GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Virtualization in Telecommunications Networks, PG_00056860		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Optional subject group Specialty subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Teleinformation Networks -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Narloch	
	Teachers	dr inż. Marcin Narloch	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	30	4.0	16.0	50

Subject objectives

Learning the methods and solutions used in Network Function Virtualization in telecommunications. Practical study of problems regarding virtualization in telecommunication networks.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	Student defines basic notions of the virtualization in telecommunications, characterizes elements of Network Function Virtualization architecture and describes exemplary solutions of Network Function Virtualization realizations.	[SW1] Assessment of factual knowledge
[K7_U12] is able, to an increased extent, to analyze the operation of components and systems related to the field of study, as well as to measure their parameters and study their technical characteristics, and to plan and carry out experiments related to the field of study, including computer simulations, interpret the obtained results and draw conclusions	Student configures parameters of selected virtualization solution for realization of particular network function and modifies its values according to analysis of conducted test and measurements, moreover student knows planning and conducting of network function virtualization solution tests including measurement of its performance and scalability.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems	The student assesses the practical usefulness of known solutions for virtualization of particular network functions.	[SK5] Assessment of ability to solve problems that arise in practice

Subject contents	Course content – lecture Notion of virtualization in telecommunications and overview of virtual system solutions used in telecommunications. Introduction to the concept of Network Functions Virtualization (NFV). The reasons and the aim of NFV introduction. NFV standardization. Basic notions of virtualization. NFV architecture elements. Network Functions Virtualization Infrastructure (NFVI). Software and hardware mechanisms used in Network Functions Virtualization Infrastructure realization. Network functions implemented in the virtual form (Virtualized Network Functions, VNF). Examples of VNF realization in the context of NGN data transport layer and control layer. Relation between NFV and Software Defined Networks (SDN). NFV MANagement and Orchestration Framework (NFV-MANO). Systems, protocols and data structures used in NFV-MANO. Evolution of NFV concept in the context of (Cloud-native Network Functions (CNF). Container technology (operating system level virtualization) and its influence on NFV in the context of CNF. Measurement, testing, performance and scalability of NFV and CNF solutions. Detailed description of selected NFV and CNF realization.
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	50.0%	60.0%
Practical exercise	50.0%	40.0%

Recommended reading		
	Basic literature	Materials prepared by lecturer, made accesible as xerocopy. Manual in the form of xeroxcopy
	Supplementary literature	Smith J. E., Nair R. Virtual Machines Versatile Platforms for Systems and Processes, Morgan Kaufman, 2005. Stallings W., Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud, Prentice Hall, 2015. Chayapathi R., Hassan S. F., Shah P., Network Functions Virtualization with a Touch o SDN, Addison-Wesley Professional, 2016. Zhang Y., Network Function Virtualization.Concepts and Applicability in 5G Networks, Wiley, 2018.

	eResources addresses	
Example issues/ example questions/ tasks being completed	Configuration and optimization of virtualization system (virtual machine) for software executed in virtual environment. Realization of selected network function in full virtualization environment with hardware extension support. Realization of selected network function in selected virtualization environment on operating system level. Realization of selected network function in selected cloud environment. Realization of management and orchestration of network function virtualization. Automation of virtualization solution deployment in telecommunication.	
Practical activites within the subject	Not applicable	

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