A short-term plan for Redis

@antirez - Pivotal

Redis is made of pieces

Transactions

Replication

Storage

Pub/Sub

API

Cluster

Scripting

CLI

Persistence

Sentinel

Networking

Evolution

- Redis can be analyzed as separated components. Most of them are modular.
- Evolution: adding or removing components.
- Evolution: altering existing components.

Mem storage

What it is.

- It organizes data into memory.
- Files: `dict.c`, `ziplist.c`, `zipmap.c`, `adlist.c`, `intset.c`, skiplist implementation.
- Effects: memory usage, cache locality, API
- Last changes: Redis object embedded string.

Mem storage

Possible evolution.

- Unrolled linked lists.
- Compressed Redis objects (Hi HTML!).
- Key space iterator (Hi Pieter!).

Persistence

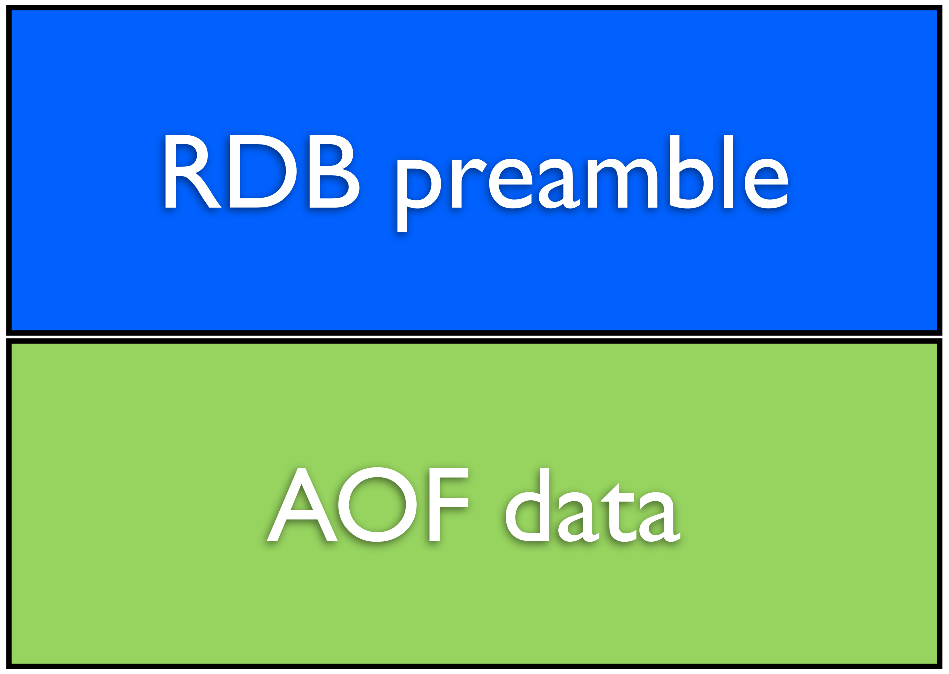
What it is.

- Dumps and loads RDB / AOF data on disk.
- Files: `rdb.c`, `aof.c`.
- Effects: durability, replication, startup speed, on-disk space efficiency.
- Last changes: COW memory reporting, CRC64, verbatim zipped values...

Persistence

Possible evolution.

- AOF and RDB format (not scope!) unification.
- Gain: Faster AOF rewrites and reloads, One format is better than two.
- dump.rdb, aof.rdb



Replication

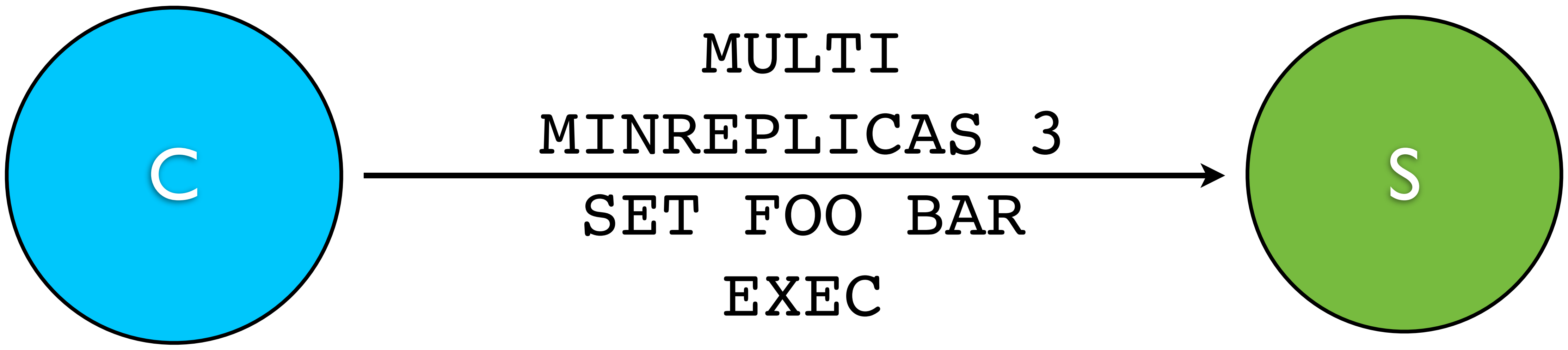
What it is.

- Asynchronous replication, finally able to incrementally resynchronize.
- Files: `replication.c`.
- Effects: durability, memory usage, availability, consistency.
- Last changes: PSYNC, Slave ACKs, deny writes when sensing less than N slaves.

Replication

Possible evolution.

- Synchronous replication.
- Gain: Consistency, a cluster nearest to a CP system.



```
MULTI
MINREPLICAS 3
SET FOO BAR
EXEC
```

Replication

Discarded evolution

- SYNC via AOF.
- In theory, you could avoid to create the RDB, and feed the AOF file if enabled.
- Discard reason: AOF rewrite requires to dump anyway. Systems that can't cope with slaves? This is the symptom not the illness.
- Also: PSYNC makes full resyncs less likely.

Transactions

What it is.

- Isolated execution of a group of commands.
- Files: `multi.c`.
- Effects: API, persistence, replication, scripting.
- Last changes: Refactoring only.

Transactions

Discarded evolution.

- Remove MULTI/EXEC since there is scripting.
- Discard reason: transactions are composable, don’t need to be fast (only linearizability, no serializability), good API building block for new features.
- There are a total of 19 commits on multi.c.

Pub/Sub

What it is.

- Fire and forget style Publish / Subscribe.
- Used for notification of internal events.
- Files: `pubsub.c`, `notify.c`.
- Effects: Events API, external tools bus, messages reliability.
- Last changes: Pub/Sub in Redis Cluster, Notification API.

Pub/Sub

Possible evolution.

- `HPUBLISH chan msg history_len`
- Snowflake-alike unique IDs for every message.
- API to subscribe & get history.
- Gain: Reliable Pub/Sub.

API IS JUST AN EXAMPLE :-)

Cluster

What it is.

- Automatic partitioning and failover.
- Files: `cluster.c`.
- Effects: Consistency, Resharding speed, Usefulness.
- Last changes: Complete implementation. Use of proper algorithms.

Cluster

Possible evolution #1.

- Non blocking `MIGRATE`.
- Semi-automatic resharding (currently it is assisted by `redis-trib` for every key moved).
- Gain: Faster reshardings with less impact on latency / availability.

Cluster

Possible evolution #2.

- Redis Cluster as an highly available AP store? (as an optional mode).
- The design is compatible with this idea.
- Type-based merge semantics.
- Gain: Ability to serve different use cases where availability is the first concern but values are small.

API

What it is.

- The set of exported commands.
- Short term plan: avoid bloating it, no new data types or command if not very general.
- Except for the iterator.
- Scripting is helping a lot (big adoption!).

Scripting

What it is.

- Server side execution of Lua scripts.
- Files: `cluster.c`.
- Effects: Speed, Applicability.
- Last changes: Replication of EVALSHA when possible.

Scripting

Possible evolution.

- Speed!
- Currently we dispatch Redis calls from Lua via the normal command execution path.
- What we can do: write direct implementations of notable commands.
- Gain: Reduce the execution time of scripts.

CLI

What it is.

- redis-cli command, basically.
- Files: `redis-cli.c`.
- Effects: User experience, observability, debugging.
- Last changes: --stat, --bigkeys, --pipe, --latency-history.

CLI

Possible evolution.

- Better way to test scripts: multi line editing, call scripts by name, ...
- Commands expansion. Example: `TYPE `RANDOMKEY``
- Better Redis Cluster support.
- Simplify working with many instances.

Stats and reporting

What it is.

- `INFO`, Slow log, Watchdog, `MONITOR`.
- Files: `replication.c`, `slowlog.c`, `debug.c`, `redis.c`.
- Effects: Observability, debugging, monitoring.
- Last changes: None important recently.

INFO

Possible evolution

- `INFO` is pretty bad: requires parsing, is slow. We need backward compatible changes :-(
- Proposal: tree alike properties.

```
INFO memory.used # get single field

INFO replication.slave.0.lag

INFO memory # today output
```

Redis Doctor?

Possible evolution

- Check latency of many operations.
- Store metrics as time series.
- Be able to tell the user if there are problems.
-
```
redis> DOCTOR
Probably disk is too slow:
45 recently delayed fsync()
RDB saving time 2 mb/sec
```

Sentinel

What it is.

- Automatic failover and monitoring.
- Files: `sentinel.c`.
- Effects: Availability, durability.
- Last changes: Beta implementation.

Sentinel

Possible evolutions.

- Sentinel is here to stay, but needs changes.
- Use Redis Cluster algorithms (versioned changes).
- Use persistent state like Redis Cluster.
- Or... just use Redis Cluster itself? Only enabling monitoring and failover.

Thanks!

for your attention

- Ask any question, there are no stupid ones.
- What changes you like most, what do you think is a bad idea?
- What changes do you propose?