

# Middleware Architectures 2

## Motivation and Course Overview

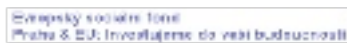
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Humla v1.0

## 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, ...*
  - *Complex backends (microservices, API gateways, etc.)*

## AM2 and AM1 Courses

- **AM2 builds on AM1**
- **Application Architecture**
  - *Multi-tier client-server architecture*
  - *Cloud native and microservices*
  - *Interface of the app, REST, gRPC*
  - *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

- Advanced HTTP
  - Same origin policy, cross-origin
  - OAuth, Open ID, JWT
  - Realtime Web protocols
- Cloud Architectures
  - Details of some IaaS and PaaS services
  - Cloud Native, more microservice architecture
  - More Kubernetes

## Organization of Lectures

- 12 Lectures
  - Czech: *Mon 11:00-12:30, TH:A-s134*
- Plan
  - 16.02.2025 – Motivation and Course Overview
  - 23.02.2025 – Asynchronous I/O
  - 02.03.2025 – Browser Networking (SOP, CORS)
  - 09.03.2025 – Security (concepts, mTLS, JWT)
  - 16.03.2025 – Security (OAuth, OpenID)
  - 23.03.2025 – Protocols for the Realtime Web (streaming, SSE)
  - 30.03.2025 – Protocols for the Realtime Web (WebSocket)
  - 06.04.2025 – Easters
  - 13.04.2025 – Cloud Architectures (introduction, IaaS)
  - 20.04.2025 – Kubernetes Architecture (overview, containers)
  - 27.04.2025 – Kubernetes Architecture (scheduling)
  - 04.05.2025 – Kubernetes Architecture (fault-tolerance)
  - 11.05.2025 – Kubernetes Performance (self-healing, scalability)

## 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. *TBD*
- Plus a number of tasks to complete at home

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- **Assessment, Resources, Communication**

## Assessment

- Details available in Courses:  
<https://courses.fit.cvut.cz/NI-AM2/classification/index.html>

## 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