

NATIONAL UNIVERSITY OF SINGAPORE

CS3219 – SOFTWARE ENGINEERING PRINCIPLES and PATTERNS

(Semester 1 AY2018/2019)

Time Allowed: 2 Hours

INSTRUCTIONS TO CANDIDATES

1. Write your Student Number only. Do not write your name.
2. This assessment paper contains **EIGHT questions** and comprises **FOURTEEN** printed pages.
3. Answer **ALL** questions within the space in this booklet.
4. Use a pen to write descriptions. You can use a pencil to draw and label diagrams.
5. This is a CLOSED book assessment. An A4 size help-sheet is allowed.

STUDENT NO: _____

This portion is for examiner's use only

Question	Marks	Remarks
Question 1	/10	
Question 2	/10	
Question 3	/10	
Question 4	/10	
Question 5	/10	
Question 6	/10	
Question 7	/10	
Question 8	/10	
Total	/80	

Read following scenario before answering **questions 1-2** that follow :

Samantha's car recognizes her as she nears the car. Car knows her calendar and current day and time , for example it knows that it's 12 noon on a Thursday. After connecting with Samantha's smartphone calendar, the car knows that on Thursdays she goes for Community Work. It then checks the real-time traffic information and automatically recommends the best route to the Community Centre. When Samantha is about to head home after her community work, her smart refrigerator notifies her to stop and pick up some grocery because she has run out, so her car routes her to her regular favorite Cold Storage at StarVista. The next day, when she is driving to her workplace, the car notifies her that the battery is about to go bad. It recommends her to a workshop along her route that it specifies is open on Fridays. Prior to making the recommendation, the car has already checked that the workshop is open, has the battery, and that they can replace it for her anytime she walks in. After a quick battery change, she is back on the road and heading for workplace.

Question 1 (10 marks)

Car manufacturer has appointed you to head a software team to elicit requirements and develop the application(s) required for above scenario. You have divided your team in three sub-groups – (i) for embedded software in the car , (ii) for real-time data processing application, and (iii) for developing a mobile app.

Would you consider DevOps platform for development of any one or more of above software or for coordinating the development of above three software? If yes, why ? If not, why not?

Answer 1

Answer 1

A large, empty rectangular box with a thin black border, occupying most of the page. It is intended for the student to write their answer to the question.

Question 2 (10 marks)

The group lead of each of the three software gather and specify the requirements. You have asked each of the group lead to get their requirement specification to be peer reviewed by other two groups. Specify at least 5 criteria (other than requirements being unambiguous, concise and written in proper language) you would set against which requirements would be reviewed.

Answer 2

Question 3 (10 marks)

Imagine for your next project, you find that MVC style would be most suitable for its design. What would you tell your team in terms of (a) benefits of separating UI from core application, and about (b) two patterns which you find very useful in designing above separation.

Clearly but briefly write about the two patterns of your choice for 3(b). You may draw diagrams to illustrate your understanding.

Answer 3

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Question 4 (10 marks)

One of your CS3219 classmates stated that though Mediator and Observer compete in the context of how components in the respective pattern interact, yet they can work together while implementing Pub/Sub pattern. Do you agree that these two patterns, though different in context of their components, could collaborate in implementing Pub/Sub? Give reasons for your answer.

Your answer description should clearly compare and contrast the two patterns providing evidence of your understanding of these two patterns and of Pub/Sub. Use diagrams or examples to illustrate your understanding.

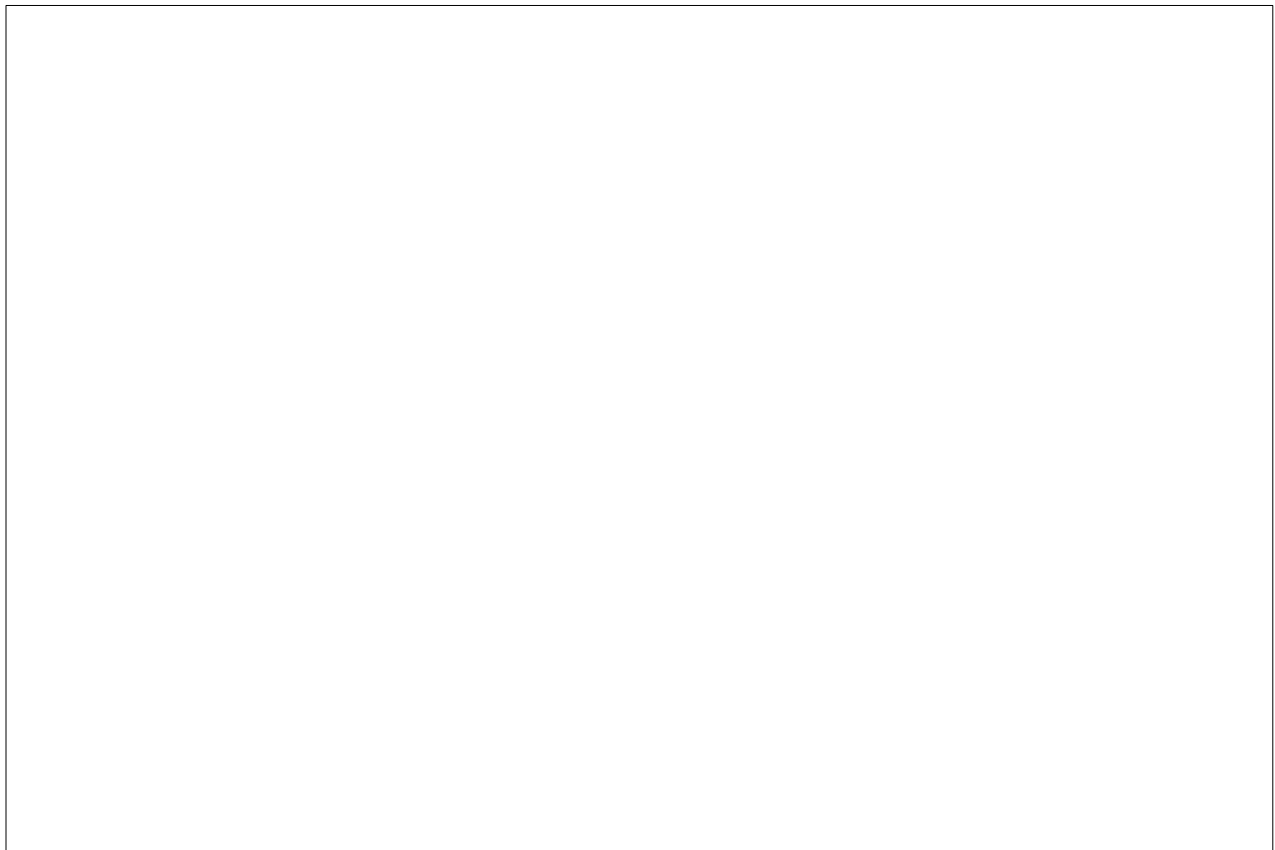
Answer 4

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Question 5 (10 marks)

Imagine you are designing several small components to work together through messaging. Each component has its own internal data format. Your natural concern is to resolve the dependencies when you integrate these components. Your further concern is that of when you introduce a new component. You would like to follow a design principle when you add a new component i.e. it should be integrated to the existing solution independent from the number of components that already participate. How can you achieve it i.e. how do you minimize dependencies when integrating these components that use different data formats?

Your answer description should clearly provide evidence of your understanding. You may use diagram(s) to illustrate your understanding.

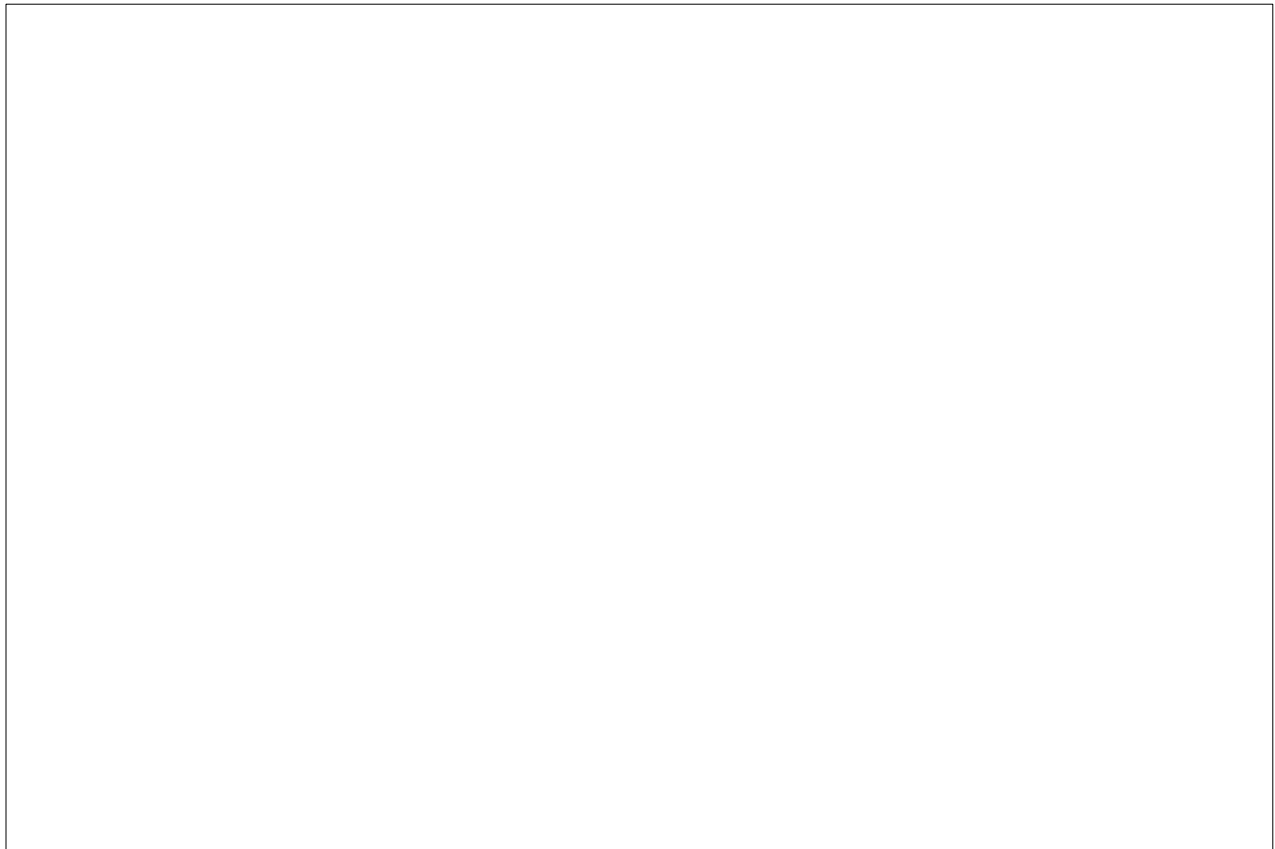
Answer 5

Question 6 (10 marks)

Imagine, in one of your projects, you have designed a RequestReplyService component that receives messages, from multiple requestors, on a fixed Request channel and replies messages to a fixed Reply channel.

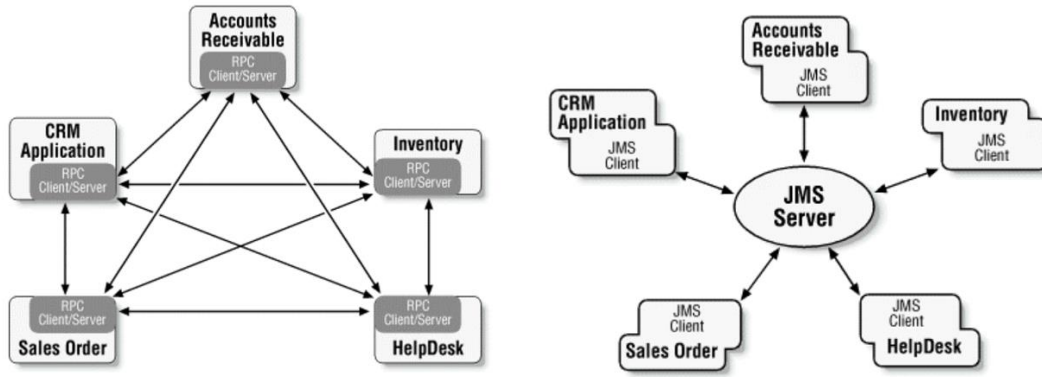
In a new project, you are required to design a RequestReplyService component that is required to reply messages to the channel specified by the return address included in the request message. How would you reuse your previous RequestReplyService component to fulfil this new requirement?

You are allowed to introduce additional components in your new design. You may use diagram(s) to illustrate your understanding.

Answer 6

Question 7 (10 marks)

Compare and contrast the given two models for integrated applications using RPC and JMS. *Your answer description should show your general understanding of component communication patterns(or mechanisms).*



Answer 7

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Question 8 (10 marks)

Software metrics are great help to development teams. Imagine you are appointed team leader for your project team in CS3219. What do you think will be your focus(5 or more goals/aims) in using software metrics e.g. for your team management, development process and product quality. Try to be specific in your answer(e.g. to find if test cases provide sufficient code coverage) and not be very high level(e.g. to control product quality).

Answer 8

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