# Presentation Master SNE

## Security and Network Engineering

## UvA online Open House

OS3 Team

University of Amsterdam

November 16, 2020

# History of SNE

- Master of Science education, started in 2003

- Originally called System and Network Administration

  - In Dutch: "Systeem- en NetwerkBeheer"

- Now called Security and Network Engineering

  - In Dutch: "Security- en NetwerkEngineering"

- Moved to Science Park Amsterdam in 2009

  - Also part-time and international students

- Two focus areas

  - Networking and Security

  - Security includes Forensics

- An interesting mix of bachelor educations

  - Bachelors of Science in Computer Science ("WO")

  - Bachelors of (Technical) Informatics (Polytechnic ("HBO"))

    - Belonging to the best polytechnic students

- Intake procedure (assessment) is required for all students

- You need to be well motivated

# Outflow

- SNE master with an academic view
    - Abstraction power
    - Scientific knowledge
    - Innovation power
    - Presentation skills
    - Reporting skills
    - Research skills

# Focus

- Open Technology

- OS3
  - Open Standards
  - Open Software
  - Open Security

- Security is omnipresent

- Technical orientation

- Middle ground between abstract science

  and professional application

# Accreditation

## Accreditation by the NVAO

In March 2020 SNE has been visited by an accreditation panel.

*"The panel is impressed about the educational concept and the teaching methods of the programme. Students are very intensively guided by lecturers and lab teachers and work together productively. As a result, students manage to acquire knowledge and skills at a very high pace."*

The official report of the NVAO ("Accreditation Organisation of the Netherlands and Flanders") is available at their site:

https://www.nvao.net/nl/besluiten/universiteit-van-amsterdam/m-security-and-network-engineering

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Keuzegids 2020
(Dutch)

**KEUZEGIDS** 2020
masters

# Career prospects

- Very good career perspectives
  - Companies are actively scouting for OS3 graduates
  - Almost 100% job guarantee
- Some sectors with many graduates
  - Networking organisations like AMS-IX and SURF
  - Security companies like Fox-IT and Secura
  - Research organisations like UvA and NLnetLabs
  - Government institutes like NCSC
  - Accountancy firms like KPMG and Deloitte
  - Many others

SNE students 2003-2020

Histogram

# Curriculum
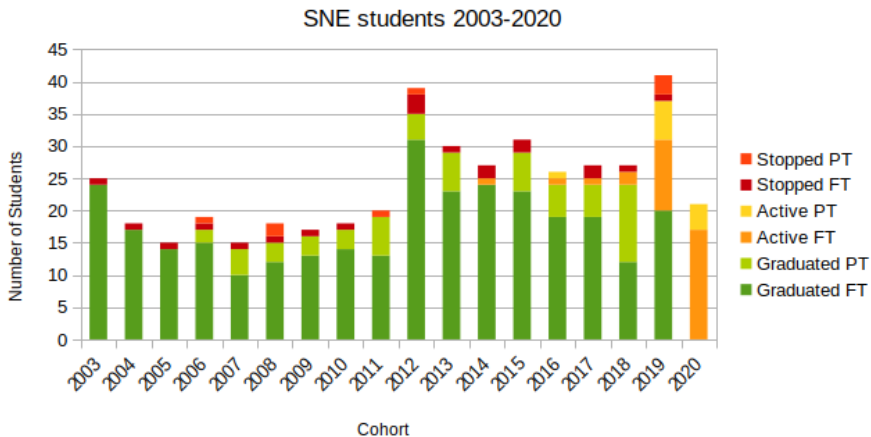
- Total of 10 modules of 6 ECTS each

    - 60 ECTS $==$ 1 year

    - 2 weeks $==$ 3 ECTS

- Semester 1: 8+8+4 weeks

- Semester 2: 8+8+4 weeks

- Full-time or part-time ($\equiv$ full-time in 2 years)

# Focus Area: Networking

- Focus on advanced networking
  - In-depth Routing and Switching (OSPF/IS-IS/MPLS/BGP)
  - In-depth TCP (high bandwidth/high latency)
  - Software Defined Networking (SDN)
  - Fiber optics
  - Wireless technology
- Two specialistic courses
  - InterNetworking and Routing
  - Advanced Networking

# Focus Area: Security

- Focus on digital security, including forensics
  - Gather evidence in a way that will hold up in court
  - Malware
  - Security of radio-based technologies (GSM, BlueTooth, ZigBee)
  - Security of mobile operating systems
- Four specialistic courses
  - Security of Systems and Networks
  - CyberCrime and Forensics
  - Offensive technologies
  - Advanced Security

# Focus Area: Foundations and Complexity

- Focus on history, foundational aspects and complexity
  - History of Unix and the Internet
  - Basic Computer Architecture and Operating Systems
  - Basic protocols: DNS, SMTP, HTTP
  - Scaling techniques and Virtualisation
  - Administration and DevOps
- Two specialistic courses
  - Classical Internet Applications
    - Foundations of the Internet
  - Large Systems

# Semester 1

| Month | Part-time year 1 | Part-time year 2 |
|-------|------------------|------------------|
| Sep | Security of | Classical Internet |
| Oct | Systems and Networks | Applications |
| Nov | Large | InterNetworking |
| Dec | Systems | and Routing |
| Jan | Research Project 1 | |

# Semester 2

| Month | Part-time year 1 | Part-time year 2 |
|-------|------------------|------------------|
| Feb   | CyberCrime       | Advanced         |
| Mar   | and Forensics    | Networking       |
| Apr   | Offensive        | Advanced         |
| May   | Technologies     | Security         |
| June  |                  | Research Project 2 |

# "Theoretical" courses

- 7 weeks (20 hours a week)

  - 2 * 2 hours lectures

  - 2 * 4 hours lab exercises and practical work

  - 1 * 8 hours private study

- 1 week examination

# "Project" or "Practical" courses

- Same as theoretical courses, but with a small project as part of the practical work
  - Teamwork
  - Communication
  - Presentation

# Research Project

- 4 weeks (full-time)

- Individual work (mostly)

    - Week 1: orientation and project definition

    - Week 2 and 3: research

    - Week 4: report writing

    - One day in week 5: presentation

# The "fifth" day

- Lectures and lab exercises fill 4 full days every week
- The remaining day (mostly Wednesday) contains
  - Guest lectures
  - Colloquia
  - Site visits
  - Research preparation
  - Private study

# Obligatory presence

- 10:00-16:00 on normal days

- On Wednesdays if there is an organized event

- Research projects: twice 1 month full time.

# Corona times situation

- Lectures are online (09:00-10:45)
- Labs are, if possible, on-site in multiple groups
    - Labs may also be partially online

# Visit to Bletchley Park in October 2016

# SNE Lab production

- Production environment
  - x86-64 based PCs
  - Running Ubuntu Linux on the desktop
  - Using our own servers
  - Using our own IP space 145.100.96.0/20
    - and our own IPv6 space 2001:610:158::/48
    - and our own AS AS1146

# SNE Lab experimental

- Experimental environment
  - Unix (Linux, BSD, macOS), Windows, …
  - Hardware routers and software routers
  - Each student uses own backend server
    with virtualisation technology (Xen, containers)

# Security of Systems and Networks (SSN)

- Security of Systems and Networks

  - Crypto (traditional and modern)

  - Protocols (SSL, IPsec)

  - Authentication

  - Hacking tools

  - Passwords

- Mini-project included

# Classical Internet Applications (CIA)

- Classical Internet Applications
  - History
  - Computer Architecture
  - DNS(SEC)
  - Email
  - Web

# Large Systems (LS)

- Large Systems
  - Design
  - Administration
  - Cloud Computing
  - Scaling
  - Automation
  - Change Management

# Offensive Technologies (OT)

- Offensive Technologies

    - Sniffing

    - Intrusion detection

    - Hacker mindset

    - Malware

    - Botnets

- Mini-project included

# InterNetworking and Routing (INR)

- InterNetworking and Routing
  - Physical and logical structure of the Internet
  - Addressing (IPv4, IPv6)
  - Layer 2 and loop prevention
  - Layer 3 and routing
    - Interior (RIP, OSPF, IS-IS)
    - Exterior (BGP)

# Advanced Networking (AN)

- Advanced Networking
  - In-depth transport layer (TCP)
  - Software Defined Networking (SDN)
  - Network Function Virtualisation (NFV)
  - Optical technology
  - Wireless technology
  - Carrier grade connectivity
  - Build your own network!

# CyberCrime and Forensics (CCF)

- Cybercrime and Forensics

  - Reliable gathering of digital information

  - Recovering (partially) destroyed information

  - Timelining

  - Trap avoidance

  - File systems

  - Volatile information capture

- Mini-project included

# Advanced Security (AS)

- Advanced Security topics

  - Wireless security

  - Mobile security

  - Internet of Things

- Mini-project included

# Research Projects

- Research a problem of your <span style="color:orange">own choice</span>

- Examples

  - OV Chipcard

  - Detection of peer-to-peer botnets

  - Smart metering

  - Wireless protocol analysis using GNUradio

  - Industrial-Scale Software Defined Networking

  - Optical Networks using Hollow Fibers

# Staff

- The Core Team
  - Director of education Karst Koymans
    - Also Networking Area coordinator
  - Security Area coordinator Jaap van Ginkel
  - Lecturers / Lab teachers Arno Bakker, Vincent Breider, Roy Vermeulen
  - System Engineer Niels Sijm
- Other lecturers
  - Jeroen van Beek, Paola Grosso
  - Cees de Laat
- Guest lecturers

# SNE information

- https://www.os3.nl/

- mailto:info@os3.nl

- "goto: Science Faculty, Science Park 904, Amsterdam"

  for a visit and a personal introduction

# Application and Admission (1)

- Check the deadlines at https://www.uva.nl/

  - Dutch students: **June 30** 23:59

  - EU/EEA students: **June 30** 23:59

  - Non-EU/EEA students: **January 31** 23:59

- Register in Studielink at https://www.studielink.nl/

## Application and Admission (2)

- Receive your UvA-net ID and further instructions
  by email (check your spam folder)

- Apply for the programme in Datanose **before the deadline**
  Go to www.datanose.nl, log in with your UvA-net ID and
  upload all necessary documents

- **Pass SNE intake!**
  The Admissions Board will consider your request