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
* Project over - took place from Oct 26, 2023 5:00 AM to Oct 30, 2023 5:00 AM
* Manual QA review was done by on Sep 9, 2023 10:16 AM

In a nutshell…

* **Manual QA review:** 0.0/42 mandatory & 0.0/5 optional
* **Altogether:**  **0.0%**
  + Mandatory: 0.0%
  + Optional: 0.0%
  + Calculation:  0.0% + (0.0% \* 0.0%)  == **0.0%**

Concepts

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

* [DNS](https://intranet.alxswe.com/concepts/12)
* [Monitoring](https://intranet.alxswe.com/concepts/13)
* [Web Server](https://intranet.alxswe.com/concepts/17)
* [Network basics](https://intranet.alxswe.com/concepts/33)
* [Load balancer](https://intranet.alxswe.com/concepts/46)
* [Server](https://intranet.alxswe.com/concepts/67)

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](https://intranet.alxswe.com/rltoken/n3CdS3EA5l5psDDKbEhApA)
* [What’s the difference between a web server and an app server?](https://intranet.alxswe.com/rltoken/0as4wDlFqyhLhf0f_gedcw)
* [DNS record types](https://intranet.alxswe.com/rltoken/Pl3UoEfAO7K_jUKRLMmnAQ)
* [Single point of failure](https://intranet.alxswe.com/rltoken/uxpx2YhXs10TFLIDg78chA)
* [How to avoid downtime when deploying new code](https://intranet.alxswe.com/rltoken/4ansLu2gtHnoFrNThqyObA)
* [High availability cluster (active-active/active-passive)](https://intranet.alxswe.com/rltoken/TAJeVYy9U9iLaEDd6XkbRA)
* [What is HTTPS](https://intranet.alxswe.com/rltoken/c0zs2MxrmxFLsCPOizxq6g)
* [What is a firewall](https://intranet.alxswe.com/rltoken/j6idMcUTyNEDj1oYDQFmUw)

Learning Objectives

At the end of this project, you are expected to be able to [explain to anyone](https://intranet.alxswe.com/rltoken/FPJvEE-DRJDvmVTNWeFR8A), **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](https://intranet.alxswe.com/rltoken/m_O2HLsKrO1zg31LMcLOGQ" \o "imgur" \t "_blank) 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: 0.0% (*Checks completed: 0.0%*)

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](https://intranet.alxswe.com/rltoken/YVDX0XsC6XHp0nmezvT9vQ).

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:

Save

1. [localhost/foobar.com/0-simple\_web\_stack](https://intranet.alxswe.com/projects/localhost/foobar.com/0-simple_web_stack) 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: 0.0% (*Checks completed: 0.0%*)

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:

Save

1. [localhost/foobar.com/1-distributed\_web\_infrastructure](https://intranet.alxswe.com/projects/localhost/foobar.com/1-distributed_web_infrastructure) 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: 0.0% (*Checks completed: 0.0%*)

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:

Save

1. [localhost/foobar.com/2-secured\_and\_monitored\_web\_infrastructure](https://intranet.alxswe.com/projects/localhost/foobar.com/2-secured_and_monitored_web_infrastructure) 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: 0.0% (*Checks completed: 0.0%*)

Readme

* [Application server vs web server](https://intranet.alxswe.com/rltoken/toFi_SdFHyi2MaELB8ekqw)

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:

Save

1. [localhost/foobar.com/3-scale\_up](https://intranet.alxswe.com/projects/localhost/foobar.com/3-scale_up) 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

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