

# Middleware Architectures 2

## Motivation and Course Overview

**doc. Ing. Tomáš Vitvar, Ph.D.**

tomas@vitvar.com • @TomasVitvar • <https://vitvar.com>



Czech Technical University in Prague

Faculty of Information Technologies • Software and Web Engineering • <https://vitvar.com/lectures>



EVROPSKÁ  
UNIE

Evropský sociální fond  
Praha & EU: Investujeme do vaší budoucnosti

Modified: Mon Feb 16 2026, 11:51:47  
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.)*

# Overview

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

# 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

# Overview

- Motivation
- Scope, Requirements, Learnings
- **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*