Software Engineering
Sapienza Università di Roma

21 January 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 (Software quality) [30 mins]

- Describe the general concept of software quality and possible definitions/standards, also providing examples.
- Enumerate the quality of the ISO 25010, for each of them provide the definition and possible ways to measure.

Question 2 (REST Web services) [45 mins]

- Discuss what a REST Web service is, all the concepts and technologies underlying them.
- Describe how concretely a programmer can develop a REST Web service in Java, by providing also simple pseudo-code.
- Consider a (set of) service(s) that is/are able to provide information on COVID-19 vaccinations, infected persons, when they have received doses, tests, etc. Provide the exact specification of such services (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 REST interfaces of such service(s).
  In doing this exercise. please provide motivations on the choices you may take and develop the solution on the basis of such assumptions.

Question 3 (DevOps) [15 mins]

- Describe what is DevOps and its basic principles.
- Describe the type of approaches/technologies, providing classifications and examples, whenever possible.

a)

THE STANDARD ISO 9126 DEFINED SW QUALITY AS THE SET OF CHARACTERISTICS THAT INFLUENCE THE ABILITY OF THE PRODUCT TO SATISFY IMPLICIT AND EXPLICIT REQUIREMENTS.
THE QUALITY IS NOT JUST ABOUT THE CODE, BUT ALSO INCLUDES DOCUMENTATION AND ASSOCIATED DATA.

AN EXAMPLE IS AN E COMMERCE SYSTEM THAT MUST GUARANTEE THE CORRECTNESS OF TRANSACTIONS (FUNCTIONALITY), THE ABILITY TO MANAGE MANY USERS SIMULTANEOUSLY (EFFICIENCY) AND AN INTUITIVE INTERFACE (USABILITY).

b)

THE STANDARD ISO 25010 IS THE REVISION OF ISO 9126.
DEFINES TWO QUALITY MODEL:

- QUALITY MODEL IN USE: IT FOCUSES ON THE USER EXPERIENCE WHEN USING THE PRODUCT IN A SPECIFIC CONTEXT.

  IT BASED ON:

  - EFFECTIVENESS: THE ABILITY TO COMPLETE THE USER'S OBJECTIVES.
    $$\frac{\# \text{ REACHED OBJ}}{\# \text{ TARGET OBJ}}$$

  - EFFICIENCY: THE EFFORT REQUIRED TO ACHIEVE GOALS.
    $$\frac{\# \text{ REACHED OBJ}}{\text{MAN POWER}}$$

  - SATISFACTION: USER'S SATISFACTION USING THE PRODUCT.
    QUESTIONNAIRES

  - FREEDOM FROM RISKS. THE ABILITY OF THE PRODUCT TO AVOID EVERY TYPE OF RISKS.
    SAFETY INCIDENT RATE

  - CONTEXT COVERAGE: ADAPTABILITY OF THE PRODUCT IN DIFFERENT CASES OF USE.
    $$\frac{\# \text{ SUCCESSFULLY TESTED SPECIFIED CONTEXTS}}{\# \text{ SPECIFIED CONTEXTS}}$$

- PRODUCT QUALITY MODEL: IT DEALS WITH STATIC AND DYNAMIC PROPERTIES OF THE PRODUCT.

  INCLUDES 8 MAIN FEATURES:

  - FUNCTIONAL SUITABILITY: ABILITY OF THE SW TO SATISFY FUNCTIONAL REQUIREMENTS.
  - PERFORMANCE EFFICIENCY: THE EFFORT REQUIRED TO ACHIEVE GOALS.
  - COMPATIBILITY: THE ABILITY TO WORK PROPERLY WITH OTHER SYSTEMS.
  - USABILITY: SW USER-FRIENDLY.
  - RELIABILITY: THE ABILITY TO WORK PROPERLY AND WITHOUT ERRORS.
  - SECURITY: THE ABILITY TO PROTECT DATA AND PRIVACY.
  - MAINTAINABILITY: EASE WITH WHICH THE SW CAN BE IMPROVED AND MANAGED.
  - PORTABILITY: THE ABILITY TO BE EASILY TRANSFERRED TO OTHER PLATFORMS.

Q2

REST

/PERSONA / {CF}
- GET: RETURN THE SPECIFIC ATTRIBUTES OF THIS PERSON
- DELETE: DELETE A PERSON WITH THIS CF

/PERSONA / {CF} / VACCINE
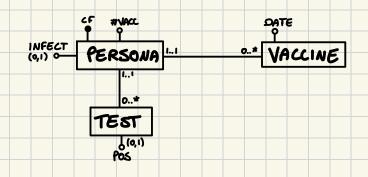- GET: RET ALL CF'S VACCINES WITH ATTRIBUTES.
- POST: ADD A NEW VACCINE

/PERSONA / {CF} / VACCINE / {VACC ID}
- GET: RET VACCID'S ATTRIBUTES
- PUT: UPDATE VACCID'S ATTRIBUTES

/PERSONA / {CF} / TESTS
- GET: RET CF'S TESTS
- POST: ADD A NEW TEST

/PERSONA / {CF} / TESTS / {TEST ID}
- GET: RET TESTID'S OUTCOME
- PUT: MODIFY THE OUTCOME

/PERSONA ?INFECTED=1 — GET: RET ALL INFECTED PEOPLE

Q3

a)

DEVOPS IS A METHODOLOGY THAT COMBINES SW DEVELOPMENT AND IT OPERATIONS (RELEASE, CONFIGURE AND MONITOR).

IT INCREASE THE SPEED ACROSS THE SW LIFECYCLE AND IMPROVES COLLABORATION AND AUTOMATION. IT ALSO REDUCE DOWNTIME AND HUMAN ERRORS BY AUTOMATING DELIVERY AND INFRASTRUCTURE CHANGES

DEVOPS BRINGS TOGETHER DEVELOPMENT, OPERATIONS AND BUSINESS TEAMS TO SHARE RESPONSABILITY.

b)

DEVOPS TRANSFORMS THE TRADITIONAL SW DELIVERY CYCLE INTO A CONTINUOUS CYCLE, INTEGRATING:

- CONTINUOUS INTEGRATION (CI): SHARED REPOSITORY (GITHUB).
- CONTINUOUS DELIVERY (CD): EACH BUILD IS KEPT READY FOR DEPLOYMENT.
- CONTINUOUS DEPLOYMENT: EVERY CHANGES THAT PASSES THE AUTOMATED TESTS IS DEPLOYED DIRECTLY TO PRODUCTION.