Scalus

DApps Development Platform

λantr

Version 1.1 - April 2025

Updates:
v1.1:

- New Section: Adoption – Outlines our approach to adoption and early engagement
- Roadmap: Timeline – Summarises the development timeline and it's alignment with Catalyst-funded projects

λantr

SCALUS DEVELOPMENT PLATFORM

Problem

λantr

Problem

Developer Experience: Make it easier to build DApps on Cardano L1/L2

Building DApps on Cardano remains harder than it should be. New developers need to invest a substantial amount of time to become productive. It makes Cardano less attractive to build on, and limits the ability to innovate and produce value to end users.

New developers face multiple obstacles:

1. Steep technical learning curve
2. Fragmented technology stack (on-chain/off-chain, front-end/back-end)
3. Limited development tooling and standard libraries
4. Scattered educational resources

In anticipation of the wider adoption of Cardano technology by traditional organisations (e.g., in finance and fintech, where Java and Scala are dominant), it should be simpler for their web2 developers to start building on Cardano. Companies need a smooth path for their existing teams — without the need to learn new programming languages or hire specialists just to get started.

SCALUS DEVELOPMENT PLATFORM

Solution

λantr

Solution

Scalus - DApps Development Platform for Cardano

Developing DApps on Cardano shouldn't require juggling multiple languages, libraries and frameworks.

Scalus changes this by bringing the power of Scala 3 to the Cardano ecosystem, supporting:

- full-stack DApp development - on-chain, off-chain, and application layers
- complete development flow - setup, development, testing, debugging and deployment

... backed by an industry-grade toolset and great development experience.

Scalus is a Cardano DApps development platform made for professionals and businesses who want to get things done.

scalus

λantr

Solution

Why Scala 3?

Scala 3 is a modern functional programming language, well-suited for building fast, concurrent, and distributed systems with its JVM, JavaScript, and Native (via LLVM) runtimes.

People around the world trust Scala for creating services, processing data, scripting utilities, front-end applications — and now blockchain development!

Big names like Klarna and Stripe lean on Scala to keep payments and transactions running smoothly, while banks like Morgan Stanley and Deutsche Bank tap into it for fast analytics and trading platforms. Scala has earned trust across tech and finance, proving it can handle tough, real-world challenges.

Solution

Cardano Roadmap 2025: Dev Experience

Scalus supports Cardano's 2025 Roadmap by improving the Development Experience, addressing the following sub-goals:

- Simplifies and unifies Cardano development tooling
- Builds libraries for JVM/JavaScript/Native platforms to simplify blockchain interactions
- Accelerates the DApp development cycle
- Promotes local nodes to support querying and transaction building
- Eases onboarding of professionals and businesses into DApp development

Solution

Benefits for professionals

Scalus meets developers where they are. It bridges Web2 engineers from traditional firms with progressive onboarding and built-in safety, while giving seasoned Cardano builders advanced control and optimisations.

Web 2 developers:

- Familiar dev experience & tooling using Scala
- Elegant syntax with gentle learning curve of blockchain specifics
- Built-in safety controls to reduce common mistakes and risks

Cardano builders / R&D Labs:

- Low-level optimisations (memory, cost, advanced patterns)
- Expressiveness beyond limited DSL
- Advanced features (macros, meta-programming)
- Rich Scala ecosystem for complex protocols and mission-critical solutions

Solution

Benefits for businesses

Scalus, paired with Scala 3, helps businesses build on Cardano without the usual headaches. It’s a practical way to deliver value quickly and reliably.

Benefits:

- Productivity boost at scale with Scala 3
- Reduced time-to-market - from prototyping to production in less time
- Deep pool of Scala/Java/Kotlin talent available on the market
- Code quality and safety are first-class citizens
- Reduced training investments to transition Scala/Java/Kotlin teams to blockchain

SCALUS DEVELOPMENT PLATFORM

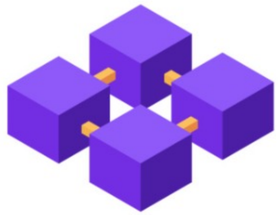
Full-stack Development

λantr

Key features

Full-stack Development

Scalus development platform covers a full-stack of Cardano DApp development.



Cardano Smart Contracts

scalus

Application development
with Scala 3

Off-chain toolset
(txBuilder, evaluation, etc)

λantr

Key features

Write Cardano Smart Contracts in Scala 3

Scalus brings Scala 3 to Cardano smart contract development.
It's direct. It's robust. It gets the job done.

- Scala's edge — a powerful functional language with great dev experience
- Strong typing — catch mistakes early, write reliable code
- Elegant syntax — turn Cardano logic into something you can actually read
- Versatile — suits beginners and seasoned Cardano buidlers alike

This means reliable contracts, built quickly and right.

Scalus supports Plutus V1, V2, and V3 built-ins with a rich standard library. Ready for L2 expansion (Midgard, Hydrozoa, Hydra)

```
object HelloCardano {
    def validator(scriptContext: Data): Unit = {
        val ctx = scriptContext.to[ScriptContext]
        ctx.scriptInfo match
            case SpendingScript(_, datum) ⇒
                val owner = datum.getOrFail("Expected datum").to[PubKeyHash]
                val signed = ctx.txInfo.signatories.contains(owner)
                require(signed, "Must be signed")
                val saysHello = ctx.redeemer.to[String] == "Hello, Cardano!"
                require(saysHello, "Invalid redeemer")
            case _ ⇒ fail("Must be spending")
    }
}
```

λantr

Key features

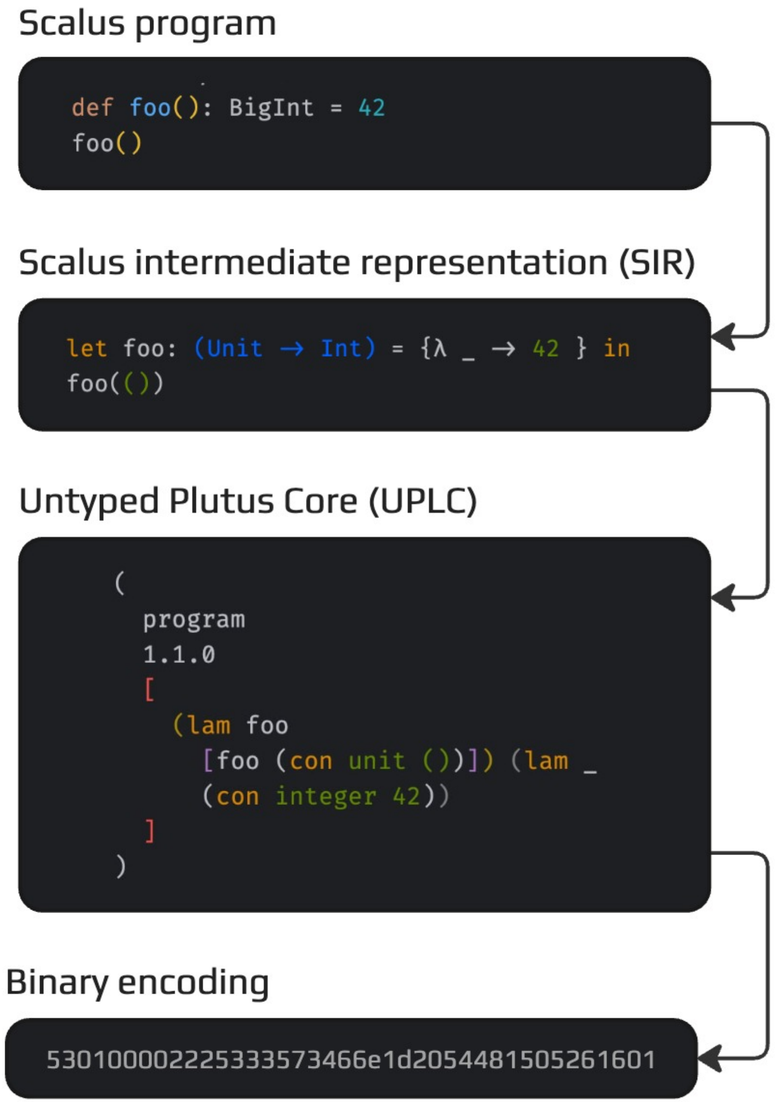
Scala 3 to UPLC (with advanced features)

Scalus compiles a subset of Scala 3 code to UPLC. It intelligently optimises your code, producing efficient smart contracts:

- minimises execution budget — lowering transaction fees
- reduces validator size — crucial for complex applications

Experienced builders have a fine-grained control over the generated on-chain code. It provides:

- custom optimisation pipelines (inliner, debug elimination)
- type-safe UPLC expression builder (à la Plutarch)
- interaction with a readable intermediate representation — SIR
- UPLC parser, pretty printer
- Scala macros, pattern-matching and more



λantr

Key features

Building and evaluating transactions off-chain

Scalus offers the tools necessary for building and evaluating transactions before submitting them to the blockchain.

- CBOR serialisation/deserialisation
- Plutus script evaluation and execution budget calculation
- transaction building
- and more (e.g., ledger rules).

One of Scalus key advantages is library support for major modern platforms, including JVM, JS/TS and Native via LLVM:

- Eliminates the need for WASM and intermediate solutions, simplifying Cardano interactions
- all from the same code - cuts the maintenance costs and ensures consistency.

λantr

Key features

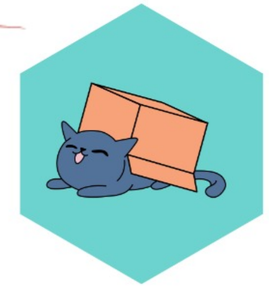
Full-Stack Development with Scala 3

Scala is well-positioned for building fast, concurrent, and distributed systems:

- Financial Systems: Scala is a go-to language for financial modelling and trading systems (e.g., Morgan Stanley in complex financial computations)
- Distributed Systems: concurrent, fault-tolerant, and high-load systems (Walmart in inventory management, Disney Streaming)
- Big Data: Apache Spark makes it ideal for processing large-scale datasets efficiently (Twitter and LinkedIn in real time analytics)

It enables developers to share data structures, validation logic, and utility functions across all decentralised application components.

It opens access to vast Scala/Java ecosystem and a multitude of industry proven engines for back-end and front-end development.



Scala.js

kafka

Laminar

APACHE Spark™

λantr

SCALUS DEVELOPMENT PLATFORM

Complete development flow

λantr

Development experience

Complete development flow

Scalus covers the full cycle of the DApp development process:

1. Set up development environment with one command
2. Bootstrap DApp from a selection of templates
3. Explore the whole DApp in one project (smart contracts, transaction building, business logic, server/client, etc)
4. Deliver high-quality code with unmatched IDE support
5. Test with unit, integration, property-based testing
6. Debug your solution on a testnet
7. Build and deploy to mainnet

Development experience

Your DApp in one project

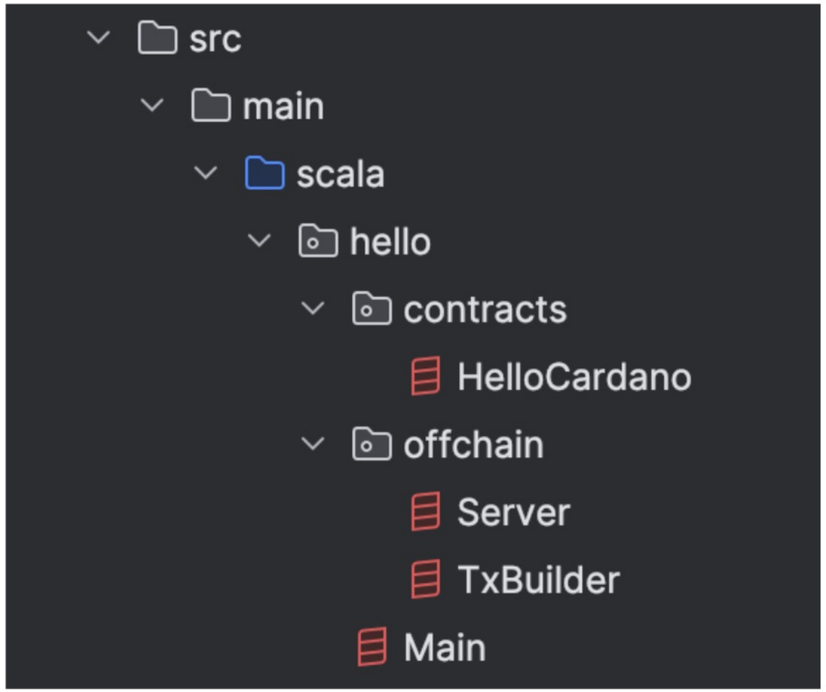
We want developers building now, not spending days figuring out how to set up the environment or bootstrap the project.

Scalus takes care of all the hassle:

1. One-line development environment setup
2. One-command project bootstrap

Select from a collection of templates to suit your case, extend it as you start building.

Scalus puts your DApp in a single project, no more need to switch between smart-contract, off-chain code and your application.



Development experience

Unmatched IDE support

Scalus leverages the rich IDE support (IntelliJ, VS Code, Vim, etc).
It unlocks productive development, with:

- code highlighting, autocomplete, linting, X-Ray mode
- code navigation across the whole DApp project
- search everywhere, find usage features

... ai-assistance (trained on millions of Scala lines of code)

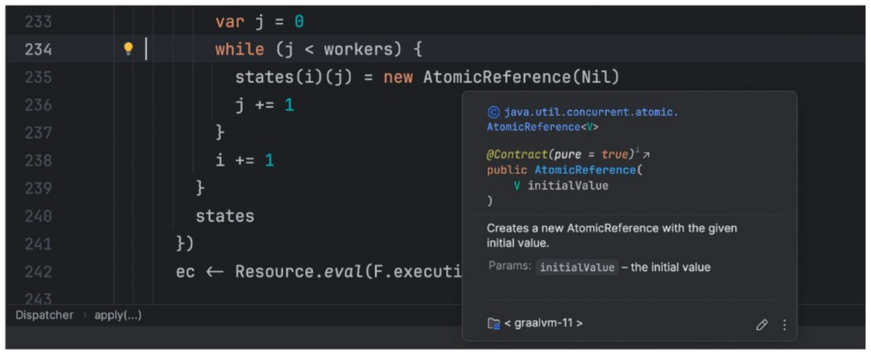
- full line code completion
- Copilot via Scala MCP

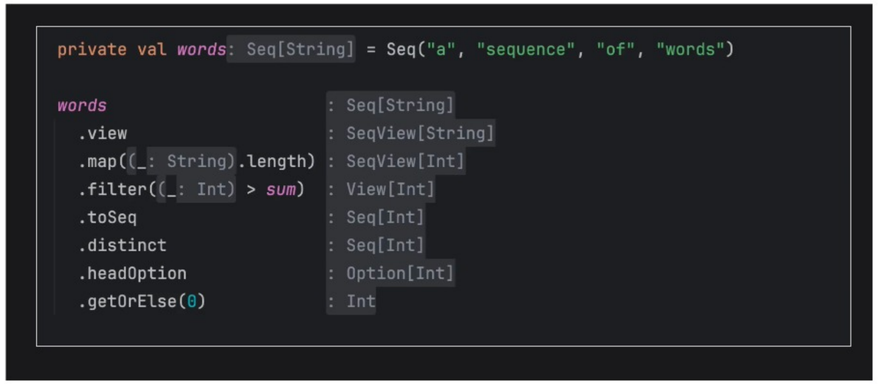
... collaboration, code review with

- Code with me

and more...

JetBeans in collaboration with ScalaCentre offers IntelliJ Ultimate Free OpenSource licences!





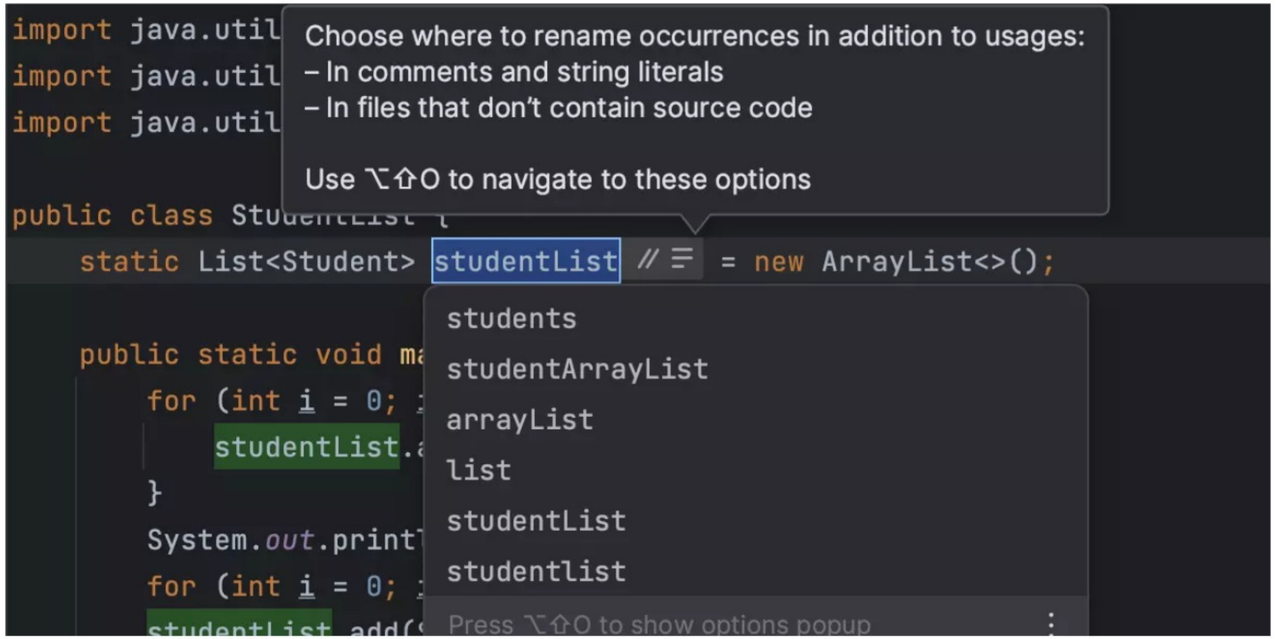
λantr

Development experience

Deliver high-quality code

Craft quality code easily, minimising bugs and technical debt. IDE handles troubleshooting and polishes your code to perfection, letting you focus on building new features and driving innovation.

- Project-wide refactoring
- Working debugger!
- Inspections and context actions
- Call hierarchies
- Detection of code duplicates
- and more...



λantr

Development experience

Zero error tolerance / Test-driven development

Scalus backs test-driven development with a type-safe language. Errors don’t stand a chance.

Quality toolkit:

- Trusted testing frameworks - MUnit, ScalaTest, Scala Check
- Formal verification with Stainless verifier
- Code coverage and profiling available from IDE
- Continuous testing - running the tests after every code change
- Property-based testing
- Set of blockchain specific testing helpers with Scalus Test Library

```
test("success when payments are correctly split") {
    val context = makeScriptContext(scriptHash).toData
    val payees =
        List(List(hex"1234567890abcdef1234567890abcdef1234567890abcdef12345678")).toData
    val program = compile(PaymentSplitter.validator).toUplc().plutusV3 $ payees $ context
    val result = program.evaluateDebug
    assert(result.isSuccess, clue = result.toString)
    assert(result.budget == ExBudget(ExCPU(1060906), ExMemory(44061)))
}
```

```
PaymentSplitterSpec:
- success when payments are correctly split
Run completed in 298 milliseconds.
Total number of tests run: 1
Suites: completed 1, aborted 0
Tests: succeeded 1, failed 0, canceled 0, ignored 0, pending 0
All tests passed.
```

Development experience

Debugging with your local Cardano L1/L2 networks

Scalus connects to the local node, pre-configured for you, so you don't need to set up anything. Just run your tests.

In MVP version (2025) includes the integration with Yaci dev tools for faster development cycles and proof-testing in real-life conditions.

Future versions will add support for test datasets, epochs, and L2 protocols like Midgard, Hydrozoa, and Hydra.

λantr

SCALUS DEVELOPMENT PLATFORM

Adoption

λantr

Adoption

Enabling adoption

Friends & Partners

When: January - March 2025

Pre-requirements:
- Production ready Smart Contracts with Scala 3
- Compiling to UPLC (Plutus v1, 2, 3)
- Basic documentation + Starter Kit

Who:
- One R&D Lab (friends)
- Two businesses (partners)

How:
- Dedicated demonstrations
- Personalised support + assistance

Results:
- Serious traction to Scalus platform
- Several collaborations and projects
- Valuable feedback about syntax, standard library and next features

Early Adopters Club

When: April - June 2025

Pre-requirements:
- Key issues addressed from the Friends & Partners phase

Who:
- Web2 Java/Scala developers
- Seasoned Cardano builders motivated to try Scalus

How:
- Cardano Foundation - Demo: 11/04
- Builder Fest 2 - Practical Workshop - 24/04
- IOG - Demo: to be defined

Scalus Club: https://form.typeform.com/to/XQhDPGGH
- Up to 10 developers ready for close collaboration with Scalus team
- Early access to features, early feedback
- Frequent demonstrations (every 2 weeks)

Wider adoption

When: June 2025

Pre-requirements:
- Positive feedback from the Early adopters
- Financing for the maintenance & support

Who:
- Developers (web2 and Cardano builders)
- Businesses

How:
- Frequent delivery of new features (2-4 weeks)
- Monthly open demo sessions
- Github / Discord support
- Personalised assistance for businesses*

λantr

Adoption

Early adoption

Scalus is currently in the early adoption phase, emphasising close collaboration with the selected partners (individuals & businesses).

Solutions in development with Scalus:

- Hydrozoa L2 - an evolution of the Hydra Head protocol (full stack development, node, networking, L2 ledger rules, transaction building)
- Innovative L2 protocol - block producing node MVP and related components
- Lucid Evolution - an alternative Scalus native JS implementation of serialisation/deserialization functions
- Script evaluation and cost calculation libraries used by the Cardano Foundation
- Cardano Client Lib (Java TxBuilder library) - an integration with the Scalus Smart Contracts evaluator

Two businesses participated in the early adoption program:

- Guild1 - expressed the interest in using the platform for future projects
- Proof Space Trusted Identity - Implemented one of their components using Scalus

Adoption

Early adopters and partners speak about Scalus

Ilia Rodionov
@iliarodionov

We decided to use Scalus as the foundation for building Hydrozoa L2 solution for Cardano - a project of @SwiftlyUnmoving from Catalyst Fund 12. We believe Scala can significantly boost development by providing an excellent dev experience.

6:10 PM · Apr 8, 2025 · **156** Views

Satya || $satran004
@satran004

Scalus Tx Evaluator is now our preferred way to do offline script cost evaluation in Java.
While CCL Java also supports this through Aiken lib via native/JNI calls, Scalus just works out of the box... no native calls needed (Scala and Java both run on JVM).

Scalus opens up a big opportunity for Java devs to build Cardano smart contracts and integrate with offchain code... all while using familiar tools like IntelliJ.

8:30 AM · Apr 13, 2025 · **328** Views

George Flerovsky
@SwiftlyUnmoving

Hydrozoa project: we're all-in on Scalus. We were very impressed by a Scalus demo in early Feb, so we adopt it when we kicked off development in mid-Feb.

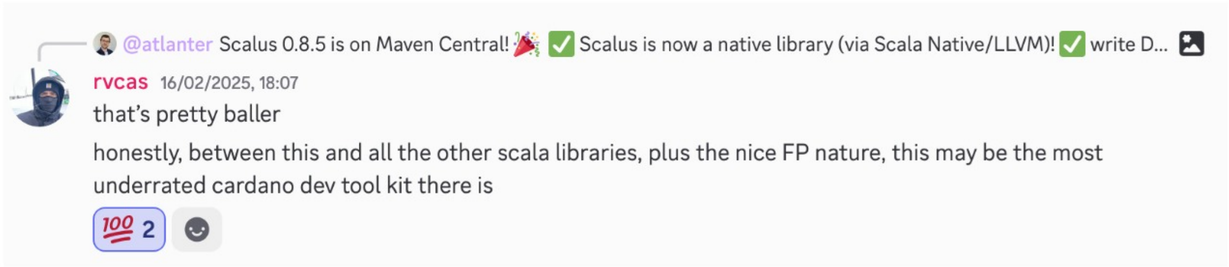
The progress that we've achieved with these tools in the almost two months since then exceeds anything I've seen before!

4:10 PM · Apr 11, 2025 · **73** Views

Jonathan
@solidsnakedev

Scalus is one of the most promising frameworks for our ecosystem, strong statically type system and impressive performance!

4:34 PM · Apr 9, 2025 · **161** Views



SCALUS DEVELOPMENT PLATFORM

Roadmap 2025: What's next?

λantr

Roadmap 2025

Timeline

Inception

scalus

Fund 11
on-boarding - March, 2024
Project Catalyst

Total: 328k ADA, approx. 150k USD
Project 1 + Project 2

Smart Contracts with Scala 3

Production-ready version already includes:

- Writing Cardano smart contracts in Scala 3
- Compiling them into UPLC (Plutus v1, 2, 3)
- Multi-platform support (Scala/Java/JS/Native):
  - script evaluation and cost calculation
- Developing with unmatched IDE support
- Basic documentation and Starter Kit

Fund 13
on-boarding - January, 2025
Project Catalyst

Total: 100k ADA, approx. 60k USD
Project 3

DApp Development Platform

Full-stack DApp Development

- (A)TDD for Smart Contracts development
- Building and evaluating Transactions off-chain
- Advanced UPLC optimisations
- Integration with application layers

Full cycle of the development process

- Easy setup
- Accelerated development cycle

Onboarding materials + v2 documentation

Budget proposal
period covered - June-December 2025
CARDANO

Total: 657,692 ADA, 427,5k USD
Proposal

λantr

Roadmap 2025

Q1-Q2 2025

Production-ready version contains following capabilities:

- Writing Cardano smart contracts in Scala 3
- Compiling them into UPLC (with support for Plutus v1/2/3, standard library)
- Multi-platform support from a single codebase (Scala/Java/JS/Native):
    - providing script evaluation and cost calculation
- Supports an end-to-end development cycle with existing Cardano toolset
    - initiation – IDE support – testing – integration
- Basic documentation and Starter Kit

Development is supported by Catalyst:

- Fund 11: Scalus – Scala implementation of Plutus
- Fund 11: Multiplatform Script Cost & Evaluation Library
- Fund 13: Scalus: Multiplatform Tx Builder

Roadmap 2025

Q3-Q4 2025

We will bring the MVP of Cardano DApps Development Platform by the end of 2025.
Our methodology allows us to deliver features progressively and improve from the customers feedback.

1. Full-stack DApp Development
    - Writing Smart Contracts
    - Using Advanced UPLC optimisations
    - Building and evaluating Transactions off-chain
    - Combining it with the application written in Scala 3
2. Full cycle of the development process
    - Easy setup in no time
    - Bootstrapping DApp project
    - Developing with unmatched IDE support
    - Testing for quality and security
    - Debugging in testnet
    - Deployment to mainnet

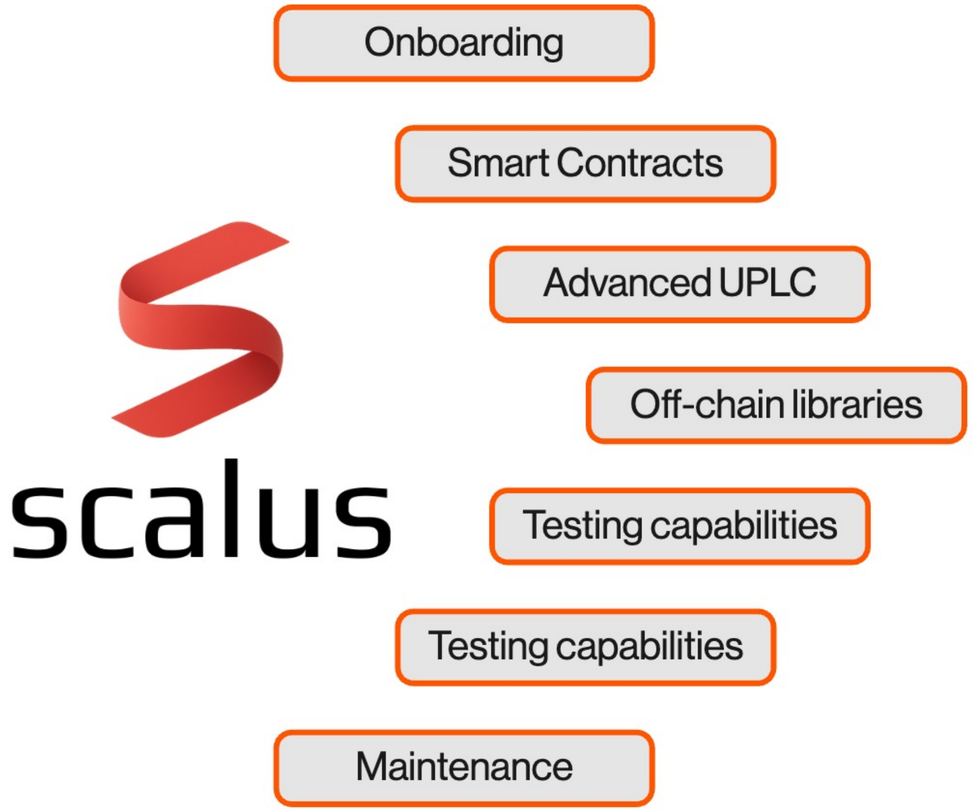
Scalus - Cardano DApps Development Platform

Code	Title	Description	Delivery	
			Q3 2025	Q4 2025
ONB	**Onboarding**			
ONB1	Documentation & Onboarding tutorials		x	
ONB2	Smart Contracts Catalogue - Design Patterns / Rosetta		x	x
ONB3	Automated setup		x	
ONB4	DApp templates for various cases		x	x
SC	**Smart Contracts**			
SC1	Smart Contract - Syntax tunning		x	
SC2	Standard library - Enrichment		x	x
SC3	Blueprint integration / CIP-0057		x	
ADV	**Advanced UPLC**			
ADV1	Typed UPLC expression builder - Enrichment		x	x
ADV2	Advanced script optimisation & control paths		x	x
ADV3	Optimised pattern matching		x	
ADV4	Scala macros for advanced contracts			x
MPL	**Off-chain libraries**			
MPL1	Serialisation / deserialisatin		x	
MPL2	Transaction builder - Enrichment			x
MPL3	Evaluation & cost function		x	
MPL4	Domain objects & ledger rules			x
MPL5	Bindings for JS/TS/Native - Tunning		x	x
TEST	**Testing capabilities**			
TEST1	Scalus Test library - Enrichment		x	
TEST2	Property-based testing - ScalaCheck helpers for Cardano developement			x
INT	**Integration / Deployment**			
INT1	Local Cardano network/node infrustructure		x	
INT2	Comprehensive CLI			x
INT3	Working with test data			x
INT4	Toolkit for effective deployment of Smart Contracts			x

λantr

Roadmap 2025

Estimation



Scalus - Cardano DApps Development Platform

Code	Title	Estimated, FTE	Secured, FTE	Final ask, FTE
ONB	Onboarding	0,5	0,25	0,25
SC	Smart Contracts	1	0,25	0,75
ADV	Advanced UPLC	1	0,25	0,75
MPL	Off-chain libraries	0,5	0,25	0,25
TEST	Testing capabilities	0,5	0	0,5
INT	Integration / Deployment	0,5	0	0,5
MAN	Maintenance	1	0	1
PM	Product management	0,5	0	0,5
	TOTALS	5,5	1	**4,5**

Estimated resources required for 6 months period:

- Senior Scala engineers: 5 FTE
- Senior Product manager: 0,5 FTE

Resources and funding already secured:

- Senior Scala engineers: 1 FTE

Additional effort required:

- Senior Scala engineers: 4 FTE
- Senior Product manager: 0,5 FTE

λantr

Budget

Scalus - Cardano DApps Development Platform

Code	Title	Description	Final ask, FTE	Budget, USD	Budget, ADA
ONB	Onboarding	Automated dev env setup, Documentation, Smart Contracts Catalogue	0,25	$23 750	₳36 538,46
SC	Smart Contracts	Simple syntax, standard library, blueprint implementation	0,75	$71 250	₳109 615,38
ADV	Advanced UPLC	Advanced optimisations, Expression builder, pattern matching, macros	0,75	$71 250	₳109 615,38
MPL	Off-chain libraries	Exportable multi-platform library (JVM/JS/TS/Native)	0,25	$23 750	₳36 538,46
TEST	Testing capabilities	Scalus Test library, Property-based testing enablers	0,5	$47 500	₳73 076,92
INT	Integration / Deployment	Local network/node for testing, Deployment to mainnet	0,5	$47 500	₳73 076,92
MAN	Maintenance	Maintenance, bugfixing and support	1	$95 000	₳146 153,85
PM	Product management	Management of the product lifecycle	0,5	$47 500	₳73 076,92
		TOTALS	**4,5**	**$427 500**	**₳657 692,31**

We are projecting 6 months of development and maintenance (starting from June 2025 to the end of the year).

All the scopes are estimated in FTE (Full Time Employee). For the sake of evaluating the budget, we took the assumption that one Senior Scala Engineer / Senior Product Manager with expertise in DLT (Distributed Ledger Technology) is valued at $190k (recruitment, onboarding and extra costs related to working – i.e paid vacations, sick leave – are considered included in the $190k figure).

SCALUS DEVELOPMENT PLATFORM

Lantr R&D Labs

λantr

Lantr R&D Labs

Our Vision & Strategic plan

We are passionate about the idea of making Cardano a default financial operating system of tomorrow's society.

Our plan consists of 3 steps:

1. Enhancing dev experience to improve productivity and simplify onboarding for mainstream developers.
2. Addressing scalability and interoperability to support adoption.
3. Building decentralised financial applications to make open trade available for everyone.

Alexander Nemish
Founder and CTO at Lantr

Oleksii Khodakivskyi
Co-founder at Lantr

λantr

Three pillars

λantr

Deep expertise & Talents

Technical Excellence & Safety

Product Development
with Scrum / LeSS

Lantr R&D Labs

Deep expertise & Talents

Our strength is real people with serious skills behind Scalus. We're a crew of seasoned professionals who've wrestled with Cardano, Scala 3, and big enterprise projects — and have come out on top every time. You're getting a team that's been there, done that, and is ready to nail your critical work.

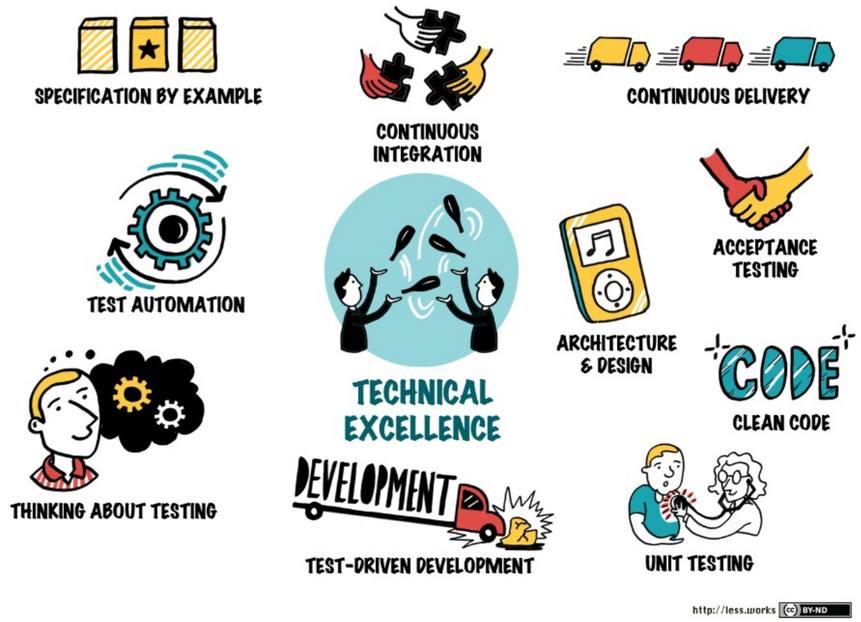
Alexander Nemish is a seasoned software engineer with a specialized focus on functional programming, type theory, meta-programming, compilers, and blockchains. His expertise is underscored by his proficiency in languages such as Scala, Haskell and Rust.
Alexander has a robust professional background, having worked for prominent financial organizations like Deutsche Bank and UBS.
Alexander Nemish is a former engineer at IOG, the engineering company behind the Cardano blockchain. He worked on the design and implementation of Marlowe – a new financial smart contracts programming language for Cardano.
As a Founder and CTO at Lantr, he focuses on advancing Scala/JVM based infrastructure for Cardano L1/L2.

λantr

Lantr R&D Labs

Technical Excellence & Security

Our technical excellence and security come from sticking to modern engineering practices. We use test-driven development, continuous delivery, clean code, and automation to build DApps that are rock-solid and easy to maintain. This means businesses get secure, high-quality solutions delivered fast, with no shortcuts or slip-ups.



Ruslan Shevchenko, Ph.D, is a Software Architect with focus on building reliable software systems in Fintech, Blockchain and Code Analysis domains. His expertise is underscored by his proficiency in languages such as Scala, Java, C++ and Rust.

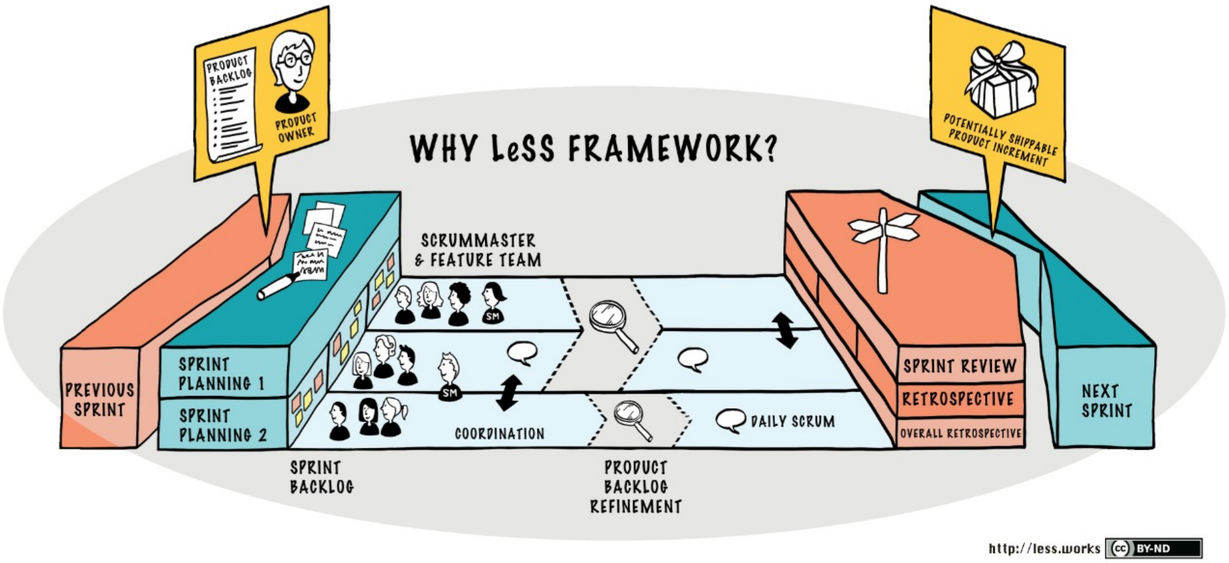
Roman Hulenko - Lead Scala developer, passionate about blockchain development and advancements in AI.
C++, Scala, Java and Deep Learning Engineer

λantr

Lantr R&D Labs

Product development with Scrum / LeSS

The third pillar is our product development methodology, based on the deployment of Professional Scrum. We prioritise a customer-centric approach and working closely with customers and users. Combined with short iterations (1-2 weeks) and continuous delivery, this activates a frequent feedback loop.
Our adaptability to change & feedback, transparency and unstoppable drive for improvement, ensure that we deliver what is valuable in time.



Oleksii Khodakivskyi, a co-founder at Lantr, a seasoned professional with over 10 years in various leadership positions, specialising in modern product development, business agility, and organisational design.

He’s successfully led the growth of multiple product development scale-ups in Europe (communication, real estate and fintech sectors).

λantr

Thank you

λantr

Visit: https://scalus.org/
Join Lantr Discord