# DV1566 - Int. to Cloud Computing

## Booklet for the final Project

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| *NOTES:*<br>1) The *"should"* form used in what follows indicates "obligation, duty, or correctness";<br>*2) Ri* stands for Requirement *i*. |

The purpose of the project is to put in practice the knowledge acquired during the course and to deep dive one or more specific topics.

According to the timeline that follows, you should first submit a project idea proposal and then a project report.

| **Timeline** | |
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| **Deadline** | **Activity** |
| 12/17 23:59 | Submission of the project idea proposals. The project idea proposal is built according to what specified in<br>● Annex 1: project idea<br>● Annex 2: inputs/suggestions for the project idea<br>● Annex 3: project idea proposal |
| 12/20-21 | Feedback on the project idea proposal are posted on Canvas. The project idea proposal could be approved as it is, or changes/improvements will be requested |
| 2022/1/15 (1st submission deadline)<br>2022/3/15 (1st resubmission opportunity)<br>2022/07/15 (2nd and final resubmission opportunity) | Submission of the project report. The project report should be structured as described in Annex 4<br><br>You have three opportunities to submit your project or resubmit a project evaluated UX. |

The project is assessed on the base of the criteria listed in Annex 5.

# - Annex 1: Project idea

The project idea should satisfy the following requirements (R1 -- R4):

**R1)** The project should be related to the course topics, it could be the deployment of a scalable application on top of a cloud infrastructure; the deployment of a distributed application using docker containers (in the cloud or on your own computer); the investigation and verification of security mechanisms for cloud technologies (e.g. docker container); and the like. Inputs/suggestions for the project idea are in Annex 2.

**R2)** The solution you propose should have at least one of the following features:

- scalability with respect to computation;
- scalability with respect to data;
- security of data at rest;
- security of the computation;
- high availability of the data;
- high availability of the computation;
- one of the self-* properties (self-optimization, self-configuration, self-healing, self-protection).

**R3)** The project should foresee the use of at least one of the cloud technologies presented in the course or you should use at least one of any other cloud technology (e.g. AWS, google cloud, Microsoft Azure, docker containers, microservice architecture, and the like).

**R4)** The project should foresee: a design part; an implementation part; and a test/validation part.

# - Annex 2: Input/suggestions for the project idea

- Implementation and deployment of a scalable cloud application by composing AWS cloud services (computing, storage, DB, autoscaling, load balancer, EMR, and the like)
- Implementation and deployment of a scalable application by using docker containers orchestrated with kubernetes
  - Kubernetes on AWS https://aws.amazon.com/kubernetes/
  - Minikube (Kubernes deployed into a single node (VM), it does not support multiple nodes features) https://kubernetes.io/docs/setup/learning-environment/minikube/
- Docker security, e.g.
  - A Defense Method against Docker Escape Attack https://dl.acm.org/citation.cfm?id=3058085

- Comparison of standard docker deployment and security enhanced docker deployment with respect to one or more vulnerabilities https://docs.docker.com/engine/security/security/
- Applying host hardening techniques (probably this paper is quite old and suggestions could not be valid anymore, moreover some of the hardening techniques are in the docker security documentation) https://ieeexplore.ieee.org/document/7911971

- Serverless computing
  - To implement a serverless computing application with AWS lambda that perform simple tasks like image/sound recognition, process streams of data, and the like.

# - Annex 3: Project idea proposal

The project idea proposal is a document (max 2 pages) organized in three sections, as described in what follow:

1) Problem description
   - This section contains the description of the problem you would like to address or the system you would like to implement.
   - The problem should present some challenge related to the requirements R2 (Annex 1)
2) Proposed solution
   - This section describes
     - What, among the requirements R2 (Annex 1) your solution will satisfy
     - how you plan to address the challenges in the problem described in the "Problem description" section
     - How you plan to address the requirement R3, that is what are the cloud technologies you would like to use. ***In selecting the technologies, verify you are capable to access those technologies, for example are accessible in the AWS free tier.***
3) Test plan
   - How you plan to test/validate your solution, i.e. how you plan to test/validate requirements R2 and R3. (the test plan is part of requirement R4).

NOTE: When you propose something, be sure you can implement it with the free tier services.

# - Annex 4: Project Report

To show what you have done you can provide one of the following:

- A written report that describes how you have implemented and validated your project idea proposal. It could include: explanatory text, code; configuration files; screenshots

(when you add screenshot, please be sure that the text in the screenshot can be easily read); and screencast containing audio narration.

- A recorded presentation (max 20min) where you explain how you have implemented and validated your "project idea proposal", i.e. you should show what you have done, that your implementation/deployment properly works and satisfy the requirements R1 -- R4.
- A mix of written report or recorded presentation.

The report or presentation should contain

- Description of the problem addressed
- Description of the design of the solution
- Description of the Implementation of the solution
- Description of the deployment of your solution (if is the case)
- Test/validation design (i.e. description of how you test/validate your solution and why)
- Experimental results (i.e. the description of the results obtained in your test/validation phase).

# - Annex 5: Assessment

*Points: 2.5*

*Assessment (A-F):* You will be evaluated on the basis of the submitted report.

Grading scale is defined as follow

A = Excellent; You provide a correct, brilliant/efficient solution to the problem, showing a deep level of understanding of the technologies; and you clearly motivate all Your design and implementation choices; and Your report is written using and appropriate technical language; and Your results are supported by experiments, plots, figures, tables, screen shots.

B = Very Good; You provide a correct solution to the problem, showing a good level of understanding of the technologies; and You clearly motivate all your design and implementation choices; and Your report is written using and appropriate technical language; and Your results are supported by experiments, plots, figures, tables, screen shots;

C = Good; You provide a correct solution to the problem, showing a good level of understanding of the technologies; and You motivate all Your design and implementation choices; and Your report is written using an technical language not always appropriate; and Your results are partially supported by experiments, plots, figures, tables, screen shots;

D = Satisfactory; You provide a solution to the problem which correctness is questionable, shoving a level of understanding of the technologies that is sufficient to do the work; design and implementation choices are not always motivated; Your report is written using an technical


language that need improvement. Your results are partially supported by experiments, plots, figures, tables, screen shots;

E = Sufficient; You provide a solution to the problem which work but cloud not be correct, shoving a low level of understanding of the technologies; design and implementation choices are not always motivated; our report is written using an technical language that need improvement. Your results are partially supported by experiments, plots, figures, tables, screen shots;

F = Fail; You provide an incorrect solution to the problem, shoving that Your level of understanding of the technologies need to be improved; and/or design and implementation choices are not motivated; and/or Your report is written using poor technical language. and/or Your results are not supported by experiments, plots, figures, tables, screen shots;