

FreeBSD bhyve intro

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What is bhyve ?

- bhyve == “bsd hypervisor”
- Minimal hosted hypervisor
 - FreeBSD analog of kvm + qemu
 - All code BSD 2-clause licensed
- In the FreeBSD base system since 10.0 (2014)

History

- Started as a skunkworks project at NetApp in late 2010
 - Provided a hypervisor alternative to ESXi (owned by a competitor)
 - Implemented on Intel Nehalem - first generation EPT
 - Project died internally: code contributed to FreeBSD in May 2011
 - 8 vCPUs, x2apic, PV AP spinup, virtio net/block MSI, polled-mode uart.
- Lived in a project branch until merge to mainline, Jan 2013
- Shipped in 10.0-RELEASE, Jan 2014 (FreeBSD guests only)
- Ported to Illumos, MacOS (xhyve), Intel ACRN

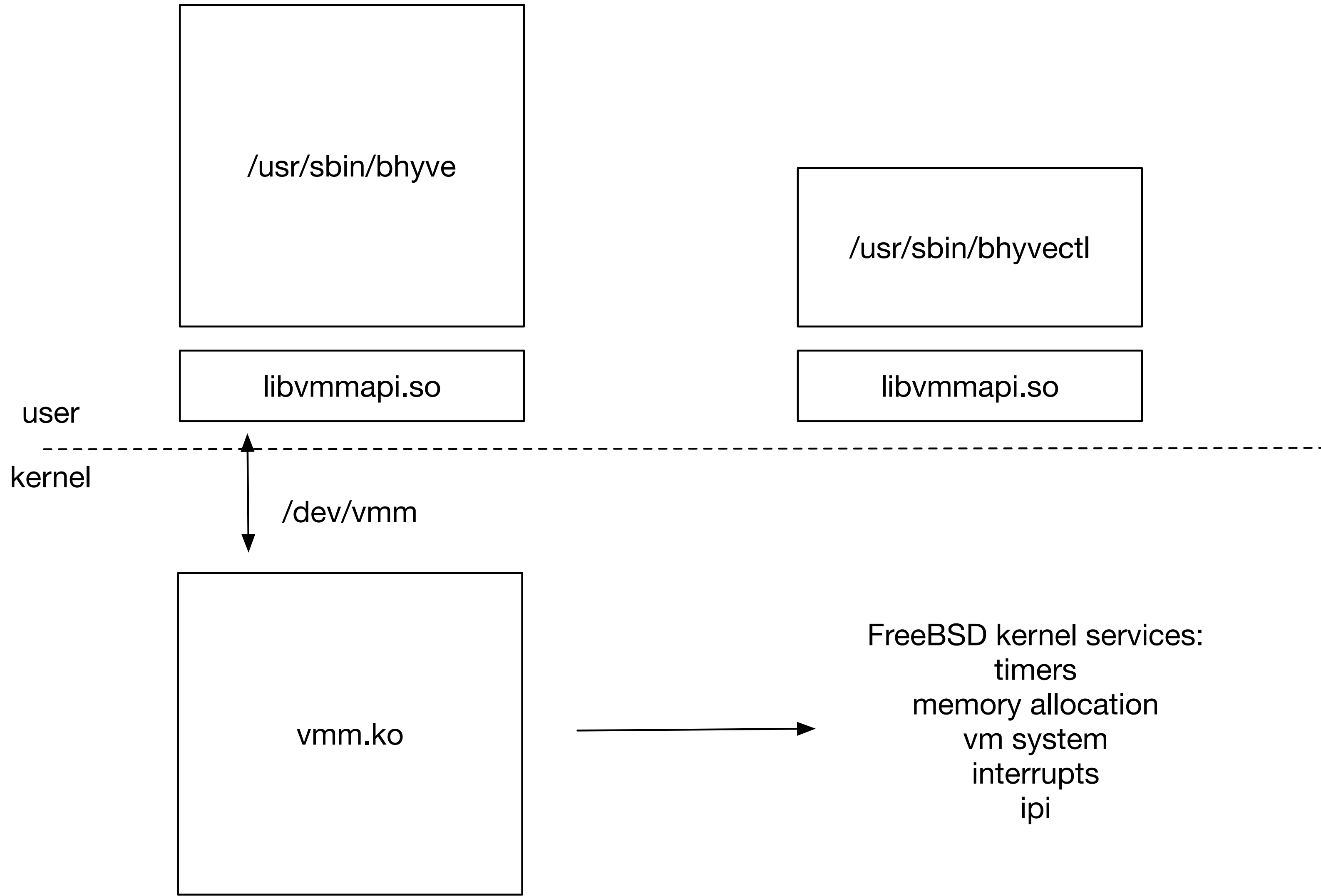
Features #1

- Intel + AMD processor support (2nd-level paging required)
- Integration with FreeBSD: a VM is a process, vCPUs are threads, demand-paged guest memory.
- Battle-hardened device emulations:
 - PCI, virtio net/block/scsi/console/rng, e1000, ahci, nvme, xhci, 16550 uart, ps2 kbd/mouse, HDA audio, PC junk i/o (8254/ioapic/hpet).
- graphical output via built-in VNC server and kbd/mouse/framebuffer emulation
- PCI passthru

Features #2

- Guests:
 - *BSD 32/64-bit
 - Linux 32/64-bit
 - Windows 64-bit, desktop 7->10, server 2k8 -> 2019
 - Misc - Illumos, Plan9, etc

Structure



Invocation

- “Build your own PC”
- Provide PCI slot structure, attached devices, and back-ends
- Plus global options (number of vCPUs, RAM, ...)
- Not particularly user-friendly
 - Fully described in the bhyve(4) man page
 - Front-ends available (e.g. **vm-bhyve** from ports)
- FreeBSD Handbook a great resource
https://www.freebsd.org/doc/en_US.ISO8859-1/books/handbook/virtualization-host-bhyve.html

```
bhyve \  
-c 2 \  
-s 3,ahci-cd,/images/en_windows_10_enterprise_x64_dvd.iso \  
-s 5,ahci-cd,./virtio-win-0.1.118.iso \  
-s 11,fbuf,tcp=0.0.0.0:5900,w=1280,h=720,wait \  
-s 12,xhci,tablet \  
-s 18,virtio-net,tap0 \  
-s 20,nvme,./win10.img \  
-s 31,lpc \  
-l bootrom,./BHYVE_UEFI.fd \  
-m 2G -H -w \  
windows
```


Futures

- non-X86 support (ARMv8, Power9, riscV)
- Nested virt
- Host filesystem access (plan9fs, virtio-fs)
- Functioning GPU passthru
- USB device passthru
- Live migration

Questions ?