I. Introduction to the course and to Web services

**Course introduction.** Objectives, tentative syllabus, organization and motivations of the course. A first gentle introduction to Web services.

**Introduction to Web services.** Definition of service and of service-oriented computing, properties and characteristics of services. Introduction to service-oriented architecture (SOA), WS technology stack, QoS, SLAs and REST.

II. Core standards of Web services


**SOAP.** Structure of SOAP messages, SOAP communication model, fault handling in SOAP, SOAP over HTTP.

**WSDL.** WSDL abstract interfaces, concrete interfaces, message exchange patterns.

III. Service composition


IV. Enhanced service descriptions

**Including behavioural information in service descriptions.** Motivations, potential impact of behavioural analysis, need of suitable abstractions, relation between abstraction and analysis, examples of formalisms for expressing service behaviour, conclusions.

**Service policies.** Types of service policies, WS-Policy. Predicting the QoS of service orchestrations.

V. Emerging technologies

**RESTful services.** Motivations, principles, strengths and weaknesses of REST, WS-* vs. REST.


VI. Lab

**Developing Web services in Java.** Introduction to JAX. Hands-on keyboard development and invocation of Web services with JAX.

**Developing WS-BPEL processes with GlassFish.** Introduction to developing services with GlassFish. Hands-on keyboard development of WS-BPEL processes with GlassFish.

**Modelling and analysing business processes.** Modelling and analysing WS-BPEL processes with workflow nets and WoPeD. Modelling and analysing business processes with BPMN and workflow nets.

References


Teaching notes and slides


**[S1]** A. Brogi. Orchestrating services: From Java to WS-BPEL.

**[S2]** A. Brogi. Including behavioural information in service contracts.

**[S3]** A. Brogi. Business process analysis.

**[S3b]** A. Brogi. BPMN.

**[S4]** A. Brogi. RESTful services.

**[S5]** A. Brogi. Probabilistic prediction of the QoS of service orchestrations.

**[S6]** A. Brogi. Lock-in issues with PaaS.

**[S7]** A. Brogi. Seamless adaptive multi-cloud management of service-based applications.

A copy of [Pap12] is available in the library of Mathematics, Computer Science and Physics. Students can get a copy of the other references, as well as of the other material distributed during the course, by sending an email to the instructor from their unipi account.