Network Performance Toolkit

Background

NPToolkit is a knoppix based boot cd with a lot of the internet2 tools built in. This page looks at some features, security considerations and custom installation to be done at SLAC for deployment.

The benefit of running NPT over a standard install is as follows:

- no need to recompile kernels for web100 each time
- no need for taylor as updates are maintained by Internet2 (although time will tell if the security updates are sufficiently regular)
- relocation of performance host trivial - pop cd into new machine and plug in the USB key - settings should be maintained
    - SLAC's reverse traceroute server run's on default on port 3765 (perhaps we should redirect to this host).

Disadvantages

- no AFS client (yet?)
- security strongly depends on release cycle of boot disk

Overview

This guide will look at

- setting up a nptoolkit host
- configuring services to suit SLAC, this specifically includes
    - syslog logging to a remote host
    - setting up the NPT server
    - Configuring ntp for SLAC's stratum servers
    - setting up bwctl servers
    - setting up owamp servers

It will also look at changing the NDT and rev-tracerouter servers to use apache2 instead of their own daemon http listeners.

- Apache2 and NDT
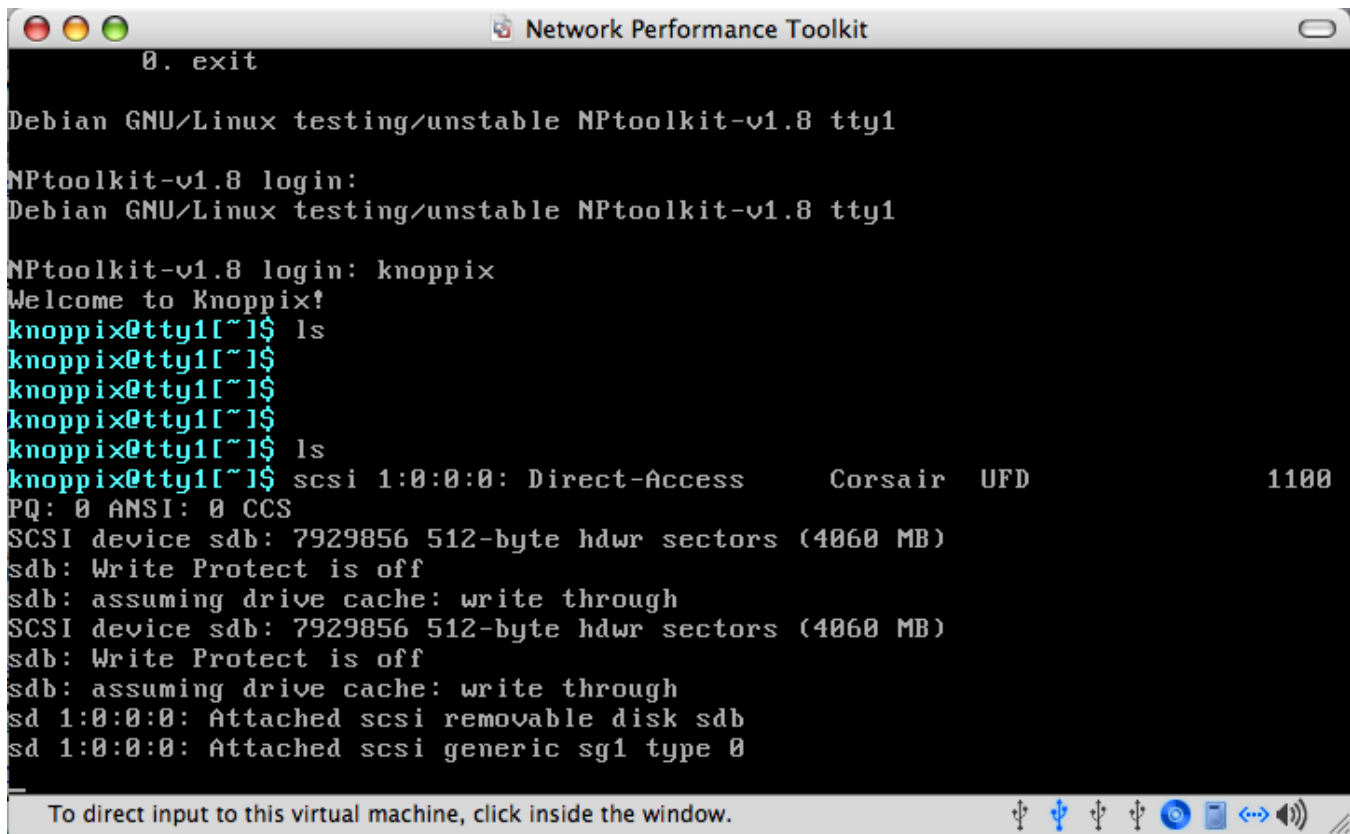- Traceroute Server and Apache2

Boot

The Knoppix disk is a live cd. Hard-drive will be used to keep the data thus no particular need for a USB key. However the procedure is mentioned below.

Things have changed slightly since the arrival of pS Performance Toolkit 3.1. After booting, you can log on with same user name and password i.e. 'knoppix'.

USB key usage

Upon inserting a USB key into the connector, you get:

The drive is automounted, in this case, it's mounted under `/mnt/sdb1`.

We then copy the `knoppix.sh` file so that the thumbdrive will be picked up and auto run to override the relevant commands.

```
sudo cp /usr/local/etc/knoppix.sh /mnt/sdb1
```

Configure

There is a tool called `customize.NPTools` that handles the scripting to configure the tools present.

I'm too lazy to use the vmware screen to do the configuration, so i will set up a ssh daemon and ssh into it.

SSH

You can start a ssh daemon by running:

```
/etc/init.d/ssh start
```

After generating the keys (are these stored on the usb?), the daemon will run.

We now need to set a password for user 'knoppix' and to determine the IP address to access the NPToolkit machine on.

We can use `ifconfig` to determine the IP. You can run `passwd` to change the password.

Voila, you can now ssh into the host. (as i'm running under a virtual machine, only the host machine can access it for now).

Setup USB External Storage

Note that you need to copy the `knoppix.sh` to the relevant drives first.

```
knoppix@0[~]$ customize.NPtools
Internet2 Network Performance Tool Customization script
    Tools listed in RED need to be customized
        1. Setup Drive(s) to hold customization files
        2. bwctl
        3. ndt
        4. npad
        5. ntp
        6. owamp
        7. staticIP
        0. exit
1
Configuring system drive(s) to support customized tools.
Configure External USB drive 'sdb1' to hold NPToolkit customization files? [y] - y
done.
```

bwctl

```
knoppix@0[~]$ customize.NPtools
Internet2 Network Performance Tool Customization script
    Tools listed in RED need to be customized
        1. Setup Drive(s) to hold customization files
        2. bwctl
        3. ndt
        4. npad
        5. ntp
        6. owamp
        7. staticIP
        0. exit
2
BWCTL server configuration program.
echo
echo Manual configuration is currently required. Please edit the
echo /usr/local/etc/bwctld.conf and /usr/local/etc/bwctld.limits files
echo to create custom versions for your site.
echo
echo See http://e2epi.internet2.edu/bwctl for more details.
/bin/rm: remove write-protected regular empty file `/tmp/customize.bwctld'? y
/bin/rm: cannot remove `/tmp/customize.bwctld': Operation not permitted
Internet2 Network Performance Tool Customization script
```

Hmm... try with sudo:

```
knoppix@0[~]$ sudo customize.NPtools
Internet2 Network Performance Tool Customization script
    Tools listed in RED need to be customized
        1. Setup Drive(s) to hold customization files
        2. bwctl
        3. ndt
        4. npad
        5. ntp
        6. owamp
        7. staticIP
        0. exit
2
BWCTL server configuration program.
echo
echo Manual configuration is currently required. Please edit the
echo /usr/local/etc/bwctld.conf and /usr/local/etc/bwctld.limits files
echo to create custom versions for your site.
echo
echo See http://e2epi.internet2.edu/bwctl for more details.
```

npt

```
knoppix@0[~]$ sudo customize.NPtools
Internet2 Network Performance Tool Customization script
     Tools listed in RED need to be customized
          1. Setup Drive(s) to hold customization files
          2. bwctl
          3. ndt
          4. npad
          5. ntp
          6. owamp
          7. staticIP
          0. exit
3
Welcome to the NDT server configuration program.  This
program will create a custom tcpbw100.html file for your site.

Enter your site name [Internet2]  : Stanford Linear Accelerator Center
Enter your site's location [Ann Arbor - MI]  : Menlo Park - CA
Server connection info, enter 1 for 100 Mbps, 2 for 1 Gbps, 3 for 10 Gbps [2]  : 2

Information for email trouble reporting
Enter email userid [rcarlson]  : ytl
Enter email domain name [internet2.edu]  : slac.stanford.edu
Enter default subject line [Trouble report from NPtoolkit-v1.8]  :
The base web page 'tcpbw100.html' has now been created.  You
must move this file into the ndt_DATA directory [/usr/local/ndt]
created during the 'make' process.
Do you want to install this file now? [yes]  : yes
Enter location [/usr/local/ndt]  :
NDT customization file being saved to 'sdb1'
```

NPAD

```
knoppix@0[~]$ sudo customize.NPtools
Internet2 Network Performance Tool Customization script
     Tools listed in RED need to be customized
          1. Setup Drive(s) to hold customization files
          2. bwctl
          3. ndt
          4. npad
          5. ntp
          6. owamp
          7. staticIP
          0. exit
4
NPAD server configuration program.

/usr/local/npad-1.3 /ramdisk/home/knoppix

Importing existing config.xml.

---------------------------------------------------------------
| For each configuration value, you will see brief help       |
| followed by a prompt. Default values are in brackets on     |
| the prompt line.  To accept default values, press Enter.    |
---------------------------------------------------------------


The directory to install the diagnostic server,
including binaries, libraries, and configuration files.
It is recommended to use the default value.

Exec dir [/usr/local/npad-dist]:
```

The directory to install web pieces, such as the tester
page and the Java and C clients. If you are running the
built-in web server (recommended), the default value
should work. Otherwise you will need to point to a
directory accessible by your web server.

Web dir [/usr/local/npad-dist/www]:

The user as which the server will run. We recommend using
a relatively unprivileged user. If you specify a user
that doesn't exist, 'make install' will create it.

User [npad]:

The group as which the server will run. We recommend using
a relatively unprivileged group. If you specify a group
that doesn't exist, 'make install' will create it.

Group [npad]:

The port that the control channel listens on. It should be
safe to leave this alone unless you must work within
firewall restrictions, or unless another service is
using this port.

Control port [8100]:

The bottom of the ephemeral port range used for test
connections.

Port range min [8002]:

The top of the ephemeral port range used for test
connections.

Port range max [8020]:

This package comes with a small python-based web server.
If you would like to use the server, enter "yes".
Otherwise you will need to have installed and set
up another web server such as Apache.

Use built-in web server [yes]:

The port number used by the built-in web server

Built-in web server port [8200]:

This name should should complete "NPAD server located at ...", and
will be used as the title for your server, as it appears on the
tester page. You must supply a value.

Site (organization) name [Internet2 Knoppix-based NPAD Server]: Stanford Linear Accelerator Center NPAD Server

The geographical location of your server, probably a city name.
Since pathdiag works best over short distances, this information
will be included on the tester page so users can tell how close
they are to the server. You must supply a value.

Site location [Please customize]: Menlo Park - CA

```
The (optional) name of the contact for your site.
This is probably you or the network support team.

Site contact name [RACarlson]: Yee-Ting Li


This is the (optional) email address for your site contact.

Site contact email [rcarlson@internet2.edu]: ytl@slac.stanford.edu

Configuration complete.  You're now ready to 'make'.

make[1]: Entering directory `/UNIONFS/usr/local/npad-1.3/diag_server'
make[1]: Nothing to be done for `all'.
make[1]: Leaving directory `/UNIONFS/usr/local/npad-1.3/diag_server'
make[1]: Entering directory `/UNIONFS/usr/local/npad-1.3/pathdiag'
make[1]: Nothing to be done for `all'.
make[1]: Leaving directory `/UNIONFS/usr/local/npad-1.3/pathdiag'
make[1]: Entering directory `/UNIONFS/usr/local/npad-1.3/diag_server'
make[1]: Nothing to be done for `all'.
make[1]: Leaving directory `/UNIONFS/usr/local/npad-1.3/diag_server'
make[1]: Entering directory `/UNIONFS/usr/local/npad-1.3/pathdiag'
make[1]: Nothing to be done for `all'.
make[1]: Leaving directory `/UNIONFS/usr/local/npad-1.3/pathdiag'

Group npad already exists.  Will not create.

User npad already exists.  Will not create.

Installing...

rm -f /usr/local/npad-dist/config.xml /usr/local/npad-dist/template_diag_form.html
cp config.xml template_diag_form.html /usr/local/npad-dist/
make[1]: Entering directory `/UNIONFS/usr/local/npad-1.3'
make[2]: Entering directory `/UNIONFS/usr/local/npad-1.3/diag_server'
cp *.py /usr/local/npad-dist
cp DiagClient.jar diag-client.c /usr/local/npad-dist/www
make[2]: Leaving directory `/UNIONFS/usr/local/npad-1.3/diag_server'
make[2]: Entering directory `/UNIONFS/usr/local/npad-1.3/pathdiag'
cp pathdiag.py* pathtools.py* prettyhtml.py* pathlib.py* _pathlib.so mkdatasummary.py *.fmt /usr/local/npad-dist
cp boxes.css help.html /usr/local/npad-dist/www/ServerData

Regenerating report summary...  Done.

make[2]: Leaving directory `/UNIONFS/usr/local/npad-1.3/pathdiag'
make[1]: Leaving directory `/UNIONFS/usr/local/npad-1.3'
chown -R npad.npad "/usr/local/npad-dist/www/ServerData"
/ramdisk/home/knoppix
/usr/local/npad-dist/www /ramdisk/home/knoppix
NPAD customization files are being saved to 'sdb1'
/ramdisk/home/knoppix
```

NTP

```
knoppix@0[~]$ sudo customize.NPtools
Internet2 Network Performance Tool Customization script
    Tools listed in RED need to be customized
        1. Setup Drive(s) to hold customization files
        2. bwctl
        3. ndt
        4. npad
        5. ntp
        6. owamp
        7. staticIP
        0. exit
5
NTP server configuration program.

Manual configuration is currently required.  Please edit the
/etc/ntpd.conf file to create custom versinos.
create custom version for your site.
```

owamp

```
knoppix@0[~]$ sudo customize.NPtools
Internet2 Network Performance Tool Customization script
    Tools listed in RED need to be customized
        1. Setup Drive(s) to hold customization files
        2. bwctl
        3. ndt
        4. npad
        5. ntp
        6. owamp
        7. staticIP
        0. exit
6
OWAMP server configuration program.

Manual configuration is currently required.  Please edit the
/usr/local/etc/owampd.conf and /usr/local/etc/owampd.limits files
to create custom versions for your site.

See http://e2epi.internet2.edu/owamp for more details.
```

Static IP Address

Can be configured from the customize tool. However, i will leave it for now until the machine is installed.

```
knoppix@0[~]$ customize.NPtools
Internet2 Network Performance Tool Customization script
    Tools listed in RED need to be customized
        1. Setup Drive(s) to hold customization files
        2. bwctl
        3. ndt
        4. npad
        5. ntp
        6. owamp
        7. staticIP
        0. exit
7
Welcome to the NPToolkit server Static IP configuration program.  This
program will prompt you for the necessary information for your site.

Use Static IP addresses or DHCP [static] :
Enter your IP address [192.168.1.99]  :
Enter your Netmask value [255.255.255.0]  :
Enter your gateway's IP address [192.168.1.1]  :
Enter the network interface identifer [eth0]  :
Enter your nameserver's IP address (3 max, blank line to exit early)  :
mount: only root can do that
mount: only root can do that
Static IP customization files are being saved to 'sdb1'
Do you want to start this interface? [Yes] :
```

Reboot

Let's reboot to see if things stick...

Knoppix looses it's password (so you'll have to passwd again)
SSHD regenerates keys (so you have to modify known_hosts)

Keeping SSH Up (not recommended)

As per the FAQ,

```
knoppix@0[~]$ cat /usr/local/NPToolkit/contrib/remote.access >> /mnt/sdb1/knoppix.sh
knoppix@0[~]$ cp /usr/local/NPToolkit/contrib/remote.access /mnt/sdb1/NPTools/
```

however, there is a bit more to it to this (from looking into the remote.access file)

Passwords:

```
knoppix@0[~]$ sudo cp /etc/passwd /mnt/sdb1/NPTools/passwd.new
knoppix@0[~]$ sudo cp /etc/shadow /mnt/sdb1/NPTools/shadow.new
```

SSH:

```
knoppix@0[~]$ sudo cp /etc/ssh/sshd_config /mnt/sdb1/NPTools/sshd_config
```

don't i need to copy the keys over too? ie

```
/etc/ssh/ssh_host_key
/etc/ssh/ssh_host_key.pub
/etc/ssh/ssh_host_rsa_key
/etc/ssh/ssh_host_rsa_key.pub
/etc/ssh/ssh_host_dsa_key
/etc/ssh/ssh_host_dsa_key.pub
```

So append `/mnt/sdb1/knoppix.sh` to include

```
# Maintain SSH keys through reboot and host transfer
# append to knoppix.sh file on any external storage medium
#  by Yee-Ting Li (ytl@slac.stanford.edu)

if [ -f /UNIONFS/media/$MNT/NPTools/ssh_host_key ]; then
    restore_NPT_file $MNT ssh_host_key /etc/ssh
fi

if [ -f /UNIONFS/media/$MNT/NPTools/ssh_host_key.pub ]; then
    restore_NPT_file $MNT ssh_host_key.pub /etc/ssh
fi

if [ -f /UNIONFS/media/$MNT/NPTools/ssh_host_rsa_key ]; then
    restore_NPT_file $MNT ssh_host_rsa_key /etc/ssh
fi

if [ -f /UNIONFS/media/$MNT/NPTools/ssh_host_rsa_key.pub ]; then
    restore_NPT_file $MNT ssh_host_rsa_key.pub /etc/ssh
fi

if [ -f /UNIONFS/media/$MNT/NPTools/ssh_host_dsa_key ]; then
    restore_NPT_file $MNT ssh_host_dsa_key /etc/ssh
fi

if [ -f /UNIONFS/media/$MNT/NPTools/ssh_host_dsa_key.pub ]; then
    restore_NPT_file $MNT ssh_host_dsa_key.pub /etc/ssh
fi
```

And copy the keys over to a directory on the thumbdrive:

```
knoppix@0[~]$ sudo cp /etc/ssh/ssh_host_* /mnt/sdb1/NPTools/
```

The sshd server should start at boot now.

Running services

```
knoppix@0[~]$
knoppix@0[~]$ ps ax
  PID TTY      STAT   TIME COMMAND
    1 ?        Ss     0:00 init [3]
    2 ?        S      0:00 [migration/0]
    3 ?        SN     0:00 [ksoftirqd/0]
    4 ?        S      0:00 [watchdog/0]
    5 ?        S<     0:00 [events/0]
    6 ?        S<     0:00 [khelper]
    7 ?        S<     0:00 [kthread]
   62 ?        S<     0:00 [kblockd/0]
   63 ?        S<     0:00 [kacpid]
  124 ?        S<     0:00 [ata/0]
  125 ?        S<     0:00 [ata_aux]
  126 ?        S<     0:00 [kseriod]
  153 ?        S      0:00 [pdflush]
  154 ?        S      0:00 [pdflush]
  155 ?        S<     0:00 [kswapd0]
  156 ?        S<     0:00 [aio/0]
  812 ?        S<     0:00 [kpsmoused]
  841 ?        S<     0:00 [ksuspend_usbd]
  844 ?        S<     0:00 [khubd]
  867 ?        S<     0:00 [khpsbpkt]
  957 ?        S<     0:00 [aufsd]
  958 ?        S<     0:00 [aufsd]
  959 ?        S<     0:00 [aufsd]
  960 ?        S<     0:00 [aufsd]
 1124 ?        S<s    0:00 udevd --daemon
 1576 ?        S<     0:00 [scsi_eh_0]
 3047 ?        Ss     0:00 /usr/bin/dbus-daemon --system
 3054 ?        Ss     0:00 /usr/sbin/hald
 3055 ?        S      0:00 hald-runner
 3076 ?        S      0:00 /usr/lib/hal/hald-addon-acpi
 3089 ?        S      0:00 /usr/lib/hal/hald-addon-keyboard
 3101 ?        S      0:00 /usr/lib/hal/hald-addon-storage
 3220 ?        Ss     0:01 pump -i eth0
 3242 ?        Ss     0:00 /sbin/klogd
 3247 ?        Ss     0:00 /sbin/syslogd
 3294 ?        Ss     0:00 /usr/sbin/ntpd -p /var/run/ntpd.pid
 3303 ?        Ss     0:00 /usr/local/bin/bwctld -c /usr/local/etc
 3310 ?        S      0:00 /usr/local/sbin/fakewww
 3311 ?        S      0:00 /usr/local/sbin/web100srv -a
 3317 ?        Sl     0:00 python /usr/local/npad-dist/DiagServer.py -d -u npad -p /var/run/npad.pid
 3325 ?        Ss     0:00 /usr/local/bin/owampd -c /usr/local/etc
 3332 ?        S      0:00 /usr/local/sbin/shttpd -p3765 -d /usr/local/rev-tr -c .pl -C/usr/bin/perl
 3365 tty1     Ss     0:00 /bin/login --
 3367 tty2     Ss+    0:00 /sbin/getty 38400 tty2
 3368 tty3     Ss+    0:00 /sbin/getty 38400 tty3
 3369 tty4     Ss+    0:00 /sbin/getty 38400 tty4
 3373 ttyS0    Ss+    0:00 /sbin/getty -L ttyS0 9600 vt100
 3386 tty1     S+     0:00 -bash
 3412 ?        Ss     0:00 /usr/sbin/sshd
 3414 ?        Ss     0:00 sshd: knoppix [priv]
 3417 ?        S      0:00 sshd: knoppix@0
 3418 /UNIONFS/dev/pts/0 Ss   0:00 -bash
 3467 /UNIONFS/dev/pts/0 R+   0:00 ps ax
```

Open ports:

```
knoppix@0[~]$ netstat -a
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 *:8100                  *:*                     LISTEN
tcp        0      0 *:bootpc                *:*                     LISTEN
tcp        0      0 *:8200                  *:*                     LISTEN
tcp        0      0 *:3765                  *:*                     LISTEN
tcp6       0      0 *:7123                  *:*                     LISTEN
tcp6       0      0 *:ssh                   *:*                     LISTEN
tcp6       0      0 *:4823                  *:*                     LISTEN
tcp6       0      0 *:3001                  *:*                     LISTEN
tcp6       0      0 *:861                   *:*                     LISTEN
udp        0      0 172.16.203.130:ntp      *:*
udp        0      0 NPToolkit:ntp           *:*
udp        0      0 *:ntp                   *:*
udp6       0      0 fe80::20c:29ff:fe1b:ntp *:*
udp6       0      0 ip6-localhost:ntp       *:*
udp6       0      0 *:ntp                   *:*
```

Note that SSH is on only for this demo.

The use of ipv6 is becauase the virtual machine is networked over ipv6.

Port	Use	Information
8100	NPAD Control	Does not respond to HTTP
8200	NPAD	Traceroutes
3765	Reverse (SLAC) Traceroute server	cgi scripts
3001	Network Diagnostics Tool	Performance testing port
7123	Network Diagnostics Tool	web frontend to java applet for performance tests
4823	bwctl	bandwidth measurement
861	owamp	One way delay measurements

On top of this list, iperf instances instantiated through `bwctl` must also have some ports (tcp) open for tcp tests. The default range is 5001-5100.

Also NPAD requires ports 8002-8020 open.

Setting up Syslog

The syslog daemon starts on default. It can be customised with a copy of the `syslog.conf` file.

Add the following code for syslog configuration in `knoppix.sh`.

```
# Syslog configuration
if [ -f /UNIONFS/media/$MNT/NPTools/syslog.conf ]; then
    restore_NPT_file $MNT syslog.conf /etc/
fi
```

The standard syslog.conf was used from a slac machines (however, as netlog is accessible from anywhere by the slac subnet, this may be somewhat limited).

Testing Services

ntp

```
knoppix@0[~]$ cp /etc/ntp.conf /mnt/sdb1/NPTools/
```

All of the servers are remoted from the file `/mnt/sdb1/NPTools/ntp.conf` and were replaced with

```
# You do need to talk to an NTP server or two (or three).
server 134.79.18.40
server 134.79.18.41
server 134.79.18.34
server 134.79.18.35
```

NDT

Going to

```
http://172.16.203.130:7123/
```

shows up the ndt webpage where you can run the java applet.

bwctl

owamp

thrulay