Middleware Architectures 1

Motivation and Course Overview

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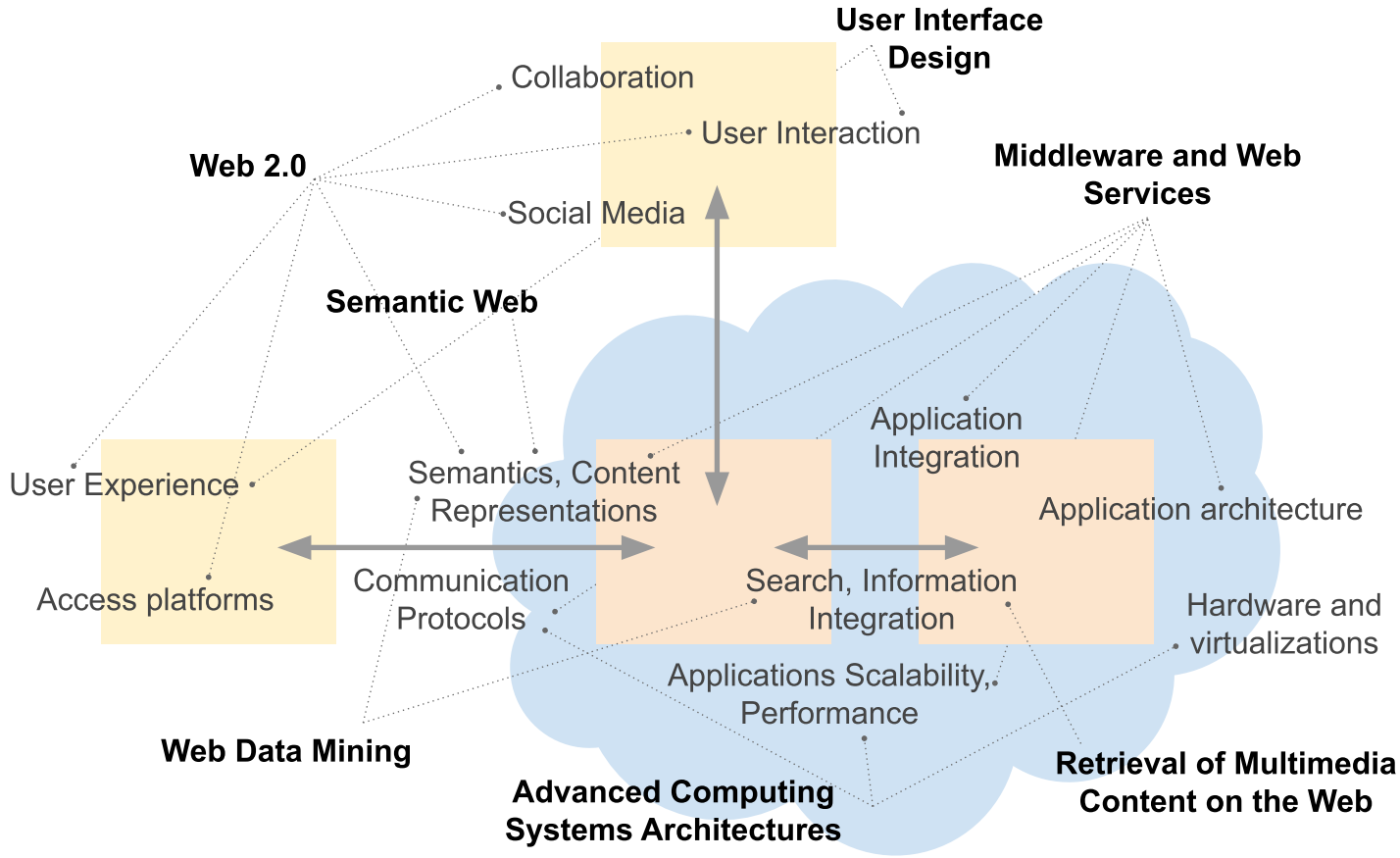
Humla v1.0

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!*



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, gRPC*
- Performance and Scalability
  - *Performance tuning*
  - *Load balancers*

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Prerequisites

- Object-oriented programming
  - *Principles*
    - → *class, object, inheritance, encapsulation, ...*
      - → *basis for service concepts*
- Java
  - *All code examples will be in Java*
  - *All lab work will be in Java*
- 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. *25.09.2023 – Motivation and Course Overview*
  2. *02.10.2023 – Information System Architectures*
  3. *09.10.2023 – Service Architecture 1*
  4. *16.10.2023 – Service Architecture 2*
  5. *23.10.2023 – Communication protocols, HTTP, TLS*
  6. *30.10.2023 – HTTP/2 and HTTP/3*
  7. *06.11.2023 – Application Server Architecture*
  8. *13.11.2023 – REST*
  9. *20.11.2023 – HATEOAS, Caching, Concurrency Control*
  10. *27.11.2023 – Other service technologies*
  11. *04.12.2023 – High Availability and Performance 1*
  12. *11.12.2023 – High Availability and Performance 2*
  13. *18.12.2023 – Rserve*

Organization of Labs

- Individual work (no teams!)
- Labs every second week
- Number of labs: 6
  1. *Introduction - Setup, Simple Web Application*
  2. *REST – Basics, development of a REST service*
  3. *REST advanced*
  4. *TBA*
  5. *Messaging systems*
  6. *Monitoring and analysis*

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*

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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*