# S90.09$^{\text{Q\&As}}$

SOA Design & Architecture Lab

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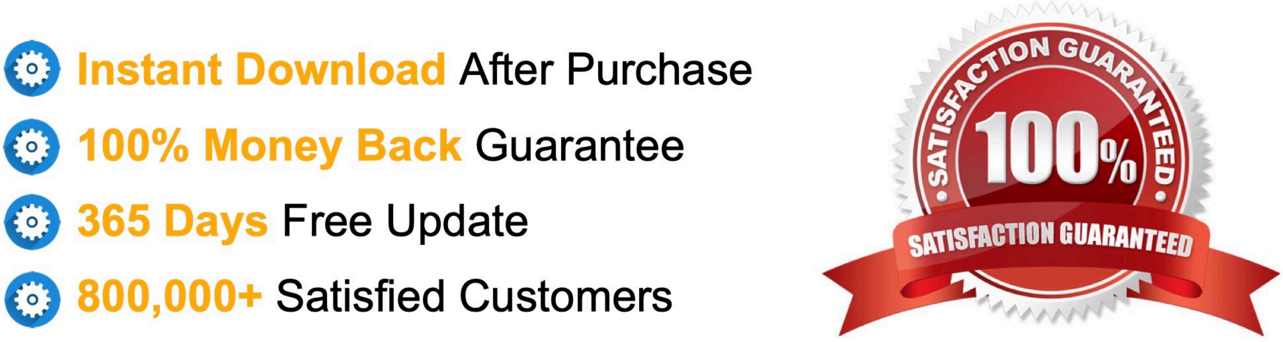
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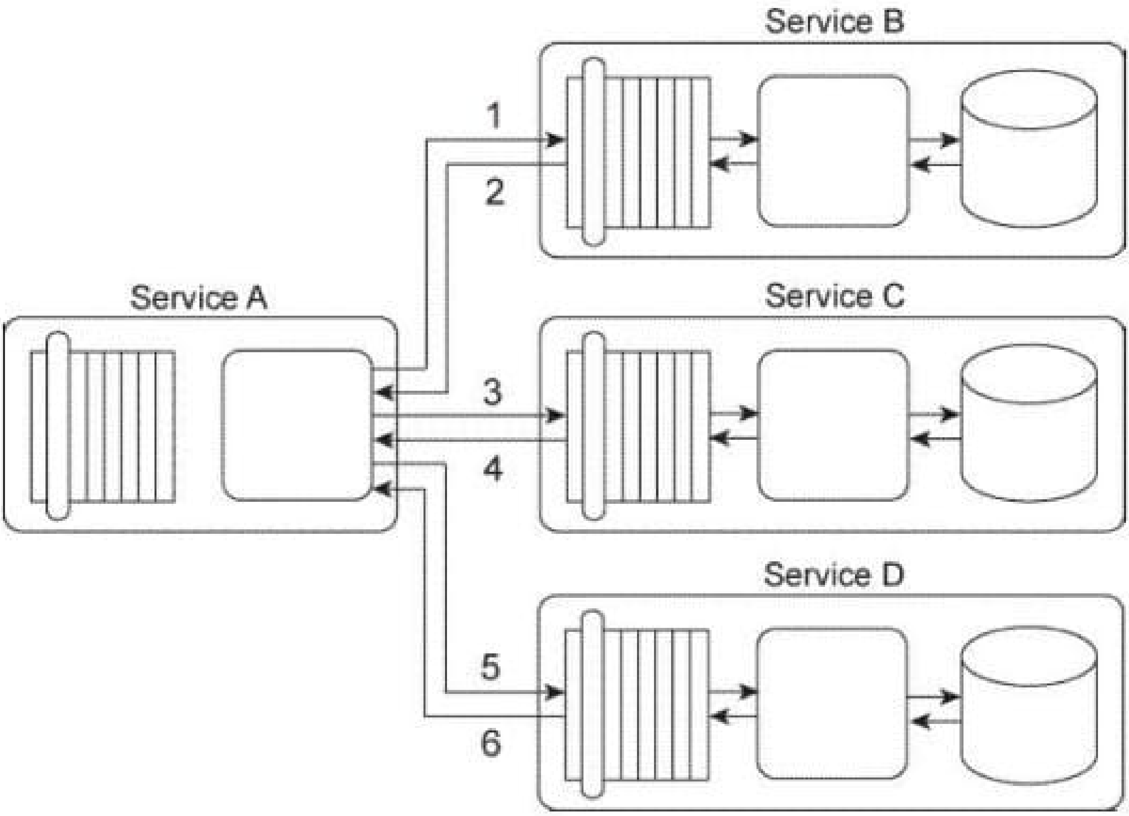
**QUESTION 1**

Service A is a task service that is required to carry out a series of updates to a set of databases in order to complete a task. To perform the database updates Service A must interact with three other services, each of which provides standardized data access capabilities.

Service A sends its first update request message to Service B (1), which then responds with a message containing a success or failure code (2). Service A then sends its second update request message to Service C (3), which also responds with a message containing a success or failure code (4). Finally, Service A sends a request message to Service D (5), which responds with its own message containing a success or failure code (6).



You\\'ve been given a requirement that all database updates must either be completed successfully or not at all. This means that if any of the three response messages received by Service A contain a failure code, all of the updates carried out until that point must be reversed. Note that if Service A does not receive a response message back from Services B, C, or D, it must assume that a failure has occurred. How can this service composition architecture be changed to fulfill these requirements?

A. The Reliable Messaging pattern can be applied to guarantee the delivery of positive or negative acknowledgements. This way, Service A will always be informed of whether a failure condition has occurred with any of the database updates performed by Services B, C, and D. Furthermore, the Service Loose Coupling principle can be applied to ensure that the request and response messages exchanged by the services do not contain any implementation details that would indirectly couple Service A to any of the databases.

B. The Atomic Service Transaction pattern can be applied individually to Services B, C, and D so that each of these services performs its own database update within the scope of an atomic transaction. If anyone update fails, that change can be rolled back on that database. Furthermore, the Service Loose Coupling principle can be applied to ensure that Service A is kept out of the scope of the atomic transaction so that it is not negatively coupled to the proprietary database technologies that are required to enable the atomic transaction functionality.

C. The Compensating Service Transaction can be applied to Service A so that when any one response message containing a failure code is received by Service A, it can invoke exception handling logic that will log the failed database updates. The Service Loose Coupling principle can be further applied to ensure that Services B, C, or D are not indirectly coupled to the exception handling logic, especially if Service A requires additional access to Services B, C, or D in order to collect more information for logging purposes.

D. None of the above.

Correct Answer: D

**QUESTION 2**

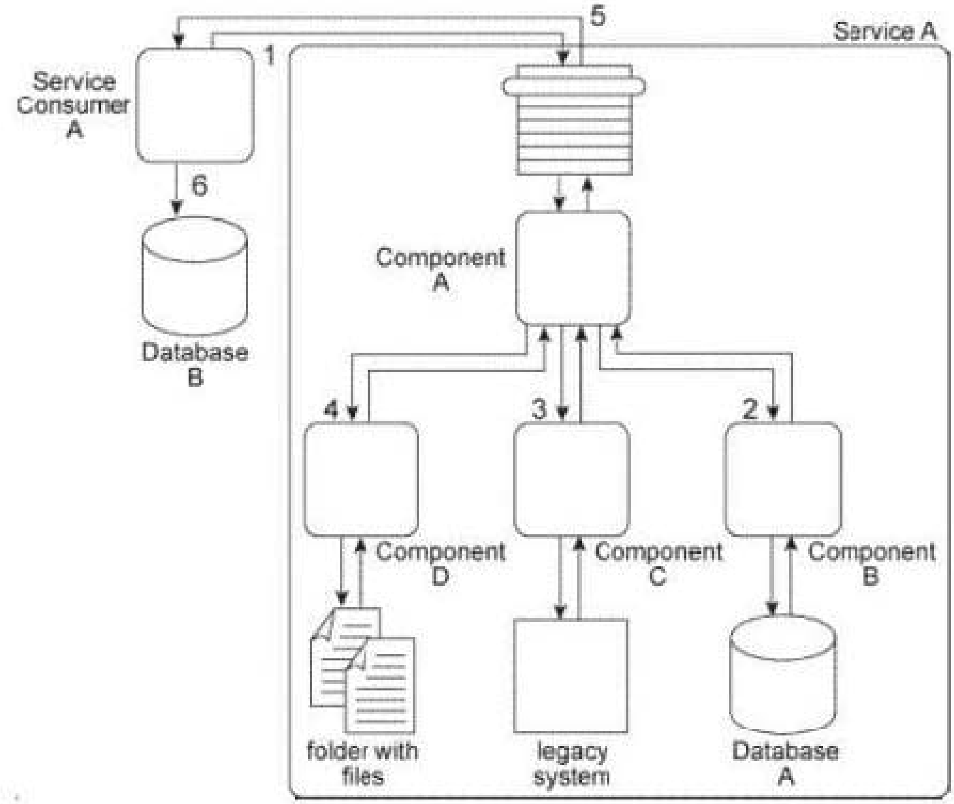
When Service A receives a message from Service Consumer A(1),the message is processed by Component A. This component first invokes Component B (2), which uses values from the message to query Database A in order to retrieve additional data. Component B then returns the additional data to Component A.

Component A then invokes Component C (3), which interacts with the API of a legacy system to retrieve a new data value. Component C then returns the data value back to Component A.

Next, Component A sends some of the data it has accumulated to Component D (4), which writes the data to a text file that is placed in a specific folder. Component D then waits until this file is imported into a different system via a regularly scheduled batch import. Upon completion of the import, Component D returns a success or failure code back to Component A.

Component A finally sends a response to Service Consumer A (5) containing all of the data collected so far and Service Consumer A writes all of the data to Database B (6).

Components A, B, C. and D belong to the Service A service architecture. Database A, the legacy system, and the file folders are shared resources within the IT enterprise.



Service A is a task service that completes an entire business task on its own without having to compose other services. However, you have received many complaints about the reliability of Service A . Specifically, it has three problems. First, when Component B accesses Database A, it may not receive a response for several minutes when the database is being accessed by other applications in the IT enterprise. Secondly, the legacy system accessed by Component C frequently crashes and therefore becomes unavailable for extended periods of time. Third, for Component D to respond to Component A, it must first wait for the batch import of the files to occur. This can take several minutes during which Service Consumer A remains stateful and consumes excessive memory. What steps can be taken to address these three problems?

A. The Legacy Wrapper pattern can be applied so that Component B is separated to wrap the shared database, thereby allowing Component A to interact with this new service instead of directly interacting with the database. The Legacy Wrapper pattern can be applied again so that Component C is separated into a separate service that acts as a wrapper of the legacy system API. Component D can then be separated into a separate service and the Event-Driven Messaging pattern can be applied to establish a publisher- subscriber relationship between this new service and Component A and between Service A and Service Consumer A. The interaction between Service Consumer A and Component A is then redesigned so that Component A issues a message back to Service Consumer A when the event related to the batch import is triggered.

B. The Service Data Replication pattern can be applied so that Component B can access a replicated database instead of having to access the shared Database A directly. The Legacy Wrapper pattern can be applied so that Component C is separated into a separate service that acts as a wrapper of the legacy system API. Next, the Reliable Messaging pattern can be applied so that acknowledgements are issued from the new wrapper service to Component A, thereby enabling notifying Component A during times when the legacy system is unavailable. Finally, Component D is separated into a separate service and the Event-Driven Messaging pattern is applied to establish a publisher-subscriber relationship between this new service and Component A. The interaction between Service Consumer A and Component A is then redesigned so that Component A first interacts with Component B and the new wrapper service. Service A then issues a final message back to Service Consumer A.

C. The Service Data Replication pattern can be applied so that Component B can access a replicated database instead of having to access the shared Database A directly. The Legacy Wrapper pattern can be applied so that Component C is separated into a separate service that acts as a wrapper of the legacy system API. Next, the Asynchronous Queuing pattern can be applied so that a messaging queue is positioned between Component A and the new wrapper service, thereby enabling communication during times when the legacy system is unavailable. Finally, Component D is separated into a new service and the Event-Driven Messaging pattern is applied to establish a publisher-subscriber relationship between this service and Component A and between Service A and Service Consumer A. The interaction logic is redesigned as follows: Component A interacts with Component B, the new wrapper service, and then issues a request to the new event-driven service. Upon receiving a response triggered by the event related to the batch import, Service A responds to Service Consumer A.

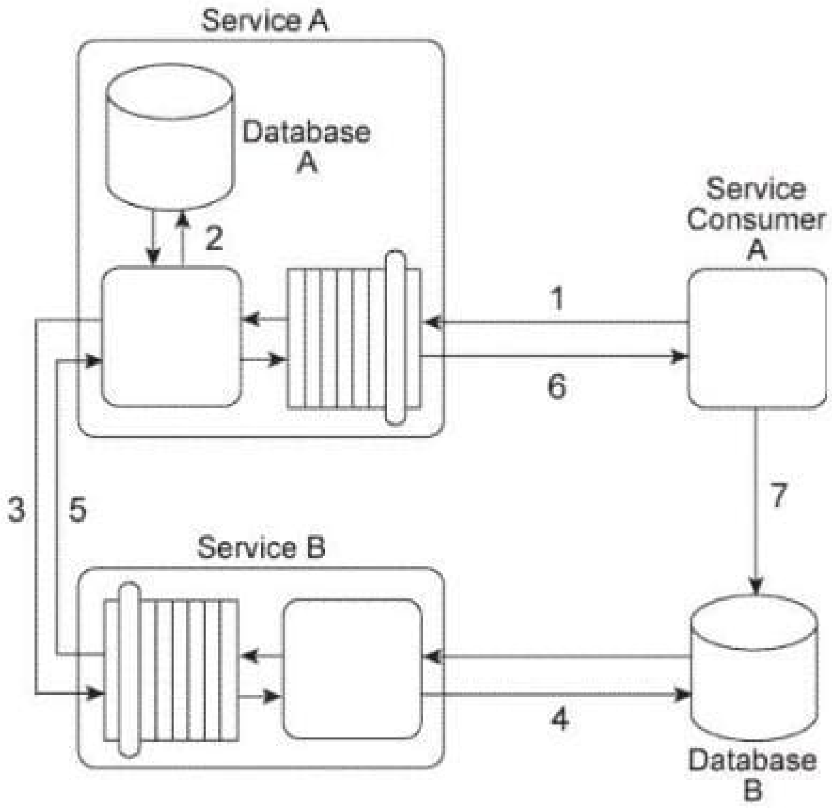
D. None of the above.

Correct Answer: C

**QUESTION 3**

Service Consumer A sends a message with a business document to Service A (1), which writes the business document to Database A (2). Service A then forwards the business document to Service B (3), which writes the business document to Database B (4).

Service B then responds to Service A with a message containing a failure or success code (5) after which Service A responds to Service Consumer A with a message containing a failure or success code (6). Upon receiving the message, Service Consumer A updates a log table in Database B (7). The log entry is comprised of the entire business document. Database A is dedicated to the Service A service architecture and Database B is a shared database.



You are told that the database updates performed by Service A and Service B must be either both successful or they cannot happen at all. The database update performed by Service Consumer A must happen after it is given the outcome of the database updates performed by Service A and Service B . Given that Service Consumer A must also update Database B as part of this service composition architecture, how is it possible to fulfill these requirements?

A. The State Repository pattern can be applied so that Service A writes the business document data to a separate state database until it receives a response message from Service B . If the response message contains a success code, Service A writes the business document to Database A. If the response contains a failure code, Service A discards the data that was written to the state database.

B. The Service Data Replication pattern can be applied to Service Consumer A and Service B so that separate dedicated databases can be established allowing Service Consumer A to make updates independently of Service B . Service A is simply redesigned to not write the business document to Database A until after it receives a message containing a success code from Service B.

C. The Atomic Service Transaction pattern can be applied to encompass Service A, Service B and Service Consumer A. This will guarantee that all of the actions performed by the service composition participants will either be successful or will be rolled back if anyone is not successful.

D. None of the above.

Correct Answer: D

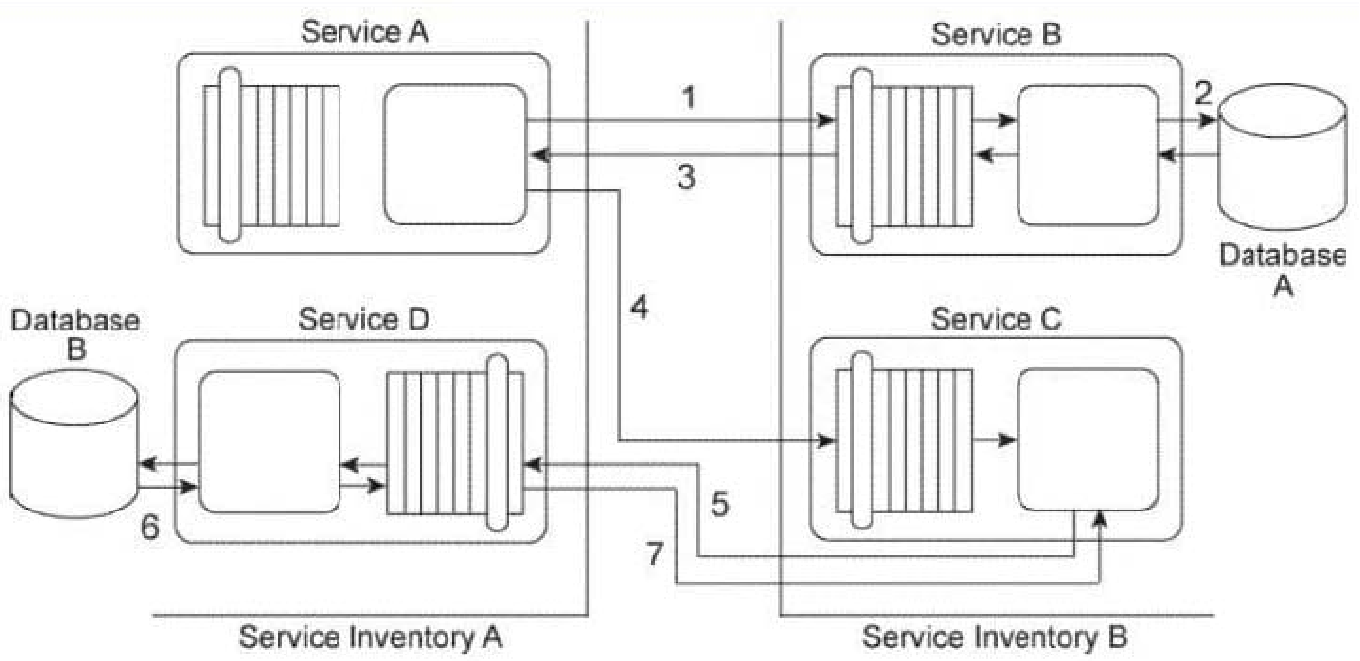
**QUESTION 4**

Service Consumer A invokes Service A (1). The logic within Service A is required to retrieve three independent data values from Services B, C, and D and to then return these data values back to Service Consumer A.

To accomplish this, Service A begins by sending a request message to Service B (2). After receiving a response message with the first data value from Service B, Service A sends a request message to Service C (3). After it receives a response message with the second data value from Service C, Service A then sends a request message to Service D (4). Upon receiving a response message with the third data value from Service D. Service A finally sends its own response message (containing all three collected data values) back to Service Consumer A.

Service Consumer A and Service A reside in Service Inventory A. Service B and Service C reside in Service Inventory B. Service D is a public service that can be openly accessed via the World Wide Web. The service is also available for purchase so that it can be deployed independently within IT enterprises.

Due to the rigorous application of the Service Abstraction principle within Service Inventory B, the only information that is made available about Service B and Service C are the published service contracts. For Service D, the service contract plus a Service Level Agreement (SLA) are made available. The SLA indicates that Service D has a planned outage every night from 11 PM to midnight.



You are an architect with a project team building services for Service Inventory A . You are told that the owners of Service Inventory A and Service Inventory B are not generally cooperative or communicative. Cross-inventory service composition is tolerated, but not directly supported. As a result, no SLAs for Service B and Service C are available and you have no knowledge about how available these services are. Based on the service contracts you can determine that the services in Service Inventory B use different data models and a different transport protocol than the services in Service Inventory A. Furthermore, recent testing results have shown that the performance of Service D is highly unpredictable due to the heavy amount of concurrent access it receives from service consumers from other organizations. You are also told that there is a concern about how long Service Consumer A will need to remain stateful while waiting for a response from Service A . What steps can be taken to solve these problems?

A. The Event-Driven Messaging pattern is applied so that a subscriber-publisher relationship is established between Service Consumer A and Service A . This gives Service A the flexibility to provide its response to Service Consumer A whenever it is able to collect the three data values without having to require that Service Consumer A remain stateful. The Asynchronous Queuing pattern is applied so that a central messaging queue is positioned between Service A and Service B and between Service A and Service C . The Data Model Transformation and Protocol Bridging patterns are applied to enable communication between Service A and Service B and between Service A and Service C . The Redundant Implementation pattern is applied so that a copy of Service D is brought in- house and made part of Service Inventory A.

B. The Asynchronous Queuing pattern is applied so that a central messaging queue is positioned between Service A and Service B and between Service A and Service C and so that a separate messaging queue is positioned between Service A and Service Consumer

C. The Data Model Transformation and Protocol Bridging patterns are applied to enable communication between Service A and Service B and between Service A and Service C . The Redundant Implementation pattern is applied so that a copy of Service D is brought in- house for fail-over purposes. The Legacy Wrapper pattern is further applied to wrap Service D with a standardized service contract that is in compliance with the design standards used in Service Inventory

A. This wrapper utility service first attempts to access the external service, but if that service is

unavailable it will access the redundant internal service instead.

D. The Reliable Messaging pattern is applied so that a system of acknowledgements is established between Service Consumer A and Service A . This gives Service A the flexibility to provide Service Consumer A with acknowledgements that indicate that the processing steps that are occurring between Service A and Service B, Service C, and Service D are progressing. The Asynchronous Queuing pattern is applied so that a central messaging queue is positioned between Service A and Service B and between Service A and Service C and between Service A and Service D . The Data Model Transformation and Protocol Bridging patterns are applied to enable communication between Service A and Service B and between Service A and Service C .

E. None of the above.

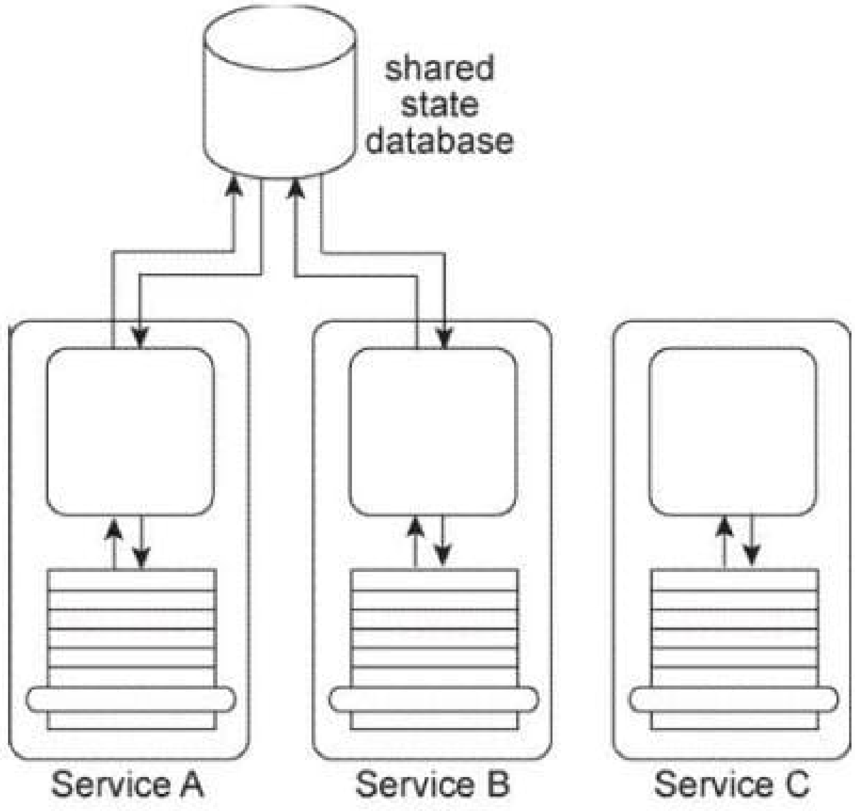
Correct Answer: B

**QUESTION 5**

Services A, B, and C are non-agnostic task services. Service A and Service B use the same shared state database to defer their state data at runtime.

An assessment of these three services reveals that each contains some agnostic logic, but because it is bundled together with the non-agnostic logic, the agnostic logic cannot be made available for reuse.

The assessment also determines that because Service A and Service B and the shared state database are each located in physically separate environments, the remote communication required for Service A and Service B to interact with the shared state database is causing an unreasonable decrease in runtime performance.



You are asked to redesign this architecture in order to increase the opportunity for agnostic service logic to be reused and in order to decrease the runtime processing demands so that performance can be improved. What steps can be taken to achieve these goals?

A. The Enterprise Service Bus pattern can be applied to establish an environment whereby the Process Abstraction and Process Centralization patterns are naturally applied, resulting in a clean separation of non-agnostic task services from newly designed agnostic services that are further shaped into reusable services by the application of the Service Reusability principle.

B. The Process Centralization pattern can be applied, resulting in a redesign effort where agnostic logic is removed from the three task services so that they only encapsulate non- agnostic logic. The agnostic logic is then moved to one or more new agnostic services that are shaped into reusable services by the application of the Service Reusability principle. The Process Abstraction pattern is then applied to the redesigned task services Service A and Service B, so that their logic is physically centralized, turning them into orchestrated task services.

C. The Process Abstraction pattern can be applied, resulting in a redesign effort where agnostic logic is removed from the three task services so that they only encapsulate non- agnostic logic. The agnostic logic is then moved to one or more new agnostic services that are shaped into reusable services by the application of the Service Reusability principle. The Orchestration pattern can be further applied to establish an environment whereby the Process Centralization pattern is naturally applied to Services A and B and the State Repository pattern in naturally applied to further help avoid remote communication by providing a local and centralized state database that can be shared by both services.

D. None of the above.

Correct Answer: C

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