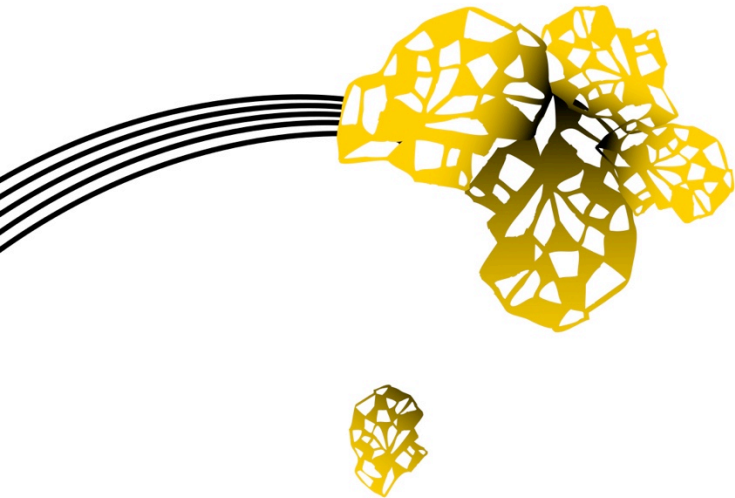# UNIVERSITY OF TWENTE.

CYBER SECURITY SPECIALIZATION

Dr. Andreas Peter
Services, Cyber Security, and Safety Group

UNIVERSITY OF TWENTE.
CYBER SECURITY

Why Cyber Security?

• Our world increasingly becomes digital and connected

• Cyber Security is BIG news: check the papers today

• Cyber Security is a BIG issue: 10% of our PCs are hijacked

• Cyber Security is BIG business: Patch Tuesday

• Graduates are in high demand!

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CYBER SECURITY

Two Choices

- **3TU Cyber Security Specialization**
- "High Tech, Human Touch":

  Cyber Security Technology in context:

  Social, Psychological, Economical, and Legal
- Industrial integration: courses, summer school, (optional) internships

- **EIT ICT Labs[1] Master on Security & Privacy**
- Double Degree (1st or 2nd year at an EU partner university)
- 1st year: technical basics, 2nd year: specialization
- Innovation & Entrepreneurship (I&E) basics

[1] European Institute of Innovation & Technology

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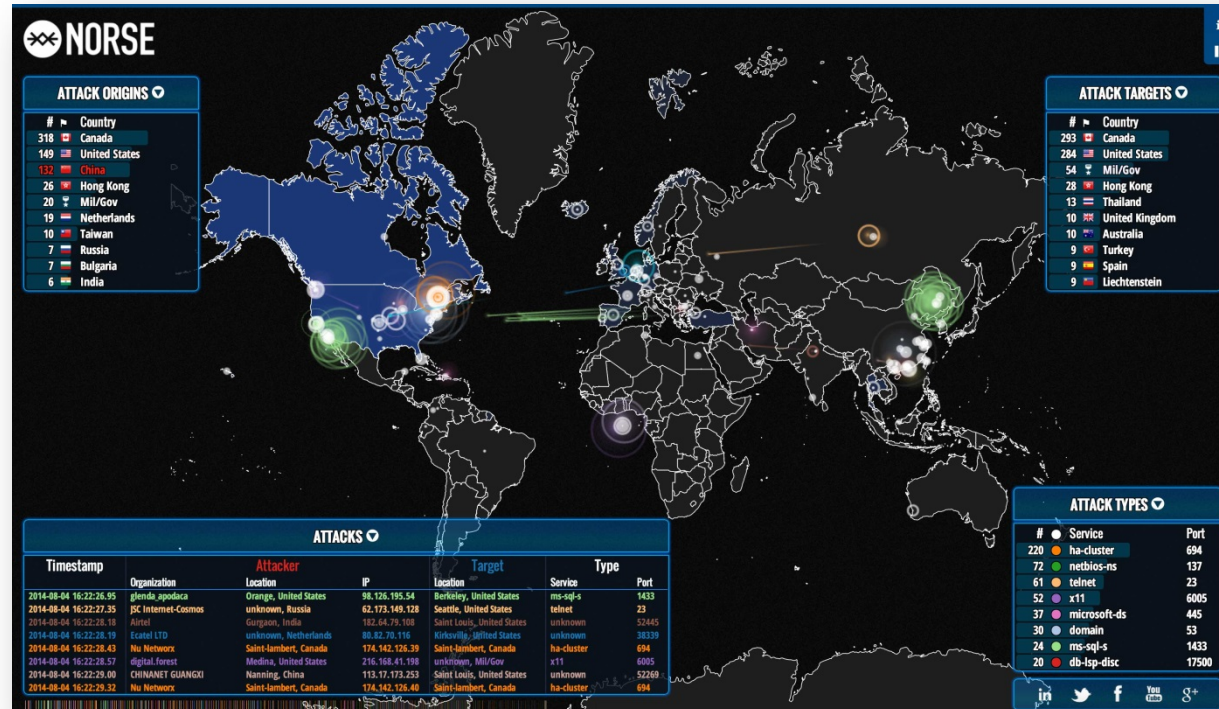## 3TU CYBER SECURITY SPECIALIZATION

Cyber Security (Overview)

- Assessment of cyber risks and the design & implementation of countermeasures

- Three important Cyber Security measures
  - ✓ Prevention: for example using firewalls and awareness campaigns
  - ✓ Detection: for example using intrusion detection tools and data analytics
  - ✓ Recovery: for example using incident response methods and backups

- Cyber risk management: balancing the three measures to reach states of acceptable risk levels in various cyber domains.

- Multidisciplinary
  - ➢ Computer science core: for example cryptography, formal methods, secure software engineering, and machine learning
  - ➢ Supporting disciplines: for example law, economics, criminology, management, and psychology

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3TU CYBER SECURITY SPECIALIZATION

Example (technical): Cyber Attacks

- What are cyber attacks and how do they work (e.g., hacking)?

- How can we prevent (e.g., firewalls), detect (e.g., data analytics), and recover from (e.g., backups) such attacks?

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3TU CYBER SECURITY SPECIALIZATION

Example (technical): Cyber Attacks

- Attackers become more and more powerful, e.g., **governments**!

Edward Snowden

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3TU CYBER SECURITY SPECIALIZATION

Example (socio-technical): Phishing

- What is phishing and how does it work (e.g., persuasion techniques)?

- How can we protect against it (e.g., awareness campaigns)?

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3TU CYBER SECURITY SPECIALIZATION

Example (socio-technical): Phishing

PayPal

You sent a payment   Transaction ID: 64L26412CA5567224

Dear Ann.

You sent a payment for $319.29 USD to Gillian Bourdeau with **Bill Me Later®**

Please note that it could take a while for this payment to post in your Account.

View the info of this order online

Here are your details

Email Address	**Payment Method**
ANN.___@BILLMELATER.COM	**Bill Me Later®**
Confirmation #	**Address**
1582-4261-3245	9690 Deereco Rd. Timonium, MD 21093 443-921-1900

Stay in control of your spending. It's as easy as linking your card account. Find out how

Thank you,
PayPal

Bank	Percentage of Phishing
ING	41%
Rabobank	26%
SNS	21%
ABN Amro	8%
PayPal	4%

Targeted phishing on banks as reported to Fraudehelpdesk.nl. In total (Oct 2014): 8850

- Phishing becomes more and more sophisticated, e.g., **targeted attacks!**

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3TU CYBER SECURITY SPECIALIZATION

- Combines Cyber Security expertise of the 3 TUs

- Basic (core) courses (5 EC each, **[TL] = tele-lectured**)

UT	TUD
– Network Security [TL]	[TL] Security and Cryptography –
– *Cybercrime Science* [TL]	[TL] Software Security (TU/e) –
– *Computer Ethics*	[TL] *Cyber Risk Management* –
– Machine Learning	[TL] Cyber Data Analytics –

- Joint elective courses (5 EC each, **all tele-lectured [TL]**):

– Biometrics	*Economics of Security* –
– Secure Data Management	Principles of Data Protection (TU/e) –
– Privacy-Enhancing Technologies	Software Testing and Reverse Engineering –

- Local elective courses (5 EC each):

– *Cyber Security Management* [TL]	[TL] *E-Law* –
– Security Verification [TL]	[TL] Quantum Cryptography –
– ES and SCADA Security and Survivability	Applied Security Analysis "Hacking Lab" –

- Off-site *Summer School* (1.5 EC) where students solve a real cyber security problem

➢ Required is a minimum of 20 EC of core courses + *Computer Ethics* (5 EC)!

➢ Otherwise, free choices! Courses that are not listed can also be attended (→ program mentor)

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3TU CYBER SECURITY SPECIALIZATION

Sample Timetable

Year 1 (60 EC)				Integration Week	Year 2 (60 EC)			
Q1	**Q2**	**Q3**	**Q4**		**Q1**	**Q2**	**Q3**	**Q4**
Cyber Risk Management	**Software Security**	***Cyber Crime Science***	**Cyber Data Analytics**		*Economics of Security*	Embedded System and SCADA Security and Survivability	**Final Degree Project (30 EC)**	
Security and Cryptography	***Computer Ethics***	**Network Security**	Privacy Enhancing Technologies		Secure Data Management	Introduction to Biometrics		
Machine Learning	*Cyber Security Management*	Principles of Data Protection	*E-Law*	**(1.5 EC)**	**Research Topics Paper (10 EC)**			

- Individual timetables (→ program mentor: Pieter Hartel)

- Individual Final Degree Projects (socio-/purely technical, optional internship)

- Students can start in September or in February

Bold = core course
Italic = socio-technical

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EIT ICT LABS SECURITY & PRIVACY MASTER

Overview

- Double Degree Master (1st or 2nd year at an EU partner university)
- Entry year: technical basics; exit year: specialization
- Innovation & Entrepreneurship (I&E) basics
- Mandatory Internship

Partner Universities

Entry + Exit:

UNIVERSITY OF TWENTE.

Cyber Security:
High Tech, Human Touch

UNIVERSITY OF TRENTO - Italy

Applied Security

Exit Only:

TECHNISCHE UNIVERSITÄT DARMSTADT

UNIVERSITÄT DES SAARLANDES

System Security

Information Security
and Privacy

Advanced Cryptography

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EIT ICT LABS SECURITY & PRIVACY MASTER

Entry Year

- Mandatory courses (5 EC each)

– Network Security	Software Security –
– Security and Cryptography	Cyber Risk Management –
– Privacy Enhancing Technologies	*I&E High Tech Marketing* –
– *I&E Business Development Lab (7 EC)*	

- Elective courses (5 EC each):

– Biometrics	Economics of Security –
– Secure Data Management	Principles of Data Protection –
– Cyber Security Management	Software Testing and Reverse Engineering –
– Security Verification	Quantum Cryptography –
– ES and SCADA Security and Survivability	E-Law –
– Applied Security Analysis "Hacking Lab"	Cyber Data Analytics –

- Summer School on Security & Privacy after 1st year (3-6 EC)

Exit Year (Specialization: Cyber Security – High Tech, Human Touch)

- Mandatory courses (5 EC each)

– Embedded System and SCADA Security and Survivability	Computer Ethics –

- Elective courses (5 EC each):

– Biometrics	Cyber Security Management –
– Secure Data Management	Security Verification –

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EIT ICT LABS SECURITY & PRIVACY MASTER

Sample Timetable (1st year OR 2nd year at UT)

Year 1 (60 EC)				EIT Summer School	Year 2 (60 EC)			
Q1	**Q2**	**Q3**	**Q4**		**Q1**	**Q2**	**Q3**	**Q4**
Cyber Risk Management	**Software Security**	**Network Security**	**Privacy Enhancing Technologies**		Economics of Security	**Embedded System and SCADA Security and Survivability**	**Final Degree Project (30 EC)** Mandatory Internship	
Security and Cryptography	*I&E Business Dev Lab (7 EC)*	Cyber Crime Science	E-Law		Secure Data Management	**Computer Ethics**		
I&E High Tech Marketing	Embedded System and SCADA Security and Survivability	Principles of Data Protection	→	**(3-6 EC)**	**Research Topics + I&E Minor Thesis (10 EC)**			

- Individual timetables   (→ program mentor: Pieter Hartel)
  (→ program coordinator: Andreas Peter)

- Individual Final Degree Projects (socio-/purely technical)

Bold = mandatory
Italic = I&E part

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FINAL DEGREE PROJECTS

Examples (technical):

- "C&C botnet detection over SSL" (at Security Matters)

- "Drone Security" (at KPMG)

- "Detecting botnets using file system indicators" (at NHTCU of Dutch police)

Examples (socio-technical):

- "The Impact of Cyber Security on SMEs" (at Bicore)

- "Secure and privacy-preserving national eID systems with Attribute-based credential technologies" (at NXP)

- "Cognitive Cryptography: Planting a Password into a Person's Brain without Him Having Any Conscious Knowledge of the Password" (local)

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CYBER SECURITY GRADUATES

Typical job titles of graduates would be:

- Computer and network security specialist
- Developer
- Digital expert police
- Entrepreneur and security consultant
- Entrepreneur and developer
- Ethical hacker
- Information security advisor
- Lead engineer
- Management consultant
- PhD student
- Researcher IT-innovations
- Security & privacy consultant
- Security analyst
- Senior analyst and test consultant
- Software engineer
- Teacher
- Technical consultant

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SECURITY MASTER

Interested?

http://www.utwente.nl/en/education/master/

- **3TU Cyber Security Specialization**

  http://www.3tu.nl/cybsec/en/course-program/

- **EIT ICT Labs Master on Security & Privacy**

  http://www.masterschool.eitictlabs.eu/programmes/sap/