ripple | University Blockchain Research Initiative

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UBRI Connect

Testing Frameworks for XRP Ledger and Beyond

Virtual Event   October 11–13, 2020   ubri.ripple.com

Distributed Ledgers Research Center (DLRC)

„The Distributed Ledgers Research Centre (DLRC) positions itself as the bridge between pure academic research and the open challenges from the wider Blockchain ecosystem. The Centre aims to advance the field with transformative applications of the technology that emerge directly from the ecosystem.“

Klitos Christodoulou, PhD
IFF Research Manager,
DLRC Lab Leader

Elias Iosif, PhD
IFF Project Manager,
DLRC Lab Co-Leader

Antonios Inglezakis
Senior Researcher

Marios Touloupou
Researcher/ PhD Student

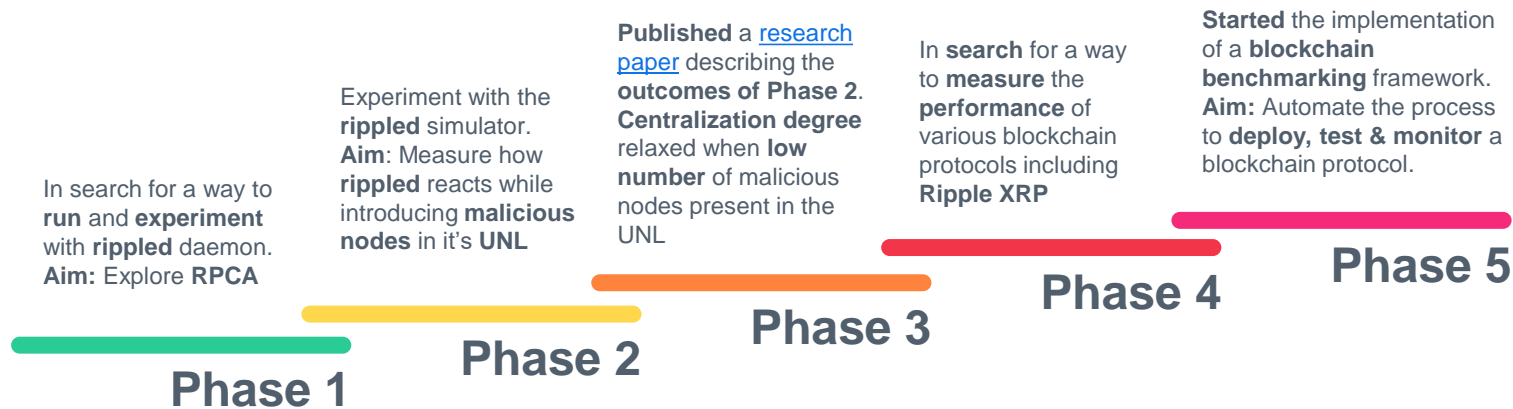https://www.unic.ac.cy/iff/dlrc

https://medium.com/ripple-series

https://github.com/unic-iff

Benchmarking the Behaviour of Blockchain Protocols

UNIC/IFF Involvement to UBRI

In search for a way to **run** and **experiment** with **rippled** daemon. **Aim:** Explore **RPCA**

Phase 1

Experiment with the **rippled** simulator. **Aim**: Measure how **rippled** reacts while introducing **malicious nodes** in it's **UNL**

Phase 2

Published a research paper describing the **outcomes of Phase 2**. **Centralization degree** relaxed when **low number** of malicious nodes present in the UNL

Phase 3

In **search** for a way to **measure** the **performance** of various blockchain protocols including **Ripple XRP**

Phase 4

Started the implementation of a **blockchain benchmarking** framework. **Aim:** Automate the process to **deploy, test & monitor** a blockchain protocol.

Phase 5

Benchmarking the Behaviour of Blockchain Protocols

Challenges & Facts

- Blockchain **protocols are difficult** to understand (at the technical side).

- **Even simple tasks from using a blockchain protocol** (generate transactions etc.) require a significant learning curve.

- There is a **difficulty to understand** the behavior of the network after a **deep change of the network's source code**.

- **Deploy and connect** a blockchain node to a real network is challenging.

- **Monitoring the behavior** of such systems is often impossible since monitoring is coupled to the blockchain protocol itself.

- There is **lack or "broken" documentation source** that often do not reflect changes and updates to the latest source code.

Benchmarking the Behaviour of Blockchain Protocols

The Solution

- **"One-click" docker**-based deployment of various Blockchain protocols and topologies.

- Enable the generation of synthetic scenarios that:
  - Simulate traffic
  - Emulate consensus participation of nodes – monitor fault-tolerance
  - Simulate malicious actors and adversarial attempts
  - Stress-test the protocol on transaction throughput etc.
  - Record data and provide opportunities for data analytics

- Our Solution
  - A benchmarking framework with a "plug-play" modular design
  - Close-to-real data and environment testing
  - Easy to setup scenarios using our JSON syntax
  - Ease to create your test workflows

Benchmarking the Behaviour of Blockchain Protocols

The Framework
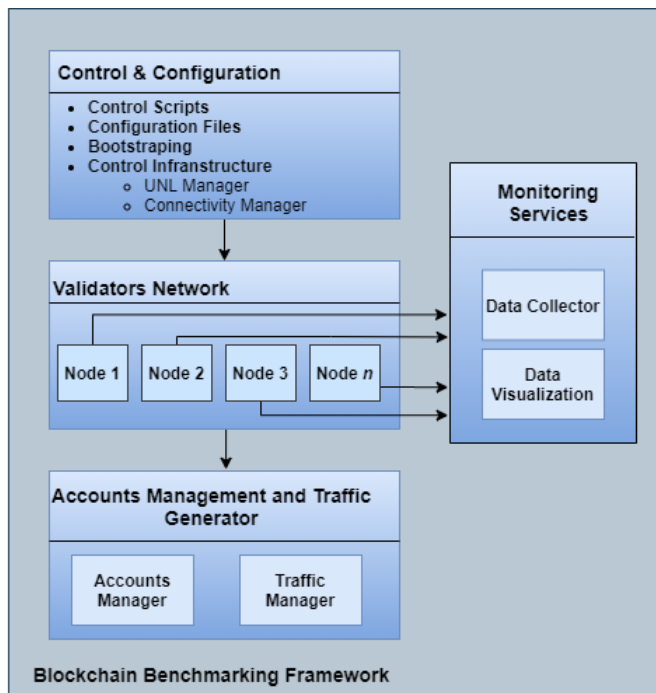
- **Overview of Building Blocks**
  1. Control & Configuration (Setup Scenarios - Bootstrapping)
  2. Validators Network (Consensus Setup)
  3. Accounts Management and Traffic Generator
  4. Monitoring Services
- **Control & Configuration**
  - Network Bootstrap: using control scripts and configuration files
- **Validators Network**
  - Setup the blockchain network topology
- **Accounts Management and Traffic Generators**
  - Setup the communication with the network allowing the generation of accounts and transactions
- **Monitoring Services**
  - Scrap data from the validator nodes
  - Visualize time series data in form of graphs etc.

Benchmarking the Behaviour of Blockchain Protocols

Framework instantiation with *rippled*

- **Automatically deploy a Ripple Network topology** with *n* number of nodes/validators.
  - Config UNL
  - UNL Manager to server UNL List (Web App serving the UNLs for each validator)
- **Create Accounts and spread XRPs** to the network
- **Deploy a monitoring framework** for capturing data regarding transaction metrics and server's info
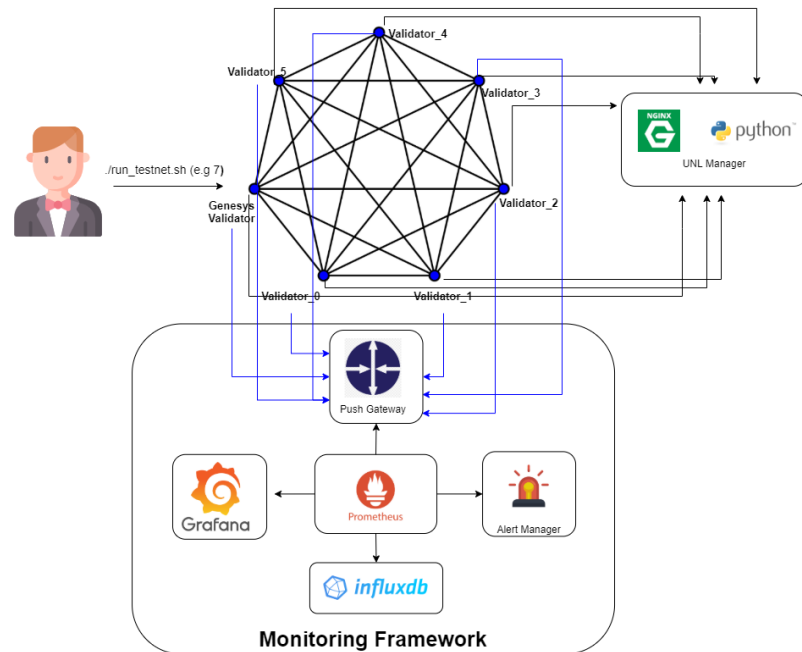
Benchmarking the Behaviour of Blockchain Protocols

Live Demo – Interactive Session

![Medium] https://medium.com/ripple-series

Medium

![GitHub] **Explore our repos**

https://github.com/UNIC-IFF/rippled

https://github.com/UNIC-IFF/rippled_dev_environment

https://github.com/UNIC-IFF/ripple-docker-testnet

- **Demo Presentation ([here](#))**

- **Interactive Demo Video ([here](#))**

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Benchmarking the Behaviour of Blockchain Protocols

Future Roadmap

- Test Benchmarking framework with various synthetic scenarios
- Integrate the benchmarking framework to a Kubernetes platform
  - automatic deployment, high availability, high scalability etc.
- Simulate fault-tolerance with a Connectivity Manager
  - generate firewall rules for each validator according to a scenario file.
- Simulate advanced malicious scenarios
  - attempt to issue malicious transactions, attempt forks etc.
  - adapt UNL during runtime and check times for validation
- Improve support with other blockchain protocols (e.g., Ethereum, Bitcoin etc).
- Test and compare the outcomes while experimenting with different parameters and scenarios.
- Provide advance monitoring services from scrapping data
- Complete documentation and open-up to community for usage.

Thank you for your attention!

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