Remote questions: https://course.netsec.inf.ethz.ch/questions

Seat nr:

4L (3)

Ignore

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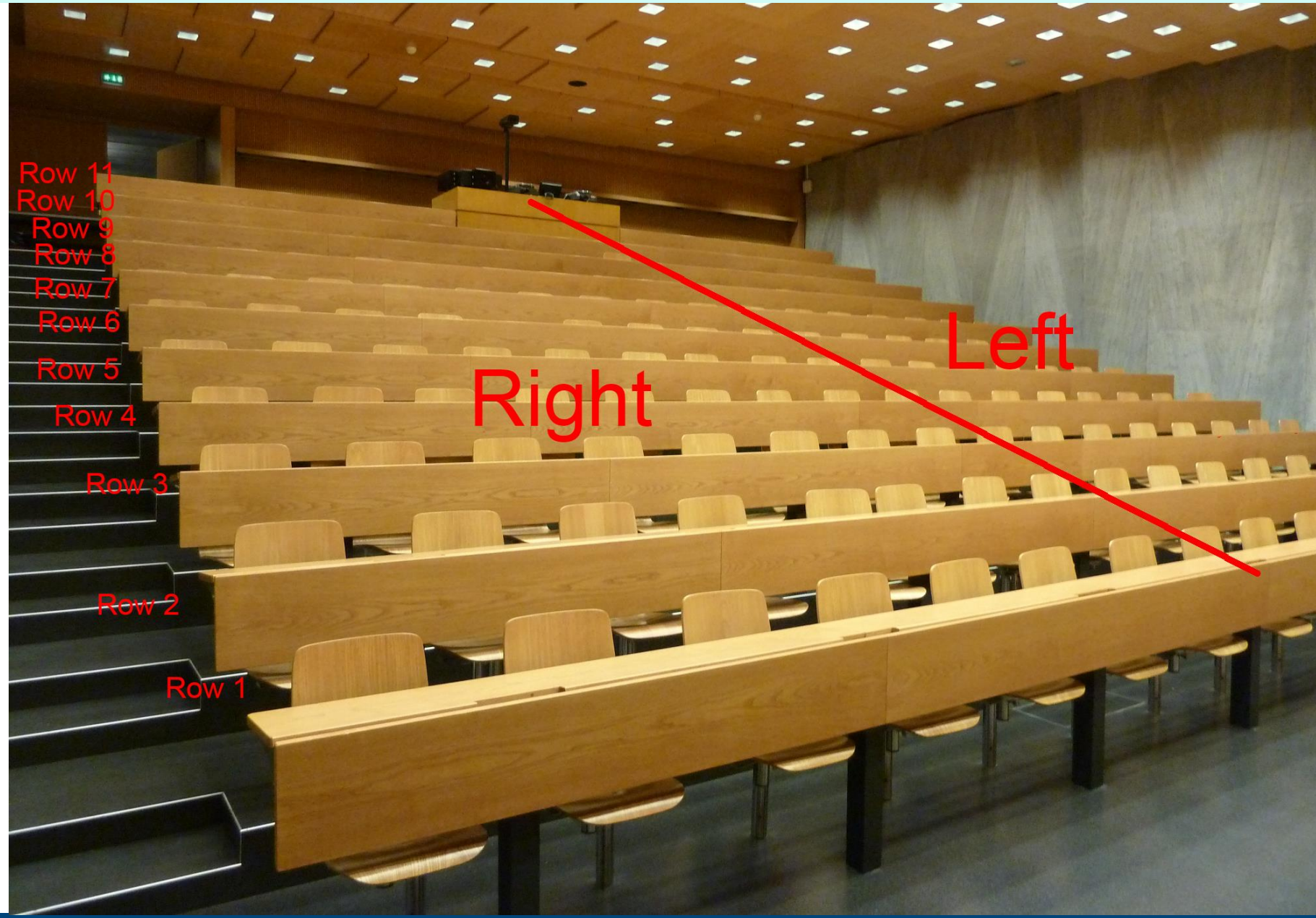


Remote questions: https://course.netsec.inf.ethz.ch/questions

Network Security
Autumn Semester 2020

Introduction and Organization

15 September 2020

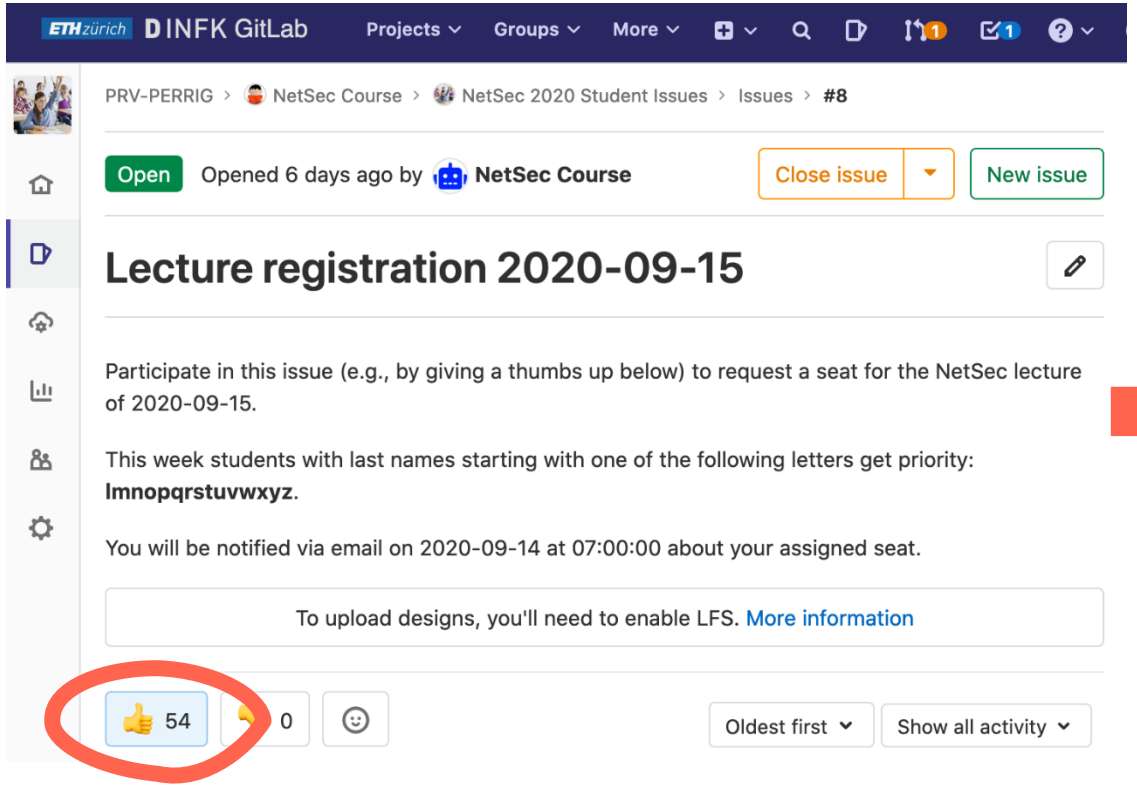
Prof. Dr. Adrian Perrig
Dr. Markus Legner
Dr. Stefan Frei

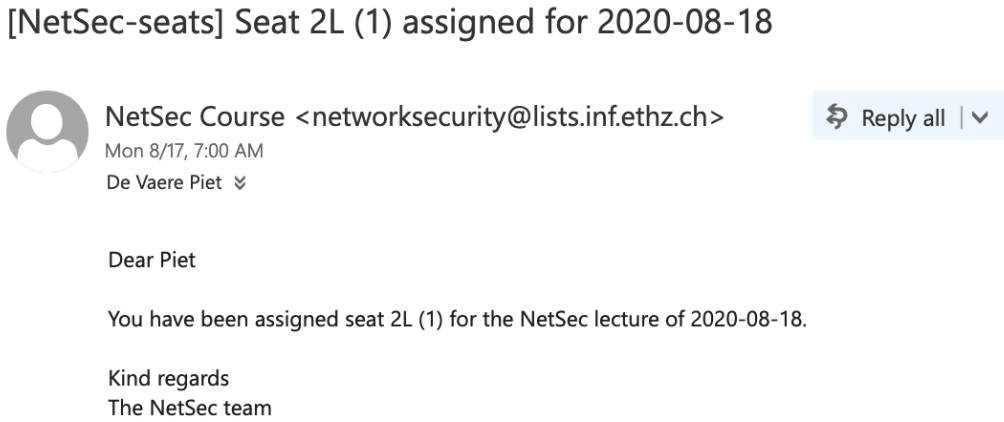
ETH zürich

Remote questions: https://course.netsec.inf.ethz.ch/questions

Lecture Tickets

In order to attend the lecture in person,
you must obtain a *lecture ticket* through GitLab





COVID-19 Measures

- Follow the general safety guidelines.
- **Always** wear a face mask over mouth and nose.
- **Do *not* attend the lecture if you have illness symptoms!**

Remote questions: https://course.netsec.inf.ethz.ch/questions

Seat nr:

4L (3)

Ignore

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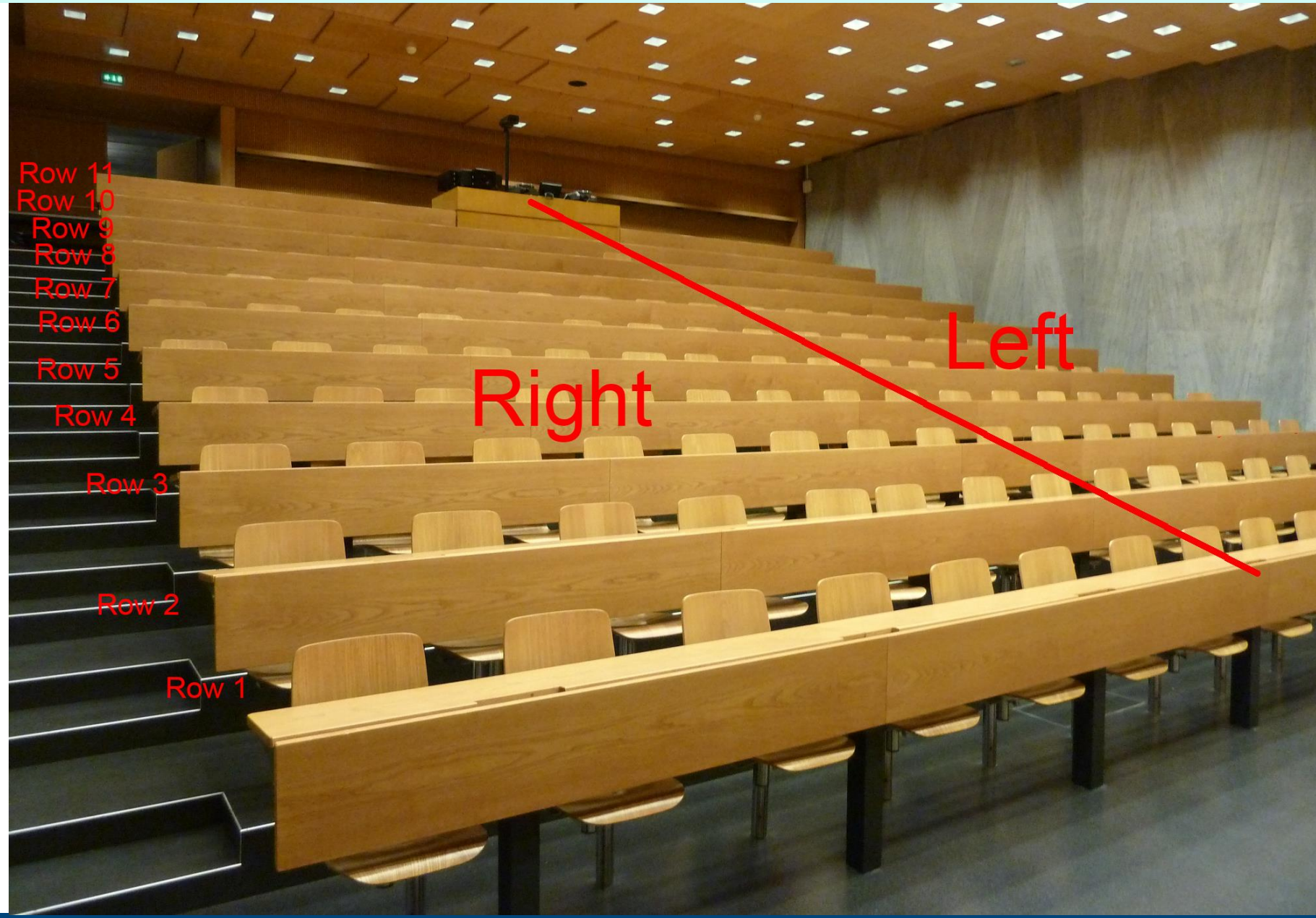
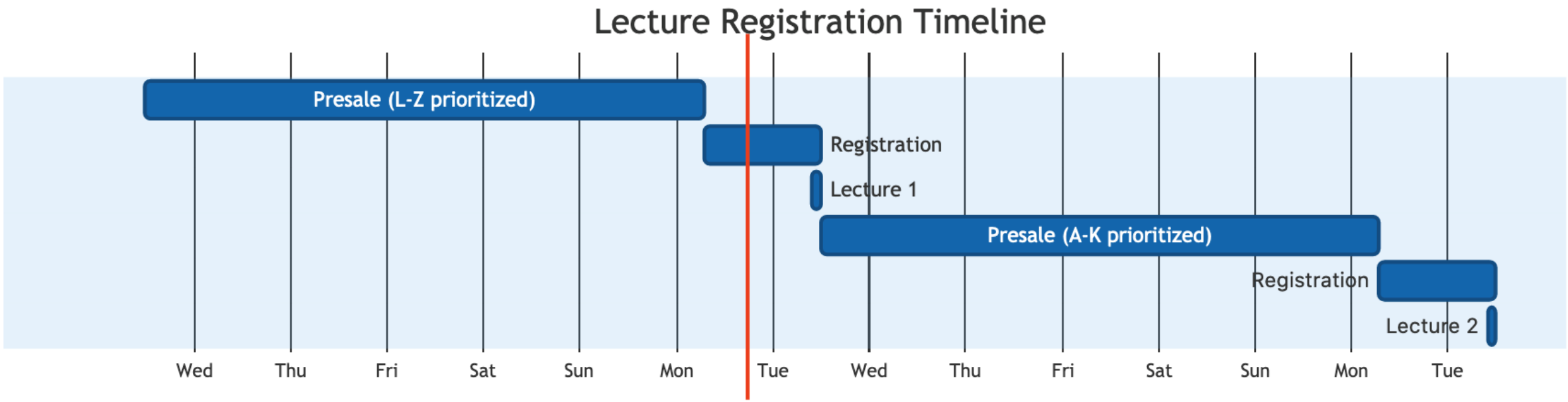


Lecture Tickets

Alternating prioritization ensures that you can visit at least every other lecture.



More information on GitLab (see later)

Network Security in the News

Hackers attacking US and European
energy firms could sabotage power grids

...ny Phone

The Register®
Biting the hand that feeds IT

DATA CENTRE SOFTWARE **SECURITY** DEVOPS BUSINESS PERSONAL TECH SCIENCE EMERGENT TECH BOOTNOTES VENDOR VOICE

{* SECURITY *}

There are DDoS attacks, then there's this 809 million packet-per-second tsunami Akamai says it just caught

Bank on the receiving end of massive 418Gbps traffic barrage

Thu 25 Jun 2020 // 10:03 UTC 50 GOT TIPS?

Symantec reports the hacking group appears to be in information-gathering mode, but warns this could pr... an attemp at sabotage. Photograph: Gareth Fuller/PA

A hacking campaign is targeting the energy sector in Europe and the US to potentially sabotage national power grids, a cybersecurity firm has warned.

The group, dubbed "Dragonfly" by researchers at Symantec, has been in opera... since at least 2011 but went dark in 2014 after it was first exposed, secretly

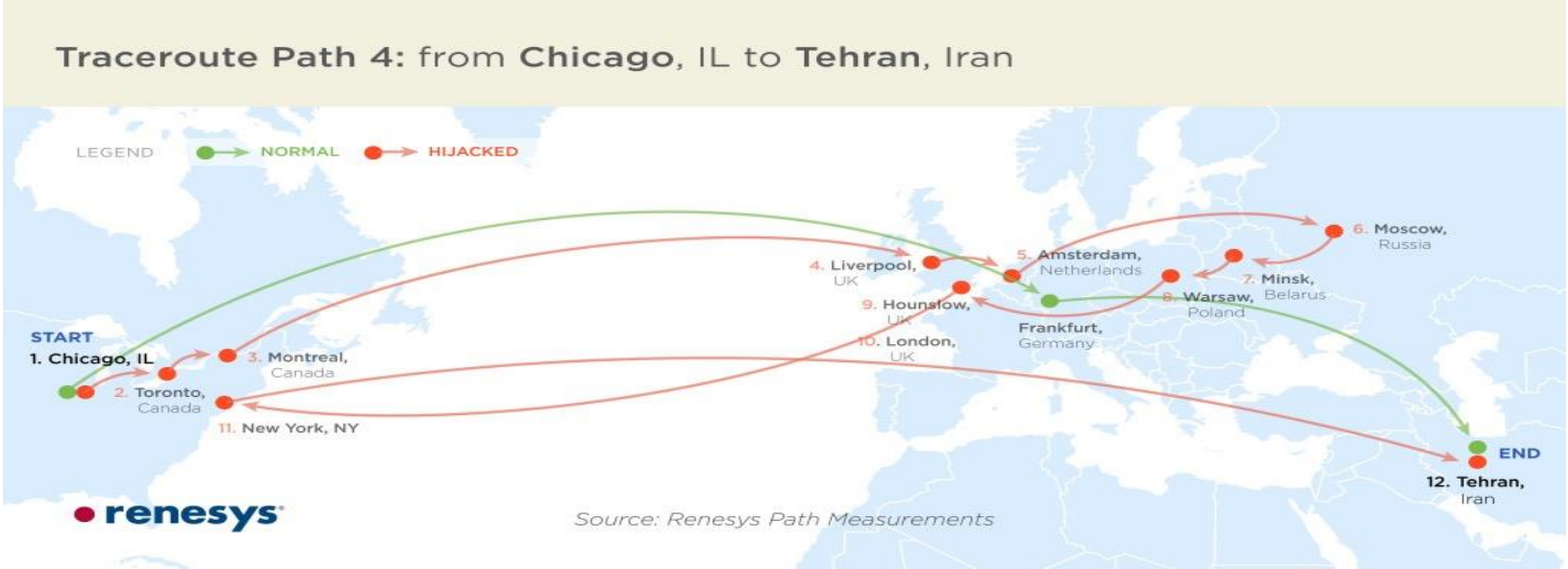
...nplice
...vice

Victims
Device

Cybersecurity researchers today revealed the existence of a new and previously undetected critical vulnerability in SIM cards that could allow remote attackers to compromise targeted mobile phones and spy on victims just by sending an SMS.

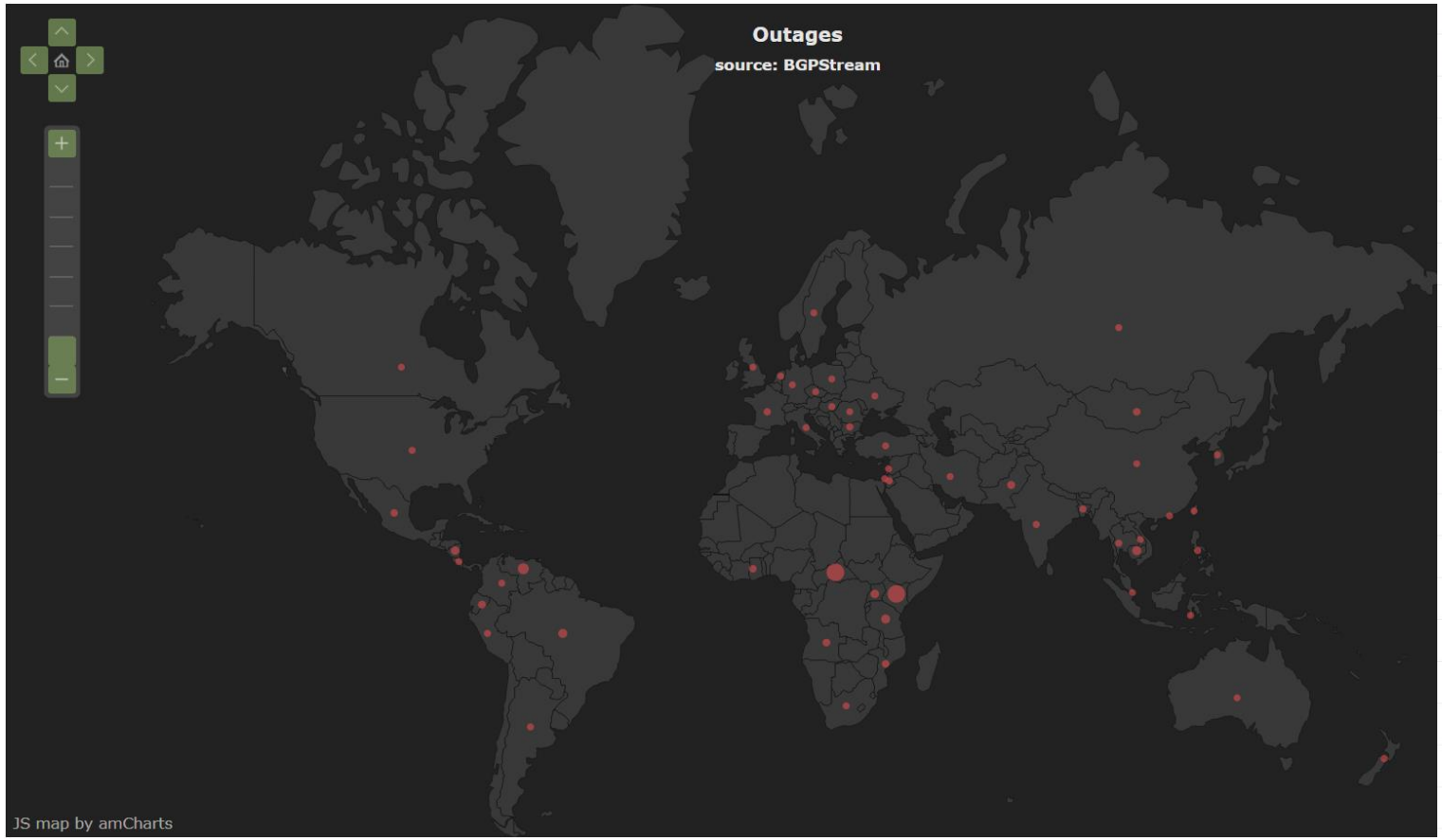
Dubbed "**SimJacker**," the vulnerability resides in a particular piece of software, called the **S@T**

Daily Internet Attack: BGP Prefix Hijacking



Remote questions: https://course.netsec.inf.ethz.ch/questions

Attack Monitor: bgpstream.com

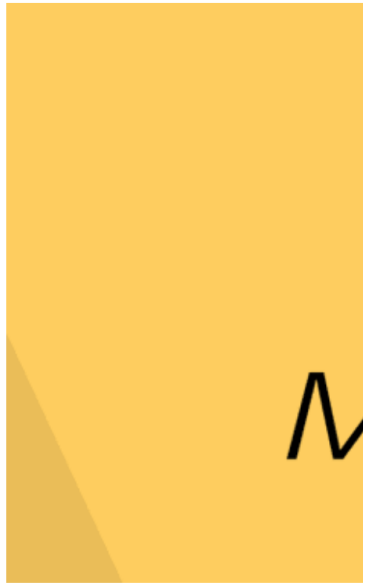


Event type	Country	ASN	Start time (UTC)	End time (UTC)
Possible Hijack		*Expected Origin AS:* COGENT-174, US (AS 174) *Detected Origin AS:* EAGLENET, LB (AS 60372)	2020-09-14 20:42:41	
Possible Hijack		*Expected Origin AS:* COGENT-174, US (AS 174) *Detected Origin AS:* EAGLENET, LB (AS 60372)	2020-09-14 20:42:41	
Possible Hijack		*Expected Origin AS:* IPMEN, GB (AS 209372) *Detected Origin AS:* RU-FIXED-KRSK, RU (AS 57129)	2020-09-14 19:47:29	
Outage		VALLEY-COMMUNICATIONS, US (AS 394972)	2020-09-14 19:41:00	2020-09-14 19:44:00
Possible Hijack		*Expected Origin AS:* SIGNET-AS, NL (AS 28878) *Detected Origin AS:* COLT Technology Services Group, SE (AS 15404)	2020-09-14 19:34:52	
Possible Hijack		*Expected Origin AS:* SIGNET-AS, NL (AS 28878) *Detected Origin AS:* COLT Technology Services Group, SE (AS 15404)	2020-09-14 19:34:52	
Outage		INFOSTROY-AS INFOSTROY AS, RU (AS 208397)	2020-09-14 16:48:00	2020-09-14 16:55:00
Outage		INFOSTROY-AS INFOSTROY AS, RU (AS 208397)	2020-09-14 16:33:00	2020-09-14 16:36:00
Possible Hijack		*Expected Origin AS:* JOSE MARIA DELPINO(TELMIIX), PY (AS 269763) *Detected Origin AS:* (AS 269764)	2020-09-14 16:22:20	
Possible Hijack		*Expected Origin AS:* GROUPNET, IQ (AS 209699) *Detected Origin AS:* ALSARD, IQ (AS 39216)	2020-09-14 15:29:59	
Possible Hijack		*Expected Origin AS:* FORCEPOINT-CLOUD-AS, EU (AS 44444) *Detected Origin AS:* ASN-ORANGE-ROMANIA, RO (AS 8953)	2020-09-14 15:07:56	
Possible Hijack		*Expected Origin AS:* SMPHI-AS-AP SM Prime Holdings, Inc., PH (AS 58884) *Detected Origin AS:* SMIC-AS-AP SM Investments Corporation, PH (AS 141016)	2020-09-14 14:56:46	
Outage		Global Conect Ltda, BR (AS 262735)	2020-09-14 13:56:00	
Possible Hijack		*Expected Origin AS:* ASSKYNET, LB (AS 48418) *Detected Origin AS:* Beirut-Lebanon, LB (AS 9051)	2020-09-14 13:50:41	
Possible Hijack		*Expected Origin AS:* ALTIMA-TELECOM, CA (AS 22423) *Detected Origin AS:* SPRINTLINK, US (AS 1239)	2020-09-14 12:11:04	
Possible Hijack		*Expected Origin AS:* ALEXHOST_SRL, MD (AS 207636) *Detected Origin AS:* SPRINTLINK, US (AS 1239)	2020-09-14 12:11:04	
Outage		INFOSTROY-AS INFOSTROY AS, RU (AS 208397)	2020-09-14 12:04:00	2020-09-14 12:10:00
Outage		COOPERATIVAS DE CALAMUCHITA - CONSORCIO DE COOPERACION, AR (AS 263230)	2020-09-14 11:55:00	2020-09-14 11:58:00
Outage		INFOSTROY-AS INFOSTROY AS, RU (AS 208397)	2020-09-14 11:54:00	2020-09-14 11:58:00
Outage	KI	N/A	2020-09-14 09:42:00	
Outage		BENCHMARK-AS-IN Benchmark Infotech Services Pvt.Ltd., IN (AS 58966)	2020-09-14 09:34:00	2020-09-14 09:37:00
Outage		KINGS-AS-ID Kings Network Indonesia, PT, ID (AS 45725)	2020-09-14 06:51:00	
Possible Hijack		*Expected Origin AS:* ESINNET Shenzhen ESIN Technology Co., Ltd, CN (AS 59072) *Detected Origin AS:* ULAN-NETWORK-LIMITED ULan Network Limited, HK (AS 134196)	2020-09-14 01:40:00	
Outage		COFRACTAL-001, US (AS 26073)	2020-09-14 01:24:00	2020-09-14 01:31:00

Network Components are Also Vulnerable

Hackers Infect Ov
Crypto Mining Ma

August 02, 2018 Mohit Kuma



Security researchers have discover
thousands of unpatched MikroTik
connected to them.

In all, the malware campaigns have
hardware provider Mikrotik across

Thousands of Mikro
On Network Traffic

September 03, 2018 Swati Khandelw

Last month we reported abou
MikroTik routers using a previ

Now Chinese security researc
vulnerable MikroTik routers, m
maliciously, allowing attacker

Some
Passw

Septembe

What could

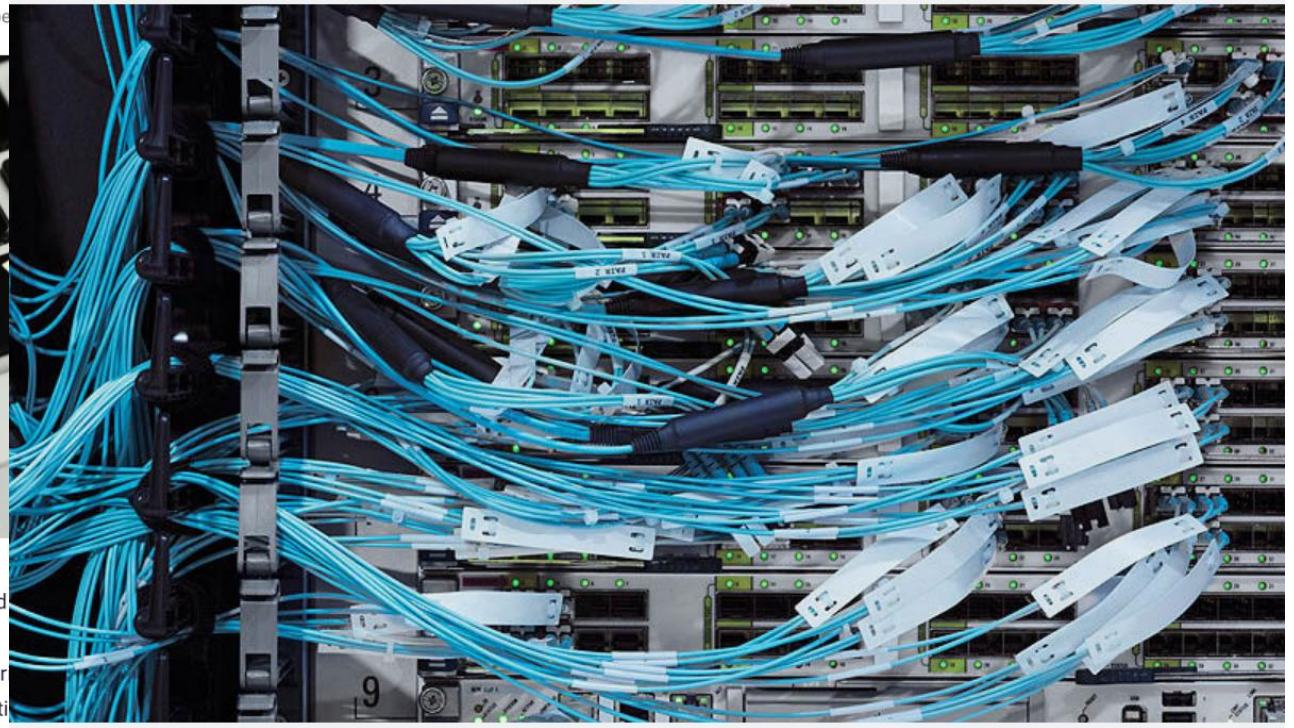
Cybersecur
vulnerabiliti
—that involve insecure storage of credentials, potentially affecting every user and system on that

TELECOMS TAKE NOTE —

Attackers are trying to exploit a high-severity zeroday in Cisco gear

Exploits can exhaust memory in hardware used by telecoms and cloud providers.

DAN GOODIN - 8/31/2020, 9:59 PM



Example: Ethereum Wallet Heist

THE VERGE TECH SCIENCE CULTURE CARS REVIEWS LONGFORM VIDEO MORE

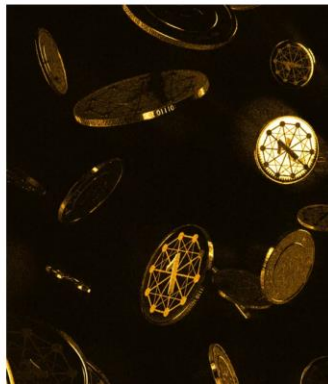
TECH CYBERSECURITY ENTERPRISE

Hackers emptied Ethereum wallets by breaking the basic infrastructure of the internet

21

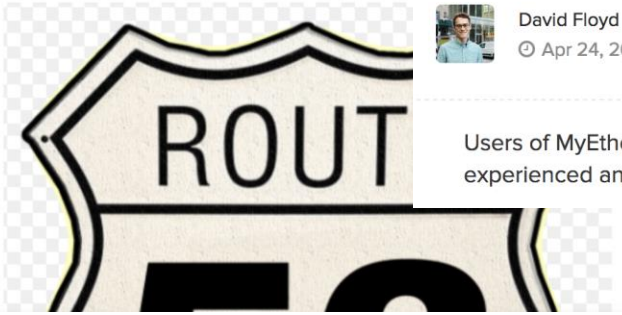
By Russell Brandom | @russellbrandom | Apr 24, 2018, 1:40pm EDT

SHARE



Hijack of Am
service used
hours unnot

Between 11am until 1
internet, routing you t
unknown actor.



$150K Stolen From MyEtherWallet Users in DNS Server Hijacking

363 7

David Floyd

Apr 24, 2018 at 16:35 UTC | Updated Apr 24, 2018 at 16:37 UTC

NEWS

Users of MyEtherWallet, a web app for storing and sending ether and ethereum-based tokens, experienced an attack Tuesday that saw users of the service lose around $152,000 worth of ether.

commercial cloud provider who
count major websites such as
Twitter.com as customers.

About This Course

- The course will cover topics spanning four broad themes:
  - Network **defense mechanisms** such as secure routing protocols, TLS, anonymous communication systems, network intrusion detection systems, and public-key infrastructures;
  - Network **attacks** such as denial of service (DoS) and distributed denial-of-service (DDoS) attacks;
  - Attack **analysis and inference** topics such as network forensics and attack economics;
  - Secure **next-generation network architectures**.
- We will assume knowledge of the “Computer Networks” course taught in the spring semester (https://ndal.ethz.ch/courses/networks.html)
  - “Networking Refresher” in exercise session this week
  - More pointers during the course
  - No specific questions in exam, but may be required to answer other questions

Draft Syllabus

AP	Course introduction, crypto refresher
AP	PKI systems
KP	TLS
KP	TLS
ML	VPNs, IPsec, Wireguard
ML	Anonymous-communication systems
ML	BGP security, BGPsec, best practices
ML	(D)DoS attacks and current defense mechanisms
SF	DNS security and privacy
SF	Firewalls, IDS, evasion and limitations
SF	Cybersecurity in practice / legal aspects
AP	Probabilistic traffic-monitoring techniques
AP	Next-generation Internet (SCION)
AP	Next-generation PKIs + DRKey

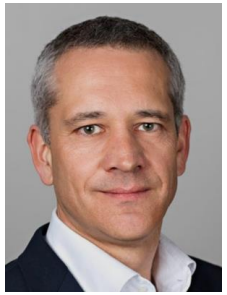
Learning Objectives

- You are familiar with fundamental **network-security concepts**.
- You can **assess current threats** that Internet services and networked devices face and can evaluate appropriate countermeasures.
- You can **identify and assess known vulnerabilities** in a software system that is connected to the Internet (through analysis and penetration testing tools).
- You have an in-depth understanding of a range of important **security technologies**.
- And: You develop some **intuition** and reasonable **paranoia** in your work with ICT.

Lecturers

Prof. Dr. Adrian Perrig, Twitter @adrianperrig

- Since 2013, Professor of Computer Science, ETH Zürich
- 2002-2012: Professor at Carnegie Mellon University
- Core focus: network and systems security, secure communication architectures



Dr. Stefan Frei, Twitter @stefan_frei

- Senior Security Principal, Accenture Cyber Defense
- PhD ETH Zurich
- Formerly VP Research NSS Labs, Austin/TX, USA, Research Director Secunia
- Penetration Tester/Researcher ISS X-Force (now part of IBM)

Dr. Markus Legner,

- Postdoctoral Researcher, Network Security Group
- PhD ETH Zurich (in theoretical physics)
- Working on further improving data-plane security and quality of service for SCION

Prof. Dr. Kenny Paterson, Twitter @kennyog

- Since 2019, Professor of Computer Science, ETH Zürich
- Until 2019: Professor at University of London
- Core focus: applied cryptography, many contributions to TLS

Lecture and Exercise Sessions

Lecture: **Tue 10:00-12:00, CHN C 14**

- Key security concepts, theory, technologies, case studies
- Schedule and topics at https://www.netsec.ethz.ch/courses/netsec-2020/

Exercise session and guest talks: **Thu 16:00-18:00, HG F 1**

- "Attack show cases", discussion of assignments, guest talks

Teaching assistants

- Piet De Vaere, Head TA
- Giacomo Giuliari, Exercise TA
- Simon Scherrer, Project TA

Student assistants

- Tommaso Ciussani
- Marc-Philippe Bartholomä
- Ben Fiedler, DtF project






Exercise Sessions

- Will take place on Thursday 16:15–18:00 in HG F 1
- Sessions will consist of:
  - 1 hour discussion of last exercise sheet
  - 1 hour of one of the following:
    - Guest lecture
    - Project discussion
    - Question hour
- First exercise session is this Thursday (17.09.2020)
  - By exception this exercise session will contain a “Networking Refresher” lecture

Guest Lectures

We will again have exiting guest lectures this year

- Nico Schottelius, **Ungleich**, “Security Aspects of IPv6”
- Maxim Salomon, **Google**, “Security vulnerabilities of modern Wireless LAN Systems”
- Rayhaan Jaufeerally, **AS210036**, “An exploration of real-world network security”
- Candid Wüest, **Acronis**, “Malware Analysis and Prevention”
- Patrick Schmid, **RedGuard**, “Top X Ways to get Domain Admin”
- David Mc Laughlin, **ETH Zürich**, “Email spam prevention at ETH”

Course Webpage

The course's webpage is at:

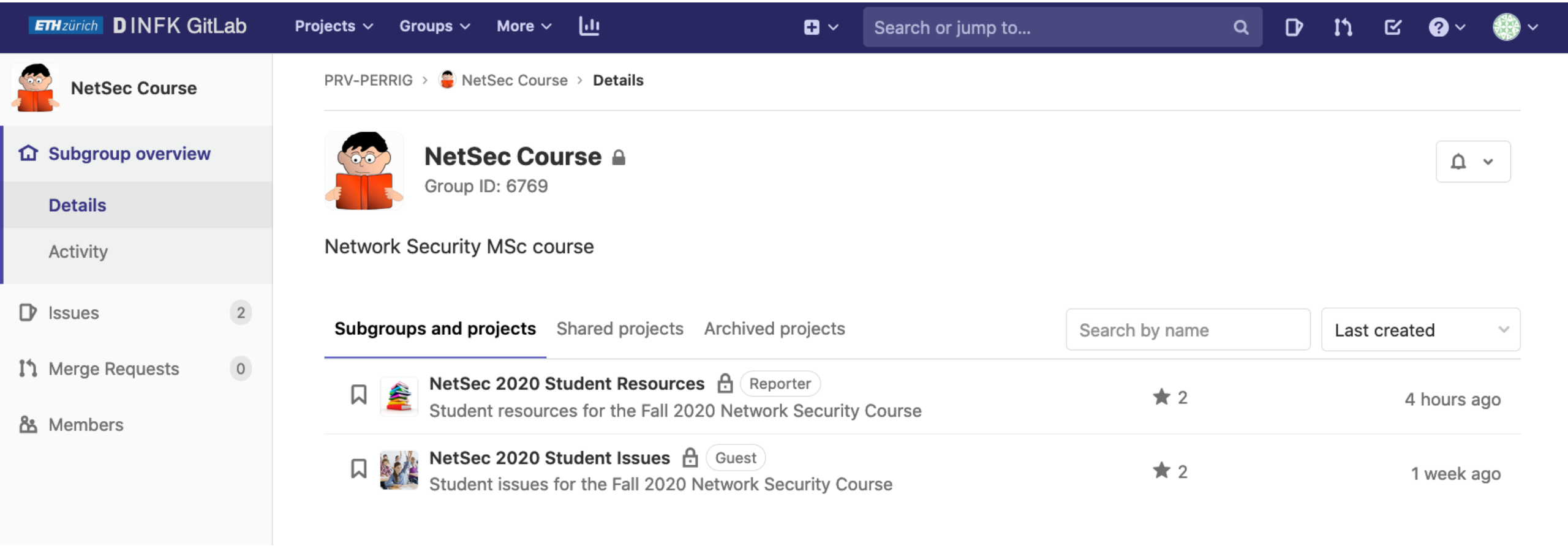
https://netsec.ethz.ch/courses/netsec-2020/

Course materials (slides, exercises, …) will be distributed through a GitLab repository linked to on this page. Course registration is required for access.

Lecture recordings will be distributed through the ETH video portal.

Remote questions: https://course.netsec.inf.ethz.ch/questions

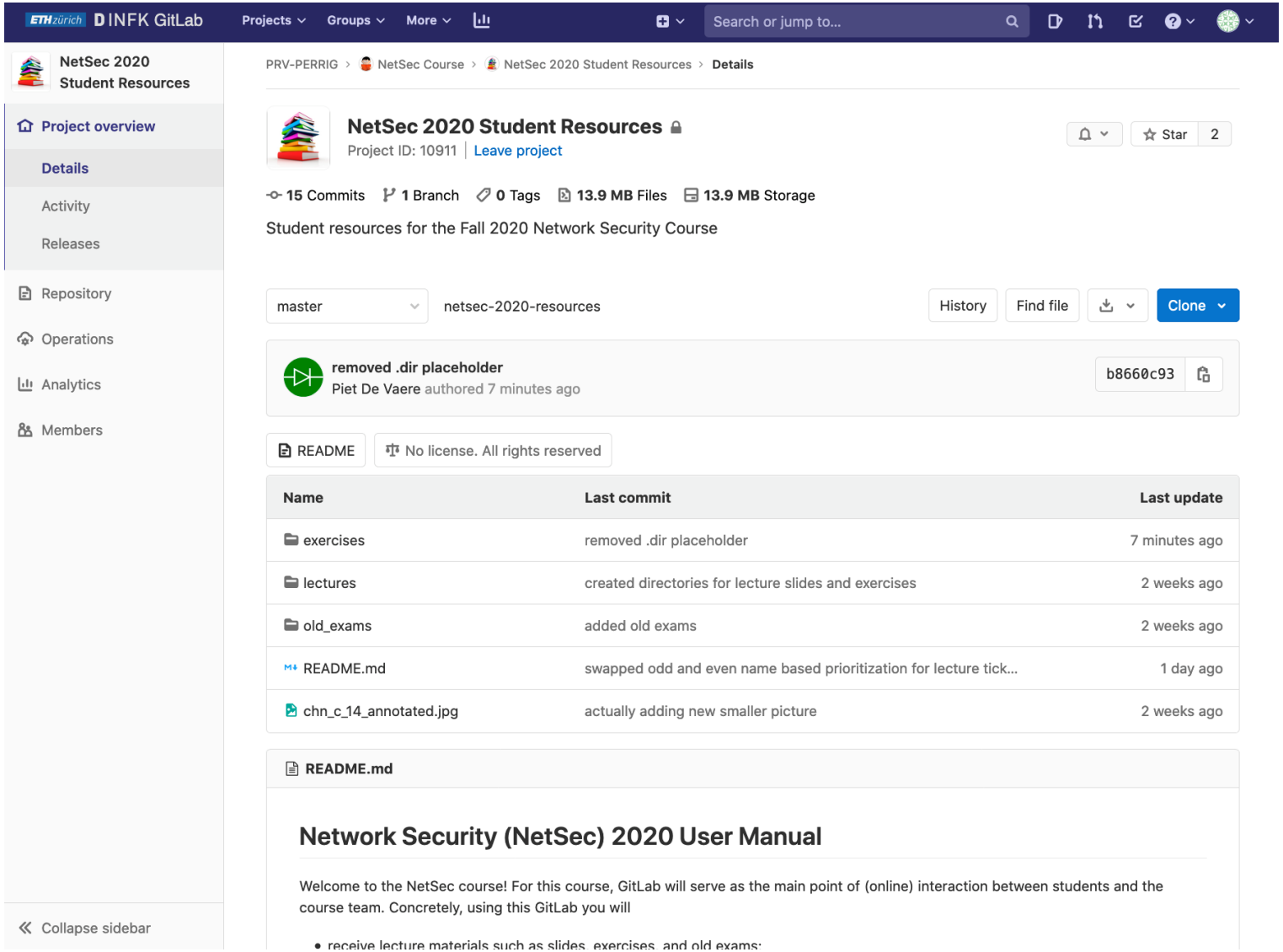
GitLab



We use the D-INFK GitLab instance: **https://gitlab.inf.ethz.ch**

Remote questions: https://course.netsec.inf.ethz.ch/questions

GitLab Resources



Slides

Exercises

Old Exams

Project Descriptions

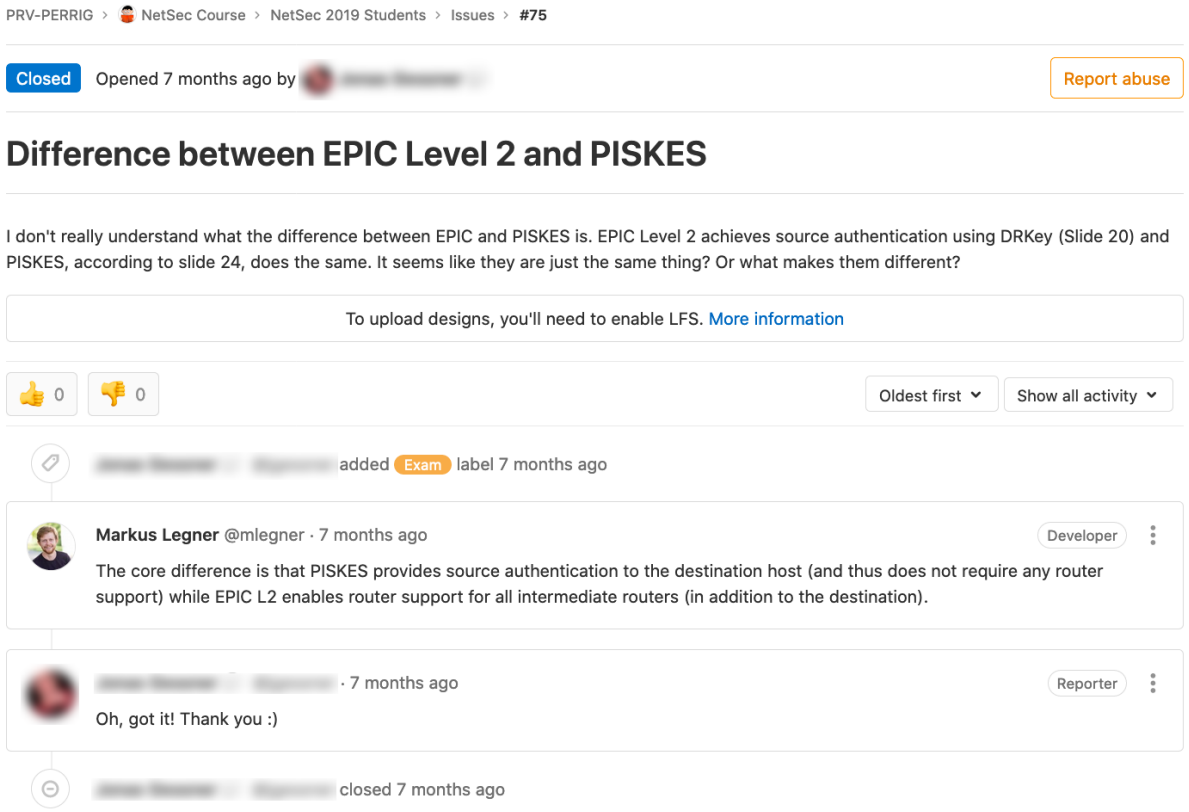
...

Remote questions: https://course.netsec.inf.ethz.ch/questions

GitLab Issues

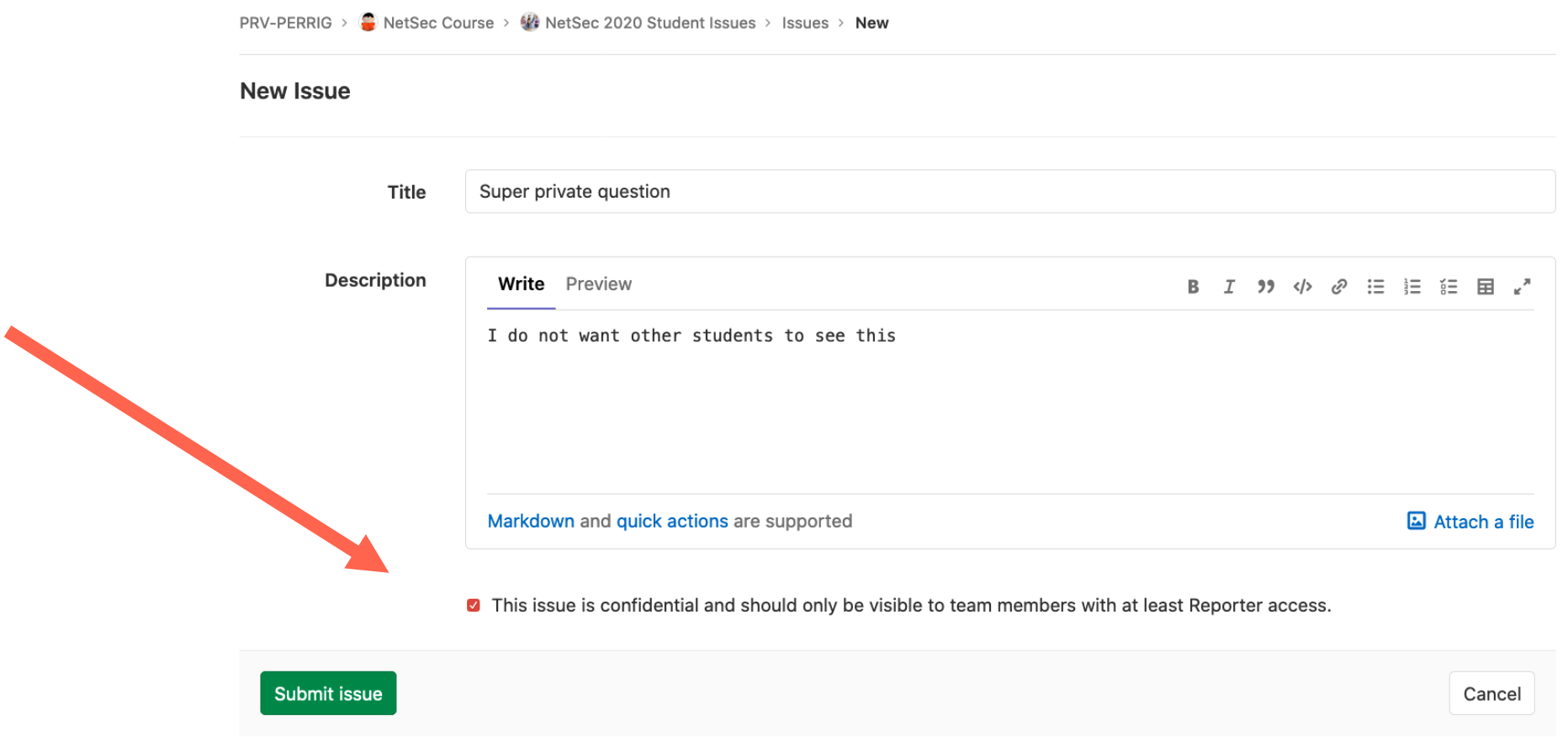
We will use the GitLab issue tracker extensively in this course:

- Lecture registration
- Questions about lecture, exercises, projects
- Administrative questions
- Handing in exercises
- ...



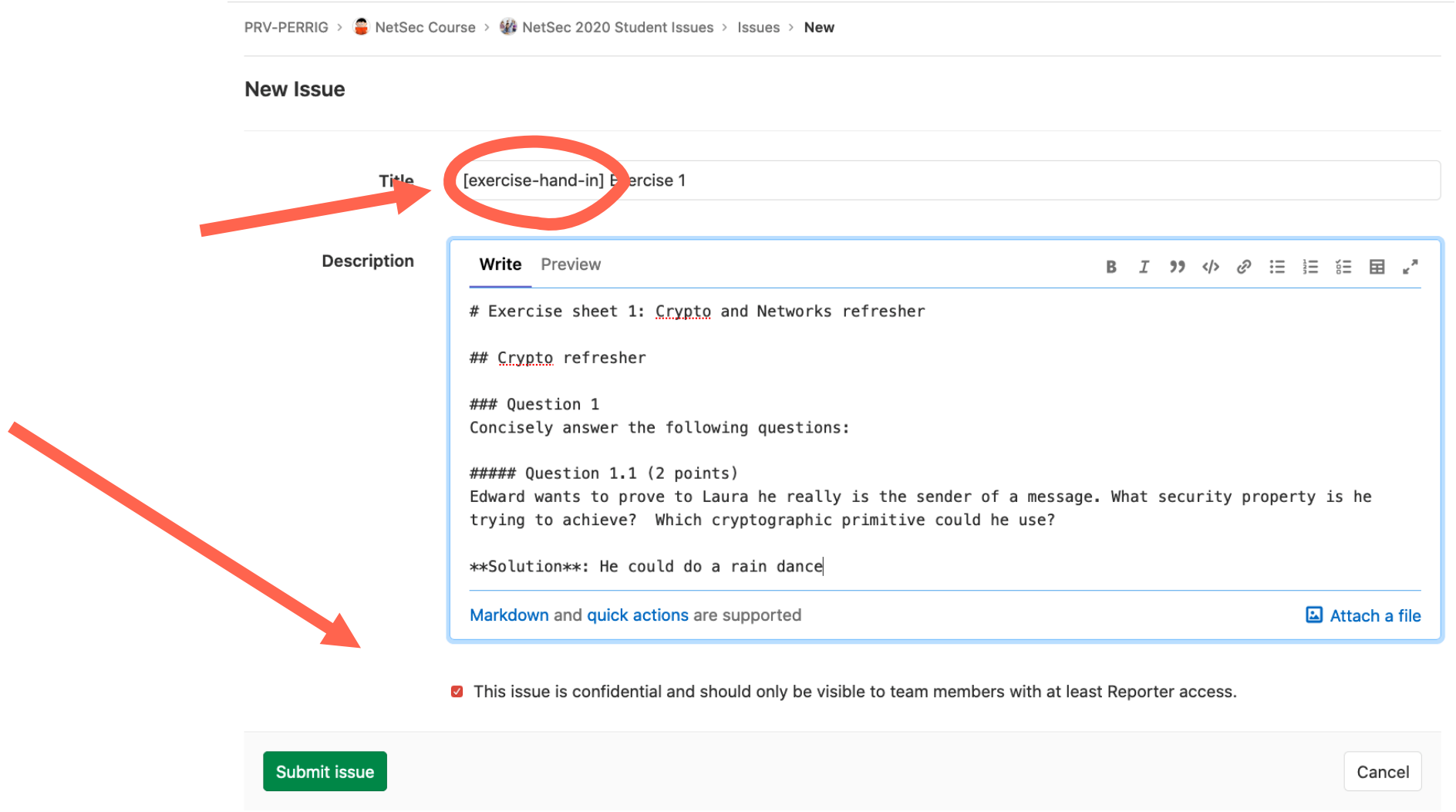
Remote questions: https://course.netsec.inf.ethz.ch/questions

Private questions through GitLab



Remote questions: https://course.netsec.inf.ethz.ch/questions

Handing in Exercises through GitLab



Remote questions: https://course.netsec.inf.ethz.ch/questions

Email

Please use GitLab issues whenever possible

and do not send us email.

Using issues allows for discussion, better tracking of questions, and more transparency!

Hacking Lab

- Students can autonomously solve challenges on hacking lab.
- Solving the challenges is NOT mandatory and does NOT influence the final grade. Solving the challenges will provide some practical experience and may help with the exam.
- Hacking Lab will be explained more in detail in an exercise session.

Projects

- There will be two projects
- The projects are mandatory and individual
- 20 % of the final grade will be determined by the projects
- Each project has an equal weight

- ACME Project:
  - Implement an Automatic Certificate Management Environment (ACME) client

- Defend-the-Flag Project:
  - Diagnose and patch a vulnerable server

- More information will follow in the exercise session.

Exam in January/February

- **Time:** Written exam, 120 minutes
- **Language:** Q: English, A: German or English (your choice)
- **Exam materials:** No extra materials are permitted
- **Exam coverage:**
  - Lectures, guest talks, exercises, projects
- **What and how we assess:**
  - We cover most (if not all) course topics
  - Understanding of security concepts, techniques and attacks as well as the ability to suggest appropriate defense measures
- **The exam will probably take place on computers**

Grading

- **Exam:** 80 % of grade
- **Projects**: 20 % of grade
  - The two projects are weighted equally.
  - Not handing in a projects results in a 1 *for that project.*
  - ➔ Not handing in the projects results in a maximum score of 5.00 for the course.

Action Items for Network Security Students

- **Lecture registration** (“Einschreibung”)
  - Subscribe to “Network Security HS 2020” on https://www.mystudies.ethz.ch/

Legal use of NetSec material

- Some knowledge, technologies, code usable for attacks, it is illegal to use them for criminal activities
- It is also illegal to make available such technologies and code without proper measures
- Only myStudies-registered students have access to the course materials