Software Engineering
Sapienza Università di Roma

15 February 2022 – Duration 90 mins

- **Be concise and right to the point.** What you write should be understandable by a colleague of yours who just enrolled the MSc in Engineering in CS.

Question 1 (REST Web services) [30 mins]

- Discuss what a SOAP Web service is, all the concepts and technologies underlying them.
- Consider a (set of) service(s) that is (are) able to provide information on quality of air and pollution (air/sound/water), e.g., stations, their locations, measurements with corresponding timestamps, etc. Provide the exact specification of such (a) service(s) (i.e., write in a schematic way which assumptions you are doing on data provided and how). On the basis of such a specification, design the SOAP interfaces of such (a) service(s) (you can use pseudocode / pseudo-WSDL)
  In doing this exercise, please provide motivations on the choices you may need to do, and develop the solution on the basis of such assumptions.

Question 2 (SCRUM) [30 mins]

- Describe ALL the basic elements of SCRUM.
- Consider a system like the one used for registering tests about COVID and reserving vaccinations (i.e., the system used by the Italian Government for managing vaccines, tests, green passes) and assume that:
  - you have a team of 7 persons - including UI designers, database designer, programmers, etc.;
  - the length of a sprint is 4 weeks.

  Propose and discuss a possible product backlog, its evolution over the different sprints (i.e., show the division of the features over the sprints), by presenting how you would evolve the system over 6 months of project (i.e., you have to present the initial 6 sprints of the project).

Question 3 (Function Points and COCOMOII) [30 mins]

- Describe the method of Function Points for evaluating software development complexity. Provide all the basic notions and exemplify through examples, whenever possible and appropriate.
- Describe the method of cost and effort estimation commonly referred to as COCOMOII, by also discussing the relationships with Function Points
- Solve the following exercise
  The application under investigation allows to manage a list of restaurants, managing the following information:
  - *restaurant code*
  - *chain / single restaurant*
  - *VAT number*
  - *name of the restaurant*
  - *street code*
  - *street number*
  - *city*
  - *province*
  - *typology code*
  - *opening date*

  You also want to manage a list of types of restaurants:
  - *typology code*
  - *typology description*

  A street directory on the Web, external to the application, lists all the streets with a unique code
  - *street code*
  - *street name*
  - *coordinates*

  The features to be implemented are:
  - *insertion of a restaurant with the code of an existing typology*
  - *restaurant modification (whose search is done with the restaurant code)*
  - *restaurant cancellation*
  - *inclusion of restaurant typologies in the typology list*
  - *modification of the typology of restaurants in the typology list (whose search is done with the Typology code)*
  - *cancellation of typology of restaurants*
  - *display all restaurants with restaurant data, coordinates, street name, typology description and total count*
  - *single restaurant display with restaurant data, coordinates, street name, typology description*

  Calculate the dimension in Function Points of the above applications, by providing all the explanation of your calculus and motivations for your choices. Consider the tables in the following page.

Q1

a) SOAP (SIMPLE OBJECT ACCESS PROTOCOL) IS A STANDARD PROTOCOL FOR EXCHANGING INFORMATION BETWEEN APPLICATIONS IN A DISTRIBUTED ENVIRONMENT, USING XML AS THE MESSAGE FORMAT. IT WAS DESIGNED TO ENSURE INTER OPERABILITY BETWEEN DIFFERENT SYSTEMS, MAKING IT SUITABLE FOR INTEGRATION ACROSS HETEROGENEOUS PLATFORMS.

SOAP MESSAGES ARE ENCODED IN XML.
SOAP CAN BE TRANSPORTED OVER VARIOUS PROTOCOLS.
THERE IS PLATFORM INDEPENDENCE.

A SOAP MESSAGE CONSISTS OF 3 MAIN PARTS:

- ENVELOPE: THE MAIN CONTAINER OF THE MESSAGE.
- HEADER: CONTAINS CONTROL INFORMATION (OAUTH, SECURITY, TRANSACTIONS...).
- BODY: CONTAINS THE MAIN DATA OF THE MESSAGE (REQUEST OR RESPONSE). INCLUDES THE PARAMETERS AND RESULTS OF AN OPERATION.

SOAP CAN BE IMPLEMENTED IN TWO WAYS FOR EXCHANGING DATA AND INVOKING SERVICES BETWEEN A CLIENT AND A SERVER:

- REMOTE PROCEDURE CALL (RPC): ALLOWS AN APPLICATION TO INVOKE METHODS ON A REMOTE SERVER AS IF THEY WERE LOCAL. THE SOAP MESSAGE CONTAINS THE NAME OF THE PROCEDURE TO EXECUTE AND ITS PARAMETERS. THE SERVER PROCESSES THE REQUEST AND RETURNS THE RESULTS IN THE BODY OF THE SOAP RESPONSE.

- DOCUMENT ORIENTED: THE CLIENT SENDS AN XML MESSAGE/DOCUMENT TO THE SERVER. THE SERVER PROCESSES THE DOCUMENT AND GENERATES A RESPONSE.

b)

Q2

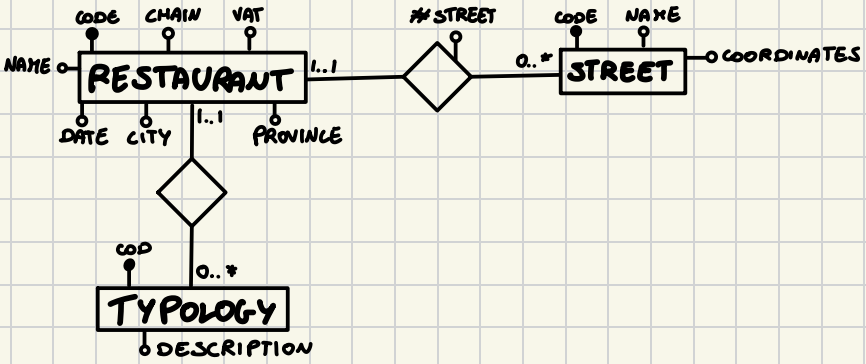
PRODUCT BACKLOG:

	PRIORITY
AUTHENTICATION	HIGH
VACCINATIONS RESERVATION	HIGH
CONSULTATION OUTCOME	MEDIUM
SHOW GREEN PASS	MEDIUM
ADMINISTRATIVE MANAGEMENT	HIGH
UI SYSTEM DESIGN	HIGH
TESTING IMPROVEMENTS	MEDIUM
DATABASE DESIGN AND IMPLEMENTATION	HIGH

6 MONTH OF 4 WEEKS SPRINTS → 6 SPRINTS

SPRINT	MAIN OBJECTIVE	DEVELOPED FEATURES
1	ACCESS AND DATA MANAGEMENT	AUTHENTICATION, DB DESIGN, FIRST UI DESIGN.
2	ADDING ADMINISTRATIVE FEATURES	ADMINISTRATIVE MANAGEMENT, DATA LOADING.
3	POSSIBILITY TO BOOK A VACCINE FOR CITIZEN	VACCINATIONS RESERVATION, UI IMPROVEMENTS, FIRST RELEASE.
4	SUPPORT FEATURES	CONSULTATION OF OUTCOME, VACCINES AND GREEN PASS.
5	TESTING AND OPTIMIZATION	FUNCTIONAL TESTING AND BUG FIXES.
6	DELIVERY	FINAL IMPROVEMENTS AND COMPLETE RELEASE

Q3



COMPLEXITY ENTITY:

2 ILF → RESTAURANT AND TIPOLOGY
1 EIF → STREET

RESTAURANT:	1	RET	10 DET
TIPOLOGY:	1	RET	2 DET
STREET:	1	RET	3 DET

16 FP → ILF
5 FP → EIF

ILF/EIF

Ret/Det	1-19 Det	20-50 Det	51+ Det
1 Ret	Low (7/5)	Low (7/5)	Medium (10/7)
2-5 Ret	Low (7/5)	Medium (10/7)	High (15/10)
6+ Ret	Medium (10/7)	High (15/10)	High (15/10)

ACTIVITIES:

EI)

FTR / DET	1-4 DET	5-15 DET	16+ DET
0 – 1 FTR	Low (3)	Low (3)	Medium (4)
2 FTR	Low (3)	Medium (4)	High (6)
3+ FTR	Medium (4)	High (6)	High (6)

1) INS RESTAURANT 3 FTR 10 DET → 6 FP
2) UPD RESTAURANT 3 FTR 9 DET → 6 FP
3) DEL RESTAURANT 1 FTR 1 DET → 3 FP
4) INS TYPOLOGY 1 FTR 2 DET → 3 FP
5) UPD TYPOLOGY 1 FTR 1 DET → 3 FP
6) DEL TYPOLOGY 1 FTR 1 DET → 3 FP

EO)

EO/EQ

FTR / DET	1-5 DET	6/19 DET	20+ DET
0 – 1 FTR	Low (4/3)	Low (4/3)	Medium (5/4)
2-3 FTR	Low (4/3)	Medium (5/4)	High (7/6)
4+ FTR	Medium (5/4)	High (7/6)	High (7/6)

7) DISPLAY 3FTR 13 DET → 5 FP

EQ)

8) DISPLAY 3FTR 13 DET → 4 FP

EI 24 FP EO 5 FP EQ 4FP ILF 14 FP EIF 5 FP

TOTAL 52 FP