

#### AN0033

应用笔记

Eclipse with GCC

# 前言

Eclipse是著名的跨平台的自由集成开发环境(IDE),通过安装不同的插件Eclipse可以支持不同的 计算机语言,比如C/C++等,Eclipse本身只是一个框架平台,众多的Eclipse插件使其拥有很高的灵 活性,软件可以以Eclipse为架构开发自己的IDE。 这边文档主要描述怎样用现成的Eclipse插件来调试AT32系列芯片。

支持型号列表:

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# 1 概述

本文档介绍通过使用Eclipse,ARM-GCC编译工具,GNU-ARM插件,Jlink,ATLink等资源来调试AT32系列芯片。

本文档主要介绍:

- Eclipse 调试环境安装
- Eclipse template工程
- Eclipse 编译配置
- Eclipse 调试配置

环境说明:本文档安装说明基于WINDOWS7x64系统下实现,使用

AT32Fxx\_Firmware\_Library\project\at\_start\_xx\templates\eclipse\_gcc下的工程进行说明。

本文档所使用的软件都打包在AT32\_Eclipse\_Packet.zip,直接解压即可安装运行

AT32\_Eclipse\_Packet.zip包含文件:

#### 图 1. AT32\_Eclipse\_Packet.zip 包含文件

- eclipse-cpp-2019-06-R-win32-x86\_64.zip
- ig gcc-arm-none-eabi-8-2019-q3-update-win32-sha2.exe
- II gnuarmeclipse-build-tools-win32-2.6-201507152002-setup.exe
- 🔢 gnuarmeclipse-build-tools-win64-2.6-201507152002-setup.exe
- 🔚 ilg.gnumcueclipse.repository-4.5.1-201901011632.zip



# 2 Eclipse 调试环境安装

首先要明确需要安装哪些软件,如下是需要安装的软件:

- Eclipse IDE for C/C++ Developers
- GNU ARM Eclipse 插件
- GCC ARM 编译器
- GNU ARM Eclipse Build Tools 安装 (make, rm等工具)

下面将详细介绍软件的安装部分。

# 2.1 Eclipse IDE for C/C++ Developers 安装

Eclipse有多个版本,我们只需下载C/C++的版本,下载最新版本,AT32\_Eclipse\_Packet.zip 包含有 一个可以使用的版本eclipse-cpp-2019-06-R-win32-x86\_64.zip。

下载地址: <u>http://www.eclipse.org/downloads/eclipse-packages/</u>

#### 图 2 Eclipse 下载页面

Lonpoe n	2010 0011 0000505		
©.	Eclipse IDE for C/C++ Developers 235 MB 335,559 DOWNLOADS An IDE for OC++ developers with Myth Integration	*	Windows 64-bit Mac Cocoa 64-bit Linux 64-bit
۲	Eclipse IDE for Enterprise Java Developers 346 Mai 303.007 DOWNLOADS Tools for Java developers creating Enterprise Java and Web applications, Including a Java IDE, tools for Enterprise Java, JPA, JSE, Mylyn, Maven, Gir and more. Click here to Bit a bug against Eclipse Web Tools Partorm. Click here to Bit a bug against Eclipse Meb Tools Partorm. Click here to Bit a bug against Maven Integration for web projects.	¥	Windows 64-bit Mac Cocoa 64-bit Linux 64-bit
<b>8</b>	Eclipse IDE for Java Developers 195 MB 183 #55 DOWNLOADS The essential tools for any Java developer, including a Java IDE, a Git client, XML Editor, MyNawer and Gradie integration	÷	Windows 64-bit Mac Cocoa 64-bit Linux 64-bit

下载完成后直接解压eclipse-cpp-2019-06-R-win32-x86\_64.zip,这里我们直接点击eclipse.exe 就可以运行Eclipse,但此时还不能进行代码调试,需要进一步安装一下插件。

# 2.2 GNU ARM Eclipse 插件安装

下载最新的GNU ARM Eclipse插件: ilg.gnumcueclipse.repository-4.5.1-201901011632.zip并解压。

AT32\_Eclipse\_Packet.zip 包含有一个可以使用的版本ilg.gnumcueclipse.repository-4.5.1-201901011632.zip。

网络下载地址: <u>https://github.com/gnu-mcu-eclipse/eclipse-plugins/releases</u> 开始安装:

1. 打开Eclipse Help->Install New Software.

eclipse-cpp-2019-06-F	t-win32-x86_64 - Eclipse IDE		
File Edit Source Ref	actor Navigate Search Project Run Window	Help Welcome	1 · · · · · · · · · · · · · · · · · · ·
🔤 🖨 ecli	PSE Welcome to the Eclip	<ul> <li>Help Contents</li> <li>Search</li> <li>Show Contextual Help</li> </ul>	Workbench
=	Tutorial: Import an existing project	Show Active Keybindings Ctrl+Shift+L Tips and Tricks Report Bug or Enhancement Cheat Sheets	
	A guided walk-through how to import an existi project	<ul> <li>Eclipse User Storage</li> <li>Perform Setup Tasks</li> </ul>	
•	Review IDE configuration settings Review the IDE's most fiercely contested preferences	Check for Updates     Install New Software     Eclipse Marketplace     Arduino Downloads Manager	E
0	Create a new C/C++ project Create a new Eclipse project for C/C++ source	About Eclipse IDE     Contribute	
0	Import a project with a working Mak Open the New item wizard	efile What's New Find out what is new	

图 2. 进入 Install New Software 页面

2. 点击 "Add..."

图 3. 〕	选择 Add
--------	--------

Available Software         Select a site or enter the location of a site.         Work with: type or select a site         type filter text         Select All         Name         Image:
Work with: type or select a site  ype filter text  Add. Manage.  ype filter text  Select Al  Deselect Al  Deselect Al  Details  Details  C Show only the latest versions of available software  Show only the latest versions of available software  Show only the latest versions of available software  Show only software applicable to target environment C Contact all update sites during install to find required software
type filter text     Select All       Name     Version       O There is no site selected.     Deselect All       Details     :       Constrained of the selected
Name     Version       Image: Contract all update sites during install to find required software
Show only the latest versions of available software Group items by category What is <u>already installed</u> ? Show only software applicable to target environment Contact all update sites during install to find required software
Image: Show only the latest versions of available software       Image: Mode latest versions of available software         Image: Show only software applicable to target environment       What is <u>already installed</u> ?         Image: Contact all update sites during install to find required software       Image: Software applicable to target environment

3. 添加一个本地插件,也可以使用网络路径自动下载安装

图 4. Add Respository

(	Add Repository		
	Name:	_ Local	
	Location: http://	Archive	
	0	Add Cancel	

4. 选择本地插件解压目录,点击 "Add"



图 5. 选择插件解压目录

Name: Local Location: 1/ilg.gnumcueclipse.repository-4.5.1-201901011632/ Archive
Location: 1/ilg.gnumcueclipse.repository-4.5.1-201901011632/ Archive
Add Cancel

#### 5. 勾选所有的插件, "Next"

图	6.	勾选插件
---	----	------

O instal		100	
Available Software			
Check the items that you wish to install.			Same 1
Work with: file:/D:/Jun.T/\$2#/eclipse/eclipse-cpp-2019-06-R-win32-x	36_64/ilg.gnumcueclipse.repository-4.5.1 -	Add	Manage
type filter text			Select All
Name	Version	÷ f	Deselect All
Of WA ARK & RISC-V (C++ Cross Development Tools     Son MU ACK (C++ AVAM Cross Compiler     Son MUC (C++ AVAM Cross Compiler     Son MUC (C++ AMM Cross Compiler     Son MUC (C++ C-backet Debug Perspective     Son MUC (C++ Decumentation (Rescholden)     Son MUC (C++ F-Link Debugging     Communication     Details	1.1.5.201900011692 2.6.4.201900011692 11.2.20190001692 2.2.9.20190001692 2.4.20190001692 4.1.4.201900011692	E .	
Show only dong the latest version of available software     Group kenns by category     Group kenns by category     Show only software applicable to target environment     Contact all update sites during install to find required software	I Gide items that are already installed What is <u>already installed</u> ?		
0	< Back Next > Er	nish	Cancel

#### 6. 安装完成 "Next"

 Instal     Install     Install     Review the items to be installed.	安装完成		
Name           By GNU MCU C/C++ ADU/GNO Project Template           By MU MCU C/C++ FreeState Project Template           By MU MCU C/C++ ADU/GNO Project Template           By MU MCU C/C++ FreeState Project Template           By MU MCU C/C++ ADU/GNO Project Template           By MU MCU C/C++ ADU/GNO Project Template           By MU MCU C/C++ Pack Stypermemal           By MU MCU C/C++ Pack Template           By MU MCU C/C++ STREE MCV Project Template	Version 1.1.5.20190101632 2.4.20190011632 1.1.20190011632 2.3.50190011632 2.4.30190011632 4.4.30190011632 4.3.30190011632 1.3.30190011632 2.3.30190010	1d ing grunnozefipse templates ad ing grunnozefipse managedbul ing grunnozefipse acadered fast ing grunnozefipse templates fast ing grunnozefipse templates fast ing grunnozefipse templates co ing grunnozefipse templates co ing grunnozefipse gacks fast ing grunnozefipse packs fast ing grunnozefipse templates cf ing grunnozefipse templates cf	
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Review Losses Licenses must be reviewed and accepted before the software can be installed.           Licenses         Licenses part.           # Licipie Accordance Software User Agreement ONU MCU CC++ AMC Costs Compiler 24A203050011812 ONU MCU CC++ AMC Costs Compiler 24A203050011812 ONU MCU CC++ Costemate Fighter Hanglare 11.3203050011812 ONU MCU CC++ Costemate Fighter Hanglare 24A03050011812 ONU MCU CC++ Northereade Projet Tempiler 24A03050011812 ONU MCU CC++ Norteade Projet Tempiler 24A03050011812 ONU MCU CC++ Norte Strepheneting 223050011812 ONU MCU CC++ Norte Strepheneting 2230500011812 ONU MCU CC++ Norte Strepheneting 233030500011822 ONU MCU CC++ Norte Strepheneting 233030500001822 ONU MCU CC++ Norte Strepheneting 233030500001822 ONU MCU CC++ Norte Strepheneting 233030500001822 ONU MCU CC++ Norte Strepheneting 233030500000000000000000000000000000000	Italied.	view Licenses renses must be reviewed and accepted before the software can be installed, need.
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Licenses: Licenses part Licenses: Licenses part Licenses part L	License text: Eclipse Foundation Software User Agreement	nies:
A Edge Foundation Software User Agreement     Of UN MUC CV-+ AADCM300 Project Template 11.320190101182     ONU MUC CV-+ AADCM300 Project 11.320190101182     ONU MUC CV-+ AADC Cost Complex 23.420190101182     ONU MUC CV-+ Neetale Project Template 23.20190101182     ONU MUC CV-+ Neetal Project Template 23.20190101182     ONU MUC CV-+ NoCO Template 23.20190101182     ONU MUC CV-+ NoCO Template 23.20190101182     ONU MUC CV-+ NoCO Template 23.201901182	Eclipse Foundation Software User Agreement	
GMU MCU C/C++ ST62-Y Cross Compiler 32.32050010182     GMU MCU C/C++ STM326 Project Templanes 2.8.3.2005010182     GMU AUX AUX AUX AUX AUX AUX AUX AUX AUX AU	Content & Annual Content     Content Content     Content Content     Content Content     Content Content Content     Content Content Content Content     Content Content Content     Content Content Content     Content Content     Content Content     Content Content     Content	Glops Foundation Software User Agreement     Orku MCU CC+ ACM/MMP Project Trendste 1.3.230501011812     Orku MCU CC+ AAM Creast Compiler 2.6.420530101812     Orku MCU CC+ ACM/MMP Project Trendster 1.3.23051011812     Orku MCU CC+ Documentation Ulseholders 1.1.2.3051011812     Orku MCU CC+ ACM/ACM/MP Project Trendster 2.6.30180101812     Orku MCU CC+ ACM/ACM/MP Project Trendster 2.6.30180101812     Orku MCU CC+ ACM/ACM/MP Project Trendster 2.6.30180101812     Orku MCU CC+ ACM/ACM/ACM/ACM/ACM/ACM/ACM/ACM/ACM/ACM/

#### 图 8. accept the license agreement

7. "Install anyway"

#### 图 9. Install anyway

<ul> <li>Security Warning</li> <li>Warning: You are installing software that contains unsigned content. The authenticity or validity of this software cannot be established. Do you want to continue with the installation?</li> </ul>
Install anyway Cancel Details >>

#### 8. 重启Eclipse

图 10. 車后 ECIIDSE	图	10.	重启	Ecli	pse
------------------	---	-----	----	------	-----

Software Updates
Would you like to restart Eclipse IDE to apply the changes?
Restart Now No

## 2.3 ARM GCC 编译工具链安装

下载最新的编译工具链gcc-arm-none-eabi-8-2019-q3-update-win32-sha2.exe

AT32\_Eclipse\_Packet.zip 包含有一个可以使用的版本gcc-arm-none-eabi-8-2019-q3-update-win32-sha2.exe。

下载地址: <u>https://launchpad.net/gcc-arm-embedded/+download</u> 开始安装:

1. 选择语言

图 11. Install

Installer	anguage
	Please select a language.
	English 🔹
	OK Cancel

2. 安装向导,点击"下一步"



Welcome to the GNU Tools for ARM Embedded Processors 8-2019-q3-update 8 2019 Setup
This wizard will guide you through the installation of GNU Tools for ARM Embedded Processors 8-2019-q3-update 8 2019. It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer. Click Next to continue.
Next > Cancel

3. 许可证协议,点击"我接受"



🕝 GNU Tools for ARM Embedded Processors 8-2019-q3-update 📃 💷 💌
License Agreement Please review the license terms before installing GNU Tools for ARM Embedded Processors 8-2019-q3-update 8 2019.
Press Page Down to see the rest of the agreement.  Contains code from project GNU Binutils ( <u>https://www.anu.org/software/binutils/</u> ), GNU Debugger ( <u>https://www.anu.org/software/adb/</u> ) under the following license(s).
GNU GENERAL PUBLIC LICENSE Version 3, 29 June 2007 Copyright (C) 2007 Free Software Foundation, Inc. < <u>http://fsf.org/</u> > Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.
If you accept the terms of the agreement, dick I Agree to continue. You must accept the agreement to install GNU Tools for ARM Embedded Processors 8-2019-q3-update 8 2019.
Nullsoft Install System v2.51-1                

4. 选择安装位置,安装到默认位置,点击 "安装",进入安装过程



#### 图 14. 安装过程

NU Tools for ARM Embedded Processors 8-2019-q3-update	
talling ease wait while GNU Tools for ARM Embedded Processors 8-2019-q3-update 8 2019 being installed.	
tract: c++config.h 100%	
oft Install System v2.51-1	
	NU Tools for ARM Embedded Processors 8-2019-q3-update talling ease watk while GNU Tools for ARM Embedded Processors 8-2019-q3-update 8 2019  (tract: c++confg.h 100% Show details  oft Install System v2.51-1

5. 安装完成界面,要将" Add path to environment variable "选项勾上,会自动添加到环境变量之中,否则需要手动添加环境变量。

A 19. 2017 And path to chartenine and and be				
G GNU Tools for ARM Embedded Processors 8-2019-q3-update				
	Completing the GNU Tools for ARM Embedded Processors 8-2019-q3-update 8 2019 Setup			
	GNU Tools for ARM Embedded Processors 8-2019-q3-update 8 2019 has been installed on your computer. Click Finish to dose this wizard.			
	<ul> <li>✓ Show Readme</li> <li>✓ Launch gccvar.bat</li> <li>✓ Add path to environment variable</li> <li>✓ Add registry information</li> </ul>			
	< Back Finish Cancel			

#### 图 15. 选择 Add path to environment variable

6. 安装完成之后在弹出的命令窗口中输入 arm-none-eabi-gcc –v, 会显示一些版本信息, 表示安装 成功。

#### 图 16. 安装结果查看

C:\Program Files <x86>\GNU Tools ARM Embedded\8 2019-q3-update&gt;arm-none-eabi-gcc</x86>
-v -
Jsing built-in specs.
COLLECT_GCC=arm-none-eabi-gcc
COLLECT_LTO_WRAPPER=c:/program\ files\ <x86>/gnu\ tools\ arm\ embedded/8\ 2019-q</x86>
3-update/bin//lib/gcc/arm-none-eabi/8.3.1/lto-wrapper.exe
farget: arm-none-eabi
Configured with: /tmp/jenkins/jenkins-GCC-8-build_toolchain_docker-594_20190704
1562200936/src/gcc/configurebuild=x86_64-linux-gnuhost=i686-w64-mingw32
target=arm-none-eabiprefix=/tmp/jenkins/jenkins-GCC-8-build_toolchain_docker-
594_20190704_1562200936/install-mingwlibexecdir=/tmp/jenkins/jenkins-GCC-8-bu
ild_toolchain_docker-594_20190704_1562200936/install-mingw/libinfodir=/tmp/je
nkins/jenkins-GCC-8-build_toolchain_docker-594_20190704_1562200936/install-mingw
/share/doc/gcc-arm-none-eabi/infomandir=/tmp/jenkins/jenkins-GCC-8-build_tool
chain_docker-594_20190704_1562200936/install-mingw/share/doc/gcc-arm-none-eabi/m
anhtmldir=/tmp/jenkins/jenkins-GCC-8-build_toolchain_docker-594_20190704_1562
200936/install-mingw/share/doc/gcc-arm-none-eabi/htmlpdfdir=/tmp/jenkins/jenk
ins-GCC-8-build_toolchain_docker-594_20190704_1562200936/install-mingw/share/doc
/gcc-arm-none-eabi/pdfenable-languages=c,c++enable-mingw-wildcarddisabl
e-decimal-floatdisable-libffidisable-libgompdisable-libmudflapdisabl
e-libquadmathdisable-libsspdisable-libstdcxx-pchdisable-nlsdisable-s
hareddisable-threadsdisable-tlswith-gnu-aswith-gnu-ldwith-headers
=yeswith-newlibwith-python-dir=share/gcc-arm-none-eabiwith-sysroot=/tmp
/jenkins/jenkins-GCC-8-build_toolchain_docker-594_20190704_1562200936/install-mi 🔽



## 2.4 GNU ARM Eclipse Build Tools 安装

此部分主要是安装make,rm等命令。

下载地址: <u>https://sourceforge.net/projects/gnuarmeclipse/files/Build Tools/</u>

AT32\_Eclipse\_Packet.zip 包含有一个可以使用的版本gnuarmeclipse-build-tools-win64-2.6-201507152002-setup.exe,或者下载其它适用版本。

1. 运行安装包

图 17. 运行安装包

Welcome to the GNU ARM Eclipse Built ToolsWelcome to the GNU ARM Eclipse Built Tools
The ward will guide you through the installation of GNU AME ficipre Build Tools. It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system file without having to reboot your computer. Click Next to continue.
The recommended that you does all other applications before starting Secture. This will make the possible to update relevant system files without having to reboot your computer. Click Next to continue.
Click Next to continue.

2. 选择安装路径



🚺 GNU ARM Eclipse Build Tools Setup	
Choose Install Location Choose the folder in which to install GNU ARM Eclipse Build Tools.	
Setup will install GNU ARM Eclipse Build Tools in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.	
Destination Folder           Environmerican Files (2NU ARM Edges (Build Tools (2.6:20150715200)         Browse	
Space required: 3.7MB Space available: 31.7GB	
Nullsoft Install System v2.46-10       	

- 3. 安装完成 需要重启Eclipse
- 图 19. 安装完成

CNULADAAT I'

	Build Tools Setup Wizard	
	GNU ARM Eclipse Build Tools has been installed on your computer.	
	Click Finish to dose this wizard.	
400		
	Visit the GNU ARM Eclipse site!	
	< Back Finish Cancel	

## 2.5 安装 Jlink

需要将AT32 系列芯片拷贝到Jlink目录,目前可使用ICP完成拷贝工作

1. Jlink 安装(略)

此部分按照下载最新的Jlink进行安装即可

2. 算法文件拷贝

为了Jlink能够识别和下载程序到AT32芯片,可以将AT32芯片的下载算法拷贝到Jlink目录中,这里有个简单的方法是使用最新的ICP,直接运行ICP,ICP会将相应的AT32算法拷贝的Jlink目录。



# 3 template 工程配置与编译

本章介绍如何使用template工程,工程路径: AT32Fxx\_Firmware\_Library\project\at\_start\_xx\templates\eclipse\_gcc 本章以AT32F437为例说明工程的配置与编译

# 3.1 打开 template 工程

1. 选择File→Open Projects from File System..

• work_t	ase - Eclips	e IDE				
File Edi	t Source	Refactor	Navigate	Search	Project	Run Window Help
New				Alt+Sh	ift+N ►	
Ope	n File					
😋 Ope	n Projects f	rom File Sy	stem			o the Eclipse IDE for C/C++ Developers
Rece	ent Files				•	o the Eclipse IDE for C/C++ Developers
Clos	e			C	trl+W	
Clos	e All			Ctrl+Sh	ift+W	

2. 在Import source中选择路径,然后点击Finish。AT32F437xx template路径如下,其它系列路径 类似xxx\AT32F435\_437\_Firmware\_Library\project\at\_start\_f437\templates\eclipse\_gcc\template

Import Projects from File System or Archive This wizard analyzes the content of your folder or archive	e file to find projects and import them in the IDE.	
Import source: D:\BSP\AT32F435_437_Firmware_Librar	y\project\at_start_f437\templates\eclipse_gcc\template 🔹	Directory Archive
type filter text		Select All
Folder	Import as Eclipse project	Deselect All
Close newly imported projects upon completion	I	Hide already open projects
Use <u>installed project configurators</u> to:		
Search for nested projects           Image: Control of the project network           Image: Control of the project network		
Working sets		
Add project to working sets		New
Working sets:		v Select
	Show of	her specialized import wizards
-		

3. 工程打开之后看到一个template的项目工程如下





### 3.2 编译

在编译过程中,需要对头文件的路径,以及一些芯片宏的定义,此部分在template工程有对应都有配置。配置包括如下内容

- 芯片配置
- 头文件路径配置
- 宏定义配置
- 链接脚本文件配置(不同型号之前ld文件会涉及到要修改)
- 1. 右键选择 template 工程,选择 Build Project

⊿ 😴 temp	late			2.4
⊳ ∦≵r Bi ⊳ ∭ In		New Go Into	,	2
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	29	Export		IC
		Build Project		K.3
		Clean Project		

2 编译结束之后会生成template.elf



3. 对于同一系列不同型号的配置,只需要修改ld文件即可,在下图的setting中修改。另外,其它如 果要修改的如头文件路径等也是在下图setting中对应选项中修改即可。



# **17[57**]

# Eclipse with GCC

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Debug Configurations	
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U	Unlink Prototype
R	Reset with Prototype Values

## Eclipse with GCC







## 4 调试

本章分别描述用jlink和atlink调试at32系列芯片。

#### 4.1 Jlink 调试

本部分主要说明调试的一些配置:

- Jlink配置
- GDB配置
- SVD 外设寄存器配置

#### 4.1.1 Debug 配置

 "Run" → " Debug Configurations" → "GDB SEGGER J-Link Debugging" → "New Configuration" 建立一个新的Debug配置,配置JlinkGDBServerCL,Device name根据需要调试的具体芯片型号 填写,例如AT32F437ZMT7,AT32F413RCT7,AT32F415RCT7等

🗋 🖻 🐌 📄 🗙 📄 🆆 🗸	Name: template Deb	ug (1)					
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C/C++ Remote Application	Actual executable:	C:/Program (to change	m Files (x86)/SEGGER/J it use the <u>global</u> or <u>we</u>	Link_V620c//JLink@ orkspace preferend	DBServerCL.exe	<u>oject</u> properties page)	Е
GDB Hardware Debugging     GDB Jumper Debugging	Device name:	AT32F437ZMT7 Supported device names					
GDB OpenOCD Debugging	Endianness:	Little	🗇 Big				
c template Debug	Connection:	USB	© IP		(USB serial or IP	name/address)	
GDB PyOCD Debugging	Interface:	SWD	JTAG				
GDB SEGGER J-Link Debugging	Initial speed:	Auto	O Adaptive  Fixe	d 1000 kH	z		
c template Debug (1)	GDB port:	2331					
I Launch Group ▶ Launch Group (Deprecated)	SWO port:	2332		Verify 🗸	downloads 🛛 Initia	lize registers on start	
	Telnet port:	2333		🔽 Local h	ost only 📃 Siler	t	
	Log file:					Browse	

- 2. 配置GDB,选择GCC 安装目录下的arm-none-eabi-gdb.exe
- 3. SVD Path选择,用于Debug寄存器的描述,这里可以直接使用keil下的svd文件,当安装了AT32 的keil Packet之后,会自动将svd拷贝到keil 目录下。

Image:		
Type filter text       Imain Status Sta	🗋 🖻 🎭 🗎 🗮 🖛 🔹	Name: template Debug (1)
C/C++ Application       SVD file (used by the peripheral registers viewer)         C/C++ Attach to Application       C/C++ Rotimotem Debugger         C/C++ Postmortem Debugging       GOB Jumper Debugging         GOB Jumper Debugging       GOB Jumper Debugging         GOB Jumper Debugging       GOB Jumper Debugging         GOB Jumper Debugging       GOB Jumper Debugging         GOB Jongen Debugging       GOB Jumper Debugging         GOB BArdware Debugging       GOB Jumper Debugging         GOB BArdware Debugging       GOB Jumper Debugging         GOB BArdware Debugging       GOB Jumper Debugging	type filter text	📄 Main 🗱 Debugger 🕨 Startup 💱 Source 🔲 Common 😹 SVD Path
C/C++ Catach to Application C/C++ Catach to Application C/C++ Container Launcher C/C++ Remote Application C/C++ Remote Application C/C++ Unit GOB Hardware Debugging GOB Jumper Debugging GOB Symper Debugging GOB Symper Debugging GOB QEMU Debugging GOB QEND Debugging GOB QEMU Debugging	C/C++ Application	SVD file (used by the peripheral registers viewer)
C/C++ Container Launcher C/C++ Postmortem Debugger C/C++ Remote Application C/C++ Remote Applica	C/C++ Attach to Application	File path: Keil_v5\ARM\Pack\ArteryTek\AT32F435_437_DFP\2.0.4\SVD\AT32F437xx_v2.svd Browse Variables
C/C++ Rende Application C/C++ Rende Application C/C++ Renderate Debugging GOB Jumper Debugging GOB Jumper Debugging GOB OpenCD Debugging GOB OpenCD Debugging GOB OpenCD Debugging	C/C++ Container Launcher	
V C/C++ Unit GOB Hardware Debugging GOB Ardware Debugging GDB OpenOCD Debugging Termplate Debug GOB P/OCD Debugging GOB QEMU Debugging	C/C++ Remote Application	
GOB Hardware Debugging         GOB Hardware Debugging         GOB OpenOCD Debugging         E template Debug         GOB QCD Debugging         GOB QEMU Debugging	t C/C++ Unit	
G 06 Jumper Debugging	GDB Hardware Debugging	
Glob OpenCCD Debugging Glob OpenCD Debugging Glob PyCCD Debugging Glob PyCCD Debugging Glob QEMU Debugging Glob QEMU Debugging	GDB Jumper Debugging	
GOB P/OCD Debugging GOB QCD Debugging	GDB OpenOCD Debugging     template Debug	
GDB QEMU Debugging	GDB PyOCD Debugging	
	GDB QEMU Debugging	
GDB SEGGER J-Link Debugging	GDB SEGGER J-Link Debugging	
c template Debug (1)	c template Debug (1)	
Launch Group	Launch Group	



4. Debug 配置完成 → "Apply"→"Debug" 进入调试

🌣 Debug 12 🍐 Project Explorer 🛛 🙀 🕨 🔍 🗆	💽 0x0 🔣 main.c 23		- 0	01- Varia % Brea 62 Esp	r 🛋 Mod 🔛 Disa	n 🚼 Perip 32 🔍 🗆
# [1] template Debug (1) [GDB SEGGER J-Link Debugging]	1000 void EXINTO_IRQHandler(void)		*			む 📑 🖻 🍸
🖌 🔐 template.elf	101 ( 102 button (sr())			Peripheral	Address	Description
# 🥐 Thread #1 57005 (Suspended : Breakpoint)	105 }			E S DMAL	0x40026400	DMA controller
main() at main.c112 0x80003ea	104			E 2. DMA2	0x80026600	DMA controller
	106 * Abrief main function.			E Z DVP	0x50050000	Digital video parallel inter
	107 * Sparam none			E S EDMA	0x40026000	EDMA controller 1
	100 Cetval none			ERTC	0x40002800	Real-time clock
	1100 int main(void)			ETHERNET_DMA	0x40029000	Ethernet: DMA controller
	111 (			ETHERNET_MAC	0x40028000	Etherneti media access cc
	115 system clock config();			ETHERNET_MMC	0x40028100	Ethernet: MAC managem-
	114			ETHERNET_PTP	0x40028700	Ethernet: Precision time p
	115 at32_board_init();			E TUDAT	0x80013C00	EXINT
	117 button_exist_init();			E 7 FLASH	0x40023C00	Rash memory controler
				R 2 GPIOA	0x40020000	General purpose I/Os
	120 (			12 7 GP108	0x80020400	General purpose I/Os
	121 j += buffer[i];			00140	0x40020800	General purpose I/Os
	122 }			E A GPIOD	0x40020000	General purpose I/Os
	124 1f(1 -= 0)				0x00021000	General purpose (/Os
	125 (			*	11	,
	125 ats2_led_toggle(LEA2))					
	128					
	129 shile(1)					
	131 at32_led_toggle(1202);					
	132 delay_ms(g_speed * DELAY);					
	134 delay_ms(g_speed * DELAY);					
	<pre>135 at32_led_toggle(1f24);</pre>					
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	Console IIII Registers C Problems O Executable	ies up beougger console () Memory II				E 题 🐠 🔹 🖓 🖬
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		1 22 GD1	Over the second se	40020414	0+00000280	
		- 101 SAN	0.0	1000041C	0-0000280	
		> BH AND	0.0	0000430	0+0000280	
		A REALING AND A REAL A	0.0	0000424	0+0000280	
		P INT CIR	0.0	10000428	0+0000280	

#### 4.2 ATLink 调试

本部分主要说明使用OpenOCD + Eclipse + ATLink来调试AT32。关于ATLink的使用说明请参考 《AT-Link\_User\_Manual\_SC.pdf》

本节主要说明如下内容:

- Eclipse Openocd配置
- GDB配置
- SVD 外设寄存器配置

在解压**OpenOCD**包文件<<**OpenOCD\_V2.x.x.zip>>** 

包含5个目录,bin文件下为可执行exe,scripts目录为配置文件目录

OpenOCD包含如下目录文件:

鷆 bin
퉬 contrib
퉬 OpenULINK
퉬 scripts
퉬 share

## 4.2.1 Debug 配置

1. 配置 OpenOCD 路径, Project→Properties→MCU→OpenOCD Path



	OpenOCD P	ath			¢	• => • •
<ul> <li>Resource Builders</li> <li>C/C++ Build</li> <li>C/C++ General Linux Tools Path</li> <li>MCU ARM Toolchains Paths</li> </ul>	Configure th The values a used for all workspace of After installin re-evaluated location.	e location where C re stored in the w build configuration or global paths. ng OpenOCD upda l and use the Resto	NU MC orkspac is of this ites, res ore Defa	CU Eclipse Ope e (not in the pr s project, and d tart Eclipse for aults button to	enOCE roject overr r the confi	) is installed ;). They are ide the defaults to b gure the new
Build Tools Path Jumper Path OpenOCD Path pyOCD Path QEMU Path SEGGER J-Link Path Project Natures Project References Run/Debug Settings ▷ Task Repository Task Tags Validation	Executable: Folder:	bin\openocd.exe D:\OpenOCD		Browse		xPack
WikiText			App	Restore <u>D</u> efault	ts	<u>A</u> pply Cancel

 "Run" → " Debug Configurations" → "GDB OpenOCD Debugging" → "New Configuration" 建立一 个新的Debug配置

可配置项如下:

openocd的可执行文件路径: D:\OpenOCD\bin\openocd.exe

Config options: -s \${openocd\_path}\scripts -f ./interface/atlink.cfg -f ./target/at32f437xM.cfg

atlink.cfg表示使用atlink调试工具,at32f437xM.cfg表示at32f437 FLASH有4032KB的型号,其它 AT32F437的型号可统一使用at32f437xx.cfg。对于不同的系列,如AT32F403A,AT32F415等此处 对应的target/xxx.cfg需要做对应的修改。

Create, manage, and run configura	tions		Ś
Image: Second	Ame: template De Main State Debug OpenOCD Setup Start OpenOCD Executable path: Actual executable: GDB port: Telnet port: Tcl port: Config options: Allocate console	bug ger Startup Source Common Sto SVD Path locally  \${openocd_path}\\${openocd_executable} D:\OpenOCD\bin\openocd.exe (to change it use the global or workspace preferences pages or 3333 4444 6666 -s \${openocd_path}\scripts -f ./interface/atlink.cfg -f ./target/at3. for OpenOCD Allocate console for the	Browse Variables the project properties page) 2f437xM.cfg
< III > Filter matched 15 of 15 items	GDB Client Setup	on \${cross_prefix}gdb\${cross_suffix} III	Browse) Variables) Revert Apply

#### **3**. 配置SVD文件

Г

#### 可下载对应型号的SVD文件用于Debug

Image: SVD Path         C/C++ Application         C/C++ Attach to Application         C/C++ Attach to Application         C/C++ Container Launcher         C/C++ Postmortem Debugger         C/C++ Remote Application         C/C++ Remote Application         C/C++ Unit         GDB Hardware Debugging
--

#### 4. Debug 配置完成 → "Apply"→"Debug" 进入调试

# Eclipse with GCC

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<b>;</b>	X		

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🕸 Debug 12 🔥 Project Explorer 🙀 😥 👻	P D E 0x80003fe @ main.c 13		- 0	109 Varia 🎭 Brea 🕂 Expr	🛋 Mod 🔡 Disas 🐕 Perip.	
a C template Debug (GDB OpenOCD Debugging)	100- void EXINTO_IRQHandler(void)			8- (B) D Y		
+ Template.elf			Perinheral	Address Description		
A P Thread #1 (Suspended : Breakpoint)	101 Button_Lar();	in partner_low(); 184 1869 1879 - Wester main fraction. 187 - Wester main fraction.		ER DAVAL	0-40036400 DMA control	Ter.
main() at main.ct112 0x80003ea	104			E S DMA2	0x40026500 DMA control	ler
	1850 /**			THE OVE	0x50050000 Disital video	o parallal inte
	107 * Sparam none			ET S. EDMA	0x40026000 EDMA contr	oler
	100 * @rstval none	100 * Bratval none			0x40002800 Real-time cl	ock
	1100 int main(void)			E S. ETHERNET_DMA	0x40029000 Ethernet: DN	AA controller
	111 (			THERNET_MAC	0x40028000 Ethernet: me	dia access cc
	• 112 uint32_t 1 = 0, j = 0;			7. ETHERNET MMC	0x40028100 Ethernet MJ	AC managem-
	113 System_clock_convig(); 114			THERNET_PTP	0x40028700 Ethernet: Pre	ecision time p
	<pre>115 at32_board_init();</pre>			EXINT	0x40013C00 EXINT	
	115 112 button exist init/):			E %, FLASH	0x40023C00 Flash memo	ry controler
	118			👿 🔂 GPIOA	0x40020000 General pur	pose I/Os
	<pre>119 for(i = 0; i &lt; SUFFER_LEN; i +</pre>	<pre>133 fre(1 * 0; 1 &lt; furth_LOD; 1 ++) 130 { 121 j ++ buffer[1]; 122 } 123 L(j += buffer[1]; 123 L(j += 0) 123 L(j += 0)</pre>		E % GPIO8	0x40020400 General pur	pose I/Os
	120 1 += buffer[1];			E S GPICC	0x40020800 General pur	pose I/Os
	122 }			E S GPIOD	0x40020C00 General pur	pose I/Os
	123			T 7, GPIOE	0x40021000 General pur	pose I/Os
	125 (			HIQ GRIDE	Out0021400 Gagaral out	nore UOr
	<pre>131 delay_ns(g_peed * DELV); 132 delay_ns(g_peed * DELV); 133 at32_led_toggle(LED3); 134 delay_ns(g_peed * DELV); 135 at32_led_toggle(LED4);</pre>	131         etal_p_m(c_streat + SGLAY);           131         etal_p_m(c_streat + SGLAY);           131         etal_p_m(c_streat + SGLAY);           134         etal_p_m(c_streat + SGLAY);           135         etal_p_m(c_streat + SGLAY);           136         etal_p_m(c_streat + SGLAY);				
	136 delay ms(g speed * DELAY):	136 delay ms(g speed * DELAY):		4		
	Console III Registers 🖄 Problems 🚺	xecutables 🙀 Debugger Console 🚺 Memory 🖾				
	Monitors	🔶 🗶 🔆 GPIOB: 0x40020400 🔅 🌵 New Re	nderings			
	GPIDA     GPIDE	Register	4	ddress	Value	2
		GPIOB	0	×40020400		
		> ### CFGR	0	×40020400	0x00000280	
			0	×40020404	0x00000280	
		> III OMODE		40020408	0x00000280	
		> IIII OMODE > IIII ODRVR	0			
		⇒ IIIT OMODE ⇒ IIIT ODRVR ⇒ IIIT PULL	0	+4002040C	0x00000280	
		> 101 OMODE > 101 ODRVR > 101 PULL > 101 ED	0	×4002040C ×40020410	0x00000280 0x00000280	
		⇒ IIII OMODE ⇒ IIII ODRVR ⇒ IIII PULL ⇒ IIII IDT ⇒ IIII ODT	0 0 0	+4002040C +40020410 +40020414	0x00000280 0x00000280 0x00000280	
		- JIT OMCOF - JIT OMCOF - JIT PULL - JIT PULL - JIT ODT - JIT ODT - JIT SCR	0 0 0 0	+4002040C +40020410 +40020414 +40020418	0x00000280 0x00000280 0x00000280 0x00000280	
		2011 OMODE     2011 OMODE     2011 OPUR     2011 FULL     2011 FULL     2011 IDT     2011 ODT     2011 SCR     2011 SCR     2011 VOR     2011 SCR     2011 VOR     2011 VOR	0 0 0 0 0 0	+4002040C +40020410 +40020414 +40020418 +4002041C	0x0000280 0x0000280 0x0000280 0x0000280 0x00000280	
		<ul> <li>3 mit OMADOE</li> <li>3 mit ODKVR</li> <li>3 mit PUAL</li> <li>3 mit DT</li> <li>3 mit OCT</li> <li>3 mit SGR</li> <li>3 mit VGR</li> <li>3 mit MIXAL</li> <li>5 mit MIXAL</li> </ul>		+002040C +0020410 +0020418 +0020418 +002041C +002041C +0020420 +0020420	0x0000280 0x0000280 0x0000280 0x0000280 0x0000280 0x0000280 0x0000280	
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# 5 版本历史

表 1. 文档版本历史

日期	版本	变更
2021.12.13	2.0.0	最初版本



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