

## TOWARDS THE MODEL AND SOFTWARE COMPONENTS FOR BUILDING AN EFFICIENT IT INFRASTRUCTURE ON THE AWS PLATFORM

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Information technology is an integral component of modern business and infrastructure. Companies and enterprises continually refine their IT infrastructure to enhance productivity, reduce costs, and improve security. Leveraging cloud services, especially the Amazon Web Services (AWS) platform, has become an increasingly popular approach for building the IT infrastructure [1]. Therefore, this paper delves into research on the construction of the efficient IT infrastructure on the AWS platform, examining the following aspects:

1. Research Objective of this study is to create a formal model to improve the process of IT infrastructure building on the AWS platform. This model should encompass methods and approaches for deploying, managing, and scaling infrastructure on AWS with an emphasis on improving performance and efficiency.

2. Significance of the Research [1]:

- Cost Reduction: Optimizing IT infrastructure helps businesses cut expenses related to procuring and maintaining physical equipment. Using AWS enables “pay-as-you-go” pricing model, ensuring that costs align with actual resource utilization.

- Rapid Deployment: AWS offers the capability of swiftly provisioning virtual servers and services, reducing the time required to implement new projects and respond to market changes.

- Enhanced Security: AWS provides tools for data and infrastructure security, including automated backups, monitoring, and identity and access management.

- Scalability: AWS allows to automate IT infrastructure scaling based on demand, preventing server overloads and reducing the risk of failures.

- Flexibility: AWS offers a wide array of customizable and combinable services to meet specific business needs.

The development of an optimized IT infrastructure on the AWS platform involves the formulation of a mathematical model. The mathematical model is based on the well-known Knapsack Problem (from the combinatorial optimization domain) [2] and aims to represent the various components of an IT infrastructure, including virtual machines, storage, networking, and application services. It factors in computing power  $P_i$ , cost considerations  $c_i$ , and cost constraints  $C$ . It may include other parameters like memory, storage capacity, and network bandwidth, while its objective function seeks to maximize infrastructure performance:

$$\begin{aligned} & \text{maximize } \sum_{i=1}^n P_i x_i \\ & \text{subject to } \sum_{i=1}^n c_i x_i \leq C \text{ and } x_i \in \{0, 1\}. \end{aligned}$$

To ensure system security and monitor infrastructure performance, it is important to choose the right tools and services, such as Amazon CloudWatch for monitoring and Amazon Identity and Access Management (IAM) for access control. The choice of tools and

technologies is a critical step in the development of a software solution, as it determines the technical architecture of the system and the ability to achieve the desired goals.

Careful analysis and selection of appropriate tools helps to create an effective and reliable automation system for building IT infrastructure on AWS (Figure 1).

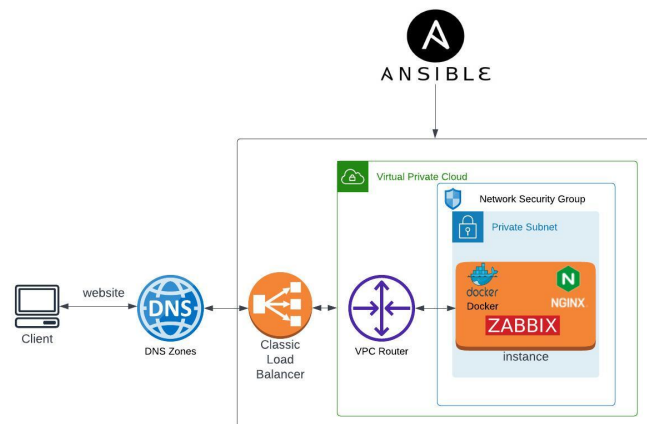


Figure 1 – AWS deployment diagram of the software solution components

Figure 1 shows the use of automation through Ansible to manage infrastructure, configure networking and security using the following components:

- Ansible: This component is responsible for automating and orchestrating infrastructure deployment and management. Ansible helps to configure various system components.
- Elastic Load Balancer (ELB): ELB is used to balance the load between EC2 Instances to ensure high availability and resilience.
- VPS Router: This component can be used to route network traffic between different parts of the infrastructure and interact with other network components.
- Virtual Private Cloud (VPC): VPC creates your own virtual network in AWS that allows you to configure segmentation and control network access to different parts of infrastructure.
- Network Security Group (NSG): NSG is used to set security rules at the network level. It allows engineers to control traffic to and design network components.
- EC2 Instance: These virtual servers in AWS are used to run applications and services. In this case, the EC2 instances are configured using Docker and contain the Nginx web server.
- Zabbix Monitoring: This monitoring system is important to ensure the reliability and availability of the IT infrastructure on the Amazon Web Services platform.

Research on the optimization model to build the IT infrastructure on the AWS platform is a crucial task in the context of a rapidly evolving business landscape. Using the proposed model, the configuration of two “t3.nano” and two “t3.micro” computing instances [3] were selected to implement the IT infrastructure and deploy the proposed environment (Figure 1). Obtained solution allows to get the “24 by 7” provision under the 30 USD per month cost constraint.

Effective optimization can lead to cost reductions, increased productivity, and a reliable infrastructure. Thus, this study can be found valuable for enterprises considering the transition to cloud services and the enhancement of their IT infrastructure.

#### References:

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2. *Efficient 0/1-Multiple-Knapsack Problem Solving by Hybrid DP Transformation and Robust Unbiased Filtering*. URL: <https://doi.org/10.3390/a15100366>
3. *Amazon EC2 T3 Instances*. URL: <https://aws.amazon.com/ec2/instance-types/t3/>