Cardano C - Close-out Report

About the Project

Name	**Bind-friendly C Library for Cardano**
Project URL:	**https://milestones.projectcatalyst.io/projects/1100037**
Project Number:	**1100037**
Name of Project Manager:	**Angel Castillo**
Starting Data:	**March, 2024**
Completion Date	**December, 2024**

Challenge KPIs

Cardano C is a feature complete, robust C library, this opens the door for the vast global community of C developers to build on the Cardano blockchain. As one of the most widely used programming languages in the world, C offers unparalleled reach across industries, platforms, and applications. With Cardano C, these developers now have the tools to integrate Cardano's powerful blockchain capabilities into their projects.

The library can be easily bound to numerous programming languages, such as Python, Java, C#, and Ruby, among others. This capability brings first-class support for Cardano to developers across diverse ecosystems, significantly expanding the reach and impact of the Cardano blockchain.

Project KPIs

1. Robust Feature Set

The library has full support for the protocol features up to Conway era, broadly, it provides:

- Address Parsing & Generation
- Ed25519 Cryptography
- Transaction Serialization & Deserialization
- Powerful Transaction Builder
- UTF-8 support, no global shared state, and flexible memory management make it threading-friendly and highly portable.

2. Platform Independence

Fully statically linked dependencies (libsodium, libjsonc, libgmp) ensure no runtime dependencies, the library is lightweight, can be compiled virtually on any environment (even resource-constrained environments).

The library first release include binaries for, Linux, Windows and Mac OS for the x86_64 and ARM64 platforms. However the library can be compiled to any architecture (as demonstrated by our CI workflow which compiled and runs the test suite of the library in a big range of platforms/operating systems).

3. Documentation and Usability

The library comes with comprehensive API documentation, and practical examples available at https://cardano-c.readthedocs.io/en/latest/ and https://github.com/Biglup/cardano-c/tree/main/examples

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Key Achievements

1. Full Feature Support for Cardano Protocol:

Developers can build any valid transaction and leverage advanced protocol capabilities, including Conway-era governance operations.

2. Commercial-Grade Quality:

Cardano C adheres to the rigorous MISRA 2012 standard. The library boasts over 8,000 unit tests, achieving a 93% overall code coverage coverage. It is also subjected to aggressive fuzz testing to uncover edge cases and potential vulnerabilities. Additionally, continuous integration (CI) pipelines are configured to run Valgrind alongside the unit tests, ensuring the code is free from memory leaks and other runtime issues. Significant effort has been dedicated to crafting comprehensive API documentation, making it easier for developers to understand and effectively utilize the library’s features.

3. Cross-Language Compatibility:

The binding-friendly architecture allows seamless integration with diverse programming ecosystems.

Key Learnings

Building Cardano C taught us a lot about what it takes to create reliable and flexible blockchain tools. Testing was a huge focus, over 8,000 unit tests, fuzzing, and Valgrind checks helped us catch issues and keep things stable. Writing clear documentation was another big focus; it's not just an extra step, but something that makes the library approachable for developers from all backgrounds.

Next Steps

Looking ahead, we're planning to expand Cardano C with several important features. This includes adding advanced coin selection strategies, integrating with more blockchain data providers like Maestro, Ogmios, and Kupos, and implementing native script execution cost budget computation with a C-based Plutus machine. We also aim to support more secure key handlers, such as Ledger and Trezor, to make the library even more versatile. Beyond these features, the next big step will be creating bindings for other programming languages, bringing Cardano C's capabilities to an even wider developer audience.

Final Thoughts

We hope that the community find in the Cardano C library a strong foundation for building blockchain applications. With its focus on quality, safety, and ease of use, it's set to become an important tool in expanding the Cardano ecosystem. By making it easier for developers using different programming languages to work with Cardano, the library helps improve the current dApp ecosystem and opens the door for future innovations.

Links

- **Source Code Repository:** https://github.com/Biglup/cardano-c
- **Documentation:** https://cardano-c.readthedocs.io/
- **IdeaScale Proposal:** https://milestones.projectcatalyst.io/projects/1100037
- **Link to Close-out video:** https://www.youtube.com/watch?v=NdU-Sy2LAsU