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Overview

The manual is mainly divided into four chapters according to its content:

- Chapter 1. is mainly about the installation of VMware, and the version used is VMware® Workstation 15 Pro15.1.0. Users need to install VMware before using the ubuntu development environment.
- Chapter 2. mainly introduces the method of loading the ubuntu development environment provided by Forlinx, and the development environment is 64-bit ubuntu18.04.
- Chapter 3. mainly introduces the method of building a new ubuntu development environment. This section uses the 64-bit Ubuntu 18.04 as an example to describe the process of Ubuntu creation, cross-compiler installation, and QT Creator installation. Due to different computer configurations, unexpected problems may occur in the building process. It is recommended that beginners directly use the environment we have built.
- Chapter 4. mainly describes the compiling method of the source code related to the development board, including the kernel source code compilation and the application program compilation.

A description of some of the symbols and formats in the manual:

Format	Meaning
	Note or information that require special attention,
	be sure to read carefully.
Ĥ	Relevant notes on the test chapter.
	Indicates a related path
Blue font on gray	Refers to commands entered at the
background	command line (Manual input required).
Black font on a	Serial port output message after entering a
gray background	command.
Bold black on	Key information in the serial port output
gray background	message
//	Interpretation of input instructions or output
	information



GAOTek Programmable Industrial IOT Development Kit

Chapter 1. VMware Virtual Machine Software Installation

This chapter mainly introduces the installation of VMware virtual machines, using VMware Workstation 15 Prov15.1.0 as an example to demonstrate the installation and configuration process of the operating system.

1.1.VMware Software Download and Purchase

Tools & Training Support Blogs & Communities VMware Customer Connect VMware Customer Connect Blogs VMware Trust Center Support Offerings Podcasts Learning & Certification Skyline News & Stories Tech Zone Support Customer Welcome Center Communities Product Downloads Marketplace Customer Stories Product Trials Cloud Marketplace Customer Stories Cloud Services Engagement Platform VMware Marketplace Events Hands-on Labs Videos VMware Explore Professional Services VMware Video Library SpringOne Professional Services VMware Explore Video Library All Events & Webcasts	vm ware ⁻	Multi-Cloud Services	Products	Solutions	Partners	Resources	Q Search GET STAR	TED
VMware Trust Center Support Offerings Podcasts Learning & Certification Skyline News & Stories Tech Zone Support Customer Welcome Center Communities Product Downloads Marketplace Customer Stories Product Trials Cloud Marketplace Customer Stories Cloud Services Engagement Platform VMware Marketplace Events Hands-on Labs Videos VMware Explore Services VMware Video Library SpringOne Professional Services VMware Explore Video Library All Events & Webcasts	Tools & Training		Support			Blogs & Co	ommunities	
Learning & Certification Skyline News & Storles Tech Zone Support Customer Welcome Center Communities Product Downloads Marketplace Customer Storles Product Trials Cloud Marketplace Customer Storles Cloud Services Engagement Platform YMware Marketplace Events Hands-on Labs Videos VMware Explore Professional Services VMware Video Library SpringOne VMware Explore Video Library All Events & Webcasts	VMware Customer Co	nnect	VMware Cus	stomer Connect		Blogs		
Note Net Net Product Downloads Marketplace Customer Stories Product Trials Cloud Marketplace Customer Stories Cloud Services Engagement Platform Wware Marketplace Events Hands-on Labs Videos VMware Explore Services VMware Video Library SpringOne Professional Services VMware Explore Video Library All Events & Webcasts	VMware Trust Center		Support Offe	erings		Podcasts		
Product Downloads Marketplace Customers Product Trials Cloud Marketplace Customer Stories Cloud Services Engagement Platform VMware Marketplace Events Hands-on Labs Videos VMware Explore Services VMware Video Library SpringOne Professional Services VMware Explore Video Library All Events & Webcasts	Learning & Certificatio	n	Skyline			News & Stori	es	
Marketplace Customers Product Trials Cloud Marketplace Customer Stories Cloud Services Engagement Platform VMware Marketplace Events Hands-on Labs VIdeos VMware Explore Services VMware Video Library SpringOne Professional Services VMware Explore Video Library All Events & Webcasts	Tech Zone		Support Cus	tomer Welcome Cen	ter	Communities		
Cloud Marketplace Customer Stories Cloud Services Engagement Platform Wware Marketplace Events Hands-on Labs Videos VMware Explore Services VMware Video Library SpringOne Professional Services VMware Explore Video Library All Events & Webcasts	Product Downloads		Marketpla	ce		Customers		
VMware Marketplace Events Hands-on Labs Videos vMware Explore Services VMware Video Library SpringOne Professional Services VMware Explore Video Library All Events & Webcasts	Product Trials		Cloud Marke	etplace		Customer Sto	pries	
Services VMware Video Library SpringOne Professional Services VMware Explore Video Library All Events & Webcasts		ement Platform	VMware Ma	rketplace		Events		
VMware Video Library SpringOne Professional Services VMware Explore Video Library All Events & Webcasts	Constant		Videos			VMware Expl	ore	
	Customer Success		VMware Exp	olore Video Library		All Events & \	Webcasts	

After the download is complete, double-click the installation file to start the installation program.



1.2.VMware Software Installation

Double-click the startup program to enter the installation wizard.



Click on "Next".

End-User License Ac	reement			Ø
Please read the follow	a subscription of the second	ent carefully.		L
VMWARE END	USER LICE	INSE AGRE	EMENT	^
PLEASE NOTE LICENSE AGR OF THE SOFT THAT MAY APP THE SOFTWAR	EEMENT SH WARE, REG PEAR DURII	ARDLESS	RN YOUR	
LICENSE AGR OF THE SOFT THAT MAY APP	EEMENT SH WARE, REG PEAR DURII RE.	HALL GOVE ARDLESS NG THE INS	RN YOUR	\$



Check the terms in the license agreement that I accept, then click "Next".

VMware Workstation Pro Setup	8 <u>1</u> 83		\times
Custom Setup			5
Select the installation destination and any additional featu	res.		2
Install to:	1	-	
C:\Program Files (x86)\VMware\VMware Workstation\		Change	
Enhanced Keyboard Driver (a reboot will be required to This feature requires 10MB on your host drive.	use this <mark>f</mark> eature)	Ì	

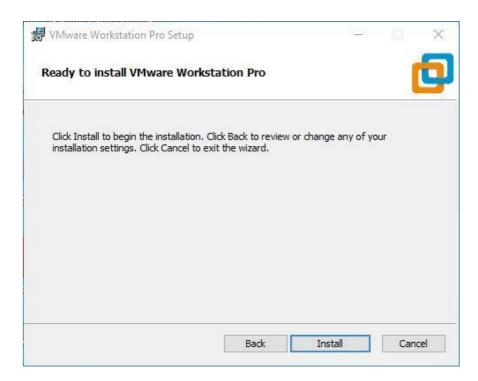
Modify the installation location to the partition where you want to install the software on your computer, thenclick "Next".

ser Experience Settings			
Edit default settings that can improve your user ex	(perience,		_
Check for product updates on startup			
When VMware Workstation Pro starts, check for and installed software components.	or new versions	of the appl	ication
☑ Join the VMware Customer Experience Improve	ement Program		
VMware's Customer Experience Imp ("CEIP") provides VMware with info		-	^
VMware to improve its products and	d services, to	fix	
problems, and to advise you on how our products. As part of the CEIP, VM			



Check and click on "Next".

🕼 VMware Workstation Pro Setup	81_18		\times
Shortcuts			5
Select the shortcuts you wish to place on your system.			9
Create shortcuts for VMware Workstation Pro in the following places			
☑ Desktop			
Start Menu Programs Folder			
Back		Can	cel
			100000





Check the box to add a shortcut, then click "Next".

Click "Installation".

🛃 VMware Workstation Pro :	Setup	— L X
Installing VMware Wor	kstation Pro	Ċ
Please wait while the Setup V Status:	/izard installs VMware Worksta	tion Pro.
	Back	Next Cancel
🖉 VMware Workstation Pro S	Getup	
15		re Workstation Pro Setup
	Click the Finish button to ex	it the Setup Wizard.
	Press the License button be key now.	low if you want to enter a license
		License Finish

Wait for the installation to complete.

Click "Finish" to try it out. If the user wants to use it long-term, they need to purchase it officially and fill out thelicense.



Chapter 2. Loading an Existing Ubuntu Development Environment.

▲ Note:

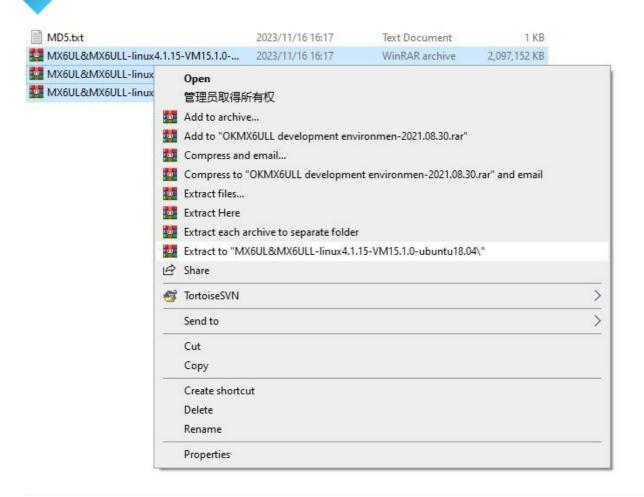
It is recommended for beginners to directly use the pre-built virtual machine environment provided by Forlinx, which already includes installed cross-compiler and Qt environment. After understanding this chapter, you can directly jump to the compilation chapter for further study. The development environment provided is: forlinx (username), forlinx (password).

There are two ways to use a virtual machine environment in VMware: one is to directly load an existing environment, and the other is to create a new environment. Let's first talk about how to load an existing environment.

First, download the development environment provided by Forlinx. In the development environment documentation, there should be an MD5 checksum file. After downloading the development environment, you should verify the integrity of the compressed package using the MD5 checksum. (You can use an on-line MD5 checksum tool or download a specific MD5 checksum tool for this purpose). To check if the checksum in the verification file matches the checksum of the file itself. If they match, the file download is successful. If they don't match, it suggests that the file may be corrupt, and you should consider downloading it again.

Select all the compressed packages and right click to extract them to MX6UL&MX6ULLlinux4.1.15-VM15.1.0-ubuntu18.04:

Name		Date modified	Туре	Size
MD5.txt document containing MD5 verification		2023/11/16 16:17	Text Document	1 KB
MX6UL&MX6ULL-linux4.1.15-VM15.1.0-ubuntu18.04.part01.rar		2023/11/16 16:17	WinRAR archive	2,097,152 KB
MX6UL&MX6ULL-linux4.1.15-VM15.1.0-ubuntu18.04.part02.rar	development environment	2023/11/16 16:17	WinRAR archive	2,097,152 KB
MX6UL&MX6ULL-linux4.1.15-VM15.1.0-ubuntu18.04.part03.rar	compression package	2023/11/16 16:17	WinRAR archive	1,359,149 KB



After the decompression is completed, as shown in the figure below:

GADTek

S称	修改日期	类型	大小
MX6UL&MX6ULL-linux4.1.15-VM15.1.0-ubuntu18.04	2021/8/13 15:08	文件夹	
] MD5校验文件	2021/8/30 16:38	文本文档	0 KB
MX6UL&MX6ULL-linux4.1.15-VM15.1.0-ubuntu18.04.part01.rar	2021/8/30 16:25	RAR 文件	2,097,152
] MX6UL&MX6ULL-linux4.1.15-VM15.1.0-ubuntu18.04.part02.rar	2021/8/30 16:28	RAR 文件	2,097,152
MX6UL&MX6ULL-linux4.1.15-VM15.1.0-ubuntu18.04.part03.rar	2021/8/30 16:30	RAR 文件	1,359,149

The file "Ubuntu18.04 64-bit.vmx" in the MX6UL&MX6ULL-linux4.1.15-VM15.1.0-ubuntu18.04 folder is the file that needs to be opened by the virtual machine.



Open the installed virtual machine.

UNivare Workstation		- E 8
Ble Fly Kenn AN Fage Field		
🙆 Bone ×		
	WORKSTATION 15 PRO ¹⁴	
VITTWORC		

Navigate to the directory where the recently extracted MX6UL&MX6ULL-linux4.1.15-VM15.1.0ubuntu18.04virtual machine file is located, and double-click on the startup file to open it.

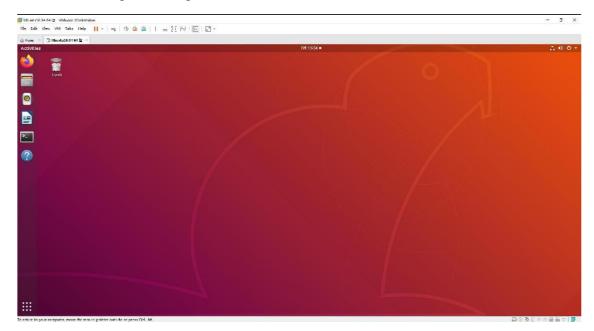
anize 🔻 🛛 New f	older				833	•	
Quick access	Name	Date modified	Туре	Size			
	ြ Ubuntu18.04 64 位.vmx	2021/8/13 15:08	VMware	4 KB			
This PC							
Desktop							
Documents Downloads							
Music							
Pictures							
Videos							
system (C:)							
D (D:)							
E (E:)							
, F (F:)							
G (G:)							
Network							



Click Turn on this virtual machine after loading is complete to run it and enter the system's interface.

🗋 Ubuntu18.04 64 😥 ×		
Ubuntu18.04	64 位	
Power on this virtual m Edit virtual machine se		
✓ Devices		
📰 Memory	2 GB	
Processors	4	
🖂 Hard Disk (SCSI)	200 GB	
S CD/DVD (SATA)	Auto detect	
🔁 Network Adapter	NAT	
🐨 USB Controller	Present	
⊲) Sound Card	Auto detect	
🖶 Printer	Present	
🛄 Display	Auto detect	
		Virtual Machine Details
 Description 		State: Powered off
Type here to enter a descri machine.	ption of this virtual	Snapshot: 快服 1 Configuration file: F:\OKMX6ULL development environmen-2021.08.30\MX6UL&MX6ULL-linux4.1.15- 64位、vmx Hardware compatibility: Workstation 15.x virtual machine Primary IP address: Network information is not available

The provided development environment account is: forlinx and the password is: forlinx; fill in the password and select Sign in to log in.





Chapter 3. Setting up a New Ubuntu Development Environment

▲ Note:

Beginners are not recommended to set up a system on their own. It is recommended to use an **existing virtual machine environment. If you do not need to set up the environment, you can skip this section.** This chapter mainly explains the process of setting up the Ubuntu system, installing the cross-compiler, and installing Qt Creator. If the user is not using Qt, the installation of Qt Creator can be ignored.

3.1. Ubuntu System Setup

3.1.1. Creating an Ubuntu Virtual Machine

Open the VMware software, click on create a new virtual machine. Enter the following interface.



Choose custom and click "Next".



irtual machine hardware (compatibility		
Hardware compatibility:	Workstation	1 15.x	\sim
Compatible with:	ESX Serv	er	
Compatible products:		Limitations:	
Fusion 11.x Workstation 15.x	^	64 GB memory 16 processors 10 network adapters 8 TB disk size 3 GB shared graphics memory	^
	~		~

Select the compatibility with the corresponding version of VMware, which can be found in Help->About VMwareWorkstation, and click "Next".

instal from:			
O Installer disc:			
No drives availa	ble	~	
O Installer disc image f	ile (iso):		
	04.6-desktop-amd64.iso		HANNER
G. Joub Japana-16.0	urio-desktop-anidoriiso	· · · · ·	Browse
	ating system later.		
I will install the operation			
	will be created with a bla	ank hard disk.	



Select "Install" the operating system later and click "Next".

Guest operating system		
○ Microsoft Windows		
Linux VMware ESX		
Other		
Version		
Ubuntu 64-bit		~

Leave the default and click "Next".

Modify the virtual machine name and installation location, click "Next".

lew Virtual Machine Wizard			
Name the Virtual Machine What name would you like t	to use for this vir	tual machine?	
Virtual machine name:			
Ubuntu 64-bit			
Location:			
D:\Documents\Virtual Machines\U	buntu 64-bit		Browse

Page | 17



Processors Number of <u>p</u> roces Number of <u>c</u> ores Total processor c	per processor:	2 2 4		>	
Number of <u>c</u> ores	per processor:	2	1	~	
Number of <u>c</u> ores	per processor:	2		*	
				~	
Total processor o	ores:	4			
Help		< <u>B</u> ack	N	ext >	Cancel
	nine Wizard he Virtual Mac memory would ye				
			r this vir	tual machir	ne?
pecify the amour nust be a multiple			a (11) (1	1.10 C C C C	
	of 4 MB.		tual mac	hine. The r	nemory size
64 GB - 32 GB -	of 4 MB.	cated to this vir	tual mac	hine. The r	
64 GB - 32 GB - 16 GB -	of 4 MB.	cated to this vir	tual mac	hine. The r	nemory size
64 GB - 32 GB - 16 GB - 8 GB -	of 4 MB. <u>M</u> emory for th	cated to this vir is virtual machir	tual mac	hine. The r	nemory size
64 GB - 32 GB - 16 GB - 8 GB - 4 GB -	of 4 MB. <u>M</u> emory for th	cated to this vir	tual mac	hine. The r	nemory size
64 GB - 32 GB - 16 GB - 8 GB - 4 GB - 2 GB -	of 4 MB. <u>M</u> emory for th Maximum re	cated to this vir is virtual machir	tual mac	hine. The r	nemory size
e4 GB - 32 GB - 16 GB - 8 GB - 4 GB - 2 GB - 1 GB -	of 4 MB. <u>M</u> emory for th Maximum re 27.8 GB	cated to this vir is virtual machir ecommended me	tual mac	hine. The r	nemory size
aust be a multiple 64 GB 32 GB 16 GB 8 GB 4 GB 2 GB 1 GB 512 MB	of 4 MB. <u>Memory for th</u> Maximum re 27.8 GB Recommend	cated to this vir is virtual machir ecommended me	tual mac	hine. The r	nemory size
64 GB - 32 GB - 16 GB - 8 GB - 4 GB - 2 GB - 1 GB - 512 MB - 256 MB -	of 4 MB. <u>M</u> emory for th Maximum re 27.8 GB	cated to this vir is virtual machir ecommended me	tual mac	hine. The r	nemory size
64 GB - 32 GB - 16 GB - 8 GB - 4 GB - 2 GB - 1 GB - 512 MB - 256 MB - 128 MB -	of 4 MB. <u>M</u> emory for th Maximum re 27.8 GB Recommend 2 GB	cated to this vir is virtual machir ecommended me ded memory:	tual mac e: emory:	hine. The r	nemory size
Aust be a multiple 64 GB 32 GB 16 GB 4 GB 2 GB 1 GB 512 MB 512 MB 5256 MB 128 MB 64 MB -	of 4 MB. <u>M</u> emory for th Maximum re 27.8 GB Recommend 2 GB Guest OS re	cated to this vir is virtual machir ecommended me	tual mac e: emory:	hine. The r	nemory size
64 GB - 32 GB - 16 GB - 8 GB - 4 GB - 2 GB - 1 GB - 512 MB - 256 MB - 128 MB -	of 4 MB. <u>M</u> emory for th Maximum re 27.8 GB Recommend 2 GB	cated to this vir is virtual machir ecommended me ded memory:	tual mac e: emory:	hine. The r	nemory size
Aust be a multiple 64 GB - 32 GB - 16 GB - 8 GB - 4 GB - 2 GB - 1 GB - 1 GB - 1 GB - 1 GB - 1 GB - 1 GB - 2 GB - 1 GB - 1 GB - 2 GB - 2 GB - 1 GB - 2 GB -	of 4 MB. <u>M</u> emory for th Maximum re 27.8 GB Recommend 2 GB Guest OS re	cated to this vir is virtual machir ecommended me ded memory:	tual mac e: emory:	hine. The r	nemory size
Aust be a multiple 64 GB 32 GB 4 GB 2 GB 1 GB 2 GB 1 GB 512 MB 256 MB 128 MB 512 MB 514 MB 515 MB 515 MB 516 MB 517 MB 518 MB 518 MB 518 MB 518 MB 518 MB 519 MB 519 MB 519 MB 510 MB	of 4 MB. <u>M</u> emory for th Maximum re 27.8 GB Recommend 2 GB Guest OS re	cated to this vir is virtual machir ecommended me ded memory:	tual mac e: emory:	hine. The r	nemory size

Again, set the memory size as appropriate.

Page | 18



New Virtual Machine Wizard	X
Network Type What type of network do you want to add?	
Network connection	_
O Use bridged networking Give the guest operating system direct access to an external Ethernet network. The guest must have its own IP address on the external network.	
Use network address translation (NAT) Give the guest operating system access to the host computer's dial-up or external Ethernet network connection using the host's IP address.	
 Use host-only networking Connect the guest operating system to a private virtual network on the host computer. 	t
O Do not use a network connection	
Help < Back Next > Cance	1

Set the network type, the default is NAT mode, click "Next". Keep the default values for the remaining steps until you reach the step to specify the disk capacity.

I/O controller		
SCSI Control		
	gic (Not available for 64-bit guests)	
●LSI Log	gic (Recommended)	
O LSI Log	gic <u>S</u> AS	

 \times

	Nachine Wizard		
Select a D What	isk Type kind of disk do you	want to create?	
Virtual disk t	ype		
● <u>SCSI</u>	(Recommended)]	
O S <u>A</u> TA			
○ N <u>V</u> Me			

The default selection for the IO controller type here is LSI

The default selection here is also SCSI.

GADTe

Disk			
• Cr	eate a new vir <mark>tua</mark> l disl	k	
wi	l appear as a single h	ard disk to the guest o	on the host file system, which operating system. Virtual disks ost or between hosts.
OUs	e an existing virtual d	isk	
Cł	loose this option to re	euse a previously conf	igured disk.
OUs	e a physical disk (for a	advanced users)	
	noose this option to gi sk. Requires administr		direct access to a local hard

GROTek	

New Virtual Machine Wizard $ imes$
Specify Disk Capacity How large do you want this disk to be?
Maximum disk <u>s</u> ize (GB): 200.0
Recommended size for Ubuntu 64-bit: 20 GB
Allocate all disk space now.
Allocating the full capacity can enhance performance but requires all of the physical disk space to be available right now. If you do not allocate all the space now, the virtual disk starts small and grows as you add data to it.
○ Store virtual disk as a single file
Split virtual disk into <u>m</u> ultiple files
Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.
Help < Back Next > Cancel

Choose to create a new virtual disk here.

Set the disk size to 200 gigabytes and select the form in which the disk exists, then click "Next" to finish.

)isk file				
A 200 GB virtual disk be crea automatically named based (ated using multipl on this file name.	le di <mark>s</mark> k files. Ti	ne disk files wi	ll be
Ubuntu 64-bit-0.vmdk			Brow	vse



Specify the disk file, the default one here is fine.

Name:	Ubuntu 64-bit
Location:	D: \Documents \Virtual Machines \Ubuntu 64-bit
Version:	Workstation 15.x
Operating System:	Ubuntu 64-bit
Hard Disk:	200 GB, Split
Memory:	2048 MB
Network Adapter:	NAT
Other Devices:	4 CPU cores, CD/DVD, USB Controller, Printer, Sound
Customize Hardw	

Click "Finish" by default.

Power on this virtual n	The second se	
Edit virtual machine se		
 Devices 		
E Memory	2 GB	
Processors	4	
🖂 Hard Disk (SCSI)	200 GB	
S CD/DVD (SATA)	Auto detect	
🔁 Network Adapter	NAT	
🚭 USB Controller	Present	
ব। Sound Card	Auto detect	
🖶 Printer	Present	
🛄 Display	Auto detect	
 Description 		
Type here to enter a descr	iption of this virtual	 Virtual Machine Details
machine.		State: Powered off Configuration file: D:\Documents\Virtual Machines\Ubuntu
		64-bit\Ubuntu 64-bit.vmx
		Hardware compatibility: Workstation 15.x virtual machine Primary IP address: Network information is not available



The virtual machine creation is now complete.

In the next section, we will introduce the installation of Ubuntu system in the virtual machine, which is similar to the installation method in the real machine. Here we describe the method of installing Ubuntu system in a virtualmachine.

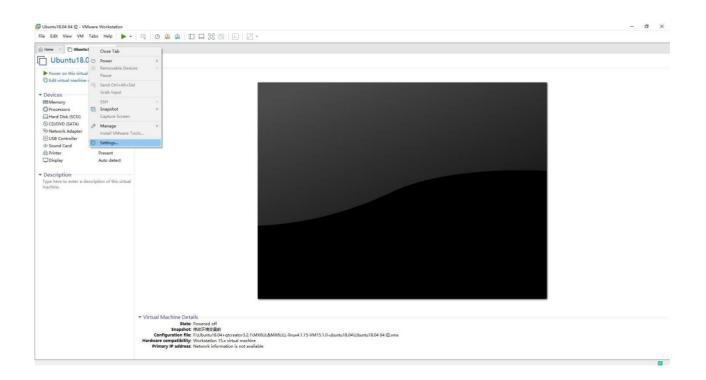
3.1.2. System Installation

The version of Ubuntu we choose to install is 18.04, first of all go to the official website of Ubuntu to getUbuntu18.04 64-bit image, the download address is: <u>http://releases.ubuntu.com/18.04/</u> download

ubuntu-18.04.5-desktop-amd64.is	2020-08-06 22:59	2.0G	Desktop image for 64-bit PC (AMD64) computers (standard download)
---------------------------------	------------------	------	--

ubuntu-18.04.5-desktop-amd64.iso

Right-click on the newly created Ubuntu 64-bit and select Settings from the pop-up menu.





Device Memory		Memory
Processors Processors	Summary 2 GB 4 200 GB Auto detect NAT Present Auto detect Present Auto detect	Memory Specify the amount of memory allocated to this virtual machine. The memory size must be a multiple of 4 MB. Memory for this virtual machine: 1 2 3 3 4 4 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 7.8 GB 256 MB 2 GB 256 MB 2 GB 64 MB 6 32 MB 1 GB 64 MB 1 GB

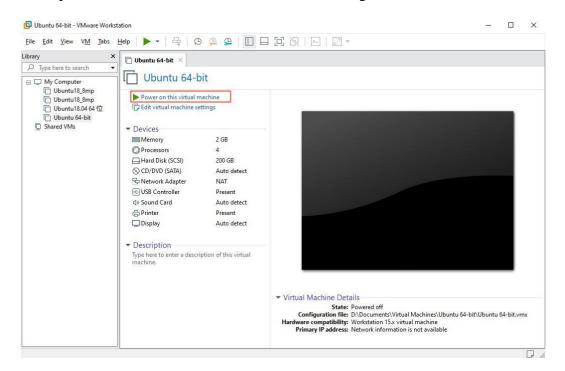
The "Virtual Machine Settings Menu" pops up as shown below:

Click on CD/DVD (SATA), select "Use ISO image file," browse and choose the previously downloaded Ubuntuimage, then click "OK" to confirm.

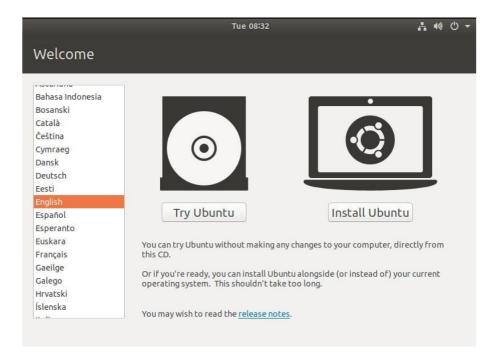
Device ■ Memory Processors Hard Disk (SCSI) So CD/DVD (SATA) Privetwork Adapter USB Controller USB Controller USB Controller Display	Summary 10 GB 6 500 GB Auto detect NAT Present Auto detect Present Auto detect	Device status Connected Connect at power on Connection Use physical drive: Auto detect Use ISO image file: E:\dubuntu-18.04.6-desktop-amd64.iso	Browse
			Advanced



After setting up the image, ensure that the network is available. Then, start the virtual machine and proceed with the installation of the Ubuntu image.



After starting the virtual machine, wait for the installation interface to appear as shown below.





After selecting the language on the left side as shown in the image, click "Install Ubuntu", and the language selection interface will pop up. Ubuntu default language is English, of course, you can also choose others, the default choice of language in the later stage can also be reset, after selection then click "Continue".

Keyboard layout	
Dzongkha English (Australian) English (Cameroon) English (Ghana) English (Nigeria) English (South Africa) English (UK) English (UK) English (US)	English (US) English (US) - Cherokee English (US) - English (Colemak) English (US) - English (Dvorak) English (US) - English (Dvorak, alt. intl.) English (US) - English (Dvorak, intl., with dead keys) English (US) - English (Dvorak, left-handed) English (US) - English (Dvorak, right-handed) English (US) - English (Macintosh)
Type here to test your keyboard Detect Keyboard Layout	Quit Back Continue

Next, by default, select "Continue" to finish the installation; the installation process will be very slow, then click"Continue":

media formats	
ary.	
Back	Continue
DOCK	continue
	media formats tary. Back



Next, select "Continue" by default to continue the installation; the installation process will be very slow, and thenclick "Continue":

Tue 08:42 👫 🐠 🕛 🔻
Installation type
This computer currently has no detected operating systems. What would you like to do?
Erase disk and install Ubuntu Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.
 Encrypt the new Ubuntu installation for security You will choose a security key in the next step.
 Use LVM with the new Ubuntu installation This will set up Logical Volume Management. It allows taking snapshots and easier partition resizing.
 Something else You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.
Quit Back Install Now
Tue 08:42 📇 🐠 🕛 👻
Installation type
This computer currently has no detected operating systems. What would you like to do?
 Erase disk and install Ubuntu Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.
Write the changes to disks? 🛛 😵
If you continue, the changes listed below will be written to the disks. Otherwise, you will be able to make further changes manually.
The partition tables of the following devices are changed: SCSI33 (0,0,0) (sda)
The following partitions are going to be formatted: partition #1 of SCSI33 (0,0,0) (sda) as ext4
Go Back Continue
Back



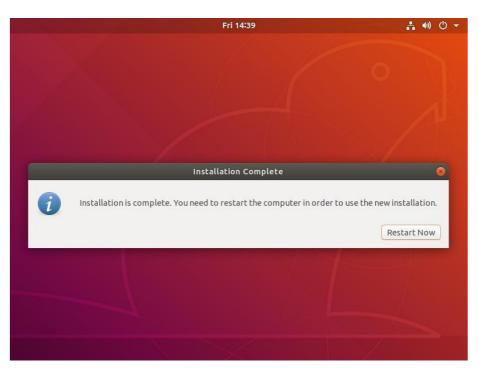
Next, select the time zone. You can either click on the Shanghai time zone or enter "Shanghai" (or choose the appropriate time zone based on your location). Then, click "Continue" to proceed. Finally, set your username and password and click "Continue" to automatically install the program:

Who are you?		
	Forlinx-virtual-machine Ine name it uses when it talks to other computers. Forlinx Weak password	
•	Bac	k Continue

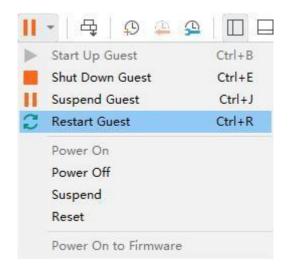
The installation process is shown in the figure below, you can skip it if the network is bad, it will not affect the installation.







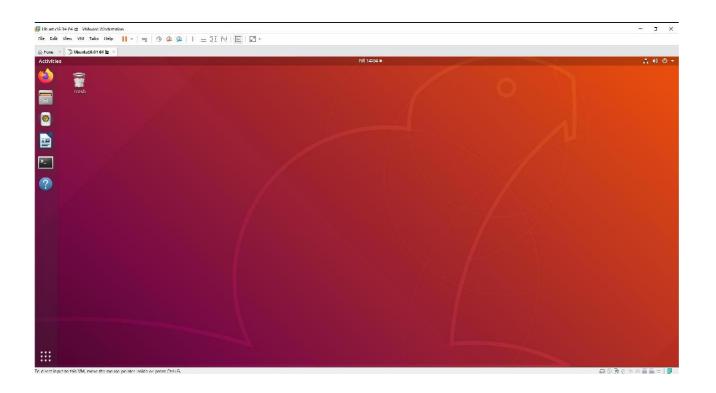
After the installation, click "Restart Now" to reboot (or click "Reboot Client"):





After the reboot, you need to log in with your username and password, and the system interface is shown belowafter logging in:







Above, the Ubuntu system installation is completed by the following figure configuration, click "OK", and thenre-open the virtual machine to see if you can start Ubuntu normally.

Virtual Machine Settings		>
Hardware Options Device Memory Hard Disk (SCSI) CD/DVD (SATA) Network Adapter VUSB Controller Sound Card Printer Display	Summary 2 GB 4 200 GB Auto detect NAT Present Auto detect Present Auto detect Present Auto detect	ve
		OK Cancel Help

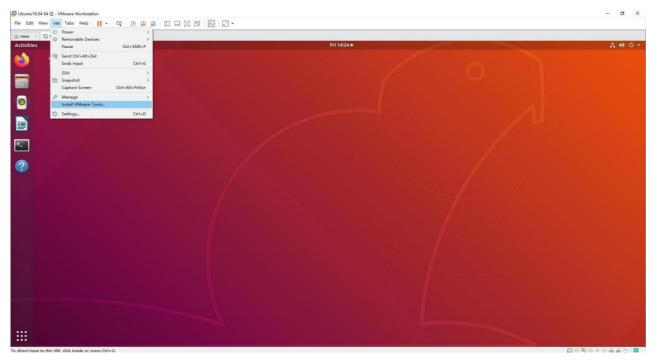
3.1.4. Basic Ubuntu Configuration

After installing the Ubuntu 18.04 operating system, there are a few configurations to make.

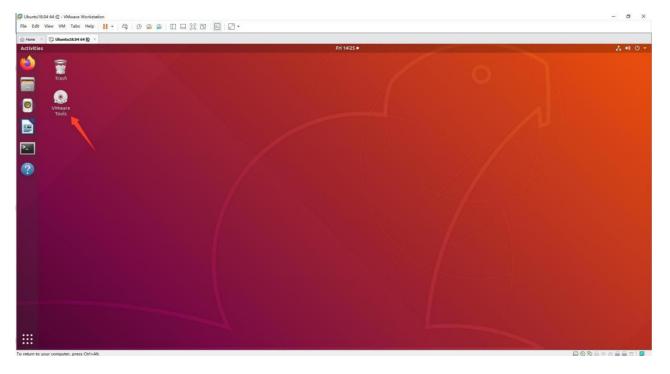
VMware Tools Installation:

Next, install VMware Tools. Without installing this tool, you won't be able to copy and paste and drag file between the Windows host and the virtual machine. First click on "Virtual Machines" on the VMware navigationbar, then click "Install VMware Tools" in the drop-down box.



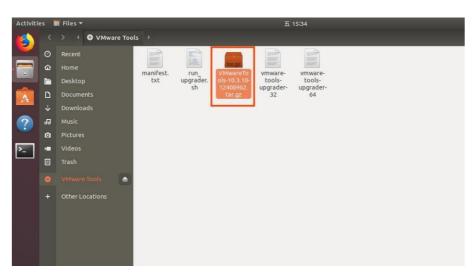


Once done, enter Ubuntu and the VMware Tools CD icon will appear on your desktop, click into it:



Double-click on the VMware Tools icon, go to it and see a zip file VMwareTools-10.3.10-12406962.tar.gz (it may be different for different VM versions).





Copy the file under the home directory (i.e., the directory of the home personal username):

Activiti	es 🗧 Files 🔻		Sat 11:52
	< > I 🛛 VMward	e Tools 🔸	
• 100 100 100 100 100 100 100 100 100 10	Recent Image: Arrow of the second	manifest. txt upgrader. sh VMwareTo ols=10.3.22- 15902021. tar.gz Umware- tools- upgrader- 32 64	
Can	icel	Select Copy Destination	Q Select
Ø	Recent	forlinx	C7
ŵ		Name Si	ze Modified
	Desktop	Desktop	5 Jul
	Trash	📔 nfs	14 Jul
		i snap	12 Jul
۲	VMwar 📤	tftp vmware-tools-distrib	14 Jul 20 Feb 2019
+	Other Locations	work	14 Jul
·			0 kB 5 Jul
		WMwareTools-10.3.10-12406962.tar.gz 56	6.4 MB 20 Feb 2019



Press [Ctrl+Alt+T] to bring up the terminal command interface, and use the tar command to decompress the VMware tools installation package (using the sudo command will prompt for the password, according to the prompts directly enter the password enter can be used, Linux system password input does not show):

```
forlinx@ubuntu:~$ sudo tar xvf VMwareTools-10.3.10-12406962.tar.gz
[sudo] password for forlinx:
```

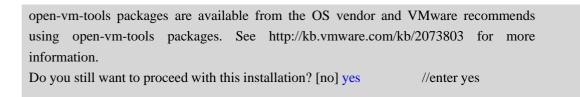
After executing the extract command, use ls to view the file directory vmware-tools-distrib, and go to the directory.

forlinx@ubuntu:~\$ ls	
Desktop examples.desktop nfs snap tf	tp VMwareTools-10.3.10-12406962.tar.gz
vmware-tools-distrib work	
forlinx@ubuntu:~\$ cd vmware-tools-distrib/	//Use the cd command to enter the directory
forlinx@ubuntu:~/vmware-tools-distrib\$ ls	//View files in this directory

In the current directory, enter sudo ./vmware-install.pl to install, enter the password after pressing Enter, and then start the installation. When you encounter yes, enter yes, and press Enter for the rest to install by default.

forlinx@ubuntu:~/vmware-tools-distrib\$ sudo ./vmware-install.pl

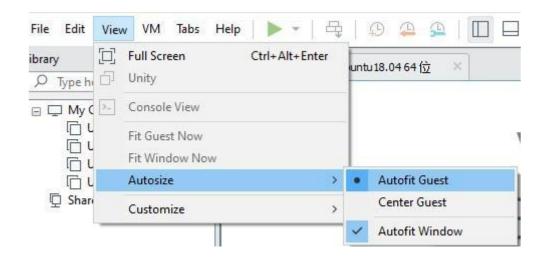
[sudo] password for forlinx: //Enter password for forlinx account, no display, can't see what's entered



The installation process information is long, here omitted.

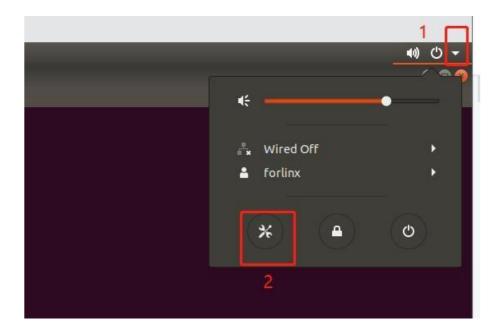


After completing the VMware tools tool, you can achieve file copy and paste, virtual machine adaptive full display and other functions between Windows and Ubuntu. If the virtual machine cannot be displayed in full screen, you can click View, select Auto Resize, and click Auto Adapt to Client to display the virtual machine in full screen. VMware tools is installed successfully.



Basic Settings:

Make most of the system settings in the location shown below. A lot of the setup requirements on Ubuntu can be done here.





3.1.5. UbuntuNetwork Settings

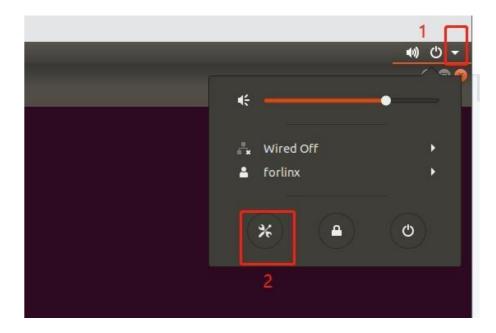
NAT Mode

Before using the network, make sure that our virtual machine can connect to the Internet, open the virtual machine settings, and change the network bridge mode in the network adapter to "NAT mode":

Device Summary Memory 10 GB Processors 6		Device status Connected Connect at power on
Hard Disk (SCSI) CD/VD (SATA) Network Adapter USB Controller USB Controller Sound Card Printer Display	500 GB Using file E:\VM\ware 16.0\Vin NAT Present Auto detect Present Auto detect Auto detect	Network connection Bridged: Connected directly to the physical network Replicate physical network connection state NAT: Used to share the host's IP address Host-only: A private network shared with the host Custom: Specific virtual network
		VMnet0 LAN segment:
		LAN Segments Advanced
	Add Remove	

When the VMware virtual NIC is set to NAT mode in a virtual machine, the network in the Ubuntu environment can be set to dynamic IP. The virtual NAT device and the host NIC are connected to communicate for Internet access in this mode. This is the most common way for our VMs to get on the extranet.

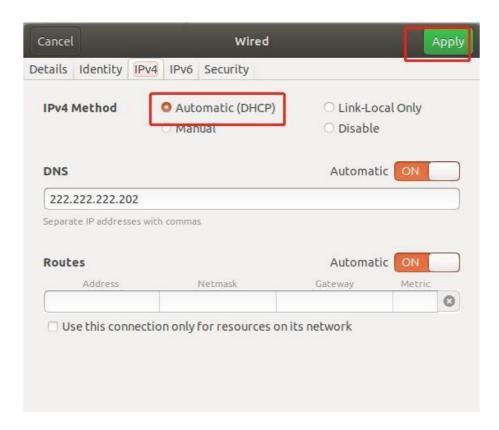




Q Settings	Networl	k 🕒 🖯
🕈 Wi-Fi		
8 Bluetooth	Wired	+
Background	Connected - 1000 Mb/s	
Dock	VPN	+
Notifications	Not set up	
Q Search		
🖾 Region & Language	Network Proxy	Automatic
Universal Access		
€ Online Accounts		
lu Privacy		
< Sharing		
■) Sound		
Ce Power		
🗹 Network		
To Devices		
Details >		



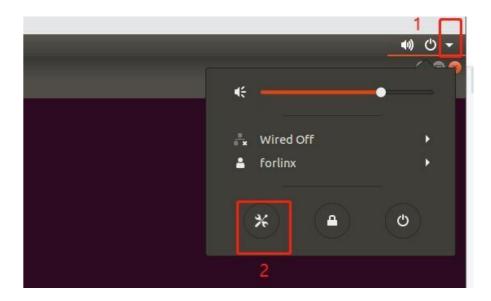
The network is set to dynamic ip.



Bridge Mode:

If TFTP, SFTP and other servers are used, it is necessary to set the network connection mode of the virtual machine as bridging mode. When the VMware virtual NIC is set to bridge mode, the host NIC and the VM NIC communicate via a virtual bridge, which requires the Ubuntu IP to be set to the same network segment as the hostIP.





lardware Options		
Device	Summary 10 GB 6 500 GB Using file E:\VMware 16.0\jin NAT Present Auto detect Present Auto detect	Device status Connected Connected Connect at power on Network connection Pelicate physical network connection state NAT: Used to share the host's IP address Host-only: A private network shared with the host Custom: Specific virtual network VMnet0 LAN segment:
		LAN Segments Advanced
	Add Remove	



٩	Settings	Network	e 🛛 😣
(:-	Wi-Fi		
*	Bluetooth	Wired +	
⊴	Background	Connected - 1000 Mb/s	
D	Dock	VPN +	
Â,	Notifications	Not set up	
۹	Search		
9	Region & Language	Network Proxy Automatic	
0	Universal Access		
€	Online Accounts		
₩	Privacy		
4	Sharing		
u(1)	Sound		
Ge	Power		
97	Network		
ō	Devices >		
٥	Details >		

Cancel	Wired		Арр
tails Identity	IPv4 IPv6 Security		
IPv4 Method	O Automatic (DHCP) O Manual	Link-Local OnlDisable	y
Addresses Address	Nétmask	Gateway	
192.168.0.209	255.255.255.0	192.168.0.1	0
[0
DNS 8.8.8.8		Automatic O	1
Separate IP addres	ses with commas		
Routes		Automatic 💽	۷ [
Address	Netmask	Gateway Me	tric
			0



Set up static ip, at this time Ubuntu's IP and the host IP need to be set in the same network segment.

Note: The IP and DNS involved in the network settings section should be set according to the user's own actual environment, the manual is an example.

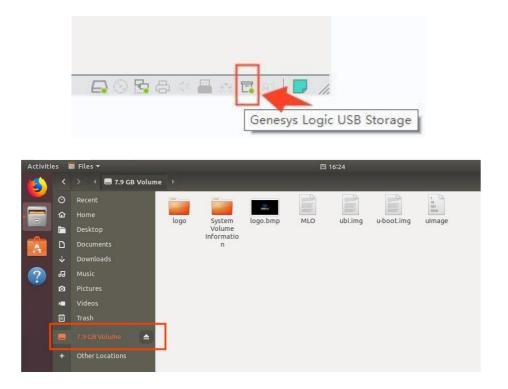
3.1.6. U Disk Loading

Open VM Settings, USB Controller, select USB 3.0 in Compatibility and OK. As shown in the picture below, since most computers nowadays support USB3.0 ports, if we don't set it up, when we plug in the USB3.0 port, we can't connect to the virtual machine. As shown below:

dware Options		
Device Memory Processors Hard Disk (SCSI) CD/DVD (SATA) Network Adapter USB Controller USB Controller Sound Card Printer	Summary 2 GB 4 200 GB Auto detect NAT Present Auto detect Present	Connections USB compatibility: USB 3.0 Show all USB input devices Share Bluetooth devices with the virtual machine Using USB devices with a USB 3.0 controller requires Linux kernel 3.2 or newer.
Display	Auto detect	



After the virtual machine boot, insert the U disk, the virtual machine will be more in the lower right corner of the icon similar to the "U disk", right-click --> connect, and then you can see in the file system to see more than a directory, that the U disk loaded successfully, as shown in the figure:



3.1.7. Required Library Installation

Before development, there are some other necessary libraries, we use the following commands to install them oneby one, before installation, you need to ensure that the network can be used normally, you can get on the extranet:

forlinx@ubuntu:~\$ sudo apt-get update	//Update download source information
forlinx@ubuntu:~\$ sudo apt-get install build-essential	//Provide a list of packages necessary for
compiling the program	
forlinx@ubuntu:~\$ sudo apt-get install libncurses*	//Be used to generate text-based user
interfaces.	
forlinx@ubuntu:~\$ sudo apt-get install lzop	//Lzo library-based compression and
decompression tool	//L20 notary-based compression and
forlinx@ubuntu:~\$ sudo apt-get install net-tools	



3.2. Setting up A Cross-compilation Environment

The cross-compilation environment can be subdivided into installing the SDK (which contains the cross-compilation toolchain) and setting cross-compilation environment variables.

3.2.1. SDK Installation

Information/tool/fsl-imx-x11-glibc-x86_64-meta-toolchain-qt5-cortexa7hf-neon-toolchain-4.1.15-2.0.0.sh Copy the above script to any directory like /home/forlinx/ and execute it there:

forlinx@ubuntu:~\$./fsl-imx-x11-glibc-x86_64-meta-toolchain-qt5-cortexa7hf-neon-toolchain-4.1.15-2.0.0.s h

The command line prompts: Enter target directory for SDK (default): /opt/fsl-imx-x11/4.1.15-2.0.0) Press the Enter key twice in a row, the program will automatically install the cross-compilation toolchain (the cross-compilation toolchain can be installed once, you don't need to reinstall it when you change terminals or reboot the system). Make sure that the network is open during the installation process and that the Ubuntu systemhas access to an extranet.

File Edit View Search Terminal Help
forlinx@ubuntu:~\$./fsl-imx-x11-glibc-x86_64-meta-toolchain-qt5-cortexa7hf-neon-toolchain-4.1.15-2.0.0.sh Freescale i.MX Release Distro SDK installer version 4.1.15-2.0.0
Enter target directory for SDK (default: /opt/fsl-imx-x11/4.1.15-2.0.0): The directory "/opt/fsl-imx-x11/4.1.15-2.0.0" already contains a SDK for this architecture. If you continue, existing files will be overwritten! Proceed[y/N]? y Extracting SDK
Setting it updone
SDK has been successfully set up and is ready to be used. installation complete Each time you wish to use the SDK in a new shell session, you need to source the environment setup script e.g.
\$. /opt/fsl-imx-x11/4.1.15-2.0.0/environment-setup-cortexa7hf-neon-poky-linux-gnueabi

You can determine whether the installation was successful by outputting the printed information.

3.2.2. Environment Variables Setting

\Lambda Note:

- After setting the environment variables, you don't need to reset them the next time you compile as long as you don't change terminals.
- If you reopen a new terminal or switch accounts, you need to reset the environment variables

beforecompiling.

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The main purpose of setting up the compilation environment is to specify the target architecture and cross-compilation toolchain, as well as the paths of some libraries used in the compilation process, etc. Use the following commands to configure the compilation environment (**. followed by a space**):

. /opt/fsl-imx-x11/4.1.15-2.0.0/environment-setup-cortexa7hf-neon-poky-linux-gnueabi

forlinx@forlinx:~/work/linux-4.1.155 . /opt/fsl-imx-x11/4.1.15-2.1.0/environment-setup-cortexa9hf-neon-poky-linux-gnueabi
forlinx@forlinx:~/work/linux-4.1.155 space after.

Then use the command arm-poky-linux-gnueabi-gcc -v to determine if the setup was successful (note: -v ispreceded by a space):



Normally the gcc version information is printed, gcc version 5.3.0 (GCC):

3.3. Qt Creator Installation

Qt Creator is a cross-platform QT integrated development environment (IDE) that includes advanced C + + code editors, project and build management tools for QT application framework design and application development. Qt Creator 3.2.1 installation package selected for this installation:qtcreator-opensource-linux-x86_64-3.2.1.run. Copy the installation package to the path /home/forlinx/work/. Installation package acquisition site: https://download.gt.io/archive/gtcreator/3.2/3.2.1/.

3.3.1. Modifying the QT Configuration File



After installing the SDK, modify the QT profile qmake. Conf.

Open the configuration file to be modified, the path of the file in the development environment is: /opt/fsl-imx-x11/4.1.15-2.0.0/sysroots/cortexa7hf-neon-poky-linux-gnueabi/usr/lib/qt5/mkspe cs/linux-oe-g++/qmake.conf

Remove the line include(...) from the file qmake.conf. /oe-device-extra.pri) line in the qmake.conf file.



Save and exit after making changes

3.3.2. Qt Creator Installation

forlinx@ubuntu:~/work\$ chmod u+x qt-creator-opensource-linux-x86_64-3.2.1.run forlinx@ubuntu:~/work\$./qt-creator-opensource-linux-x86_64-3.2.1.run

Execute the following command in the/home/forlinx/work/path to install Qt Creator:

Then the installation window of the graphical interface will pop up, and install according to the instructions:





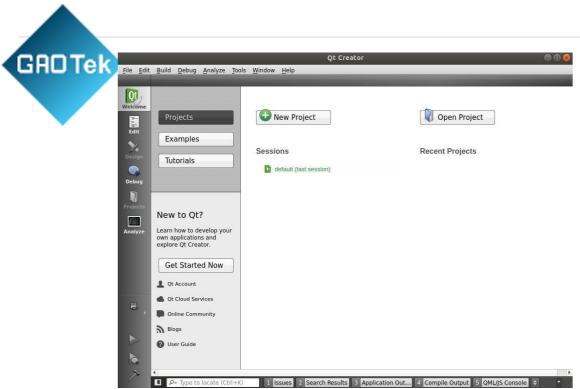


Qt Creator 3.2.1 Setup						
nstallation Folder						
Please specify the folder where Qt Creator will	be installed.					
/home/forlinx/qtcreator-3.2.1	Browse					
<pre>ack</pre>	Next > Cancel					

Users can set the installation path according to their own habits.

Execute the following command to open Qt Creator in the background, and users should follow their actualinstallation path when opening it:

forlinx@ubuntu:~\$ /home/forlinx/qtcreator-3.2.1/bin/ qtcreator.sh &



The Qt Creator tool screen appears. Qt Creator is installed.

3.3.3. Environment Configuration

A Note:

- Be sure to configure the environment variables first (see "<u>3.2.2 Environment Variables</u> <u>Setting</u>"), thenopen the Qt Creator with the command.
- Open Qt Creator according to your actual installation path.

Qt is a cross-platform graphics development library, which supports many operating systems. Before compiling, you need to configure the compiling environment of Qt Creator.

3.3.3.1. Configuration of the Cross-compiler

- 1. Click Qt Creator Tools ->Options->Build & Run->Compilers, and then click Add ->GCC.
- 2. Name enters GCC;
- 3. Compiler Path Click Browse to select the path of the cross-compiler as:

/opt/fsl-imx-x11/4.1.15-2.0.0/sysroots/x86_64-pokysdk-linux/usr/bin/arm-poky-linuxgnueabi/arm-poky-linu x-gnueabi-g++

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As shown in the following figure:

		Options			
ilter	Build & Run				
Environment	General Kits Qt V	ersions Compilers Debugge	rs CMake		
Text Editor	Name Type Auto-detected Manual GCC GCC				Add • Clone
C++					Remove
Build & Run Debugger					
🗶 Designer 🛯 Analyzer					
Version Control	Name:	GCC			
Android	Compiler path:	kysdk-linux/usr/bin/arm-poky-li	nux-gnueabi/arm-poky-linux-gnueabi-g++	Browse	
BlackBerry	Platform codegen flag	IS:			
w QNX	Platform linker flags: ABI:	arm-linux + arm	nux = - generic = - elf =	32bit -	
Devices Code Pasting	<u>MD1.</u>	anninux • lann • l	- Generic - Fell -		

4. Then click Apply and OK

3.3.3.2. Qt Versions Configuration

- 1. Click Qt Creator Tools ->Options->Build & Run->Qt Versions,
- 2. Then click Add, a pop-up dialog box to select

the/opt/fsl-imx-x11/4.1.15-2.1.0/sysroots/x86_64-pokysdk-linux/usr/bin/qt5/qmake,

3. Click open to add.

1	Selec	t a qmake Exec	utable				8
Look in:	imx-x11/4.1.15	okysdk-linux/us	sr/bin/qt5	- 0 0	0	a 🗉	
Computer	Name qmake	*	Size 3.2 MB	Type File		lodified 3 下午9:	41
File <u>n</u> ame: Files of type:	qmake (qmake* qmake-qt	4* qmake4* qmal	ke-qt5* qn	nake5*)	•	Ope Cane	



4. It will then return to the Qt Version configuration box, and the Version name will be entered in the Qt5.6.2.

					Options				
er	Build &	Run							
Environment	General	Kits	Qt Versions	Compilers	Debuggers	CMake			
Text Editor	Name		make Location						Add
FakeVim	💌 Manua								Remove
Help	Qt	5.6.2 /	opt/fsl-imx-x11,	4.1.15-2.0.0/9	ysroots/x86_6	1-pokysdk-l	linux/usr/bin/qt5/qmake	E	
C++									
Qt Quick									
Build & Run									
Debugger									
Designer									
Analyzer									
Version Control	Version n	name:	Qt 5.6.2						
			/opt/fsl-imx-x1	1/4.1.15-2.0.0	/sysroots/x86	54-nokvsdk	-linux/usr/bin/qt5/qmake	Browse	
Android	qmake lo	scation:							
Android BlackBerry			for Embedded I	inux				Details 💌	
		on 5.6.2		inux				Details ▼ Details ▼	

5. Then click "Apply and OK".

3.3.3.3. Kits Configuration

Kits is a build kit for building and selecting development build environments useful for projects with multiple QT libraries. Add the previously added cross-compiler and QT Version to Kits to build a compilation environment suitable for the development board.

1. Click Qt Creator 的 Tools ->Options->Build & Run->Kits and then click Add; the configuration section appears.



- 2. Name input qt5.6.2.
- 3. Compiler selects GCC
- 4. Qt version Qt 5.6. 2.
- 5. Qt mkspec write linux-oe-g++.

lter	Build & Run						
Environment		Qt Versions Co	mpilers	Debuggers	CMake		
Text Editor	Name						Add
FakeVim	Auto-detected Manual						Clone
} c++	Desktop (det qt5.6.2	fault)					Remove
Qt Quick							Make Defaul
Build & Run							
Debugger	Name:	qt5.6.2					
2 Designer	File system name:						
Analyzer	Device type:	Desktop				•	
Version Control	Device:	Local PC (default	t for Desk	top)		•	Manage
	Sysroot:						Browse
Android	Compiler:	GCC				*	Manage
BlackBerry	Debugger:	System GDB at /	usr/bin/go	lb		-	Manage
« QNX	Qt version:	Qt 5.6.2				•	Manage
Devices	Qt mkspec:	linux-oe-g++					
Code Pasting							

6. Then click "Apply and OK".

3.3.4. Problems Encountered During Installation

Note: The following presents some problems and solutions encountered during the installation of Qt

Creator 3.2.1. The issues may differ depending on the Ubuntu and Qt Creator version used. The example below details one specific installation case, and serves only as a reference. Users should focuson their own actual situation and resolve any issues accordingly.

1. Opening Qt Creator appears qtcreator-3.2.1/lib/qtcreator/plugins/libHelp. so: Cannot load library

/home/forlinx/qt; You cannot use help to report an error. You need to modify the software source and download and install some installation packages.

Method:

• Add mirror sources to sources.list in etc/apt, use sudo vi /etc/apt/sources.list to open the file and add them at the end: deb http://archive.ubuntu.com/ubuntu/ trusty main universe restricted multiverse;



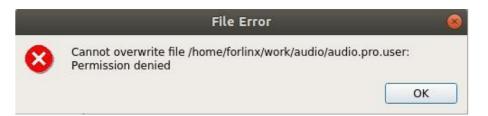
• Inform Ubuntu to enable the new update source: sudo apt-get update

• Install the relevant installation package:

sudo apt-get install libgstreamer0.10-dev

sudo apt-get install libgstreamer-plugins-base0.10-dev

2. Open the project file in Qt Creator with an ordinary account, and there is a write permission error.



Method:

- Check if the original qt file, under the current account, has executable permissions
- Add writable permissions to the user group: sudo chmod -R o+w audio/

Chapter 4. Related Code Compilation

A Note:

This chapter uses the development environment with SDK (including cross-compilation chain) installed by default, and the development environment provided by Forlinx can directly operate this chapter. If users use their own development environment, they need to refer to the previous section to build the environment.



This chapter mainly describes the compilation methods of the development boardrelated source code, including kernel source code compilation, making file system methods, and application program compilation methods.

4.1. Preparation Before Compilation

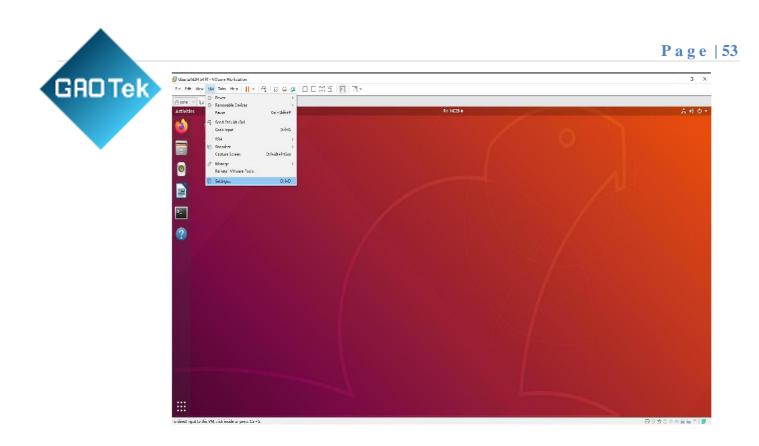
- 4.1.1. Description of the Environment
 - Development environment OS: Ubuntu18.04 64-bit version
 - Cross tool chain: arm-poky-linux-gnueabi-gcc 5.3.0
 - The board uses the Bootloader version: u-boot-2016.03.
 - Development board kernel: Linux -4.1.15
 - Development board port QT version: qt5.6.2

4.1.2. Copy Source Code

- \square Kernel Source: User Profile \ Linux \ source \ kernel \ linux-4.1.15.tar.bz2
- E File system: User Profile \Linux\ mirror \ rootfs-console.tar.bz2 and rootfs-qt.tar.bz2
- Command line test program: User Data\Linux\Test Program\cmd.
- C QT test program: User Data\Linux\Test Program\qt5.6.

There are many kinds of file transfers between ubuntu and Windows hosts. After installing VMware Tools, you can set up a virtual machine shared folder to mount the file directory of the Windows host to ubuntu for file sharing.

Click "Virtual Machine" in the menu bar and select "Settings".



Click "Options", enable "Shared Folders", set the shared directory on the Windows host, and click "OK".

dware Options Settings Summary General Ubuntu 18.04 64 ☆ Power Shared Folders Disabled Shared Folders Disabled Guest Isolation Access Control Not encrypted WWare Tools Time sync off WWare Tools Disabled	 Folder sharing ▲ Shared folders expose your files to programs in the virtual machine. This may put your computer and your data at risk. Only enable shared folders if you trust the virtual machine with your data. ○ Disabled ● Always enabled ○ Enabled until next power off or suspend 	
· Unity 폐 Appliance View Autologin 전 Advanced	Not supported Default/Default	Name Host Path Share G:\share Add Remove Properties

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After the virtual machine's file sharing is set up, put the following items for testing: the kernel source code linux-4.1.15.tar.bz2, the file system (rootfs-console.tar.bz2 is used as an example in this section), the command line test program wdttest.c, and the QT test program audio into the shared folder on the Windows host.

The shared folder is in the mount directory /mnt/hgfs/share in ubuntu; view the files in the mount

//File copy succeeded.

directory.

GADTek

Copy the source code from the shared folder to ubuntu/home/forlinx/work.

forlinx@ubuntu:~\$ ls /mnt/hgfs/share/

```
audio linux-4.1.15.tar.bz2 rootfs-console.tar.bz2 wdttest.c
```

forlinx@ubuntu:~\$ sudo cp -r /mnt/hgfs/share/audio /home/forlinx/work/ [sudo] password for forlinx: forlinx@ubuntu:~\$ sudo cp /mnt/hgfs/share/linux-4.1.15.tar.bz2 /home/forlinx/work/ forlinx@ubuntu:~\$ sudo cp /mnt/hgfs/share/rootfs-console.tar.bz2 /home/forlinx/work/ forlinx@ubuntu:~\$ sudo cp /mnt/hgfs/share/wdttest.c /home/forlinx/work/ forlinx@ubuntu:~\$ sudo cp /mnt/hgfs/share/wdttest.c /home/forlinx/work/ forlinx@ubuntu:~\$ cd /home/forlinx/work/

forlinx@ubuntu:~/work\$ ls audio linux-4.1.15.tar.bz2 rootfs-console.tar.bz2 wdttest.c forlinx@ubuntu:~/work\$

4.1.3. Environment Variables Setting

Note: After switching accounts, you need to set the environment variables again.

To set environment variables before compiling related source code. When compiling the kernel, it is recommended to use the root account to reduce some permission problems. The following source code compilations default to having environment variables set. Set environment variable method, refer to "EnvironmentVariables Settings".

4.2. Kernel Compilation

\land Note:

- After the kernel source code is decompressed for the first time, the source code needs to be compiled as a whole
- After the overall compilation, it can be compiled separately according to the actual situation

Switch to the root account and extract the kernel source code copied to the /home/forlinx/work directory using thetar command to the kernel source path.



forlinx@ubuntu:~/work\$ sudo su	//Switch to root user identity		
[sudo] password for forlinx:	Enter the forlinx account password as		
prompted, no echo.			
root@ubuntu:/home/forlinx/work# tar xvf linux-4.1.15.tar.bz2	//Extract the kernel source code.		
The decompression information is omitted here.			
root@ubuntu:/home/forlinx/work# cd linux-4.1.15			

Reset the environment variables after switching accounts:



 $.\ /opt/fsl-imx-x11/4.1.15-2.0.0/environment-setup-cortexa7hf-neon-poky-linux-gnueabiant-setup-cortexa7hf-ne$

4.2.1. Compiling Linux-4.1. 15 Kernel as A Whole

In the source code directory, there is a compilation script named "build.sh". Running this script will compile the entire source code.

```
root@ubuntu:/home/forlinx/work# cd linux-4.1.15
```

root@ubuntu:/home/forlinx/work/linux-4.1.15#./imx6ull_build.sh

The following operations need to be done in the source directory to compile the kernel methods:

After executing the compilation, there is a lot of information generated, so only the last part need to be captured.



LD [II]	ui tvei syusuyyaugety tegatyyy_nass_stui age.ku
LD [M]	drivers/usb/gadget/legacy/g_serial.ko
LD [M]	drivers/usb/gadget/legacy/g_zero.ko
LD [M]	drivers/usb/gadget/legacy/g_ncm.ko
LD [M]	drivers/usb/gadget/legacy/gadgetfs.ko
LD [M]	drivers/usb/gadget/libcomposite.ko
LD [M]	fs/binfmt_misc.ko
LD [M]	fs/configfs/configfs.ko
LD [M]	drivers/video/fbdev/mxc/mxc_dcic.ko
LD [M]	fs/fat/msdos.ko
LD [M]	fs/nls/nls_iso8859-15.ko
LD [M]	fs/isofs/isofs.ko
LD [M]	fs/udf/udf.ko
LD [M]	lib/crc-itu-t.ko
LD [M]	lib/crc7.ko
LD [M]	sound/core/snd-hwdep.ko
LD [M]	sound/core/snd-rawmidi.ko
LD [M]	sound/usb/snd-usb-audio.ko
LD [M]	sound/usb/snd-usbmidi-lib.ko
root@ubun	tu:/home/6ul/linux-4.1.15#
100 C 100	

After a successful compilation, module files with the extension ".ko" will be generated. In the directory "linux-4.1.15/arch/arm/boot/", a file named "zImage" will be generated. In the directory "linux-4.1.15/arch/arm/boot/dts/", related dtb (Device Tree Blob) files will be generated. Please refer to these parate section on compiling Device Trees for detailed information.

Explanation of some of the commands in build.sh:



File	Description								
make imx6ull_defconfig	 This command loads a configuration file into .config (which is read from .config when menuconfig does graphical configuration). inux-4.1.15/arch/arm/configs/imx6ull_defconfig is the kernel configuration file, when you use the source code for the first time, you need to configure the kernel through this step. To configure using "menuconfig", you need to perform this step first. After saving and exiting the graphical interface configuration, the latest configuration will be updated in the ".config" file. At this point, you can copy the configurations from the ".config" file to "imx6ull_defconfig", which will serve as the new configuration file 								
make zImage	To compile "zImage", after a successful compilation, the "zImage" file will be generated in the "linux-4.1.15/arch/arm/boot/" directory.								
make dtbs	Compile the device tree. Generate the corresponding dtb file under the path inux-4.1.15/arch/arm/boot/dts.								
make modules	Compile module								
make distclean	The latest.config is cleared and the kernel needs to be reconfigured after the operation.								

4.2.2. Compiling zImage Separately

The user operates under the kernel source path, provided that the environment variables are set.

1. Copy the compiled wdttest to the board via USB flash drive, for example, under the path

root@fl-imx6ull:~# cp /run/media/sda1/wdttest ./

/home/root, and runthe test.

The default user login path is /home/root.

Copy the compiled wdttest program from the USB drive mount path to the current path.

Give the program executable permission and run it

root@fl-imx6ull:~# chmod 766 wdttest //Set executable permissions to a program root@fl-imx6ull:~#./wdttest /dev/watchdog settimeout 60 & //Run the program



2. Refer to the "Watchdog Test" section of the software manual for testing.

4.2.3. QT Application Compilation and Running

4.2.3.1. QT Application Compilation

▲ Note: The cross-compiler is installed and the environment variables are set by default for the following operations

> Method 1: Compile with qmake from the command line

forlinx@ubuntu:~/work\$ sudo chmod -R 766 audio/ app forlinx@ubuntu:~/work\$ qmake forlinx@ubuntu:~/work\$ make // Add permissions to the audio

> Method 2: Call qmake to compile through Qt Creator Add permissions

to the audio application. forlinx@ubuntu:~/work\$ sudo chmod -R 777 audio/

forlinx@ubuntu:~/work\$/home/forlinx/qtcreator-3.2.1/bin/qtcreator.sh &

Open Qt Creator using the command line method (users open it according to their actual path)

Click File->Open File or Project in Qt Creator, a pop-up window will appear, select

/root/Desktop/audio/audio.pro.

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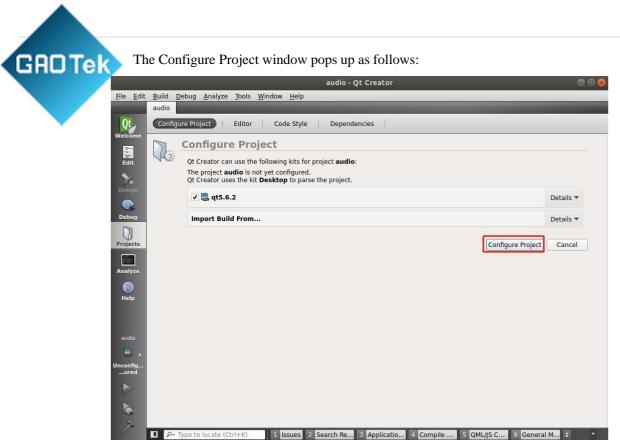
GRD Tek As shown below:

Look in:	/home/forlinx/audio			000	🤹 📰 🔳
Computer	Name Nainwindow.h	▲ Size 7 KB	Type h File	Date Modified	
	moc_mainwindow.o	4 KB	o File cpp File	17/72:45 23/15:07	
	Makefile mainwindow.ui		ui File	23/15:07 18/79:44	
	mainwindow.o mainwindow.h mainwindow.cpp	891tes	o File h File cpp File	17/72:45 18/79:44 18/79:44	
	main.o main.cpp	553 KB	o File cpp File	17/72:40	
	audio.pro.user.e4a0640.3.3-pre1 audio.pro.user.675cfd3	17 KB 18 KB	3-pre1 File 675cfd3 File		
	audio.pro.user.2.5pre1 audio.pro.user	17 KB	5pre1 File user File		
	audio.pro	454tes 1,010 KB	pro File File	18/79:44 17/72:45	
ile <u>n</u> ame:	audio.pro				Open
Files of type:	All Files (*)			•	Cancel

Click open.

A pop-up window will appear to indicate whether to keep the original environment settings, select no, as follows:





Click "Configure Project".

After opening the project, the interface is as follows:

Projects V Projects V Proje	<u>⊟</u> + ×
Welcone Headers Edit Sources Forms	
Edit	
Debug	
Projects	
Analyze	
Image: Second	
Open Documents ◆ ⊕ × audio	
Debug	
P- Type to locate (Ctrl+K) 1 Issues 2 Search Re 3 Applicatio 4 Compile 5 QML/JS C 6 General M	•

Click Build->Clean All to clear it. (If the intermediate file is not cleared, it can be deleted manually) Click Projects to uncheck Shadow build

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		audio - Qt Creator	908
<u>F</u> ile <u>E</u> dit		Debug <u>A</u> nalyze <u>T</u> ools <u>W</u> indow <u>H</u> elp	
	audio		
Qt	Build &	& Run Editor Code Style Dependencies	
Welcome	Add Ki	itqt5.6.2	
Edit	Manage	Kits Build Run	
*	×	Build Settings	
C. Design	1	Edit build configuration: Debug 👻 Add 👻 Remove Rename	
Debug		General	
Projects		Shadow baild: Build directory:/work/audioBrowse	
Analyze		Build Steps	
Help		qmake: qmake audio.pro -r -spec linux-oe-g++ CONFIG+=debug Details •	
		Make: make in /home/forlinx/work/audio Details 🕶	
audio		Add Build Step *	
		Clean Steps	
Debug		Make: make clean in /home/forlinx/work/audio Details 🕶	
		Add Clean Step ~	
		Build Environment	
1	D 0-	Type to locate (Ctrl+K) 1 Issues 2 Search Re 3 Application // Compile 5 OMI/IS C 6 General M 🖨	*

Then click Build-> Build All to compile.

									aud	io - Qt (reator					3	
<u>File</u>	dit	Build	<u>D</u> ebug	<u>A</u> nalyze													
		ojects		÷ 77.	9 B	×	+	>	<no docu<="" td=""><td>ment></td><td></td><td>¢</td><td>_</td><td>-</td><td>-</td><td></td><td>8+ ×</td></no>	ment>		¢	_	-	-		8+ ×
Qt		in a	udio audio n	ro													
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Design	1																
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Project	:s																
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Debug	1																
∧ ∧ ∧																	Build
1	L	<u>م</u> [• Type to	locate (Ct	rl+K)		1 Is:	sues	2 Search	Results	3 Applic	ation Out	. 4 Compile O	utput 5	QML/JS Con	sole 🗢	^

After the Build progress bar in the lower right corner is finished, you will see the newly generated audio binaryfile in the /files/audio/ directory as follows:

🗆 Tek 📕	› ፋ 🏠 Home	work audio					۹ ::	
C	Recent			<1>	<1>		<12	
<u>۵</u>	Home	audio	audio.pro	audio.pro.	audio.pro.	audio.pro.	audio.pro.	c++ main.cpp
	Desktop	00010	addio.pro	user	user. 2.5pre1	user. 675cfd3	user. e4a0640	шатерр
	Documents				z.spret		C-480040	
*	Downloads		C++	THE CONTRACT OF CONTRACT.				c++
	Trash	main.o	mainwindo w.cpp	mainwindo w.h	mainwindo w.o	mainwindo w.ui	Makefile	moc_ mainwindo
	Music	1 00	wepp			w.u		w.cpp
	Pictures							
		moc	ui					
		mainwindo w.o	mainwindo w.h					
+	Other Locations							

4.2.3.2. QT Application Running

- Replace the method of running QT program in the desktop
- 1. Flash the development board and boot qt system.
- 2. Copy the generated audio executable file to the SD card, and then insert the SD card to the developmentboard.
- 3. Execute the following commands to copy the audio to the appropriate directory, replace the original audio application, set executable permissions for the program, and reboot the board after file synchronization.

root@fl-imx6ull:~# cd /forlinx/qtbin/

Use the cd command to enter the default path to the qt program on the development board's desktop system:

Rename the original audio file for backup with the mv command

root@fl-imx6ull:/forlinx/qtbin# mv audio audio-old

root@fl-imx6ull:/forlinx/qtbin# cp /run/media/mmcblk1p1/audio ./

Copy the audio program in the SD card to the current directory.

Give executable permissions and save to reboot the development board:

//Give all groups executable

//File synchronization //Reboot the development board



root@fl-imx6ull:/forlinx/qtbin# chmod a+x audio permissions root@fl-imx6ull:/forlinx/qtbin# sync

- 4. After the board restarts, if the audio test application in the Qt interface is the latest version and you can play audio by clicking on "play," it indicates that the newly compiled Qt application is functional. This also confirms the successful configuration of the Qt application development environment.
- > Method of testing the QT program individually
- 1. Copy the generated audio executable file to the SD card, insert the SD card to the development board, and copy the program to the/home path.
- 2. Set executable permissions to the program.
- 3. You need to use the command export DISPLAY=:0.0 to load the QT environment variables before testing the

QT program.

Copy the audio file from the sd mounted path to the /home path of the development board.

root@fl-imx6ull:~#cp /run/media/mmcblk1p1/audio /home Go into the /home directory with the cd command and give audio executable permissions

root@fl-imx6ull:/home# chmod a+x audio Set the environment variable for QT root@fl-imx6ull:/home# export DISPLAY=:0.0 Run the audio application root@fl-imx6ull:/home# ./audio

4.2.3.3. QT Desktop (EMMC version only)

Boot-up Application

Qt system starts the desktop program by default after booting, if you need to start the user program automatically, please modify the file system: /etc/matchbox/session Add the user's own application after 在 matchbox-desktop & e.g. ping test program: fltest_qt_ping & The ping test program is automatically started at boot.



matchbox-desktop &

matchbox-panel --titlebar --start-applets \$START_APPLETS --end-applets \$END_APPLETS &

If the following sections are commented

out

The desktop will not run and the title bar will not be displayed.

If you modify the match-panel option, it will modify the content of the title bar, e.g. remove: "END_APPLETS=clock,battery,\$KEYBOARD_APPLET,systray,startup-notify,notify" inside clock; i will notdisplay the time.e.g.:

START_APPLETS=showdesktop,windowselector END_APPLETS=battery,\$KEYBOARD_APPLET,systray,startup-notify,notify matchbox-panel --titlebar --start-applets \$START_APPLETS --end-applets \$END_APPLETS &

Add Desktop Application

> This section describes how to set up folders such as Forlinx and Application:

[Desktop	E	ntry]
Name=Forlinx		
Name[de]=Einstellu	ngen	
Comment=Forlinx	test	app
Comment[de]=Forli	nx tes	t app
Icon=mbfolder.png		
Type=Directory		
Match=Forlinx		

1. Folder settings are stored in: /usr/share/matchbox/vfolders e.g.: Forlinx.directory

The important thing is the Match property, which determines what type of App is displayed in the folder.

Forlinx	
Applications	



2. Folders are displayed in the following order: /usr/share/matchbox/vfolders/Root.order

Settings All

Application settings:

Icon directory: /usr/share/pixmaps Application settings: /usr/share/applications

Each application corresponds to a.desktop file. Take Ping as an example:

[Desktop Entry] Name=Qt5 Ping Exec=/usr/bin/fltest_qt_ping Icon=ping-icon Type=Application Categories=Forlinx;

Each application corresponds to a.desktop file. Take Ping as an example:

It specifies the icon, the location of the executable program, and the folder in which it is displayed on the desktop.