

Setting up a looking-glass server with OpenBSD & OpenBGPD

Adam Thompson
Consultant, Infrastructure Services
athompson@merlin.mb.ca

MUUG Meeting, 2019-Feb-11

VM creation

- Running in VMware vSphere 6.x
- Using HTML5 or Flash wizards to create the VM
- Minimal resources required

New Virtual Machine

1 Select a creation type

- 2 Select a name and folder
- 3 Select a compute resource
- 4 Select storage
- 5 Select compatibility
- 6 Select a guest OS
- 7 Customize hardware
- 8 Ready to complete

Select a creation type

How would you like to create a virtual machine?

- Create a new virtual machine**
- Deploy from template
- Clone an existing virtual machine
- Clone virtual machine to template
- Clone template to template
- Convert template to virtual machine

This option guides you through creating a new virtual machine. You will be able to customize processors, memory, network connections, and storage. You will need to install a guest operating system after creation.

CANCEL

BACK

NEXT

New Virtual Machine

✓ 1 Select a creation type

2 Select a name and folder

3 Select a compute resource

4 Select storage

5 Select compatibility

6 Select a guest OS

7 Customize hardware

8 Ready to complete

Select a name and folder

Specify a unique name and target location

Virtual machine name: bgpmirror.merlin.mb.ca

Select a location for the virtual machine.

- ▼ vim.merlin.ca
 - ▼ MERLIN
 - > Discovered virtual machine
 - > IAAS - BPSD
 - > IAAS - BU
 - > IAAS - CMU
 - > IAAS - DSFM
 - > IAAS - FFSD
 - > IAAS - ITC
 - > IAAS - PLPSD
 - > IAAS - PWSD
 - > IAAS - SJASD
 - > IAAS - SOSD
 - > IAAS - SRSD
 - > MERLIN - Hosted
 - > MERLIN - Hosted Exchange
 - MERLIN - Internal**
 - > Testing%2fCloners

CANCEL

BACK

NEXT

New Virtual Machine

- ✓ 1 Select a creation type
- ✓ 2 Select a name and folder
- 3 Select a compute resource**
- 4 Select storage
- 5 Select compatibility
- 6 Select a guest OS
- 7 Customize hardware
- 8 Ready to complete

Select a compute resource

Select the destination compute resource for this operation

- esx25.merlin.ca
 - > IAAS - BPSD
 - > IAAS - BU
 - > IAAS - CMU
 - > IAAS - DSFM
 - > IAAS - FFSD
 - > IAAS - ITC
 - > IAAS - PLPSD
 - > IAAS - PWSD
 - > IAAS - SJASD
 - > IAAS - SOSD
 - > IAAS - SRSD
 - > MERLIN - Hosted
 - > MERLIN - Hosted Exchange
 - MERLIN - Internal
 - > Testing/Cloners

Compatibility

✓ Compatibility checks succeeded.

CANCEL

BACK

NEXT











New Virtual Machine

- ✓ 1 Select a creation type
- ✓ 2 Select a name and folder
- ✓ 3 Select a compute resource
- 4 Select storage**
- 5 Select compatibility
- 6 Select a guest OS
- 7 Customize hardware
- 8 Ready to complete

Select storage

Select the datastore in which to store the configuration and disk files

VM Storage Policy: Datastore Default ▼

Name	Capacity	Provisioned	Free	Type
 MERLIN_GRAYLOG03_S...	8.81 TB	8 TB	830.65 GB	VM
 MERLIN_HOSTED_SSD	25.48 TB	33.35 TB	3.34 TB	NF
 MERLIN_HOSTED_T2_S...	2.65 TB	3.64 TB	695.16 GB	NF
 MERLIN_HOSTED_T3_S...	7.35 TB	6.3 TB	3.33 TB	NF
 MERLIN_INT_SSD	3.23 TB	7.81 TB	1.37 TB	NF
 MERLIN_INT_T3_SAS	7.84 TB	4.53 TB	6 TB	NF
 MERLIN_ISO	100 GB	55.31 GB	44.69 GB	NF
 VeeamBackup_10.1152.2...	59.45 GB	17.42 GB	42.03 GB	NF
 VeeamBackup_bImp02....	67.26 GB	52.84 GB	14.42 GB	NF
 VeeamBackup_Veeam-...	39.51 GB	31.78 GB	7.73 GB	NF

Compatibility

✓ Compatibility checks succeeded.

CANCEL

BACK

NEXT


New Virtual Machine

- ✓ 1 Select a creation type
- ✓ 2 Select a name and folder
- ✓ 3 Select a compute resource
- ✓ 4 Select storage
- 5 Select compatibility**
- 6 Select a guest OS
- 7 Customize hardware
- 8 Ready to complete

Select compatibility

Select compatibility for this virtual machine depending on the hosts in your environment

The host or cluster supports more than one VMware virtual machine version. Select a compatibility for the virtual machine.

Compatible with: 

This virtual machine uses hardware version 13, which provides the best performance and latest features available in ESXi 6.5.

CANCEL

BACK

NEXT

- ✓ 1 Select a creation type
- ✓ 2 Select a name and folder
- ✓ 3 Select a compute resource
- ✓ 4 Select storage
- ✓ 5 Select compatibility
- 6 Select a guest OS**
- 7 Customize hardware
- 8 Ready to complete

Select a guest OS

Choose the guest OS that will be installed on the virtual machine

Identifying the guest operating system here allows the wizard to provide the appropriate defaults for the operating system installation.

Guest OS Family:

Guest OS Version:

Compatibility: ESXi 6.5 and later (VM version 13)



Note:

VMware does not specifically support OpenBSD, so we pick something close – 64-bit FreeBSD, in this case. This affects a number of compatibility options in the VM in subtle ways.

- ✓ 1 Select a creation type
- ✓ 2 Select a name and folder
- ✓ 3 Select a compute resource
- ✓ 4 Select storage
- ✓ 5 Select compatibility
- ✓ 6 Select a guest OS
- 7 Customize hardware**
- 8 Ready to complete

Customize hardware

Configure the virtual machine hardware

Virtual Hardware

VM Options

ADD NEW DEVICE

> CPU *	2	▼	<i>i</i>
> Memory *	8	GB	▼
> New Hard disk *	20	GB	▼
> New Network *	InternalOfficeServ	▼	<input checked="" type="checkbox"/> Connect...
> New CD/DVD Drive *	Client Device	▼	<input type="checkbox"/> Connect...
> Video card *	Auto-detect settings	▼	
VMCI device	Device on the virtual machine PCI bus that provides support for the virtual machine communication interface		
> Other	Additional Hardware		

Compatibility: ESXi 6.5 and later (VM version 13)

Here we have to make some changes:

- HDD from SCSI0:0 to IDE0:0
- delete the SCSI controller
- NIC type to VMXNET2 (to avoid a bug with VMXNET3)
- pick the correct VLAN
- CDROM to IDE1:0
- attach the OpenBSD-netinstall64.iso image
- Video card to Auto-detect
- (on VM Options tab) force BIOS Setup

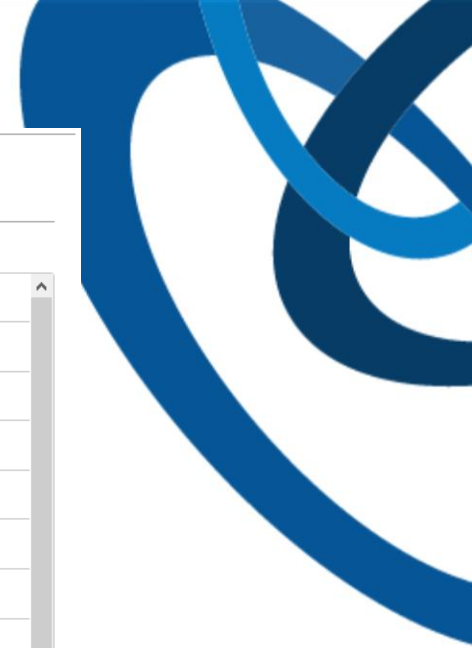
- ✓ 1 Select a creation type
- ✓ 2 Select a name and folder
- ✓ 3 Select a compute resource
- ✓ 4 Select storage
- ✓ 5 Select compatibility
- ✓ 6 Select a guest OS
- ✓ 7 Customize hardware
- 8 Ready to complete**

Ready to complete

Click Finish to start creation.

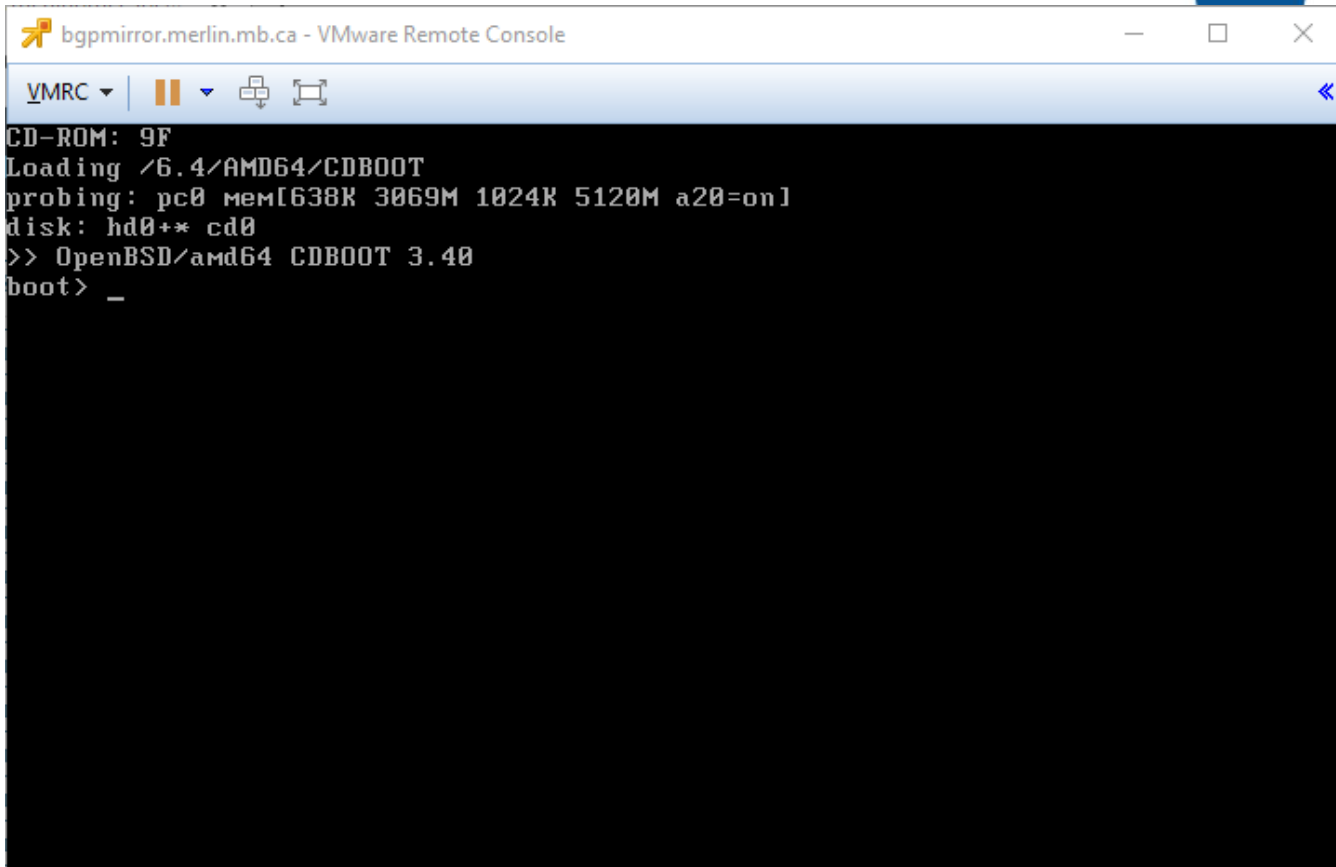
Provisioning type	Create a new virtual machine
Virtual machine name	bgpmirror.merlin.mb.ca
Folder	MERLIN - Internal
Resource pool	MERLIN - Internal
Datastore	MERLIN_INT_SSD
Guest OS name	FreeBSD (64-bit)
CPUs	2
Memory	8 GB
NICs	1
NIC 1 network	InternalOfficeServers
NIC 1 type	VMXNET 2 (Enhanced)
Create hard disk 1	New virtual disk
Capacity	20 GB

Compatibility: ESXi 6.5 and later (VM version 13)



Power on the VM

- BIOS setup screen will appear automatically this one time, because the checkbox in “VM Options” is a one-shot setting.
- Change anything you need to in the BIOS
 - Typically boot order



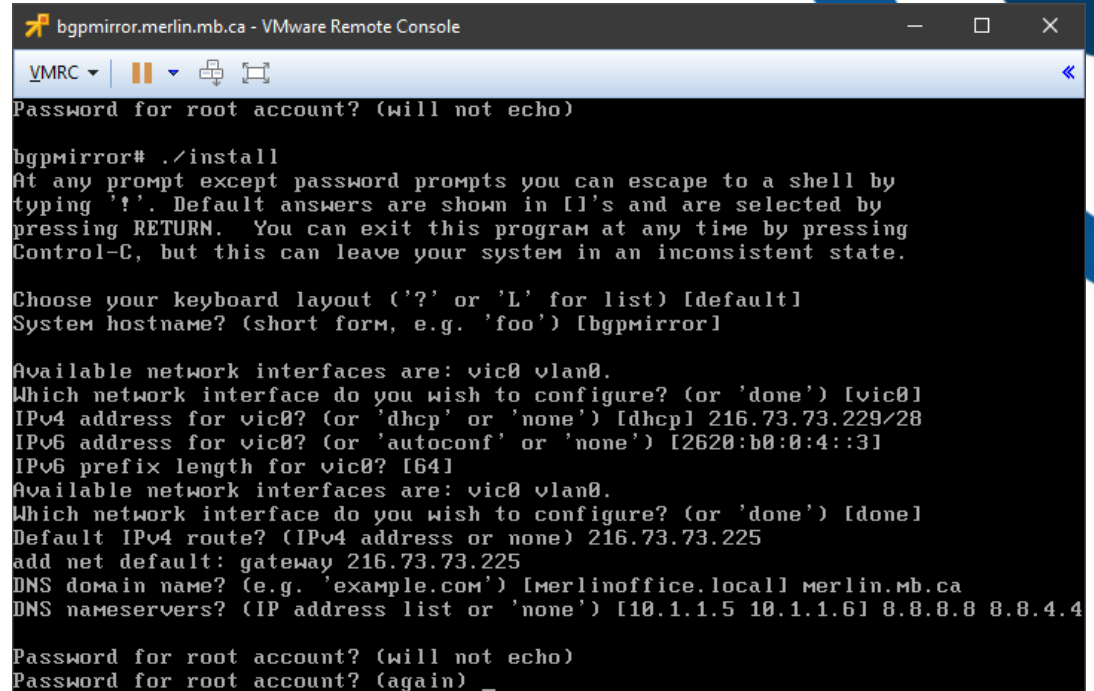
```
bgpmirror.merlin.mb.ca - VMware Remote Console
VMRC | || |
CD-ROM: 9F
Loading /6.4/AMD64/CDBOOT
probing: pc0 mem[638K 3069M 1024K 5120M a20-on]
disk: hd0+* cd0
>> OpenBSD/amd64 CDBOOT 3.40
boot> _
```

OpenBSD Boot screen

...will automatically continue after 5sec if no key is pressed

Installation steps

- Choose “I” for install
- Keep the default keyboard layout
- provide the short (unqualified) hostname
- choose the vic(4) device (it’s the default)
- enter an IPv4 address with netmask
- enter an IPv6 address with netmask
- enter for “done”
- enter the IPv4 gateway
- enter the domain name
- enter the DNS nameservers
- enter the root password
- add a regular user (not shown)
- provide full name for user



```
bgpmirror.merlin.mb.ca - VMware Remote Console
VMRC | [Icons]
Password for root account? (will not echo)

bgpmirror# ./install
At any prompt except password prompts you can escape to a shell by
typing '!'. Default answers are shown in []'s and are selected by
pressing RETURN. You can exit this program at any time by pressing
Control-C, but this can leave your system in an inconsistent state.

Choose your keyboard layout ('?' or 'L' for list) [default]
System hostname? (short form, e.g. 'foo') [bgpmirror]

Available network interfaces are: vic0 vlan0.
Which network interface do you wish to configure? (or 'done') [vic0]
IPv4 address for vic0? (or 'dhcp' or 'none') [dhcp] 216.73.73.229/28
IPv6 address for vic0? (or 'autoconf' or 'none') [2620:b0:0:4::3]
IPv6 prefix length for vic0? [64]
Available network interfaces are: vic0 vlan0.
Which network interface do you wish to configure? (or 'done') [done]
Default IPv4 route? (IPv4 address or none) 216.73.73.225
add net default: gateway 216.73.73.225
DNS domain name? (e.g. 'example.com') [merlinoffice.local] merlin.mb.ca
DNS nameservers? (IP address list or 'none') [10.1.1.5 10.1.1.6] 8.8.8.8 8.8.4.4

Password for root account? (will not echo)
Password for root account? (again) _
```

Installation steps (cont'd)

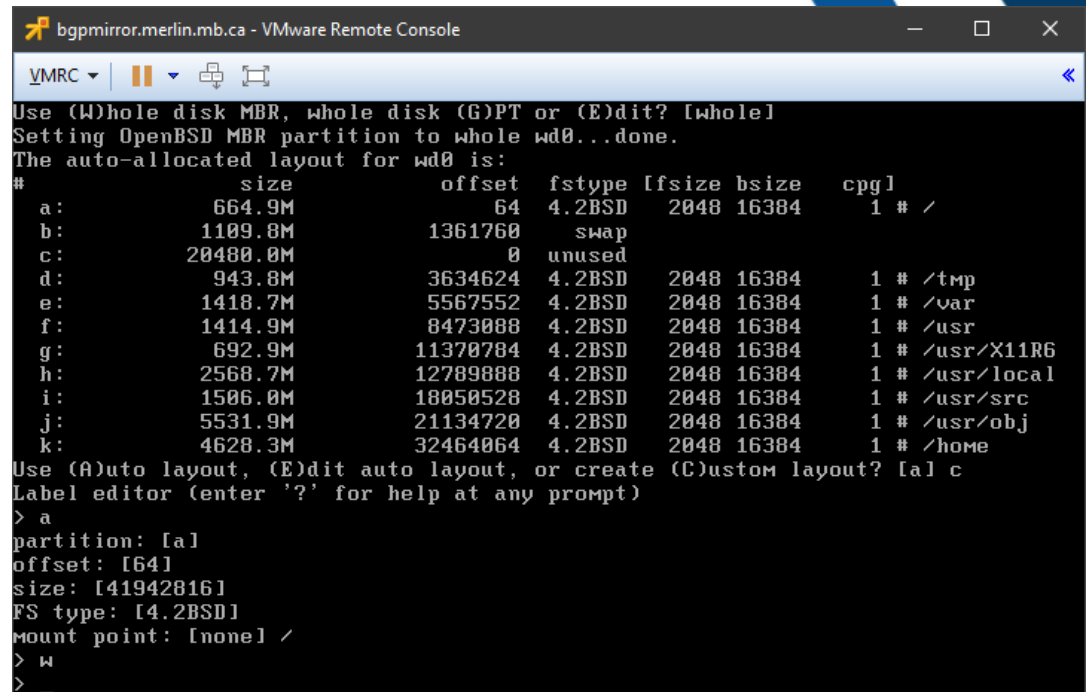
- enter the password for that user
- decide whether root can login via SSH or not (hint: do not pick “yes”)
- select the correct timezone
- pick **W**hole disk
- select **C**ustom layout
 - Default partition scheme is OK for some purposes, but partly obsolete in a VM where disks can be expanded.
 - Default partition scheme still offers some nice features, make sure you understand why it exists before discarding it.

```
bgpmirror.merlin.mb.ca - VMware Remote Console
VMRC | [Icons]
WARNING: root is targeted by password guessing attacks, pubkeys are safer.
Allow root ssh login? (yes, no, prohibit-password) [no]
What timezone are you in? ('?' for list) [America/Winnipeg]

Available disks are: wd0.
Which disk is the root disk? ('?' for details) [wd0]
No valid MBR or GPT.
Use (W)hole disk MBR, whole disk (G)PT or (E)dit? [whole]
Setting OpenBSD MBR partition to whole wd0...done.
The auto-allocated layout for wd0 is:
#          size      offset  fstype  [fsize bsize  cppl
a:         664.9M         64  4.2BSD   2048 16384    1 # /
b:        1109.8M    1361760    swap
c:       20480.0M         0  unused
d:         943.8M   3634624  4.2BSD   2048 16384    1 # /tmp
e:        1418.7M   5567552  4.2BSD   2048 16384    1 # /var
f:        1414.9M   8473088  4.2BSD   2048 16384    1 # /usr
g:         692.9M  11370784  4.2BSD   2048 16384    1 # /usr/X11R6
h:        2568.7M  12789888  4.2BSD   2048 16384    1 # /usr/local
i:        1506.0M  18050528  4.2BSD   2048 16384    1 # /usr/src
j:        5531.9M  21134720  4.2BSD   2048 16384    1 # /usr/obj
k:        4628.3M  32464064  4.2BSD   2048 16384    1 # /home
Use (A)uto layout, (E)dit auto layout, or create (C)ustom layout? [a] c
Label editor (enter '?' for help at any prompt)
> _
```

Installation steps (cont'd)

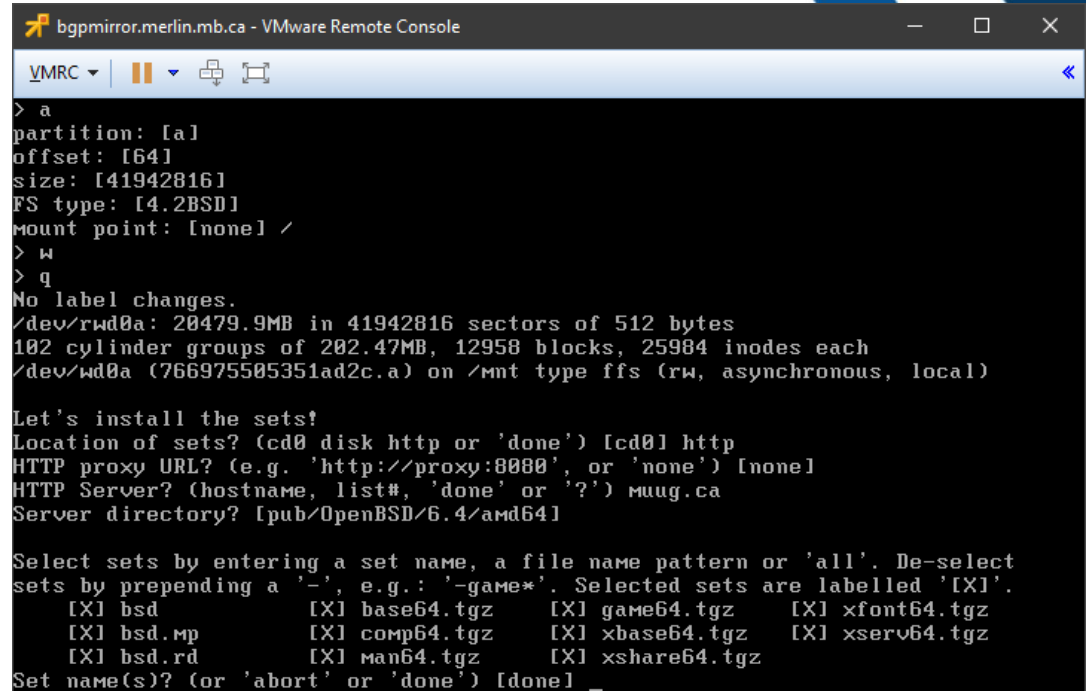
- add an “a” slice, filling the whole disk, mounted at “/”
 - no swap!
 - shouldn't need it on this server



```
bgpmirror.merlin.mb.ca - VMware Remote Console
VMRC
Use (W)hole disk MBR, whole disk (G)PT or (E)dit? [whole]
Setting OpenBSD MBR partition to whole wd0...done.
The auto-allocated layout for wd0 is:
#          size          offset  fstype  [fsize bsize  cpg]
a:         664.9M          64    4.2BSD   2048 16384    1 # /
b:         1109.8M       1361760    swap
c:         20480.0M          0   unused
d:          943.8M       3634624    4.2BSD   2048 16384    1 # /tmp
e:         1418.7M       5567552    4.2BSD   2048 16384    1 # /var
f:         1414.9M       8473088    4.2BSD   2048 16384    1 # /usr
g:          692.9M       11370784    4.2BSD   2048 16384    1 # /usr/X11R6
h:         2568.7M       12789888    4.2BSD   2048 16384    1 # /usr/local
i:         1506.0M       18050528    4.2BSD   2048 16384    1 # /usr/src
j:         5531.9M       21134720    4.2BSD   2048 16384    1 # /usr/obj
k:         4628.3M       32464064    4.2BSD   2048 16384    1 # /home
Use (A)uto layout, (E)dit auto layout, or create (C)ustom layout? [a] c
Label editor (enter '?' for help at any prompt)
> a
> a
partition: [a]
offset: [64]
size: [41942816]
FS type: [4.2BSD]
mount point: [none] /
> w
> _
```

Installation steps (cont'd)

- quit the partition editor
- wait for formatting to finish
- select “http”
- skip the proxy
 - unless you need one, in which case my condolences
- provide the server name
 - “muug.ca”
- accept the default path
 - your MUUG mirror managers know their stuff ☺
- press Enter again to confirm the defaults



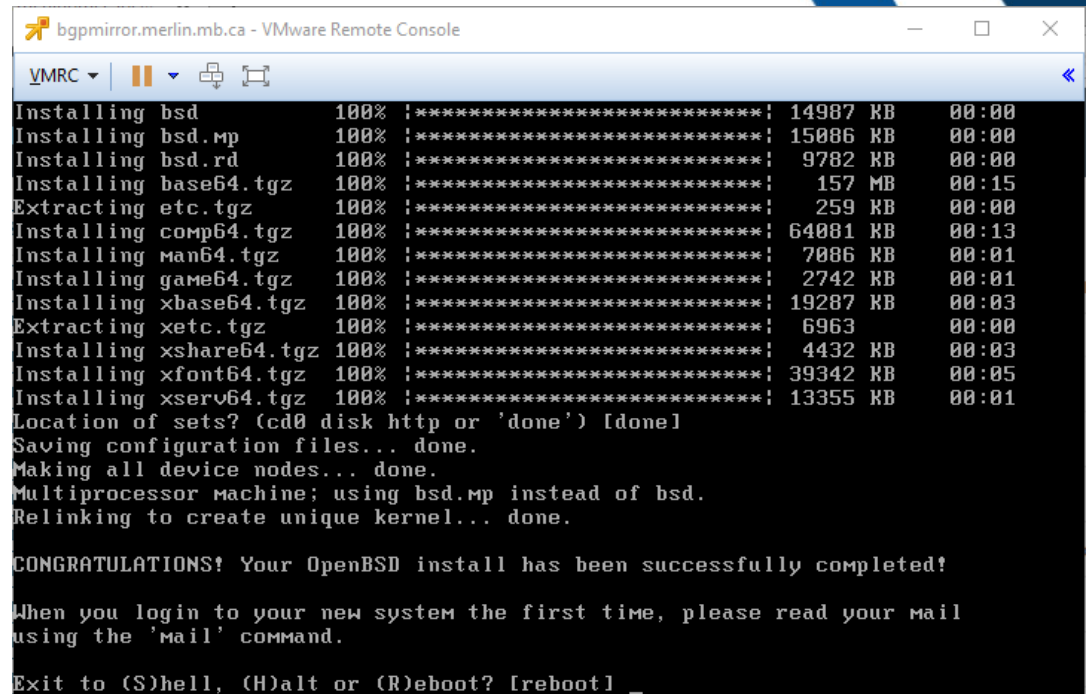
```
bpgmirror.merlin.mb.ca - VMware Remote Console
VMRC | [Icons]
> a
partition: [a]
offset: [64]
size: [41942816]
FS type: [4.2BSD]
mount point: [none] /
> w
> q
No label changes.
/dev/rwd0a: 20479.9MB in 41942816 sectors of 512 bytes
102 cylinder groups of 202.47MB, 12958 blocks, 25984 inodes each
/dev/wd0a (766975505351ad2c.a) on /mnt type ffs (rw, asynchronous, local)

Let's install the sets!
Location of sets? (cd0 disk http or 'done') [cd0] http
HTTP proxy URL? (e.g. 'http://proxy:8080', or 'none') [none]
HTTP Server? (hostname, list#, 'done' or '?') muug.ca
Server directory? [pub/OpenBSD/6.4/amd64]

Select sets by entering a set name, a file name pattern or 'all'. De-select
sets by prepending a '-', e.g.: '-game*'. Selected sets are labelled '[X]'.
[X] bsd             [X] base64.tgz       [X] game64.tgz       [X] xfont64.tgz
[X] bsd.mp          [X] comp64.tgz      [X] xbase64.tgz     [X] xserv64.tgz
[X] bsd.rd          [X] man64.tgz      [X] xshare64.tgz
Set name(s)? (or 'abort' or 'done') [done] _
```


Installation steps (cont'd)

- wait for installation to complete
- reboot



```
bgpmirror.merlin.mb.ca - VMware Remote Console
VMRC | || |
Installing bsd 100% |*****| 14987 KB 00:00
Installing bsd.mp 100% |*****| 15086 KB 00:00
Installing bsd.rd 100% |*****| 9782 KB 00:00
Installing base64.tgz 100% |*****| 157 MB 00:15
Extracting etc.tgz 100% |*****| 259 KB 00:00
Installing comp64.tgz 100% |*****| 64081 KB 00:13
Installing man64.tgz 100% |*****| 7086 KB 00:01
Installing game64.tgz 100% |*****| 2742 KB 00:01
Installing xbase64.tgz 100% |*****| 19287 KB 00:03
Extracting xetc.tgz 100% |*****| 6963 00:00
Installing xshare64.tgz 100% |*****| 4432 KB 00:03
Installing xfont64.tgz 100% |*****| 39342 KB 00:05
Installing xserv64.tgz 100% |*****| 13355 KB 00:01
Location of sets? (cd0 disk http or 'done') [done]
Saving configuration files... done.
Making all device nodes... done.
Multiprocessor machine; using bsd.mp instead of bsd.
Relinking to create unique kernel... done.

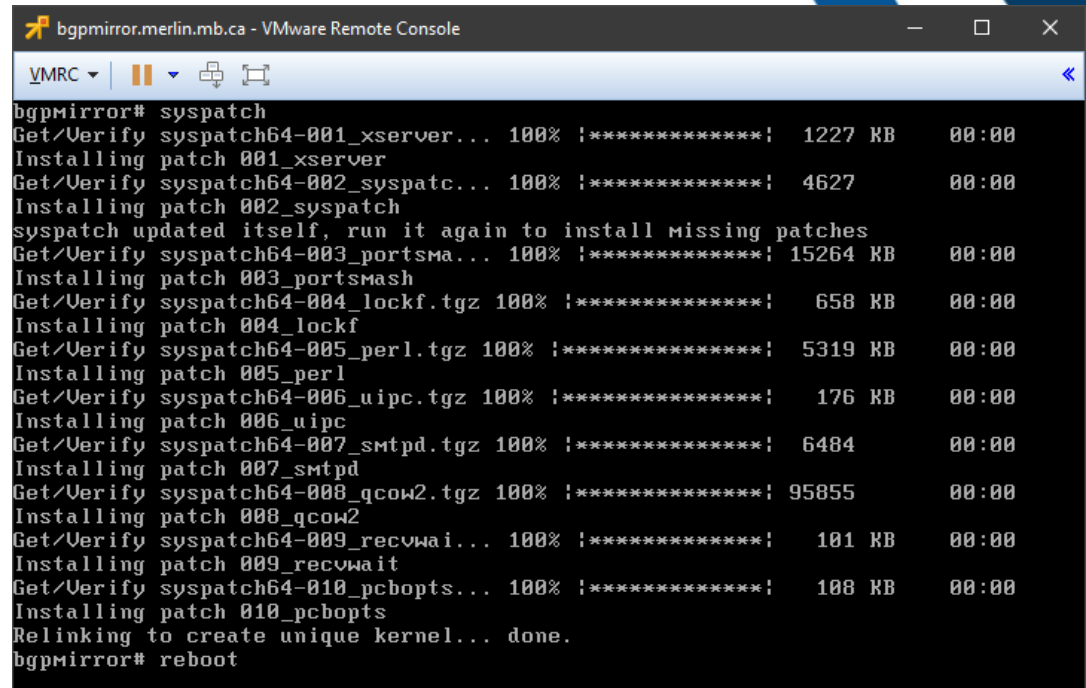
CONGRATULATIONS! Your OpenBSD install has been successfully completed!

When you login to your new system the first time, please read your mail
using the 'mail' command.

Exit to (S)hell, (H)alt or (R)eboot? [reboot] _
```

OS Configuration

- Login as root on the console
 - or SSH in as the user you created, and use "su -" to become root
- run syspatch(8) to update the kernel
- reboot immediately



```
bgpmirror.merlin.mb.ca - VMware Remote Console
VMRC | [Icons]
bgpmirror# syspatch
Get/Verify syspatch64-001_xserver... 100% !*****! 1227 KB 00:00
Installing patch 001_xserver
Get/Verify syspatch64-002_syspatc... 100% !*****! 4627 00:00
Installing patch 002_syspatch
syspatch updated itself, run it again to install missing patches
Get/Verify syspatch64-003_portsma... 100% !*****! 15264 KB 00:00
Installing patch 003_portsmash
Get/Verify syspatch64-004_lockf.tgz 100% !*****! 658 KB 00:00
Installing patch 004_lockf
Get/Verify syspatch64-005_perl.tgz 100% !*****! 5319 KB 00:00
Installing patch 005_perl
Get/Verify syspatch64-006_uipc.tgz 100% !*****! 176 KB 00:00
Installing patch 006_uipc
Get/Verify syspatch64-007_smtpd.tgz 100% !*****! 6484 00:00
Installing patch 007_smtpd
Get/Verify syspatch64-008_qcow2.tgz 100% !*****! 95855 00:00
Installing patch 008_qcow2
Get/Verify syspatch64-009_recvwai... 100% !*****! 101 KB 00:00
Installing patch 009_recvwait
Get/Verify syspatch64-010_pcbopts... 100% !*****! 108 KB 00:00
Installing patch 010_pcbopts
Relinking to create unique kernel... done.
bgpmirror# reboot
```

OS Configuration

- edit /etc/ntp.conf to disable the sometimes-buggy VMware time “sensor”
- add local timeservers instead

```
bgpmirror# cat /etc/ntp.conf
# $OpenBSD: ntp.conf,v 1.14 2015/07/15 20:28:37 ajacoutot Exp $
#
# See ntp.conf(5) and /etc/examples/ntp.conf

servers pool.ntp.org
servers time.merlin.mb.ca
# sensor *
constraints_from "https://www.google.com"
```

OS Configuration

- edit or create /etc/rc.conf.local to change default start/stop options
 - like using “**sysconfig**” in RHEL

```
bgpmirror# cat /etc/rc.conf.local
bgpd_flags=
httpd_flags=
ntpd_flags=
pflogd_flags=NO
slaacd_flags=NO
slowcgi_flags=
smtpd_flags=NO
sndiod_flags=NO
snmpd_flags=
pf=NO
check_quotas=NO
accounting=YES
multicast=YES
pkg_scripts=
bgpmirror# █
```

OS Configuration

- Copy example configuration files

```
bgpmirror# cd /etc  
bgpmirror# cp examples/httpd.conf examples/bgpd.conf .  
bgpmirror#
```

OS Configuration

- Add vim before using vi(1) drives me crazy

```
bgpmirror# pkg_add -viz vim
quirks-3.16 signed on 2018-10-12T15:26:25Z
quirks-3.16: ok
Ambiguous: choose package for vim
a
  0: <None>
  1: vim-8.1.0438-gtk2
  2: vim-8.1.0438-gtk2-lua
  3: vim-8.1.0438-gtk2-perl-python-ruby
  4: vim-8.1.0438-gtk2-perl-python3-ruby
  5: vim-8.1.0438-no_x11
  6: vim-8.1.0438-no_x11-lua
  7: vim-8.1.0438-no_x11-perl-python-ruby
  8: vim-8.1.0438-no_x11-perl-python3-ruby
  9: vim-8.1.0438-no_x11-python
 10: vim-8.1.0438-no_x11-python3
 11: vim-8.1.0438-no_x11-ruby
Your choice: 5
vim-8.1.0438-no_x11:libiconv-1.14p3: ok
vim-8.1.0438-no_x11:gettext-0.19.8.1p1: ok
vim-8.1.0438-no_x11: ok
Extracted 26612743 from 26615769
bgpmirror#
```

HTTPD configuration

- edit httpd to be HTTP-only (no TLS)
 - just enough for our Letsencrypt cert to get created

```
bgpmirror# cat /etc/httpd.conf
server "bgpmirror.merlin.mb.ca" {
    listen on * port 80
    location "/.well-known/acme-challenge/*" {
        root "/acme"
        request strip 2
    }
#    location * {
#        block return 302 "https://$HTTP_HOST$request_uri"
#    }
}
```

TLS Cert creation

- Edit the acme-client.conf file to use our public hostname and the STAGING server

```
bgpmirror# cat /etc/acme-client.conf
#
# $OpenBSD: acme-client.conf,v 1.7 2018/04/13 08:24:38 ajacoutot Exp $
#
authority letsencrypt {
    api url "https://acme-v01.api.letsencrypt.org/directory"
    account key "/etc/acme/letsencrypt-privkey.pem"
}

authority letsencrypt-staging {
    api url "https://acme-staging.api.letsencrypt.org/directory"
    account key "/etc/acme/letsencrypt-staging-privkey.pem"
}

domain bgpmirror.merlin.mb.ca {
    alternative names { lg.merlin.mb.ca, lg.merlin.ca }
    domain key "/etc/ssl/private/bgpmirror.key"
    domain certificate "/etc/ssl/bgpmirror.crt"
    domain full chain certificate "/etc/ssl/bgp.fullchain.pem"
    sign with letsencrypt-staging
}
```


Letsencrypt cert creation

- make sure the webserver is running
 - “rcctl start httpd”
- run “acme-client -DA”
- if everything is setup correctly, you wind up with an SSL cert
 - that you can't use

```
bgpmirror# acme-client -DA bgpmirror.merlin.mb.ca
bgpmirror# ls -l /etc/ssl
total 776
-r--r--r--  1 root  wheel    3956 Jan 23 16:12 bgp.fullchain.pem
-r--r--r--  1 root  wheel    2277 Jan 23 16:12 bgpmirror.crt
-r--r--r--  1 root  bin     346545 Oct 11 14:18 cert.pem
-rw-r--r--  1 root  wheel    2703 Oct 11 14:18 ikeca.cnf
drwxr-xr-x  2 root  wheel    512 Oct 11 14:18 lib
-r--r--r--  1 root  bin      745 Oct 11 14:18 openssl.cnf
drwx-----  2 root  wheel    512 Jan 23 16:11 private
-r--r--r--  1 root  bin     1006 Oct 11 14:18 x509v3.cnf
bgpmirror# █
```

Letsencrypt cert creation

- edit `/etc/acme-client.conf`
 - switch to the production Letsencrypt server
- re-run `“acme-client -DA”`
- edit `httpd.conf`
 - use the SSL cert we just got
- restart `httpd(8)`
 - `“rcctl restart httpd”`

```
bgpmirror# cat /etc/httpd.conf
server "bgpmirror.merlin.mb.ca" {
    alias lg.merlin.mb.ca
    alias lg.merlin.ca
    listen on * port 80
    location "/.well-known/acme-challenge/*" {
        root "/acme"
        request strip 2
    }
    location * {
        block return 302 "https://$HTTP_HOST$request_uri"
    }
}

server "bgpmirror.merlin.mb.ca" {
    alias lg.merlin.mb.ca
    alias lg.merlin.ca
    listen on * tls port 443
    fastcgi
    tls {
        certificate "/etc/ssl/bgpmirror.fullchain.pem"
        key "/etc/ssl/private/bgpmirror.key"
    }
    location "/.well-known/acme-challenge/*" {
        root "/acme"
        request strip 2
    }
}
bgpmirror# rcctl restart httpd
httpd(ok)
httpd(ok)
bgpmirror#
```

Letsencrypt cert creation

- add a cron entry to keep the cert up to date

```
bgpmirror# crontab -l | tail -2  
@daily acme-client bgpmirror.merlin.mb.ca && rcctl reload httpd  
bgpmirror#
```

bgplg(8) configuration

- Per the bgplg(8) manpage
 - chmod some files
 - create some directories
 - copy some files

```
bgpmirror# chmod 0555 /var/www/{cgi-bin/bgplg,bin/bgpctl}  
bgpmirror# mkdir /var/www/etc  
bgpmirror# cp /etc/resolv.conf /var/www/etc/
```


bgplg(8) configuration

- still following the bgplg(8) manpage:
 - add some lines to httpd.conf(5)
 - reload httpd(8)

```
bgpmirror# cat /etc/httpd.conf
server "bgpmirror.merlin.mb.ca" {
    alias lg.merlin.mb.ca
    alias lg.merlin.ca
    listen on * port 80
    location "/.well-known/acme-challenge/*" {
        root "/acme"
        request strip 2
    }
    location * {
        block return 302 "https://$HTTP_HOST$request_uri"
    }
}

server "bgpmirror.merlin.mb.ca" {
    alias lg.merlin.mb.ca
    alias lg.merlin.ca
    listen on * tls port 443
    fastcgi
    tls {
        certificate "/etc/ssl/bgpmirror.fullchain.pem"
        key "/etc/ssl/private/bgpmirror.key"
    }
    location "/.well-known/acme-challenge/*" {
        root "/acme"
        request strip 2
    }
    location "/cgi-bin/bgplg*" {
        fastcgi
        root ""
    }
}

bgpmirror# rcctl reload httpd
httpd(ok)
bgpmirror#
```



After much troubleshooting, remove the first (global) “fastcgi” directive in httpd.conf, and now things mostly work... oops.

bgpd.conf (1/2)

```
bgpmirror# cat /etc/bgpd.conf
route-collector yes
socket "/var/www/run/bgpd.rsock" restricted      # for bgplg

# settings
nexthop qualify via default
fib-update no

# myself
AS 16796
router-id 216.73.73.229

# neighbors

group hermes {
    enforce local-as no
    enforce neighbor-as no
    export none

    neighbor 216.73.73.225 {
        remote-as 16796
        descr "Hermes IPv4"
    }
    neighbor 2620:b0:0:4::1 {
        remote-as 16796
        descr "Hermes IPv6"
    }
}
```

bgpd.conf (2/2)

```
group bgpresearch {
    multihop 32
    enforce local-as no
    enforce neighbor-as no

    neighbor 192.160.102.196 {
        remote-as 65204
        descr "MBNOG IPv4"
    }
    neighbor 2620:132:3003:300::196 {
        remote-as 65204
        descr "MBNOG IPv6"
    }
    neighbor 129.82.138.6 {
        remote-as 6447
        descr "BGPMon.io IPv4"
    }
    neighbor 146.48.78.12 {
        remote-as 65517
        descr "isolario.it IPv4"
    }
    neighbor 2a00:1620:c0:4e:146:48:78:12 {
        remote-as 65517
        descr "isolario.it IPv6"
    }
}

# policies
allow quick from group hermes
allow quick to group bgpresearch
```


bgpd configuration

- use “**bgpctl show**” to confirm all your sessions are up and running

```
bgpmirror# bgpctl show
Neighbor      AS      MsgRcvd  MsgSent  OutQ  Up/Down  State/PrfRcvd
isolario.it IPv6     65517    19      23619  0 00:08:15    0
isolario.it IPv4     65517    19      22074  0 00:08:14    0
BGPMon.io IPv4      6447     68      22135  0 00:08:15    0
MBNOG IPv6     65204     20      23490  0 00:07:58    0
MBNOG IPv4     65204     21      22136  0 00:08:15    0
Hermes IPv6    16796   23751     18     0 00:08:15   62476
Hermes IPv4    16796   22433     18     0 00:08:15  133811
bgpmirror# █
```

bgplg(8) configuration

- lastly, edit the customization files:
`/var/www/conf/bgplg.{css,head,foot}`

```
bgpmirror# cd /var/www/conf
bgpmirror# ls
bgplg.css  bgplg.foot  bgplg.head
bgpmirror# head *
=> bgplg.css <==
.footer {
    text-align: left;
    width: 100%;
}
img {
    border: none;
    border-width: 0px;
}

=> bgplg.foot <==
<br>
<hr/>
<p>Running on <a href="http://www.openbgp.org/"></a>, brought to you by <a href="http://www.openbsd.org/"></a>.
</body>



=> bgplg.head <==
</head>
<body>
<p>This service is operated on an "as-is" basis only by<br>
<a href="http://www.merlin.mb.ca/"></a></p>
<hr>
<br>
bgpmirror# █
```

This service is operated on an "as-is" basis only by



Neighbor	AS	MsgRcvd	MsgSent	OutQ	Up/Down	State/PrfRcvd
isolario.it IPv6	65517	24	23781	0	00:10:42	0
isolario.it IPv4	65517	24	22124	0	00:10:41	0
BGPMon.io IPv4	6447	85	22185	0	00:10:42	0
MBNOG IPv6	65204	26	23652	0	00:10:25	0
MBNOG IPv4	65204	27	22186	0	00:10:42	0
Hermes IPv6	16796	23905	23	0	00:10:42	62477
Hermes IPv4	16796	22484	23	0	00:10:42	133827

success.

Running on  , brought to you by 

It's alive!

further httpd.conf customization

If you want to redirect any and all visitors to the looking glass, add these two stanzas to the bottom of your httpd.conf.

The first block allows browsers to retrieve the images (under /htdocs, because we're already chrooted to /var/www by default) and then for every single other path, redirect to the CGI.

```
location "/bgplg/*" {  
    root "/htdocs"  
}  
location * {  
    block return 302 "https://$HTTP_HOST/cgi-bin/bgplg"  
}  
}
```





Done!

Any questions?