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COMP 301 Final Exam Fall 2024

1. (40 pts) A company is developing an e-commerce platform using microservices. The platform consists of the following services:

* **Inventory Service**: Manages product stock levels and provides information about stock availability.
* **Payment Service**: Handles payment processing, including credit card transactions and payment confirmations.
* **Notification Service**: Sends email and SMS notifications to customers for order confirmations and updates.
* **Order Processing Service**: Coordinates the order workflow, such as verifying stock, processing payments, and notifying customers.

1. (15 pts) Describe how these microservices can communicate synchronously and asynchronously.

Synchronously call is the easiest way of comunicating. When the one of the service calls other it wait until the other services respond and it gives a request it is so simple like a phone call.

Asynchronously call is more like texting. First one service calls then it forget the message and the other service done it when it is okey but they don’t know each other at all.

1. (15 pts) Identify a scenario where asynchronous communication would be preferred and explain why.

When I buy something online, I want to see "Thanks for buying!" right away. I don't want to wait for an email. It's better because:

- I get my "thanks" message fast.

- The email can come later.

- If the email system isn't working, I can still buy stuff.

- Everything stays fast even when the shop is busy.

1. (10 pts) List the challenges of ensuring consistency across microservices in this architecture and suggest potential solutions.

Challenges:

- Some parts stop working sometimes

- Connection problems

- Some services sometimes stop working

Solutions:

-Do things step by step

-Having backup plans

-Checking everything carefully

-Keeping track on some changes

2. (30 pts) A bank needs to expose its services to third-party applications for functionalities such as account balance inquiries and fund transfers.

1. (15 pts) Compare and contrast SOAP and RESTful web services in terms of the following criteria:
   1. Protocol and Standards
      * SOAP is like sending a letter with strict rules about how to package it
      * Rest is like sending a postcard, simpler and more flexible.
   2. Data Format Support
      * SOAP only uses one type = xml.
      * Rest can use different types(flexible) = JSON, simpler text.
   3. Performance and Scalability
      * SOAP is big so it takes more time.
      * Rest is faster and easier.
   4. Security Features
      * SOAP has strong locks and safety features.
      * Rest is like basic mail you should add extra safety features.
2. (15 pts) Based on the bank’s requirements for reliable, secure, and standardized communication, explain whether SOAP or RESTful web services would be more suitable. Provide specific reasons for your choice and mention how features like SOAP’s built-in security standards (e.g., WS-Security) or REST’s simplicity and performance could impact the decision.

For a bank SOAP is more reliable than REST.

- SOAP comes with strong security.

- SOAP has strict contracts that ensure consistency for all third party entegrations.

- Being extra careful than extra fast is more important when dealing with money.

- Most of banks are already using SOAP and they know how it works.

1. (30 pts) In a microservice architecture, a message broker is often used to enable communication between services.
2. (10 pts) Explain the role of a message broker in asynchronous communication.

-Recieves messages from services.

-Stores them until they processed.

- Deliveres them to appropriate subscribers.

-Handles them routing and transformation.

- Helps them when some services are busy or not working.

1. (10 pts) Describe two advantages and two potential drawbacks of using a message broker.

Advantages:

* Services don’t need to know about each other.
* Messages don’t get lost even if something goes wrong.

Disadvantages

* It makes the system more complicated.
* If the message broker gets too busy, everything might be slow.

1. (10 pts) Provide an example of how a message broker could be used in an online food delivery system involving services such as Restaurant, Order, and Notification.

* When a restaurant accept your order they send “Order Accepted” message.
* They order service gets this message and updates status.
* Notification dervice gets message and sends you an update.
* If the restaurant is very busy messages wait in line.
* If the message about your order fails, it can try again without messing up your order.

Good Luck