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ÚSTAV INFORMAČNÍCH SYSTÉMŮ

**PROCESSING OF THE BLOCKCHAIN EMPLOYING IPFS**

VYUŽITÍ IPFS PRO ZPRACOVÁNÍ BLOCKCHAINU

**MASTER'S THESIS**

DIPLOMOVÁ PRÁCE

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## **Abstract**

Do tohoto odstavce bude zapsán výtah (abstrakt) práce v anglickém jazyce.

## **Abstrakt**

Do tohoto odstavce bude zapsán výtah (abstrakt) práce v českém (slovenském) jazyce.

## **Keywords**

Sem budou zapsána jednotlivá klíčová slova v anglickém jazyce, oddělená čárkami.

## **Klíčová slova**

Sem budou zapsána jednotlivá klíčová slova v českém (slovenském) jazyce, oddělená čárkami.

## **Reference**

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# Processing of the Blockchain Employing IPFS

## Declaration

Prohlašuji, že jsem tuto bakalářskou práci vypracoval samostatně pod vedením pana X... Další informace mi poskytli... Uvedl jsem všechny literární prameny, publikace a další zdroje, ze kterých jsem čerpal.

.....

Matúš Múčka  
November 26, 2019

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# Chapter 1

## Introduction

HTTP is „good enough“ for the most use cases of distributing files over the network (like webpages, etc.). But when we want to stream lots of data to multiple connected clients at once, we are starting to hit its limits. When two clients are requesting the same data, there is no mechanism in HTTP that would allow sending the data only once. Sending duplicate data has become a problem in large companies because of bandwidth capacity. Blizzard <sup>1</sup> started to distribute video game content by distributed solution because it was cheaper for the company and faster for players [1]. Linux distributions use BitTorrent to transmit disk images <sup>2</sup>.

The bitcoin blockchain has now 242 gigabytes <sup>3</sup>. When blockchain is processed (parsed address, created search indexes), the size on a disk can double. If there are multiple blockchains, then data can have few terabytes. When we are sharing blockchains data from the server for several clients, there is a big chance that multiple clients want the same data. They may be working on the same case and investigating the same wallets. So in standard solution with relational database and some HTTP server, for every request server has to search in all data (that can have a size of few terabytes) and transmit selected data to the client. This happens even if a different client asks for the same data in a few minutes ago. Behaviour mentioned above dramatically limits the scalability of the server.

Services that are using HTTP, often have client-server architecture, so there is also a problem with one point of failure. If the server for some reason stops working, the client can not receive data. In distributed file system such as IPFS, there is no such problem as one point of failure, because all data are duplicated on multiple clients.

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<sup>1</sup>Game company

<sup>2</sup>Image of Debian downloadable by BitTorrent <https://www.debian.org/CD/torrent-cd/>

<sup>3</sup>Current size of bitcoin blockchain can be seen at <https://www.statista.com/statistics/647523/worldwide-bitcoin-blockchain-size/>

## Chapter 2

# Cryptocurrencies

2.1 Ethereum

2.2 Bitcoin

2.3 DigiByte

2.4 Decred

2.5 Monero

## Chapter 3

# IPFS

IPFS stands for InterPlanetary File System and is a peer-to-peer distributed filesystem designed to make the Web faster, safer, and more open. In contrast with standard filesystems, objects in IPFS are content-addressed, by the cryptographic hash of their contents. In the case of the standard Web, when user wants some file, he needs to know on which server is a file located and the full path to the file. In IPFS user needs only to know the hash of the requested file. He does not care about the location of the file.

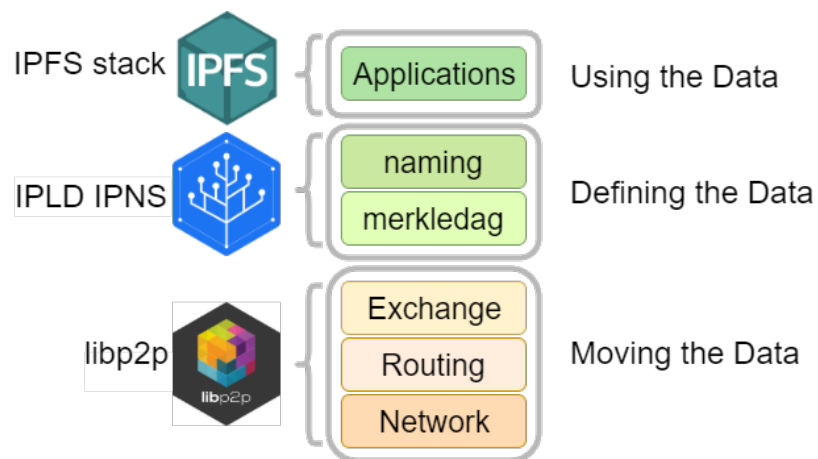


Figure 3.1: IPFS stack

**3.0.1 Cluster**

**3.0.2 Node**

**3.0.3 CID**

**3.1 IPLD**

**3.1.1 Formats**

**3.1.2 Routing**

**3.1.3 Exchange**

**3.1.4 Objects**

**3.1.5 Files**

**3.1.6 Naming (IPNM)**



# Chapter 4

## Design

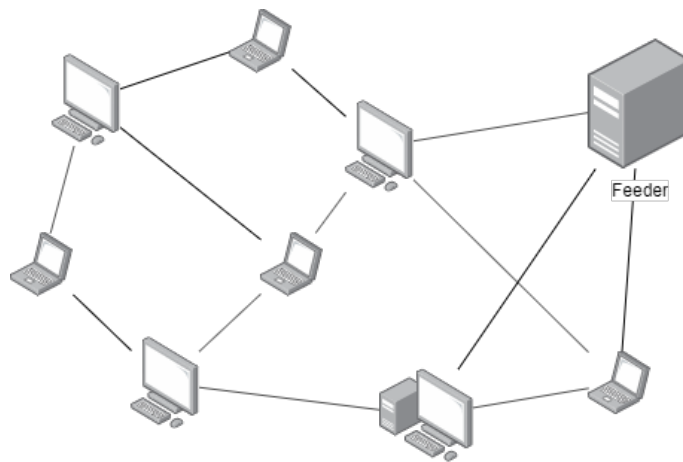


Figure 4.1: System design

### 4.1 Feeder

#### 4.1.1 Blockbook

### 4.2 Client application

#### 4.2.1 API

Routes:

```
getBlockByHash(string hash) -> block  
getTransactionByHash(string hash) -> transaction  
getAddressByHash(string hash) -> address
```

#### 4.2.2 UI

## Chapter 5

# Implementation

## Chapter 6

# Testing

### 6.1 Testing enviroment

## Chapter 7

## Conclusion

# Bibliography

- [1] KALLE, K. *Big data in video games*. Lappeenranta, FI, 2017. Bakalářská práce. Lappeenranta University of Technology, School of Business and Management, Computer Science. Available at: <http://lutpub.lut.fi/handle/10024/147666>.