INTERNATIONALE HOCHSCHULE

# PORTFOLIO

## Tasks for the course: Cloud Programming (DLBSEPCP01_E)

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# 1. TOPICS AND TASKS

Within the framework of this course, one of the following topics must be selected.

**Note on copyright and plagiarism:**
Please take note that IU Internationale Hochschule GmbH holds the copyright to the examination tasks. We expressly object to the publication of tasks on third-party platforms. In the event of a violation, IU Internationale Hochschule is entitled to injunctive relief. We would like to point out that every submitted written task is checked using plagiarism software. We therefore suggest not to share solutions under any circumstances, as this may give rise to the suspicion of plagiarism.

## 1.1. Task 1: Host a simple webpage on AWS

Your boss asked you to help set-up the cloud architecture for the company's website. To achieve this, you have to come up with the cloud architecture first and later deploy it. For now, your boss is not concerned with deploying the real website and you can work freely with your own example web templates. (Please, remember this course won't assess your web programming abilities. You can use a simple 'hello-world' html file for the web page.)

It's up to you to decide which AWS services you can/should use. However, bevor choosing your architecture, please consider the following:

- The website must be *highly available*.
- The visitors come from all-around the globe and should not experience *latency*.
- The backend should *autoscale* if more visitors come to the webpage.

In order to make your AWS infrastructure understandable and replicable, please consider using an Infrastructure as Code (IaC) Tool such as **Terraform or AWS CloudFormation**.

**Task:** Deployment of a simple webpage on AWS

### 1.1.1. Conception phase

This phase represents the most important part of the design process. Anything that is overlooked or forgotten in this phase has a negative effect on the implementation later and will lead, in the worst case, to useless results.

**The first step is to create a written concept** to describe your cloud architecture. Describe the services you plan to use and explain why. At least **1 diagram** (e.g., in UML or PNG) will be created and inserted to the written concept to show the interaction of the components and the process. In order to create the diagram, you can use this online tool - https://app.diagrams.net. **This step is perhaps the most important of the entire design process**. It is crucial to take/plan enough time for this phase **BEFORE** the next steps can be taken. **It is therefore essential to follow the sequence of the respective steps carefully.**

Think about which cloud services and which tools you can use to implement each component and the communication between the components. Then name the planned architecture and explain your decisions.

**A conceptual text (1 DIN A4 page in PDF)** has to be prepared for the submission, explaining your thoughts and considerations, together with the **diagram** showing the interaction of the components and the process. The text field inside the PebblePad template can be left empty.

Throughout the process, online tutorials are offered, and they provide an opportunity to talk, share ideas and/or drafts, and obtain feedback. In the online tutorials, exemplary work can be discussed with the tutor. Here, everyone has the opportunity to get involved and learn from each other's feedback. **It is recommended to make use of these channels to avoid errors and to make improvements.** You should only submit work after making use of the above-mentioned tutorial and informative media. This will be followed by feedback from the tutor and the work on the second phase can begin.

### 1.1.2. Development phase/reflection phase

In this phase you have to implement the cloud architecture for your website based on the concept from the conception phase with the help of the selected services and tools. This is where the actual work of implementation begins:

- The services and tools are set up.
- The components outlined in the diagram are implemented.
- The cloud infrastructure is written in Terraform and replicable

An explanation of the procedure is submitted as **a composite presentation PDF with about 10 slides.** The file should contain visual elements that facilitate comprehension, it needs to be structured and also include hyperlinks to the frameworks used. Furthermore, the procedure should be described briefly. The text field inside the PebblePad template can be left empty.

Throughout the process, online tutorials and other channels provide the opportunity to profoundly discuss ideas and/or drafts and to get sufficient feedback, tips, and hints. **It is recommended to use these channels to avoid errors and to improve your work.** Once this is done, you can hand in your second phase for evaluation. Following feedback from the tutor, your work on the final draft will continue in the third phase.

### 1.1.3. Finalisation phase

In the finalisation phase, the goal is to **optimise the cloud infrastructure** after having received feedback from the tutor, and to complete the task. Certain elements may have to be improved or changed again.

Additionally, an **abstract** is desired which describes the solution of the task in terms of content and concept and which presents a short break-down (making of) about the technical approach in a clear and informative way. The **finished product (a 10-page description of your idea in PDF and the IaC code)** is submitted, together with the abstract, the results from phase 1 and 2. In addition, a zip folder (containing **all used files**) created specifically for this course should be included in the PebblePad template. Please do not forget to add your IaC scripts so that your project can properly be tested.

In the “Finalisation phase”, the online tutorials and other channels also provide the opportunity to obtain sufficient feedback, tips, and hints before the finished product is finally handed in. **It is recommended to use these channels to avoid errors and to make improvements.** The finished product is submitted with the results from Phase 1 and Phase 2 and together with the materials mentioned above. Following the submission of the third portfolio page, the tutor submits the final feedback which includes evaluation and scoring within six weeks.

### 1.2. Task 2: Come up with your own creative cloud solution

The cloud provides unlimited possibilities. If you have your own idea or a personal project which you want to implement in the cloud, now is the time to do it. It could be anything - you can deploy a machine learning model, implement an ETL process, develop a shiny dashboard, etc. Reach out to your tutor to discuss in detail if your idea is suitable. Please consider that your project will be evaluated only on the cloud implementation and not on the implementation of your actual use case.

When architecting your solution, please consider the following aspects:

- Your solution should be *highly available*.
- Your solution should be *cost efficient*.
- Your solution should be *secure*.

You should follow these main cloud best practices. If your architecture doesn't fulfil these requirements, you have to discuss why this is the case.

In order to make your AWS infrastructure understandable and replicable, please consider using an Infrastructure as Code (IaC) Tool such as **Terraform or AWS CloudFormation**.

**Task:** Design and deploy a cloud architecture for a project of your own

#### 1.2.1. Conception phase

This phase represents the most important part of the design process. Anything that is overlooked or forgotten in this phase has a negative effect on the implementation later and will lead, in the worst case, to useless results.

**The first step is to create a written concept** to describe your idea and your proposed cloud architecture. Describe the services you plan to use and explain why. At least **1 diagram** (e.g., in UML or PNG) will be created and inserted to the written concept to show the interaction of the components and the process. In order to create the diagram, you can use this online tool - https://app.diagrams.net. **This step is perhaps the most important of the entire design process**. It is crucial to take/plan enough time for this phase **BEFORE** the next steps can be taken. **It is therefore essential to follow the sequence of the respective steps carefully.**

Think about which cloud services and which tools you can use to implement each component and the communication between the components. Then name the planned architecture and explain your decisions.

**A conceptual text (1 DIN A4 page in PDF)** has to be prepared for the submission, explaining your thoughts and considerations, together with the **diagram** showing the interaction of the components and the process. The text field inside the PebblePad template can be left empty.

Throughout the process, online tutorials are offered, and they provide an opportunity to talk, share ideas and/or drafts, and obtain feedback. In the online tutorials, exemplary work can be discussed with the tutor. Here, everyone has the opportunity to get involved and learn from each other's feedback. **It is recommended to make use of these channels to avoid errors and to make improvements.** You should only submit work after making use of the above-mentioned tutorial and informative media. This will be followed by feedback from the tutor and the work on the second phase can begin.

### 1.2.2. Development phase/reflection phase

In this phase you have to implement the cloud architecture for your website based on the concept from the conception phase with the help of the selected services and tools. This is where the actual work of implementation begins:

- The services and tools are set up.
- The components outlined in the diagram are implemented.
- The cloud infrastructure is written in one of the IaC tools and replicable

An explanation of the procedure is submitted as **a composite presentation PDF with about 10 slides.** The file should contain visual elements that facilitate comprehension, it needs to be structured and also include hyperlinks to the frameworks used. Furthermore, the procedure should be described briefly. The text field inside the PebblePad template can be left empty.

Throughout the process, online tutorials and other channels provide the opportunity to profoundly discuss ideas and/or drafts and to get sufficient feedback, tips, and hints. **It is recommended to use these channels to avoid errors and to improve your work.** Once this is done, you can hand in your second phase for evaluation. Following feedback from the tutor, your work on the final draft will continue in the third phase.

### 1.2.3. Finalisation phase

In the finalisation phase, the goal is to **optimise the cloud infrastructure** after having received feedback from the tutor, and to complete the task. Certain elements may have to be improved or changed again.

Additionally, an **abstract** is desired which describes the solution of the task in terms of content and concept and which presents a short break-down (making of) about the technical approach in a clear and informative way. The **finished product (a 10-page description of your idea in PDF and the IaC code)** is submitted, together with the abstract, the results from phase 1 and 2. In addition, a zip folder (containing **all used files**) created specifically for this course should be included in the PebblePad template. Please do not forget to add your IaC scripts so that your project can properly be tested.

In the “Finalisation phase”, the online tutorials and other channels also provide the opportunity to obtain sufficient feedback, tips, and hints before the finished product is finally handed in. **It is recommended to use these channels to avoid errors and to make improvements.** The finished product is submitted with the results from Phase 1 and Phase 2 and together with the materials mentioned above. Following the submission of the third portfolio page, the tutor submits the final feedback which includes evaluation and scoring within six weeks.

## 2. TUTORIAL SUPPORT

In principle, several channels are open to attain feedback for the portfolios. The respective use is the sole responsibility of the user. The independent development of a product and the work on the respective portfolio parts is part of the examination performance and is included in the overall assessment.

On the one hand, the tutorial support provides feedback loops on the portfolio parts to be submitted in the context of the conception phase as well as the development and reflection phase. The feedback takes place within the framework of a submission of the respective part of the portfolio. In addition, regular online tutorials are offered. These provide you with an opportunity to ask any questions regarding the processing of the portfolio and to discuss other issues with the tutor. The tutor is also available for technical consultations as well as for formal and general questions regarding the procedure for portfolio management.

Technical questions regarding the use of “PebblePad” should be directed to the exam office via mail.

## 3. EVALUATION

The following criteria are used to evaluate the portfolio with the percentage indicated in each case:

| Evaluation criteria | Explanation | Weighting |
|---|---|---|
| Problem Solving Techniques | *Capturing the problem<br>*Clear problem definition/objective<br>*Understandable concept | 10% |
| Methodology/Ideas/Procedure | *Appropriate transfer of theories/models<br>*Clear information about the chosen Methodology/Idea/Procedure | 20% |
| Quality of implementation | *Quality of implementation and documentation | 40% |
| Creativity/Correctness | *Creativity of the solution approach<br>*Solution implemented fulfils intended objective | 20% |
| Formal requirements | * Compliance with formal requirements | 10% |

The design and construction of the portfolio should take into account the above evaluation criteria, including the following explanations:

**Problem Solving Techniques:**

- Does the student have a good understanding of cloud architecture?
- Is the best possible architecture chosen?

**Methodology/Idea/Procedure:** Does the student consider the general cloud framework (high availability, autoscaling, security, etc.)?

- Is the solution and its components well described?
- Did the student consider other possible combinations of cloud services?
- Is it clear what the student aims to achieve?

**Quality of implementation:** Does the solution work as intended?

- Are best practices considered and followed?
- Is the IaC script readable and replicable?

**Creativity/Correctness:** Is the solution creative?

- Did the student manage to achieve his:her goal?

**Formal requirements:** Did the student comply with formal requirements when writing the homework?

- Is the solution developed in an IaC framework (Terraform or AWS CloudFormation)?

# 4. FORMAL GUIDELINES AND SPECIFICATIONS FOR SUBMISSION

## 4.1. Components of the examination performance

The following is an overview of the examination performance portfolio with its individual phases, individual performances to be submitted, and feedback stages at one glance. A template in "PebblePad" is provided for the development of the portfolio parts within the scope of the examination performance. The presentation is part of this examination.

| Stage | Intermediate result | Performance to be submitted |
|---|---|---|
| Conception phase | Portfolio part 1 | • Concept presentation in written form (approx. 1 page DIN A4)<br>• Diagram in PNG/JPEG<br>➔ **Submit together in one PDF** |
| | | Feedback |
| Development phase/ reflection phase | Portfolio part 2 | • Explanation of implementation in written form (approx 2-page DIN A4)<br>• First draft of the programming code (*Terraform or AWS CloudFormation*) via hyperlink<br>➔ **Submit as a composite presentation PDF with about 10 slides** |
| | | Feedback |
| Finalisation phase | Portfolio part 3 | • 2-page abstract (making of)<br>• final product (scripts with installation manual and documentation included) as a PDF<br>• Upload a zip folder (incl. all files)<br>• Result from phase 1<br>• Result from phase 2 |
| | | Feedback + Grade |

## 4.2. Format for Digital File Submission

| **Conception phase** | |
|---|---|
| Recommended tools/software for processing | (Microsoft Word, LaTeX, Microsoft PowerPoint) |
| Permitted file formats | e.g., PDF, PNG, JPG, etc. |
| File size | as small as possible |
| Further formalities and parameters | Files must always be named according to the following pattern:<br><br>**For the performance-relevant submissions on "PebblePad":**<br>Name-FirstName_MatrNo_Course_P(hase)-1_S(ubmission)<br>Example: Mustermann-Max_12345678_Cloud Programming_P1_S |

| **Development/reflection phase** | |
|---|---|
| Recommended tools/software for processing | (Microsoft Word, LaTeX, PyCharm, VS Code) |
| Permitted file formats | e.g., PDF, TF, YAML, JSON |
| File size | as small as possible |
| Further formalities and parameters | Files must always be named according to the following pattern:<br><br>**For the performance-relevant submissions on "PebblePad":**<br>Name-FirstName_MatrNo_Course_P(hase)-2_S(ubmission)<br>Example: Mustermann-Max_12345678_Cloud Programming_P2_S |

| **Finalization phase** | |
|---|---|
| Recommended tools/software for processing | (Microsoft Word, LaTeX, PyCharm, VS Code) |
| Permitted file formats | e.g., PDF, TF, YAML, JSON |
| File size | as small as possible |
| Further formalities and parameters | **IMPORTANT** is the upload of the zip folder that has been created especially for the submission (please follow the instructions on myCampus). This folder contains all the files you used to complete the task. To ensure a better overview, please create subdirectories for this purpose.<br><br>**The folder structure then looks like this:**<br>○ Main directory (name of the zip folder) -> *Name: Name-First_Name_Matriculation_Course*<br>● Subdirectory (these are articles, useful information etc.) -> *Name: 01-Research-and-Development*<br>● Subdirectory (Conception Phase) -> *Name: 02-Conception-Phase*<br>● subdirectory (Development Phase) -> *Name: 03-Development-Phase*<br>● subdirectory (Final Phase) -> *Name: 04-Final-Phase*<br><br>Please make sure that you either embed the images (and fonts, if any) linked in your document or to place them in the respective directory. Otherwise, your documents cannot be opened completely and therefore cannot be assessed!<br><br>Files must always be named according to the following pattern:<br><br>**For the performance-relevant submissions on "PebblePad":**<br>Name-FirstName_MatrNo_ Course _P(hase)-3_S(ubmission)<br>Example: Mustermann-Max_12345678_Cloud Programming_P3_S |

### 4.3. Format of Abstract

| Length | 2 pages of text |
|---|---|
| Paper size | DIN A4 |
| Margins | Top and bottom 2cm; left 2cm; right 2cm |
| Font | General Text - Arial 11 pt.; Headings - 12 pt., Justify |
| Line Spacing | 1,5 |
| Sentences | Justified; hyphenation |
| Footnotes | Arial 10 pt., Justify |
| Paragraphs | According to mental structure - 6 pt. after line break |
| Affidavit | The affidavit shall be made in electronic form via “myCampus”. No submission of the examination performance is possible before it.<br><br>Please follow the instructions for submitting a portfolio on “myCampus”. |

If you have any questions regarding the submission of the portfolio, please contact the exam office via mail.

Please also note the instructions for using PebblePad & Atlas!

**Good luck creating your portfolio!**