M-A5D35

Linux-Ready Cortex-A5 SOM

&

Matrix-7XX

Linux-Ready Cortex-A5 IoT Gateway

Software Guide

Version: 1.2

2020 July

Artila

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Document Amendment History

Revision	Date	Remark
V 0.1	2016 Feb.	Initial
V 0.3	2017 Jan.	User Guide
V 1.0	2017 Oct.	Software Guide
V 1.1	2018 Apr.	Add information: GNSS, MEMS, DIO, Audio ..
V 1.1	2018 Apr.	Add information: GNSS, MEMS, DIO, Audio ..
V 1.1	2020 Jul.	Content amended

Table of Contents

1. Overview

This software guide applies to Artila's Matrix-7xx series Industrial IoT gateway and M-A5D35 SoM (System on Module).

- **Operation System**
  - Linux kernel 5.4.x / 4.19.x
  - Supports bootup from eMMC or SD card
  - Support Backup/Restore via SD card or USB device
  - Boot Loader: Barebox
  - File System: EXT4
    - M-A5D35 uses ETX4 file system for the built-in flash memory disk.
    - The files system is stored at NAND flash memory.
- **Software Development**
  - Toolchain: gcc 9.3 / 6.2.x + glibc 2.31 / 2.24
  - Supports in-place C/C++ code compilation
- **Package Management**
  - Package repository: Artila self-maintained repository
  - Command: Using standard apt-get command
- **Popular Packages**
  - Web server: Apache/Nginx/Lighttpd
  - Database: MySQL/SQLite3/PostgreSQL
  - Script Language: PHP/Python/Perl/NodeJS
  - Text editor: vim/nano/sed
  - Administration: Webmin
- **Protocol Stacks**
  - IPV4, ICMP, ARP, DHCP, NTP, TCP, UDP, FTP, HTTP, PPP, PPPoE, CHAP, PAP, SMTP, SNMP V1/V3, SSL, SSH 1/2
- **Utilities**
  - Bash: Shell Command
  - Telnet: Telnet client program
  - Busybox: Linux utility collection
  - FTP: FTP client program

- **Daemon**
  - pppd: Dial In/out over serial port and PPPoE
  - snmpd: SNMP agent program
  - inetd: TCP server program
  - ftpd: FTP server program
  - nginx: Web server program
  - sshd: secured shell server
  - iptables: Firewall service manager
- **Standard Device Drivers**
  - ttyS0: serial console port (M-A5D35 debug port)
  - ttyS1~ttyS4: serial ports (M-A5D35 UART0~UART3)
  - gpio: General Purpose I/O
  - mmc: SD/MMC:
  - rtc: Real Time Clock
  - sda: USB flash memory disk
  - ttyACM: USB Modem
  - ttyUSB: USB RS-232 adaptor
  - spi: spi bus
- **I/O devices Control**

  M-A5D35 uses standard I/O device control to access following devices:
  - Ethernet: eth0, eth1
  - Serial Ports: ttyS1, ttyS2, ttyS3, ttyS4
  - Serial Console Port: ttyS0
  - Real time clock: rtc0
  - USB Flash Disk: sda, sda1, sdb, sdb1
  - SD memory Card: mmc0
  - USB WLAN dongle: wlan0
  - USB Serial Cable: ttyUSB0, ttyUSB1
  - SPI bus: spi0, spi1
- **Default Setting**
  - IP Default setting:
    - eth0: DHCP
    - eth1: 192.168.2.127 (Netmask: 255.255.255.0)
  - ssh Login: root
  - Password: root
  - Terminal type: VT100

2. Access the USB Serial Console

2.1 USB Serial Console Introduction

All the M-A5D35 based Matrix IoT gateways come with a USB client port (micro-USB connector), which is used as the serial console. Please prepare a USB-to-microUSB cable to connect the Matrix IoT gateway to a Desktop/Notebook PC. The Matrix IoT gateway can be directly driven by USB power.

When the Matrix IoT gateway finished its boot up process, it will automatically emulate an USB CDC/ACM compatible serial device.

M-A5D35 based Matrix IoT gateway comes with a USB client port	Use a standard on-the-shelf USB-to-MicroUSB cable to connect to the Matrix-7XX	Linux/Windows/OSX Desktop/Notebook PC

The identifier name of the CDC/ACM serial port varies depending on your computer's operation system and the numbers of the serial ports which are already installed on your computer.

On Linux system, the serial port name appears like ttyACM0, ttyACM1, etc.
On OSX system, the serial port name appears like tty.usbmodem1421, tty.usbmodem1422, etc.
On Windows system, the serial port name appears like COM3, COM4, etc.

The serial communication parameters are: **115200**, **N81**, **VT100**. Use your preferred serial terminal tools to access the Matrix IoT gateway's serial console.
For example:
On Windows system, use **putty** or **teraterm**.
On Linux/OSX system, use **minicom** utility.

☞ Note
For Linux, Mac OSX and Windows 10 computers, the CDC/ACM serial driver is already built-in and will be activated automatically.
For Windows 7/XP computers, it may need to install the CDC/ACM serial driver manually. Users can download the CDC/ACM driver from Artila web site. (http://www.artila.com/download/A5D35/Linux/toolchain/linux-cdc-acm.inf).

2.2 USB Serial Console Log-in

User name: **root**

Password: **root**

Following example by Matrix-7XX

```
 Welcome to

      **                    **  **
      **              **        **
    **  **            **        **
    **  **      ****  ****  **  **    ******
  **      **    **    **    **  **          **
  **      **    **    **    **  **    ********
  **********    **    **    **  **  **      **
**          **  **    **    **  **  **      **
**          **  **      **  **  **    ********

For further information check:
http://www.artila.com/

Poky (Yocto Project Reference Distro) 2.2 matrix710 /dev/ttyGS0

matrix710 login: root
Password:
Welcome to

      **                    **  **
      **              **        **
    **  **            **        **
    **  **      ****  ****  **  **    ******
  **      **    **    **    **  **          **
  **      **    **    **    **  **    ********
  **********    **    **    **  **  **      **
**          **  **    **    **  **  **      **
**          **  **      **  **  **    ********

For further information check:
http://www.artila.com/

[root@matrix710 ~]#
```

3. Network Settings

3.1 Config the Network Interface

The M-A5D35 based Matrix IoT gateways come two Ethernet ports, the default network settings are shown below:

Ethernet Type	Port Label	Device mapping	IP mode	IP address
Gigabit	GLAN	eth0	DHCP	auto
10/100Mbit	LAN	eth1	static	192.168.2.127

Users may need to modify the network settings to meet their LAN environment. The network interface configuration file path is **/etc/network/interfaces**. Edit and save the configuration file, then use **ifdown** and **ifup** command to ON/OFF the specific network interface to activate the network settings.

```
[root@Matrix700 ~]#cat /etc/network/interfaces
# /etc/network/interfaces -- configuration file for ifup(8), ifdown
(8)

# The loopback interface
auto lo
iface lo inet loopback

# Wired or wireless interfaces
# Gigabit
auto eth0
iface eth0 inet dhcp

# 10/100M
auto eth1
iface eth1 inet static
        address 192.168.2.127
        netmask 255.255.255.0
        network 192.168.2.0
        #gateway 192.168.2.1

[root@Matrix700 ~]#
```

The following screen capture shows the eth0 of the Matrix-7xx got a valid IP: 192.168.1.93.

```
[root@Matrix700 ~]#ifdown eth0
[root@Matrix700 ~]#ifup eth0
udhcpc: option -h NAME is deprecated, use -x hostname:NAME
udhcpc (v1.24.1) started
Sending discover...
Sending select for 192.168.1.93...
Lease of 192.168.1.93 obtained, lease time 86400
/etc/udhcpc.d/50default: Adding DNS 208.67.220.220
/etc/udhcpc.d/50default: Adding DNS 208.67.222.222

[root@Matrix700 ~]#
```

3.2 Configure the DNS Server

The DNS configuration file path is **/etc/resolv.conf**. Users may edit the file according to their specific network environment.

```
[root@matrix700 ~]#cat /etc/resolv.conf

[root@matrix700 ~]#ifconfig eth1
eth1      Link encap:Ethernet  HWaddr 00:13:48:03:08:4a
          inet addr:192.168.2.127  Bcast:192.168.2.255  Mask:255.25
5.255.0
          inet6 addr: fe80::213:48ff:fe03:84a/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:126 errors:0 dropped:0 overruns:0 frame:0
          TX packets:45 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:14966 (14.6 KiB)  TX bytes:3770 (3.6 KiB)
          Interrupt:41 Base address:0xc000

[root@matrix700 ~]#ping google.com
ping: unknown host google.com

[root@matrix700 ~]#echo 'nameserver 8.8.8.8' > /etc/resolv.conf

[root@matrix700 ~]#cat /etc/resolv.conf
nameserver 8.8.8.8

[root@matrix700 ~]#ping google.com
PING google.com (216.58.200.238) 56(84) bytes of data.
64 bytes from tsa03s01-in-f14.1e100.net (216.58.200.238): icmp_seq=
1 ttl=52 time
=13.9 ms
64 bytes from tsa03s01-in-f238.1e100.net (216.58.200.238): icmp_seq
=2 ttl=52 tim
e=15.3 ms
^C
--- google.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 13.910/14.616/15.322/0.706 ms

[root@matrix700 ~]#
```

Warning: Please be noted that, the /etc/resolv.conf is physically located in the RAM disk, so the content of the file will disappear after system reboot.

4. Access the SSH Console

Most Linux/OSX computers come with built-in SSH client utility. For Windows users, it is highly recommended to use **putty** as an SSH client.

User name: **root**
Password: **root**

```
$ ssh root@192.168.1.64
The authenticity of host '192.168.1.64 (192.168.1.64)' can't be est
ablished. ECDSA key fingerprint is SHA256:gQQ9QzBGV0F0fZCmP5qLxioRk
bPlRqJDLnLuklLZVhQ. Are you sure you want to continue connecting (y
es/no)? yes Warning: Permanently added '192.168.1.64' (ECDSA) to th
e list of known hosts. root@192.168.1.64's
password:
Last login: Fri May 6 20:47:14 2016 from 192.168.1.54 Welcome to

      **                    **  **
      **              **        **
    **  **            **        **
    **  **      ****  ****  **  **    ******
  **      **    **    **    **  **          **
  **      **    **    **    **  **    ********
  **********    **    **    **  **  **      **
**          **  **    **    **  **  **      **
**          **  **      **  **  **    ********

For further information check:
http://www.artila.com/

[root@Matrix700 ~]#
```

5. Check Linux Kernel Version

```
[root@matrix700 ~]#uname -a
Linux matrix700 4.9.18-yocto-standard #1 Sun Mar 26 23:00:05 CST 20
17 armv7l armv7l armv7l GNU/Linux

[root@matrix700 ~]#uname -v
#1 Sun Mar 26 23:00:05 CST 2017

[root@matrix700 ~]#uname -r
4.9.18-yocto-standard

[root@matrix700 ~]#
```

6. File System Information

The M-A5D35 based Matrix IoT gateways come with 8GB on-board EMMC Flash memory, which contains boot loader, Linux kernel, root file system and user disk (/home).

```
[root@Matrix700 ~]#lsblk
NAME        MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
mmcblk0     179:0    0  7.3G  0 disk
`-mmcblk0p1 179:1    0  7.3G  0 part /
mtdblock0    31:0    0  8.3M  0 disk
mtdblock1    31:1    0  8.2M  0 disk
mtdblock2    31:2    0  7.7M  0 disk
mtdblock3    31:3    0  7.7M  0 disk
mtdblock4    31:4    0  7.6M  0 disk
mtdblock5    31:5    0  3.9M  0 disk

[root@Matrix700 ~]#
```

```
[root@Matrix700 /]#ls -F
bin/   dev/  home/  lost+found/  mnt/   run/   sys/  usr/
boot/  etc/  lib/   media/       proc/  sbin/  tmp@  var/

[root@Matrix700 /]#
```

```
[root@Matrix700 ~]#df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       7.1G  252M  6.5G   4% /
devtmpfs        251M     0  251M   0% /dev
tmpfs           251M   72K  251M   1% /run
tmpfs           251M  104K  251M   1% /var/volatile

[root@Matrix700 ~]#
```

7. Serial Port Settings

7.1 Port Mapping

The M-A5D35 based Matrix IoT gateways come with four or eight serial communication ports. The first four serial ports are CPU native serial ports. Some M-A5D35 based Matrix IoT gateways provide more serial ports via USB-to-Serial chip. The serial port mapping information is listed below:

Port 1 → /dev/ttyS1
Port 2 → /dev/ttyS2
Port 3 → /dev/ttyS3
Port 4 → /dev/ttyS4
Port 5 → /dev/ttyUSB0
Port 6 → /dev/ttyUSB1
Port 7 → /dev/ttyUSB2
Port 8 → /dev/ttyUSB3

7.2 Configure the Serial Port

Please use the built-in ***setuart*** utility to display/modify the operation mode (RS-232/485) and communication parameters of the first four serial ports (ttyS1/2/3/4).

```
[root@Matrix700 ~]#setuart -h
Artila utility: setuart
Usage: setuart [OPTION]

 -h        display this help and exit
 -v        print version number and exit
 -p        uart port number
 -t        uart interface type [232,485]
 -b        set baudrate, up to 921600bps

Examples:
  setuart -p 1                     display port 1 type and baudrate
  setuart -p 1 -t 485 -b 115200  set port 1 type RS-485 and baud to 115200
  setuart -p 1 -t 232 -b 9600   set port 1 type to RS-232 and baud to 9600
```

☞ Caution

The serial port’s mode and associated communication parameters will go back to factory default after system reboot.

8. System Time and Real-Time Clock(RTC)

8.1 Adjust System Time by data Command

The M-A5D35 based Matrix IoT gateways support standard ***date*** command to adjust the Linux system time manually. A typical usage is: ***date MMDDhhmmYYYY***.

```
[root@Matrix700 ~]#date 050717132016
Sat May 7 17:13:00 UTC 2016

[root@Matrix700 ~]#
```

8.2 Adjust RTC by hwclock Command

To adjust the on-board Real-time clock (RTC), please follow the steps shown below: First, to adjust the system time by using the ***date*** command. Then use the ***hwclock*** command to synchronize the system time to the RTC.

A typical usage is: ***hwclock -w***.

```
[root@Matrix700 ~]#hwclock
Thu May 26 15:31:49 2016  0.000000 seconds

[root@Matrix700 ~]#date
Thu May 26 15:32:00 UTC 2016

[root@Matrix700 ~]#hwclock -w

[root@Matrix700 ~]#
```

8.3 Synchronize System Time by NTP Server

8.3.1 Install the ntpdate utility

The M-A5D35 based Matrix IoT gateways support the ***ntpdate*** NTP client utility to synchronize the system date with specified NTP server. Users need to install the ***ntpdate*** utility first by executing the ***apt-get install ntpdate*** command.

```
 [root@matrix700 ~]#apt-get install ntpdate
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  ntpdate
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 0 B/41.0 kB of archives.
After this operation, 0 B of additional disk space will be used.
Selecting previously unselected package ntpdate.
(Reading database ... 17344 files and directories currently install
ed.)
Preparing to unpack .../ntpdate_4.2.8p9-r0_armhf.deb ...
Unpacking ntpdate (4.2.8p9-r0) ...
Setting up ntpdate (4.2.8p9-r0) ...

[root@matrix700 ~]#
```

8.3.2 Using the ntpdate utility

The following example shows how to use the ***ntpdate*** utility to synchronize the system with the NTP server **0.pool.ntp.org**.

```
[root@matrix700 ~]#date
Mon Apr 10 07:17:31 UTC 2017

[root@matrix700 ~]#date 050717132016
Sat May  7 17:13:00 UTC 2016

[root@matrix700 ~]#ntpdate 0.pool.ntp.org
10 Apr 07:18:36 ntpdate[1025]: step time server 61.216.153.106 offs
et 29167497.848661 sec

[root@matrix700 ~]#date
Mon Apr 10 07:18:45 UTC 2017

[root@matrix700 ~]#date;hwclock
Mon Apr 10 07:18:59 UTC 2017
Mon Apr 10 07:18:58 2017  0.000000 seconds

[root@matrix700 ~]#hwclock -w

[root@matrix700 ~]#date;hwclock
Mon Apr 10 07:19:15 UTC 2017
Mon Apr 10 07:19:15 2017  0.000000 seconds

[root@matrix700 ~]#
```

9. Insert Kernel Modules

Users can use command ***lsmod*** to list all installed kernel modules.

```
[root@matrix700 rc5.d]#lsmod
Module                  Size  Used by
usb_f_mass_storage     25809  2
usb_f_acm               4064  2
u_serial                7750  3 usb_f_acm
libcomposite           33643  12 usb_f_acm,usb_f_mass_storage
nfsd                  251055  11
auth_rpcgss            39359  1 nfsd
oid_registry            2441  1 auth_rpcgss
exportfs                3541  1 nfsd
nfs_acl                 2510  1 nfsd
lockd                  53405  1 nfsd
grace                   1627  2 nfsd,lockd
sunrpc                175725  16 auth_rpcgss,nfsd,nfs_acl,lockd
atmel_usba_udc         15098  0
udc_core               10846  5 usb_f_acm,usb_f_mass_storage,atmel_
usba_udc,u_serial,libcomposite
```

To load additional kernel modules during the system boot-up, you can modify the file: ***/etc/modules***.

```
[root@Matrix700 ~]#cat /etc/modules
atmel_usba_udc
#g_serial
#mt7601Usta

[root@Matrix700 ~]#
```

10. Insert Software Package

The M-A5D35 based Matrix IoT gateways support standard **apt** (Advanced Package Tool) package management utility. With this utility, users can easily install, upgrade, remove software packages. Artila provides a self-maintained software repository. The apt configuration file path is ***/etc/apt/sources.list***.

```
[root@Matrix700 ~]#ls /etc/apt
apt.conf  apt.conf.d  preferences.d  sources.list  sources.list.d

[root@Matrix700 ~]#cat /etc/apt/sources.list
deb [trusted=yes] http://www.artila.com/download/A5D35/Linux/deb/co
rtexa5hf-vfp cortexa5hf-vfp main
deb [trusted=yes] http://www.artila.com/download/A5D35/Linux/deb/al
l all main
deb [trusted=yes] http://www.artila.com/download/A5D35/Linux/deb/ma
trix700 matrix700 main
```

** Please be noted the last line of the ***/etc/apt/sources.list*** varies according to specific model name.

Commonly used apt commands are listed below:

- ***apt-get install*** <package> to install package
- ***apt-get remove*** <package> to remove package
- ***apt-cache search*** <package> to search package
- ***apt-get update*** to update the package list
- ***apt-get upgrade*** to upgrade installed packages

11. Mount/Unmount an SD Card

The M-A5D35 based Matrix IoT gateways support SD card access. If an SD card is inserted, you can use ***lsblk*** command to find the device identifier name. And then use ***mount*** command to mount the SD card to a folder.

Before SD Insertion

```
[root@Matrix700 ~]#lsblk
NAME        MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
mmcblk0     179:0    0  7.3G  0 disk
`-mmcblk0p1 179:1    0  7.3G  0 part /
mtdblock0    31:0    0  8.3M  0 disk
mtdblock1    31:1    0  8.2M  0 disk
mtdblock2    31:2    0  7.7M  0 disk
mtdblock3    31:3    0  7.7M  0 disk
mtdblock4    31:4    0  7.6M  0 disk
mtdblock5    31:5    0  3.9M  0 disk
```

After SD Insertion

```
[root@Matrix700 ~]#lsblk
NAME        MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
mmcblk0     179:0    0  7.3G  0 disk
`-mmcblk0p1 179:1    0  7.3G  0 part /
mmcblk1     179:24   0  1.9G  0 disk
mtdblock0    31:0    0  8.3M  0 disk
mtdblock1    31:1    0  8.2M  0 disk
mtdblock2    31:2    0  7.7M  0 disk
mtdblock3    31:3    0  7.7M  0 disk
mtdblock4    31:4    0  7.6M  0 disk
mtdblock5    31:5    0  3.9M  0 disk
```

Mount mmcblk1 to /media.

```
[root@Matrix700 ~]#mount /dev/mmcblk1 /media
[root@Matrix700 ~]#lsblk
NAME        MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
mmcblk0     179:0    0  7.3G  0 disk
`-mmcblk0p1 179:1    0  7.3G  0 part /
mmcblk1     179:24   0  1.9G  0 disk /media
mtdblock0    31:0    0  8.3M  0 disk
mtdblock1    31:1    0  8.2M  0 disk
mtdblock2    31:2    0  7.7M  0 disk
mtdblock3    31:3    0  7.7M  0 disk
mtdblock4    31:4    0  7.6M  0 disk
mtdblock5    31:5    0  3.9M  0 disk
```

Unmount /media.

```
[root@Matrix700 ~]#umount /media
```

12. Mount/Unmount a USB Card

The M-A5D35 based Matrix IoT gateways support generic USB drives. If an USB drive is inserted, you can use ***lsblk*** command to find the device identifier name. And then use ***mount*** command to mount the USB drive to a folder.

Before USB drive Insertion

```
[root@Matrix700 ~]#lsblk
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
mmcblk0      179:0    0  7.3G  0 disk
`-mmcblk0p1 179:1    0  7.3G  0 part /
mtdblock0     31:0    0  8.3M  0 disk
mtdblock1     31:1    0  8.2M  0 disk
mtdblock2     31:2    0  7.7M  0 disk
mtdblock3     31:3    0  7.7M  0 disk
mtdblock4     31:4    0  7.6M  0 disk
mtdblock5     31:5    0  3.9M  0 disk
```

After USB drive Insertion

```
[root@Matrix700 ~]#lsblk
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda            8:0    1 14.5G  0 disk
`-sda1         8:1    1 14.5G  0 part
mmcblk0      179:0    0  7.3G  0 disk
`-mmcblk0p1 179:1    0  7.3G  0 part /
mtdblock0     31:0    0  8.3M  0 disk
mtdblock1     31:1    0  8.2M  0 disk
mtdblock2     31:2    0  7.7M  0 disk
mtdblock3     31:3    0  7.7M  0 disk
mtdblock4     31:4    0  7.6M  0 disk
mtdblock5     31:5    0  3.9M  0 disk
```

Mount sda1 to /media.

```
[root@Matrix700 ~]#mount /dev/sda1 /media
[root@Matrix700 ~]#lsblk
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda            8:0    1 14.5G  0 disk
`-sda1         8:1    1 14.5G  0 part /media
mmcblk0      179:0    0  7.3G  0 disk
`-mmcblk0p1 179:1    0  7.3G  0 part /
mtdblock0     31:0    0  8.3M  0 disk
mtdblock1     31:1    0  8.2M  0 disk
mtdblock2     31:2    0  7.7M  0 disk
mtdblock3     31:3    0  7.7M  0 disk
mtdblock4     31:4    0  7.6M  0 disk
mtdblock5     31:5    0  3.9M  0 disk
```

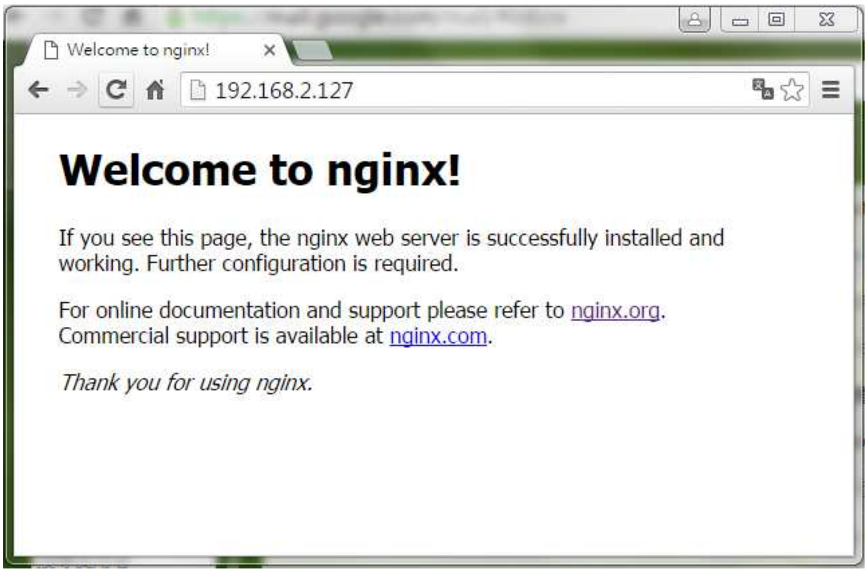
Unmount /media.

```
[root@Matrix700 ~]#umount /media
```

13. Web Server Settings

13.1 Nginx Web Server

The M-A5D35 based Matrix IoT gateways come with pre-installed ***nginx*** web server. The configuration file is **/etc/nginx/nginx.conf**.



Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to nginx.org.
Commercial support is available at nginx.com.

Thank you for using nginx.

13.2 Root Web Page Directory

The default root web page directory is ***/var/www/localhost/html***. This path can be changed by modifying the above configuration file.

```
[root@Matrix700 ~]#ls /var/www/localhost/html
50x.html  index.html

[root@Matrix700 ~]#
```

13.3 PHP Support

The M-A5D35 based Matrix IoT gateways support commonly used server-side script languages, including Perl, PHP and Python. Per and Python support are built-in, while PHP support needs to be installed manually using ***apt-get*** command.

- apt-get install ***php-cli***
- apt-get install ***php-cgi***
- apt-get install ***php-fpm***

```
[root@matrix700 ~]#php-cgi -v
PHP 5.6.26 (cgi-fcgi) (built: Mar 19 2017 01:15:26)
Copyright (c) 1997-2016 The PHP Group
Zend Engine v2.6.0, Copyright (c) 1998-2016 Zend Technologies

[root@matrix700 ~]#php-fpm -v
PHP 5.6.26 (fpm-fcgi) (built: Mar 19 2017 01:15:19)
Copyright (c) 1997-2016 The PHP Group
Zend Engine v2.6.0, Copyright (c) 1998-2016 Zend Technologies

[root@matrix700 ~]#php -v
PHP 5.6.26 (cli) (built: Mar 19 2017 01:15:12)
Copyright (c) 1997-2016 The PHP Group
Zend Engine v2.6.0, Copyright (c) 1998-2016 Zend Technologies

[root@matrix700 ~]#
```

14. Auto-execute User Applications/Shell Scripts

14.1 Modify the /etc/rc5.d directory

To automatically start user applications after system boot-up, please edit a shell script to execute the program, and put that script file to the folder: ***/etc/rc5.d***.

```
[root@matrix700 rc5.d]#ls
S01networking@   S19nfscommon@   S60php-fpm@       S99stop-bootlogd
@
S02dbus-1@       S20atd@         S90crond@         S99usbgadget@
S09sshd@         S20hwclock.sh@  S92nginx@         S99webmin@
S12rpcbind@      S20nfsserver@   S99readyled@
S15mountnfs.sh@  S20syslog@      S99rmnologin.sh@

[root@matrix700 rc5.d]#
```

14.2 Modify the /etc/profile

To automatically start user shell scripts after system boot-up, please modify the ***/etc/profile*** accordingly.

15. Change the Welcome Message

The welcome message file is ***/etc/motd***, the default content is shown below, modify the content at your will.

```
[root@Matrix700 ~]#cat /etc/motd
Welcome to

      **                    **  **
      **              **        **
    **  **            **        **
    **  **      ****  ****  **  **    ******
  **      **    **    **    **  **          **
  **      **    **    **    **  **    ********
  **********    **    **    **  **  **      **
**          **  **    **    **  **  **      **
**          **  **      **  **  **    ********

For further information check:
http://www.artila.com/

[root@Matrix700 ~]#
```

16. Reboot the System

To re-boot the system, use the ***reboot*** command.

```
[root@Matrix700 ~]#reboot

Broadcast message from root@Matrix700 (ttyGS0) (Sun May 8 15:51:47
2016):
The system is going down for reboot NOW!
```

17. User Application Development

17.1 Install C/C++ Cross Compilation Toolchain

The following instructions are based on ***64-bit*** Ubuntu Linux environment:

Step 1, Download the toolchain installation script from Artila’s website, the URL is:
$wget http://www.artila.com/download/sama5/linux/deb/sdk/poky-glibc-x86_64-meta-toolchain-cortexa5t2hf-vfp-m-a501-toolchain-3.1.1.sh

Step 2, Execute the toolchain installation script.

$ sh poky-glibc-x86_64-artila-full-cmdline-cortexa5hf-vfp-toolchain-3.1.1sh

Step 3, Activate the environment settings.

$ source /opt/poky/3.1.1/environment-setup-cortexa5hf-vfp-poky-linux-gnueabi

17.2 Using the C Cross Compiler

Step 1: Execute ***$CC*** command to compile the C source file.

Step 2: Execute ***scp*** command to upload the compiled binary file to the Matrix IoT gateway.

```
$ cat hello.c
#include <stdio.h>

int main(){
printf("Hello World!\n");
return 0;
}

$ $CC -o hello_c hello.c

$ scp hello_c root@192.168.1.70:/home/root
root@192.168.1.70's password:
hello_c                                       100% 9800      9.6KB/s
   00:00

$
```

17.3 Using the C++ Cross Compiler

Step 1: Execute ***$CXX*** command to compile the C++ source file.

Step 2: Execute ***scp*** command to upload the compiled binary to the Matrix IoT gateway.

```
$ cat hello.cpp
#include <iostream>
using namespace std;
int main() {
cout << "Hello! World!\n";
return 0;
}

$ $CXX -o hello_cpp hello.cpp

$ scp hello_cpp root@192.168.1.70:/home/root
root@192.168.1.70's password:
hello_cpp                                     100%   11KB  10.9KB/s
   00:00

$
```

17.4 Using the Native C Compiler

User application can also be directly developed on the M-A5D35 based Matrix IoT gateways. By default, ***gcc*** toolchain is pre-installed on the M-A5D35 based Matrix IoT gateways.

```
[root@Matrix700 ~]#cat hello.c
#include <stdio.h>
int main()
{
 printf("Hello World!\n");
}

[root@Matrix700 ~]#gcc -o hello hello.c

[root@Matrix700 ~]#./hello
Hello World!

[root@Matrix700 ~]#
```

17.5 Using the Native C++ Compiler

17.5.1 Install the Native C++ Toolchain

Users can install the native C++ toolchain via ***apt-get*** command. Two packages are needed to build a C++ source file, the ***g++*** package and the ***g++-symlinks*** package.

- apt-get install ***g++ g++-symlinks***

17.5.2 Using the Native C++ Compiler

```
[root@Matrix700 ~]#cat hello.cpp
#include <iostream>
using namespace std;
int main() {
cout << "Hello World!\n";
return 0;
}

[root@Matrix700 ~]#g++ -o hello_cpp hello.cpp

[root@Matrix700 ~]#./hello_cpp
Hello World!

[root@Matrix700 ~]#
```

17.6 Using the Python Interpreter

17.6.1 Python 2 Support

The M-A5D35 based Matrix IoT gateways come with pre-built Python 2.7 interpreter.

```
[root@matrix700 ~]#python
Python 2.7.12 (default, Mar 19 2017, 00:10:10)
[GCC 6.2.0] on linux2
Type "help", "copyright", "credits" or "license" for more informati
on.
>>>
```

The Python ***pip*** package manager is also included by default. To upgrade the pip itself, execute the following command:

- **pip install –upgrade pip**

17.6.2 Python 3 Support

Users can also install Python 3 via the **apt-get** command.

- apt-get install ***python3-core***
- apt-get install ***python3-pip***
- touch /user/lib/python3.5/site-packages/easy-install.pth
- ***pip3*** install --upgrade pip
-

```
[root@matrix700 ~]#python3
Python 3.5.2 (default, Mar 19 2017, 01:00:38)
[GCC 6.2.0] on linux
Type "help", "copyright", "credits" or "license" for more informati
on.
>>>
```

-

```
[root@matrix700 site-packages]#pip list --format=columns
Package    Version
---------- -------
pip         9.0.1
setuptools 22.0.5
```

18. GPIO Operation

The M-A5D35 SoM comes a bunch of GPIO (General Purpose IO) pins.

By implementation, all M-A5D35's GPIO pins are controlled in **user space**.

The M-A5D35 CPU provides five banks of GPIOs shown as below:

GPIO Bank	Bank A	Bank B	Bank C	Bank D	Bank E
GPIO label	PA0-31	PB0-31	PC0-31	PD0-31	PE0-31
GPIO chip	gpiochip0	gpiochip32	gpiochip64	gpiochip96	gpiochip128
GPIO number	0-31	31-63	64-95	96-127	128-159
GPIO mapping	pioA0-31	pioB0-31	pioC0-31	pioD0-31	pioE0-31

For example, the GPIO **PA31**, which is located on the pin43 of the CN1 connector, is mapped to number **31** (31 = 0 + 31); the GPIO **PD30**, which is located on the pin45 of the CN1 connector, is mapped to number **126** (126 = 96 + 30).

Example 1, to set PA31 as output:

```
[root@matrix700 ~]#cd /sys/class/gpio/

[root@matrix700 gpio]#ls
export   gpiochip0  gpiochip128  gpiochip32  gpiochip64  gpiochip96
unexport

[root@matrix700 gpio]#echo 31 > export

[root@matrix700 gpio]#ls
export      gpiochip128 gpiochip64  pioA31
gpiochip0  gpiochip32   gpiochip96  unexport

[root@matrix700 gpio]#cd pioA31

[root@matrix700 pioA31]#ls
active_low  device  direction  edge  power  subsystem  uevent  value

[root@matrix700 pioA31]#echo 'out' > direction

[root@matrix700 pioA31]#echo 1 > value

[root@matrix700 pioA31]#echo 0 > value

[root@matrix700 pioA31]#cd ..

[root@matrix700 gpio]#ls
export      gpiochip128 gpiochip64  pioA31
gpiochip0  gpiochip32   gpiochip96  unexport

[root@matrix700 gpio]#echo 31 > unexport

[root@matrix700 gpio]#ls
export   gpiochip0  gpiochip128  gpiochip32  gpiochip64  gpiochip96
unexport

[root@matrix700 gpio]#
```

Example 2, to set PD30 as output:

```
[root@matrix700 gpio]#pwd
/sys/class/gpio

[root@matrix700 gpio]#ls
export   gpiochip0  gpiochip128  gpiochip32  gpiochip64  gpiochip96
unexport

[root@matrix700 gpio]#echo 126 > export

[root@matrix700 gpio]#ls
export      gpiochip128 gpiochip64  pioD30
gpiochip0  gpiochip32   gpiochip96  unexport

[root@matrix700 gpio]#cd pioD30

[root@matrix700 pioD30]#ls
active_low  device  direction  edge  power  subsystem  uevent  value

[root@matrix700 pioD30]#echo 'out' > direction

[root@matrix700 pioD30]#echo 1 > value

[root@matrix700 pioD30]#echo 0 > value

[root@matrix700 pioD30]#cd ..

[root@matrix700 gpio]#ls
export      gpiochip128 gpiochip64  pioD30
gpiochip0  gpiochip32   gpiochip96  unexport

[root@matrix700 gpio]#echo 126 > unexport

[root@matrix700 gpio]#ls
export   gpiochip0  gpiochip128  gpiochip32  gpiochip64  gpiochip96
unexport

[root@matrix700 gpio]#
```

For more detailed information please refer to https://www.kernel.org/doc/Documentation/gpio/sysfs.txt.

19. Install an USB Wi-Fi Dongle

The M-A5D35 based Matrix IoT gateways support USB Wi-Fi dongles. Current driver supports RT8192/RT5390 compatible hardware (e.g. ASUS USB-N10 Nano Wireless-N or WPER-172GN).

19.1 Install Hardware Driver

The USB Wi-Fi driver can be installed via apt-get utility.

```
[root@Matrix700 ~]#apt-get install kernel-module-rtl8xxxu linux-firmware-rtl8192cu
```

Install RT5390 driver via apt-get utility

```
[root@Matrix700 ~]#apt-get install kernel-module-rt2800usb linux-firmware-ralink
```

19.2 Modify the network interface configuration

The network interface configuration file path is ***/etc/network/interfaces***. A typical configuration example is listed below:

```
# Wireless interfaces
auto wlan0
iface wlan0 inet dhcp
    wireless_mode managed
    wireless_essid any
    wpa-driver nl80211, wext
    wpa-conf /etc/wpa_supplicant.conf
```

Be noted the last line of the above example, which specifies an additional configuration file for WPA settings. In this example, the WPA configuration file path is ***/etc/wpa_supplicant.conf***.

19.3 Modify the WPA configuration

Modify the ***/etc/wpa_supplicant.conf*** according to the Wi-Fi environment of your factory/office. A typical configuration example is listed below:

```
# WPA configuration

ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=0
update_config=1
ap_scan=1

# WEP example
network={
  ssid=”Artila”
  key_mgmt=NONE
  wep_key0=ABCABCABC
}

# WPA/WPA2 example
Network={
  ssid=”Artila”
  key_mgmt=WPA-PSK
  auth_alg=OPEN
  psk=”ABCABCABC”

}
```

19.4 Restart the wireless network interface

```
[root@Matrix700 ~]#ifdown wlan0

[root@Matrix700 ~]#ifup wlan0
```

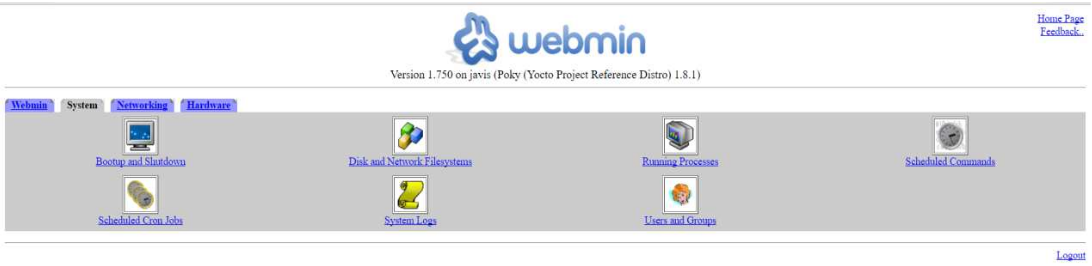
20. Webmin Support

The M-A5D35 based Matrix IoT gateways support the Webmin, which is a browser_based system management tool.

To access the Webmin, please visit https://192.168.2.127:**10000**,

Username: admin

Password: admin



Version 1.750 on javis (Poky (Yocto Project Reference Distro) 1.8.1)

21. Setup Eclipse IDE

Users can integrate the M-A5D35 tool chain into the Eclipse IDE. It can be downloaded the Eclipse IDE for **C/C++** Developers (**Luna**) from https://www.eclipse.org/downloads/packages/release/Luna/SR2

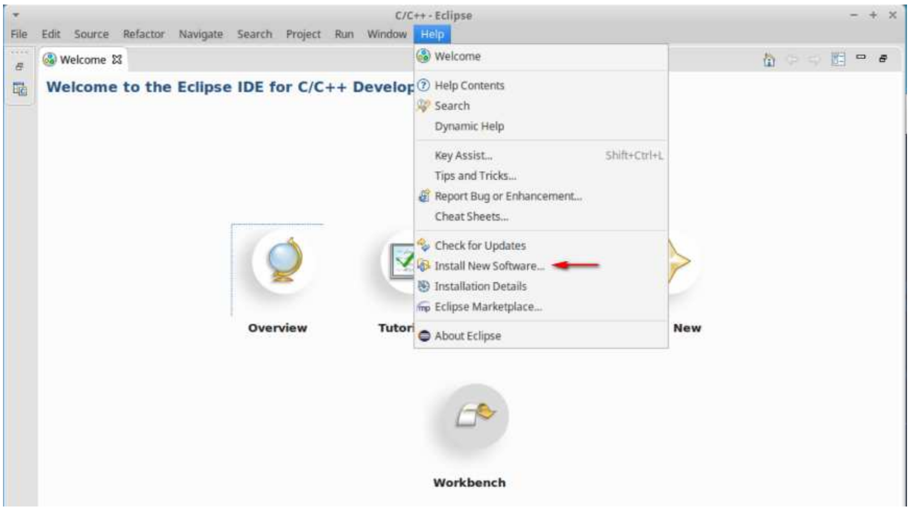
21.1 Configure the Eclipse IDE

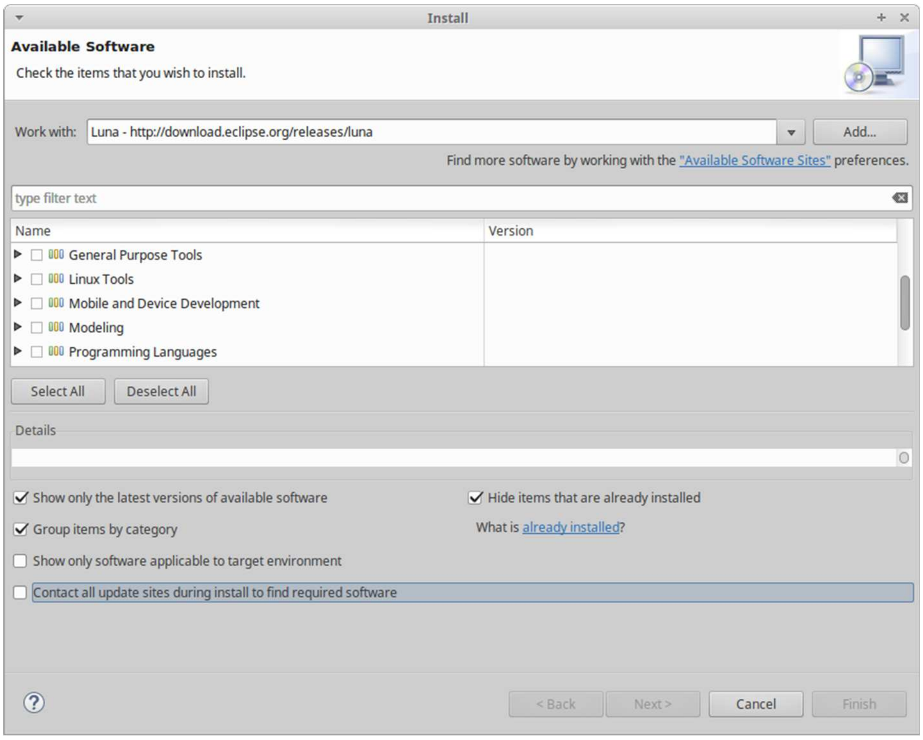
Step 1, Start the Eclipse IDE.

Step 2, From "Help" menu select "Install New Software"

- Add "Luna - http://download.eclipse.org/releases/luna".
- Select the following items (If these selections do not appear in the list, that means the items are already installed.)
  - Linux Tools
    - Linux Tools LTTng Tracer Control
    - Linux Tools LTTng Userspace Analysis
    - LTTng Kernel Analysis
  - Mobile and Device Development
    - C/C++ Remote Launch (Requires RSE Remote System Explorer)
    - Remote System Explorer End-user Runtime
    - Remote System Explorer User Actions
    - Target Management Terminal (Core SDK)
    - TCF Remote System Explorer add-in
    - TCF Target Explorer
  - Programming Languages
    - C/C++ Autotools Support
    - C/C++ Development Tools

Step3, Complete the installation and restart the Eclipse IDE



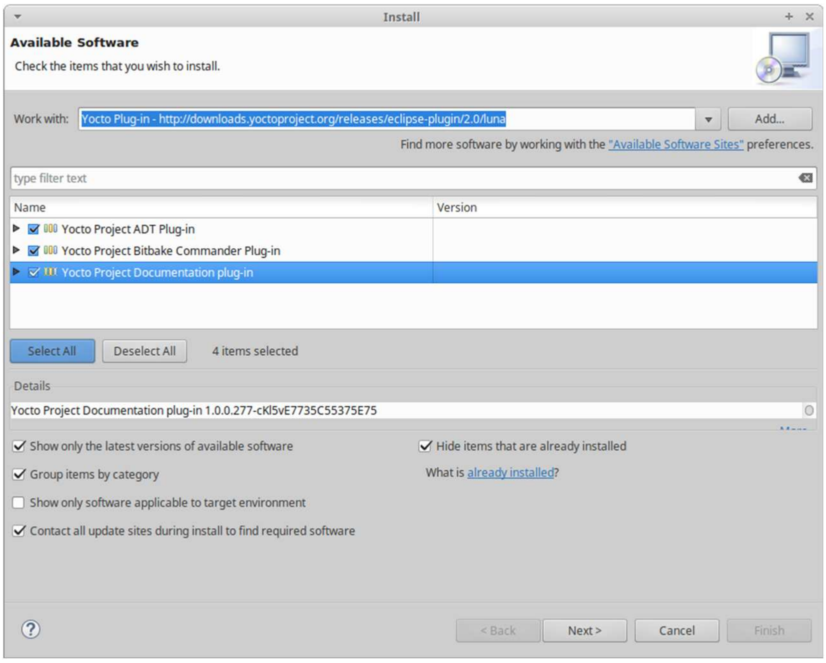

Install
Available Software
Check the items that you wish to install.
Work with: Luna - http://download.eclipse.org/releases/luna
Add...
Find more software by working with the "Available Software Sites" preferences.
type filter text
Name
Version
General Purpose Tools
Linux Tools
Mobile and Device Development
Modeling
Programming Languages
Select All
Deselect All
Details
☑ Show only the latest versions of available software
☑ Hide items that are already installed
☑ Group items by category
What is already installed?
□ Show only software applicable to target environment
□ Contact all update sites during install to find required software
< Back
Next >
Cancel
Finish

21.2 Install the Eclipse Yocto Plug-in

Step1, From the “Help” menu select “Install New Software”

- Add URL “http://downloads.yoctoproject.org/releases/eclipse-plugin/2.0/luna” and provide a meaningful name.
- Select the following items
  - Yocto Project ADT Plug-in,
  - Yocto Project Bitbake Commander Plug-in
  - Yocto Project Documentation plug-in.

Step2, Complete the installation and restart the Eclipse IDE



Install

Available Software

Check the items that you wish to install.

Work with: Yocto Plug-in - http://downloads.yoctoproject.org/releases/eclipse-plugin/2.0/luna

Find more software by working with the "Available Software Sites" preferences.

type filter text

Name	Version
☑ Yocto Project ADT Plug-in	
☑ Yocto Project Bitbake Commander Plug-in	
☑ Yocto Project Documentation plug-in	

4 items selected

Details

Yocto Project Documentation plug-in 1.0.0.277-cKl5vE7735C55375E75

☑ Show only the latest versions of available software

☑ Group items by category

☐ Show only software applicable to target environment

☑ Contact all update sites during install to find required software

☑ Hide items that are already installed

What is already installed?

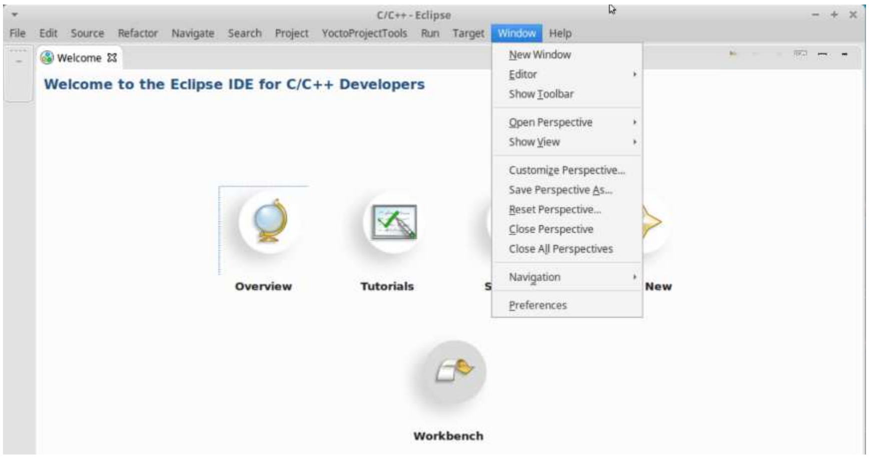
21.3 Configuring the Cross-Compiler Options

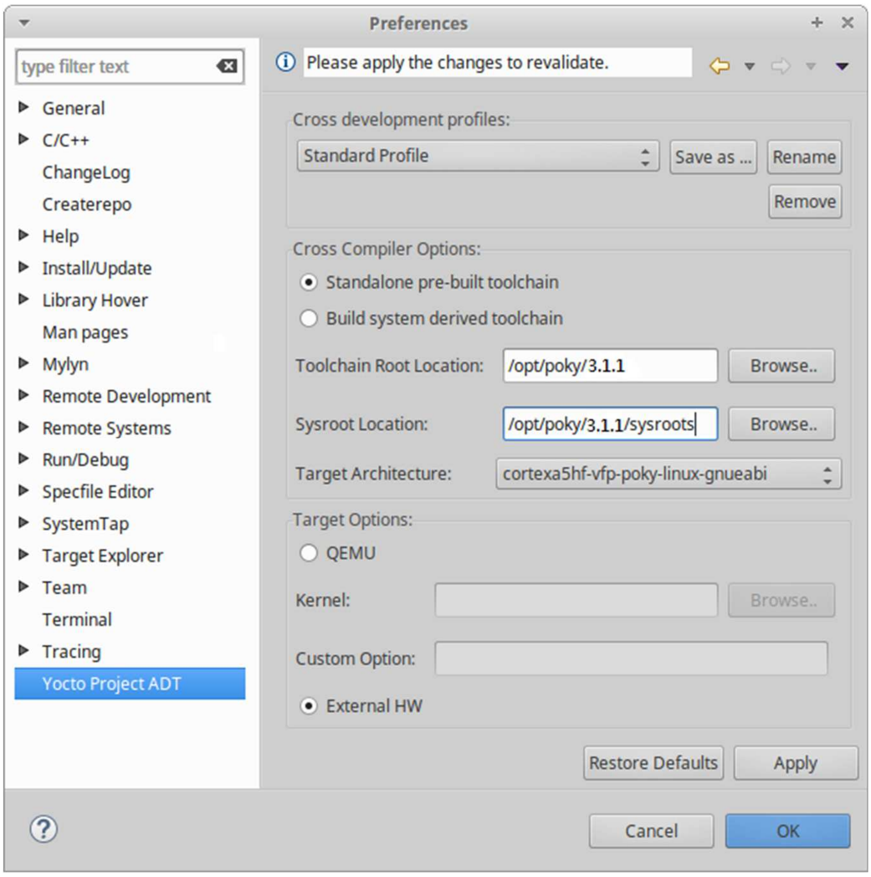
Step1, From the “Windows” menu select “Preferences”

Step2, Click "Yocto Project ADT" to display the configuration screen

Step3, Selecting the Toolchain Type: **Standalone pre-built toolchain**

- Point to the Toolchain: **/opt/poky/3.1.1**
- Specify the Sysroot Location: **/opt/poky/3.1.1/sysroots**
- Select the Target Architecture: **cortexa5hf-vfp-poky-linux-gnueabi**





Please apply the changes to revalidate.

Cross development profiles: Standard Profile

Cross Compiler Options:

● Standalone pre-built toolchain

○ Build system derived toolchain

Toolchain Root Location: /opt/poky/3.1.1

Sysroot Location: /opt/poky/3.1.1/sysroots

Target Architecture: cortexa5hf-vfp-poky-linux-gnueabi

Target Options:

○ QEMU

Kernel:

Custom Option:

● External HW

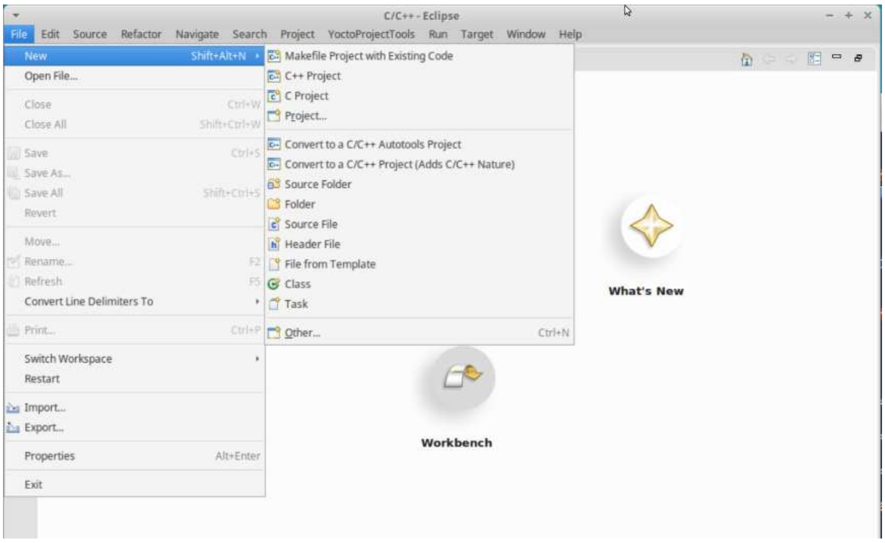
21.4 Create a Hello World Project

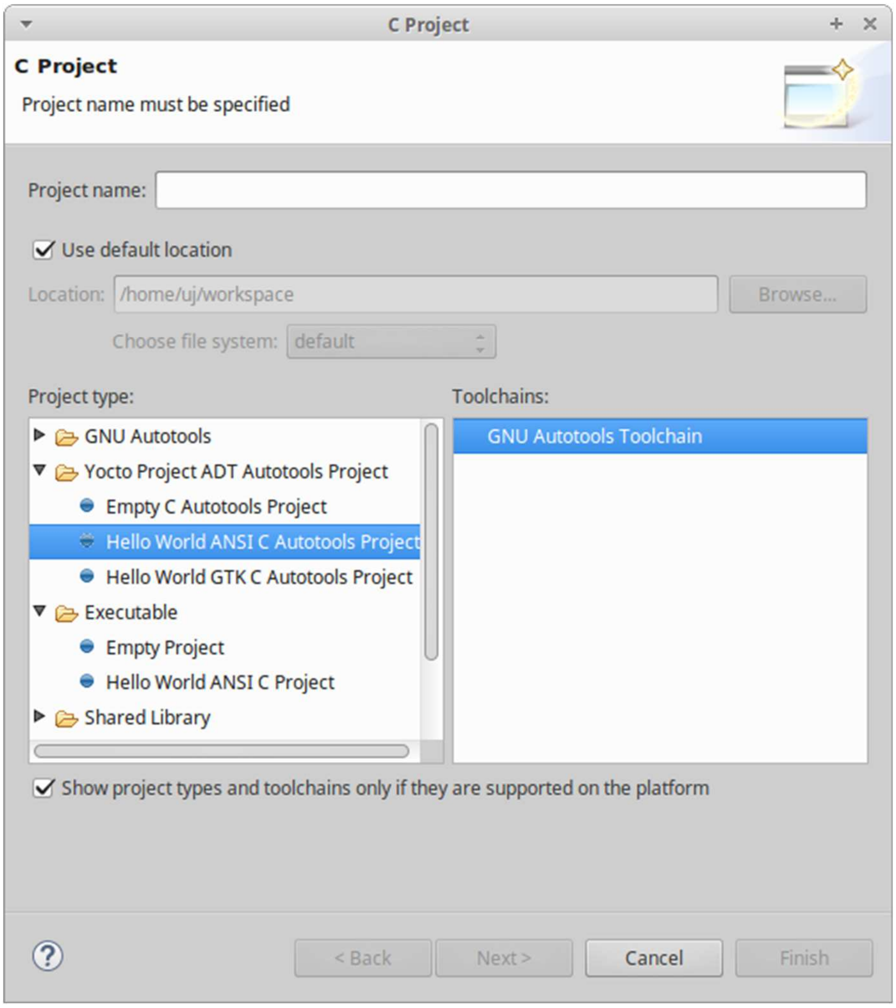
Step1, Select "Project" from the "File -> New" menu

- Double click C/C++
- Double click C Project to create the project
- Expand Yocto Project ADT Autotools Project
  select Hello World ANSI C Autotools Project.
  (This is an Autotools-based project based on a Yocto template)
- Put a name in the Project name field.
  (Do not use hyphens as part of the name)
- Click "Next".
- Add information in the Author and Copyright notice fields.
- Click "Finish".

Step2, Right-click in the navigation pane and select "Reconfigure Project" from the pop-up menu. This selection reconfigures the project by running autogen.sh in the workspace for your project.

Step3, To build the project select "Build Project" from the "Project" menu.





C Project

Project name must be specified

Project name:

☑ Use default location

Location: /home/uj/workspace

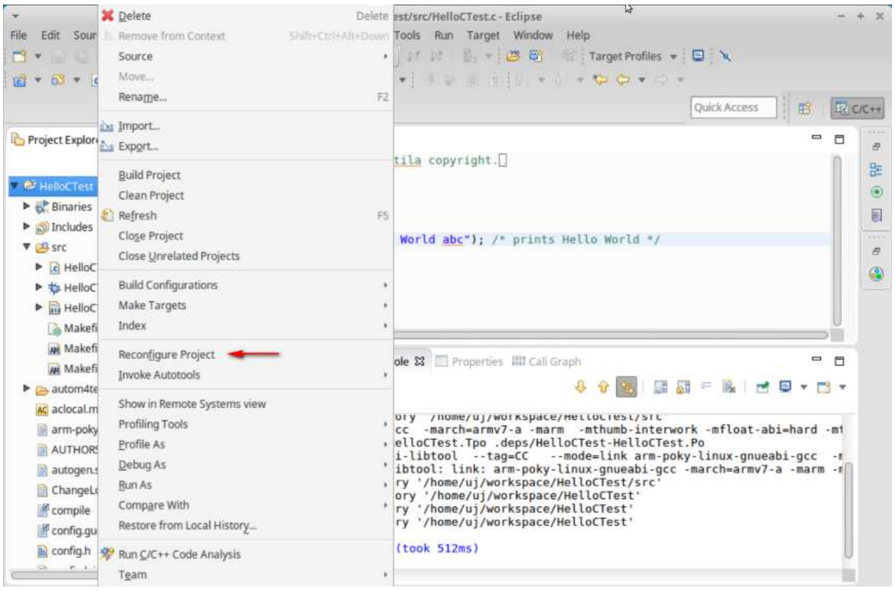
Choose file system: default

Project type:

- GNU Autotools
- Yocto Project ADT Autotools Project
  - Empty C Autotools Project
  - Hello World ANSI C Autotools Project
  - Hello World GTK C Autotools Project
- Executable
  - Empty Project
  - Hello World ANSI C Project
- Shared Library

Toolchains: GNU Autotools Toolchain

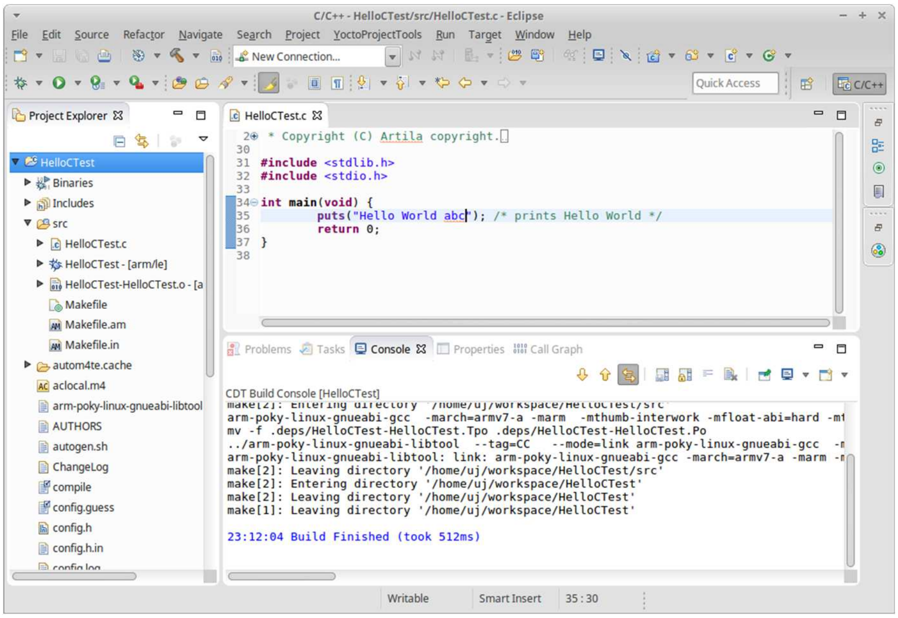
☑ Show project types and toolchains only if they are supported on the platform



```
tila copyright.
World abc"); /* prints Hello World */
```

```
ory '/home/uj/workspace/HelloCTest/src'
cc  -march=armv7-a -marm  -mthumb-interwork -mfloat-abi=hard -mt
elloCTest.Tpo .deps/HelloCTest-HelloCTest.Po
i-libtool  --tag=CC   --mode=link arm-poky-linux-gnueabi-gcc  -m
ibtool: link: arm-poky-linux-gnueabi-gcc -march=armv7-a -marm -m
ry '/home/uj/workspace/HelloCTest/src'
ory '/home/uj/workspace/HelloCTest'
ry '/home/uj/workspace/HelloCTest'
ry '/home/uj/workspace/HelloCTest'

(took 512ms)
```



```
 * Copyright (C) Artila copyright.

#include <stdlib.h>
#include <stdio.h>

int main(void) {
	puts("Hello World abc"); /* prints Hello World */
	return 0;
}
```

```
make[2]: Entering directory '/home/uj/workspace/HelloCTest/src'
arm-poky-linux-gnueabi-gcc  -march=armv7-a -marm  -mthumb-interwork -mfloat-abi=hard -mt
mv -f .deps/HelloCTest-HelloCTest.Tpo .deps/HelloCTest-HelloCTest.Po
../arm-poky-linux-gnueabi-libtool  --tag=CC   --mode=link arm-poky-linux-gnueabi-gcc  -m
arm-poky-linux-gnueabi-libtool: link: arm-poky-linux-gnueabi-gcc -march=armv7-a -marm -m
make[2]: Leaving directory '/home/uj/workspace/HelloCTest/src'
make[2]: Entering directory '/home/uj/workspace/HelloCTest'
make[2]: Leaving directory '/home/uj/workspace/HelloCTest'
make[1]: Leaving directory '/home/uj/workspace/HelloCTest'

23:12:04 Build Finished (took 512ms)
```

22. Setup miniPCIe (mPCIe) Power

The M-A5D35 based Matrix IoT gateways, Model Matrix-710 & 713, support the miniPCIe slot can be install LTE/4G/3G/WiFi …. module for wireless communication.

Following information shows how to turn on/off mPCIe power (GPIO: PA2, PA3)

Example 1, Turn on of mPCIe A (Matrix-713)

```
echo 2 > /sys/class/gpio/export
echo out > /sys/class/gpio/pioA2/direction
echo 0 > /sys/class/gpio/pioA2/value
```

Example 2, Turn off of mPCIe A (Matrix-713)

```
echo 1 > /sys/class/gpio/pioA2/value
```

23. Setup SIM card

The M-A5D35 based Matrix IoT gateways, Model Matrix-710 & 713, support the miniPCIe slot can be install LTE/4G/3G module for communication.
SIM Card setting is necessary before access by following:

NOTICE: Please unlock SIM PIN code first
Example: RYH2708
apt-get install kernel-module-cdc-acm kernel-module-pppoe kernel-module-ppp-mppe kernel-module-ppp-async ppp

configure /etc/ppp/peers/3g

```
/dev/ttyACM2 # modem port used
460800       # speed
defaultroute # use the cellular network for the default route
replacedefaultroute
noipdefault
usepeerdns    # use the DNS servers from the remote network
#nodetach     # keep pppd in the foreground
#nocrtscts    # hardware flow control
#lock         # lock the serial port
#noauth        # don't expect the modem to authenticate itself
#local        # don't use Carrier Detect or Data Terminal Ready
#persist
#demand
modem
#debug
# Use the next two lines if you receive the dreaded messages:
#
#    No response to n echo-requests
#    Serial link appears to be disconnected.
#    Connection terminated.
#
lcp-echo-failure 4
lcp-echo-interval 65535
connect    "chat -v -f /etc/ppp/chats/connect"
disconnect "chat -v -f /etc/ppp/chats/disconnect"
```

/etc/ppp/chats/connect

```
TIMEOUT 10
ABORT   'BUSY'
ABORT   'NO ANSWER'
# ABORT   'ERROR'
SAY    'Starting 3G connect script\n'

#""    'AT+CPIN="0000"'

# Get the modem's attention and reset it.

""     'ATZ'

# E0=No echo, V1=English result codes
#OK    'ATQ0 V1 E1 S0=0 &C1 &C2 +FCLASS=0'
#OK     'ATQ0 V1 E1 &C1 &C2 '
OK     'ATQ0'

# Set Access Point Name (APN)
OK     'AT+CGDCONT=1,"IP","internet"'

# Dial the number
ABORT   'NO CARRIER'
SAY    'Dialing...\n'
OK     'ATDT*99#'

CONNECT ''
```

/etc/ppp/chats/disconnect

```
""              "\K"
""              "+++ATH0"
SAY    "GPRS disconnected."
```

/etc/network/interfaces

```
# 3G PPP interface
#
# Example of a 3G ppp connection
#
auto ppp0
 iface ppp0 inet ppp
  provider 3g
```

Matrix-713 support Dual micro-SIM (GPIO: PA21) which Support cross-zone communication / seamless integration or dual-SIM for dual-LTE/4G/3G mPCIe module.

Dual SIM Ctrl

Import notes:

If config is change which restart the mPCIe power after.

Default: *

SIM_SW	mPCIe A	mPCIe B
*0	SIM A	SIM B
1	SIM A	NA

Example: Turn on and set 0

```
echo 21 > /sys/class/gpio/export
echo out > /sys/class/gpio/pioA2/direction
echo 0 > /sys/class/gpio/pioA2/value
```

24. Setup “STATUS” LED indicator

The M-A5D35 based Matrix IoT gateways, Model Matrix-713, support three “STATUS” LED indicators for user definition control by GPIO: A22, A23, A26

Example 1, Enable and turn on the LED1

```
echo 22 > /sys/class/gpio/export
echo out > /sys/class/gpio/pioA22/direction
echo 0 > /sys/class/gpio/pioA22/value
```

Example 2, Turn off and disable the LED1

```
echo 1 > /sys/class/gpio/pioA22/value
echo 22 > /sys/class/gpio/unexport
```

25. Setup Digital Input / Digital Output

The M-A5D35 based Matrix IoT gateways, Model Matrix-713, support 2x digital input and 2x digital output port.

DI / Digital Input (GPIO: D7, D21)
DO / Digital Output (GPIO: D19, D20)

Example 1, Read value of DI1

```
    cat /gpio/DI1/value
```

Example 2, Set High of DO1

```
    echo 0 > /gpio/DO1/value
```

26. Setup GNSS & IMU

The M-A5D35 based Matrix IoT gateways, Model Matrix-713, support GNSS and IMU as following:

GNSS (Global Navigation Satellite System)

- Support Dual Satellite: GPS & GLONASS
  Command: gpsmon

IMU (Inertial Measurement Unit)

- 1 x 3-Axis digital output Gyroscope
  Command: iio_info
- 1 x 3-Axis Accelerometer (G-Sensor)
  Command: iio_info
- 1 x 3-Axis Magnetometer (E-Compass)
  Command: apt-get install i2c-tools
  i2cdump -y 3 0x0c

27. Setup Audio Out

The M-A5D35 based Matrix IoT gateways, Model Matrix-713, support one Audio out as line-out R/L port, optional earphone R/L.

Command: aplay (support format type: voc, wav, raw or au)

Example: aplay sample.wav

28. Restore to Factory Default

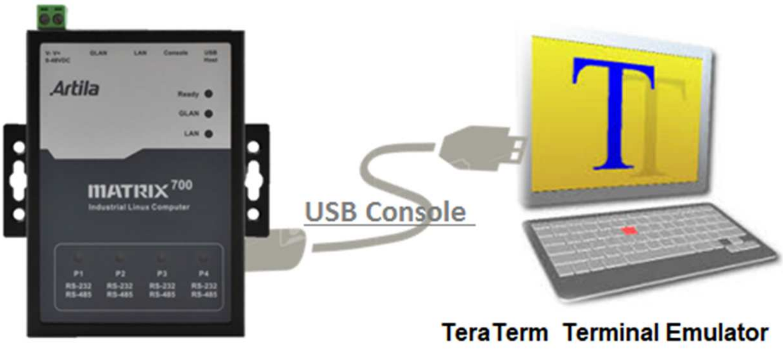
The following information shows how to restore to factory default:

Step 1,

Power-on Matrix-700 (“Ready” LED in green)

After system ready (“Ready” LED turns to yellow),

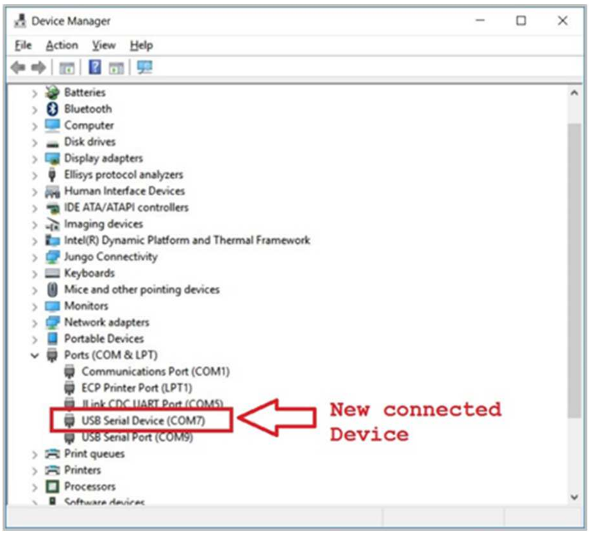
Connect the Matrix-700’s USB/serial console to a PC



Step 2,

It shows *USB Serial Device “COMx” at Device Manager / PC* Windows*:*

X : depends on your PC’s environment



New connected Device

Communicate via this Serial device (EX. By TeraTerm @115200,N81).

Step 3,

Execute the command “**restore factory” and “y”**, this command will force Matrix-700/710/713 to boot again to start the restore process.

```
# restore factory
Restore from factory, Sure?(y/n)
y
……
```

The **READY** LED will be blinking during the restore process

This process may take 20~30minutes.

USB/serial console is NOT accessible during the restore process.

After completed above steps, the Matrix-700/710/713 will automatically reboot again when the backup process is finished.

29. Backup the “File System” of Matrix-700/710/713

The following information shows how to restore to factory default:

Step 1,

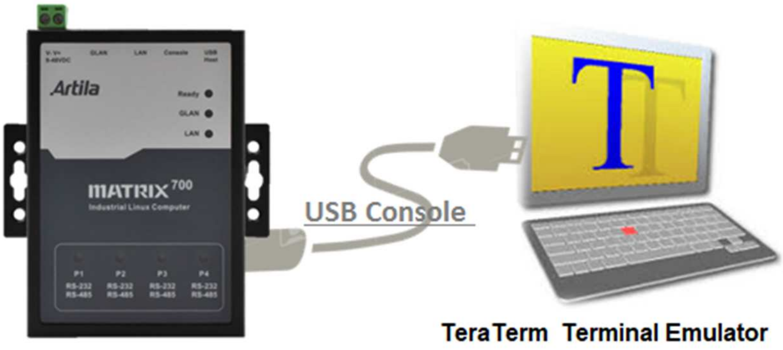
Insert an empty 16GB(or above) USB drive (FAT32 format). Let’s say the USB drive maps to **/dev/sda1**.

Step 2,

Power-on Matrix-700/710/713 (“Ready” LED in green)

After system ready (“Ready” LED turns to yellow),

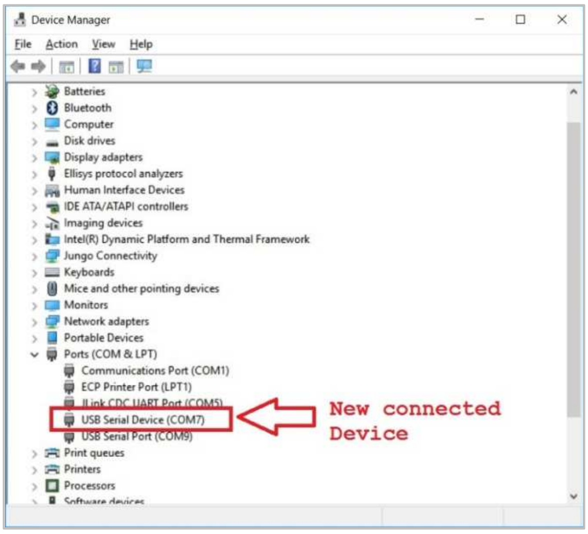
Connect the Matrix-700/710/713’s USB/serial console to a PC



Step 3,

It shows *USB Serial Device "COMx" at Device Manager / PC* Windows*:*

X : depends on your PC's environment



Communicate via this Serial device (EX. By TeraTerm @115200,N81).

Step 4,

Execute the command "**backup /dev/sda1"** and **"y"**, this command will force Matrix-700/710/713 to boot again to start the backup process.

```
# backup /dev/sda1
Backup to /dev/sda1, Sure?(y/n)
y
…….
```

The **READY** LED will be blinking during the backup process

This process may take **20~30** minutes

USB/serial console is NOT accessible during the backup process

After completed above steps, the Matrix-700/710/713 will automatically reboot again when the backup process is finished.

Remove the USB drive and keep it properly as the golden copy.

30. Restore the “File System” of Matrix-700/710/713

The following information shows how to restore to factory default:

Step 1,

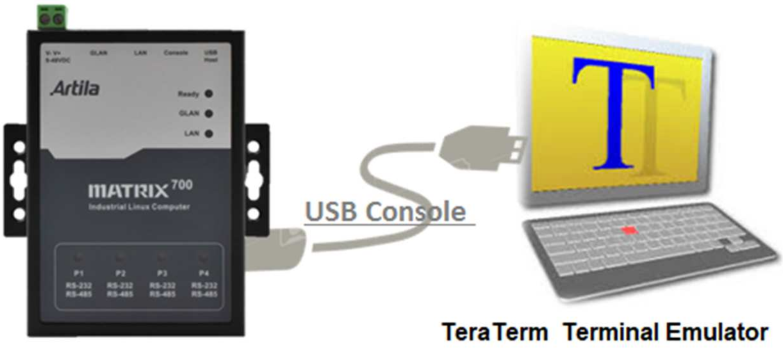
Insert the golden copy USB drive. Let’s say the USB drive maps to **/dev/sda1**.

Step 2,

Power-on Matrix-700/710/713 (“Ready” LED in green)

After system ready (“Ready” LED turns to yellow)

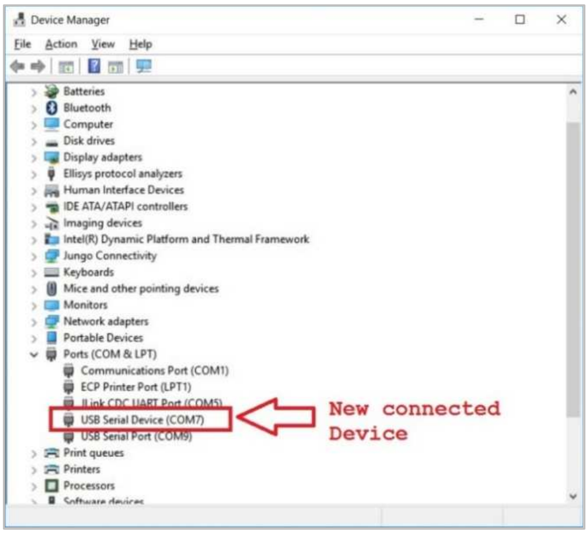
Connect the Matrix-700/710/713’s USB/serial console to a PC



Step 3,

It shows *USB Serial Device "COMx" at Device Manager / PC* Windows:

X : depends on your PC's environment



New connected Device

Communicate via this Serial device (EX. By TeraTerm @115200,N81).

Step 4,

Execute the command "**restore /dev/sda1"** and **"y"**, this command will force Matrix-700/710/713 to boot again to start the restore process.

```
# restore /dev/sda1
Restore from /dev/sda1, Sure?(y/n)
y
……
```

The **READY** LED will be blinking during the restore process,

This process may take 20~30minutes

USB/serial console is NOT accessible during the restore process.

After completed above steps, the Matrix-700/710/713 will automatically reboot again when the restore process is finished.

Remove the USB drive.