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Optware

From DD-WRT Wiki

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Introduction

With the latest DD-WRT (v23 SP2 and v24 SP2), it is possible to install Optware packages from
NSLU2-Linux project. This port of Optware is tailored for DD-WRT and extends the router to full
feature linux if enough storage (jffs, SD/MMC Card, USB) is provided for packages.

The main feature of this package is that it installs all required files under /opt with 1000 ported
applications. With buildroot toolchain, system library independence is also added. This means that
packages now depend on /opt/lib/uClibc.so and dynamic loader also in /opt/lib with separate /opt/etc/ld-
opt.so.conf for custom .so cache. Applications are built with wchar and locale support which makes
uClibc library somewhat greater than other uClibc packages, but still far smaller than glibc based
aplications.

Buildroot toolchain features:

- GCC 4.1.1
- uClibc 0.9.28 with many patches
- uClibc++ 0.2.2
- Native POSIX Threads Library (NPTL) Support for uClibc

Some packages (perl, python, Transmission, buildroot, ...) are so memory hungry that swap is needed for normal operation. Buildroot package or optware-devel meta package provides complete development toolchain for compiling programs on router itself with gcc, gdb, make, g++ , svn, ...

Basic preparation of /jffs is required (enable, clean). On WRT54GS there is room for some aplications. SD card (/mmc) may give enough space for many applications. For testing purposes also smbmount can be used. If a non /jffs filesystem is available, it is recommended to unmount /jffs and then mount eg. mmc in place of /jffs.

Prerequisites

As always here are two prerequisites.

- Hardware

1. Recommended are routers with USB support (Asus WL-500g Deluxe|Premium, Linksys WRTSL54GS).
2. WRT54g routers with hardware modification for MMC/SD card
3. 32MB of RAM may not be enough for some application and thus swap is recommended
4. USB hard disk for storage and swap or USB key without swap
5. Routers with 8MB flash can also fit some applications in /jffs without the need for swap (e.g. WRT54GS v1.1)

- Software

1. DD-WRT v23 SP2 mini or standard when MMC used
2. You should be able to use telnet and the command line.

Example scenario of installing some packages on WRT54GS (v1.0 .. v3.0)

Preparing /jffs for /opt

Prerequisite for optware is writable /opt partition. Required size depends on packages installed. WRT54GS with 8MB flash and DD-WRT SP2 mini leaves 5248k blocks for /jffs which can be binded to /opt.

```
~ # mkdir /jffs/opt
~ # mount -o bind /jffs/opt /opt
```

Installing ipkg-opt and uclibc-opt

First we will install uClibc library required by all packages and better ipkg-opt packager. Recommended way for installing basic two packages is with installation script that will also check for possible network problems and /opt directory availability. To install (or reinstall) issue the following two commands:

```
wget http://pastebin.ca/raw/876251  -O - | tr -d '\r' > /tmp/optware-install.sh
sh /tmp/optware-install.sh
```

Output should look like:

```
Checking system config ...
Using 192.168.1.1 as default gateway.
Using the following nameserver(s):
nameserver 192.168.1.30
Warning: local nameserver is different than gateway!
Check config or enter:
  sed -i s/192.168.*/192.168.1.1/ /tmp/resolv.conf
to correct this.
Installing package uclibc-opt_0.9.28-13_mipsel.ipk ...
Connecting to ipkg.nslu2-linux.org[140.211.166.82]:80
uclibc-opt_0.9.28-12 100% |*********************************************|   832 KB 00:00:00 ETA
Updating /opt/etc/ld.so.cache
/opt/sbin/ldconfig: can't create /opt/etc/ld.so.cache~ (No such file or directory)
Installing package ipkg-opt_0.99.163-9_mipsel.ipk ...
Connecting to ipkg.nslu2-linux.org[140.211.166.82]:80
ipkg-opt_0.99.163-9_ 100% |*********************************************| 75896    00:00:00 ETA
Downloading http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/Packages.gz
Inflating http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/Packages.gz
Updated list of available packages in /opt/lib/ipkg/lists/optware
Successfully terminated.
Installing uclibc-opt (0.9.28-12) to /opt/...
Downloading http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/uclibc-opt_0.9.28-12_mipsel.ipk
package uclibc-opt suggests installing ipkg-opt
Configuring uclibc-opt
Updating /opt/etc/ld.so.cache
Successfully terminated.
Installing ipkg-opt (0.99.163-9) to /opt/...
Downloading http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/ipkg-opt_0.99.163-9_mipsel.ipk
Configuring ipkg-opt
Successfully terminated.
```

Besides pre installing fundamental packages, there are also manual installation instructions. This are now somewhat deprecated due to large number of user miss-understandings.

/opt backup

Now we have prepared /opt for adding more packages. We can also create backup of the whole /opt tree in case of router upgrade, to give preinstalled /opt to a friend or just safety backup. We will create such backup with

```
~ # tar czf /tmp/opt-backup.tar.gz /opt
```

Destination for /tmp/opt-backup.tar.gz should be large enough! Beware that /tmp is RAM. Destination should be disk or remote smbfs partition. Extracting /opt backup could be:

```
cd /
rm -rf opt/*
tar xvzf /tmp/opt-backup.tar.gz
```

If /opt space is tight and no packages requiring libstdc++ will be used (like Amule) then removing this large shared library is recommended

```
~ # rm /opt/lib/libstdc\*
```

will remove

```
/opt/lib/libstdc++.so          /opt/lib/libstdc++.so.6          /opt/lib/libstdc++.so.6.0.8
```

ipkg-opt downloads packages into /opt directory and erases them after installing. If you have enough free RAM and /jffs only then adding --tmp-dir /tmp is recommended instead of default /opt

Search PATH

Adding /opt/bin to search PATH will save us from tedious typing of /opt/bin for each command from /opt/bin. For running applications from /opt tree search path should be expanded with

```
~# export PATH=/opt/bin:/opt/sbin:$PATH
```

Now we can install any package from a list of available packages.

```
~# ipkg-opt list | more
```

or less or this Quick list of Optware packages DD-WRT sets LD_LIBRARY_PATH in /etc/profile that can cause library loading clash. Unset this variable with

```
unset LD_LIBRARY_PATH
```

Installing ncFTP client

We want to get list of packages containing name ftp

```
~ # /opt/bin/ipkg-opt list '*ftp*'
atftp - 0.7-6 - Advanced TFTP server and client
ftpcopy - 0.6.7-3 - A simple FTP client written to copy files or directories (recursively) from a FTP
ftpd-topfield - 0.6.10-2 - FTPD for the Topfield TF5000PVRt
ncftp - 3.2.0-2 - Nice command line FTP client
proftpd - 1.3.0a-1 - Highly configurable FTP server with SSL-TLS
tftp-hpa - 0.45-1 - A tftp package
tnftp - 20050625-1 - tnftp (formerly lukemftp) is what many users affectionately call the enhanced ftp
tnftpd - 20061217-2 - tnftpd (formerly lukemftpd) is a port of the NetBSD FTP server to other systems.
vsftpd - 2.0.1-7 - ftp daemon with an emphasis on speed and security
Successfully terminated.
```

For example we will install ncFTP client with:

```
~ # /opt/bin/ipkg  --tmp-dir /tmp install ncftp
Installing ncftp (3.2.0-2) to /opt/...
Downloading http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/ncftp_3.2.0-2_mipsel.ipk
Installing ncurses (5.6-1) to /opt/...
Downloading http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/ncurses_5.6-1_mipsel.ipk
Configuring ncftp
Configuring ncurses
Successfully terminated.
```

and run it

```
~ # /opt/bin/ncftp ftp.si.debian.org
NcFTP 3.2.0 (Aug 05, 2006) by Mike Gleason (http://www.NcFTP.com/contact/).

Copyright (c) 1992-2005 by Mike Gleason.
All rights reserved.

Connecting to 164.8.6.249...
CAMTP Debian mirror [ftp.si.debian.org]
Logging in...
Anonymous access granted, restrictions apply.
Logged in to ftp.si.debian.org.
ncftp / > ls
backports/      debian-cd/      debian-sl/      openoffice/
debian/         debian-non-US/  favicon.ico     robots.txt
ncftp / > bye


You have not saved a bookmark for this site.

Would you like to save a bookmark to:
        ftp://ftp.si.debian.org

Save? (yes/no) yes
Enter a name for this bookmark, or hit enter for "si": debian
Bookmark "debian" saved.
```

Always check available size of your /opt partition with

```
~ # df
Filesystem          1k-blocks     Used Available Use% Mounted on
/dev/root                1984     1984         0 100% /
/dev/mtdblock/4          5248     3860      1388  74% /jffs
/dev/mtdblock/4          5248     3860      1388  74% /opt
```

Remove unneeded packages with

```
~ # /opt/bin/ipkg remove ncftp
Removing package ncftp from /opt/...
Successfully terminated.
```

You will notice that ncurses as depended package will not get removed. To correct this issue

```
~ # /opt/bin/ipkg remove ncurses
Removing package ncurses from /opt/...
Successfully terminated.
```

unless some other package require this package.

Installing torrent client

Of course there are many more packages which should run on router without a problem. All binaries have built in /opt/lib search path and there should be no problem with libraries clash like problems with OpenWRT packages. All packages have builtin package dependencies and will install required libraries automagically. Lets show this on installing torrent clients:

```
~ # /opt/bin/ipkg -t /tmp install enhanced-ctorrent
Installing enhanced-ctorrent (dnh2.2-6) to /opt/...
Downloading http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/enhanced-ctorrent_dnh2.2-6_mi
Installing libuclibc   (0.2.2-4) to /opt/...
Downloading http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/libuclibc _0.2.2-4_mipsel.ip
Installing openssl (0.9.7l-3) to /opt/...
Downloading http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/openssl_0.9.7l-3_mipsel.ipk
 Configuring enhanced-ctorrent
Configuring libuclibc
Configuring openssl
Successfully terminated
```

We will not show running example for this clients as normally huge amount of storrage is required.

Another torrent client with WWW interface is Transmission. Installing is simple as

```
~ # /opt/bin/ipkg install transmission
Installing transmission (0.6+r1378-5) to /opt/...
Downloading http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/transmission_0.6+r1378-5_mips
package transmission suggests installing gnuplot
package transmission suggests installing logrotate
Installing openssl (0.9.7l-3) to /opt/...
Downloading http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/openssl_0.9.7l-3_mipsel.ipk
Configuring openssl
Configuring transmission
Please note that /opt/etc/init.d/S80busybox_httpd is installed for
running CGI interface at http://localhost:8008/cgi-bin/transmission.cgi
See instructions for daemon and WWW interface in /opt/share/doc/transmission
Configure daemon with /opt/etc/transmission.conf
Successfully terminated
```

Besides simple command line transmissioncli client like enhanced-ctorrent, there is also possibility to run several torrents in daemon mode (background mode) with WWW page as interface watching daemon state and controlling its work.

After creating directories with

```
~ # mkdir /opt/torrent
~ # mkdir /opt/torrent/source
~ # mkdir /opt/torrent/work
~ # mkdir /opt/torrent/target
```

we will configure transmisison itself by editing /opt/etc/transmisison.conf by using

```
~ # sed -i -e 's|/tmp/harddisk|/opt|' /opt/etc/transmission.conf
```

to change default path from /tmp/harddisk to /opt. Also user should be changed from admin to root. After changing config transmission_watchdog should be run every half an hour with cron. We will start it manually and check if it is running

```
~ # /opt/sbin/transmission_watchdog
~ # ps |grep transmission
10621 root        808 S   transmissiond -p 65534 -w 300 -u -1 -d -1 -i /opt/var
10624 root        808 S   transmissiond -p 65534 -w 300 -u -1 -d -1 -i /opt/var
10625 root        808 S   transmissiond -p 65534 -w 300 -u -1 -d -1 -i /opt/var
10626 root        808 R   transmissiond -p 65534 -w 300 -u -1 -d -1 -i /opt/var
```

We will configure http server to show the startup page at port 8008. Although dd-wrt SP2 uses /opt/sbin/httpd for its WEB interface, this httpd server cannot be reused as it has serioius problems running CGI programs and showing index.html files.

For public trackers CGI interface provides 'Fetch' button which downloads .torrent file into /opt/torrent/source directory. Private trackers use passkey which means that .torrent file should be saved with browser itself.

After seeing .torrent file int Queued list, one can press Watchdog button to force queue processing. This will move .toorent file from source into work directory and notify daemon for the change to start processing the file. After download finishes, transmission_watchdog will automaticly move torrent from work to target. Meanwhile, user can pres Update button to see status of active torrents.

Besides transmissiond two other daemons are required for normal queue processing. Both are provided by dd-wrt if enabled. Cron is enabled under Admin control panel. Syslogd is enabled under Services tab.

Cron should regulary run /opt/sbin/transmisison_watchdog with sample /opt/etc/crontab

```
*/30 * * * * root /opt/sbin/transmission_watchdog
```

Visit CRON page to see where this line should be included. I recommend

```
cat /opt/etc/crontab >> /tmp/crontab
```

at startup,

Syslog will collect cumulative reports from transmisisond and CGI will show it when Log or Update is pressed. If gnuplot is installed then also transfer graph is showed when Log is pressed. SYSLOG line in /opt/etc/transmission.conf must be changed to

```
SYSLOG=/var/log/messages
```

to be able to see Log messages from daemon when Log button is pressed.

Opening default listening port 65534 for Transmission is another required task which can be solved by DD-WRT control panel or adding

```
/usr/sbin/iptables -I INPUT 1 -p tcp --dport 65534 -j logaccept
```

to startup file.

Installing Throttling HTTP server

For our purposes thttpd WEB server will handle most requirements like browsing directories and runing CGI program located at /opt/share/www/cgi-bin/transmission.cgi

```
~ # /opt/bin/ipkg install thttpd
Installing thttpd (2.25b-4) to /opt/...
Downloading  http://ipkg.nslu2-linux.org/feeds/optware/ddwrt/cross/stable/thttpd_2.25b-4_mipsel.ipk
Configuring thttpd

To complete the installation, you must edit /opt/etc/thttpd.conf,
and then run /opt/etc/init.d/S80thttpd to start thttpd.

Successfully terminated.
```

Edit /opt/etc/thttpd.conf with vi (or nano) and add cgipat, change user to root, change port to 8008 to see the following contents:

```
dir=/opt/share/www
port=8008
user=root
nochroot
nosymlink
novhost
logfile=/var/log/thttpd.log
pidfile=/var/run/thttpd.pid
cgipat=cgi-bin/*
```

Manually start thttpd with

```
~ # /opt/etc/init.d/S80thttpd start
```

After that you will be able to see default index.html page at http://192.168.1.1:8008/ assuming that your router is at 192.168.1.1 . There is also link to CGI page http://192.168.1.1:8008/cgi-bin/transmission.cgi which is preaty empty with several buttons for controlling daemon.

Installing Samba2

It looks like Samba 3 is too big for all "swapless" routers. For this reason I have prepared Samba 2 packages with Samba Web Admin Tool (SWAT) which will ease config and admin for samba newcomers. SWAT interface looks like:

SWAT globals   SWAT shares   SWAT status
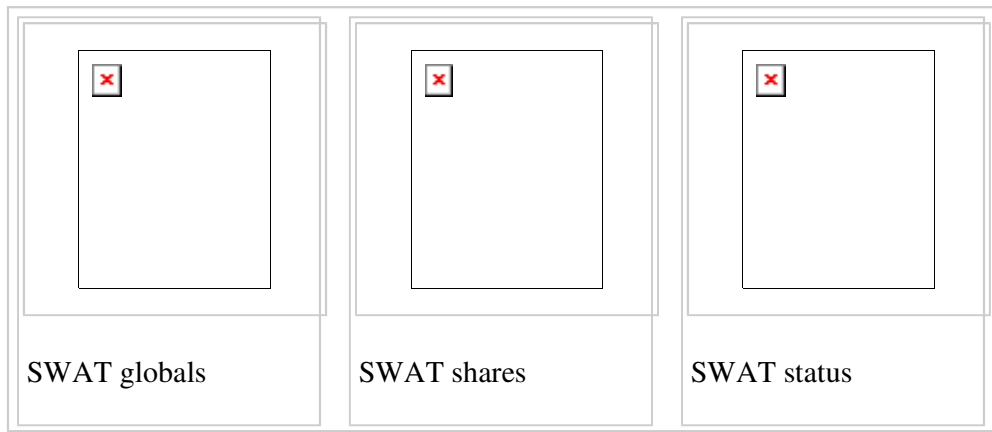
Installation and running samba 2 is done out of the box by the following commands:

```
/opt/bin/ipkg update
/opt/bin/ipkg remove samba
/opt/bin/ipkg install samba2
/opt/bin/ipkg install xinetd
/opt/etc/init.d/S10xinetd start
/opt/etc/init.d/S80samba start
```

Point your browser to http://192.168.1.1:901/ to administer samba. Installation of xinetd is optional and it is not required if one wants to manually edit /opt/etc/samba/smb.conf

The problem that dd-wrt does not include user nobody at startup can be overcome with adding this at startup with /opt/etc/init.d/S80samba script like:

```
#!/bin/sh
[ -d /tmp/samba ] || mkdir /tmp/samba
grep -q nobody /etc/passwd || echo "nobody:*:65534:65534:nobody:/var:/bin/false" >> /etc/passwd
killall smbd
killall nmbd
/opt/sbin/nmbd -D
/opt/sbin/smbd -D
```

Another long term problem that could happen when running samba on FLASH memory like jffs, mmc or USB stick is FLASH wear. Such use could destroy FLASH if log files and browsing databases are

constantly updated. Use of /tmp partition is recommended for such use. Amend startup script with:

```
echo "Starting smbd:"
if [ ! -d /tmp/samba ]; then
      mkdir /tmp/samba
      mkdir /tmp/samba/log
      rm -rf /opt/var/log/samba
      ln -s /tmp/samba/log /opt/var/log/samba
      rm -rf /opt/var/samba
       ln -s  /tmp/samba /opt/var/samba
fi
```

Running at startup

DD-WRT provides user startup files in /jffs/etc/config . To create optware startup file do

```
~ # mkdir /jffs/etc
~ # mkdir /jffs/etc/config
~ # vi /jffs/etc/config/optware.startup
```

with the following contents

```
#!/bin/sh

mount -o bind /jffs/opt /opt

unset LD_LIBRARY_PATH
unset LD_PRELOAD

[ -e /opt/etc/profile ] && mount -o bind /opt/etc/profile /etc/profile

if [ -d /opt/etc/init.d ]; then
  for f in /opt/etc/init.d/S* ; do
      [ -x $f ] && $f start
  done
fi
```

and mark it as executable with

```
~ # chmod +x /jffs/etc/config/optware.startup
```

After reboot this file will be executed. I recommed first trying it manually

```
~ # /jffs/etc/config/optware.startup
```

Creating /opt/etc/profile with the following contents

```
export PATH=/opt/bin:/opt/sbin:/bin:/sbin:/usr/bin:/usr/sbin
export PS1='\u@\h:\w\$ '

[ -x /opt/bin/less ] ||  alias less=more
[ -x /opt/bin/vim ] ||  alias vim=vi


arp() { cat /proc/net/arp; }
ldd() { LD_TRACE_LOADED_OBJECTS=1 $*; }
reboot() { killall nmbd
           killall smbd
           killall xinetd
           killall thttpd
           sleep 1
           umount /opt
           /sbin/reboot
          }
```

is also recommended as this will unset LD_LIBRARY_PATH provided by stock /etc/profile

Startup for external USB Disk

The following script is recommended when using external USB hard disk. The main feature of this script is prevention of disk corruption and automatic replacement. It also shows how LD_LIBRARY_PATH can be used to compensate uClibc incompatibility between dd-wrt /lib and OpenWRT /jffs/lib . With dd-wrt.V24 the difference between system and OpenWRT Whiterussian R6 uClibc is so big, that running even simple programs causes segmentation fault. Optware also uses its own uClibc that resides in /opt/lib but all programs have built-in rpath to /opt/lib. This means that it is simpler to use Optware packages under DD-WRT than OpenWRT packages. But the following script relies on two OpenWRT packages just to provide filesystem checking and enabling swap at startup. Besides reguired kernel modules, two disk related packages were installed: e2fsprogs and swap-utils. All others packages could be used from Optware.

```
#!/bin/sh
# /jffs/etc/config/optware.startup script for USB disk support
# Recommended ext3 partitions:
#  /dev/discs/disc0/part1 for /opt 1GB
#  /dev/discs/disc0/part2 for swap 512MB
#  /dev/discs/disc0/part3 /mmc for user files aka MultiMediaCenter
# Tune partition checks to max 10 counts disregarding last check time
# tune2fs -i 0 -c 10 /dev/discs/disc0/part1
# tune2fs -i 0 -c 10 /dev/discs/disc0/part3
# Required OpenWrt packages: /bin/ipkg install swap-utils e2fsprogs
(
unset LD_PRELOAD
export PATH=/bin:/usr/bin:/sbin:/usr/sbin
export LD_LIBRARY_PATH=/lib:/usr/lib

echo "Inserting modules for USB disk support..."
insmod  /jffs/lib/modules/2.4.30/usbcore.o
insmod  /jffs/lib/modules/2.4.30/ehci-hcd.o
insmod  /jffs/lib/modules/2.4.30/scsi_mod.o
insmod  /jffs/lib/modules/2.4.30/usb-storage.o
insmod  /jffs/lib/modules/2.4.30/sd_mod.o
insmod  /jffs/lib/modules/2.4.30/jbd.o
insmod  /jffs/lib/modules/2.4.30/ext3.o


echo "Waiting for modules to initialize disk access..."
sleep 20

# assure correct paths when running OpenWRT programs like e2fsck
export LD_LIBRARY_PATH=/jffs/lib:/jffs/usr/lib
export PATH=/jffs/bin:/jffs/sbin:/jffs/usr/sbin:/jffs/usr/bin:/bin:/sbin

echo "Activating swap..."
swapon /dev/discs/disc0/part2

echo "Checking optware partition..."
e2fsck -p /dev/discs/disc0/part1

echo "Checking user-data partition"
e2fsck -p /dev/discs/disc0/part3

echo "Mountint disk partitions..."
export LD_LIBRARY_PATH=/lib:/usr/lib
mount -t ext3 -o noatime /dev/discs/disc0/part1 /opt
mount -t ext3 -o noatime /dev/discs/disc0/part3 /mmc

if [ -e /opt/etc/profile ]; then
     cp /opt/etc/profile /tmp
     mount -o bind /tmp/profile /etc/profile
fi

# provide Optware search paths
unset LD_LIBRARY_PATH
export PATH=/opt/bin:/opt/sbin:/bin:/sbin:/usr/sbin:/usr/bin

echo "Starting Optware programs..."
if [ -d /opt/etc/init.d ]; then
     for f in /opt/etc/init.d/S* ; do
     [ -x $f ] && $f start
     done
fi
) > /tmp/optware.log 2>&1
```

Forcing filesystem recheck on next boot could be marked with

```
tune2fs -C 100 /dev/discs/disc0/part1
```

Although ext3 filesystem uses journaling that prevents major corruption and faster recover during crash,

it is recommended that one writes its shutdown scrtipt as alias for /etc/profile that kills all optware daemons, umounts filesystems and then issue /sbin/reboot. This is what we call *clean shutdown*.

Known bugs

ngrep doesn't work

ngrep is compiled with IPV6 support and ddwrt doesn't provide IPV6 support.

If ngrep is recompiled without IPV6 support, it works ok after adding the nobody user to /etc/passwd

```
# grep nobody /etc/passwd
nobody:x:99:99:Nobody:/:
```

Remarks

- DD-WRT provided /bin/ipkg is not full feature ipkg but it can do the job for installing ipkg-opt. It could also be used for installing other packages, but this is not recommended any more.
- Using samba share for /opt is not easy as there is no notion for symbolic links on SMB. This is most problematic for symbolic links on shared libraries. Rewriting "ln" to act as a script and put it on the head of search path could be used to copy instead of link. See this dd-wrt forum topic for info on issueof relinking. Possibility of mounting filesystem in a file as a loop device on a samba share is not yet verified.
- DD-WRT kernel lacks many "server" features like NFS, NBD support, ... Provided samba, mysql, thttp-php and other applications can do the job if enough space is provided. This means that external storage is required for memory hungry applications. Experience from nslu2 and Oleg firmware showed that 512MB swap space is recommended if external USB hard disk is available. See USB page for instructions how to initialize USB kernel modules and harddisk.
- Do not use VFAT filesystem for /opt. Use ext2 or ext3 instead. Alternatively one can use loop device to mount filesystem in file that resides on VFAT. See http://www.nslu2-linux.org/wiki/FAQ/Optware-uClibcBuild for example on doing this on USB stick.
- Optware for DD-WRT is beta-stage feature. Report problems and suggestions in DD-WRT forum under Optware.
- For instuctions on some other packages look at http://www.nslu2-linux.org/wiki/Unslung/Packages
- Optware package tracking and repository access
- There is also posibility to install Optware packages under Oleg, X-wrt or OpenWRT Whiterussian firmware. See instructions on http://www.nslu2-linux.org/wiki/FAQ/Optware-uClibcBuild

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Oleo

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