

FRENDY installation

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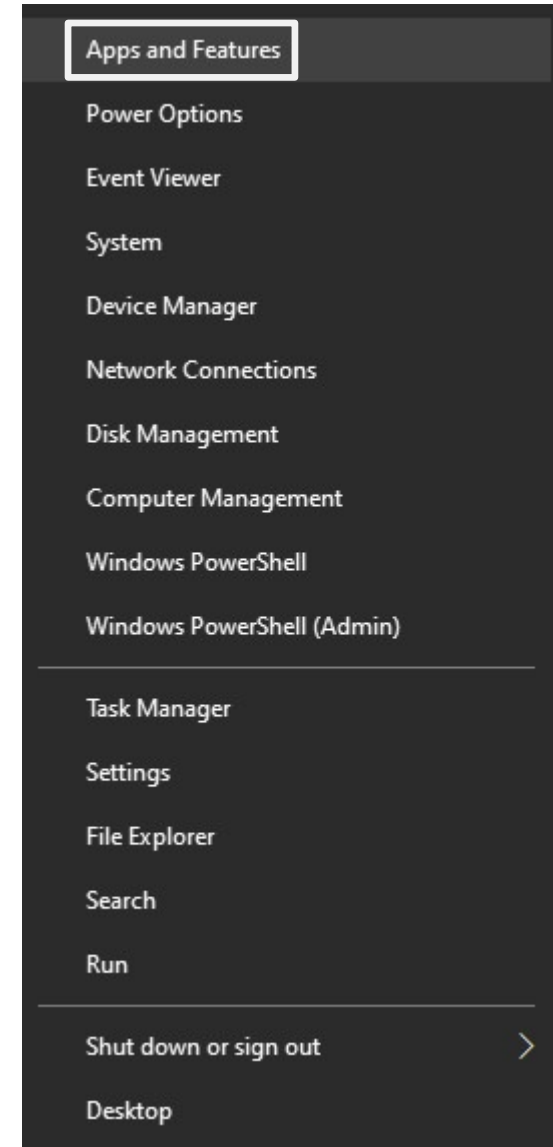
Contents

- Installation Ubuntu (Ubuntu 20.04.1 LTS) on Windows Subsystem for Linux (WSL)
- Construction of development environment on Ubuntu
 - Installation of development tools, *e.g.*, gcc
 - Compilation of FRENDY

Introduction of Windows Subsystem for Linux (WSL)

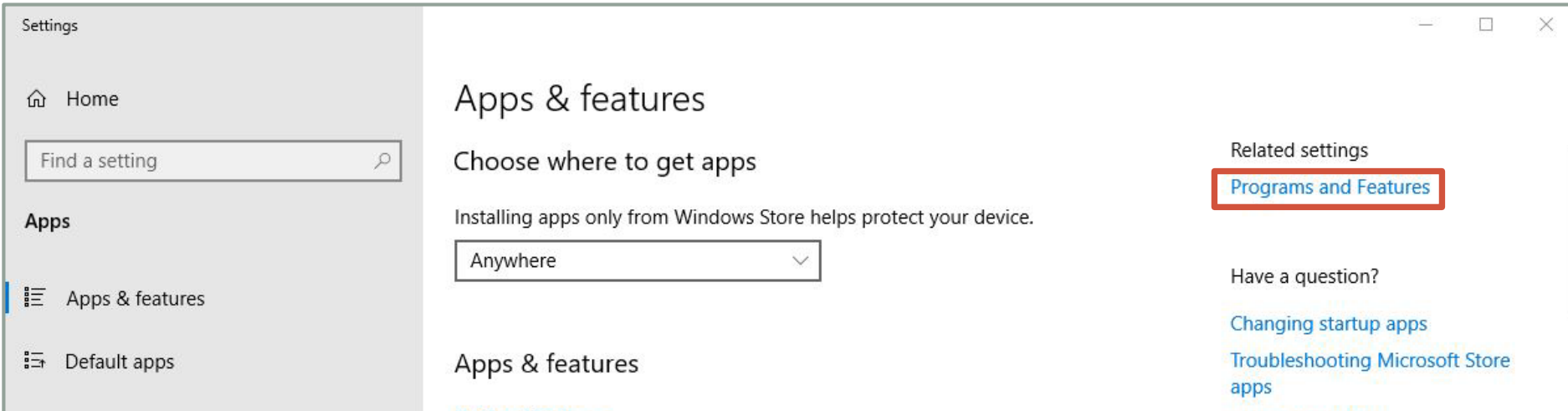
Activation of WSL (1/4)

- Right click the Windows icon.
- Launch up “Apps and Features”.

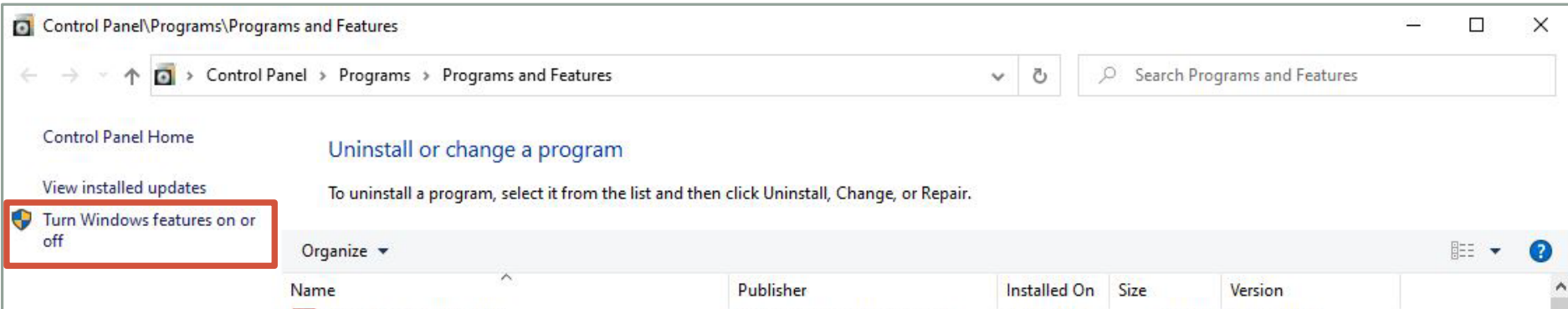


Activation of WSL (2/4)

- Click “Program and Features” on Related settings.

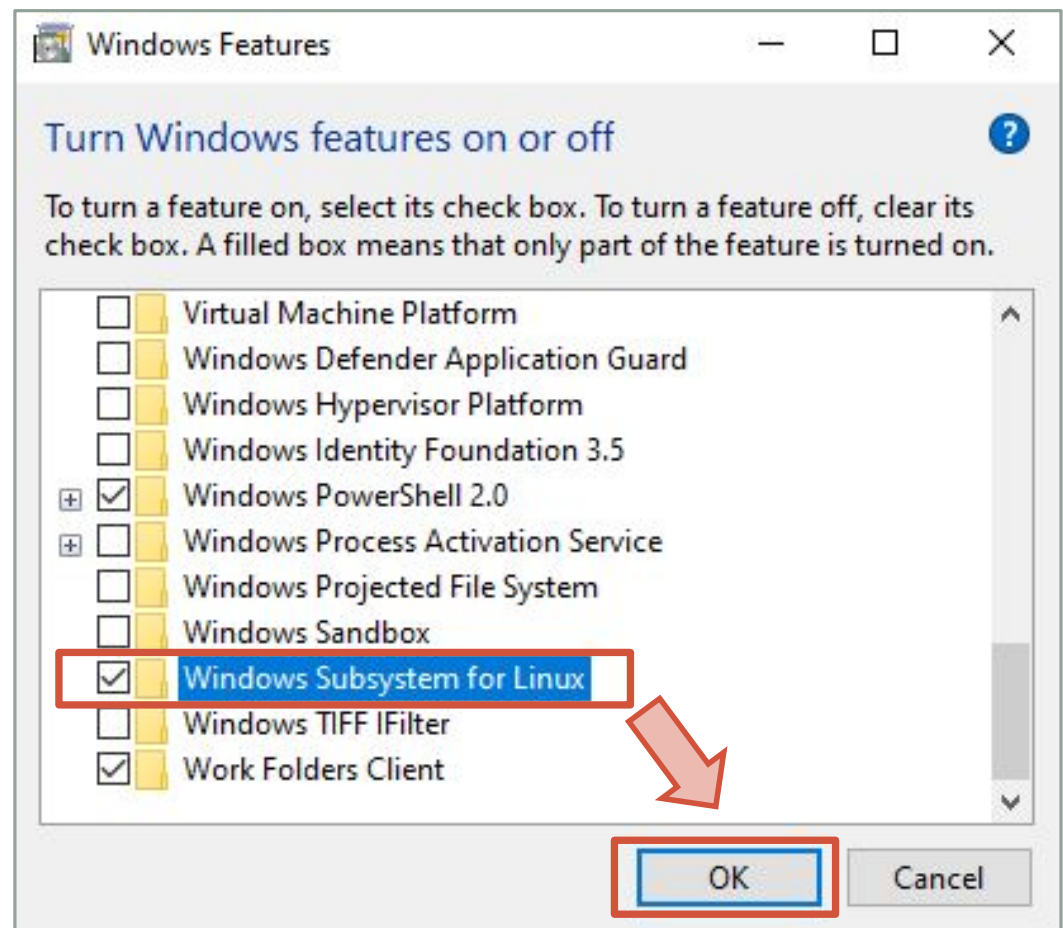


- Click “Turn Windows features on or off”.



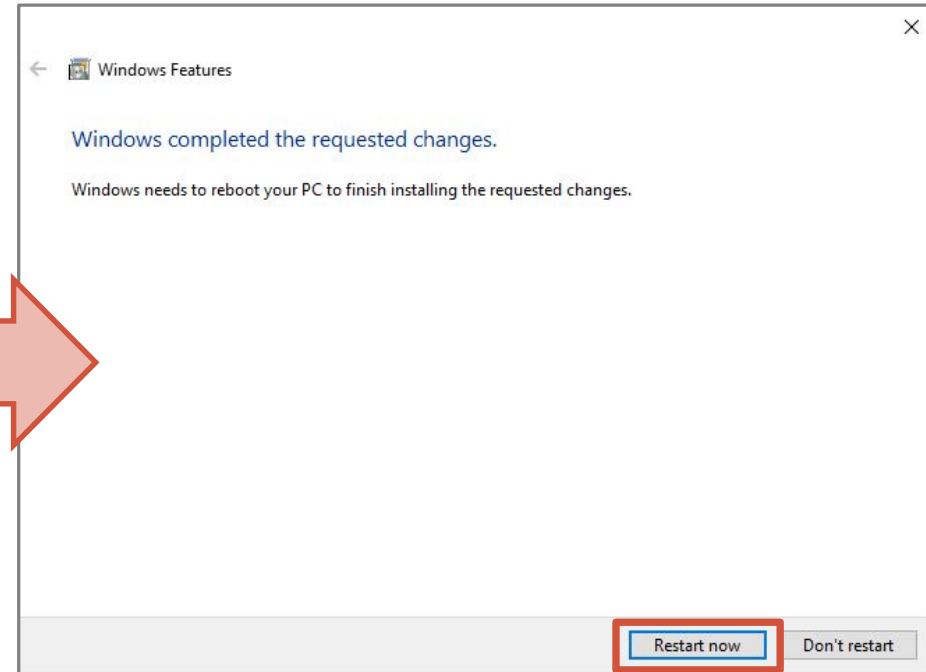
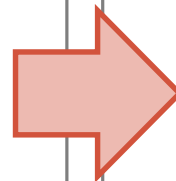
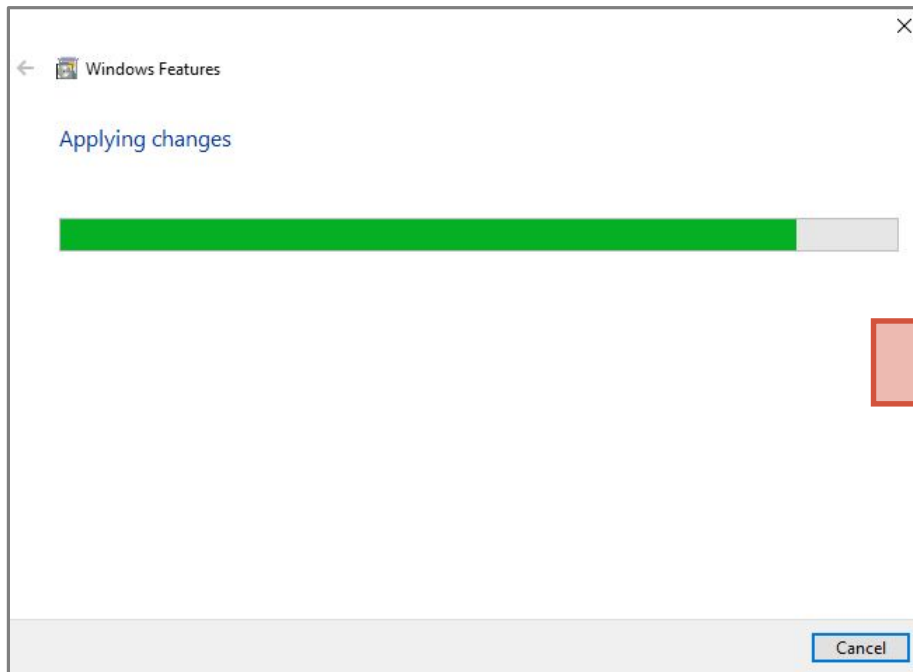
Activation of WSL (3/4)

- Put a check mark on “Windows Subsystem for Linux”.
- Click “OK” button.



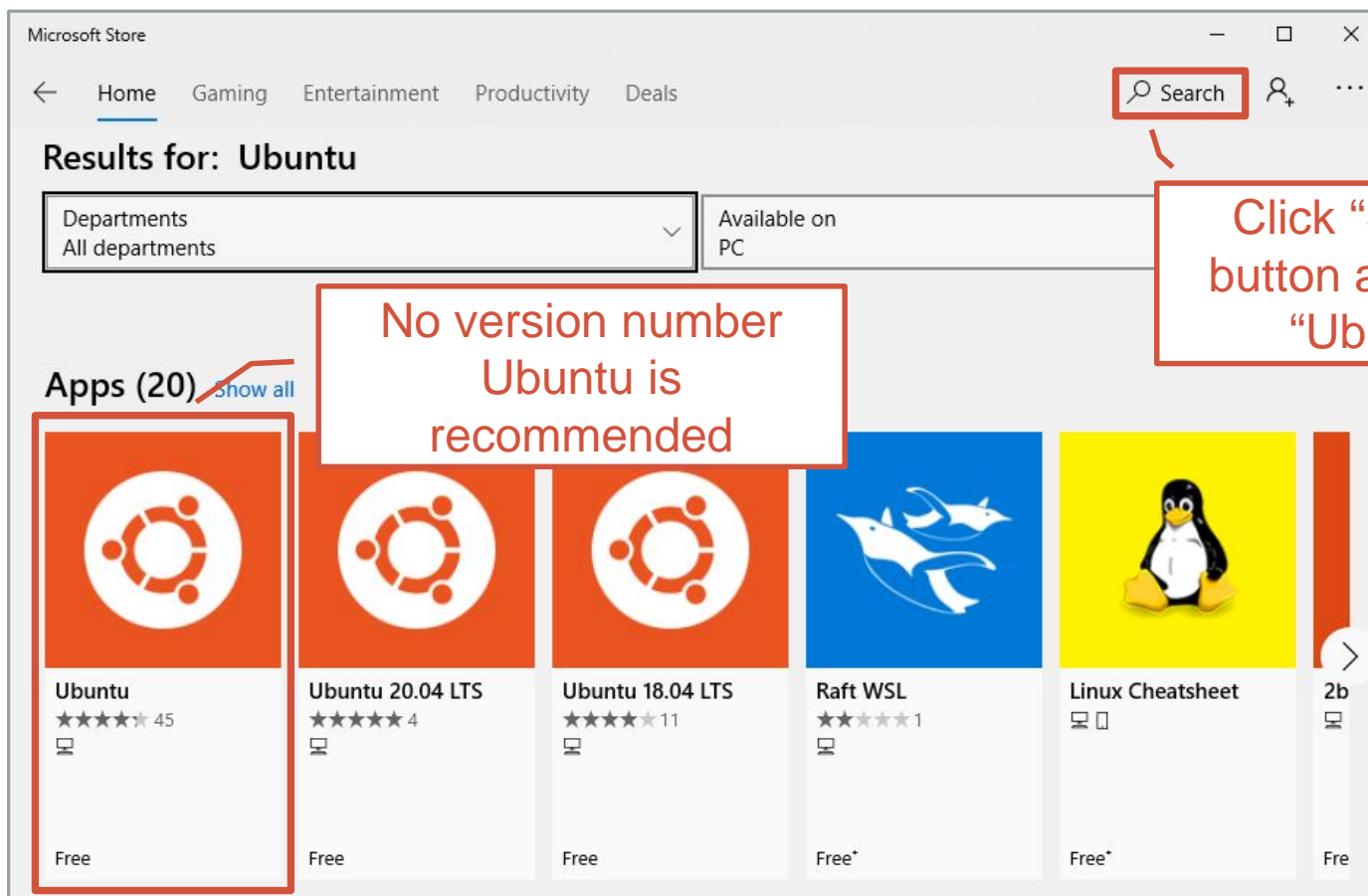
Activation of WSL (4/4)

- Wait a few minutes
- Restart Windows when Windows completed the requested changes



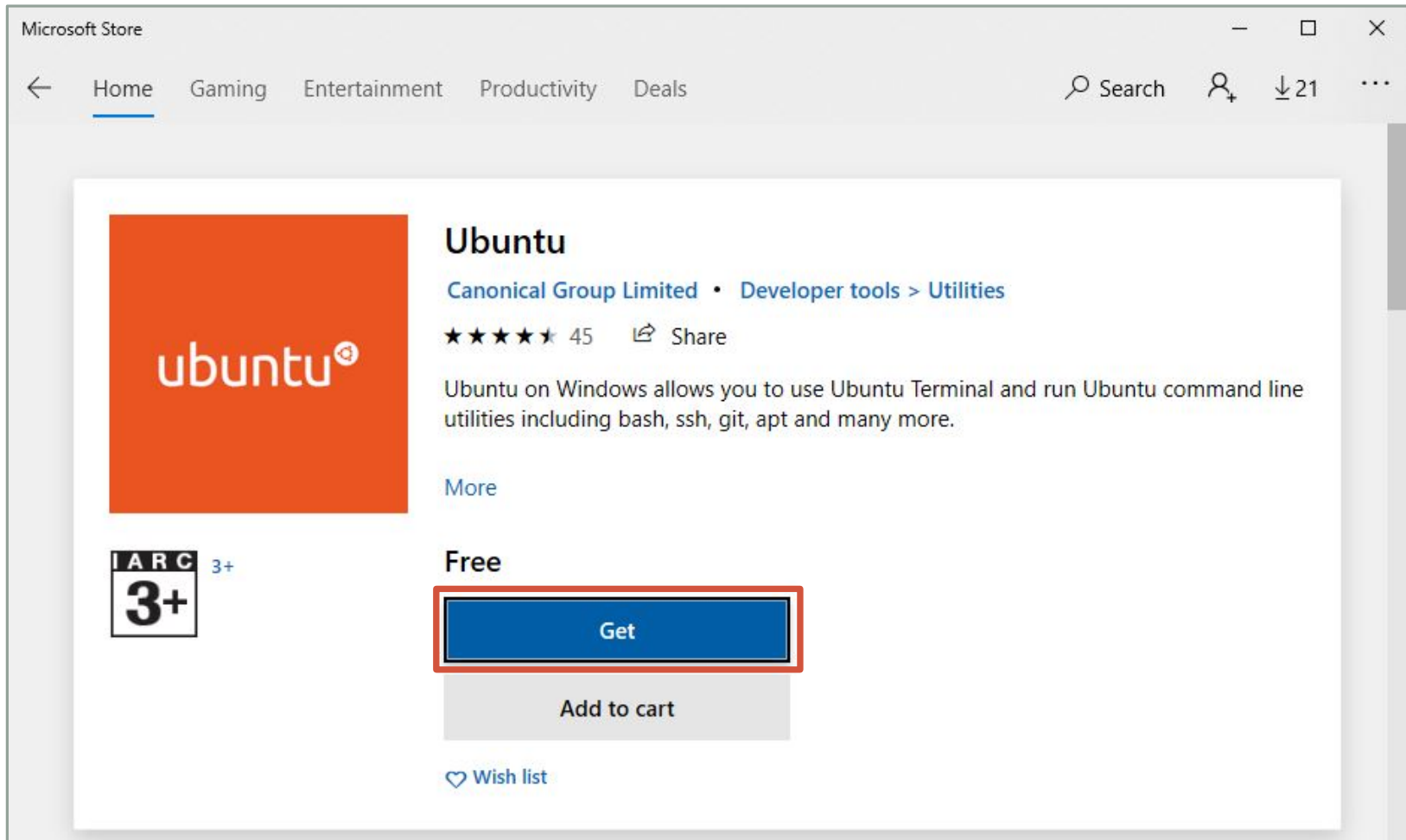
Installation of Ubuntu (1/7)

- Go to Microsoft Store and search “Ubuntu”.
- Select Linux OS and click icon.



Installation of Ubuntu (2/7)

- Click “Get” button



Microsoft Store

Home Gaming Entertainment Productivity Deals

Search 21

Ubuntu

Canonical Group Limited • Developer tools > Utilities

★★★★★ 45 Share

Ubuntu on Windows allows you to use Ubuntu Terminal and run Ubuntu command line utilities including bash, ssh, git, apt and many more.

More

Free

Get

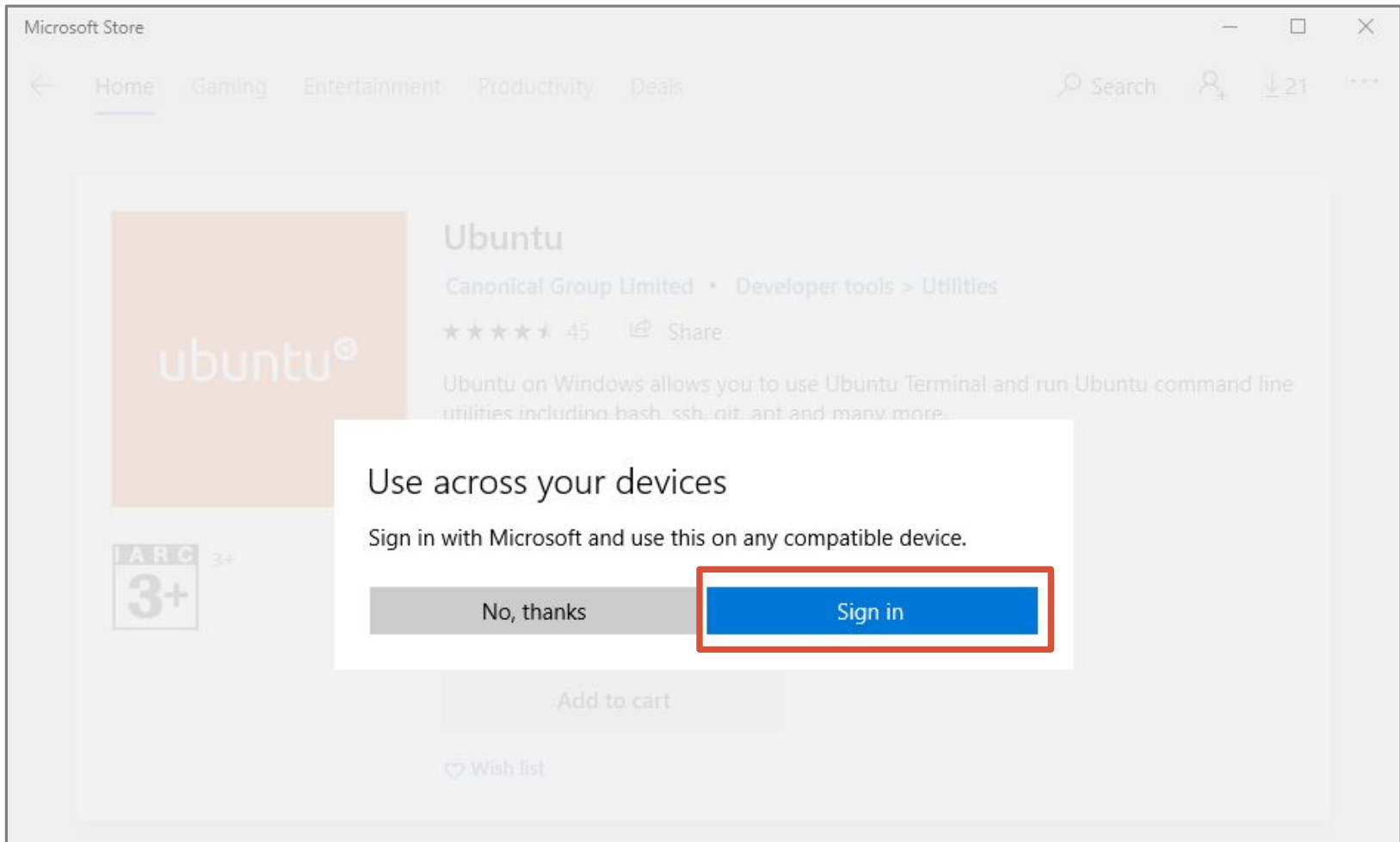
Add to cart

Wish list

IARC 3+ 3+

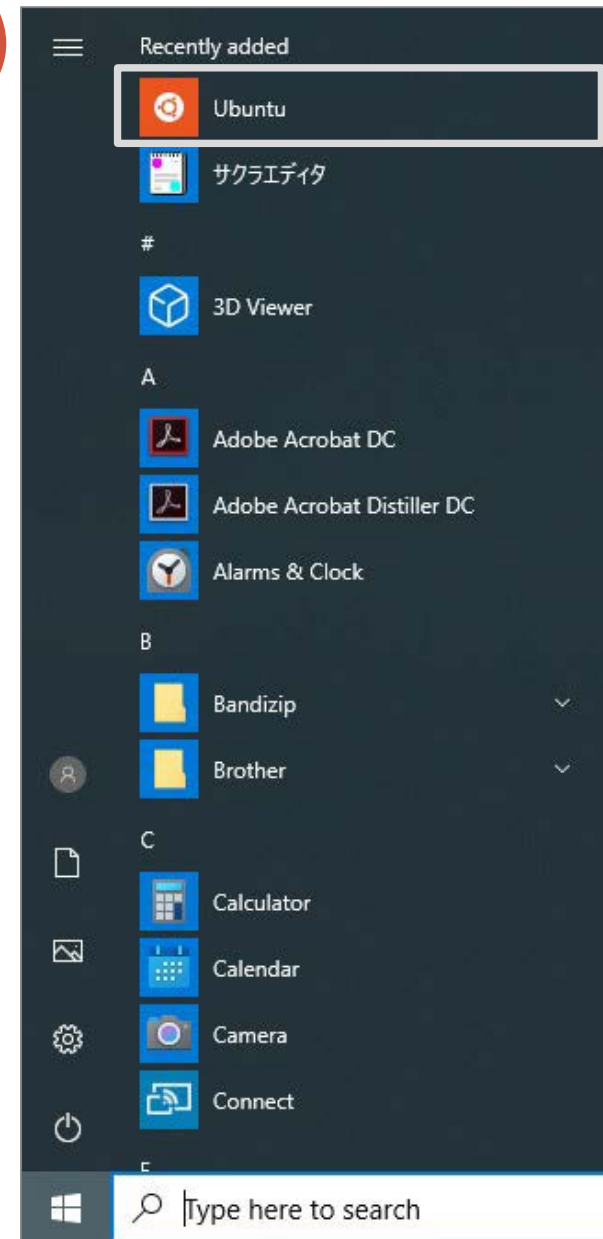
Installation of Ubuntu (3/7)

- Sign in Microsoft account if you needed



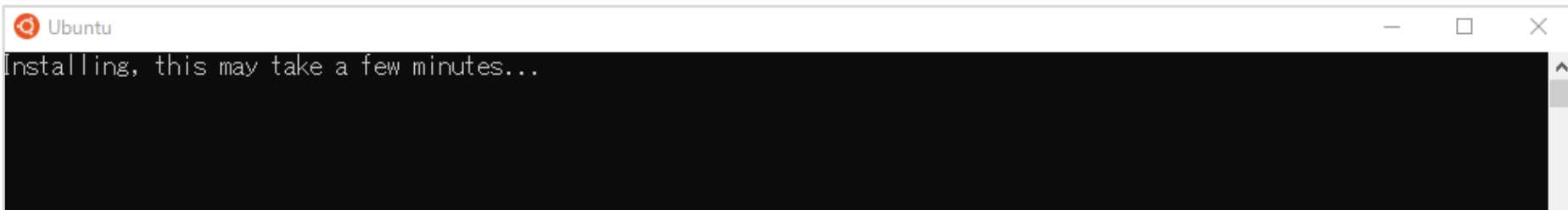
Installation of Ubuntu (4/7)

- Launch up “Ubuntu” in the program list



Installation of Ubuntu (5/7)

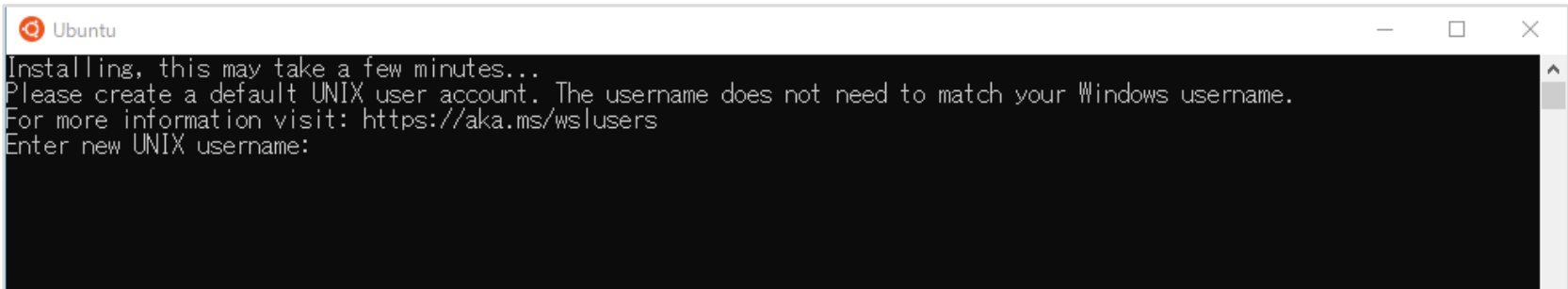
- Open Ubuntu terminal
- Start remaining installation work when you launch up Ubuntu.
 - Wait about 10 minutes.

A screenshot of a terminal window titled "Ubuntu". The window has standard window control buttons (minimize, maximize, close) in the top right corner. The terminal text shows "Installing, this may take a few minutes..." followed by a large black redaction box covering the rest of the output.

```
Ubuntu
Installing, this may take a few minutes...
```

Installation of Ubuntu (6/7)

- After installation, Ubuntu requires user name and password.
 - This user name and password are not related to the Windows account.
 - Password is required for sudo command.
 - User name of this example is “tada”.



```
Ubuntu
Installing, this may take a few minutes...
Please create a default UNIX user account. The username does not need to match your Windows username.
For more information visit: https://aka.ms/wslusers
Enter new UNIX username:
```

Installation of Ubuntu (7/7)

- Installation procedure is completed when you enter user name and password.

```
tada@DESKTOP-8DR8GSO: ~
passwd: password updated successfully
Installation successful!
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

Welcome to Ubuntu 20.04.1 LTS (GNU/Linux 4.4.0-18362-Microsoft x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Thu Aug 27 18:37:41 JST 2020

System load:   0.52      Processes:            7
Usage of /home: unknown  Users logged in:     0
Memory usage:  36%      IPv4 address for eth1:
Swap usage:    0%

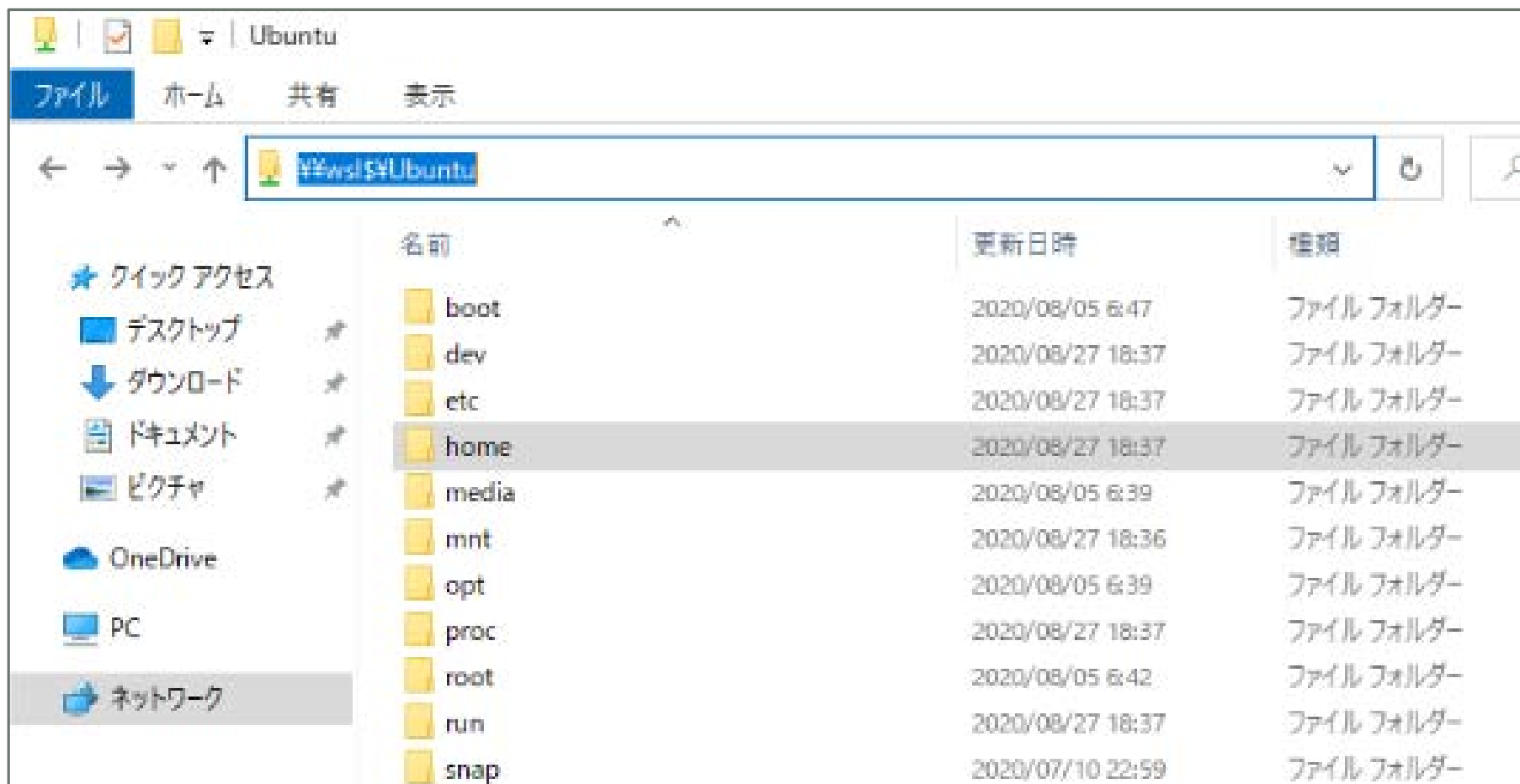
1 update can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

This message is shown once once a day. To disable it please create the
/home/tada/.hushlogin file.
tada@DESKTOP-8DR8GSO: ~$
```

How to access Ubuntu directory?

- Absolute path of Ubuntu directory
 - [\\wsl\\$Ubuntu](#)



Efficient use of Ubuntu on WSL

- Setting up a link to the desktop directory of Windows
 - `ln -s /mnt/c/Users/UserName/Desktop/DirectoryName ./`
 - User can easily exchange data from Windows to Ubuntu.

```
tada@DESKTOP-8DR8GSO: ~
tada@DESKTOP-8DR8GSO:~$ ln -s /mnt/c/Users/██████████/Desktop/wsl_data/ ./
tada@DESKTOP-8DR8GSO:~$ ll
total 44
drwxr-xr-x 1 tada tada 4096 Sep 23 20:06 .
drwxr-xr-x 1 root root 4096 Aug 27 18:37 ..
-rw-r----- 1 tada tada 5502 Sep 23 20:03 .bash_logout
-rw-r----- 1 tada tada 220 Aug 27 18:37 .bashrc
-rw-r----- 1 tada tada 3771 Aug 27 18:37 .cache/
drwxr-xr-x 1 tada tada 4096 Sep  1 15:55 .gitconfig
-rw-rw-rw- 1 tada tada  53 Aug 27 19:48 .gnuplot_history
-rw-r----- 1 tada tada  21 Sep  1 15:54 .landscape/
drwxr-xr-x 1 tada tada 4096 Aug 27 18:37 .motd_shown
-rw-rw-rw- 1 tada tada  0 Sep 23 11:08 .profile
-rw-r----- 1 tada tada  807 Aug 27 18:37 .sudo_as_admin_successful
-rw-r----- 1 tada tada  0 Aug 27 18:57 .viminfo
-rw-r----- 1 tada tada 25972 Sep  1 18:13 code/
drwxrwxrwx 1 tada tada 4096 Sep  1 16:14 work/
lrwxrwxrwx 1 tada tada  43 Sep 23 20:06 wsl_data -> /mnt/c/Users/██████████/Desktop/wsl_data/
tada@DESKTOP-8DR8GSO:~$
```

Annotations in the image:

- User name of Windows:** Points to the redacted user name in the path `/mnt/c/Users/██████████/`.
- Drive name (C drive):** Points to the `/mnt/c/` part of the path.
- Directory name:** Points to the redacted directory name `██████████` in the path.

Launch up Ubuntu at desired directory

- Ubuntu can be launched from any directory
 - Open desired directory and enter “wsl” on address bar.

The image illustrates the process of launching Ubuntu from a specific directory on a Windows PC. It shows two screenshots of a Windows File Explorer window. In the first screenshot, the address bar shows the current directory as 'Desktop'. A red box highlights the address bar with the label 'Address bar'. A red arrow points from this box to a terminal window below. In the second screenshot, the address bar contains the text 'wsl', and a dropdown menu shows search results for 'wsl', 'wsl_data', and '"wsl" の検索'. Below the terminal window, a red box contains the text 'Start Ubuntu from desktop directory'.

Launch up Ubuntu from command prompt

- Enter “wsl” on command prompt



```
選択 tada@DESKTOP-8DR8GSO: /mnt/c/Users/ [redacted]
Microsoft Windows [Version 10.0.18363.1082]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\ [redacted] > wsl
tada@DESKTOP-8DR8GSO: /mnt/c/Users/ [redacted] $
```

Enter “wsl”

Launch up Ubuntu

Installation of development tools

Development tools

- Following development tools are required to compilation of FRENDY.
 - tcsh: Shell
 - gcc, make: Compiler
 - Boost, Lapack, Blas, Eigen: Library
- **Please ask to the administrator before installing above tools.**

Update and installation of tcsh

- Update Ubuntu OS
 - `sudo apt-get update`
 - `sudo apt-get upgrade`
- Installation of tcsh
 - `sudo apt-get install tcsh`
 - For CentOS: `sudo yum install tcsh`

```

tada@DESKTOP-8DR8GSO:~$ sudo apt-get install tcsh
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  tcsh
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 427 kB of archives.
After this operation, 1363 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu focal/universe amd64 tcsh amd64 6.21.00-1 [427 kB]
Fetched 427 kB in 2s (259 kB/s)
Selecting previously unselected package tcsh.
(Reading database ... 31871 files and directories currently installed.)
Preparing to unpack .../tcsh_6.21.00-1_amd64.deb ...
Unpacking tcsh (6.21.00-1) ...
Setting up tcsh (6.21.00-1) ...
update-alternatives: using /bin/tcsh to provide /bin/csh (csh) in auto mode
Processing triggers for man-db (2.9.1-1) ...
tada@DESKTOP-8DR8GSO:~$
    
```

Please enter green commands on Ubuntu terminal

Installation of compilers and libraries

- Installation of gcc and make
 - `sudo apt-get install build-essential`
 - Wait for a few minutes
 - For CentOS: `sudo yum install gcc`
- Installation of Boost library
 - `sudo apt-get install libboost-all-dev`
 - Wait about 10 minutes.
 - For CentOS: `sudo yum install boost boost-devel`
- Installation of Lapack and Blas
 - `sudo apt-get install liblapack-dev libblas-dev`
 - Wait about 10 minutes.
 - For CentOS: `sudo yum install lapack-devel blas-devel`

Installation of Eigen library

- Installation of Eigen library
 - Eigen library is not required for FRENDY
 - Eigen library is required for random sampling tool.
 - `sudo apt-get install libeigen3-dev`
- CentOS does not prepare the install package
 - User has to download Eigen manually.
 - ① Get Eigen3 from following website.
 - http://eigen.tuxfamily.org/index.php?title=Main_Page#Download
 - ② Decompress downloaded file.
 - ③ Setting up a link to "eigen-3.X.X/Eigen" at FRENDY directory, e.g., "frendy_YYYYMMDD"

Compilation of FRENDY

Get FRENDY from JAEA website

- Everyone can download FRENDY from following web site:
 - https://rpg.jaea.go.jp/main/en/program_frendy/

Japan Atomic Energy Agency Nuclear Science and Engineering Center Nuclear Data and Reactor Engineering Division

Research Group for Reactor Physics and Standard Nuclear Code System

Japanese

Research Group for Reactor Physics and Standard Nuclear Code System » index

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- Reference of FRENDY
- License (2-clause BSD license) and Copyright
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FRENDY

Download of nuclear data processing code FRENDY version 1

FRENDY: FROm Evaluated Nuclear Data librARy to any application

Latest version

- [README](#)
- [Update list](#)
- [FRENDY\(1.03.003\)](#)

Old version

- [FRENDY\(1.02.003\)](#)
- [FRENDY\(1.01.001\)](#)
- [FRENDY\(1.00.005\)](#)

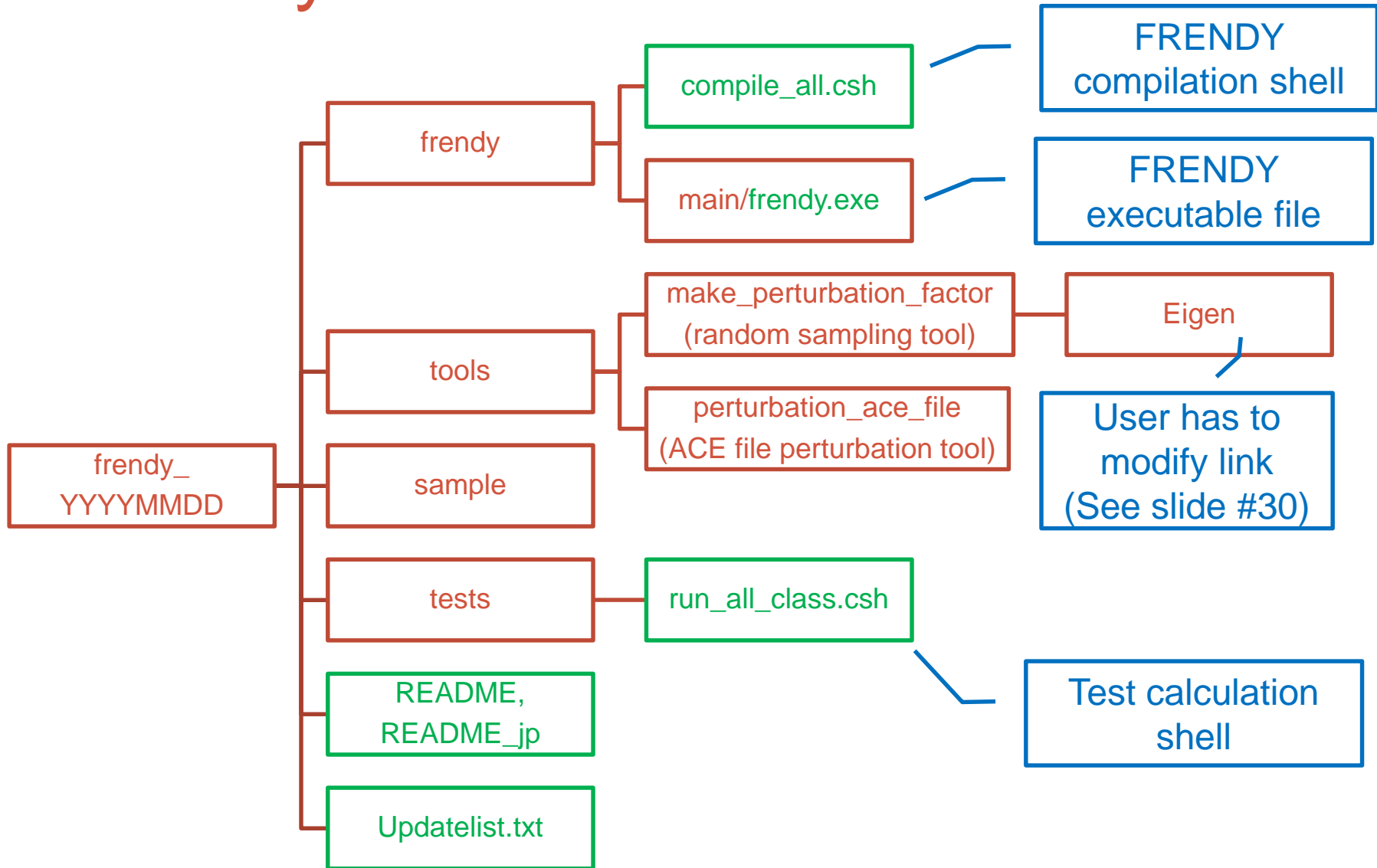
Reference of FRENDY

K. Tada, Y. Nagaya, S. Kunieda, K. Suyama, T. Fukahori, "Development and verification of a new nuclear data processing system FRENDY," J. Nucl. Sci. Technol., 54, pp.806-817 (2017).
<https://www.tandfonline.com/doi/abs/10.1080/00223131.2017.1309306>

Decompression of FRENDY

- Get FRENDY from JAEA web site.
 - File name: frendy_YYYYMMDD.tar.gz
 - “YYYYMMDD” means release date
- Decompression of FRENDY
 - `tar -xvzf frendy_YYYYMMDD.tar.gz`

Directory structure of FRENDY



Compilation of FRENDY

- Go to “frendy_YYYYMMDD/frendy”.
 - `cd frendy_YYYYMMDD/frendy`
- Run “compile_all.csh”
 - `csh ./compile_all.csh`
 - Wait about 10 minutes.
 - Warning message may be output on terminal.
 - Compilation will be OK if there is no fatal error message.
 - Compilation is completed when following message is displayed
 - “### Completed to make FRENDY ###”
 - Executable file (frendy/main/frendy.exe) is generated.

Running sample program of FRENDY

- Go to “frendy_YYYYMMDD/sample/run”.
 - `cd sample/run`
- Running run_frendy.csh shell.
 - `csh ./run_frendy.csh`
- Several nuclides and materials are automatically processed and corresponding ACE files are generated.
 - H-001, C-000, O-016, Fe-056, Xe-135, Gd-155, U-235, U238, Pu-238, and Pu-239
 - HinH3O, para-H, ortho-H, and graphite
 - Wait about 20~30 minutes.
 - ACE file is generated in “col_data” directory
 - ACE file: j40a00fa for nuclides and f40a00ta for TSL data
 - XSDIR file : xsdir.j40a00f for nuclides and xsdir.j40a00t for TSL data

Compilation of random sampling tool

- User has to compile FRENDY before compilation of this tool.
- Go to “frendy_YYYYMMDD/tools/make_perturbation_factor”.
 - `cd tools/make_perturbation_factor`
- Setting up a link to **Eigen** at “make_perturbation_factor” directory.
 - `ln -s /usr/include/eigen3/Eigen/ ./`
 - Please remove existing Eigen file
- Compilation of random sampling tool.
 - `make`
- Running sample calculation.
 - `cd sample`
 - `csh ./run_make_perturbation_factor.csh`
 - Compilation of random sampling tool is successfully completed if there is no warning and 100 files are generated in “output/1001” directory.
 - File name of output files: “1001_0001” ~ “1001_0100”

Compilation of ACE file perturbation tool

- User has to compile FRENDY before compilation of this tool.
- Go to “frendy_YYYYMMDD/tools/perturbation_ace_file”
 - `cd tools/perturbation_ace_file`
- Compilation of ACE file perturbation tool
 - `make`
- Running sample calculation.
 - User has to run sample of random sampling tool.
 - `cd sample`
 - `csh ./run_perturbation_ace_file.csh`
 - Compilation of random sampling tool is successfully completed if there is no warning and 100 directories are generated in “output” directory.
 - Directory name: “0001” ~ “0100”