

0x09. Web infrastructure design

DevOpsSysAdminweb infrastructure

- By: Sylvain Kalache, co-founder at Holberton School
- Weight: 1
- Project to be done in teams of 3 people (your team: Emmanuel Ahuron, Esther Odzao Lardze, Bismark Boateng)
- Project over - took place from Aug 18, 2022 6:00 AM to Aug 22, 2022 6:00 AM
- Manual QA review was done by Michael Oppong on Aug 21, 2022 9:01 PM

In a nutshell...

- **Manual QA review:** 42.0/42 mandatory & 5.0/5 optional
- **Altogether: 200.0%**
 - Mandatory: 100.0%
 - Optional: 100.0%
 - Calculation: $100.0\% + (100.0\% * 100.0\%) == 200.0\%$

Concepts

For this project, we expect you to look at these concepts:

- DNS
- Monitoring
- Web Server
- Network basics
- Load balancer
- Server

Resources

Read or watch:

- **Network basics** concept page
- **Server** concept page
- **Web server** concept page
- **DNS** concept page
- **Load balancer** concept page
- **Monitoring** concept page
- **What is a database**
- **What's the difference between a web server and an app server?**
- **DNS record types**
- **Single point of failure**
- **How to avoid downtime when deploying new code**
- **High availability cluster (active-active/active-passive)**

- What is HTTPS
- What is a firewall

Learning Objectives

At the end of this project, you are expected to be able to **explain to anyone, without the help of Google:**

General

- You must be able to draw a diagram covering the web stack you built with the sysadmin/devops track projects
- You must be able to explain what each component is doing
- You must be able to explain system redundancy
- Know all the mentioned acronyms: LAMP, SPOF, QPS

Copyright - Plagiarism

- You are tasked to come up with solutions for the tasks below yourself to meet with the above learning objectives.
- You will not be able to meet the objectives of this or any following project by copying and pasting someone else's work.
- You are not allowed to publish any content of this project.
- Any form of plagiarism is strictly forbidden and will result in removal from the program.

Requirements

General

- A **README.md** file, at the root of the folder of the project, is mandatory
- For each task, once you are done whiteboarding (on a whiteboard, piece of paper or software or your choice), take a picture/screenshot of your diagram
- This project will be manually reviewed:
- As each task is completed, the name of that task will turn green
- Upload a screenshot, showing that you completed the required levels, to any image hosting service (I personally use **imgur** but feel free to use anything you want).
- For the following tasks, insert the link from of your screenshot into the answer file
- After pushing your answer file to GitHub, insert the GitHub file link into the URL box
- You will also have to whiteboard each task in front of a mentor, staff or student - no computer or notes will be allowed during the whiteboarding session
- Focus on what you are being asked:
- Cover what the requirements mention, we will explore details in a later project

- Keep in mind that you will have 30 minutes to perform the exercise, you will get points for what is asked in requirements
- Similarly in a job interview, you should answer what the interviewer asked for, be careful about being too verbose - always ask the interviewer if going into details is necessary - speaking too much can play against you
- In this project, again, avoid going in details if not asked

Quiz questions

Great! You've completed the quiz successfully! Keep going! ([Show quiz](#))

Tasks

0. Simple web stack

mandatory

Score: 100.0% (Checks completed: 100.0%)

A lot of websites are powered by simple web infrastructure, a lot of time it is composed of a single server with a **LAMP stack**.

On a whiteboard, design a one server web infrastructure that hosts the website that is reachable via **www.foobar.com**. Start your explanation by having a user wanting to access your website.

Requirements:

- You must use:
 - 1 server
 - 1 web server (Nginx)
 - 1 application server
 - 1 application files (your code base)
 - 1 database (MySQL)
 - 1 domain name **foobar.com** configured with a **www** record that points to your server IP **8.8.8.8**
- You must be able to explain some specifics about this infrastructure:
 - What is a server
 - What is the role of the domain name
 - What type of DNS record **www** is in **www.foobar.com**
 - What is the role of the web server
 - What is the role of the application server
 - What is the role of the database
 - What is the server using to communicate with the computer of the user requesting the website
- You must be able to explain what the issues are with this infrastructure:
 - SPOF
 - Downtime when maintenance needed (like deploying new code web server needs to be restarted)
 - Cannot scale if too much incoming traffic

Please, remember that everything must be written in English to further your technical ability in a variety of settings.

Add URLs here:

1. <https://imgur.com/vIaz5kU> Remove

Repo:

- GitHub repository: `alx-system_engineering-devops`
- Directory: `0x09-web_infrastructure_design`
- File: `0-simple_web_stack`

Done! Help QA Review

1. Distributed web infrastructure

mandatory

Score: 100.0% (Checks completed: 100.0%)

On a whiteboard, design a three server web infrastructure that hosts the website `www.foobar.com`.

Requirements:

- You must add:
 - 2 servers
 - 1 web server (Nginx)
 - 1 application server
 - 1 load-balancer (HAproxy)
 - 1 set of application files (your code base)
 - 1 database (MySQL)
- You must be able to explain some specifics about this infrastructure:
 - For every additional element, why you are adding it
 - What distribution algorithm your load balancer is configured with and how it works
 - Is your load-balancer enabling an Active-Active or Active-Passive setup, explain the difference between both
 - How a database Primary-Replica (Master-Slave) cluster works
 - What is the difference between the Primary node and the Replica node in regard to the application
- You must be able to explain what the issues are with this infrastructure:
 - Where are SPOF
 - Security issues (no firewall, no HTTPS)
 - No monitoring

Please, remember that everything must be written in English to further your technical ability in a variety of settings.

Add URLs here:

1. <https://imgur.com/lwHXTbc> Remove

Repo:

- GitHub repository: [alx-system_engineering-devops](#)
- Directory: [0x09-web_infrastructure_design](#)
- File: [1-distributed_web_infrastructure](#)

Done! Help QA Review

2. Secured and monitored web infrastructure

mandatory

Score: 100.0% (Checks completed: 100.0%)

On a whiteboard, design a three server web infrastructure that hosts the website [www.foobar.com](#), it must be secured, serve encrypted traffic, and be monitored.

Requirements:

- You must add:
 - 3 firewalls
 - 1 SSL certificate to serve [www.foobar.com](#) over HTTPS
 - 3 monitoring clients (data collector for Sumologic or other monitoring services)
- You must be able to explain some specifics about this infrastructure:
 - For every additional element, why you are adding it
 - What are firewalls for
 - Why is the traffic served over HTTPS
 - What monitoring is used for
 - How the monitoring tool is collecting data
 - Explain what to do if you want to monitor your web server QPS
- You must be able to explain what the issues are with this infrastructure:
 - Why terminating SSL at the load balancer level is an issue
 - Why having only one MySQL server capable of accepting writes is an issue
 - Why having servers with all the same components (database, web server and application server) might be a problem

Please, remember that everything must be written in English to further your technical ability in a variety of settings.

Add URLs here:

1. <https://imgur.com/djaeyYv> Remove

Repo:

- GitHub repository: `alx-system_engineering-devops`
- Directory: `0x09-web_infrastructure_design`
- File: `2-secured_and_monitored_web_infrastructure`

Done! Help QA Review

3. Scale up

#advanced

Score: 100.0% (Checks completed: 100.0%)

Readme

- **Application server vs web server**

Requirements:

- You must add:
 - 1 server
 - 1 load-balancer (HAproxy) configured as cluster with the other one
 - Split components (web server, application server, database) with their own server
- You must be able to explain some specifics about this infrastructure:
 - For every additional element, why you are adding it

Please, remember that everything must be written in English to further your technical ability in a variety of settings.

Add URLs here:

1. <https://imgur.com/DGYvc86> Remove

Repo:

- GitHub repository: `alx-system_engineering-devops`
- Directory: `0x09-web_infrastructure_design`
- File: `3-scale_up`

Done! Help QA Review

Ready for a new manual review