HANDS-ON

MICHAEL DEXTER
BSDCan 2013
10 Years of BSDCan, eh?

I’ll be sentimental, briefly
January 1991

Unix! \o/

BSD 4.3 - CS Lab Only - Pre-Desktop - Prehistoric Software Freedom
January 1991

Unix (o)

Limited Personal Resources - No Root - LIMITED EXPERIMENTATION
1995 - 2002

OS Soup: Coherent, OpenSTEP x86, UnixWare, RedHat 5.2

Experimentation Achieved! <Insert xkcd Science! Humour>

What happens if I rm -rf /usr?

Conclusion: One keyboard please!
2002 - 2010

FreeBSD jail - NetBSD/xen

Setting up a Jail Directory Tree
To set up a jail directory tree containing an entire FreeBSD distribution, the following sh(1) command script can be used:

```
D=/here/is/the/jail
cd /usr/src
mkdir -p $D
make world DESTDIR=$D
make distribution DESTDIR=$D
```

Now we’re talking...

Unix Encapsulation - Automated system lifecycle from install to operation
A Toy Chest!

Distribution Sets - Disk Images - rc Management Scripts - Appliances

Cloud! 

Hands-On bhyve © 2013 Michael Dexter for BSDCan 2013
This presentation was made using in-base FreeBSD tools
Established API’s - Unified OS - Rapid Deployment - Unified Management...
What took so long?

\o/  Unix!  \o/
bhyve History

MeetBSD California 2010 - Conclusion: We need a hypervisor :(  

BSDCan 2011 - We have a hypervisor! \o/  

CFT/bhyve.org Documentation 2012 - You can too!  

FreeBSD 10-CURRENT January 19th, 2013 - Life begins...
bhyve

A permissively-licensed legacy-free Hypervisor

PRIMARY DEVELOPERS

neel@freebsd.org
grehan@freebsd.org

SPECIAL THANKS

Bryan Venteicher (VirtIO)
John Baldwin (binutils EPT support)
Permissively-Licensed

Give us credit, use as you please, don’t come after us if it breaks

legacy-free

Leverages modern virtualization hardware extensions, VirtIO

Hypervisor

An implementation of Popek and Goldberg’s Formal Requirements (Within the constraints of the PC "architecture")
Get Involved

freebsd-virtualization@freebsd.org

#bhyve on freenode

Testing! Testing! Testing!
NEWS

AMD Support is Undergoing Testing

grehan@ Demonstrated a CentOS VM at the DevSummit

OpenBSD VM Components are Being Reviewed

An Unnamed Company is Running bhyve on an Unnamed Non-Linux OS
(And is Contributing Patches!)
FEATURES

PCI Pass Through
(Xeon 5600/5500 - 5520 Chipset)

GDB Debugging Interface

Up to Better-Than-Host Performance

Up to 8 Virtual CPUs per VM
HOST HARDWARE REQUIREMENTS

Nehalem -> Extended Page Tables (EPT)

Features=0xbfebfbff<FPU,VME,DE,PSE,TSC,MSR,PAE,MCE,CX8,APIC,SEP,MTRR,PGE,MCA,C
MOV,PAT,PSE36,CLFLUSH,DTS,ACPI,MMX,FXSR,SSE,SSE2,SS,HTT,TM,PBE>

Features2=0x1fbae3ff<SSE3,PCLMULQDQ,DTES64,MON,DS_CPL,VMX,SMX,EST,TM2,SSSE3,CX
16,xTPR,PDCM,PCID,SSE4.1,SSE4.2,x2APIC,POPCNT,TSCDLE,AESNI,XSAVE,OSXSAVE,AVX>

Watch for POPCNT (POP COUNT)

ark.intel.com

is your friend!
**GUEST REQUIREMENTS**

**VirtIO**

```
/boot/kernel/
```

- if_utnet.ko
- virtio.ko
- virtio_balloon.ko
- virtio_pci.ko
- virtio_blk.ko
- virtio_scsi.ko

(Available in *-STABLE and 10-CURRENT)

```
/etc/ttys
```

```
console "/usr/libexec/getty std.9600" vt100 on secure
```
GUEST REQUIREMENTS

/boot/loader.conf

virtio_load="YES"
virtio_pci_load="YES"
virtio_blk_load="YES"
if_vtnet_load="YES"

hw.pci.honor_msi_blacklist=0
smbios.bios.vendor="BHYVE"
### COMPONENTS

<table>
<thead>
<tr>
<th>File Path</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/boot/kernel/vmm.ko</td>
<td>Virtual Machine Manager Kernel Module</td>
</tr>
<tr>
<td>/usr/lib/libvmmapi</td>
<td>Front End to the vmm.ko chardev Interface</td>
</tr>
<tr>
<td>/usr/sbin/bhyvectl</td>
<td>Utility to Dump VM State and terminate VM’s</td>
</tr>
<tr>
<td>/usr/sbin/bhyveload</td>
<td>FreeBSD VM Kernel Loader</td>
</tr>
<tr>
<td>/usr/sbin/bhyve</td>
<td>VM Boot Utility</td>
</tr>
<tr>
<td>/dev/vmm/</td>
<td>Runtime VM Entries</td>
</tr>
</tbody>
</table>
APPROACHES

neel@’s Installer/Launcher for 10-CURRENT, 9-STABLE, 8-CURRENT

http://people.freebsd.org/~neel/bhyve/bhyve_instructions.txt
http://people.freebsd.org/~neel/bhyve/vmrun.sh
/usr/share/examples/bhyve/vmrun.sh

davide@’s release regression test/automated installer
(Next, Next, Next, Finish!)

https://github.davideitaliano/regression
APPROACHES

bhyve-scripts for 8.4-RC*, 9-STABLE and 10.0-CURRENT

http://bhyve.org

Setting up a Jail Directory Tree...

Xen Directory Tree... bhyve Directory Tree...
APPLIANCES

DevSummit BSDCan 2013:
We need appliance installation options

(Cloud! <insert definition here>)

QEMU, VirtualBox, Xen, VMware, Hyper-V, bhyve?
APPLIANCES

Here and Now:

pfSense ALPHA, FreeNAS ALPHA ...

DEMO
Utilities

ls /dev/vmm

bhyvectl --get-stats --vm=guest10
DTrace

dtrace -n 'io:::start /execname == "bhyve"/ { @[ustack()] = count(); }'

/usr/ports/sysutils/DTraceToolkit

/usr/share/dtrace/toolkit/hotkernel

/usr/share/dtrace/toolkit/hotuser -p `pgrep -n bhyve`
THANK YOU!

freebsd-virtualization@freebsd.org
bhyve.org
editor@callfortesting.org