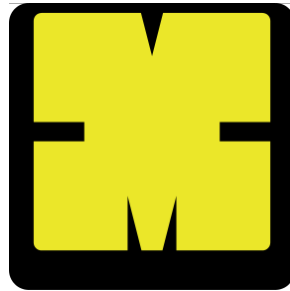


REDIS - HOW TO PROFIT FROM ADDING IT TO YOUR STACK



ABOUT ME

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WHAT IS REDIS?

- in memory data store
- high performance
- publish/subscribe
- replication
- persistence
- no need for switch, just add it to your stack

WHEN TO USE REDIS

- performance
- write-heavy app
- lot of changes
- data fits natural Redis structures

WHEN NOT TO USE REDIS

- You need ACID
- Complex data structures

INSTALLATION

- Windows - Port or Cygwin
- Linux
- OSX
- Docker

REDIS CLIENTS

- <http://redis.io/clients>
- Java - Jedis/lettuce
- Spring Data Redis

JAVA PROJECT - POM.XML

```
<dependency>
  <groupId>org.springframework.data</groupId>
  <artifactId>spring-data-redis</artifactId>
  <version>1.6.4.RELEASE</version>
</dependency>

<dependency>
  <groupId>redis.clients</groupId>
  <artifactId>jedis</artifactId>
  <version>2.8.0</version>
</dependency>
```


JAVA PROJECT - SPRING CONTEXT

```
<bean id="connectionFactory" class="...connection.jedis.JedisConnecti
    <property name="usePool" value="true"/>
</bean>

<bean id="redisTemplate" class="...redis.core.RedisTemplate">
    <property name="connectionFactory" ref="connectionFactory"/>
</bean>
```

DATA STRUCTURES

- Strings
- Lists
- Sets
- Hashes
- Sorted Sets

STRINGS

- Strings
- Integers
- Floats
- Bitmaps
- Atomic multiples

STRINGS - EXAMPLES

```
SET name RedisTalk  
GET name  
# RedisTalk
```

```
SET counter 1  
INCR counter  
GET counter  
# 2
```

```
GETSET counter 3  
# 2
```

```
SETNX counter 4  
GET counter  
# 3
```

```
SETBIT flags 0 1  
GETBIT flags 0  
# 1
```

SETS

- unsorted collections of strings
- add/remove
- membership
- union/intersection/diff

SETS - EXAMPLES

```
SADD products iPad Nexus  
SMEMBERS products  
# iPad Nexus  
SISMEMBER products Nexus  
# 1
```

```
SADD offers iPad Galaxy  
SINTER offers products  
# iPad
```

```
SUNION products offers  
# iPad Nexus Galaxy
```

SETS

- good for:
 - collections
 - verifying existence
- complexity $O(1)$

SORTED SETS

- same as sets but with order
- add/fetch/remove
- scoring
- rank

SORTED SETS - EXAMPLES

```
ZADD access:hours 1457628349333 1500
ZADD access:hours 1457624749333 800
# ZINCRBY access:hours 1457624749333 1
ZADD access:hours 1457621149333 1200
ZREVRANGE access:hours
# 1500 800 1200
```

```
ZREVRANGEBYSCORE access:hours inf 1457624749333
# 1500 800
```

```
ZREVRANGE access:hours 0 0
# 1500
```

SORTED SETS

- good for:
 - leaderboards
 - timestamp data ranges
 - autocomplete
- complexity $O(\log(N))$

LISTS

- Linked list
- push/pop
- search
- remove

LISTS - EXAMPLES

```
LPUSH stack 1  
LPUSH stack 2  
LPUSH stack 3  
LPOP stack  
# 3
```

```
RPOP stack  
# 1
```

LISTS

- good for:
 - stacks
 - queues
 - last updated
 - sidekiq
- complexity $O(1)$
- but $O(n)$ for inserting

HASHES

- add
- fetch
- remove
- complex structures

HASHES - EXAMPLES

```
HMSET user:98765 name "Milan Heimschild" logins 0  
HINCRBY user:98765 logins 1
```

```
HGET user:98765 logins  
# 1
```

```
HGETALL user:98765  
# "name" "Milan Heimschild"  
# "logins" "1"
```

HASHES

- good for:
 - representing objects
 - storing objects
 - storing objects references

HYPERLOGLOGS

- computes cardinality of a set

EXAMPLE

```
PFADD h11 user:1 user:2 user:3
PFCOUNT h11
# 3
```

PUBLISH/SUBSCRIBE

- ! In Memory
- Reliability

EXAMPLE

```
redisTemplate.convertAndSend("chat", "Hello All!");

redisConnectionFactory.getConnection()
    .subscribe((message, bytes) -> {
        sout(valueSerializer.deserialize(message.getBody()));
        sout(stringSerializes.deserialize(message.getChannel()));
    })
```

EXAMPLE - FIXED

```
ExecutorService exServ = Executors.newFixedThreadPool(1);

exServ.submit(() -> redisConnectionFactory.getConnection()
    .subscribe((message, bytes) -> {
        sout(valueSerializer.deserialize(message.getBody()));
        sout(stringSerializes.deserialize(message.getChannel()));

        redisConnectionFactory.getConnection().getSubscription().unsubscribe(
    }, "chat".getBytes()));
```

EXPIRING KEYS

- Good for volatile keys
- sessions/caching/quotas
- EXPIRE
- PERSIST
- TTL

EXAMPLE

```
SETEX myValue 1 42
GET myValue
# 42
# delay
GET myValue nil
```

```
SETEX myValue 60 42
TTL myValue
# 59
PERSIST myValue
TTL myValue
# -1
GET myValue
# 42
```

TRANSACTIONS

- MULTI/EXEC
- DISCARD
- WATCH/MULTI/EXEC
- Errors during transactions

EXAMPLE

```
HMSET item:42 desc "Nexus" count 10
```

```
HGET item:42 count
```

```
# 10
```

```
MULTI
```

```
HINCRBY item:42 count -1
```

```
# QUEUED
```

```
LPUSH cart:123 "item:42"
```

```
# QUEUED
```

```
EXEC
```

```
#9
```


EXAMPLE - MORE TRANSACTIONAL

```
HMSET item:42 desc "Nexus" count 10
```

```
HGET item:42 count
```

```
# 10
```

```
WATCH item:42
```

```
MULTI
```

```
HINCRBY item:42 count -1
```

```
# QUEUED
```

```
LPUSH cart:123 "item:42"
```

```
# QUEUED
```

```
# in another client
```

```
HINCRBY item:42 count -1
```

```
# 9
```

PERSISTENCE

- Snapshot
 - manually/automatically
 - frontend/backend
 - 200ms/1 GB
- AOF
 - transaction log
 - best in RAID
 - system FS

REPLICATION

- Master/Slave
- Sentinels
- Cluster

BENCHMARKS

- redis-benchmark

SECURITY

- requirepass config
- AUTH password
- Must be really strong
- Proxy

ADVANCED EXAMPLES

PAGINATION (OR N LATEST ELEMENTS)

First	Previous	...	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	...	Next	Last
-------	----------	-----	------	------	------	------	------	------	------	------	------	------	-----	------	------

- Long lists
- What for? (SCO)
- Why not DB

SOLUTION #1 - LISTS

```
LPUSH lastcomments 1 2 3 4 5
LLEN lastcomments
# 5
LRANGE lastcomments 0 -1
# 1 2 3 4 5
```

```
LPUSH lastcomments 6
LTRIM 0 4
LRANGE lastcomments 0 -1
# 2 3 4 5 6
```

```
LRANGE comments 11 20
```


SOLUTION #2 - SORTED SETS

```
ZADD topcomments 10 1  
ZADD topcomments 5 2  
ZADD topcomments 15 3  
ZREVRANGE topcomments 0 -1  
# 3 1 2
```

```
ZADD topcomments 7 4  
ZREMRANGEBYRANK topcomments 0 -4  
ZREVRANGE topcomments 0 -1  
# 3 1 4
```

CACHING

- In-memory caching
- Redis vs. Memcached
- NGINX redis adapter
- Redis via unix sockets
- maxmemory options
- can grow too fast

SOLUTION

```
SET page42 '<div>42</div>'  
EXPIRE page42 300
```

```
SETEX page42 300 '<div>42</div>'
```

```
SET object:1234 "some value" # wrong  
HSET object 1234 "some value" # right
```

PRODUCTS CATALOG

- Product attributes
- List of products
- Searching

SOLUTION

```
HMSET phone:1234567 company "LG" model "Nexus" price 300
```

```
HMSET phone:search "Nexus" 1234567
```

```
HSCAN phone:search 0 MATCH "*Nex*" COUNT 5
```

```
# Next 5 entries
```

```
HSCAN phone:search 5 MATCH "*Nex*" COUNT 5
```

AUTOCOMPLETE

- use Elasticsearch
- IP-to-city
- GEO-to-city

SOLUTION

```
ZADD autocomplete 0 m
ZADD autocomplete 0 mi
ZADD autocomplete 0 mil
ZADD autocomplete 0 mila
ZADD autocomplete 0 milan
ZADD autocomplete 0 milan$
```

```
ZRANK autocomplete mil
# 2
```

```
ZRANGE autocomplete 3 50
#mila milan milan$
```

```
ZRANGEBYLEX autocomplete [mi (miz
```

SESSION MANAGEMENT

- does not require stickiness
- faster than DB
- stabler than Memcached

SOLUTION

```
HMSET session:42 username "milan" locale "de"  
EXPIRE session:42 3600
```

LEADERBOARD

My League		Top Clans		Top Players		Search Clans		X	
Global				Local: GU					
191.	▲ 1	57	TITAN671			1604	🏆		
192.	▲ 1	69	htcbub91	Attacks Won: 8 Defenses Won: 7		1602	🏆		
193.	▲ 26	78	RON	Attacks Won: 54 Defenses Won: 7		1599	🏆		
194.	▲ 23	61	donneler	Attacks Won: 1 Defenses Won: 0		1599	🏆		
195.	▼ 12	58	gwentastic	Attacks Won: 5 Defenses Won: 16		1599	🏆		
196.	▼ 1	63	\$-CHETTI-\$	Attacks Won: 26 Defenses Won: 21		1599	🏆		
197.	▲ 4	55	..RORO'15..	Attacks Won: 13 Defenses Won: 14		1596	🏆		
198.	▲ 31	51	jolietjoliet+	Attacks Won: 20 Defenses Won: 10		1594	🏆		
199.	▼ 2	78	Nicejaz	Attacks Won: 13 Defenses Won: 7		1593	🏆		
200.	▼ 2	61	Sora1228			1593	🏆		

SOLUTION

```
ZADD points 200 Milan 300 Sigi
ZREVRANGE points 0 -1
# "Sigi" "Milan"
```

```
ZADD stars 5 Milan 2 Sigi
ZREVRANGE stars 0 -1
# "Milan" "Sigi"
```

```
ZUNIONSTORE leaderboard 2 points stars WEIGHTS 1 100
ZREVRANGE leaderboard 0 -1 WITHSCORES
# "Milan" "700"
# "Sigi" "500"
```

NOTIFICATION CENTER

- PUB/SUB not reliable



SOLUTION

- Publish/Subscribe
- Retrieve N latest entries

COMMENTS

- Nonthreaded

SOLUTION

```
LPUSH article:42:comments comment:12
HMSET comment:12 author "Milan Heimschild" text "Awesome comment"
timestamp "2014-05-17 23:00:34"
```

```
# Deleting
DEL comment:12
LREM article:42:comments 0 comment:12
```

```
# Listing
LRANGE article:42:comments 0 10
# comment:12
HGETALL comment:12
# author: ... text ... timestamp
```

SHOPPING CART

- Product catalog
- Transactions
- Publish/Subscribe
- Key-Space notification

SOLUTION

```
HMSET product:1 desc "iPad" price 500 count 10
HMSET product:2 desc "Nexus" price 300 count 20
```

```
MULTI
HGET product:1 count
# 10
HINCRBY product:1 count -1
# 9
RPUSH cart:42 product:1
EXPIRE cart:42 600
EXEC
```

```
PSUBSCRIBE __keyspace@0__:cart* del
```

TIPS AND TRICKS

- (hash|list|zset|set)-max-zip(map|list)-(entries|value) - factor 10
- Pipelining - factor 5
- Lua Scripting
- Big Data Import (use protocol RESP)
- Data partitioning (key based)

RESOURCES

- <http://redis.io/commands>
- <http://redis.io/clients#java>
- <http://github.com/mheimschild/redis-talk>