**Cost/Benefit Analysis Report**

**Title: Cost/Benefit Analysis for Backend Service Selection**

**1. Introduction**

**1.1 Purpose of the Analysis** The purpose of this analysis is to evaluate the costs and benefits of using Firebase as the backend service for the cross-platform scheduling application. This report aims to provide a comprehensive comparison to justify the selection of Firebase based on technical and economic feasibility, as well as operational benefits.

**1.2 Alternatives Considered**

* Firebase
* AWS Amplify

**2. Cost Analysis**

**2.1 Firebase Cost Breakdown** Firebase offers a variety of services that will be used for the application. The pricing for Firebase services is based on usage, and for the scope of this project, we will consider the free tier and estimate costs for potential usage beyond the free limits.

* **Firebase Authentication**
  + Free tier: 10,000 verifications per month
  + Expected cost: Free (assuming usage within the free tier)
* **Firebase Firestore (Database)**
  + Free tier: 1 GB of storage, 50,000 reads, 20,000 writes, 20,000 deletes per day
  + Expected cost: Free (assuming usage within the free tier)
* **Firebase Cloud Functions**
  + Free tier: 2 million invocations per month
  + Expected cost: Free (assuming usage within the free tier)
* **Firebase Cloud Messaging**
  + Free tier: Unlimited notifications
  + Expected cost: Free

**2.2 AWS Amplify Cost Breakdown** AWS Amplify also offers a range of services with pricing based on usage. While AWS Amplify does not have a free tier as extensive as Firebase, we will consider the basic costs for similar services.

* **AWS Amplify Authentication**
  + Cost: $0.0055 per MAU (monthly active user)
  + Expected cost: Approximately $5.50 for 1,000 users
* **AWS Amplify Datastore**
  + Cost: $0.02 per 1,000 reads, $0.01 per 1,000 writes, and $0.09 per GB storage
  + Expected cost: Approximately $20 per month (estimating 50,000 reads, 20,000 writes, and 1 GB storage)
* **AWS Lambda (equivalent to Cloud Functions)**
  + Cost: $0.20 per million requests
  + Expected cost: Approximately $0.40 per month (assuming 2 million requests)
* **Amazon SNS (equivalent to Cloud Messaging)**
  + Cost: $0.50 per 1 million push notifications
  + Expected cost: Approximately $0.50 per month

**3. Benefits Analysis**

**3.1 Technical Benefits of Firebase**

* **Ease of Use**: Firebase provides a comprehensive SDK and extensive documentation, making it easier for developers to integrate and use the services.
* **Integration**: Firebase offers seamless integration with other Google services and tools, providing a unified platform for development.
* **Real-Time Database**: Firebase Firestore supports real-time data synchronization, which is crucial for ensuring that the scheduling application is always up-to-date across devices.

**3.2 Technical Benefits of AWS Amplify**

* **Scalability**: AWS Amplify is built on top of AWS, offering robust scalability options for applications with growing user bases.
* **Flexibility**: AWS Amplify provides a more flexible and customizable backend solution, allowing for more advanced configurations and integrations.

**3.3 Economic Benefits of Firebase**

* **Cost-Effective**: Firebase offers a generous free tier, making it highly cost-effective for small to medium-sized applications.
* **Predictable Pricing**: Firebase's pricing model is straightforward, with clear thresholds for free and paid usage, allowing for easier budgeting and cost management.

**3.4 Economic Benefits of AWS Amplify**

* **Pay-As-You-Go**: AWS Amplify charges based on actual usage, ensuring that costs scale with the application's growth.
* **Enterprise-Level Services**: AWS Amplify provides access to a wide range of enterprise-level services and features, which can be beneficial for future scalability and advanced use cases.

**4. Risk Assessment**

**4.1 Risks with Firebase**

* **Vendor Lock-In**: Relying heavily on Firebase may lead to vendor lock-in, making it challenging to switch to another provider in the future.
* **Service Limitations**: The free tier has limitations that may not be sufficient as the user base grows, potentially leading to higher costs.

**4.2 Risks with AWS Amplify**

* **Complexity**: AWS Amplify can be more complex to set up and manage compared to Firebase, requiring more advanced technical knowledge.
* **Higher Initial Costs**: AWS Amplify may incur higher initial costs due to the lack of an extensive free tier, especially for small applications.

**5. Decision Rationale**

**5.1 Summary of Findings** Based on the cost and benefit analysis, Firebase emerges as the more cost-effective solution for the initial phase of the cross-platform scheduling application. Firebase offers a generous free tier, which is suitable for the anticipated usage, and provides ease of integration and real-time synchronization capabilities essential for the application.

**5.2 Final Decision and Justification** The decision is to use Firebase as the backend service for the cross-platform scheduling application. This choice is justified by the lower initial costs, ease of use, and sufficient features provided by Firebase's free tier. As the application grows, potential costs and the need for advanced features will be reassessed, and a switch to AWS Amplify or another service can be considered if necessary.