ATAM Scenario for the Arizona Investment Bank (AIB) System: - Case Study

Purpose

The purpose of this case study is for students to apply ATAM software architecture evaluation process in real world context.

Objectives

Students will be able to demonstrate the application of key concepts discussed in this unit. In particular, students will demonstrate:

a) Steps involved in the Light Weight ATAM process
b) Apply steps in the ATAM process to carryout an architecture evaluation

Introduction

In this case study, we will perform the Light Weight ATAM process to the Arizona Investment Bank (AIB) case study to evaluate the software architecture of the AIB System. In this introduction section, we present the description of AIB system and the steps involved in the Light Weight ATAM process. Note that rest of content in the introduction section is not apart of the ATAM process, but we present them for learning purpose.

Arizona Investment Bank (AIB) Operations and User Scenarios

General Operation Scenario: AIB is a premier investment bank in Arizona. This bank provide two types of accounts to its customers: checking accounts and savings accounts. When the bank create accounts for customers, they need to provide the first name, last name, and the home phone number. At the time of registering customers, the bank assign a unique four digit customer ID. Both savings and checking accounts have an account number, owner ID (same as the customer ID). Also, each account store its account balance. The customers can perform following transactions. Before performing any transaction, customer needs to provide the customer ID. Then the bank verify if the customer is a valid customer. They can deposit money to both checking and savings accounts. At the time of deposit, the customer need to provide the account number and the deposit account. Customers can withdraw money from checking

accounts. No withdrawal can be done from savings accounts. However, customers can transfer money from their savings accounts to the checking accounts. Each customer can have multiple checking and savings accounts.

Create Customer Scenario: Potential customer visit a branch of AIB will be greeted by a bank representative and discuss possible banking options mentioned above. If the visitor agrees to become a customer, a customer account will be created by the bank representative. At this time, the customer will provide the first name, last name, and the home phone number. Also, the customer account creation process will generate a four digit customer number and assign to the customer. The, the customer will be added to the bank as an AIB customer.
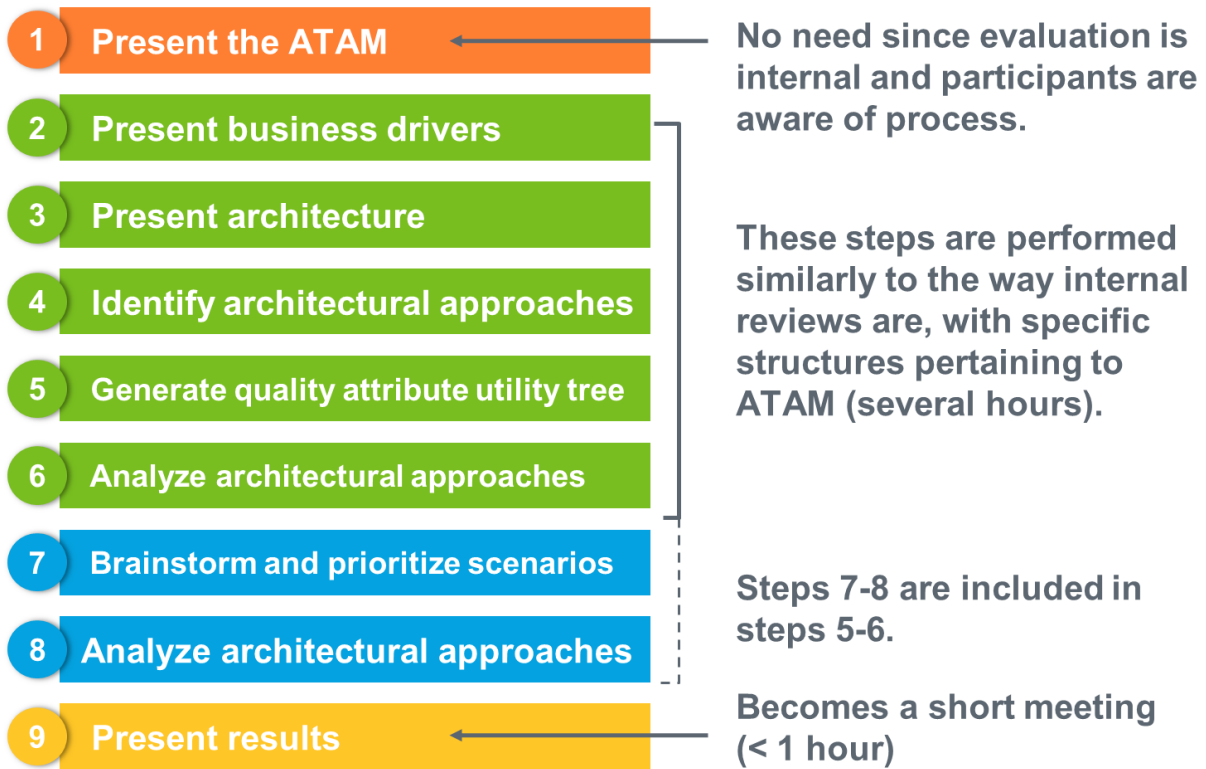
Create Account Scenario: Customers can create bank accounts (both savings and checking). When customers create an account, they need to provide the customer number, account type, and the initial deposit. The bank account creation process will generate a 5 digit account number and assigned the account. Customer is related to the account through bank accounts customer id.

Deposit Scenario: Customers can deposit money to both savings and checking accounts. The customer need to provide the account number, customer number, and the deposit amount. Then, the bank will verify that the customer holds the bank account. If so, deposit will proceed and the balance of the bank account will be updated.

Withdraw Scenario: Unlike deposit, withdrawal can be done only from checking accounts. The customer need to provide the account number, customer number, and the deposit amount. Then, the bank will verify that the customer holds the bank account and the account is a checking account. If the withdrawal amount is less than or equal to the balance, the withdrawal will proceed and the balance of the bank account will be updated.

Transfer Money Scenario: Customers can transfer money from savings account to a checking account. For this operations, the customer will be asked to enter the savings account number, checking account number and the transfer amount. Similar to the other operations, the bank will verify if the customer holds both checking and savings accounts and the saving account has the sufficient money to transfer. If so, the transfer operation will proceed and account balances will be updated.

Lightweight ATAM - Steps

1	**Present the ATAM**	← No need since evaluation is internal and participants are aware of process.
2	**Present business drivers**	
3	**Present architecture**	These steps are performed similarly to the way internal reviews are, with specific structures pertaining to ATAM (several hours).
4	**Identify architectural approaches**	
5	**Generate quality attribute utility tree**	
6	**Analyze architectural approaches**	
7	**Brainstorm and prioritize scenarios**	Steps 7-8 are included in steps 5-6.
8	**Analyze architectural approaches**	
9	**Present results**	← Becomes a short meeting (< 1 hour)

ATAM Scenario for the AIB Bank System Design

1. **Present ATAM :** In-house, all the familiar with each other, project, and the setup
2. **Present Business Goals:** Primary focus on the business goals to list important functions, constraints (technical, economic …etc), stakeholders, major quality considerations and other architectural drivers

> **Background:** AIB is a premier investment bank in Arizona. The bank's main objective is to provide faster, reliable, and easy access to bank functionality using web and other relevant applications. That will help the bank to retain its customers, improve customer satisfaction, and expand the customer base.
>
> **Key functionality:** AIB system is the font end of the Bank operations mainly providing functionalities to bank representatives and customers. Both of these two categories of users can access the system functionality through web interface. Bank representatives can open two types of accounts to customers: Checking and Savings. Then, customers can perform account transactions (deposit, withdraw, and transfer money). Later, the bank plans to provide mobile apps to mobile users to perform the same set of operations. Such enhancements will help the bank to serve wide range of customers. The major stakeholders of the system are customers, bank representatives, and the bank.
>
> **Quality Attributes:** Bank's priority is to provide above functionality securely and reliably. One of the main goals of the bank to make sure that the system is available 24/7 for its customers. Also, in case of a failure, the bank expect the system recover as fast as possible. Not more than 30 minutes downtime. The data confidentiality and integrity is high priority. Finally, the bank expects expand its functionality for create other types of bank accounts and services across different types of mobile and other computational devices.

3. **Present the Architecture:** The current architecture is a client-server architecture where client is a web application running on a web browser. Web server hosts the bank application functionality while a relational database holds customer and account data.
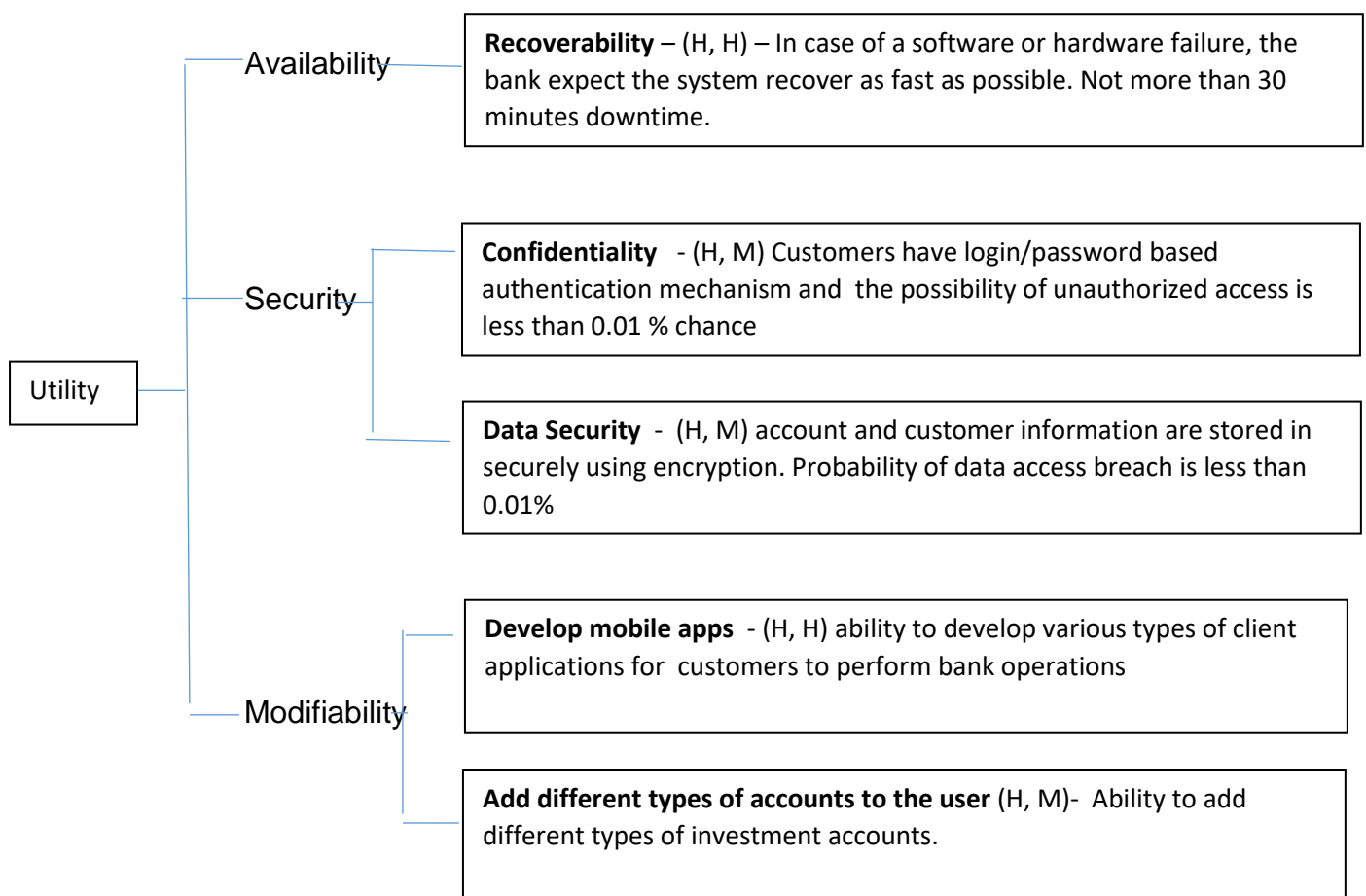
Architecture Diagram
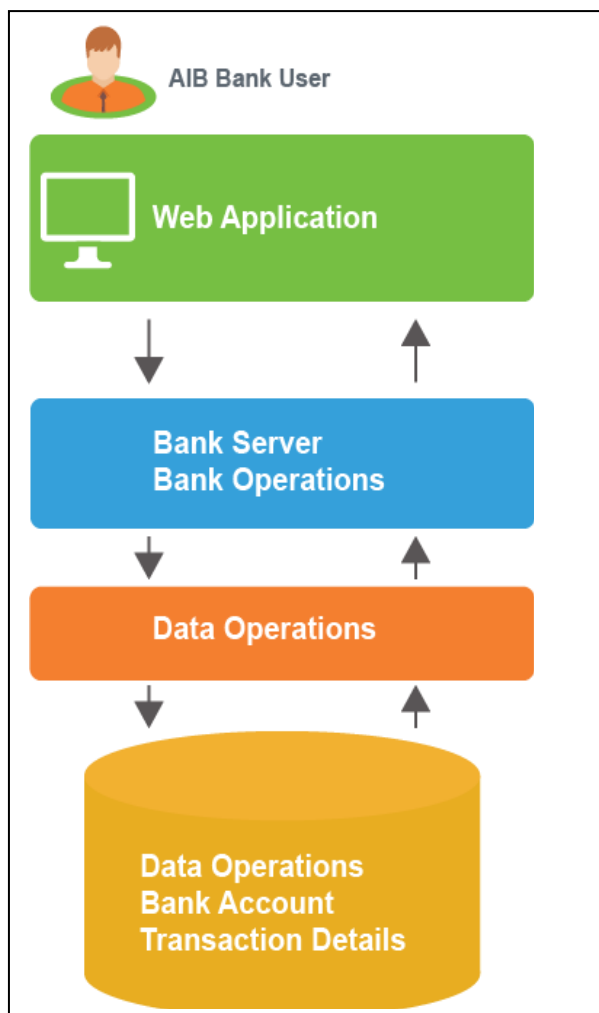
Realization of the architecture - Technology
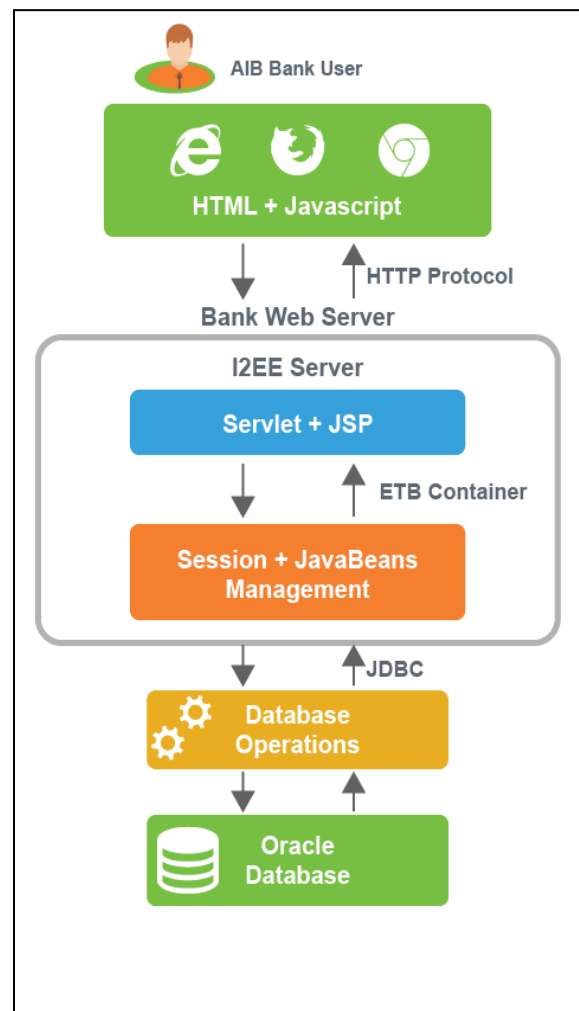
The main use case scenarios can be traced on this architecture to further evaluate and understand how architectural components work together in realizing main use case scenarios

4. **Identify architectural approaches:** This architecture uses several architectural approaches, tactics in achieving key functionality and quality attributes. For example, in order to achieve 24/7 availability, a duplicate backup server is running and synchronization between the duplicate server and the operational server occurs using regular, seamless synchronization. Similarly other architectural approaches and tactics will be discussed

5. **Utility Tree**

Availability

Recoverability – (H, H) – In case of a software or hardware failure, the bank expect the system recover as fast as possible. Not more than 30 minutes downtime.

Security

Confidentiality - (H, M) Customers have login/password based authentication mechanism and the possibility of unauthorized access is less than 0.01 % chance

Data Security - (H, M) account and customer information are stored in securely using encryption. Probability of data access breach is less than 0.01%

Utility

Modifiability

Develop mobile apps - (H, H) ability to develop various types of client applications for customers to perform bank operations

Add different types of accounts to the user (H, M)- Ability to add different types of investment accounts.

6. Analyze Architecture Approaches

The current proposed client – server architecture can accommodate availability and security concerns. However, the modifiability is harder to achieve as the client development technology is tightly coupled with the application web sever and its technology. So, adding mobile clients and other types of clients in the future will be challenging. The alternative is the provide uniform "Enterprise Communication Bus" where clients communicate with the ECB using well defined interfaces so that clients are not aware of the web server technology. ECB can be implemented as REST web API's. This enables clients to use the web communication protocols such as HTTP. The following diagram shows the alternative architecture proposal.

Side by side comparison of the two architectures:
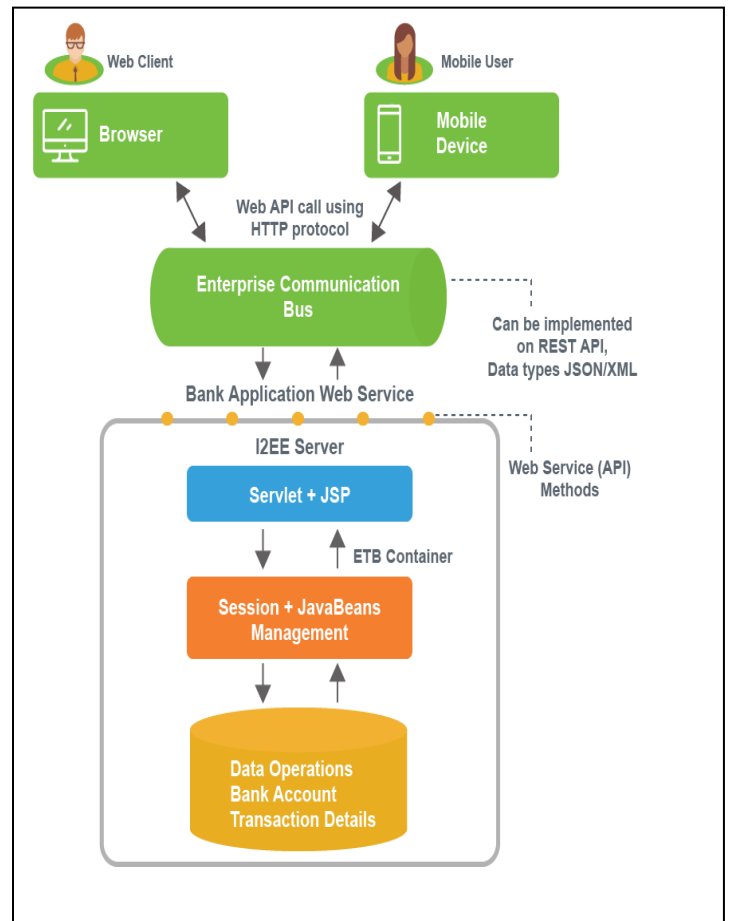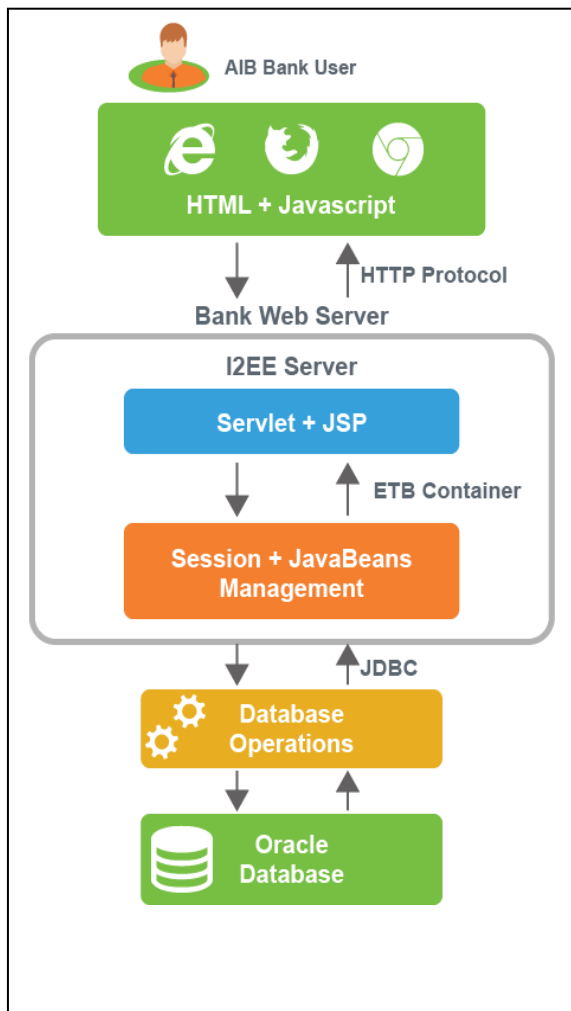
Similarly, other quality factors will be analyzed and discuss architectural alternatives. Finally, reconcile with a most appropriate software architecture

7. **Brainstorm and Prioritize Scenarios** – No need as this happens in-house and captured in 4, 5, and 6 above
8. **Analyze Architectural Approaches** - – No need as this happens in-house and captured in 4, 5, and 6 above
9. **Present Results** – Final documentation