Smart Recovery Linux User's Manual

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Technical Support Contact Information

www.moxa.com/support

Moxa Americas
Toll-free: 1-888-669-2872
Tel: +1-714-528-6777
Fax: +1-714-528-6778

Moxa China (Shanghai office)
Toll-free: 800-820-5036
Tel: +86-21-5258-9955
Fax: +86-21-5258-5505

Moxa Europe
Tel: +49-89-3 70 03 99-0
Fax: +49-89-3 70 03 99-99

Moxa Asia-Pacific
Tel: +886-2-8919-1230
Fax: +886-2-8919-1231

Moxa India
Tel: +91-80-4172-9088
Fax: +91-80-4132-1045

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1

Introduction

Moxa's Smart Recovery is an automated platform-rescue utility that allows users to easily back up and recover a device's operating system, and all installed applications and scripts. Most importantly, the Smart Recovery utility can be fully automated for use in a number of distinct configuration scenarios that are used in industrial automation solutions.

Currently, Moxa Smart Recovery is available for Moxa x86-Windows and x86-Linux platforms. The following topics are covered in this chapter:

- **System Requirements**
  - Hardware
  - Operating System

System Requirements

Before you install the Smart Recovery utility, make sure your system meets the following requirements:

Hardware

- A Moxa x86 platform that supports BIOS functions for Moxa Smart Recovery (e.g., DA-682A-DPP).
- Two independent storage devices: one clean storage device to clone the system that you want to back-up and one for the recovery system.

Operating System

- Linux Debian 7 64 bit.

2

Installation and Uninstallation

This chapter describes how to install and uninstall Moxa Smart Recovery utility.

The following topics are covered in this chapter:

- **Acquiring Smart Recovery**
- **Installing Smart Recovery**
- **Uninstalling Smart Recovery**

Acquiring Smart Recovery

The Moxa Smart Recovery utility is currently available for download only on the Moxa website. To download the utility, do the following:

1. Navigate to the Moxa Smart Recovery product page (http://www.moxa.com/product/Smart-Recovery.htm) and click on the **Drivers & Software** link.

2. In the **Drivers & Software** page, click on the **Utilities** link.
3. Choose the Debian 64-bit Smart Recovery utility.
4. Click **Download** to download a compressed file containing the **mxsmarec_1.0.0-1_all.deb** file.

Installing Smart Recovery

IMPORTANT You should have root (user) privileges to be able to install Moxa Smart Recovery.

Extract **mxsmarec_1.0.0-1_all.deb** from the compressed file that you downloaded and use the **dpkg** command to install the Smart Recovery utility as follows:

```
# dpkg –i mxsmarec_1.0.0-1_all.deb
```

```
root@Moxa:~# dpkg -i mxsmarec_1.0.0-1_all.deb
(Reading database ... 45582 files and directories currently installed.)
Preparing to replace mxsmarec 1.0.0-1 (using mxsmarec_1.0.0-1_all.deb) ...
Unpacking replacement mxsmarec ...
Setting up mxsmarec (1.0.0-1) ...
```

Uninstalling Smart Recovery

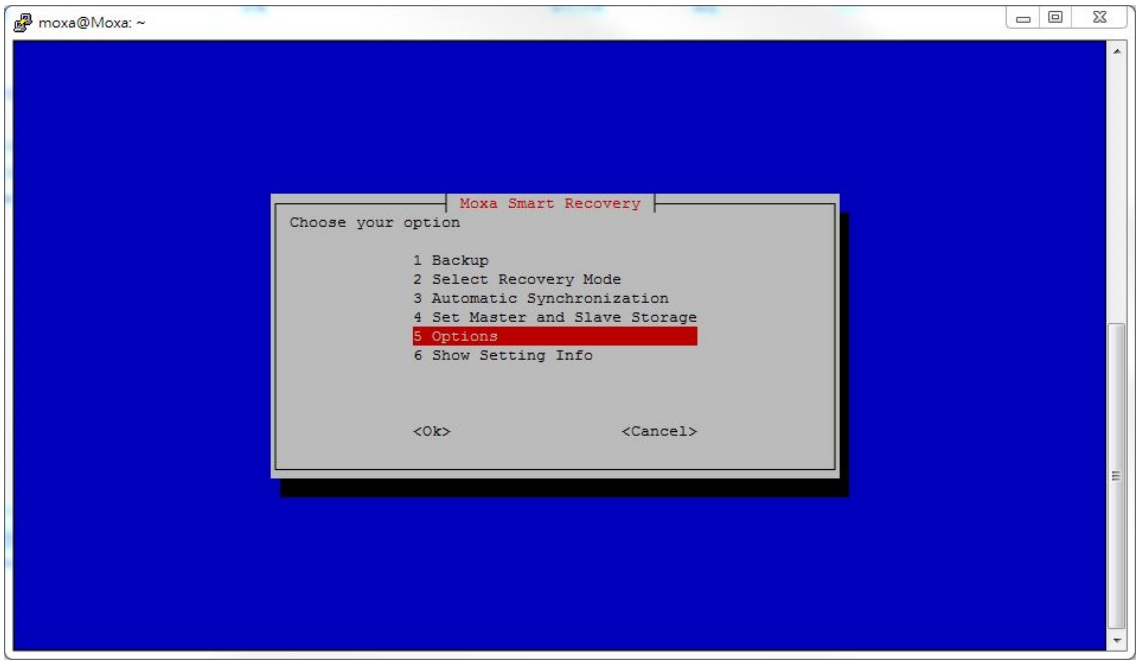
IMPORTANT You should have root (user) privileges to be able to uninstall Moxa Smart Recovery.

To uninstall the Smart Recovery utility from your system, do the following:

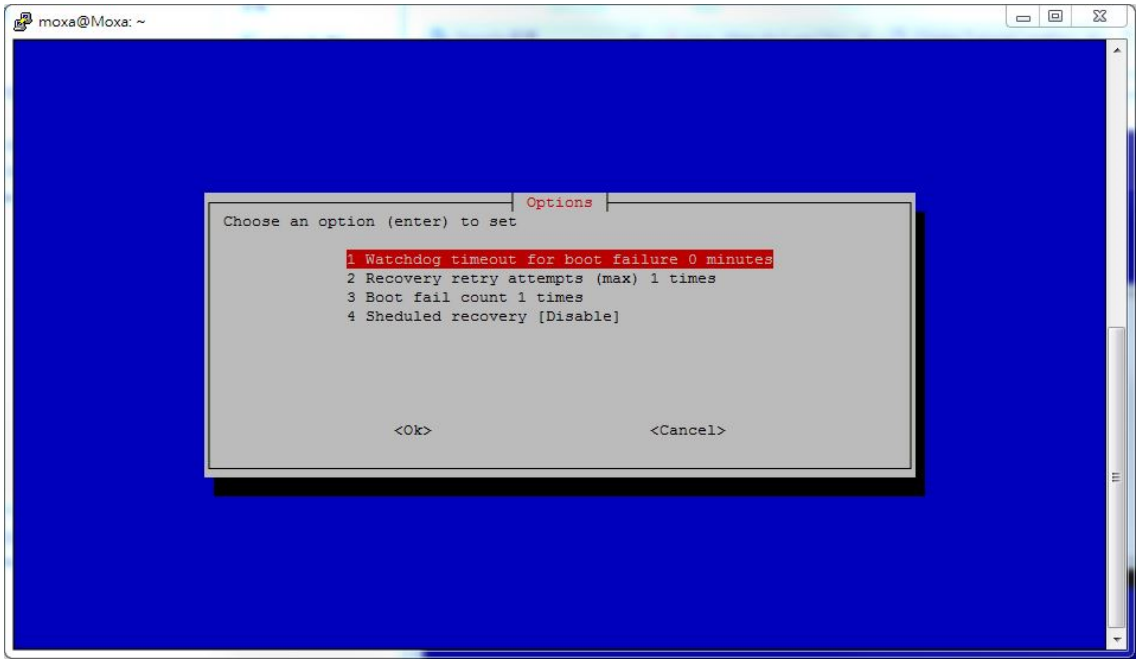
1. Run the **apt-get** utility and select **5 Options.**

WARNING

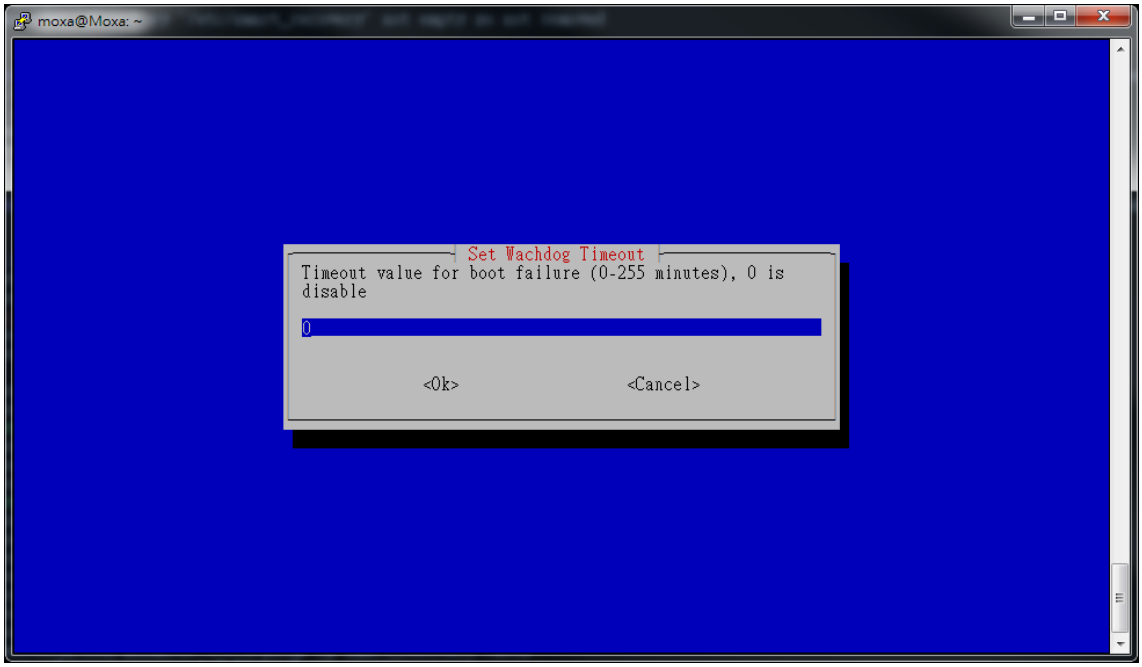
If you are uninstalling Smart Recovery from a machine that has been configured for *Fully Automated Recovery* mode, then you must first disable the watchdog timer before uninstalling the software package. The watchdog runs at the BIOS level, and will continue to check if the Smart Recovery service is running in the background even after the software has been removed. If the watchdog is not stopped before the background Smart Recovery service is removed, it will register the disappearance of the Smart Recovery service as a system hang, and will initiate a system restart and attempt a recovery procedure.



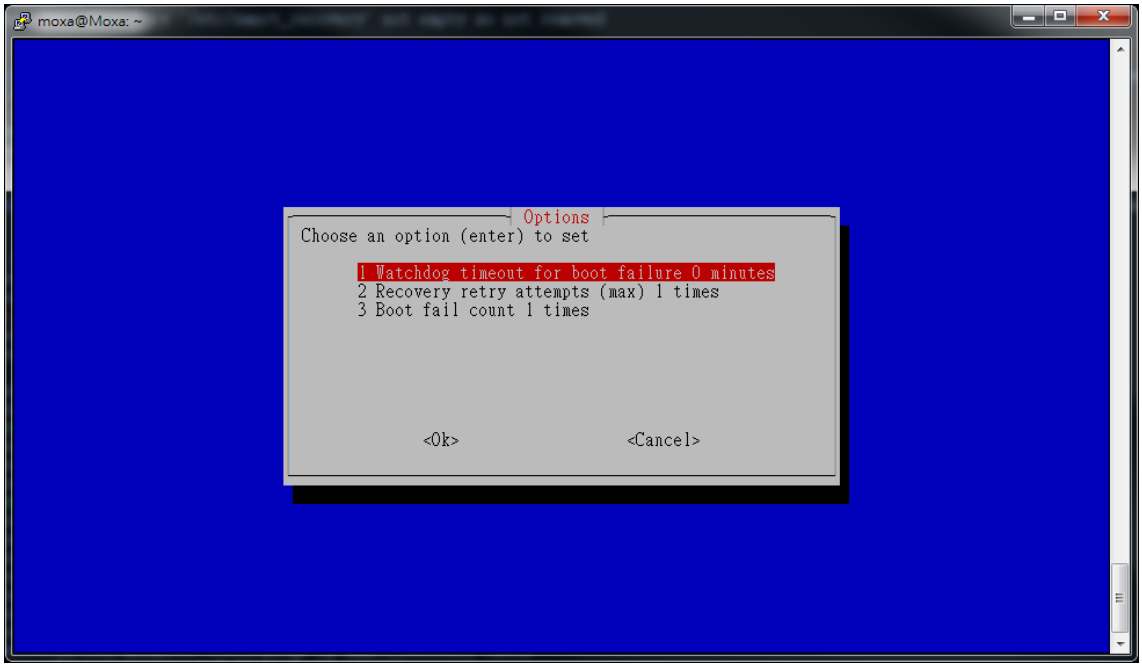
2. In the **Options** menu, select the **1 Watchdog timeout for boot failure …** option.



3. Enter **0** in the **Set Watchdog Timeout** field**.**



4. Press **<Ok>** to confirm.
   If you do not want to proceed, use the TAB key to select the <Cancel> option.



5. Use the **apt-get** command to uninstall Moxa Smart Recovery as follows:

   # apt-get purge mxsmarec

```
root@Moxa:~# apt-get purge mxsmarec
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages will be REMOVED:
  mxsmarec*
0 upgraded, 0 newly installed, 1 to remove and 103 not upgraded.
After this operation, 108 kB disk space will be freed.
Do you want to continue [Y/n]?
```

6. Enter **Y** to confirm the uninstallation of Moxa Smart Recovery and wait till the process is complete.

3

Getting Started

This chapter describes how to launch the Smart Recovery utility and how to do the initial set up.

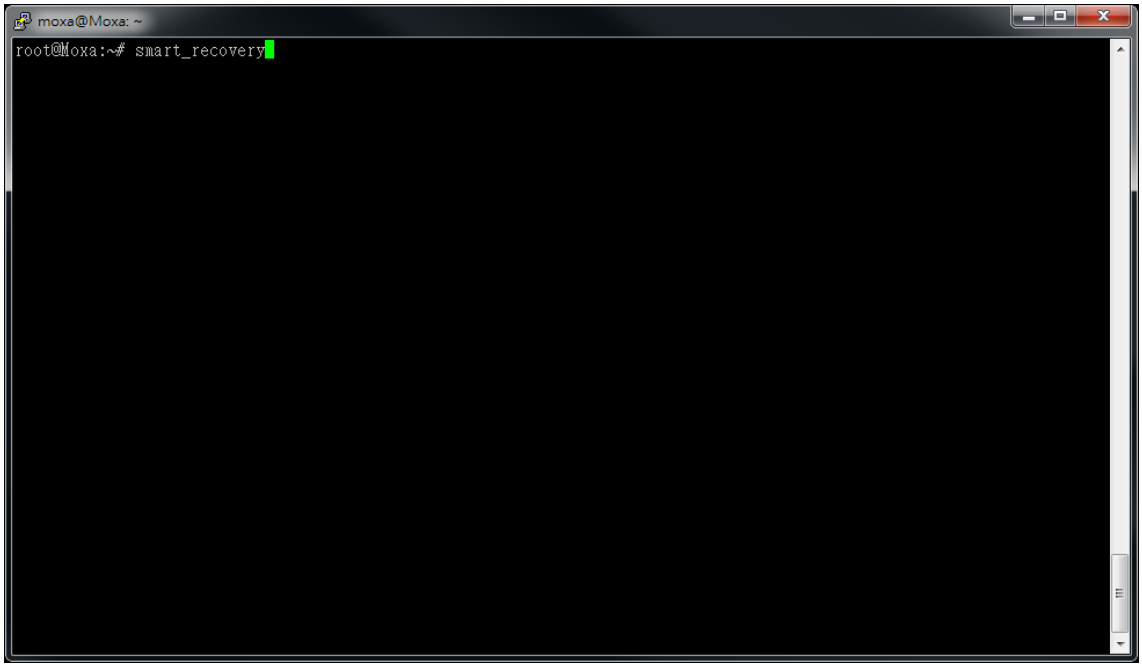
The following topics are covered in this chapter:

- **Launching Smart Recovery**
- **Working with the Home Interface**
  - Options
  - Show Setting Info

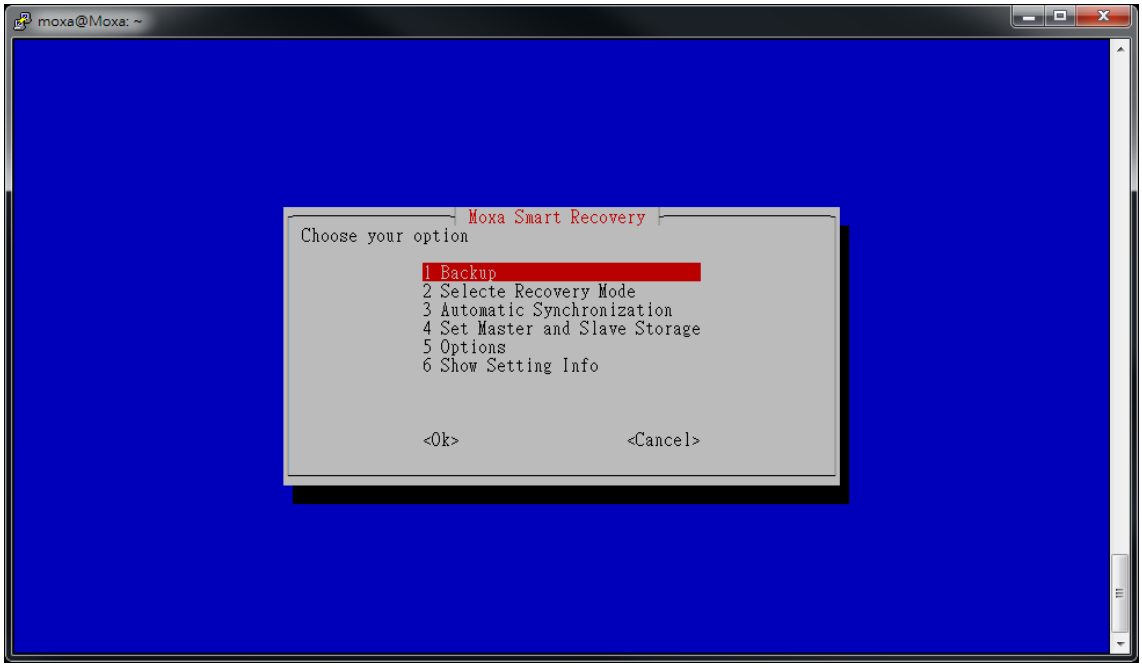
Launching Smart Recovery

Once you have installed the Moxa Smart Recovery utility, start it as the **root** user using the following command:

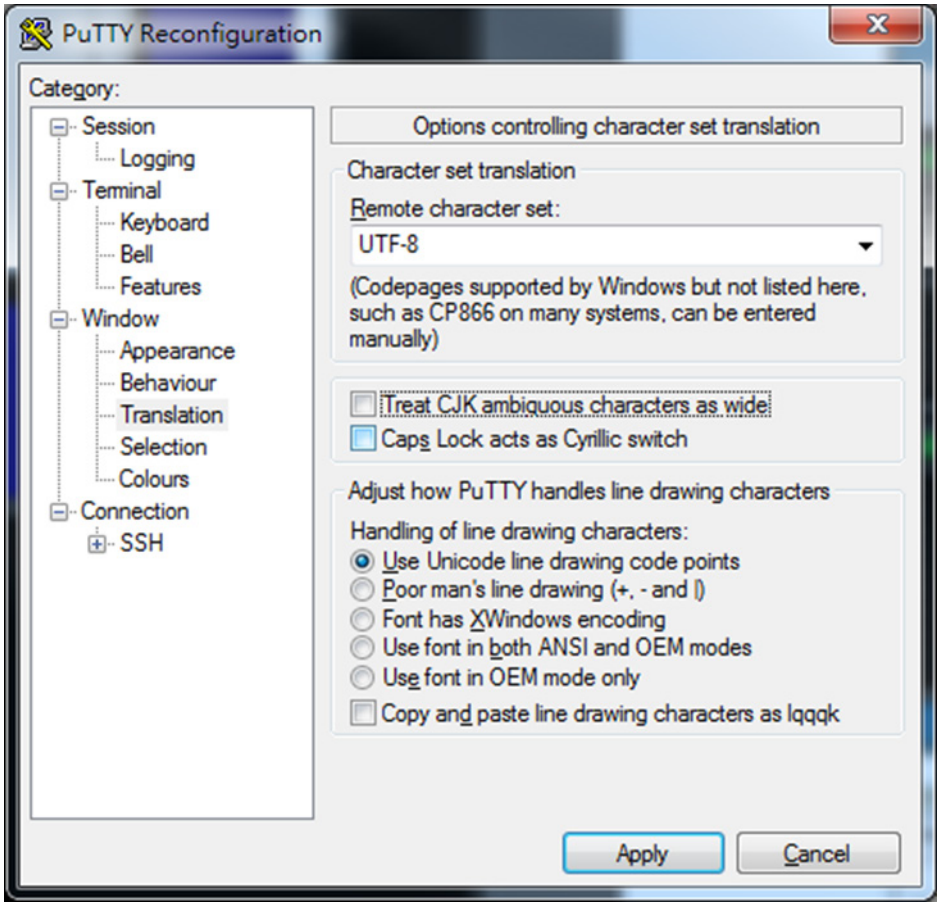
```
# smart_recovery
```



After launching Smart Recovery you should see the splash screen shown below, which is also the home interface of the utility:

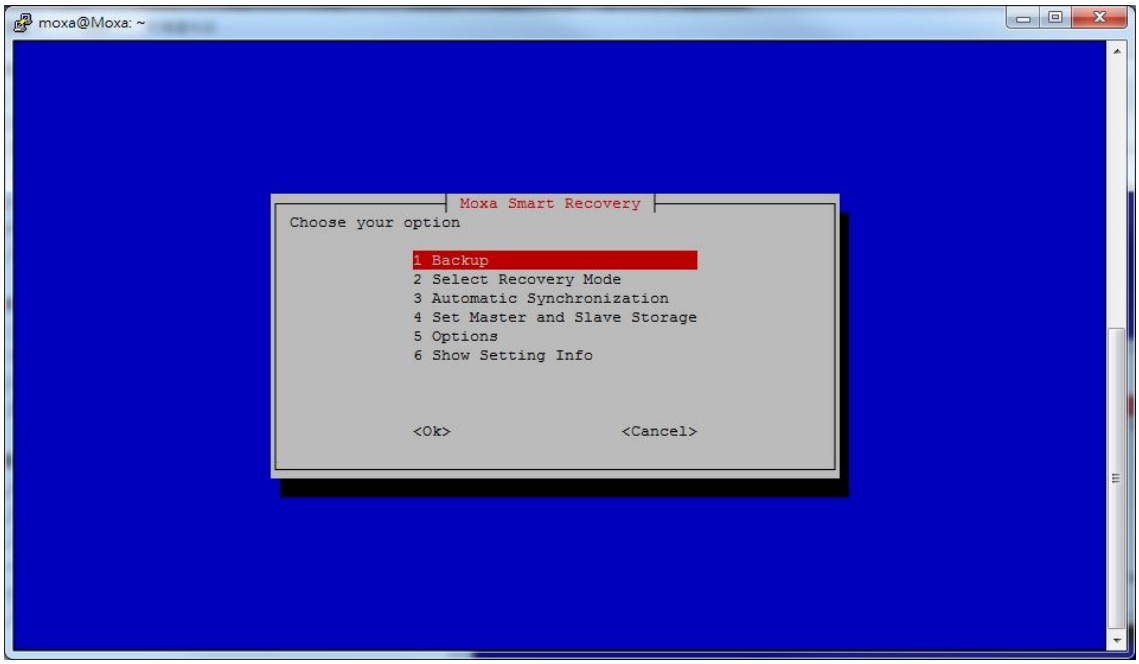


NOTE There may be cases where garbage characters, as shown in the screenshot below, appear in the Smart Recovery window. You can rectify this situation by changing your computer's "Remote character set" from `UTF-8` to a different encoding (for example, `ISO-8859-1`), and then restarting Smart Recovery.



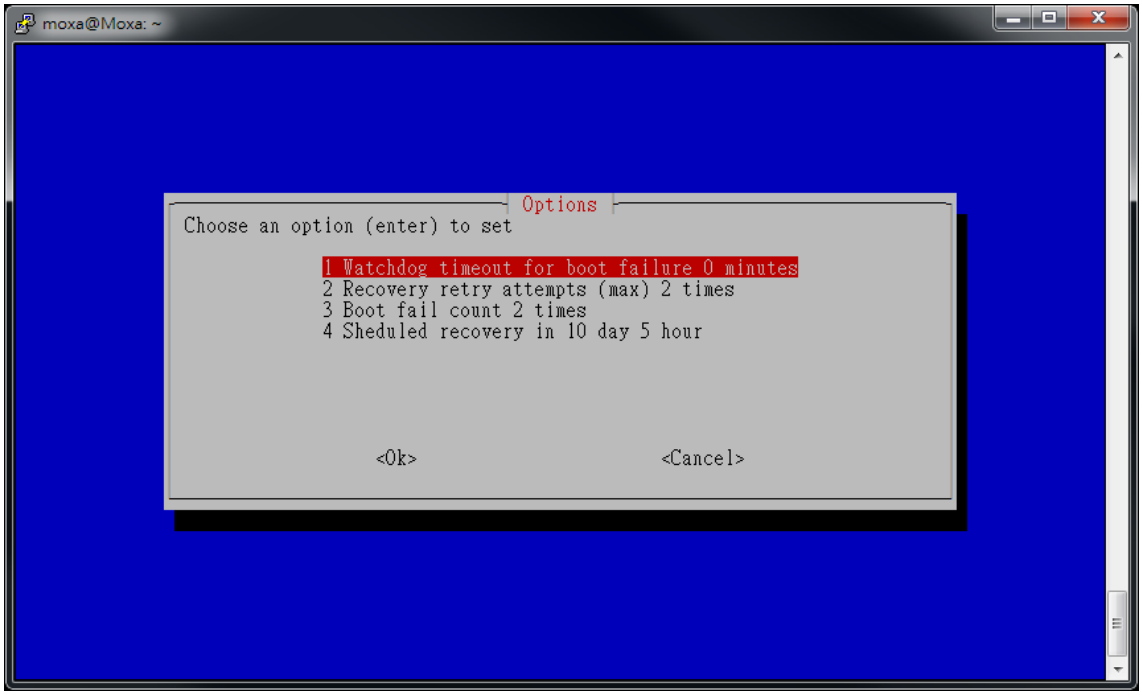
Working with the Home Interface

Smart Recovery's home interface has the following controls: **Backup**, **Select Recovery Mode**, **Automatic Synchronization**, **Set Master and Slave Storage**, **Options**, and **Show Setting Info**. The **Backup** and **Select Recovery Mode** options are covered in detail in the **Creating Backup Images and Recovery Keys** and **Recovery Setup and Execution** sections.

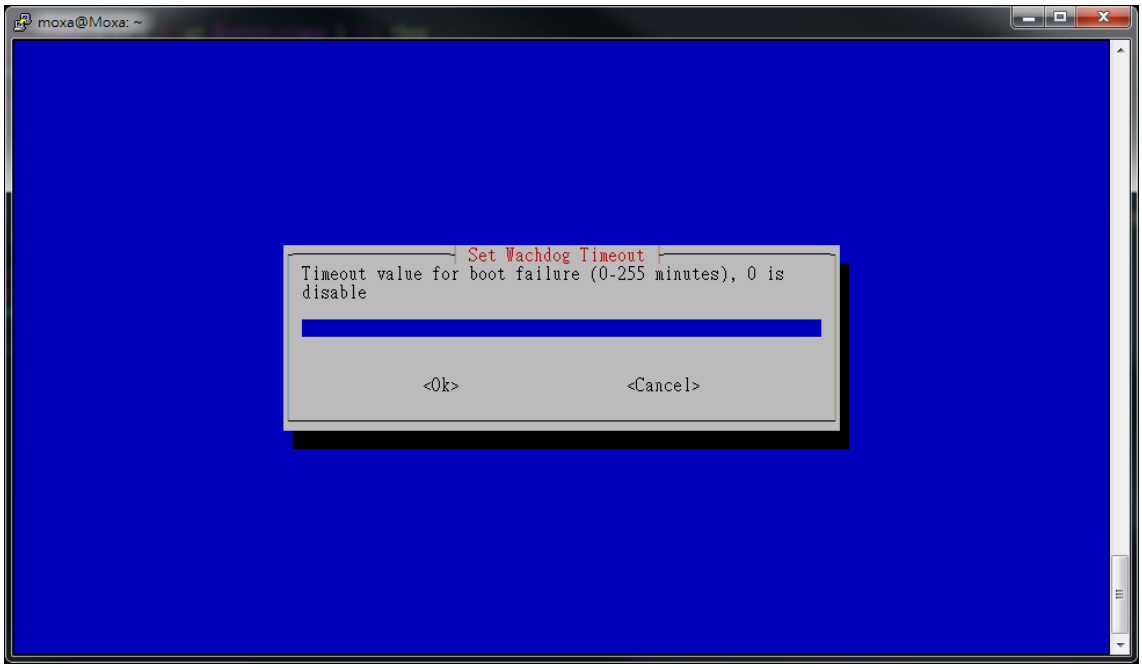


Options

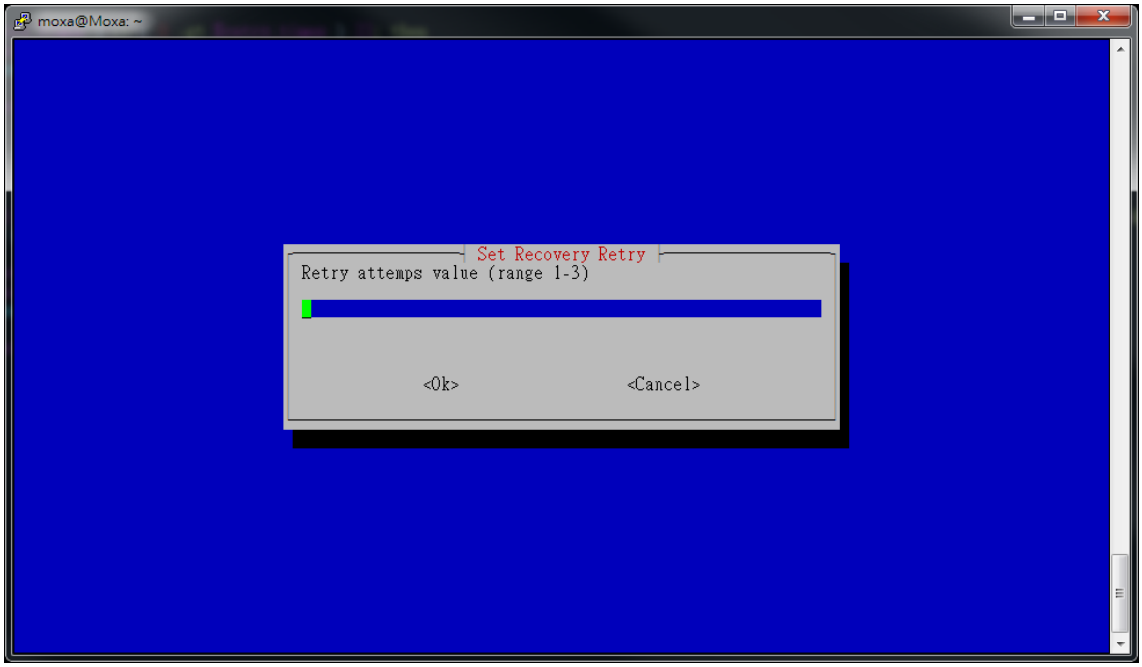
Currently, the **Options** menu only allows you to change the setting of the Moxa Smart Recovery.



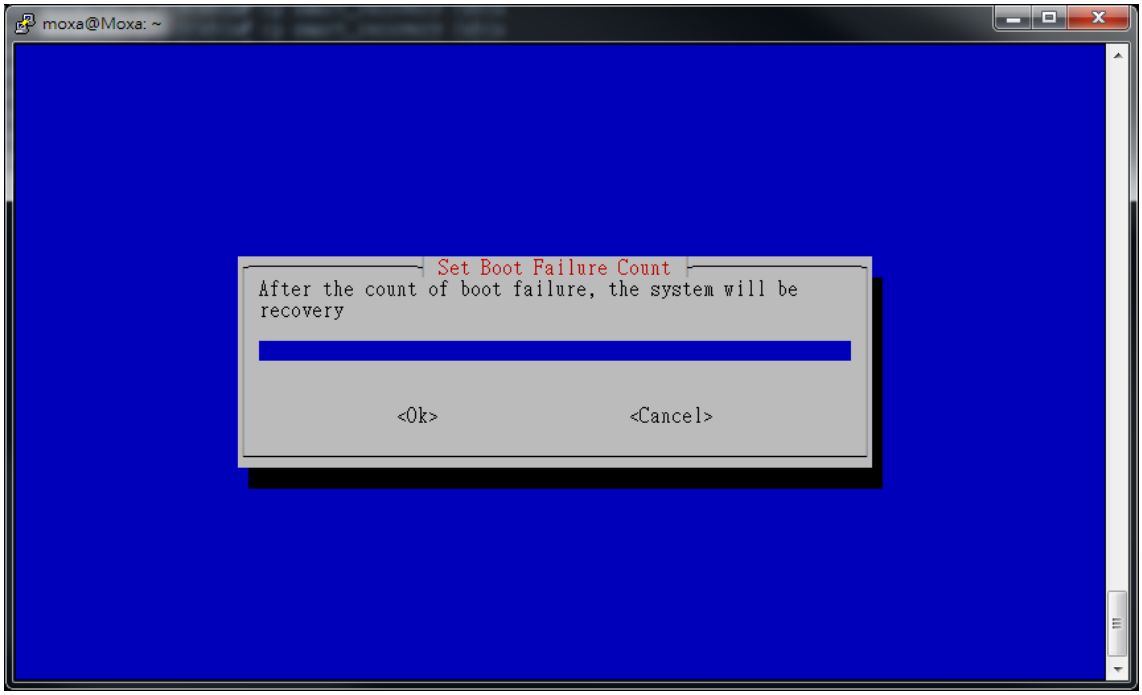
1 Watchdog timeout for boot failure...: If your system OS does not boot successfully within the timeout minutes specified here, the system will reboot automatically. The range is **0–255**. The value **0** is used to disable the watchdog timeout.



2 Recovery retry attempts...: This setting is for the maximum retry attempts to recover your system. The range is **1–3**. If you specify a value above this range, it is set to **3**.



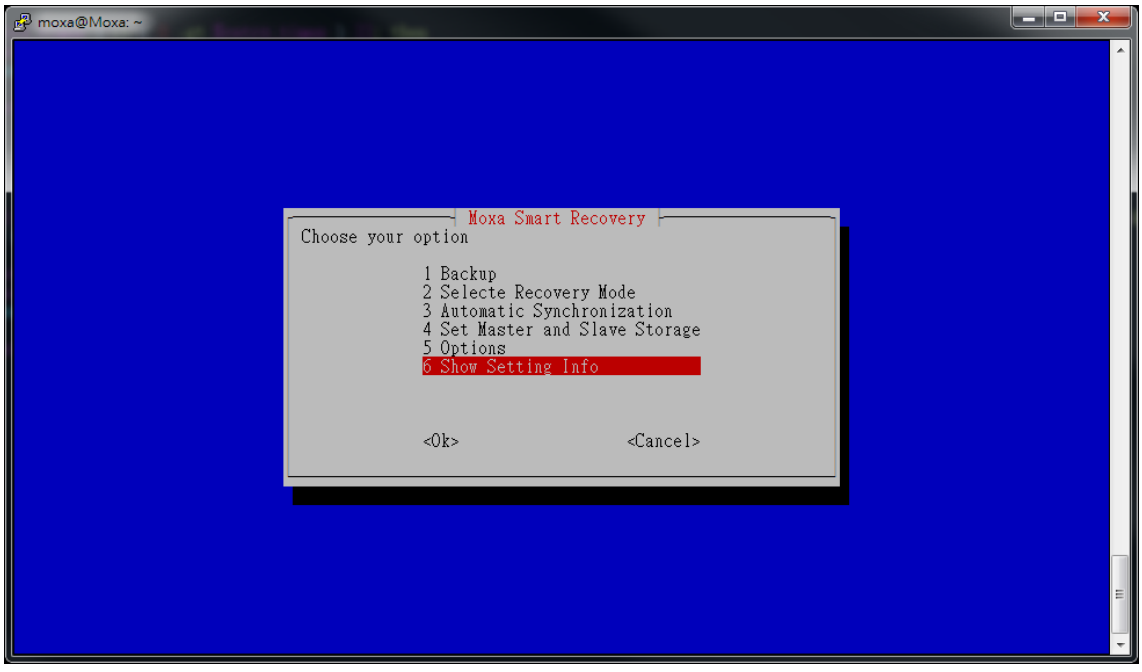
3 Boot fail count...: This setting indicates the number of times the system failed to boot and entered the automatic recovery mode.

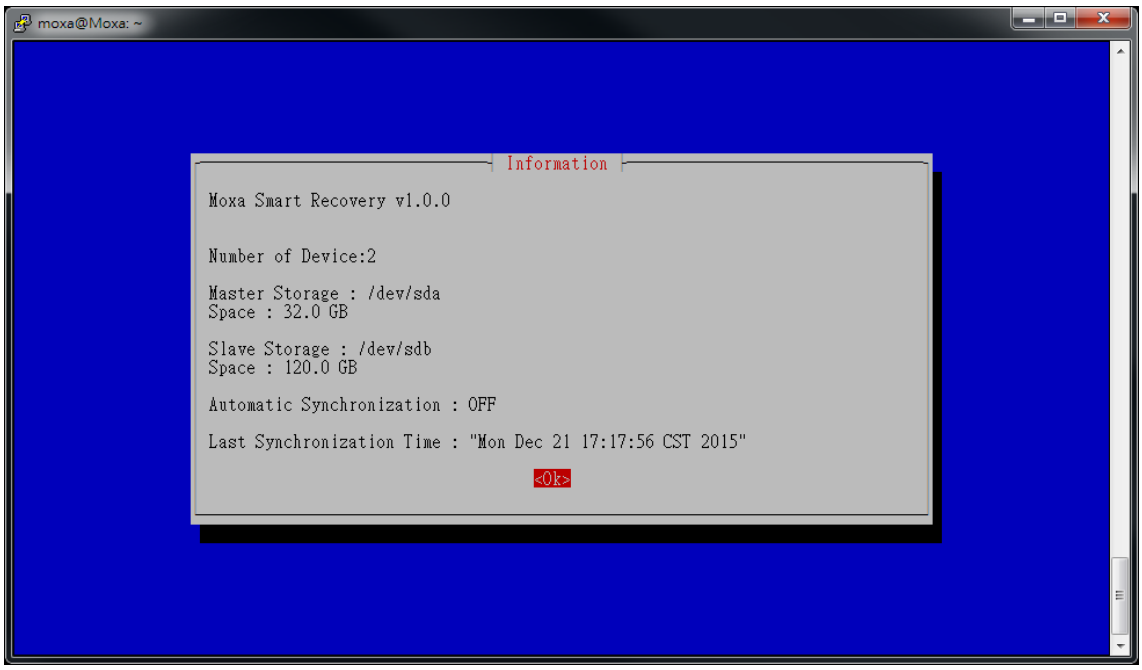


4 Scheduled recovery in ...: This setting indicates when the next recovery process is scheduled.

Show Setting Info

Displays information on the version, packaging, and settings of the Smart Recovery utility.




moxa@Moxa: ~
Information
Moxa Smart Recovery v1.0.0
Number of Device:2
Master Storage : /dev/sda
Space : 32.0 GB
Slave Storage : /dev/sdb
Space : 120.0 GB
Automatic Synchronization : OFF
Last Synchronization Time : "Mon Dec 21 17:17:56 CST 2015"
<Ok>

4

Creating Backup Images and Recovery Keys

This section takes you through the first steps in setting up the Smart Recovery utility: creating the recovery environment on a USB drive, and saving a copy of the current system image, to be used to recover the system later on.

The following topics are covered in this chapter:

- **Setting Up the Recovery Environment**

Setting Up the Recovery Environment

Before you can use the Smart Recovery utility, you must first install the live recovery system on a bootable device. A removable USB, a CompactFlash drive, or a second SATA drive (SSD or HDD) as well as an internal DOM can be used as the live Smart Recovery device/drive.

NOTE **There can only be a single Smart Recovery environment per device.**
The BIOS will get confused and might fail to boot up if two live recovery systems are installed on the same device.

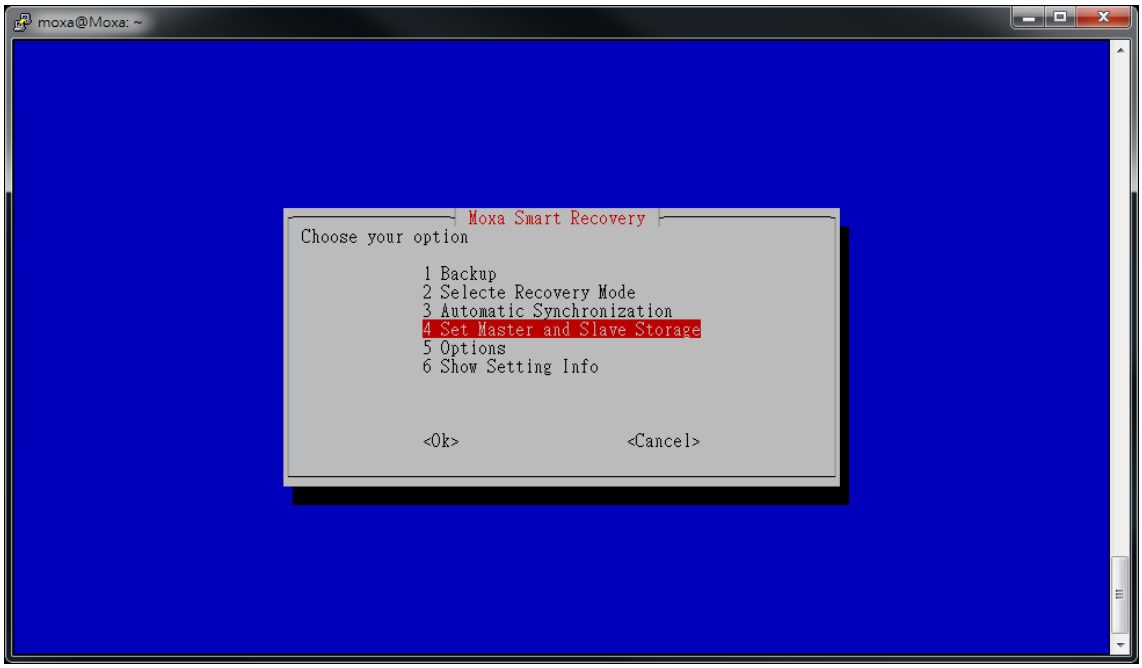
For Smart Recovery to work, you will need to configure a permanent storage space for the live environment and the backup image. You can use one of the following with the recovery system:

- a removable USB drive via the USB port of the computer
- an internal CompactFlash drive
- an internal DOM
- an entire SATA drive

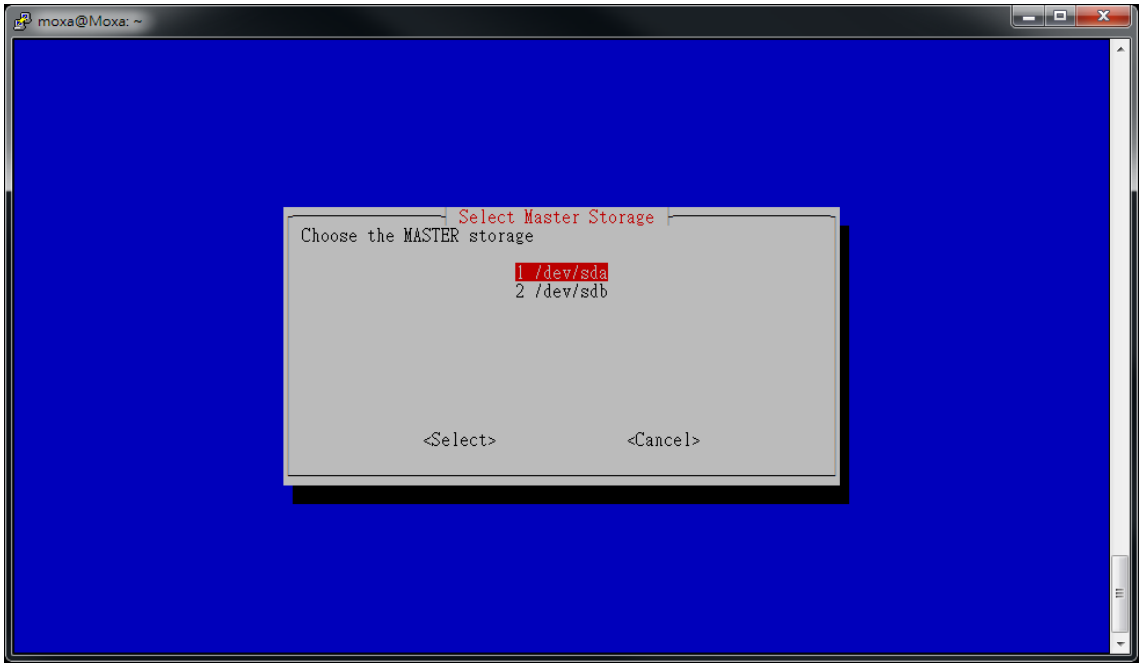
At the same time as you create the recovery environment, Smart Recovery will create and store a backup image of your system.

If you have already created a live recovery system on a bootable device/drive and just want to create a new backup image, then do the following:

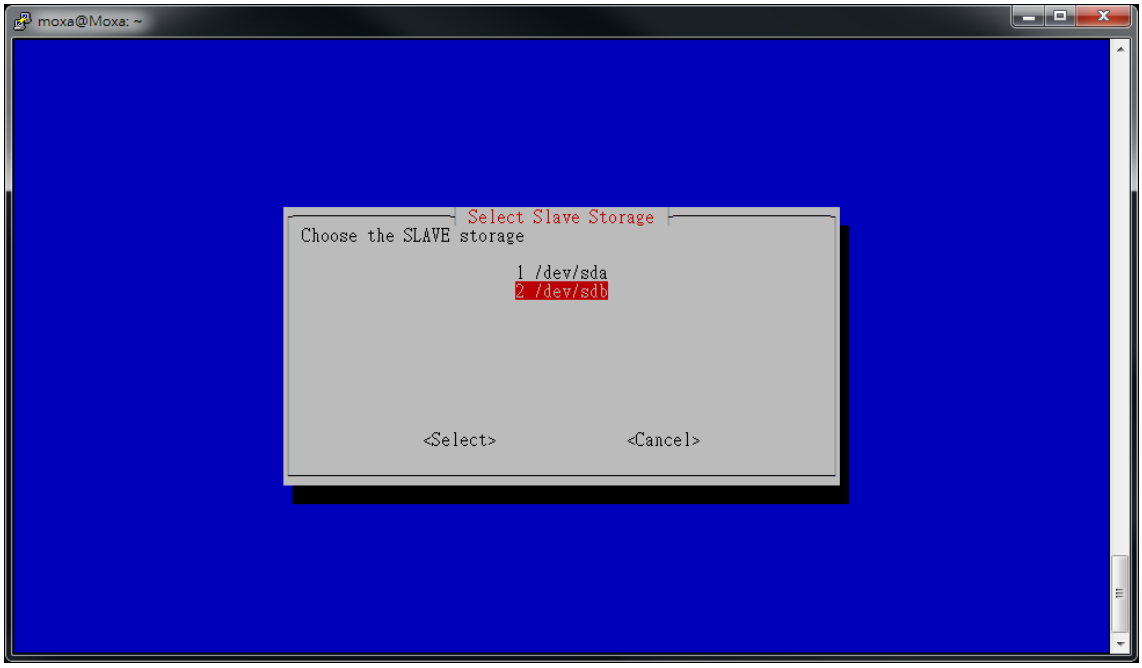
1. In the home interface, choose the **4) Set Master and Slave Storage** option.



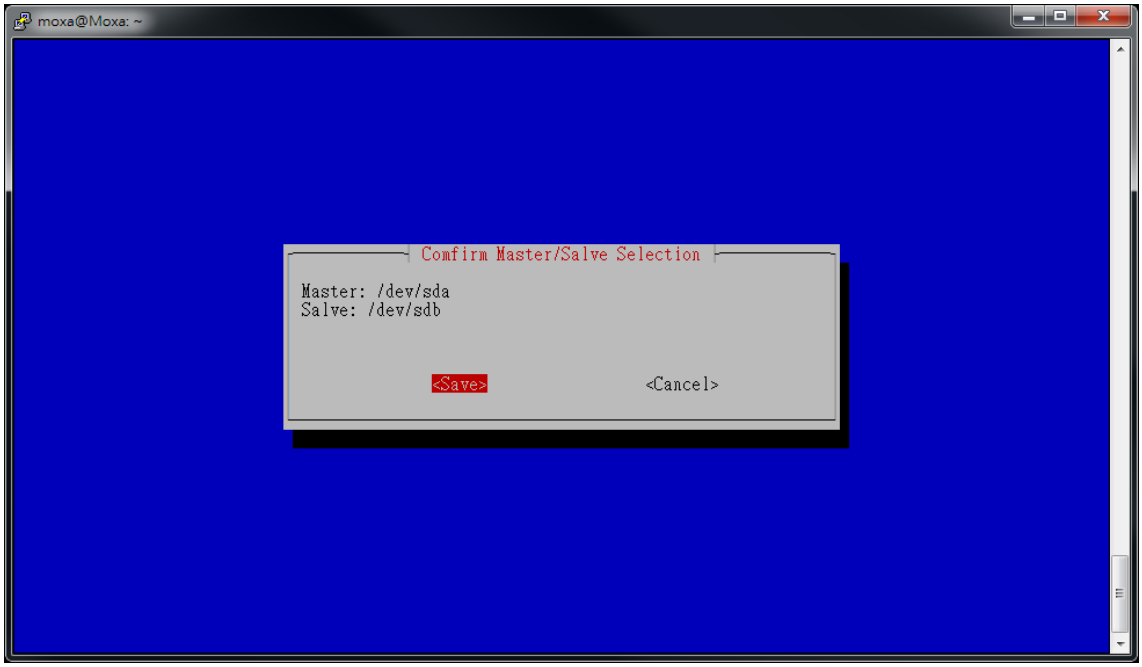
2. Select the master storage partition that you want to backup.



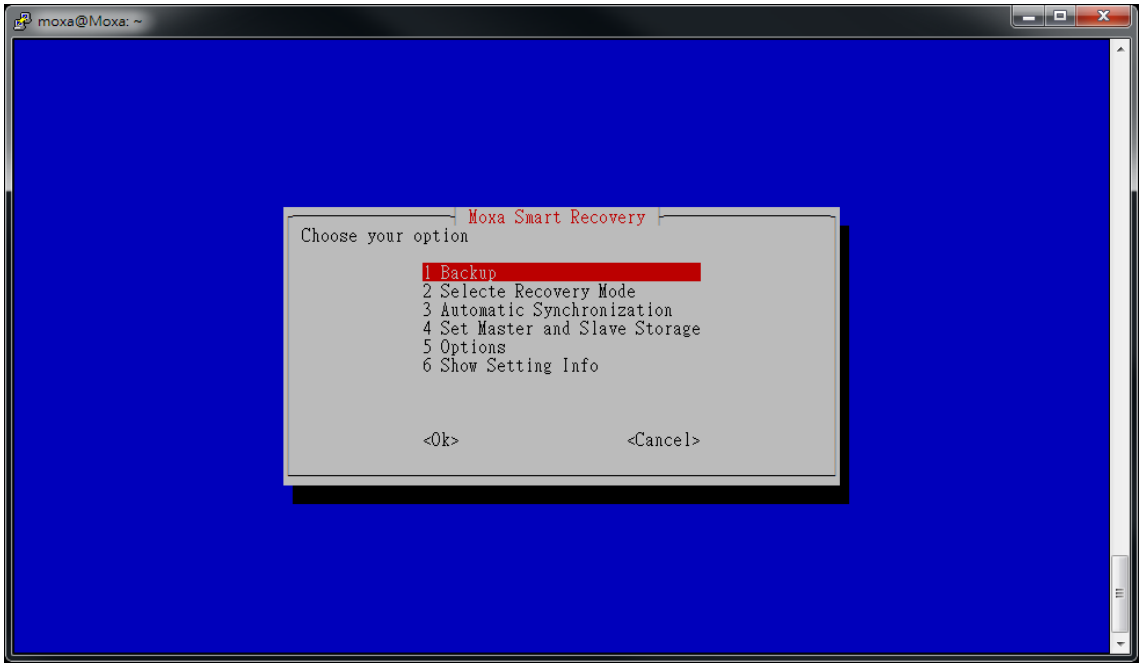
3. Select the path to the slave storage, which will be used to save the backup data for system recovery.



4. Select **<Save>** to confirm your choices and to save the settings.



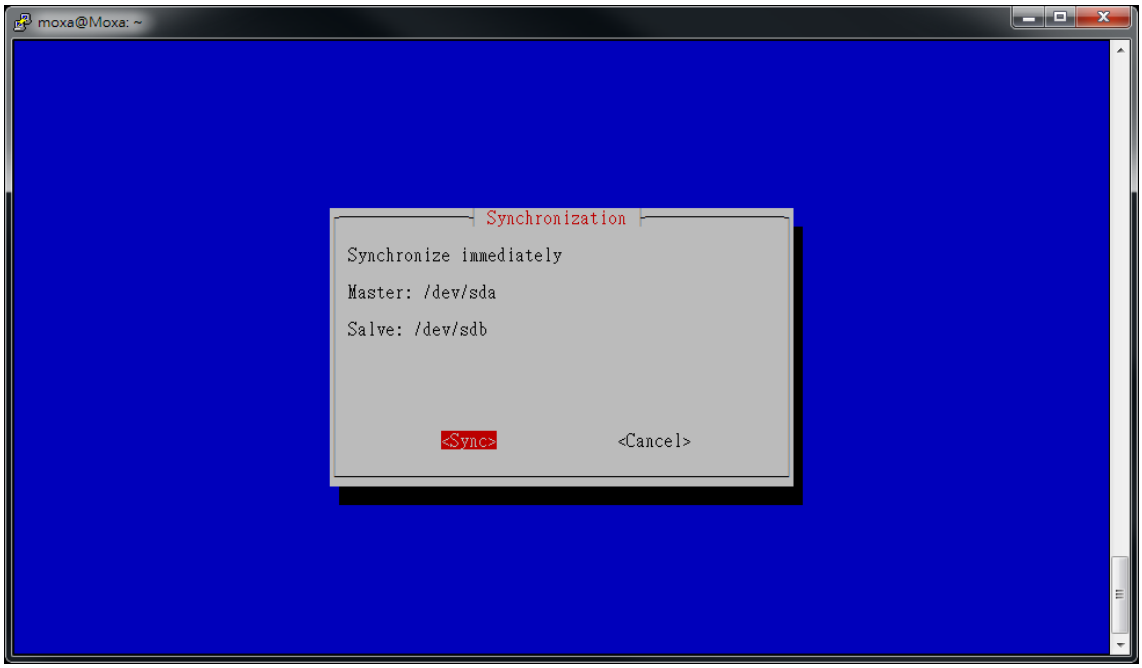
5. In the home interface, select **1) Backup.**



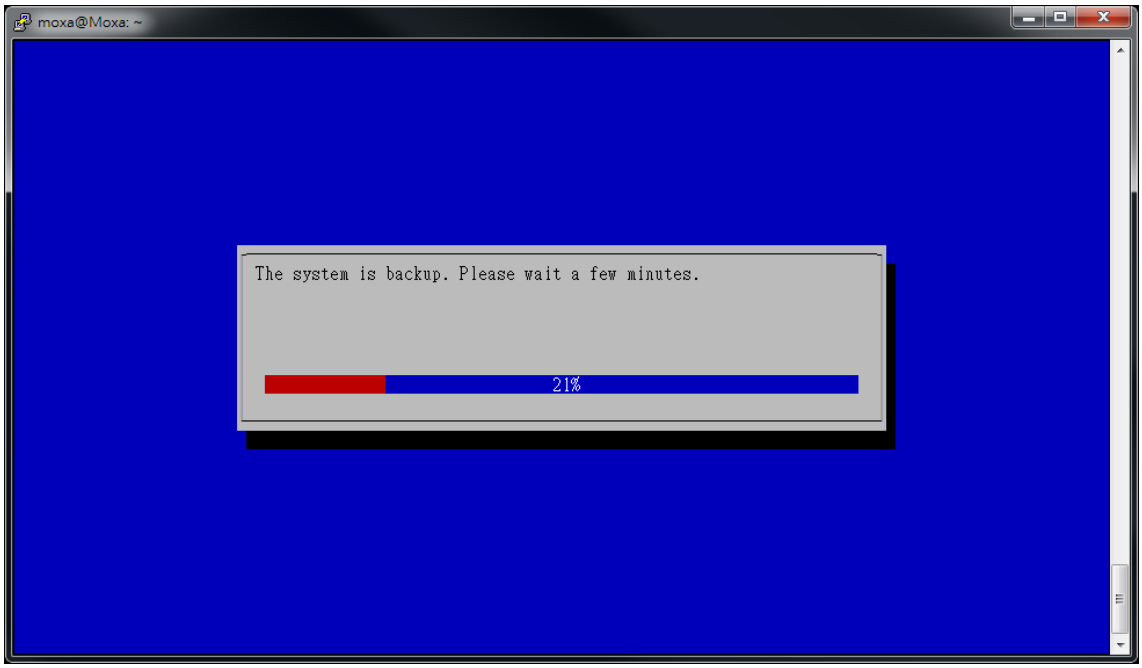
6. Select **<Sync>** to back up the data from the master storage to the slave storage

WARNING

This action will erase the data in the slave storage device.



7. Wait until the backup process is complete.



5

Recovery Automation Scenarios

This chapter gives the precise details of the recovery scenarios that the Smart Recovery utility provides.

The following topics are covered in this chapter:

- **Manual Recovery Using a USB Key**
- **Fully Automated Recovery**
- **User-Initiated Recovery**

Manual Recovery Using a USB Key

This recovery method requires that a user has physical access to the machine where the software platform must be recovered; it is intended to be used by users who are physically present at a computing station. This method is designed for industrial field sites where users who might require a system recovery are not expected to be technically competent in system administration, and/or where monitors, keyboards, and other standard HMIs are not available to the user.

By default, the platform is set for user-initiated recovery mode. You can set Moxa Smart Recovery to manual recovery mode using the following steps:

1. In the Smart Recovery home interface, select the **2) select recovery mode** option.
2. Select **2) Manual recovery**

To initiate a manual recovery, all you need is a live recovery key on a USB storage device. Simply by inserting the USB into the computing station and then restarting the system, even a user lacking any technical competency in system administration can fully recover a damaged operating system (including the customized software platform installed on the OS). The steps to manually recover a system using a USB key are as follows:

1. Upon discovering that a software platform requires recovery, acquire the USB recovery key and insert the key into the USB drive of the computer.
2. Power on the computer (with the USB recovery key in the USB drive).

   The computer's BIOS verifies that the USB key is carrying a recovery image, boots into the recovery environment on the UBS key, and automatically initiates a system recovery.
3. After the recovery has been completed (the system will beep indicating this) remove the USB key from the drive and restart the computer.

If there are no problems with the hardware, the computer will restart using the new, clean system that has just been copied over.

For instructions on creating a USB recovery key, see **Setting Up a Manual Recovery Process**.

WARNING

Whenever USB drives are configured to be used as manual recovery keys they become an extreme security liability. Systems administrators are advised to store these system recovery keys in highly secure, locked storage boxes with carefully administered access privileges.

Fully Automated Recovery

This method is designed to be implemented on unmanned and remote computers where on-site maintenance is difficult or impossible. Such sites include offshore wind farms, remote solar farms, or remote power stations. Additionally, this method is ideal for configuring regular, scheduled software rewrites to protect against the slowdowns in system performance that often emerge as operating systems are run over long periods of time.

Administrators can configure the recovery environment on internal DOM, SATA, or CompactFlash drives, or on an externally attached (i.e., removable) USB drive. After configuring the system for a fully automated recovery, the administrator must configure a watchdog timer to monitor system status, while at the same time the computer BIOS will monitor the system for delays in boot times or boot failures. Whenever the system detects a hang or slowdown in performance, it will automatically initiate a full recovery of the software platform and then reboot the system.

Here is a basic outline of what happens in a fully-automated recovery process.

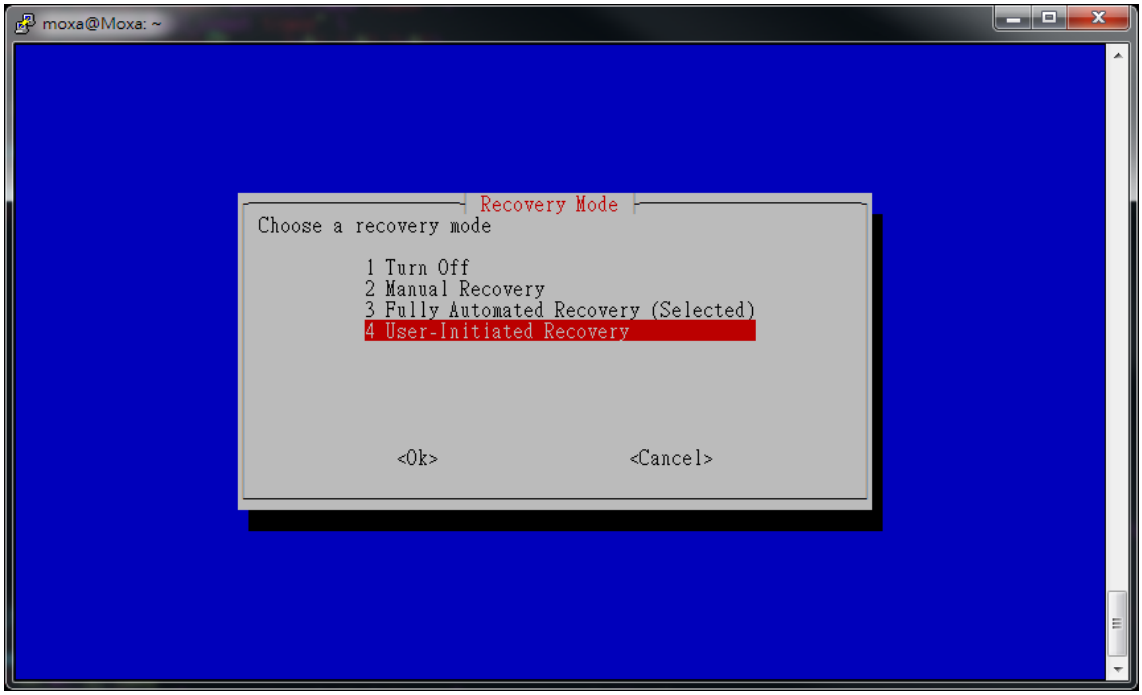
1. After detecting a slowdown or system hang the system reboots into the recovery environment,
2. The software platform is rewritten using the stored image.
3. Once the recovery is complete the computer will reboot into the newly restored software environment.

For instructions on how to set up fully automated recovery mode, see **Setting Up a Fully Automated Recovery Process**.

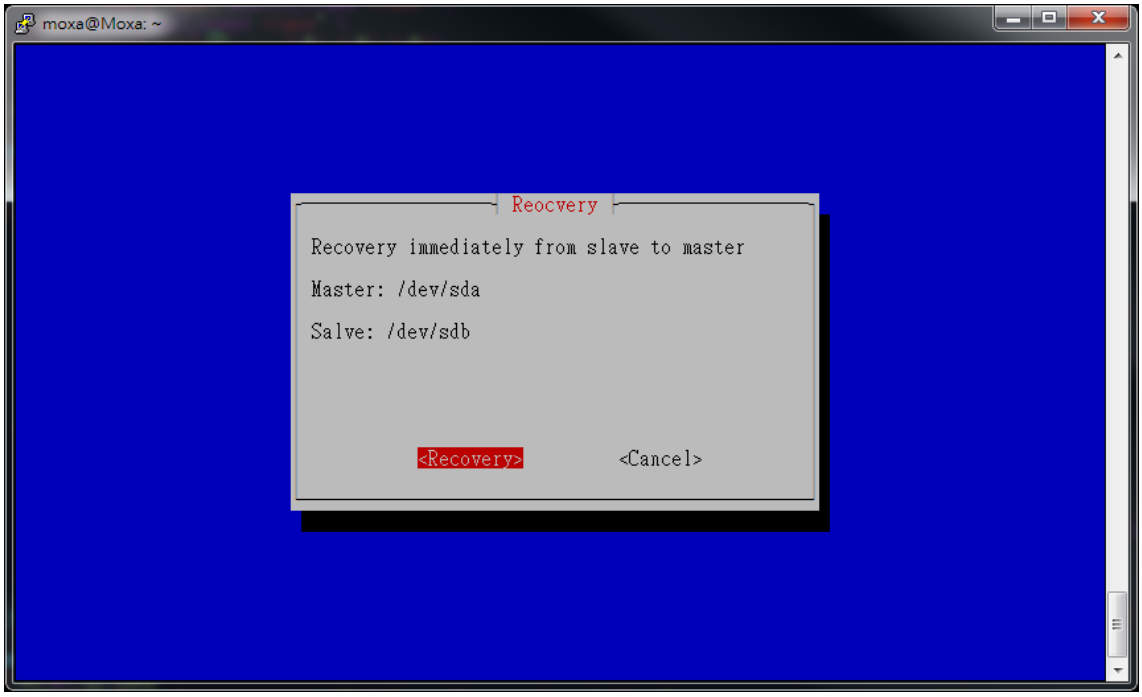
User-Initiated Recovery

This method differs from manual recovery in that it does not require a user's physical presence and may be remotely triggered by a systems administrator. To trigger a user-initiated recovery, users or administrators simply need to:

1. Open the Smart Recovery control and setup menu.
2. Select **4) User-Initiated Recovery**.



3. Click **Recovery**



4. Click **Reboot**

The recovery process is run and the computer will automatically reboot into the newly restored software system.

For instructions on how to execute a user-initiated recovery, see **Carrying Out a User-Initiated Recovery**.

6

Recovery Setup and Execution

This chapter describes the Smart Recovery modes in detail.

The following topics are covered in this chapter:

- **Setting Up a Manual Recovery Process**
  - Initiating a Manual Recovery Process
- **Setting Up a Fully Automated Recovery Process**
  - Configuring Fully Automated Recovery
- **Carrying Out a User-Initiated Recovery**

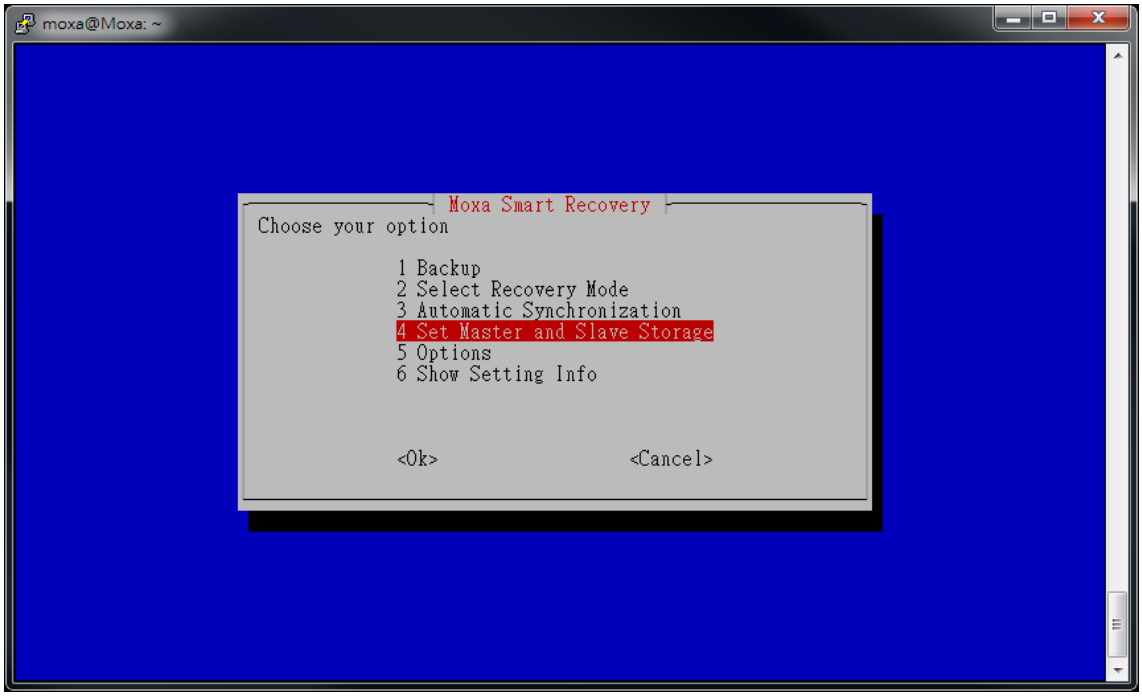
Setting Up a Manual Recovery Process

For precise information about the purpose and intended use of manual recovery, see **Manual Recovery Using a USB Key**.

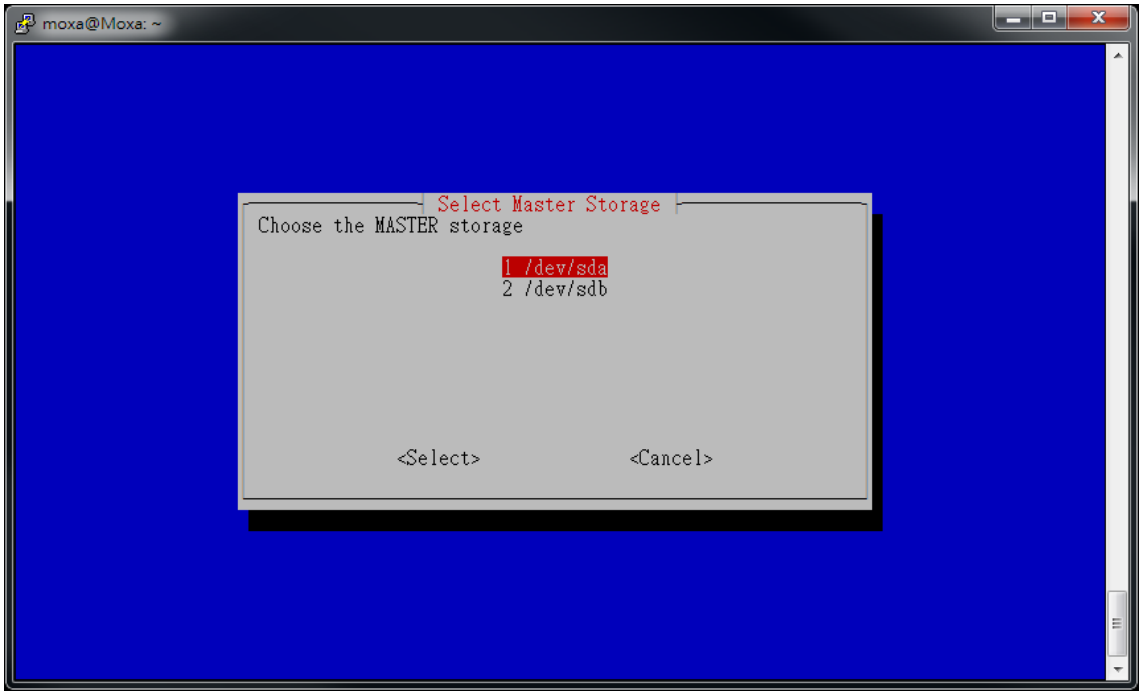
Initiating a Manual Recovery Process

To initiate a manual recovery process on your system, do the following:

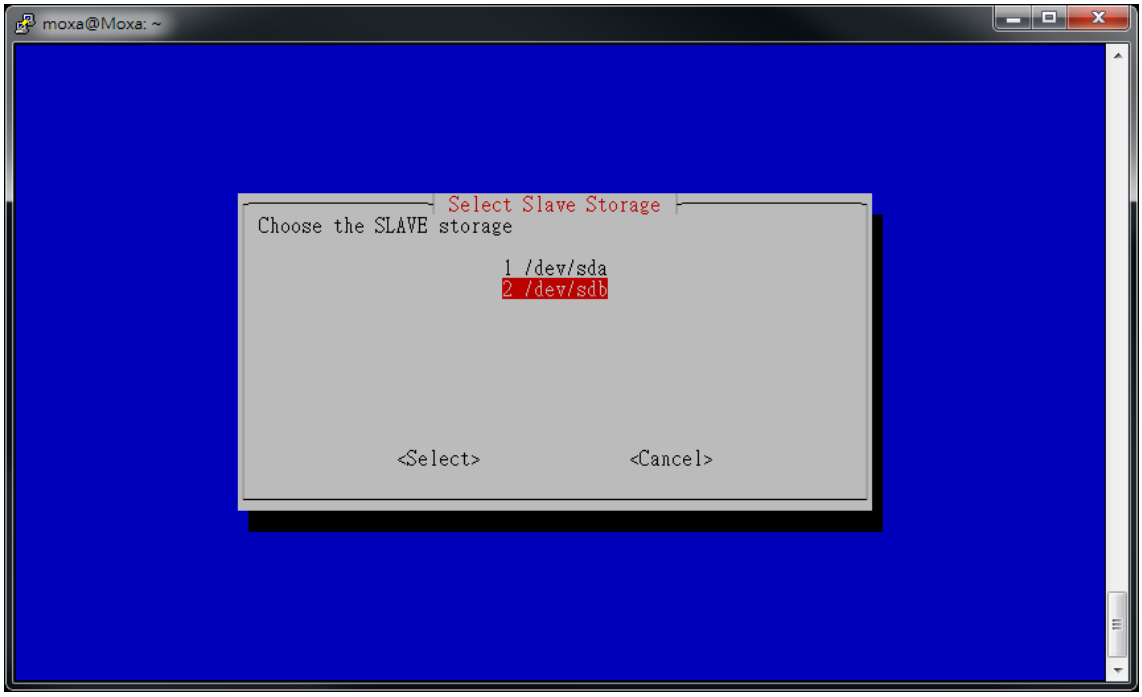
1. In the home interface, select **4) Set Master and Slave storage** option to configure the master and slave storage paths/drive.



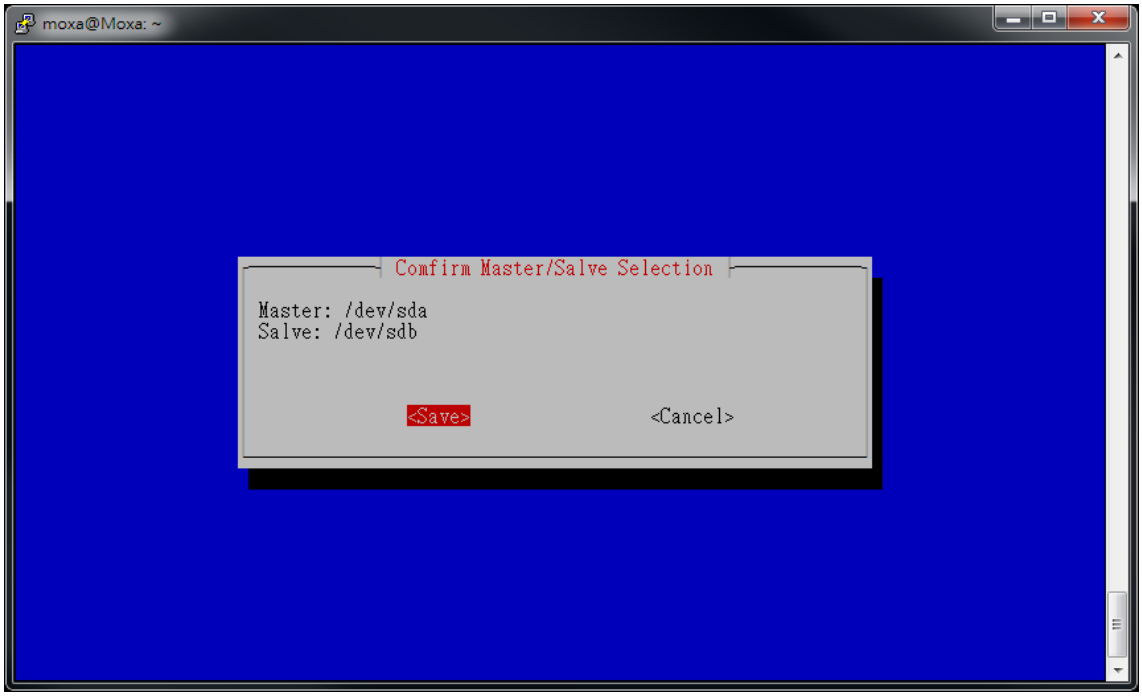
2. Select the master storage partition and click **<Select>**.



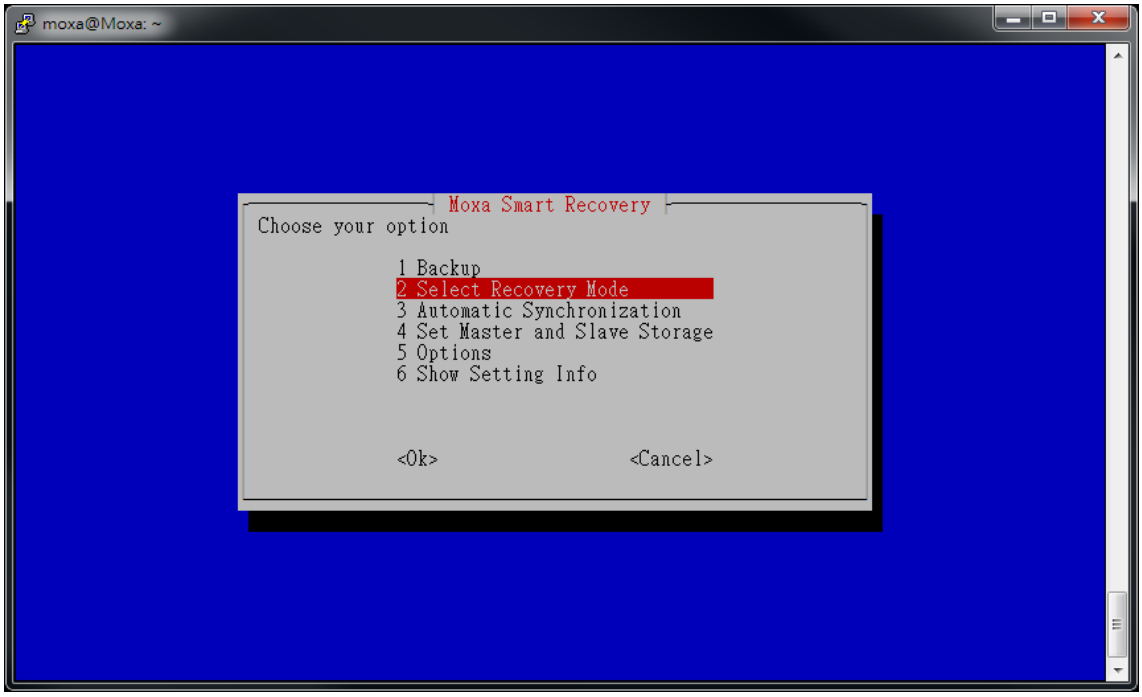
3. Select Slave storage partition and click **<Select>**.



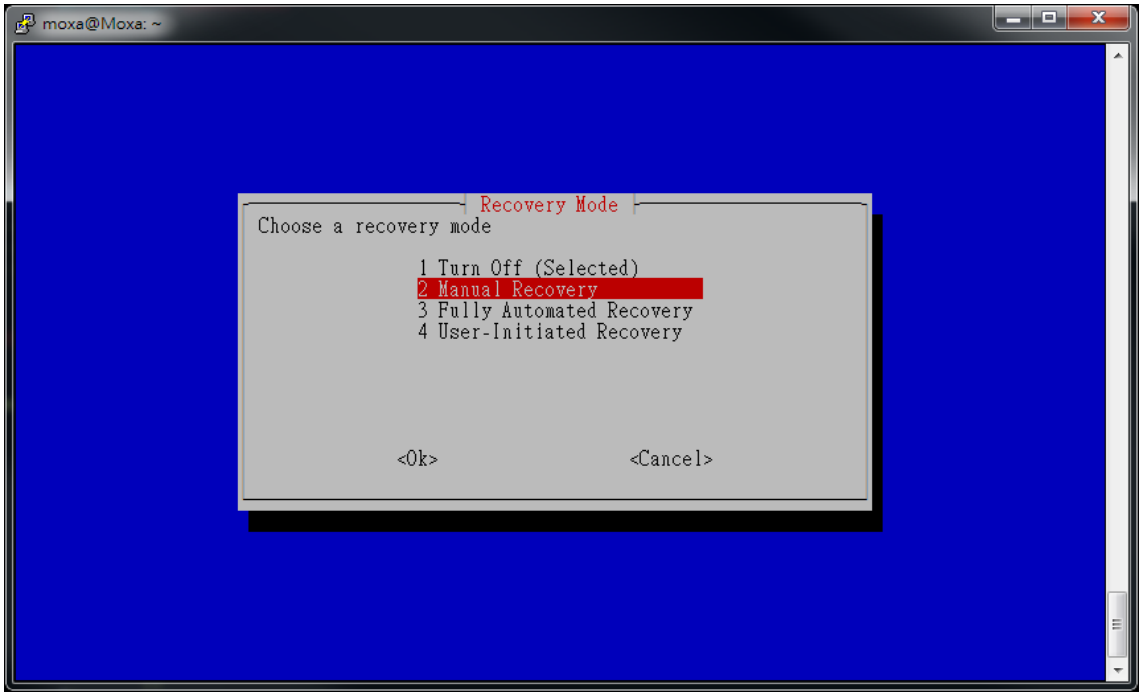
4. Confirm your selection with **<Save>**.



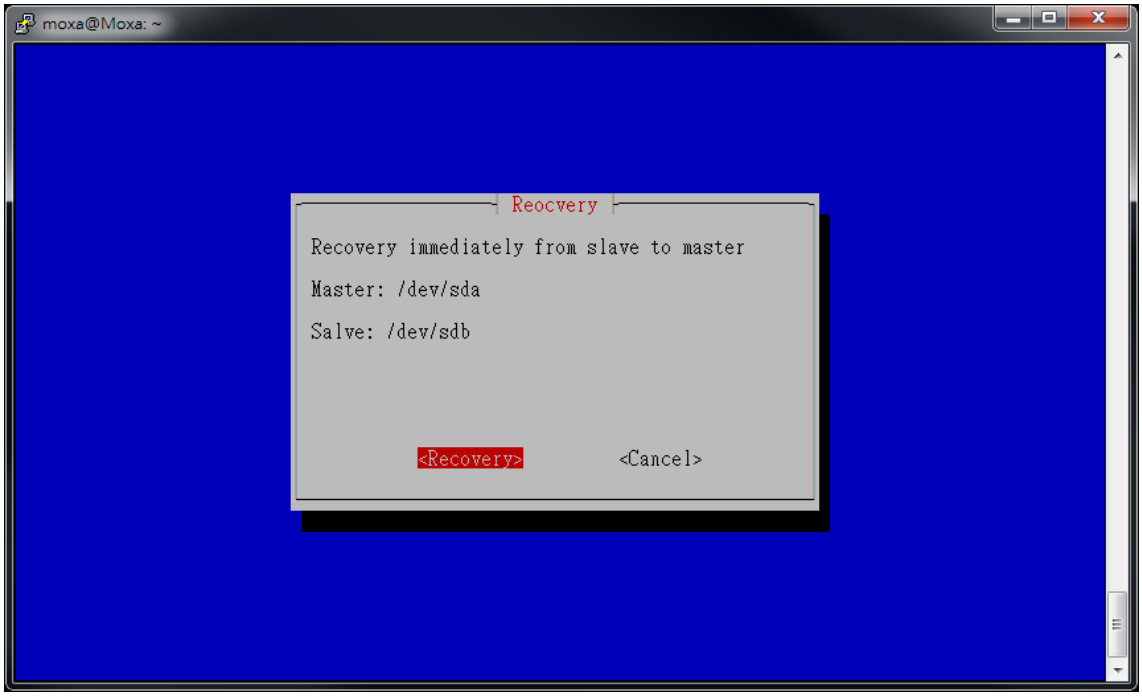
5. In the home interface, select **2) Select Recovery Mode**.



6. Select **2) Manual Recovery**.



7. Select <**Recovery>** to confirm that you want to recover data from the slave storage to master storage.



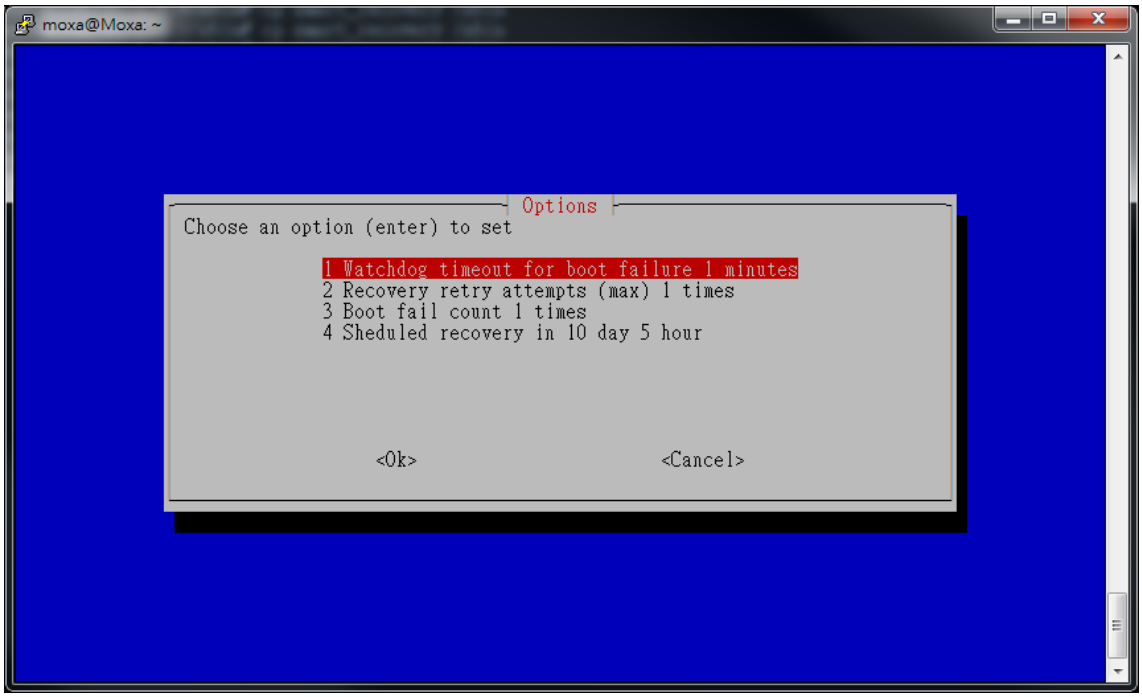
8. Select **<Reboot>** to reboot the system and carry out the recovery process.

The recovery process is complete once the system restarts and returns to Linux.

Setting Up a Fully Automated Recovery Process

A fully-automated recovery process in Smart Recovery requires configuration of many parameters depending on whether you want to configure scheduled rewrites of the software platform or configure emergency rewrites upon boot failures or watchdog timer triggers. All these options are available after you select **5) Options** in the home interface.

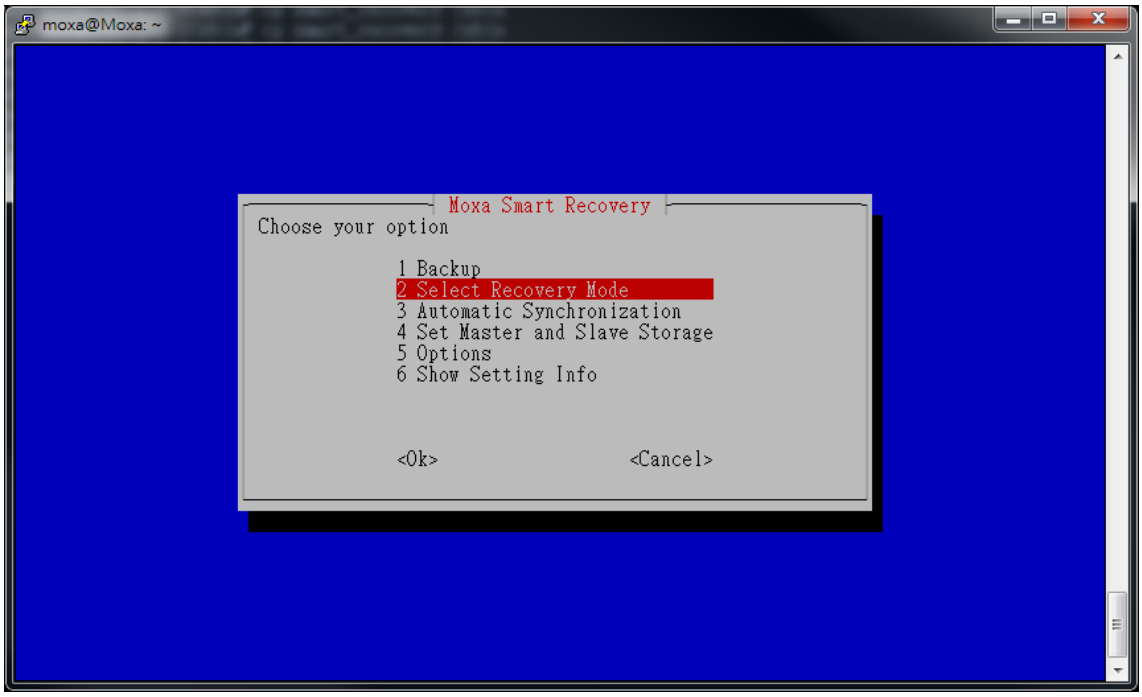
- **Watchdog timeout for boot failure:** This sets the time, in minutes, that the computer will wait before deciding a boot attempt has failed and a system recovery must be initiated.
- **Recovery retry attempts:** This sets the total number of times the computer will rewrite the system and attempt a restart before determining that the problem is unresolvable, and ceases attempting to recover the system.
- **Boot fail count:** This setting only takes effect after the watchdog timer has determined that the boot process has failed. This entry sets the number of times the system will attempt a restart before deciding the software platform is broken and a system rewrite is required.
- **Scheduled auto-recovery in days:** This sets the number of days that will pass before the system initiates a scheduled rewrite procedure.



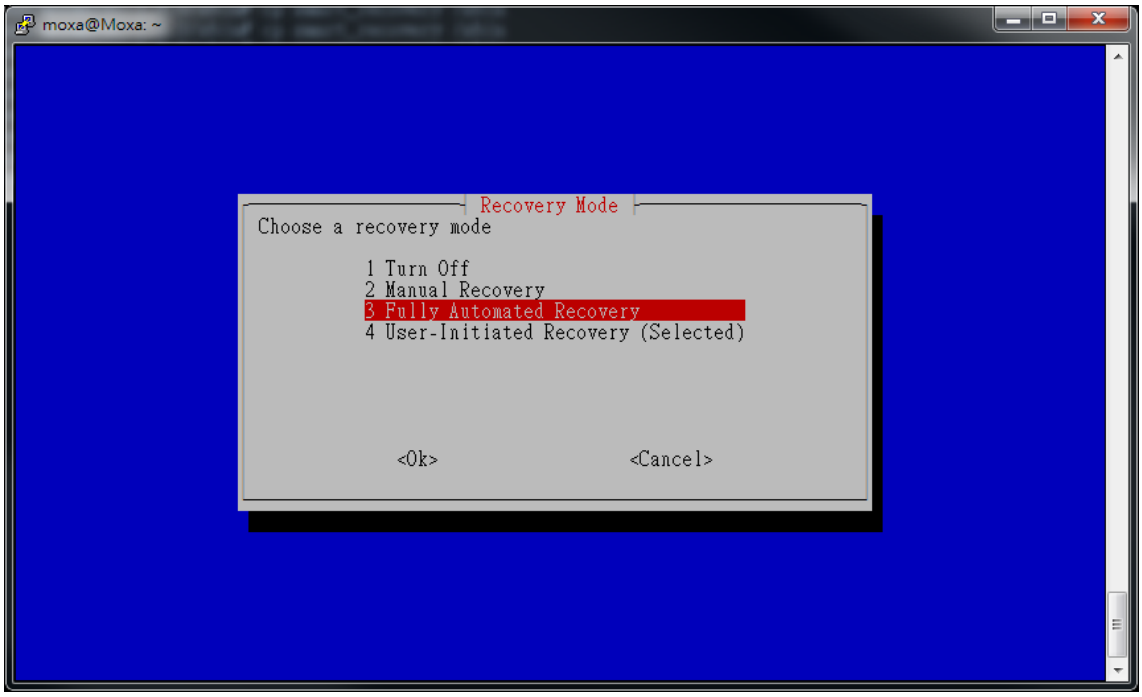
Configuring Fully Automated Recovery

To configure fully-automated system recovery, do the following:

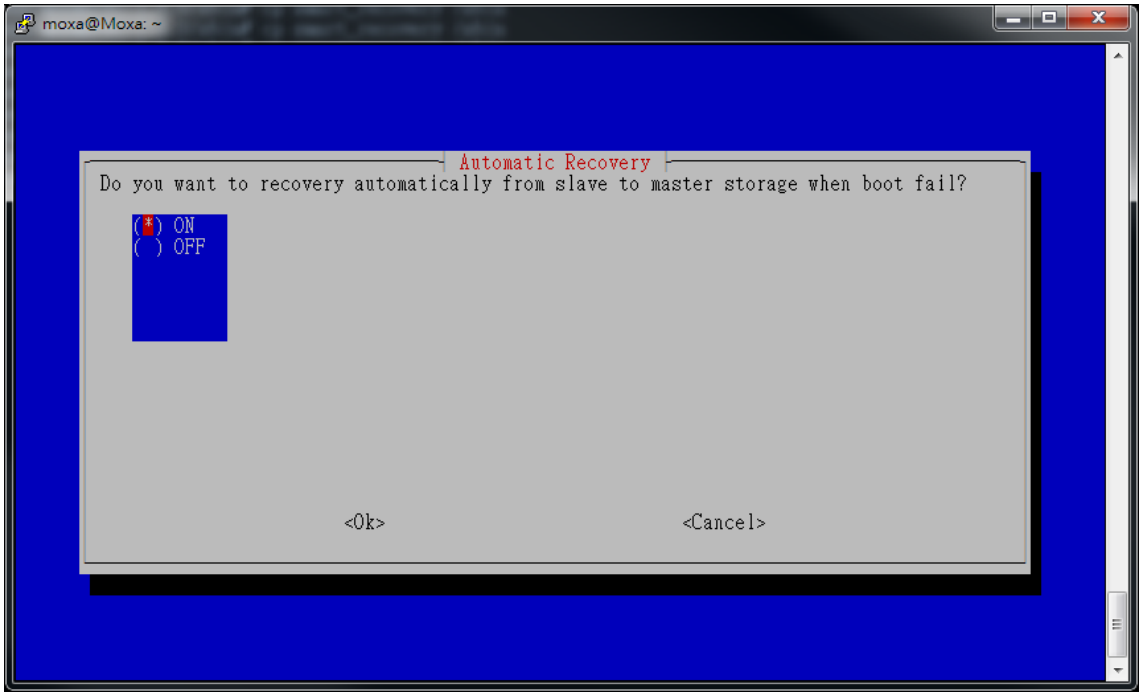
1. In the home interface, select **2) Select Recovery Mode**.



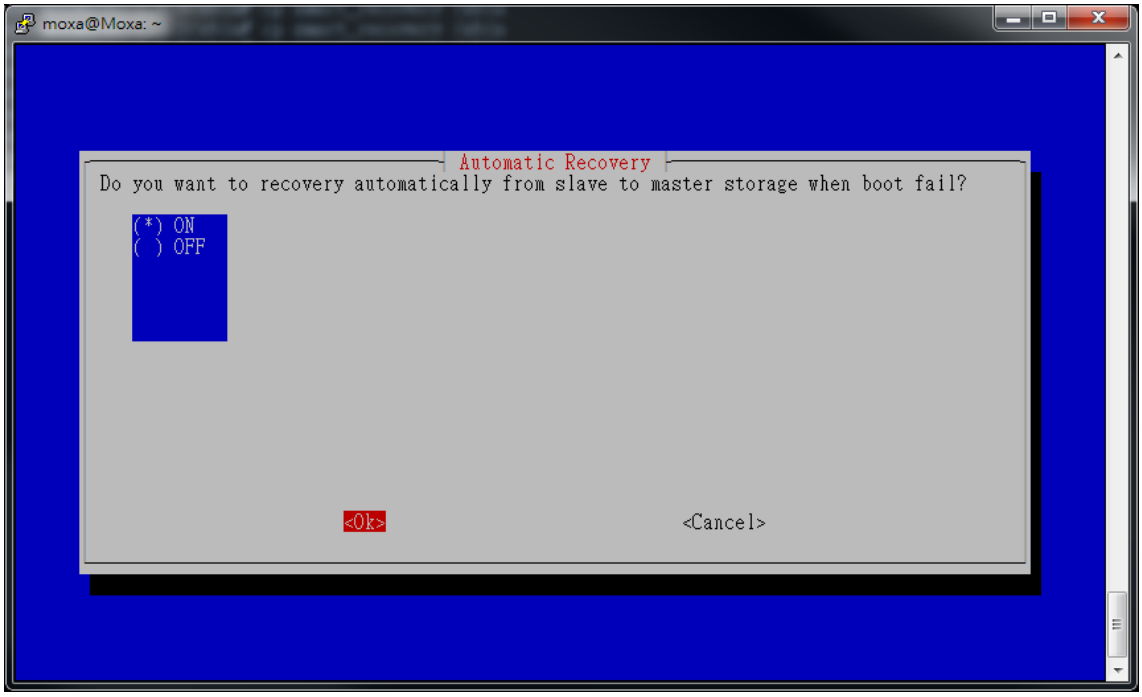
2. Select **3) Fully Automated Recovery**.



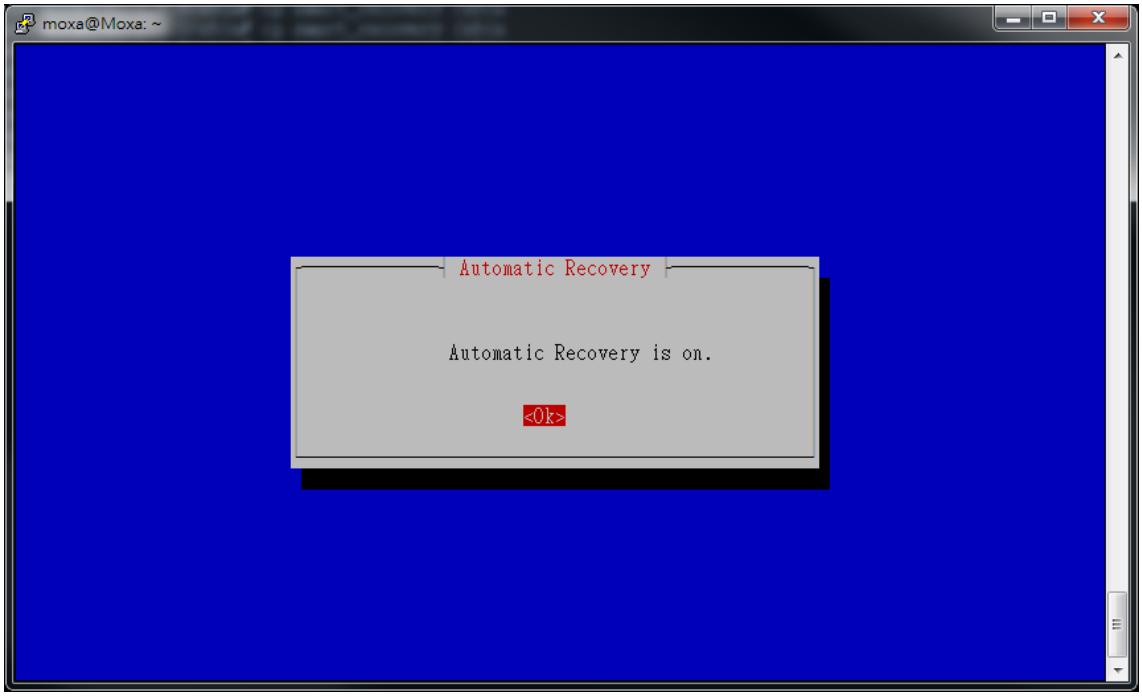
3. Select **ON**, and press <space>.



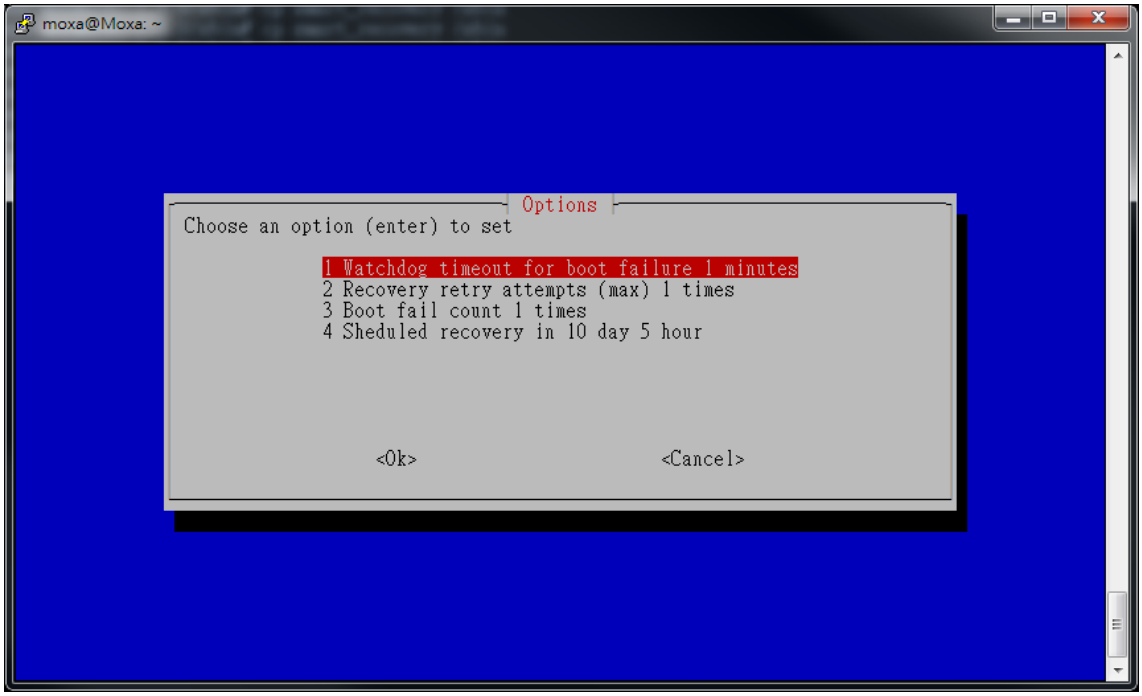
4. Press <tab> to select **<Ok>**.



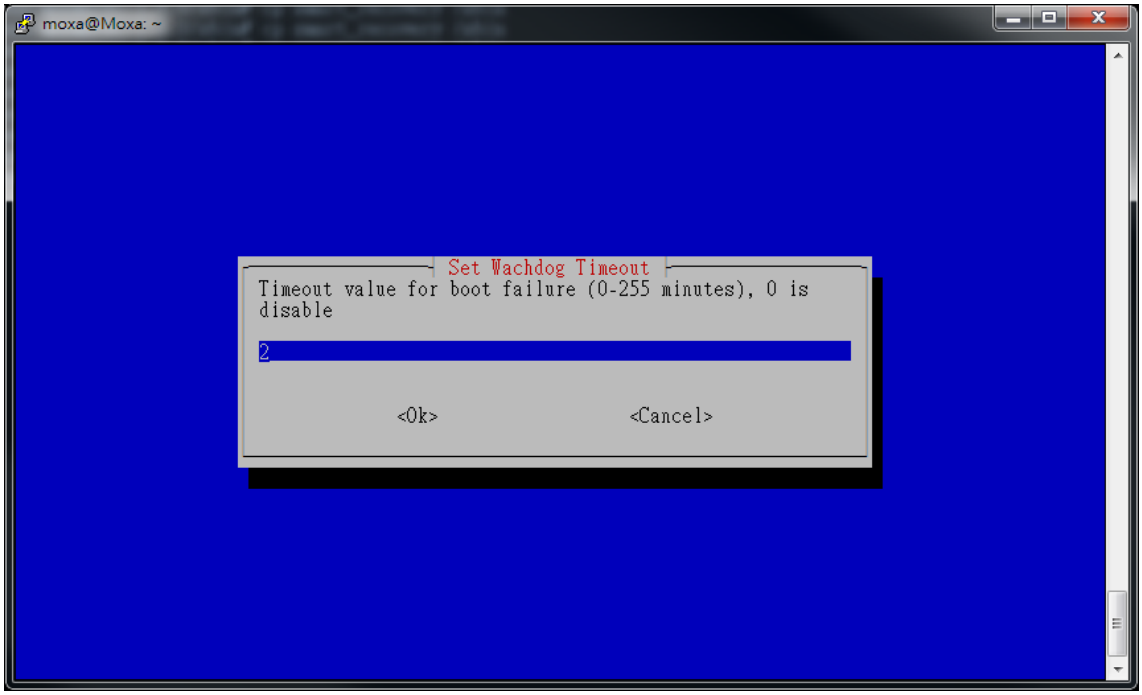
5. Select **<Ok>** in the **Automatic Recovery** message window.



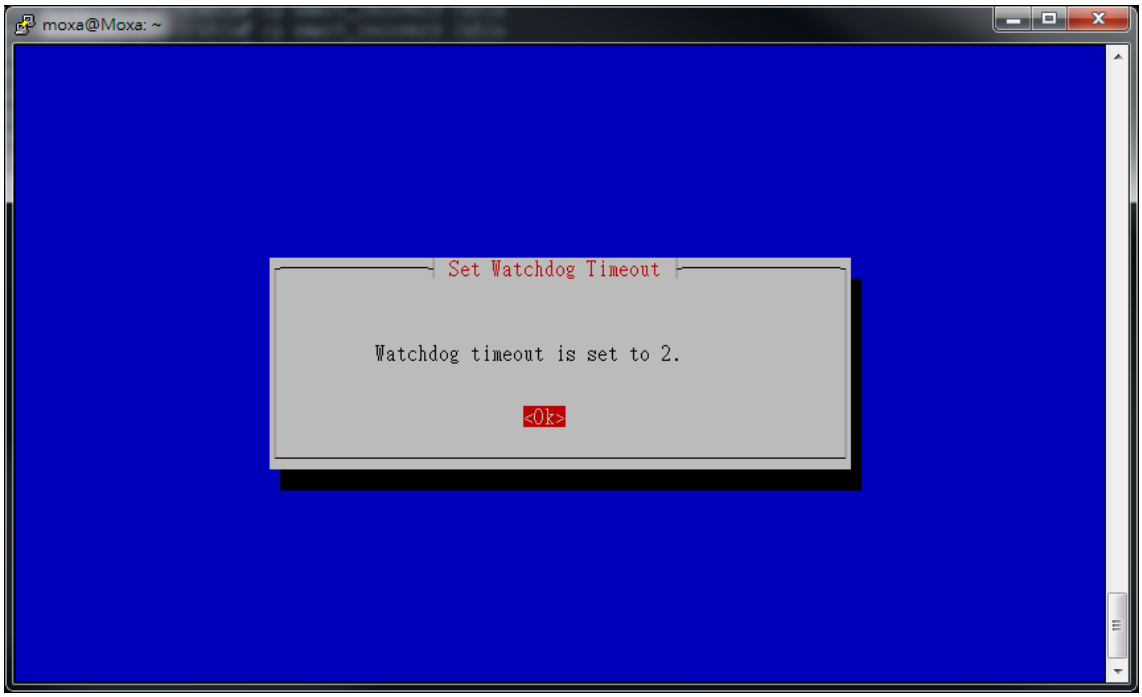
6. The default value for the watchdog timeout is 1 minute. Press <enter> to change the default value.



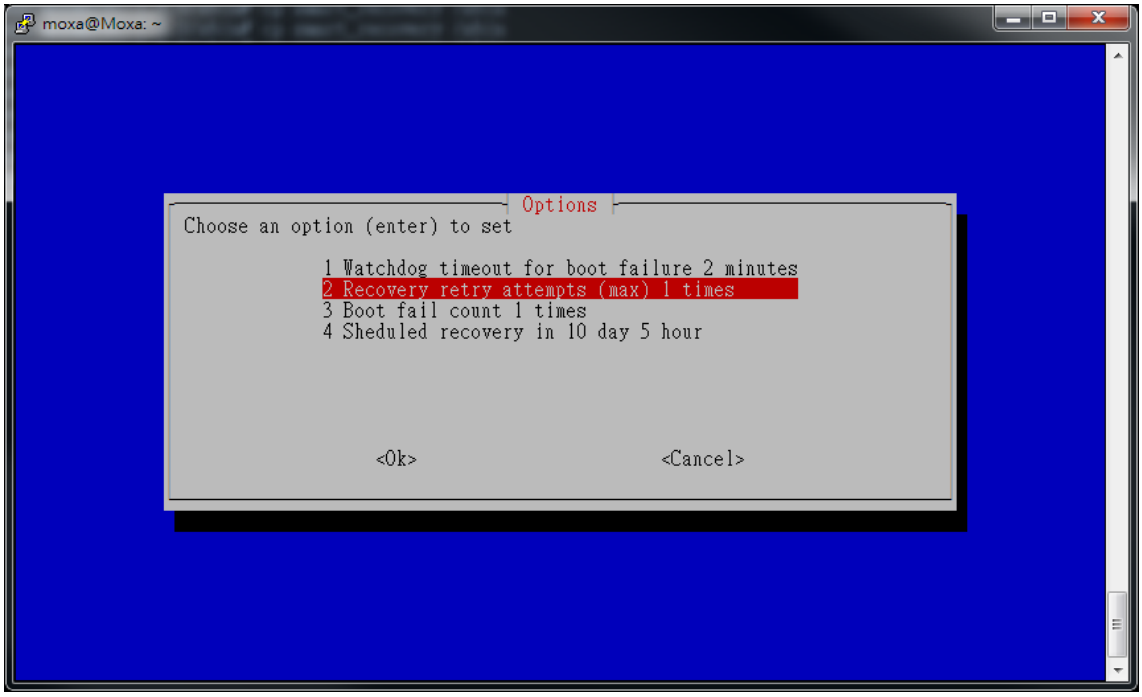
7. Enter a number in the range **0–255** minutes. The value **0** is for disabling the watchdog timeout and press <enter> to confirm your input.



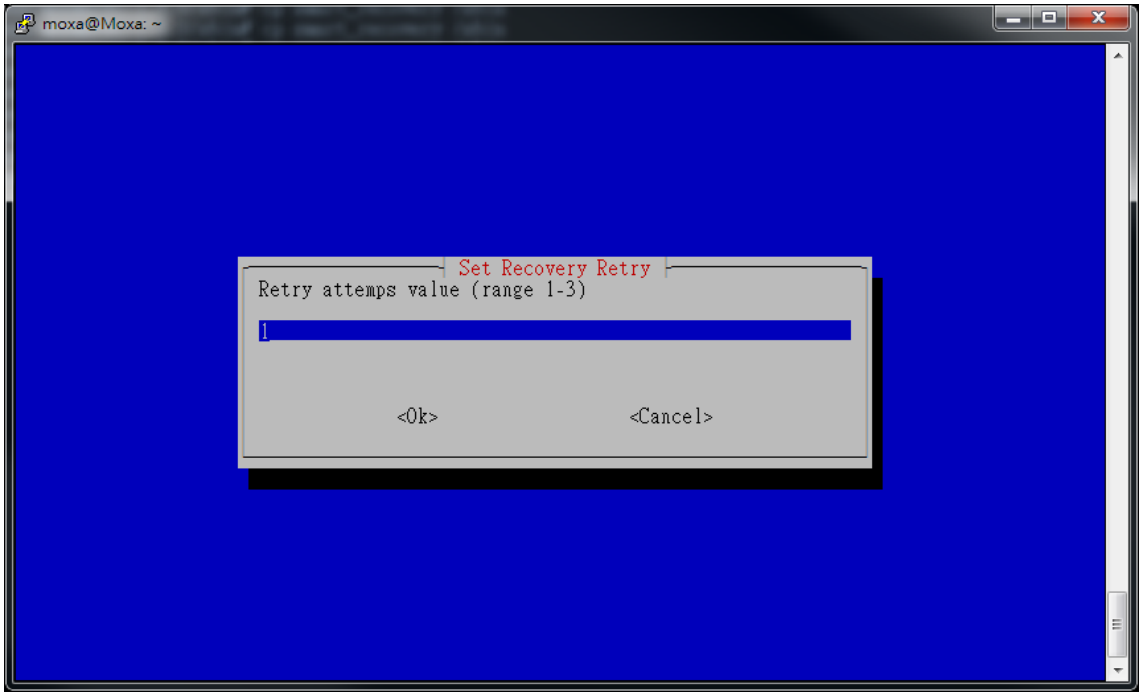
8. Select <Ok> to confirm the setting again.



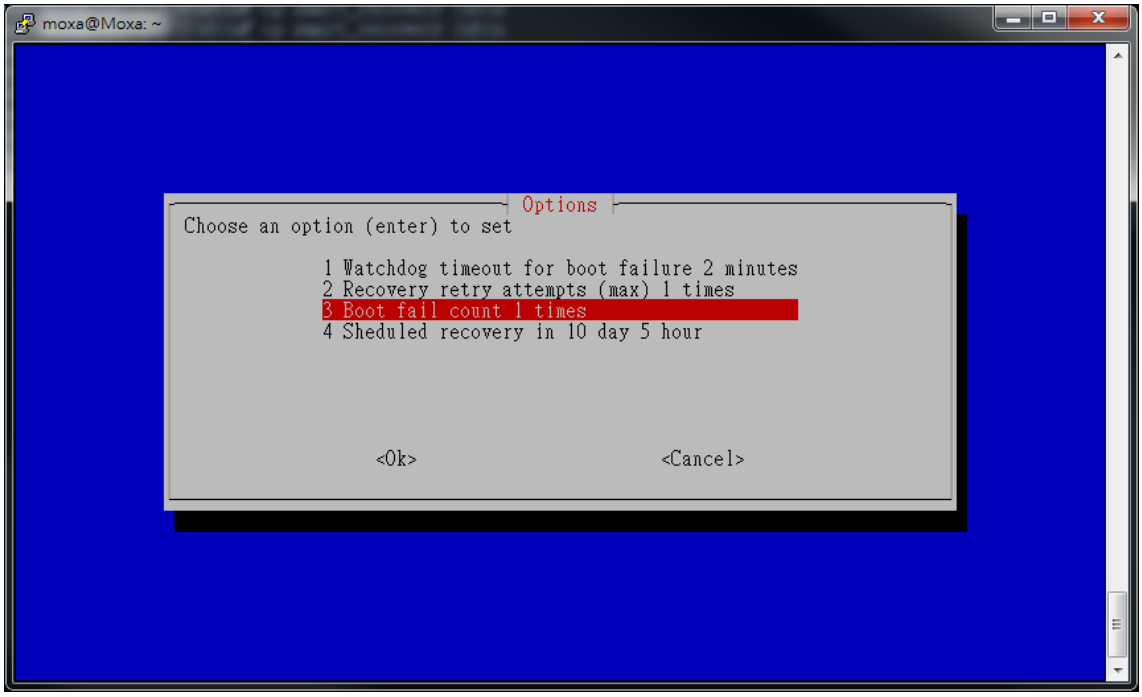
9. Select **2) Recovery retry attempts (max)...** to set the recovery retry attempts.



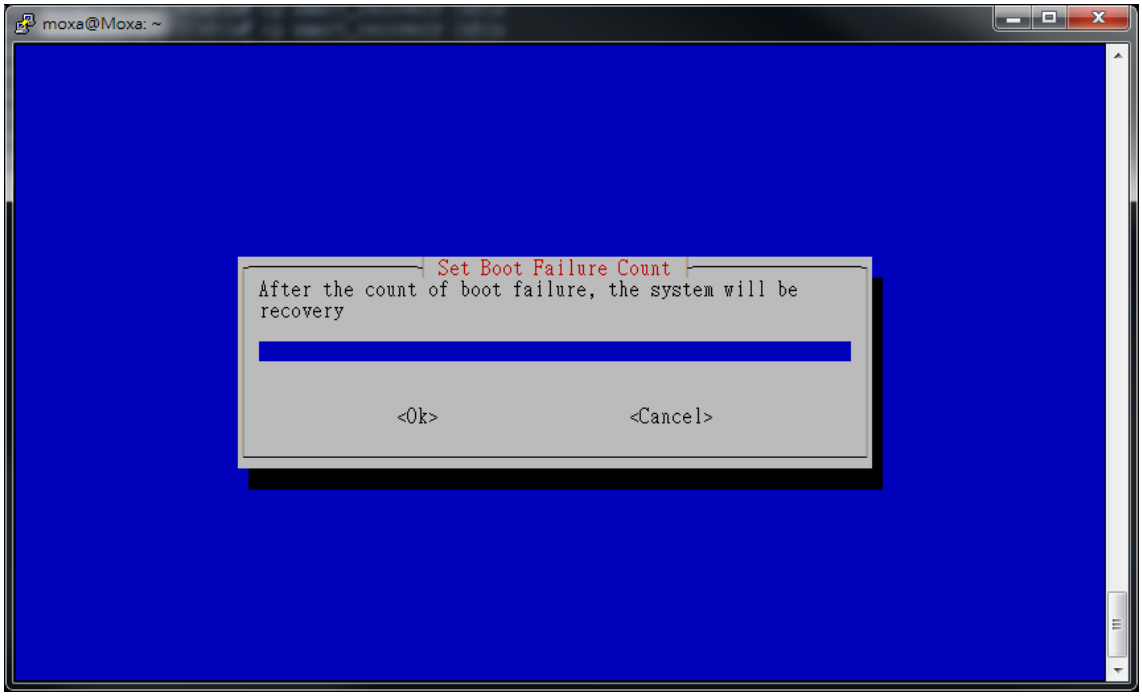
10. Enter a number in the range **1–3** and press <enter> to confirm the setting.



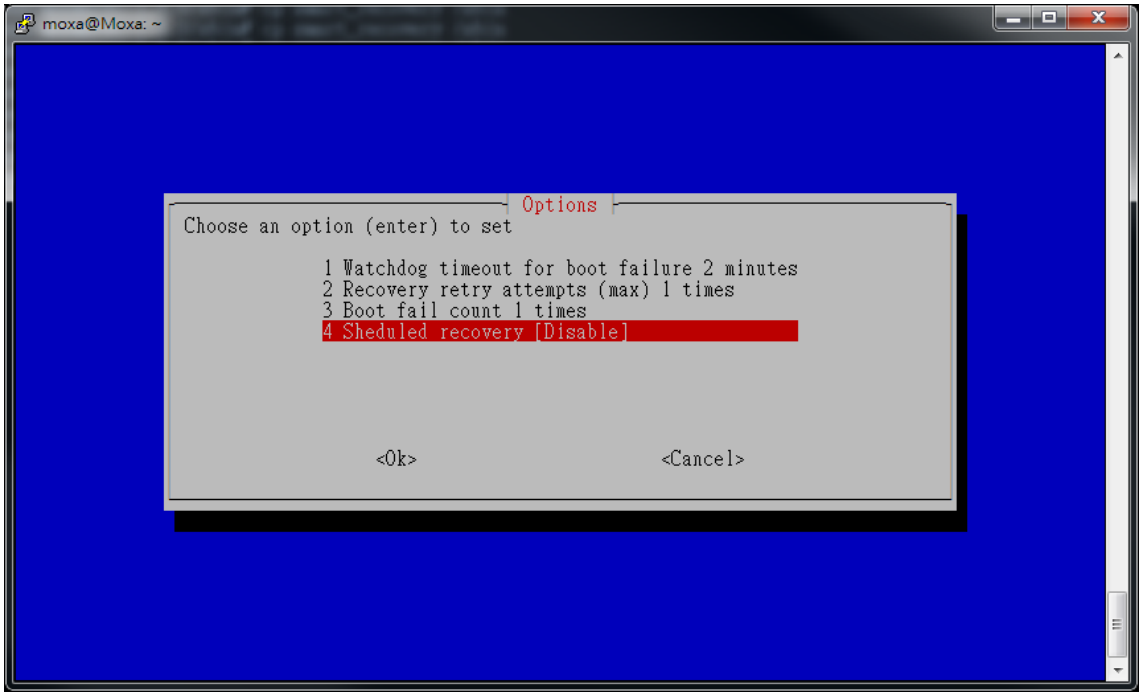
11. Select **3) Boot fail count** to set the boot fail count**.**



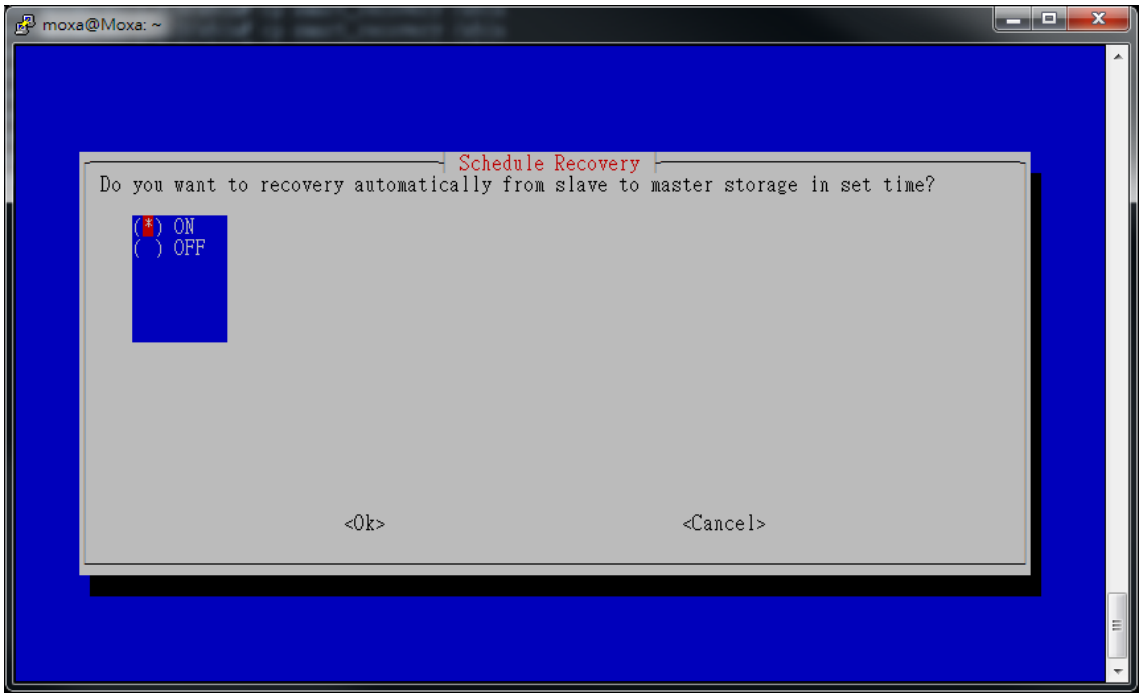
12. Input a number in the range **1–3** and press <enter> to confirm.



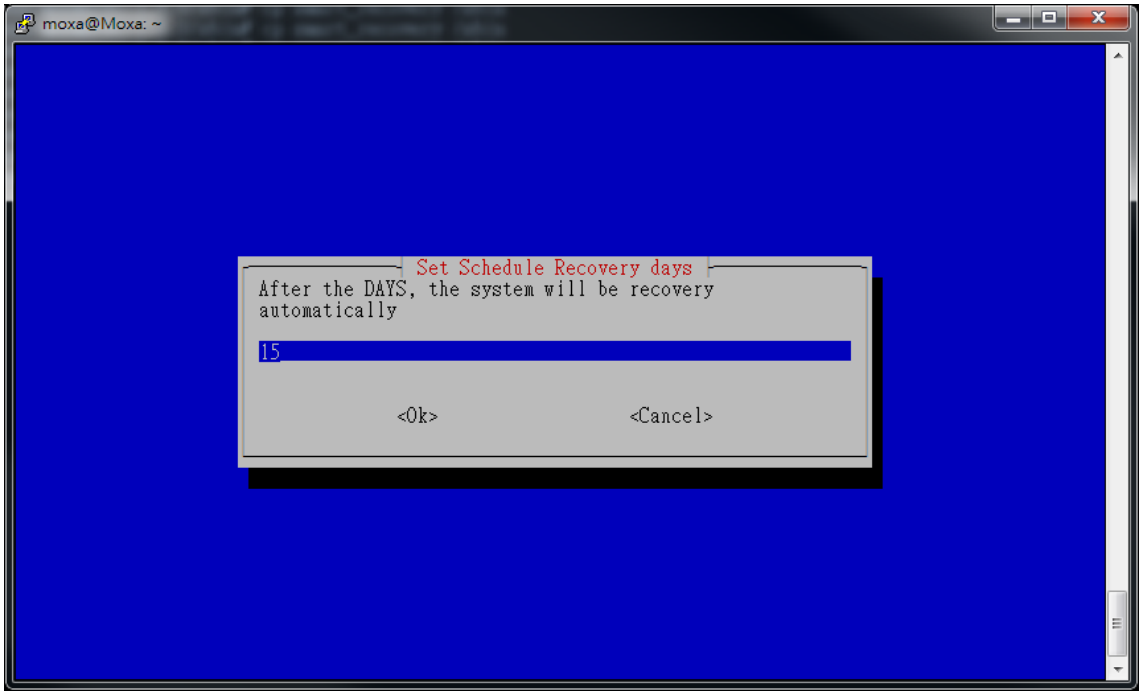
13. You can also set scheduled recovery in days and hours or disable it by selecting **4) Scheduled recovery.**



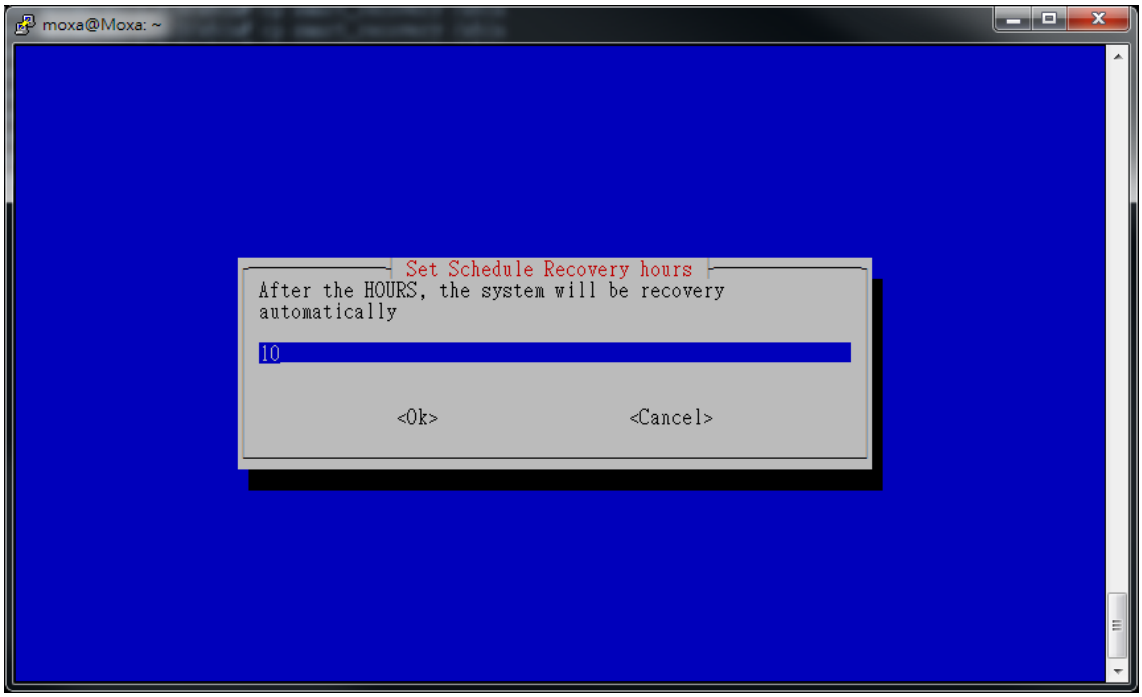
14. If you want to turn on scheduled recovery, select **ON** and press <space>, then press <tab> to select **<Ok>** to confirm it



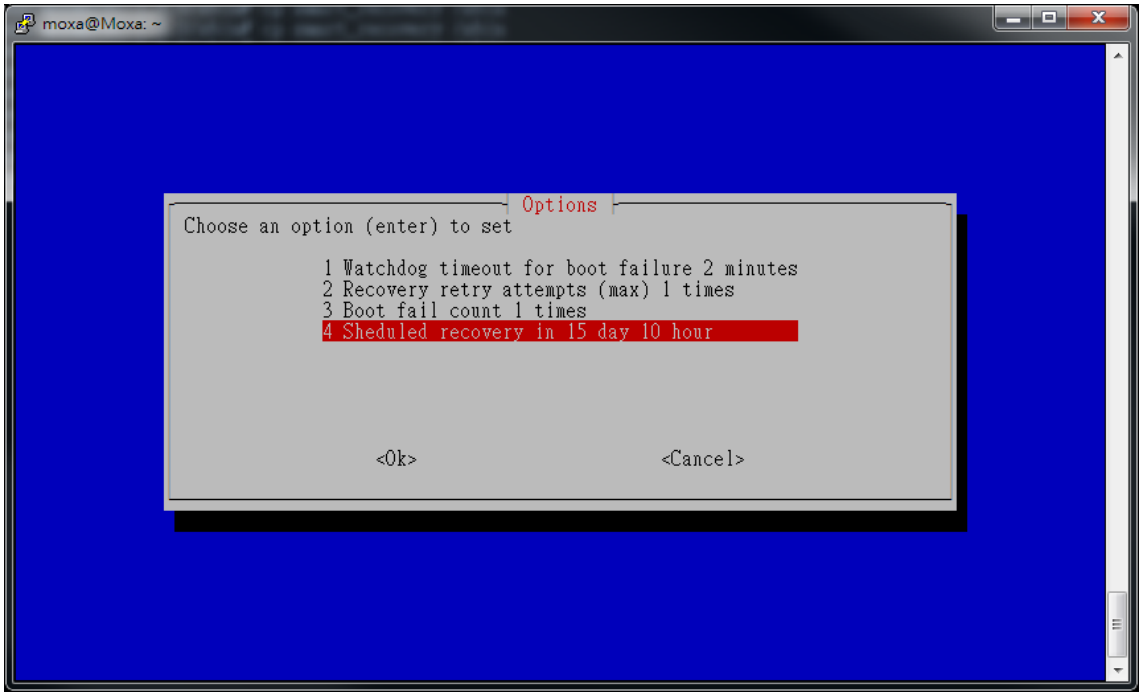
15. If you are turning on the scheduled recovery, you should set the number of days after which recovery process should be initiated.



16. Enter the number of hours to perform recovery.



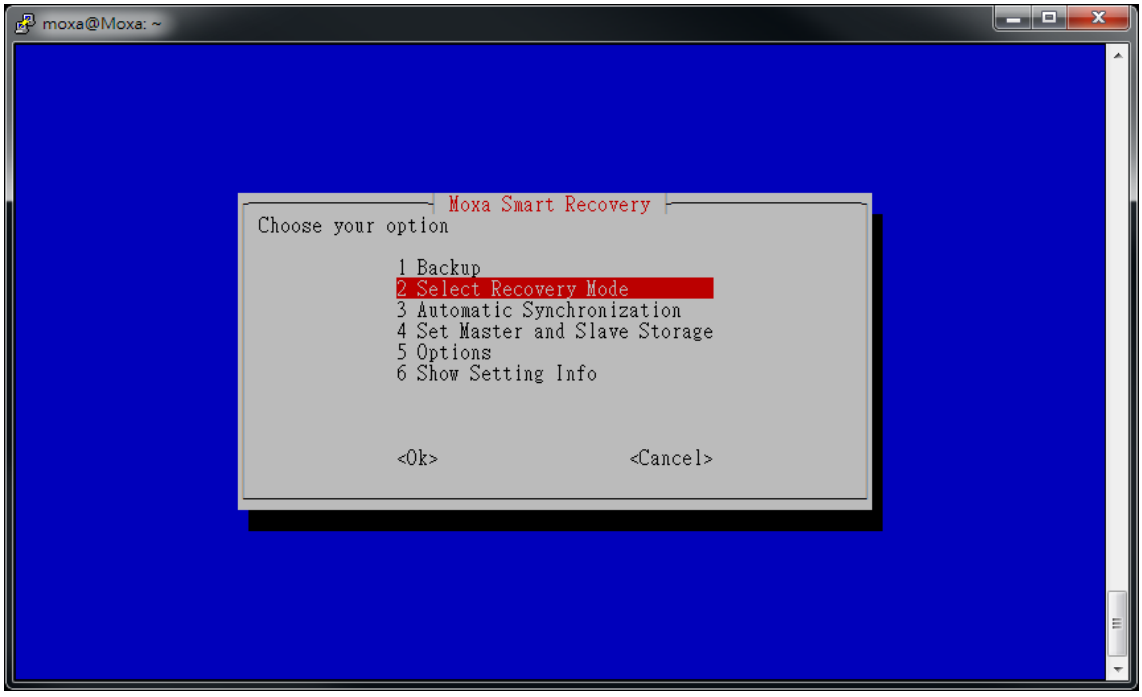
You will be able to see the configuration changes that you just made in the home interface.



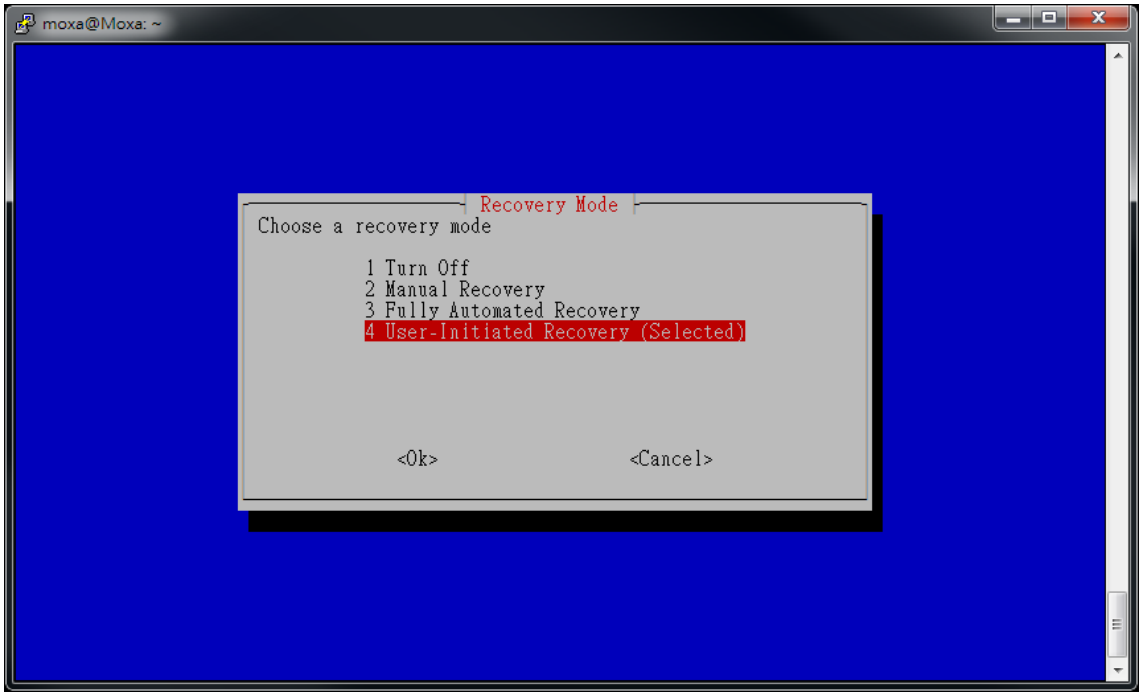
Carrying Out a User-Initiated Recovery

User-initiated recovery is intended to provide system administrators and ordinary users with a configuration option that allows system recovery to be initiated on-the-fly, whether remotely or locally. These user-initiated recovery procedures can be used either for standard upkeep and maintenance, or for emergency administration (particularly in remote installations where it is difficult or impossible to send support personnel). This recovery process can also be initiated over a local network such as in the case where a monitor and user input are not directly available at the computer station.

1. In the home interface, select **2) Select Recovery Mode**.



2. Select **4) User-Initiated Recovery**.



7

BIOS Information

This chapter shows you how to set up your system's BIOS to interact with Smart Recovery's user space software.

The following topics are covered in this chapter:

- **BIOS Options: The Watchdog and System Defaults**
- **Smart Recovery Command Line Notifications**

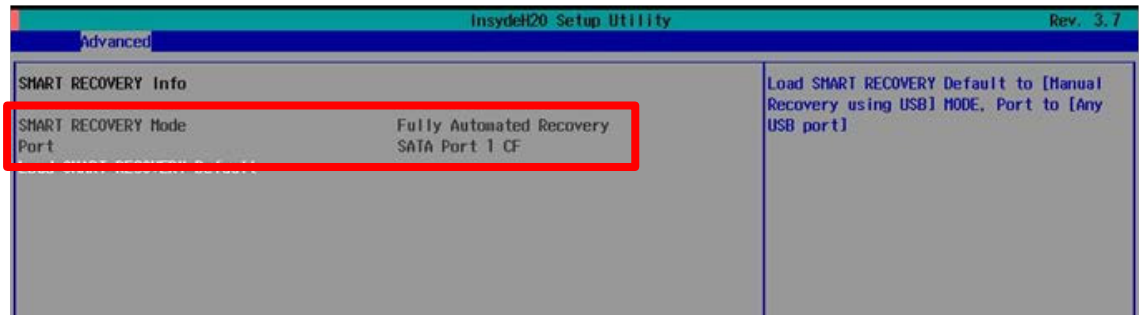
BIOS Options: The Watchdog and System Defaults

This section shows you how to set up your system's BIOS to interact with Smart Recovery's user space software.

1. Reboot your computer and press **F2** during the power-on self-test (POST) process to enter the BIOS setup environment (SCU).
2. Use the right/left arrows to navigate to the **Advanced** tab at the top of the BIOS setup screen.

NOTE If the **SMART RECOVERY Info** option is not present in the list of features shown under the **Advanced** tab, then your BIOS does not support the Smart Recovery automated system rescue utility.

3. Use the up/down arrows to navigate to **SMART RECOVERY Info** and press **Enter** to open Smart Recovery's BIOS setup page.
   If you have already configured Smart Recovery for a particular recovery method you will see the currently configured method listed on the first line of information, and the device that contains the recovery environment on the one immediately following. In the screenshot below, the system is currently configured for a **Fully Automated Recovery**. In this setup, the BIOS level watchdog timer is enabled, and constantly monitoring the system for anomalies like extended boot times or other software problems.



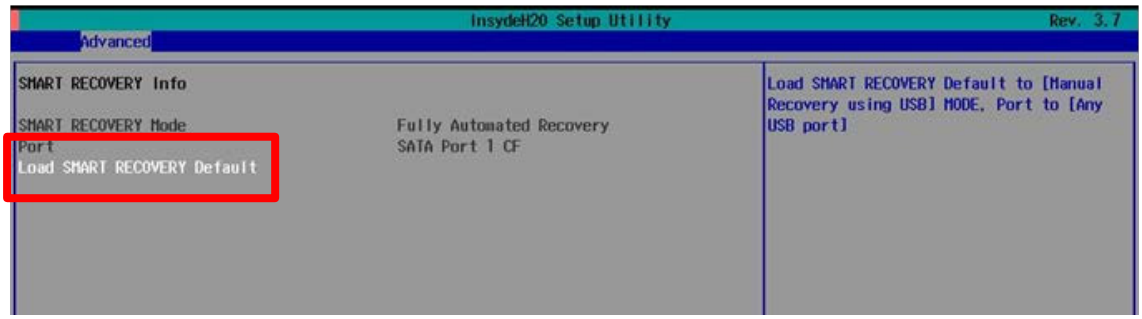
4. Check and change (optional) the Smart Recovery mode as per your requirement.

IMPORTANT!

When the system is configured for **Fully Automated Recovery**, users who want to initiate one of the other recovery methods (**Manual Recovery Using a USB Key** or a **User-Initiated Recovery**) must first enter the BIOS and reset Smart Recovery to its BIOS defaults: **Manual Recovery using USB** mode and **Any USB Port** for the recovery device port.

The reason for this is because the BIOS level watchdog that is associated with the Fully Automated Recovery mode will, if kept running, register the time used to copy the system as an indication of a system error (i.e.: as a timeout on the boot process), and will consequently restart the recovery procedure mid-way through. Resetting Smart Recovery to its BIOS defaults turns off the watchdog and eliminates the possibility of this error.

To check the BIOS defaults, use the up/down arrow keys to navigate to the **Load SMART RECOVERY Default** entry and press **Enter**.



ATTENTION

Please note the following:

1. After configuring a machine for **Fully Automated Recovery** mode you must take care not to kill the background Smart Recovery Tool service. The watchdog monitors the Smart Recovery Tool service to validate that the system is functioning normally. If the service is removed when the watchdog is still running, it will cause the system to reboot and attempt a system recovery.
2. When running a machine configured for a **Fully Automated Recovery**, the watchdog function will be enabled. This watchdog runs at the BIOS level. Consequently, if a user attempts a system recovery using either of the other methods (manual recovery or user-initiated recovery), the watchdog will register the operating system's down time as a system failure and will interrupt the recovery process mid-way to initiate its own configured procedure. To avoid this, users who are applying one of the other recovery procedures on a machine configured for a fully automated recover will need to stop the BIOS-level watchdog, either by selecting **Manual Recovery using USB method**, as described in the section just above, or by disabling the watchdog from within the Smart Recovery interface, as described in Chapter 3.

Smart Recovery Command Line Notifications

When performing a **Manual Recovery Using a USB Key**, you should see the following message, which indicates that the BIOS has detected the USB drive with the recovery system:

```
USB port 3 have smart recovery system, boot to…
```

If a normal system restart fails and the system is configured for a **Fully Automated Recovery** then the notification below will appear just before the recovery procedure is attempted. In the screenshot below, the system was configured for a single retry of the boot process before entering the recovery procedure, and a USB drive mounted in port 3 was set as the recovery device.

```
Meet boot retry count 1
```

```
Enter Recovery Process
Change Boot to USB, Port=3
```

If a fully automated recovery is attempted but the system fails to recover, the message below will be displayed. Pressing **Enter** at this point will exit Smart Recovery and return the device to the normal boot process.

```
Meet boot retry count 1
Enter Recovery Process
Recovery Process Fail and meet retry limit.
Return to normal process
Press Enter to continue
```