Project Cloud Computing

Project outline, semester project and information

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Cloud Computing – Admission to Exam

We only have a limited capacity...

therefore we have a strict limit for the admission to Cloud Computing!

Classification Cloud Computing - summer semester 2025

List of Participants in Summer Term 2025

Unless you have at least **40 ECTS** from previous courses in the **High Integrity System Master** you are not allowed to participate in the Course **Cloud Computing**!!! Please **do not** register for the exam, because we cannot make any exceptions and this will result in an **failed attempt**!!!

Please check the list before registering in the HIS Portal!!!

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Semester project

Examination

The examination in the master course **Cloud Computing** will be a group research project over the course of the semester. You need to form groups of **4-5 people** and work on the milestones outlined in this presentation.

There are three different forms for the final submission on the project:

1. **Style 1** – Systematic Literature Review and Survey Paper
2. **Style 2** – Prototypical Implementation and Demonstration with Scientific Poster
3. **Style 3** – Prototypical Implementation and Workshop

Deadlines

The dates for the submission and presentation of your milestones will be announced in the CampUAS course and on my Website: www.henrycocos.de/vorlesungen!

Survey Paper

Explanation (Source: Perplexity)

A systematic literature review (SLR) is a structured and methodical approach to reviewing existing research on a specific topic or question. It is designed to minimize bias, ensure reproducibility, and provide a comprehensive synthesis of the best available evidence.

Key features, methodology, and distinctions from traditional literature reviews

- **Focused Research Question:** SLRs begin with a clearly defined and specific research question, often framed using structured frameworks like PICO (see slide 8).
- **Predefined Protocol:** The process is governed by a detailed protocol that outlines objectives, inclusion/exclusion criteria, data collection methods.
- **Rigorous Methods:** Studies are identified through systematic searches in multiple databases using predefined search terms.
- **Quality Assessment:** Each study is critically appraised for its quality and relevance.
- **Data Synthesis:** Findings from selected studies are synthesized either quantitatively (e.g., meta-analysis) or qualitatively (e.g., narrative synthesis).
- **Transparency and Reproducibility:** All steps are documented to ensure the review can be replicated by others.

Poster Presentation

Explanation (Source: Perplexity)

A scientific poster is a visual communication tool used to present research findings, concepts, or ideas in a concise and engaging format at academic conferences, workshops, or other scholarly events. It is designed to summarize key aspects of a study or project and facilitate discussions between the presenter and the audience.

Key Characteristics of a Scientific Poster

- **Visual Layout:** Posters combine text, figures, tables, graphs, and images to convey information clearly and attractively.
- **Concise Content:** Information is presented in a condensed format, focusing on essential details such as the research question, methodology, results, and conclusions.
- **Interactive Presentation:** Posters are often displayed during dedicated sessions where the presenter can discuss their work with attendees.
- **Audience-Friendly:** Posters are designed to be easily understood by a broad audience, including experts and non-specialists.

Workshop

Explanation (Source: Perplexity)

A scientific workshop is an interactive and focused gathering of researchers, professionals, or participants designed to explore, develop, or discuss specific scientific topics, methodologies, or skills. Unlike academic conferences, workshops emphasize active participation, collaboration, and hands-on activities rather than passive listening to presentations.

Key characteristics of scientific workshops

- **Interactive Format:** Workshops often include discussions and problem-solving exercises.
- **Skill Development:** Workshops are typically aimed at teaching specific skills or methodologies, such as using software tools or applying research techniques.
- **Collaborative Environment:** Participants work together to achieve a common goal, such as developing solutions to scientific problems.
- **Focused Topics:** Workshops are centered around specific areas of interest within a field.
- **Output-Oriented:** Many workshops aim to produce tangible outcomes, such as reports or actionable recommendations.
- **Flexible Structure:** The format can vary widely—from short sessions to multi-day events—and may include panel discussions, Q&A sessions, and practical exercises.

Assessment and grading of the Survey Paper (Style 1)

The quality of **Style 1** will be assessed under the following criteria:

- Relevance (Paper fits one or more of the topic areas?): 1-5
- Originality (Newness of the ideas expressed):1-5
- Methodology (How was the survey conducted?): 1-5
- Technical Quality (Theoretical soundness/methodology): 1-5
- Significance (Is the problem worth the given attention?): 1-5
- Presentation (Structure/Length/English): 1-5
- **Overall Rating (Weighted value of above items): 6-30**

Sources

A. Carrera-Rivera, W. Ochoa, F. Larrinaga, G. Lasa, **How-to conduct a systematic literature review: A quick guide for computer science research**, MethodsX, Volume 9, 2022, 101895, ISSN 2215-0161, https://doi.org/10.1016/j.mex.2022.101895.

Assessment and grading

VERY IMPORTANT!!!

Always mark your individual contribution to the projects!
Otherwise there will be no grading of your contribution!

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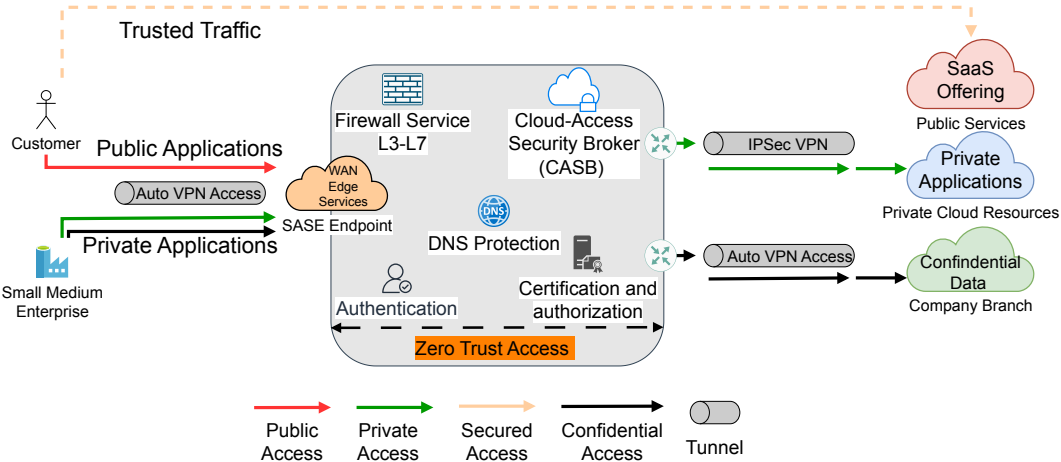
Project 1 outline – SASE (Secure Access Service Edge)

- Analysis of the functionalities
- Presentation of the technologies
- Research on SASE Open Source projects
- **RESULT:** Implementing a use case and Poster!

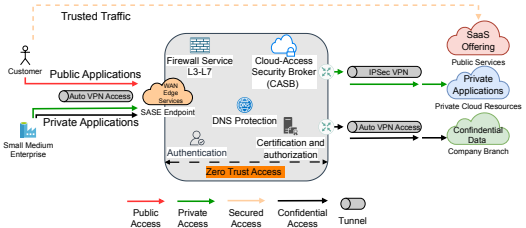
Exam

Style 2 for the final submission! **Maximum 2 teams!!!**

Project outline – SASE (Secure Access Service Edge)



Project outline – SASE (Secure Access Service Edge)



- **SD-WAN** – optimizes wide area networks by enabling companies to use multiple transport services (MPLS, LTE, 5G, broadband) for secure connectivity.
- **Secure Web Gateway (SWG)** – filters and monitors web traffic to protect users from threats and ensure compliance.
- **Cloud Access Security Broker (CASB)** – enforces security policies between cloud users and providers.
- **Firewall-as-a-Service (FWaaS)** – offers scalable, cloud-based firewall functionalities.
- **Zero Trust Network Access (ZTNA)** – follows the principle of "never trust, always verify" and secures user sessions inside and outside company networks.

Project 2 outline – Sky Computing

- Analysis of the trend and development of a concept.
- Analysis of possible fields of application for SMEs
- Analysis of previous solutions (e.g. Sky Pilot).
- **RESULT:** Conducting a Systematic Literature Review with Survey Paper.

Exam

Style 1 for the final submission! **Maximum 1 team!!!**

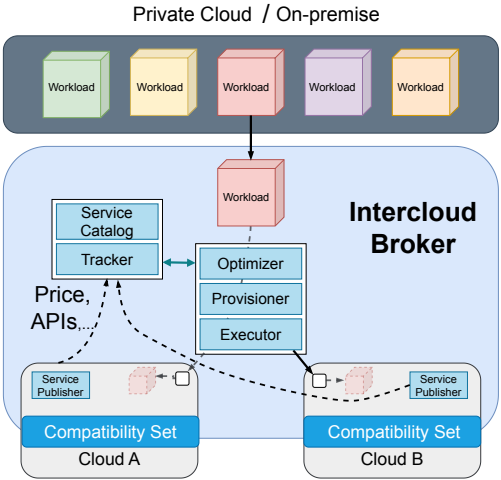
Sources

Stoica, I. and Shenker, S. (2021). **From cloud computing to sky computing.** In Proceedings of the Workshop on Hot Topics in Operating Systems, HotOS'21, page 26–32, New York, NY, USA. ACM.

Yang, Z., et al. (2023). **SkyPilot: An intercloud broker for sky computing.** In 20th USENIX Symposium on Networked Systems Design and Implementation (NSDI 23), pages 437–455, Boston, MA. USENIX Association.

Project outline – Sky Computing

Source: Stoica et al.



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Project 3 outline – Cost Control in Multi-Cloud Environments

- Analysis of cost structures for various services in multi-cloud environments.
- Implementation of a tool for automated analysis of cost API.
- Create dashboard for overview of costs with various providers.
- **RESULT:** Implementing a Prototype and Presentation as a Workshop!

Exam

Style 3 for the final submission! **Maximum 2 teams!!!**

Project 4 outline – Risk Management in Multi-Cloud Environments

- Analysis of compliance guidelines and governance in multi-cloud.
- Analysis of the relevant documentation for governance e.g. General Data Protection Regulation (GDPR), IT Security Act, Telecommunications and Telemedia Laws, etc.
- Analysis of the relevant documentation for security guidelines e.g. BSI C5 (Cloud Computing Compliance Criteria Catalogue), SOC 2, ISO 27001, etc.
- Screen the literature and derive relevant questions, measures and guidelines for multi-cloud setups (in germany and international)!
- **RESULT:** Conducting a Systematic Literature Review with Survey Paper.

Exam

Style 1 for the final submission! **Maximum 1 team!!!**

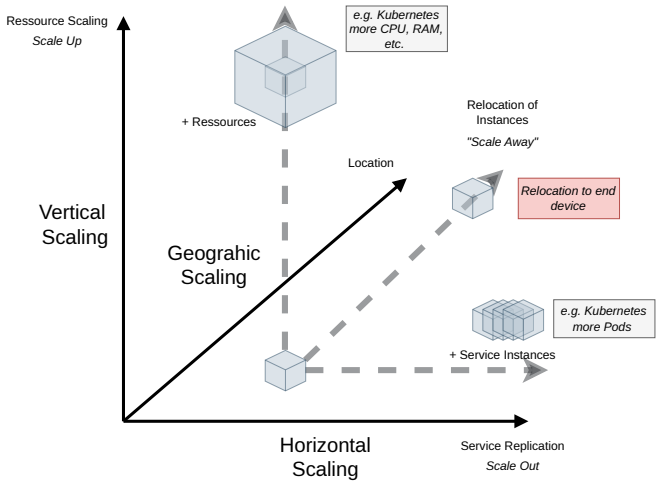
Project 5 outline – Attaching on-premises workloads to the SKY

- Research on the possibility of moving workload between CSPs.
- Analysis of the technological requirements.
- Analysis of different dimensions of scaling: Vertical scaling (adding resources), Horizontal scaling (adding service instances), Geographical scaling (placing services closer to users, or "scaling away").
- Defining criteria for outsourcing computing-intensive tasks, an area with no standardized research methodology.
- Investigating service migration to optimize resource distribution across cloud, end devices, and services.
- Exploring vertical migration (between cloud and end devices) and horizontal migration (between end devices), assessing their impact and technical feasibility.
- **RESULT:** Implementing a Prototype and Presentation as a Workshop!

Exam

Style 3 for the final submission! **Maximum 2 teams!!!**

Project outline – Attaching on-premises workloads to the SKY



Choice of groups and topics

You can choose your topics and groups until next week **(15.04.2025)**! If there is a tie between multiple teams regarding the project topics, these will be decided by chance so make sure you choose wisely!

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Next Steps

Choose your group members till 21.04.2025!

in CampUAS:

Cocos:Cloud Computing SoSe 25

Password: `SkyIsTheLimit`

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Thank You For Your Attention!

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