

RMIT International University Vietnam

Assignment Cover Page

Course Name:	Cloud Foundations
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I declare that in submitting all work for this assessment I have read, understood and agreed to the content and expectations of the Assessment Declaration.

A. Choice and Justification

I would go with the Viet Rock City Concert Venue scenario for cloud implementation and AWS infrastructure. This company can get great benefit from the cloud by these reasons:

1. **High Scalability:** With 20 music venues around Vietnam and the option of online streaming, the organization must handle unexpected traffic increases without downtime. The cloud's ability to seamlessly scaling resources, quickly and efficiently deal with unpredictable traffic is crucial. (DigitalOcean 2023a)
2. **Reliability:** AWS provides high availability and fault tolerance, which is essential for businesses like Viet Rock City to reduce the risk of business disruption (Chris 2022), which cannot afford downtime during performances or busy booking periods. Cloud infrastructure is designed to be durable and redundant, reducing the likelihood of service disruptions.
3. **Cost Optimization:** Instead of investing in expensive infrastructure and maintenance costs, the company can leverage the pay-as-you-go model of the cloud (CipherLogik September 2023). This can lead to incredible cost savings especially in low demand time.
4. **Disaster Recovery:** AWS offers several data protection options and several regions to ensure that the data in the cloud's infrastructure is regularly indexed and checked for recoverability (ATELIERE October 2023). To ensure business continuity in case of outages or disasters.
5. **Innovation and Flexibility:** Cloud services provide access to wide range of cutting-edge technologies and services, allow the company to adapt with the latest features and innovation without the need of massive update in infrastructure (Ilker Koksai November 2019)
6. **Reduced Human Resources:** By offloading the infrastructure maintenance to AWS the company can focus its resources to main business operation and innovation while reducing the amount of human resources needed (Box Communications February 2023). Rather than spending time and money on maintaining a physical center.

B. Thought Process and Factors Considered

In my analysis for task A, I considered these factor to choose Viet Rock City but not Mango Pearl Bakery and identify the benefit it can get:

1. **Scale:** Viet Rock City is an organization that hosts VPOP star concerts, with approximately 20 music venues throughout Vietnam and the concept of online streaming. These factors can result in a significant

gap in traffic volume between regular and performing times. This requires a high scaling need in infrastructures. In comparison, Mango Pearl Bakery's IT requirements are comparatively low and predictable.

2. **Complexity:** Their requirements are "booking website", "deal with high volume", "traffic spike", and "online streaming", which are complicated and can gain the most from the use of cloud services.
3. **Traffic Pattern:** Consider that their traffic will have a significant difference between low and high demand, therefore flexibility is required to accommodate that large gap if they do not want to waste money on overkill equipment. Cloud adoption can also help with unpredictable spikes that the physical system cannot handle efficiently.
4. **Business Continuation:** Viet Rock City's failure during concerts or busy booking seasons could result in considerable revenue losses and customer dissatisfaction therefore ensuring high availability and fault tolerance is critical to their business operations. Mango Pearl Bakery, on the other hand, can handle unusual downtime, especially outside of business hours.
5. **Future Growth and Innovation:** Viet Rock City is looking into online music streaming, which might expand its IT infrastructure. Cloud computing allows you to increase resources as needed, supporting future development and new business prospects.
6. **Cost Considerations:** While both companies could gain from cost optimization via cloud computing. Because of Viet Rock City's unpredictable traffic patterns and potential for expansion, the pay-as-you-go cloud computing approach is more effective for adjusting prices based on demand.

In conclusion, the Mango Bakery's requirements do not nearly match the benefits of cloud service. Their needs are "locally focused traffic," "email server," and "order management system," all of which can benefit from Cloud deployment and AWS infrastructure, but the Bakery's IT requirements are quite straightforward, with a lesser emphasis on high availability and scalability.

Furthermore, the cost benefits from cloud adoption may be less significant for smaller organizations with fewer resource requirements.

C. Cloud Implementation Model Recommendation

For Viet Rock City's cloud installation, I recommend the Infrastructure as a Service (IaaS) model. IaaS gives a firm like Viet Rock City the freedom and management it needs to design and optimize its infrastructure (Michelle et al. 2022).

Justification

1. **Scalability and Flexibility:** With IaaS Viet Rock City can scale their infrastructure resources such as storage, networking components up or down to accommodate traffic spike and growth. This flexibility is essential for handling unpredictable traffic patterns (Andrey September 2023).
2. **Control and Customization:** IaaS provides Viet Rock City with complete control over the infrastructure, allowing them to configure and optimize resources based on their individual needs (Linda 2021). This includes customizing operating systems, software stacks, and security settings.
3. **Cost Optimization:** IaaS operates on a pay-as-you-go model, requiring the organization to pay only for the resources it uses (Andrey September 2023). This means that during periods of low demand, businesses can scale down and reduce operational costs. This cost-cutting strategy is consistent with their unpredictable traffic.
4. **Security:** IaaS is the most secure among the three services, it offers unshared physical hardware that can only be managed by you, which means only you can get access to the data stored on IaaS. Provided more advanced security and protection compared to other models (Andrey September 2023).
5. **Other Factor:** Viet Rock City has a long-term partnership with another company that specializes in cloud development. They can have an open discussion with that IT business to understand their strengths, recommendations, and business needs so that they can make the most out of IaaS's flexibility without being tied to a supplier or restricted customization options like SaaS or PaaS (Linda 2021).

Other Recommendations: While SaaS may not be the primary choice for Viet Rock City's core infrastructure, the IT company's expertise could be valuable in integrating SaaS solutions for non-critical or ancillary services. For example, they may recommend using SaaS applications for email, collaboration tools, or customer relationship management (CRM) systems, while keeping the core infrastructure on IaaS or PaaS.

Note: "Other Recommendation" part was generated using Claude (2024, Mar)
Prompt: Consider the fact that Viet Rock City has a long-term contract with an IT company that specializes in cloud development. How could it impact these choices of IaaS, PaaS or SaaS?

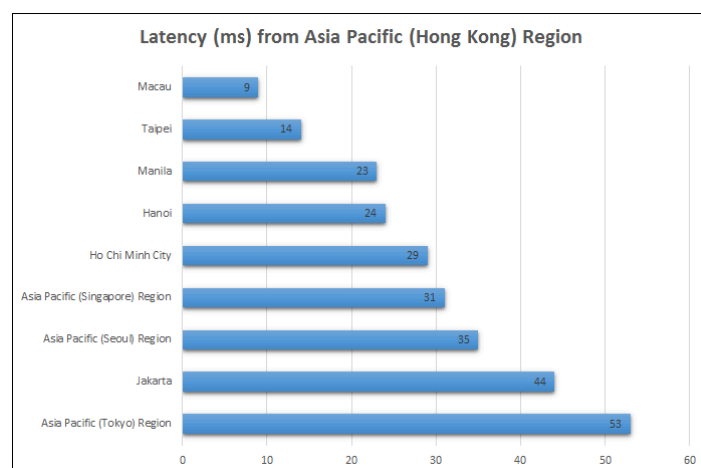
D. Closest AWS Regions and Purpose of Multi-Region Deployment

The two closest AWS regions to Vietnam are HongKong and Singapore.

The reasons for Viet Rock City to spread their resources into two regions would be to achieve high availability, fault tolerance and disaster recovery capacity.

Justification

- 1. High Availability and Fault Tolerance:** By spreading resources across several locations, Viet Rock City ensures that their workloads are highly available and durable to breakdowns or disruptions in a single region (Jesse June 2023). If one area experiences an outage, the other region can continue to serve traffic and provide services, reducing downtime.
- 2. Disaster Recovery:** Using numerous regions creates a comprehensive backup strategy. In the case of a significant disaster, data loss or breakdown in one location, Viet Rock City may immediately fail over to the other region, maintaining business continuity and reducing data loss (Jesse June 2023).
- 3. Laws and Regulations:** Certain nations have specific database standards within their country's borders, particularly for private information. Many Asian Pacific countries have laws governing data privacy or protection, such as the Personal Data Protection Act (PDPA), PDP, and so forth (Sangfor Technology December 2023). Because of having several areas, Viet Rock City will have additional options for storing client data in the location where the law is most applicable to their operations.
- 4. Improved Performance:** Viet Rock City has the ability to improve speed and minimize latency by offering content and workloads from the location nearest to its end users, hence improving the overall user experience (DigitalOcean 2023b).



<Graph 1: Network Latency from Hong Kong Region to Ha Noi and Ho Chi Minh city>

E. Security Measure and Services

I would like to recommend these measure and services for Viet Rock City's cloud implementation:

1. **AWS Identity and Access Management (IAM):** Viet Rock City may use IAM to securely manage access to AWS resources by creating user accounts and enforcing policies. This guarantees that only authorized workers have access to critical information, therefore lowering the possibility of unauthorized access or data theft (Vishwas November 2023).
2. **AWS Virtual Private Cloud (VPC):** VPC allows Viet Rock City to create isolated and secure virtual networks on the AWS cloud. This allows users to use identity-based access control, create network access control lists (ACLs), run automated backups, and build secure connections between their on-premises infrastructure and AWS services (CloudVisor February 2023).
3. **AWS Web Application Firewall (WAF):** Viet Rock City depends mostly on web apps for the booking system and video streaming, therefore deploying AWS WAF can provide security against common web-based assaults, such as distributed denial-of-service (DDoS) attacks, by filtering HTTP and HTTPS traffic (Vivek February 2024).
AWS WAF integrates with other AWS services and offers a scalable and adaptable solution for securing AWS-deployed applications.
4. **AWS Shield:** AWS Shield is a DDoS protection service, and while the recommendation currently includes WEF, which is also a DDoS protection service, given that most of Viet Rock City's revenue is generated through web applications, it would be preferable if they could reduce the threat. Furthermore, by providing an always-on detection and automatic inline mitigations, it can avoid application downtime as well as minimize latency (AWS Community Builder October 2022).
5. **AWS CloudTrail:** Cloudtrail tracks and records every change made to a resource in an AWS account, documenting who did what and when. Having this information allows administrators to rapidly identify what went wrong, boost visibility, and also play a significant part in debugging and troubleshooting (Darcy 2023).
6. **Encryption at Rest and in Transit:** Viet Rock City should also consider encryption for data at rest and in transit. For data at rest, the organization can encode data with secret keys maintained by AWS Key Management Service (KMS), ensuring that their data is safeguarded (The Catalyst2 team June 2021). With data in transit, they can use secure HTTP (HTTPS), secure VPN connections, or decode using an encrypted key exchange protocol such as Transport Layer Security (TLS) or Secure Sockets Layer (SSL) (BAS April 2023).

Optional Recommendation:

Cloudflare Web Application Firewall (WAF): Cloudflare WAF is another WAF solution to consider as a competitor to AWS WAF. In terms of comparison to AWS, Cloudflare stands out for its DDoS mitigation and API security. However, AWS has its own advantages when using the same AWS ecosystem and more flexibility in rules (Vivek February 2024).

AWS CloudWatch: CloudWatch is a predictive service that can pair with the data provided by CloudTrail to explain current performance, find out and alert if anything goes wrong (Darcy 2023).

F. Suitable AWS Services

For the cloud implementation of Viet Rock City, I would recommend these services:

- 1. Amazon Elastic Compute Cloud (EC2):** EC2 offers scalable and adaptable virtual machines (VMs) that can run Viet Rock City's web applications, booking systems, and other workloads. EC2 provides customers with high availability and safety while also being adaptable, allowing them to choose from a wide range of components. EC2 is also very competitively priced in comparison to other providers (Shiksha Online October 2023)
- 2. Amazon Simple Storage Service (S3):** S3 offers scalable and long-lasting object storage for storing and serving static website content, media assets (such as concert videos for streaming), and backups. Its high availability and data replication across several Availability Zones ensure that data is durable and fault-tolerant (José February 2018).
- 3. Amazon Elastic Load Balancing (ELB):** ELB distributes incoming traffic across many EC2 instances to ensure high availability and fault tolerance. It automatically adapts the load balancing capacity in response to demand, ensuring a seamless and consistent experience for end users (Vikas July 2015).
- 4. Amazon Relational Database Service (RDS):** RDS can be used to host Viet Rock City's relational databases, such as MySQL, Microsoft SQL or PostgreSQL, which contain booking information, customer data, and other structured data. RDS provides high availability, automatic backups, and easy scalability (Hiren November 2022).
- 5. Amazon CloudFront:** CloudFront, AWS' content delivery network (CDN), can be utilized to cache and distribute static website content and media resources closer to end users, hence enhancing performance and lowering latency for Viet Rock City's global customers (Siranjeevi R September 2021).
- 6. Amazon CloudWatch:** CloudWatch offers monitoring and logging services, allowing Viet Rock City to track resource use, application

performance, and set alerts for proactive problem detection and reaction (Darcy 2023).

7. **Amazon API Gateway:** API Gateway can be used to establish, maintain, and protect APIs for Viet Rock City's web apps and booking systems, allowing for seamless integration with other services and third-party solutions. Aside from that, API Gateway is straightforward to monitor and cost-effective when it comes to scale and performance (Cybershop LLC June 2022).
8. **AWS Lambda:** Lambda, AWS's serverless computing service, can be used to execute event-driven, scalable code functions for a variety of purposes, including data processing, automation, and integration with other AWS services. It could assist businesses reduce time, minimize costs, etc (Ashish January 2021)

G. Cost Assumption

The assumption come in three parts, assumption, justification and calculation

Assumption

1. S3 Storage (5TB each):

Assumption: Viet Rock City requires 10 TB of Amazon Simple Storage Service (S3) storage, divided into two regions for static website content, media assets, and backups.

Justification: S3 is an excellent storage solution for providing static material, storing media assets (such as concert videos for streaming), and creating backups. The 10 TB storage capacity is estimated based on the possible volume of media content and the necessity to keep backups for disaster recovery when considering Viet Rock City as a medium size vendor (CricleHD).

Cost: 128 USD x 2 = 256 USD

2. EC2 (m5.xlarge, 10 instances):

Assumption: Viet Rock City requires 10 EC2 instances of the m5.xlarge type for their web application and booking system.

Justification: The m5 instance family is intended for general-purpose tasks and offers a balanced set of compute, memory, and network resources. The xlarge size was selected to meet the anticipated traffic and workload demands of Viet Rock City's applications and systems. The number of instances is estimated based on the company's ability to handle high amounts of traffic and expected increases during concerts or busy booking seasons (Adem July 2022).

Cost: 1,873.64 USD

3. EBS Storage (1TB):

Assumption: Viet Rock City requires 1TB of EBS storage for their EC2 instances.

Justification: EBS provides persistent block-level storage for EC2 instances, making it ideal for storing application data, logs, and other

essential files. The storage capacity of 1TB is assumed based on the expected storage requirements for web applications and booking systems (Cloudelligent June 2023).

Cost: Included with EC2

4. RDS (db.m5.xlarge, 1TB):

Assumption: Viet Rock City utilizes an RDS instance of the db.m5.xlarge type with 1TB storage for their database.

Justification: The 1TB storage capacity is assumed based on the possible data storage requirements for a company on the scale of Viet Rock City, as well as the necessity to handle future expansion (Andrew January 2017).

Cost: 433.08 USD

5. CloudFront Data Transfer (10TB/month):

Assumption: Viet Rock City utilizes CloudFront for content delivery, with an estimated data transfer of 10TB per month.

Justification: The 10TB data transfer estimate is based on anticipated traffic volume and the possibility of broadcasting concerts or distributing media content to a global audience (about 200 hours of 4k video) (CricleHD).

Cost: 1,240.80 USD

6. AWS Lambda (1 million request, 100ms each):

Assumption: Viet Rock City employs AWS Lambda for serverless services, with a monthly execution of around 1 million requests per month and 100ms each.

Justification: The one million request estimate is based on the assumption that Viet Rock City will use Lambda for a variety of functions, including data processing, automation, and integration with other AWS services.

Cost: 0 USD

7. IT Worker (3 full-time, 2 freelance):

Assumption: Viet Rock City employs three full-time DevOps engineers to manage and maintain the AWS infrastructure. They can consider 2 freelance engineers to work in high demand time.

Justification: Managing and maintaining a complex cloud infrastructure frequently necessitates a team of professional IT experts who are knowledgeable with cloud technologies, automation, and DevOps approaches. The assumption of three DevOps engineers is based on the expected workload and the need for 24-hour monitoring and assistance.

The monthly cost of 1,500 USD per engineer is based on the average salary for skilled DevOps specialists in the region or industry (Glassdoor 2024).

Cost: 4,500 to 7,000 USD

8. Other Cost:

Assumption: Other costs can be network fee, food and beverage(fnb), training fee, professional service and support, backup,ect.

Justification: These are the fee to run a group of IT workers, which include network(VPC, VPN or direct network), fnb, worker training, AWS support and AWS backup.

Cost: 1000 USD

Total Monthly Cost:

$$128 \times 2 + 1,873.64 + 1,240.80 + 433.08 + 4,500 + 1,000 = 9,303.52\$$$

The pricing estimates did not include all of the AWS services that were indicated above since the organization needs to conduct a trial run before deciding to add any product so that they can fully understand their requirements.

pricing calculator
 Feedback
 Language: English
 Contact Sales
 Create an AWS Account

Upfront cost
0.00 USD

Monthly cost
3,803.52 USD

Total 12 months cost
45,642.24 USD
 Includes upfront cost

Get started for free
 Contact Sales

My Estimate
 Duplicate
 Delete
 Move to
 Create group
 Add support
 Add service

Find resources

< 1 >

	Service Name	Status	Upfront cost	Monthly cost	Description	Region	Config Summary
<input type="checkbox"/>	Amazon Simple St... 	-	0.00 USD	128.00 USD	-	Asia Pacific (Singa...	S3 Standard stora...
<input type="checkbox"/>	Amazon EC2 	-	0.00 USD	1,873.64 USD	-	Asia Pacific (Singa...	Tenancy (Shared In...
<input type="checkbox"/>	Amazon CloudFront 	-	0.00 USD	1,240.80 USD	uses AWS Lambda ...	Asia Pacific (Singa...	Data transfer out t...
<input type="checkbox"/>	AWS Lambda 	-	0.00 USD	0.00 USD	-	Asia Pacific (Hong ...	Architecture (x86), ...
<input type="checkbox"/>	Amazon Simple St... 	-	0.00 USD	128.00 USD	-	Asia Pacific (Hong Kong)	standard stora...
<input type="checkbox"/>	Amazon RDS on A... 	-	0.00 USD	433.08 USD	-	Asia Pacific (Singa...	Number of RDS for...

<Image1: Pricing for AWS services>

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