RCHAIN
COOPERATIVE

RChain Developer's Conference

Spring 2018

RCHAIN

SCALABLE, SECURE, SUSTAINABLE

April 2018 Developers Conference

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If you have any questions or requests, please contact events@pyrofex.net

The April 2018 RChain Developers Conference was organized by Pyrofex.

Welcome!

Dear RChain Developer,

What got you into development? What keeps you writing code? What creates that spark of amazement and wonder? For me it was the recognition that the proof is in the code, literally! In computer science there is this amazing result known as the Curry-Howard isomorphism that began as a small, almost offhand observation made by Haskell Curry and William Howard that formulae in a particular kind of logic (known as Intuitionistic Logic) corresponded to types in an idealized functional programming language (known as the simply typed lambda calculus). As computer scientists and logicians began investigating this, they noticed that the idea just kept getting deeper and deeper. It wasn't just that formulae and the types that were isomorphic, it was that the process of proof normalization (getting rid of the application of implications to their hypotheses) corresponded to the process of evaluating programs in this idealized functional language.

This turned out to be an even deeper result when several decades later J-Y Girard discovered Linear Logic and the same correspondence turned out to be present in the proof systems and programming languages that grew out of that work. What was especially exciting about this development was that Linear Logic included notions of parallelism and resource sensitivity that were simply not present in the functional setting, which is decidedly sequential and copies resources with abandon. Samson Abramsky changed the direction of my career when he published Computational Interpretations of Linear Logic in which he developed the correspondence first for Intuitionistic Logic and then Intuitionistic Linear Logic (the resource sensitive, but more or less sequential version of Linear Logic) and then for Classical Linear Logic. In this he repeats the process of going from a logic to a programming language to a virtual machine three times, each time revising the operational semantics of the programming model from functional, to resource-sensitive functional, to concurrent; and each time providing a typed programming language with a sound and complete type system and a virtual machine all of which are correct by construction!

About the same time Robin Milner was discovering the π-calculus, a calculus meant to be for concurrent computing what lambda calculus was for sequential computing. And in this context both Samson and i intuited independently the idea that proofs ought to correspond to processes. This lead me to envision a smart contracting language for the Internet that was built on top of a correct-by-construction platform. My first attempt at this was XLang, the process orchestration language built directly from the asynchronous π-calculus that powered Microsoft's BizTalk Process Orchestration and seeded W3 standards ranging from WSDL to WS-Choreography, and launched the whole business process wave in the early 2000's. Yet, this was very far from my vision, because most of these offerings, including BizTalk, were decidedly centralized, hub-and-spoke architectures due to the fact that the market didn't yet grok the importance of decentralized computational infrastructure.

Enter the blockchain. With both Bitcoin and Ethereum people had proof in running code that decentralization was a practically attainable goal with very significant social and market implications. All of the concerns that were foreshadowed by Linear Logic and the π-calculus are present and significant in the blockchain. The resource sensitivity of Linear Logic corresponds to the need to eliminate double spend in blockchain-based resources, such as tokens. The path to scaling the blockchain lies in computational models, such as the π-calculus, that connect sharding to a concurrent computation of smart contracts. In the interim i had discovered a way to fix a

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small bug in the π-calculus that led to a much more powerful calculus, which i called the rho-calculus, with vitally important features for programming at scale, namely reflection and higher order mobile computation. The coincidence of these events is almost too good to be true. We had a market recognizing the need for a programming model with all of the features spelled out in the rho-calculus, and we had almost 10 years of exploration of the model.

Now we are at a juncture where the programme of realizing a correct by construction smart contracting compute platform is no longer just a π-in-the-sky pipe dream. It's here. At the first RChain developer retreat you will have a chance to meet the team that is proving out this architecture in running code. More importantly, you will have a chance to share with us your π-in-the-sky pipe dreams. You will have the opportunity to share with us your vision of the services and applications that make the world a better place to live. You can share with us what keeps you writing code and creates that spark of wonder and amazement. Together we can do what we love to do, make the code that makes it so.

Best wishes,

Greg Meredith
President
RChain Cooperative

Welcome!

As CTO of Pyrofex Corporation, I welcome you all to the Spring 2018 RChain Developer Conference. Nash Foster and I founded Pyrofex a couple of years ago believing that a sea change is coming in the way people compute. With the proliferation of fast networking and ubiquitous, powerful computers in everyone's pocket, we saw distributed computation as the way of the future. Unfortunately, developers are still trying to manage that using tools from the last century. We originally focused our attention on building tools for computation in data centers, but then my longtime friend Greg Meredith broadened our view to the potential of blockchain-based computation. We found that while people were very receptive of our original vision once we could get them to listen to our pitch, we didn't have to say anything to them to get them interested in cryptocurrency. We agreed to hire and manage a development team to build the RChain platform, working out the details along the way.

In November of last year, we had our first developer retreat. Only one of our group understood Vlad Zamfir's Casper design. It was unclear to us how namespaces could possibly work. The Rosette virtual machine seemed practically kabbalistic in its mysteries. There was no way to persist the state of a node, so it would live only so long as it could avoid power failures and stray gamma rays. We saw the project through a glass, darkly.

We've made enormous progress since then. All of our key developers understand how Casper works, how code migrates between namespaces, and the fundamentals of the tuplespace. In addition to the virtual machine, we now have a working interpreter with support for destructuring processes and we have a sketch of the foreign function interface architecture. We now know a great deal about the inner workings of the virtual machine and are adapting it to do just-in-time compilation for the interpreter. Three scala developers have left the project, but four scala developers, two staff, a web developer, and a system administrator have joined, and we have several more offers out to great scala developers.

Meanwhile, the RChain Cooperative acquired a large equity stake in Pyrofex and we exchanged crypto tokens with the promise of continued collaboration. One of the deals funds the creation of a new team at Pyrofex working on developer tools, including an IDE and an app store. We intend to support the deployment of distributed applications with both datacenter and blockchain components in a way that's both new and yet deeply familiar to developers.

There's still a lot to do on the RChain platform: we're just beginning the implementation of the Casper algorithm and the contracts for bonding, unbonding, slashing, and distributing rewards. We're setting up code signing. We're designing the communication protocols between nodes and the key management for ensuring the integrity of those protocols. We're refactoring the virtual machine to make it more modular and easier to maintain. But we're all confident that we'll have something to be proud of in Q4 of this year.

Thank you all for coming and invite you to become more involved; there are as many ways to contribute as there are contributors, and we're all united by the common goal of seeing the RChain platform become a reality.

Michael Stay
Chief Technical Officer
Pyrofex Corporation

17 Apr 2018

Mediterranean Buffet *(Millenium Room)*
Lunch is available for pick up from 12:30 pm to 2:30 pm. Guests are invited to take their lunch into the speaking track of their choice.

Time	Grand Ballroom Track	Century Room Track
8:00 am to 9:00 am	**Rocky Mountain Breakfast Buffet** *(Millenium Room)*	
9:00 am to 10:30 am	**State of the RChain Project** Nash Foster & Mike Stay *(Grand Ballroom)*	
10:30 am to 11:30 am	**Understanding Protocol States in Casper** Vlad Zamfir *(Grand Ballroom)*	
11:30 am to 12:30 pm	**RChain VM** Greg Meredith & VM Developer Team *(Grand Ballroom)*	**Business Strategy and Perspective** Lawrence Lerner *(Century Room)*
12:30 pm to 1:30 pm	**Rholang Language Syntax and Semantics** Kyle Butt *(Grand Ballroom)*	**Digital Identity Solutions on RChain** Ed Eykholt *(Century Room)*
1:30 pm to 2:30 pm	**RChain Storage Layer** Medha Parlikar & Henry Till *(Grand Ballroom)*	**Get Started with Rholang Smart Contracts in Less Than 30 Minutes** Mike Stay and Kent Shikama *(Century Room)*
2:30 pm to 3:30 pm	**Namespaces** Mike Stay & Kyle Butt *(Grand Ballroom)*	**The Web is Under Threat. Can RChain Answer?** *Dan Connolly* *(Century Room)*
3:30 pm to 4:30 pm	**RChain Rev/Rhoc Swap** Nash Foster *(Grand Ballroom)*	
4:30 pm to 5:30 pm	**Keynote Address: The Role of Correctness in Scaling** Greg Meredith *(Grand Ballroom)*	
5:30 pm to 6:30 pm	**Cocktails** *(Boulder Creek Living Room)* **Dinner** Individual Plans	

18 Apr 2018

Mediterranean Buffet *(Millenium Room)*
Lunch is available for pick up from 12:30 pm to 2:30 pm. Guests are invited to take their lunch into the speaking track of their choice.

Time		
8:00 am to 9:00 am	**Flatirons Breakfast Buffet** *(Millenium Room)*	
9:00 am to 10:00 am	**Roadmap to Web 3.0 - How RChain will Re-architect the Web** Nash Foster & Mike Stay *(Grand Ballroom)*	
10:00 am to 11:00 am	**Communications** Pawel Szulc & Nash Foster *(Grand Ballroom)*	**Games and Governance** Greg Meredith *(Century Room)*
11:00 am to 12:00 pm	**RChain Roadmap** Medha Parlikar *(Grand Ballroom)*	**How Reflective Ventures Invest in DApp Companies** Greg Heuss *(Century Room)*
12:00 pm to 1:00 pm	**The RChain Blockchain Structure** Michael Birch & Kent Shikama *(Grand Ballroom)*	
1:00 pm to 2:00 pm	**Payment Semantics** Mike Stay & Joe Denman *(Grand Ballroom)*	**Hosting Your Own Secure Computer Infrastructure From Home** Jeremy Busk *(Century Room)*
2:00 pm to 3:00 pm	**Tokenomics** Jon West *(Grand Ballroom)*	**Getting Involved in the RChain Bounty Program Dan Connolly** *(Century Room)*
3:00 pm to 4:00 pm	**LADL From the Group Up** Mike Stay and Greg Meredith *(Grand Ballroom)*	**Panel: Tokens & the Law, a Discussion** Nash Foster, David Otto, and Stephen Middlebrook *(Century Room)*
4:00 pm to 5:00 pm	**Closing Remarks** Greg Meredith & Nash Foster *(Grand Ballroom)*	
5:00 pm to 6:00 pm	**Cocktails** *(Boulder Creek Living Room)*	
	Dinner Individual Plans	

19 Apr 2018

9:00 am to 12:00 pm	**Check-Out**

Speaker Information

Michael Birch—Software Engineer at Pyrofex Corporation

Michael is a member of the RChain core dev team. He has been working on applying the CBC Casper consensus framework to RChain as well as developing Rholang system contracts to manage the state of RChain's blockchain.

Jeremy Busk—Site Reliability Engineer at Pyrofex Corporation

Lover of Linux and other open source projects, Jeremy has 5 years of working in classified computing, 12 years in telecom, and loves to build information infrastructure from ground up. Jeremy enjoys automating himself and others out of mundane work and into better work. He is a huge fan of empowering others through technology and education in order to help them increase their ability to do more with less. Hopefully they use the ability to do more for helping others.

Dan Connolly—MadMode

Dan Connolly has been an open web advocate since 1991, playing leading roles in the development of HTML, HTTP, and URLs as well as the growth of the World Wide Web Consortium. Dan Connolly has been an open web advocate since 1991, playing leading roles in the development of HTML, HTTP, and URLs as well as the growth of the World Wide Web Consortium.

Ed Eykholt—Pithia, Inc.

Ed is an author of the RChain Architecture, a co-founder of the Co-op and of Pithia (was RChain Holdings). Ed's background is in product ownership, development team leadership, and technical program management. Prior to venturing into blockchain, Ed managed a team at Alstom building an electric power distribution management and outage management system deployed at multiple large utilities.

Nash Foster—CEO of Pyrofex Corporation

Nash Foster is co-founder and CEO of Pyrofex Corporation, which he founded with Dr. Michael Stay in the spring of 2016. At Pyrofex, he and Dr. Stay have focused on new blockchain technologies, large-scale distributed systems research, and programming language design and theory.

Greg Heuss—CEO of Reflective Ventures

Greg has been involved with technology companies for over 20 years and has helped build some of the largest brands in the world. He currently holds the position of Managing Partner at Reflective Venture Partners, a fund investing in Blockchain focused startups. He got his first taste of the start-up world when Amazon actually was a start-up, in 1998, where he led the sales and marketing efforts of new product (music), brand and special events. Greg later went on to help create Kiss.com which he sold to Match.com. Throughout his career he has helped build and direct multiple companies to a point of merger, sale and/or public offering. He has a deep background in data analytics, mobile and location based technologies, and has always been on the cutting edge of consumer trends and technology most recently the expanding blockchain space. He co-led the fundraising efforts for RChain Co-op in 2017.

Lawrence Lerner—CEO of Pithia, Inc.

During his career, Lawrence has worked across industries in multiple roles (executive, lead technologist, public board director) to enable digital transformation, scaling up businesses using edge technologies and processes creating $100Ms in new revenue. Whether it was re-architecting Dun & Bradstreet's core product (35% growth), delivering the next generation of coupons across 31,000 retailers, growing an outsourcing business by $100M, defining Motorola's smartphone strategy, or helping launch a dozen startups he's generated wealth for businesses, owners and shareholders.

Lawrence has worked in the cryptocurrency space since the late 90's. Today he is the CEO of Pithia, a blockchain corporation with $170M in assets. Pithia's first two investments are Identity based blockchain companies.

Keith McQueen—Software Engineer at Pyrofex Corporation

Keith McQueen has been active in the computer software industry since the late 1970's developing products in fields as varied as accounting, education and training, flight simulation, wired and wireless telecommunications, and embedded systems. Of the dozen or more computer languages he's learned in the past 40+ years, his language of choice is C/C++. His hobbies include flying his own plane, amateur radio, travel, and SCUBA diving.

Greg Meredith—President of the RChain Cooperative

Lucius Gregory (Greg) Meredith is the president of the RChain Cooperative, a blockchain company devoted to providing a scalable blockchain to serve humanity in its expanding need to coordinate and cooperate to address the swift and dramatic challenges it will be facing in climate change and other related consequences of our approach to being human on planet Earth.

Greg worked to establish RChain because he believes that we are witnessing a transformation of our way of being one of many, the emergence of an e pluribus unum 2.0. If the Internet has been the harbinger of this shift, the blockchain is its manger. Decentralization is really about finding a new center on a scale-invariant axis reconciling the wisdom of collective and the wisdom of the individual.

Greg is a mathematician, and the discoverer of the rho-calculus, a co-inventor of the LADL algorithm, and the inventor of the ToGL approach to graph theory. He is also a musician, having performed with Mapathe Diop, toured with Robert Fripp and the Orchestra of Crafty Guitarists, and is an active member in Seattle Circle, and a founding member of the new ensemble, The Crown.

Stephen Middlebrook—Attorney at Womble Bond Dickinson

Steve Middlebrook is attorney in the Atlanta office of Womble Bond Dickinson. He advises start-up and established companies on a wide array of legal and business issues arising from the intersection of technological innovation and financial services. He has more than 20 years of experience helping clients navigate complex regulatory and compliance matters, including licensing, consumer protection, anti-money laundering, data privacy, and security. He has helped clients interact with regulators and respond to inquiries at the state and federal level. Steve has an extensive background in emerging payment technologies, prepaid and stored value products, mobile payments, web-based financial services, virtual currency and distributed ledger technology. His prior experience includes being General Counsel at two FinTech companies, and a decade's service at the US Department of the Treasury. Steve served as an advisor to the Uniform Law Commission's drafting committee for the Uniform Regulation of Virtual Currency Businesses Act.

David Otto—Martin Davis, PLLC

David M. Otto has over 30 years experience in corporate finance, securities, mergers and acquisitions, corporate governance, and capital markets. He received his B.A. from Harvard University and his J.D. from Fordham University School of Law. He is the founding Managing Partner at Martin Davis, PLLC ("Martin Davis"), a boutique law firm based in Seattle, WA, and General Partner of Reflective Venture Partners ("Reflective"), a blockchain technology fund and strategic partnership with RChain Cooperative.

Martin Davis is streamlining the contractual and legal processes necessary to launch innovative blockchain technology projects and decentralized application business models. Services provided include entity formation, transactional structure, token allocation, token-economics, contracts and legal documentation, legal opinions and memoranda, analysis regarding token payment/utility/asset-backed functionality, and Federal and State regulatory compliance.

Martin Davis is currently representing various blockchain-related projects positioned to disrupt commerce, finance, and peer-to-peer transactions. These projects include (i) the development of technology that enables the fractional ownership of art, (ii) the design and deployment of a faster and more scalable blockchain protocol capable of providing solutions such as monetized content delivery and financial services, (iii) the creation of a decentralized retail e-commerce platform deploying smart contracts, and (iv) re-design and deployment of a "bounty" technology and payment platform for the Ethereum blockchain.

Medha Parlikar—Project Manager at Pyrofex Corporation

Medha's exposure to computing dates back to the early 80's, debugging software with her father in their basement. After college, she spent time working in corporate IT and then moved into software engineering in the mid 1990's. In SaaS, Medha has held engineering leadership positions at marquee companies such as MP3.com, Adobe (Omniture Business unit) and most recently Avalara, giving her over 20 years of experience in building, testing and deploying internet applications at scale. Her passion is creating an environment where development teams can do their best work and delighting customers with software that solves real business problems.

Timm Schauble—Software Engineer at Pyrofex Corporation

Senior Scala engineer at Pyrofex & Lead Developer of the Roscala project. Studied computer science at the University of Heidelberg. Among other things, he is mostly interested in functional programming and blockchain technology. Located in Berlin, Germany.

Kent Shikama—Software Engineer at RChain Cooperative

Kent has been involved with RChain as a developer since March of 2017. He initially joined through his interest in decentralized social networks. He's spent most of the past year working on the Rholang compiler, but is now primarily working on consensus. Before Rchain, he had spent several years involved in a number of projects as a web developer.

Dr. Michael Stay—CTO of Pyrofex Corporation

Michael Stay is co-founder and CTO of Pyrofex Corporation and holds a PhD in computer science. His thesis is on mathematical structures that arise in both computer science and physics. He worked as a reverse engineer and cryptanalyst for four years and on Google's security team for six.

Pawel Szulc—Software Engineer at Pyrofex Corporation

Pawel Szulc is a senior engineer at Pyrofex. Scala developer by day, Haskell enthusiast by night. He has been active member of Scala community for quite few years now, defending its functional nature. In his code he strives for readability and maintainability, which (he argues) is best achieved in FP paradigm.

Jon West—RChain Cooperative & Reflective Ventures

Jon West has helped manage some of the largest cryptocurrency positions to date: He began as an intern at Bridgewater Associates in 2011. He graduated from Dartmouth College in 2012 and majored in Philosophy. Jon went on to work as an Analyst at Citigroup trading Credit Default Swaps and FX interest rates and spot. At the beginning of 2016, Jon began working for Mike Novogratz as his first hire. In May 2017, Jon left Novogratz's family office to co-found Omega One, a liquidity aggregator and execution platform. Jon has now joined R-Chain full time, helping both Reflective Partners and the Coop strategize, understand, and interact with markets.

Vlad Zamfir—Director at RChain Cooperative

Vlad Zamfir is a researcher focused on public consensus protocol design and governance, known in the blockchain space for his work on Casper proof-of-stake and sharding.

Restaurant Recommendations

Boulder

Oak on Fourteenth

Innovative, locally sourced New American cuisine & cocktails in stylish space with open kitchen.
400 Pearl St, Boulder, CO 80302
(303) 444-3622

Zolo Southwestern Grill

Seasonal Southwestern dishes, ample tequila & mezcal options served in relaxed digs with a patio.
2525 Arapahoe Ave, Boulder, CO 80302
(303) 449-0444

Brasserie Ten Ten

Vibrant, cozy cafe with a patio offering homestyle French fare, plus a popular brunch & happy hour.
1011 Walnut St, Boulder, CO 80302
(303) 998-1010

The Kitchen

Farm-to-table American food in an urban space, plus drinks from the upstairs community bar.
1039 Pearl Street, Boulder, CO 80302
(303) 544-5973

Pizzeria Locale

Artisanal pies wood-fired in full view of patrons, plus an extensive wine list (some on tap).
1730 Pearl St, Boulder, CO 80302
(303) 442-3003

Rincon Argentino

Traditional empanadas, milanesa sandwiches & other Argentinean eats in a bright, colorful space.
2525 Arapahoe Ave, Boulder, CO 80302
(303) 442-4133

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