DAT151
Database and System Administration

Spring 2026

Assignment 0

No deadline, but has to be done before obligatory assignment 1.
No report to hand in for this assignment.

Observe: Before you modify an existing configuration file, save a copy of the original somewhere on the computer, e.g. below /root/origs.

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Before installation

Read the lecture notes about installation before starting this task.

Choose a machine in the lab and use the same machine for the entire course. You should put a label on the computer with your name, and *DAT151 Spring 2026*.

It is possible to use your own PC for this course, but some of the later tasks require access to two computers in the same local network.

You should install AlmaLinux 10. If you choose another Linux distribution, you be warned that the lecturers are best able to help you if you choose RedHat or a RedHat clone (e.g. CentOS stream, Rocky or AlmaLinux).

The official ISO-images for installing AlmaLinux 10.1 can be found e.g. here. Use the image *AlmaLinux-10-latest-x86_64-boot.iso*. Alternatively, you boot from a live media with AlmaLinux 10 and and do the install.

See the lecture notes on installation on how to transfer a disk image to an USB stick.

Most of the machines in the lab already has MS Windows installed. You should delete the windows partitions and also any prior Linux installation, but not an AlamLinux system installed for the spring of 2026. If the computer already has an AlamLinux system installed for the spring of 2026, pick another computer or ask the lecturer.

If you keep the MS Windows installation, the machine must be set up with dual boot, running both MS Windows and AlmaLinux.

Installation

Some important points (read all before you start installing) are given below.

Firmware and boot

You should choose UEFI-boot for the Linux installation.

Plug in the USB stick with AlmaLinux, turn on the computer and press F9 to select the boot media.

- Choose the USB pen.
- Select Install AlmaLinux 10.1.
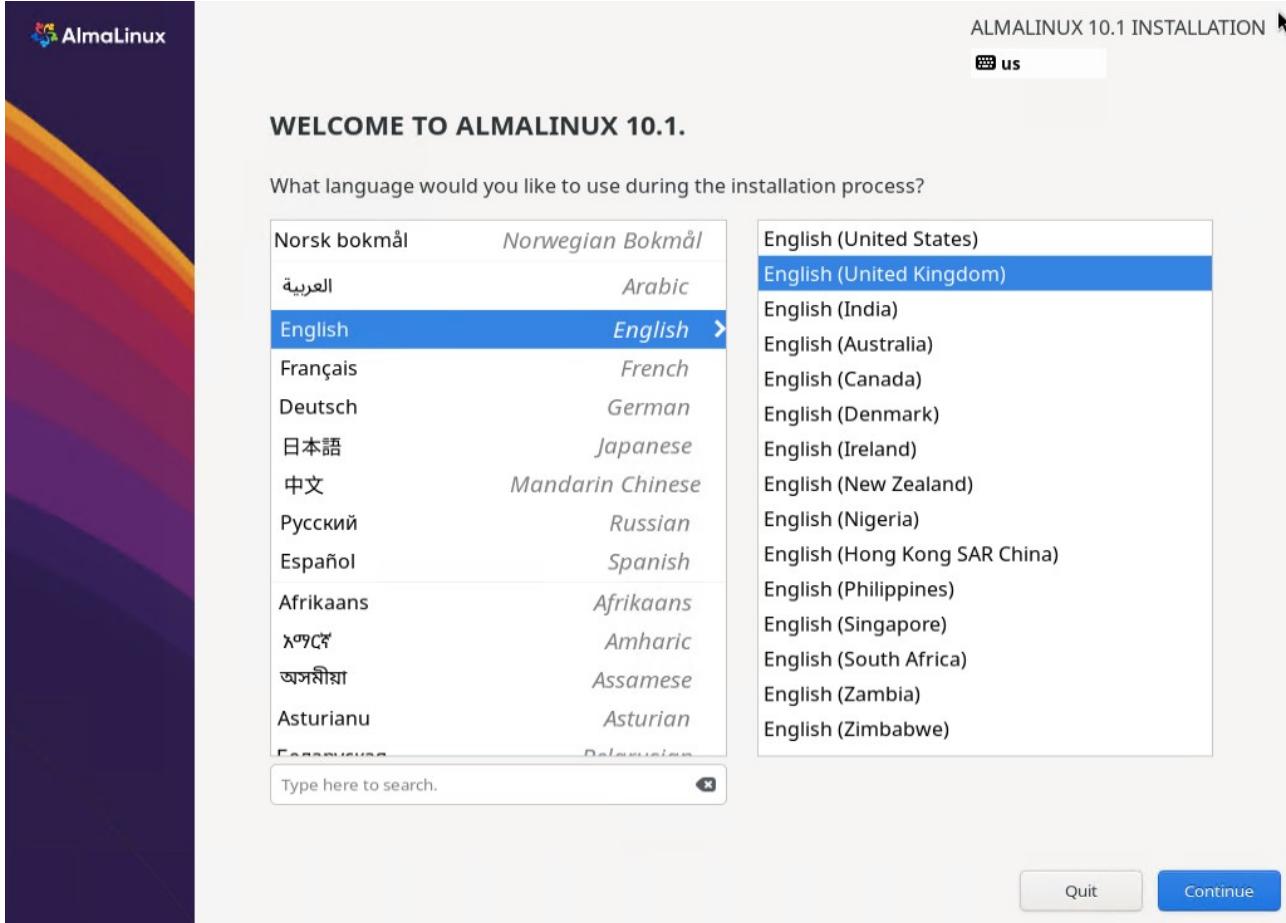
The illustration below show the GRUB boot screen.

The installer will start after selecting an entry in the above GRUB window. Statup of the installer will take some time.
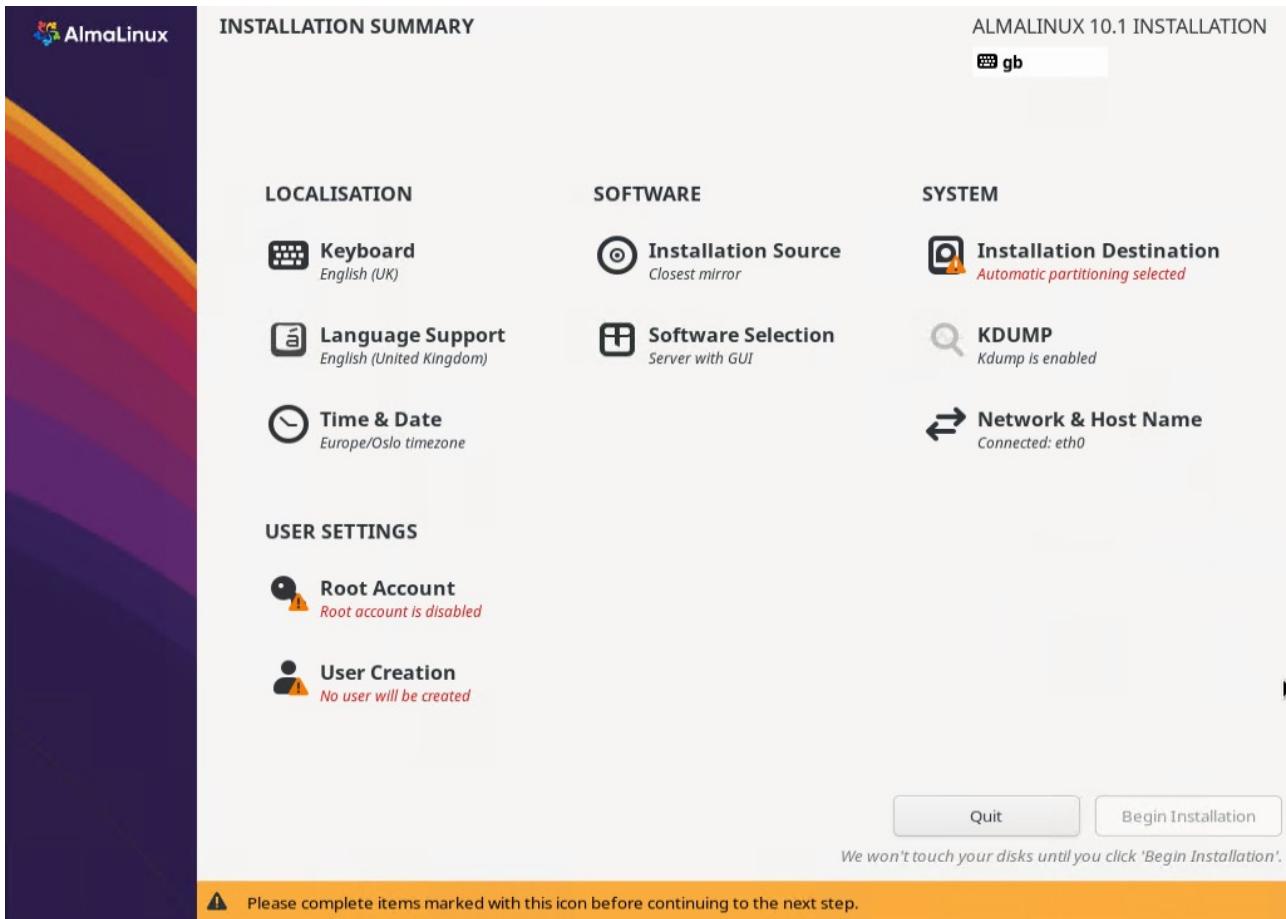
Language for the installation

Next, the installer will open a window for selecting the language to be used during the installation. This does not need to match the language support that is later installed on the computer.

Installation Summary

The installer will open the *Installation Summary* window shown below.

You do the:
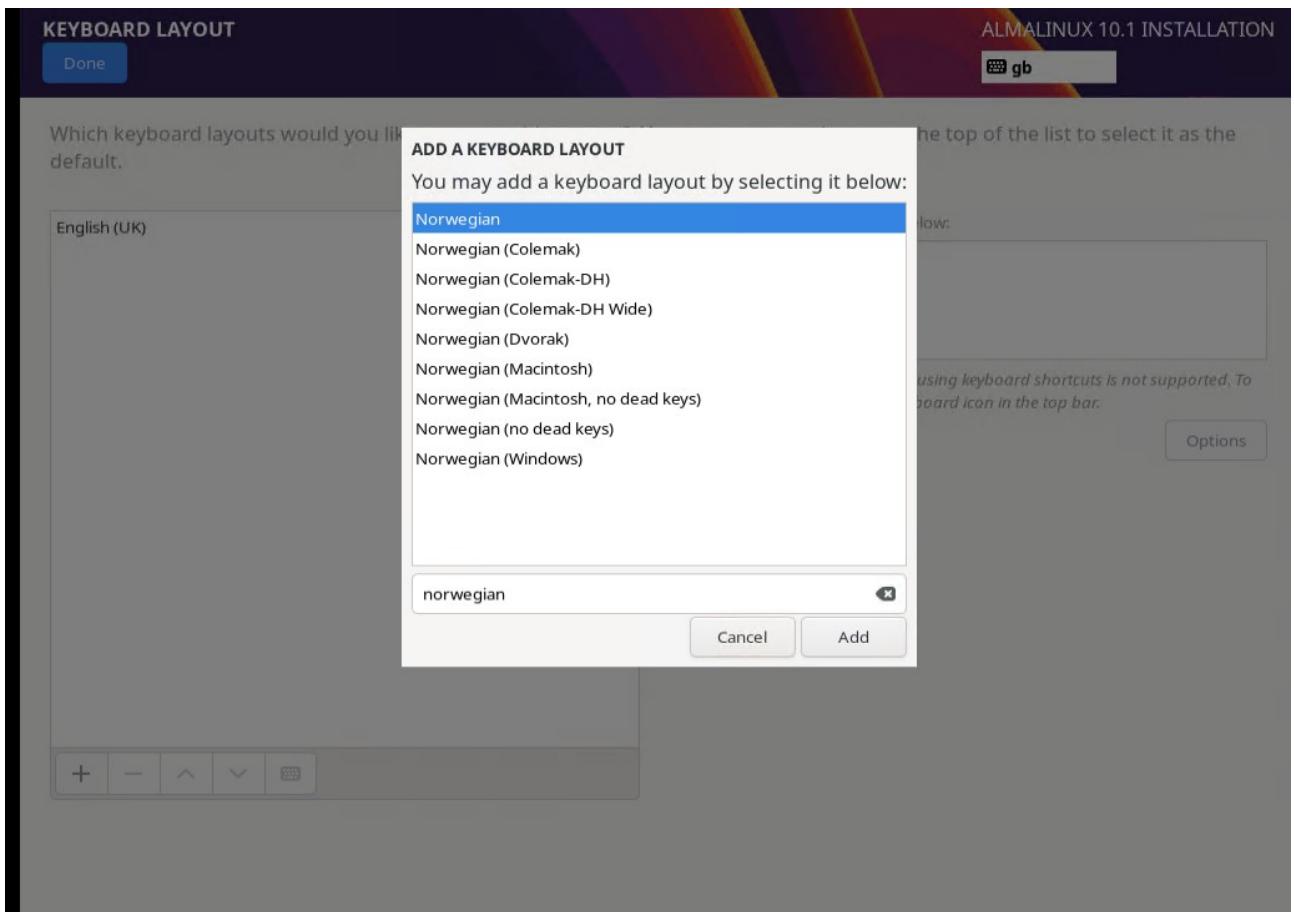
- Keyboard
- Installation Destination
- User Creation
- Root Account
- Network & Host Name

You can do the:
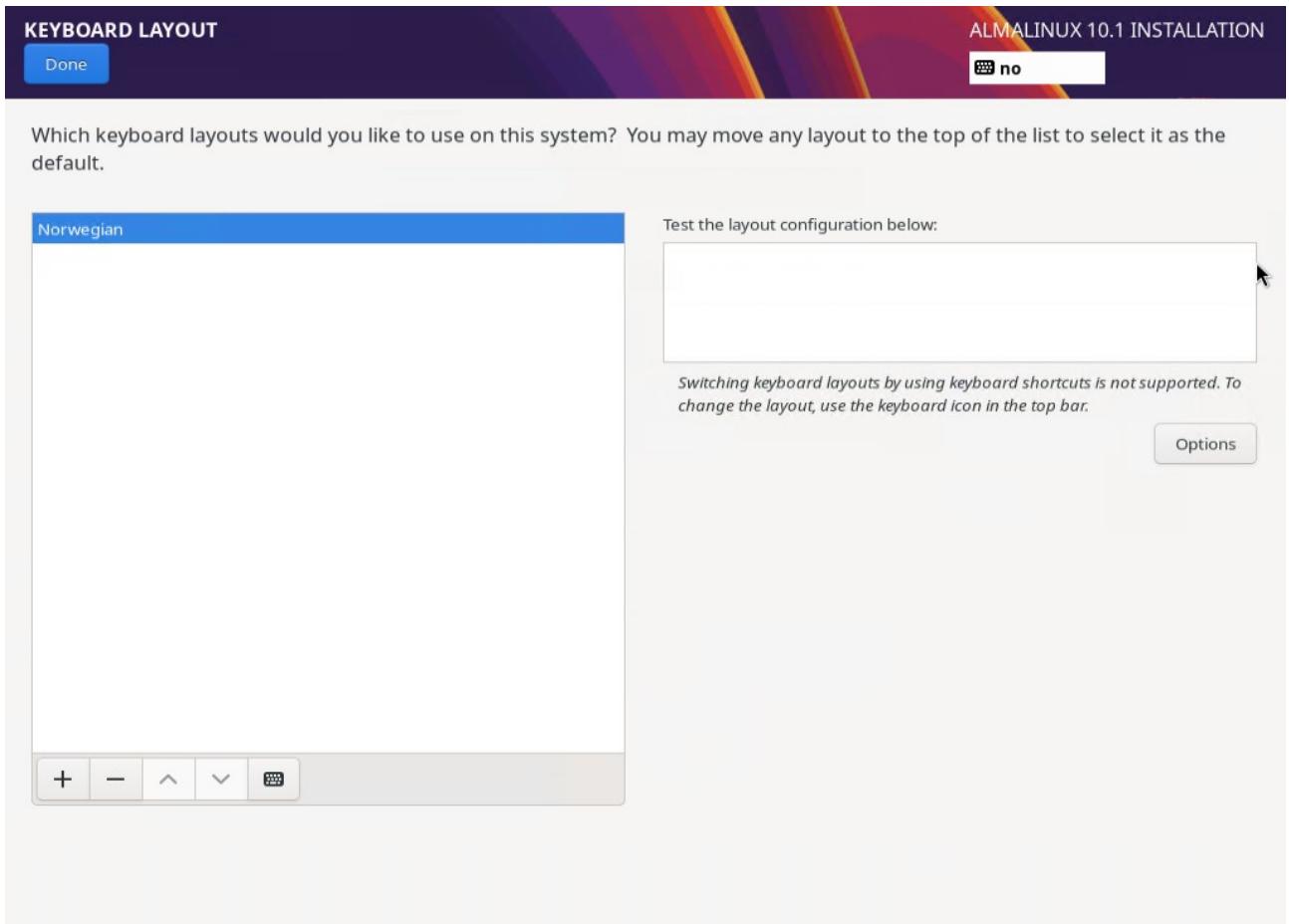
- Software Selection
- Language Support

Keyboard

You must select or add a Norwegian keyboard. The lecturer can only help you at the lab if the keyboard layout matches the real hardware keyboard. You can add additional keyboard layouts.
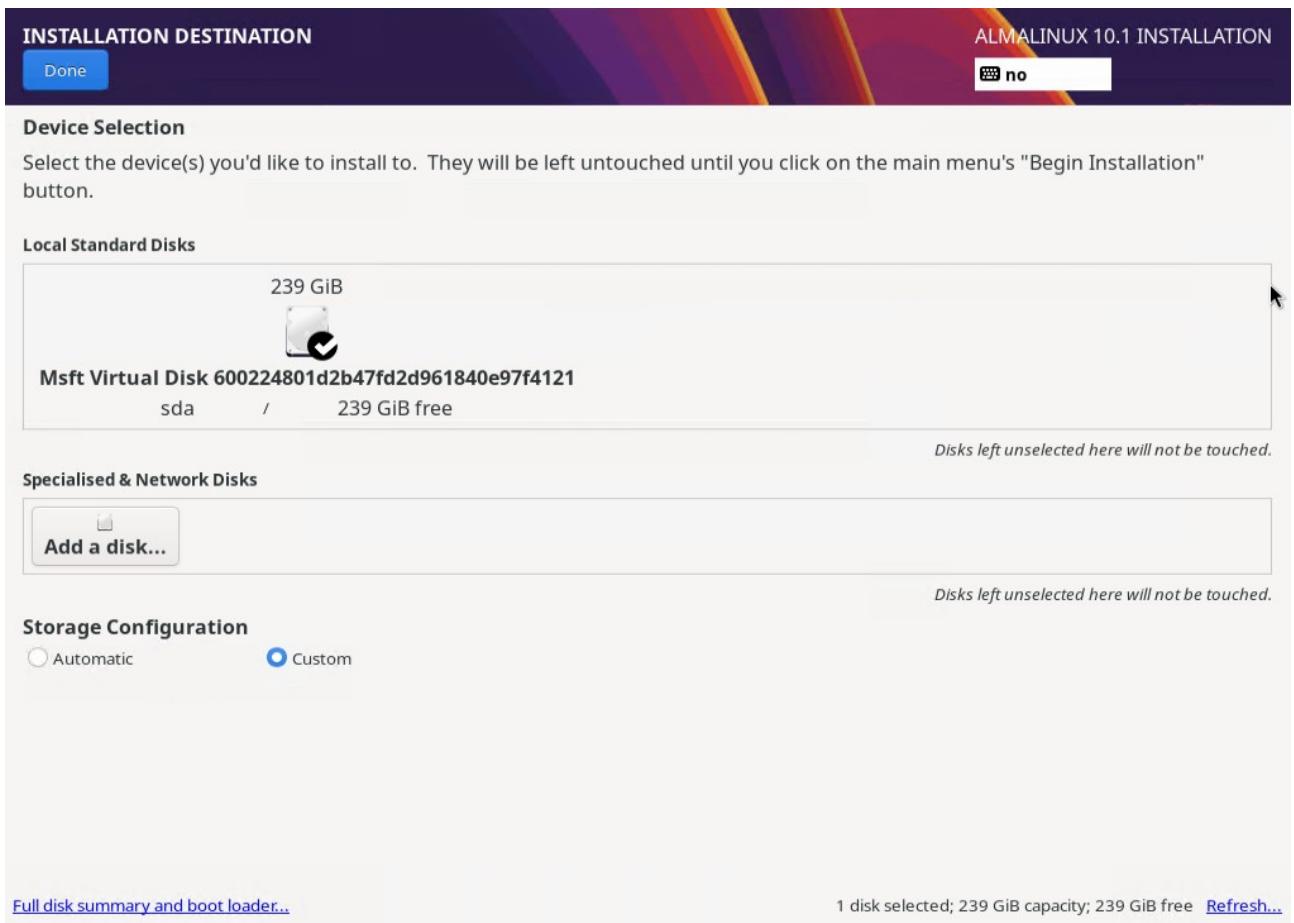
The *Keyboard Layout* window should than include a Norwegian keyboard.
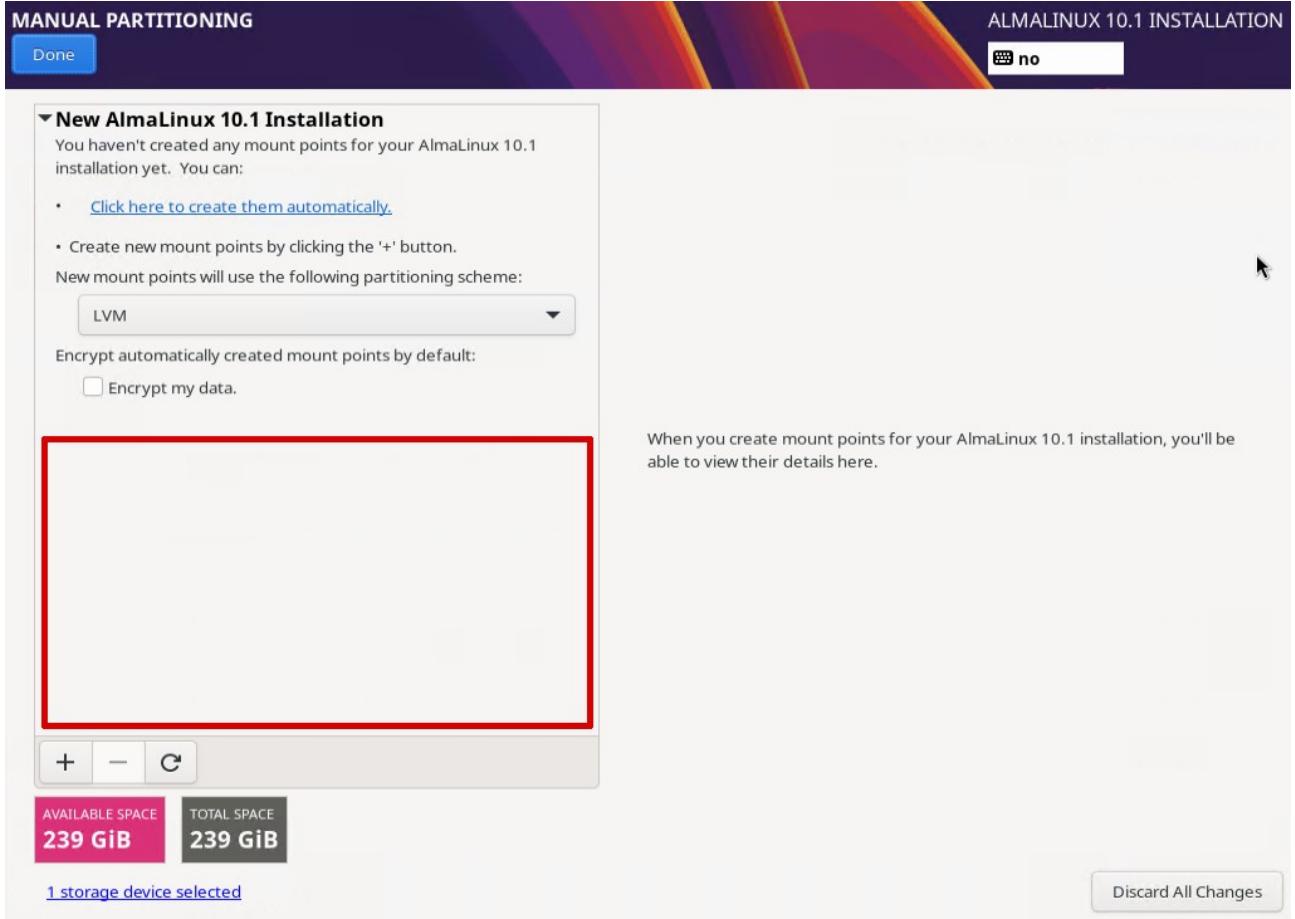
Installation Destination

Select *Installation Destination* to specify the disk layout. Partition the disk manually to make sure that you get the right structure on the disk for use with DAT151:

For "Storage Configuration", choose *Custom* at bottom left. Then click *Done* top left in window.

Done

⌨ no

Device Selection

Select the device(s) you'd like to install to. They will be left untouched until you click on the main menu's "Begin Installation" button.

Local Standard Disks

239 GiB

Msft Virtual Disk 600224801d2b47fd2d961840e97f4121
            sda   /   239 GiB free

Disks left unselected here will not be touched.

Specialised & Network Disks

☐ Add a disk...

Disks left unselected here will not be touched.

Storage Configuration

○ Automatic   ● Custom

Full disk summary and boot loader...   1 disk selected; 239 GiB capacity; 239 GiB free   Refresh...

The window for Manual Partitioning can add and remove disk partitions.

The red border outlines the regions where already existing partitions are displayed. Any existing Windows partitions will be listed with header *Unknown*.

You should delete all Windows partitions before continuing. Select a Windows partition and press the "-" button. The installer will ask if you wish to delete all partitions of the unknown system. You can answer yes, but this will not delete the EFI partition. The installer will only delete the EFI partition if this is the only partition to delete.

With all prior partitions gone, click the option "Click here to create them automatically". This should propose a disk layout as shown below.

For a later assignment, the AlmaLinux system will need 10GiB of free space, but the partitions suggested by automatic partitioning will reclaim all disk space. Therefore delete and recreate the root partition ("/") and/or "/home" using less disk space.

You final system should have the following partitions:
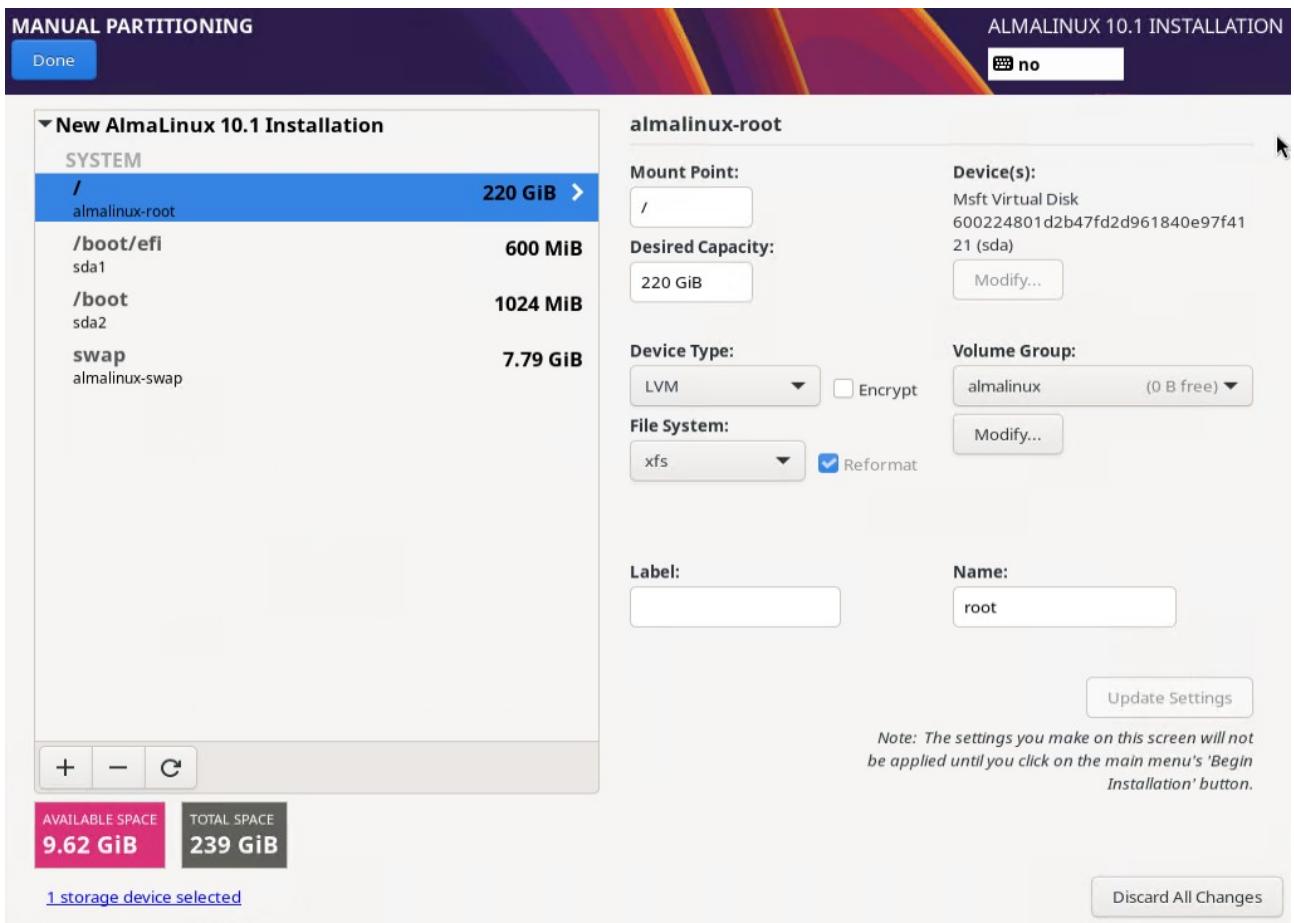
- /   Root system, approximately 220GiB
- /boot   *N*ecessary if LVM, keep as suggested (1024MiB)
- /boot/efi   ESP partition, needed for UEFI-boot, keep as suggested (600MiB)
- swap   Swap partition, 1-2 times physical memory, keep as suggested (7,79GiB)

You may also add other partitions, e.g. for "/home" or "/var". A "/home" partition is usually not needed on a server type machine. If adding a "/home" partition, reduce the size of the root partition "/" accordingly.

You can use LVM for the all partitions, except for "/boot" and "/boot/efi".

If deleting the "/home" partition, the size of the root partition can be set to 220GiB leaving approximately 10GiB of free space. The red boarders outline the field where to set the new size and the button that will then update the partition size.
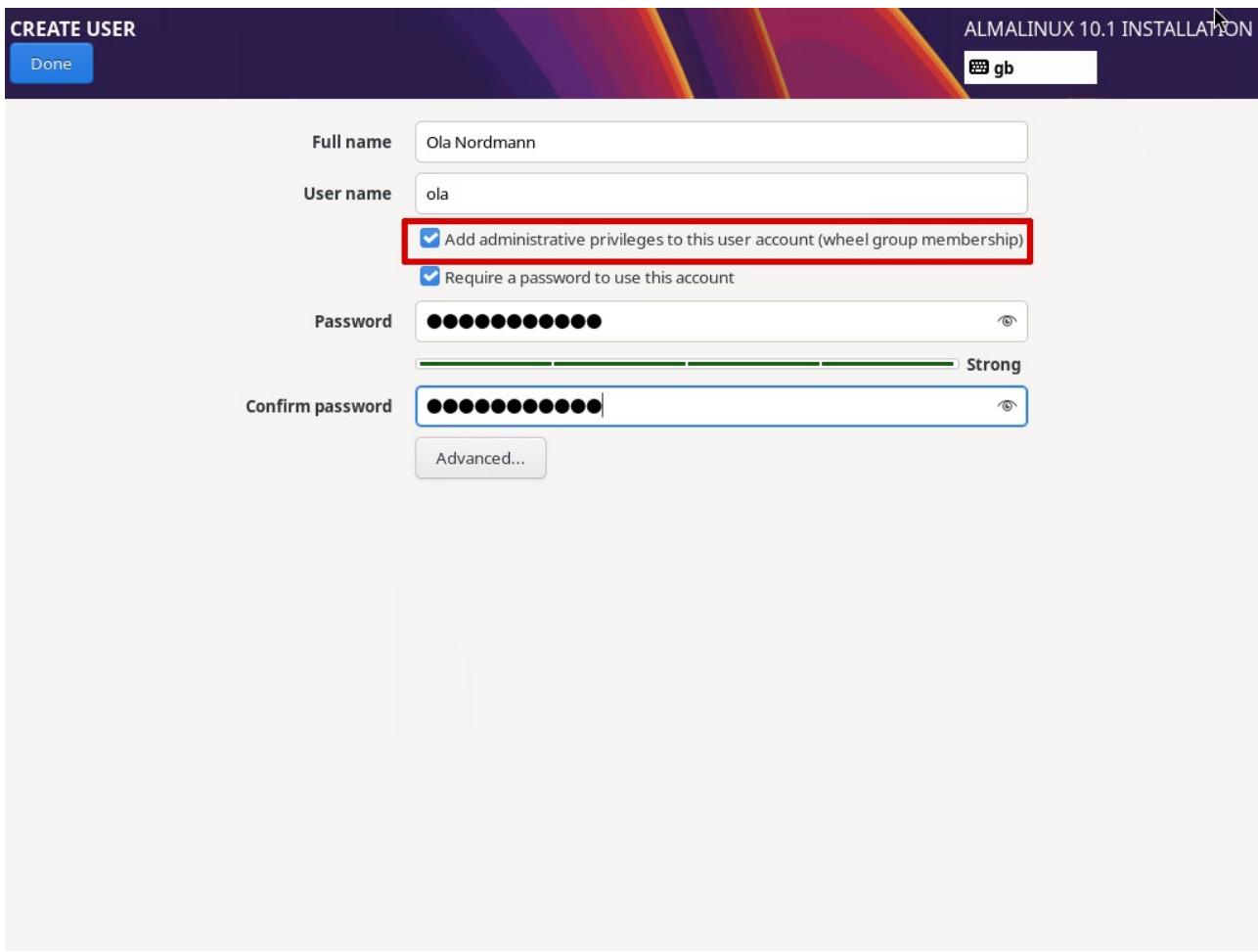
The illustration below shows the final result.

Click the button *Done* create the prosed layout on the disk.

User creation

Normal work on the computers should be done as a regular user. Therefore, create a regular user.
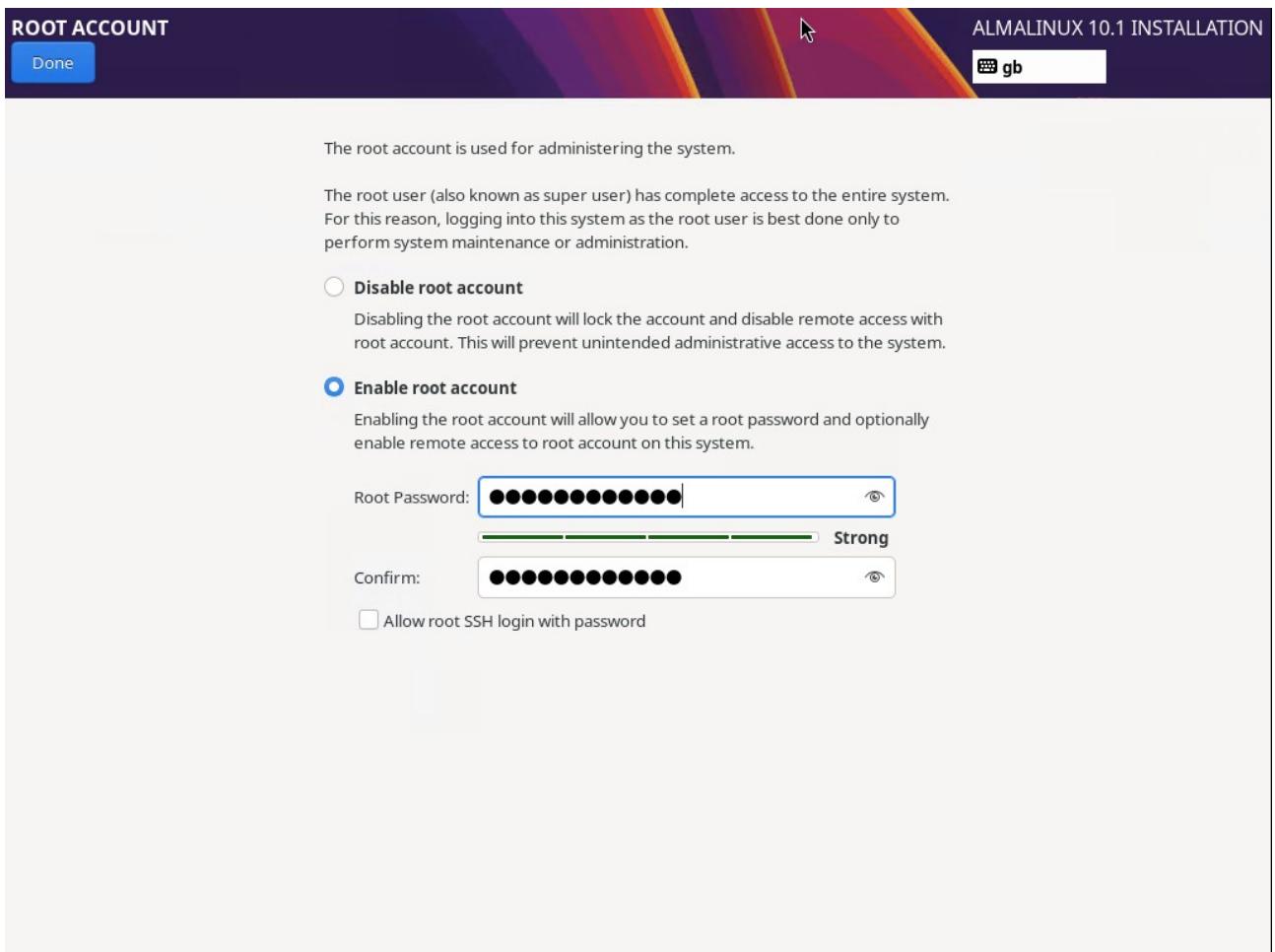
You should give at least on regular user administrative privileges, the option outlined with the red border.

Root Account

If problems during the boot process, the system can open an emergency or rescue shell for solving problems. If boot fails, access to these shells will only be possible if the root account is enabled.

A later assignment will require you to correct boot problems from the rescue shell. You must enable the root account.

The root account is used for administering the system.

The root user (also known as super user) has complete access to the entire system. For this reason, logging into this system as the root user is best done only to perform system maintenance or administration.

○ **Disable root account**

Disabling the root account will lock the account and disable remote access with root account. This will prevent unintended administrative access to the system.

◉ **Enable root account**

Enabling the root account will allow you to set a root password and optionally enable remote access to root account on this system.

Root Password: ●●●●●●●●●●●● 👁

                                              Strong

Confirm: ●●●●●●●●●●● 👁

☐ Allow root SSH login with password

For security reasons, do not allow SSH root access.

Software Selection

For *Software Selection*, select *Server with GUI* or *Workstation*. You can add extra packages now if you like, but this is most easily postponed to later when you know what is needed.

The suggested AlmaLinux image only provides the Gnome desktop environment, but AlmaLinux also provide live media desktop environments with both KDE and Gnome. Use Gnome unless you prefer KDE.

A live media boots up a running distribution from the ISO-image. They also provide the possibility to install AlmaLinux on the computer.

Language Support

Choose language as you prefer, but you must include either English or Norwegian (bokmål or nynorsk). The lecturer must be able to access you computer if you need help.

Done

⌨ no

Select additional language support to be installed:

Català	Catalan	
Čeština	Czech	
Cymraeg	Welsh	
Dansk	Danish	
Deutsch	German	
Ελληνικά	Greek	
✓ **English**	**English**	›
Esperanto	Esperanto	
Español	Spanish	
Eesti	Estonian	
Euskara	Basque	
فارسی	Persian	
Suomi	Finnish	
Filipino	Filipino	
Français	French	
Furlan	Friulian	
Frysk	Western Frisian	

Type here to search.
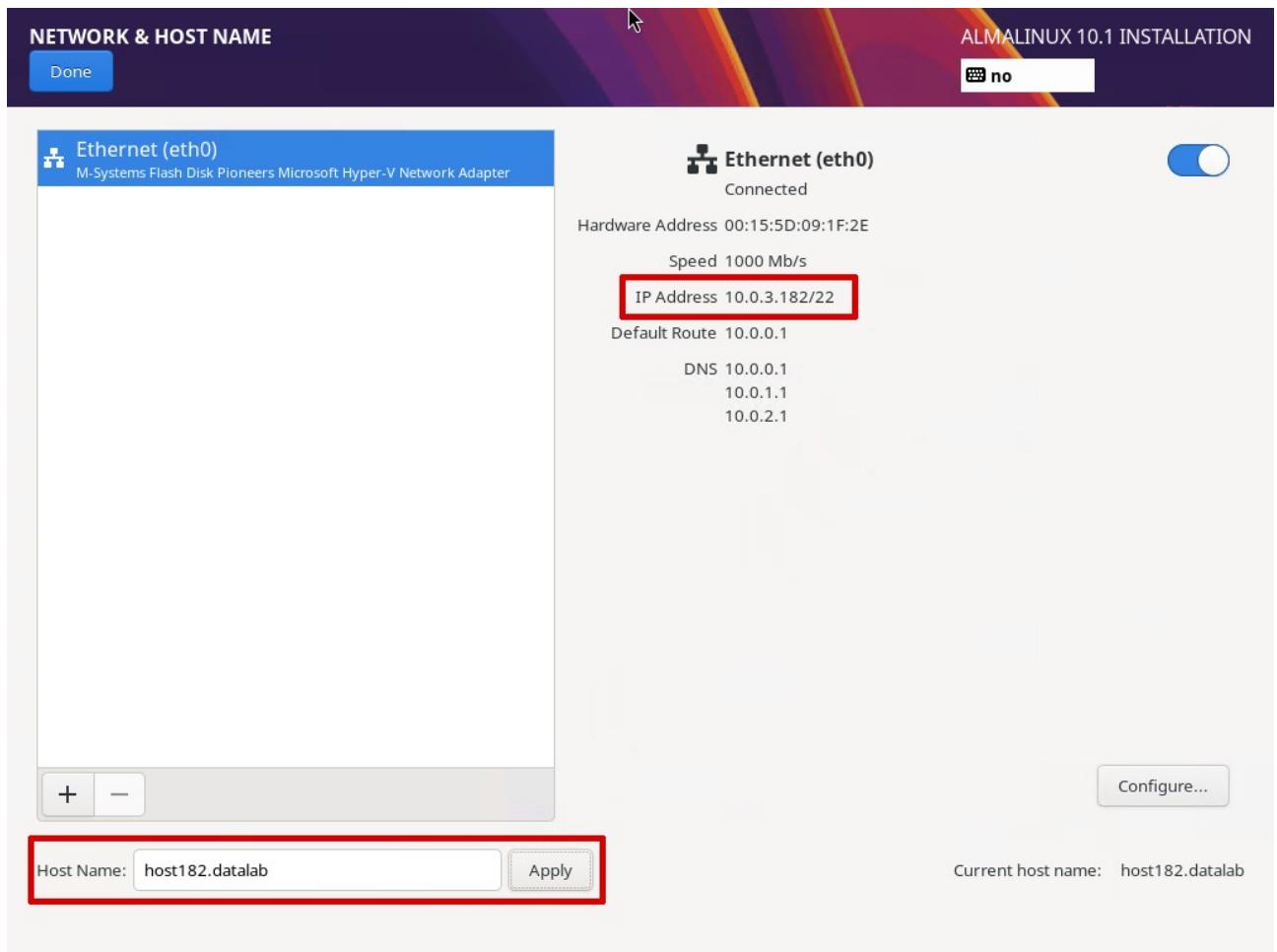
- ☐ English (United States)
- ☑ **English (United Kingdom)**
- ☐ English (India)
- ☐ English (Australia)
- ☐ English (Canada)
- ☐ English (Denmark)
- ☐ English (Ireland)
- ☐ English (New Zealand)
- ☐ English (Nigeria)
- ☐ English (Hong Kong SAR China)
- ☐ English (Philippines)
- ☐ English (Singapore)
- ☐ English (South Africa)
- ☐ English (Zambia)
- ☐ English (Zimbabwe)
- ☐ English (Botswana)
- ☐ English (Antigua & Barbuda)
- ☐ English (Israel)

Network & Host Name

Check that Ethernet is enabled.

Set a Host Name for you computer. With *<some_number>* the last part of the computer IP, you can use the host name "host*<some_number>*.datalab", e.g. "host99.datalab" if the computer IP is "10.0.0.99".
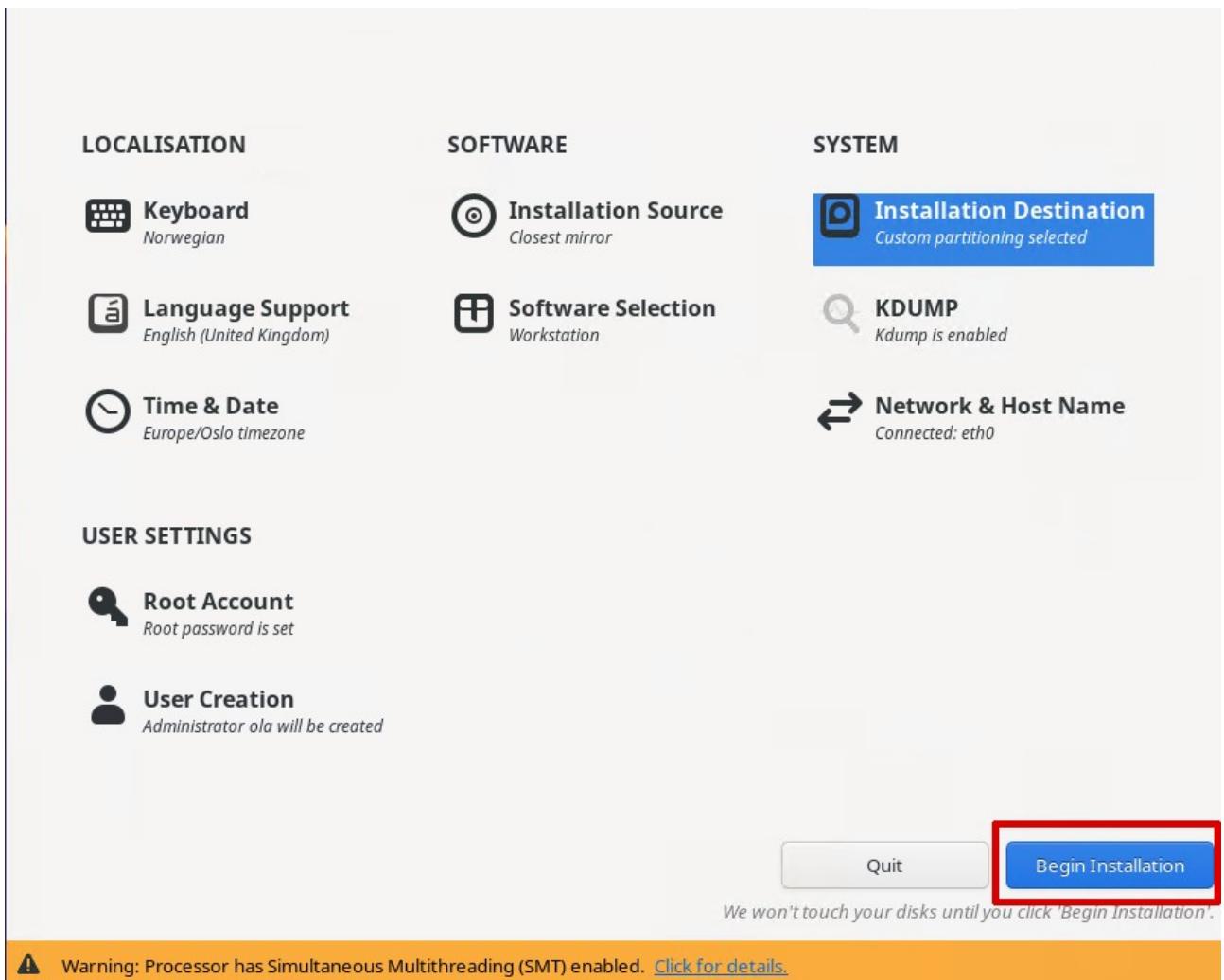
In the illustration above the Host Name is set to *host182.datalab* since the IP-number ends with 182. The Host Name should be unique within the lab group as later assignment will require the computers to communicate.

Do not modify the Host Name later. Several tasks of later assignments will depend on the host name.

The DHCP server at the lab will assign the IP address printed on the machine to your computer. You can therefore now click *Done*.

Begin Installation

Press the button Begin Installation to install AlmaLinux on the computer.

After work

After installation, restart the computer. You should update all programs in the system. The easiest way to do this is by using [DNF](#) . Use man pages for dnf (`man dnf`) to find out how to do it.

Install the editor emacs

If you later need help form the lecturer, install the editor *emacs* as it used by the lecturer:

```
[user@computer]$ sudo dnf -y install emacs
```

Keyboard mapping for emergency shells

A boot process that fails will typically start an emergency shell. The keyboard mapping in these shells will default to an American keyboard.

- GRUB shell
    - GRUB can not find its configuration or kernel image
- Initramfs shell
    - Kernel starts but can not locate the root partition "/".
- Rescue shell:

◆ Kernel is running, but a serious problem occurs when Systemd tries to start the services.

A new keyboard mapping can be loaded from inside an emergency shell, but a better solution is to configure the Linux kernel to load the correct keyboard mapping from the beginning.

The command below will configure all GRUB stanzas with a kernel parameter that loads the mapping for a Norwegian keyboard.

```
[user@computer]$ sudo grubby \
    --update-kernel=ALL --args="vconsole.keymap=no"
```

Observe that the above keyboard mapping does not affect the GRUB shell. It is possible, though complicated to configure a keyboard mapping for GRUB, and GRUB can only read Latin1 characters.
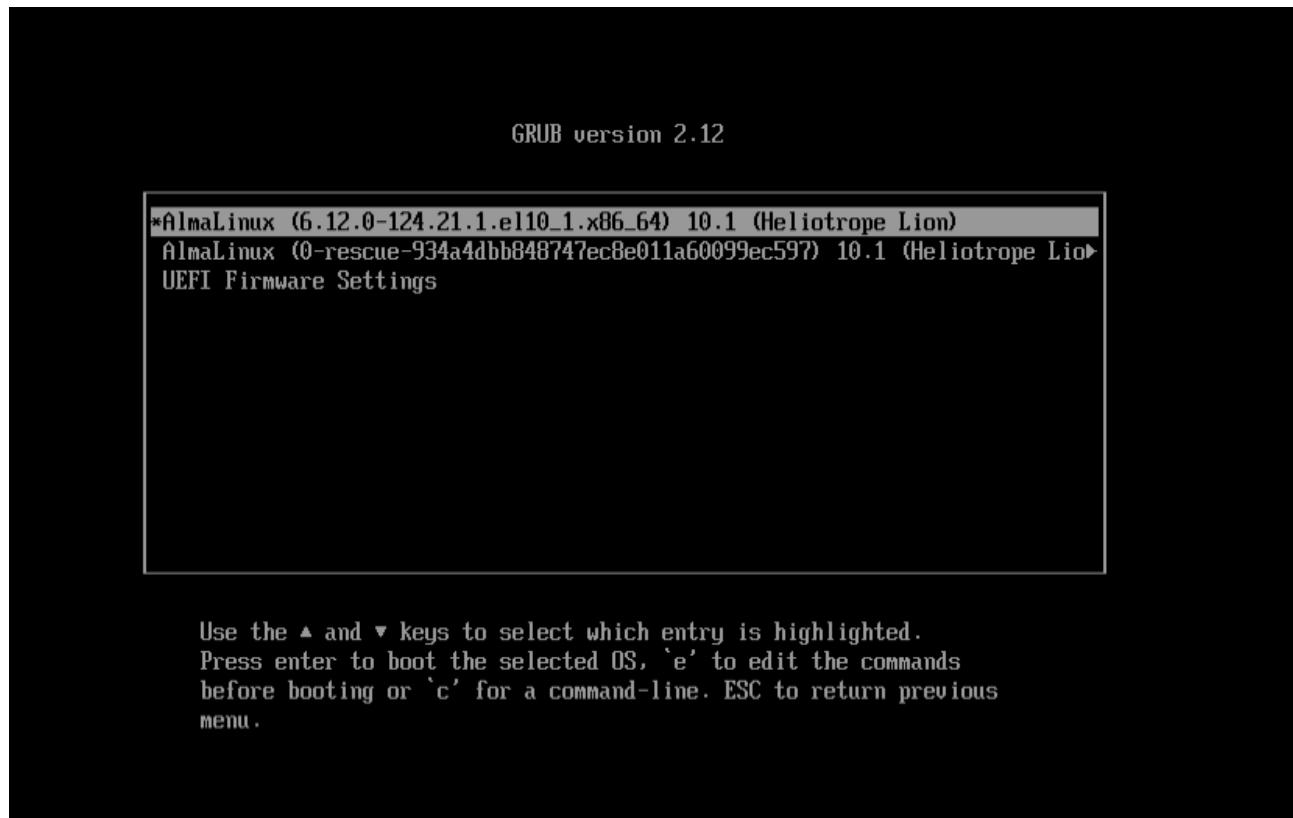
Minimize button on windows in Gnome

To add a minimize button to windows in Gnome, run the below command as your normal user, the user that owns the window session:

```
[user@computer]$ gsettings set org.gnome.desktop.wm.preferences \
    button-layout "appmenu:minimize,maximize,close"
```

Configure GRUB to display the GRUB menu

The GRUB menu let us choose what kernel to load, and also modify parameters for booting the system.

By default GRUB will hide the GRUB menu unless multiple kernel versions. If problems, you may need to modify a GRUB stanza in the menu. The below command will force GRUB to always display the GRUB menu:

```
[user@computer]$ sudo grub2-editenv - unset menu_auto_hide
```

Installing a DBMS

MariaDB is a community-developed fork of the MySQL database source code. For all practical purposes, MariaDB was a binary drop in replacement of the same MySQL version. Some major Web sites like Wikipedia and Google have moved from MySQL to MariaDB .

Both MySQL and MariaDB can be installed with dnf from the AlmaLinux repositories.

The most current LTS releases are MariaDB 11.8.5 and MySQL 8.4.7. The most current stable releases are MariaDB 12.1.2 Rolling and MySQL 9.5.0 Innovation.

AlmaLinux 10.1 ships with MariaDB 10.11.15 and MySQL 8.4.7. For our purpose these versions are sufficient.

The documentation below is for MariaDB. For most of the DB tasks, both MySQL and MariaDB will work, but a few task will require MariaDB, e.g. a task on temporal DB tables.

What packages should you install? A MariaDB-server will need as a minimum the packages **mariadb** and **mariadb-server**.

For administration purposes, the GUI tool [Dbeaver](#) can be useful. If MySQL, you can also use the graphical tool MySQL workbench that you can [download from MySQL](#).

The installation has to be done as root, e.g. with sudo. Use dnf and install the packages **mariadb** and **mariadb-server**.

Database configuration

After the installation is finished, the MariaDB server should be started and you must configure AlmaLinux to start MariaDB at boot.

As **root**, check if MariaDB is running and set it to be started at boot:

```
[user@computer]$ systemctl status mariadb
```

From the output, the line starting with "Loaded" tells us whether the MariaDB server will be started at boot. The line starting with "Active" tells us if the server is currently running.

You ask Systemd to start the MariaDB server at boot by:

```
[user@computer]$ sudo systemctl enable mariadb
```

If the server is not running, you start it with:

```
[user@computer]$ sudo systemctl start mariadb
```

A fresh MariaDB install will have root accounts accessible from the outside without password. The next tasks therefore is to protect your server. All the below tasks can be achieved by issuing commands to the DBMS as the DBMS user **root**, but an easier solution is to use the script *mysql_secure_installation* which is found in the RPM package **mariadb-server**.

- Remove all unnecessary DBMS accounts.
- The root account must be protected.
    - See [Authentication from MariaDB 10.4](#).
    - To list all authentication methods for user, check the table **mysql.global_priv**.
    - You can use Unix socket authentication for the MariaDB **root** user.

- Remove all anonymous DBMS user accounts.

- Remove the database *test* that everyone can access.

- Remove the grants which allow everyone access to databases with names starting with *test_*.

The *Getting Started* section of the MariaDB documentation gives a basic introduction on how to work with MariaDB. A more comprehensive document on how to install and upgrade MariaDB is found in the document on Deployment.

Next now:

1. Create a database **PRIVBASE**,

2. add a normal DBMS user; and

3. give the new DBMS user access to **PRIVBASE**.

Use the MariaDB server reference to solve the above tasks.

You connect to the MariaDB server as root from a terminal by:

```
[user@computer]$ sudo mysql
```

A normal user that has a MariaDB password can connect to the database server from a terminal by:

```
[user@computer]$ mysql -u username -p
```

You should not work with a database as user root. The root user can be used to create the databases and give grants, but a non-root user should be used to fill the database with content.

Giving a DBMS user access to a database is done with the **GRANT** statement. You will need the following SQL commands:

- **CREATE DATABASE** – MariaDB server reference > SQL Statements > Data Definition (DDL)> CREATE > CREATE DATABASE

- **CREATE USER** – MariaDB server reference > SQL Statements > Account Management > CREATE USER

- **GRANT** – MariaDB server reference > SQL Statements > Account Management > GRANT

- **SET PASSWORD** – MariaDB server reference > SQL Statements > Account Management > SET PASSWORD

Details on how to manage a MariaDB server is found in the document Server Management

. a maraiDB server is

Configuration of MariaDB is explained in the document Configuring MariaDB. Read about the MariaDB configuration files and options in the in the MariaDB Documentation:

- Server Management > Deployment > Configuring MariaDB > Configuring MariaDB with Option Files

- Server Management > Starting & Stopping > mariadb Options

Use the documentation and find the purpose of the following options:

```
[mysqld]
log-bin=mysql-bin
log-bin-trust-function-creators
character-set-server=utf8
collation-server=utf8_danish_ci
```

You will do more configurations later, but the above is enough for now.

More configuration

The computers in the network lab (that is E425) should have access to the MariaDB server. Check the use of the command **firewall-cmd** and open access through the firewall to the MariaDB server from all computers in the lab. Then test that you can access your MariaDB server from other lab computer.

The last task can be a little bit complicated if you have not worked with Firewalld before. Firewalld is a dynamic firewall system and used by default on AlmaLinux.

The Firewalld system divides the network into zones. Different zones can have different firewall settings. Examples of predefined zones are **public** for a computer connected directly to the internet, and **home** and **work** for computers behind a firewall.

You can ask Firewalld to use a specific zone for some source addresses (IP numbers) or for specific network cards. If no zone is chosen, Firewalld will use a default zone.

The system comes with a list of predefined zones that you can adapt for your use, but you can also create your own.

List all zones by:

```
[user@computer]$ sudo firewall-cmd --list-all-zones
```

 Get the default zone by:

```
[user@computer]$ sudo firewall-cmd --get-default-zone
```

Set the default zone by:

```
[user@computer]$ sudo firewall-cmd --set-default-zone=<Zone>
```

There is no outside access to the lab, so you can use the predefined zone **work**. Configure Firewalld to use **work**, either as the default zone, or for all computers in the lab, an then check that the zone got activated. You list active zones by:

```
[user@computer]$ sudo firewall-cmd --get-active-zones
```

If the zone is not active, restart the Firewalld daemon, the the network service, or restart the computer

Now, add the MariaDB service to the **work** zone, i.e. open the network for connections to MariaDB:

```
[user@computer]$ sudo firewall-cmd --zone=work --add-service mysql
```

Some final remarks

When logged in to MariaDB, find your user by issuing the following command:

```
MariaDB [privBase]> SELECT USER();
```

Find your current privileges by:

```
MariaDB [privBase]> SHOW GRANTS;
```