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| International School  SE-MIS Program | **Assignment 2b**  **CMU-SE 403 Software Architecture & Design**  Fall – 2023-2024  Duration: 2 hours / Date: 17-Nov, 2024 |
| **Score** | **Student Name:**  **Student ID:** |

1. Identify 01 Scalability, 01 Performance, and 01 Security scenarios that you think would be necessary for a widely used website, such as Shopee, Lazada, and MyDTU (use a six-part scenario template) (40 points)
2. Select 01 of the 3 questions below answer that question in detail and give an example.(30 points)
   1. How does Security trade-off against Performance? How would you change a system that is required to have strong security?
   2. [How might availability trade-off against cost-effectiveness?](https://link.springer.com/article/10.1007/s11219-019-09478-x)
   3. How might usability trade-off against security?
3. Consider the student database at Duy Tan University. (30 points)  
   1. Identify two kinds of sensitive data or other resources in the system.  
   2. Determine the possible attackers, their motivations, and their resources.

1. Analyze website lazada.com  
1 Scalability

**1.1 Elasticity:**

+ Stimulus: Increased user traffic or demand.

+ Source of Stimulus: Lazada Seasonal promotions, marketing campaigns, or sudden popularity of specific products.

+ Artifact: Lazada utilizes cloud-based infrastructure, allowing them to scale resources based on demand during peak shopping seasons, ensuring a seamless shopping experience for users.

+ Environment: The online platform and server infrastructure.

+ Response: Automatic allocation or deallocation of resources based on demand.

+ Measure of Response: Monitoring server loads, response time during peak periods.

**1.2 Load Balancing:**

+ Stimulus: High traffic leading to server strain.

Source of Stimulus: Varied user activities, promotional events.

+ Artifact: Lazada employs load balancers to distribute incoming traffic across multiple servers, optimizing resource usage and preventing server overload.

+ Environment: Network infrastructure and server clusters.

+ Response: Distributing incoming traffic across multiple servers.

+ Measure of Response: Even distribution of workloads, reduced server response time.

**1.3 Redundancy:**

+ Stimulus: Risk of system failure or downtime.

+ Source of Stimulus: Server malfunctions, unexpected traffic spikes.

+ Artifact: Lazada implements redundant server setups to ensure continuous operation in case of server failures, minimizing downtime for users.

+ Environment: Primary and backup server environments.

+ Response: Automatic switch to backup systems in case of failure.

+ Measure of Response: In the event of a server malfunction during a high-traffic period, Lazada ensures continuous service by seamlessly switching user requests to backup servers. This is crucial to maintain uninterrupted access to the platform.

**1.4 Flexibility:**

+ Stimulus: Changes in user behavior or technology.

+ Source of Stimulus: Shifts in market trends, introduction of new devices.

+ Artifact: Lazada's modular and adaptable software architecture enables quick adaptation to changing market trends, introduction of new features, and accommodation of various devices.

+ Environment: Evolving technological landscape.

+ Response: The system can adapt to new features, devices, or requirements.

+ Measure of Response: As new trends emerge or new devices are introduced to the market, Lazada's flexible software architecture allows them to seamlessly integrate new features and adapt to the evolving needs of online shoppers.

2 Security

**2.1 Confidentiality:**

+ Stimulus: Attempted unauthorized access to sensitive information.

+ Source of Stimulus: Hackers or malicious users trying to gain access to customer data.

+ Artifact: Encryption algorithms, access controls, secure authentication methods.

+ Environment: Customer databases, personal information storage.

+ Response: Implementation of encryption to protect sensitive data, access controls to limit user privileges.

+ Measure of Response: When customers provide personal information do this sensitive information

**2.3 Availability:**

+ Stimulus: DDoS attacks, server outages, or other disruptions.

+ Source of Stimulus: Malicious actors attempting to disrupt service, technical failures.

+ Artifact: Redundant servers, DDoS mitigation tools, disaster recovery plans.

+ Environment: Online platform, server infrastructure.

+ Response: Automatic failover to redundant systems, DDoS protection measures.

+ Measure of Response: In the face of a DDoS attack or server outage, Lazada ensures availability by automatically redirecting traffic to redundant servers and implementing measures to mitigate the impact of such attacks.

**2.4 Authentication:**

+ Stimulus: Attempted unauthorized access to user accounts.

+ Source of Stimulus: Credential stuffing attacks, phishing attempts.

+ Artifact: Secure login mechanisms, multi-factor authentication.

+ Environment: User account databases, login interfaces.

+ Response: Strong authentication protocols, account lockout mechanisms.

+ Measure of Response: To protect user accounts from unauthorized access, Lazada implements secure login mechanisms, including multi-factor authentication, to ensure that only legitimate users can access their accounts.

**Performance**:

When a user requests to view a flash sale product on Lazada through their app, the app sends a request to the server. The server is responsible for processing user requests. In a flash sales day, servers need to be optimized for load, speed, and load balancing. This ensures that the server can handle increased traffic and deliver a seamless user experience to display products on the flash sale page in less than 2 seconds. By meeting this performance metric, Lazada can ensure that users can quickly access and browse desired products, enhancing their overall shopping experience.

o Stimulus: The user requests to view a flash sale product.

o Source of stimulus: User's

o Artifact: Server.

o Environment: Flash sale day.

o Response: Optimization for load, speed, and load balancing.

o Measurement: Display products in less than 2 seconds.