

Title of Tutorial: Introduction to Blockchain Technology

Prof Simão Melo de Sousa & Dr. Sabiri Khadija
C4-Cloud Computing Competence Center
University Beira Interior, Portugal

Abstract

The aim of this tutorial is to provide an overview of the structure and mechanism of Blockchains. It covers the technological underpinnings of blockchain, the concept of decentralization behind blockchain, how consensus on their contents is achieved, what is the difference between different governance models such as “permissioned” and “permissionless” blockchains. You will learn about the Tezos Blockchain ecosystem, how smart contracts are developed and deployed and how to develop blockchain Dapps.

Tutorial contents:

1. Introduction to Blockchain and its main concepts
 - a. Distributed and decentralized ledger
 - b. Immutable and persistent P2P databases
 - c. Deployment and governance model
2. How blockchains work?
 - a. Block: merkle trees, hash, digital signature
 - b. Network and nodes: network based architecture of a blockchain, nodes
 - c. Consensus protocol: consensus models
 - d. Economic models for blockchains
 - e. Privacy mechanisms
3. A self amending blockchain: Tezos
 - a. Tezos fundamental concepts and its economic model
 - b. Liquid Proof of Stake and backing
 - c. Tezos node setup

- d. Interacting with Tezos Nodes
4. Smart contracts, virtual machine and Tezos
 - a. Concept of a smart contracts, its life cycle
 - b. Smart Contract Engineering
 - c. Smart contracts Deployment
 - d. Interacting with a smart contract and a blockchain
 - e. Low level smart contract languages : Michelson
 - f. High level smart contracts languages (Liquidity, Ligo...).
5. RPC, Dapp and Tezos
 - a. Technologies for implementing blockchain supported services
 - b. Dapp development and deployment

Intended Audience

- This course has been designed for those who have no prior experience with Blockchain technology
- It will explain all concepts and methods from the ground up, allowing the audience to understand what it is and what it is used for

Prerequisites

- As this is an introductory level course to Blockchain, no prior experience is required. It assumes that the audience has not used the technology before and this is its first experience with Blockchain.

Biographie

Simão Melo de Sousa is an Associate Professor (Tenured, with HDR) of Computer Science at the University of Beira Interior. He is an expert in reliability and security of computer systems. In particular he is actively developing research on the fundamentals and the design of techniques and tools for the security, formal verification and development of software. He received his PhD degree at INRIA Sophia Antipolis /

UNSA (France) on the theme "Tools and techniques for the formal verification of the JavaCard platform". He is co-author of the textbook "Rigorous Software Development - An Introduction to Program Verification" from Springer-Verlag.

As a member of the LISP (Laboratory for Informatics, Systems and Parallelism) research center, he is coordinating the research group RELEASE (Reliable and Secure Computation group). He was also in charge of the research project RESCUE (Safe and Reliable code execution for Embedded systems, 2008-2011) that involved almost 30 researchers and 4 institutions. He is also a member of several national and international funded research projects. For instance, he has worked, in the context of the FAVAS research project (2010-2014), on a certified semantics for concurrent real-time systems and its support for the machine-checked compliance of concurrent real-time requirements.

He collaborates actively with several national and international companies, leaders in the area of critical systems, security, railways, avionics and aerospace industry in technology transfer projects. He was consultant in an industrial project about a formally designed, implemented and formally verified railway signaling system that achieve a CENELEC SIL 4 (the highest) certification. He was also involved in the European project that lead to the first EAL7 (Common Criteria) certified JavaCard Platform (in COQ).

Homepage: <https://www.di.ubi.pt/~desousa>

Khadija SABIRI received her Ph.D degree in the cloudification legacy system to a cloud-native application from the Science Faculty of Ben M'sik in Casablanca-Morocco , then she moved to University of Beira Interior in Portugal as Postdoc researcher as part of cloud computing competence center-C4 projects.

Her overarching research is to explore rigorous software development methodologies and cloud-based technology solutions that increase and guarantee citizen rights, such as privacy, transparency, etc. whilst empowering a better and larger digital citizenship both from the local administration's and from the citizen's point of view. Furthermore, fundamental research is expected to be conducted on the use of Blockchains for better accountability of the public information system and decision support systems in use in local administration.

She is also certificated in : IBM Cloud Developer Application, IBM Blockchain and Cisco IoT.

She leads many associatives projects, she is currently a national coordinator of the world clean up day at Junior Chamber International Morocco