Assignment – 1 Total Points: 100

Due Date: Jan 28th, 11.59 pm (through Blackboard)

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Please note that this is an individual assignment. Each student is expected to produce their work.

1. In our video lectures on Software Architecture, we explored prevalent software architectures and patterns. Over the years, Service Oriented Architecture (SOA) and Microservices Architecture have become prominent, with a more recent surge in the popularity of Micro Frontend Architecture. I'd like you to research internet resources to gain insights into Service Oriented Architecture, Microservices Architecture, and Micro Frontend Architecture. Please provide a comprehensive write-up in your own words about drawing on your understanding of these architectures. Your write-up will include answers to the following questions:

a. Explain each of these architectures and identify the architectural problems these patterns solve. (15 points)

**Service Oriented Architecture (SOA)**

Service Oriented Architecture (SOA) is a type of architectural style that uses components of software as services, being independent and functionality within. Service Oriented Architecture identify the problems from system integration, reusability, and agility.

**Architectural Problems that the patterns solve:**

* System Integration: The service oriented architecture makes the communication go smooth between various systems.
* Reusability: The way that it could be allowed to be able to reuse in its service among other applications.
* Flexibility: The service oriented architecture makes it so they can allow changes and updates and so it can be changed without making the whole system cause problems.

**Microservices Architecture**

Microservices Architecture makes up of a large number of small, independent usable services. Every one of the microservices has a specific ability/capability that allows it to communicate through APIs. This type of architectural style makes its so it can fixed the problems of scalability, making several deliveries, and fault isolation.

**Architectural Problems that the patterns solve:**

* Scalability: The microservices architecture allows it to make a small/scalable individual service that can alter to the demand wanted and allowing it to maximize it utilization.
* Delivery: microservice architecture makes it so it can support singular uses resulting in fast and more efficient cycles and updates.
* Fault Isolation: Microservices architecture make it so failure in microservices don’t mess with other systems.

**Micro Frontend Architecture**

Micro Frontend Architecture goes into the ideas and principles of microservices but to the frontend making it so that it has independent development and uses of frontend components. Every micro frontend has a certain job for UI features, and it looks at solving problems in the patterns of independent development, scalability, and diversity of technology.

**Architectural Problems that the patterns solve:**

* Independent Development: Micro Frontend Services allows it so different teams are allowed to work on different features in the frontend and not need for the need of continuous coordination.
* Scalability: Allows for the micro frontend architecture to scale to specific components in the UI upon what the people want and to maximize the utilization.
* Diversity of Technology: Micro frontend services make it so they can support the use of many different frontend services and technologies in an system application if he follows the requirements given.

b. For each of the architectures, Identify the major components and how they are organized and related. (15 points)

Service Oriented Architecture (SOA)

**Major Components and Organization in SOA:**

* Services: Service oriented architecture have an autonomous units offering specific functionalities.
* Service Registry: A place where users can have a catalog tracking available services.
* Message Bus: A way for the system to pass on communication and coordination between services.

Microservices

**Major Components and Organization in Microservices:**

* Microservices: Microservices are usually independent, self-contained units with specificity for the needs of the business.
* API Gateway: Microservices have this so that it can manage and expose APIs that are found in the system to external clients, acting as a central point for communication.
* Service Registry and Discovery: It is a way for the system to keep track of available microservices for efficient interaction.

Micro Frontend Services

**Major Components and Organization in Micro Frontend:**

* Micro Frontends: Independent UI components with specific responsibilities.
* Integration Layer: Coordinates and integrates micro frontends, ensuring a cohesive user experience.
* Routing Mechanism: Directs user requests to the appropriate micro frontend, optimizing user interactions.

c. What are the roles of each of the components in three architectures? (15 points)

Service Oriented Architecture (SOA)

**Roles of Each Component in SOA:**

* Services: Implement specific business functions.
* Service Registry: Maintains a catalog of available services for seamless discovery.
* Message Bus: Coordinates communication between services, ensuring efficient data flow.

Microservices

**Roles of Each Component in Microservices:**

* Microservices: Implement specific business capabilities independently, ensuring modular development.
* API Gateway: Manages external communication, providing a unified interface for clients.
* Service Registry and Discovery: Tracks available microservices for seamless interaction and service discovery.

Micro Frontend Services

**Roles of Each Component in Micro Frontend:**

* Micro Frontends: Implement specific UI features independently, facilitating modular frontend development.
* Integration Layer: Coordinates and integrates micro frontends, ensuring seamless user experience across features.
* Routing Mechanism: Directs user requests to the appropriate micro frontend, optimizing navigation.

d. What are some of the quality attributes that each of these architectures address? (15 points)

Service Oriented Architecture (SOA)

**Quality Attributes Addressed by SOA:**

* Interoperability: Makes it so the service oriented architecture to have smooth interaction between disparate systems.
* Flexibility: Allows the users in the system to be able to make change and update
* Reusability: this attributes allows the service oriented architecture to encourage the reuse of services across diverse applications.

Microservices

* Scalability: The microservices architecture allows it to make a small/scalable individual service that can alter to the demand wanted and allowing it to maximize it utilization.
* Delivery: microservice architecture makes it so it can support singular uses resulting in fast and more efficient cycles and updates.
* Fault Isolation: Microservices architecture makes it so failure in microservices don’t mess with other systems.

Micro Frontend Services

**Quality Attributes Addressed by Micro Frontend:**

* Independent Development: Allows for concurrent development of different frontend features.
* Scalability: Permits scaling of specific UI components based on user demand.
* Technology Diversity: Supports the use of diverse frontend technologies within a unified application.

e. Identify the key differences between SOA and Microservices architecture. (20 points)

The key differences between SOA and microservices architecture is various reasons from the size and scope to communication to the data management. The size and scope of the SOA usually tends to be a lot larger and covering more functionality compared to the microservices where the are usually more specificity to the applications abilities. There is also how it communicates where in SOA it uses a message bus that is centralized between service for communication while the microservices use a more easier communications of HTTP protocols between the services. Lastly, there is the data management, in SOA it uses once again a centralized type of model that can be used among various services and the microservices use a data storage mechanism that allows it to be more independent because it uses it own storage.

f. What are the applications of these different architectures? (15 points)

**Service Oriented Architecture (SOA):**

One of the main applications of the service oriented architecture is that is it used in large companies an enterprises for integrating systems to automate their processes.

**Microservices Services:**

An application for the use of the microservices services is that it can be used in the same case as service oriented architecture but it would have frequently change mainly focusing on the scalability of the system.

**Micro Frontend Services:**

Applications for the micro frontend services is that it can be used in projects that use multiple frontend services or teams or applications with a range of diversity in technology allowing it to be flexible.

g. Provide references of the sources that you used with links. (5 points)

“What Is SOA (Service-Oriented Architecture)?” *IBM*, www.ibm.com/topics/soa. Accessed 28 Jan. 2024.

“Service-Oriented Architecture (SOA).” *Overview*, www.ibm.com/docs/en/rbd/9.6?topic=overview-service-oriented-architecture-soa. Accessed 28 Jan. 2024.

Martinekuan. “Microservices Architecture Design - Azure Architecture Center.” *Azure Architecture Center | Microsoft Learn*, Azure DevOps, learn.microsoft.com/en-us/azure/architecture/microservices/. Accessed 28 Jan. 2024.

Laughlin, Chris. “A Beginner’s Guide to the Micro Frontend Architecture.” *SitePoint*, sitepoint, 22 Dec. 2020, www.sitepoint.com/a-beginners-guide-to-the-micro-front-end-architecture/.