Training Course Outline

ITU and National Institute of Telecommunications

Title	Security and QoS in Internet network
Modality	Online instructor-led
Level	Intermediate
Dates	19 – 26 August 2024
Duration	8 days
Language	English
Region	World
Registration type	Application and selection
Registration deadline	18 August 2024
Training fees	150 USD
Description	This course focuses on Security and Quality of Service (QoS) in Internet network from technology, regulation and business aspects. It covers Internet fundamentals, including Internet protocols and architectures, Internet security standards and approaches as defined by IETF (Internet Engineering Task Force), as well as ITU's security architectures for end-to-end communications. Further, the course incorporates cybersecurity approaches from the ITU viewpoint, and security aspects of emerging cloud computing and Internet of Things (IoT). Further, the course covers Internet QoS, including the standardized solutions and practical approaches for provision of end-to-end QoS. In that manner, it includes QoS parameters as defined by the ITU and QoS for data (i.e., Over-The-Top services) and mobile services. Finally, the course also covers network neutrality, Internet KPIs (Key Performance Indicators) and their measurements.

Training topics	*Quality of service* *Cybersecurity*
Certification	*Certificate*
Code	*24OI100419MUL-E*

1. TARGET POPULATION

This course is targeted at managers, engineers and employees from regulators, government organizations, telecommunication companies and academia, who are interested in understanding, implementation and regulation of Security and QoS in Internet Network, including technologies, standardization, regulation and content. Other institutions and individuals that are dedicated in building their capacity related to Security and QoS in Internet Network are also welcome to participate.

2. ENTRY REQUIREMENTS

No prior knowledge or qualification is required to register for this course, considering the given target population.

3. TRAINING OBJECTIVES

At the end of the training, the participant should have gained an understanding of the key aspects of:

- Internet fundamentals
- Internet security by IETF
- ITU's security architectures providing end-to-end communications
- Cybersecurity
- Cloud coumputing and Internet of Things (IoT) security
- Internet QoS
- QoS parameters
- QoS for data and mobile broadband services
- Network neutrality and Internet KPIs measurements
- ITU guidelines for QoS regulation

4. METHODOLOGY

This course will be delivered using instructor-led online learning. The course methodology will be as follows:

- Each day from 19 August to 23 August 2024 there will be made available two recorded video lectures. In total, there are 10 video lectures during the course.
- Course forum, asynchronous, will be organized based on discussion topics raised by the instructor on a daily basis, from Course Day 1 to Course Day 5, which will cover the course material on the given day. Also, participant responses will be asynchronous, keeping in mind the different time zones and daily commitments of participants from different countries around the world.
- General discussion forum, asynchronous, will be provided for participants to ask their own questions which can be answered by the instructor and other participants.
- Final Quiz test will be assigned on the last day of the course, 26 August 2024.
- All announcements for all events (lectures, quiz and forum) will be given in a timely manner (prior to the event) by the course tutor.

5. ASSESSMENT AND GRADING

The evaluation of the participants will be based on 80% from the Final Quiz and 20% from the answers given in the course forum on the raised discussion topics on daily basis by the tutor, thus reflecting both the quantity and the quality of time spent on the course.

Participation in the course forum is mandatory in order to access the Final Quiz.

The Final Quiz will be open from 00:00 hours on Monday (26th of August 2024) according to the GMT+1 time, and will remain open for 30 hours after opening, so each participant can choose the most convenient time to solve it. However, after the start of the attempt the Quiz should be completed in 90 minutes. The Final Quiz contributes with 80% in the total grade.

The course is completed successfully with a total grade of 70% or higher. The grading will be completed by the course tutor after the course is fully completed.

Each fully registered participant who successfully completes the course with a total grade of 70% or higher will receive an ITU Certificate for this course.

The ITU certificates will be given to participants via the ITU Academy platform after completion of the course reporting and processing within the ITU.

6. TRAINING DETAILS & INSTRUCTIONAL APPROACH

Day	Sessions/Topics covered	Key learning points (detail learning outcomes)	Training activities details
Day 1 Monday	Lecture 1. **Internet fundamentals** Lecture 2. **Internet security by IETF**	Outline, discuss, use, analyze, design and evaluate the following topics using technical, business and regulatory aspects: - Telecommunications/ICT and Internet evolution - Internet protocols - IP addresses and domain names - IPv4 vs. IPv6 - TCP connection - DHCP, NAT - Client-server and peer-to-peer Internet networking - Autonomous Systems - BGP (Border Gateway Protocol) - World Wide Web (WWW) and HTTP - Real-Time Streaming Protocol (RTSP) - Session Initiation Protocol (SIP) - Internet governance – the technical side - Security solutions - Goals of Internet security - Internet security on network layer – IPsec - Internet security on transport layer - SSL/TLS - Authentication, Authorization and Accounting (AAA) in Internet - RADIUS, Diameter - SCTP (Stream Control Transmission Protocol) use in mobile core networks - Firewalls (packet-filter, proxy)	Watching and listening to video lectures 1 and 2. Answering on questions asked by the tutor, and possibility to ask questions to him via course forum.

Day 2 Tuesday	Lecture 3. **ITU's security architectures providing end-to-end communications** Lecture 4. **Cybersecurity**	Outline, discuss, use, analyze, design and evaluate the following topics using technical, business and regulatory aspects: - ITU-T X.805 framework for end-to-end security5 - Risk management, asset management - Governance of information security - Cryptographic concepts and algorithms, hashing - Digital signature - Public-Key Infrastructure (PKI) and Privilege Management Infrastructure (PMI) - Privacy protection - Identity management - Securing the network infrastructure - Framework for secure mobile end-to-end data - General security architecture for IPTV - Key cybersecurity challenges - ITU mandate on cybersecurity - Global Cybersecurity Agenda (GCA) - ITU Child Online Protection (COP) - Cybersecurity information Exchange (CYBEX) - Vulnerability scoring - Common Weakness Scoring System (CWSS) - Incident handling - Global Cybersecurity Index (GCI) - ITU Global Cybersecurity Agenda (GCA)	Watching and listening to video lectures 3 and 4. Answering on questions asked by the tutor, and possibility to ask questions to him via course forum.
Day 3 Wednesday	Lecture 5. **Cloud computing and Internet of Things (IoT) security** Lecture 6. **Overview of Internet QoS**	Outline, discuss, use, analyze, design and evaluate the following topics using technical, business and regulatory aspects: - Cloud ecosystem, functional architecture and service categories (IaaS, PaaS, SaaS) - Over The Top (OTT) and telco cloud services - Cloud computing security challenges	Watching and listening to video lectures 5 and 6. Answering on questions asked by the tutor, and possibility to ask questions to him via course forum.

		- Regulation and business aspects of cloud security - Internet of Things (IoT) and Web of Things (WoT) - IoT security examples and requirements - Security in Future Networks - Smart Sustainable Cities (SSC) and security - QoS, QoE and Network Performance - ITU's QoS framework (viewpoints of QoS, market model) - Audio, video and data traffic characteristics - TCP behavior and Internet congestion - Requirements of common Internet applications - Packet classification, queuing, admission control - Internet QoS framework by IETF - QoS architectural framework by ITU-T (control, data and management plane) - Integrated services (IntServ) - Differentiated services (DiffServ) - Multi-Protocol Label Switching (MPLS) - Ethernet 802.1Q Class of Service - Deep Packet Inspection (DPI) and QoS	
Day 4 Thursday	Lecture 7. **QoS parameters** Lecture 8. **QoS for data and mobile broadband services**	Outline, discuss, use, analyze, design and evaluate the following topics using technical, business and regulatory aspects: - Primary and derived QoS parameters - QoS and Network Performance parameters - Model for user-centric QoS categories - ITU standardized QoS parameters - IP network performance parameters - Layered model for IP networks and services - ITU QoS Classes - End-to-end QoS in an IP environment - KPIs, targets and measurement methods	Watching and listening to video lectures 7 and 8. Answering on questions asked by the tutor, and possibility to ask questions to him via course forum.

		- Web Browsing (HTTP) QoS parameters, KPIs for data services - Non-technical KPIs - QoS parameters measurement methodologies - Comparison between Telco and OTT VoIP - OTT multimedia streaming, social networking, cloud services - End-to-end QoS for data services - 4G Quality of Service - QoS for mobile services - 5G/IMT-2020 Quality of Service - AI/ML for QoS support in 5G-Advanced and 6G - 6G/IMT-2030 Quality of Service	
Day 5 Friday	Lecture 9. **Network neutrality and Internet KPIs measurements** Lecture 10. **ITU guidelines for QoS regulation**	Outline, discuss, use, analyze, design and evaluate the following topics using technical, business and regulatory aspects: - Introduction to Network Neutrality - Regulatory intervention for Internet access service - NRA imposing minimum QoS requirements - Network neutrality regulation - Challenges regarding QoS vs. network neutrality - Basic network model for QoS measurements - ITU's framework for monitoring QoS of IP network services, minimum set of KPIs - Measurement methods - HW and SW testing tools classification by ITU - QoS evaluation scenarios by ITU at national and international levels - Considerations regarding Internet QoS measurements - ITU's Guidelines for QoS regulation - Measurements aspects of QoS regulation - Activities in QoS Regulation	Watching and listening to video lectures 9 and 10. Answering on questions asked by the tutor, and possibility to ask questions to him via course forum.

		- Information gathering and publication - Penalties, compensation to customers - SLA and QoS Regulation - Criteria for QoS Parameters - Minimum QoS parameters for mobile voice and Internet services	
Day 6 Saturday	Time to consolidate the acquired knowledge	Summarizing the knowledge	Possibility to watch all video lecture once again with possibility to ask questions to the tutor.
Day 7 Sunday	Time to consolidate the acquired knowledge	Summarizing the knowledge	Possibility to watch all video lectures once again with possibility to ask questions to the tutor.
Day 8 Monday	Final Quiz	Final assessment	Solving the Final Quiz.

7. TUTORS/INSTRUCTORS

Name of tutor(s)/instructor(s)	Title	Contact details
Prof. Dr. Toni Janevski	Professor Doctor	tonij@feit.ukim.edu.mk

8. TRAINING COURSE COORDINATION

Course coordinator	ITU coordinator
Name: Dr. Sylwester Laskowski Title: Doctor, Chief Training Specialist Email address: s.laskowski@il-pib.pl	Name: Célia Pellet Title: Associate Capacity Development Officer Email address: ituacademy@itu.int