

BRNO UNIVERSITY OF TECHNOLOGY

Faculty of Electrical Engineering
and Communication

SEMESTRAL THESIS

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ÚSTAV TELEKOMUNIKACÍ

APPLICATION FOR MONITORING OF LINUX SERVERS

APLIKACE PRO MONITOROVÁNÍ SERVERŮ S OPERAČNÍM SYSTÉMEM LINUX

SEMESTRAL THESIS

SEMESTRÁLNÍ PRÁCE

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POKYNY PRO VYPRACOVÁNÍ:

Seznamte se s aplikací vyvíjenou na Ústavu telekomunikací pro vzdálenou práci se servery sítě PlanetLab (www.planet-lab.eu). Tato aplikace je dostupná na adrese pypi.org/project/plbmng/. V rámci semestrálního projektu aplikaci převeďte do jazyka Python 3. Dále proveďte její aktualizaci na repositáři PyPI. V rámci diplomové práce aplikaci rozšiřte o možnost vyhledávání serverů podle jejich aktuálního stavu činnosti. Vytvořený kód vystavte pod licencí MIT a umístěte jej na repositář PyPI. Aktualizujte popis aplikace v anglickém jazyce.

DOPORUČENÁ LITERATURA:

[1] Linux Dokumentační projekt. 4. vyd. Computer Press, 2008. 1336 s. ISBN: 978-80-251-1525-1.

[2] PILGRIM, M. Ponořme se do Python(u) 3. CZ.NIC, 2010. 435 s. ISBN: 978-80-904248-2-1.

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UPOZORNĚNÍ:

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Introduction

Task of developing a network project can become a challenging task. Internet is a huge worldwide network and to properly simulate the usage and architecture of the internet requires at least several servers on different locations at best. PlanetLab Network offers a global research network that enables development of new network services. The goal of this semestral is to improve existing tool, make it easier to use and publish the changes by updating the PyPi repositories. PlanetLab Server Manager is an existing tool that allows users to get information about nodes in the PlanetLab network and creates an user interface that helps interact with them. The current state of the application, which will be described later, can be a barrier for more extensive usage of the application and community driven improvements. Semestral thesis aims to re-write the application into Python; a popular community supported multi-platform object oriented programming language [2]. This thesis extends existing tools developed by Ivan Andrašov [1] and Filip Šuba [4].

The approach to achieve the goals of this thesis is to take existing Bash functions and re-write them to Python 3. During this process each functions is evaluated whether the used implementation is correct or not. To achieve easier usage of the application, main focus is applied onto removing system package dependencies and scrapping the necessity to localize the installation folder. To achieve better readability improvements to the implementation of functions are added by using best coding practices. Special emphasis is laid on logical structure and good programming practices to empower later community improvements to the tool.

Since this thesis uses already existing tool created by previous students, in Chapter 1 the tool and summary of previous work is reviewed. In the Chapter ?? the PlanetLab project will be introduced and characterized. As Linux is the main operating system nodes uses, in the Chapter 3 it will be described along with virtualization as it is the technology used for provisioning the PlanetLab nodes [3]. In the Chapter 4 the improvements made to the Plbmng tool will be explained.

1 Plbmng Tool

Plbmng application called **Data miner for PlanetLab** is available at public PyPi repository¹. The tool allows managing **PlanetLab** nodes, gathering information about them and pulling the latest data from the **PlanetLab** API service. Its core is written in Bash and additional modules are written in Python 3 [4]. At the moment, it is depended on both Bash and Python modules and it's installation consists of several steps:

- Installing the application from PyPi repository or downloading the source codes from GitHub.
- Installing additional system packages like `dialog`, `pssh` and `fping`.
- Locating installation folder and putting symlink into `$PATH` directory.

After the first start of the application user is required to fill credentials and SSH public key details to be able to access **PlanetLab** API and nodes using the menu option **Credentials**. All the current options in the menu are **Search nodes** for retrieving a node from internal database, **Measure Menu** that allows user to schedule gathering of data about the nodes or run the data gathering now, **Map Menu** that allow user to generate map showing location of the nodes and mentioned **Settings**. Menu is created using bash library `dialog` and can be seen in Figure 1.1.

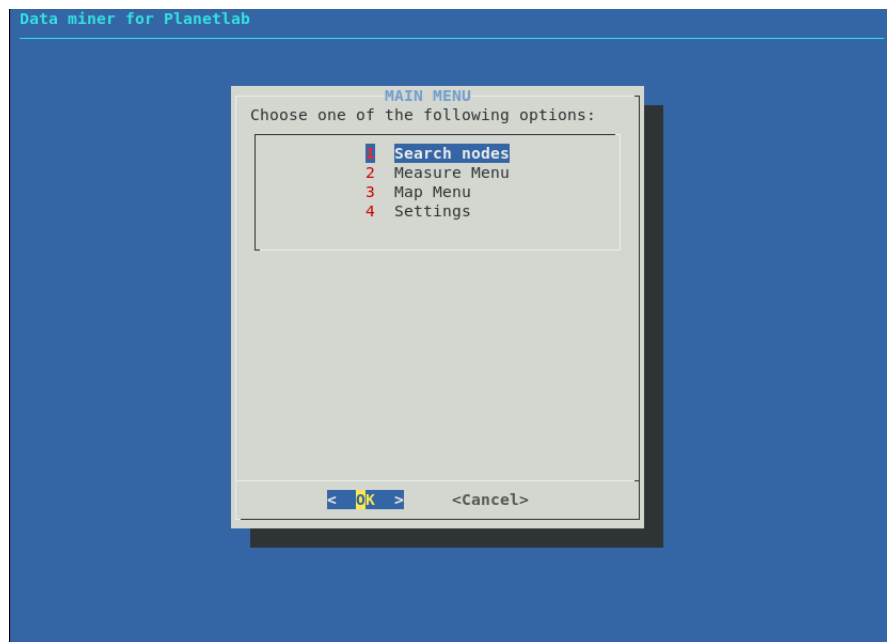


Fig. 1.1: Data miner for PlanetLab menu.

asd

¹PyPi page of the plbmng tool: <https://pypi.org/project/plbmng/>

1.1 Current Tool Funcionality

1.2 Current Tool State

The first problem of the existing tool is language disparity having half of the functionality in Bash and half of the functionality in Python 3. This makes it difficult to make adjusment to the tool as one needs to study a great amount of scripts that are in several different folders.

1.3 Areas of improvement

easier installation description of the menu

2 extttPlanetLab Network

3 Linux and Virtualization

4 Plbmng Tool Improvements

Teoretické zázemí studentské práce vhodně rozdělené do částí.

(Struktura navržená v této šabloně je nejhrubší možná, po konzultaci s vedoucím je vhodné zvolit přiléhavější.)

5 Výsledky studentské práce

Praktická část a výsledky studentské práce vhodně rozdělené do částí.

5.1 Programové řešení

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5.2 Výsledky měření

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6 Závěr

Shrnutí studentské práce.

Bibliography

- [1] ANDRAŠOV, I. *Měření experimentální sítě PlanetLab*. Brno: Brno, University of Technology, 2017. Bachelor thesis. Available at:
<https://www.vutbr.cz/studenti/zav-prace/detail/110277>.
- [2] LUTZ, M. *Learning Python: Powerful Object-Oriented Programming*. [b.m.]: O'Reilly Media, 2013. Safari Books Online. Available at:
<https://books.google.cz/books?id=4pgQfXQvekC>. ISBN 9781449355692.
- [3] PLANETLAB. *About PlanetLab project* [online]. Revised: 29, May, 2017 [cit. 24. November 2018]. Available at: <https://www.planet-lab.eu/about>.
- [4] ŠUBA, F. *Monitorování serverů s OS Linux*. Brno: Brno, University of Technology, 2018. Bachelor thesis. Available at:
<https://www.vutbr.cz/studenti/zav-prace/detail/110178>.