개발환경 구축

Hancheol Cho

개발환경 설치 순서

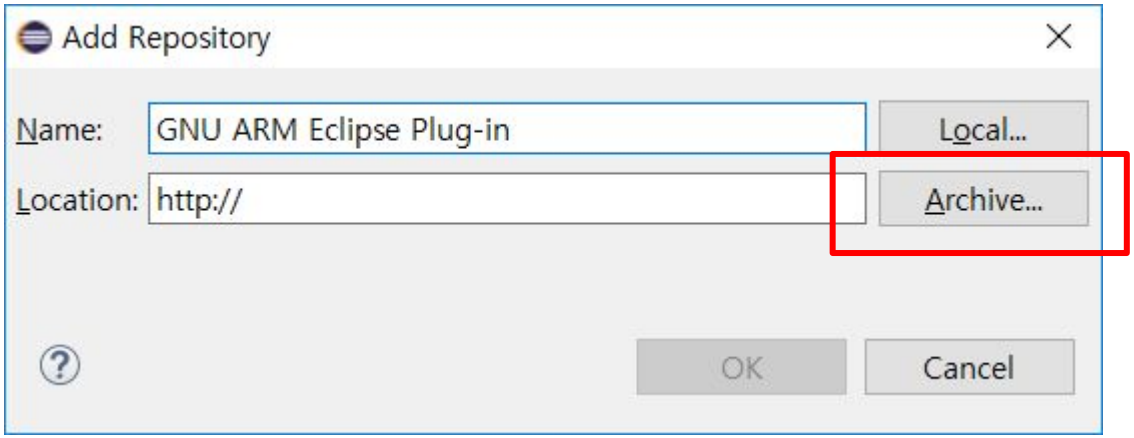
- JAVA SE(JDK) 설치
- Eclipse IDE for C/C++ Developers 설치
- GNU ARM Eclipse Plug-in 설치
- Windows Build Tools 설치
- GNU ARM GCC 설치
- OpenOCD 설치
- STLink-V2 드라이버 설치
- USB Serial 드라이버 설치
- DFU 드라이버 설치

개발환경 설치

- Java SE (JDK) 설치
  - http://www.oracle.com/technetwork/java/javase/downloads/index.html
- Eclipse IDE for C/C++ Developers 설치
  - https://eclipse.org/downloads/

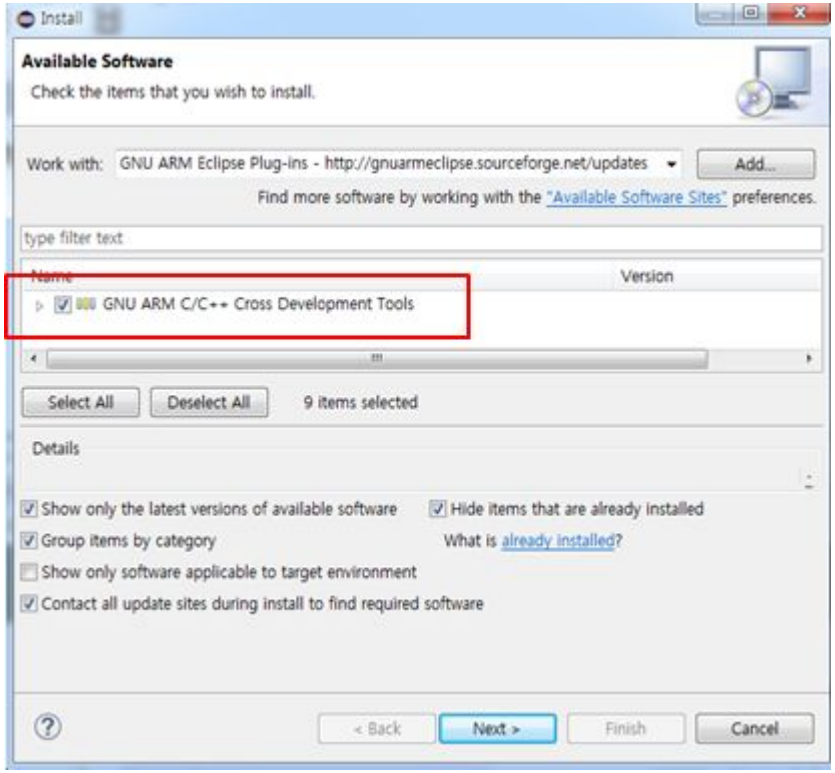
개발환경 설치

- GNU ARM Eclipse Plug-in 설치 (ZIP 파일을 이용한 설치)
  - https://github.com/gnuarmeclipse/plug-ins/releases 에서 최신 zip 파일을 다운로드
  - Help->Install New Software->Add 선택 후 Archive에 다운받은 zip파일을 선택하고 Name에 GNU ARM Eclipse Plug-in



개발환경 설치

- GNU ARM Eclipse Plug-in 설치
  - GNU ARM C/C++ Cross Development Tools 선택 후 설치함



개발환경 설치

- Windows Build Tools 설치
  - GCC로 빌드하기 위해서는 make와 rm 실행파일이 필요한데
    윈도우에서는 기본 내장되어 있지 않기 때문에 설치 필요
  - https://github.com/gnuarmeclipse/windows-build-tools/releases
    윈도우 버전에 맞게 zip 파일을 다운로드
  - 다운로드 후에 원하는 폴더에 zip 파일을 압축 해제

개발환경 설치

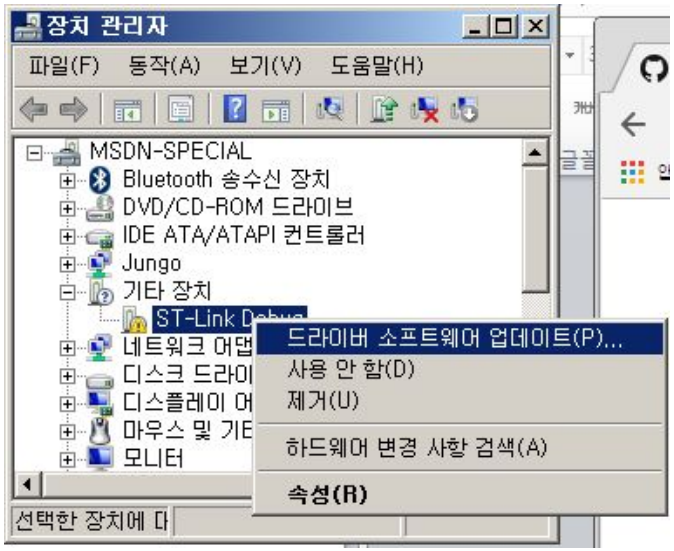
- GNU ARM GCC 설치
  - https://launchpad.net/gcc-arm-embedded/5.0/5-2016-q2-update 각 플랫폼에 맞는 버전의 zip 파일로 다운로드
  - Zip 파일로 다운로드 하고 원하는 폴더에 압축을 푼다.

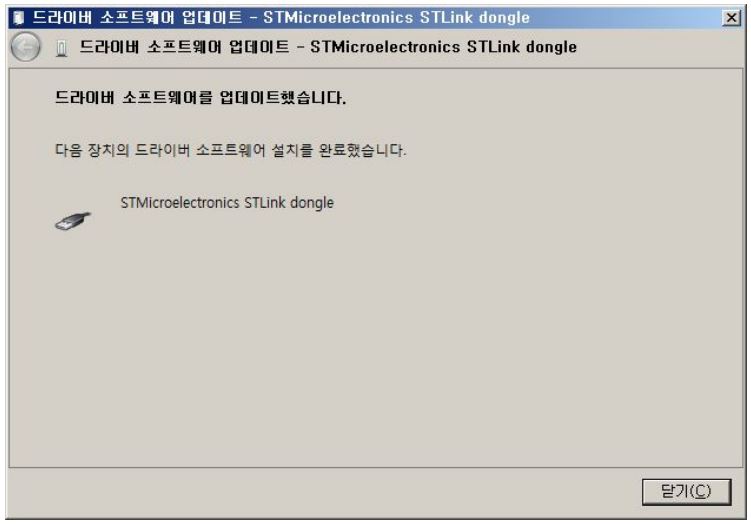
개발환경 설치

- OpenOCD 설치
  - https://github.com/gnuarmeclipse/openocd/releases 에서 윈도우 버전에 맞는 실행파일을 다운로드 후 설치

개발환경 설치

- STLink-V2 드라이버 설치
  - http://www.st.com/content/st_com/en/products/embedded-software/development-tool-software/stsw-link009.html 에서 드라이버를 다운로드
  - STLink-V2를 PC에 연결하고 장치 관리자에 ST-Link Debug장치가 보이고 드라이버 소프트웨어 업데이트를 선택하면 자동으로 설치됨



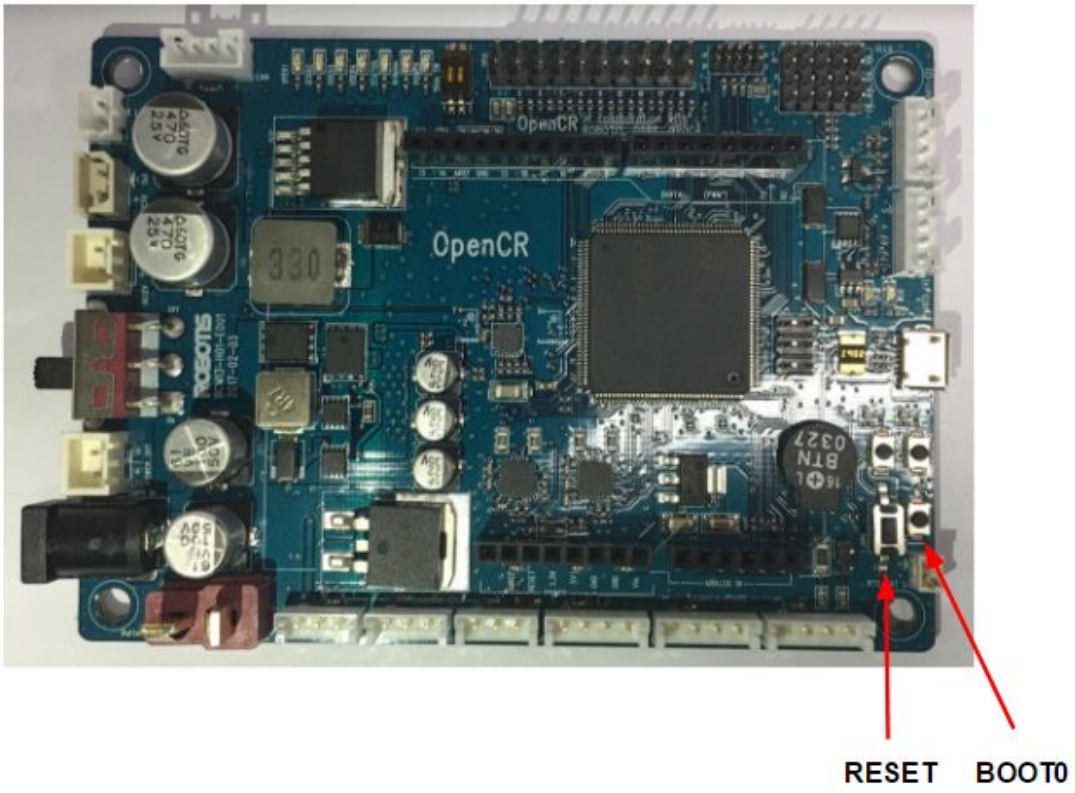


개발환경 설치

- ST Virtual COM 드라이버 설치
  - USB를 가상의 시리얼포트로 인식하게 해주는 드라이버를 http://www.st.com/en/development-tools/stsw-stm32102.html 에서 다운로드 후 설치
  - 드라이버를 다운로드 하기위해서는 간단히 성명과 이메일주소가 필요

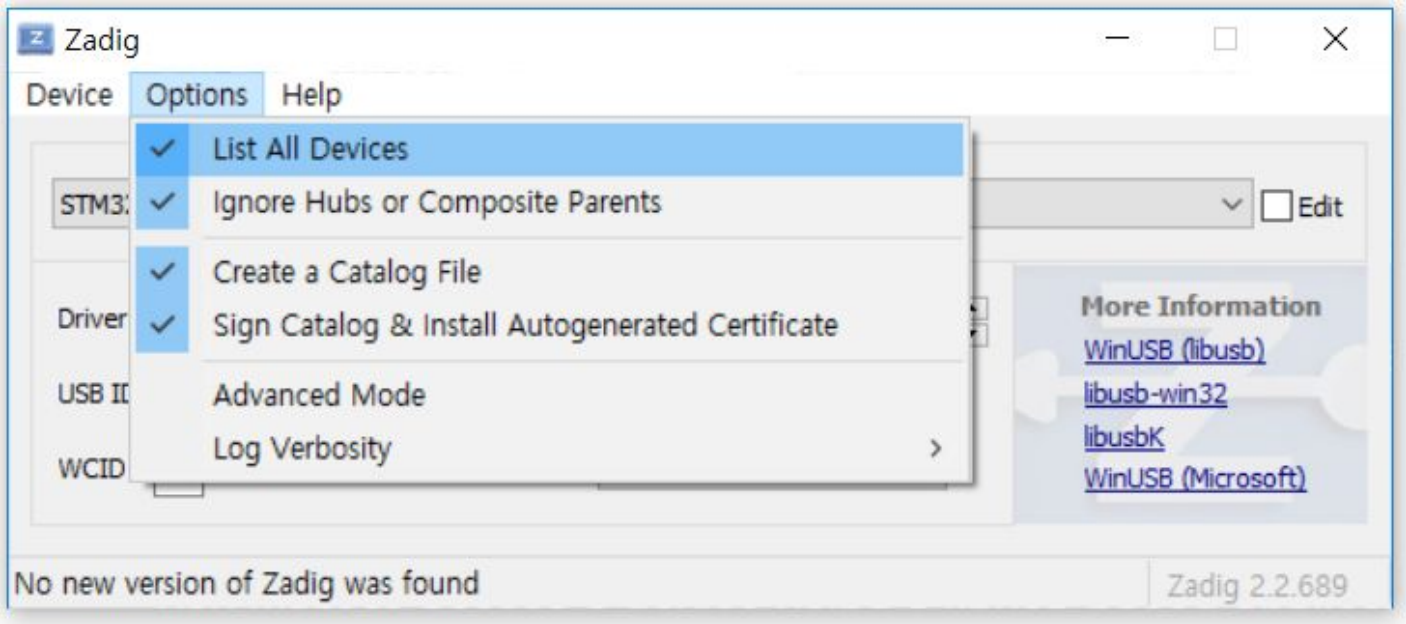
개발환경 설치

- DFU 모드 실행
  - OpenCR보드의 BOOT0핀을 누른 상태에서 RESET을 누르면 DFU모드로 실행됨



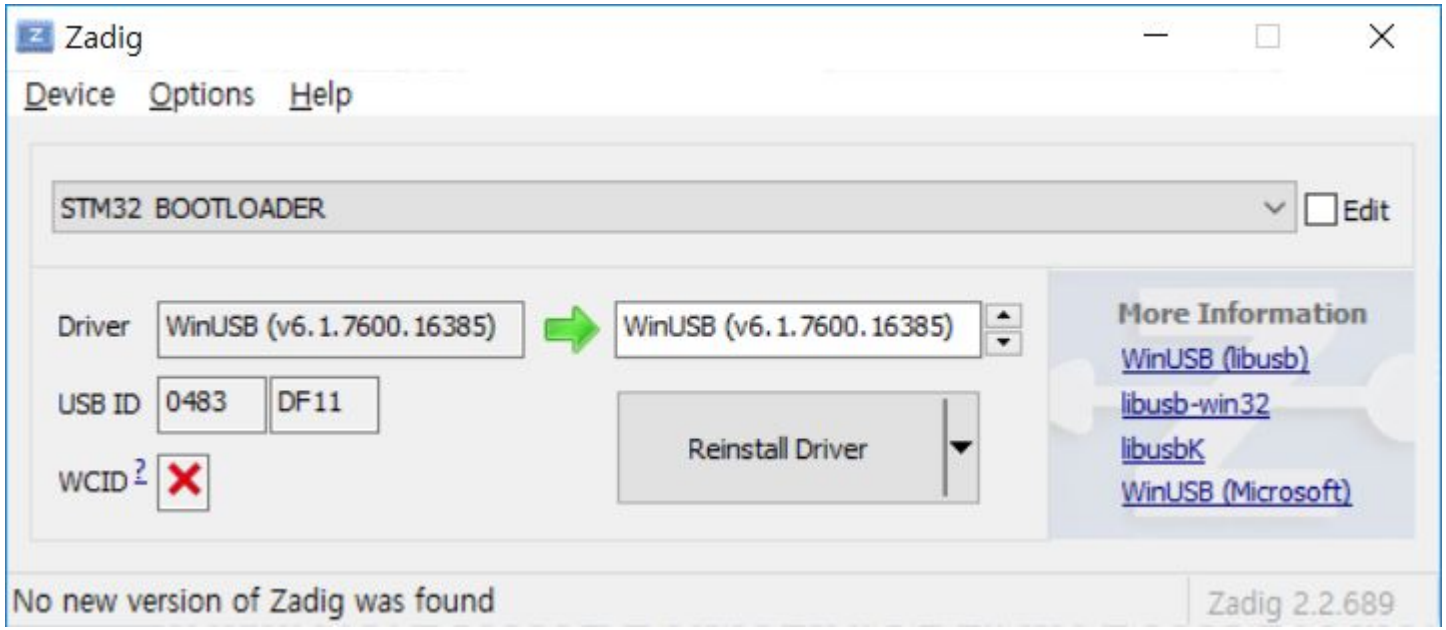
개발환경 설치

- DFU 드라이버 설치
  - DFU 유틸리티를 이용해서 다운로드 하기 위해서는 DFU 드라이버가 필요한데 ST에서 제공하는 드라이버가 아닌 WinUSB 드라이버를 설치
  - http://zadig.akeo.ie/ 에서 zadig를 다운로드
  - Zadig실행 후 Options->List All Devices를 선택

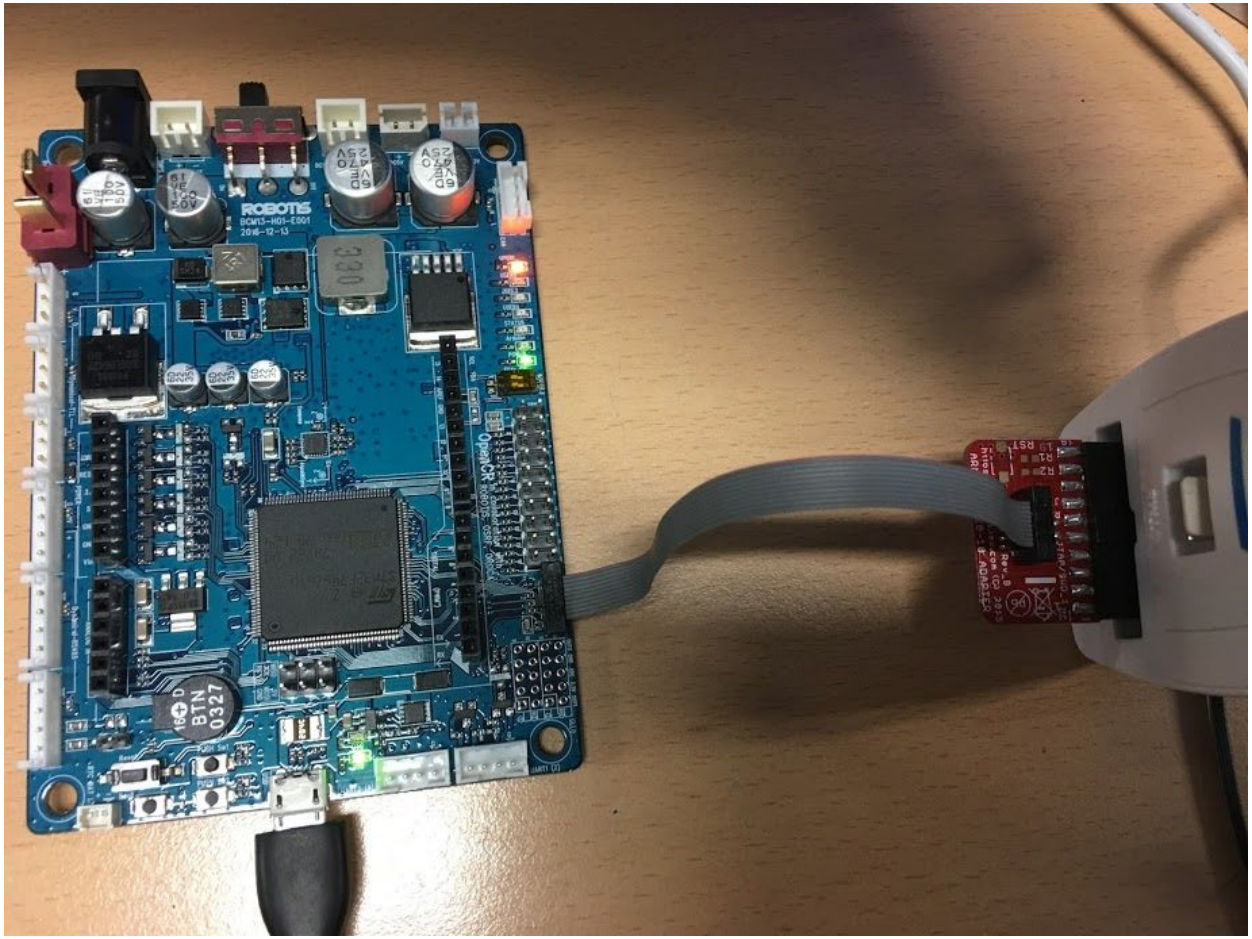


개발환경 설치

- DFU 드라이버 설치
  - STM32 BOOTLOADER를 선택하고 WinUSB 드라이버를 설치

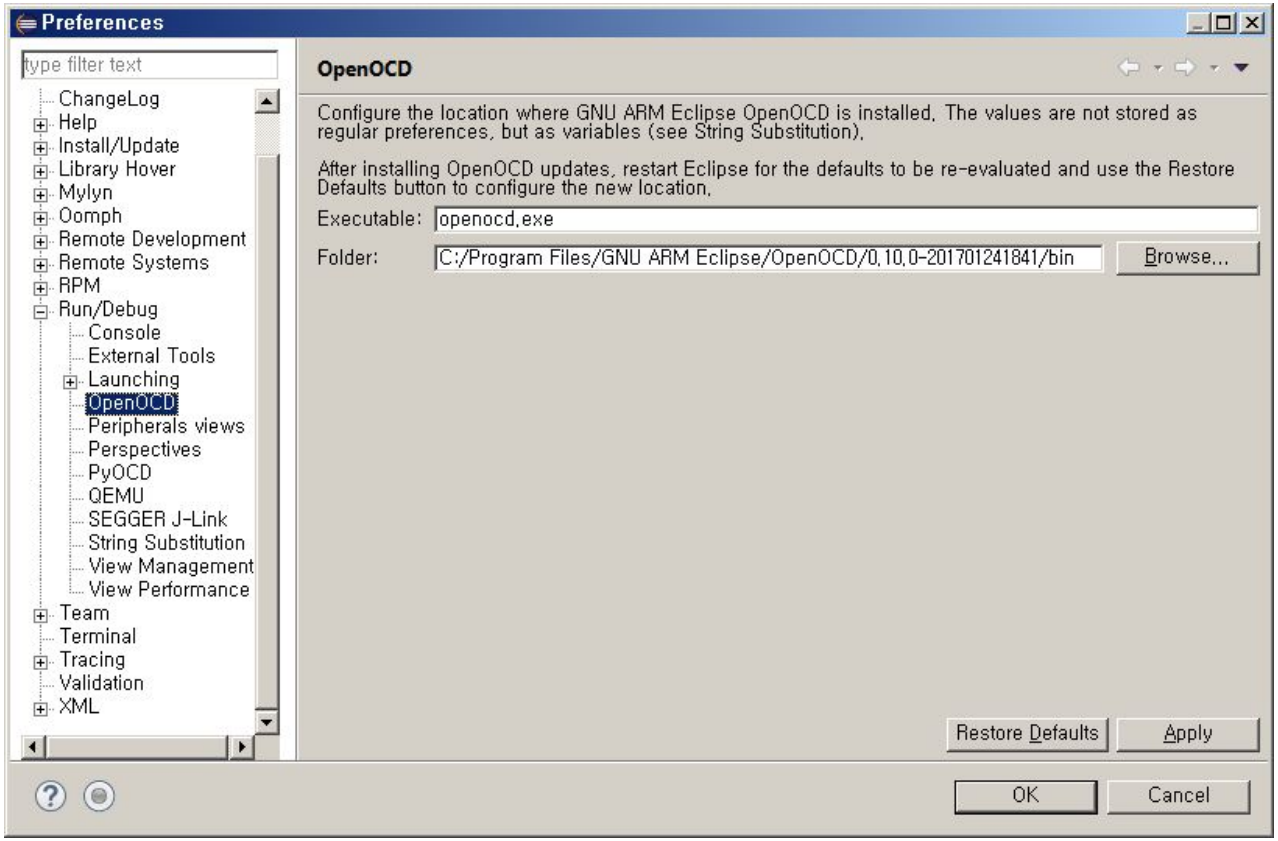


STLink-V2 연결



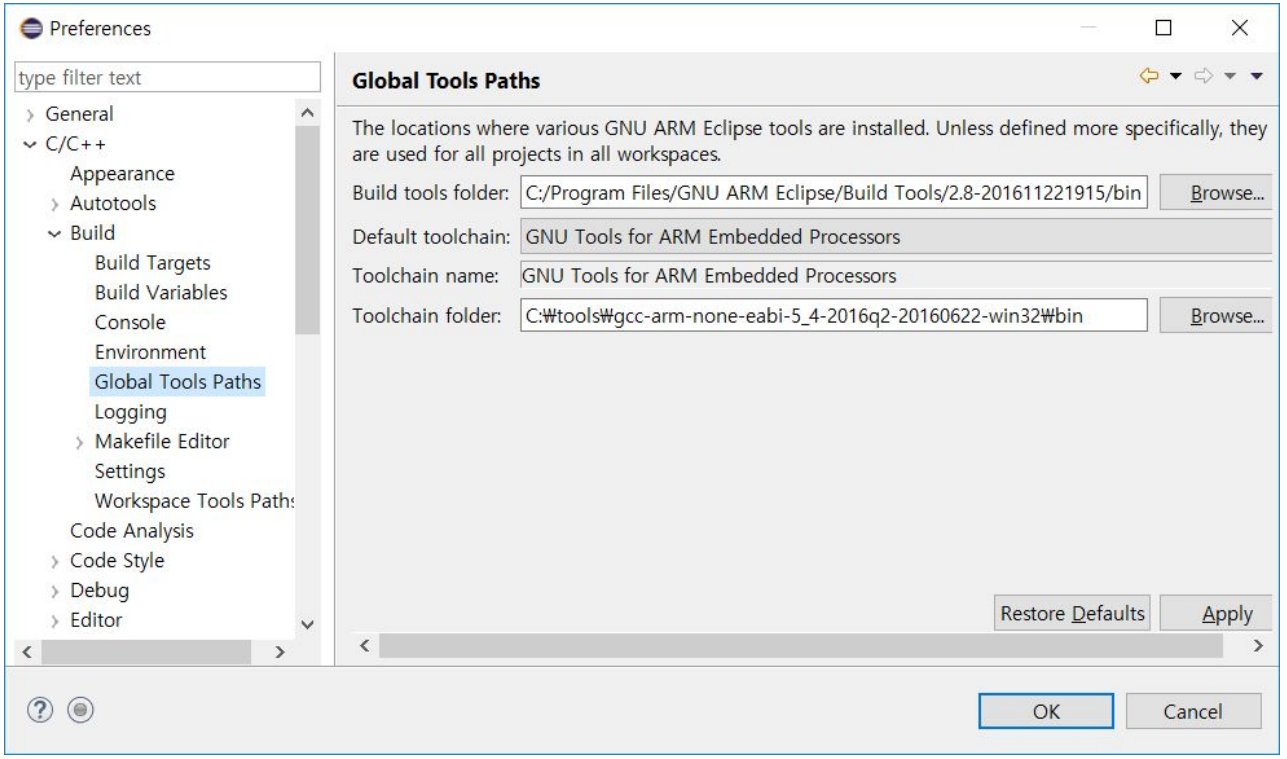
Eclipse 설정

- OpenOCD 패스 설정
  - Window->Preferences->Run/Debug->OpenOCD에 실행 파일과 폴더 설정



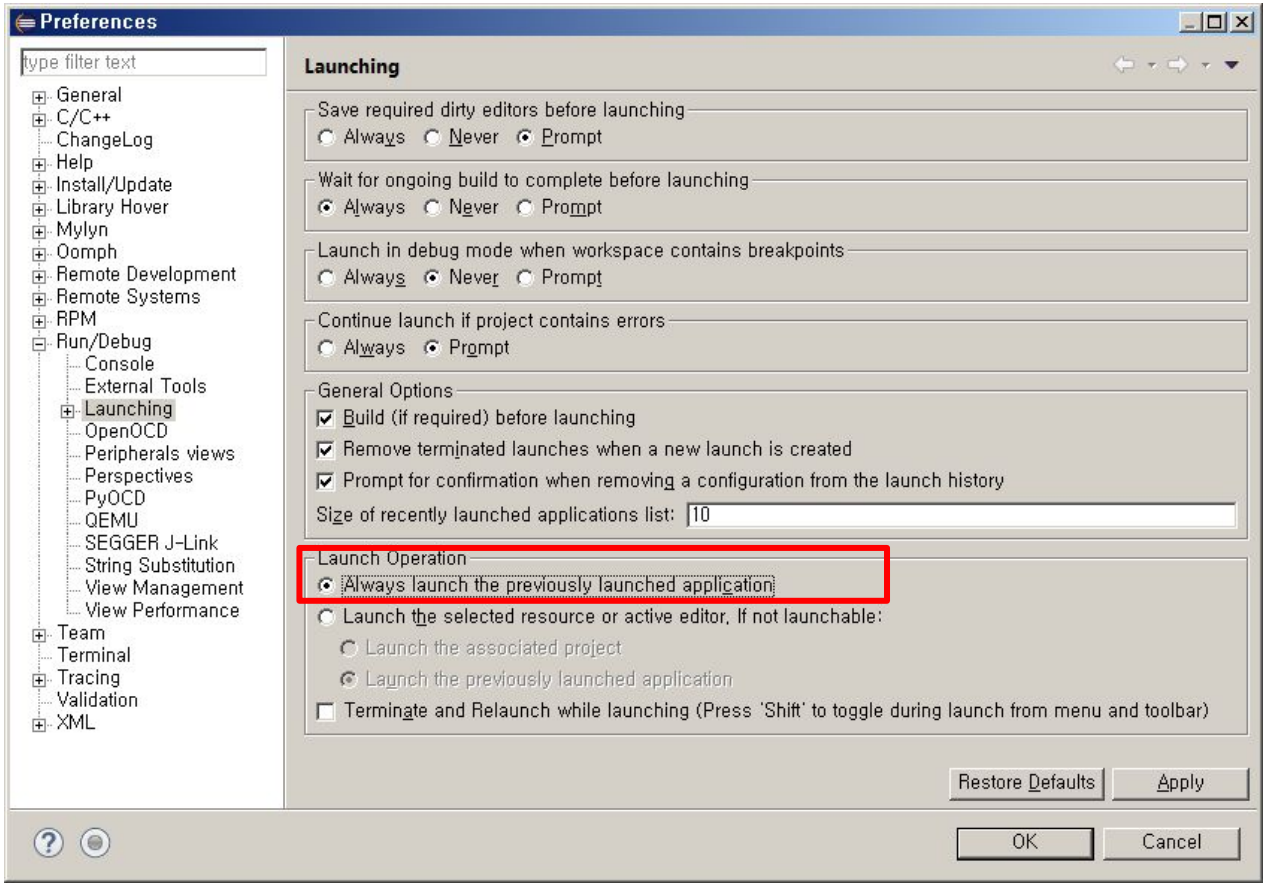
Eclipse 설정

- Global Tools Paths 설정
  - Window->Preferences->C/C++->Global Tools Paths에 Build tools와 Toolchain 폴더를 지정한다.



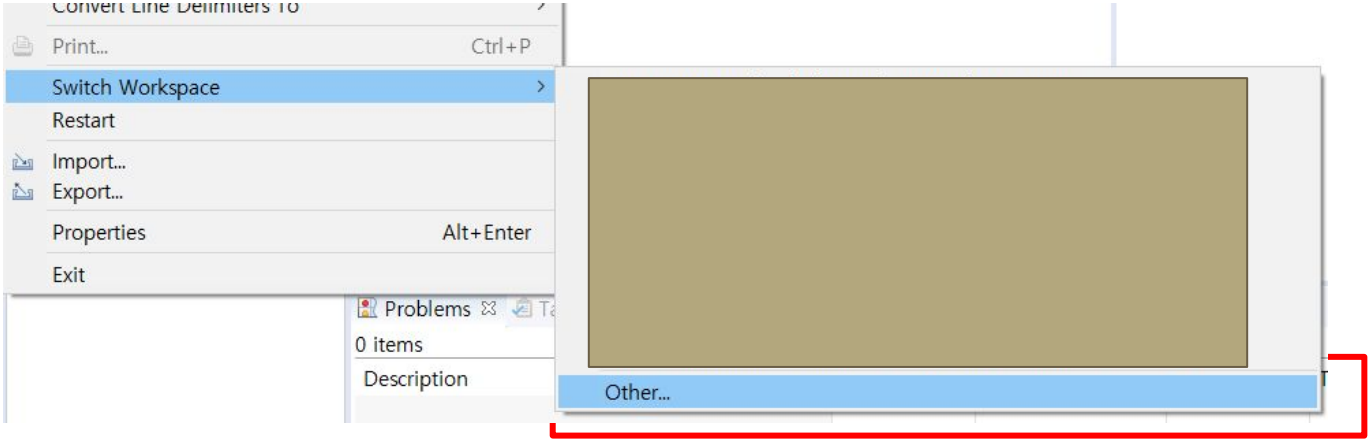
Eclipse 설정

- Launching 설정
  - 마지막 디버깅 실행 내용을 저장했다가 디버깅 실행시 저장된 디버깅 설정으로 실행됨



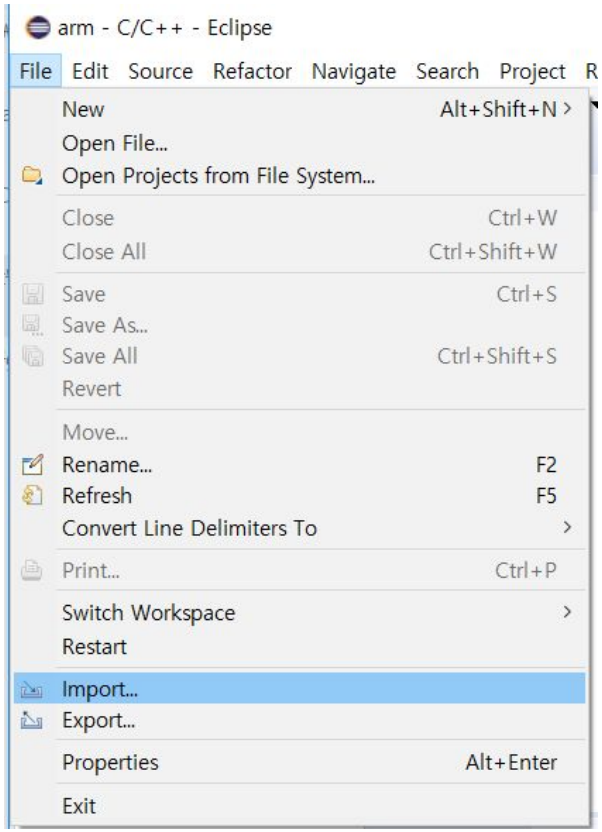
Workspace 변경

- 새로운 Workspace로 변경
  - 새로운 프로젝트를 사용하기 위해서 새로운 Workspace를 생성
  - File->Switch Workspace->Other를 선택하여 새로운 Workspace이름을 지정함



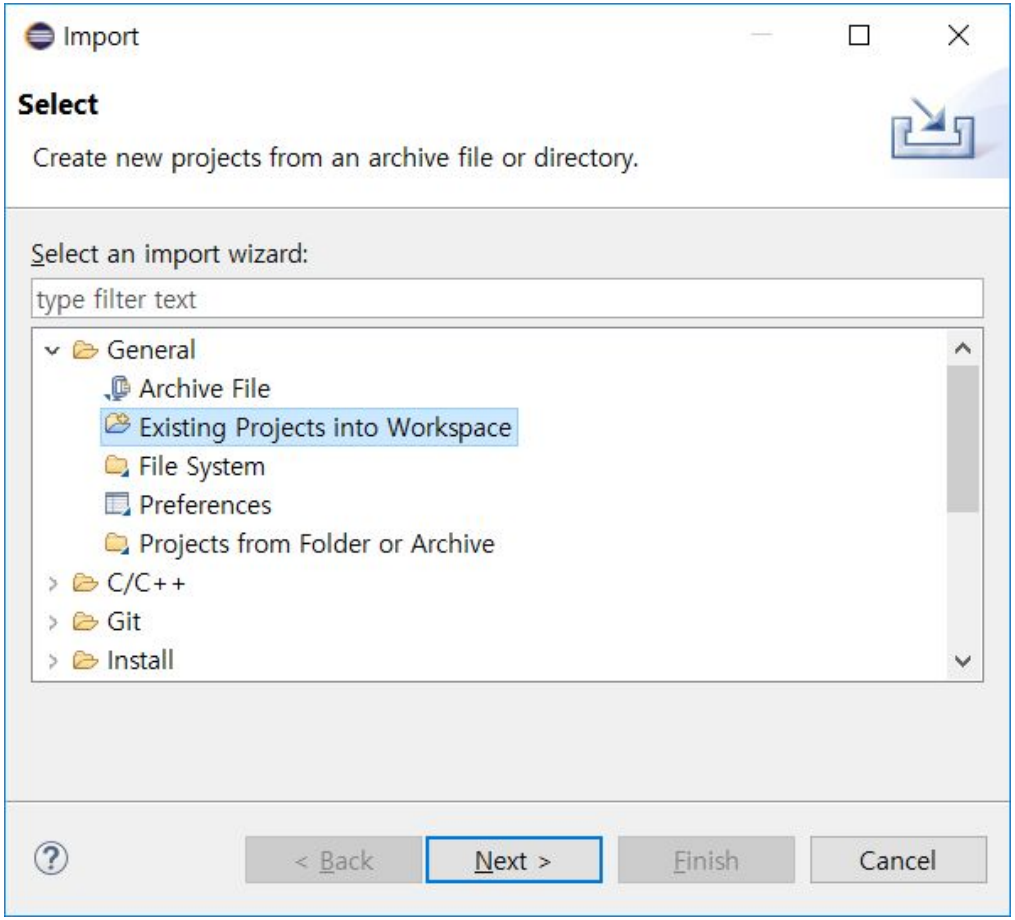
프로젝트 Import

- File->Import

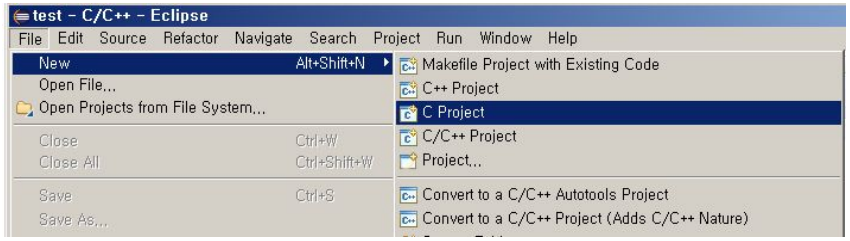


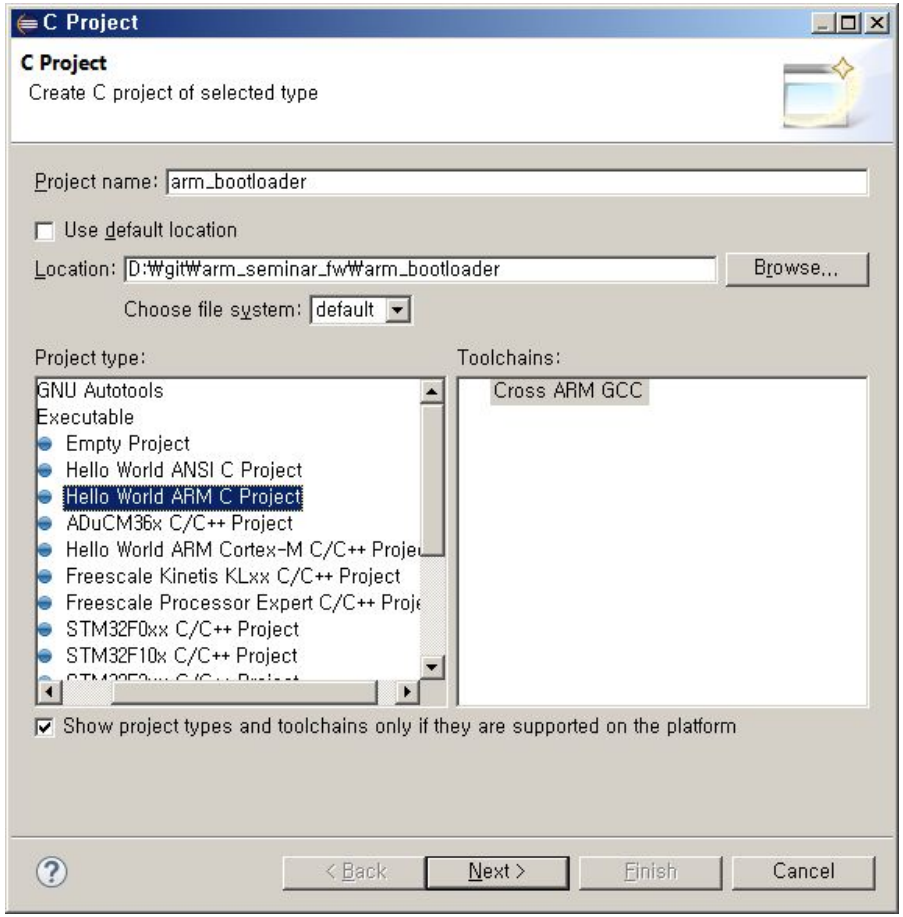
프로젝트 Import

- General -> Existing Projects into Wrokspace



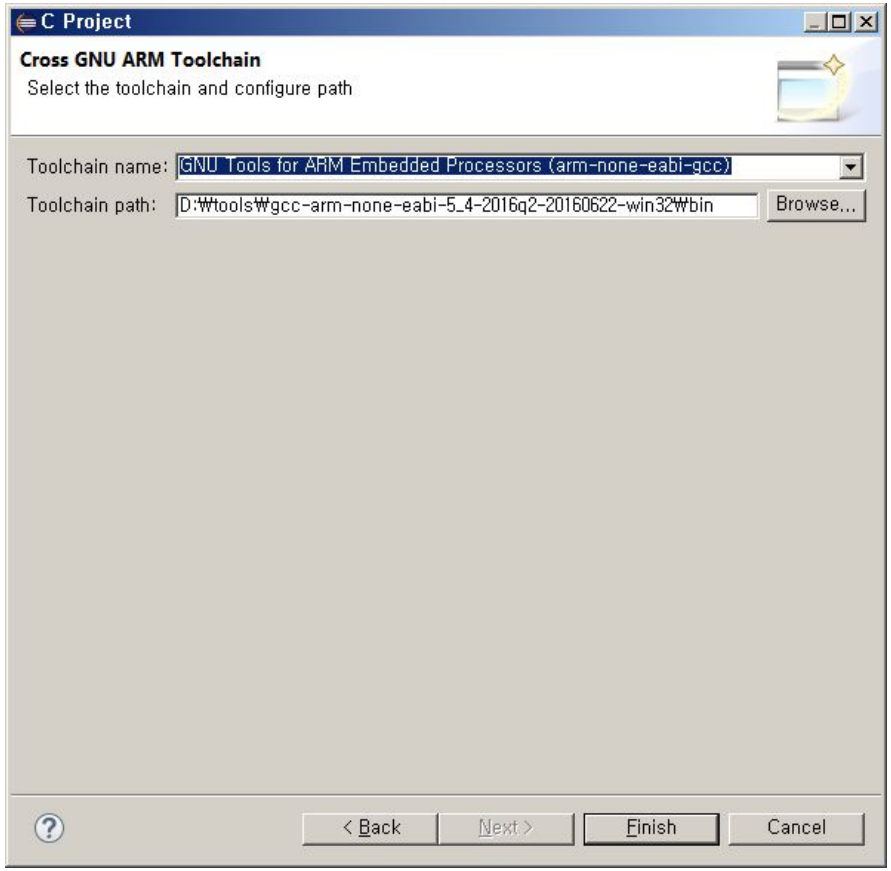
프로젝트 생성


test - C/C++ - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help
New Alt+Shift+N
Open File...
Open Projects from File System...
Close Ctrl+W
Close All Ctrl+Shift+W
Save Ctrl+S
Save As...
Makefile Project with Existing Code
C++ Project
C Project
C/C++ Project
Project...
Convert to a C/C++ Autotools Project
Convert to a C/C++ Project (Adds C/C++ Nature)

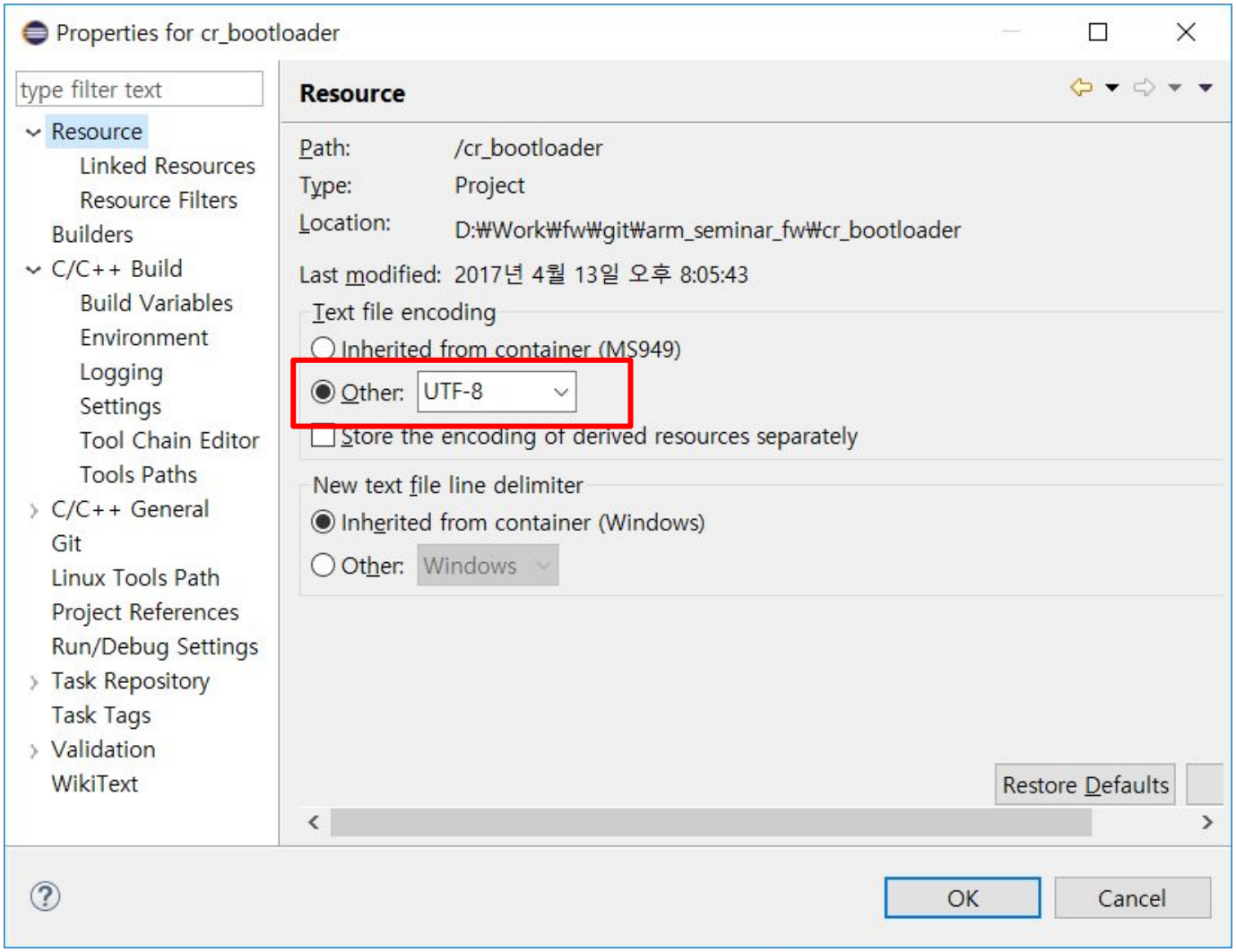

C Project
C Project
Create C project of selected type
Project name: arm_bootloader
Use default location
Location: D:₩git₩arm_seminar_fw₩arm_bootloader
Browse...
Choose file system: default
Project type:
Toolchains:
GNU Autotools
Executable
Empty Project
Hello World ANSI C Project
Hello World ARM C Project
ADuCM36x C/C++ Project
Hello World ARM Cortex-M C/C++ Proje
Freescale Kinetis KLxx C/C++ Project
Freescale Processor Expert C/C++ Proje
STM32F0xx C/C++ Project
STM32F10x C/C++ Project
Cross ARM GCC
Show project types and toolchains only if they are supported on the platform
< Back
Next >
Finish
Cancel

프로젝트 생성

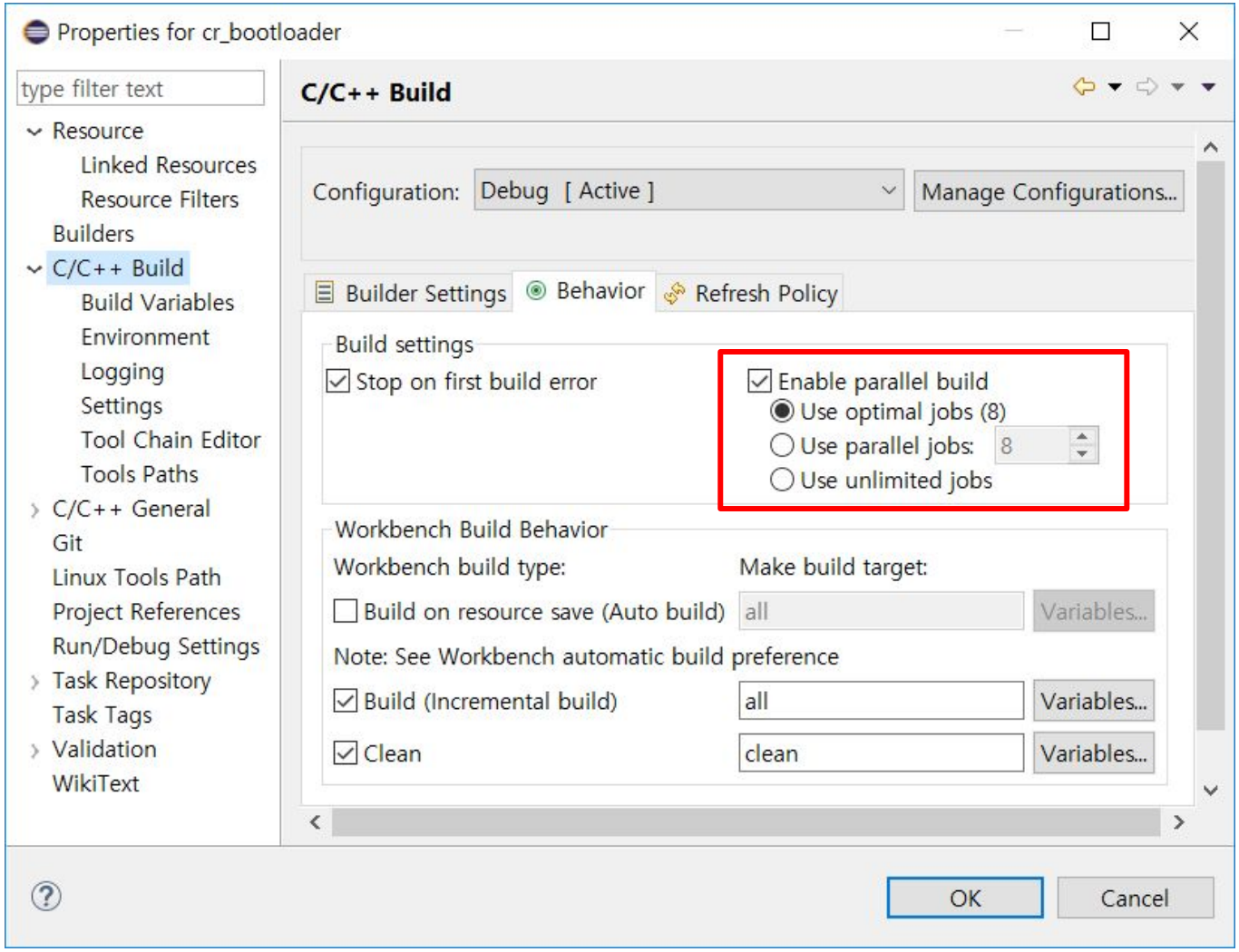
- Toolchain 패스 지정



프로젝트 설정

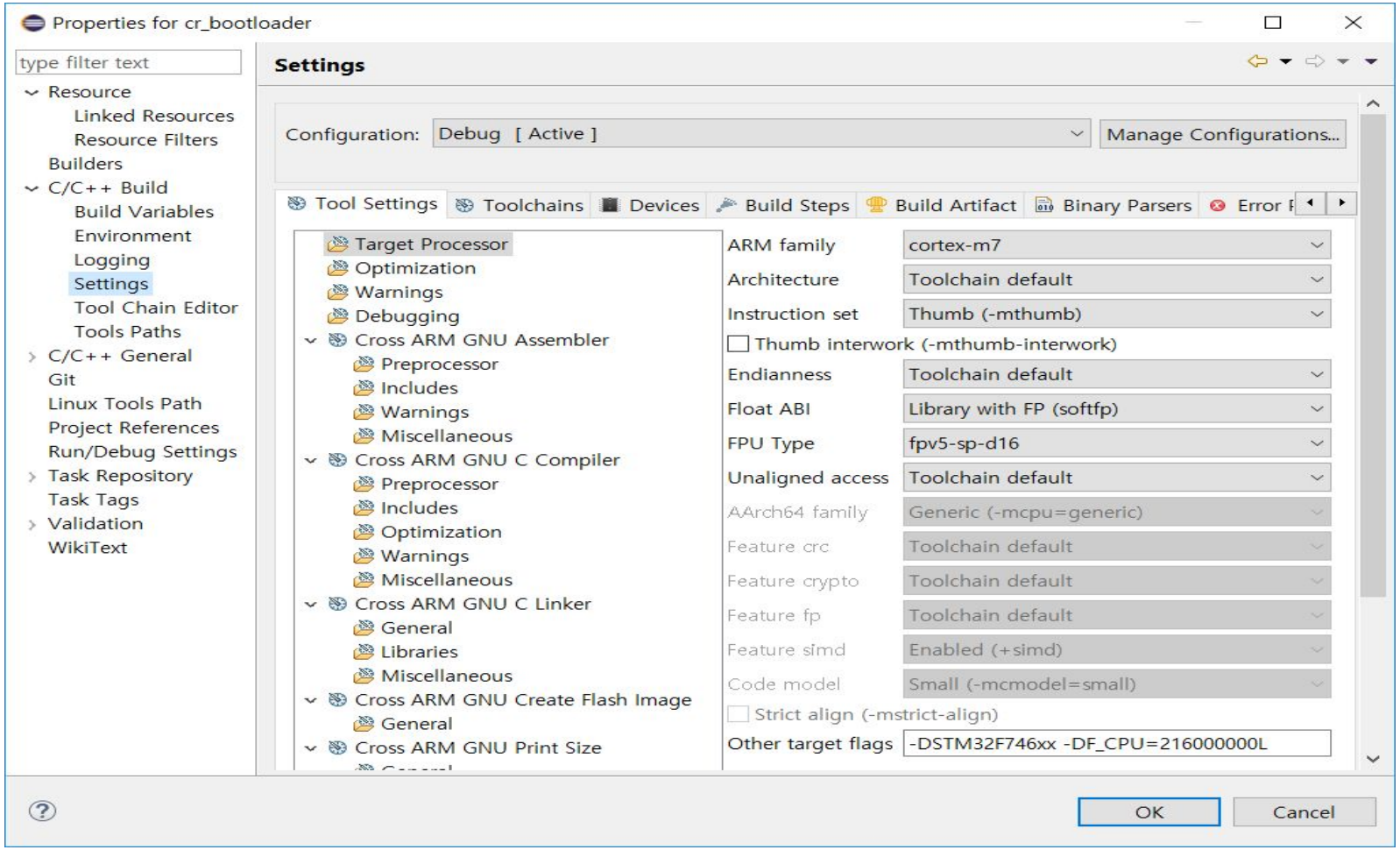

Properties for cr_bootloader
type filter text
Resource
Linked Resources
Resource Filters
Builders
C/C++ Build
Build Variables
Environment
Logging
Settings
Tool Chain Editor
Tools Paths
C/C++ General
Git
Linux Tools Path
Project References
Run/Debug Settings
Task Repository
Task Tags
Validation
WikiText
Resource
Path: /cr_bootloader
Type: Project
Location: D:₩Work₩fw₩git₩arm_seminar_fw₩cr_bootloader
Last modified: 2017년 4월 13일 오후 8:05:43
Text file encoding
Inherited from container (MS949)
Other: UTF-8
Store the encoding of derived resources separately
New text file line delimiter
Inherited from container (Windows)
Other: Windows
Restore Defaults
OK
Cancel

프로젝트 설정

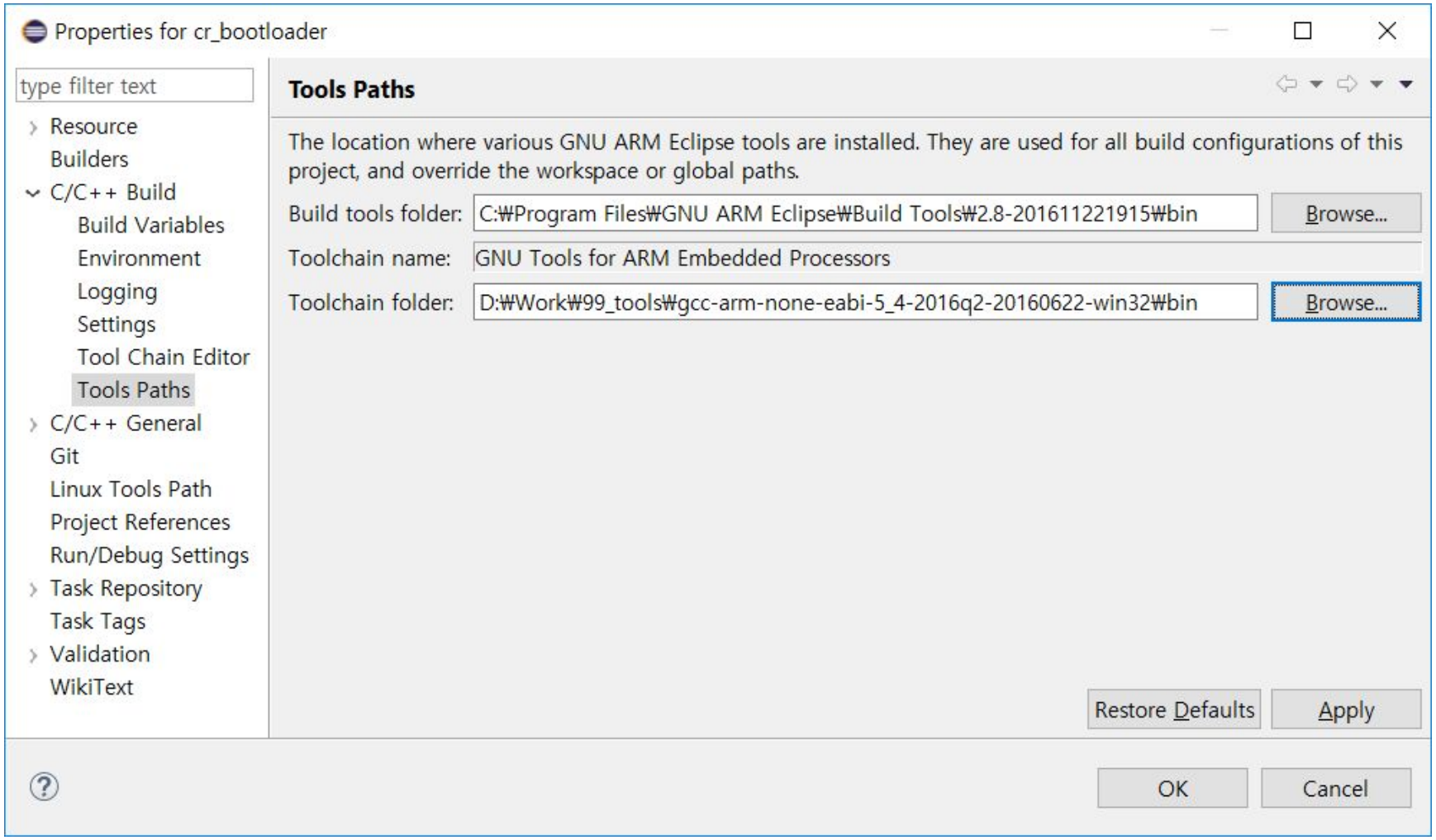

Properties for cr_bootloader
type filter text
Resource
Linked Resources
Resource Filters
Builders
C/C++ Build
Build Variables
Environment
Logging
Settings
Tool Chain Editor
Tools Paths
C/C++ General
Git
Linux Tools Path
Project References
Run/Debug Settings
Task Repository
Task Tags
Validation
WikiText
C/C++ Build
Configuration: Debug [Active]
Manage Configurations...
Builder Settings
Behavior
Refresh Policy
Build settings
Stop on first build error
Enable parallel build
Use optimal jobs (8)
Use parallel jobs: 8
Use unlimited jobs
Workbench Build Behavior
Workbench build type:
Make build target:
Build on resource save (Auto build)
all
Variables...
Note: See Workbench automatic build preference
Build (Incremental build)
all
Variables...
Clean
clean
Variables...
OK
Cancel

프로젝트 설정

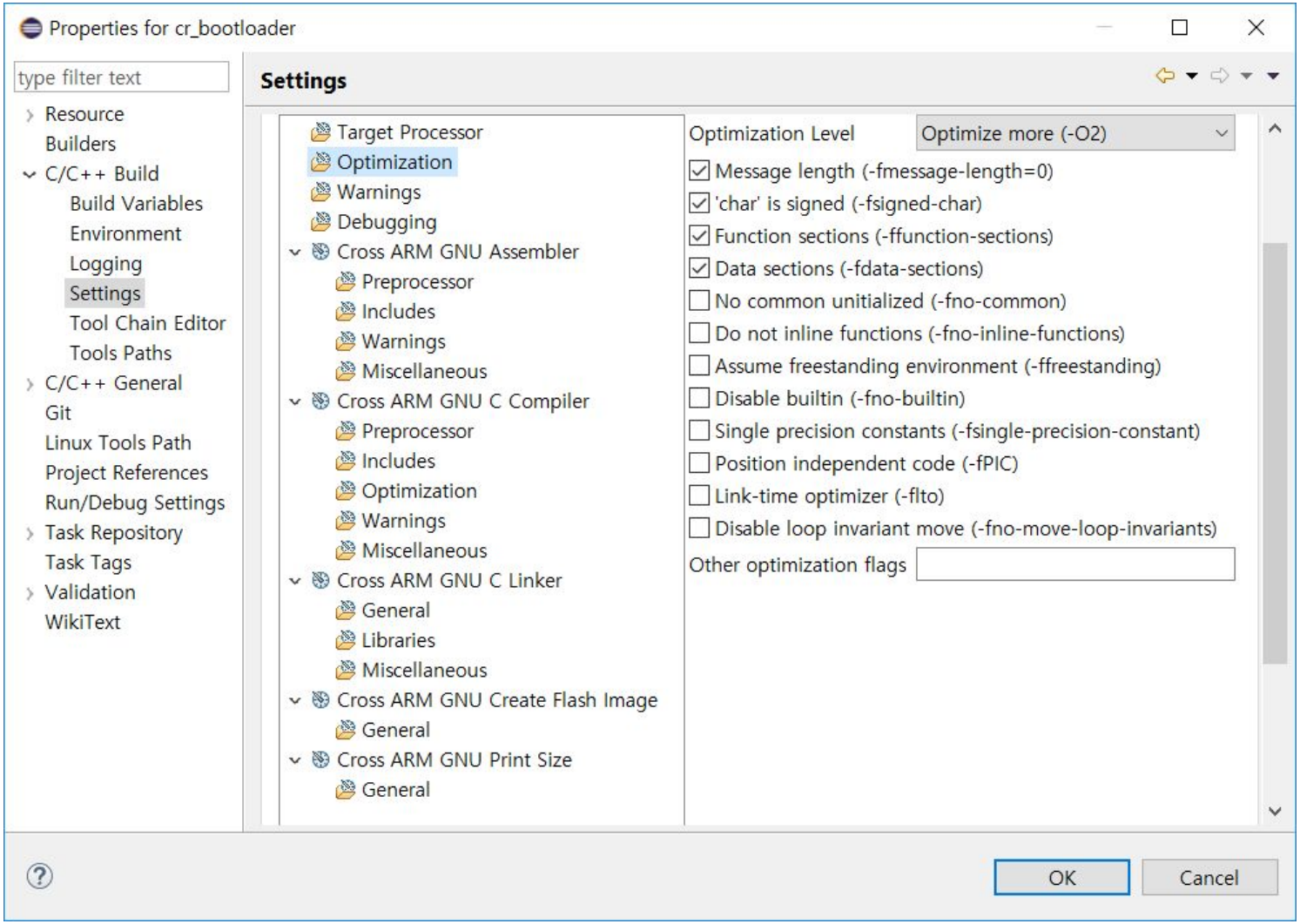
-DSTM32F746xx -DF_CPU=216000000L



프로젝트 설정


Properties for cr_bootloader
type filter text
Resource
Builders
C/C++ Build
Build Variables
Environment
Logging
Settings
Tool Chain Editor
Tools Paths
C/C++ General
Git
Linux Tools Path
Project References
Run/Debug Settings
Task Repository
Task Tags
Validation
WikiText
Tools Paths
The location where various GNU ARM Eclipse tools are installed. They are used for all build configurations of this project, and override the workspace or global paths.
Build tools folder:
C:₩Program Files₩GNU ARM Eclipse₩Build Tools₩2.8-201611221915₩bin
Browse...
Toolchain name:
GNU Tools for ARM Embedded Processors
Toolchain folder:
D:₩Work₩99_tools₩gcc-arm-none-eabi-5_4-2016q2-20160622-win32₩bin
Browse...
Restore Defaults
Apply
OK
Cancel

프로젝트 설정


Properties for cr_bootloader
type filter text
Resource
Builders
C/C++ Build
Build Variables
Environment
Logging
Settings
Tool Chain Editor
Tools Paths
C/C++ General
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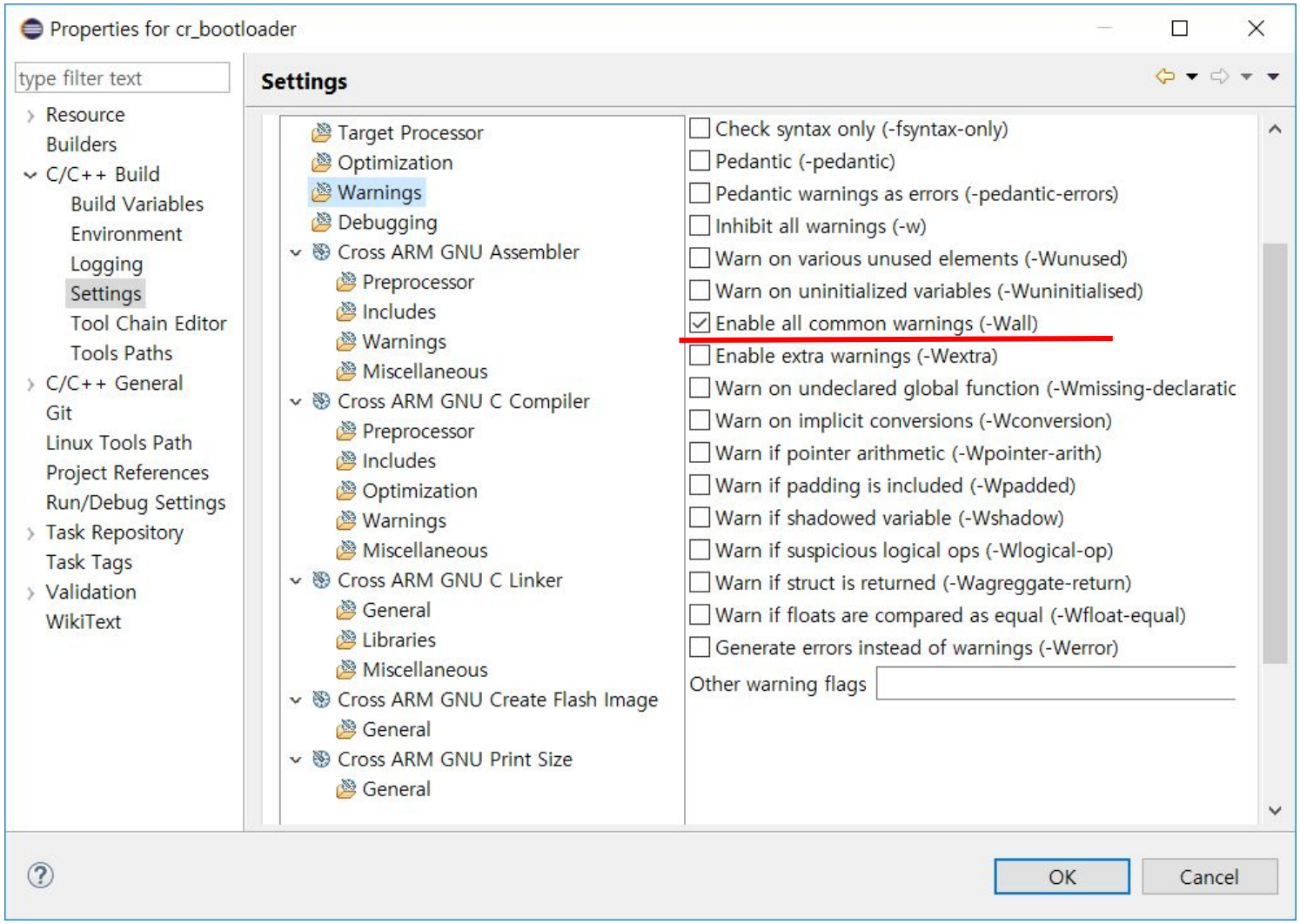
Linux Tools Path
Project References
Run/Debug Settings
Task Repository
Task Tags
Validation
WikiText
Settings
Target Processor
Optimization
Warnings
Debugging
Cross ARM GNU Assembler
Preprocessor
Includes
Warnings
Miscellaneous
Cross ARM GNU C Compiler
Preprocessor
Includes
Optimization
Warnings
Miscellaneous
Cross ARM GNU C Linker
General
Libraries
Miscellaneous
Cross ARM GNU Create Flash Image
General
Cross ARM GNU Print Size
General
Optimization Level
Optimize more (-O2)
Message length (-fmessage-length=0)
'char' is signed (-fsigned-char)
Function sections (-ffunction-sections)
Data sections (-fdata-sections)
No common unitialized (-fno-common)
Do not inline functions (-fno-inline-functions)
Assume freestanding environment (-ffreestanding)
Disable builtin (-fno-builtin)
Single precision constants (-fsingle-precision-constant)
Position independent code (-fPIC)
Link-time optimizer (-flto)
Disable loop invariant move (-fno-move-loop-invariants)
Other optimization flags
OK
Cancel

프로젝트 설정


Properties for cr_bootloader
type filter text
Resource
Builders
C/C++ Build
Build Variables
Environment
Logging
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C/C++ General
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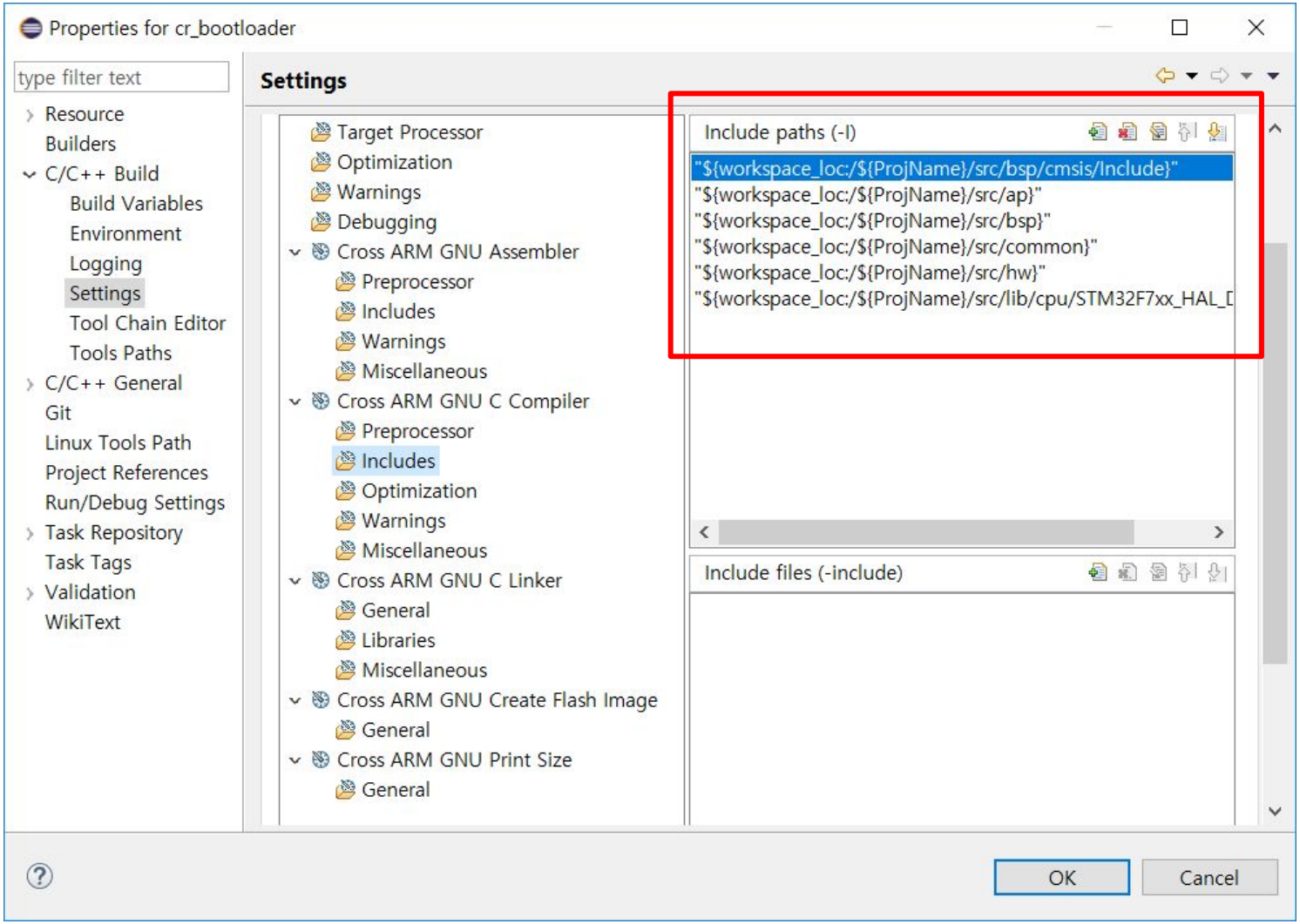
Linux Tools Path
Project References
Run/Debug Settings
Task Repository
Task Tags
Validation
WikiText
Settings
Target Processor
Optimization
Warnings
Debugging
Cross ARM GNU Assembler
Preprocessor
Includes
Warnings
Miscellaneous
Cross ARM GNU C Compiler
Preprocessor
Includes
Optimization
Warnings
Miscellaneous
Cross ARM GNU C Linker
General
Libraries
Miscellaneous
Cross ARM GNU Create Flash Image
General
Cross ARM GNU Print Size
General
Check syntax only (-fsyntax-only)
Pedantic (-pedantic)
Pedantic warnings as errors (-pedantic-errors)
Inhibit all warnings (-w)
Warn on various unused elements (-Wunused)
Warn on uninitialized variables (-Wuninitialised)
Enable all common warnings (-Wall)
Enable extra warnings (-Wextra)
Warn on undeclared global function (-Wmissing-declaratic
Warn on implicit conversions (-Wconversion)
Warn if pointer arithmetic (-Wpointer-arith)
Warn if padding is included (-Wpadded)
Warn if shadowed variable (-Wshadow)
Warn if suspicious logical ops (-Wlogical-op)
Warn if struct is returned (-Wagreggate-return)
Warn if floats are compared as equal (-Wfloat-equal)
Generate errors instead of warnings (-Werror)
Other warning flags
OK
Cancel

프로젝트 설정


Properties for cr_bootloader
type filter text
Resource
Builders
C/C++ Build
Build Variables
Environment
Logging
Settings
Tool Chain Editor
Tools Paths
C/C++ General
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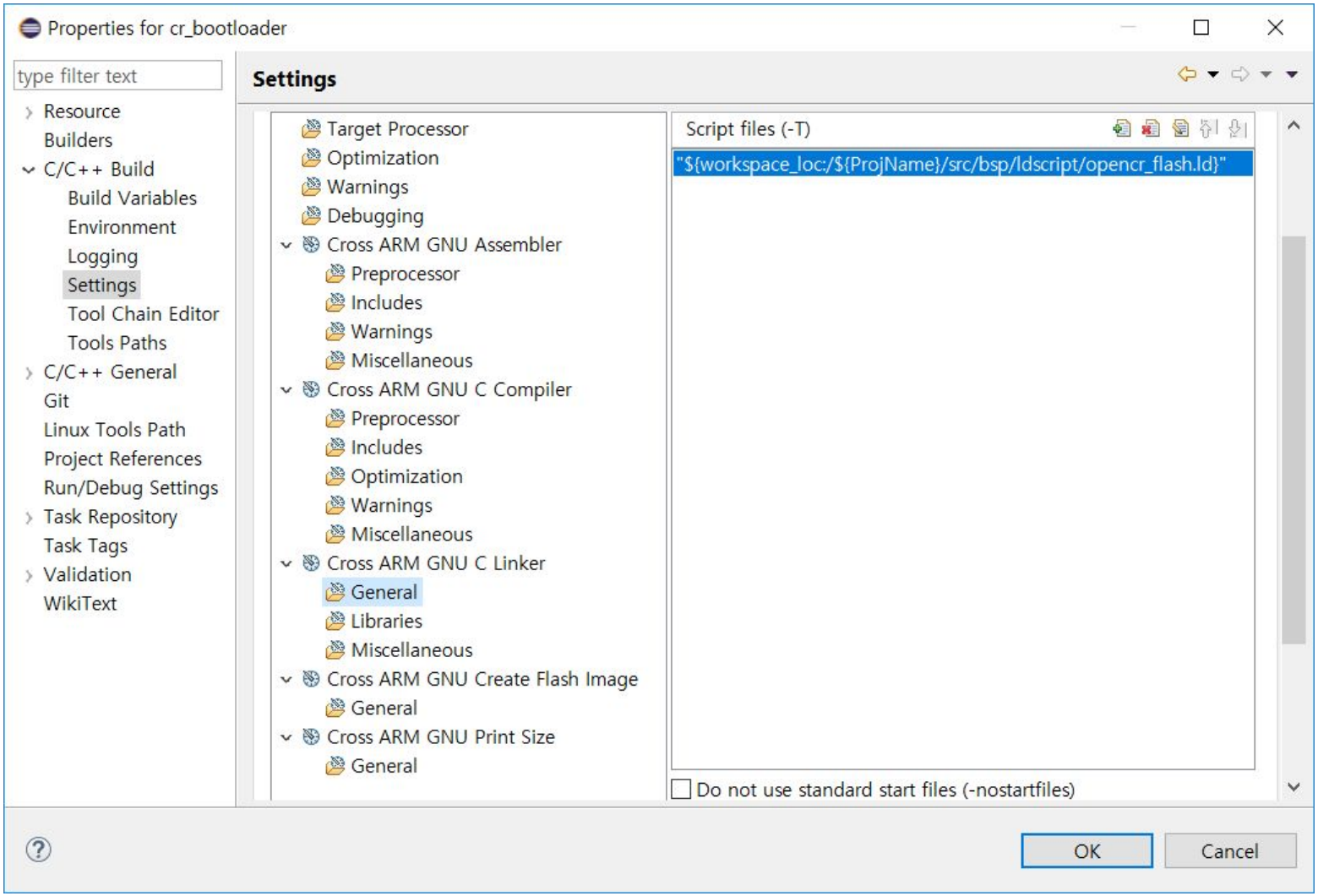
Task Repository
Task Tags
Validation
WikiText
Settings
Target Processor
Optimization
Warnings
Debugging
Cross ARM GNU Assembler
Preprocessor
Includes
Warnings
Miscellaneous
Cross ARM GNU C Compiler
Preprocessor
Includes
Optimization
Warnings
Miscellaneous
Cross ARM GNU C Linker
General
Libraries
Miscellaneous
Cross ARM GNU Create Flash Image
General
Cross ARM GNU Print Size
General
Include paths (-I)
"${workspace_loc:/${ProjName}/src/bsp/cmsis/Include}"
"${workspace_loc:/${ProjName}/src/ap}"
"${workspace_loc:/${ProjName}/src/bsp}"
"${workspace_loc:/${ProjName}/src/common}"
"${workspace_loc:/${ProjName}/src/hw}"
"${workspace_loc:/${ProjName}/src/lib/cpu/STM32F7xx_HAL_D
Include files (-include)
OK
Cancel

프로젝트 설정


Properties for cr_bootloader
type filter text
Resource
Builders
C/C++ Build
Build Variables
Environment
Logging
Settings
Tool Chain Editor
Tools Paths
C/C++ General
Git
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Project References
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Task Repository
Task Tags
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WikiText
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Optimization
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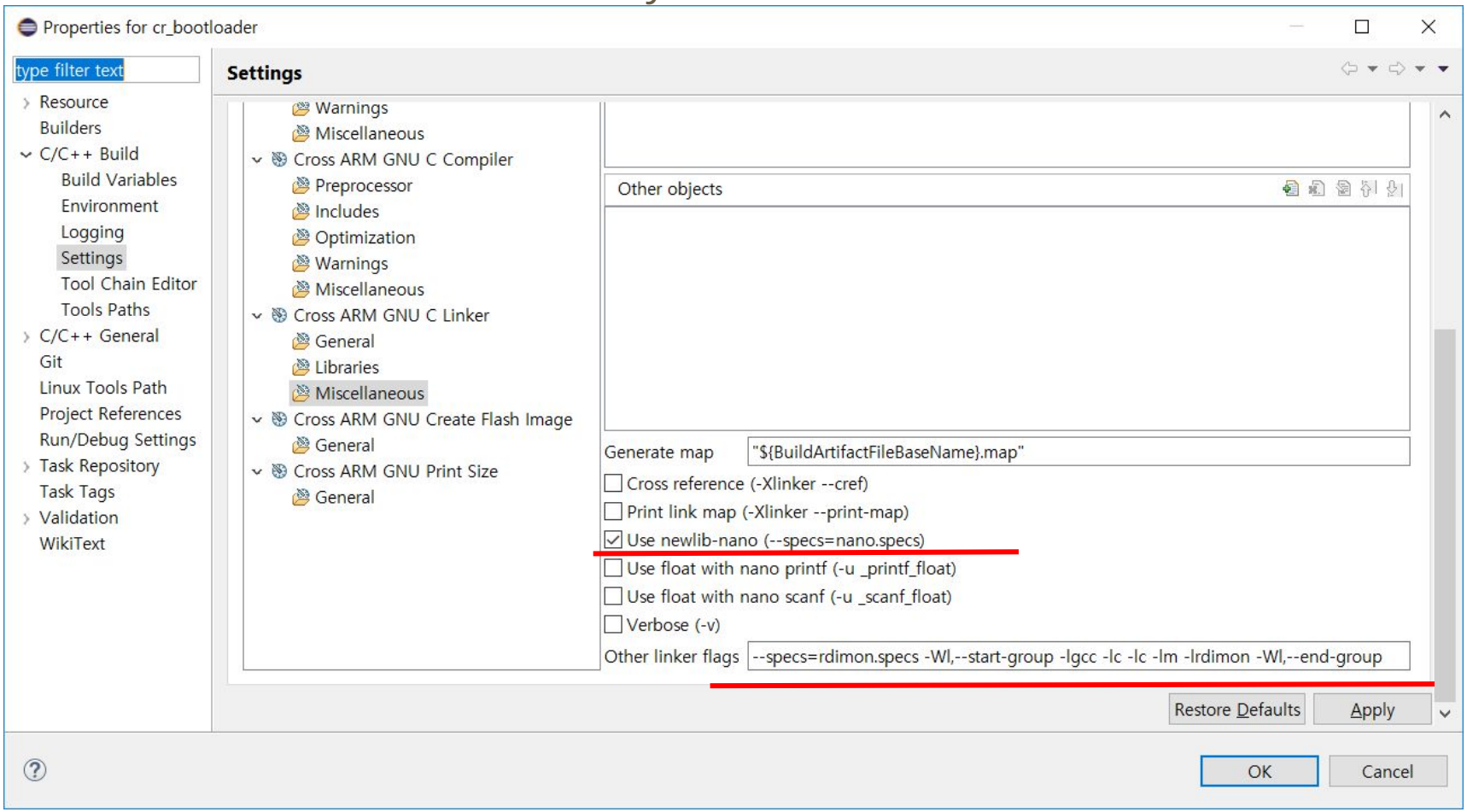
Cross ARM GNU Assembler
Preprocessor
Includes
Warnings
Miscellaneous
Cross ARM GNU C Compiler
Preprocessor
Includes
Optimization
Warnings
Miscellaneous
Cross ARM GNU C Linker
General
Libraries
Miscellaneous
Cross ARM GNU Create Flash Image
General
Cross ARM GNU Print Size
General
Script files (-T)
"${workspace_loc:/${ProjName}/src/bsp/ldscript/opencr_flash.ld}"
Do not use standard start files (-nostartfiles)
OK
Cancel

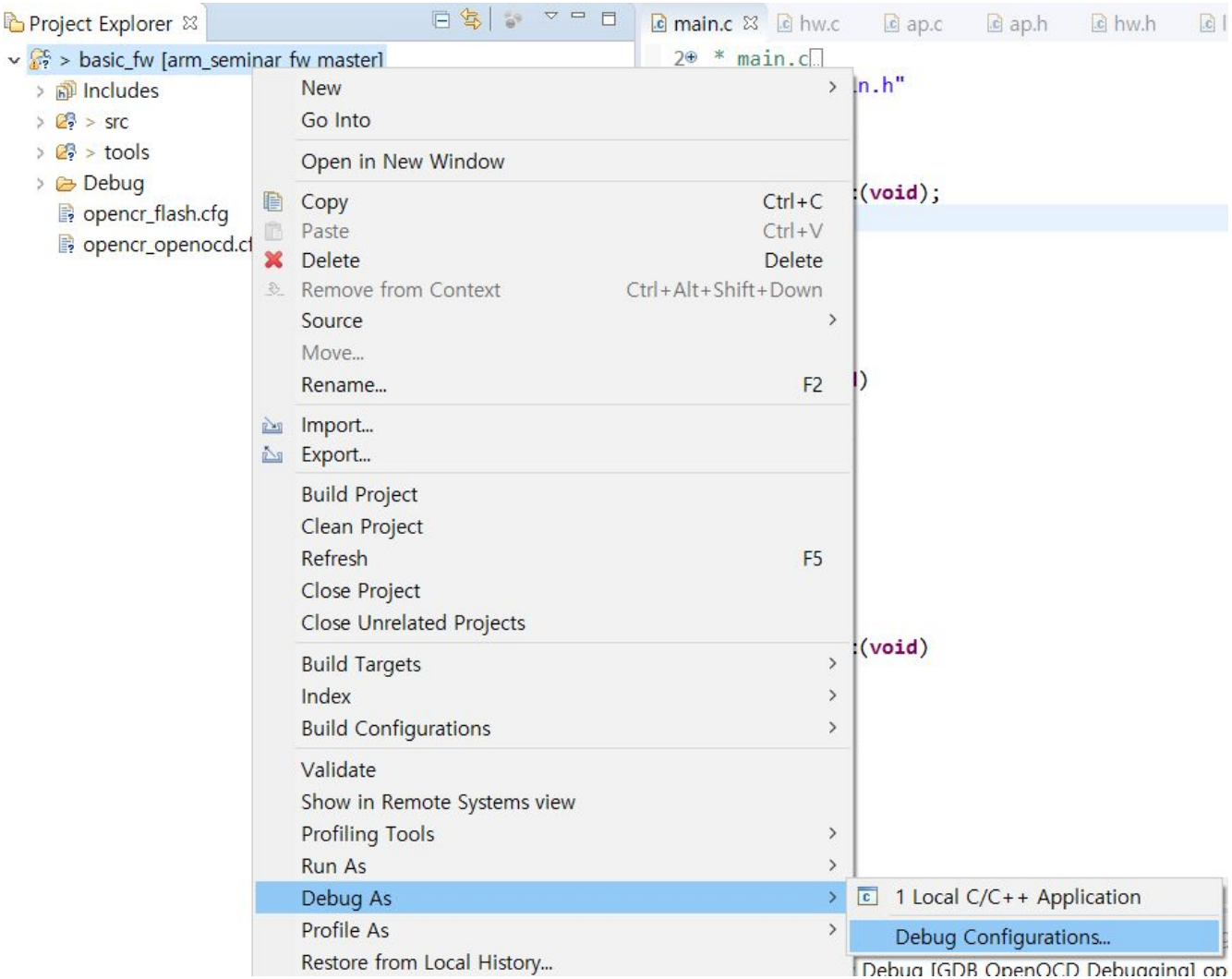
프로젝트 설정

--specs=rdimon.specs -Wl,--start-group -lgcc -lc -lc -lm -lrdimon -Wl,--end-group

> 위의 옵션을 사용하지 않는경우 syscalls.c 를 추가한다.

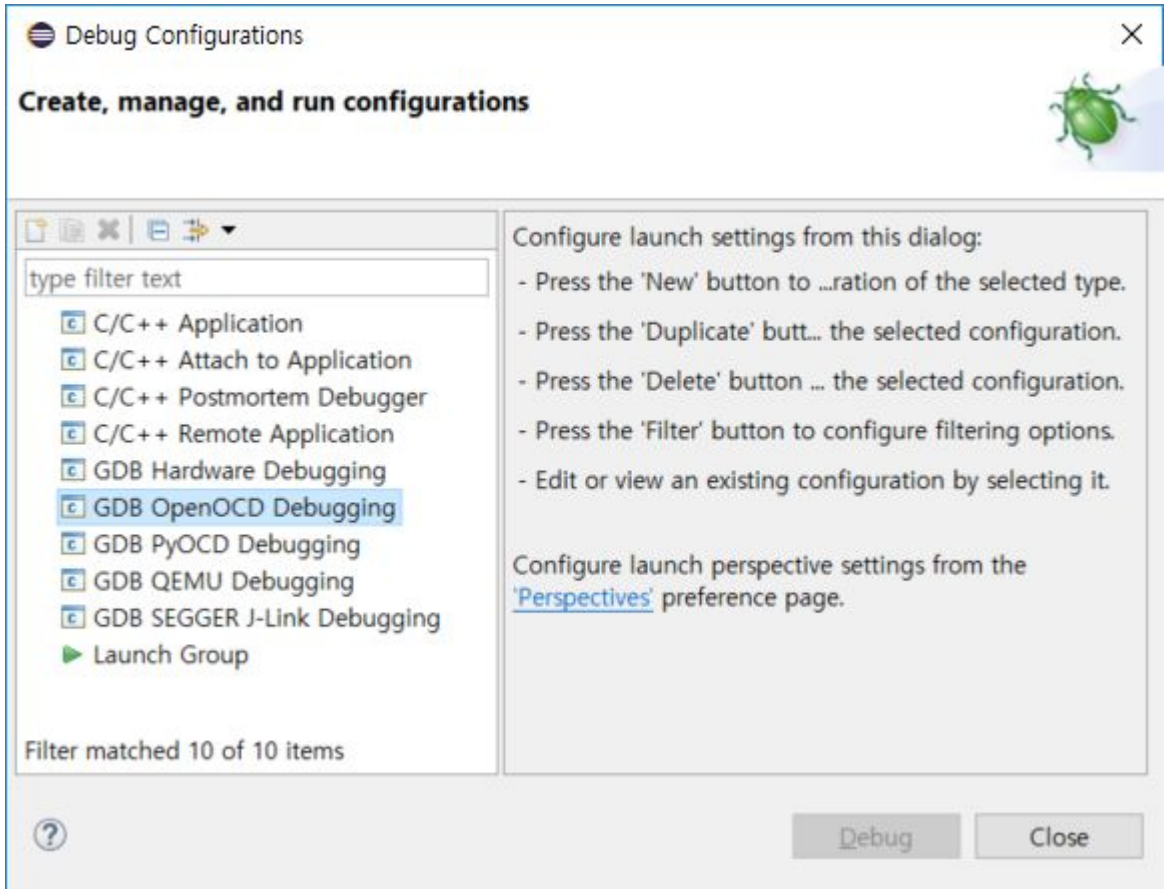


디버그 설정 - OpenOCD



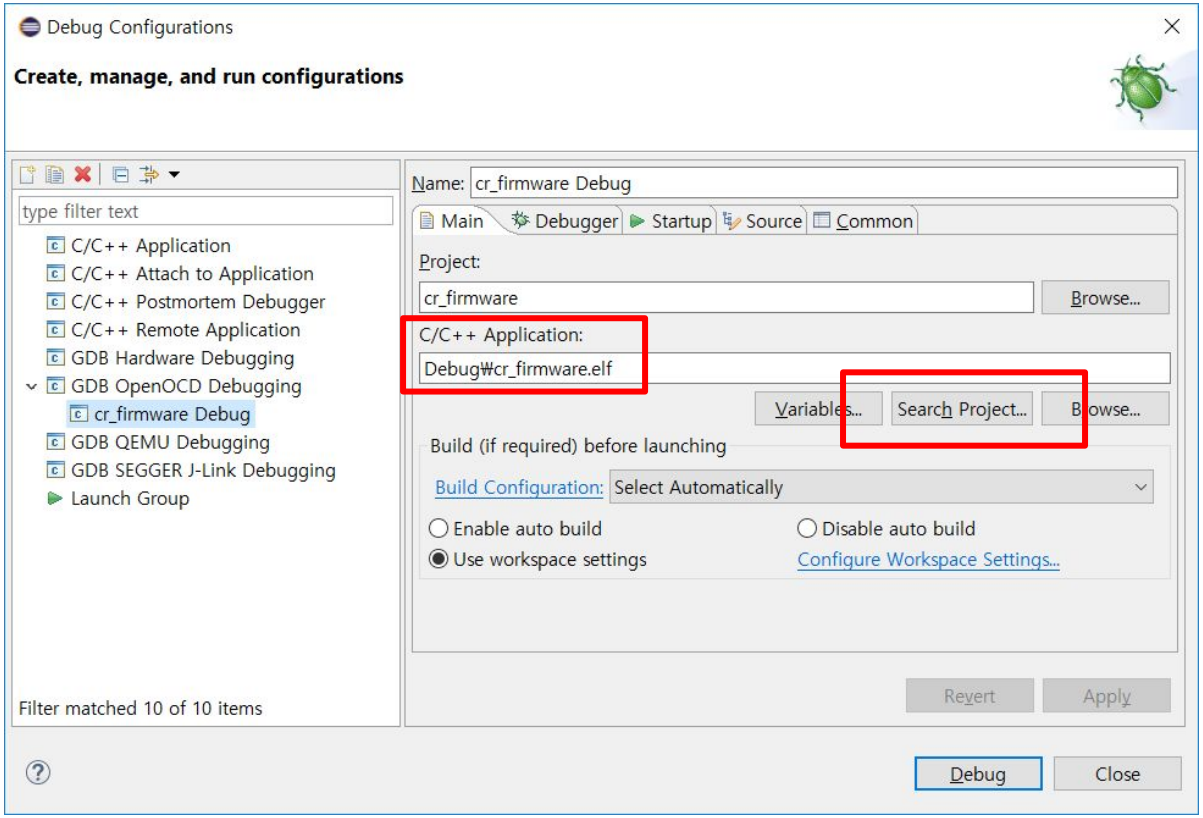
디버깅 설정 - OpenOCD

- GDB OpenOCD Debugging 에서 더블 클릭



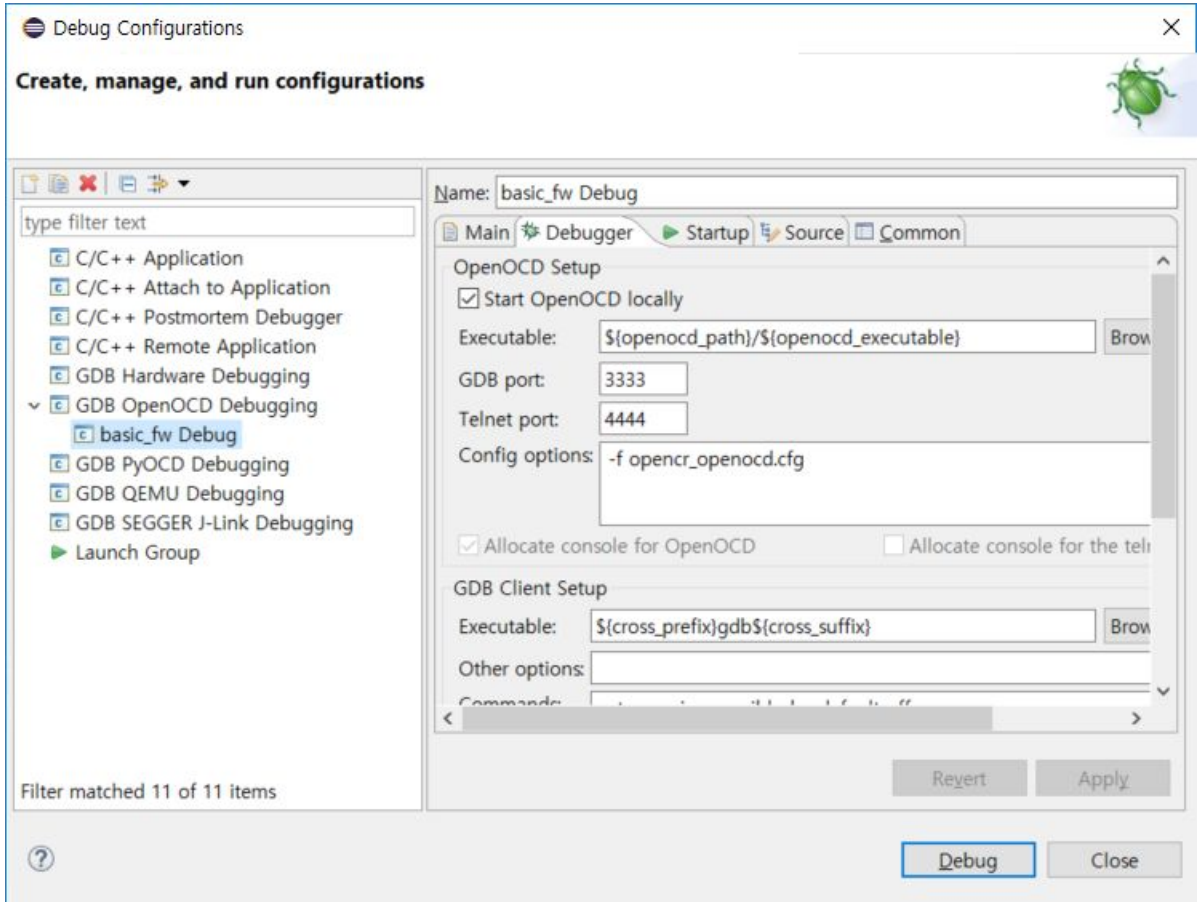
디버깅 설정 - OpenOCD

- Main->C/C++ Application이 빈 공백인 경우 Search Project로 elf파일을 선택함



디버깅 설정 - OpenOCD

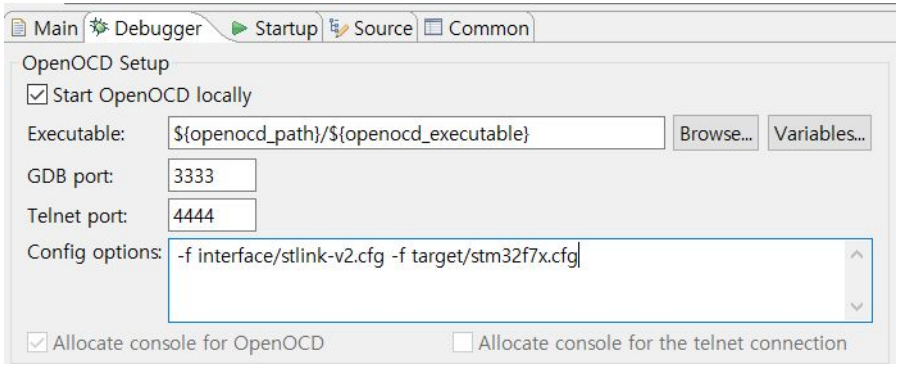
-f opencr_openocd.cfg



디버깅 설정 - OpenOCD

- opencr_openocd.cfg의 내용을 옵션에 직접 입력 가능

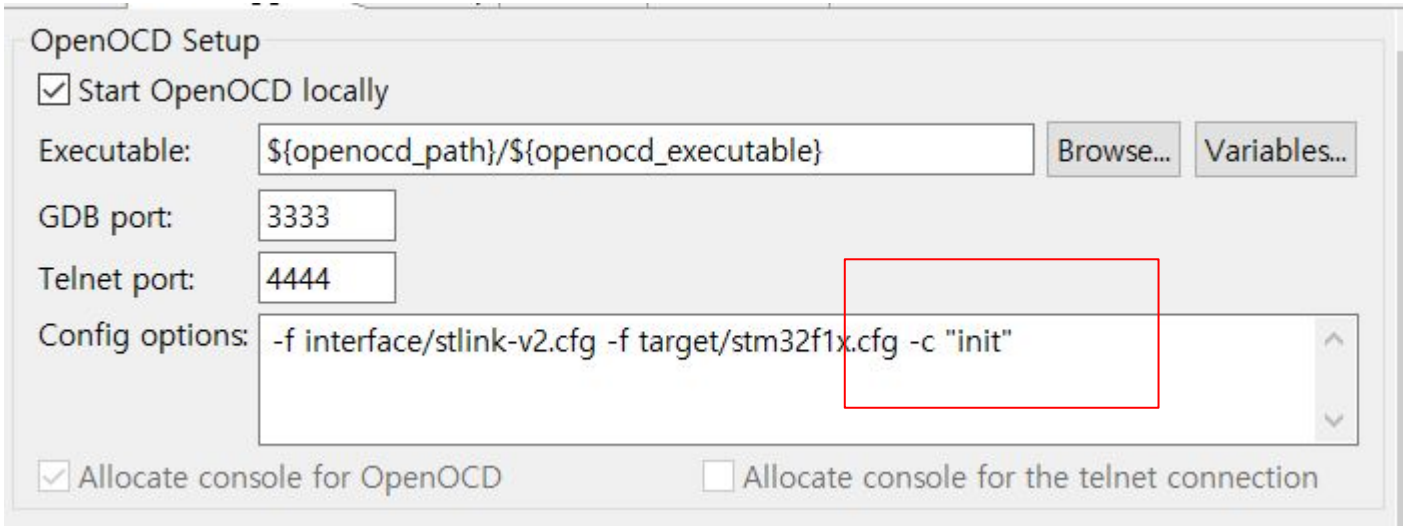
```
interface hla
hla_layout stlink
hla_device_desc "ST-LINK/V2"
hla_vid_pid 0x0483 0x3748

transport select hla_swd

# increase working area to 256KB
set WORKAREASIZE 0x40000

adapter_nsrst_delay 100

source [find target/stm32f7x.cfg]

reset_config none
```



-f interface/stlink-v2.cfg -f target/stm32f7x.cfg

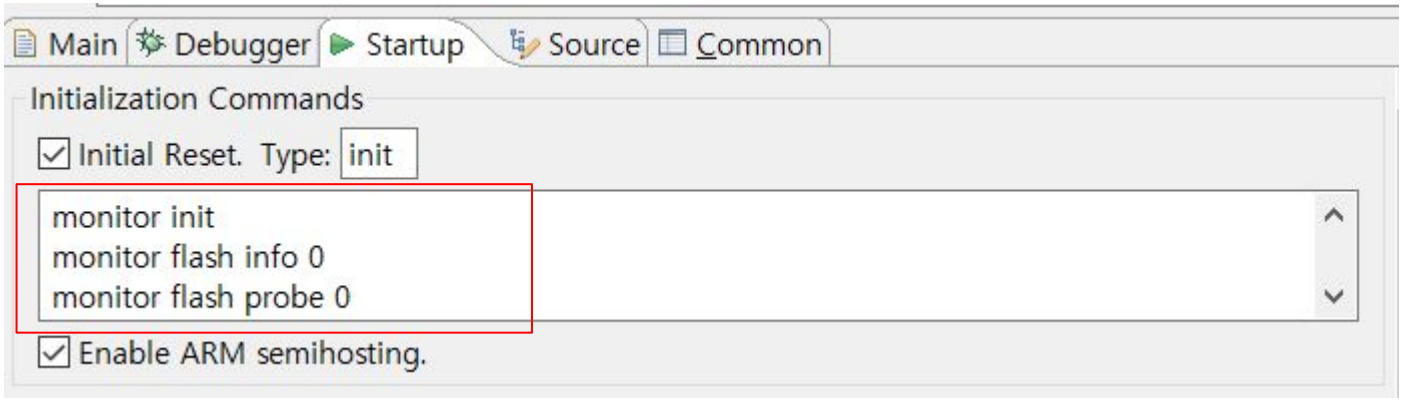
디버깅 설정 - OpenOCD

- OpenOCD 추가 명령어 입력
  - Config options에 -c 를 이용하여 추가하고자 하는 명령어를 입력



디버깅 설정 - OpenOCD

- OpenOCD 추가 명령어 입력
  - Startup의 초기화 명령어에 monitor 명령 이후에 필요한 OpenOCD 명령어를 입력

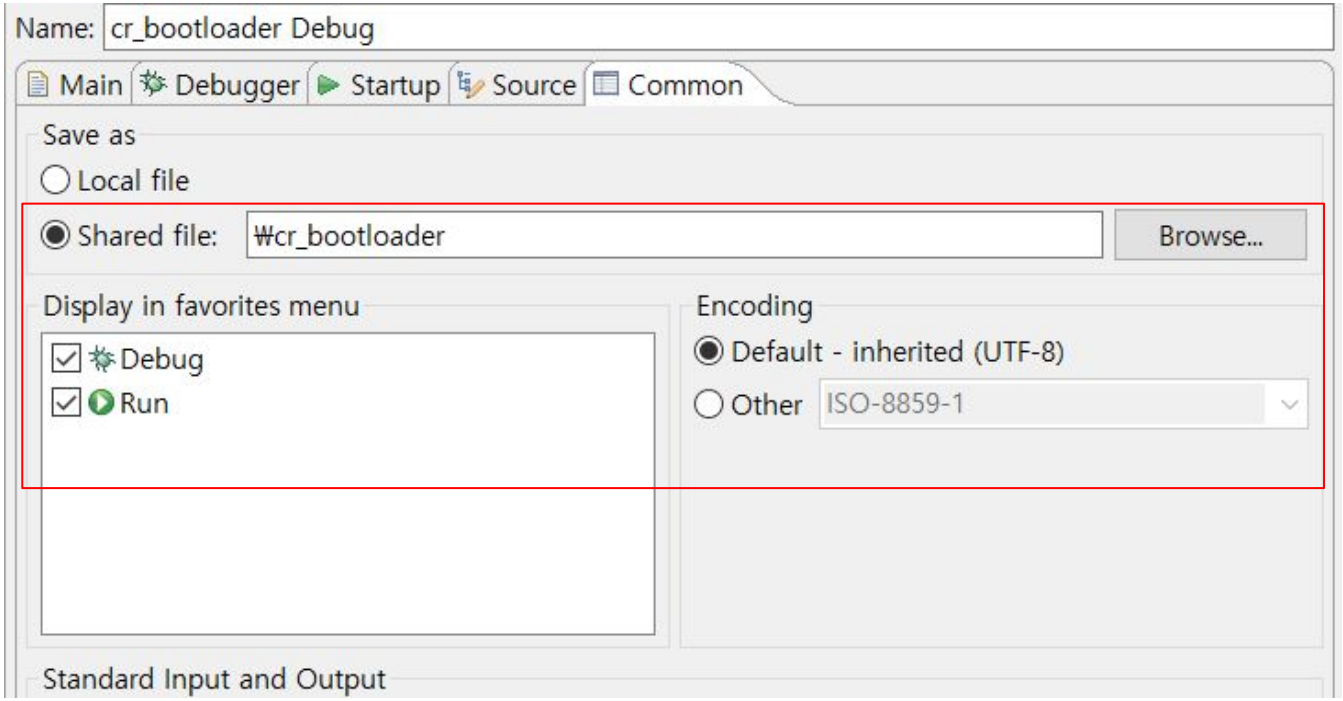


  - Flash의 메모리 보호를 해제하는 명령의 예제

```
monitor init
monitor flash info 0
monitor flash probe 0
monitor flash protect 0 0 127 off
monitor flash info 0
```

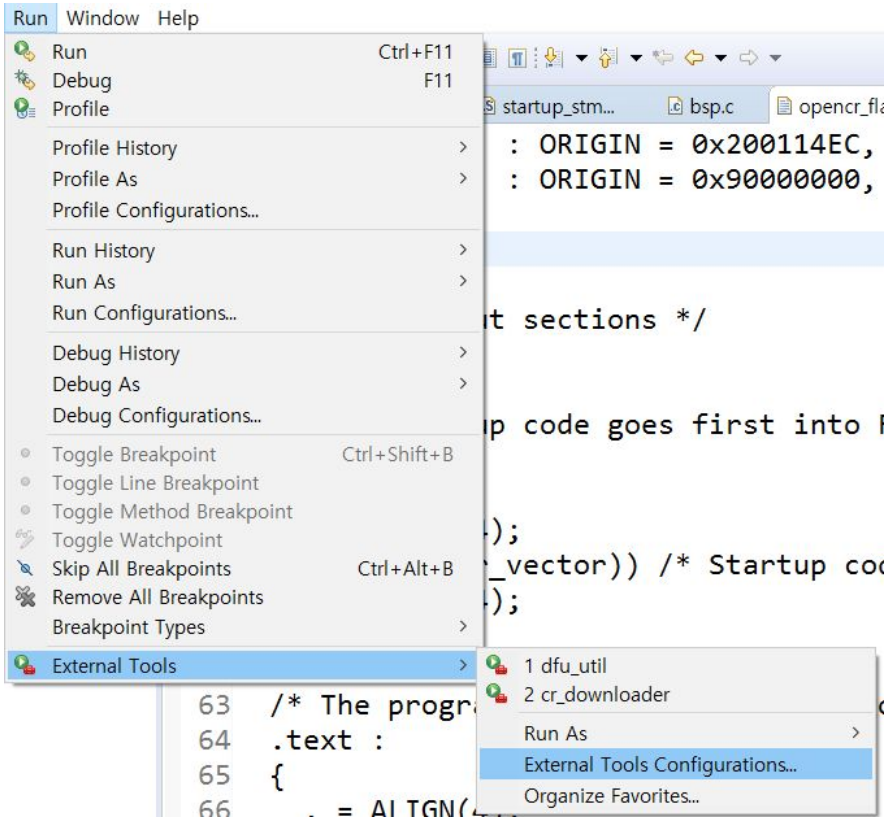
디버깅 설정 - OpenOCD

- OpenOCD 설정 저장
  - 디버깅 설정은 기본적으로 Local 즉 Workspace에 저장되어 Workspace를 변경하면 재설정해야 함으로 Common탭에서 Shared file로 하면 프로젝트 Import시 디버깅 설정도 같이 로드 된다.



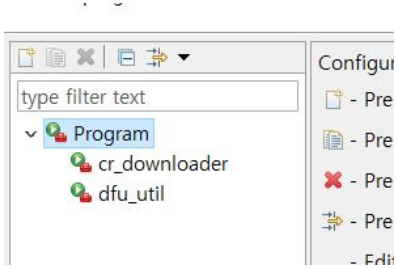
External Tools

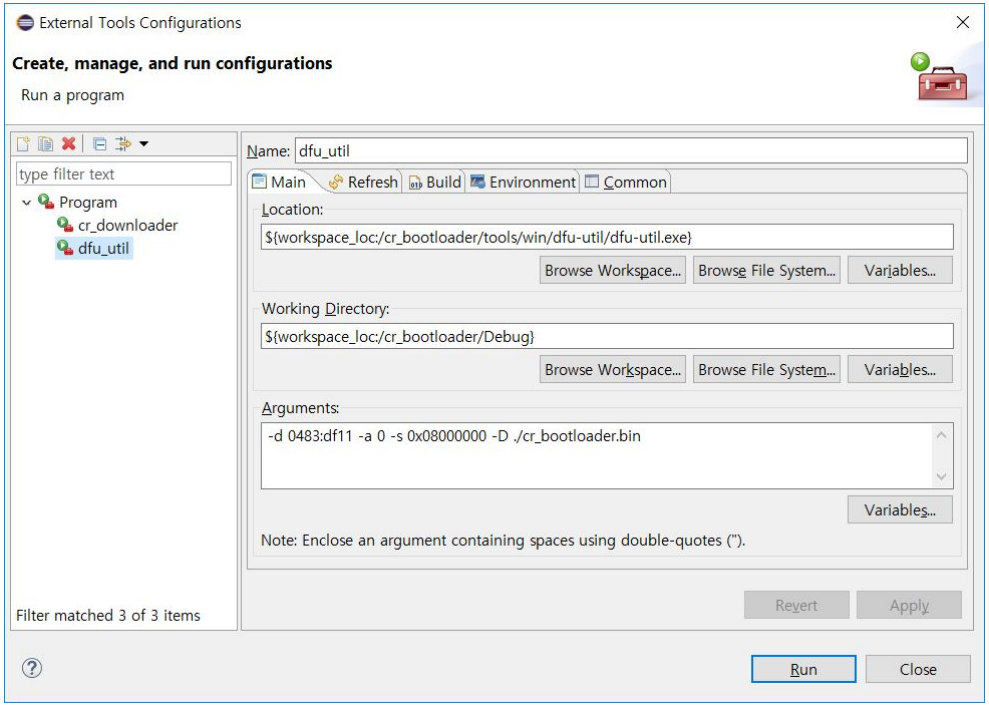
- 외부 프로그램을 단축키처럼 등록해서 사용 가능
- Run->External Tools->External Tools Configurations 선택



External Tools

- Program 더블 클릭하여 신규 생성





이름

명령어 위치

작업 디렉토리

명령행 옵션