Introduction

Established in December 2009
- Prof. Dr. Axel Küpper
- Part of TU Berlin and Telekom Innovation Laboratories

Information
- http://www.snet.tu-berlin.de

Research Areas
- Mobile Computing
- Cloud Computing
- Online Social Networks

Other Courses
- Mobile Services (ST)
- Geschäftsprozesse und IT-Dienste (ST)
- Electronic Commerce (WT)
- Digital Communities (WT)
Project organization

In this project, you will work in a small team on a given task. You will need to define a working plan for your project and organize the teamwork. There will be meetings with your supervisor(s) on a regular basis where you report what has been done and discuss the next steps.

What you will learn

- Teamwork and team organization: Communication and problem solving
- Project work: Organizing a project and assigning tasks
- Research: Evaluating existing solutions

…but not

- Coding
Project organization

Prerequisites
– Basic knowledge of computer science
– Practical experience in object-oriented programming and software design
– Communicating in Englisch

Good to have (depending on the topic)
– Profound knowledge and experience in
  • Web Services (Protocols and APIs)
  • Mobile Computing (especially Android)
  • DBMS (e.g. SQL)
– Experience with IDEs (e.g. Eclipse) and Version Control Systems
Project organization

You will be working together in small teams
- Each team will get a specific topic
- ca. 3-6 students per topic
- Teams will have to organize themselves, i.e. come up with a project plan etc.

Working mode
- The project has 9 ECTS (approx. 6 SWS)
- Project duration: 12 weeks

Workload per person per week
- Max: 18 – 22 hours
- Realistic: 12 – 16 hours
Meetings

– Milestone presentation: **Wednesday May 13th**
– Final presentation: **Wednesday July 15th**
– Furthermore, there will be regular meetings with the supervisors

Talks

– Milestone presentations: **10 minutes + 5 minutes Q&A**
  • Present the topic in detail, tasks, project plan and distribution of work among students
– Final presentations: **20 minutes (demo included) + 5 minutes Q&A**
  • Present the meaningful results and significant demonstration video
– Each student need to present at least one time

Attendance

– Attendance to all appointments is mandatory
Project organization

Teams are required to define a project plan
- Define and assign tasks
- Estimate each task's time consumption
- Track who worked on what task for how long

Project documentation
- To be handed in one week after final presentation, Wednesday July 22\textsuperscript{nd}

Project focus
- Implementation (50%)
- Including group organization, distribution of workload, project plan, etc.
- Presentation (25%)
- Documentation (25%)
Tools and Infrastructure

- Redmine Project Management System
  - Repository: SVN/GIT/Mercurial
  - Wiki
  - Ticketing system

- Gitlab Project Account (can also be used as management system)

- The implementation results must be handed in in a reproducible way
  - E.g., using Docker container
  - Clear build process and files

- Mobile devices

- Linux or Windows root server (tubIT VMs)
We register you – the self-enrollment via QISPOS is deactivated

- Some majors accept this course in several study areas/pillar (computer engineering, business informatics, etc.). The system doesn’t allow the assignment to a specific study area/pillar. This means: We still register you, but after finishing this course you have to go the examination office and move this course to your preferred area/pillar.

- Exception: you want to have this as an additional course, e.g. extracurricular studies (Studium Generale) or carry over to master studies -> Registration via Yellow Page (“Zusatzmodul”)

- All students need to clarify for themselves if they can use the credits in their TUB subjects
IoSP

Topics
Topics - Overview

**Topic 1: Open Service Compendium**
- Supervisor: Mathias Slawik, Ilke Zilci (4 Places)

**Topic 2: Federated Open Source Identity Management**
- Supervisor: Mathias Slawik und Dirk Thatmann (4 Places)

**Topic 3: Google Native Client**
- Supervisor: Dirk Thatmann und Sebastian Zickau (4 Places)

**Topic 4: Search and Recommendation in Distributed OSN**
- Supervisor: Sebastian Göndör, Felix Beierle, Kai Grunert (4 Places)

**Topic 5: Crowdsourced Music Playlist Generation**
- Supervisor: Sebastian Göndör, Felix Beierle, Kai Grunert (4 Places)

**Topic 6: New York Cab**
- Supervisor: Bersant Deva und Ana Kosareva (4 Places)
Topic #1: Mathias Slawik, Ilke Zilci

The Open Service Compendium
Topic #1: Challenge: Cloud Service Selection

flickr.com/photos/photodude_de/6471018809
flickr.com/photos/alessandrogrussu/16068476081

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Target

- Feature Set
- APIs
- Data Formats
- Legal Information
- Pricing
- ...
Topic #1: Vision: Open Service Compendium

Provider Information
User Information
Reviews
Ratings
Benchmarks
Live data

Open Service Compendium

Information, Comparison, Matchmaking
Independent, Comprehensible, Pertinent, Up-to-date
Topic #1: How far are we?

- Service-Vocabulary
- Dynamic Service Description Language
- Open Service Broker
Topic #1: Your task: Extension towards IaaS

• IaaS vocabulary
  – Sources: Journal Articles, Research Papers, Empiric Studies, Blogs, Best Practices, Whitepapers, ...

• IaaS descriptions
  – AWS, Azure, GCE, Rackspace, IBM, HP, T-Systems, ...

• IaaS selection tool
  – e.g. AngularJS frontend for Open Service Broker
Topic #1: Prerequisites

• Required
  – Interest in Cloud Computing
  – Appetite for scientific activities (literature study, research, implementation & evaluation)
  – Curiosity for new technologies

• Beneficial
  – Abstraction & modelling skills
  – Web Development skills (Ruby, JavaScript, MongoDB)
Topic #1: Outcome

• Helping others
• Understanding Cloud
• Learning new technologies

... we’re looking for a CYCLONE student worker & thesis applications!
Topic #2: Mathias Slawik, Dirk Thatmann

Federated Open Source Identity Management
Topic #2: Federated Authentication Flow

1. Initial Service Access
2. Redirect to Federation Provider
3. Redirect to Identity Provider
4. Authentication
5. Send Token to Federation Provider
6. Send Token to Service Provider
7. Authenticated Consumption

Trusted Relationship
Topic #2: Current TRESOR Deployment

User B  
Domain B  
Active Directory  
Domain B AD FS Identity Provider  
ST (SAML) Domain B  

User A  
Domain A  
Active Directory  
Domain A AD FS Identity Provider  
ST (SAML) Domain A  

Secure 3rd Party (e.g. SkIDentity)  
S3T (SAML) e.g. SkIDentity, DFN  

TRESOR Mock Identity Provider  
ST (SAML) Tresor  

Third Party IP (Google, Facebook, Microsoft etc.)  
TRESOR  

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Topic #2: Richard Stallman says: NO!
Topic #2: Your task
• Requirements Analysis
• Status Quo dissection
• Software shortlist and selection
• Software configuration and Docker integration
Topic #2: Prerequisites

• Required
  – Interest in Computer and Web Service Security
  – Eagerness for learning new technologies

• Beneficial
  – Standards Knowledge (SAML, OAuth, OpenID, ...)
  – Knowledge of resp. implementation language (e.g. Java)
Topic #2: Outcome

- Creating IDM research platform
- Understanding Cloud Security
- Learning new technologies

... we’re looking for a CYCLONE student worker & thesis applications!
Browser-based content decryption: using a content decryption module
What's your electronic data worth to you?

What *is it worth to others?*
Topic #3: What is your data worth to others?

...of course, your data is 100% secure and private...
Topic #3: NSA says…., Bruce Schneier says…

NSA to Congress: “But we want ALL the data. Any other way is just TOO hard.”

// July 22nd, 2013 // Politics and legal

“People don’t notice privacy until it is gone.”
Enable encrypted data sharing!

- Use free software
- Open standards and technologies
- Targeted user group: private individuals
- Increase the level of privacy
Topic #3: Practical task 4 you

• Develop a “Content Decryption Module” (CDM)
• The CDM will be plugged into Chrome/Chromium (PPAPI)
• Support a given use-case – Picture Gallery Sharing
• Build a CDM from scratch OR extent existing source code
Topic #3: CDM contained by a sandbox
Topic #3: Get in contact with:

- C++ development
- W3C Encrypted Media Extension (EME)
- Attribute-based Encryption (ABE) decryption keys and general ABE paradigms
Topic #3: Requirements

- Passion in IT security / cryptography
- Preliminary knowledge in C++
- Good team organization skills
- Independent working mode
It’s now safe to turn off your computer.
Search and Recommendation in Distributed Online Social Networks
Topic #4: Search and Recommendation

DOSN
- Distributed Online Social Networks
- No central server: All data is distributed over many Pods or clients
- Gives users better control over the distribution of their personal data

Problems
- No central server that can run algorithms on the whole social graph
- Access to remotely stored data is not always possible (e.g. due to access restrictions)
Topic #4: Search and Recommendation

Recommendation
- Content-based recommendation
- Collaborative recommendation
- Hybrid approaches

Search
- Indexing approaches
- P2P: Flooding / DHT lookup

Problem:
- Central approaches work mostly fine
- Distributed approaches are significantly more complicated
Topic #4: Search and Recommendation

Tasks

- Analyze existing approaches and implementations
- Choose/modify or design a recommendation mechanism for an OSN federation
- Choose/modify or design a search mechanism for an OSN federation
- Define an API and a protocol for search and recommendation support
- Implement a prototype that demonstrates the functionality of the approach
- Evaluate your approach, i.e. compare it with existing mechanisms

This is research!

- You won’t get a list of steps to simply implement in order to get to your grade
- You need to come up with own and innovative ideas
- You need to acquire information and knowledge about existing approaches on your own!
Simple setup example:

- Servers host user profiles, which are a set of attributes such as name, gender, or age. Each user has a unique identifier.
- Users can “like” things such as bands, brands, or venues.
- Users can “link” their profiles, i.e. define friend relations.

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<th>Age</th>
<th>Likes</th>
<th>LinkedToID</th>
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<th>Item</th>
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</tr>
<tr>
<td>1</td>
<td>TU Berlin</td>
</tr>
<tr>
<td>1</td>
<td>The Beatles</td>
</tr>
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</table>

...
**Topic #4: Search and Recommendation**

**Prerequisites:**
- Ability and motivation to work in a small group
- Willingness to dig into the state-of-the art
- Organize your work schedule independently
- Knowledge and experience in DBMS, Web Services, and Online Social Network APIs
- Knowledge in the area of “Search and Recommendation” is a plus

**Summary**
- Analyze the current state of the art (i.e. existing solutions and research papers)
- Design a solution that allows to search for user profiles in a distributed network
- Define the required APIs
- Implement a prototype
- Analyze the approach (i.e. compare, measure, evaluate)
Topic #5: Felix Beierle, Sebastian Göndör, Kai Grunert

Crowdsourced Music Playlist Generation
Topic #5: Crowdsourced Music Playlist Generation

Idea

– User’s taste in music can be inferred by his/her listening behavior on the smartphone
– Collect this data and use it for sharing and additional services

Vision

– Music at a party is played according to the aggregated music preferences of all attending guests
Topic #5: Crowdsourced Music Playlist Generation

Automatically collect data on the smartphone
- Music listening
- Additional data, e.g., time, location

Automatically rank music preferences on the smartphone
- E.g., top 10 artists
Topic #5: Crowdsourced Music Playlist Generation

**Share collected data**
- Directly between smartphones (Wi-Fi Direct, Bluetooth) and/or
- Via a webserver

**Visualize crowdsourced data**
- Listening history, location, time, …
- Visualization of music preferences on a map
Recommendation based on automatically ranked top 10 artists
- E.g., automatically generated playlist based on several users
Topic #5: Crowdsourced Music Playlist Generation

Challenges include

- What APIs are available for collecting music data and location data?
- What data format to store the data in?
- How to rank tracks listened to for creating a top 10 of artists?
- How to do recommendations on shared data? What APIs from which services are available (or implement yourself)?
- Demonstration of prototype
Topic #5: Crowdsourced Music Playlist Generation

Prerequisites
- Motivation to work in a small team
- Programming experience (preferably Android)

What we expect
- Analyze existing technologies and APIs that could be useful for this project
- Implement data collection app, and visualization and recommendation modules
Topic #6: Bersant Deva, Ana Kosareva

NYCab
Topic #6: NYCab

Idea

- Create a tool providing service for event detection (e.g. traffic jams) on the streets of NYC
- Find out which other events / what patterns can be recognized from the given dataset
- Validate your results by observing Tweets in the area of the inferred event
- Present your results in an interactive, easy-to-understand way
Topic #6: NYCab

NYC Taxis: A Day in the Life

This visualization displays the data for one random NYC yellow taxi on a single day in 2013. See where it operated, how much money it made, and how busy it was over 24 hours.

A Special Thanks goes out to Mapbox and Heroku for generously sponsoring this project to cover the recent surge of activity.

Here's Technical Blog Post #1 about how this visualization was built.
Task #6: NYCab

Tasks

- Discover machine learning / data mining algorithms
- Use them on real-life data
- Learn technologies for analyzing Big Data (Flink / Spark / Storm) and geographical data (PostGIS / QGIS)
- Use Google Maps API, Twitter API
- Visualize your results
Topic #6: NYCab

Requirements

- Object oriented programming language (Java / C++)
- Scripting language (Python / R)
- Interest in data analytics / pattern recognition / data mining
- Motivation for learning new technologies (for analyzing large amounts of data)
Topic 7: Kai Grunert

Fair distribution of project topics
Topic 7: Use Case – What is the best distribution of topics?

- What does best mean?
  - Stable pairs?
  - Maximize Utilitarian social welfare (SWF)?
Topic 7: Use Case – There are some constraints

- DSS students have to get a topic, but should not be preferred
- There is a maximum number of students, depending on the topics
Topic 7: Further Requirements

• Two processes: register phase and topic allocation
• Indifference should be possible
• Consider the skills
• TU students can drop out, if they would get a specific topic (let them decide, not a machine)
• Fair and transparant (understandable)
• After an allocation, maybe there is a changing phase
Topic 7: Tasks

• Find algorithms (Matching):
  – Preferences as sequence (ordinal) or numbers (cardinal)
  – Handle all requirements
  – Define „Fair“
  – Compare and evaluate

• Create a portal
  – User and Role management (students and supervisors)
  – Students: Register, set preferences, swap topics
  – Supervisors: insert topics, settings
  – System: Allocate, Visualize the allocation process
  – Maybe two algorithms implemented
Topic 7: Literature

- The marriage problem
- „deferred acceptance“
- Hungarian algorithm
- Properties of mechanism design (goals)
## Topic Assignment

<table>
<thead>
<tr>
<th>Topic #1 OSC</th>
<th>Topic #3 BCD</th>
<th>Topic #4 S&amp;R OSN</th>
<th>Topic #5 CMPGen</th>
<th>Topic #6 NYCab</th>
<th>Topic #7 FDoT</th>
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<tr>
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<td>1) Kuipou</td>
<td>1) Beckmann</td>
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Todos

• Please get in touch with your supervisors now
• Schedule a first meeting within the next days
• Get familiar with your topic and the state-of-the-art
• Schedule regular meetings with your group members
• Time is ticking …