UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

ACADEMY FOR COMPUTER SCIENCE AND SOFTWARE ENGINEERING

MODULE **IT08X31 - SERVICES COMPUTING**

CAMPUS **APK**

SSA **AUGUST 2020**

DATE: 4 AUGUST 2020 **SESSION 15:00 – 18:00**

ASSESSOR(S) **PROF M COETZEE**

EXTERNAL MODERATOR **POF HS VENTER (UP**

DURATION: 3 HOURS **MARKS: 70**

NUMBER OF PAGES: 6 PAGES

INSTRUCTIONS:

- Answer all the questions.
- You may use Microsoft Word (or equivalent) and Microsoft Visio (or equivalent) to answer your questions.
- Type your name at the top of the document. Clearly number the questions, leaving spaces between questions. Include the diagrams directly in the document at the correct place.
- Once you are finished writing, please save the document as a PDF and upload a single document. Create a document using your student number and surname as file name.
- You only need Internet access to download the exam and then to upload your final submission. You do not need to be connected for the duration of the test.
- Should loadshedding be implemented during the day, we will communicate with you.

- While it is advised that you type the test, you may also write the test by hand, on paper. If you do this, please number the physical pages before scanning/taking the photos. After that you must use CamScanner or take CLEAR photographs and upload.
- During the exam, if you have any queries, you can contact me via our Discord server channel or email me at marijkec@uj.ac.za

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Refer to Appendix A for the next questions.

QUESTION 1:

The Company Registration Service communicates with tree other services to perform its task.

a) Should the Company Registration Service be implemented as a SOAP or RESTful service? Motivate your answer well. (6)
b) To be able to enforce accountability, all traffic to and from the Company Registration Service and the three services needs to be monitored. Explain how this can be implemented by referring to a design pattern in your answer. (6)
c) For RESTful services, define what is meant by API frontend design decisions and API backend design decisions. Using the example from Appendix A, explain how and where this can be applied as the Company Registration Service communicates with tree other services. (8)

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QUESTION 2:

The Company Registration Service communicates with three other services in order to finalise the registration of a company. Throughout all communication the Company Registration Service needs to keep track of the state of process.

a) The developer of the Company Registration Service is considering to use WCF instance management to store session information across all calls to services? Do you agree with this solution? Motivate your answer. (3)
b) Comprehensively describe the best way to maintain application state for the all calls made by the Company Registration Service. (6)
c) Define loose coupling in terms of state management and explain the effect that your solution described in question 2b will have on loose coupling. (4)

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QUESTION 3:

a) In SOAP-based web services applications, security can be removed from platform-based mechanisms. Explain why this is necessary for the authentication of the Company Registration Service to the Tax Authority Service. (2)

b) What type of SOAP web services security is platform independent? (1)

c) How should the authentication of the Company Registration Service to the Tax Authority Service be implemented? Describe in detail. (10)

d) How can the encryption of communications be implemented between the Company Registration Service and Ministry of Justice service? Name this type of security and contrast it to the security applied in question 3b. (4)

e) What is third party authentication? Where would you use it in the company registration application? (3)

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The next questions do not refer to Appendix A.

QUESTION 4:

Given the following code:

```
# Bookmark a page
GET /bookmarks/add_bookmark?href=http%3A%2F%2F
    www.example.org%2F2009%2F10%2F10%2Fnotes.html HTTP/1.1
Host: www.example.org

# Add an item to a shopping cart
GET /add_cart?pid=1234 HTTP/1.1
Host: www.example.org

# Send a message
GET /messages/send?message=I%20am%20reading HTTP/1.1
Host: www.example.org

# Delete a note
GET /notes/delete?id=1234 HTTP/1.1
Host: www.example.org
```

a) Describe the function of the GET HTTP command. (2)

b) Criticize the manner in which the HTTP command in the code above is used in all cases and the possible effect that this will have on the results. (4)

c) On which level of the Richardson's maturity model are these requests? Explain why you say so. (3)

d) Given the following code snippet as example, explain what is meant by the term "Hypermedia as the engine of application state". (7)

Flicker is a site where pictures are stored. Data returned from the "flickr.contacts.getList" operation, which a user can use to get a list of their own contacts, is shown below. The "nsid" attribute contains a value which is a unique identifier for each individual contact, in this case three of them. But once a client has retrieved a list of names in the document, what should the developer implement next?

```
<contacts page="1" pages="1" perpage="1000" total="3">

 <contact
     nsid="http://api.flickr.com/services/rest/?method=flickr.people.getInfo?id=12"
     realname="Eric Costello" friend="1" family="0" ignored="1" />

 <contact
     nsid="http://api.flickr.com/services/rest/?method=flickr.people.getInfo?id=34"
     realname="Ben Cerveny" friend="0" family="0" ignored="0" />

 <contact
     nsid="http://api.flickr.com/services/rest/?method=flickr.people.getInfo?id=66"
     realname="Cal Henderson" friend="1" family="1" ignored="0" />

</contacts>
```

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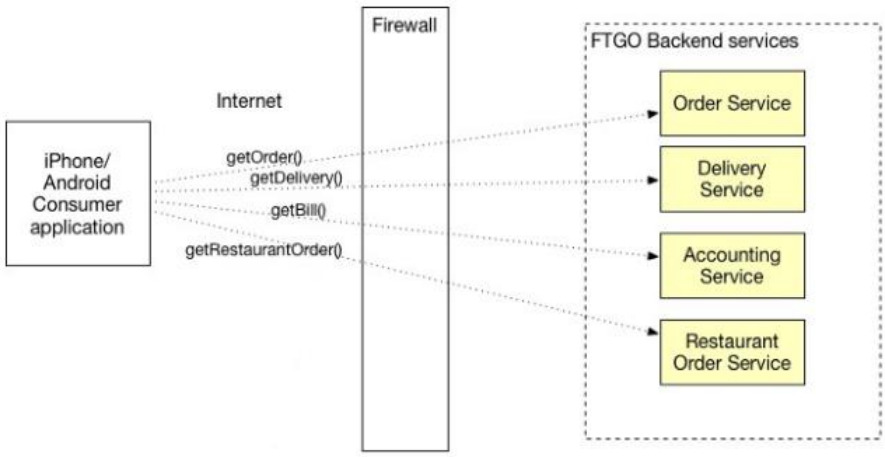
QUESTION 5:

The following diagram illustrates the components of the FTGO restaurant order service. The service is used across the country by very large numbers of clients at the same time and are struggling to meet demand. You are tasked to implement a more efficient application.



a) Propose an architectural design for these services using a diagram. Include all components in the design. Give your answer as a diagram. (6)

b) Describe each aspect of your design (as on the diagram) and how it can make the design more efficient. (10)

c) Describe a design pattern that you can use to make **data access** more efficient. (5)

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Appendix A

This case study implements a public administration process by combining different government systems to allow a person to register a company, as shown in Figure 1. The Customer initiates the registration process and the Clerk approves the application. They both access the public administration system through a web site, called the CustomerGate. CustomerGate accepts different forms and starts the corresponding public administration processes.

- The *Company Registration Service* is responsible for the management of the registration process by composing the web services offered by the three separate parties.
- The *Tax Authority Service* stores taxation information of the taxpayers, and provides a SOAP method to retrieve this information.
- The *Ministry of Justice Service* stores criminal records and provides a RESTful service to retrieve this information.
- The *Registrar of Companies Service* stores current registered companies and provides SOAP methods to retrieve this information and create new registered companies.

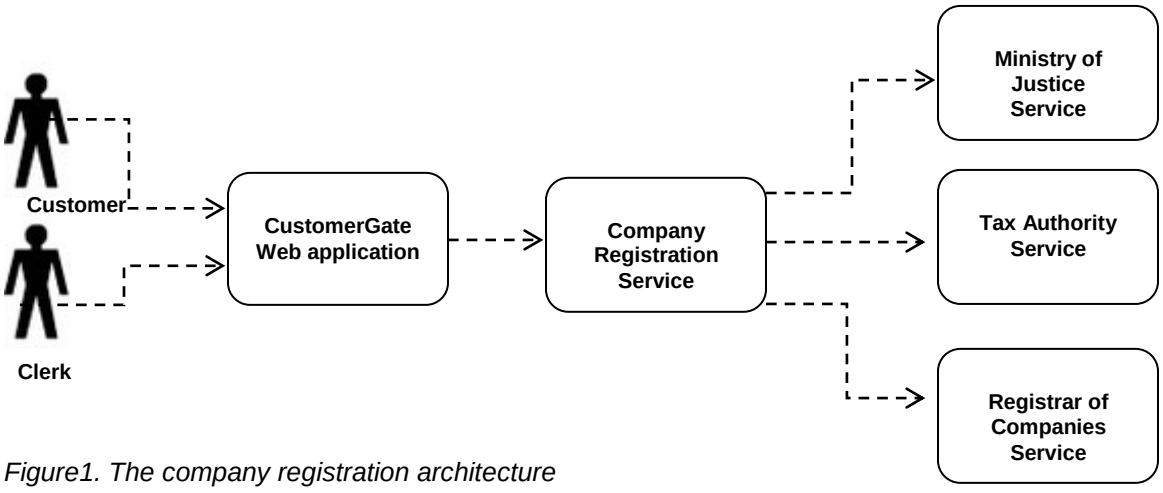

Figure1. The company registration architecture

Both the Customer and the Clerk authenticate themselves when entering the CustomerGate and are then provided with web-interfaces tailored to their roles. Company Registration Service

provides two methods. One initiates the registration process while the other waits for the Clerk's acknowledgement. Thus the CustomerGate accepts forms submitted from the Customer. If the registration process is successful, it is approved or rejected by the Clerk. For this purpose, a web service starts the approval as a sub-process to enable the Clerks with the appropriate assignment to see a new approval request in their work list. The approval is passed to the Company Registration Service.