

# AdvLinuxTU

User Manual

## V1.0.8

**ADVANTECH**

*Enabling an Intelligent Planet*

**VICPAS**  
HMI Parts Center

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# 1. About This Manual

Thank you for choosing Advantech. This manual is for AdvLinuxTU\_1.0.8 and may be copied and distributed in any medium, either commercially or non-commercially.

## 2. AdvLinuxTU Overview

AdvLinuxTU is an embedded Linux system designed for Advantech embedded devices, and it is especially optimized for TPC/UNO/PPC/APAX series.

AdvLinuxTU can be installed on all Advantech devices theoretically, though it has been tested on TPC/UNO/PPC/APAX only.

### 2.1. Hardware Support List

We currently support the following products:

TPC-651T-ExAE, TPC-1251T-ExAE, TPC-1551T-ExAE, TPC-1751T-ExAE,  
TPC-1051WP-ExAE, TPC-1551WP-ExAE, TPC-1782H-433AE, TPC-8100TR,  
TPC-B500-633AE, TPC-B500-6C3AE, TPC-5152T-633AE, TPC-5152T-6C3AE,  
TPC-5172T-633AE, TPC-5172T-6C3AE, TPC-5212W-633AE, TPC-5212W-6C3AE,  
UNO-1372G-ExAE, UNO-2272G-J2AE, UNO-2483G, UNO-2271G-E2xAE,  
UNO-2484G-673xAE, UNO-3283G/3285G-674AE, PPC-3060S, PPC-3100S,  
APAX-5580-433AE, UNO-2372G, UNO-1372G-J021AE.

### 2.2. Kernel Version

The kernel version of AdvLinuxTU\_1.0.8 is 4.4.0.

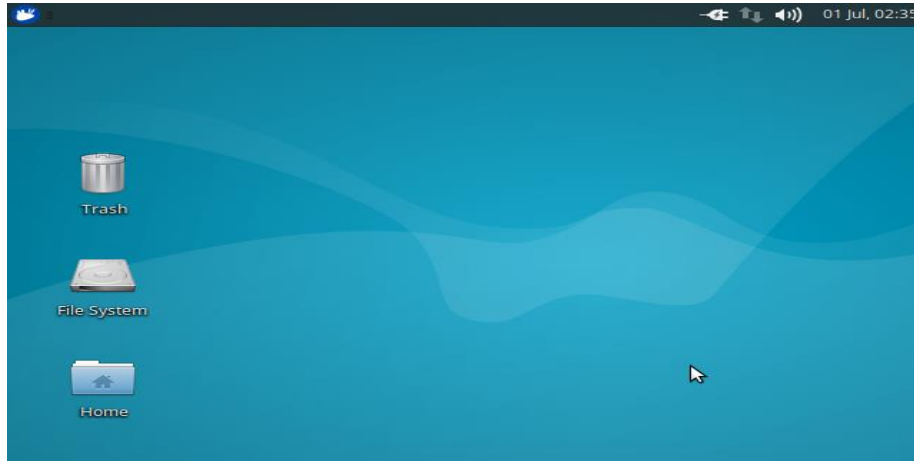
### 2.3. Main Features

AdvLinuxTU has many important features coming for industrial customers. Here we list some of them and give a brief introduction. We will explain them in detail in later sections.

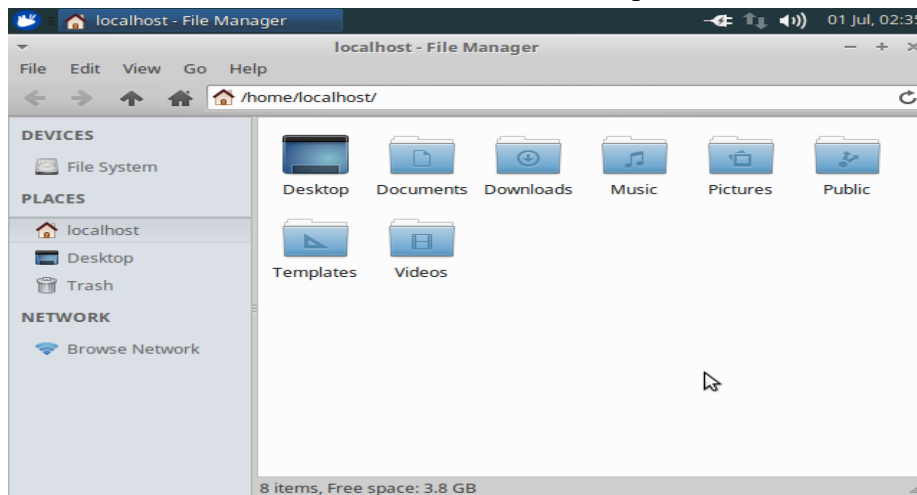
- Provide Embedded QT(based on frame buffer)runtime environment  
The user can run embedded QT application based on frame buffer.
- Real time kernel  
The user can install real time kernel to improve the real time performance.

- **Read-Only filesystem**  
This prevents any changes from occurring on the filesystem that may alter system behavior, and it allows a simple reboot to restore a system to its pristine state.
- **VNC support**  
The AdvLinuxTU provide remote desktop service named VNC server, user can use VNC client to connect the AdvLinuxTU remotely through internet to get the devices desktop and control the remote device.
- **Docker support**  
Docker is the company driving the container movement and the only container platform provider to address every application across the hybrid cloud. Today's businesses are under pressure to digitally transform but are constrained by existing applications and infrastructure while rationalizing and increasingly diverse portfolio of clouds, datacenters and application architectures. Docker enables true independence between applications and infrastructure and developers and IT ops to unlock their potential and creates a model for better collaboration and innovation.
- **Udisk upgrade tool support**  
The software has friendly interfaces and can easily upgrade the user's app in a way of "One-Click".
- **Auto login**  
The installation offers an auto login option; if the user chooses it, the user will be able to auto login to AdvLinuxTU after the installation.
- **USB installation support**  
The user can use UltraISO software to burn the AdvLinuxTU ISO to a USB disk with USB-HDD+ according to BIOS boot configuration. Then the user can install AdvLinuxTU from the USB disk.
- **Hardware auto detection**  
When installing AdvLinuxTU, the installation will detect the hardware automatically and install all drivers it needs. Therefore, once the installation is completed, no more drivers will be needed unless the user adds some other devices such as Advantech data collecting card to the embedded device.
- **Online Installation and Update**  
You can use apt-get command to install and update software, extending AdvLinuxTU functions.

## 2.4. AdvLinuxTU Screenshot



Picture 2-1 Default Desktop



Picture 2-2 Desktop Environment

## 3. Installation Guide

In this chapter, we will introduce the installation step by step.

### 3.1. System Requirements

Recommended requirements:

Storage size:

4 G or more

Memory size:

1 G or more

## 3.2. Prepare For Installation

We suggest that the user makes a copy of data in storage medium in order to prevent data damage in case of improper operation during installation.

If there's any other operating system already installed in computer, the user should determine whether to have the previously installed system remained in computer together with AdvLinuxTU. If yes, the user should know the system partition of the previous system and then partition the disk manually during the installation.

AdvLinuxTU can install from USB DVD Driver and USB disk.

- Install AdvLinuxTU from the USB DVD Driver:  
Burn the AdvLinuxTU ISO to a DVD disk. Then insert the DVD disk of AdvLinuxTU into the CD driver, set the BIOS to boot from CDROM and reboot the computer.  
**Note:** TPC/UNO/PPC/APAX devices have no built-in CDROM, so the user should connect to an external USB DVD driver to the target device.

- Install AdvLinuxTU from the USB disk:  
If there is no USB DVD driver, the user can also install the AdvLinuxTU from USB disk, we will introduce the way in the tail of this section.

**Note:**

**For TPC-651T-ExAE, TPC-1251T-ExAE, TPC-1551T-ExAE, TPC-1751T-ExAE, TPC-1051WP-ExAE, TPC-1551WP-ExAE, UNO-2272G-J2AE and UNO-2271G-E2xAE, UNO-2372G, UNO-1372G-J021AE. Please configure the BIOS before installation.**

**BIOS->Advanced->Miscellaneous Configuration->OS Selection [Windows 8.X].**

**For UNO-1372G-ExAE, please configure the BIOS before installation.**

**BIOS->Chipset->South Bridge->USB Configuration->OS Selection [Windows 8.X].**

**For PPC-3060S, PPC-3100S, please configure the BIOS before installation.**

**BIOS->Chipset->South Bridge->OS Selection [Windows 8.X].**

## 3.3. Install From USB Disk

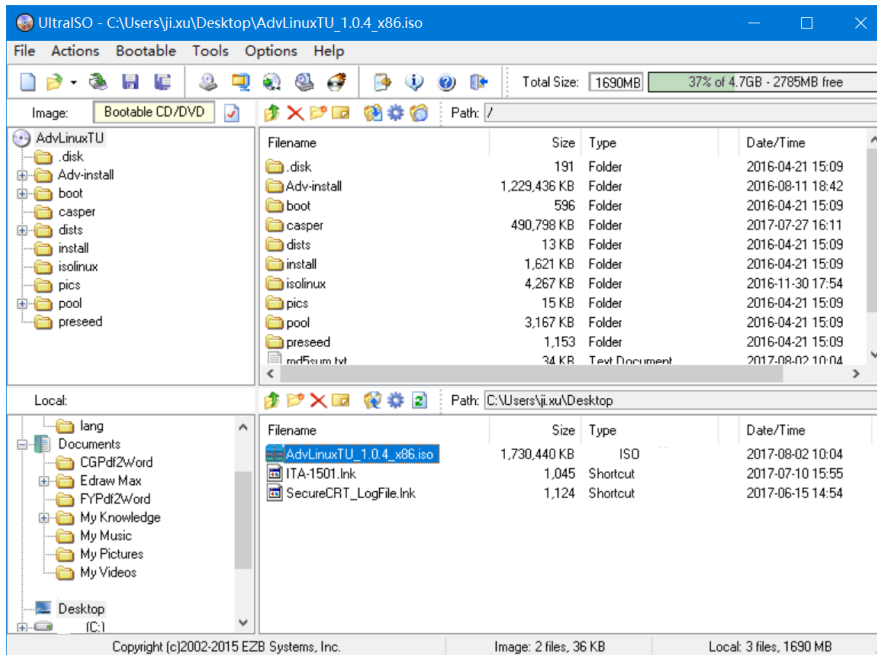
AdvLinuxTU supports installing from USB disk and it's unnecessary to burn the CD or DROM. Here we will give an example on how to install AdvLinuxTU form USB disk. In Windows (windows XP for example), insert the USB disk.

First you need to prepare a USB disk, the size of which should be larger than 2GB.

Launch UltraISO

Open ISO file

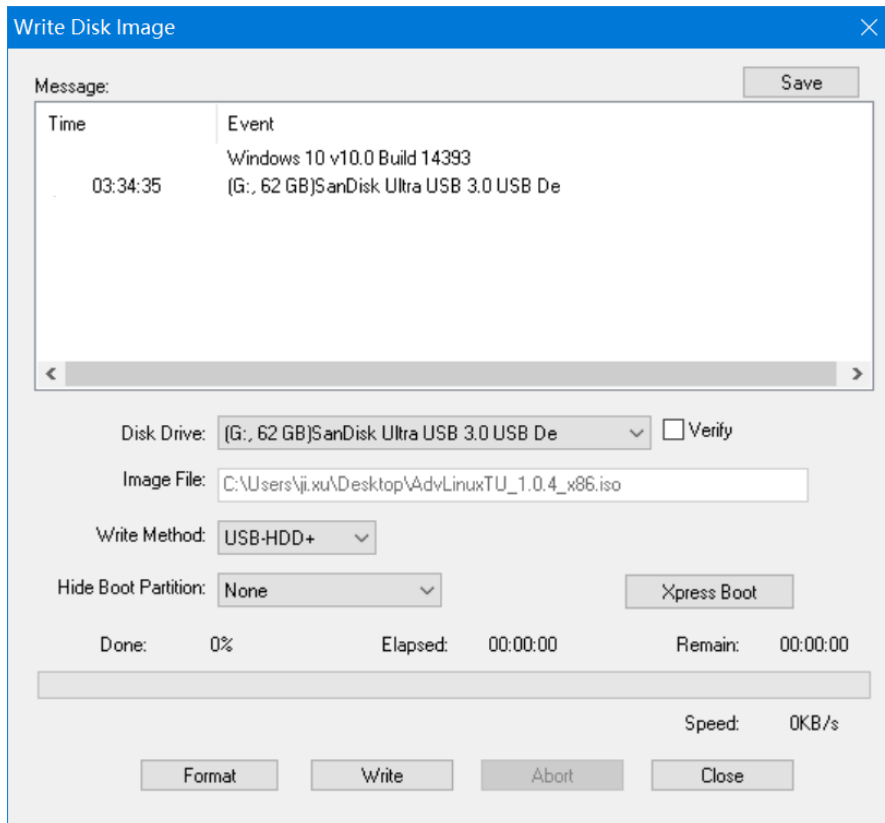
From menu File->Open Select AdvLinuxTU ISO file



Picture 3-1 Select and open the AdvLinuxTU ISO File

Burn ISO file to USB disk.

Select “Bootable->WriteDiskImage” from the menu. The write method depends on your device's BIOS, but in this version we do the test on USB-HDD+ only. Finally press “Write” to burn ISO to the USB disk.



Picture 3-2 Burn ISO to USB disk



Set the device to boot from USB disk, and the installation picture will show. The installation steps are the same as CDROM boot steps.

**Note:** In some devices, you should also set “Hard Disk Boot Priority” to “USB disk” in BIOS in order to boot from USB disk.

## 3.4. Installation Step

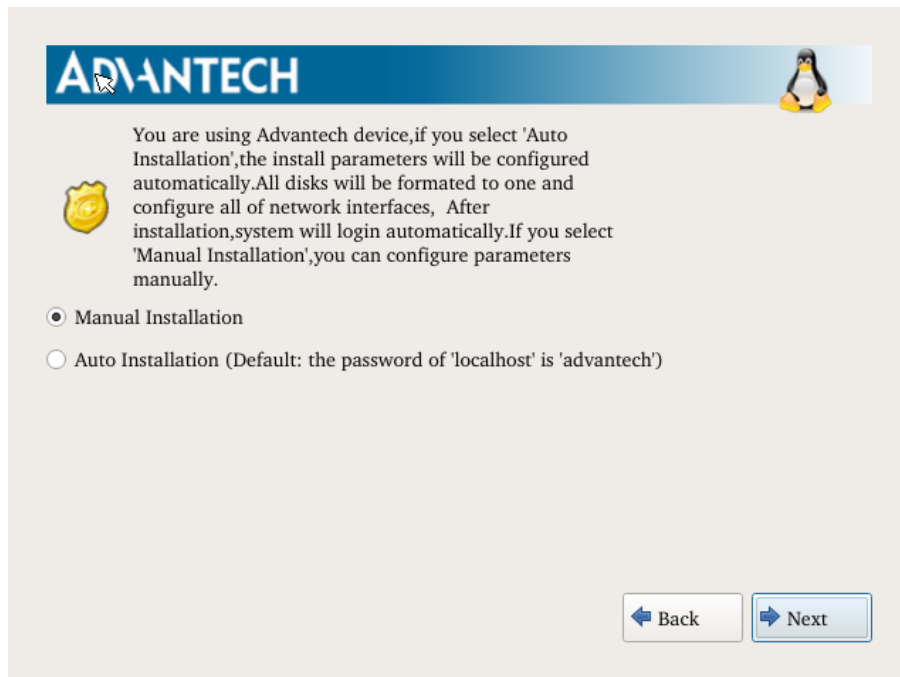
### 3.4.1. Step 1: Welcome Page For Graphic Installation

Please follow the introductions step by step to complete the installation. Click <Next> to continue the installation.



Picture 3-3 Welcome

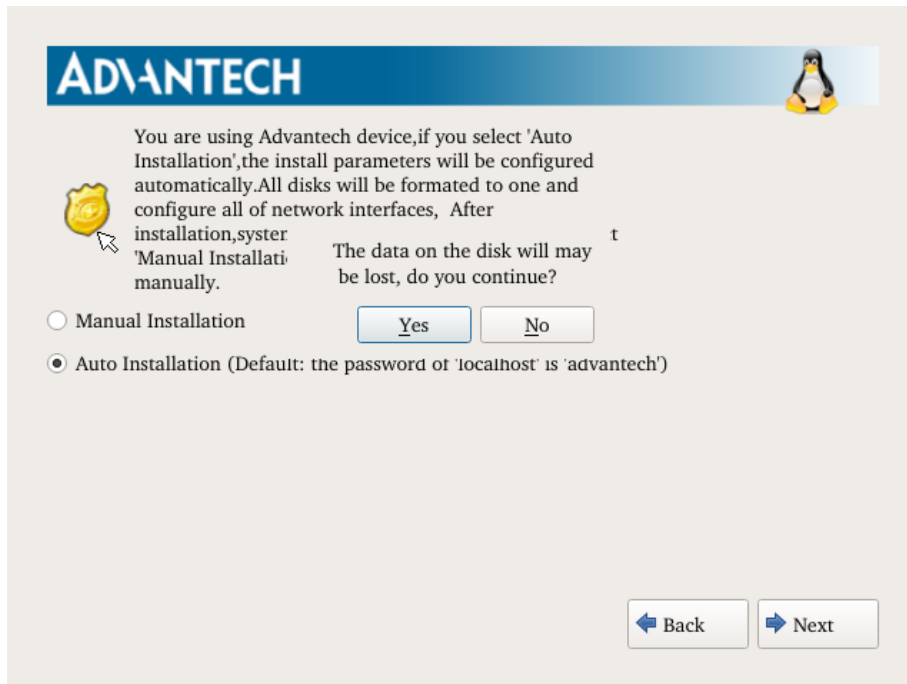
### 3.4.2. Step 2: Select Installation Process Type



Picture 3-4 Select installation process type

There are two installation types: “Auto Installation” and “Manual Installation”. If choosing “Manual installation”, the user will need to configure the system, including partition, hostname, password, time and so on, step by step. If choosing “Auto installation”, these configurations will be set by default(of course, the user can modify them after the installation is completed and the OS boots up).

**Note:** If choosing “Auto installation”, the entire disk will be formatted. All the data in the disk will be lost.

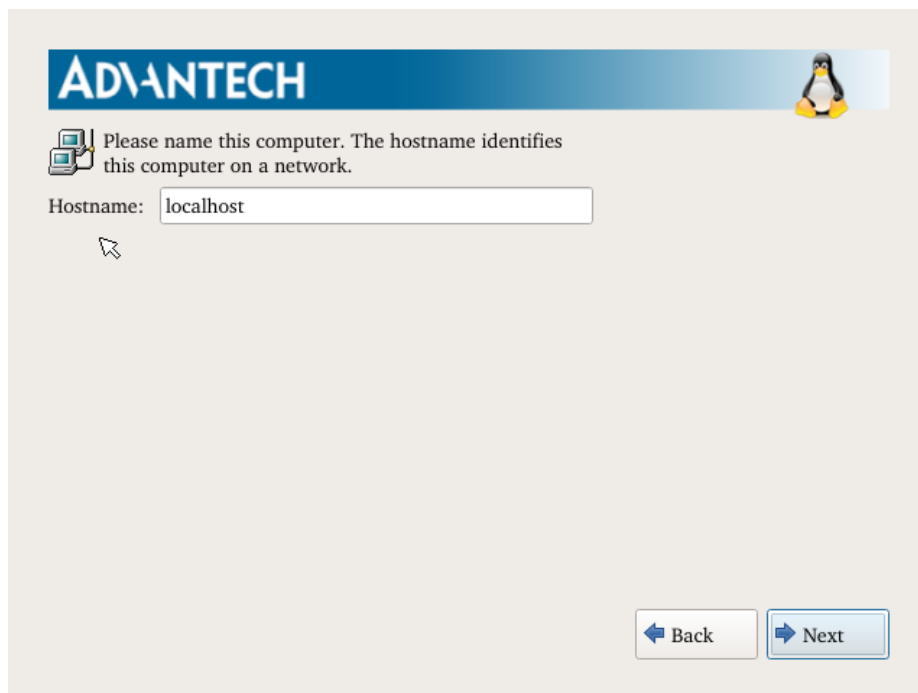


Picture 3-5 Select Auto installation process type

Click <Next> to continue the installation.

If the user chooses Auto installation, please go to Step 7 directly.

### 3.4.3. Step 3: Hostname Configuration



Picture 3-6 Set computer name

Set the hostname and click <Next>.

### 3.4.4. Step 4: Time Zone Configuration

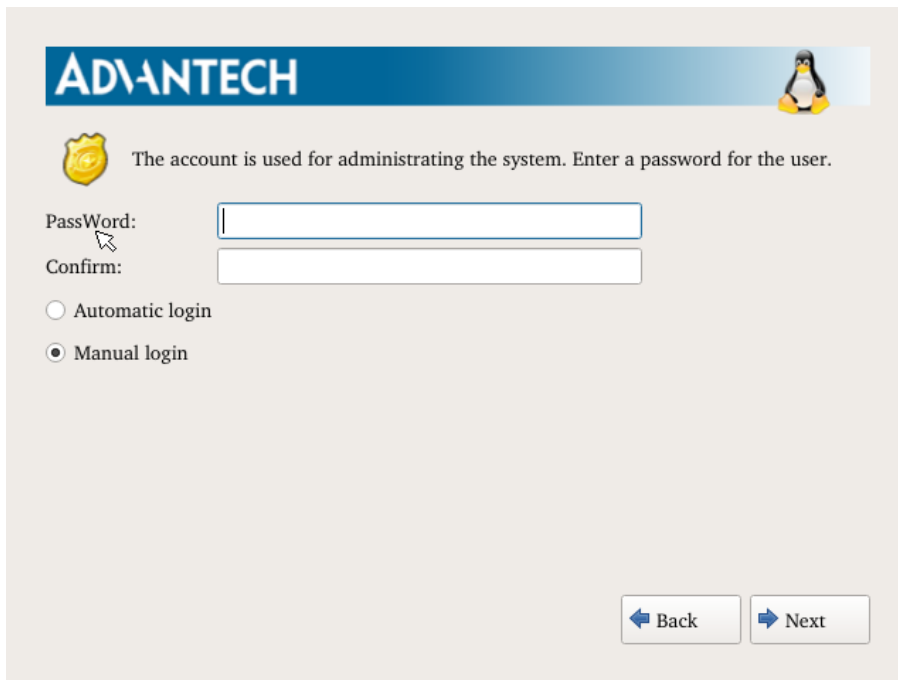


Picture 3-7 Time Zone configuration

The user can click on the yellow marks (when the yellow mark is clicked, the information about the selected address will be shown in the tool tip on the screen). The user can also select the time zone by using the drop-down list. Click <Next>. And then the user could set the password of user.

### 3.4.5. Step 5: Password Configuration

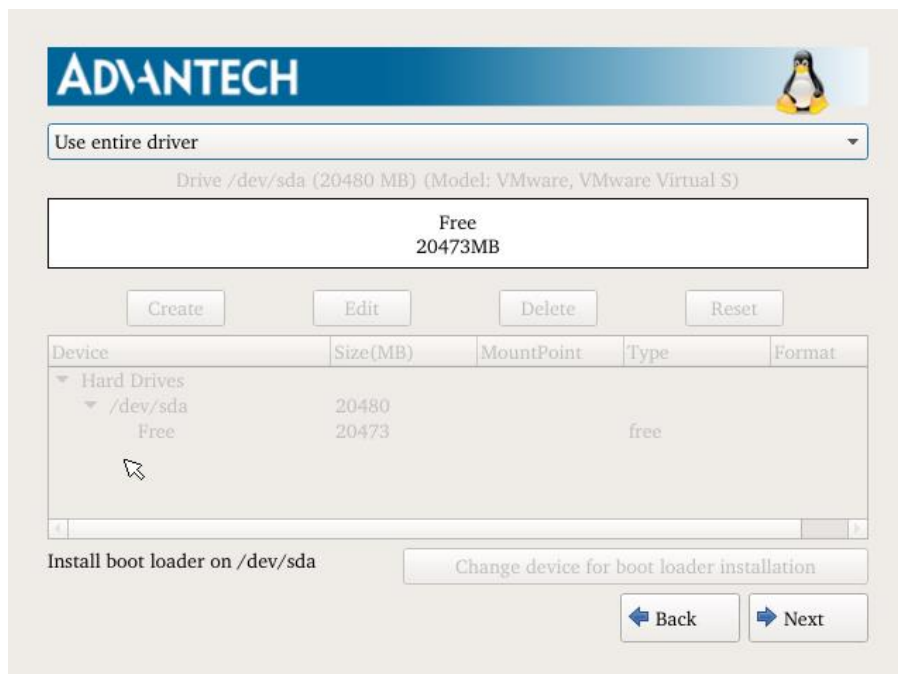
In this step, the user should set the password and select “Automatic login” or “Manual login”. If the user selects “Automatic login”, the AdvLinuxTU can auto login and there is no need to enter the password. In addition, AdvLinuxTU provides a normal user account whose username is “localhost”, and the password of “localhost” is “advantech”.



Picture 3-8 Set password

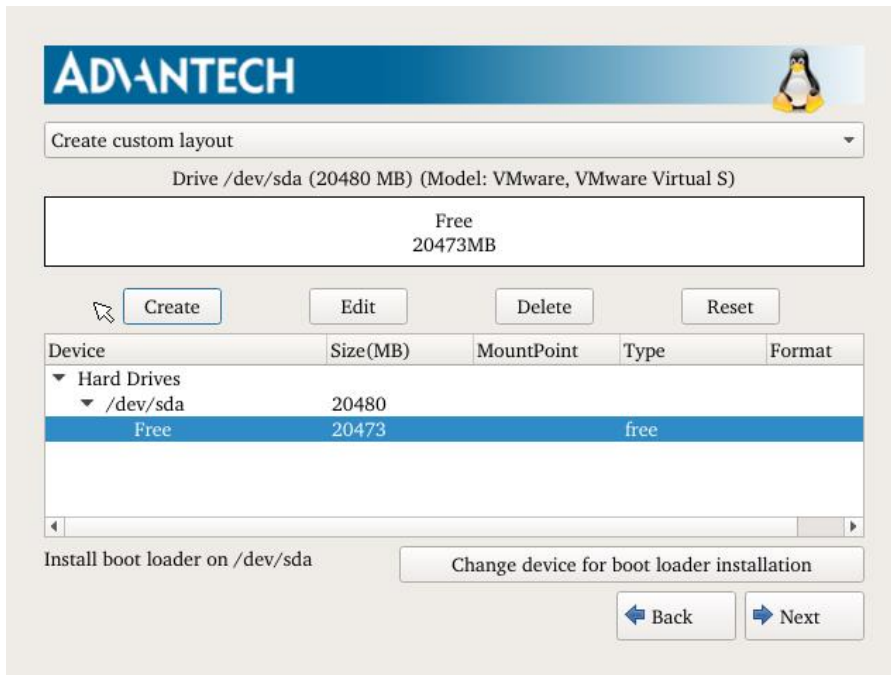
After the configuration, click <Next> to continue the installation.

### 3.4.6. Step 6: Disk Partition



Picture 3-9 Disk partitioning type selection interface

The user should choose the suitable partition type. If “Create custom layout” is selected, the following picture will appear:

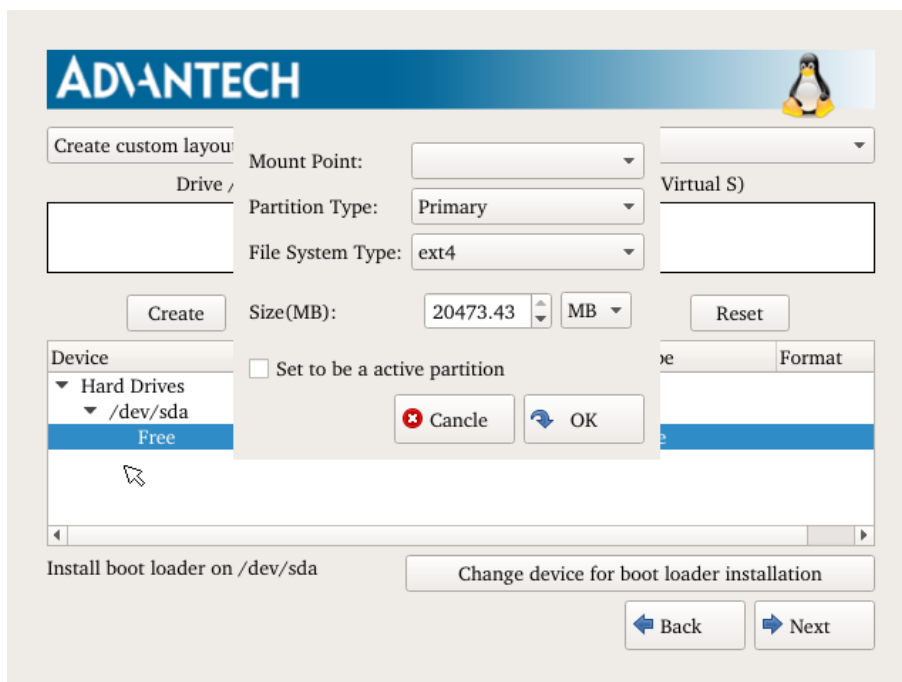


Picture 3-10 Manual partitioning interface

Manual partitioning is convenient. The user can edit, build and delete partitions as well as specify the size of partitions, format file system and set the mount point.

Create a new partition:

To install a system on a new partition, press the “Create” button on the main window to build a new partition. A dialog box will pop up(as shown below), allowing the user to specify partition parameters. AdvLinuxTU uses ext4 file system type by default.



Picture 3-11 Create a new partition

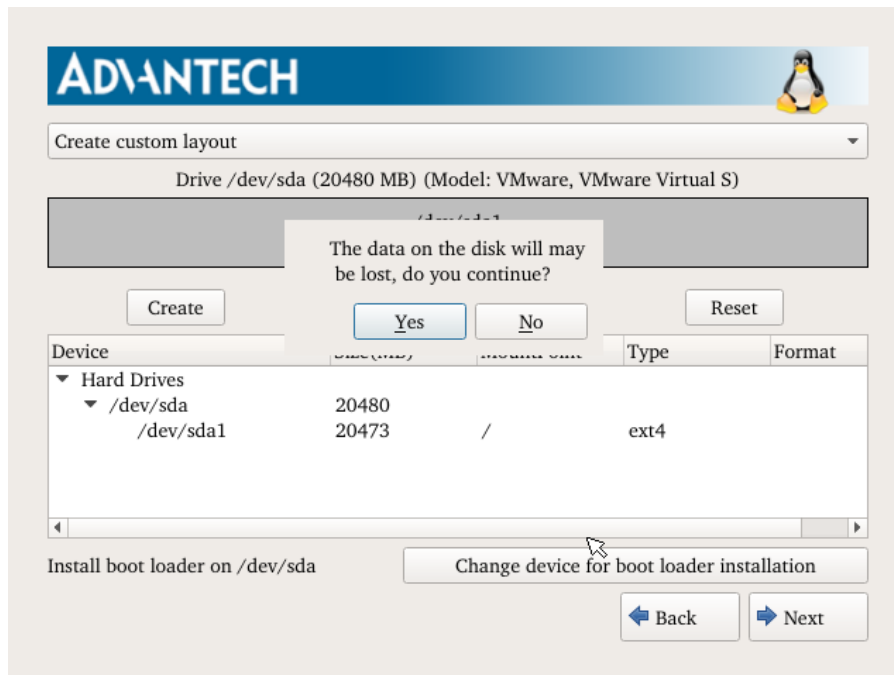
**Note:** For more excellent performance, build a swap partition if the disk space is sufficient. The space of this partition should be the same as that of the memory or better twice the memory space. If the user selects the “Auto installation” or “Use entire driver” mode, the installation will not build a swap partition.

➤ Delete a partition:

Press the “Delete” button on the main window to delete the selected partitions.

➤ Edit a partition:

Edit the selected partition's parameters. Select the existing partition to install the system. After the custom layout is created, click <Next>, and a warning box will be shown. Then click <Yes> to format the disk.



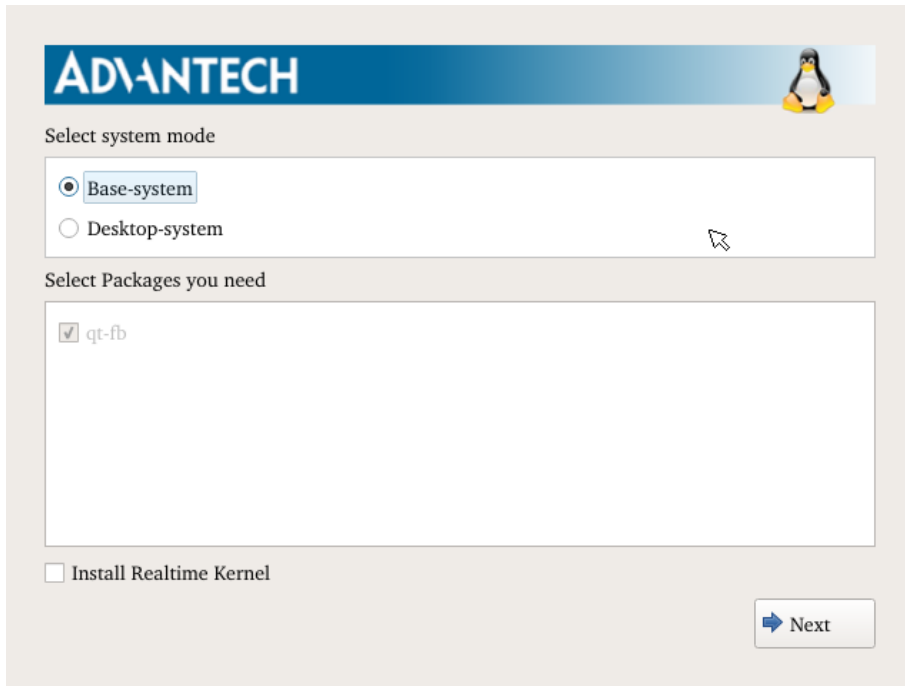
Picture 3-1 Format the disk

### 3.4.7. Step 7: Select OS Type To Install

There are two installation types:

- Base-system installation mode:  
Include elementary and necessary components.
- Desktop-system installation mode:  
Include X window using Xorg and XFCE window manager, basic development environment, and more tools.

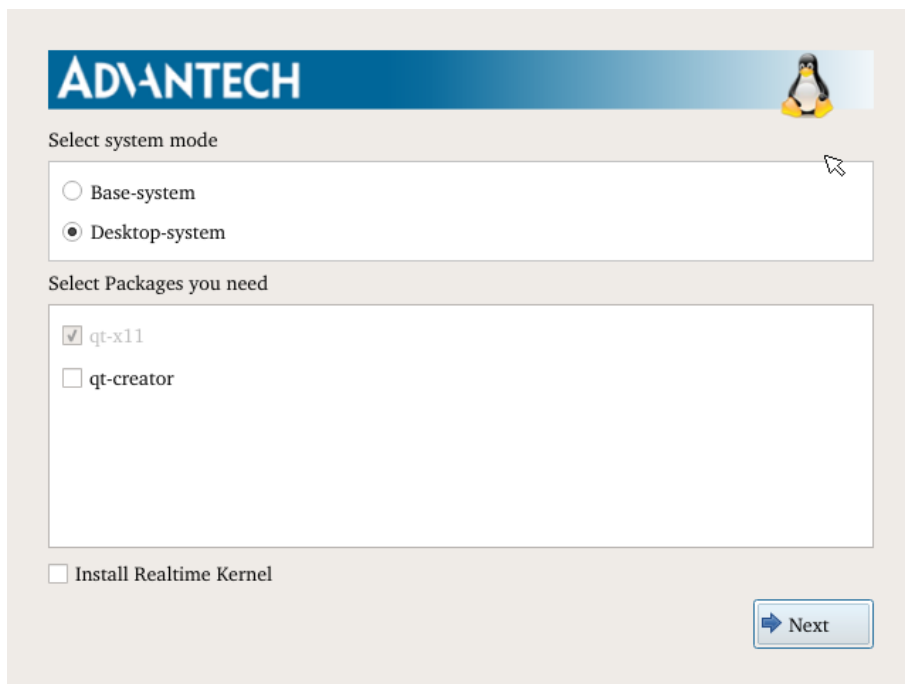
By choosing the Base-system type, the user can select other option packages in the list to extend the OS function on Base-system. It mainly contains packages as below:



Picture 3-2 Installation mode selection interface

- ✓ qt-fb: QT runtime environment based on frame buffer.

When the Desktop-system type is chosen, the user can select other option packages in the list below to extend the OS function of Desktop-system.



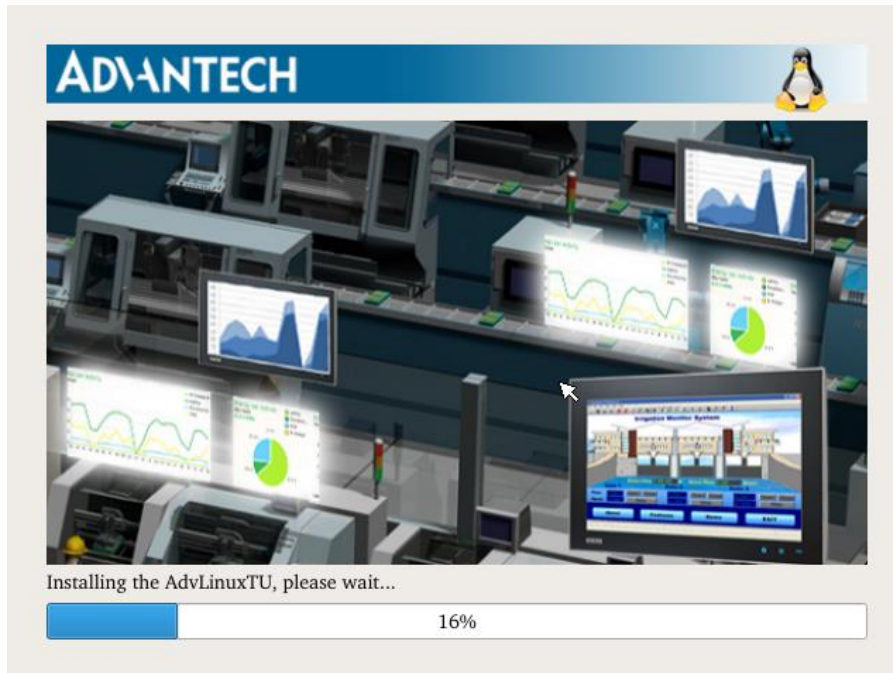
Picture 3-3 Installation mode selection interface

- ✓ qt-x11: qt based X11.
- ✓ qt-creator: QT Development environment.



After the installation type and tools are selected, click <Next> to continue the installation.

### 3.4.8. Step 8: Installation



Picture 3-45 Installation process interface

The time required for the installation process is relative to hardware performance. It can be several minutes.

### 3.4.9. Step 9: Congratulation

The installation completion picture is shown below.



Picture 3-16 Installation completion interface

After the installation is completed, please remove the CD from CDROM and press “reboot” to restart the system. Now the system installation is finished, please enjoy it!

## 4. Read only root file system

AdvLinuxTU1.0 can mount root file system with read-only or read-write mode according to the parameter setting in grub configuration file -- /etc/default/grub. Here are the steps you can use to select “Read Only system”.

```
#vim /etc/default/grub
```

And then delete “overlayroot=disabled”.

```
#update-grub
```

### Note:

1. When you install a multi-system, you need to modify the /boot/grub/grub.cfg and remove "overlayroot=disabled" in the last installed operating system.
2. By default, overlayroot will mount all filesystems under / in the specified mode. The configuration file is stored at /etc/overlayroot.conf. This can be prevented by adding another option to the configuration:

Change from "overlayroot="tmpfs "" to "overlayroot="tmpfs: recurse=0""

All of / will be protected from any modifications, except /data which is what you want to write.

## 5. Advantech Device Driver

AdvLinuxTU supports Advantech eAutomation products, and the related drivers, such as adsname and advec, will be installed in the folder /usr/src/advantech and loaded during the booting process. When the system boots up, all of these drivers will be loaded. Each driver is provided with test program which can be found in /usr/src/advantech/driver name/example/.

## 6. AdvLinuxTU X-Windows Introduction

### 6.1. X-Windows Overview

The Advantech Linux's Desktop-system is based on Xorg and xfce.

#### ➤ Xorg

It is a cost-free standard X server software with high configurability. All graphic cards on the market have certain configuration for Xorg.

For further details, please refer to <http://www.x.org/>

#### ➤ Xfce4

Xfce is a lightweight desktop environment for unix-like operating systems. It aims to be fast and lightweight, while still being visually appealing and user friendly. The system uses the version xfce4-4.12.

Official website: <http://www.xfce.org/>

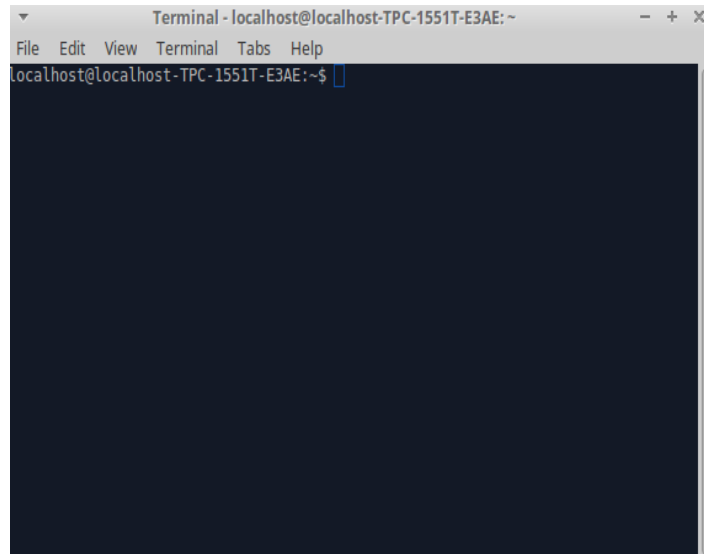
For further details, please refer to <http://docs.xfce.org/>

### 6.2. X-Windows Tools

AdvLinuxTU provides many tools based on X-Windows. Here we mainly introduce some important tools that the user may use frequently.

#### 6.2.1. X Terminal

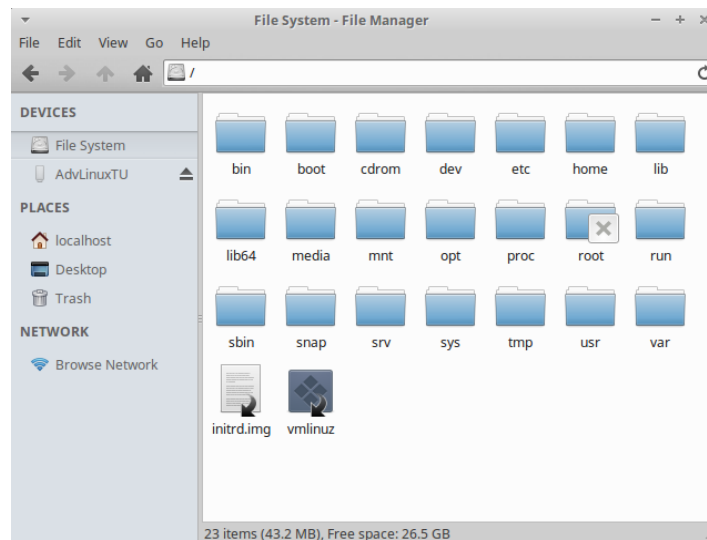
It is a terminal tool for X environment. It is applied to several Released versions of Linux.



Picture 6-1 X Terminal

### 6.2.2. Thunar

It provides folder management functions similar to windows and can be used to configure desktop icons. It follows the GPL.



Picture 6-2 Thunar

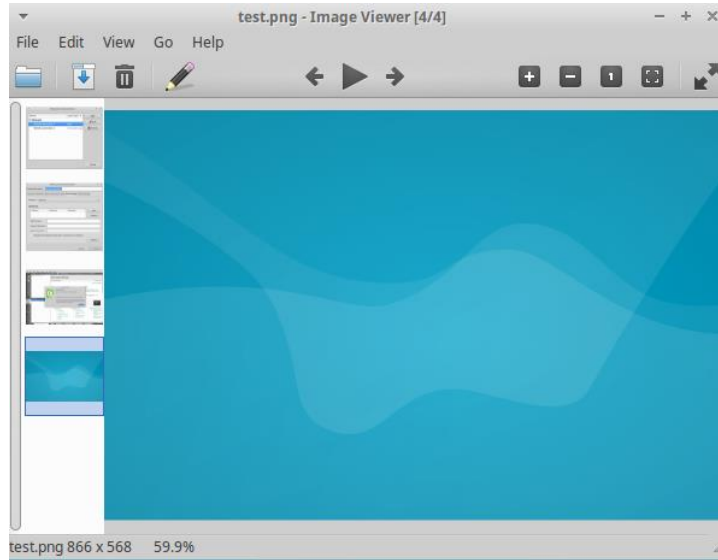
The system uses the version Thunar-1.6.10. Thunar is a fast and easy-to-use file manager for xfce desktop environment.

Official site: <http://thunar.xfce.org/>

### 6.2.3. Image Viewer

Ristretto is a fast and lightweight picture-viewer for the Xfce desktop environment.

Ristretto is different from other image viewers. You can navigate between images, view image thumbnails, run a slideshow, flip or rotate images. Ristretto does not do any basic image editing. But it is aware of the image editing applications and gives you options to open the images for editing in apps like GIMP.



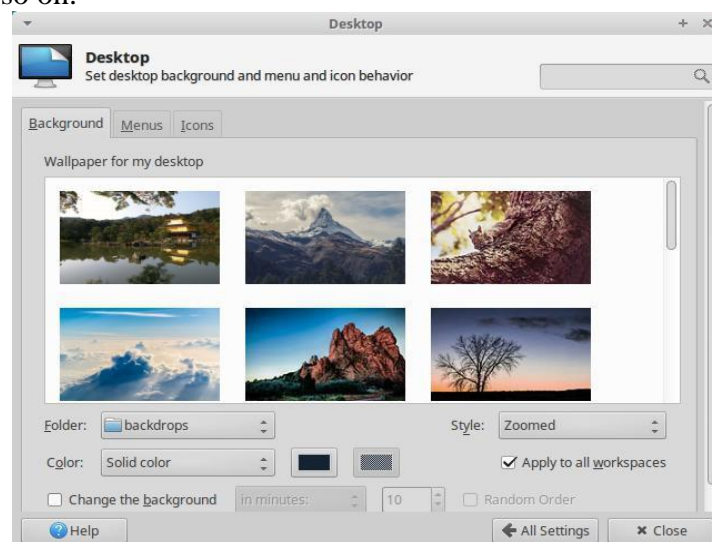
Picture 6-3 Lightweight picture-viewer Ristretto

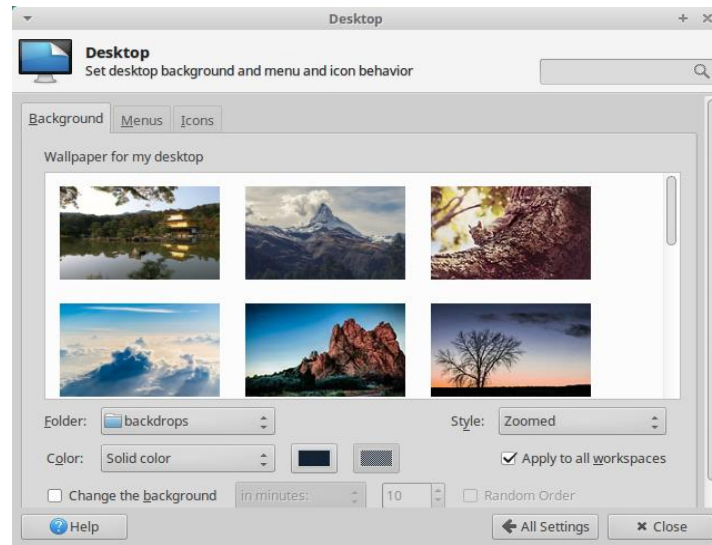
## 6.3. X-Windows Configuration

AdvLinuxTU provides many helpful tools, most of which can be opened from the XFCE setting manager, for user configuration. In the following sections, we will introduce some of them which are helpful for the user to configure the system.

### 6.3.1. Desktop Configuration

This allows XFCE to manage desktop; For example, changing desktop background color and setting desktop background image, adjusting brightness, changing desktop icons size and so on.

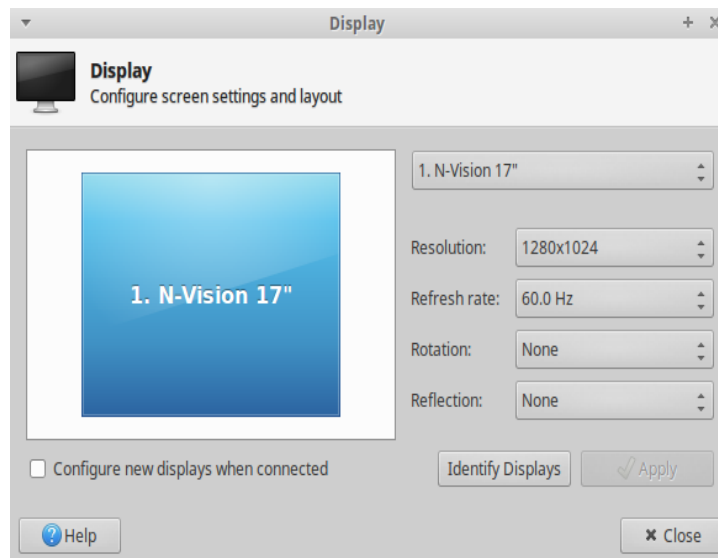




Picture 6-4 XFCE desktop setting

### 6.3.2. Resolution Configuration

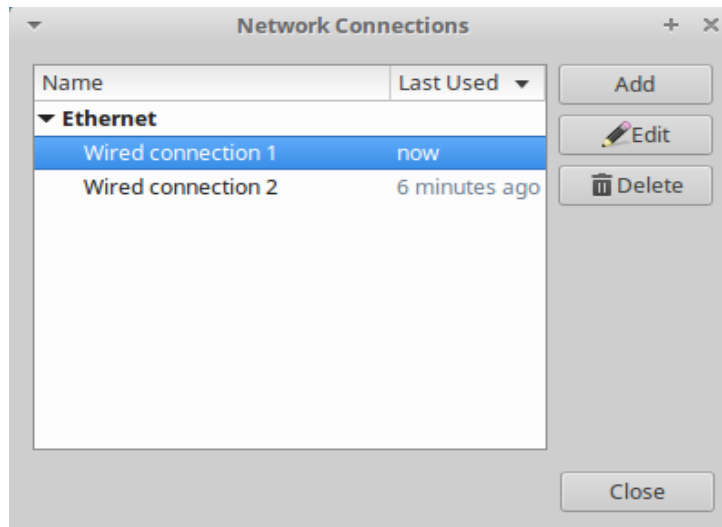
Select the Display item from list to change the Xorg resolution.



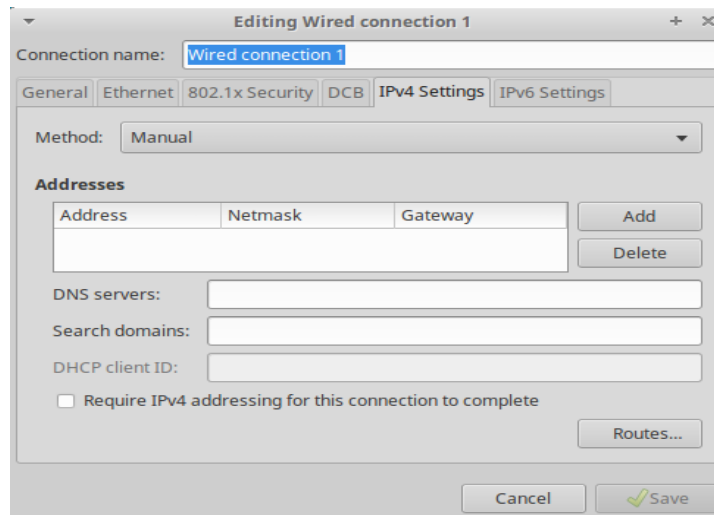
Picture 6-5 Resolution Setting

### 6.3.3. IP Configuration

The AdvLinuxTU Network has supported WIFI and Ethernet. It gets IP according to DHCP default. If you want to get IP by static, you can use “Network Connections”. To set static IP, you must restart the service of NetworkManager. Please run: `systemctl restart NetworkManager.service`.



Picture 6-6 Network Connections

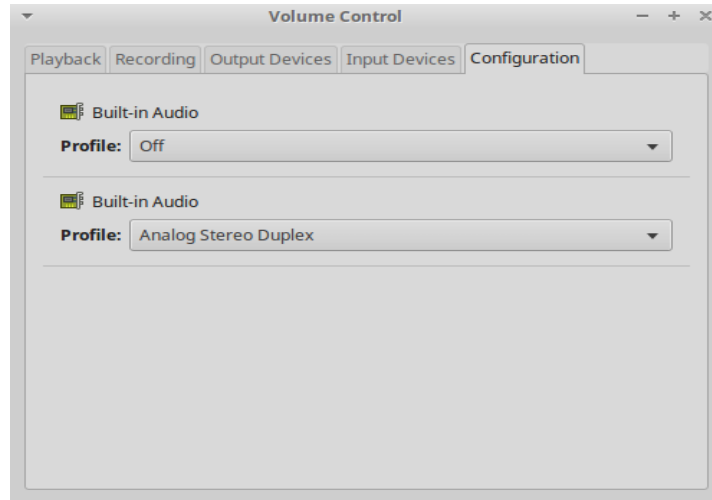


Picture 6-7 Network IP Setting

### 6.3.4. Sound Card Configuration

AdvLinuxTU provides Audio Devices Manager. Configuration method to take TPC-1782H-433AE as an example:

Desktop-system is already installed on this touch panel computer. If you want to select this device as an output audio device, please switch off “Digital Stereo (HDMI) Output” and switch on “Analog Stereo Duplex”. The correct configuration is as follows.



Picture 6-8 Sound Settings

Base-system is already installed on this touch panel computer. If you want to select this device as an output audio device, please switch off “Digital Stereo (HDMI) Output” and switch on “Analog Stereo Duplex”. The correct configuration is as follows.

Please run a command to list all the information and choose the appropriate profile.

```
$ pacmd list-cards
```

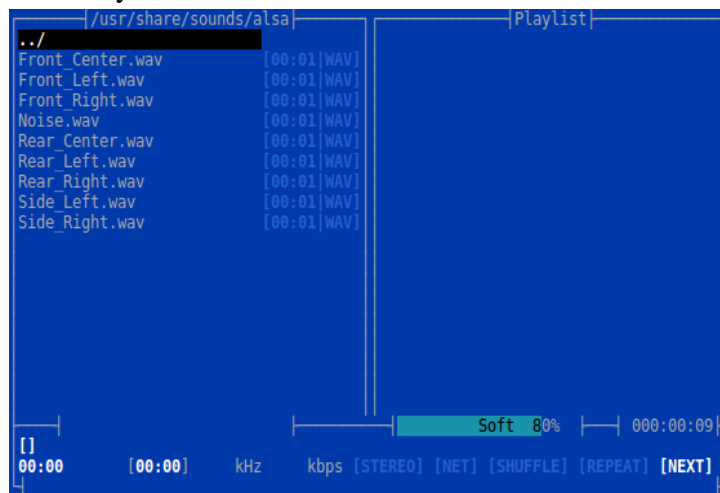
```
$ pacmd set-card-profile 0 off
```

```
$ pacmd set-card-profile 1 output:analog-stereo+input:analog-stereo
```

And then adjust the volume of the audio by MOCP.

```
$ mocp
```

The Console Audio Player tools will be shown as below.



Picture 6-9 Volume Setting

### 6.3.5. TPC/PPC Touch Screen Calibration

Advantech Linux supports Advantech TPC/PPC products, and it provides touch



screen driver, configuration files and calibration tools for TPC/PPC products.

A. Open a terminal and type the following command to check the device's hardware type.

```
$dmesg | grep eGalaxTouch
```

If there is any information about eGalaxTouch. You need to follow the following steps to calibrate.

```
#cd /usr/src/advantech/eGalaxTouch/  
#tar zxvf eGTouch_v2.5.5814.L-x.tar.gz  
#tar zxvf eGalaxMonitorMapping_release_20180131.tgz  
#cd eGTouch_v2.5.5814.L-x  
#./setup.sh  
#cd ../eGalaxMonitorMapping_release_20180131  
#./eGalaxMonitorMapping_x64  
#sync  
#reboot
```

Note:

Once the screen resolution is changed, the user should calibrate the touch screen first.

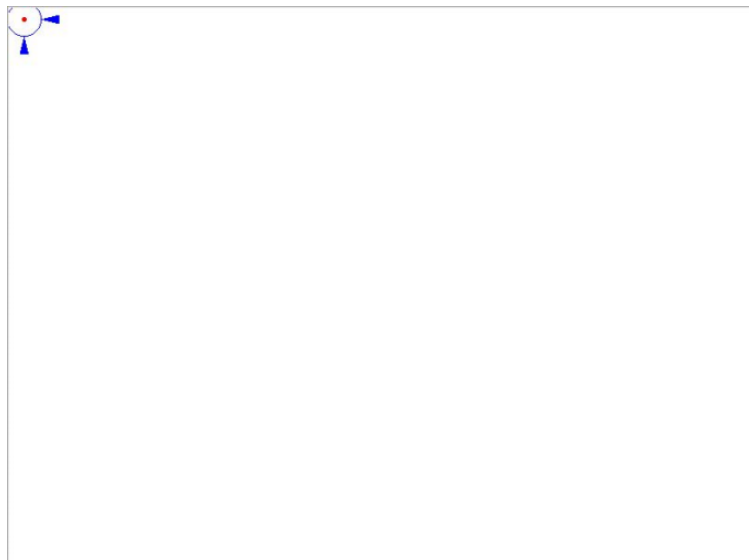
B. Open a terminal and type the following command to check the device's hardware type.

```
$dmesg | grep PenMount
```

If there is any information about PenMount. You need to follow the following steps to calibrate.

```
#gCal 16
```

The following picture will be shown:



Picture 6-10 Calibration Picture

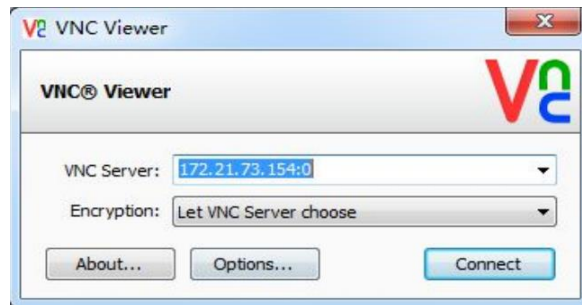
### 6.3.6. VNC server configuration

- 1) Switch to the “root” user to config VNC:
 

```
$su root
```
- 2) Set VNC password for vnc user:
 

```
#x11vnc -storepasswd
```
- 3) Start VNC server:
 

```
#x11vnc -rfbauth ~/.vnc/passwd -display :0
```
- 4) Use VNC viewer to connect to your VNC server:



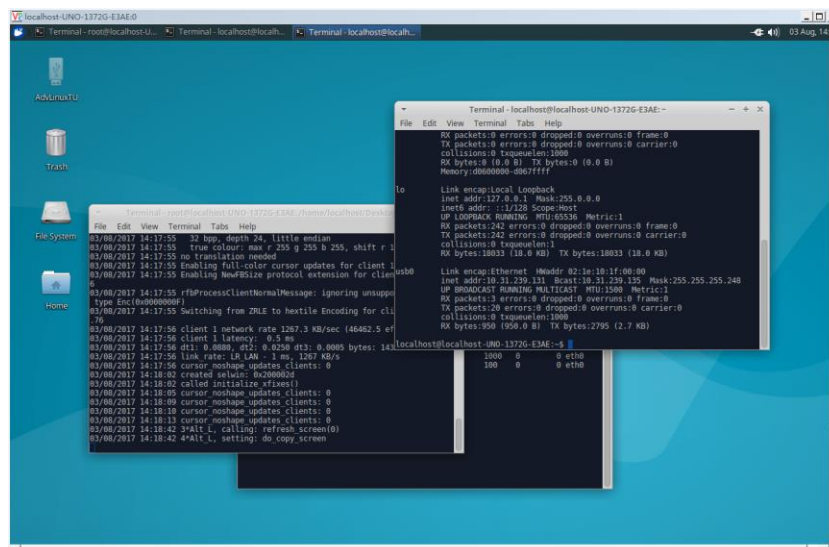
Picture 6-11 VNC Viewer

- 5) Type your VNC password to connect:



Picture 6-12 VNC Viewer

- 6) Now you can use AdvLinuxTU remotely:



## Picture 6-13 VNC Viewer

### 6.3.7. Boot Logo

AdvLinuxTU boot logo which can be found in  
/usr/share/plymouth/themes/xubuntu-logo/logo\_16bit.png and  
/usr/share/plymouth/themes/xubuntu-logo/logo.png. You can replace the picture to get  
what you want, and then run the command line in console.

```
#update-initramfs -u
```

### 6.3.8. Docker

In order to better solve Phasing out older devices`s problem, we now provide docker  
services that can run old systems on new devices through docker containers.

The tested systems and projects are as follows:

OS: AdvLinux2.5.7\_x86\_64, AdvLinux3.0.5\_x86\_64

Peripherals: Watchdog, Serial ports.

**Advanced:**

Customers may not have to worry about the redeployment of the Linux environment  
in the years to come.

**Note:**

Docker image cannot run in Read-Only file systems.

### 6.3.9. Udisk Upgrade tool

AdvLinuxTU is built a Udisk upgrade tool. If you want to use this function, login as  
'root' before executing the following instructions. Here's an example of the U-disk as  
/dev/sdb1.

```
$su
```

```
#mount /dev/sdb1 /mnt
```

Modify the U-disk label.

```
#mlabel -i /dev/sdb1 ::UPGRADEDISK
```

```
#cp -xarf /usr/src/advantech/adv_upgrade /mnt/
```

Change from /mnt/adv\_upgrade/app/test to your app.

```
#eject /dev/sdb1
```

And then insert the U-disk, the following interface will be displayed.



Picture 6-14 Upgrade tools

When you click “YES”, you will find `/home/adv_upgrade/user_app` is appearance. At this point, user 's app has been upgraded successfully. The customer can change the directory “`/home/adv_upgrade/`” into the actual directory in the “`/usr/src/advantech/adv_upgrade/script/upgrade.sh`”.

**Note:**

1. We can customize the encryption service according to the customer's needs.
2. This function is only available on the Desktop-system.

### 6.3.10. 3G/4G support

By default, AdvLinuxTU has support 3G/4G. When you configure the 3G/4G module, here are some tips you may see: “choose password for new keyring” in dialog. In the dialog, you should click “Continue” to ensure that the keyring`s password is “NULL”, otherwise the Network Connections utility`s crash will be occurring.

**Note:**

1. if the network icon is missing, you should run command line in console to start the service.  
`$nm-applet &`
2. When you can't visit the domain name, kill the process of the “`/usr/sbin/dnsmasq`”.  
`#ps -ef | grep dnsmasq`  
`#kill -9 dnsmasq.PID`

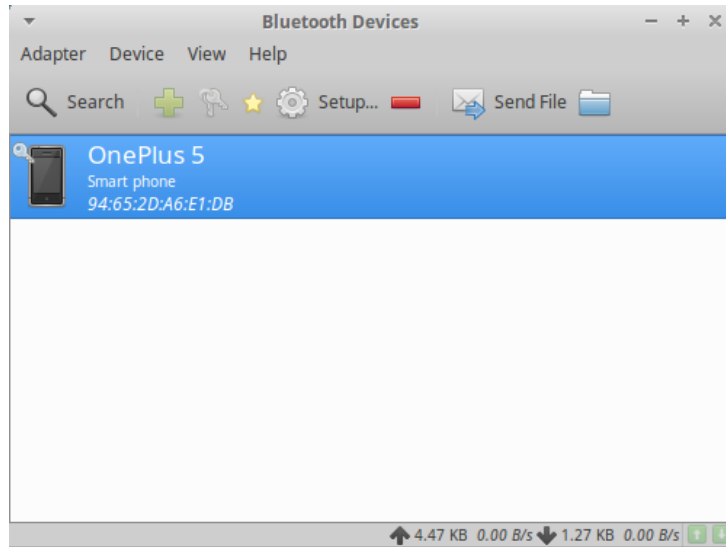
### 6.3.11. Bluetooth support

By default, AdvLinuxTU has support bluetooth. When you insert the Bluetooth module, its icon will be displayed.



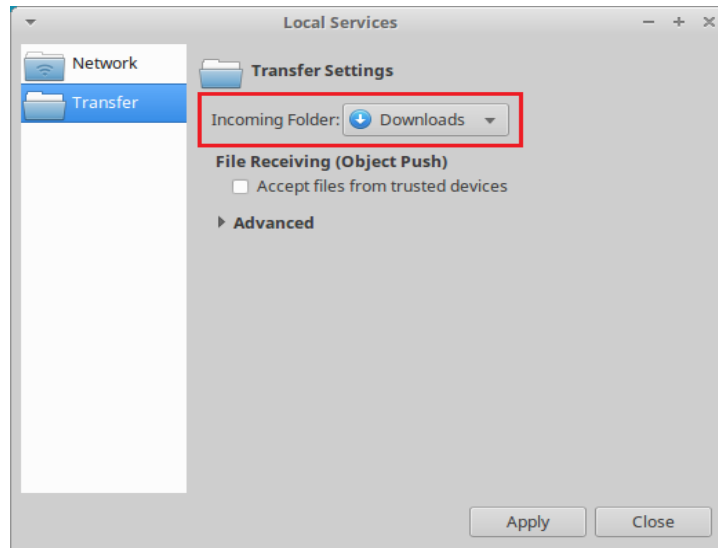
Picture 6-15 Bluetooth icon

The step of Bluetooth pairing is in the “Devices” option, as shown in the figure.



Picture 6-16 Bluetooth icon

When you want to transfer the files, you need to configure its destination path to “Downloads”.



Picture 6-17 Bluetooth configuration

## 7. Introduction Of Console Mode Tools

### 7.1. Date And Time Configuration

Use the date command to modify the date.

Usage:

```
#date [OPTION]... [+FORMAT]
```

```
#date [-u|--utc|--universal] [MMDDhhmm[[CC]YY][.ss]]
```

For example:

```
Fri Oct 18 09:11:05 CST 2013
```

```
#date 101809112013.05
```

## 7.2. Ftp Service

The File Transfer Protocol (FTP) is a standard network protocol used to transfer computer files between a client and a server on a computer network.

**Note:**

You may stop firewall to allow the user to login to your machine.

## 7.3. Ssh Service

SSH server is a software program which uses the secure shell protocol to accept connections from remote computers.

**Note:**

You may stop firewall to allow the user to login to your machine.

## 7.4. Telnet Service

Telnet is an application layer protocol used on the Internet or local area networks to provide a bidirectional interactive text-oriented communication facility using a virtual terminalconnection.

**Note:**

You may stop firewall to allow the user to login to your machine.

## 7.5. Screen Saver

The linux framebuffer has a default blank screen saver. The timeout (in seconds) can be changed or disabled with a kernel parameter: consoleblank. Currently, the status of the screen saver is disabled.

**Note:**

To set the status of the screen saver, you can modify the “consoleblank=0” of the “/etc/default/grub” to what you want, and then run command line in console.

```
#update-grub
```

## 7.6. Network Configuration

The AdvLinuxTU Network has supported WIFI and Ethernet.

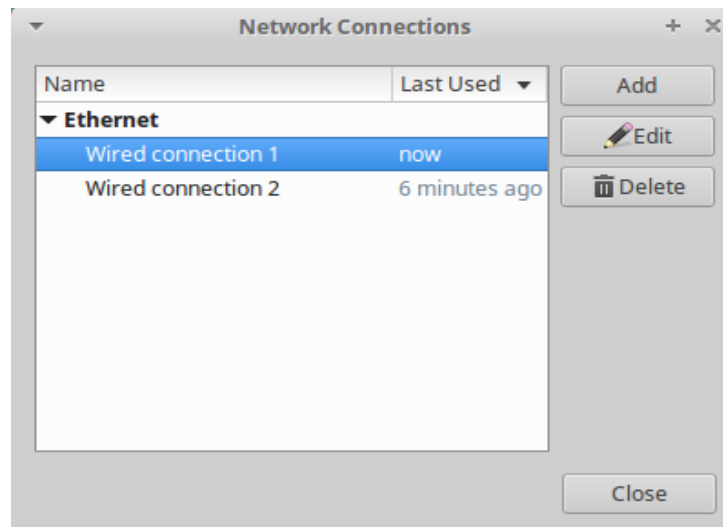
1) Switch to the “root” user:

```
$su root
```

2) Start the XFCE Desktop and log in:

```
#/etc/init.d/lightdm start
```

3) Use the Network Connections to configure your network.



Picture 7-1 Network Connections

4) Switch to original console with Ctrl + Alt + F1.

Note:

Before the reboot, you would like to configure the network by switching back with Ctrl + Alt + F7.

## 7.7. QT Runtime And Development Environment

### 7.7.1. QT Runtime Environment Based On Frame Buffer

The user can choose QT runtime environment by selecting “qt-fb” based on frame buffer in installing process as shown in Picture 3-13. Currently we only support touch screen on TPC/PPC series devices.

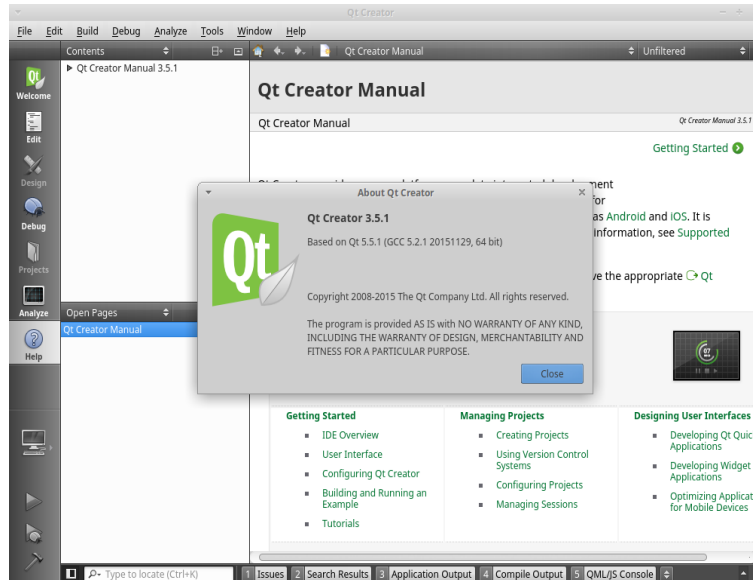
a) Calibrate touch screen and test

```
#/opt/tslib/bin/ts_calibrate
```

Press the point the screen and then you will see the calibration has been completed.

## 7.7.2. QT Development Environment

The user can choose QT Development environment by selecting “QT creator” in installing process illustrated in section 3.4.7.



Picture 7-2 QT Creator

## 8. Known Issue

1. For HDMI & VGA hotplug in XFCE, the screen may not display sporadically. If this issue happens, please switch to another console with Ctrl + Alt + F1, and then switch back with Ctrl + Alt + F7.
2. The CPU c-state are set to above with kernel parameter intel\_idle.max\_cstate=1. For Intel Bay-trail platform, the GPU driver issues on linux kernel 3.16-4.4, which may cause the system crash. This is just a workaround for the issue, which doesn't affect the user's normal operation.
3. Do not update the system, otherwise the drive can not be used.
4. If you want to set the static netmask to 255.255.255.0 by utility, it may become 24. This is because the Mask Subnet is converted to CIDR, which doesn't affect the user's normal operation.
5. Mouse cursor may be lost when unlocked. If this issue happens, please switch to another console with Ctrl + Alt + F1, and then switch back with Ctrl + Alt + F7.
6. For TPC-651T-ExAE , PPC-3060S. The screen may not support 320x240.
7. For PPC-3100S. The screen may not support 400x300.
8. The hibernate , suspend function may not be supported.
9. The default resolution of TPC-1782H is 1024x768 when system boots. The user



can set to the optimal resolution 1280x1024 by display utility.

10. In Base-system, when the qt application is closed, the system sleep time parameter "consoleblank" will change from 0 to 900, and the system will sleep after 15 minutes when the user do nothing. If the qt program is executed again, the system sleep time parameter "consoleblank" will change to 0, and the system will not sleep.

11. For UNO-3283G/3285G-674AE. The i915 driver may produce warnings, but the video card works normally.

12. For UNO-2484G-673xAE. The device does not support real-time kernel at present. If you install a real-time system on the device, it may cause a crash.

13. For TPC-5xxx-6C3AE. The device does not support the dual monitor setup. If you insert another monitor, it may cause a crash on the system boot.

14. For TPC-5152T-633AE, TPC-5152T-6C3AE, TPC-5172T-633AE, TPC-5172T-6C3AE, TPC-5212W-633AE, TPC-5212W-6C3AE. In Base-system, the touch screen does not support calibration.