Assessing User Experience & Developing a Cloud Migration Plan with 4Stay

A Professional Readiness Experiential Program (PREP) Project Effort

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Introduction

Our client needs to shift away from its current infrastructure Heroku to Amazon Web Services (AWS). The reasons for this transition are due to Heroku's challenges in efficiently managing databases for international regions outside of the United States, coupled with the significant financial burden of an annual expense nearing $18,000, which is deemed unsustainable and expensive for the company.

This migration has two primary objectives. First, our client aims to enhance their user interface experience by actively seeking and incorporating product feedback from users directly on its website. This approach allows for continuous improvement of the platform, ultimately leading to a more seamless and accurate user experience.

Secondly, the migration to AWS aligns with our client's strategic goals by offering a more cost-effective solution compared to Heroku. AWS follows a pay-as-you-go pricing model, where users are billed for the resources they consume, providing greater control over infrastructure costs with options for reserved instances and volume usage discounts. While this offers flexibility, it requires careful monitoring and optimization to avoid unexpected costs. Additionally, AWS' comprehensive support and global scalability ensure a robust platform for accommodating our client's international operations, leading to cost savings, enhanced performance, and continued growth in the competitive online accommodation market.

By leveraging AWS' capabilities, our client anticipates not only cost savings but also enhanced performance, scalability, and reliability, setting the stage for continued growth and success in the competitive market of online accommodation and housing services.

Business Challenge 1 Activities: Product Feedback

The first activity completed for the client was to analyze one of their web products, identify any areas where the usability could be a problem or potential bug was present, and propose a solution for improvement. The following shows a snippet of the findings and analysis.

Bugs	Proposed Solution	Benefits of the Proposed Solution
Housing Description	Need to fix the bug/code for a "readable" description for housing when set into column view for room listings	Customers who prefer using column view when searching for housing will have a better experience. Description will be clear for the user to read.
DC Default	The default location search algorithm needs to be updated to interpret user inputs accurately rather than defaulting to the DC area.	Accurate search results enhance user experience and improve website reliability, increasing user satisfaction.
Repetitive Wording	Need to Fix the Repetitive wording for the room listing	Customers would want to look at not confusing title words. (Fixed Proposal)
Confirmation Instructions	Need to fix the bug/code for confirmation instructions when trying to use account recovery.	Customers who have forgotten their password for their account can regain access to their account with ease.
Dropdown Menu	Room/Housing filters should be condensed into a compact one-column drop-down list.	UI has less white space which will allow a more efficient user experience. Customers can quickly navigate and filter through different criteria's easily and without looking around too much.

Business Challenge 2 Activities: Cloud Migration

The next activity was to perform an analysis of alternative for a new cloud platform where our client can migrate their existing cloud instance to. This analysis came down to a compare and contrast between the existing cloud platform of Heroku, and a new contender – AWS. Specifically, our client wanted the focus to be on using Infrastructure as a Service (IaaS) during a cloud platform migration because it offers more control and flexibility over the cloud environment. Because this method does not require hardware to be on-premises, it saves enterprises a considerable amount of money on maintenance and upgrades.

So we first identified and analyzed the important Benefits of IaaS-Assisted Cloud Migration which included:

- **Cost Savings:** Moving to the cloud lowers infrastructure and maintenance costs, which has a positive financial impact on the company.
- **Complete Control and Configurability:** IaaS provides a great deal of control over cloud resources, enabling complete customization to fulfill particular requirements and goals.
- **Flexibility and Scalability:** The cloud environment is kept productive and economical by having the flexibility to quickly scale resources up or down in response to demand.
    - Cloud platforms provide comprehensive regional and global support, enabling businesses to reach a global client base and adhere to local laws.
- **Web Server Instances**: Within the cloud platform, applications can be hosted on virtual servers, enabling scalability and effective management. Virtual servers provide a multitude of use cases by enabling the execution of worker server instances and web application instances.
- **Database Support**:
    - **PostgreSQL:** This relational database, available as open-source software, offers flexibility and variety in relational and non-relational queries.
    - **Memcached:** Memcached is a well-liked memory data store for caching and data retrieval that is well-known for its excellent performance.
    - **Redis:** Redis is a different quick and effective in-memory data store that has additional functionality for use in more complex applications.
- **Pricing and Regional Support**:
    - Cloud platforms help businesses minimize expenses by offering price structures that correspond with different usage levels and requirements.
    - Support for non-US regions also makes it possible for companies to grow internationally and still have dependable database support.

To sum up, the process of transitioning to a new cloud platform using IaaS is made more functional overall by offering greater control, cost savings, and reconfigurability. Along with effective databases like PostgreSQL, Memcached, and Redis, the usage of virtual servers for worker and web applications further meets technical requirements while guaranteeing regional support and cost-effective pricing models.

Heroku vs. AWS

Next, the main advantages of using AWS vs. Heroku were analyzed and presented to our client.

Heroku is a cloud-based platform that offers Platform as a Service (PaaS). Heroku is based on AWS. However, its services are much simpler to use than the AWS Elastic Compute Cloud service. It is high on efficiency and support for building, deployment, and rapid scaling. One of its popularity is that it has add-on capabilities supporting multiple management tools and alerts. Heroku is known to speed up development cycles as the infrastructure part is fully managed. Heroku is a platform as a service (PaaS) that is designed to simplify the deployment and management of web applications. It's popular among developers who want to focus on building their applications without worrying about infrastructure management.

For AWS, we looked at the infrastructure as a Service (IaaS) offering specifically. Among the many benefits it provides, it includes management and analytics with data. AWS has a wide range of cloud services. Amazon Simple Storage (S3) and Elastic Compute Cloud (EC2) are two popular and commonly used services. Elastic Compute Cloud (EC2) is a web service that controls computing resources in Amazon's computing environment. Amazon S3 is object storage that's built to store and retrieve data from the web. It offers performance, durability, availability, security, and virtually unlimited scalability at economical costs. AWS offers granular control over scalability with services like Amazon EC2 users can customize scaling policies based on the specific metrics and conditions, making it suitable for a wide range of workload types and scenarios. The Most Popular AWS services include Amazon Elastic Compute Cloud (EC2), Amazon Simple Storage Service (Amazon S3), & AWS Lambda.

Cost-effectiveness

- Whether using it long-term or only for a short while, AWS remains cost-effective. Compared to rivals, its charges are very reasonable.
- Moreover, it has a free tier for startups or those unaware of its products. Similarly, AWS pricing vs. Heroku is better. AWS users can pay for only the instances they use since the service has a Pay-as-you-go pricing model.
- A broad range of products and services: AWS has a wide range of products and services. One platform can have over 200 products spanning numerous categories, including Databases, Computing, Networking, content delivery, Storage, identity compliance, Analytics, Security, & Machine learning.

Security

- A team of global security experts handles the AWS physical infrastructure, its software, and operational complexities.
- Amazon's robust backing also makes the platform highly secure for programmers everywhere.

Reliability

- Due to its enhanced scalability, AWS is a reliable cloud hosting provider.

- Whether you want to use it for a high-traffic program or a small application, it works well, and you only have to make a few clicks to extend or reduce instances.
- Availability in multiple regions. AWS has physical servers in numerous parts of the globe, which is why so many users prefer it.

Cost

- **Heroku:** Heroku's pricing model is relatively straightforward, typically based on the resources consumed by the application (such as dynos, databases, and add-ons). While it simplifies cost estimation, it might be more expensive compared to managing infrastructure directly on AWS for certain use cases.
- **AWS:** AWS follows a pay-as-you-go pricing model, where users are billed for the resources they consume. While this offers flexibility, it requires careful monitoring and optimization to avoid unexpected costs. AWS also provides various pricing options and discounts for reserved instances and volume usage.

Ease of Use:

- **Heroku:** Heroku is known for its simplicity and ease of use. Developers can deploy their applications with just a few commands using Heroku's Command Line Interface (CLI) or through integrations with popular version control systems like Git.
- **AWS:** AWS offers a vast array of services and configurations, which can be overwhelming for beginners. While AWS provides extensive documentation and management tools like AWS Management Console, setting up and configuring services typically requires more expertise compared to Heroku.

Scalability

- **Heroku:** Heroku provides automatic scaling capabilities, where applications can dynamically adjust resources based on demand. It simplifies scalability management for developers, but it may come with some limitations in terms of customization and control.
- **AWS:** AWS offers granular control over scalability with services like Amazon EC2 Auto Scaling, Amazon ECS, and AWS Lambda. Users can customize scaling policies based on specific metrics and conditions, making it suitable for a wide range of workload types and scenarios.

Flexibility and Customization:

- **Heroku:** Heroku abstracts much of the underlying infrastructure, which limits flexibility and customization options compared to AWS. While it provides a curated set of services and add-ons, users have less control over low-level configurations.
- **AWS:** AWS offers extensive customization and flexibility, allowing users to configure virtual servers, storage, databases, networking, and more according to their specific requirements. This makes it suitable for a wide range of use cases, from simple web hosting to complex enterprise applications.

Pricing Analysis

We then took an in-depth look at the pricing for the AWS Offering for comparison with the current Heroku costs.

US Architecture Service Pricing

Our client is seeking AWS pricing specifically for the US East Coast, with a minimum requirement of 10 gigabytes of RAM. Their goal is to find an AWS architecture that is more cost-effective than Heroku. Heroku's annual cost is approximately $18,000, whereas AWS is estimated to cost between $8,000 and $10,000 annually, making it around 40% to 60% less costly than Heroku's infrastructure. For the US region, its architecture service is estimated to be $8,842.08 a year.

Canada Architecture Service Pricing

When expanding to Canada, our client will have to look into a multiple-region architecture to allow its web application to reach customers in both the US and Canada. This will cost extra as we will have to create a duplicate architecture for that particular region. When expanding to Canadian regions, the cost of architecture will be slightly higher than the company's US counterpart. For the Canada region , its architecture service is estimated to be $9,628.44 a year.

Amazon EC2 Instance Pricing

Because our client's product is a SaaS web application, its application must be hosted by both a web and a worker instance. To mirror our client's current architecture, the hardware requirements from Amazon EC2 will be equivalent to the hardware on Heroku. The closest match in RAM and vCPUs are the m4.xlarge instance (m4 instance family: web) and the t4g.small (t4g instance family: worker). These instances were picked based on the balance of being low cost while maintaining high efficiency.

One of the most important aspects of instance pricing to account for in AWS is the different savings plans that the platform offers regarding computing and instances. It is crucial that our client utilizes a savings plan in order to reduce costs, especially when working with an infrastructure that will use multiple EC2 instances. The EC2 Instance savings plan would reduce costs by up to 72%, and would further allow for reducing costs under a 1 or 3-year commitment with Amazon EC2. This can only be applied to one instance family within a region. Users may still change instances when needed.

Because our client will be making a transition towards a new cloud environment, we recommend using an EC2 Savings Plan under a 1-year commitment for both the US and Canada regions. Within a 1-year commitment savings plan, the **US region** is expected to cost:

- web: **m4.xlarge:** $1,248.36 a year
- worker: **t4g.small:** $105.96 a year

Within a 1-year commitment savings plan, the **Canada region** is expected to cost:

- web: **m4.xlarge:** $1,375.32 a year
- worker: **t4g.small:** $116.52 a year

Full Architecture Pricing

Within the US region architecture, our client is expected to pay an estimate of **$10,196.40 per year**. As for the Canada region, they are expected to pay an estimate of **$11,120.28 per year.** In total, the full architecture annual expense is **$21,316 per year.**

The Benefits of the Pricing Structure & its Preference over Heroku's Pricing Model

Savings & Reduced Costs

While our client's current architecture costs are reaching approximately $19,000/year while using Heroku's architecture, having a completely new architecture should aim for lower costs to take full advantage of migrating towards a new cloud platform. Utilizing the savings plans, configurable services, and pricing flexibilities that AWS offers, our client can reduce operating expenses while delivering toward a greater consumer base.

Because Heroku lacks the flexibility of AWS due to being a Platform-as-a-Service (compared to being an Infrastructure-as-a-Service), Heroku cannot deliver flexibility on pricing. Heroku lacks providing a variety of instance types, savings plans, and configurations that may be needed when reducing costs.

Value

Creating a greater outreach towards customers globally can be expensive but it has become a necessary aspect for businesses to grow. Especially for our client's business model, expanding further from the US is important if they want to reach towards a larger market. When using AWS pricing structures, our client can gain more value on its architecture due to annual cost per region.

AWS US Region	AWS Canada Region	Heroku Architecture
$10,196.40 / annual	$11,120.28 / year	$18,000 - $19,000 / year
Total AWS Region Costs	$21,316.68 / year	

Based on current requirements and usage for our client's needs, each AWS region is significantly less expensive than one single region in Heroku.

When combining the costs of both AWS regions, the costs are slightly higher but nearly the same costs within Heroku's architecture for the US itself. Though slightly more expensive, it creates a greater value as our client can reach consumers in Canada. As a result, AWS will provide a greater return on investment.

The Positive Impact For Our Client

Migrating to AWS provides several benefits for our client. First, it improves database management, addressing challenges with Heroku, especially concerning global regions. Second, the move results in substantial cost savings due to AWS' pay-as-you-go model and cost optimization options, contrasting with Heroku's high annual expenses. Third, AWS empowers our client to improve user experience through feedback integration and interface refinement. These efforts along with AWS' scalability and performance advantages guarantee a resilient platform capable of meeting the expanding demands of our client's operations. Overall, the migration to AWS aligns strategically with our client's goals, offering cost-effective solutions and supporting its expansion in the competitive online accommodation market. While Heroku's platform is a great start for companies to kickstart their cloud infrastructure, it becomes very limited when the company makes plans to grow. The Migration can benefit greatly from the conversion of our from Heroku to AWS, with notable gains in performance, cost-effectiveness, scalability, operational efficiency, and UI/UX enhancements. The following results support our client's activities and overall success and strategic expansion:

- **Enhanced Performance:** AWS's cutting-edge infrastructure and services provide excellent performance and dependability, assisting our client's operations and guaranteeing the platform runs without a hitch. The user experience is improved by AWS's strong architecture and worldwide network, which reduces downtime and increases response times.
- **Cost-Effectiveness:** Our client may optimize expenditures and cut down on unnecessary spending by only paying for the resources it utilizes thanks to AWS's pay-as-you-go pricing model. With the range of pricing options and savings programs that AWS provides, our client is able to reduce costs by taking advantage of volume usage discounts and reserved instances.
- **Scalability:** AWS offers a wide range of scalability solutions, like Amazon EC2 Auto Scaling, which lets our client modify resources in response to demand. Because of its scalability, our client is able to quickly extend its operations in response to changes in user traffic.
- **Operational Efficiency:** By eliminating the need for manual intervention and simplifying processes, AWS's wide range of services and tools enable effective management and monitoring of the cloud environment. Our client is able to concentrate on its primary business operations while increasing operational efficiency thanks to the platform's automated features and extensive support.
- **Enhancement of UI/UX:** Amazon's flexibility and control over the cloud environment allow for feedback integration and ongoing enhancement of the user interface and experience. AWS helps our client in its endeavors to improve the functionality and appearance of its web application, which leads to a more user-friendly platform and happier customers.
- **Enhanced Global and Regional Support:** Our client has been able to grow its market presence globally and provide more effective support to foreign users thanks to AWS's vast reach and support for multiple regions. Regional data centers ensure that local ordinances and data privacy rules are followed.

Conclusion

This article concludes with a discussion of our client's successful move from Heroku to AWS, highlighting the benefits of the change and its favorable effects on the business's objectives and operations.

- **Cloud Migration:**
  - Heroku to AWS: The migration effort addressed Heroku's high annual costs and its inability to manage databases for foreign areas outside of the US.
  - With its pay-as-you-go price structure, AWS provides a more economical option, saving the business a substantial amount of money.
- **Product Suggestions and UI/UX Enhancements:**
  - By immediately displaying user-generated product feedback on its website, our client hopes to improve the user experience. User happiness rises as a result of more accurate and seamless user experiences brought about by improvements to the user interface and experience.
- **AWS advantages:**
  - Cost Savings: Our client can cut operating costs thanks to AWS's cost optimization tools and pricing structure.
  - Scalability and Flexibility: Our client is able to increase its operations and effectively handle its increasing user base because of AWS's greater scalability and flexibility.
  - Performance and Reliability: Our client's services are more reliable and perform better because of AWS's sophisticated infrastructure and extensive support.
  - Global and Regional Support: By providing support for areas outside of the US, AWS helps our client enter new markets.

PREP Student Reflection

Since our work has been focused on cloud computing and architecture, we have been exposed to the technical area of developing a cloud architecture for a business. We have learned a lot about Amazon Web Services; its services, pricing, and applications towards a business need. We have had exposure to the differences in PaaS vs. IaaS cloud platforms as well.

Working with our client has brought a new experience for all of us regarding project planning and development. Because there was no clear direction of where the project was going, project planning and requirements elicitation was the most crucial part of completing this project. We learned about creating a direction of our own rather than having a supervisor instructing us what to do. We adjusted ourselves and planned accordingly with deliverable deadlines by creating a project execution plan and setting up team deadlines.