

A stylized graphic of a digital twin. It features a central square containing two interlocking gears. From this square, numerous circuit-like lines radiate outwards, some ending in small circles. Above the square, the words "DIGITAL TWIN" are written in a bold, sans-serif font. The background is dark with a faint grid pattern and some blurred light spots.

DIGITAL
TWIN

A close-up of a hand with the index finger pointing towards the left, towards the "DIGITAL TWINS" text. The hand is in focus, with the background being the same dark, circuit-themed background as the rest of the slide.

DIGITAL TWINS

BaSyx:
Software installation
step-by-step instruction towards running
BaSyx examples locally

OVERVIEW

This guide is made for Windows (Version 11) operating system – status 04/2024

- ↗ Step 1: Download and install software packages
 - ↗ Step 1.A: Integrated Development Environment – Eclipse IDE for Java Developers
 - ↗ Step 1.B: Distributed Version Control System – git
 - ↗ Step 1.C: Distributed Version Control System GUI – TortoiseGit
 - ↗ Step 1.E: Containerization Engine – Docker
- ↗ Step 2: Clone BaSyx git repository
- ↗ Step 3: Start BaSyx examples

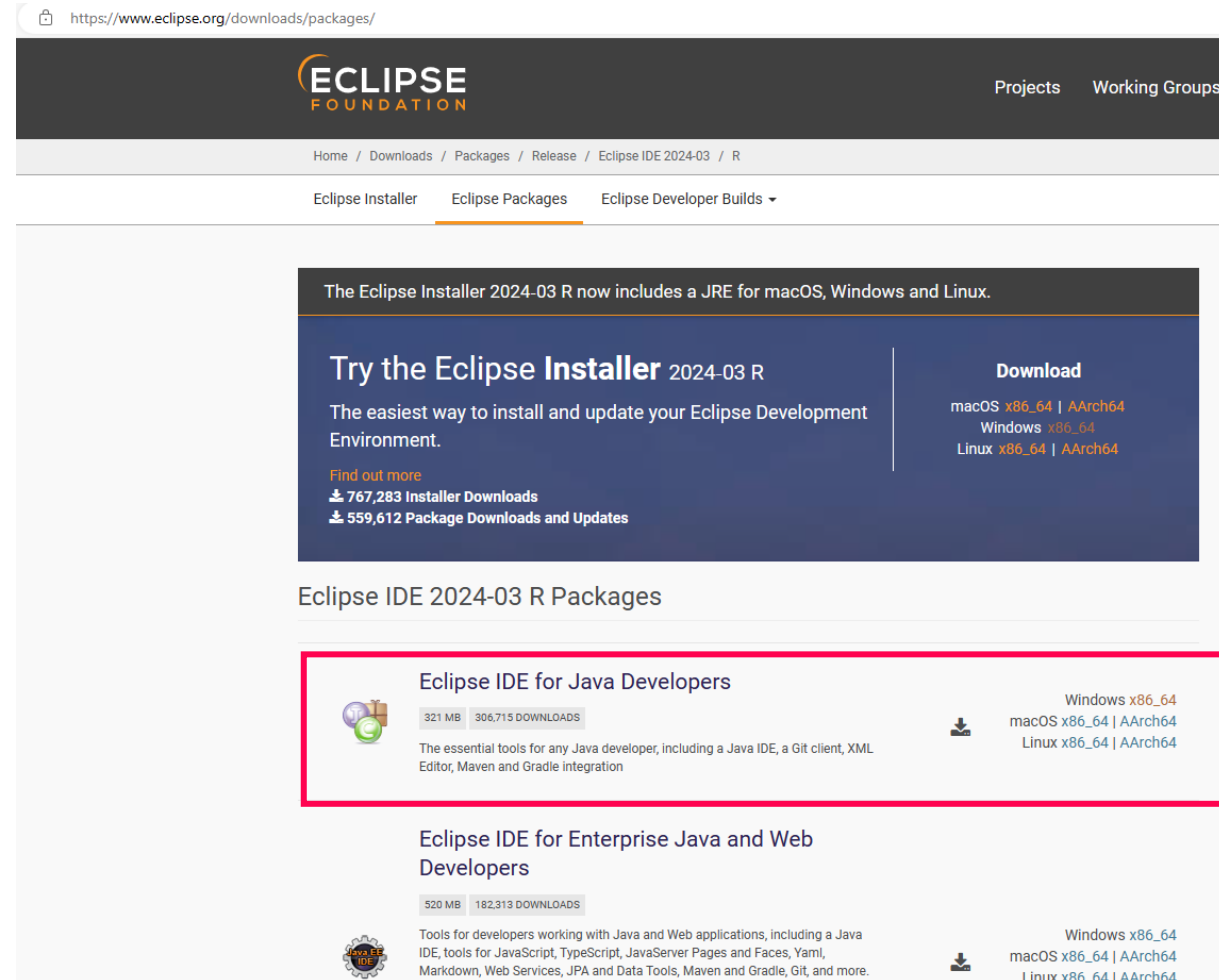
STEP 1: DOWNLOAD AND INSTALL SOFTWARE PACKAGES

Step 1.A: Integrated Development Environment – Eclipse IDE for Java Developers

➤ Go to <https://www.eclipse.org/downloads/packages/>

➤ Download „Eclipse IDE for Java Developers“

➤ Install the downloaded software




The screenshot shows the Eclipse Foundation website's download page for Eclipse IDE 2024-03 R. The page features a dark header with the Eclipse Foundation logo and navigation links. Below the header, there's a section titled "The Eclipse Installer 2024-03 R now includes a JRE for macOS, Windows and Linux." This section promotes the Eclipse Installer as the easiest way to install and update the development environment, with links to find out more and download statistics (767,283 installer downloads and 559,612 package downloads and updates). Below this, the "Eclipse IDE 2024-03 R Packages" section lists two main packages: "Eclipse IDE for Java Developers" and "Eclipse IDE for Enterprise Java and Web Developers". The "Eclipse IDE for Java Developers" package is highlighted with a red border. It is 321 MB, has 306,715 downloads, and includes a description of its features. The "Eclipse IDE for Enterprise Java and Web Developers" package is 520 MB and has 182,313 downloads. Both packages list their available operating systems and architectures: Windows x86_64, macOS x86_64 | AArch64, and Linux x86_64 | AArch64.

STEP 1: DOWNLOAD AND INSTALL SOFTWARE PACKAGES

Step 1.A: Integrated Development Environment – Eclipse IDE for Java Developers

↗ Check correctness of this step:

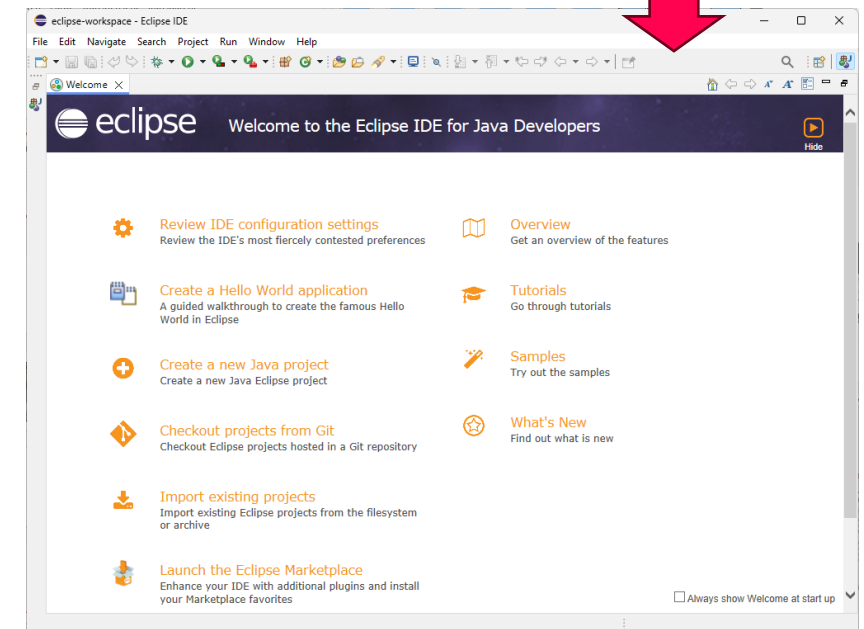
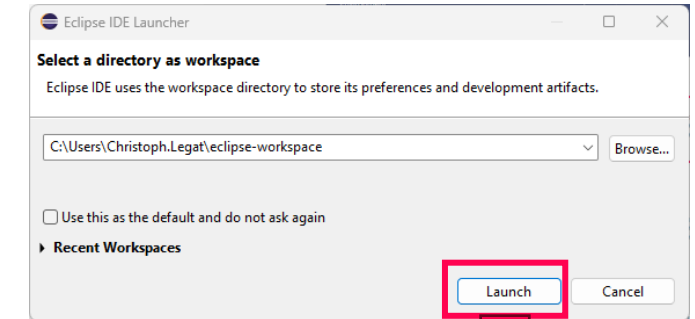
↗ Start „Eclipse IDE for Java Developers“ on your computer

 Eclipse IDE for Java Developers - 2024-03

↗ Eclipse IDE Launcher will start for defining the workspace location (see image top right)

↗ Click Launch

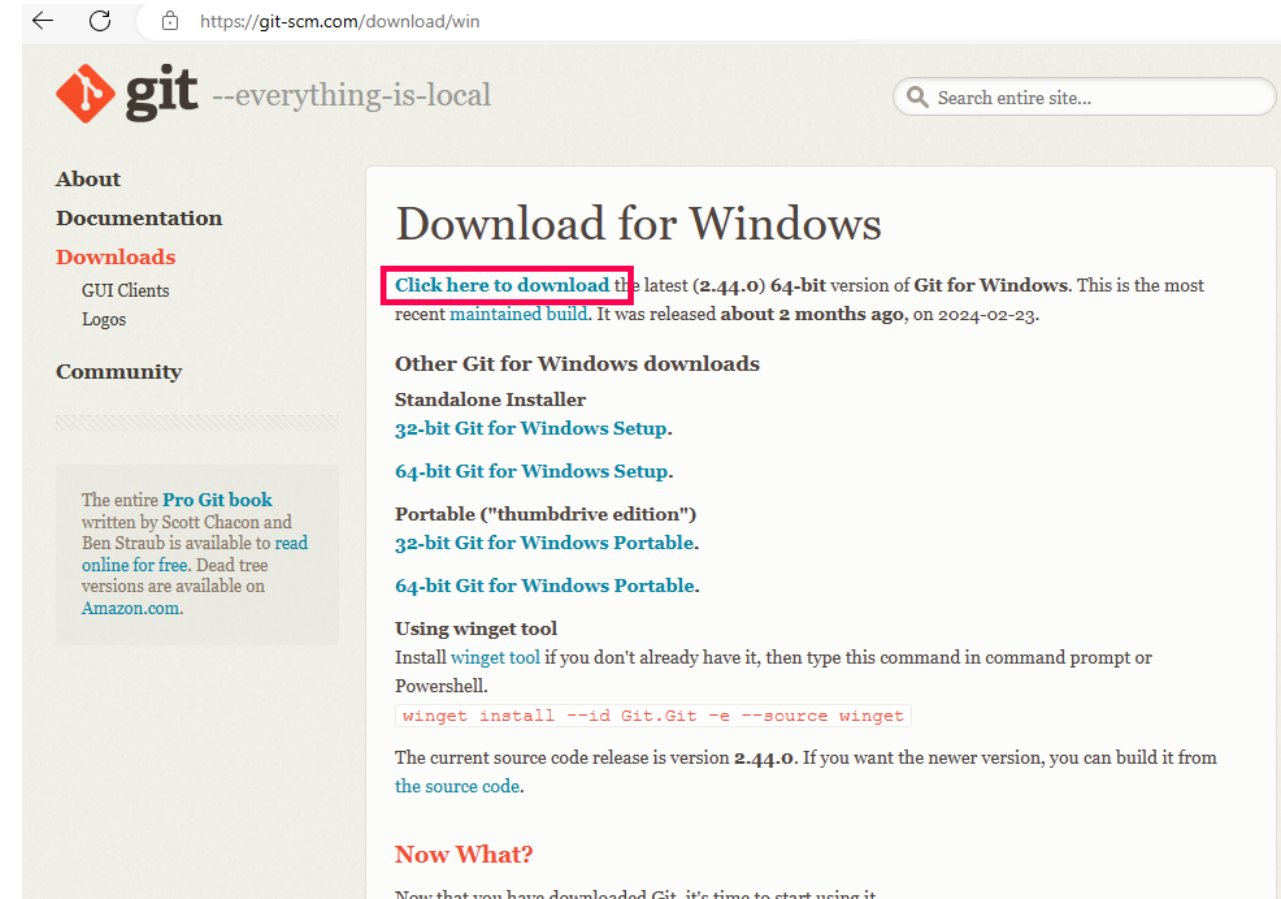
↗ Afterwards, the Eclipse IDE will start (see image bottom right)



STEP 1: DOWNLOAD AND INSTALL SOFTWARE PACKAGES

Step 1.B: Distributed Version Control System – git

- Go to <https://git-scm.com/download/win>
- Download „Git for Windows“
- Install the downloaded software with standard settings



STEP 1: DOWNLOAD AND INSTALL SOFTWARE PACKAGES

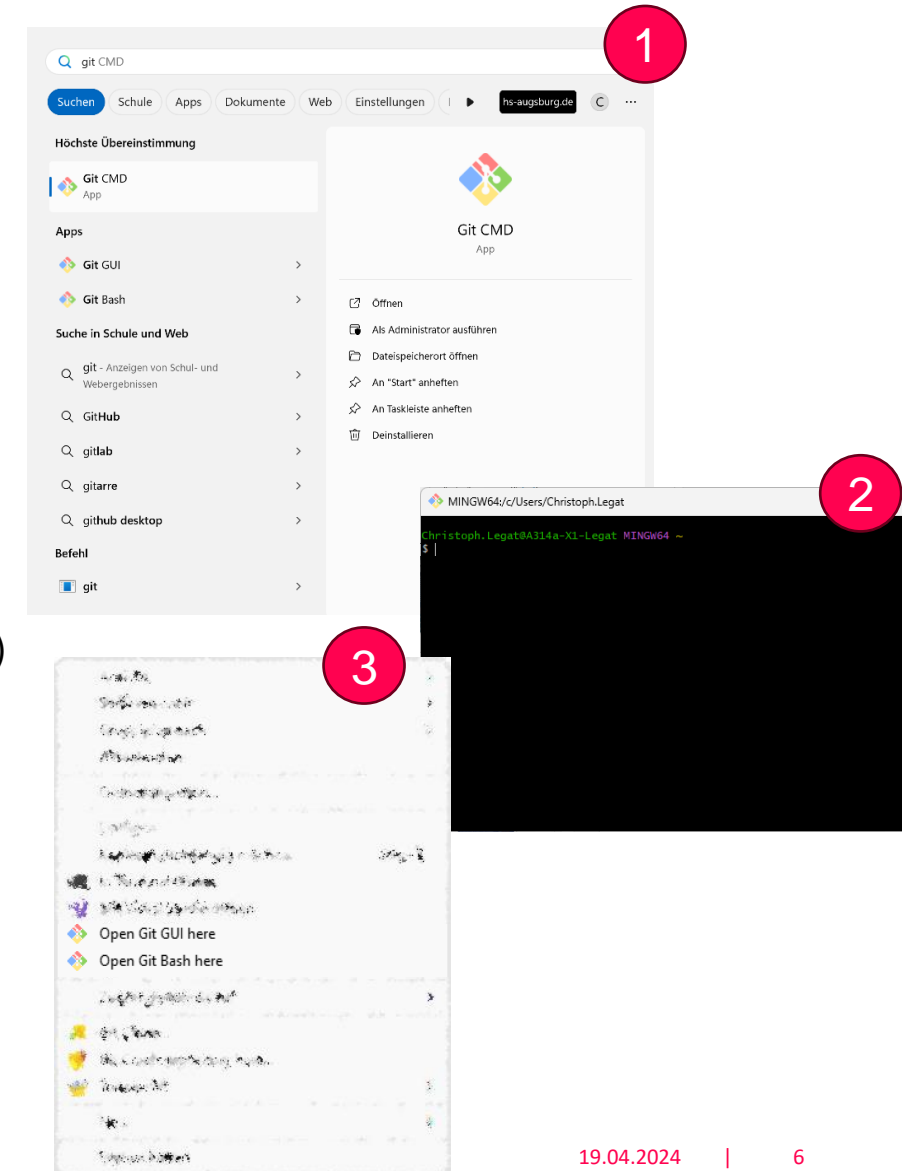
Step 1.B: Distributed Version Control System – git

↗ Check correctness of this step:

↗ Press windows button on task bar and search for “git” (see image #1)

↗ Starting Git Bash results in opening the command line (see image #2)

↗ Go to the explorer > right click > “show more options” > git is available in menu (see image #3)



STEP 1: DOWNLOAD AND INSTALL SOFTWARE PACKAGES

Step 1.C: Distributed Version Control System GUI – TortoiseGit

➤ Go to <https://tortoisegit.org/>

➤ Download „TortoiseGit”

➤ Install the downloaded software with standard settings

The screenshot shows the TortoiseGit website. The main page has a 'Download' button highlighted with a red box and a red arrow pointing to the 'Download' page. The 'Download' page shows the current stable version as 2.15.0 and provides download links for 32-bit, 64-bit, and ARM64 Windows. It also includes a section for an incremental security fix for PuTTY CVE-2024-31497.

for 32-bit Windows	for 64-bit Windows	for ARM64 Windows
Download TortoiseGit 2.15.0 32-bit (18.2 MiB)	Download TortoiseGit 2.15.0 64-bit (21.5 MiB)	Download TortoiseGit 2.15.0 ARM64 (20.2 MiB)

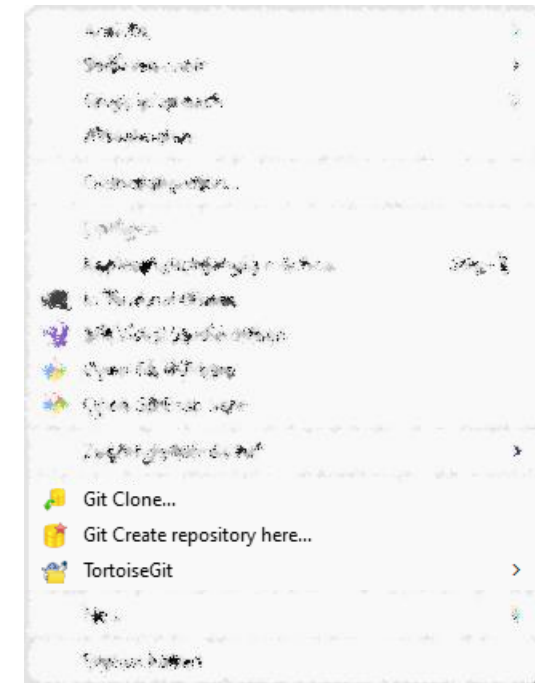
for 32-bit Windows	for 64-bit Windows	for ARM64 Windows
Download TortoiseGit 2.15.0.1 incremental update 32-bit (2.5 MiB)	Download TortoiseGit 2.15.0.1 incremental update 64-bit (2.5 MiB)	Download TortoiseGit 2.15.0.1 incremental update ARM64 (2.4 MiB)

STEP 1: DOWNLOAD AND INSTALL SOFTWARE PACKAGES

Step 1.C: Distributed Version Control System GUI – TortoiseGit

↗ Check correctness of this step:

- ↗ Go to the explorer
 - > right click
 - > “show more options”
 - > some TortoiseGit options are available in menu (see image)

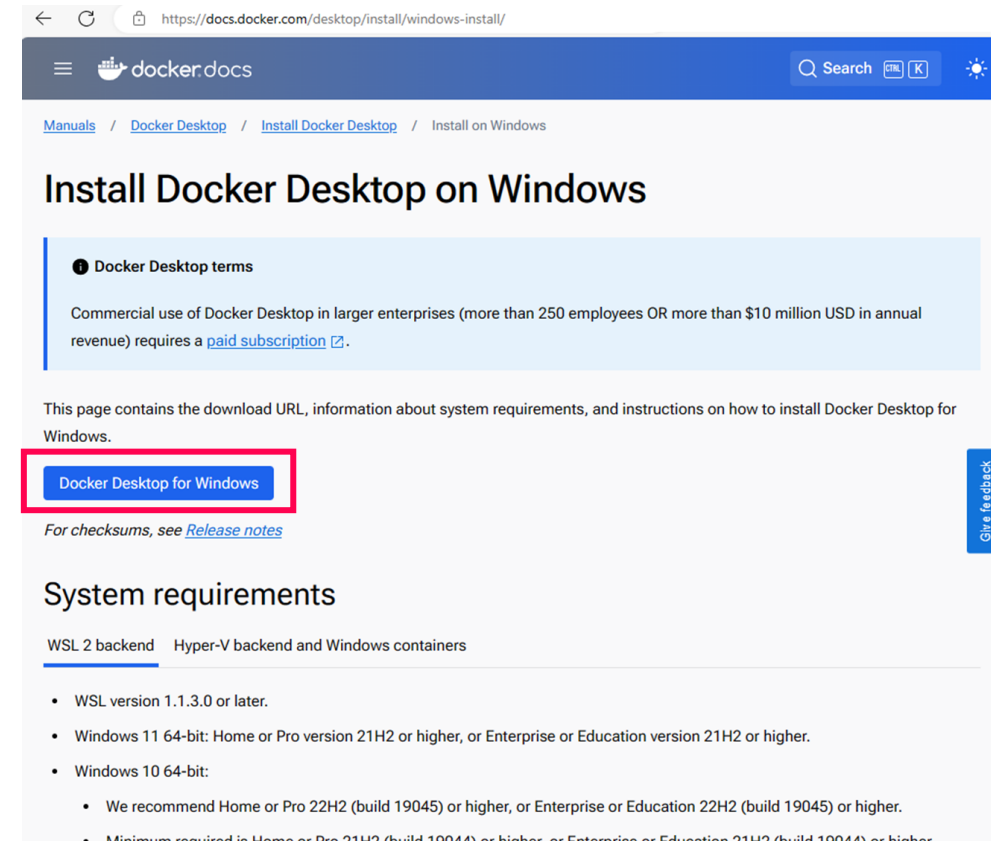


STEP 1: DOWNLOAD AND INSTALL SOFTWARE PACKAGES

Step 1.E: Containerization Engine – Docker

➤ Go to <https://docs.docker.com/desktop/install/windows-install/>

➤ Install the downloaded software with standard settings



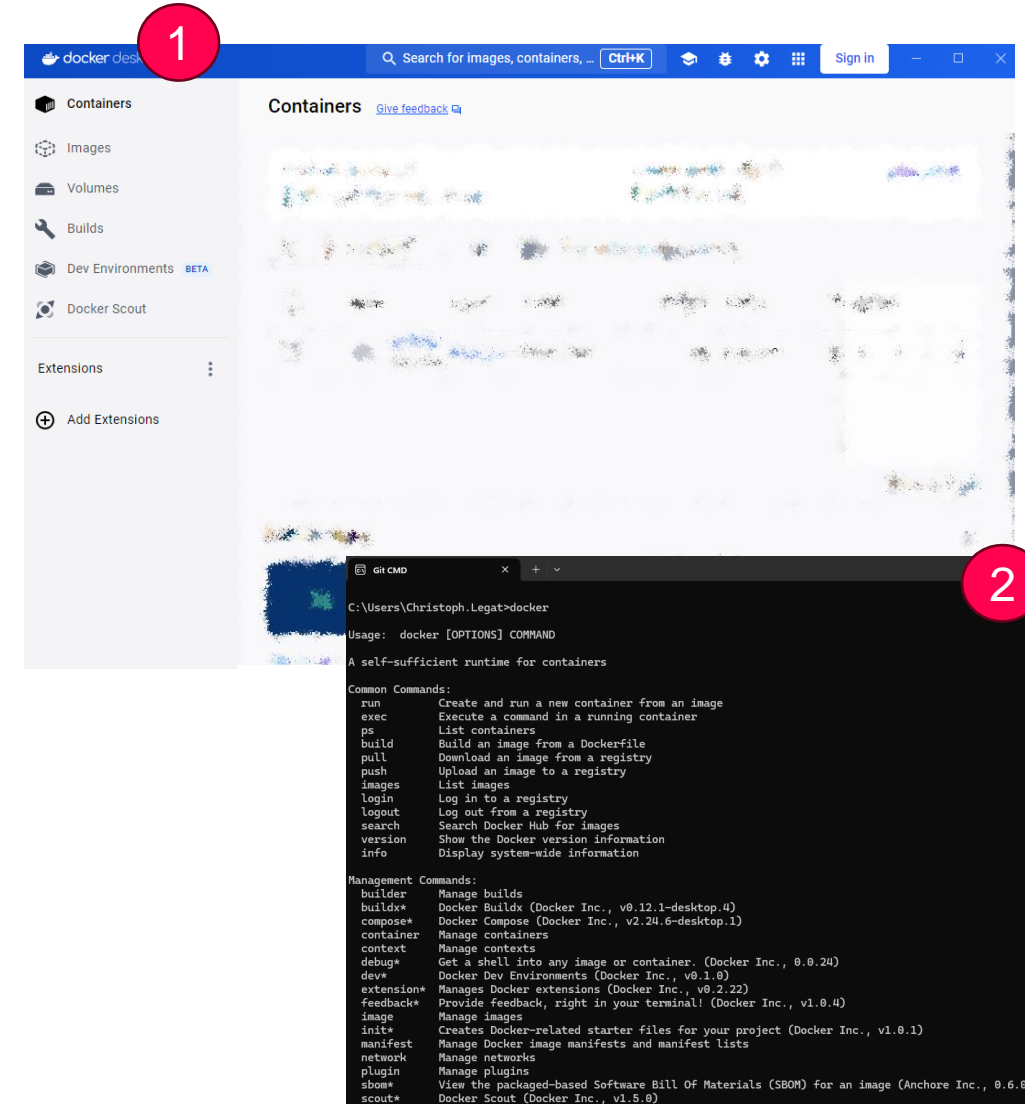
STEP 1: DOWNLOAD AND INSTALL SOFTWARE PACKAGES

Step 1.E: Containerization Engine – Docker

➤ Check correctness of this step:

➤ “Docker Desktop” is available on the system and starts (see image #1)

➤ “docker” command is available in command line (see image #2)



STEP 2: CLONE BASYX GIT REPOSITORY

Step 2: Variant A – using command line

- ↗ Open command line in your eclipse workspace folder
- ↗ This can either be done by
 - ↗ using the explorer, navigate to the folder, right click, select “open in terminal”
 - ↗ Open the command line (Windows Start->”CMD”) and navigate to the folder
 - ↗ Changing directory: <https://learn.microsoft.com/en-us/windows-server/administration/windows-commands/cd>
 - ↗ List files: <https://learn.microsoft.com/en-us/windows-server/administration/windows-commands/dir>
- ↗ Enter “git clone <https://github.com/eclipse-basyx/basyx-java-server-sdk>”

```
git config --system core.longpaths true
```

STEP 2: CLONE BASYX GIT REPOSITORY

Step 2: Variant A – using command line

↗ Check correctness of this step:

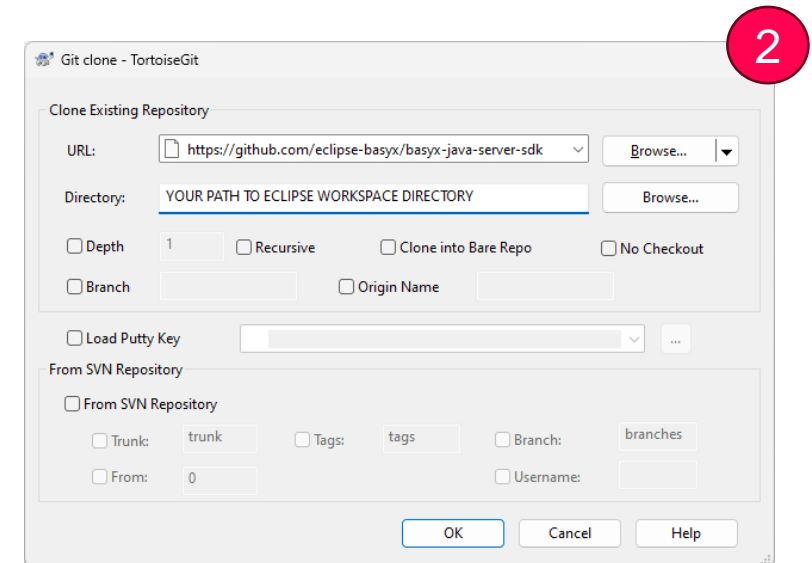
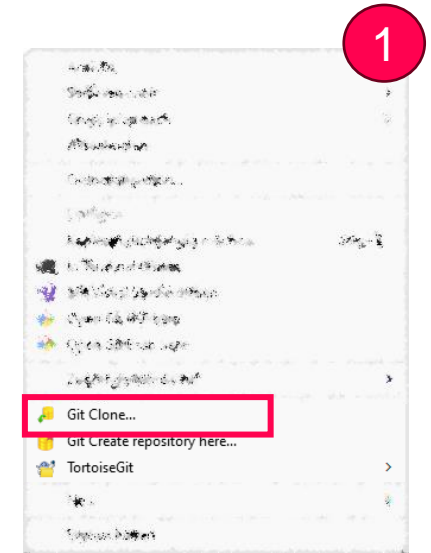
↗ Repository was cloned without any failure, see image

```
C:\>git clone https://github.com/eclipse-basyx/basyx-java-server-sdk
Cloning into 'basyx-java-server-sdk'...
remote: Enumerating objects: 15879, done.
remote: Counting objects: 100% (4692/4692), done.
remote: Compressing objects: 100% (1587/1587), done.
remote: Total 15879 (delta 2656), reused 3672 (delta 2106), pack-reused 11187
Receiving objects: 100% (15879/15879), 11.21 MiB | 7.91 MiB/s, done.
Resolving deltas: 100% (4595/4595), done.
```

STEP 2: CLONE BASYX GIT REPOSITORY

Step 2: Variant B – using TortoiseGit UI

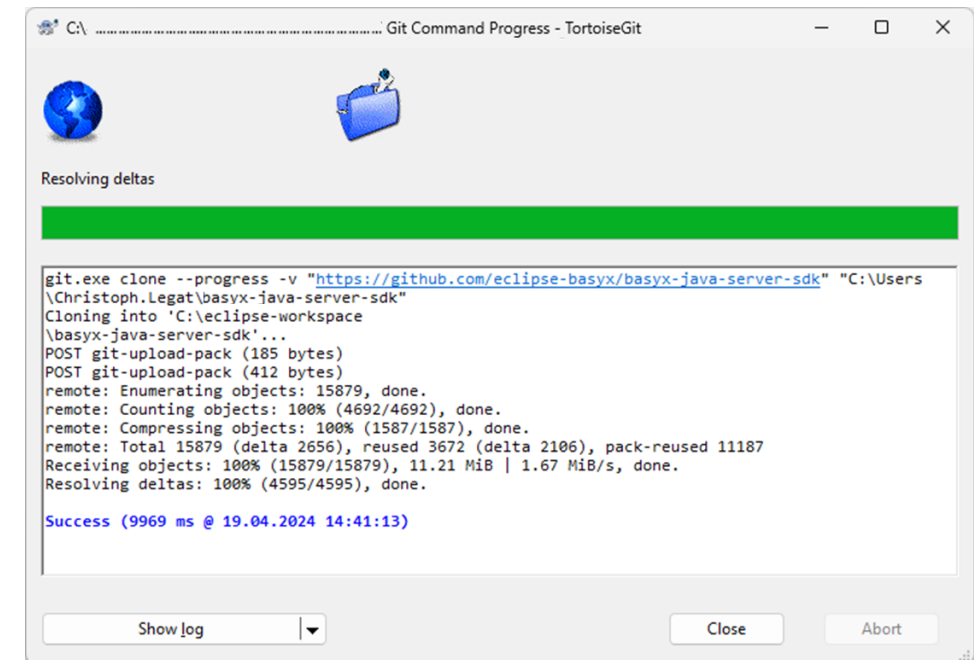
- Open your eclipse workspace folder in the explorer
- Open context menu (right click) and select “Git Clone..” (see image #1)
- Enter URL of the repo: <https://github.com/eclipse-basyx/basyx-java-server-sdk> (see image #2)



STEP 2: CLONE BASYX GIT REPOSITORY

Step 2: Variant B – using TortoiseGit UI

- ↗ Check correctness of this step:
- ↗ Repository was cloned without any failure (indicated by “Success” message), see image



STEP 2: CLONE BASYX GIT REPOSITORY

Known Issues and Solutions

- ↗ Problem: Cloning of some files failed with message "**Filename too long**„
- ↗ Solution: Open command line as administrator and use the following command: `git config --system core.longpaths true`

STEP 3: START BASYX EXAMPLES

- Go folder of your eclipse workspace in the command line
- Switch to subdirectory “examples”
- Use command “docker-compose up -d”
- Check for success:
 - Firstly, various elements are pulled (image #1 shows final situation)
 - Secondly, various containers are started (image #2 shows final situation)

```
\basyx-java-server-sdk\examples> docker-compose up -d
```

```
✓aas-web-ui_v2 17 layers [#####] 0B/0B Pulled
✓aas-env 5 layers [#####] 0B/0B Pulled
✓mongo 9 layers [#####] 0B/0B Pulled
✓sm-registry 6 layers [#####] 0B/0B Pulled
✓aas-registry 5 layers [#####] 0B/0B Pulled
✓aas-discovery 5 layers [#####] 0B/0B Pulled
✓mqtt 3 layers [#####] 0B/0B Pulled
```

```
[+] Running 7/8
- Network examples_default Created
✓Container examples-mqtt-1 Healthy
✓Container examples-mongo-1 Healthy
✓Container examples-aas-discovery-1 Started
✓Container examples-aas-registry-1 Healthy
✓Container examples-sm-registry-1 Healthy
✓Container examples-aas-env-1 Healthy
✓Container aas-web-ui_v2 Started
```

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