

August 28

KEYSPACE

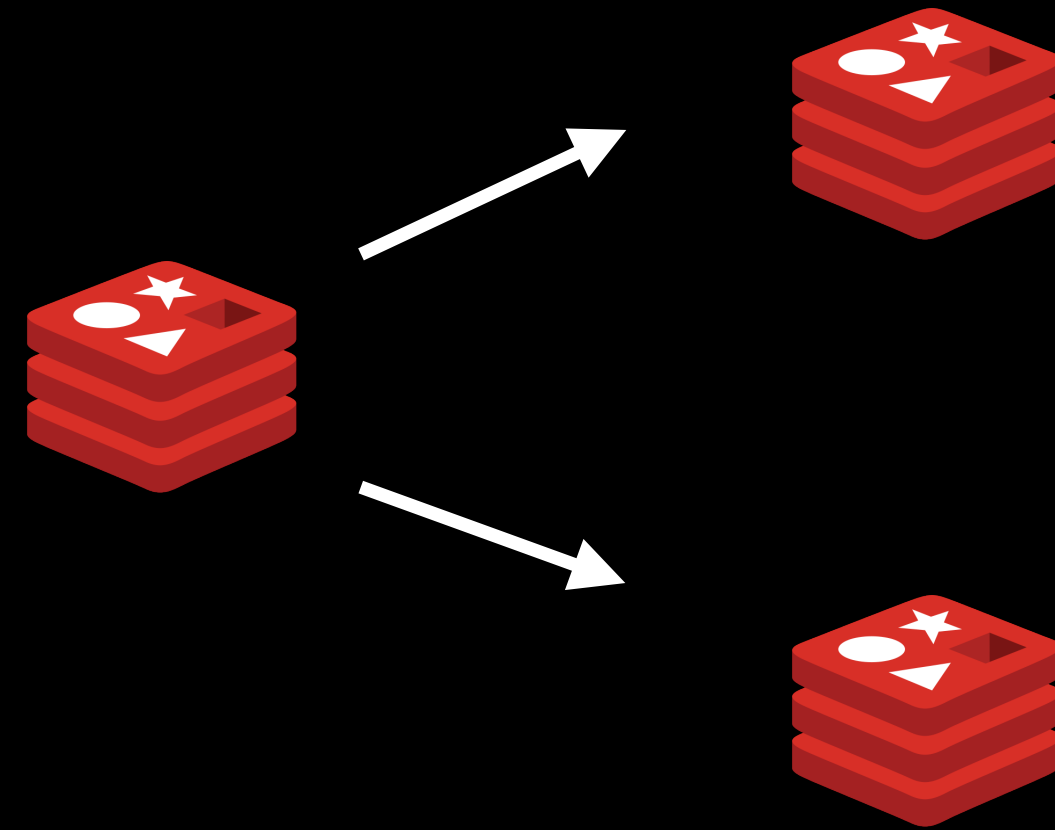
Amsterdam

Redis to Valkey: Upgrade and Downgrade Compatibility

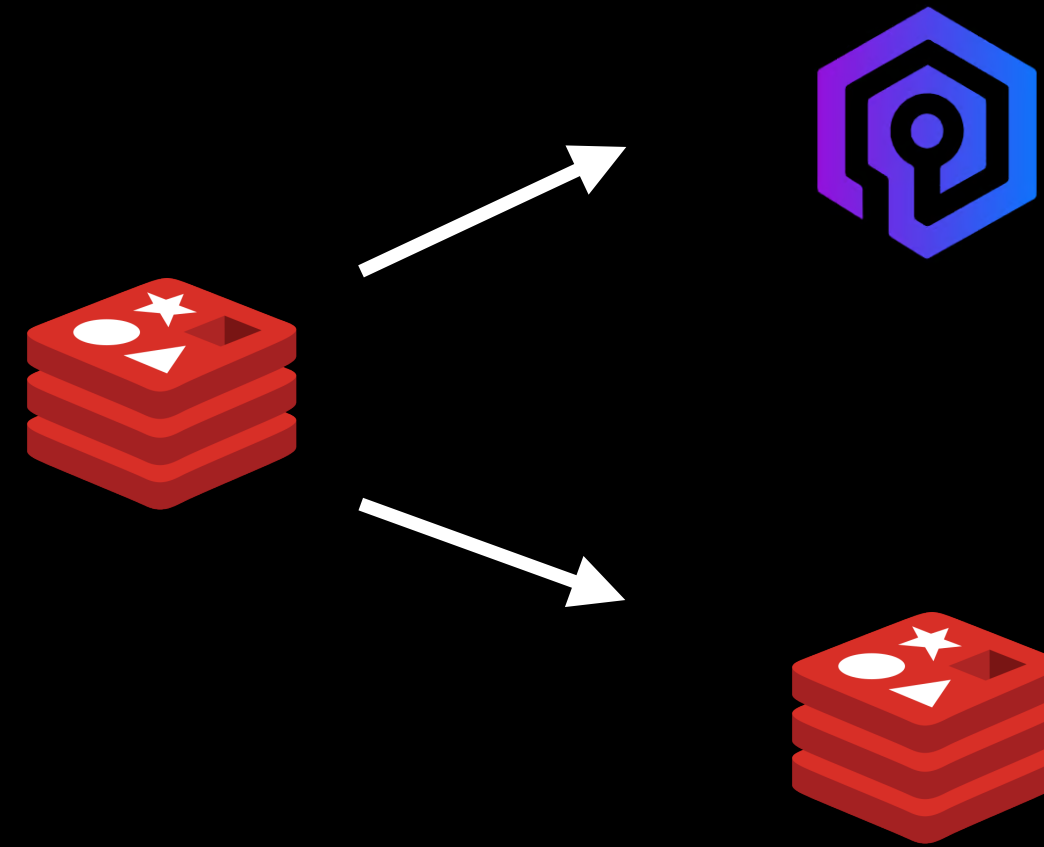
Yaxing Chen
Engineering Manager, Apple



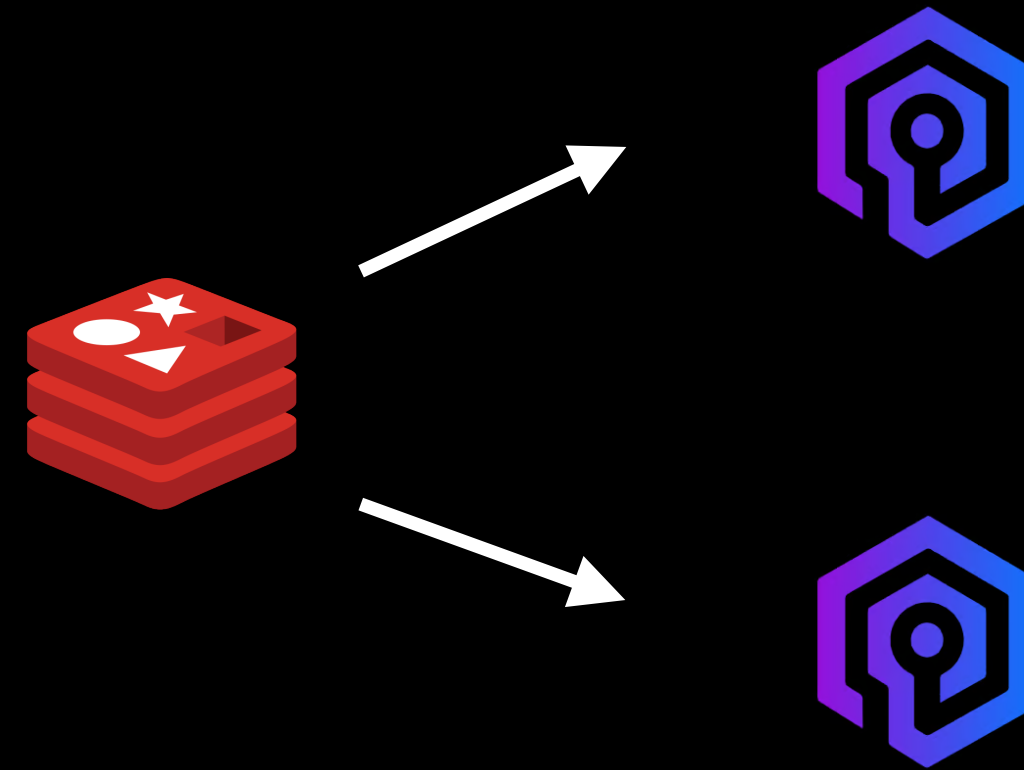
Migration to Valkey



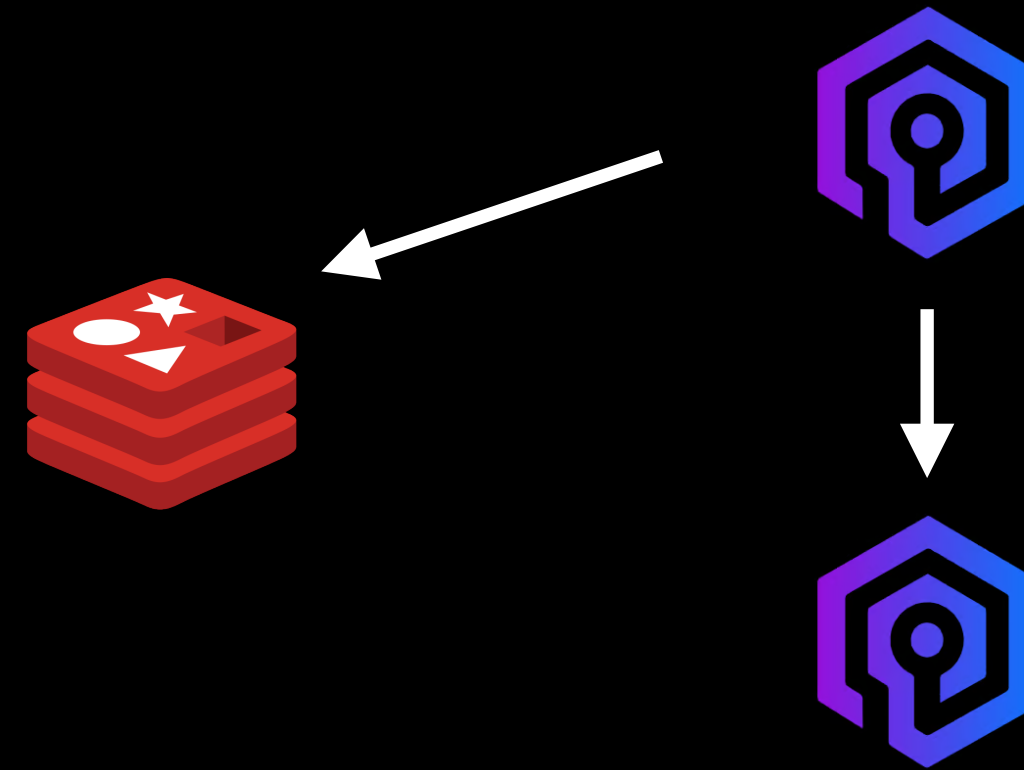
Migration to Valkey



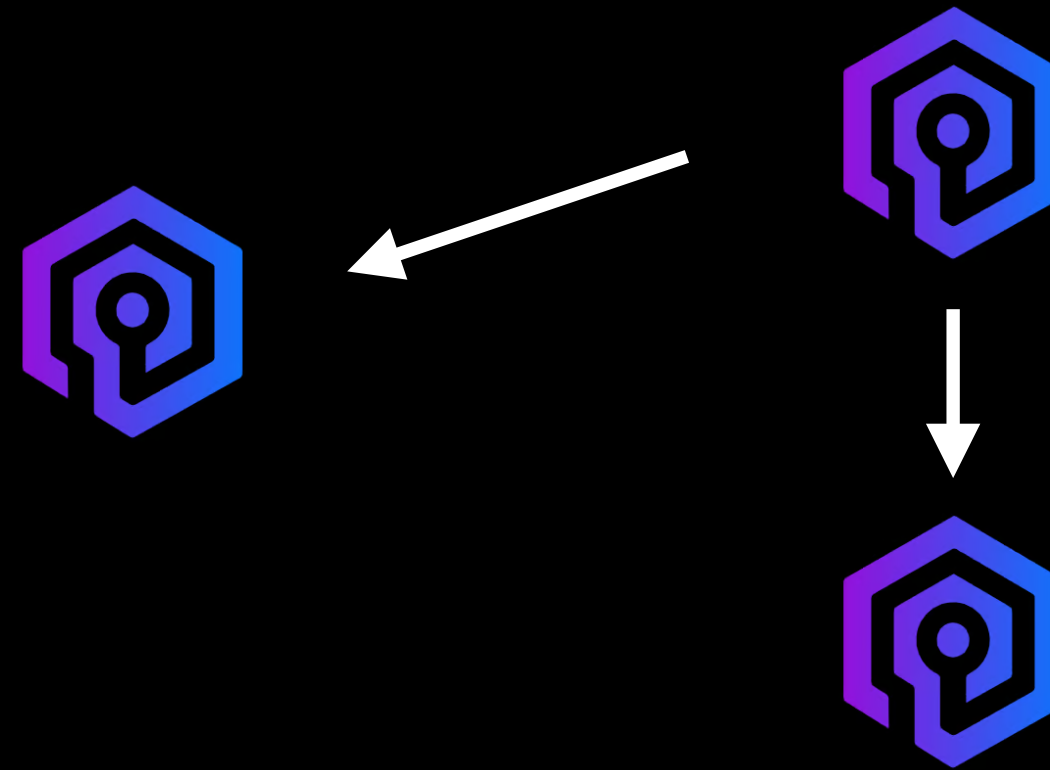
Migration to Valkey



Migration to Valkey



Migration to Valkey

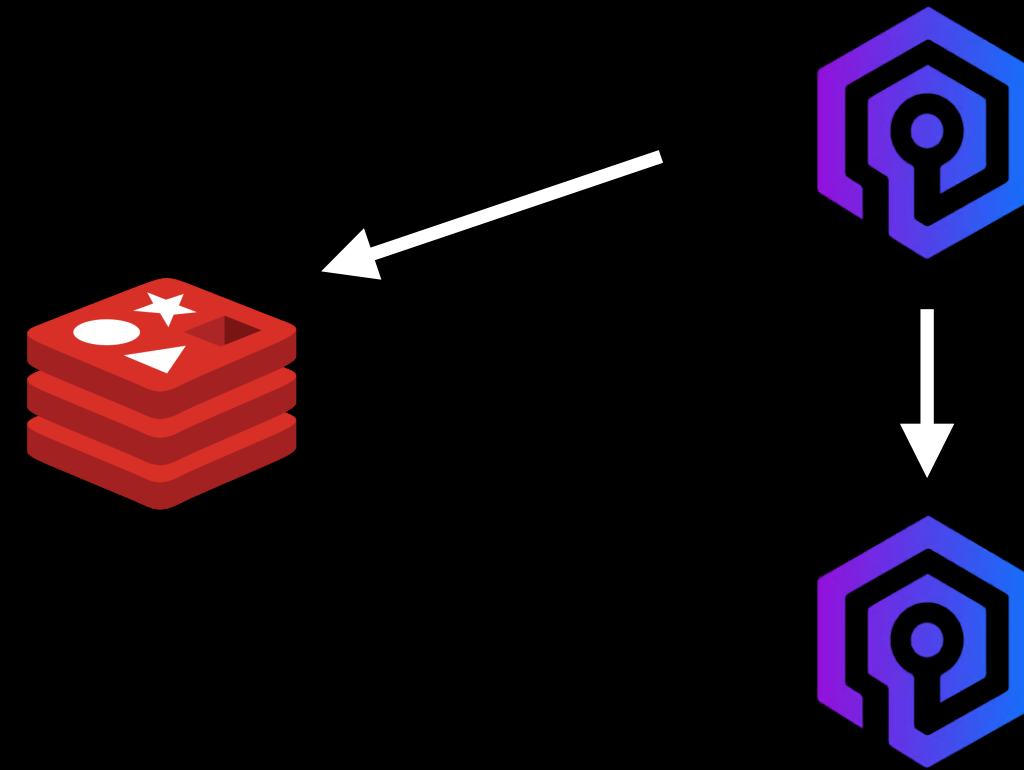


Migration to Valkey - Rollback

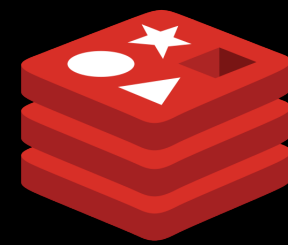
Business Continuity & Risk Mitigation

Complex Dependencies

Compliance & SLA Requirements



Versions



6.0, 6.2, 7.0



7.2, 8.0

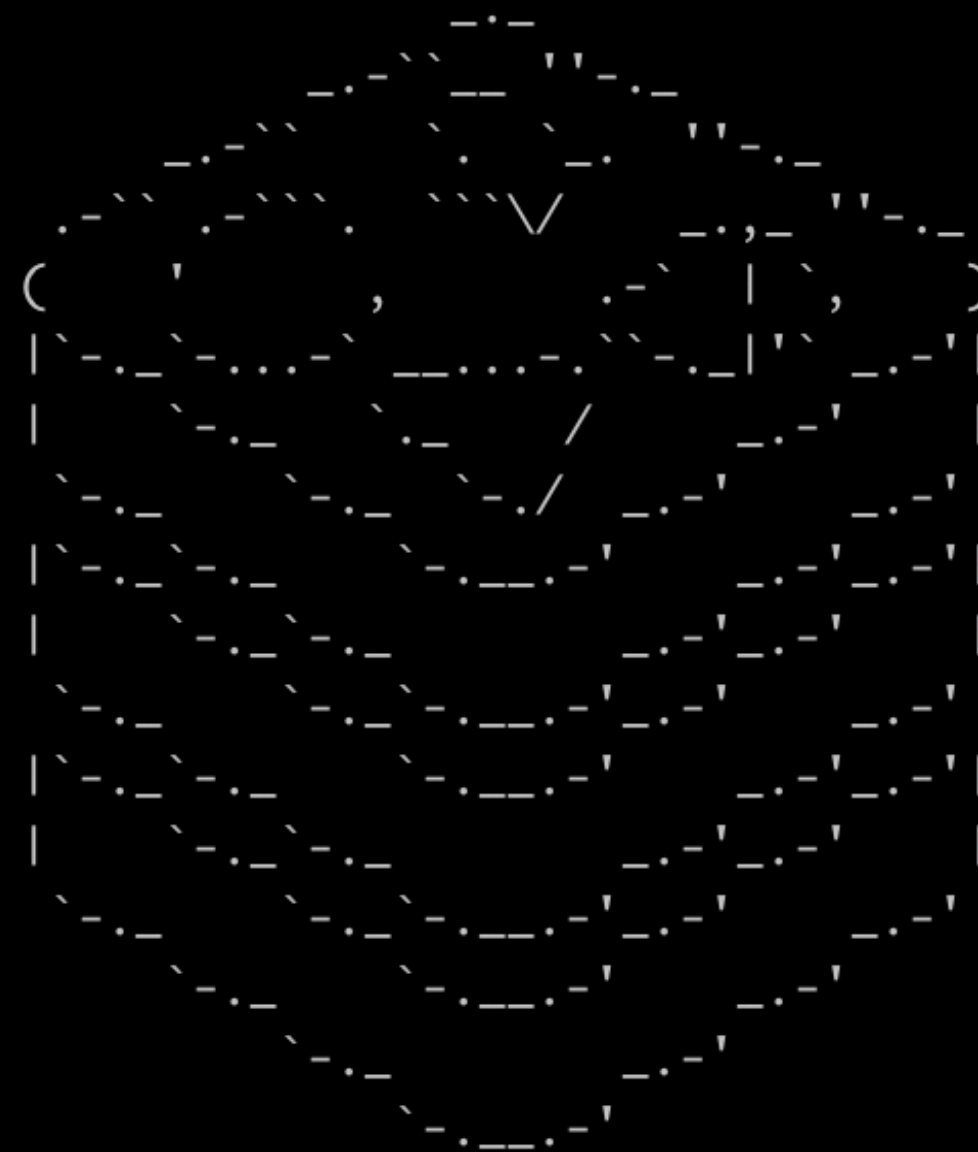
Version Compatibilities

Current Version	Target Redis 6.0	Target Redis 6.2	Target Redis 7.0	Target Redis 7.2	Target Valkey 7.2	Target Valkey 8.0
Redis 6.0	-	?	?	?	?	?
Redis 6.2	?	-	?	?	?	?
Redis 7.0	?	?	-	?	?	?
Redis 7.2	?	?	?	-	?	?
Valkey 7.2	?	?	?	?	-	?
Valkey 8.0	?	?	?	?	?	-

Downgrade Incompatibilities

→ ~ redis-server

```
93791:C 14 Jun 2025 10:34:43.439 # o000o000o000o Redis is starting o000o000o000o
93791:C 14 Jun 2025 10:34:43.439 # Redis version=7.0.15, bits=64, commit=6a8d8740, modified=1, pid=93791, just started
93791:C 14 Jun 2025 10:34:43.439 # Warning: no config file specified, using the default config. In order to specify a c
93791:M 14 Jun 2025 10:34:43.440 * Increased maximum number of open files to 10032 (it was originally set to 256).
93791:M 14 Jun 2025 10:34:43.440 * monotonic clock: POSIX clock_gettime
```



Redis 7.0.15 (6a8d8740/1) 64 bit

Running in standalone mode
Port: 6379
PID: 93791

<https://redis.io>

```
93791:M 14 Jun 2025 10:34:43.441 # WARNING: The TCP backlog setting of 511 cannot be enforced because kern.ipc.somaxcon
93791:M 14 Jun 2025 10:34:43.441 # Server initialized
93791:M 14 Jun 2025 10:34:43.441 # Can't handle RDB format version 11
93791:M 14 Jun 2025 10:34:43.441 # Fatal error loading the DB: Invalid argument. Exiting.
```

→ ~ █

Downgrade Incompatibilities



gopivalleru on Nov 8, 2024

After the failover, here's what I observed:

1. The new master and replica on 7.2 are communicating as expected, but the 5.0.3 instances encountered an error with "Can't handle RDB format version 11."

This highlights the issue: while upgrading from 5.0.3 to 7.2 is feasible, if any problems arise with 7.2, a downgrade is not possible, meaning I can't switch the master back to one of the 5.0.3 nodes.

Source: <https://github.com/redis/redis/discussions/13187>



oranagra on Aug 22, 2022

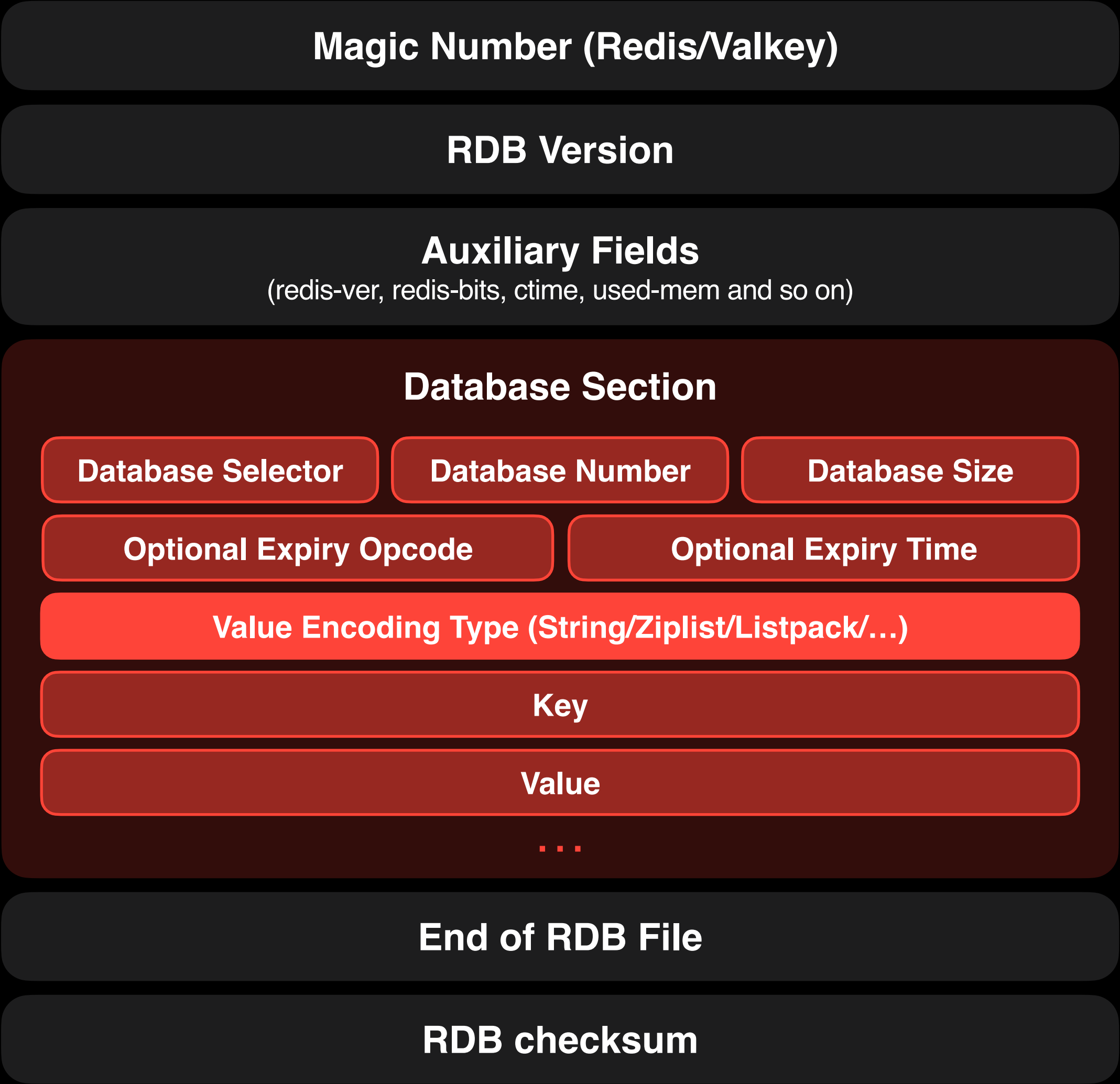
We discovered this issue while upgrading from Redis 6.x -> 7.0. The workaround was to drop the old RDB file and start the new server; however, this results in data loss.

@burkestar as stated, upgrades should work seamlessly, it's downgrades that are not possible.
please describe what problems you actually run into during upgrade.

Source: <https://github.com/redis/redis/issues/11172>

RDB Structure

Point-in-time-snapshot of in-memory data to disk



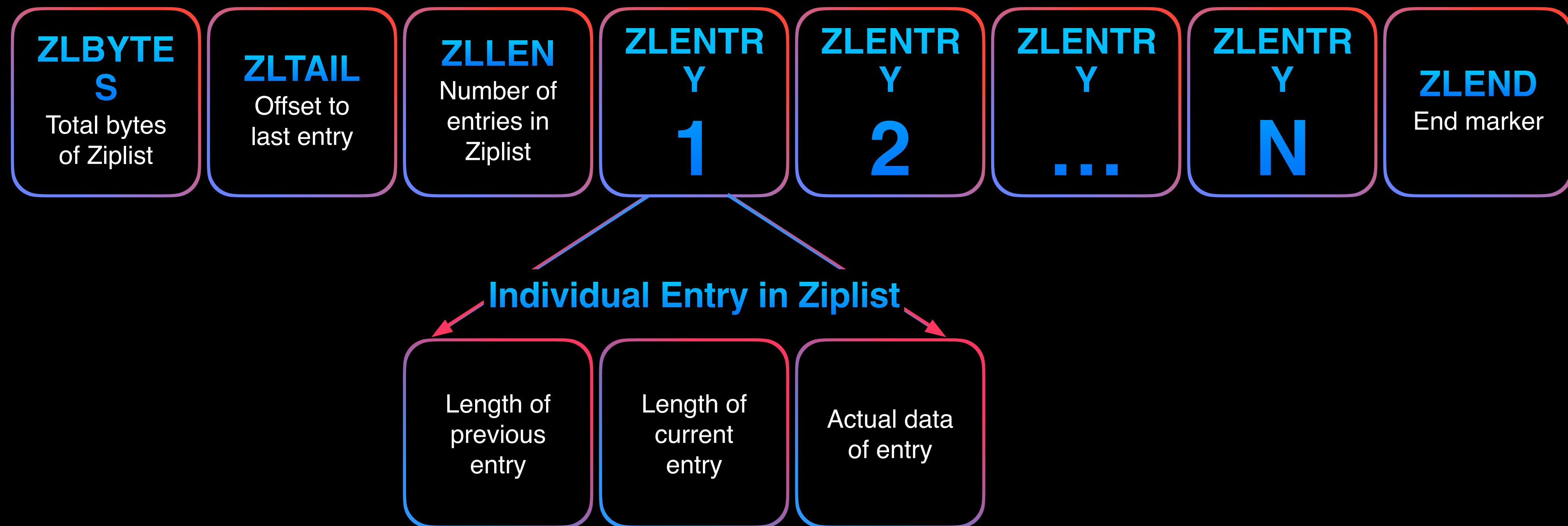
Source: https://rdb.fnordig.de/file_format.html

Encoding

- Lists (Small)
- Sets (Small)
- Hashes (Small)
- Sorted Sets (Small)

Ziplist Structure

Redis Version 6.x RDB Version 9



Source: https://rdb.fnordig.de/file_format.html#ziplist-encoding

Ziplist Structure

Redis Version 6.x RDB Version 9: Insert an entry

Increase data size -> 253+ bytes



ENTRY 3

entry2 len + entry3 len + entry3 data

ENTRY 4

entry3 len + entry4 len + entry4 data

ENTRY 5

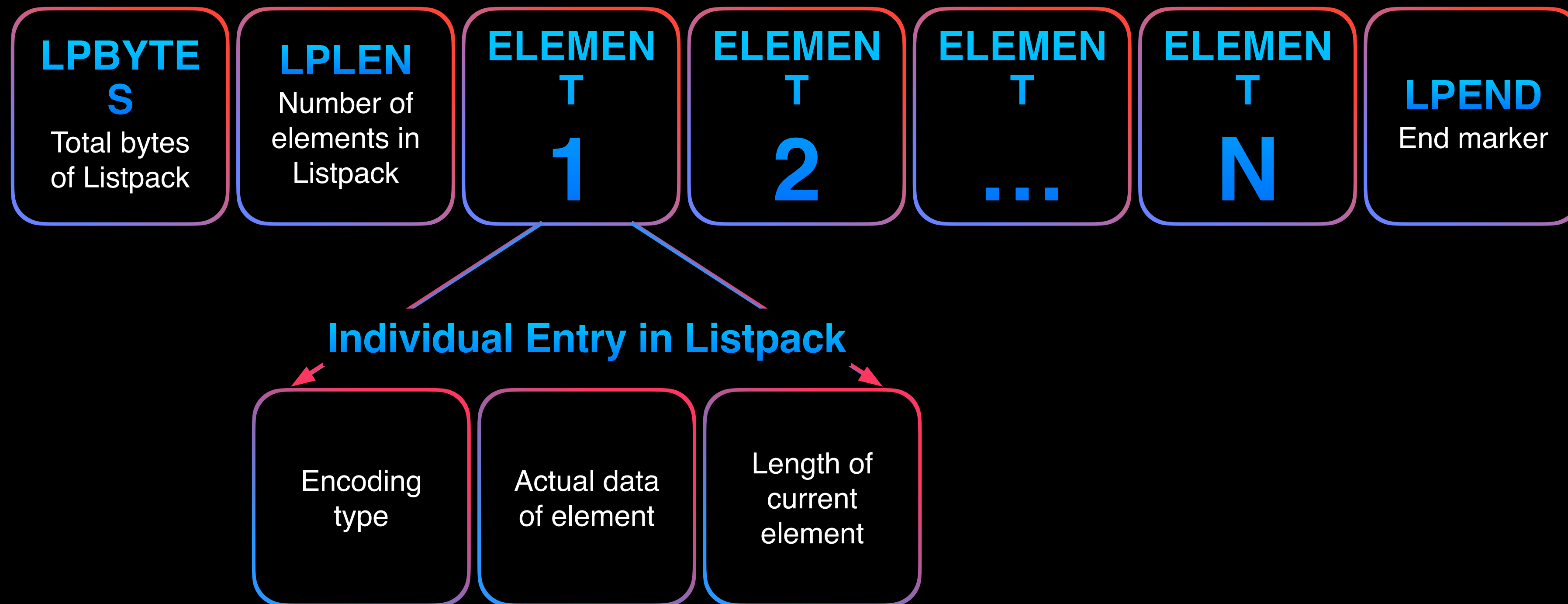
entry4 len + entry5 len + entry5 data

ENTRY 5

entry4 len + entry5 len + entry5 data

Listpack Structure

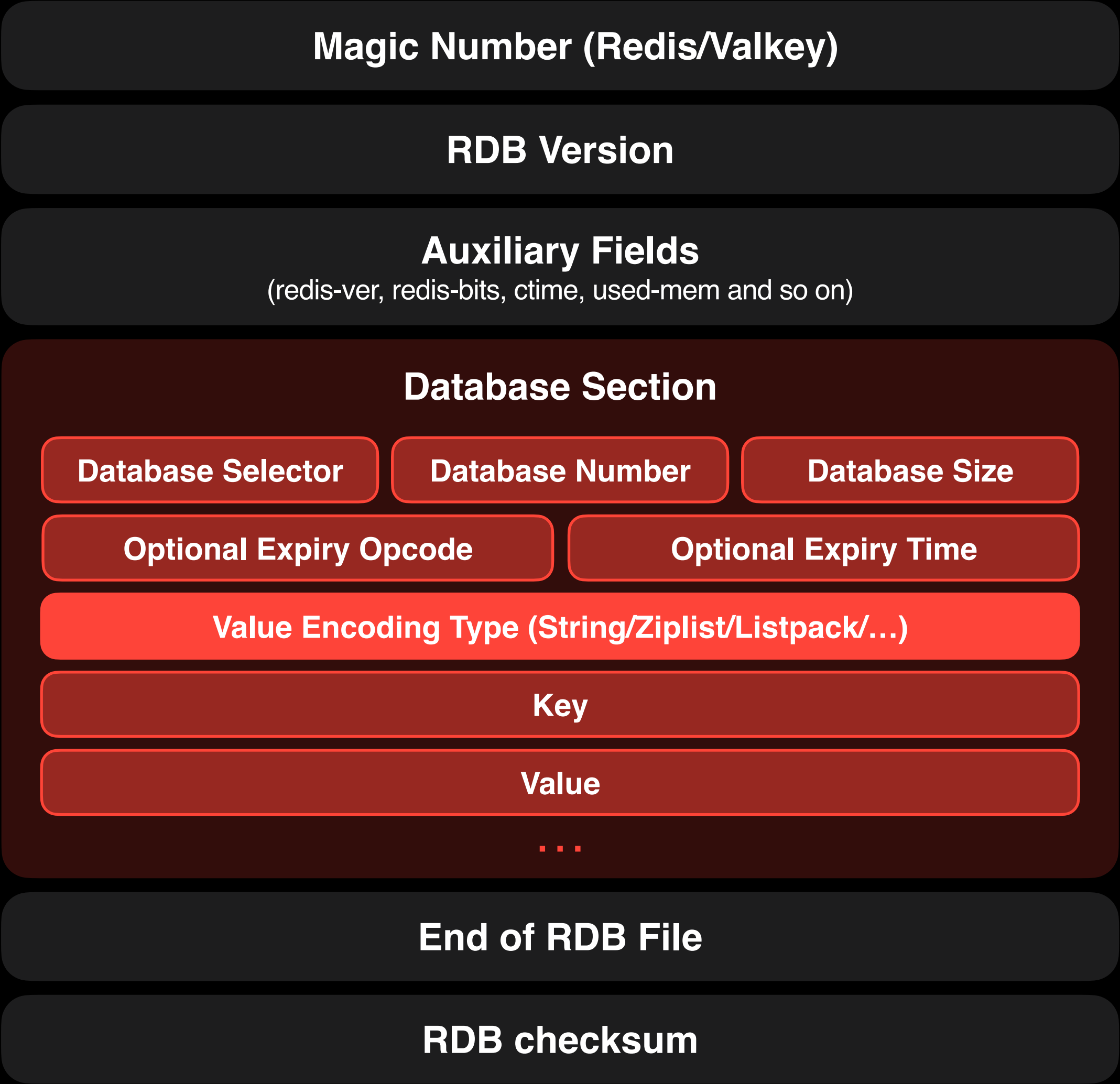
Redis Version 7.0 RDB Version 10



Source: <https://github.com/antirez/listpack/blob/master/listpack.md>

RDB Structure

Point-in-time-snapshot of in-memory data to disk



Source: https://rdb.fnordig.de/file_format.html

Enhance Redis for downgrade compatibility

Redis 6.x/7.0 (RDB 9/10) <—> Valkey 8.0 (RDB 11)

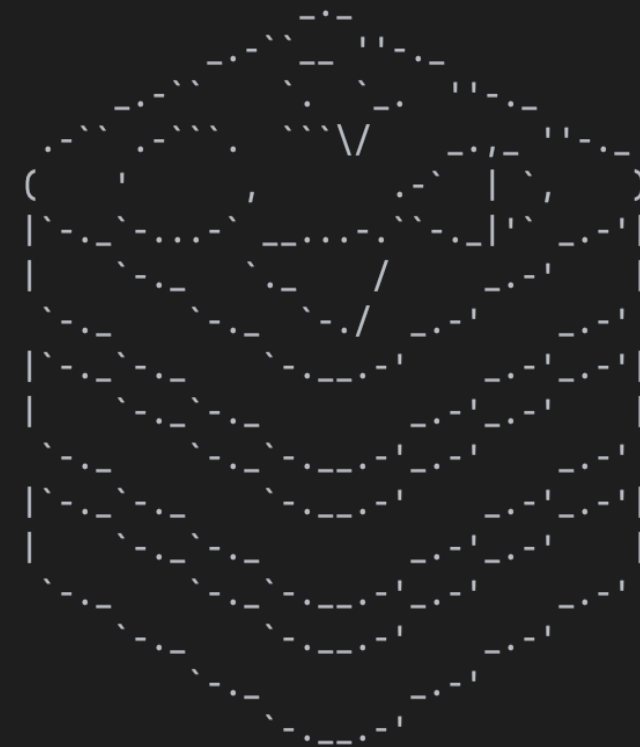


Version Compatibilities

Current Version	Target Redis 6.0	Target Redis 6.2	Target Redis 7.0	Target Redis 7.2	Target Valkey 8.0
Redis 6.0/RDB9	-	?	?	?	?
Redis 6.2/RDB9	?	-	?	?	?
Redis 7.0/RDB10	?	?	-	?	?
Redis 7.2/RDB11	?	?	?	-	?
Valkey 7.2/RDB11	?	?	?	?	?
Valkey 8.0/RDB11	?	?	?	?	?

[Solved] Downgrade incompatibilities

```
redis-core [redis-7.0.15] ./src/redis-server redis.conf --tls-port 17379 --port 0 --tls-cert-file /Users/satheesha/workspac
kspace/apple/valkey/utils/tests/tls/valkey.key --tls-ca-cert-file /Users/satheesha/workspace/apple/valkey/utils/tests/tls/ca.c
7334.crt --tls-client-key-file ~/Desktop/Redis/TLSCerts/narrative/rsa.keystore.4607334.key --tls-replication yes --loglevel de
15061:C 16 Jun 2025 12:56:28.380 # o000o000o000o Redis is starting o000o000o000o
15061:C 16 Jun 2025 12:56:28.380 # Redis version=7.0.15, bits=64, commit=5ecd6ca0, modified=1, pid=15061, just started
15061:C 16 Jun 2025 12:56:28.380 # Configuration loaded
15061:M 16 Jun 2025 12:56:28.380 . Configuring TLS
15061:M 16 Jun 2025 12:56:28.382
15061:M 16 Jun 2025 12:56:28.383 * monotonic clock: POSIX clock_gettime
```



Redis 7.0.15 (5ecd6ca0/1) 64 bit

Running in standalone mode
Port: 17379
PID: 15061

<https://redis.io>

```
15061:M 16 Jun 2025 12:56:28.384 # WARNING: The TCP backlog setting of 511 cannot be enforced because kern.ipc.somaxconn is s
15061:M 16 Jun 2025 12:56:28.384 # Server initialized
15061:M 16 Jun 2025 12:56:28.384 . The AOF directory appendonlydir doesn't exist
15061:M 16 Jun 2025 12:56:28.384 * Loading RDB produced by Valkey version 8.0.3
15061:M 16 Jun 2025 12:56:28.384 * RDB age 1801089 seconds
15061:M 16 Jun 2025 12:56:28.384 * RDB memory usage when created 1.38 Mb
15061:M 16 Jun 2025 12:56:28.384 - RDB: Successfully loaded a RDB_TYPE_SET_LISTPACK and converted to OBJ_ENCODING_ZIPLIST.
15061:M 16 Jun 2025 12:56:28.384 * Done loading RDB, keys loaded: 5, keys expired: 0.
15061:M 16 Jun 2025 12:56:28.384 * DB loaded from disk: 0.000 seconds
15061:M 16 Jun 2025 12:56:28.384 * Ready to accept connections
15061:M 16 Jun 2025 12:56:28.384 - DB 0: 5 keys (0 volatile) in 8 slots HT.
15061:M 16 Jun 2025 12:56:28.384 . 0 clients connected (0 replicas), 1099824 bytes in use
15061:M 16 Jun 2025 12:56:33.446 - DB 0: 5 keys (0 volatile) in 8 slots HT.
15061:M 16 Jun 2025 12:56:33.446 . 0 clients connected (0 replicas), 1099824 bytes in use
15061:M 16 Jun 2025 12:56:38.504 - DB 0: 5 keys (0 volatile) in 8 slots HT.
```

Redis 6.0: <https://github.com/valkey-io/valkey/pull/2549>

Redis 6.2: <https://github.com/valkey-io/valkey/pull/2550>

Redis 7.0: <https://github.com/valkey-io/valkey/pull/2551>