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Using Driver Update Disk to Install Linux on Lenovo ThinkSystem Servers

Introduces the Driver Update Disk feature

Describes the use of the DUD file

Explains how to build a DUD file under Linux

Shows how to confirm that the DUD file is loaded

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Abstract

Driver Update Disk (DUD) is a feature of Linux operating systems used to install drivers for required devices or updated software packages during operating system installation. It is easy to fix any installation issues and does not require a pre-installed operating system and application.

This document introduces Driver Update Disk feature, shows users how to build a DUD file, and how to use it on supported Lenovo® ThinkSystem™ servers. This paper is intended for IT specialists and IT administrators who are familiar with Red Hat/SUSE Linux operating system and want to install an older or customized operating system on Lenovo ThinkSystem servers with newer devices.

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Introduction

Driver Update Disk (DUD) is a feature of Linux operating systems used to install drivers for required devices or updated software packages during operating system installation. Compared to other update methods, with DUD, it is easy to fix any installation issues and does not require a pre-installed operating system and application. The DUD file is a special format file that is created based on driver source code provided by hardware component vendor or updated software packages provided by OS vendor, and is ultimately used by the installed system.

In general, the OS or hardware component vendor only provides the current standard version of the DUD file, but if you are using a customized OS or meet the following conditions you need to make your own DUD file:

- The OS image does not support new devices and OS/hardware component vendor does not provide DUD files of new devices.
- You want to use the latest driver or specified version, but it is not in the OS image, or there is no DUD file provided by OS/hardware component vendor.
- There are some software issues when you install OS via the released image. You can build the fixed package as a DUD file and solve the problem.

DUD (also known as Driver Update Programmer, DUP), is supported by the following Linux distributions:

- Red Hat Enterprise Linux 5 and later
- SUSE Linux Enterprise Server 9 and later

Secure Boot limitation: On UEFI systems with the Secure Boot technology enabled, the software package cannot be loaded or installed because it is not signed by the OS vendor.

Layout of the DUD

The DUD layout depends on different Linux distributions. For SLES, the structure is as follows and shown in Figure 1.

```
linux / [ Distribution ] / [ Architecture ]-[ Version ] /
```

```
# tree linux/
linux/
··· suse                      # [ Distribution]
    ··· x86_64-sles15          # [ Architecture ]-[Version]
        ··· dud.config
        ··· inst-sys
        ·   ··· lib
        ·       ··· modules
        ·           ··· 5.3.18-22-default
        ·               ··· weak-updates
        ·                   ··· megaraid_sas
        ·                       ··· megaraid_sas.ko.new
        ··· install
            ··· megaraid_sas-07.717.02.00-1.x86_64.rpm
            ··· update.post2
            ··· update.pre
```

Figure 1 SLES DUD Structure

For RHEL and CentOS, the DUD structure is as follows and shown in Figure 2.

```
OEMDRV/ [ rhdd3 & rpms] / [ Arch & Any other architecture file]
```

```
# tree OEMDRV/      # The storage device MUST labeled “OEMDRV“
OEMDRV/
··· rhdd3        # DD marker, contains the DUD's description string
··· rpms
    ··· x86_64    # Contains RPMs for this arch and acts as package repo
        ··· kmod-megaraid_sas-07.717.02.00_el8.1-1.x86_64.rpm
        ··· repodata
            ··· 3d92d42ad490563…db-other.xml.gz
             …
            ··· repomd.xml
```

Figure 2 RHEL / CentOS DUD Structure

Building a DUD file

This section demonstrates how to build a DUD file from source code.

The requirements to build a DUD file are as follows:

- Operating system with compilation environment (including gcc, rpmbuild, make, createrepo, mkisofs, etc)
- Driver source code
- Open source tools:
  - mkdud - see https://github.com/openSUSE/mkdud
  - mkdriverdisk.sh - see https://gist.github.com/h2onda/9c73da8ddaa0f8dacc41#file-mkdriverdisk-sh
  - ddiskit - see https://github.com/orosp/ddiskit

The following steps show how to build a DUD file. We are using the Broadcom MegaRAID driver for our example.

1. Download the source code package from the component vendor website.
2. Install the source rpm and review the output to determine the full path to the SPECS directory as shown in Figure 3.

   Note: If provided by the IO vendor, it is recommended to install Kernel Module Packages (KMP) for SLES and Kernel Module (KMOD) package for RHEL / CentOS.

```
# rpm -ivvvh megaraid_sas-07.717.02.00-1.src.rpm
…
D:     0 /usr/src/packages/SOURCES/
D:     1 /usr/src/packages/SPECS/
```

Figure 3 Full path to the SPECS directory

3. Navigate to the SPECS file directory and build the driver using the rpmbuild command as shown in Figure 4.

```
localhost:/usr/src/packages/SPECS # rpmbuild -ba megaraid_sas.spec
Executing(%prep): /bin/sh -e /var/tmp/rpm-tmp.rge8Yb
…
Wrote: /usr/src/packages/RPMS/x86_64/megaraid_sas-07.717.02.00-1.x86_64.rpm

localhost:/usr/src/packages/SPECS #
```

Figure 4 rpmbuild command

4. Build DUD/ISO file based on the rpm compiled in Step 3.

   For SLES:

   a. Create the DUD file using mkdud:

```
# ./mkdud --dist SLES15SP2 --create SLES15SP2_RAID.dud
megaraid_sas-07.717.02.00-1.x86_64.rpm
```

Figure 5 mkdud command

   b. Get the directory “linux” by extracting the dud file:

```
# gzip -dc SLES15SP2_RAID.dud | cpio -dim
# ls
SLES15SP2_RAID.dud linux
```

Figure 6 Determine the

   c. Create the ISO file with the “linux” directory above:

```
# mkdir build     # Create a temporary directory
# mv linux build/  # Move the directory “linux” into temporary directory.
# mkisofs -r -o SLES15SP2_RAID.iso ./build/
```

Figure 7 Creating the ISO image

   For RHEL/CentOS:

   a. Create the ISO file via tool “mkdriverdisk.sh” using the rpm created in Step 3.

```
# ./mkdriverdisk.sh /root/rpmbuild/RPMS/x86_64/kmod-megaraid_sas-07.717.02.00-1.x86_64.rpm
Directory walk started
Directory walk done - 1 packages
…
create driver disk to driverdisk_2022-01-12_19:39:42.iso is done!
#
```

Figure 8 Creating the ISO

Using the DUD ISO file

This section describes how to use the DUD file under Red Hat/CentOS and SUSE.

To install an operating system using the DUD file, use the following steps:

1. Burn the DUD ISO into a DVD/CD/USB flash drive or make the ISO image available to the system through a virtual disk.
2. Boot the installer media and use the appropriate boot parameters for the version of OS you are installing:
   - For RHEL/CentOS 6 and 5, use the option **dd** (driver disk)
   - For RHEL/CentOS 8 and 7, use the option **inst.dd** or **inst.dd=*location*** where location can be a local storage device or a network location (HTTP, HTTPS or FTP server). For example:
     - `inst.dd=http://host.fake.domain/path/to/dd.iso`
     - `inst.dd=cdrom:/dev/cdrom`

     If you are using **inst.dd** without a location, you will be asked for the driver file during boot.
   - For SUSE, use the option **dud=1** or **dud=*URL*** where URL can be, for example:
     - `dud=ftp://ftp.example.com/PATH_TO_DRIVER`
     - `dud=http://www.example.com/PATH_TO_DRIVER`

     If you use **dud=1**, you will be asked for the URL during boot.
3. Select the drivers required to complete the installation.

Verification

You can check the driver information via the command **modinfo DRIVER_NAME** as shown in Figure 9.

```
localhost:~ # modinfo megaraid_sas | head -n4
filename:       /lib/modules/5.3.18-22-default/weak-updates/megaraid_sas/megaraid_sas.ko
description:    Broadcom MegaRAID SAS Driver
author:         megaraidlinux.pdl@broadcom.com
version:        07.717.02.00
localhost:~ #
```

Figure 9 Verifying the driver

If the output version or file name path is identical to DUD file, the installation is successful.

Resources

- Red Hat: How to create a driver update disk (DUD) for installation using USB
  https://access.redhat.com/solutions/6078541
- Red Hat: How to create an anaconda driver disk for RHEL
  https://access.redhat.com/solutions/158193

- Red Hat: Where can I download Driver Update Program (DUP) disks?

  https://access.redhat.com/articles/64322
- SUSE: drivers.suse.com usage

  https://drivers.suse.com/doc/Usage/Driver_Kits.html
- Novell: Creating a Driver Update Disk (DUD)

  https://www.novell.com/developer/creating_a_driver_update_disk_%28dud%29.html
- CentOS: Preparing for a Driver Update During Installation
- https://docs.centos.org/en-US/centos/install-guide/DU-Updating_drivers_during_installation_x86/#sect-driver-updates-during-installation-preparing-x86
- Driver Update Disks Developer Documentation

  https://github.com/rhinstaller/anaconda/blob/master/dracut/README-driver-updates.md
- ddiskit repository

  https://github.com/orosp/ddiskit

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