

# Advanced Computer Networking

## IN2097, Winter Semester 2023/24

### Exercise Procedure

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## Content of the Exercise

The instructions in this worksheet help prepare the tools necessary to participate in the ACN tutorial. The first tool presented is the version control system `git`<sup>1</sup>, which is used for the hand-in of your submissions. The second tool is Jupyter, which offers an environment for creating the actual submissions. We provide notebooks, which are processed by Jupyter and can be edited in your browser. There you have to complete problems, such as answering questions, creating short snippets of code, or plotting graphs. Additionally, we provide virtual machines (VMs) used for the exercise and the projects.

## Academic Misconduct

We check your submissions for plagiarism. Participants violating the academic code of conduct will be excluded from the bonus system.

It is allowed and encouraged to discuss the assignment with other students. However, the creation of the submission itself has to be done by each student individually. Group work is not allowed. Using Google, StackOverflow, and other Internet sources is allowed (as long as no license is violated). If your submission contains copied information, it has to be clearly marked as such, and the original source has to be referenced. For example, StackOverflow provides a share link. Use that to obtain a link, which must be added to your source code. In any case, you have to understand the code you submitted, which means you must be able to explain how it works.

See also code of conduct by the Department of Informatics:

- en: <http://go.tum.de/103707>
- de: <http://go.tum.de/750259>

## Getting Access

We provide you with Git repositories hosted at the LRZ Gitlab<sup>2</sup>. Every TUM student already has an account. Use your LRZ ID (e.g., `ga23wat`) to log in if you have never used Gitlab before to initialize your account. We have a service to link your student account to your Gitlab account. There you authenticate yourself both against TUMonline and the LRZ Gitlab. Make sure you registered for the Advanced Computer Networking course in TUMonline. Follow the steps listed below to get access to the course infrastructure:

1. Login into <https://gitlab.lrz.de> if you have never logged in before and accept the terms and conditions
2. Visit <https://acn.net.in.tum.de/auth> to access the authentication service
3. You are prompted to log in to TUMonline (make sure you are enrolled in the course)
4. Then you are prompted to log in to the LRZ Gitlab

Once you followed these steps, you are granted access to several Git repositories.

<sup>1</sup>see e.g., <http://www.ndpsoftware.com/git-cheatsheet.html>

<sup>2</sup><https://gitlab.lrz.de>

## Repositories

### Your personal repository: [read-write access]

This is your personal working repository. There you have write access on the `main` branch and you hand in your exercise and project submissions. The repository is already initialized with the correct directory structure and you are not allowed to change this structure.

### Material: [read-only access]

In this repository, we distribute course materials like lecture slides, exercise slides and solutions, and old exams. The content of the material repository is also available at <https://acn.net.in.tum.de>.

### Template: [read-only access]

This repository is used to distribute content for the exercise and projects to you. You are supposed to merge corresponding Git branches into your repository as explained below.

## Tools

To access the git repositories and to ssh into your VM you need to install tools on your local machine. For Unix-based systems there are command line clients for git and ssh available via your distribution's packet manager. For Windows we recommend using the Windows Subsystem for Linux (WSL)<sup>3</sup>.

## Uploading SSH Keys

For pulling or pushing the above repositories you can authenticate yourself with your password or a public key. Key authentication provides a more secure and convenient way. For example, you can use the following command to create an ssh key pair:

```
ssh-keygen -t ed25519 -C "ACN key" -f acn_key
```

Then upload the **public** key (in the above case `acn_key.pub`) to Gitlab <https://gitlab.lrz.de/-/profile/keys>. This enables you to clone the repositories using ssh. Note that you might need to add the generated private key to your default keys or specify it in your ssh config file:

```
Host gitlab.lrz.de
  User git
  IdentityFile path/to/your/private_key
```

---

<sup>3</sup>[https://en.wikipedia.org/wiki/Windows\\_Subsystem\\_for\\_Linux](https://en.wikipedia.org/wiki/Windows_Subsystem_for_Linux)

## Accessing Exercise and Project Materials

We use the **Template** repository mentioned above to distribute the Jupyter notebooks for the exercise and resources for the projects. For this, these materials are pushed on certain branches to the **Template** repository:

```
tutorial    for the exercise,
```

By using the following commands **within your own repository** the resources are merged into your repository and you can work on them. You will have a closer look at them in the first tutorial. For now, just copy them.

```
git remote add template git@gitlab.lrz.de:acn/terms/2023ws/template.git
git remote update
git merge --allow-unrelated-histories template/tutorial
```

For the projects, replace the branch name `tutorial` with the corresponding project branch in the third command.

## Accessing the VM

Besides the Git repositories, you will need the uploaded ssh keys to access the virtual machine we provide. It can be used for the exercise and is required for the projects. We extract your uploaded keys from Gitlab and add them to the authorized keys to the VM. Every time you upload a new key to Gitlab, which you want to use for ACN, use the authentication service explained above (<https://acn.net.in.tum.de/auth>). Then we extract your new key(s).

Once this is done, use the following command to boot your VM:

```
ssh svm@acn.net.in.tum.de
```

Make sure you use the correct key (i. e., create an entry in your ssh config). After some time, you should see on the console which VM is assigned to you including its ssh fingerprints. For example, the VM domain name could look like:

```
root@svm1010.net.in.tum.de
```

You have `root` access on the VM and can log in with your uploaded keys. The VM is shut down again after 12 hours of inactivity, and needs to be rebooted afterward.

## Using Jupyter Notebook

The exercises are done using Jupyter notebooks, which can simply be accessed with your browser. You receive the empty notebooks from the **Template** repository following the above steps. Then you can either execute them locally or on the VM. For the VM, you can follow these steps:

1. Copy your repository to the VM (e. g., use scp or rsync)
2. Create an ssh tunnel to your VM with  
`ssh -L 1337:localhost:1337 root@<VM NAME>.net.in.tum.de`
3. On the VM, start the Jupyter notebook process with `jupyter notebook`
4. Then you can access it on your browser on the address <http://localhost:1337/>