Becoming a Hyperledger Aries Developer (LFS173x)

Course Overview

The four Hyperledger Identity projects, Indy, Aries, AnonCreds, and Ursa, provide a foundation for building distributed applications using authentic data. Together, the projects include protocol specifications and open source tools, libraries, and reusable components for establishing secure, peer-to-peer messaging channels that can be used for issuing, receiving, holding, presenting and verifying verifiable credentials. These capabilities enable the creation and use of independent digital identities rooted on blockchains or other distributed ledgers that are interoperable across administrative domains, applications, and any other data silo.

While this course will mention Ursa and dive a bit into Indy and AnonCreds, its main focus is on Aries, and the possibilities Aries brings for building applications on a solid foundation of digital trust. This focus will be explained further in the course but for now, rest assured: if you want to start developing applications that are identity focused and using the blockchain, this is where you need to be.

Course Instructors

Stephen Curran of Cloud Compass Computing, Inc. is a Software Development and DevOps veteran who dove full on into the identity-on-blockchain world in 2017. Working with the British Columbia Government, Stephen helped define, build and launch the Verifiable Organizations Network (VON)—a production instance of the Linux Foundation's Hyperledger Aries, AnonCreds, and Indy projects that makes public information about organizations (incorporations/legal entities) in BC available in the form of verifiable credentials. He contributes

to the Hyperledger Identity projects by moving forward open specifications, protocols, and open source code to enable important, privacy-protecting identity solutions. Stephen is a regular contributor in the Hyperledger community, facilitating discussions and driving interoperability. He has presented on the Aries, AnonCreds, and Indy projects many times, is a member of Hyperledger Technical Oversight Committee, and is on the Sovrin Foundation's Board of Trustees and Technical Governance Board.

Carol Howard of Cloud Compass Computing, Inc. is a technical writer with more than 14 years experience, working for both hardware and software companies writing user guides, technical references, help text, and so on. She has been helping document the BC Government initiatives (VON, Greenlight, OrgBook BC and IIWBook) and became hooked on self-sovereign identity at IIW28.

Audience

The intended audience for this course are developers who want to learn how to build applications that use self-sovereign identity (SSI) and Trust over IP (ToIP) capabilities. The technical examples can be run by anyone familiar with using the command line and executing scripts. As such, a broader technical audience beyond developers will find the course helpful in understanding how ToIP can be used in designing business solutions.

Prerequisites

This course assumes that you have knowledge of blockchain technology, cryptography and public/private key pairs. If you are not familiar with these topics, we would suggest that you take a look at either of these courses:

- Blockchain: Understanding Its Uses and Implications (LFS170x)

If you are new to Aries and verifiable credentials, we recommend you first take the precursor to this course:

- Introduction to Self-Sovereign Identity Blockchain Solutions (LFS172x)

We review some of the core material from that course in Chapter 1, but only enough to set the context for the rest of the course. If you haven't taken it yet, you should!

You must be comfortable working with GitHub, the Linux command line and following

instructions for building and running demo applications. Docker is used in many of the labs in the course, and at least some require a local installation of Docker. Some of the assignments assume at least an ability to read Python code, and some suggest doing Python development. Note that building Aries applications can be done in any modern programming language.

Course Length

30-40 hours.

Course Learning Objectives

By the end of this course, you should be able to:

- Build Trust over IP (ToIP) applications for a variety of use cases in the real world.
- Develop Aries agent code for issuing, presenting, and verifying AnonCreds and other types of credential.
- Understand the basics of how Hyperledger Indy and other ledgers are used by Aries agents.
- Understand the architecture and components of Aries agents.
- Understand the data exchange protocols that are the core of Hyperledger Aries, particularly those involving establishing peer-to-peer connections, and exchanging verifiable credentials and presentations.
- Learn about the mechanisms and tools used in the broad and diverse Aries community to enable interoperability.
- Understand DIDComm routing, mediators and relays, their applicability in the Aries general case, and why routing is required for mobile agents.
- Get started with your own Aries mobile wallet.
- Understand the requirements in moving to production in an Aries environment.
- Learn about current happenings in Aries and how you can join and contribute to this amazing community!

Course Outline

Welcome!

- Welcome!

Chapter 1. Overview

- Introduction
- Why Focus on Aries Development?
- Identity Solutions
- The Verifiable Credential (VC) Model
- Key Concepts
- Knowledge Check (Verified Certificate track only)

- Summary

Chapter 2. Exploring Aries and Aries Agents

- Introduction
- Examples of Aries Agents
- An Aries Ecosystem
- Aries Agent Architecture
- Current Aries Agent Frameworks
- Aries Interoperability
- Knowledge Check (Verified Certificate track only)
- Summary

Chapter 3. Running a Network for Aries Development

- Introduction
- Ledgers
- Why Use a Distributed Ledger with Aries?
- Running a Local Indy Network
- The Indy Genesis File
- Resolving DIDs
- AnonCreds Resolvers and Registrars
- Knowledge Check (Verified Certificate track only)
- Summary

Chapter 4. Developing Aries Controllers

- Introduction
- Aside: The Term "Wallet"
- Agent Start Up
- How Aries Protocols Impact Controllers
- Building Your Own Controller
- Controllers for Other Frameworks
- Knowledge Check (Verified Certificate track only)
- Summary

Chapter 5. Digging Deeper—The Aries Protocols

- Introduction
- The All-Important Aries-RFCS Repository
- Basic Concepts of DIDComm Messaging
- The Format of Aries Protocol Messages
- Framework Message Processing
- Aries Interop Profile (AIP) Versions
- Knowledge Check (Verified Certificate track only)
- Summary

Chapter 6. DIDComm Message Routing

- Introduction
- Agent Message Routing
- Mobile Wallets and Mediators
- Establishing a Mobile Wallet Connection
- Knowledge Check (Verified Certificate track only)
- Summary

Chapter 7. Mobile Wallets

- Introduction
- Agent Mobile Wallets Features
- Open Source Mobile Wallets
- Other Aries Mobile Wallet Options
- Knowledge Check (Verified Certificate track only)
- Summary

Chapter 8. Planning for Production

- Introduction
- Mobile Wallet Apps
- Working with Production Indy Ledgers
- Holding Credential Revocations
- The Impact of Decentralized Governance
- Horizontally Scaling Enterprise Aries Agents
- Multi-Tenant Aries Agency
- Knowledge Check (Verified Certificate track only)
- Summary

Chapter 9. What to Do Next

- Introduction
- Where to Go From Here
- Building Decentralized Identity/Trust over IP Applications
- Contributing to Aries Projects
- How to Get Involved
- Knowledge Check (Verified Certificate track only)
- Summary

Final Exam (Verified Certificate track only)

edX Platform

If you are using edX for the first time, we strongly encourage you to start by taking a free 'how to use edX' course that the team at edX has made available. In this course, you will learn how to navigate the edX platform, how to connect with other edX learners, how to answer problems on the edX platform, how grades work in edX courses, and how to complete your first course.

Click here to register for "*DemoX*" and you will be on your way. You will find the edX platform simple and intuitive.

Getting Help

For any **technical issues** with the edX platform (including login problems and issues with the Verified Certificate), please use the **Help** icon located on the upper right side of your screen.

One great way to interact with peers taking this course and resolving any **content-related issues** is via the **Discussion Forums**. These forums can be used in the following ways:

- To discuss concepts, tools, and technologies presented in this course, or related to the topics discussed in the course material.
- To ask questions about course content.
- To share resources and ideas related to Hyperledger Aries.

We strongly encourage you not only to ask questions, but to share with your peers opinions about the course content, as well as valuable related resources. The Discussion Forums will be reviewed periodically by The Linux Foundation staff, but it is primarily a community resource, not an 'ask the instructor' service.

Course Timing

This course is entirely self-paced; there is no fixed schedule for going through the material. You can go through the course at your own pace, and you will always be returned to exactly where you left off when you come back to start a new session. However, we still suggest you avoid long breaks in between periods of work, as learning will be faster and content retention improved.

The chapters in the course have been designed to build on one another. It is probably best to work through them in sequence; if you skip or only skim some chapters quickly, you may find there are topics being discussed you have not been exposed to yet. But this is all self-paced and you can always go back, so you can thread your own path through the material.

Learning Aids

Besides simple exposition through text and figures, this course uses additional methods to present the learning material, including labs, demonstrations, external resources, glossary and knowledge check questions (Verified Certificate track only).

Audit and Verified Tracks

You can enroll into an audit or a verified track. In an audit track, you will have access to all ungraded course content: course readings, videos, and learning aids, but no certificates are awarded when auditing. You will not be able to access any graded content (knowledge check questions at the end of each chapter, and the final exam).

In order to receive a certificate, you will need to obtain a passing grade (please refer to the "Grading" section below), verify your identity with edX, and pay a fee. Once all edX requirements have been met, you can download your certificate from the Progress tab.

To learn more about audit and verified tracks, visit edX Help Center > Certificates.

Grading (Verified Certificate track only)

At the end of each chapter, you will have a set of graded **knowledge check questions**, that are meant to further check your understanding of the material presented. The grades obtained by answering these knowledge check questions will represent **20%** of your final grade.

The remaining **80%** of your final grade is represented by the score obtained in the **final exam**. The final exam is located at the end of the course and it consists of 30 questions.

You will have a maximum of two attempts to answer each knowledge check and final exam question (other than True/False questions, in which case, you have only one attempt). You are free to reference your notes, screens from the course, etc., and there is no time limit on how long you can spend on a question. You can always skip a question and come back to it later.

In order to complete this course with a passing grade, you must obtain a passing score (knowledge check and final exam) of minimum 70%.

Course Progress and Completion (Verified Certificate track only)

Once you complete the course (including knowledge check questions and final exam), you will want to know if you have passed. You will be able to see your completion status using the **Progress** tab at the top of your screen, which will clearly indicate whether or not you have achieved a passing score.

Professional Certificate Program

Professional Certificate programs are a series of courses designed by industry leaders and top universities to build and enhance critical professional skills needed to succeed in today's most in-demand fields.

To learn more about the programs and courses offered by the Linux Foundation, click here.

About The Linux Foundation

The Linux Foundation provides a neutral, trusted hub for developers to code, manage, and scale open technology projects. Founded in 2000, The Linux Foundation is supported by more than 1,000 members and is the world's leading home for collaboration on open source software, open standards, open data and open hardware. The Linux Foundation's methodology focuses on leveraging best practices and addressing the needs of contributors, users and solution providers to create sustainable models for open collaboration.

The Linux Foundation hosts Linux, the world's largest and most pervasive open source software project in history. It is also home to Linux creator Linus Torvalds and lead maintainer Greg Kroah-Hartman. The success of Linux has catalyzed growth in the open source community, demonstrating the commercial efficacy of open source and inspiring countless new projects across all industries and levels of the technology stack.

As a result, the Linux Foundation today hosts far more than Linux; it is the umbrella for many critical open source projects that power corporations today, spanning virtually all industry sectors. Some of the technologies we focus on include big data and analytics, networking, embedded systems and IoT, web tools, cloud computing, edge computing, automotive, security, blockchain, and many more.

The Linux Foundation Events

Over 85,000 open source technologists and leaders worldwide gather at Linux Foundation events annually to share ideas, learn and collaborate. Linux Foundation events are the meeting place of choice for open source maintainers, developers, architects, infrastructure managers, and sysadmins and technologists leading open source program offices, and other critical leadership functions.

These events are the best place to gain visibility within the open source community quickly and advance open source development work by forming connections with the people evaluating and creating the next generation of technology. They provide a forum to share and gain knowledge, help organizations identify software trends early to inform future technology investments, connect employers with talent, and showcase technologies and services to influential open source professionals, media, and analysts around the globe.

The Linux Foundation hosts an increasing number of events each year, including:

- Open Source Summit North America, Europe, and Japan
- Embedded Linux Conference North America and Europe
- Open Networking & Edge Summit
- KubeCon + CloudNativeCon North America, Europe, and China
- Automotive Linux Summit
- KVM Forum
- Linux Storage Filesystem and Memory Management Summit
- Linux Security Summit North America and Europe
- Linux Kernel Maintainer Summit
- The Linux Foundation Member Summit
- Open Compliance Summit
- And many more.

To learn more about The Linux Foundation events and to register, click here.

The Linux Foundation Training

The Linux Foundation offers several types of training:

- Classroom
- Online
- On-site
- Events-based.

To get more information about specific courses offered by the Linux Foundation, click here.

The Linux Foundation Certifications

The Linux Foundation certifications give you a way to differentiate yourself in a job market that's hungry for your skills. We've taken a new, innovative approach to open source certification that allows you to showcase your skills in a way that other peers will respect and employers will trust:

- You can take your certification from any computer, anywhere, at any time.
- The certification exams are either performance-based or multiple choice.
- The exams are distribution-flexible.
- The exams are up-to-date, testing knowledge and skills that actually matter in today's IT environment.

For a list of currently offered certifications, click here.

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