

<b>Data field</b>	<b>Explanation</b>
Module number	WP08
German title / English title	Verteilte Systeme und Dienste / Distributed Systems and Services
Credits	5 ECTS
Workload	68 Contact hours (4 SWS Ü), 82 Hours of independent study
Subject coverage	Subject-specific specialization
Learning outcomes	Students understand fundamental properties of distributed systems relevant to the design and implementation of communication systems. They know standard design patterns for distributed systems and can design and build software that makes optimal use of features offered by operating systems and network protocols. The students understand current trends in distributed systems research and standardisation.
Requirements	none
Level	1./2. Semester
Type of module	Seminar, Laboratory Training
Status	Required-elective module
Semesters when offered	Every semester
Method of assessment / Type of examination	The method of assessment / type of examination must be defined by the lecturer within the deadline determined in §19 (2) RSPO. Should the deadline pass without determination of the form of assessment in the module, the following method of assessment / type of examination applies: 50% Written examination (90 minutes), 50% Written laboratory report (10-15 pages) of the laboratory group with consultation (15-30 minutes)
Grade assessment	See study and examination regulations
Content	<ul style="list-style-type: none"> <li>• Foundation of operating systems: resource-management, process abstraction and life-cycle, scheduling mechanisms</li> <li>• Foundation of communication systems: Two-Army-Problem, principal properties of communication channels, network transport protocols</li> <li>• Inter-process communication: signals, shared memory, pipes, sockets</li> <li>• Understand typical issues in distributed systems: error-cases, synchronisation, distributed time-base and event mechanisms</li> <li>• Socket-programming in Java and C</li> <li>• Properties of low-power wireless networks such as 802.15.4</li> <li>• Communication Architectures: Client/Server, Publish/Subscribe, P2P</li> <li>• Middleware-Architectures: Remote Procedure Calls (RPC) and application protocols: (HTTP, HTML, XML, JSON)</li> <li>• Exemplary distributed architectures: DNS &amp; Web</li> <li>• Designing RESTful services with AJAX and JSON</li> <li>• Design of application scenarios for wireless sensor networks</li> <li>• Using the Contiki-OS for 8/16/32-bit microcontrollers</li> <li>• Analysis of use cases for communication protocols (real-time communication, management of limited resources, energy efficiency, excessive packet drop, secure deployment and operation)</li> </ul>
Reading list	A. Tanenbaum, M. van Steen: Distributed Systems, Prentice-Hall G. Bengel: Grundkurs Verteilte Systeme, Springer Vieweg R. Stevens, S. Rago: Advanced Programming in the UNIX Environment, Addison-Wesley
Further information	Language employed in the module: English
Required Room type	Ü-Sem, Ü-Lab