NOTTINGHAM TRENT UNIVERSITY

School of Science and Technology

COURSEWORK ASSESSMENT ELEMENT

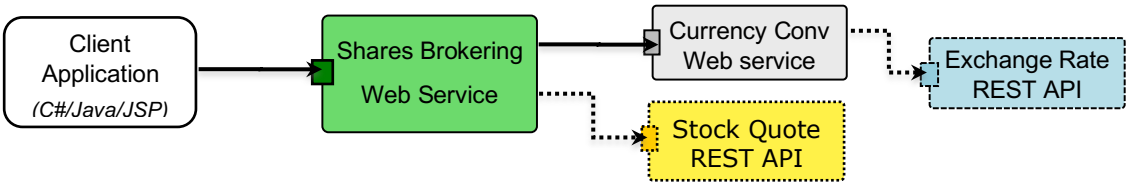
MODULE CODE	COMP30231
MODULE TITLE	Service-Centric Cloud Computing
MODULE LEADER	Taha Osman
TUTOR(S)	Nigel King
COMPONENT	Coursework
TITLE	Software Applications Integration using Web Services
LEARNING OUTCOMES ASSESSED	K1 to K4 & S1-S4
WEIGHTING	60% of the overall module mark
DISTRIBUTION DATE	22nd October 2019
SUBMISSION DATE	* Program demos during week beginning **20/1/2020** * Report hand-in **Wed 29/1/2020**
SUBMISSION METHOD	* Upload zipped development code folder(s) to the module dropbox * Submit the report to the module dropbox
NOTE	The usual University penalties apply for late submission and plagiarism. Please consult your student handbook for further details.

I. Assessment Requirements

- The practical element (sections A & B) of the coursework will be viva examined. Please have a top-level schematic diagram ready for the viva.
- You should submit a coursework report documenting your solution and answers to the research elements (sections C & D). The structure of the report should contain:
  1. Self-evaluation of the achieved implementation (please be brief and precise, no introductions or background information needed) including functional description of your program, and discussion of your major design decisions. Please include top-level design diagrams only. Try to fit in 2-3 pages.
  2. Maximum of 600 words for Section-C and any charts describing the results of your experiments.
  3. Maximum of 1000 words for Section-D. Again, please adhere to the required comparison, with minimum introductory information.
  4. List of references and appendices.

II. Assessment Scenario/Problem

The goal of this coursework is to demonstrate an understanding of using Service Oriented Architecture principles in software applications integration. In the first section, you will utilise web services to compose a Shares Brokering system. The Shares Brokering system consists of a shares acquisition service that you should build yourself and an external currency conversion service that you need to consume and integrate with the shares acquisition service; both services can be complemented by consuming external APIs. The research element of the coursework investigates using advanced (semantic-based) techniques to further extend your application.



A - Core Web Service *(weighting - 35%)*

1. Implement Shares Brokering service

a) Current shares on trade should be held in an XML file based on an XSD schema containing: company name, company symbol on the stock exchange, number of available shares, a complex 'share_price' element containing currency and value, and date of the last-update of the share price.

- *You can opt to use conventional structures to store the data (arrays, Lists, etc.) instead of XML objects. However, this will affect the standard of your work and also progression into Section-B.*

b) The web service should allow users to list shares details and update the number of shares on offer when a purchase is made. You might opt to utilise JAXB to generate helper Java classes, which allow reading and populating the XML documents.

- *You may choose to implement the core Web Service using as a RESTful service, but for full marks you need to evidence that you can build & communicate a Shares data structure similar to what can be provided by an XML Schema as in 1.a) above.*

c) Implement a search functionality allowing customers to list shares' offerings using various criteria such as company details, highest price, etc. More sophisticated search functionality will merit higher marks.

❖ *The choice of client is your decision. Java GUI Apps or JSP are more appreciated but should not be attempted at the expense of providing core functionality.*

B – Web Service Composition *(weighting - 35%)*

2. Integrate currency conversion service

Download the pre-coded project with the currency conversion web service from the module's NOW room site and deploy it. Consume the currency conversion service in the shares brokering service to *auto-convert* the share price rate to the rate preferred by the customer.

3. Extend functionality by utilising external REST APIs

a) Research and utilise external RESTful service to extend the functionality of your shares brokering system. Example of such service can be:
   - A service that returns up-to-date currency exchange rate.
   - A service that returns the latest share value quote for a particular company.

b) Implement your *own* RESTful service to persist the output of the consumed REST API for off-line use. For instance, your RESTful service can update the exchange rate of your currency conversion service or the latest value of the share price.

In order to achieve the highest marks, you must show initiative and inventiveness beyond the stated specification; the contribution of the advanced functionality depends on technical challenge in its implementation. Examples include:

- *utilising additional external REST APIs (e.g. to display relevant tweets or other info about the shares company)*
- *implementing non-java clients to demonstrate SOA's platform independence*
- *creating user accounts for clients allowing them to sell shares back to the brokering service*

C – Analysis of Quality of services 'QoS' *(weighting - 10%)*

Referring to your implementation, describe SOA Web Services' performance and scalability challenges, in particular with the increase in service demand - such as the number of concurrent client connections and the size of the payload (response messages). Highest marks will be awarded to submissions that perform physical QoS testing for the developed application.

Explain how Cloud Computing provision can address these issues, and referring to the deployment model, elaborate on the challenges accompanying migration to the Cloud Infrastructure.

D – Application of Semantic Web and Linked Data technologies *(weighting - 20%)*

In the NOW room, find links to two articles discussing Semantic Web technologies and their application to publish Open Linked Data on the web; perform the following tasks:

1. Carefully read and analyse the two papers, using external resources on the subject matter of 'Semantic Web' and 'Linked Open Data' to assist your understanding of the subject area.
2. Explore how you can utilise Semantic technologies to extend the application you built in sections A&B to facilitate 'smarter' search for companies to trade shares with in the stock exchange. The search should enable finding suitable companies whose name/symbol/industry-section is not explicitly provided in the search keywords.

   Refer to how the workflow of *Domain Analysis*, *Ontology engineering*, *Semantic Tagging*, and *Reasoning*, contributes to your recommender system. Also describe how you can consume Open Linked Datasets to boost its functionality. Endeavour to use other sources of information (papers, articles, etc.).

III. Assessment Criteria

The development element of the coursework will be assessed during your program demonstration. A marking grid will be used to assess the standard of implementing each detail. You are encouraged to implement and document additional functionality to improve your marks, but be aware that the lion' share of the marks is awarded to the specified requirements. Hence you are not advised to embark on developing any additional functionality before implementing the essential requirements. Marks will not be awarded for "attempted" functionality; your code must be fully operational.

The research element is assessed based on the submitted report. You must follow academic report writing guidelines and properly reference any quoted material. Use the Internet (e.g. Google Scholar) and NTU library one-search to research related solutions and technologies and give your own understanding/analysis of the problems and proposed solutions.

Marking

The separate sections of your report will each have a grade awarded to them, as given in NTU's assessment scheme (e.g. Exceptional Distinction, Mid Commendation, High Pass, Marginal Fail, etc.). The grade you achieve in a section will reflect how well that section delivered the required material.

In addition, each section has a percentage weighting (given above) to show you how important it is in the calculation of the overall grade of your work, i.e. the grade for your report as a whole. [Note that the weightings given above add up to 100%].

Assessment Grading Guide

Each assessment element is awarded a grade according to the scale given below. The final grade is determined by how well the criteria have been met overall and not the sum of the individual aspects of the work.

Software Development Sections (A & B) Development of core web services and integration with external services to provide value-added composed applications	
Class/Grade	**General Description**
Exceptional First	Solution developed to a commercial standard with respect to all aspects of software engineering for the back-end services and the UI design for persistent client-end and an admin interface offering a range of toolability. Demonstration of consuming external services beyond the specification and flawless implementation of heterogeneous client to demonstrate SOA's platform independence.
First **Dist | Mid | High**	Excellent implementation of web services composition beyond the specification and evidence of sophisticated consumption of the output of an external RESTful service using a presubscribed workflow. User-friendly GUI to a heterogeneous client offering realistic search and browsing experience. Consideration for the quality of service issues in the application design.
Upper Second **Com | Mid | High**	A sound implementation of the core/integrated services with error management and mitigation. Good search technology in the user interface. Persistent service provider data and evidence of consumption of an external Restful service.
Lower Second **Pass | Mid | High**	Good implementation of the core/integrated web services and workable integration solution. Evidence of consuming an external web service and either an element of advanced data/error processing or a user-friendly GUI
Third **Pass | Mid | High**	Basic web-services implementation with ability to update server-side data upon client requests with either fair search technology or fair integration of another service into the application.
Marginal Fail	Basic non-XML (or JSON) web service implementation or a solution not powered by web services but includes elements of XML or JSON processing. Static server data and no implementation of search technology
Fail **Low | Mid**	Implemented services or application program do not fulfil the basic client specifications

Analysis and Research Sections (C & D) Analysis of SOA's QoS and Contrast of workflow-based and Semantic Web / Linked Data information enrichment and intelligent retrieval approaches	
Class/Grade	**General Description**
Exceptional First	Exceptional knowledge and understanding of role of the Semantic Web, its development cycle, and Linked Data technologies and confidently argued utilisation for the use-case in hand. Evidenced by references to and use of independent reading/research to support the arguments put forward for utilising either method in current solutions. Exceptional analysis of several SOA QoS beyond that prescribed in the research question backed up by critical analysis of tested QoS criteria. Outcome useful as a methodology for selecting the suitable class of applications to implement within a SOA infrastructure. Reported research may achieve or be close to publishable standard.
First **Dist | Mid | High**	Excellent knowledge and understanding of the role of Semantic Web in Knowledge Management and intelligent information retrieval, adequately exemplified by the application of the Semantic Engineering development cycle to the use-case requirements including consumption of appropriate public datasets. Evidenced understanding of the suitability of both approaches to the current needs of the IT industry. The QoS challenges are thoroughly analysed with reference to the implemented solution, and critical analyses of the potential overheads are associated with credible solutions to mitigate the constraints of the underlying computing infrastructure. Evidence of extensive and critical evaluation of relevant research material throughout and excellent reporting. Findings are beyond the expectation of the level.
Upper Second **Com | Mid | High**	*A sound understanding of the Semantic Web/Linked Data development cycle, including domain analysis, semantic tagging and intelligent reasoning. Evidence of applying ontology engineering or consumption of Linked Datasets to the proposed use-case.* *Good analysis of SOA QoS challenges with respect to the implemented solution, but lacks proposal of methods to reduce the incurred overheads. Evidence of appropriate selection and critical evaluation of relevant research.*
Lower Second **Pass | Mid | High**	Broad knowledge and understanding of the Semantic Web/Linked Data technologies approaches in knowledge enrichment/inference and intelligent information retrieval, but attempt at relating the understanding to the proposed use-case is basic and lacking critical analysis of the requirements and argument of the improvements offered. Basic analyses of the QoS, but lacks depth in understanding the role of SOA design patterns and middleware infrastructure in maintaining the quality of the provided services. Limited referencing to support the reached conclusions
Third **Pass | Mid | High**	Knowledge of semantic technologies is sufficient to generically relate to an alternative approach to information retrieval, but fails to make meaningful synthesis. Basic understanding of SOA QoS with no references to the related bottlenecks in the implemented solution. Arguments are unsubstantiated.
Marginal Fail	Insufficient knowledge and understanding of the role of semantic approach to knowledge management and information retrieval – descriptive rather than analytical. Basic understanding of QoS challenges, but not necessarily specific to the SOA infrastructure.
Fail **Low | Mid**	At best, some descriptive information may be present about the QoS in SOA and basic definitions of semantic and Linked Data technologies but further coherence, structure and study are required for it to be workable/adequate.

IV. Feedback Opportunities

Formative (Whilst you're working on the coursework)

You will be given the opportunity to receive informal verbal feedback from your lab tutor regarding your coursework development during the practical sessions.

Summative (After you've submitted the coursework)

You tutor will give you general feedback during the program demonstrations. You will receive specific feedback regarding your coursework submission together with your awarded mark when it is returned to you.