DEI
DEPARTAMENTO
DE ENGENHARIA INFORMÁTICA
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MAP45_2 – 2025 – duration: 45 minutes. This MAP contains 4 pages.

Part I. Multiple choice. Fill the following table with only one option that corresponds to the most correct response.

Response to Question 1 (1 v)	Response to Question 2 (1 v)	Response to Question 3 (1 v)	Response to Question 4 (1 v)	Response to Question 5 (1 v)	Response to Question 6 (1 v)	Response to Question 7 (1 v)	Response to Question 8 (1 v)
D	A	D	B	B	A	C	D

Question 1. Regarding the usage of serverless functions, what is the correct statement?
a) More difficult to have high availability
b) Can only be used for synchronous invocations
c) Long time execution functions are allowed
d) Latency on cold starts

Question 2. Regarding the context of a microservice framework, which sentence is false?
a) Microservices are highly dependent on a Service-oriented architecture (SOA)
b) Microservices are based on the principle that they can be choreographed by a controller service
c) Microservices supports the implementation related to a business entity
d) An application based on microservices defines a choreography using its interface

Question 3. Regarding the concept of serverless functions, what is the correct statement?
a) The main objective is to minimize cold starts
b) There is no server executing the function
c) It is a model of execution that is founded in on-premises environments and now migrated to the cloud
d) The main objective is to reduce the function deployment and instantiation to a minimum

Question 4. Regarding Camunda authentication and authorization, what is the correct statement?
a) Camunda does not need to have an authenticated user to execute tasks
b) Camunda can use an external identity provider
c) Camunda has not an internal authorization service that enforced authorization based on the role defined in BPMN
d) Camunda is restricted on invoking external services providing authentication credentials

Question 5. Consider a business service: *Buying a product* on an C2C application. The interface of the service is specified in JSON and uses the REST protocol. The first time a user purchases a good the services require authentication and register that internally. After that, on a second invocation, the service already has the user identity and follows for the purchase. From this simple description chose the best answer:
a) Loosely coupled and connection oriented
b) Loosely coupled and connectionless
c) Tightly coupled and connection oriented
d) Tightly coupled and connectionless

Question 6. Regarding the development process of a Business Process oriented approach, what is the most correct statement?
a) Business architect model the Business Processes in BPMN, and Software architect create the executable counterparts
b) Automatically builds a service hierarchy
c) It produces applications which are more performant than with traditional development
d) It creates a software application already integrated with legacy systems and external services

Question 7. Which type, or types, of BPMN diagram are supported by the Camunda engine?
a) Process only
b) Choreography only
c) Process and Collaboration
d) Process and Choreography

Question 8. From the point of view of an API that is exposing services, what is the most correct statement?
a) APIs are focused on the governance of services
b) They must be defined in REST only
c) SOA enforces the same objective
d) APIs expose a business asset that has value for its owner

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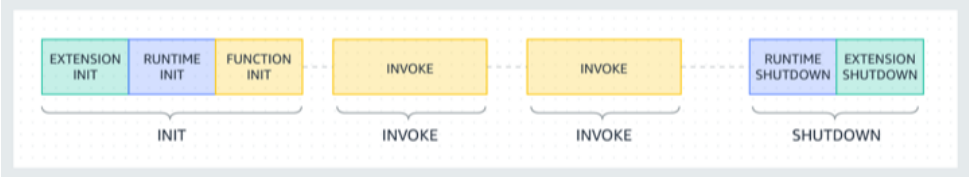
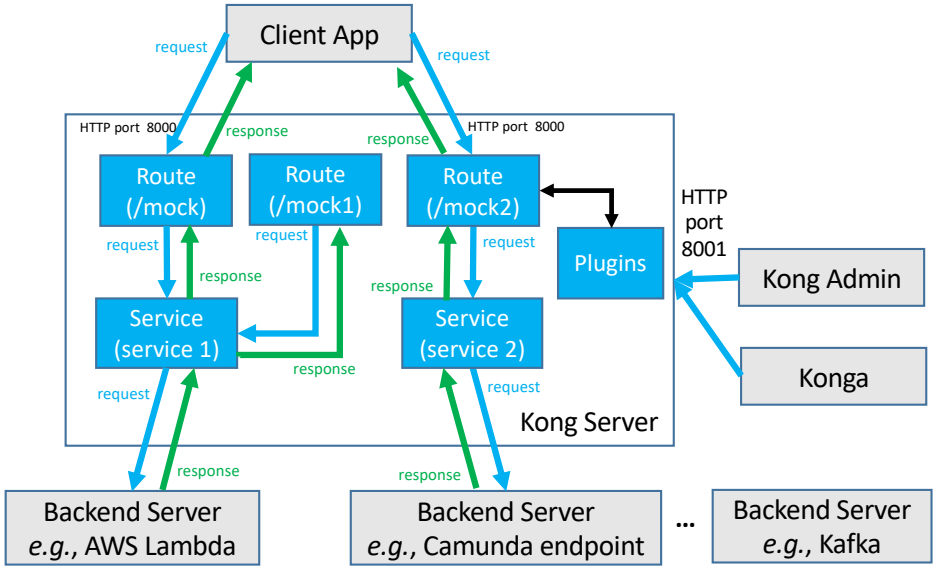
Part II. Explain the concepts. Use the designated space to formulate your concise answer.

Question 9. (2 v) In the context of a serverless API invocation, what is a cold start and a warm execution?

Cold Start?	 The process of initialization of the serverless function, encompassing the extension initialization, the runtime initialization and the function initialization. Everything runs before the invocation of the function.
Warm Execution?	The warm execution corresponds to the invocation itself but requires that a previous cold start has been executed.

Question 10. (2 v) Consider a Kong configuration as presented by the following figure.



Answer the following questions:

Which are the components used to create services?	Kong Admin or Konga
If you have a new backend server what is the creation sequence in kong? Create the route, and then, the service or the opposite?	Service, then route
In this figure, what is the HTTP port used to invoke the Kafka backend server through Kong?	8000
What is(are) the route(s) available to access service 2?	/mock2

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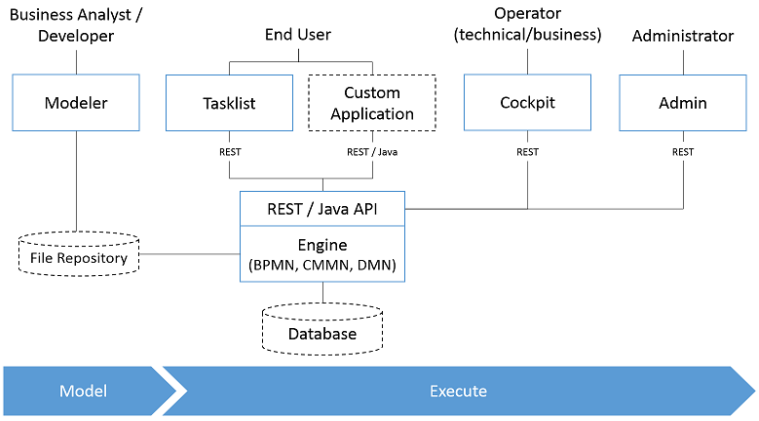
Question 11. (3 v) Considering the following response of an API Rest (level 3 of Richardson maturity model)

```
HTTP/1.1 201 Created Location: http://royalhope.nhs.uk/slots/1234/appointment
[various headers]
<appointment>
        <slot id = "1234" doctor = "mjones" start = "1400" end = "1450"/>
        <patient id = "jsmith"/>
        <link rel = "/linkrels/appointment/cancel" uri = "/slots/1234/appointment"/>
        <link rel = "/linkrels/appointment/addTest" uri = "/slots/1234/appointment/tests"/>
        <link rel = "self" uri = "/slots/1234/appointment"/>
        <link rel = "/linkrels/appointment/changeTime" uri = "/doctors/mjones/slots?date=20100104&status=open"/>
        <link rel = "/linkrels/appointment/updateContactInfo" uri = "/patients/jsmith/contactInfo"/>
        <link rel = "/linkrels/help" uri = "/help/appointment"/>
</appointment>
```

Explain in detail, what is the purpose of the provided **`link`** tags in the appointment?

This capability is provided in the maturity level 3 and the purpose is to contextualize and operate the following API Rest requests that can be used after using the API Rest appointment of the slot 1234. The provided requests corresponds to cancellation, other test, change in the appointment, a change in Time, a change in contact information and an endpoint for helping with the appointment.

Question 12. (1 v) Considering the CAMUNDA architecture depicted in the following side figure, identify the component (or the components) that is (or are) responsible:



To execute a decision table using the DMN notation?	Camunda Engine
To create a user to be involved in a business process instance?	Admin
To store the history of business process instances history?	Database
To assess the state of a business process instance?	Cockpit

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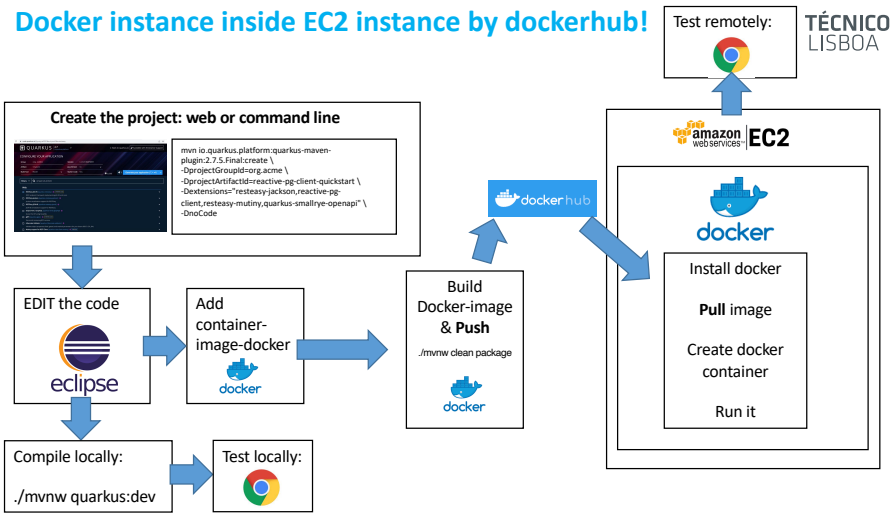
Question 13. (2 v) Consider the pipeline depicted in the following figure that serves the deployment of a new Quarkus microservice in the AWS cloud environment. Now, suppose you have a limited number of EC2 instances, **how** can you use the following four technologies, in the table below, to increase the number of deployed microservices while keeping the limited number of EC2 instances?



AWS accounts	Dividing EC2 instances by different AWS accounts
docker images	Creating less EC2 instances and pulling multiple images to the same EC2 instance
RDS databases	The bootleneck reported is on EC2 and not RDS. One technology does not replace the other. No impact estimated.
Lambda functions	Migrating the source code of microservices to lambda functions, and thus, minimizing EC2 instances

Question 14. (2 v) Consider that multiple instances of a given business process are required to be executed concurrently, which is functionality supported by Camunda. Explain, in detail, how the Camunda mechanism can differentiate each instance of the given business process?

This is possible by: Correlation ID of a process using Camunda business key (business key in the payload of each API request to start an instance of a business process).
Each instantiation provides a correlation ID that is kept while an instance executes.
Then, whenever any external activity interacts with the instance it needs to refer to a specific correlation ID