

Real-Time Multicore OS RTEMS GR740 installation

인하대학교 컴퓨터공학과

Intelligent Embedded SW 연구실

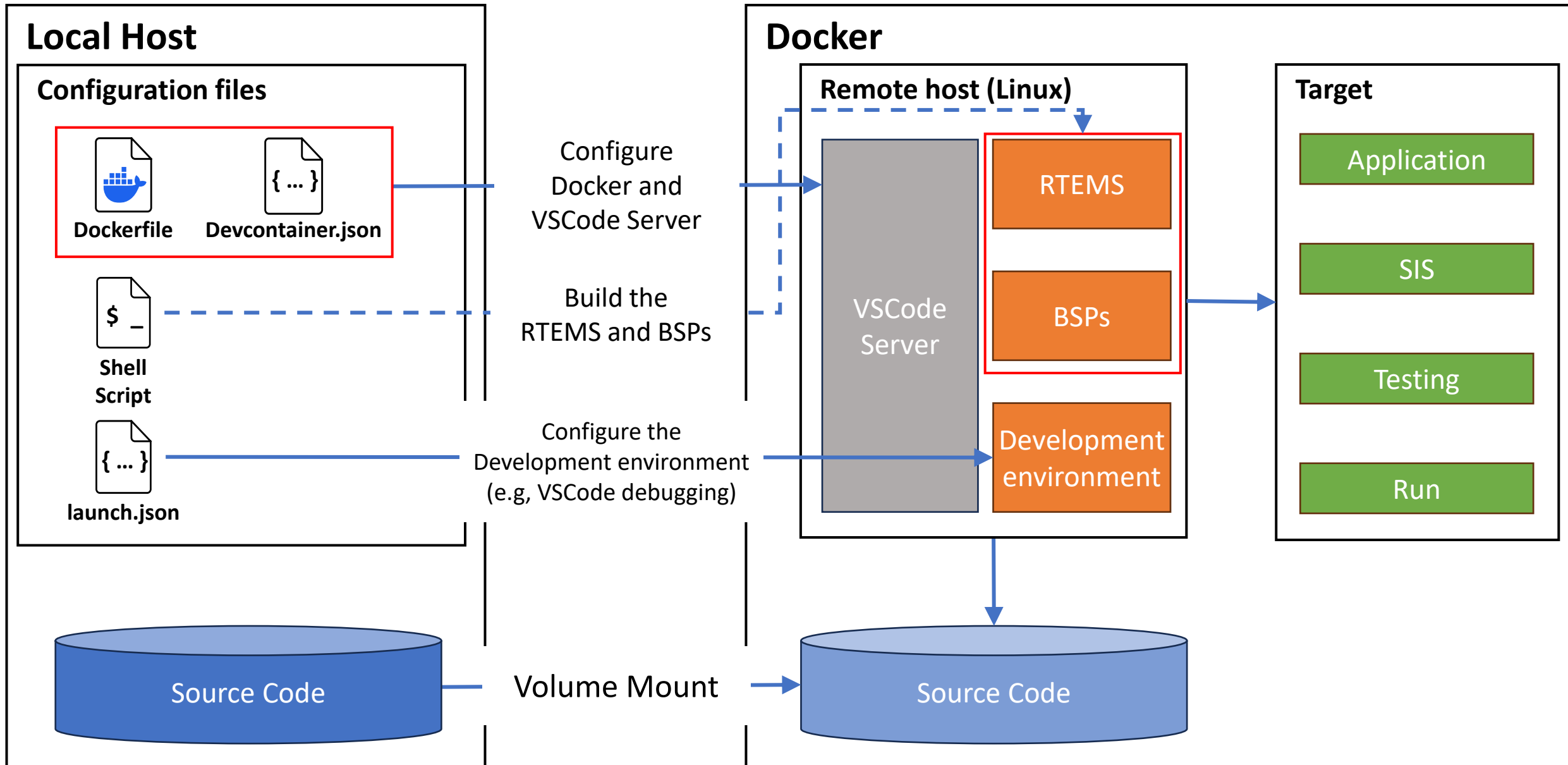
연구원 김형호

2025-08-12

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STRUCTURE



QUICK START – WINDOWS 11

- Run CMD or PowerShell with administrator rights.
- Enter the following command into CMD or PowerShell

<code>\$ dism.exe /online /enable-feature /featurename:Microsoft-Windows-Subsystem-Linux /all /norestart</code> (1)
<code>\$ dism.exe /online /enable-feature /featurename:VirtualMachinePlatform /all /norestart</code> (2)

- (1) To activate WSL
- (2) To activate VirtualMachinePlatform option

- Install WSL2

<code>\$ wsl.exe --install</code> (1)	Install WSL
<code>\$ wsl.exe --update</code> (2)	Update to latest version
<code>\$ wsl --set-default-version 2</code> (3)	Set WSL2 as default version

QUICK START – WINDOWS 11

- Download Docker Desktop for Windows

- Official Link

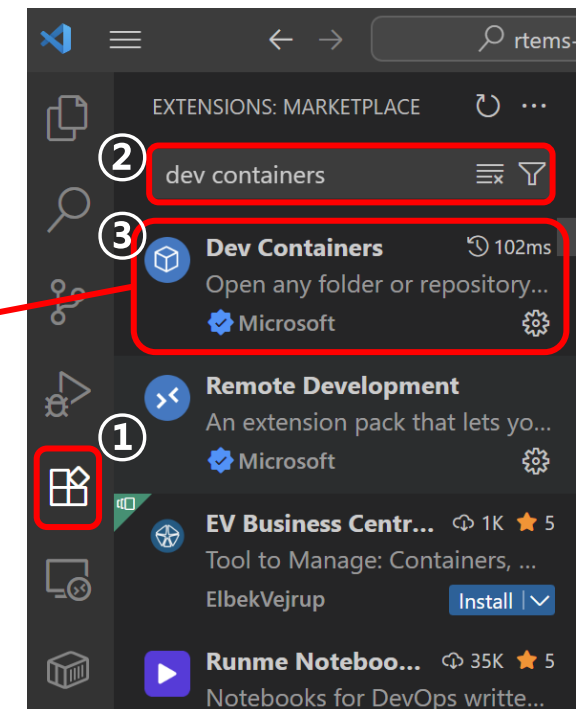
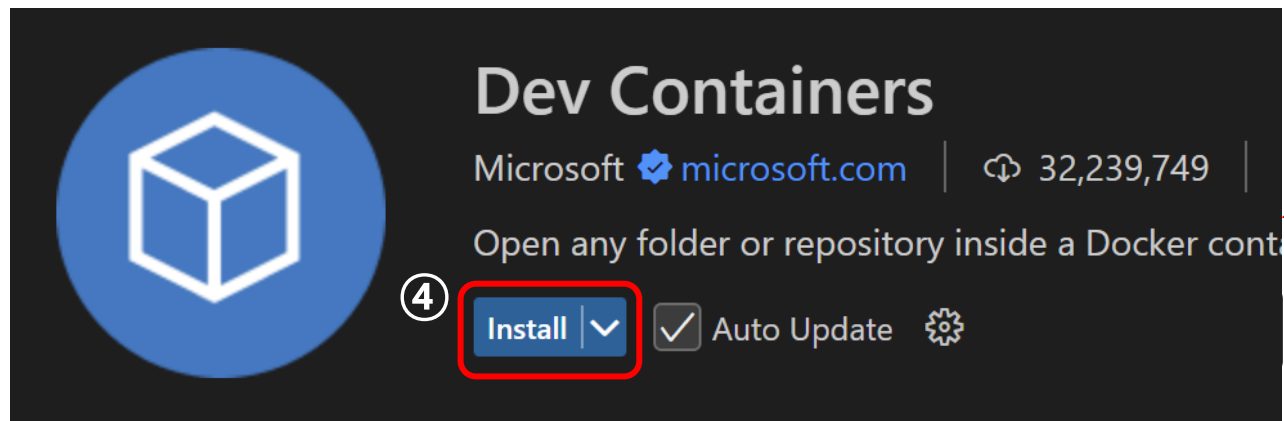
<https://docs.docker.com/desktop/setup/install/windows-install/>

- Download VSCode

- Official Link

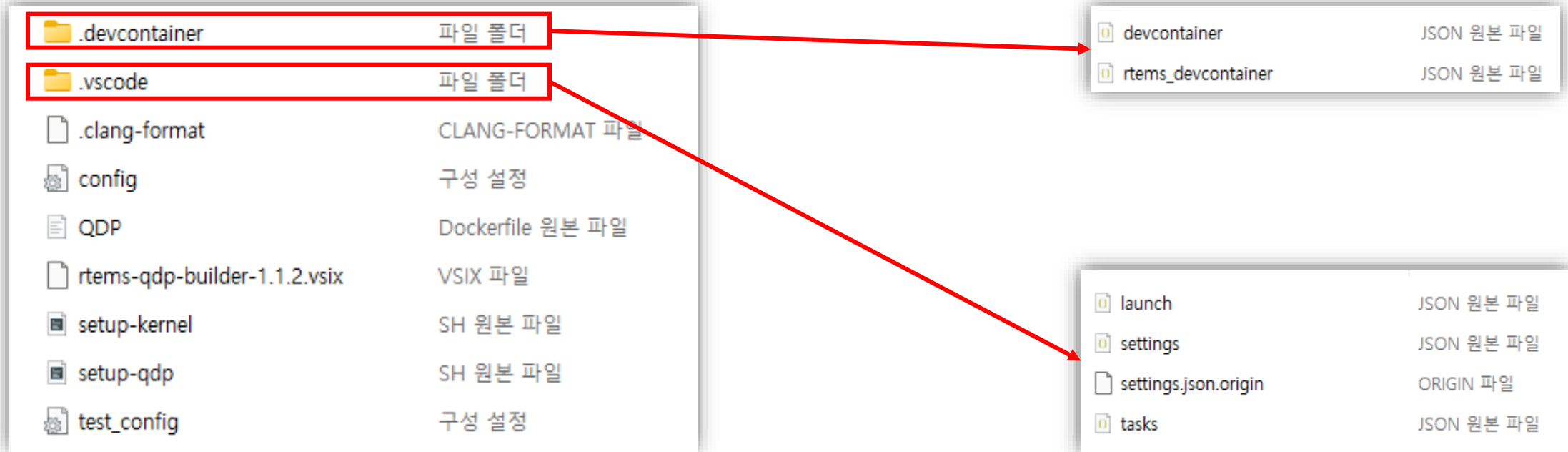
<https://code.visualstudio.com/>

- Open VSCode and Download extension : Dev Containers

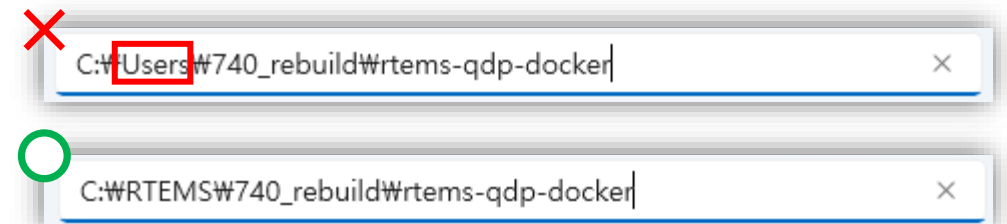


QUICK START – WINDOWS 11


- **“rtems-qdp-docker.zip” structure is as follows:**

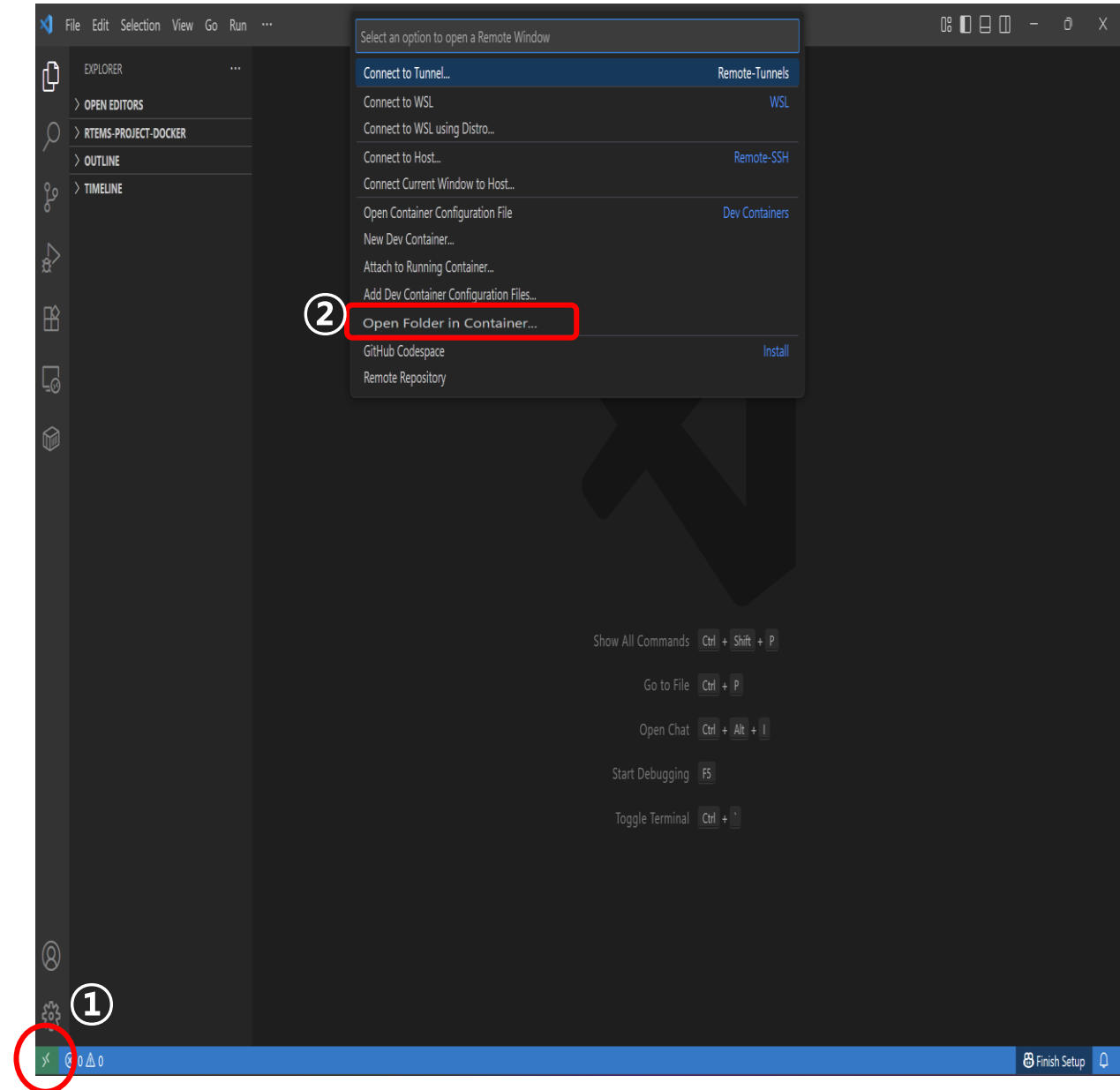


- Unzip the “rtems-qdp-docker.zip” file to any location you want, **except** the “Users” path
 - Unzipping a zip file to a “Users” path may cause permission issues.



QUICK START – WINDOWS 11

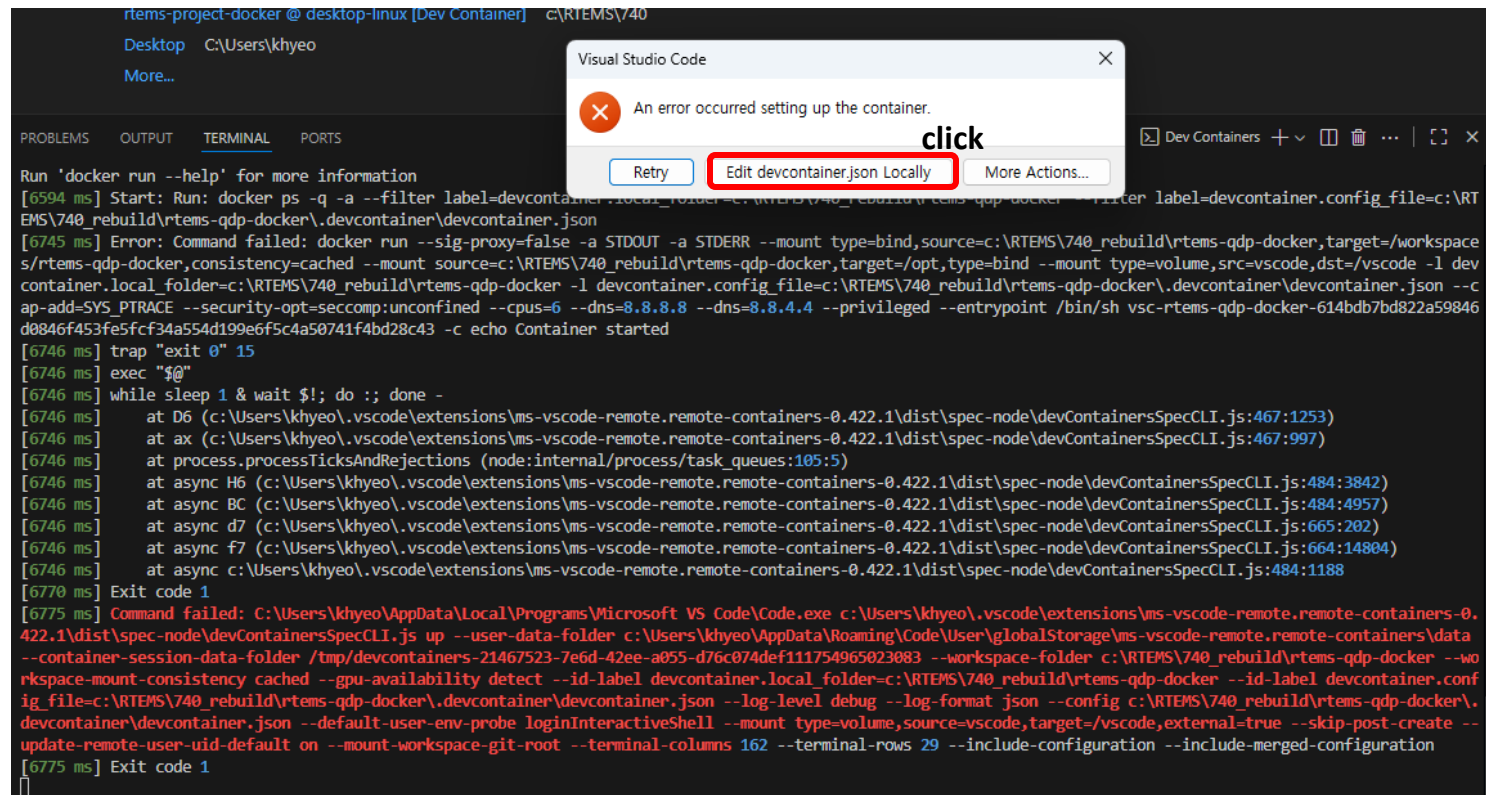
- Download “rtems-qdp-docker.zip” and unzip the file
- Click 
- Click the ‘Open folder in Container...’
- Select unzipped ‘rtems-qdp-docker folder’
- Wait until the environment setting is done
 - It takes quite a while (about 10 min)



QUICK START – WINDOWS 11

【 Technical note 1 】

- If error occurs,
click “Edit devcontainer.json Locally”



```
rtems-project-docker @ desktop-linux [Dev Container] C:\RTEMS\740
Desktop C:\Users\khyeo
More...

PROBLEMS OUTPUT TERMINAL PORTS

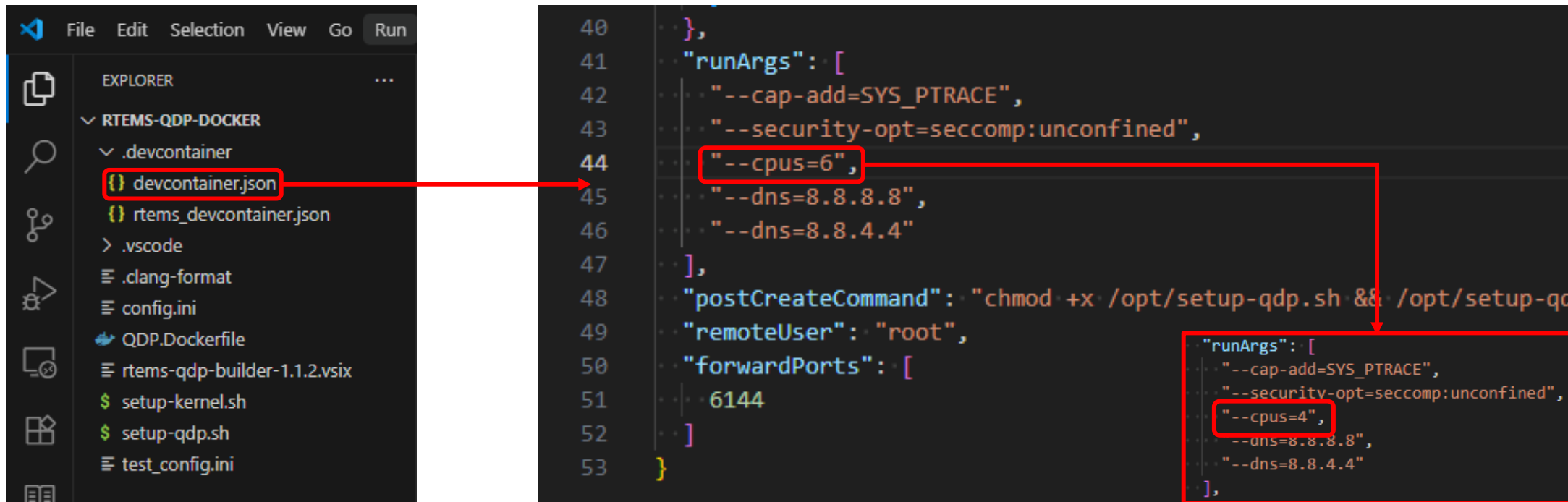
Run 'docker run --help' for more information
[6594 ms] Start: Run: docker ps -q -a --filter label=devcontainer.local_folder=c:\RTEMS\740_rebuild\rtms-qdp-docker --filter label=devcontainer.config_file=c:\RTEMS\740_rebuild\rtms-qdp-docker\devcontainer\devcontainer.json
[6745 ms] Error: Command failed: docker run --sig-proxy=false -a STDOUT -a STDERR --mount type=bind,source=c:\RTEMS\740_rebuild\rtms-qdp-docker,target=/workspace s/rtms-qdp-docker,consistency=cached --mount source=c:\RTEMS\740_rebuild\rtms-qdp-docker,target=/opt,type=bind --mount type=volume,src=vscode,dst=/vscode -l devcontainer.local_folder=c:\RTEMS\740_rebuild\rtms-qdp-docker -l devcontainer.config_file=c:\RTEMS\740_rebuild\rtms-qdp-docker\devcontainer\devcontainer.json --cap-add=SYS_PTRACE --security-opt=seccomp:unconfined --cpus=6 --dns=8.8.8.8 --dns=8.8.4.4 --privileged --entrypoint /bin/sh vsc-rtms-qdp-docker-614bdb7bd822a59846d0846f453fe5fcf34a554d199e6f5c4a50741f4bd28c43 -c echo Container started
[6746 ms] trap "exit 0" 15
[6746 ms] exec "$@"
[6746 ms] while sleep 1 & wait $!; do ;; done -
[6746 ms] at D6 (c:\Users\khyeo\.vscode\extensions\ms-vscode-remote.remote-containers-0.422.1\dist\spec-node\devContainersSpecCLI.js:467:1253)
[6746 ms] at ax (c:\Users\khyeo\.vscode\extensions\ms-vscode-remote.remote-containers-0.422.1\dist\spec-node\devContainersSpecCLI.js:467:997)
[6746 ms] at process.processTicksAndRejections (node:internal/process/task_queues:105:5)
[6746 ms] at async H6 (c:\Users\khyeo\.vscode\extensions\ms-vscode-remote.remote-containers-0.422.1\dist\spec-node\devContainersSpecCLI.js:484:3842)
[6746 ms] at async BC (c:\Users\khyeo\.vscode\extensions\ms-vscode-remote.remote-containers-0.422.1\dist\spec-node\devContainersSpecCLI.js:484:4957)
[6746 ms] at async d7 (c:\Users\khyeo\.vscode\extensions\ms-vscode-remote.remote-containers-0.422.1\dist\spec-node\devContainersSpecCLI.js:665:202)
[6746 ms] at async f7 (c:\Users\khyeo\.vscode\extensions\ms-vscode-remote.remote-containers-0.422.1\dist\spec-node\devContainersSpecCLI.js:664:14804)
[6746 ms] at async c:\Users\khyeo\.vscode\extensions\ms-vscode-remote.remote-containers-0.422.1\dist\spec-node\devContainersSpecCLI.js:484:1188
[6770 ms] Exit code 1
[6775 ms] Command failed: C:\Users\khyeo\AppData\Local\Programs\Microsoft VS Code\Code.exe c:\Users\khyeo\.vscode\extensions\ms-vscode-remote.remote-containers-0.422.1\dist\spec-node\devContainersSpecCLI.js up --user-data-folder c:\Users\khyeo\AppData\Roaming\Code\User\globalStorage\ms-vscode-remote.remote-containers\data --container-session-data-folder /tmp/devcontainers-21467523-7e6d-42ee-a055-d76c074def111754965023083 --workspace-folder c:\RTEMS\740_rebuild\rtms-qdp-docker --workspace-mount-consistency cached --gpu-availability detect --id-label devcontainer.local_folder=c:\RTEMS\740_rebuild\rtms-qdp-docker --id-label devcontainer.config_file=c:\RTEMS\740_rebuild\rtms-qdp-docker\devcontainer\devcontainer.json --log-level debug --log-format json --config c:\RTEMS\740_rebuild\rtms-qdp-docker\devcontainer\devcontainer.json --default-user-env-probe loginInteractiveShell --mount type=volume,source=vscode,target=/vscode,external=true --skip-post-create --update-remote-user-uid-default on --mount-workspace-git-root --terminal-columns 162 --terminal-rows 29 --include-configuration --include-merged-configuration
[6775 ms] Exit code 1
```


QUICK START – WINDOWS 11

【 Technical note 1 】

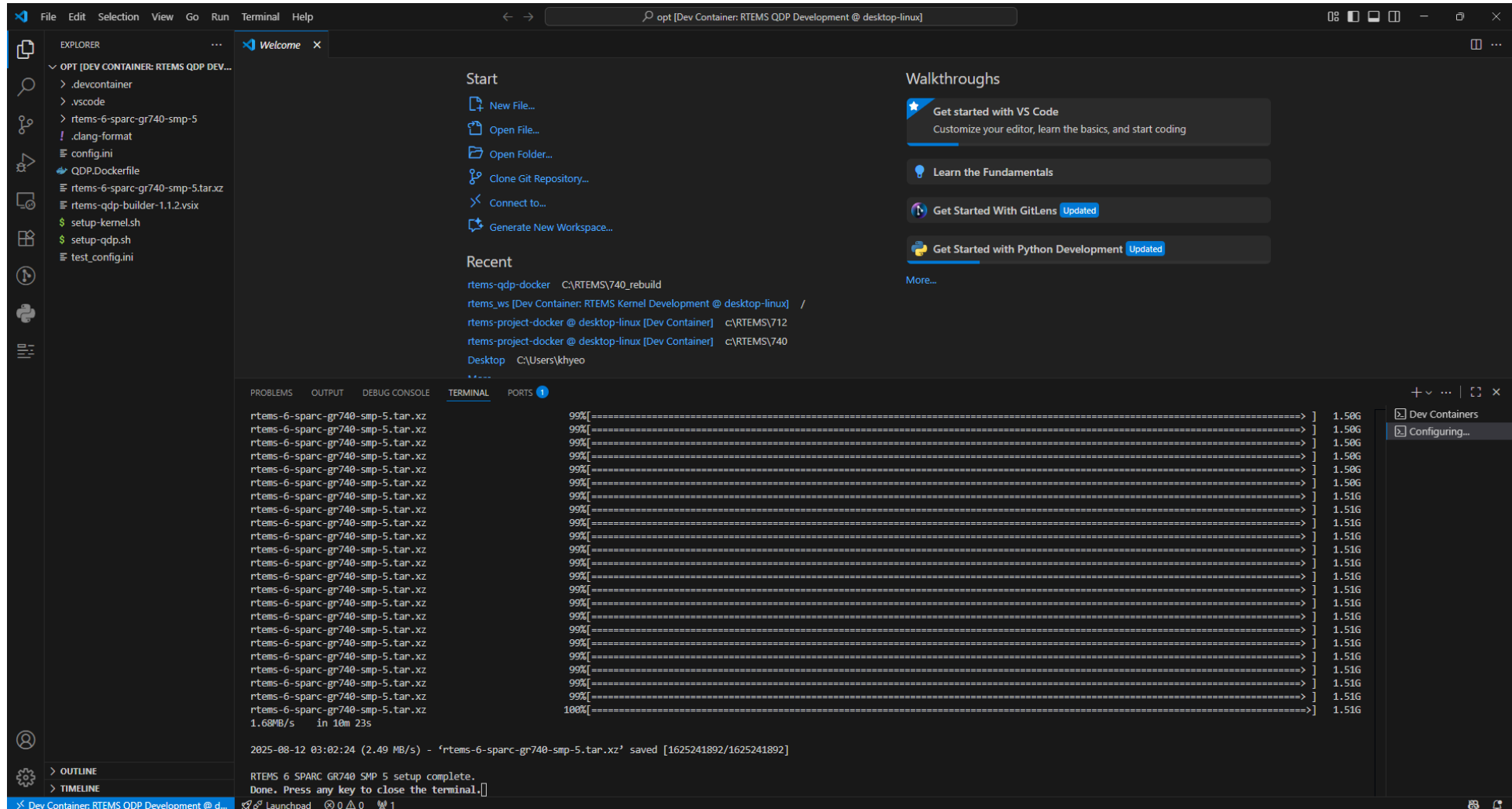
- You may see this sentence in the log

```
[2025-08-12T02:19:00.214Z] docker: Error response from daemon: range of CPUs is from 0.01 to 4.00, as there are only 4 CPUs available
```



- After editing, save changes and do 'Open folder in Container...' or 'Reopen in Container'

QUICK START – RESULTS



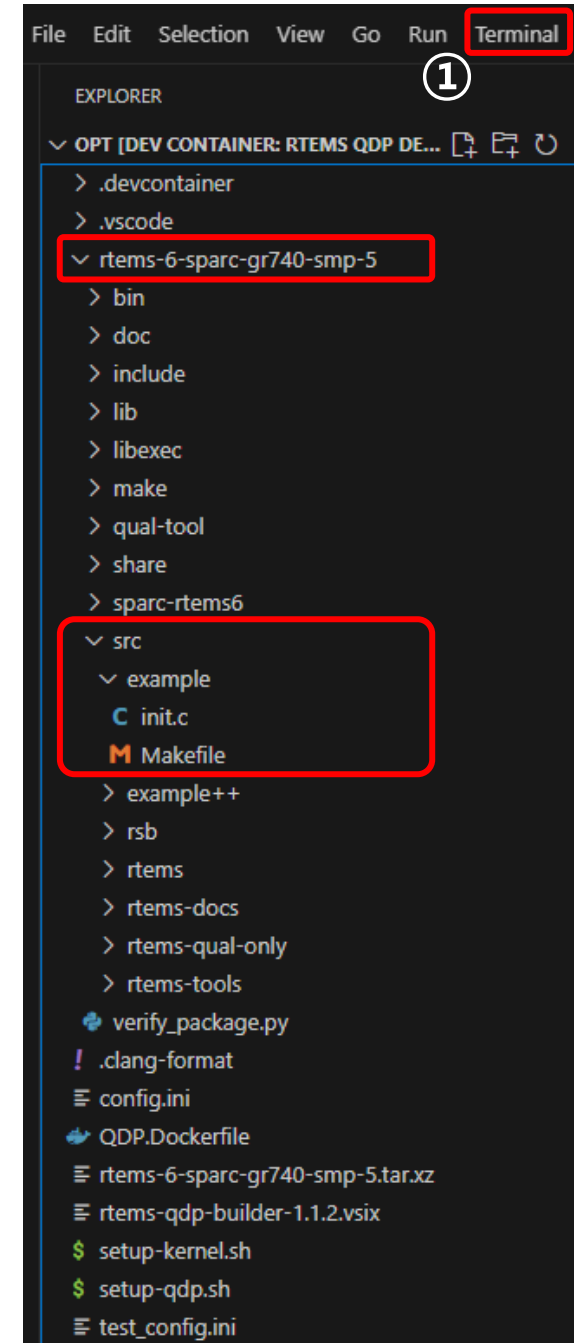
RTEMS GDB EXAMPLE

- After setting is done, 'rtems-6-sparc-gr740-smp-5' folder is created
- To test example code, click 'Terminal' and select 'New Terminal'
- Enter the following command into the terminal

```
$ export RTEMS_PATH=/opt/rtems-6-sparc-gr740-smp-5 >> ~/.bashrc ..... (1)
$ export PATH=$RTEMS_PATH/bin:$PATH >> ~/.bashrc ..... (2)
$ export RTEMS_BSP=sparc/gr740 >> ~/.bashrc ..... (3)
$ source ~/.bashrc ..... (4)
$ cd rtems-6-sparc-gr740-smp-5/src/example ..... (5)
```

- (1), (2), (3), (4) To set the Environment Variable PATH
- (5) To move the path where the Makefile and example is located

```
root@5120731066da:/opt# export RTEMS_PATH=/opt/rtems-6-sparc-gr740-smp-5 >> ~/.bashrc
root@5120731066da:/opt# export PATH=$RTEMS_PATH/bin:$PATH >> ~/.bashrc
root@5120731066da:/opt# export RTEMS_BSP=sparc/gr740 >> ~/.bashrc
root@5120731066da:/opt# source ~/.bashrc
root@5120731066da:/opt# cd rtems-6-sparc-gr740-smp-5/src/example
root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/example#
```



RTEMS GDB EXAMPLE

- Enter the following command into the terminal

```
$ make
```

..... (1) To make .exe file

```
root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/example# make
mkdir b-gr740-qual-only
sparc-rtems6-gcc -MT b-gr740-qual-only/init.o -MD -MP -MF b-gr740-qual-only/init.d -Wall -Wextra -mcpu=leon3 -I/opt/rtems-6-sparc-gr740-smp-5/sparc-rtems6/gr740-qual-only/lib/include -O2 -g -ffunction-sections -fdata-sections -c init.c -o b-gr740-qual-only/init.o
sparc-rtems6-gcc -MT b-gr740-qual-only/app.exe -MD -MP -MF b-gr740-qual-only/app.d -Wall -Wextra -mcpu=leon3 -I/opt/rtems-6-sparc-gr740-smp-5/sparc-rtems6/gr740-qual-only/lib/include -O2 -g -ffunction-sections -fdata-sections -Wl,-Map,b-gr740-qual-only/app.map b-gr740-qual-only/init.o -B/opt/rtems-6-sparc-gr740-smp-5/sparc-rtems6/gr740-qual-only/lib -qrtems -Wl,--gc-sections -nodefaultlibs -Wl,--start-group -lrtemscpu -lrtemsbsp -lgcc -Wl,--end-group -o b-gr740-qual-only/app.exe
```

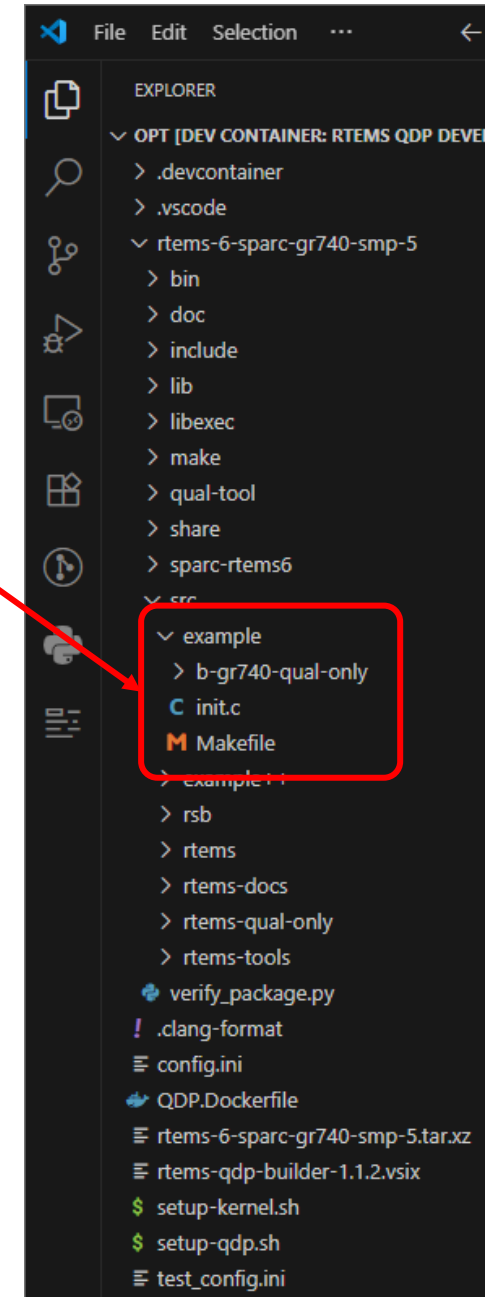
- After 'make', 'b-gr740-qual-only' folder is created

- Enter the following command into the terminal

```
$ make run
```

..... (1) To run 'app.exe'

```
root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/example# make run
```



RTEMS GDB EXAMPLE - RESULT

- Enter the following command into the terminal

```
● root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/example# make run
sparc-rtems6-sis -gr740 -dumbio -r s b-gr740-qual-only/app.exe

SIS - SPARC/RISCV instruction simulator 2.29,  copyright Jiri Gaisler 2020
Bug-reports to jiri@gaisler.se

GR740/LEON4 emulation enabled, 1 cpus online, delta 50 clocks

Loaded b-gr740-qual-only/app.exe, entry 0x00000000
Hello, world!
cpu 0 in error mode (tt = 0x80)
      83178  00008660: 91d02000   ta  0x0
○ root@5120731066da:/opt/rtems-6-sparc-gr740-smp-5/src/example#
```