

Presentation Master SNE

Security and Network Engineering

UvA hybrid Open House

OS3 Team

University of Amsterdam

November, 2023

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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>

Top programme 2016 — 2021



Best IT Master in
Keuzegids 2020
(Dutch)



KEUZEGIDS
2020
masters

Best IT Master in
Keuzegids 2021
(Dutch)



KEUZEGIDS
2021
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

Relevance?



WE ARE NO LONGER
SECURING COMPUTERS

WE ARE SECURING SOCIETY.

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/MPLS/BGP/SR)
 - In-depth network behaviour (**TCP** high bandwidth/high latency)
 - Data plane **programmability** (OpenFlow,P4)
 - 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
 - How do hackers think?
 - 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 Systems and Networks	Classical Internet Applications
Oct		
Nov	Large Systems	InterNetworking and Routing
Dec		
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.

SNE Trip: E.g. Visit to Bletchley Park



Security of Systems and Networks (SSN)

- Security of Systems and Networks
 - Crypto (traditional and modern)
 - Protocols (TLS, 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

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)

- Cybercrime and Forensics
 - Reliable gathering of digital information
 - Recovering (partially) destroyed information
 - Timelining
 - Trap avoidance
 - File systems
 - Volatile information capture
- Mini-project included

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!

Offensive Technologies (OT)

- Offensive Technologies
 - Sniffing
 - Intrusion detection
 - Hacker mindset
 - Malware
 - Botnets
- 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 **own choice**
- 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

E-passport investigation (The Times)

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THE TIMES Wednesday August 6 2008

News

Fatal flaw: How a baby became

The supposedly fail-safe system devised to foil terrorists and criminals can be easily turned to their advantage,
Steve Boggan reports

Jeroen van Beek takes the passport of a 16-month-old British boy and puts it on to a £40 smartcard reader the size of an iPod. He punches a code into his computer and, within seconds, the information contained in the passport's microchip appears on screen.

This is not supposed to happen, as communication between the chip and the reader uses powerful encryption, but a renowned British computer expert called Adam Laurie worked out how to crack the code 18 months ago.

Within seconds, in his university office in Amsterdam, Mr van Beek, 30, copies the contents of one microchip on to another chip, making a clone of the first. He launches some software called 'Golden Reader Tool' — the International Civil Aviation Organisation (ICAO) standard kit for checking biometric passports — and the new passport is flagged as 'not authentic'.



SNE lab facilities

- Three physical, dedicated classrooms at Amsterdam Science Park
- One (large!) server room, also at Science Park
 - It houses our servers & network devices
 - OS3 has its own network connection via SURFnet
 - ...so minimal firewalling etc.
- All students get their own desk, desktop PC, and server
- Use this for lectures, labs, and research projects

Hardware & software at OS3

- Nice mix of open source, multi-vendor, cutting edge, legacy
- You'll work mainly with Unix-like systems
 - Windows/Mac also possible, although not supported by us
 - Nice chance to work with different hardware/software
- Student servers are Dell PowerEdge machines
 - Virtualization (Xen/KVM, containers) to get more out of your server

Application at Studielink/UvA

- Application deadlines 2024:
 - Dutch and EU/EEA students: **June 30** 23:59
 - Non-EU/EEA students: **January 31** 23:59
- Register in Studielink at <https://www.studielink.nl/>
- Receive your UvA-net ID and further instructions by email (check your spam folder)
- Go to www.datanose.nl, log in with your UvA-net ID and upload all necessary documents

Intake exams & interview (1)

- To prepare all students for an intensive one-year MSc program
 - Info at <https://www.os3.nl/info/admission>
- Consists of 5 exams and an interview
 - Admission depends on exam scores & interview
- Exams either in our Amsterdam lab, or online
- Interview is scheduled after passing all exams
- Three opportunities in total (i.e. 2 retakes)

Intake exams & interview (2)

- Exams:
 - TCP/IP (multiple choice, 45 mins)
 - Unix (multiple choice, 45 mins)
 - Mathematics (multiple choice/fill the blanks, 1 hour)
 - Python (programming exercices, 1 hour)
 - Text Analysis (summary & questions, 1.5 hours)
- Intake exam dates: March 27, May 29, July 24
 - Dates differ for international students!

Staff

- Director of the education
 - Ana Oprescu
- The Core Team
 - Founder of the education Karst Koymans
 - Security Area coordinator Jaap van Ginkel
 - Lecturers / Lab teachers Arno Bakker, Vincent Breider, Roy Vermeulen
 - System Engineer Niels Sijm
- Other lecturers
 - Paola Grosso, Chrysa Papagianni, Francesco Regazzoni
- Many 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