Middleware Architectures 1

Motivation and Course Overview

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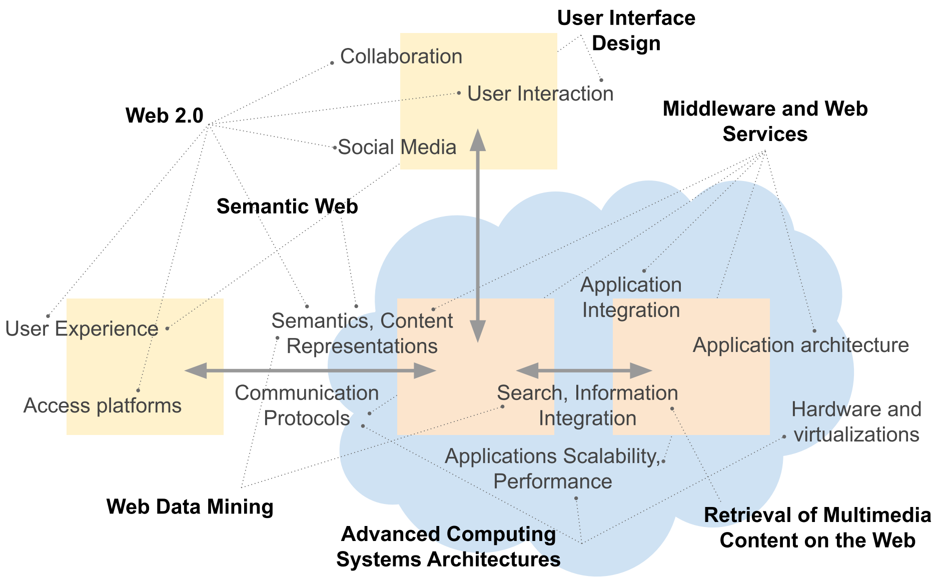
Humla v1.0

Hellos

- Tomáš Vitvar – lectures (Czech)
  - *Web engineering program chair at CTU FIT*
  - *Technology Architect Director at Oracle*
  - *Research*
    - *→ Web Services, Web Intelligence, Semantic Web*
  - *Industry*
    - *→ Large scale integration architecture projects (Vodafone UK, IKEA IT Sweden, Turkish Telecom)*
    - *→ Design, governance, troubleshooting, performance tuning*
- Jaroslav Kuchař – labs (Czech)
  - *Research assistant at CTU FIT, Seznam.cz*
  - *Web usage mining, big data analytics, Web services*
- Milan Dojčinovski – lectures and labs (English)
  - *research assistant at CTU FIT, Ph.D. candidate*
  - *Semantic Web, Linked Data, NLP, Web services*

Web Engineering Curricula – bird's view

- Web engineering is...
  - *far beyond PHP and HTML!*



User Interface Design

Collaboration

User Interaction

Web 2.0

Social Media

Middleware and Web Services

Semantic Web

Application Integration

User Experience

Semantics, Content Representations

Application architecture

Communication Protocols

Search, Information Integration

Access platforms

Hardware and virtualizations

Applications Scalability, Performance

Web Data Mining

Retrieval of Multimedia Content on the Web

Advanced Computing Systems Architectures

Overview

- Course at a Glance
  - *Motivation and Scope*
  - *Requirements and Organization*
- Assessment
- Communication and Resources

What is Middleware?

- Say anything you think has something to do with middleware
  - *Architecture*
  - *Tehnology*
  - *Tools*
  - *Concept or style*
  - *Methodology*
  - *...*
  - *No worries, there is no bad answer!*

Motivation in Brief

- Systems rely on complex infrastructures
  - *A lot of data and many processes, internal and external*
  - *As people communicate, underlying systems must too*
  - *But:*
    - → *variety of data formants, technologies, protocols*
    - → *variety of architectures, client-server, peer-to-peer, ...*
- Rapid changes in applications' functionalities
  - *modular development*
  - *reuse of application logic*
  - *low costs – do it now and quickly!*
  - *Good performance*
    - → *frequent changes in applications' loads, peek hours*
    - → *scalability – effective load balancing*
    - → *low costs – cheaper to outsource?*

Scope

- Architectural and conceptual basis
  - *What is architecture – enterprise, processes, data, software*
  - *Service concepts, integration patterns, middleware*
- Backend technologies
  - *Communication protocols – HTTP, TLS, HTTP/2*
  - *Application backend and requests handling*
  - *Advances of REST, MOM*
- Performance and Scalability
  - *Performance tuning*
  - *Load balancers*

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Prerequisites

- Object-oriented programming
  - *Principles*
    - *→ class, object, inheritance, encapsulation, ...*
      - *→ basis for service concepts*
- JavaScript
  - *All code examples will be in JavaScript*
  - *All lab work will be in JavaScript*
- Web Architecture
  - *Basics of REST, HTTP, URI/URL*
- Other
  - *Networking*
  - *Basics of OS*

Organization of Lectures

- 12 Lectures
  - *Czech: Mon 9:15-10:45, T9:107*
  - *English: TBA*
- Plan
  1. *22.09.2024 – Motivation and Course Overview*
  2. *30.09.2024 – Information System Architectures*
  3. *09.10.2024 – Service Architecture 1*
  4. *07.10.2024 – Service Architecture 2*
  5. *14.10.2024 – Communication protocols, HTTP, TLS*
  6. *21.10.2024 – HTTP/2 and HTTP/3*
  7. *28.10.2024 – No lecture*
  8. *11.11.2024 – HATEOAS, Caching, Concurrency Control*
  9. *04.11.2024 – Monolithic vs Microservices Architectures*
  10. *18.11.2024 – Messaging middleware*
  11. *25.11.2024 – High Availability and Performance 1*
  12. *02.12.2024 – High Availability and Performance 2*
  13. *09.12.2024 – Reserve*
  14. *16.12.2024 – Reserve*

Organization of Labs

- Individual work (no teams!)
- Labs every second week
- Number of labs: 6
  1. *Introduction - FIT Workspaces, setup*
  2. *REST – Basics, development of a REST service*
  3. *Security, TLS*
  4. *Messaging systems*
  5. *Load balancers, nginx*

Methodology for Lab Work

- No app development, not directly related assignments
  – *assignment every second week*
  – *be prepared for the lab!*
  – *work alone, ask others for advices*
  – ***Results:***
    → *5 completed tasks*
    → *you will submit results to gitlbab@FIT*

Overview

- Course at a Glance
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Assessment

- Labs
  - *Every task gives you the maximum of 6 points = 30 points in total*
  - *Activity in labs gives you the maximum of 10 points*
  - *Total maximum points = 40,* ***to pass****: 20 points minimum*
- Final exam
  - *Written exam: 3 exercises, 1 hour*
    - → *each gives you a max. of 20 points, the total is 60 points*
    - → *To pass, you need to have at least 50% from each exercise!*
  - *Final score:*
    - → *100 points maximum*

Final Marks

Mark	Points	In words
A	100–90	výborně
B	89–80	velmi dobře
C	79–70	dobře
D	69–60	uspokojivě
E	59–50	dostatečně
F	49–0	nedostatečně

Source: http://www.cvut.cz/pracoviste/pravni-odbor/dokumenty/studijni-predpisy/studijnirad.pdf

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Communication

- Language
  - *Text: English (slides, tweets, posts, instructions, etc.)*
  - *Voice: Czech and English (English version of the course)*
- Direct
  - *you can always contact me directly at tomas@vitvar.com or @TomasVitvar*

Overview of Resources

- Overview of resources

Item	URL
Course slides	http://mdw.vitvar.com
Courses@FIT	https://courses.fit.cvut.cz/NI-AM1/
Lab projects	https://gitlab.fit.cvut.cz/
Assessment	https://grades.fit.cvut.cz/courses/NI-AM1/

- Books
  - *L. Richardson, S. Ruby: RESTful Web Services: Web services for the real world, O'Reilly Media, May 2007, ISBN 9780596529260.*
  - *I. Grigorik: High Performance Browser Networking, O'Reilly Media, May 2013, ISBN 978-1-449-34476-4.*
  - *Thomas Erl: Service-Oriented Architecture: Concepts, Technology, and Design. Prentice Hall, Aug 2, 2005.*

About Slides

- Humla – Open Source HTML5 Presentation System
  - *every slide has a unique URL*
  - *all figures linked with Google drawings*
  - *auto-generated PDFs (1 and 2 slides per page) using travis-ci*
  - *running local (with local nodejs-based http server), and in github pages*
  - *Suggest edits or correct errors by pull requests at mdw github repo*
- Keys

1	*default browsing mode*
2	*slideshow mode (automatically scales to fullscreen)*
3	*grid (overview) mode*
4	*print mode, 2 slides per page*
←	*slide left*
→	*slide right*