Web Platform for Digital Deployment of Virtual Servers

# Motivation and rationale

## Abstract

In 2016 there are currently three billion people that have access to the internet. The website google.com handles between two and three billion search queries per day [[1]](file:///C:\Users\hallagat\Desktop\proposal.md.html#1). Achieving such task requires full usage of the available hardware. Part of Google's ability to scale and be performant is due to the emergence of cloud infrastructure. The topic of the paper is tightly connected with one of the building blocks of cloud computing, which is virtualisation.

Techopedia defines the term virtualisation, as the ability of one piece of hardware to run multiple operating systems [[2]](file:///C:\Users\hallagat\Desktop\proposal.md.html#2). Creating a platform that uses such technology enables an organisation to quickly set up any environment that can be used in a variety of cases. Virtualisation can help solve the following problems.

## Problem

These days, it is a common place for a company to buy a computer per person which requires physical access to perform repairs and maintenance. Physical systems are also more difficult to manage due to their distributions. Another downside is hardware utilisation, a case where one machine uses maximum resources but another one is idle. The solution of this problem is virtualisation. With this technology, which is part of modern Intel processor chips, one server can run numerous operating systems concurrently. This helps with performance, as a virtual machine can be configured on the fly to use resources. Another problem that my work will help to solve is…

## Approach

My project aims at making the process of managing and creating virtual machines easy. A system manager should be able to open a website, fill in a web form with enough information about the desired virtual machine, click a button and create an operating system. The user should also be able to gain credentials for that machine, as well as mark common packages for installation on it. The solution should also show performance statistics.

# Aim

Give developers a platform for easy deployment, management and monitoring of virtual servers

# Objectives

1. **Deploy a virtual machine of the user's choice quickly through shell scripts**  
   The main feature of the solution is the deployment of the virtual machine instances. The following will be achieved by using Oracle's virtualisation documentation for Virtualbox and the shell scripting language and the automation tool chef.
2. **Configure firewall settings**  
   Will be achieved through the virtualisation technology's API. Adds required security layer to the instance.
3. **Allow console access and set up authentication credentials (SSH keys) for your instances**
4. **Monitor disk/CPU usage of your virtual instances**
5. **Install software from a predefined list**
6. **Create a website with backend API that will manage and create virtual machine instances**
7. **Connect backend API to web forms for web-based deployment**

# Background

**Paper:** Menasc´e, D. A. (2005). VIRTUALIZATION: CONCEPTS, APPLICATIONS, AND PERFORMANCE MODELING  
**Description:** The document provides brief description of virtualisation, explains performance modelling and gives a diagram overview of how it works.  
**Relevance:** Gives background and context for the work that I will be doing. Gives a good overview of the technology and its relevance to the project.

**Resource:** Chef Software, Inc. (2014). bash guide  
**Description:** Description of syntax, actions properties and examples of how to use version control for deployment. It also contains examples.  
**Relevance:** Chef is an automation platform that will help me with deployment. The website's guides are a quick way to learn how to operate with the automation of the task.

**Paper:** Oracle Corporation (2016)  
**Description:** The paper gives context and intuition about Virtualbox terminology and ideas, provides getting started checklist and it shows step by step guide that cover the basics of virtual machine deployment.  
**Relevance:**This white paper will be the essential source of information for achieving the aim of my dissertation. It also lays the building blocks that need to be automated and configured.

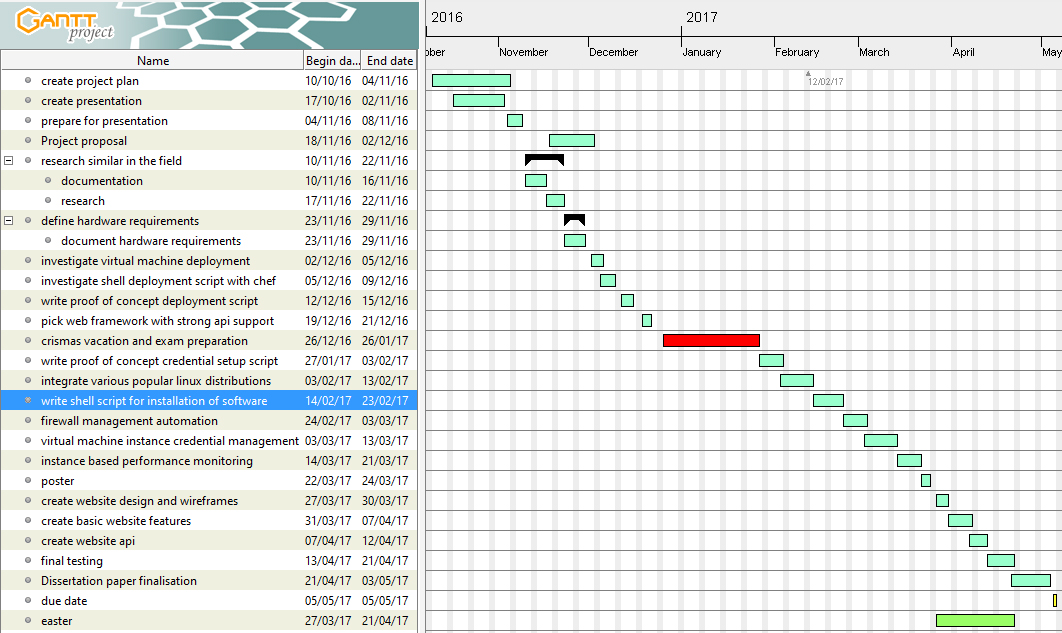
**Paper:** IEEE (2011). Understanding Cloud Computing Vulnerabilities  
**Description:**IEEE document that provides an overview of cloud computing vulnerabilities. The paper discusses Web Applications, managing access and identity and authentication.  
**Relevance:**The solution will include managing ports, installing applications and giving authentication tokens, it is important to be mindful of potential security threat vectors and any security issues that might require attention.

**Paper**: CA Technologies (2005). Creating REST APIs to Enable Our Connected World

**Description**: The document describes the importance of RESTFUL APIs and describe what “REST” is. It also details how to integrate rest with other services.

**Relevance: An important aspect of the work will be how a user interacts with the system, which will be directly associated with the web API. Such an interface will bridge the gap between the user filling a form and the deployment scripts providing the required operating system.**

# Diagrammatic work plan



# Explanation of work plan

## Work done so far

As of now, I have defined the key features of my solution and have also become familiar with key concepts and terminology. I have also found plenty of background research papers, vendor documentations, guides and relevant technologies. As part of my contingency plan, I also investigated alternative solutions that can be used in case of a failure or integration difficulties.

## Future work

As part of my research, I need to pick the web framework that will manage user interactions. I would also need to learn the technical aspects of the different tools that are necessary for full integration. Proof of concept work will be the next step, as it will yield information about the core functionality. The work involves the Virtualbox software and the shell scripting language. Once I have a script that will install and prepare an operating system, I would know the basic deployment workflow. The second semester will mark the beginning of main implementation, testing and documentation part of the work. The reason for leaving major part of the work to the second semester is the module distribution of my course, this will be the time mostly dedicated to the dissertation. Following work will be dedicated to setting up login credentials on the virtual machine instance. For improved security, all virtual machines will have no open ports until one is configured for access. Such script will be created and it should allow an arbitrary port to be opened. Next step will be choosing the software that will be monitoring the virtual machine instance and will be reporting to the web interface. This work would require a reporting interface for sending different data points to the management website API that will be created later. With these building blocks already implemented, I can move on to create the poster and start with website design and wireframes. The website will be the user facing management tool that will interface with the already implemented scripts (installation, port management, performance monitoring, etc.). The work of creating the website and its API will be done during Easter holiday. During the second part of that period, I will also be doing the final testing. After the break, the final write up for my dissertation will follow, where I will conclude the paper.

# References

1. <http://www.internetlivestats.com/google-search-statistics/>
2. <https://www.techopedia.com/definition/719/virtualization>