LFS166x - Introduction to Magma: Cloud Native Wireless Networking

Course Overview

Learn about the Magma project, an open source implementation of a mobile network core. Magma supports diverse radio technologies, including LTE, 5G and WiFi, and is particularly relevant for extending network access into remote, sparsely populated areas.

Magma leverages open source software and commodity hardware to help operators manage their networks efficiently. It provides a high level of automation, high reliability, and the ability to deliver new network services quickly. It is agnostic to the radio access network technology, supporting any cellular “generation” from 2G to 5G, as well as WiFi and CBRS for unlicensed spectrum. Magma can be federated with existing cellular networks to allow networks to be cost-effectively extended into remote areas.

This course is designed for technology strategists or decision makers at telcos looking to understand the applicability of Magma to their environment. This course is also aimed at rural ISP operators, systems integrators, and anyone looking to set up a lab environment to experiment with Magma or deploy it in production.

This course will help you gain an understanding of the overall Magma architecture and how it fits into the bigger picture of cellular network architectures, particularly 4G/LTE and 5G. You will learn to recognize and understand the main functions of a mobile wireless network, understand the key use cases and value proposition of Magma, the overall architecture of Magma at a functional block level, and the functions performed by each of the main Magma components

(Access Gateway, Federation Gateway, and Orchestrator). The course will also provide resources to learn more to deploy Magma on standard hardware.

This course prepares you to fully explore the Magma project. It provides the necessary background to help you determine if Magma is appropriate for your setting, and equips you to start installing and experimenting with the system.

Course Learning Objectives

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

- Recognize and understand the main functions of a mobile wireless network
- Understand the key use cases and value proposition of Magma
- Describe the overall architecture of Magma at a functional block level
- Understand the functions performed by each of the following: Access Gateway, Federation Gateway, Orchestrator
- Know how to learn more to deploy Magma on standard hardware

Prerequisites

- Familiarity with basic cellular networking technologies is helpful but not mandatory.
- A high level understanding of cloud native services will also be helpful.

Audience

This course is designed for technology strategists or decision makers at telcos looking to understand the applicability of Magma to their environment. This course is also aimed at rural ISP operators, systems integrators, and anyone looking to set up a lab environment to experiment with Magma or deploy it in production.

Course Instructor(s)

Bruce Davie is a computer scientist noted for his contributions to the field of networking. He is a former VP and CTO for the Asia Pacific region at VMware. He joined VMware during the acquisition of Software Defined Networking (SDN) startup Nicira. Prior to that, he was a Fellow at Cisco Systems, leading a team of architects responsible for Multiprotocol Label Switching (MPLS). Davie has over 30 years of networking industry experience and has co-authored 17 RFCs. He was recognized as an ACM Fellow in 2009 and chaired ACM SIGCOMM from 2009 to 2013. He was also a visiting lecturer at the Massachusetts Institute of Technology for five years. Davie is the author of multiple books and the holder of more than 40 U.S. Patents.

Larry Peterson is the Robert E. Kahn Professor of Computer Science, Emeritus at Princeton University, where he served as Chair from 2003-2009. His research focuses on the design, implementation, and operation of Internet-scale distributed systems, including the widely used PlanetLab and MeasurementLab platforms. He is currently leading the CORD and Aether access-edge cloud projects at the Open Networking Foundation (ONF), where he serves as CTO. Peterson is a member of the National Academy of Engineering, a Fellow of the ACM and the IEEE, the 2010 recipient of the IEEE Kobayashi Computer and Communication Award, and the 2013 recipient of the ACM SIGCOMM Award. He received his Ph.D. degree from Purdue University in 1985.

Course Length

20 hours

Course Outline

- Welcome!
- Ch 1. Introduction to Mobile Cellular Networking
- Ch 2. Introduction to the Magma Architecture
- Ch 3. The Orchestrator
- Ch 4. The Access Gateway (AGW)
- Ch 5. The Federation Gateway
- Ch 6. The Network Management System (NMS)
- Ch 7. Summary
- Final Exam (verified 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 Magma.

We strongly encourage you to not only 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.

To learn more tips on how to use them, read the following article: *"Getting the Most Out of the edX Discussion Forums"*.

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 external resources 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 14 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 Programs

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 our Professional Certificates, visit Secure Software Development Fundamentals Professional Certificate, Blockchain for Business Professional Certificate, 5G Strategy for Business Leaders Professional Certificate, Developing Blockchain-Based Identity Applications Professional Certificate and Introduction to DevOps: Practices and Tools.

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 performance-based
- The exams are distribution-flexible
- The exams are up-to-date, testing knowledge and skills that actually matter in today's IT environment.

The Linux Foundation and its collaborative projects currently offer the following certifications:

- Linux Foundation Certified IT Associate (LFCA)
- Linux Foundation Certified System Administrator (LFCS)
- Linux Foundation Certified Engineer (LFCE)

- Certified Kubernetes Administrator (CKA)
- Certified Kubernetes Application Developer (CKAD)
- Certified Kubernetes Security Specialist (CKS)
- Certified Hyperledger Fabric Administrator (CHFA)
- Certified Hyperledger Fabric Developer (CHFD)
- Certified ONAP Professional (COP)
- Cloud Foundry Certified Developer (CFCD)
- FinOps Certified Practitioner (FOCP)
- OpenJS Node.js Application Developer (JSNAD)
- OpenJS Node.js Services Developers (JSNSD)

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