```
                        HANDS-ON

bb          hh
bb          hh
bb          hh
bb          hh
bbbbbb     hhhhhh    yy     yy   vv     vv    eeeee
bb    bb   hh    hh  yy     yy   vv     vv   ee     ee
bb    bb   hh    hh  yy     yy   vv     vv   eeeeeee
bb    bb   hh    hh  yy     yy   vv     vv   ee
bb    bb   hh    hh  yy     yy    vvvvv     ee     ee
bbbbbb     hh    hh  yyyyyyy        v        eeeee
                        yy
                        yy
                        yy
                     yyyyy


            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 distribu-
   tion, 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 lifecyle from install to operation
```

A Toy Chest!

Distribution Sets - Disk Images - rc Management Scripts - Appliances

Cloud! \o/

Established API's - Unified OS - Rapid Deployment - Unified Management...

`\o/  Unix!  \o/`

`What took so long?`

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,TSCDLT,AESNI,XSAVE,OSXSAVE,AVX>
                                            ^^^^^^

Watch for POPCNT (POP COUNT)

ark.intel.com

is your friend!

GUEST REQUIREMENTS

VirtIO

/boot/kernel/

if_vtnet.ko	virtio_balloon.ko	virtio_pci.ko
virtio.ko	virtio_blk.ko	virtio_scsi.ko

(Availble 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

```
/boot/kernel/vmm.ko      Virtual Machine Manager Kernel Module

/usr/lib/libvmmapi       Front End to the vmm.ko chardev Interface

/usr/sbin/bhyvectl       Utility to Dump VM State and terminate VM's
/usr/sbin/bhyveload      FreeBSD VM Kernel Loader
/usr/sbin/bhyve          VM Boot Utility

/dev/vmm/                Runtime VM Entries
```

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