RedisDays Atlanta Workshop

Banking on Redis

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REDISDAYS

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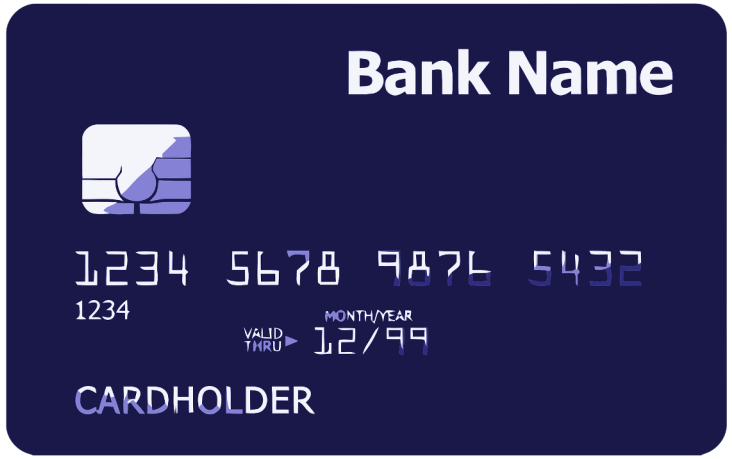
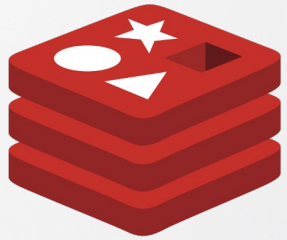
This is a workshop. This is not a talkshop. Expect to *do* stuff.

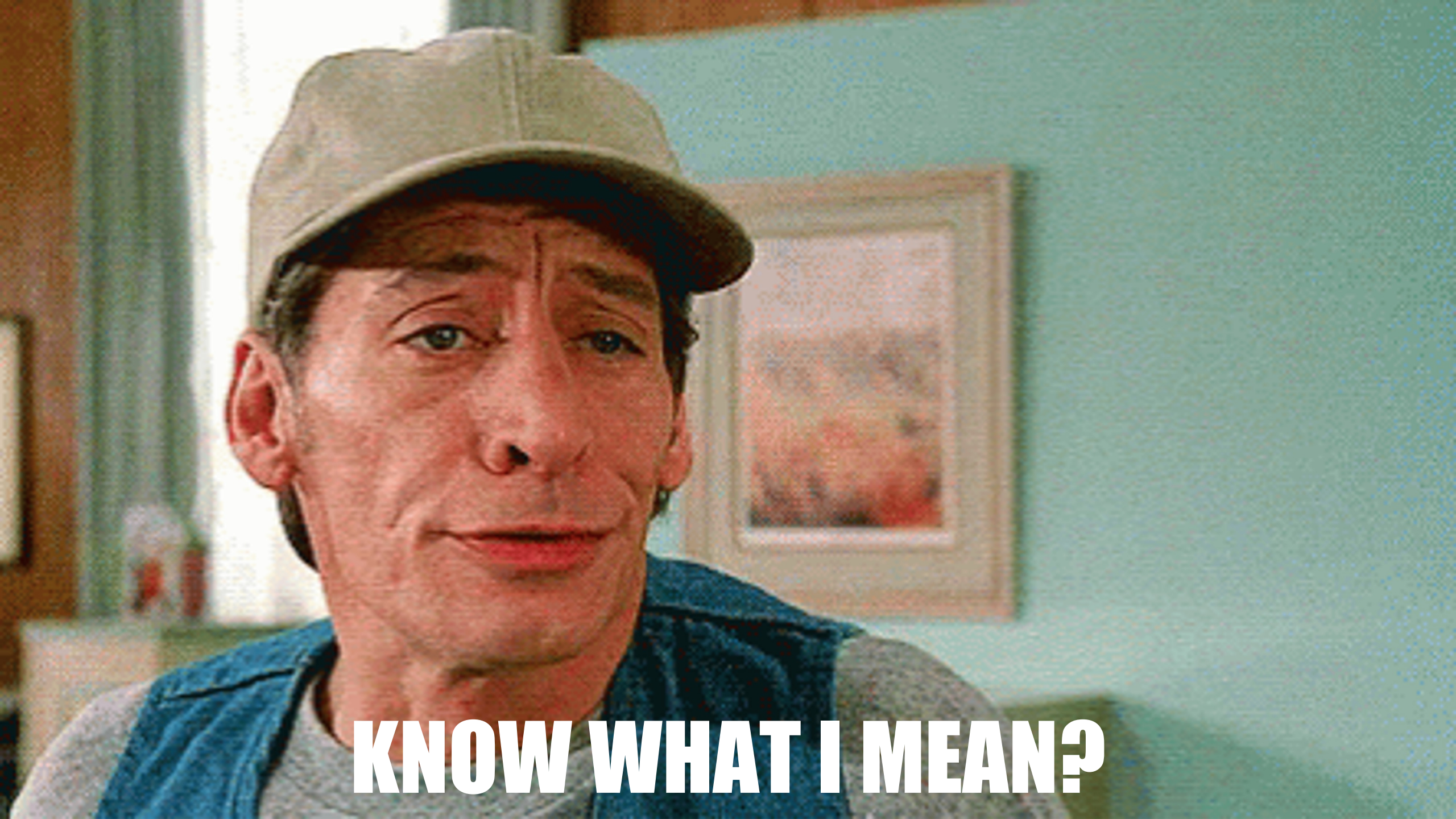
– Me

Overview

What Are We Doing Here?

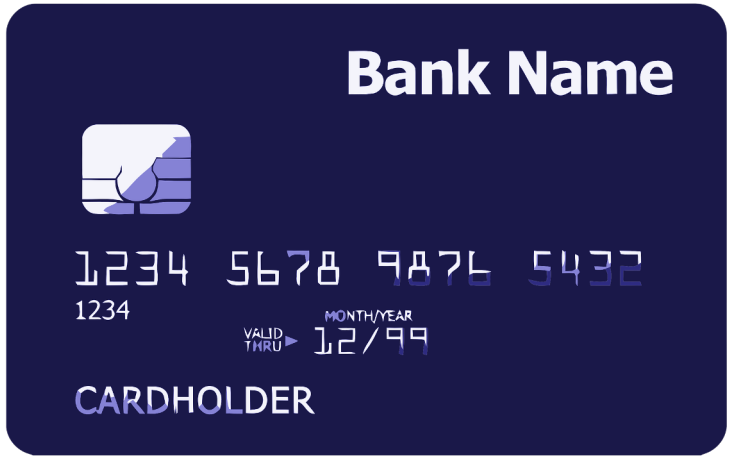





KNOW WHAT I MEAN?

Overview

Redis Capabilities We're Using



- Streams
- JSON
- Search
- Sorted Sets
- Time Series

redisOM

Get the Code & Instructions

git clone https://github.com/redis-developer/banking-on-redis.git

Which Redis To Use?

An Overview of Redis Installation Options

Which Redis?

OSS Redis

- Has the data structures we know and love.
- Makes an excellent cache, database, or session store.

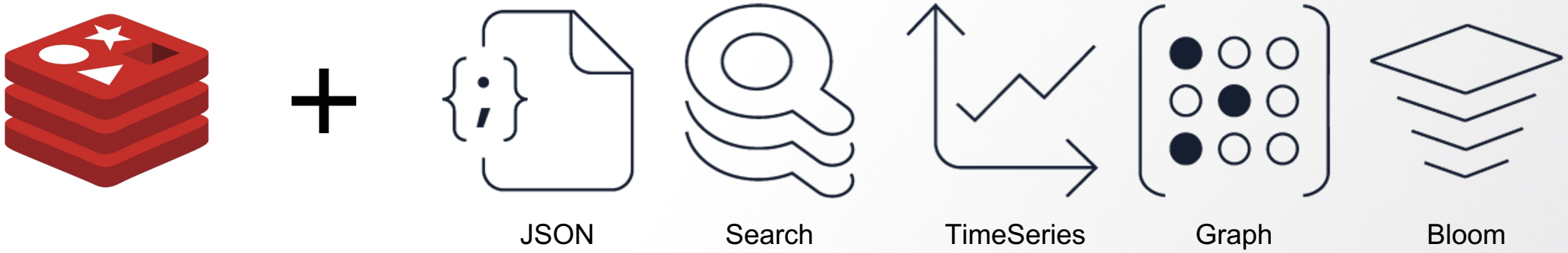
- Not so good at JSON.
- Searching can be difficult.
- Clustering requires a fair bit of work.

Which Redis?

OSS Redis is Extensible

Which Redis?

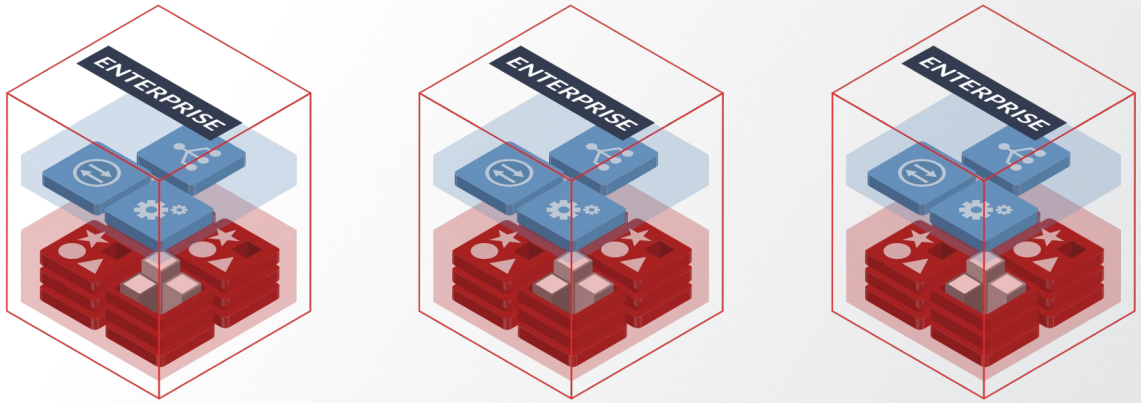
We've Implemented a Few



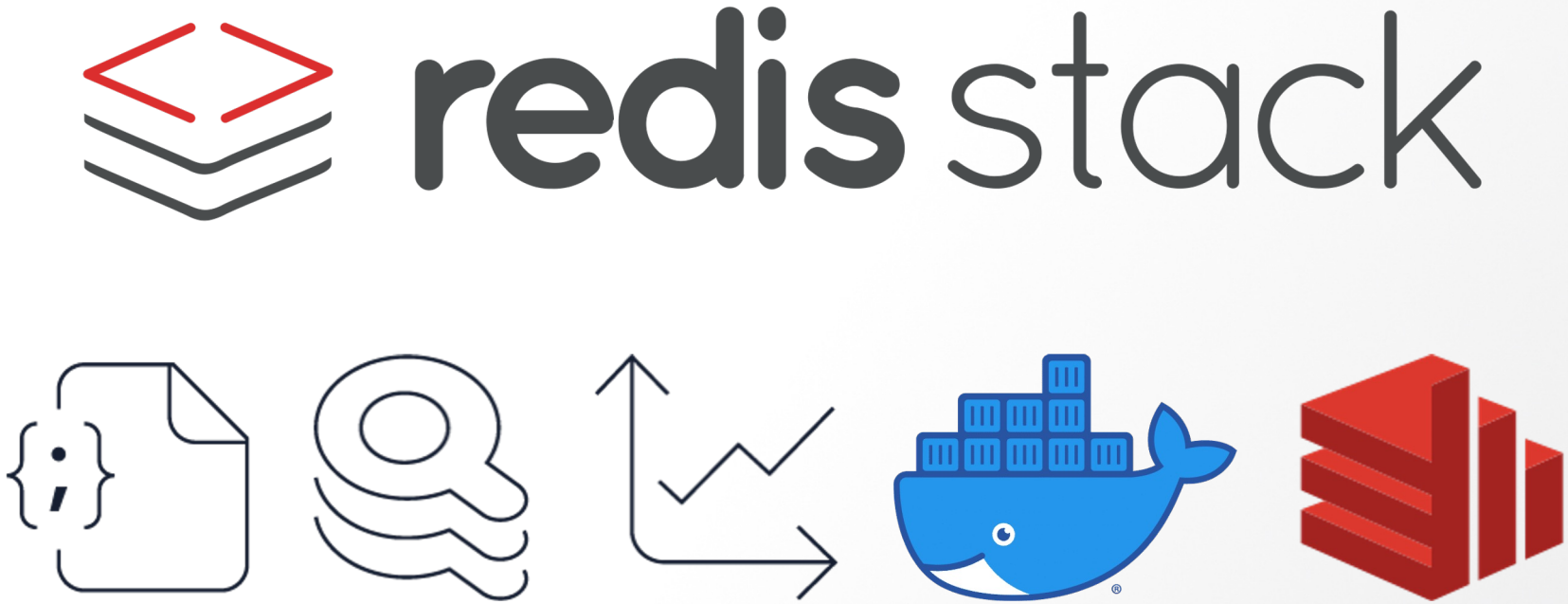
Which Redis?

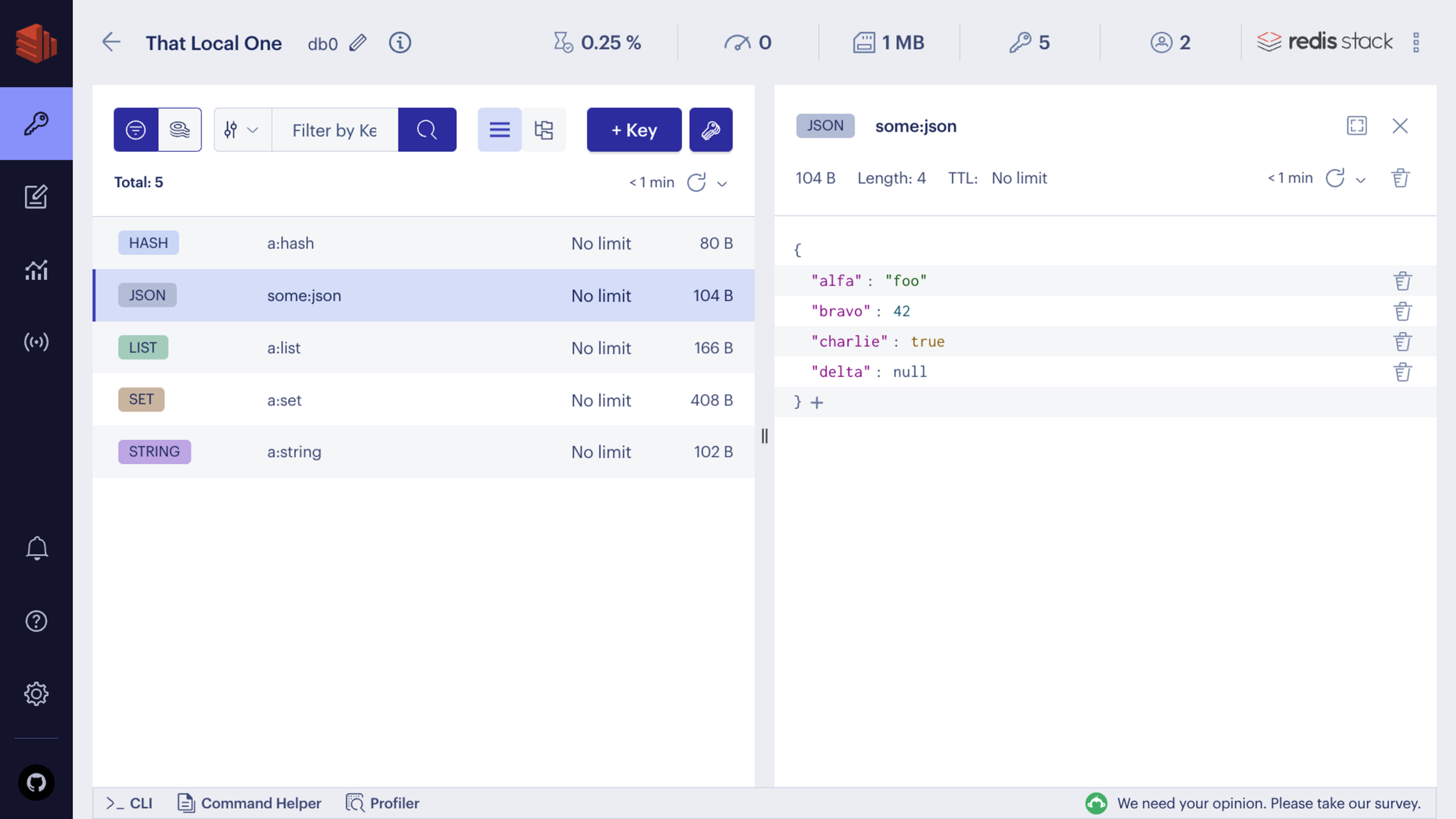
Redis Enterprise

- Includes all the modules.
- Takes care of the clustering and high availability for you.
- Easy to use proxy hides the clustering details from us developers.
- On Prem or in the Cloud.



Which Redis?




That Local One
db0
0.25 %
0
1 MB
5
2
redis stack
Filter by Ke
+ Key
Total: 5
< 1 min
HASH a:hash No limit 80 B
JSON some:json No limit 104 B
LIST a:list No limit 166 B
SET a:set No limit 408 B
STRING a:string No limit 102 B
JSON some:json
104 B Length: 4 TTL: No limit
< 1 min
{
"alfa" : "foo"
"bravo" : 42
"charlie" : true
"delta" : null
} +
CLI
Command Helper
Profiler
We need your opinion. Please take our survey.

Demo

RedisInsight

Try Out Redis Insight

Follow the instructions in 01-INSTALLATION.md

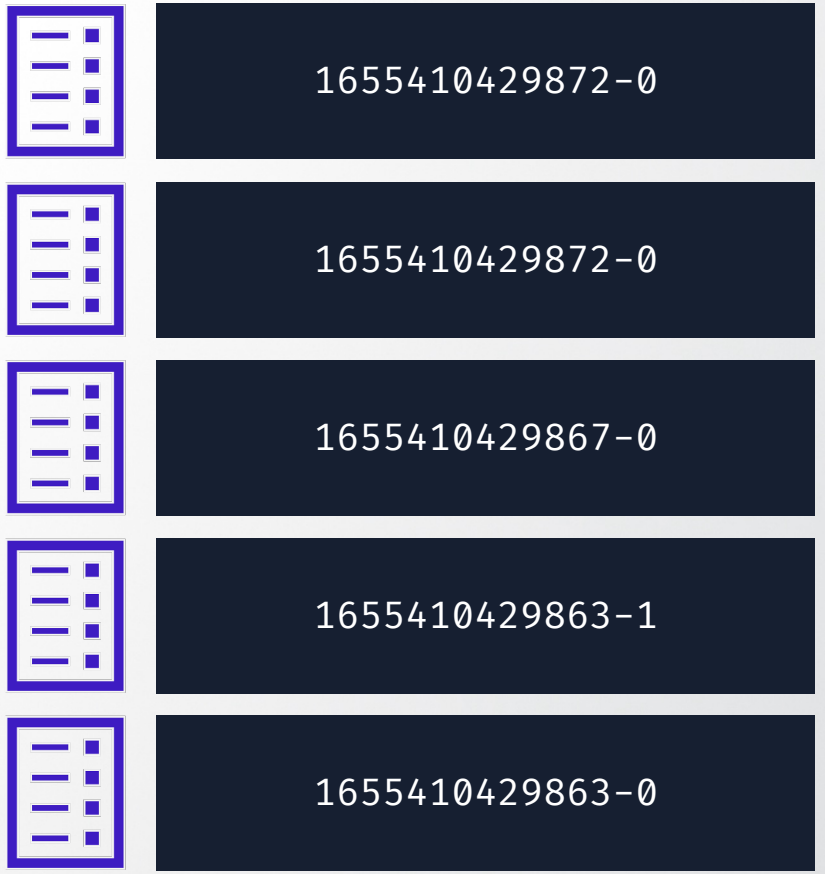
Capturing & Querying Events

An Overview of Redis Streams

Event Streams

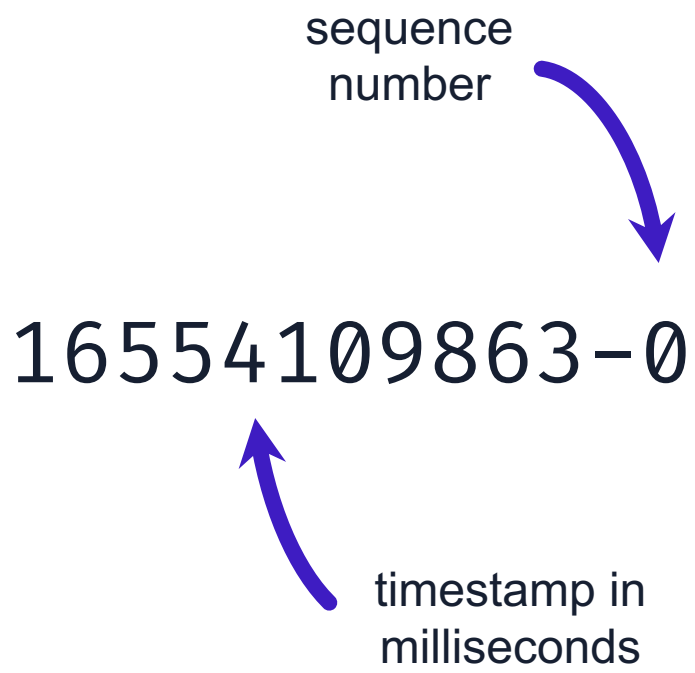
Introduction

- Series of events containing data and indexed by an ID.
- Chronological by nature.
- Used to capture, monitor, and replay a series of events.
- Makes a decent queue.
- Makes a great microservice bus.



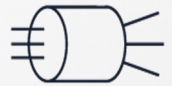
Event Streams

IDs & Data with Redis Streams

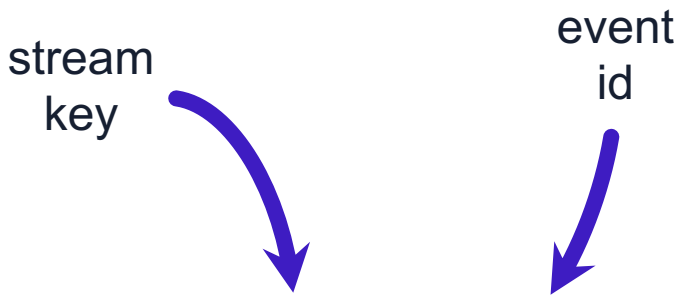


Key	Value
toAccount	5558675309
toAccountName	Always Watching H.O.A.
fromAccount	1580783161
fromAccountDescription	Justin Castilla, Esq.
amount	$167.34
transactionDate	2023-04-27
transactionType	Authorized

Event Streams



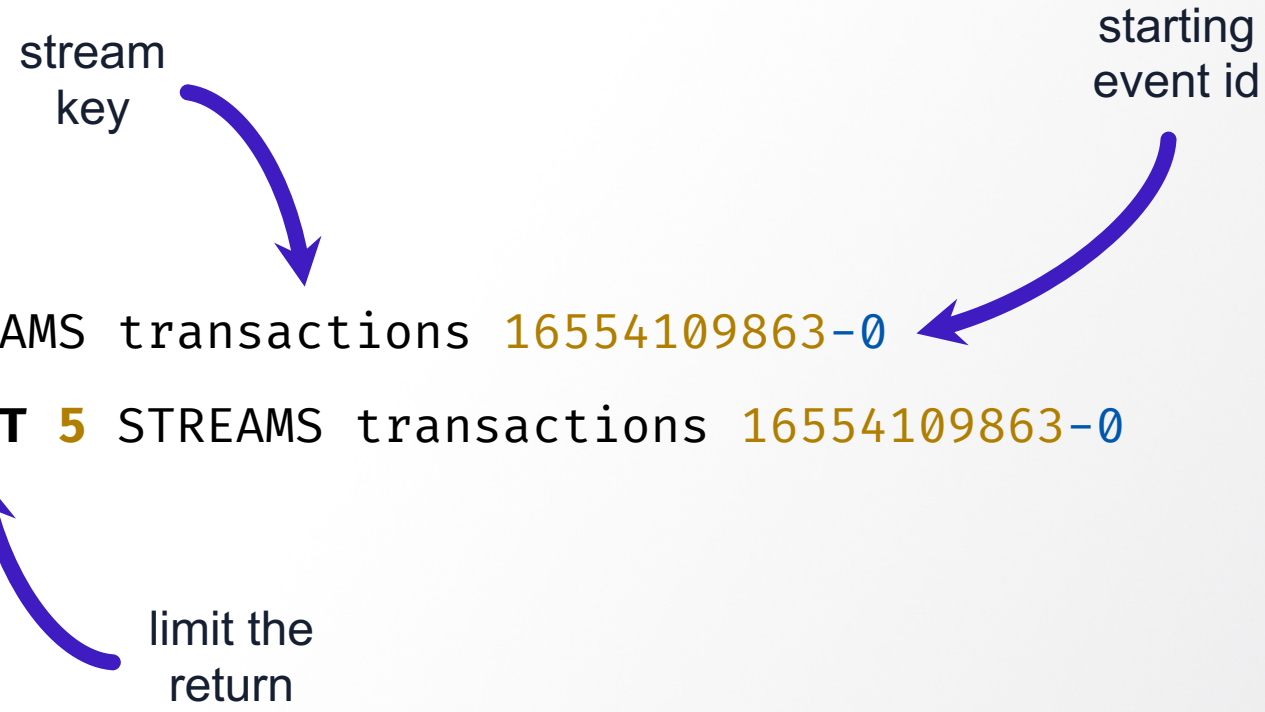
Adding Events




```
redis.local:6379> XADD transactions * amount 167.34
                  fromAccount 5558675309 toAccount 1580783161
                  transactionDate 2023-04-27 transactionType Authorized
```

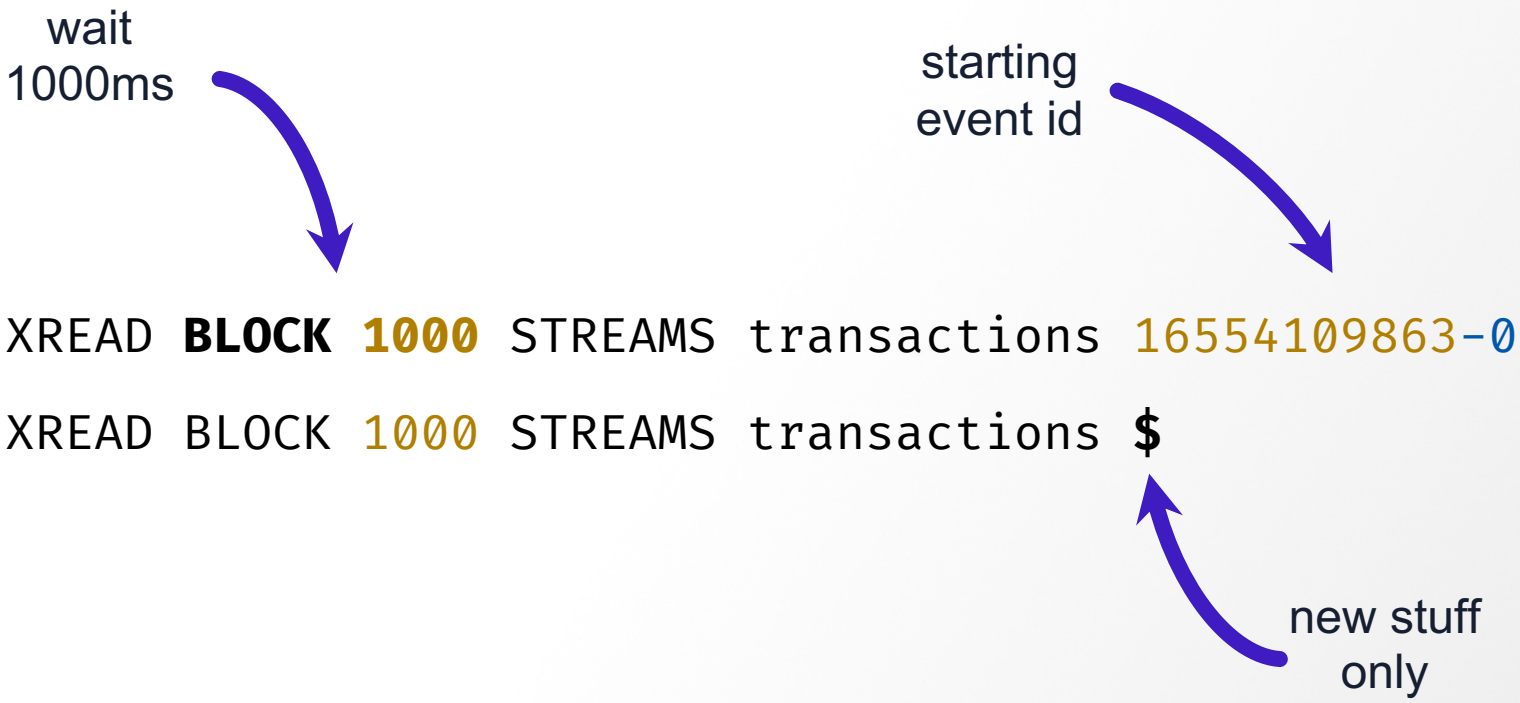
Event Streams

Reading Events

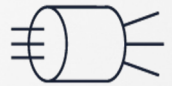


Event Streams

Awaiting Events



Event Streams



Other Commands

```
redis.local:6379> XRANGE transactions 0-0 16554109863-0
redis.local:6379> XDEL transactions 16554109863-0 16554109121-0 16554109121-1
redis.local:6379> XLEN transactions
redis.local:6379> XTRIM transactions MAXLEN 1000
redis.local:6379> XTRIM transactions MINID 16554109863-0
redis.local:6379> XTRIM transactions MAXLEN ~ 1000
redis.local:6379> XTRIM transactions MINID ~ 16554109863-0
```

Demo

Redis Streams

Try Out Streams

Follow the instructions in 02-STREAMS.md

Storing JSON the Good Way

An Overview of RedisJSON

RedisJSON

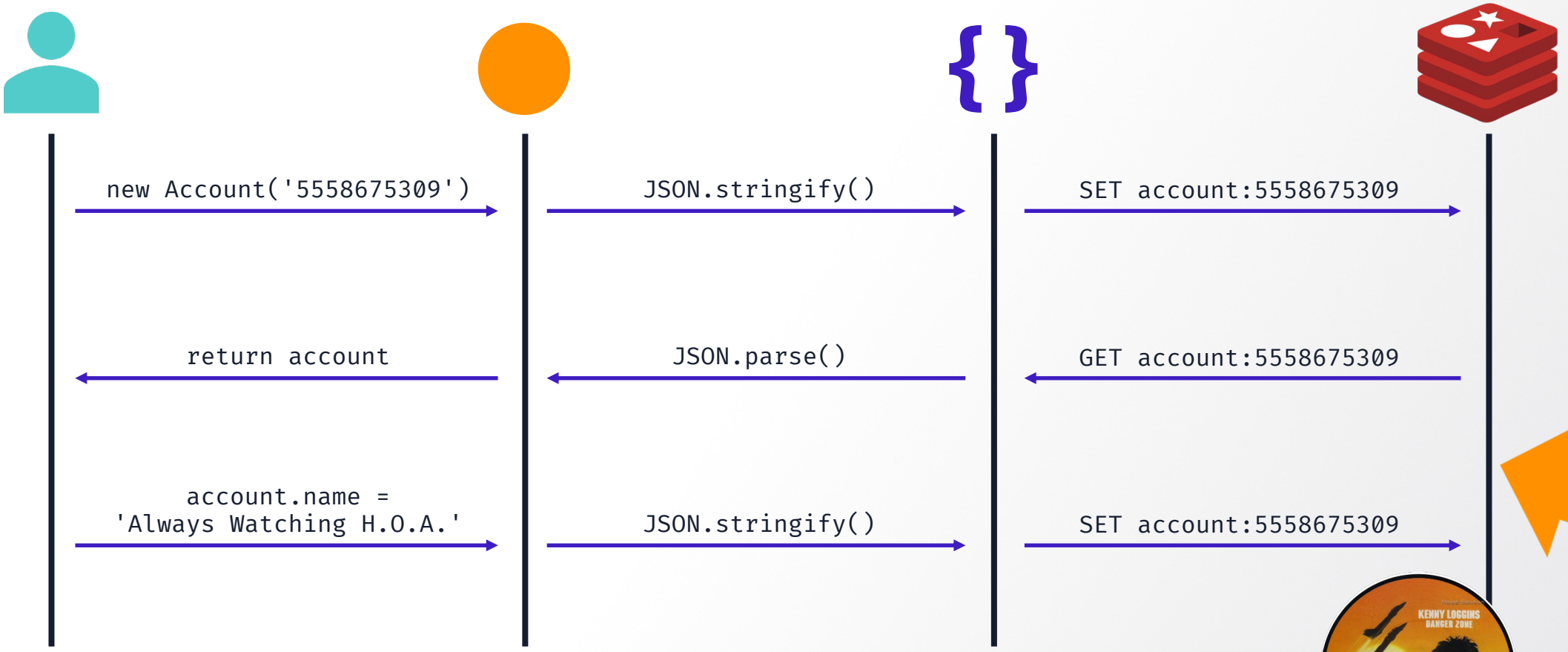
Introduction

- Store JSON in Redis *as* JSON.
- Query all or part of a document using JSONPath.
- Manipulate all or part of a document.
- All operations are atomic.

```
{
  "type": "Authorized",
  "date": "2023-04-27",
  "amount": 167.34,
  "to": {
    "account": "5558675309",
    "name": "Always Watching H.O.A."
  },
  "from": {
    "account": "1580783161",
    "name": "Justin Castilla, Esq."
  }
}
```

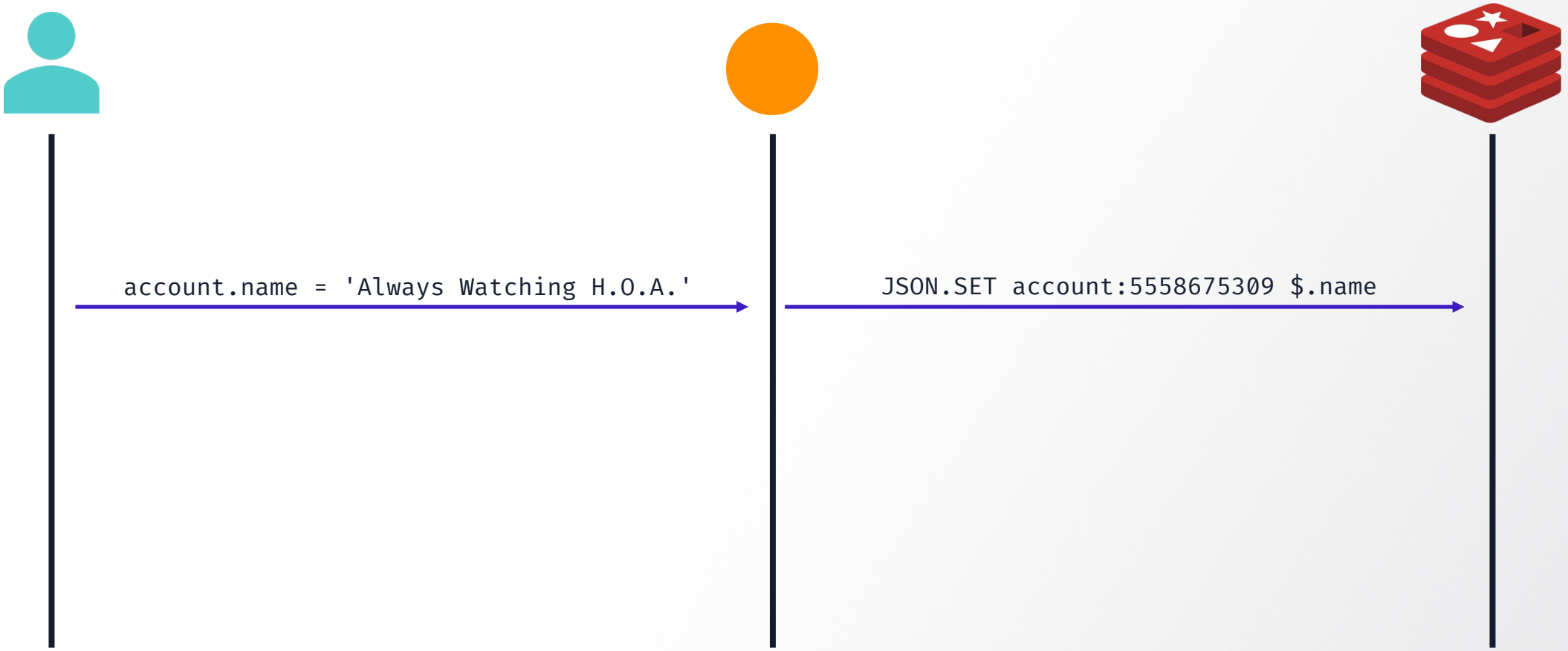
RedisJSON

A Common Scenario



RedisJSON

A Common Scenario



RedisJSON

Writing JSON


```
redis.local:6379> JSON.SET account:5558675309 $ '{"account":"5558675309"}'
redis.local:6379> JSON.SET account:5558675309 $.balance 167.34
redis.local:6379> JSON.SET account:5558675309 $.name '"Always Watching H.O.A."'
```

RedisJSON

Reading JSON

```
redis.local:6379> JSON.GET account:5558675309
```

```
{
  "account": "5558675309",
  "balance": 167.34,
  "name": "Always Watching H.O.A."
}
```

```
redis.local:6379> JSON.GET account:5558675309 $
```

```
[
  {
    "account": "5558675309",
    "balance": 167.34,
    "name": "Always Watching H.O.A."
  }
]
```

RedisJSON

Reading Using JSONPath

```
redis.local:6379> JSON.GET account:5558675309 $.name
```

```
[
  "Always Watching H.O.A."
]
```

```
redis.local:6379> JSON.GET account:5558675309 $.*
```

```
[
  "5558675309",
  167.34,
  "Always Watching H.O.A."
]
```

RedisJSON

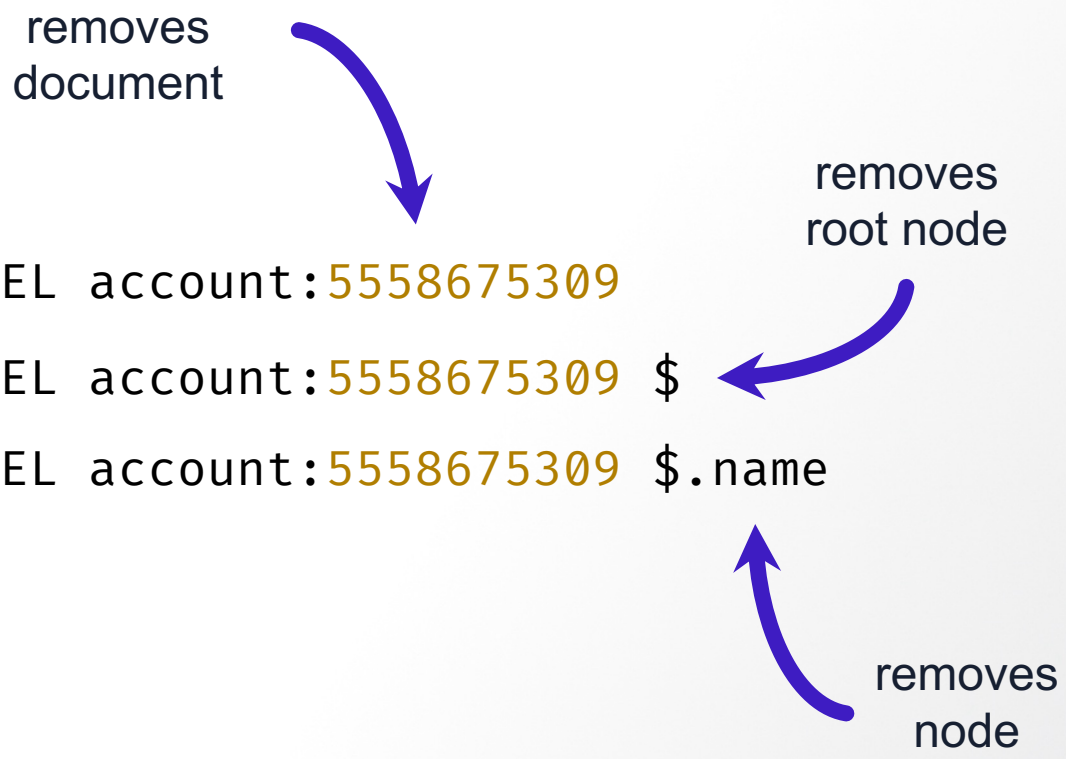
Reading Using Multiple JSONPaths

```
redis.local:6379> JSON.GET account:5558675309 $ $.name $.account
```


```
{
  "$": [
    {
      "account": "5558675309",
      "balance": 167.34,
      "name": "Always Watching H.O.A."
    }
  ],
  "$.name": [ "Always Watching H.O.A." ],
  "$.account": [ "5558675309" ]
}
```

RedisJSON

Removing JSON



RedisJSON

Other Commands

```
redis.local:6379> JSON.TYPE account:5558675309 $.balance
redis.local:6379> JSON.TOGGLE account:5558675309 $.overdrawn
redis.local:6379> JSON.ARRAPPEND account:5558675309 $.approvals JC GR TH
redis.local:6379> JSON.NUMINCRBY account:5558675309 $.balance 100
redis.local:6379> JSON.STRLEN account:5558675309 $.name
redis.local:6379> JSON.OBJKEYS account:5558675309 $
redis.local:6379> JSON.MGET account:5558675309 account:6365553226 $.balance
```

Demo

RedisJSON

Try Out RedisJSON

Follow the instructions in 03-REDIS-JSON.md

Searching & Querying

An Overview of RediSearch

Searching the Bad Way

Brute Force


```
redis.local:6379> JSON.GET account:5558675309
redis.local:6379> KEYS account:*
redis.local:6379> SCAN * MATCH account:*
```

Searching the Hard Way

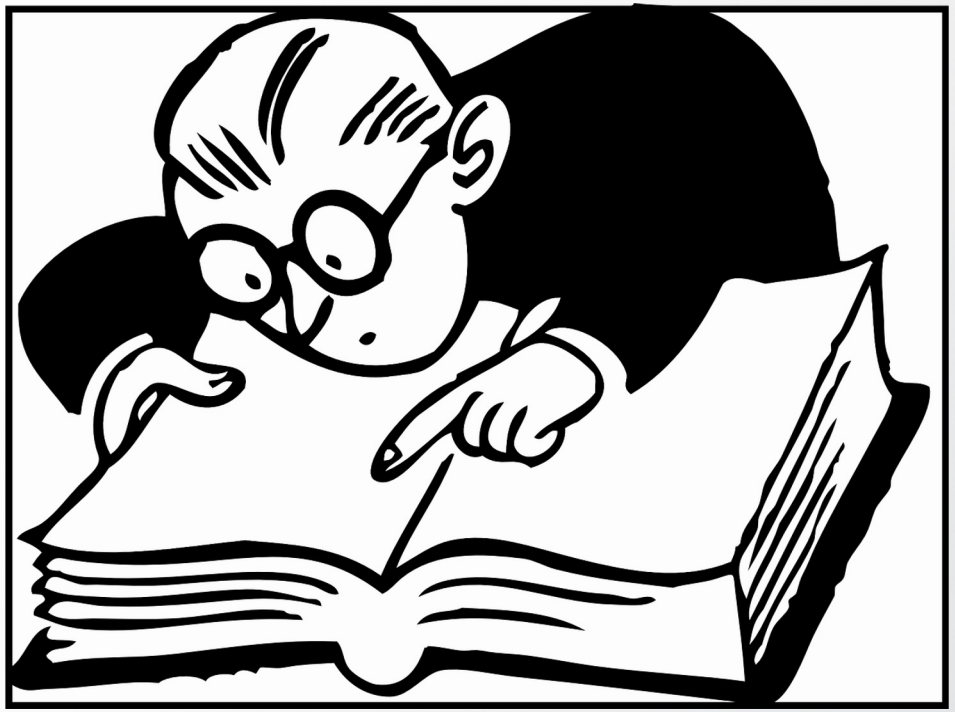
Maintaining Your Own Indices

```
redis.local:6379> SADD accounts:type:checking
                       5558675309 6365553226 2015551212

redis.local:6379> SADD accounts:type:savings
                       5558675310 6365553227 2015551213

redis.local:6379> SADD accounts:overdrawn:true
                       5558675309 6365553226 5558675310

redis.local:6379> SADD accounts:overdrawn:false
                       2015551212 6365553227 2015551213

redis.local:6379> SINTER accounts:overdrawn:true
                         accounts:type:checking
```

Searching the Smart Way

Introducing RediSearch

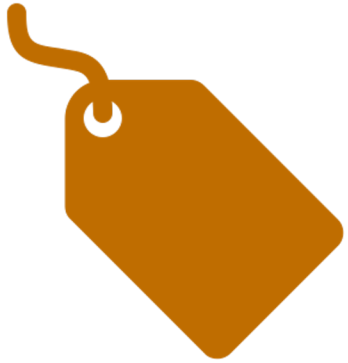
- Indexes JSON documents and Hashes.
- Provides full-text search and aggregation.
- Indices are updated automatically when data is updated.



RediSearch

Types of Fields

TEXT



TAG

NUMERIC

GEO

RediSearch

Creating Indices

```
redis.local:6389> FT.CREATE account:index
                  ON JSON
                  PREFIX 1 account:
                  SCHEMA
                     $.description AS description TEXT
                     $.type AS type TAG
                     $.approvals[*] AS approvals TAG
                     $.balance AS balance NUMERIC
                     $.location AS location GEO
```

returns single item

returns multiple items

longitude first in format `12.34,56.78`

RediSearch

Searching

```
redis.local:6379> FT.SEARCH account:index "*"

redis.local:6379> FT.SEARCH account:index "@description:watch"

redis.local:6379> FT.SEARCH account:index "@approvals:{ JC | GR }"

redis.local:6379> FT.SEARCH account:index "@balance:[ -inf 100 ]"

redis.local:6379> FT.SEARCH account:index "@location:[ 12.34 56.78 10 mi ]"

redis.local:6379> FT.SEARCH account:index "
                    @description:watching
                    @approvals:{ JC | GR }
                    @balance:[ -inf 100 ]
                    @location:[ 12.34 56.78 10 mi ]"
```

RediSearch

Other Useful Commands

```
redis.local:6379> FT._LIST

redis.local:6379> FT.INFO account:index

redis.local:6379> FT.DROPINDEX account:index

redis.local:6379> FT.AGGREGATE account:index "*"
                     GROUPBY 1 @type REDUCE COUNT 0 AS typeCount

redis.local:6379> FT.EXPLAIN account:index "
                     @description:watching
                     @approvals:{ JC | GR }
                     @balance:[ -inf 100 ]
                     @location:[ 12.34 56.78 10 mi ]"
```

Demo

RediSearch

Try Out RediSearch

Follow the instructions in 04-REDISEARCH.md

Searching & JSON Made Easy

An Introduction to redis OM

Redis OM

What's Redis OM

- A layer of abstraction over RediSearch & RedisJSON
- Available for Java, .NET, Node.js, and Python
- We'll cover Redis OM for Node.js

- Built on top of Node Redis
- Supports index creation using `Schema`
- Enables basic CRUD Operations using `Repository`
- Provides a fluent search interface using `Search`

Node Redis

What's Node Redis

- Official and supported Redis client for Node.js
- Supports RedisJSON, RediSearch and all the other Redis modules
- 1-to-1 mapping of Redis commands to JavaScript code

```
npm install redis
```

Node Redis

Creating a Client

```
import { createClient } from 'redis'

const url = 'redis://alice:foobared@awesome.redis.server:6380'
const redis = createClient({ url })
```

Node Redis

Redis URLs

```
redis://alice:foobared@awesome.redis.server:6380
```

USER PASSWORD HOSTNAME PORT

```
redis://:foobared@awesome.redis.server:6380
redis://awesome.redis.server:6380
redis://awesome.redis.server
```

Node Redis

redis OM

Connecting to Redis

```
import { createClient } from 'redis'

const url = 'redis://alice:foobared@awesome.redis.server:6380'
const redis = createClient({ url })

redis.on('error', error => console.log('Redis Client Error', error))

await redis.connect()
```

Node Redis

Sending Commands to Redis

```
await redis.sAdd('accounts:type:checking',
  [ 5558675309, 6365553226, 2015551212 ])


await redis.json.set('account:5558675309', '$', {
  account: '5558675309',
  name: 'Always Watching H.O.A.'
})


const names = await redis.json.get('foo', '$.name')
```

Redis OM

Schema and Repository

Schema

- Defines the structure of your data
- Used to build indices for RediSearch
- Used to convert JavaScript types to and from Redis types

Repository

- Provides CRUD operations for your data
- Creates indices for search
- Initiates search using RediSearch

```
npm install redis-om@beta
```

Schemas

Creating a Schema

```
const schema = new Schema('transaction', {

  account:   { type: 'string' },
  approvals: { type: 'string[]' },
  overdrawn: { type: 'boolean' },

  memo:      { type: 'text' },

  amount:    { type: 'number' },
  date:      { type: 'date' },

  location:  { type: 'point' }

})
```

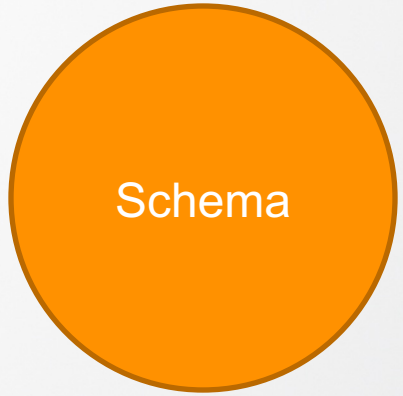
prefixes keys in Redis

maps to TAG

maps to TEXT

maps to NUMERIC

maps to GEO



Schemas

redisOM

JSONPath is Implied

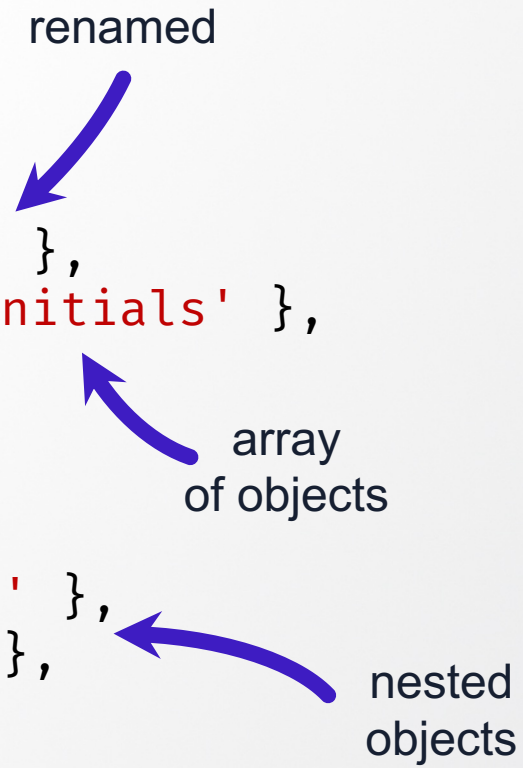
```
const schema = new Schema('transaction', {

  account:   { type: 'string',   path: '$.account' },
  approvals: { type: 'string[]', path: '$.approvals[*]' },
  overdrawn: { type: 'boolean',  path: '$.overdrawn' },

  memo:      { type: 'text',     path: '$.memo' },

  amount:    { type: 'number',   path: '$.amount' },
  date:      { type: 'date',     path: '$.date' },

  location:  { type: 'point',    path: '$.location' }

})
```

Schemas

redisOM

Can Be Mutated and Nested

```
const schema = new Schema('transaction', {

  account:   { type: 'string',   path: '$.accountNumber' },
  approvals: { type: 'string[]', path: '$.approvals[*].initials' },
  overdrawn: { type: 'boolean' },

  memo:      { type: 'text',     path: '$.memo' },

  amount:    { type: 'number',   path: '$.details.amount' },
  date:      { type: 'date',     path: '$.details.date' },

  location:  { type: 'point',    path: '$.location' }

})
```



Schemas

Missing Fields

- Missing fields are saved but not indexed and converted to the extent possible
- Strings are Strings
- Numbers are Numbers
- Booleans are Booleans
- Dates & Points are special

Schemas

If a Date or Point is Defined

Redis OM

```
new Date()
'2023-04-27T12:00:00-04:00'
1682611200000

instanceof Date
```

```
{
  longitude: 12.34,
  latitude: 56.78
}
```

RedisJSON

```
1682611200000
```

```
"12.34,56.78"
```

Schemas

If a Date or Point is Missing

Redis OM

```
new Date()
'2023-04-27T12:00:00-04:00'
1682611200000

{
  longitude: 12.34,
  latitude: 56.78
}
```

RedisJSON

```
1682611200000
'2023-04-27T12:00:00-04:00'
1682611200000

{
  longitude: 12.34,
  latitude: 56.78
}
```

Repositories

redis OM

Creating a Repository and Saving an Entity

```
const repository = new Repository(schema, redis)

let transaction = {
  account: "5158675309",
  approvals: [ "JC", "GR" ],
  overdrawn: false,
  memo: "Payment for watching",
  amount: 125.00,
  date: '2023-04-27',
  location: {
    longitude: 12.34,
    latitude: 56.78
  }
}

transaction = await repository.save(transaction)
```

Repositories

redis OM

What's in an Entity?

```
transaction.account     // "5158675309"
transaction.approvals   // [ "JC", "GR" ]
transaction.overdrawn   // false
transaction.memo        // "Payment for watching"
transaction.amount      // 125.00
transaction.location    // { longitude: 12.34, latitude: 56.78 }

transaction.date        // instanceof Date

transaction[EntityId]   // "01FJYWEYRHYFT8YTEGQBABJ43J"
```

Can I Use My Own EntityID?

```
transaction = await repository.save("5558675309-90210", transaction)
```

Repositories

Calling Save Again

```
transaction[EntityId]  // "5558675309-90210"

transaction.approvals.push('PF')
transaction.memo = "Payment for watching, always watching"
transaction.amount = 250.0

transaction = await repository.save(transaction)
```

Saving an Entity with an EntityID does an upsert

Repositories

Fetching and Removing

```
const transaction = await repository.fetch("5558675309-90210")

await repository.remove("5558675309-90210")
```

Searching

Finding All The Things

creates (or recreates) the index

```
await repository.createIndex()
```

```
redis.local:6389> FT.CREATE transaction:index
                    ON JSON
                    PREFIX 1 transaction:
                    SCHEMA
                      ...
```

creates a Search instance

```
const transactions = await repository.search().return.all()
```

```
redis.local:6379> FT.SEARCH transaction:index "*"
```

triggers the search

Searching

redis OM

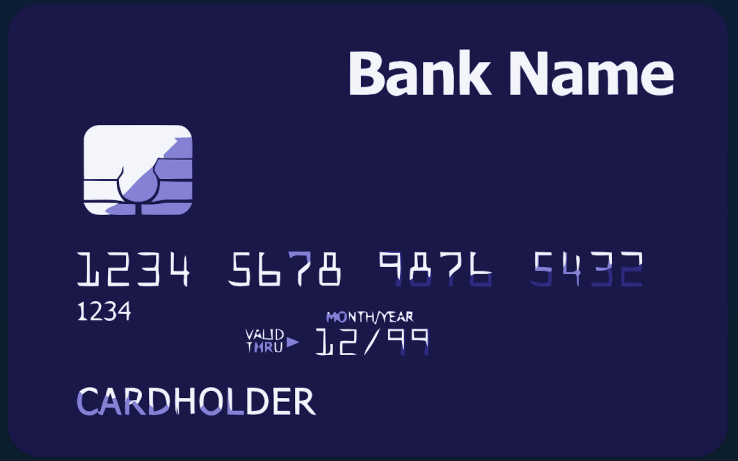
Finding Specific Things

```
const transactions = await repository.search()
  .where('account').equals('5558675309')     // string
    .and('amount').is.greaterThan(20.00)     // number
    .and('overdrawn').is.false()             // boolean
    .and('date').is.after('2023-04-27')      // date
    .and('approvals').contains('JC')         // string[]
    .and('memo').matches('watch')            // full-text search
    .and('location').inRadius(               // point
       circle => circle.origin(12.34, 56.78).radius(10).miles)
         .return.all()
```

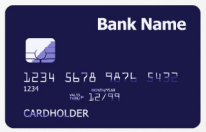
Full documentation at github.com/redis/redis-om-node/.

Banking on Redis

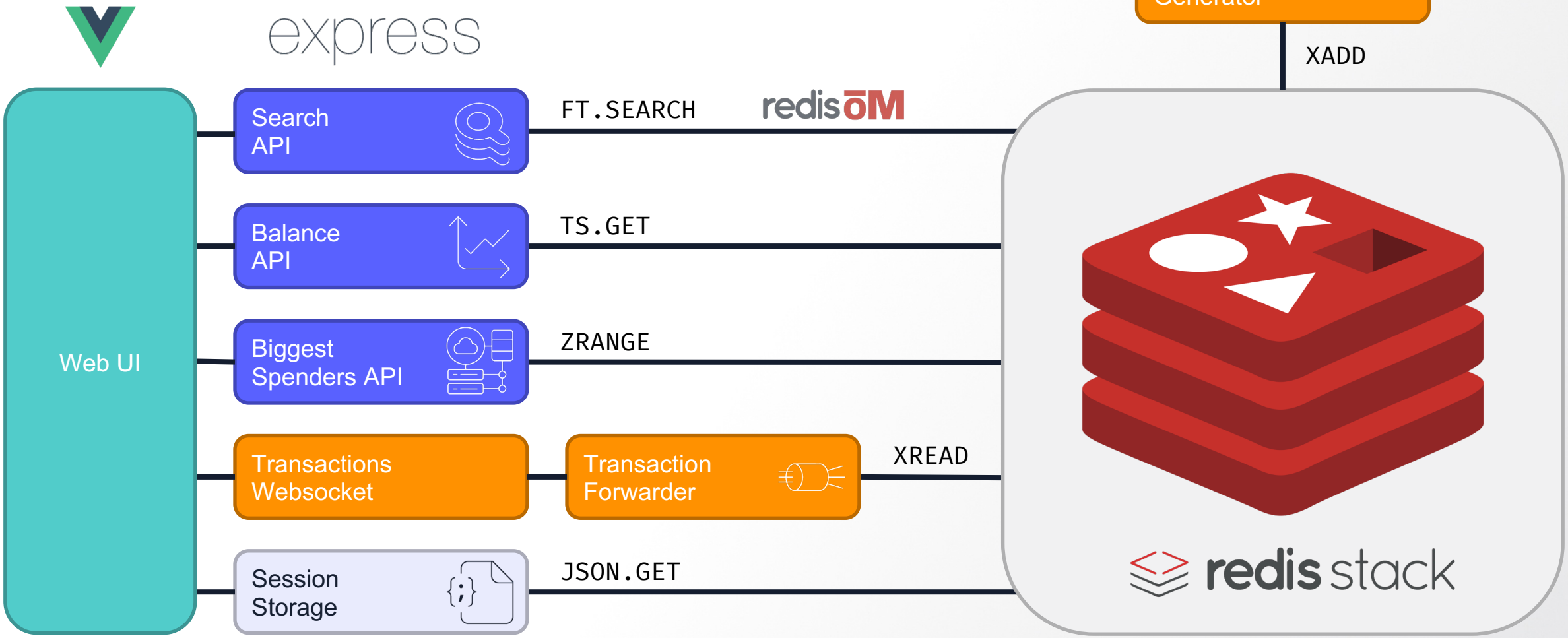
A Simple Application



Banking on Redis



Overview of the Application



Complete the Banking API

Follow the instructions in 05-BANKING-ON-REDIS.md

Connect, Learn, Explore

Redis Discord

discord.gg/redis

Redis University

university.redis.com

Redis Cloud

redis.com/try-free

Thank you

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REDISDAYS


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