C L O U D C A L C U L A T O R P R O J E C T

Cloud and Digital Transformation

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OUTLINE

Topics to cover

1

USE CASE DEFINITION

2

VM & PRICING MODELS

3

DEPLOYMENT & SERVICE MODELS

4

SUMMARY

USE CASE

Physician Office Management Software

- The use case we are trying to cover is the case of a software that manages the information of medium physician offices in France.
- The Dev & QA teams responsible for the development and testing of the software are in India and the physician offices are in France.
- The medium physician offices includes about 15 physicians and 3 nurses working from Monday to Friday, from 8:00 AM to 5:00 PM. Saturday and Sunday off.
- The medium physician offices receive, on average, 150 patients per day.

USE CASE

Physician Office Management Software (Cont'd)

The workflow adopted in the physician office is the following:

- A patient comes to the office and a nurse welcome him.
- The nurse login into the system, creates a new case in the system for the patient including his personal information, insurance information and case-specific information.
- The nurse checks if the patient has previous history in the system to attach it to the new case before talking to the physician.
- When done, the patient sees the physician, do the examinations and the physician login into the system and enters his findings and diagnosis and sign a report for the patient.
- If the patient requires additional testing, the physician orders the tests online for the patient, and the nurse collects the required specimens and send them to the laboratory. The physician, when the test results are ready, should be notified through the system that the results are ready for review.

USE CASE

Physician Office Management Software (Cont'd)

Important notes to consider in this use case:

- The performance of the application should be optimized so that the requests latency does not exceed 200 ms.
- The physician time is very sensitive and that's why the use of this system is very important to streamline the workflow of the patient accessioning and to minimize the turn around time of each patient. Hence, if the system is down, even for few minutes, this will be severe for this use case.
- The high availability of the data is very important in case of disasters.
- The software should be compliant with HIPAA regulations for patient safety which requires some considerations of the data protection and signature and data availability in the cloud.
- The medium physician offices does not have a large budget to buy an expensive system to manage their data, so they prefer to pay for the services they need and not to do commitments to pay for such a service for 1 or 3 years in advance.

VIRTUAL MACHINES

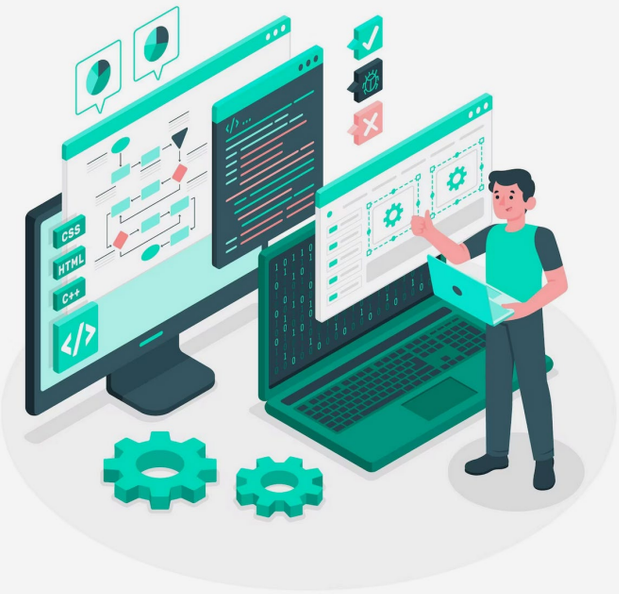
Virtual Machines & Pricing Models

Three environments are needed for this use case: Development, Quality Assurance, and Production.

01 **Development**

02 **Quality Assurance**

03 **Production**



VIRTUAL MACHINES

Virtual Machines & Pricing Models | Development

- The development of the new features and the bug fixes for the physician office software will take place on the development environment.
- This environment is needed for the internal dev team only and does not need to be highly available like the production one and does not need to have high storage capabilities because it is not a live system.
- The dev team is working in India, so it is better to have the data center in India.

VIRTUAL MACHINES

Virtual Machines & Pricing Models | Development (Cont'd)

- The dev team will be working only 5 days on this environment excluding weekends for 24 hours/day if they need to access the system at any time during working days for a hot fix.
- No disaster recovery plans are needed in this case.
- Acceptable CPUs and RAMs are needed because no serious operations will take place on this environment.

VIRTUAL MACHINES

Virtual Machines & Pricing Models | Quality Assurance

- The testing phase of any new version of the software will take place on this environment. The QA team try to simulate the production environment on this QA environment and run the automation test cases on the new version to make sure that it is running as expected.
- They can do stress testing on this environment to make sure that the performance of the application is not affected by the new code changes.
- However, the QA environment should be like the production environment in terms of size and sometimes should be bigger.

VIRTUAL MACHINES

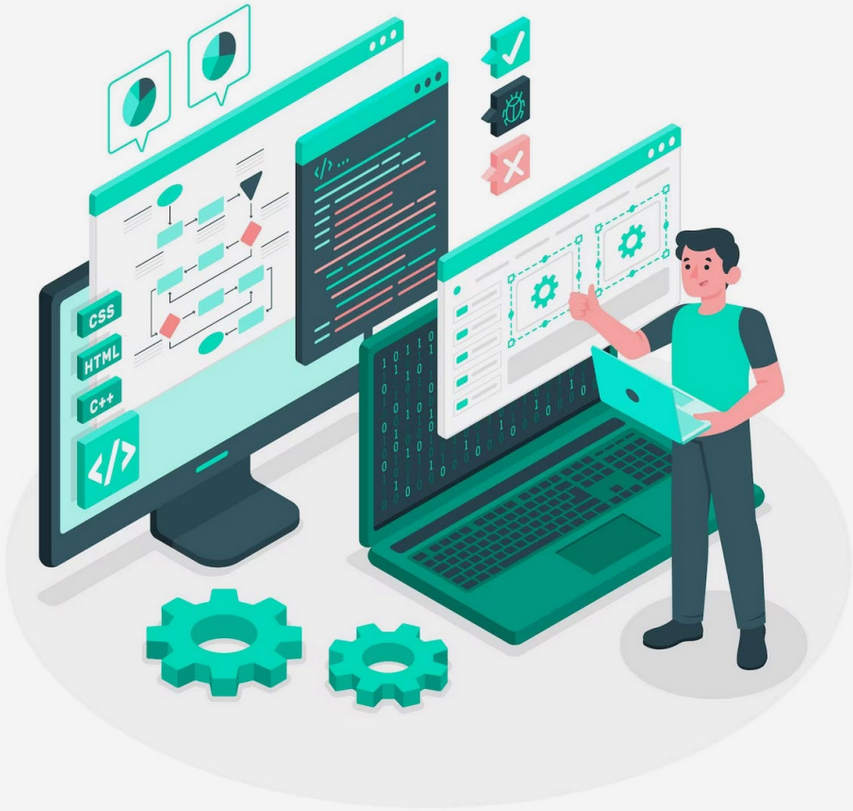
Virtual Machines & Pricing Models | Quality Assurance (Cont'd)

- Considering the example of 4 weeks sprint, the QA environment will be needed about 4 days out of those 4 weeks and will be needed for 12 hours to perform the testing in that period.
- The QA team is working in India, so it is better to have the data center in India.
- No disaster recovery plans are needed in this case.
- Good CPUs and RAMs are needed because serious operations will take place on this environment, and they should be same as the ones allocated for the production environment.

VIRTUAL MACHINES

Virtual Machines & Pricing Models | Production

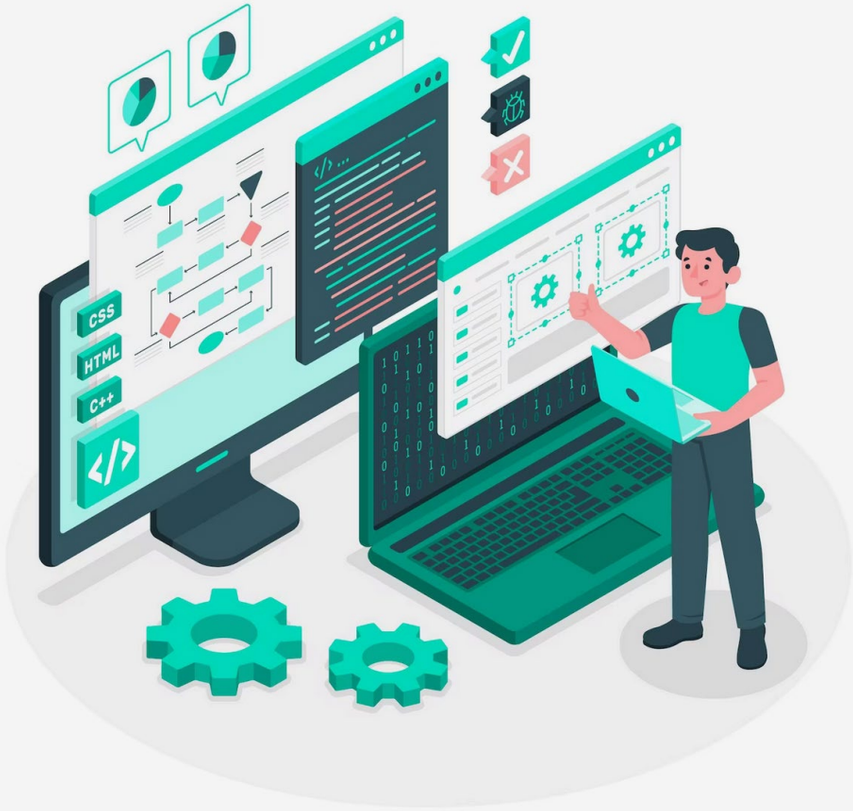
- The production live system where the clients are up and working.
- It should have high-availability in our use case and should have high storage space for the files and attachments and images that should be attached to the patient case.
- In addition, it should have disaster recovery plans so that, in case of any disaster that happens to the VM in a region, the system automatically connect to a replication of the system (Services, Database, etc.) in another region with very low down-time (few seconds to minutes).



VIRTUAL MACHINES

Virtual Machines & Pricing Models | Production (Cont'd)

- The clients of this product are physician offices in Paris, so it is better to have the data center in France.
- The clients should have access to the environment 24-7. No down-time is accepted with an estimated higher traffic within the working days and business hours.
- Good CPUs and RAMs should be allocated for this environment.
- The environment is multi-tenant so that different physician offices will work on the same environment with different tenants.



VIRTUAL MACHINES

Virtual Machines & Pricing Models | Summary

Following are the needed VMs for this use case for each environment:

01 Development

- vCPUs: 2
- RAM: 8 GB
- Threads per Core: 1
- DC: Asia
- Up for: 521 h/Month

02 Quality Assurance

- vCPUs: 8
- RAM: 32 GB
- Threads per Core: 2
- DC: Asia
- Up for: 52 h/Month

03 Production

- vCPUs: 8
- RAM: 32 GB
- Threads per Core: 2
- DC: Europe
- Up for: 730 h/Month

VIRTUAL MACHINES

Virtual Machines & Pricing Models | GCP

Following are the needed machines on each environment in Google Cloud Platform **Dev & QA n Asia-South1** and **Prod in Europe-West9:**

	Dev **CP-COMPUTEENGINE-VMIMAGE-E2-STANDARD-2**	QA **CP-COMPUTEENGINE-VMIMAGE-E2-STANDARD-8**	Prod **CP-COMPUTEENGINE-VMIMAGE-E2-STANDARD-8**
Core	Quantity: 1042 Unit Price: 0.0261 Total Price: **27.3221271428571**	Quantity: 417 Unit Price: 0.0261993 Total Price: **10.9288508571428**	Quantity: 5840 Unit Price: 0.025302 Total Price: **147.76368**
RAM	Quantity: 4171 Unit Price: 0.0035 Total Price: **14.6447177142857**	Quantity: 1668 Unit Price: 0.00351072 Total Price: **5.85788708571428**	Quantity: 23360 Unit Price: 0.003391 Total Price: **79.21376**
rhel	Quantity: 521 Unit Price: 0.06 Total Price: **31.2857142857142**	Quantity: 52. Unit Price: 0.13 Total Price: **6.77857142857142**	Quantity: 730 Unit Price: 0.13 Total Price: **94.9**
Total $/Month	**73.25**	**23.56**	**321.8**

VIRTUAL MACHINES

Virtual Machines & Pricing Models | AWS

Following are the needed machines on each environment in Amazon Web Services:
Dev & QA n Asia Pacific (Mumbai) and **Prod in Europe (Paris)**

	Dev	QA	Prod
	Amazon EC2	**Amazon EC2**	**Amazon EC2**
	Tenancy (Shared Instances) Operating system (Linux) Workload (Consistent, # instances: 1) Advance EC2 instance (m5ad.large) Pricing strategy (On-Demand Utilization: 521 Hours/Month)	Tenancy (Shared Instances) Operating system (Linux) Workload (Monthly, Baseline: 1, Peak: 2, Duration of peak: 4 Day 12 Hr 0 Min) Advance EC2 instance (t4g.2xlarge) Pricing strategy (On-Demand)	Tenancy (Shared Instances) Operating system (Linux) Workload (Consistent, Number of instances: 1) Advance EC2 instance (m5d.2xlarge) Pricing strategy (On-Demand Utilization: 730 Hours/Month)
Total $/Month	**34.91**	**150.17**	**385.44**

VIRTUAL MACHINES

Virtual Machines & Pricing Models | Azure

Following are the needed machines on each environment in Azure Cloud:
Dev & QA in Southeast Asia and **Prod in France Central**

	Dev	QA	Prod
	Compute VM	**Compute VM**	**Compute VM**
	1 B2as v2 (2 vCPUs, 8 GB RAM) x 521 Hours (Pay as you go) Linux On Demand (Pay as you go)	1 B8as v2 (8 vCPUs, 32 GB RAM) x 52 Hours (Pay as you go) Linux On Demand (Pay as you go)	1 B8as v2 (8 vCPUs, 32 GB RAM) x 730 Hours (Pay as you go) Linux On Demand (Pay as you go)
Total $/Month	**80.44**	**26.42**	**343.10**

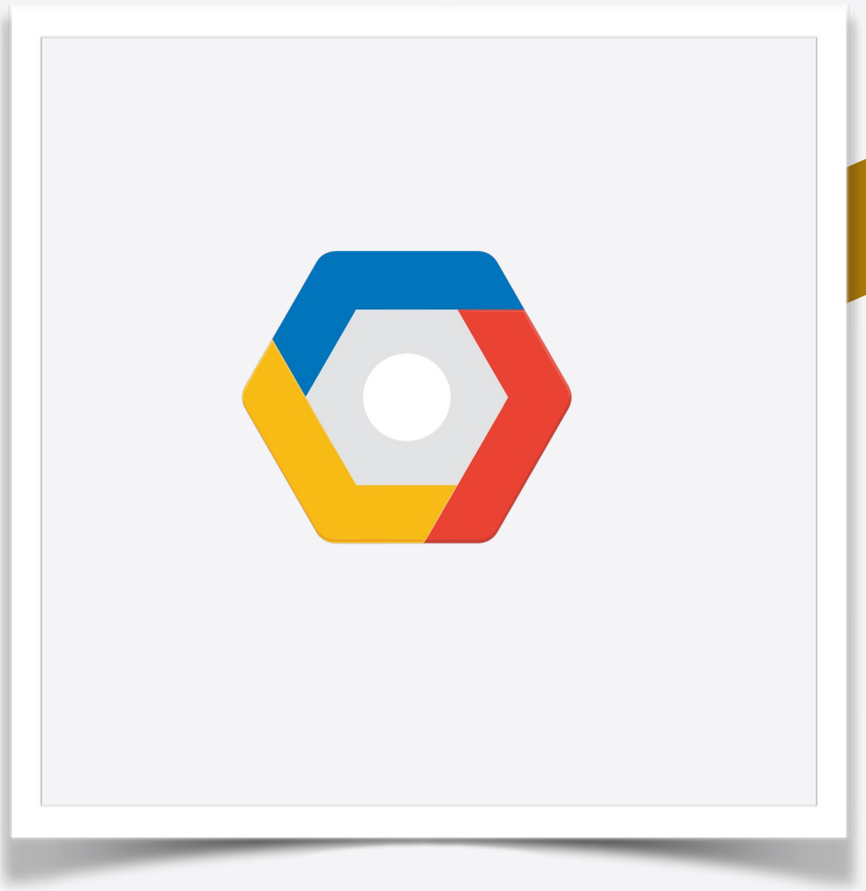
VIRTUAL MACHINES

Virtual Machines & Pricing Models | Comparison

Following is the comparison between the pay-as-you-go model for our use case for the 3 different environments for the 3 different cloud service providers:

	GCP	AWS	Azure
DEV	73.25	34.91	80.44
QA	23.56	150.17	26.42
PROD	321.8	385.44	343.10
Total $/Month	**418.61**	**570.52**	**449.96**

VIRTUAL MACHINES



BEST FIT

When looking into the different pricing of the 3 available public cloud providers, we recommend that, for our use case, GCP is the best choice.

*It is very important to note that other services like Database, Load Balancer, Cloud Storage, Kubernetes, etc. play a significant role in the decision of which SP should we subscribe to, but in this use case, we are comparing the pricing of the VM only.

DEPLOYMENT MODEL

Public Cloud Deployment

- The deployment should be on public cloud (GCP, AWS, or Azure) because those are compliant with HIPAA for patient information safety and have the SOC2 requirements for data security in the cloud.
- This use case is provisioned for open use by the general public.
- The payment model for this use case should be pay-as-you-go because we are not sure how long the physician offices will keep their subscriptions and how much they will scale up or down so a long-time commitment is not a good idea.

SERVICE MODEL

Software as a Service

- The service model that should be used in this use case is the SaaS model as all the infrastructure, service and the platform should be managed by the cloud operator (Amazon, Google or Microsoft). Customers have the capability to only use the application.
- Moreover, since the clients (physicians and nurses) will login into the Physician Office Software online, pay a subscription and work on the cloud, it should be a software as a service model; as customers only have specific application configuration settings.
- This model, in this use case, is easier for both the software company and its clients.

SUMMARY

*For a use case of a **physician office** software of **medium size** offices, **3 environments** are needed: Dev, QA and Prod with **different configurations** and **sizing** to be deployed on **Public Cloud** with the **pay-as-you-go model** and following the **SaaS** deployment.*