International Summer School Manipal University Jaipur [ISSMUJ]-2022

[Hybrid Mode]

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<tr><td>Course Overview</td></tr>
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Name of Course: Exploring Software Defined Networking using NetSim2.0

Name of instructor: **Mrs. Kuntal Gaur, Dr. Lokesh Sharma and Dr. Chagan Lal**
Session: June-July 2022
Language of instruction: English
Number of contact hours: 36
Credit awarded: 03

Objective of Course

Software Defined Networking (SDN) is an emerging paradigm in computer networking that allows a logically centralized software program to control the behaviour of an entire network. Separating a network's control logic from the underlying physical routers and switches that forward traffic allows network operators to write high-level control programs that specify the behaviour of an entire network, in contrast to conventional networks, where network operators must codify functionality regarding low-level device configuration.

This course provides students with the fundamental knowledge of SDN including history and evolution of SDN, SDN architecture, control, and data planes, SDN switches and controllers, SDN programming, traffic engineering in SDN and the use of SDN in cloud network and data centre. This course provides you the opportunity to learn skills and content to practice and engage in scalable pattern discovery methods on massive transactional data, discuss pattern evaluation measures, and study methods for mining diverse kinds of patterns, sequential patterns, and sub-graph patterns. The course outcomes are following

- Compare the conventional network and SDN paradigm
- Synthesize the flexibility and scalability of using SDN regarding innovation and network management
- Configure and troubleshoot Open Flow switches, controllers and SDN networks Using NetSim2.0
- Evaluate various emerging SDN applications

Syllabus
Software Defined Networking (SDN), Separation of Control Plane and Data Plane, IETF Forces, Active Networking; Control and Data Plane Separation: Concepts, Advantages and Disadvantages, the Open Flow protocol; Network Virtualization: Concepts, Applications, Existing Network Virtualization Framework (VMWare and others), NetSim based examples; Control Plane: Overview, Existing SDN Controllers including Floodlight and Open Daylight projects; Customization of Control Plane: Switching and Firewall Implementation using SDN

Concepts; Data Plane: Software-based and Hardware-based, Programmable Network; Hardware Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs, Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications; Data Centre Networks: Packet, Optical and Wireless Architectures, Network Topologies; Use Cases of SDNs: Data Centres, Internet Exchange Points, Backbone Networks, Home Networks, Traffic Engineering. Programming Assignments for implementing some of the theoretical concepts listed above.

Organization of course

Total contact hrs 36

1st week:	10 hrs (classes)	2 hrs (self-study/project)
2nd week:	10 hrs (classes)	2 hrs (Mid term exam/assessment/discussion)
3rd week:	10 hrs (classes)	2 hrs (End term exam)

Mode of lectures: online lecture/online videos/case study/ discussion/ workshop/ hands-on

Course

Lecture no.	Topic	Lecture mode	Instructor
L: 1-6	Software Defined Networking (SDN), Separation of Control Plane and Data Plane, IETF Forces, Active Networking; Control and Data Plane Separation: Concepts, Advantages and Disadvantages, the Open Flow protocol; Network Virtualization: Concepts, Applications, Existing Network Virtualization Framework (VMWare and others), NetSim based examples	Theory and Practical	Mrs. Kuntal Gaur, Dr. Lokesh Sharma
L: 7-12	Data Plane: Software-based and Hardware-based, Programmable Network; Hardware Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs, Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications	Theory and Practical	Mrs. Kuntal Gaur, Dr. Lokesh Sharma, Dr. Chhagan Lal
L: 13-18	Data Center Networks: Packet, Optical and Wireless Architectures, Network Topologies; Use Cases of SDNs: Data Centers, Internet Exchange Points, Backbone Networks, Home Networks, Traffic Engineering.	Theory and Practical	Mrs. Kuntal Gaur, Dr. Lokesh Sharma

Brief profile of the instructors

Mrs. Kuntal Gaur is currently working as a Assistant Professor (Selection Grade) in Department of Computer Applications, Manipal University Jaipur. Her field of expertise are Networking, SDN and VPLS. She has published more than 10 research papers, and all are in Scopus or Web of Science indexed. One of her research papers is published in 4.434 impact factor with Q1 SCI Journal.

Dr. Lokesh Sharma received the Bachelor of Engineering degree in Information Technology in 2005, Master of Technology degree in computer science and engineering in 2009 and PhD in computer Science engineering in 2018. He is currently working as Associate Professor with the School of Computing & IT, Manipal University Jaipur, India, He is doing research in the fields, including security and privacy in Internet of Things, Software Defined Networking and QoS/QoE provisioning in MANETs.

Dr. Chagan Lal is a Senior Researcher in Cybersecurity at the Faculty of Electrical Engineering, Mathematics and Computer Science, Department of Intelligent Systems, Delft University of Technology (TU Delft), Netherlands. Earlier, he was a Research Fellow at Simula Research Labs, Oslo, Norway. Before joining Simula, he was a PostDoc in the Department of Mathematics, University of Padova (UNIPD), Italy (https://spritz.math.unipd.it/team.html). In UNIPD, he is an active member of the Security and PRIvacy Through Zeal (SPRITZ) research group, which is led by Prof. Mauro Conti. His research interests are Network (e.g., IoT, SDN, VANETs, and ICN) Security and Machine Learning, Blockchain Technologies and Smart contracts