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1 Introduction

Ayla Networks is committed to helping our partners expand their core competencies into the Internet of Things space. We offer a robust mix of training, support, and co-marketing to maximize our partnership.

This document describes the installation and use of the Marvell development environment related software on Ubuntu.

Disclaimer: Content of this document is not directly supported by Ayla Networks – and is intended as a high-level installation reference only - provided ‘as is’.

1.1 Audience

This document is for developers who are familiar with Ubuntu development oriented tool chain principles and are evaluating integration of the Ayla Embedded Agent into a product.

1.2 Related Documentation

Refer to Marvell's documentation covering the WMSDK and associated hardware.

- *Ayla Embedded Agent Embedded Systems Developers Guide* (AY006DAR0), for the portable aspects of the Ayla Embedded Agent. The documents listed in the Related Documentation section may also be helpful.
- *Ayla Embedded Agent for Marvell WMSDK* (AY006DAM6)
- *Ayla Related Virtualization User Guide* (AY006URV1)
- [AW-CU300 EVB User Guide v0.2](#) (PCB 2223 Ver:I1,I2)
- *Design Kit - USB and TTL Serial Communication User Guide* (AY006TTL3)

1.3 Assumptions

This document assumes the following:

- AzureWave EBV Kit
- Completed instructions on either the Packing Slip or the Getting Started Guide.
- An account on the Ayla Support and Developers sites.

For any questions or concerns with these requirements, contact Ayla Support.

1.3.1 Required Hardware

- A workstation grade computer with the following configuration

- Windows based: 8 GB RAM and 256 GB storage or better, preferable SSD based storage for best performance.
- Apple based: 8 GB RAM and 256 GB storage or better.
- AzureWave EBV 'Design Kit', such as:
 - <https://www.arrow.com/en/products/aw-cu300evb/azurewave>
 - <http://www.buyiot.net/>

1.3.2 Required Software

- Workstation 'on the metal' OS:
 - Ubuntu 16.04.1
- Guest OS:
 - Ubuntu 16.04.1

Ayla Networks 'Open Agent' SDK, found on the [Ayla Networks Support Portal](#), including:

- ada-wmsdk-src-1.2-rc1.tgz
- wmsdk_bundle-3.4.6.tar.gz

1.3.3 Related Tools

The following tools may of useful to have on the guest OS:

- gtkterm: <https://fedorahosted.org/gtkterm/>

1.4 Glossary

- **Open Agent** – The Ayla Networks open framework, Cloud API-enabled agent.

2 Introduction to the AW-CU300 EVB Hardware

Test Install hypervisor software on your computer.

2.1 Power Supply Options

EVB Power Supply Options:

- USB B-type 5V Input
- Power Jack 5V Input (if option 1 is not available)

2.2 Device References

Familiarize yourself with the details on the following two device pictures.

Figure 1 – Device Details

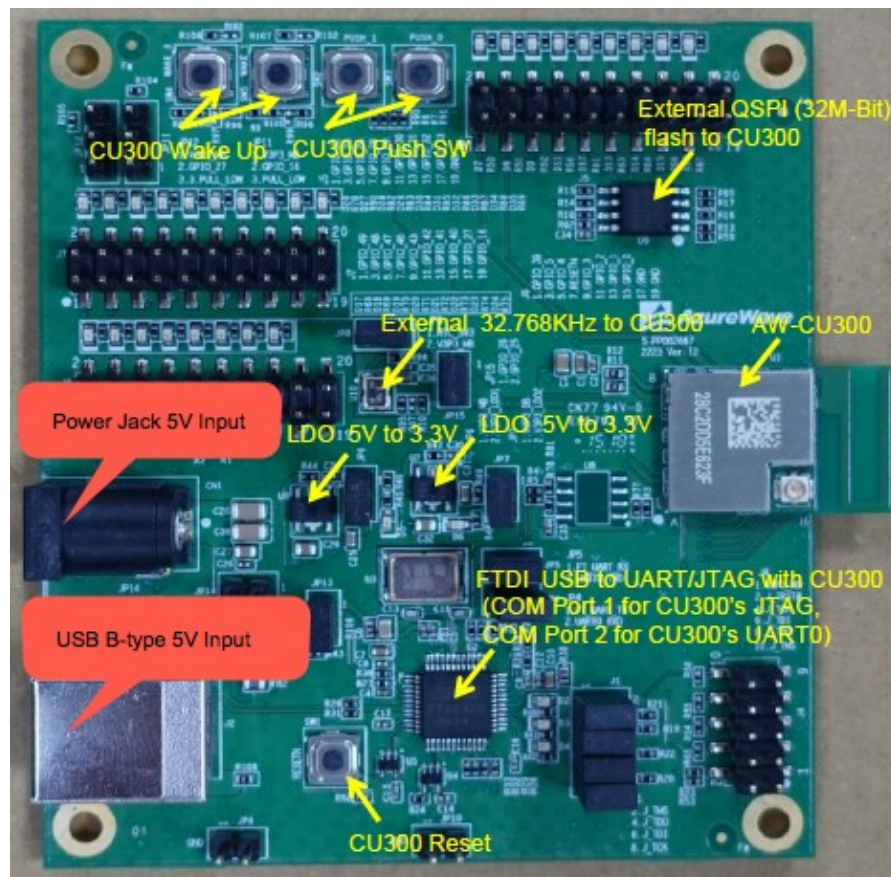
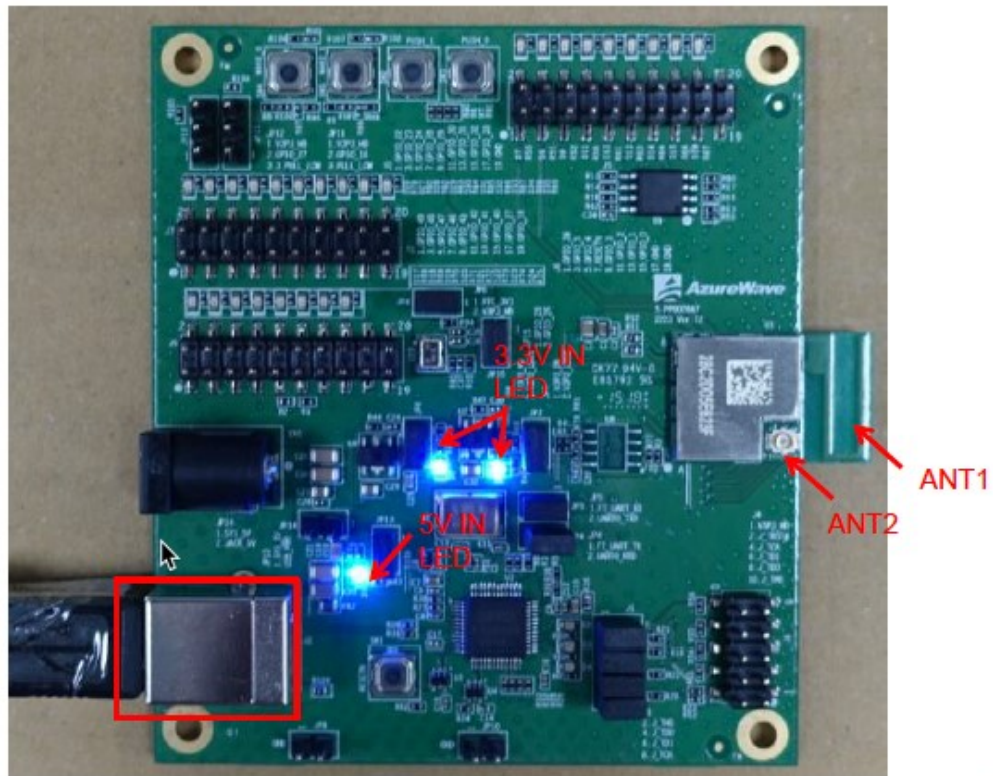


Figure 2 – Additional Device Details

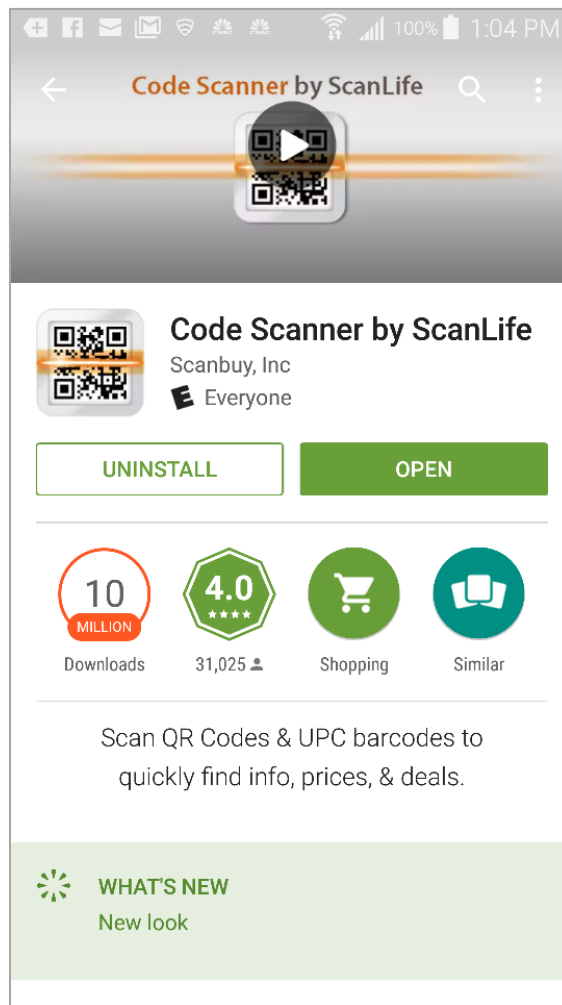


3 Device MAC Address QR Code Marking

An Android based QR code scanner can scan the Marvell module's unique Wi-Fi MAC address. To do so follow these steps:

1. Go to the Android Play Store and download the **Code Scanner by ScanLife** app,

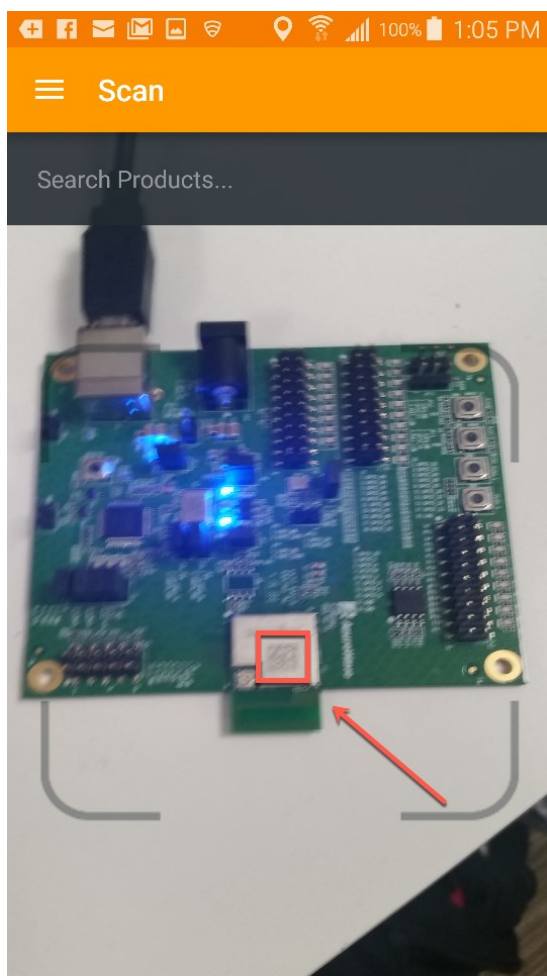
Figure 3 – App to Download



2. Launch the **Code Scanner by ScanLife** app.

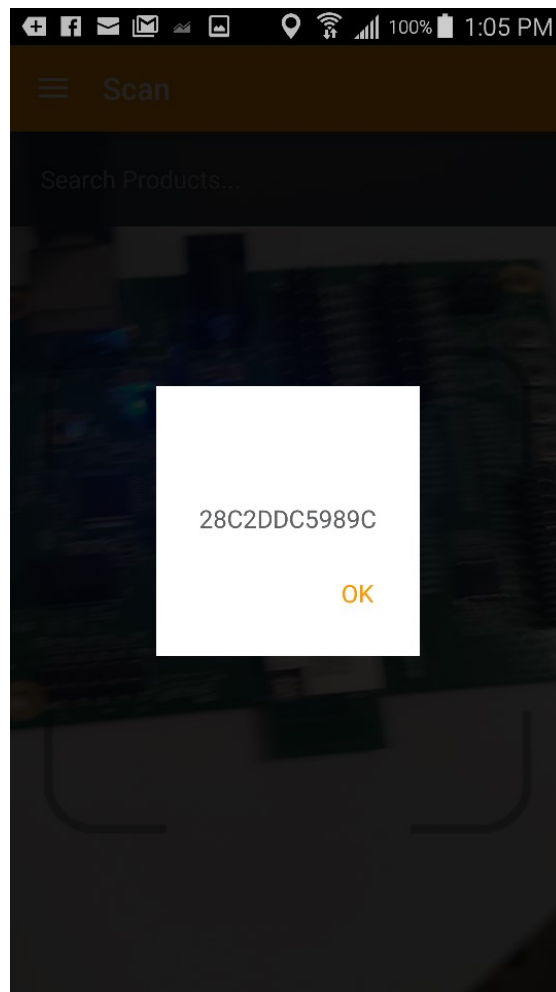
3. Within the designated viewing area, focus on the EVB Kit.

Figure 4 – Scan EVB device.



- When close enough and the image is in focus, the ID will be scanned from the QR code.

Figure 5 – QR scanned Code



In this example, the module's WI-FI MAC address is 28:C2:DD:C5:98:9C.

- To verify the MAC address on the console, type the following:

```
# wlan-mac
MAC address
28:C2:DD:C5:98:9C
```

NOTE The first three bytes, also referred to as the OUI element of the MAC address, represents the Chip vendor, which can be looked up at:

<http://standards.ieee.org/develop/regauth/oui/oui.txt>

4 Prepare the Development Environment

1. Install hypervisor software on your computer.

See *Ayla Related Virtualization User Guide* for more information.

2. Create an Ubuntu virtual machine. Ayla Networks recommends using 16.04.x LTS, 32bit version having a disk of at least 20 GB with a minimum of 10 GB free space after the OS is installed.

See *Ayla Related Virtualization User Guide* for more information.

3. Make OS up to date.

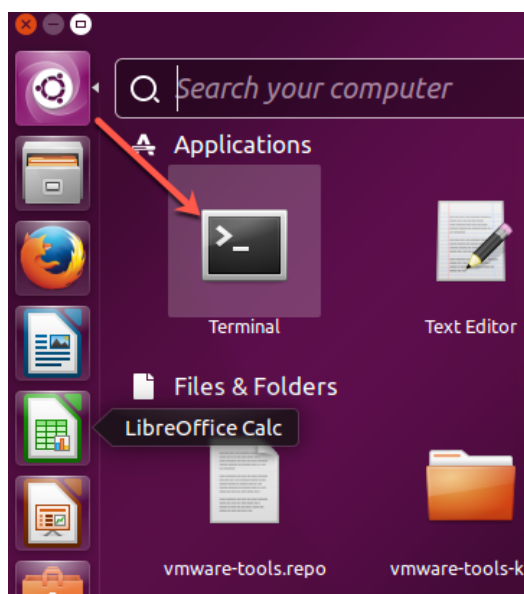
To avoid compatibility problems, keep the kernel version unchanged.

4. Install the OS extension support, which is bundled with the virtual machine software. Normally, the entry is located in top main menu. For VMware based VMs, the OS extension support is referred to as 'VMware Tools'.

See *Ayla Related Virtualization User Guide* for more information.

5. To install tool-chain, open a terminal window:

Figure 6 – Terminal Window App



6. In the terminal window, type:

```
sudo apt-get remove binutils-arm-none-eabi gcc-arm-none-eabi
```

Figure 7 – Get app

```
testuser@UBUNTU-16041-DT-86-LP-00: ~
testuser@UBUNTU-16041-DT-86-LP-00:~$ sudo apt-get remove binutils-arm-none-eabi
gcc-arm-none-eabi
[sudo] password for testuser:
Reading package lists... Done
Building dependency tree
Reading state information... Done
Package 'binutils-arm-none-eabi' is not installed, so not removed
Package 'gcc-arm-none-eabi' is not installed, so not removed
The following packages were automatically installed and are no longer required:
  linux-headers-4.4.0-31 linux-headers-4.4.0-31-generic
  linux-image-4.4.0-31-generic linux-image-extra-4.4.0-31-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 18 not upgraded.
testuser@UBUNTU-16041-DT-86-LP-00:~$
```

7. In the terminal window, type the following:

```
sudo add-apt-repository ppa:terry.guo/gcc-arm-embedded
```

Figure 8 – Add Repository

```
testuser@UBUNTU-16041-DT-86-LP-00: ~
testuser@UBUNTU-16041-DT-86-LP-00:~$ sudo apt-get remove binutils-arm-none-eabi
gcc-arm-none-eabi
[sudo] password for testuser:
Reading package lists... Done
Building dependency tree
Reading state information... Done
Package 'binutils-arm-none-eabi' is not installed, so not removed
Package 'gcc-arm-none-eabi' is not installed, so not removed
The following packages were automatically installed and are no longer required:
  linux-headers-4.4.0-31 linux-headers-4.4.0-31-generic
  linux-image-4.4.0-31-generic linux-image-extra-4.4.0-31-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 18 not upgraded.
testuser@UBUNTU-16041-DT-86-LP-00:~$ sudo add-apt-repository ppa:terry.guo/gcc-a
rm-embedded
tag:launchpad.net:2008:redacted
More info: https://launchpad.net/~terry.guo/+archive/ubuntu/gcc-arm-embedded
Press [ENTER] to continue or ctrl-c to cancel adding it

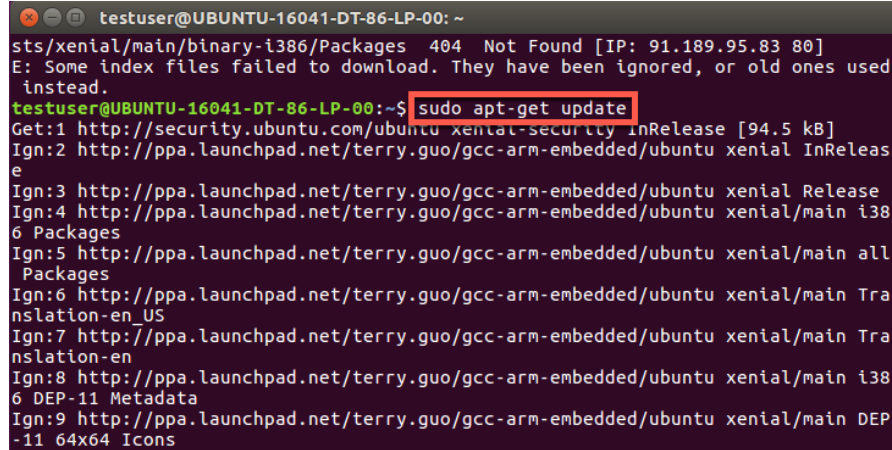
gpg: keyring `/tmp/tmpmpmzfb1u/secring.gpg' created
gpg: keyring `/tmp/tmpmpmzfb1u/pubring.gpg' created
gpg: "tag:launchpad.net:2008:redacted" not a key ID: skipping
testuser@UBUNTU-16041-DT-86-LP-00:~$
```

8. At "continue or cancel" prompt, press **Enter**.

9. In the terminal window, type:

```
sudo apt-get update
```

Figure 9 – Get Update



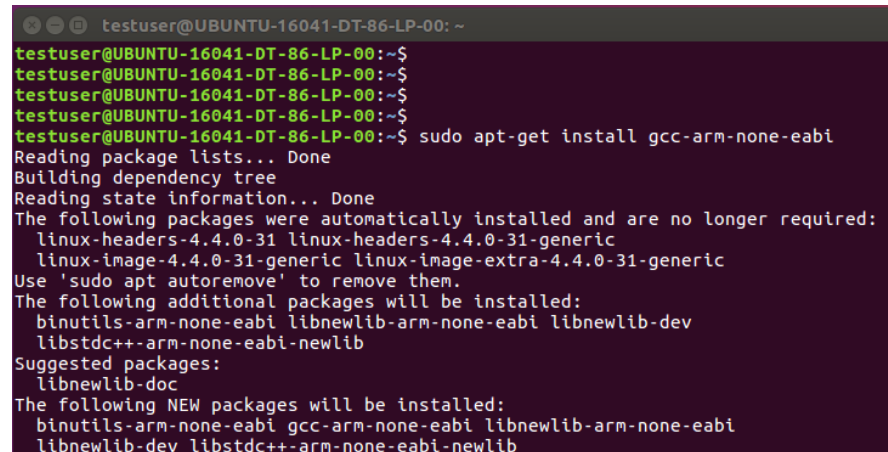
```
testuser@UBUNTU-16041-DT-86-LP-00: ~
sts/xenial/main/binary-i386/Packages 404 Not Found [IP: 91.189.95.83 80]
E: Some index files failed to download. They have been ignored, or old ones used
instead.
testuser@UBUNTU-16041-DT-86-LP-00:~$ sudo apt-get update
Get:1 http://security.ubuntu.com/ubuntu xenial-security InRelease [94.5 kB]
Ign:2 http://ppa.launchpad.net/terry.guo/gcc-arm-embedded/ubuntu xenial InReleas
e
Ign:3 http://ppa.launchpad.net/terry.guo/gcc-arm-embedded/ubuntu xenial Release
Ign:4 http://ppa.launchpad.net/terry.guo/gcc-arm-embedded/ubuntu xenial/main i38
6 Packages
Ign:5 http://ppa.launchpad.net/terry.guo/gcc-arm-embedded/ubuntu xenial/main all
Packages
Ign:6 http://ppa.launchpad.net/terry.guo/gcc-arm-embedded/ubuntu xenial/main Tra
nslation-en_US
Ign:7 http://ppa.launchpad.net/terry.guo/gcc-arm-embedded/ubuntu xenial/main Tra
nslation-en
Ign:8 http://ppa.launchpad.net/terry.guo/gcc-arm-embedded/ubuntu xenial/main i38
6 DEP-11 Metadata
Ign:9 http://ppa.launchpad.net/terry.guo/gcc-arm-embedded/ubuntu xenial/main DEP
-11 64x64 Icons
```

NOTE You will get an Error:
The requested URL /terry.guo/gcc-arm-embedded/ubuntu/dists/xenial/main/binary-i386/Packages was not found on this server.
 This is normal and does not cause any problems.

10. In the terminal window, type:

```
sudo apt-get install gcc-arm-none-eabi
```

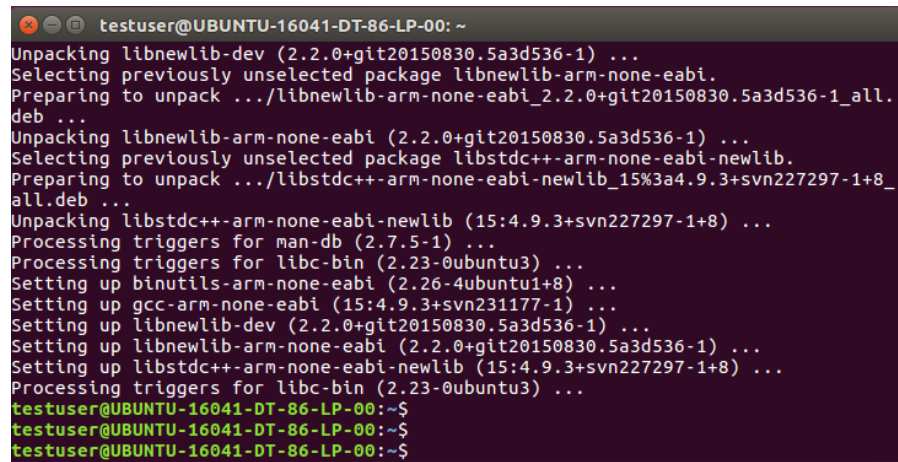
Figure 10



```
testuser@UBUNTU-16041-DT-86-LP-00:~$
testuser@UBUNTU-16041-DT-86-LP-00:~$
testuser@UBUNTU-16041-DT-86-LP-00:~$
testuser@UBUNTU-16041-DT-86-LP-00:~$
testuser@UBUNTU-16041-DT-86-LP-00:~$ sudo apt-get install gcc-arm-none-eabi
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  linux-headers-4.4.0-31 linux-headers-4.4.0-31-generic
  linux-image-4.4.0-31-generic linux-image-extra-4.4.0-31-generic
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  binutils-arm-none-eabi libnewlib-arm-none-eabi libnewlib-dev
  libstdc++-arm-none-eabi-newlib
Suggested packages:
  libnewlib-doc
The following NEW packages will be installed:
  binutils-arm-none-eabi gcc-arm-none-eabi libnewlib-arm-none-eabi
  libnewlib-dev libstdc++-arm-none-eabi-newlib
```

11. At the prompt, type Y. The window will present the following details:

Figure 11



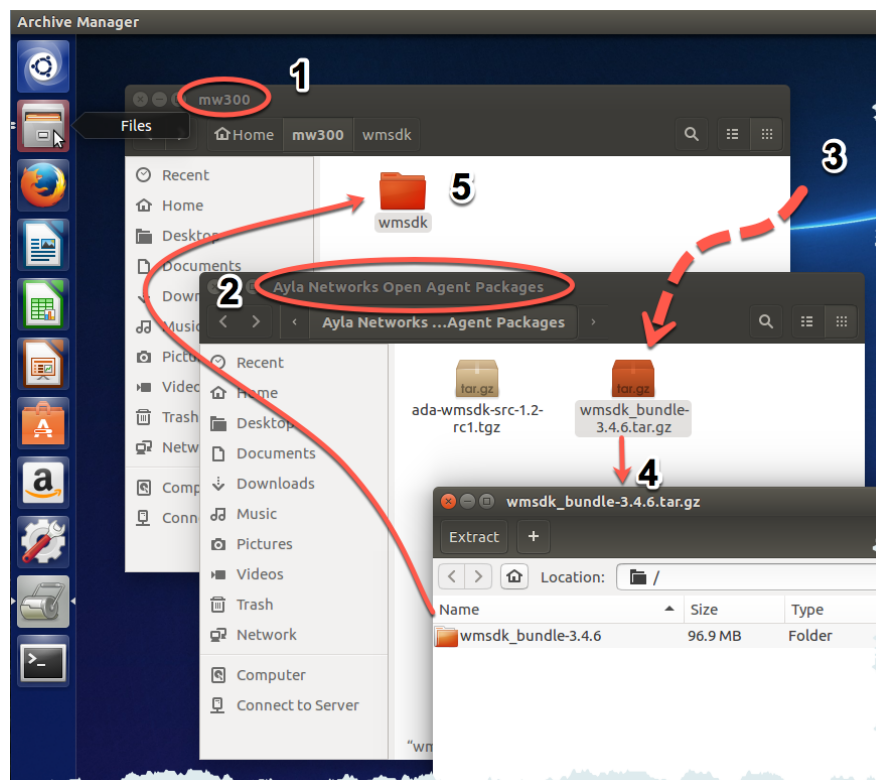
```
testuser@UBUNTU-16041-DT-86-LP-00: ~
Unpacking libnewlib-dev (2.2.0+git20150830.5a3d536-1) ...
Selecting previously unselected package libnewlib-arm-none-eabi.
Preparing to unpack .../libnewlib-arm-none-eabi_2.2.0+git20150830.5a3d536-1_all.
deb ...
Unpacking libnewlib-arm-none-eabi (2.2.0+git20150830.5a3d536-1) ...
Selecting previously unselected package libstdc++-arm-none-eabi-newlib.
Preparing to unpack .../libstdc++-arm-none-eabi-newlib_15%3a4.9.3+svn227297-1+8_
all.deb ...
Unpacking libstdc++-arm-none-eabi-newlib (15:4.9.3+svn227297-1+8) ...
Processing triggers for man-db (2.7.5-1) ...
Processing triggers for libc-bin (2.23-0ubuntu3) ...
Setting up binutils-arm-none-eabi (2.26-4ubuntu1+8) ...
Setting up gcc-arm-none-eabi (15:4.9.3+svn231177-1) ...
Setting up libnewlib-dev (2.2.0+git20150830.5a3d536-1) ...
Setting up libnewlib-arm-none-eabi (2.2.0+git20150830.5a3d536-1) ...
Setting up libstdc++-arm-none-eabi-newlib (15:4.9.3+svn227297-1+8) ...
Processing triggers for libc-bin (2.23-0ubuntu3) ...
testuser@UBUNTU-16041-DT-86-LP-00:~$
testuser@UBUNTU-16041-DT-86-LP-00:~$
testuser@UBUNTU-16041-DT-86-LP-00:~$
```


5 Prepare the Source Code

5.1 Prepare the Source Code with UI

1. Make a **mw300** directory as the root directory (relative to your home directory).
2. Create a directory named for the example Ayla Networks Open Agent Packages.
3. Get the Marvel Wi-Fi microcontroller SDK package **wmsdk_bundle-3.4.6.tar.gz** and any errata packages (if any exist), named such as **wmsdk-3.4.6-errata1.tar.gz**, from the download section of the Ayla Support portal.
4. Double-click on the **wmsdk_bundle-3.4.6.tar.gz** archive file to display a window of the contents.
5. Extract the SDK package into the **mw300/** directory.
6. Rename the sub-directory **wmsdk_bundle-3.4.6** to **wmsdk**.

Figure 12



5.2 Prepare the Source Code with CLI

1. Make a **mw300** directory as the root directory (relative to your home directory).

```
cd ~
pwd
mkdir mw300
dir
cd mw300
```

Figure 13 – mw300 directory

```
testuser@UBUNTU-16041-DT-86-LP-00: ~/mw300
testuser@UBUNTU-16041-DT-86-LP-00:~$ 
testuser@UBUNTU-16041-DT-86-LP-00:~$ 
testuser@UBUNTU-16041-DT-86-LP-00:~$ 
testuser@UBUNTU-16041-DT-86-LP-00:~$ 
testuser@UBUNTU-16041-DT-86-LP-00:~$ 
testuser@UBUNTU-16041-DT-86-LP-00:~$ 
testuser@UBUNTU-16041-DT-86-LP-00:~$ 
testuser@UBUNTU-16041-DT-86-LP-00:~$ 
testuser@UBUNTU-16041-DT-86-LP-00:~$ 
testuser@UBUNTU-16041-DT-86-LP-00:~$ 
testuser@UBUNTU-16041-DT-86-LP-00:~$ 
testuser@UBUNTU-16041-DT-86-LP-00:~$ cd ~
testuser@UBUNTU-16041-DT-86-LP-00:~$ pwd
/home/testuser
testuser@UBUNTU-16041-DT-86-LP-00:~$ mkdir mw300
testuser@UBUNTU-16041-DT-86-LP-00:~$ dir
Desktop      Downloads    Music        perltest.pl   Public       Videos
Documents    examples.desktop  mw300        Pictures      Templates
testuser@UBUNTU-16041-DT-86-LP-00:~$ cd mw300
testuser@UBUNTU-16041-DT-86-LP-00:~/mw300$
```

2. Get the Marvel Wi-Fi microcontroller SDK package **wmsdk_bundle-3.4.6.tar.gz** and any errata packages (if any exist), named such as **wmsdk-3.4.6-errata1.tar.gz**, from the download section of the Ayla Support portal.
3. Extract the SDK package into the **mw300/** directory.
4. To rename the sub-directory **wmsdk_bundle-3.4.6** to **wmsdk**, type:

```
mv wmsdk bundle-3.4.6 wmsdk
```

5.3 Install the Ayla provided packages

See *Ayla Embedded Agent for Marvell WMSDK* (AY006DAM6) for instructions to install the Ayla Networks Embedded Agent for Marvell WMSDK framework.

6 Marvell CLI commands

The following is a list of useful Broadcom CLI commands:

- help
- system-conf
- echo <on/off>
- ttcp (see ttcp -h for details)
- healthmon-stat
- dhcp-server <mlan0/uap0/wfd0> <start|stop>
- dhcp-stat
- rfprint <http_url>
- updatefw <http_url>
- updatewififw <http_url>
- updatefs <fs-name> <http_url>
- iwpriv Support for iwpriv commands
- psm-get <module> <variable>
- psm-set <module> <variable> <value>
- psm-delete <module> <variable>
- psm-erase
- psm-dump
- wlan-version
- wlan-mac
- wlan-scan
- wlan-add <profile_name> ssid <ssid> bssid...
- wlan-remove <profile_name>
- wlan-list
- wlan-connect <profile_name>
- wlan-start-network <profile_name>
- wlan-stop-network
- wlan-disconnect
- wlan-stat
- wlan-info

- wlan-address
- wlan-set-regioncode
- wlan-get-regioncode
- wlan-get-uap-channel
- wlan-gethostname <hostname>
- pm-wifi-pdn-enter (see pm-wifi-pdn-enter -h for details)
- pm-wifi-pdn-exit

7 Troubleshooting

Possible issues are listed below to assist with troubleshooting.

USB Link is failing to Connect

If using a virtual machine for the Ubuntu installation ensure the appropriate USB connections are forwarded from the host OS to the Guest OS.

8 What to Consider Next?

You have now completed this introduction to the Ayla Marvel based 'Development Kit' and thus you are well on your way to begin creating valuable Cloud enabled IoT solutions for your organization. The following provides you with some ideas of how to expand your Ayla Networks Technology ecosystem expertise.

8.1 Ayla University Portal

Ayla has many University courses, many which allows you to study various Ayla related topics. The following is an outline of the main focus areas of Ayla University:

- Embedded Device Development (Ayla Managed Agent and OEM managed Open Agent based systems, primarily Wi-Fi based)
- Gateway Development, for integration of alternative technologies and associated protocols, primarily none Wi-Fi based.
- Cloud Development, using such as the User, Device, RBAC and DSS Application Programming Interfaces (API's).
- Mobile Development (Mobile APIs, such as Aura and the AMAP Platform.

For more information visit Ayla University online at:

<http://university.aylanetworks.com>

8.2 Ayla Support Portal

On the Ayla Support Portal, registered customers can resolve many simple topics without a support ticket. For example, browse the large library of articles. If an article search cannot find a solution, create a case ticket.

The Support Portal provides access to:

- Research Topics
- View Frequently Asked Questions (FAQ's)
- Ask Questions
- Open Cases
- Get Answers
- Provide Feedback



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