UNIVERSITY OF WOLVERHAMPTON

HERALD COLLEGE KATHMANDU

5CS022/HJ1: Distributed and Cloud Systems Programming

Academic Year	Module	Task
2025	5CS022/HJ1: Distributed and Cloud Systems Programming	1

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Question

Write a research-based report on the following question: "How do Cloud systems and solutions compare with traditionally hosted systems (either in-house or out-sourced), in terms of performance, security, cost and reliability? " The report must include examples from real-world case studies, for e.g. Netflix, to support the analysis and be structured into sections covering performance, security, cost, and reliability. The report should be around 1000 words, and all sources should be correctly referenced with the Harvard referencing style.

This report will contribute 20% of the marks to the Portfolio.

Introduction

What is cloud computing?

Cloud computing can be defined as a service that provides on-demand compute resources over the internet in generally a pay-per-use basis. These compute resources can be rapidly acquired and decommissioned based on their need and share computing resources.

What is Traditional hosting?

Traditional hosting, also referred to as on-premises is an infrastructure model where a company manages their servers in-house by themselves or hosted by a third-party provider in a dedicated data center. This type of hosting requires more manual provisioning, maintenance with the benefit of offering greater control over hardware, software and security configurations.

Why does it matter?

Since the performance demands of modern day requirements are higher, economic pressures are rising and there is a critical need for uptime and reliability, choosing between cloud based and traditional hosting is a key decision for businesses might face, paired with the importance of uptime and reliability, these options help businesses decide what's best for their scale and use case. We're seeing companies like Netflix and AirBnB move to the cloud, whereas others like Dropbox are still doing traditional.

This report aims to explore the advantages and disadvantages of both cloud and traditional hosting solutions, focusing on their performance, security, cost and reliability to highlight the pros and cons and the ideal use case for each approach.

Performance

Performance is a key factor to take into consideration when comparing cloud and traditional hosting.

(Kalra, n.d)

A case study on an e-commerce app hosted on both an on-premises server and AWS highlights reveals key differences. (Kalra, n.d.). At lower loads of 500 users, the on-premises hosting showed response times averaging 70.8ms with 0% request failures, which the source suggests happened because of the direct control over resources and no virtualization overhead. But, as the user load increased to 12000 users the response times went up to 4211.8ms, failing 23.096% of all requests (Kalra, n.d., p.39).

AWS on the other hand showed variable results. Initially at 500 users, it had an average response time of 1395.8ms and failed 0.05% of requests; when the number of users increased to 8000, the average response time went up to 12165.4ms and failed 10.344% of requests, and finally when the number of users went up to 12000, the response time dropped back to 4406.4ms failing 13.404% of the requests (Kalra, n.d., p.38). Beating the on-premises version in terms of success rate while barely being lower.

Summary – Performance:

Thus, In short:

- ➢ On premises is better for consistent performance at small to medium scale but struggles to scale efficiently.
- ➢ Cloud can have some variability but it is better at handling larger loads

Security

Security is one of the most important factors for a business deciding between the types of hosting.

Core responsibilities and control:

For traditional on-premises hosting, the organization has full control over their data and they are fully responsible for securing and maintaining their assets. (Security, n.d.), whereas in cloud computing, there is a shared responsibility model between the cloud service provider and the customer. Typically:

- The cloud service provider is responsible for the security of the cloud infrastructure
- The customer is responsible for the security of their data in the cloud.

Data location and Trust: (Security, n.d); (Kalra, n.d.); (SPro and Sosnovyk, 2022)

Adopting cloud services means giving up direct control over many aspects of security and privacy (Security, n.d.), and this lack of control can be a deal breaker for some businesses and individuals. In on-premises hosting, data is stored on the user's own hardware in-house with no other third party accessing it which is often preferred by companies dealing with sensitive data (SPro and Sosnovyk, 2022) , (Kalra, n.d.). With cloud hosting, the data will be shared with the cloud provider so that it can be stored on their network (Kalra, n.d.) and as such trust in the provider becomes a big aspect in security.

Implementation of security measures: (Sarwar, 2024); (Kalra, n.d.); (Source Fuse, n.d.); (Haaga-Helia University of Applied Sciences and Partsafas, n.d.)

The on-premises security measures can be set up manually by the user with the level of security depending on the strategies and principles followed by their organization. On the other hand cloud providers implement stringent protocols (Sarwar, 2024), with multiple security layers and apply different security layers with pre-configured and optimized defaults like Virtual Private Cloud (VPC), Identity and Access Access Management Systems and Denial Of Service (DDOS) Protection , (Kalra, n.d.). Providers also continuously improve security measures and adopt new technologies and conduct regular vulnerability and penetration testing (Haaga-Helia University of Applied Sciences and Partsafas, n.d.) and offer other perks like centralized visibility and automated security processes. (Source Fuse, n.d.)

Summary – Security

Thus in summary, on-premises hosting offers full control but it also puts the burden on the organization whereas cloud hosting, while requiring trust in the provider and shared responsibility offers strong built in security features. Ultimately, the choice depends on the nature of the data an organization is trying to store and how much control the said organization wants to have vs how much security management they are willing to outsource.

Cost:

Effective cost management is the difference between companies succeeding vs failing so this is another key aspect to consider when choosing a type of hosting.

Traditional Hosting's Initial Upfront cost: (Sarwar, 2024); (SPro and Sosnovyk, 2022); (Giacomo and Brunzel, n.d.)

Traditional hosting is accepted as more expensive than cloud computing, requiring the initial upfront cost of establishing the IT infrastructures and servers on the client's premises (Sarwar, 2024), (SPro and Sosnovyk, 2022). Cloud computing is considered a cheaper option because companies don't have to pay the initial cost of setting up such infrastructures and they only have to pay for the resources they used because of the pay-per-use modal cloud services provided (Giacomo and Brunzel, n.d.)

Long Term Costs: (Kalra, n.d., p.40)

However, for the long term that might not be the case. A detailed cost analysis on the same e-commerce app stated above over a 5-year period revealed the following:

- Over a 5 day period:
  - Aws cost: $19.01 (Kalra, n.d., p.40)
  - On-Premises: $483.156 (hardware $477, electricity $0.044, internet $6.12 (Kalra, n.d., p.41)

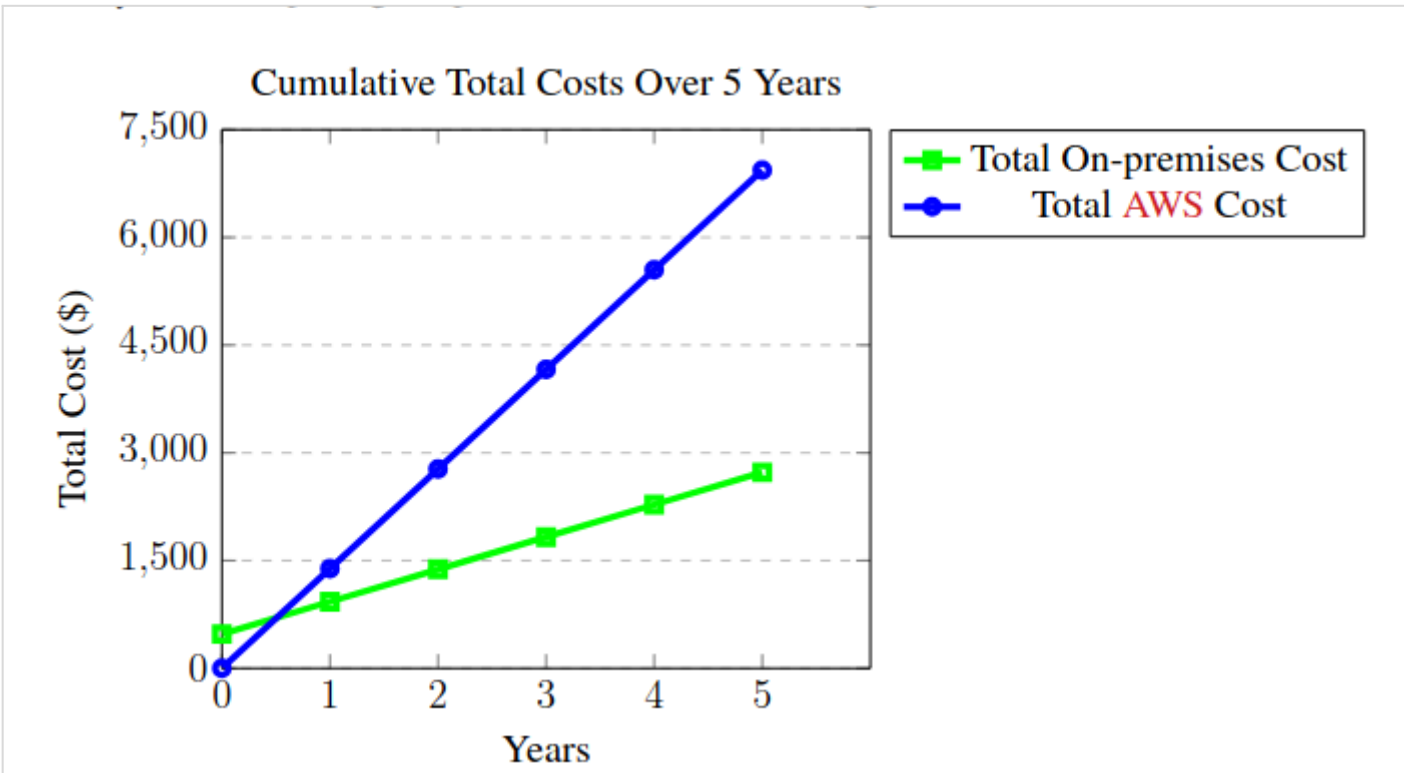

Figure showing cumulative cost of traditional vs cloud hosting over the course of 5 years

- By year 1:
  - They showed similar total costs, with on-premises being slightly affordable
- By year 5:
  - The cost for AWS was nearly 150% higher than that of on-premises.

Summary – Cost

Thus, while cloud hosting provides major short-term advantages because of the pay-as-you-go model and lower upfront costs, on-premises hosting proves to be more cost-effective in the long run. This implies that companies should take their own financial situation into consideration, before choosing or, implying a smarter approach, as demonstrated by dropbox, using a hybrid architecture, which saved them ~$74.6 million in operational costs over two years (Krazit, 2023).

Reliability

(Kalra, n.d.)

Another major aspect for any organisation to take into consideration is reliability. In the same study of the e-commerce application from Kalra, they revealed the following (Kalra, n.d., p.40):

Service	Downtime(%)
Frontend	0
Authentication	0.9
Common Data	0
Search Suggestion	0
Payment	0

Figure showing downtime of each service for AWS

Service	Downtime(%)
Frontend	0.050
Authentication	0.031
Common Data	0
Search Suggestion	0
Payment	0.031

Figure showing downtime of each service for on premise

The study revealed that AWS had most services with zero downtime. However, the Authentication service showed a higher downtime of ~1% compared to the on-premises counterpart 0.031%. But, the on-premises hosting had slightly more downtime in the frontend and Payment services. This suggests that cloud services tend to be more reliable.

Other benefits of cloud hosting in this metric: (IRJMets, 2025)

Furthermore, cloud services also provide other features like disaster recovery, automated failover mechanism using tools like global DNS load balancing and smart health checks which further ensure availability and reliability. (IRJMets, 2025)

Conclusion

In conclusion, both cloud and traditional solutions offer their own benefits and drawbacks and everything boils down to the organization's needs. Cloud computing shines in scalability , built in security and short term cost effectiveness which makes them especially a good choice for startups and businesses, whereas traditional hosting offers better long term cost, control and full data security, which is appealing for organizations who need to comply with strict requirements such as governments, hospitals etc. Finally, examples of companies like dropbox, Netflix also highlight the potential of the cloud paired with traditional solutions to get the best of both worlds. Ultimately, the right choice depends on the use case, budget and long term goals of a user.

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