

# FreeBSD on Hyper-V

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# The Project

- Support FreeBSD running as a guest on Hyper-V
- Collaboration between Microsoft, NetApp and Citrix started in Fall of 2011
  - Each company with a vested interest
  - Microsoft: Support more guests on Hyper-V
  - NetApp & Citrix: Eventually support our appliances on Hyper-V
- FreeBSD 8.2 based development
  - Github repository
  - Dedicated developers and QA

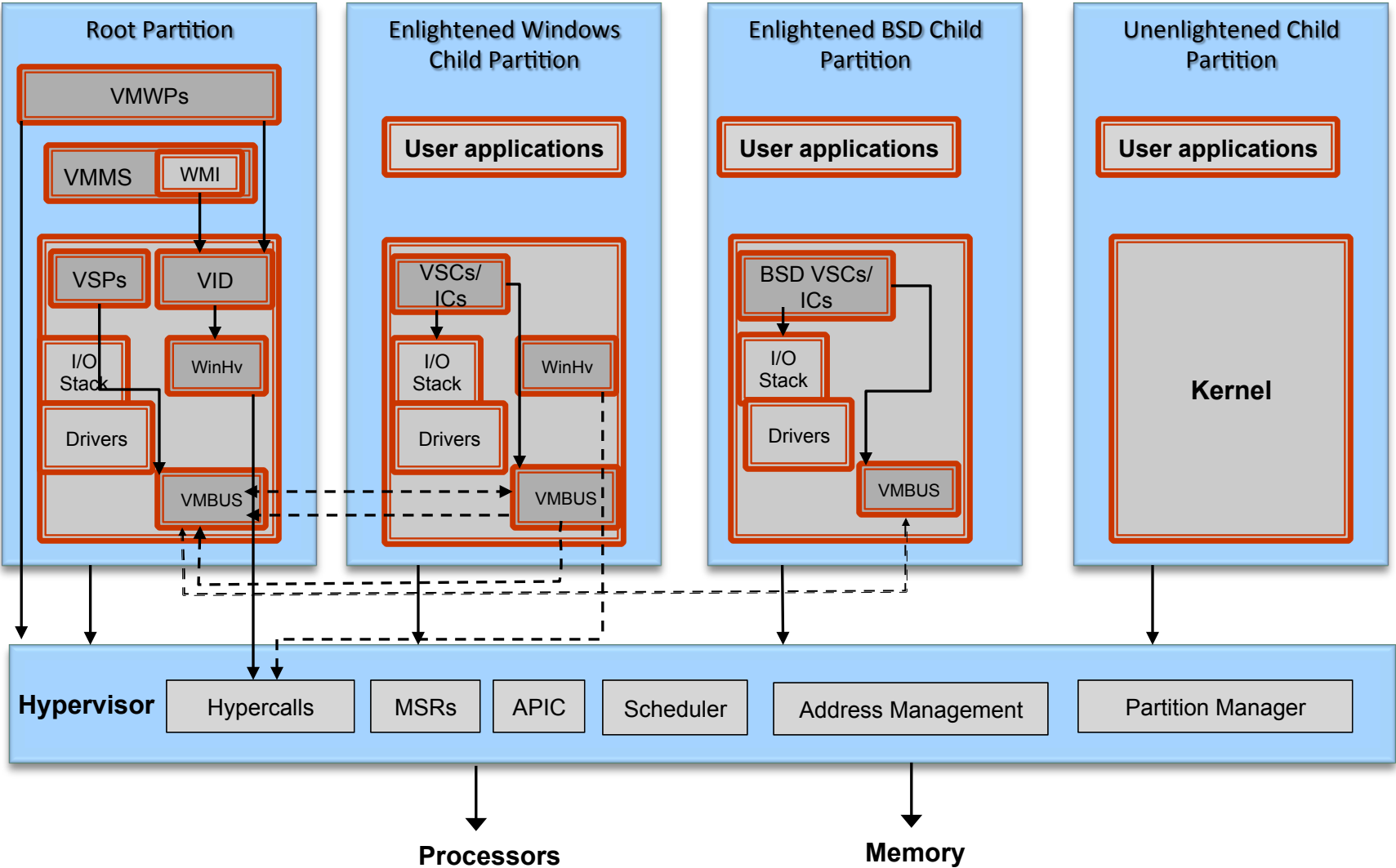
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# Hyper-V Architecture



# Hyper-V Architecture

- Hyper-V is a Type-1 Hypervisor for the x86 Instruction Set Architecture
- Requires Hardware Assist for Virtualization
- Emulates a standard x86 platform for guest Operating Systems
- Supports both 32-bit and 64-bit Guest Operating Systems

# Hyper-V Architecture

- Full Virtualization with selective enlightenments:
  - Enlightened I/O Paths
  - Other low-level enlightenments
    - Time keeping
    - Context switching
    - TLB shoot-down etc.

# FreeBSD On Hyper-V

- FreeBSD hosted as a Fully virtualized guest with I/O enlightenments:
  - Standard kernel binaries supported
  - I/O enlightenments packaged as driver modules
  - x86 64bit kernel support
- Will support on Hyper-V for Windows Server 2008 R2 and Windows Server 8
- We can potentially leverage additional Hyper-V specific enlightenments



# Changes to FreeBSD

- Driver source under `sys/dev/hyperv`
  - `vmbus`
  - `storvsc`
  - `netvsc`
  - `utilities`
  - `include`
- Minimal changes to FreeBSD kernel
  - IRQ vector element added to `intr_event` structure
  - `bootarg` to enable/disable ata driver
- Approximately 6500 lines of new code



# Windows Server

Virtual Machine Management Services (VMMS)

Virtual Machine Worker Process (VMWP)

Virtual Infrastructure Driver (VID)

Virtualization Service Provider (VSP)

Drivers

VMBus

Windows Kernel



# FreeBSD VM

Hyper-V Integration Services

CAM

ifnet

StorVSC

NetVSC

Utilities

VMBus

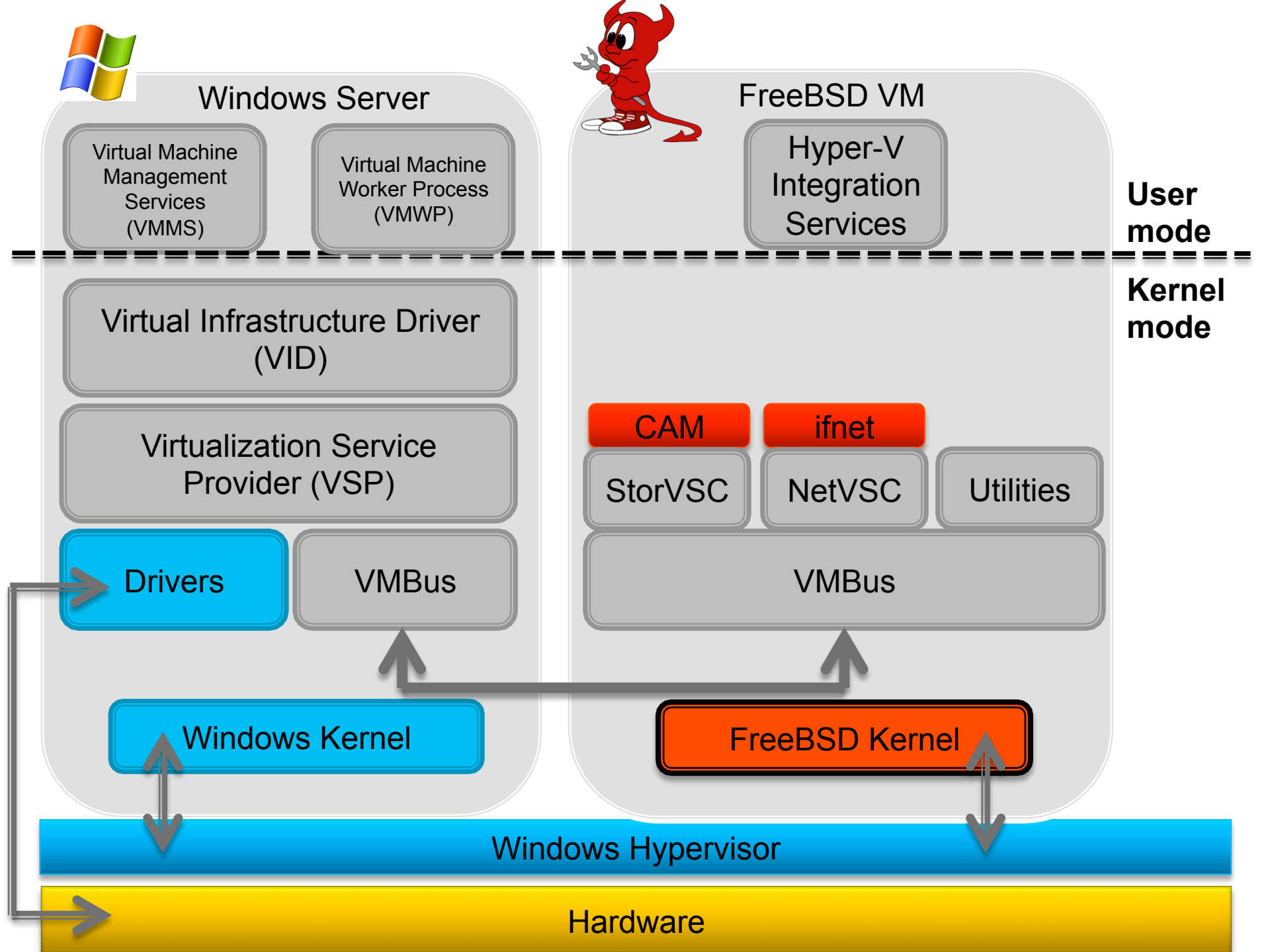
FreeBSD Kernel

User mode

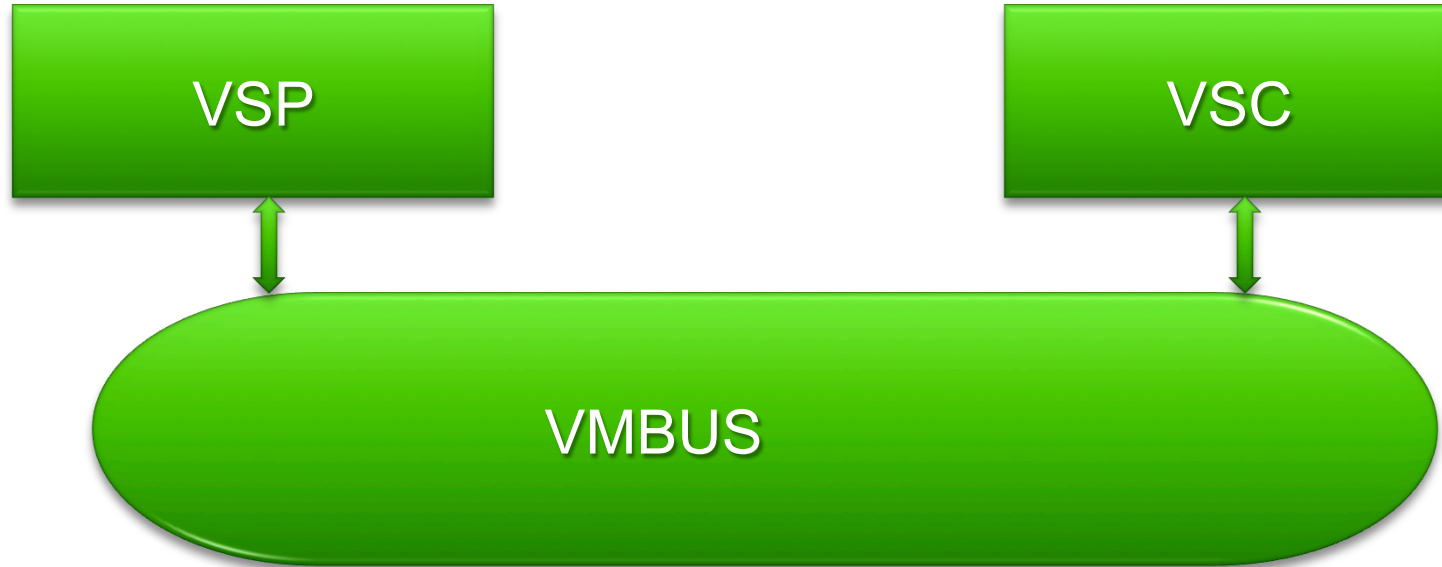
Kernel mode

Windows Hypervisor

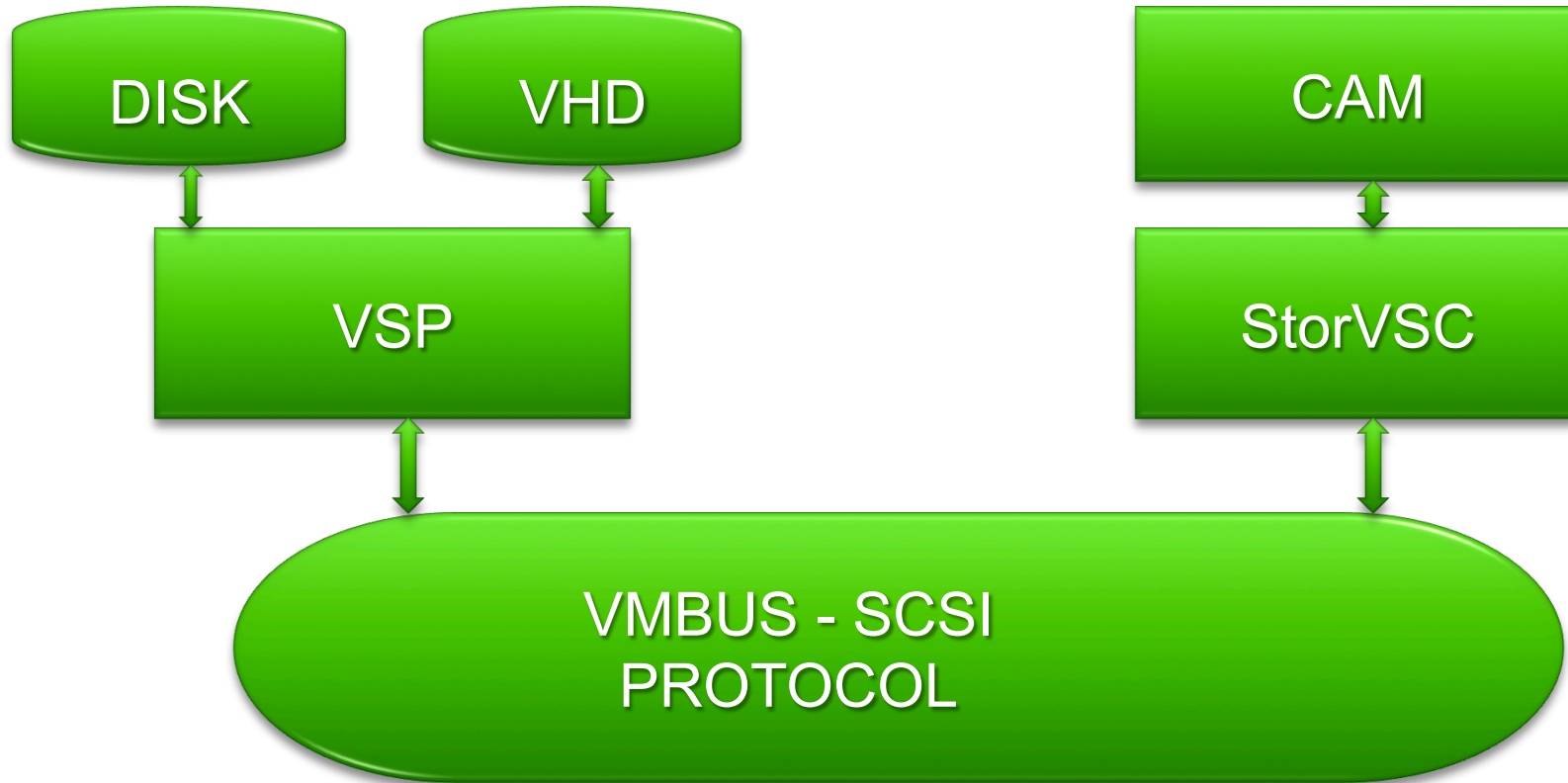
Hardware



# Vmbus Driver – hv\_vmbus



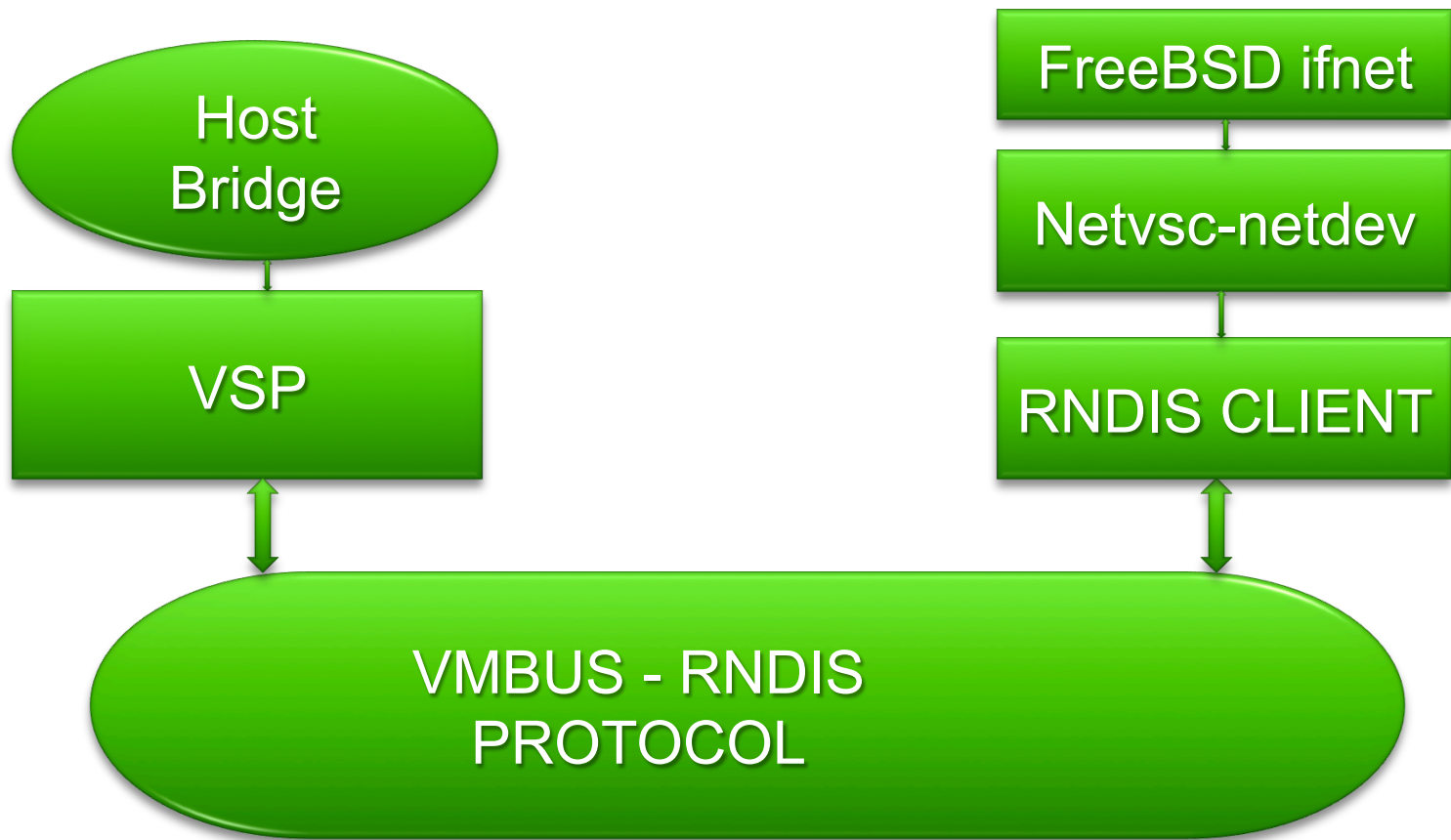
# Storage Driver – hv\_storvsc



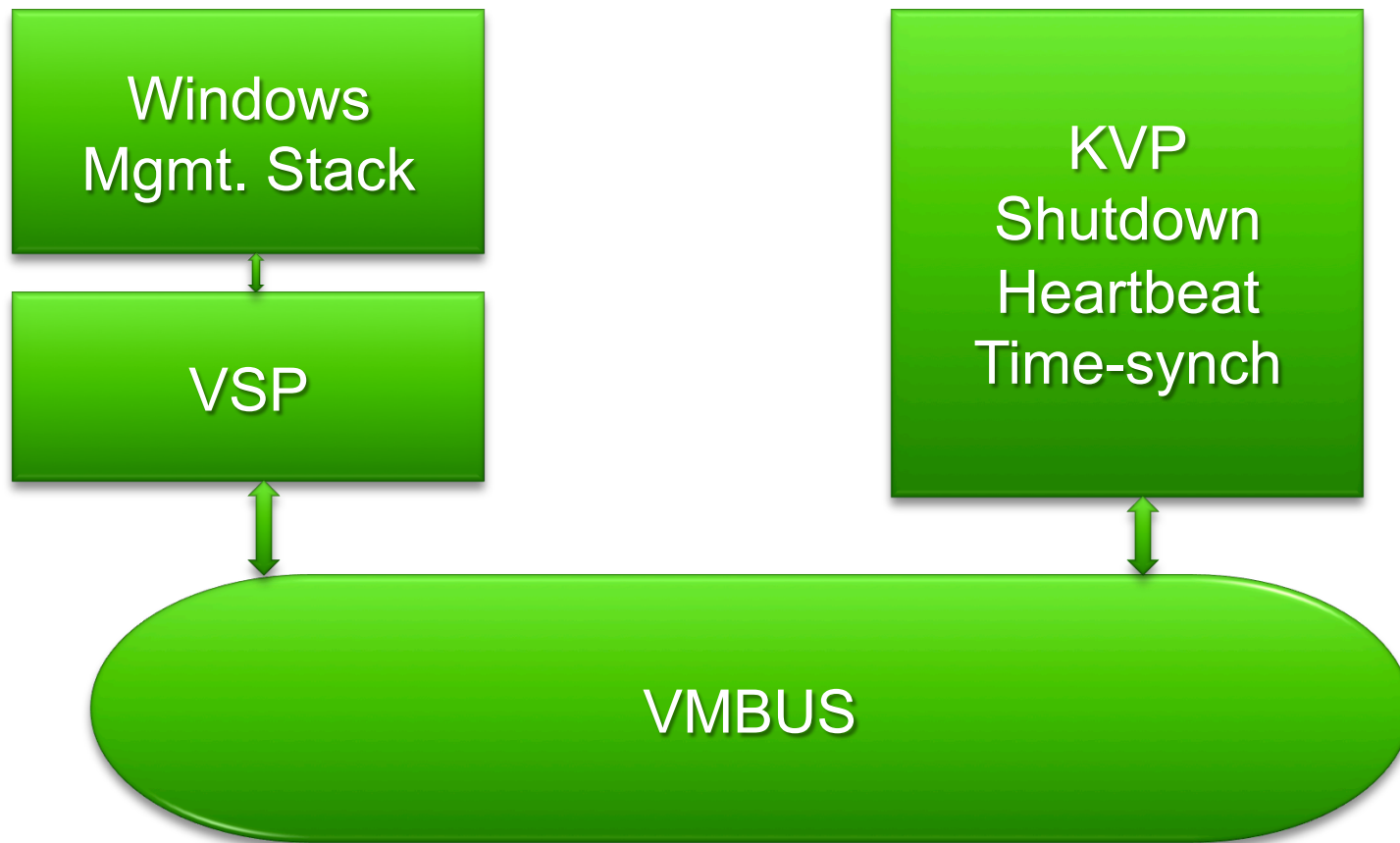
# StorVSC Storage HBA

- Interface between CAM layer and VMBUS SCSI protocol
- Each device is a SCSI controller
  - Supporting 64 LUNs and 1 Target
  - /dev/daX
- Optional replacement for emulated IDE
  - Fast IDE: better boot performance
  - Bootarg controlled hw.ata.disk\_enabled
- A disk may be configured as coredump device

# Network Driver – hv\_netvsc



# Util Driver – hv\_util



# Challenges

- No published protocol specifications
- Microsoft Style to freebsd style(9)
- Device unit and peripheral mapping
- Mounting root using enlightened storage driver
- Debugging hypervisor issues



# Status

- Development complete milestone reached for primary functionality
- Internal QA and performance testing
- Addressing outstanding bugs, reviews and FreeBSD style changes

# Next Steps

- Port changes to appropriate CURRENT
- Work with FreeBSD committers
- **Release Target: Summer 2012**

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 */
```



**QUESTIONS?**

Thank You!

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