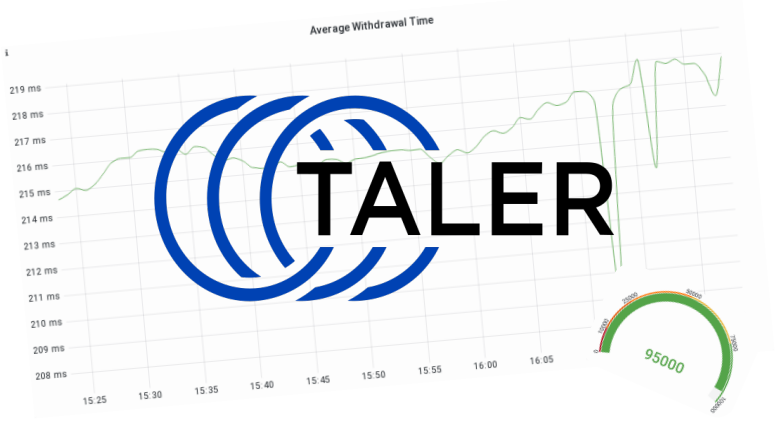
Bern University
of Applied Sciences



GNU Taler Performance Measures

Project 2

January 14, 2022

- Introduction
- Tasks
- Platform
- Results
- Outlook
- Questions?

Introduction

GNU Taler

- Privacy friendly payment system

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- Free Software

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- **No** Block Chain

GNU Taler Performance

- Previously: Single host setup only

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- Goal: Distributed setup

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- 100'000 TPS for the EU (500 mio. people)

GNU Taler Performance

- Previously: Single host setup only
- Goal: Distributed setup
- 100'000 TPS for the EU (500 mio. people)
- 2000 TPS for Switzerland

Tasks

Tasks

- Get familiar with
  - GNU Taler
  - Experiment hosting platform

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- Create experiment environment
  - Software stack
  - Data extraction, evaluation and visualization
  - Experiment configuration and automation

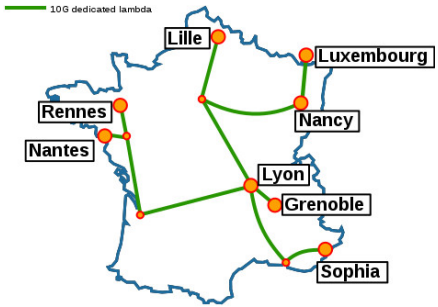
Tasks

- Get familiar with
  - GNU Taler
  - Experiment hosting platform
- Create experiment environment
  - Software stack
  - Data extraction, evaluation and visualization
  - Experiment configuration and automation
- Run experiments
  - Identify bottlenecks
  - Fix bottlenecks
  - Repeat

Platform

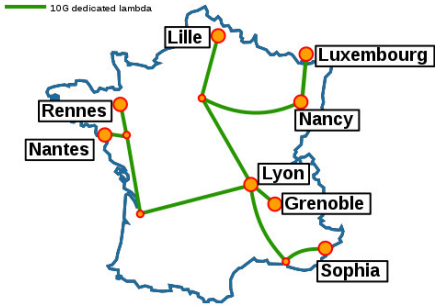
Grid5000

- Large-scale flexible testbed



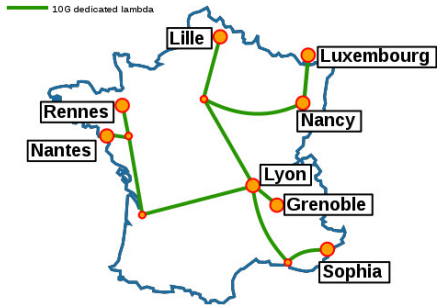
Grid5000

- Large-scale flexible testbed
- 800 nodes with total 15'000 cores



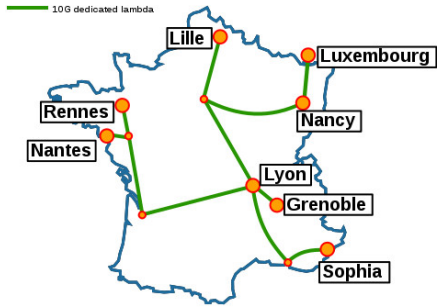
Grid5000

- Large-scale flexible testbed
- 800 nodes with total 15'000 cores
- Bare metal deployments



Grid5000

- Large-scale flexible testbed
- 800 nodes with total 15'000 cores
- Bare metal deployments
- Fully customizable software stack



Platform Access

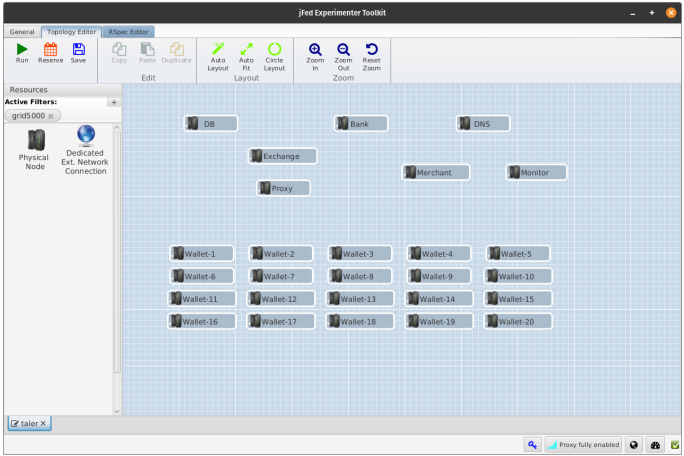


Figure: jFed - Java based GUI and CLI

Results

Tools

- Operating System
  - Debian 11

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- Experiment Software
  - GNU Taler software stack
  - Postgresql database
  - Nginx proxy server

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  - Loki / Promtail
  - Grafana

Tools

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- Experiment Software
  - GNU Taler software stack
  - Postgresql database
  - Nginx proxy server
- Monitoring Tools
  - Prometheus
  - Loki / Promtail
  - Grafana
- Experiment Automation
  - GNU Bash scripts
  - jFed Experiment Specification (ESpec)

Experiment Architecture

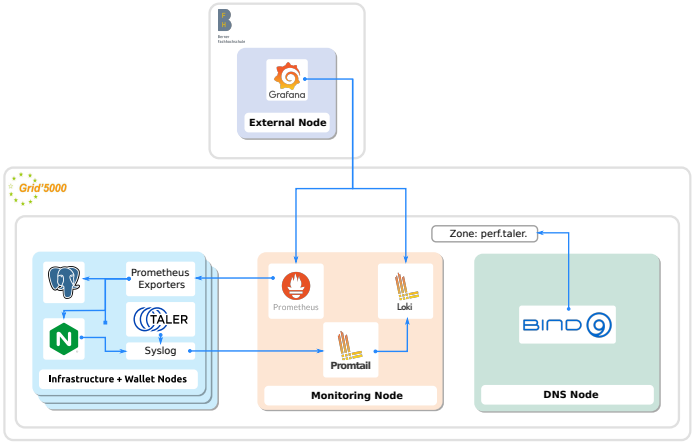

Figure: Final Top-Level Experiment Architecture

Grafana Dashboards

- Transaction Overview
- Database
- Load
- Request Statistics
- ...

Performance

- Identified various bottlenecks (some solved)

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- ∼300 TPS (number of withdrawals and payments per second)

Performance

- Identified various bottlenecks (some solved)
- ~300 TPS (number of withdrawals and payments per second)
- Current bottlenecks
  - Clients
  - Database

Outlook

Bachelor's Thesis

- Horizontal Scaling of
  - GNU Taler
  - Database

Bachelor's Thesis

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- Increase client performance

Bachelor's Thesis

- Horizontal Scaling of
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- ...

Reach 100'000 Transactions Per Second

Questions?

Bottlenecks

- Solved:
  - Slow Query due to missing indexes
  - No stub resolver in base environment
  - Database serialization errors
  - Long lived database connections - db out of memory
  - Client database performance (IndexedDB)
- Pending:
  - Database serialization errors
  - Database I/O Load
  - Client performance

Client Performance

File based Database (IndexedDB)

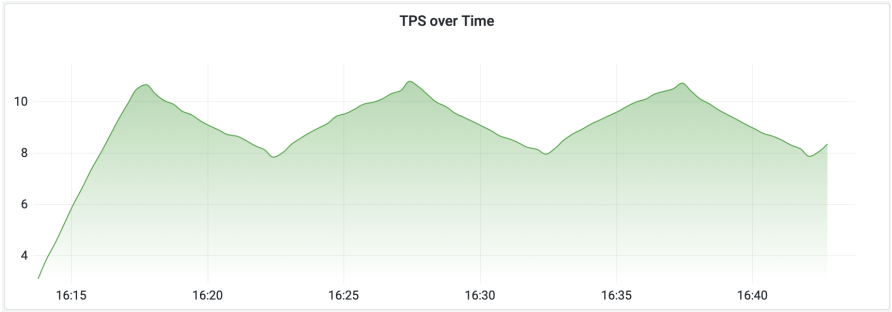

Figure: TPS when client uses a growing DB - restarted after some iterations

Client Performance

File based Database (IndexedDB)

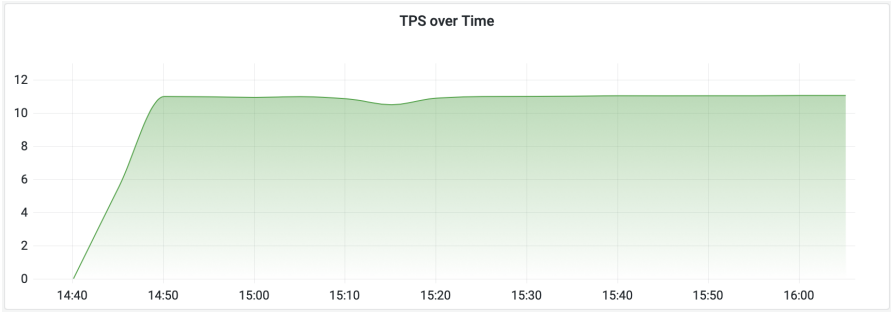

Figure: TPS when client purges DB after each iteration

Transactions Per Second

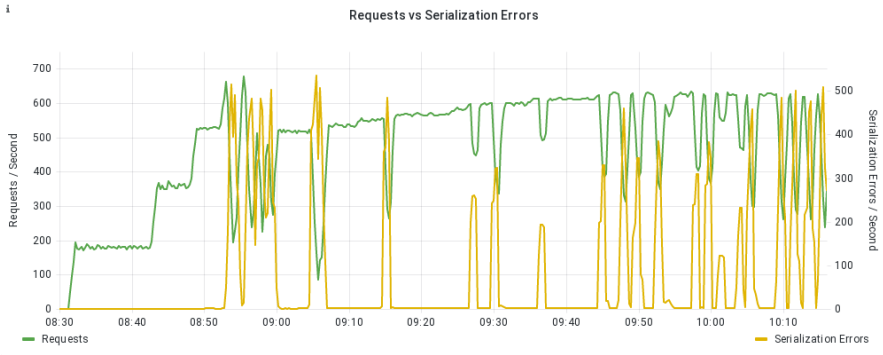

Figure: Number of requests/s affected by database serialization errors