Distributed Web Infrastructure

1. **For every additional element, why you are adding it**

   The purpose of adding elements is as follows:

   - **Redundancy:** Multiple web servers provide redundancy. If one web server fails, the others can continue to handle requests.
   - **Scalability:** Adding a load balancer will help to handle increased traffic by distributing the load across multiple web servers and potentially multiple application servers.
   - **Isolation:** Separating the application server and the database server enhances security and allows for more efficient resource allocation.
   - **Flexibility:** The use of load balancers and multiple servers allows for easier scaling and modification of the infrastructure as the website or application grows.

2. **What distribution algorithm your load balancer is configured with and how it works**
   Our distribution will use the Round-Robin algorithm.
   The Round-Robin algorithm distributes load amongst the servers in a cyclic order using a fixed time unit to process each task. After sending the request to the last server, it starts from the first server again. The algorithm is used when servers are of equal specifications, and there are not so many persistent connections.

3. **Is your load-balancer enabling an Active-Active or Active-Passive setup, explain the difference between both**
   Our load balancer enables an active-active setup. All servers are receiving traffic concurrently in a fixed time manner, rather than clogging just one of the servers.
   In an active-passive setup, the passive server stays on standby in case of a failover of the active server

4. **How a database Primary-Replica (Master-Slave) cluster works**
   Master-slave replication enables data from one database server (the master) to be replicated to one or more database servers (the slave). The master logs the updates, which then ripple through the slaves. If the changes are made to the master and slave at the same time, it is synchronous. If changes are queued up and written later, it is asynchronous.

   This cluster is used to spread read access on multiple servers for scalability. It can also be used for failover purposes, or to analyze data on the slave in order not to overload the master.

5. **What is the difference between the Primary node and the Replica node in regard to the application**
   The replica node is a copy of the primary node. They provide redundant copies of the application codebase to protect against hardware failure and increase capacity to serve read requests like searching or retrieving a document.

Issues with this Web Infrastructure

1. **Where are SPOF**
   The SPOF in this setup is having only one load balancer.

2. **Security issues (no firewall, no HTTPS)**
   Since the application connects over an unsecured HTTP protocol, it is susceptible to man-in-the-middle attacks, thereby allowing an attacker to view sensitive information like passwords, credit card info, etc.

   Since there is no firewall, it can expose the application to DDOS attacks, thereby causing a downtime in the system, or allow a malicious attacker to breach the system by exploiting unknown open ports and perform data exfiltration.

3. **No monitoring**
   A popular saying in the tech industry goes thus “you can not fix or improve what you can not measure”.

   Monitoring the server, website, or application in general, would help to identify potential problems, downtime, security threats, etc, and resolve them before they turn into serious problems. It will also improve productivity and possibly save some costs on IT support, as well as improve user experience in general.