

Middleware Architectures 2

Motivation and Course Overview

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Evropský sociální fond
Praha & EU: Investujeme do vaší budoucnosti

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Humla v1.0

Overview

- **Motivation**
- Scope, Requirements, Learnings
- Assessment, Resources, Communication

Web 2.0

- A new version of the Web?
- Principles
 - *Read-Write Web*
 - *Programmable Web*
 - *Realtime Web*
 - *Social Web*

Motivation in Brief

- Need for highly performant and scalable apps
 - *Sudden increase in traffic*
 - *Slashdot effect*
- The Web is programmable
 - *Applications provide **data** and **functionality***
 - *Users – end-users (GUI) and programmers (API)*
 - *Any company with a Web presence has an API*
 - *Google, Amazon, LinkedIn, Facebook, ...*

AM2 and AM1 Courses

- **AM2 builds on AM1**
- **Application Architecture**
 - *Multi-tier client-server architecture*
 - *Cloud native and microservices*
 - *Interface of the app, REST*
 - *Client side of the architecture, JavaScript, AJAX*
 - *Infrastructure empowered by cloud technologies*
- **Technology, Platform**
 - *JavaScript*
 - *client-side + related technologies*
 - *server-side – asynchronous I/O, node.js*
 - *It does not mean you cannot combine technologies*
 - *Node.js as a Web server, ESB for proxy services with back-end systems, all running in a cloud environment (auto scaling, load balancers, message queues, etc.)*

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Scope

- Cloud Architectures
 - *Details of some IaaS and PaaS services*
 - *Cloud Native, Microservice Architecture*
 - *Containers*
 - *Docker, Kubernetes*
- Advanced HTTP
 - *Same origin policy, cross-origin*
 - *OAuth, Open ID, JWT*
 - *Realtime Web protocols*
 - *HTTP Performance, HTTP/2*
- Selected middleware technologies

Organization of Lectures

- 13 Lectures
 - Czech: *Mon 9:15-10:45, TH:A-s135*
- Plan
 - 20.02.2023 – *Motivation and Course Overview*
 - 20.02.2023 – *Asynchronous I/O*
 - 27.02.2023 – *Cloud Architectures (introduction, IaaS)*
 - 06.03.2023 – *Cloud Native and Microservices (containers, Docker)*
 - 13.03.2023 – *Cloud Native and Microservices (Kubernetes)*
 - 20.03.2023 – *Browser Networking (SOP, CORS)*
 - 27.03.2022 – *Security (concepts, TLS, JWT)*
 - 03.04.2023 – *Security (OAuth, OpenID)*
 - 10.04.2023 – *Easters*
 - 17.04.2023 – *Protocols for the Realtime Web (streaming, SSE)*
 - 24.04.2023 – *Protocols for the Realtime Web (WebSocket)*
 - 02.05.2023 – *HTTP/2 (concepts, streams, flow control)*
 - 02.05.2023 – *HTTP/2 (server push, analysis), HTTP/3*
 - 08.05.2023 – *Public holidays*
 - 15.05.2023 – *Reserve*

Organization of Practicals

- Work alone, you can collaborate
- Practicals every second week
- Number of sessions: 6-7, 5 major tasks
 1. *Introduction, JavaScript*
 2. *CORS/JSONP*
 3. *OAuth (JWT)*
 4. *Realtime Web*
 5. *HTTP/2*
- Plus a number of tasks to complete at home

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- **Assessment, Resources, Communication**

Assessment

- Labs
 - *Presence is mandatory*
 - *You can miss up to 1 lab without sending regrets*
 - *Total maximum points: $P=40$*
 - *exercises for labs + your activity + your homeworks*
 - *to pass: $P \geq 20$*
- Final exam
 - *Mandatory written test: 3 parts, ~1 hour*
 - *each gives you a max. of 20 points, the total $E = 60$ points*
 - *you must have at least 50% of points from each theme covered by a test part and 50% of points in total*
 - *Final score:*
 - *$P + E = 100$ maximum points*
 - *The more points you have from labs, the better for the exam!*

Assessment – 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>

- Everything good and bad will count
 - *practicals, coding, (pro-)activity, passiveness, hacking, lectures, exam, cheating, ...*

Resources

- Online sources
 - <https://courses.fit.cvut.cz/NI-AM2/> – lectures and labs information
 - <http://w20.vitvar.com> – both html and pdf (1 and 2 slides per page)
- Books
 - I. Grikorik: *High Performance Browser Networking*, O'Reily 2013
 - B. Burns: *Designing Distributed Systems*, O'Reily 2018
 - L. Richardson, M. Amundsen: *RESTful Web APIs*, O'Reilly Media, May 2015, ISBN 978-1-449-35806-8.
- Other
 - Many sources on the Web, to be listed throughout the course
 - A lot of W3C sources, Web architecture, HTTP

About Slides

- Humla – Open Source HTML5 Presentation Environment
 - *every slide has a unique URL*
 - *all figures linked with Google drawings*
 - *possible to format and print in PDF*
 - *running local, with back-end NodeJS support, and offline*
 - *Fork it at [Humla github repo](#)*
- Keys
 - 1 *default browsing mode*
 - 2 *slideshow mode (automatically scales to full screen)*
 - 3 *grid (overview) mode*
 - 4 *print mode, 2 slides per page*
 - ← *slide left*
 - *slide right*
 - d *debug mode*
 - e *toggle last error messages on/off*