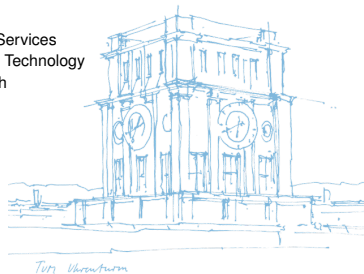


Seminar: Computer Networking and Internet

Prof. Dr.-Ing. Stephan Günther

Thursday 24th October, 2024

Chair of Network Architectures and Services
School of Computation, Information, and Technology
Technical University of Munich



Organization

- scni@hdss.cit.tum.de (only use this mail address!)
- Dr.-Ing. Stephan Günther

Overview

- Language: English
 - Paper and reviews are to be written in English
 - Talk may be in German or English
- Extent: 2 SWS, (5 ECTS)
 - $5 \text{ ECTS} \cdot 30 \text{ h} \cdot 0.75 = 112.5 \text{ h}$ of work expected from you
- Course Type:
 - For B. Sc. Students: Advanced Seminar Course (Seminar)
 - For M. Sc. Students: Master's Seminar (Master-Seminar)

First version of your paper

- Agree on the content with your advisor
 - ! Keep in touch with your advisor
- Use the provided paper template (L^AT_EX)
- Finish a preliminary version time so your advisor can give you feedback
- Your paper **must** be 4 pages of content in IEEE 2-column style (this excludes references)

Present your topic

- Choose one of {German, English}
- 15 min to 20 min talk + 5 min discussion

Peer review

- Review two papers of other participants
- Review language is English

Final version of your paper

- Use the received reviews to improve your paper
 - You may additionally request feedback from the advisor

Learning Goals of the Seminar

1. Scientific research on individual topic

- Supported by your advisor, survey literature for your topic
- Use digital (and even analog) libraries to research a given topic
- Learn to find relevant literature based on a few starting points

2. Write a scientific paper

- Learn to write a paper in \LaTeX using the given template
- Focus your research around writing the paper
- Summarize a given topic while maintaining a good structure

3. Prepare a scientific talk

- Prepare your slides using `beamerlatex`
- Manage to fit the main aspects of a topic into a given time frame

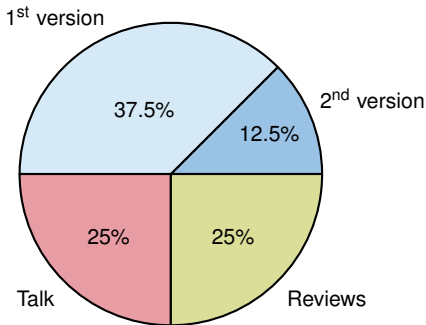
4. The peer review process

- Like in real conferences we do a peer review among all participants
- Exercise yourself on giving constructive feedback
- Critique others, giving hints on how to improve

	Dates
Topic presentation	24.10. 17:00:00
Send topic preferences	Until 01.11. 23:59:59
Pick up literature from advisor (by mail if needed)	Until 12.11.
Two advisor meetings suggested	In time before 1st deadline
1.) Discuss literature	
2.) Discuss structure and draft	
Final slides discussion with advisor (slides must be presentable)	Until 1 week before your talk
Upload paper, 1 st version	17.12. 23:59:59
Talks	tba
Upload reviews	tba
Upload paper, 2 nd version	tba

In red: hard deadlines or mandatory events

1. Your paper submissions (50 %)
 - 1st version: 37.5 %
 - 2nd version: 12.5 %
2. Your talk, 15–20 min (excluding discussion and feedback) (25 %)
3. Your two reviews of assigned other submissions (25 %)



- First version of paper must be acceptable
 - Grade worse than 4.0 \Rightarrow disqualification (seminar graded as 5.0)
 - Less than 3.5 pages text in the seminar template \Rightarrow disqualification (length of text \in [3.5, 4.25] pages)
- Observe the (hard) deadlines
 - Advisor meetings are compulsory
 - You are provided with git repositories to check in your work and submissions
- No submission
 - 1st version of paper \Rightarrow disqualification (seminar graded as 5.0)
 - Other submissions \Rightarrow grade 5.0 for the concerning part
- Write the paper yourself
 - Plagiarism \Rightarrow disqualification
 - ! Attempted cheating will be reported to the examination office
 - Summary when and why to cite: <https://mediatum.ub.tum.de/1225458> (citation guide)
- Absence during talks without valid excuse
 - 0.3 degrading per missed talk on your presentation grade
 - Talk graded worse than 4.0 \Rightarrow disqualification (seminar graded as 5.0)

- Advisors hand out topics within their research area
 - They have broad knowledge about the context of your seminar topic
 - Use them as a source for hints regarding starting points
- Your task is to autonomously research a given topic and produce a paper
 - Your advisor is not responsible for any of your tasks
 - You may ask them for input, but they will not do any of the work
- Adhering to the deadlines is your responsibility
 - Your advisor will not remind you
- Your advisor can give you feedback
 - Ask for feedback about your first paper version, the peer reviews, your slides for the talk, etc

- Prepare your talk

Finished slides shall be discussed with your advisor 1 week before the talk
Advisors may offer the opportunity of rehearsal talks

- Present your research

Present the main results & give an interesting talk

- Session chair for one talk

Introduce the speaker and keep track of the time constraints
Get the discussion started after the talk

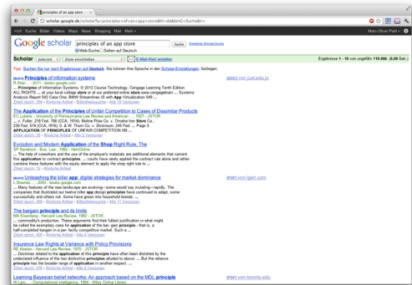
- Mandatory attendance in all sessions

If you cannot attend for a good reason, contact scni@hdss.cit.tum.de **in advance**

! Attending the talks is mandatory for passing the course

- You get some literature or hints where to start from your advisor
- This is just to get you started
- Find appropriate (scientific) sources yourself

- scholar.google.com
- scopus.com
- acm.org
- ieee.org
- semanticsscholar.org
- Your sources' sources
- ...



TUM provides access to non-free papers via eaccess.lib.tum.de. Additionally, most publishers have an institutional login in which TUM participates.

You will use the LRZ Gitlab to make your submissions. Everything has to be **committed and pushed** before the deadlines.



GitLab

- Continuously commit your changes:

1. `git add <your file>`
2. `git commit`
3. `git push`

! Do not commit any built files (e. g. use `.gitignore`)

! Do not commit files like `final_version.pdf`

! Do not duplicate directories (e. g. for the second version) → Git keeps track of the versions

! **Always** stick to the given directory structure!

- We setup a Gitlab CI to automatically compile your \LaTeX code

! We use the last commit **before** the relevant deadline as your submission

How to get access?

- To set up a repository and the according permissions, we have to connect your matriculation number to your LRZ ID
- For this we have a web service:

<https://scni.net.in.tum.de/2024ws>

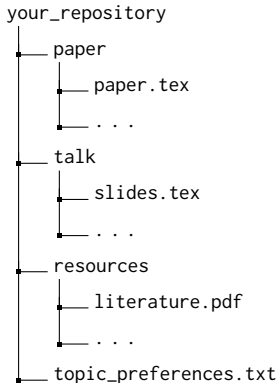
- The website will ask you to login both into TUMonline and Gitlab
- Once successful, you are granted access to the required git repositories
- If something persistently fails, let us know so that we can help you

All repositories are contained within the following Gitlab group:

[tuinh09/teaching/scni](https://gitlab.com/tuinh09/teaching/scni)

You will receive access to two repositories:

1. Material repository
 - Contains slides and templates
2. Working repository
 - Everything related to your paper and presentation
 - Only you have access
 - ! Keep the repository clean!



Directory structure of your repository

- Follow this structure, otherwise
 - ⇒ we cannot build your source files
 - ⇒ we cannot collect your submissions
- You **shall not** push any other directories
- Use the provided templates, including Makefiles
- Make sure that your \LaTeX code compiles
- You are only allowed to push to the main branch

directory

/paper	source files of your paper
/talk	source files of your slides
/resources	literature and any other material

Files you add to your repository

- `.gitignore` in the paper and talk directory. Use `git add -f` to add hidden files.
- `.tex`, `.txt`, `.png`, `.jpg` files which are either text-based or do not change (e.g. imported images)
- your literature as `.pdf`
- all files required to build your paper/slides

Files we **do not** want to find in your repo

- the compiled versions of your paper and slides: `paper.pdf` `slides.pdf`
- anything within a build directory
- temporary files like `.swp`, `.pyc`, `.synctex.gz`, `.aux`, `.bbl`, `.blg`, `.log`, ...
- `.pdf` files from your stand-alone figures

Gitlab CI

- We setup an automatic build service for your \LaTeX code
This gives you feedback, if your code compiles
- Make sure that each of your final submissions compiles!

Stages

1. Verify directory structure

This stage checks the directory structure in your repository and fails when there are any violations. Have a look at the output to identify what is wrong.

2. Build paper and slides

This stage simply calls the Makefile for the paper and slides directory and uploads the resulting PDFs as artifacts.

The screenshot displays the GitLab CI interface. On the left sidebar, the 'CI/CD' section is highlighted with a green box, and a green arrow points to the 'Jobs' sub-section. The main area shows the log output for a job named 'build_paper'. The log contains various LaTeX warnings and messages, including 'Underfull \hbox', 'Overfull \vbox', and 'LaTeX Font Warning'. A red box highlights the log content. On the right, the 'Job artifacts' section is highlighted with a blue box, and a blue arrow points to the 'Download' button. The job status is 'succeeded'.

```
65 []\T1/ptm/m/n/10.03749 Between two head-lines sub-or-di-nate, e.g.
66 []
67 Underfull \hbox (badness 3803) in paragraph at lines 175--179
68 \T1/NimbusMonoM/n/n/10.03749 \section \T1/ptm/m/n/10.03749 and \T1/NimbusMonoM/n/10.03749 \subsection\T1/pt
m/m/n/10.03749 , there must be
69 []
70 Underfull \hbox (badness 4621) in paragraph at lines 185--188
71 []\T1/ptm/m/n/10.03749 Subordinate clauses start-ing with ``be-cause'',
72 []
73 Underfull \hbox (badness 2393) in paragraph at lines 188--196
74 []\T1/ptm/m/n/10.03749 Figures, Ta-bles, Sec-tions etc. are con-sid-ered
75 []
76 --
77 Overfull \vbox (0.5404pt too high) has occurred while \output is active []
78 [3 </builds/netintum/teaching/iitm/repos/2022ss-bs/u230/paper/pics/example.png> </builds/netintum/teaching/i
tm/repos/2022ss-bs/u230/paper/figures/example.pdf>] (.paper.aux)
79 LaTeX Font Warning: Size substitutions with differences
80 (Font) up to 3.24345pt have occurred.
81 )
82 awk: cmd. line:1: warning: regexp escape sequence `\' is not a known regexp operator
83
84 Uploading artifacts for successful job
85 Uploading artifacts...
86 paper/paper.pdf: found 1 matching files and directories
87 Uploading artifacts as "archive" to coordinator... 201 Created id=3820919 responseStatus=201 Created token=5
C6ozhu_
88
89 Cleaning up project directory and file based variables
90
91 Job succeeded
```

Here you can find a list of all pipelines and jobs.

Here you find the log output of the executed job. In case of a failure, you can start here searching for the error.

Here you can download the job artifacts, i.e. the compiled PDFs.

Plagiarism is the act of taking the writing of another person and passing them off as one's own.¹

- ! Correctly cite any resources to avoid plagiarism
- ! Avoid verbose citations entirely. If necessary, use correct direct quotation with proper citing
- ! Copying from blog posts, videos, or other sources is plagiarizing
- ! Consequences will be the exclusion from the seminar and a grading with 5,0U

package occurs. In [4], a new interesting innovation that this algorithm brings, is a new recovery strategy is mentioned. An intermediate node may detect a disconnection with the next forwarding node due to high mobility, which indicates the failure of the discovered path. In this case, RGR switches to GGF mode and forwards the packets to the closest neighbor UAV until the destination UAV is reached. If GGF fails to transmit the next forwarding UAV, the packet will be dropped. In parallel, a Route Error (RERR) will be sent to the previous node until reaching the source node. If the source UAV has more data packets to transmit, it initiates a new path discovery so as to create a new reactive path to the target destination. In [4] are also mentioned some advantages and drawbacks of using this routing protocol:

From 4

The novelty in RGR is that the geographic position of the destination UAV D is cached in the routing table (maintained periodically based on Hello packets) of each intermediate UAV traversed by the RREP packet when it is sent back to the source. As a recovery strategy, an intermediate node may detect a disconnection with the next forwarding node due to high mobility (see Figure 6(b)), which signifies the failure of the discovered path. In this case, RGR switches to GGF mode and forwards the packets to the closest neighbor UAV to UAV D until reaching it. If GGF fails to find the next forwarding UAV, the packet will be dropped. In parallel, a Route Error (RERR) will be sent to the previous node until reaching the source node. If the source node has more data packets to transmit, it initiates a new path discovery so as to create a new reactive path to the target destination.

Seminar paper

Related literature

¹ From the TUM's Student Code of Conduct



- Even if GPT's output is not someone else's work, it is not yours either
- Even worse, there is no guarantee that the output of GPT is correct as regards content
- We also apply tools to detect GPT produced text

Caution!

We have a zero tolerance policy regarding academic misconduct!

If we find out (and we will) it will be reported as 5,0U!

Do not risk your entire studies!

- I have never worked with \LaTeX , can I write the paper with Word?

No, we expect you to acquire basic \LaTeX skills within the seminar to finish both the paper and the presentaion slides.

- Can I use Git and Makefile on Windows?

We recommend to use a Linux System (or Mac), but Windows 10/11 [WSL](#) will do

- How can I check if all files are uploaded correctly?

Freshly clone your repository into an empty directory and check if all files are there.

- Help, my \LaTeX code does not compile anymore and I have no idea what the log output wants to tell me.

Try to comment out scope by scope to localize the source of the error. Additionally, consult the git history (`man git-diff`)

In general, write emails only to
scni@hdss.cit.tum.de

(1) Media Access Control – CSMA/CD in Today's Ethernet

- Introduction of CSMA
- Historic overview / maybe comparison to Token Passing / 5-4-3 rule
- Switching and micro segmentation in today's Ethernets

(2) Media Access Control – CSMA/CA in Wireless Networks

- Differences between CSMA/CA and CD
- Distributed Coordination Function
- Acknowledgements and Hidden Station Problem
- Point Coordination Function and relaxation of basic media access strategies

(3) Switching and redundancy on layer 2

- How switches work
- Spanning Tree Protocol
- Fail-over and loop detection
- Learning phases of switches / port states

(4) Interior Gateway Protocols

- Distance Vector vs. Link State Routing Protocols
- Algorithms of Bellman Ford and Dijkstra
- A detailed view on RIP
 - Count to infinity
 - Convergence time
 - Solutions such as triggered updates, poison reverse etc.

(5) Policy based Routing

- Introduction to Autonomous Systems
- Border Gateway Procol
- Fundamental differences to IGPs
- Attacks on BGP, political influences

(6) Moving from IPv4 to IPv6

- Basics of IPv4 and IPv6 from a high level view
- Subnetting
- Address shortage regarding IPv4
- Multicast in IPv6, ICMPv6
- Mapping of MAC addresses / privacy

(7) Networks with different purposes: Storage

- Difference between regular networks and SAN
- Fibre Channel (FC), Fibre Channel Protocol (FCP), FCoE
- (Responsibilities of) typical FC stack layers vs OSI layers
- Network Topologies (SAN vs Internet), Redundancy
- Problems different from and in common with the Internet

(8) TCP – Variants and Implementations-specific Differences

- Brief introduction to Transport Layer Protocols
- Flow control and congestion avoidance
- Usage of capacity
- Overview of different implementations, e.g. Reno, Cubic, BBR etc.

(9) QUIC – Shortcomings and Improvements over TCP

- Yet another Transport Layer Protocol?
- Brief introduction to UDP
- What makes QUIC an Application Layer Protocol?
- Advantages and disadvantages compared to real Transport Layer Protocols
- Future of QUIC

(10) Content Delivery Networks

- CDN: bringing the content closer to the user
- Why is the distance to the user relevant
- How is the best server chosen?
- Examples and architectures of different CDN

(11) Domain Name System – The Largest Distributed System in the World

- Resolvers and Naming Servers
- Recursive vs. iterative name resolution
- Resource records and zone files
- Delegation, glue records
- Caching
- Privacy considerations

Thanks for your time. See you soon.
Contact: scni@hdss.cit.tum.de