

A 12-Day International Short-Course

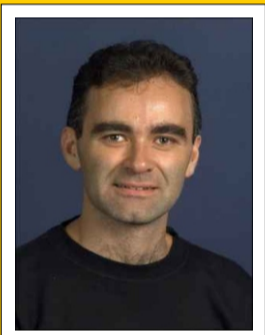
Advanced Topics on Networking, Security, and Verification

Universitas Advent Indonesia
Jl. Kol. Masturi Km. 6.5, Parongpong
Bandung, West Java
Indonesia

Nov 28 - Dec 9, 2005



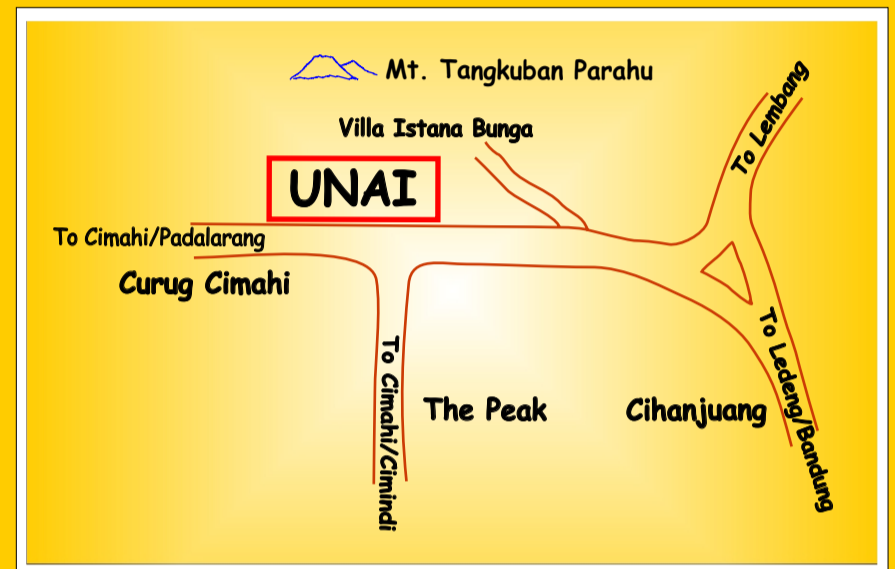
Prof. Dr. Otto Spaniol
Computer Science Department
Aachen University of Technology
Germany



Dr. Antonio Cerone
International Institute of Software Technology
United Nation University (UNU-IIST)
Macau, China



Dr. Dang Van Hung
International Institute of Software Technology
United Nation University (UNU-IIST)
Macau, China



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Sponsor : United Nation University (UNU), Macau, China
Host : Universitas Advent Indonesia (UNAI), Bandung, Indonesia



Limited number of participants.

Participant's qualification: Bachelor (S1/Sarjana) or Master in IT/Networking

Participant's profession: Educator, researcher or industry/company.

Last day of registration is **November 21, 2005.**

Registration Fee:

Food and accommodation sponsored by UNU.

\$15/person

Contact :

Prof. Dr. Marlinda Siahaan

Ph. +62-22-2700131, +62-812-2124454

E-mail : marlindash@yahoo.com

Registration :

Ph. +62-22-2700156

E-mail : intcourseunai@yahoo.com

Fax : +62-22-2700162



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A 12-Day International Short-Course

Advanced Topics on Networking, Security, and Verification

Course Title: "Data Communication and Internet Technology"
Lecturer: Otto Spaniol

Course Description:

The course will teach the basics of current communication systems. The main goal of the lecture is to impart the fundamental concepts for understanding how computer networks and communication processes in the Internet are working. To achieve this goal, the course comprises three parts. First, the architectures and common protocols of local and wide area networks are presented. The second part introduces the Internet protocols, which are the basis of all of today's communication. Because those protocols never were thought to deal with the transfer of multimedia data, the third part takes Multimedia data formats and Quality of Service as a theme - the effort to come to a Next Generation Internet.

Contents

1. Introduction

- Computer networks: basic terms and network topologies
- Communication protocols: OSI reference model and TCP/IP reference model

2. Computer Networks

- Building computer networks: communication media, Repeater, Hub, Switch, Bridge, Router
- Tasks in computer communication: representation of digital signals, error detection and correction, flow control, medium access control
- Local Area Networks - Ethernet: Specifications and medium access
- Local Area Networks - Wireless LAN: Specifications, principles of radio transmission, medium access
- Wide Area Networks - ATM/SDH: Specifications, transmission principle, comparison to Local Area Networks

3. Internet Protocols

- The Internet Protocol IP: IP packets, IP addresses, subnets, CIDER, NAT, IPv6
- Routing: basics of Distance Vector Routing and Link State Routing
- The Transmission Control Protocol TCP: TCP segments, sockets, connection management, flow and congestion control
- Other transport protocols: UDP and RTP

4. Next Generation Internet

- Multimedia data streams and their problems in the current Internet
- Multimedia data formats: basics or representation, audio (PCM), images (JPEG), video (MPEG)
- Quality of Service in the Internet: Admission control and resource management -Quality of Service approaches: IntServ, DiffServ, MPLS

Learning Outcome

The participants will get basic knowledge for future work on installing networks and realizing networked applications. Furthermore, a basis is given for research in media formats and protocol design for future networks.

Prerequisites

Basic knowledge in analysis and algebra will help in easier understanding of some topics.



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A 12-Day International Short-Course

Advanced Topics on Networking, Security, and Verification

Course Title: “Security: Principles, Techniques and Verification”
Lecturer: Antonio Cerone

Course Description:

Security has become more and more significant in information technology, especially in those applications involving data sharing, communication and transactions through the internet. In addition, security policies and standards are starting to be enforced by a growing number of legislative mandates.

This course will first introduce basic concepts used in security, such as confidentiality, integrity and availability, and outline through examples various general security issues faced by organizations. Then it will examine basic techniques necessary to implement security:

- ♦ cryptography;
- ♦ key management;

and more sophisticated techniques to design systems that are secure with respect to

- ♦ access control;
- ♦ information flow.

The last part of the course will focus on modeling cryptographic protocols and on methodologies to formally specify and verify their security properties.



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A 12-Day International Short-Course

Advanced Topics on Networking, Security, and Verification

Course Title:

“Introduction to Model Checking Techniques and the SPIN
Model Checker”

Lecturer: Dang Van Hung

Course Description:

Industrial use of software has grown rapidly in the last few decades. Industries such as telecommunications, automotive, manufacturing, defense, and aerospace use software to run and control their applications, processes, and systems. Many critical applications in such industries require that the software be accurate and highly reliable, since a malfunction can lead to catastrophic losses. Formal methods are used to improve the reliability of software and hardware systems. A formal method called model checking uses efficient search techniques to check that a model of the system being developed satisfies the specifications (properties).

The specifications that the system must have can be generally written in terms of logical propositions. A verification technique called temporal logic model checking was developed in the 1980s by Clarke, Emerson, Quielle and Sifakis. Specifications are expressed as formulas in propositional temporal logic. A finite state-transition model of the system is formed, and the model is checked by using efficient search procedures for the validity of the formulas. Over the last two decades, various model-checking tools have been developed and used. One such popular model-checker is SPIN, a tool developed by Holzmann. SPIN has been used in verification of several types of software systems including communication protocols, and some hardware verification.

This course aims to provide academic faculty members, students, and practicing IT professionals a formal training in software verification methods.

The course consists of three parts as described below.

Part 1: Introduction to Model Checking

This session will provide the basic notions of model checking, temporal logic, LTL and CTL, and model checking algorithms.

Part 2: SPIN and PROMELA

This session will introduce SPIN and PROMELA and provide hands-on training with examples.

Part 3: A Case Study

A telephone switch system. We show in this case study how to model the essential elements of a system in incremental way using the language PROMELA, and how to manage the complexity by using abstraction techniques.