

FreeBSD Installer

Now with graphics!

Work in Progress

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no software was harmed during the creation of this presentation

A word on myself

Pierre Pronchery

- NetBSD developer since 2012
- With the FreeBSD Foundation since April 2023
- Imported OpenSSL 3.0 for FreeBSD 14.0
- Improving the FreeBSD installer since

FreeBSD Installer

Agenda

1. FreeBSD Installer
 1. Installation media
 2. startbsdinstall
 3. bsddialog(1)
 4. bsdinstall(8)
2. FreeBSD System Configuration
 1. bsdconfig(8)
 2. Xdialog(1)
 3. bsdconfig -X
3. Graphical FreeBSD Installer
 1. gbsddialog(1)
 2. bsdinstall -X

FreeBSD Installer

System startup

- Installation media is created from `src/release`
- As per `src/release/Makefile`:

```
src/release$ make memstick
```

```
cd disc1 && sh /usr/src/release/amd64/make-memstick.sh . ./memstick.img
```

```
[...]
```

```
cp ./rc.local /usr/obj/usr/src/amd64.amd64/release/disc1/etc
```

- Spoiler alert: the magic starts in `rc.local`

FreeBSD Installer

rc.local

- From src/release/rc.local:

```
# resolv.conf from DHCP ends up in here, so make sure the directory exists
```

```
mkdir /tmp/bsdinstall_etc
```

```
if bsdinstall_multicons_disabled; then
```

```
    /usr/libexec/bsdinstall/startbsdinstall primary
```

```
else
```

```
    echo
```

```
    /usr/libexec/bsdinstall/runconsoles /usr/libexec/bsdinstall/startbsdinstall %
```

```
fi
```

FreeBSD Installer

startbsdinstall

- Installed in /usr/libexec/bsdinstall, therefore no manual page.
- From src/usr.sbin/bsdinstall/startbsdinstall:

[...]

```
bsddialog --backtitle "${OSNAME} Installer" --title "Welcome" \  
    --extra-button --extra-label "Shell" \  
    --ok-label "Install" --cancel-label "Live System" \  
    --yesno "Welcome to ${OSNAME}!"
```

```
Would you like to begin an installation or use the live system?" 0 0
```

[...]

```
case $? in
```

```
  $BSDDIALOG_OK) # Install
```

```
    bsdinstall
```

```
    if [ $? -eq 0 ]; then
```

```
        $BSDDIALOG --backtitle "${OSNAME} Installer" --title "Complete" \  
            --ok-label "Reboot" --extra-button --extra-label "Shutdown" \  
            --cancel-label "Live System" \  
            --yesno "Installation of ${OSNAME} complete!"
```

```
Would you like to reboot into the installed system now?" 0 0
```

FreeBSD Installer

bsddialog(1)

SYNOPSIS

```
bsddialog --dialog1 ... [--and-dialog --dialog2 ...] ...
```

DESCRIPTION

The `bsddialog` utility builds Text User Interface dialogs and widgets: to display messages, to get input and to inform about a computation status.

Dialogs

The following dialogs are available:

```
--calendar, --checklist, --datebox, --form, --gauge, --infobox, --menu...
```

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bsdinstall(8)

`bsdinstall` is used for installation of new systems, both for system setup from installation media, e.g., CD-ROMs, and for use on live systems to prepare VM images and jails.

Much like `make(1)`, `bsdinstall` takes a target and possible parameters of the target as arguments. If invoked with no arguments, it will invoke the auto target, which provides a standard interactive installation, invoking the others in sequence. To perform a scripted installation, these subtargets can be invoked separately by an installation script.

FreeBSD Installer

bsdinstall(8)

- From `src/usr.sbin/bsdinstall/bsdinstall`:

```
f_dprintf "Running installation step: %s %s" "$VERB" "$*" "
```

```
if [ "$debug" ]; then
```

```
    [...]
```

```
else
```

```
    exec "/usr/libexec/bsdinstall/$VERB" "$@" 2> /dev/null
```

```
fi
```

FreeBSD Installer

bsdinstall targets

- The targets in /usr/libexec/bsdinstall notably come from src/usr.sbin/bsdinstall/scripts

- From src/usr.sbin/bsdinstall/scripts/auto:

```
BSDCFG_SHARE="/usr/share/bsdconfig"
```

```
. $BSDCFG_SHARE/common.subr || exit 1
```

```
f_include $BSDCFG_SHARE/dialog.subr
```

```
[...]
```

```
##### MAIN
```

```
f_dprintf "Began Installation at %s" "$( date )"
```

```
[...]
```

```
    EXTRA_DISTS=$( eval bsddialog \
```

```
        --backtitle \"$OSNAME Installer\" \
```

```
        --title \"Distribution Select\" --nocancel --separate-output \
```

```
        --checklist \"Choose optional system components to install:\" \
```

```
        0 0 0 $DISTMENU \
```

```
[...]
```

```
[ -z \"$BSDINSTALL_SKIP_TIME\" ] && bsdinstall time
```

FreeBSD Installer

Key takeaways

- The FreeBSD installer is implemented with `bsdinstall(8)`
- `bsdinstall(8)` has some relation to “`bsdconfig`”
- It uses `bsddialog(1)` to create dialogs
- And calls itself in a sequence of steps (as “targets”)

FreeBSD System Configuration

bsdconfig(8)

bsdconfig is used to set up many system configuration settings, both for new systems, as well as changing configuration settings of existing systems.

bsdconfig optionally takes a command as an argument. If invoked with no arguments, it will bring up an interactive menu listing the available modules.

The following options are available:

[...]

-X Use Xdialog(1) (ports/x11/xdialog) in place of dialog(1).

FreeBSD System Configuration

Xdialog(1)

Xdialog is designed to be a drop in replacement for the dialog and cdialog programs (BTW Xdialog may also be used in place of gdialog). It converts any terminal based program into a program with an X-windows interface. The dialogs are easier to see and use, and the new widgets adds even more functionality.

To achieve this, Xdialog uses the Gimp Toolkit (also known as GTK+).

FreeBSD System Configuration

Graphical mode?!?

- Capable to leveraging sudo(8)

```
# pkg install xdialog
```

```
# bsdconfig -X
```

- DEMO: integration through `bsdconfig.desktop`

FreeBSD System Configuration

Key takeaways

- Looks outdated and unmaintained:
 - Gtk+ 2, weird icons, visual bugs
 - Loads of run-time warnings from Gtk+
 - Website best viewed in 800x600 (<http://xdialog.free.fr>)
 - Latest release 2.3.1 from August 18th 2006
- Much more user-friendly than plain bsdconfig
- Can we do the same with the installer?

Graphical Installer for FreeBSD

Drop-in replacement for `bsddialog(1)`

- `gbsddialog(1)/Xdialog(1)` (`ports/x11/gbsddialog`) in place of `bsddialog(1)/Xdialog(1)`
- Complete re-implementation:
 - BSD license
 - Sponsored by the FreeBSD Foundation
- Works wonders with `bsdconfig -X`

But how about `bsdinstall -X`?

Graphical Installer for FreeBSD

One way to go about it

a few patches later

- DEMO: the installer, graphics mode



ORACLE[®]
VM



VirtualBox 7.0

Press F12 to select boot device.

Consoles: internal video/keyboard

BIOS drive C: is disk0

PXE version 2.1, real mode entry point @9c48:04c8

BIOS 625kB/1046408kB available memory

FreeBSD/x86 bootstrap loader, Revision 1.1

(Wed Feb 21 23:09:54 CET 2024 khorben@fbsd64.ridge.defora)

FreeBSD

===== Welcome to FreeBSD =====

1. Boot Graphical Installer [Enter]
2. Boot Single user
3. Escape to loader prompt
4. Reboot
5. Cons: Video

Options:

6. Kernel: default/kernel (1 of 1)
7. Boot Options

Autoboot in 9 seconds. [Space] to pause



56.1

Next server: 192.168.56.1

Filename: FreeBSD/boot/pxeboot

Root path: nfs://192.168.56.1/home/jails/bsdinstall/

Ignoring unsupported root path

tftp://192.168.56.1/FreeBSD/boot/pxeboot... ok

pxeboot : 464896 bytes [PXE-NBP]

PXE Loader 1.00

Building the boot loader arguments

Relocating the loader and the BTX

Starting the BTX loader

BTX loader 1.00 BTX version is 1.02

```
.  
Falling back to slow lapic calibration.  
Timecounters tick every 10.000 msec  
ugen0.1: <Intel XHCI root HUB> at usb0  
uhub0random: unblocking device.  
  on usb0  
uhub0: <Intel XHCI root HUB, class 9/0, rev 3.00/1.00, addr 1> on usb0  
pcm0: measured ac97 link rate at 29240 Hz  
ada0 at ahcich0 bus 0 scbus0 target 0 lun 0  
ada0: <VBOX HARDDISK 1.0> ATA-6 SATA 2.x device  
ada0: Serial Number VB5b48c7fa-4647232c  
ada0: 300.000MB/s transfers (SATA 2.x, UDMA6, PIO 8192bytes)  
ada0: Command Queueing enabled  
ada0: 61440MB (125829120 512 byte sectors)  
cd0 at ahcich1 bus 0 scbus1 target 0 lun 0  
cd0: <VBOX CD-ROM 1.0> Removable CD-ROM SPC-3 SCSI device  
cd0: Serial Number VB1-1a2b3c4d  
cd0: 300.000MB/s transfers (SATA 2.x, UDMA6, ATAPI 12bytes, PIO 8192bytes)  
cd0: Attempt to query device size failed: NOT READY, Medium not present  
WARNING: WITNESS option enabled, expect reduced performance.  
Trying to mount root from nfs: []...  
uhub0: 14 ports with 14 removable, self powered  
NFS ROOT: 192.168.56.1:/home/jails/bsdinstall/  
em0: link state changed to UP
```

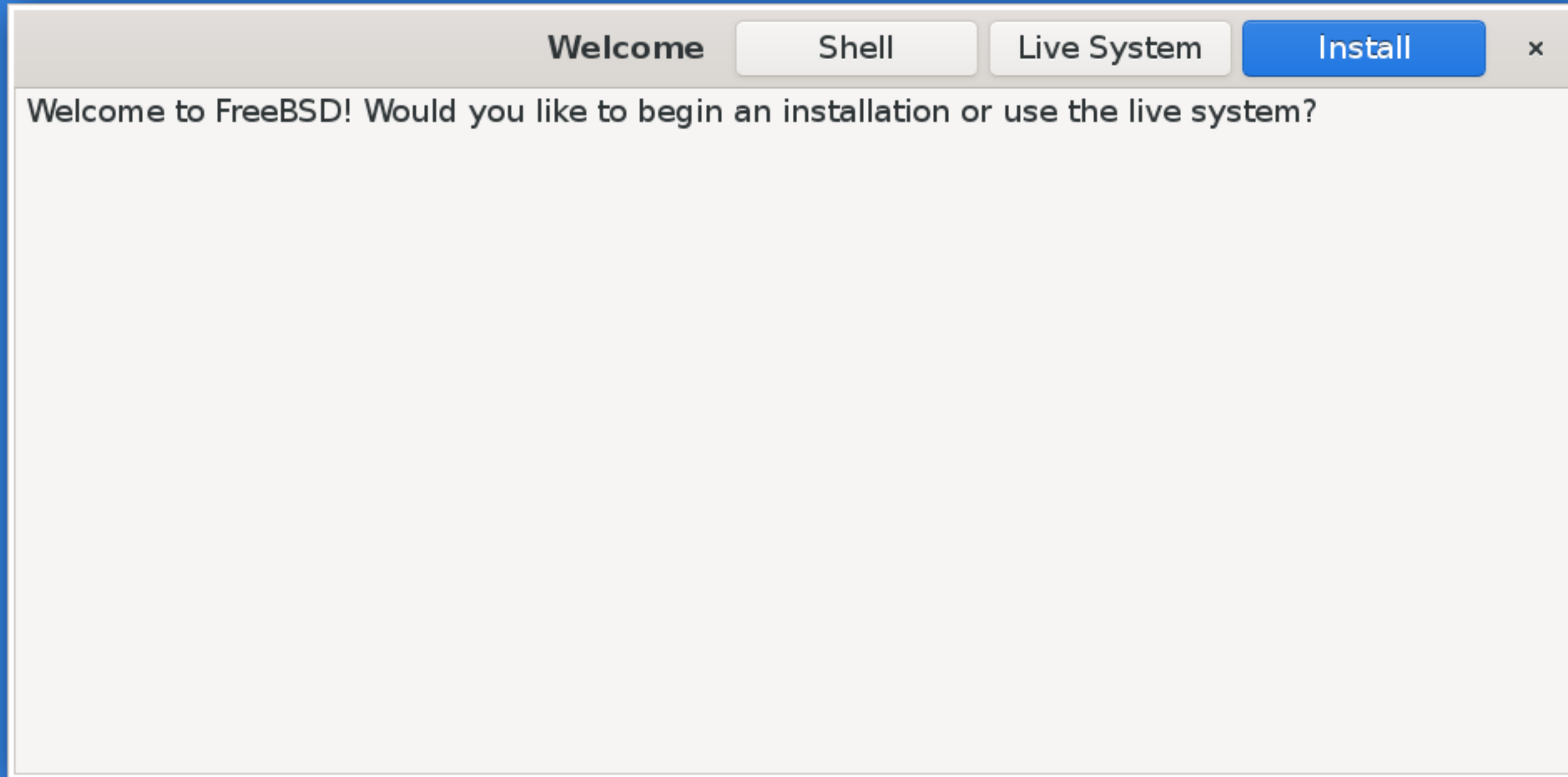
FreeBSD Installer

Welcome

Welcome to FreeBSD! Would you like to begin an installation or use the live system?

[**Install**] [Shell] [Live System]

FreeBSD Installer



Keymap Selection

FreeBSD Installer

Press arrows, TAB or ENTER

The system console driver for FreeBSD defaults to standard "US" keyboard map. Other keymaps can be chosen below.

ue with default keymap

ult keymap

phonetic layout

1

accent keys)

accent keys)

without accent keys)

(BDS)

(Phonetic)

Bilingual

uropean

... (QWERTY)



Set Hostname

FreeBSD Installer OK x

Please choose a hostname for this machine.

If you are running on a managed network, please ask your network administrator for an appropriate name.



FreeBSD Installer

Distribution Select OK x

Choose optional system components to install:

- base-dbg Base system (Debugging)
- kernel-dbg Kernel (Debugging)
- lib32-dbg 32-bit compatibility libraries (Debugging)
- lib32 32-bit compatibility libraries
- ports Ports tree
- src System source tree
- tests Test suite



Information

Probing devices, please wait (this can take a while)...



ZFS Configuration

FreeBSD Installer
Use alnum, arrows, punctuation, TAB or ENTER

Cancel Select

Configure Options:

>>> Install	Proceed with Installation
T Pool Type/Disks:	stripe: 0 disks
- Rescan Devices	*
- Disk Info	*
N Pool Name	zroot
4 Force 4K Sectors?	YES
E Encrypt Disks?	NO
P Partition Scheme	GPT (BIOS)
S Swap Size	2g
M Mirror Swap?	NO
W Encrypt Swap?	NO



ZFS Configuration

FreeBSD Installer
Press arrows, TAB or ENTER

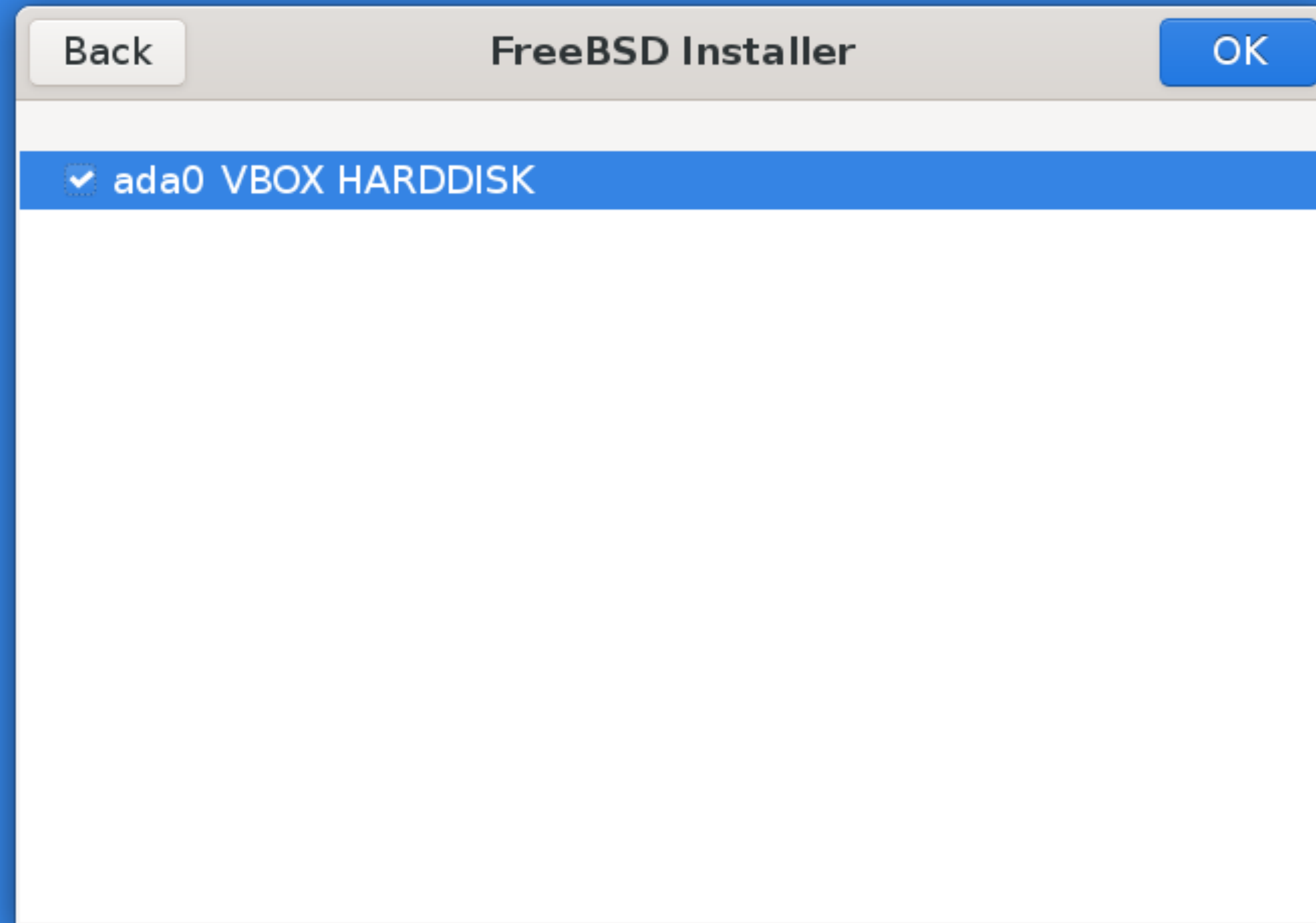
Cancel OK

Select Virtual Device type:

- stripe Stripe - No Redundancy
- mirror Mirror - n-Way Mirroring
- raid10 RAID 1+0 - n x 2-Way Mirrors
- raidz1 RAID-Z1 - Single Redundant RAID
- raidz2 RAID-Z2 - Double Redundant RAID
- raidz3 RAID-Z3 - Triple Redundant RAID



ZFS Configuration



ZFS Configuration

FreeBSD Installer
Use alnum, arrows, punctuation, TAB or ENTER

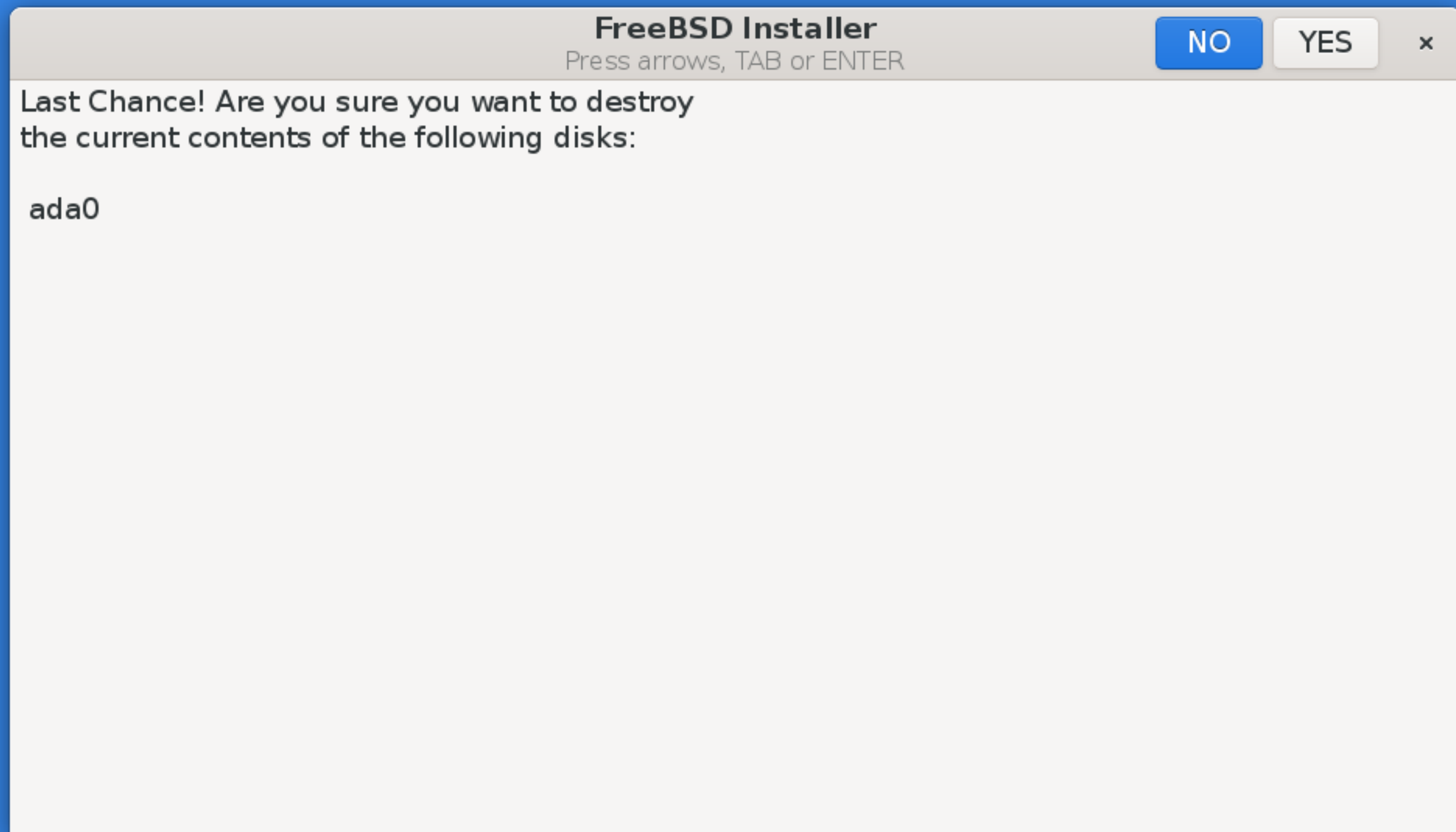
Cancel Select

Configure Options:

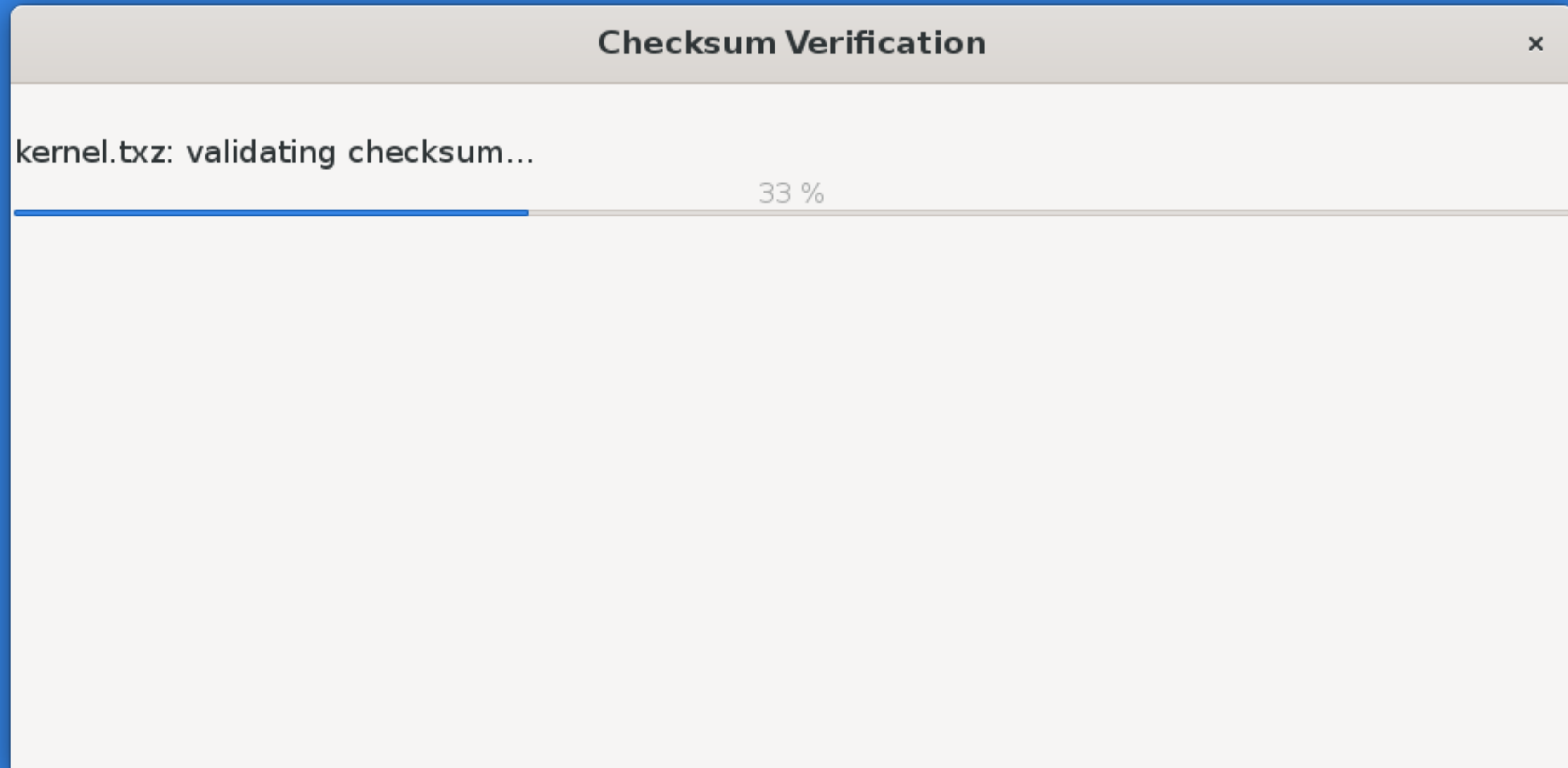
>>> Install	Proceed with Installation
T Pool Type/Disks:	stripe: 1 disk
- Rescan Devices	*
- Disk Info	*
N Pool Name	zroot
4 Force 4K Sectors?	YES
E Encrypt Disks?	NO
P Partition Scheme	GPT (BIOS)
S Swap Size	2g
M Mirror Swap?	NO
W Encrypt Swap?	NO



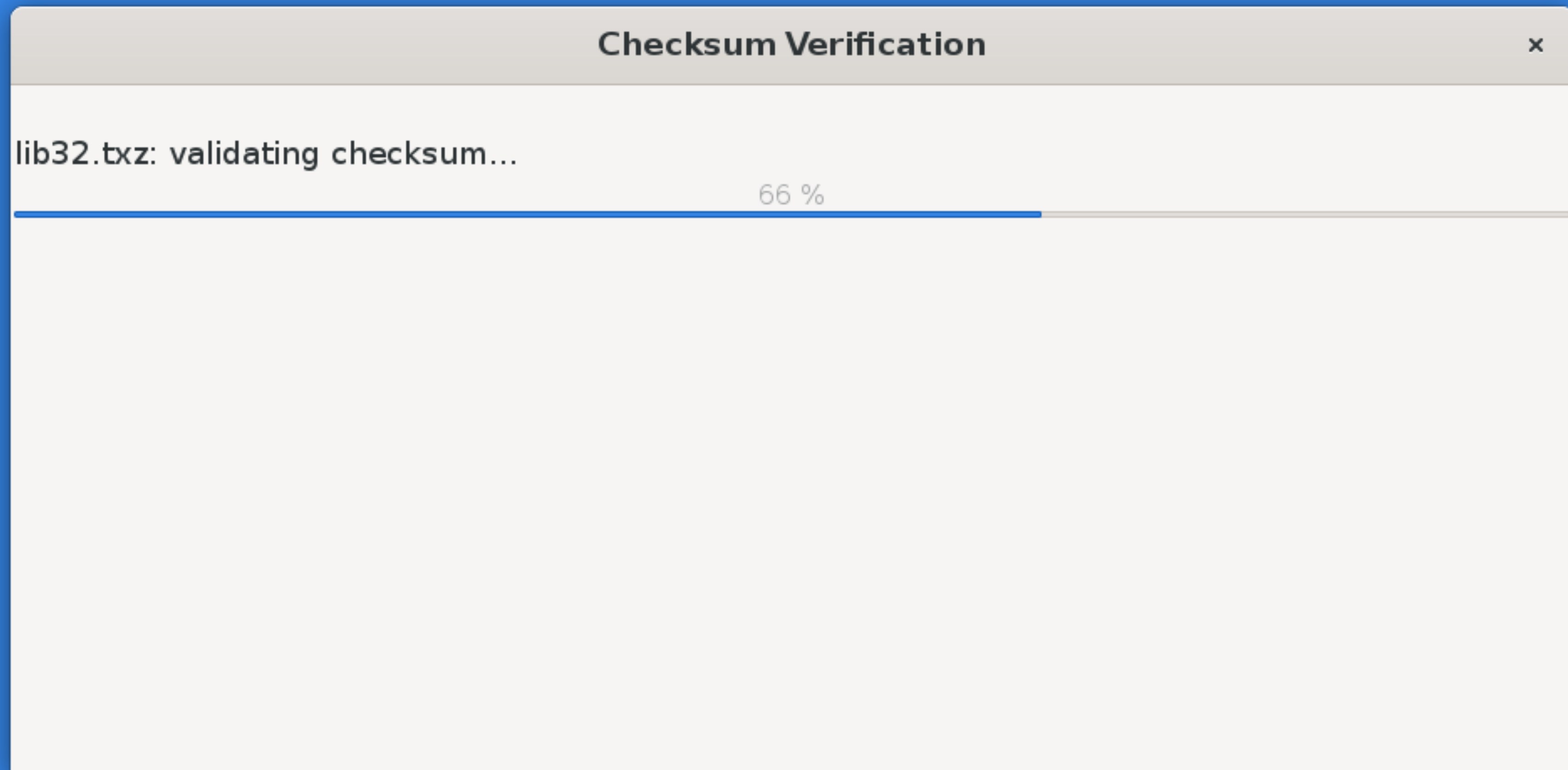
ZFS Configuration



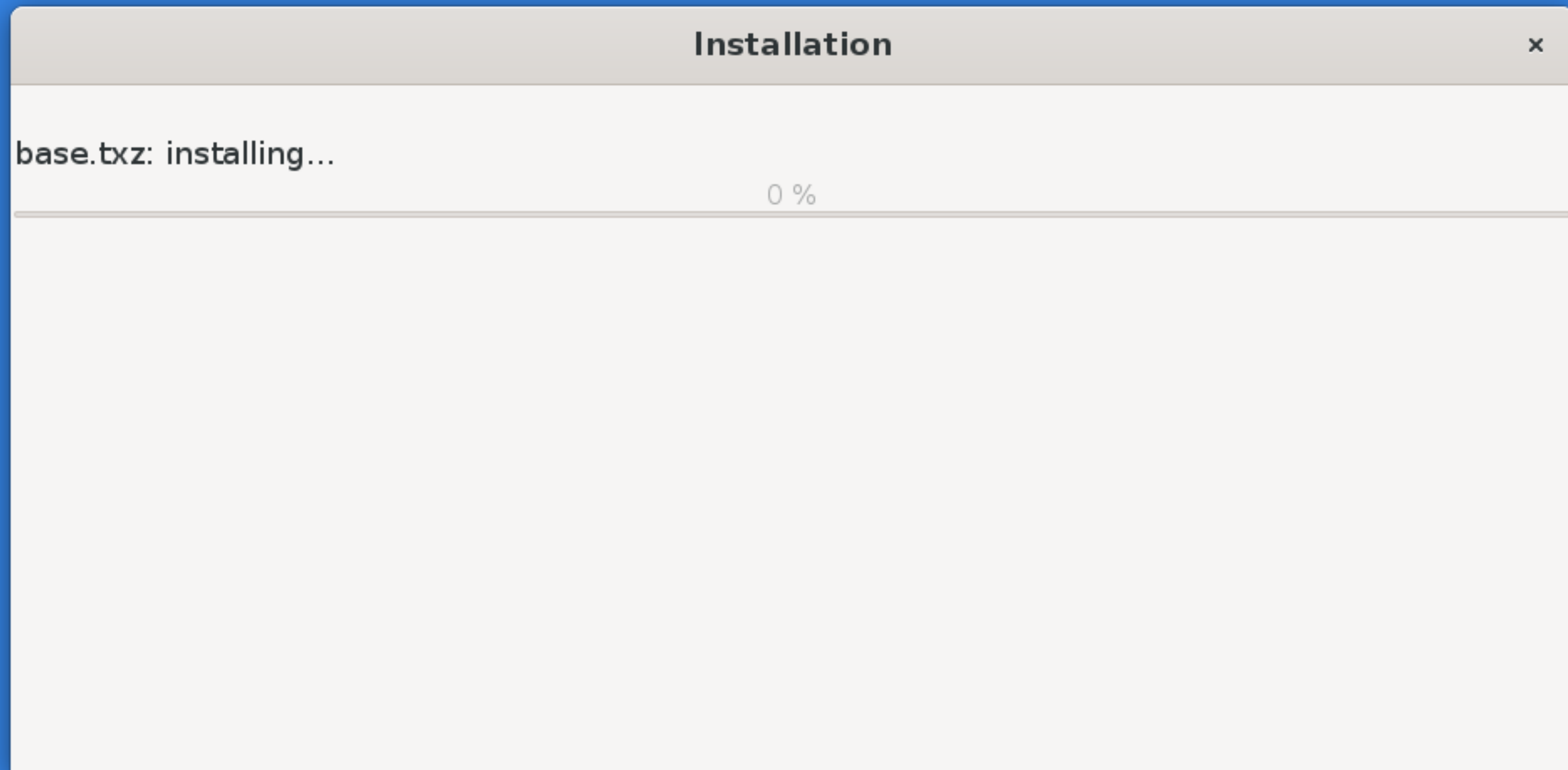
FreeBSD Installer



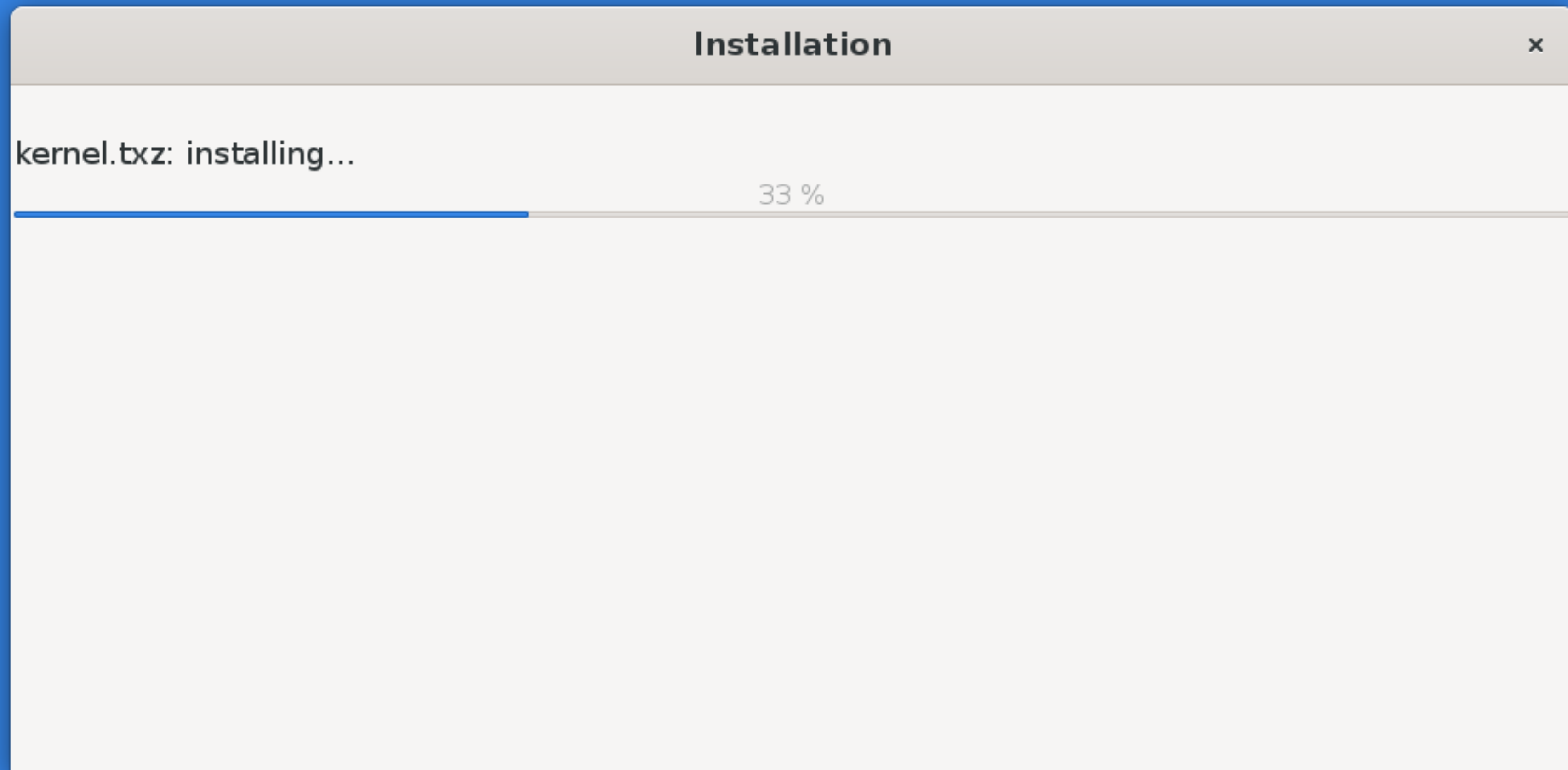
FreeBSD Installer



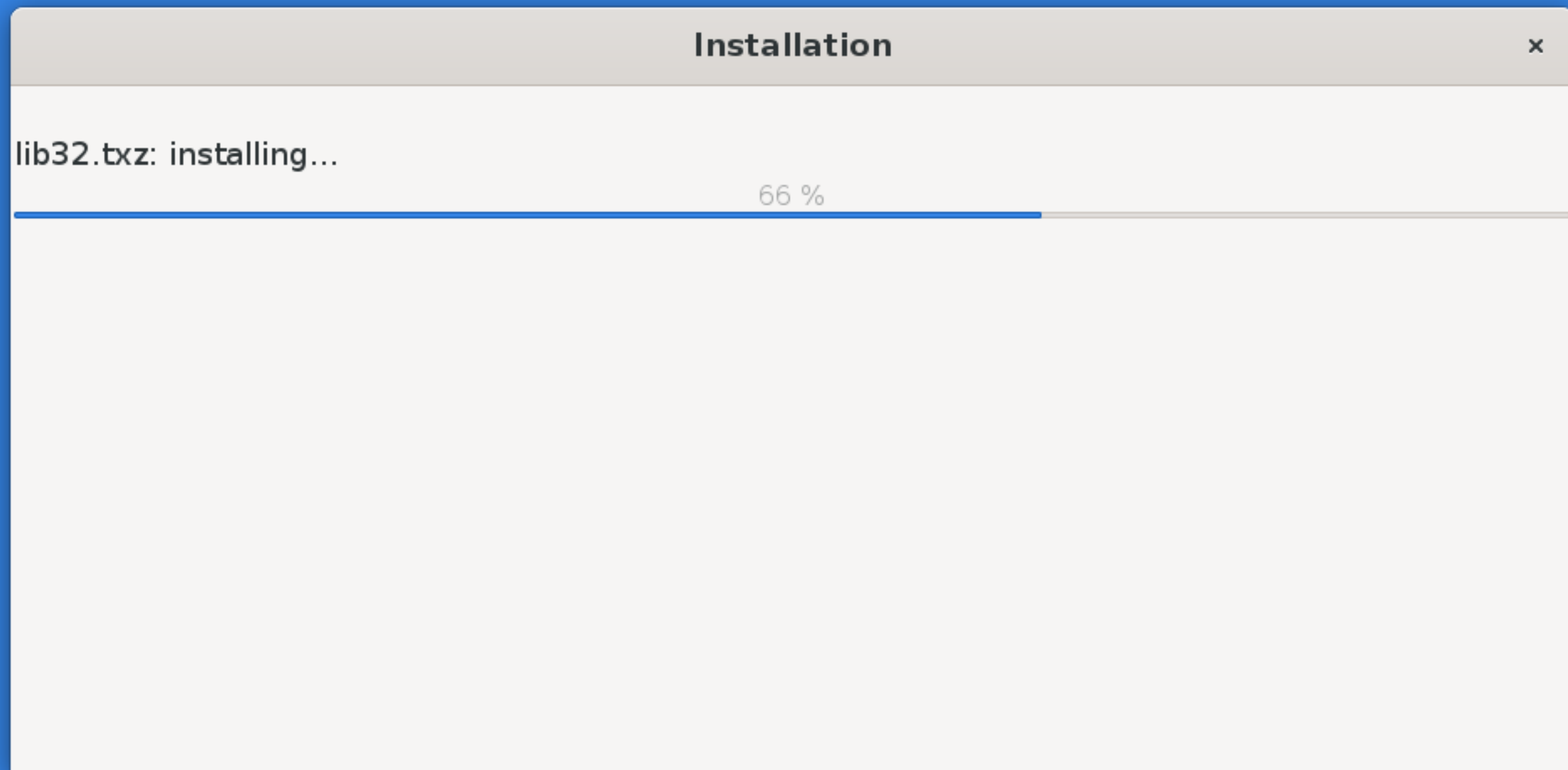
FreeBSD Installer



FreeBSD Installer



FreeBSD Installer



FreeBSD Installer

Skip **Set root password** OK

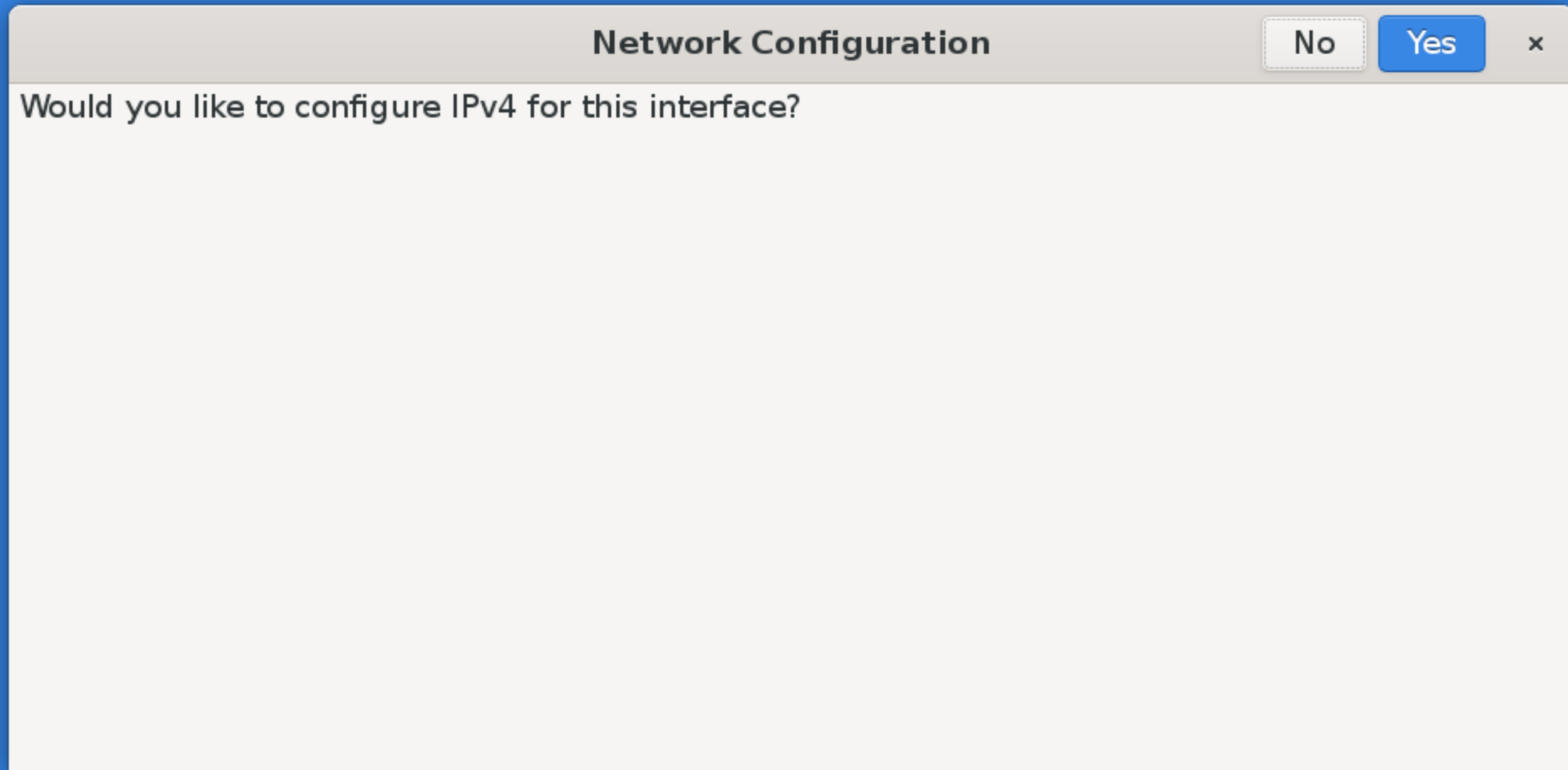
Please select a password for the system management account (root)

Password

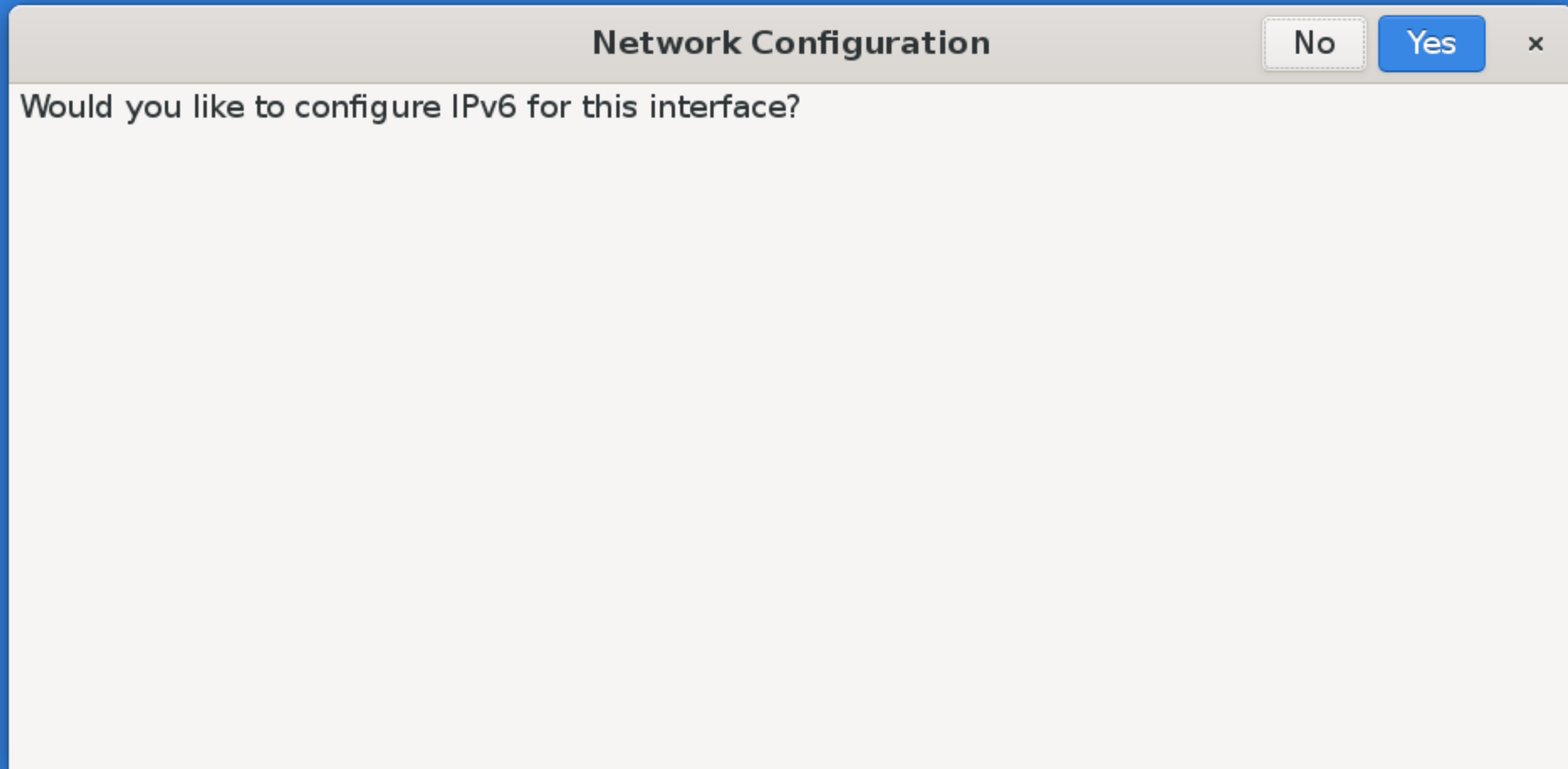
Repeat password



FreeBSD Installer



FreeBSD Installer



FreeBSD Installer

Skip **Time & Date** **Set Date**

< **March** > < 2024 >

Sun	Mon	Tue	Wed	Thu	Fri	Sat
25	26	27	28	29	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	1	2	3	4	5	6



FreeBSD Installer

Time & Date

- : -



FreeBSD Installer

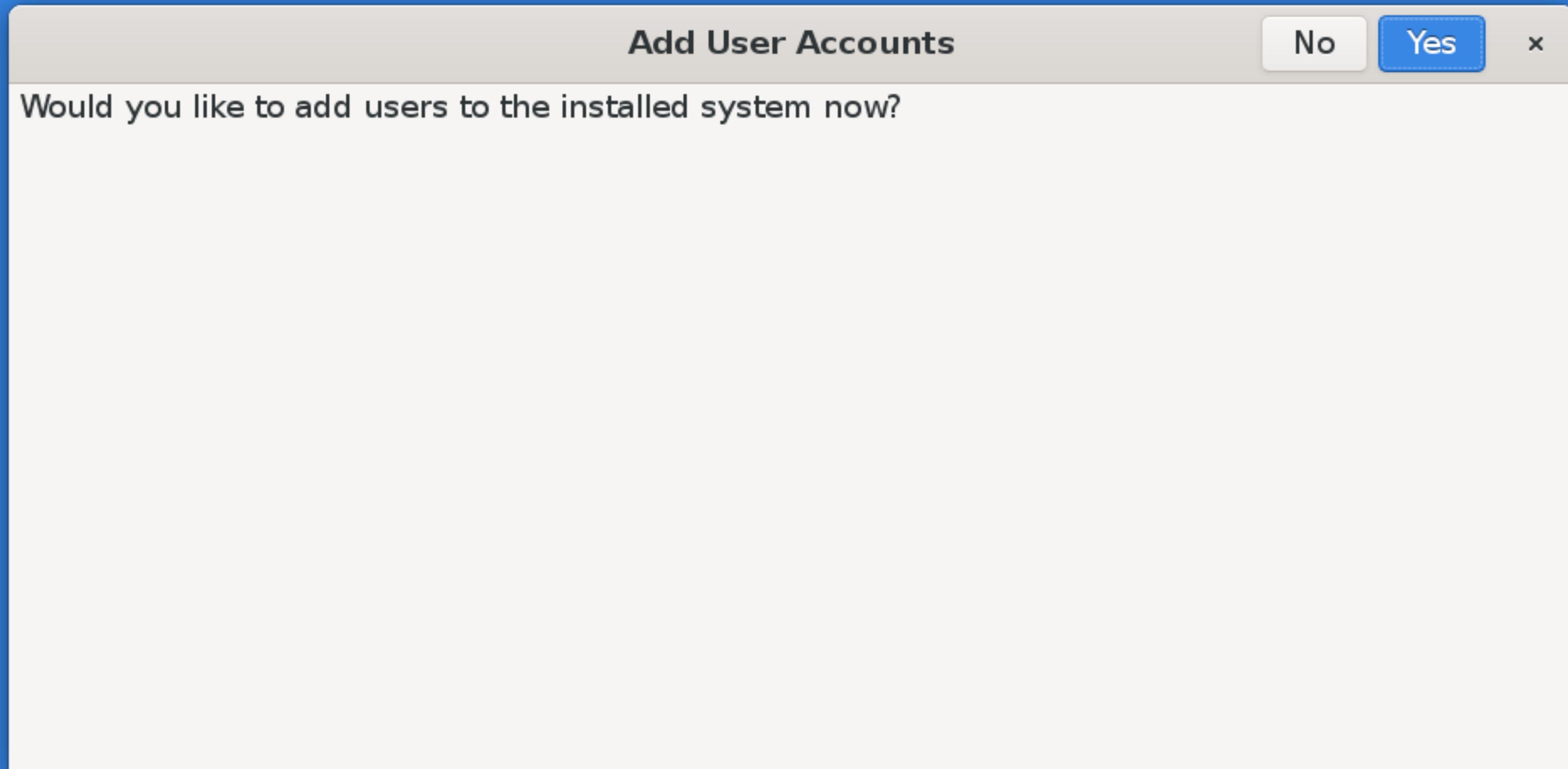
System Configuration OK x

Choose the services you would like to be started at boot:

<input type="checkbox"/>	local_unbound	Local caching validating resolver
<input checked="" type="checkbox"/>	sshd	Secure shell daemon
<input type="checkbox"/>	moused	PS/2 mouse pointer on console
<input checked="" type="checkbox"/>	ntpd	Synchronize system and network time
<input checked="" type="checkbox"/>	ntpd_sync_on_start	Sync time on ntpd startup, even if offset is high
<input checked="" type="checkbox"/>	powerd	Adjust CPU frequency dynamically if supported
<input type="checkbox"/>	dumpdev	Enable kernel crash dumps to /var/crash



FreeBSD Installer



FreeBSD Installer

Cancel Add user OK

User information (leave field empty for default)

Username	<input type="text" value="khorben"/>
Full name	<input type="text" value="Pierre Pronchery"/>
Uid	<input type="text" value="1001"/>
Login group	<input type="text"/>
Extra groups	<input type="text" value="wheel"/>
Login class	<input type="text" value="default"/>
Shell	<input type="text" value="/bin/sh"/>
Home directory	<input type="text"/>
Home permissions	<input type="text" value="0755"/>



FreeBSD Installer

Skip Add user OK

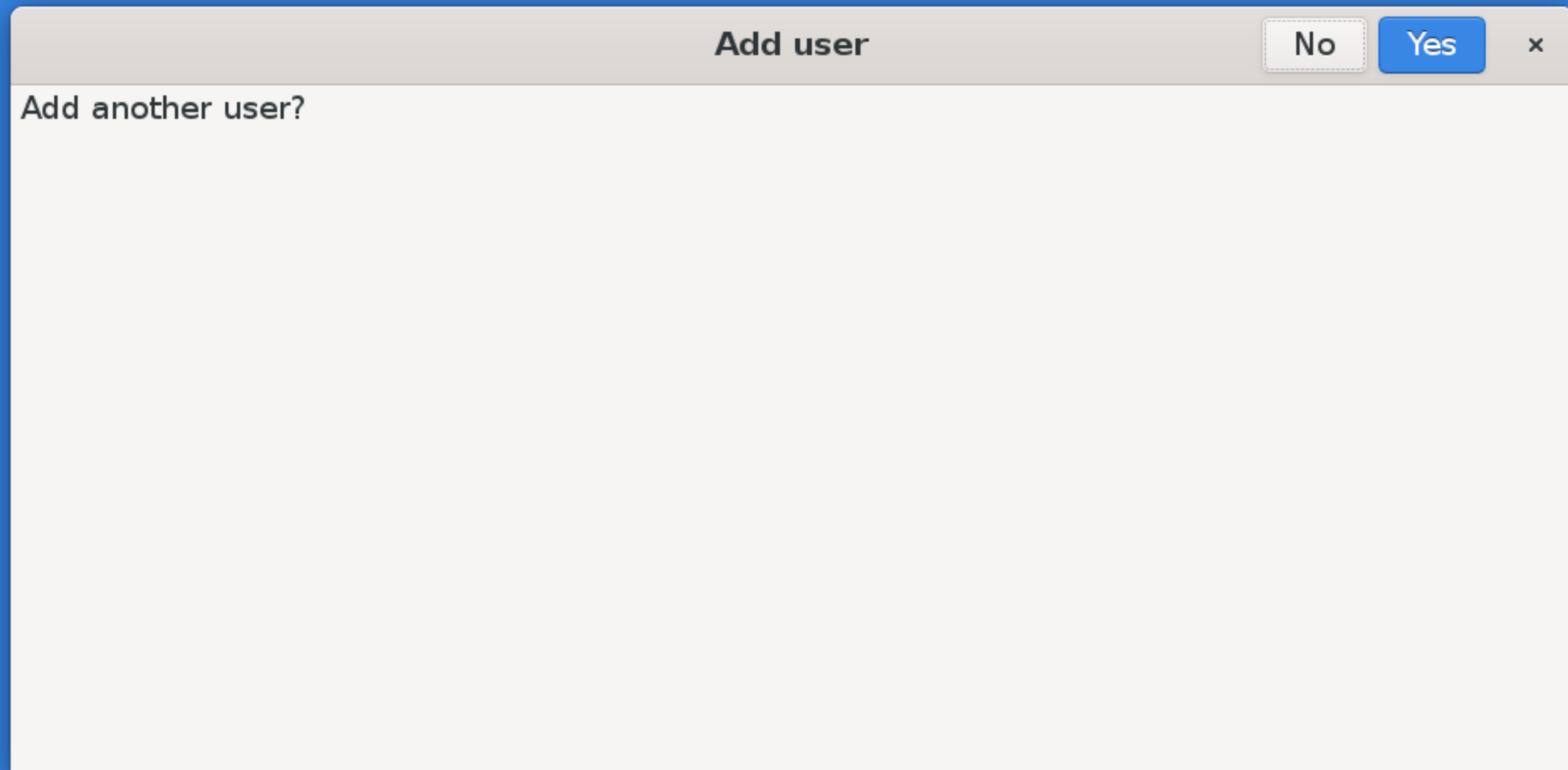
Set the password for user khorben

Password

Repeat password



FreeBSD Installer



FreeBSD Installer

Finish **Final Configuration** **Select**

Setup of your FreeBSD system is nearly complete. You can now modify your configuration choices. After this screen, you will have an opportunity to make more complex changes using a shell.

Add User	Add a user to the system
Root Password	Change root password
Hostname	Set system hostname
Network	Networking configuration
Services	Set daemons to run on startup
System Hardening	Set security options
Time Zone	Set system timezone
Date & Time	Set the date and time
Handbook	Install FreeBSD Handbook (requires network)



FreeBSD Installer

Manual Configuration

No

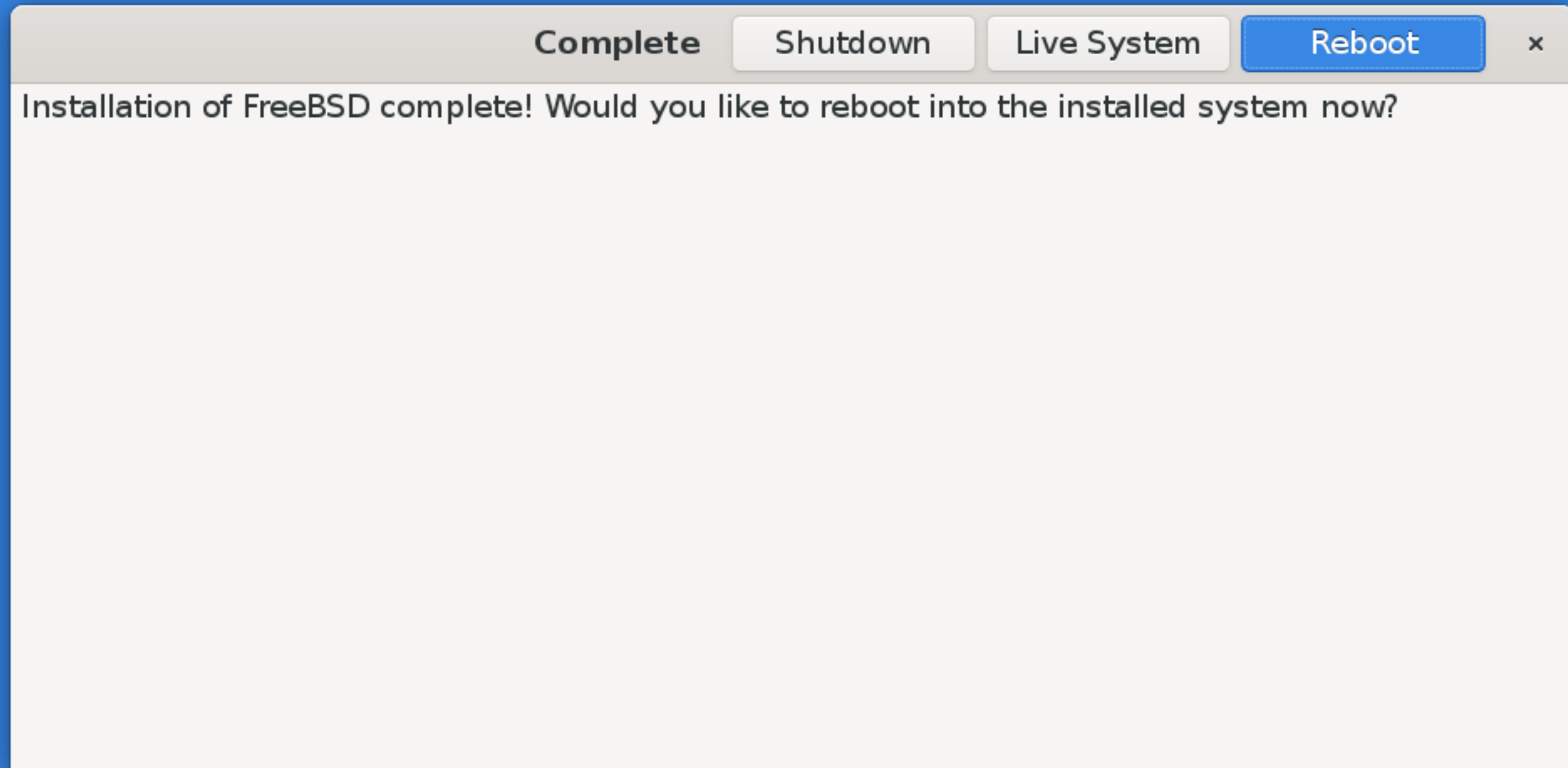
Yes

x

The installation is now finished. Before exiting the installer, would you like to open a shell in the new system to make any final manual modifications?



FreeBSD Installer



VirtualBox temporary boot device selection

Detected Hard disks:

AHCI controller:

1) Hard disk

Other boot devices:

f) Floppy

c) CD-ROM

l) LAN

b) Continue booting

FreeBSD

==== Welcome to FreeBSD =====

1. Boot Multi user [Enter]
2. Boot Single user
3. Escape to loader prompt
4. Reboot
5. Cons: Video

Options:

6. Kernel: default/kernel (1 of 1)
7. Boot Options

Autoboot in 10 seconds. [Space] to pause



```
list'): expired 87 days ago
Mounting late filesystems:.
Starting cron.
Generating RSA host key.
3072 SHA256:D8jmvLFpPGaL261iE1q/hQtE10+XE2v4R9iUVFGYgDQ root@machine3.example.com
(RSA)
Generating ECDSA host key.
256 SHA256:WdQDIquoYZ99cTcHq0CJsn82Tmr9sqC1zQ1jJcK2YJw root@machine3.example.com
(ECDSA)
Generating ED25519 host key.
256 SHA256:26rAbwWxRTKWSf8Kr6LDxyS/j3qLvovo8W/wrP0n8C4 root@machine3.example.com
(ED25519)
Performing sanity check on sshd configuration.
Starting sshd.
Starting background file system checks in 60 seconds.

Sat Mar 23 17:32:01 UTC 2024

FreeBSD/amd64 (machine3.example.com) (ttyv0)

login: Mar 23 17:32:02 machine3 ntpd[733]: error resolving pool 0.freebsd.pool.ntp.org:
Name does not resolve (8)
Mar 23 17:32:03 machine3 ntpd[733]: error resolving pool 2.freebsd.pool.ntp.org:
Name does not resolve (8)
```

Release Notes, Errata: <https://www.FreeBSD.org/releases/>
Security Advisories: <https://www.FreeBSD.org/security/>
FreeBSD Handbook: <https://www.FreeBSD.org/handbook/>
FreeBSD FAQ: <https://www.FreeBSD.org/faq/>
Questions List: <https://www.FreeBSD.org/lists/questions/>
FreeBSD Forums: <https://forums.FreeBSD.org/>

Documents installed with the system are in the `/usr/local/share/doc/freebsd/` directory, or can be installed later with: `pkg install en-freebsd-doc`
For other languages, replace "en" with a language code like `de` or `fr`.

Show the version of FreeBSD installed: `freebsd-version ; uname -a`
Please include that output and any error messages when posting questions.
Introduction to manual pages: `man man`
FreeBSD directory layout: `man hier`

To change this login announcement, see `motd(5)`.
Forget how to spell a word or a variation of a word? Use

```
    look portion_of_word_you_know
    -- Dru <genesis@istar.ca>
```

```
khorben@machine3:~ $ id
uid=1001(khorben) gid=1001(khorben) groups=1001(khorben),0(wheel)
khorben@machine3:~ $
```

Documents installed with the system are in the /usr/local/share/doc/freebsd/
directory, or can be installed later with: pkg install en-freebsd-doc
For other languages, replace "en" with a language code like de or fr.

Show the version of FreeBSD installed: freebsd-version ; uname -a
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Introduction to manual pages: man man
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To change this login announcement, see motd(5).
Forget how to spell a word or a variation of a word? Use

```
look portion_of_word_you_know  
-- Dru <genesis@istar.ca>
```

```
khorben@machine3:~ $ id  
uid=1001(khorben) gid=1001(khorben) groups=1001(khorben),0(wheel)  
khorben@machine3:~ $ su -  
Password:  
Mar 23 17:32:23 machine3 su[819]: khorben to root on /dev/ttyv0  
root@machine3:~ # uname -a  
FreeBSD machine3.example.com 14.0-RELEASE FreeBSD 14.0-RELEASE #0 releng/14.0-n2  
65380-f9716eee8ab4: Fri Nov 10 05:57:23 UTC 2023 root@releng1.nyi.freebsd.or  
g:/usr/obj/usr/src/amd64.amd64/sys/GENERIC amd64  
root@machine3:~ #
```


Graphical Installer for FreeBSD

Caveats (unfortunately)

- `--mixedgauge`
- Binary targets for `bsdinstall(8)`: `checksum`, `distextract`, `fetch` ...need to be re-implemented or replaced for graphical mode
- Bug in `makefs(8)`?

Graphical Installer for FreeBSD

Patches

In review

- `adduser` target for `bsdinstall(8)` (D44279)
- `rootpass` target for `bsdinstall(8)` (D44280)

Incoming

- `tzsetup` target for `bsdinstall(8)`

Graphical Installer for FreeBSD

Needs cleanup before review

- `s/bsddialog/$BSDDIALOG/g`
- `s/bsdinstall/$BSDINSTALL $BSDINSTALL_ARGS/`
- `while getopts $GETOPTS_STDARGS flag; do case "$flag" in
X) ...`
- Code for `bsdinstall -X`

Conclusion

Thank you!

- What do you think?

Questions, comments, feedback: pierre@freebsdoundation.org

<https://github.com/khorben/freebsd-src>, branch [khorben/bsdinstall-graphical4](https://github.com/khorben/freebsd-src/tree/khorben/bsdinstall-graphical4)

<https://github.com/khorben/gbsddialog>