

```
jedis.geoadd("pharmacies", -0.310392, 51.456454, "Charles Harry
Pharmacy");
jedis.geoadd("pharmacies",-0.296402, 51.462069, "Richmond
Pharmacy");
jedis.geoadd("pharmacies", -0.318604, 51.455338, "St Margerets
Pharmacy");

jedis.georadius("pharmacies", -0.30566239999996014, 51.452921,
600 , GeoUnit.M ,
GeoRadiusParam.geoRadiusParam().withCoord().withCoord().withDist
());
```

Count Unique Visitors

The Problem

- Count unique daily visitors to the site
- How many unique users have clicked on an ad

Why Redis Rocks

- **HyperLogLog** is perfect!
- Keeps Count of each unique element
- PFADD to add an element
- PFCOUNT to get count

HyperLogLog to Count Unique Visitors

- Stored as String

"HYLL\x01\x00\x00\x00\x04\x00\x00\x00\x00\x00\x00\x00E\xa0\x80S1\x84E
2\x88\\\x17\x80E\xdd”

- Maximum 12 KB size
- Standard error of 0.81%.

```
PFADD visitors:20160921 86.163.34.208
PFADD visitors:20160921 52.203.210.236
PFADD visitors:20160921 54.87.203.132
PFADD visitors:20160921 54.87.201.121
PFADD visitors:20160921 52.203.210.236
```

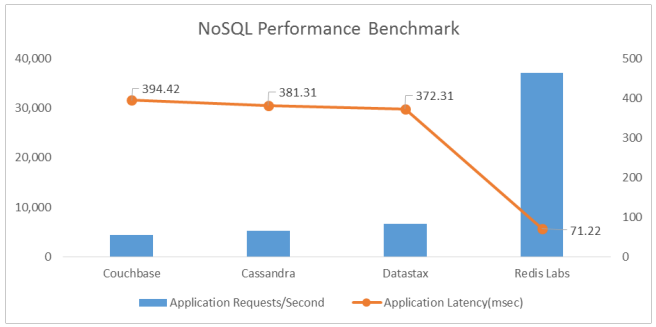
```
PFCOUNT visitors:20160921
(integer) 4
```

HyperLogLog to Count Unique Visitors

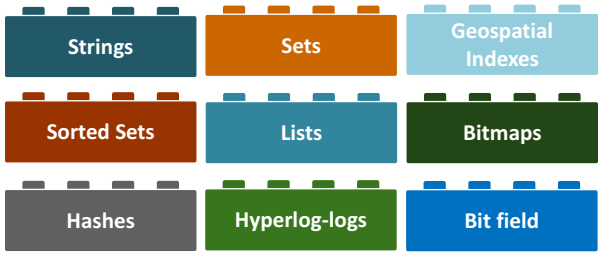
```
jedis.pfadd("visitors:20160921", "86.163.34.208");
jedis.pfadd("visitors:20160921", "52.203.210.236");
jedis.pfadd("visitors:20160921", "54.87.203.132");
jedis.pfadd("visitors:20160921", "54.87.201.121");
jedis.pfadd("visitors:20160921", "52.203.210.236");

jedis.pfadd("visitors:20160921");
```

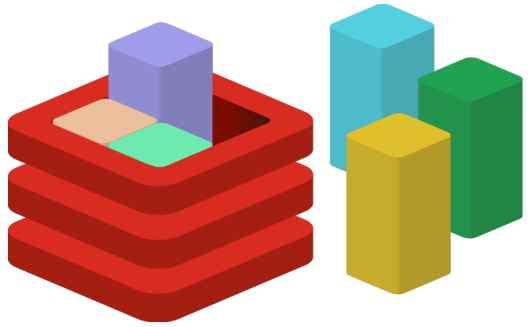
Redis is a Game Changer



Performance



Simplicity
(through Data Structures)



Extensibility
(through Redis Modules)

Full Text Search?

Secondary Index?

SQL?

Machine Learning?

But Can Redis Do X?

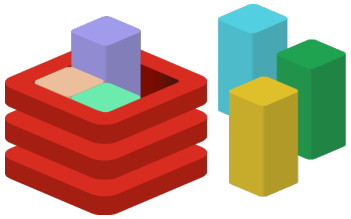
AutoComplete?

Graph?

Time Series?

Redis Modules

- C extensions to Redis
- Work at native speed
- Add commands
- Can implement their own native data types
- Can extend redis or just use it as a “Server Framework”
  - Isolated API
  - ABI Backwards Compatibility



Adapt your database to your data

Neural Redis	Redis-ML	RediSearch
Simple Neural Network Native to Redis	Machine Learning Model Serving	Full Text Search Engine in Redis
ReJSON	**Time Series**	**Graph**
JSON Engine on Redis. Pre-released	Time series values aggregation in Redis	Graph database on Redis based on Cypher language
Rate Limiter	**Crypto Engine Wrpper**	**Secondary Index/RQL**
Based on Generic Cell Rate Algorithm (GCRA)	Secure way to store data in Redis via encrypt/decrypt with various Themis primitives	Indexing + SQL -like syntax for querying indexes. Pre-released