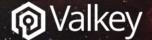
KEYSPACE

Customizing Valkey with Rust: Building High-Performance Modules

Dmitry Polyakovsky
Consulting Member of Technical Staff, Oracle Cloud. Lead Engineer for OCI Cache



About me

- Used Valkey/Redis for many years
- Oracle Cloud Cache Tech Lead
- Valkey Modules Rust SDK

Quick survey

- 1. Cache
- 2. Background job queue
- 3. Leaderboard
- 4. Session store
- 5. Autocomplete
- 6. Feature flags
- 7. Real time analytics
- 8. API throttling
- 9. Distributed Lock Management
- 10....

How many people have built modules?

- 1. C
- 2. C++
- 3. Rust

- Why build modules in Rust?
- Valley Module Rust SDK
- Valkey as a job queue



Why build modules in Rust?



Files

- valkeymodule.h
- module.c
- src/modules/*
- tests/modules/*
- runtest-moduleapi

New module

- ValkeyModule_OnLoad
- ValkeyModule_Init
- ValkeyModule_CreateCommand
- VALKEYMODULE_NOT_USED
- VALKEYMODULE_OK
- VALKEYMODULE_ERR



- Safety
- Ecosystem
- Valkey Modules SDK integrates with C

Questions

Valkey Modules Rust SDK

Valkey Modules Rust SDK

- valkeymodule.h
- valkey_module! macro
- Context
- Examples
- valkey-module-macros-internals
- valkey-module-macros

examples/*.rs

Client

- ctx.get_client_id
- ctx.set_client_username_by_id
- ...

Event Handlers

- examples/server_events.rs
- client_changed_event_handler
- shutdown_event_handler
- key_event_handler
- persistence_event_handler

Filters

Preload module validation

Validating / rejecting CONFIG SET

Optional custom config validation

Configuration

- init
- deinit
- module load path_to_file arg1 arg2 ...

crontab

enable-system-alloc feature

Useful for testing

Redis compatibility

• use-redismodule-api

Rust modules

- valkey-bloom
- valkey-ldap

Future of Valkey Module Rust SDK

- Callbacks
- Mock Context for unit testing
- Context in Filter
- ...

Contributors (in alphabetical order)

- dmitrypol
- hahnandrew
- KarthikSubbarao
- Mkmkme
- sachinvmurthy
- YueTang-Vanessa
- zackcam

Questions

Valq module

Q requirements

- at least once delivery
 - visibility timeout
 - consumer ack or extend message
 - max delivery attempts
- dead letter queue (DLQ)
 - retention period
- delayed queue

Structs

Commands

Persistence

- free
- rdb_load
- rdb_save
- aux_load
- aux_save

Replication

Background thread

Testing

- valkey-cli
- Unit
- Integration
- Code coverage

Benchmark

Questions

References

- https://valkey.io/blog/modules-101/
- https://valkey.io/blog/valkey-modules-rust-sdk-updates/
- https://github.com/valkey-io/valkeymodule-rs
- https://github.com/valkey-io/valkey-bloom
- Modules in Rust https://www.youtube.com/watch?v=c1E8jxWVfol
- https://redis.io/blog/using-the-redis-allocator-in-rust/
- https://code.visualstudio.com/docs/languages/rust
- https://hpatro.medium.com/visual-studio-code-setup-for-redis-2e15ff6a4a56