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ORACLE VM

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Oracle VM 3 – Virtual Machines

Presenter's Name
Presenter's Title

ORACLE PARTNERNETWORK

Specialized. Recognized by Oracle.
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Planning Guest Type:
Paravirtualized Virtual Machines (PVM)
vs.
Hardware Virtualized Machines (HVM)

Performance Factors – HVM vs. PVM

- Key contributors to VM overhead:
  - Memory management
  - Timer management
  - I/O management

Anatomy of an Oracle VM Server

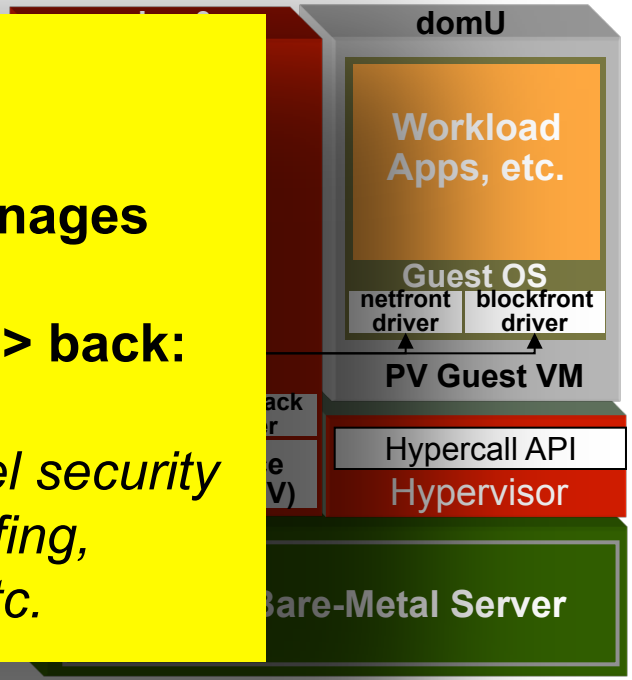
Key Concepts: Driver Architecture - PVM

- **For PV guest**
  - **Replaces ha**
    - One netw
    - One block
  - **Very stable**
    - Excellent
  - **Front-end d**
    - Inside the
  - **Back-end dr**
    - In dom0 /
  - **Open, native hardware vendor drivers**
    - Uses open Linux drivers

Paravirtualization:

Virtualization server manages high-performance communication front <=> back:

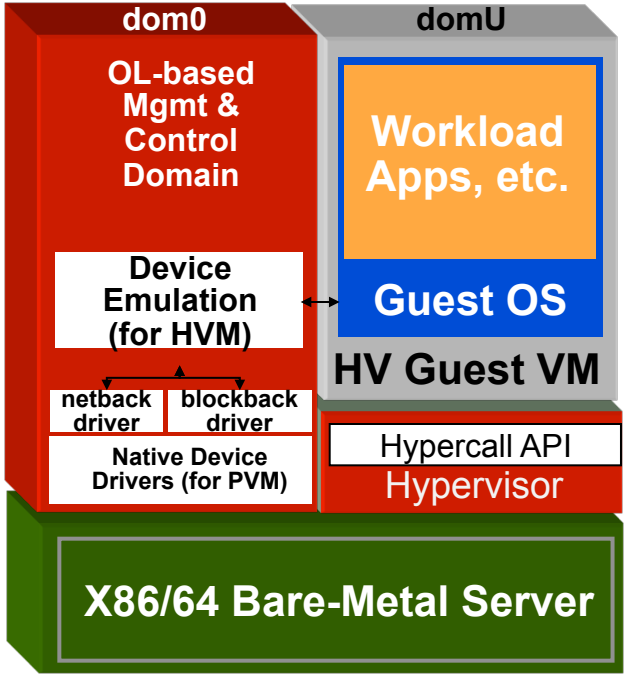
Can leverage dom0 kernel security features, e.g., packet sniffing, firewalling, rate control, etc.



Anatomy of an Oracle VM Server

Key Concepts: Driver Architecture - HVM

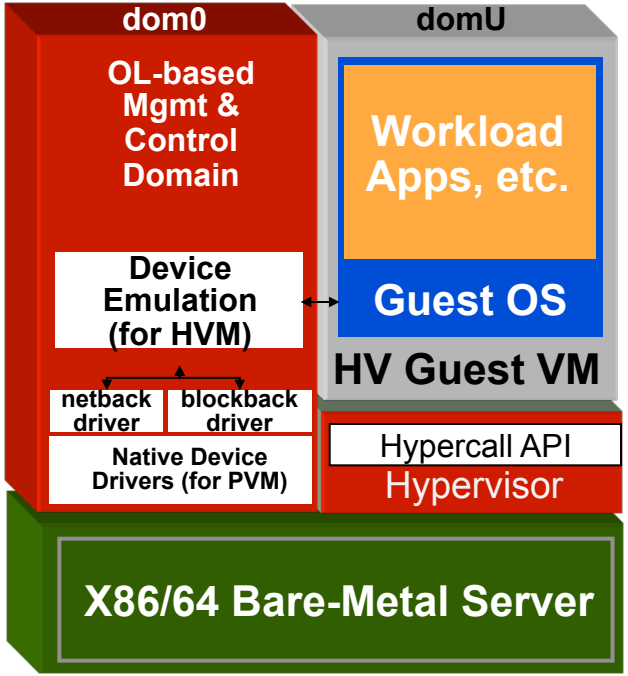
- HVM guests driver choices:
  - **Choice 1:**
  - **Unmodified native driver(s)**
    - OS typically installs basic native network and block drivers that come with the OS (not with the virtualization server)
    - Device support provided via device emulation / translation in the virtualization server on top of net- & block-back drivers in dom0
    - Slower than PV due to emulation overhead



Anatomy of an Oracle VM Server

Key Concepts: Driver Architecture - HVM

- HVM guests driver choices:
  - **Choice 2:**
  - **PV drivers** (front & back)
    - HVM (unmodified) kernels *can* use PV drivers
    - Leverages the PV driver stack same as previously described
    - Excellent performance



Performance Factors

Memory Management Overhead

Virtualization Method	Memory Management Implications & Issues	Impact on Overhead	Implications for Performance
Paravirtualization (PVM)	• Page faults handled by guest PV kernel using hardware memory management (MMU) directly • Memory page sharing in the future	• No overhead / excellent scalability • May cause swapping in guest	• Performance equals bare metal
Hardware Virtualization (HVM)	• Page faults trapped and emulated in software	• High CPU overhead with limited scalability	• Hypervisor has no knowledge of guest workload

Performance Factors

Timer Management Overhead

Virtualization Method	Timer Management Implications & Issues	Impact on Overhead	Implications for Performance
Para-virtualization (PVM)	• All VMs get real time clock directly from the dom0 clock (not emulated) • Guest PV kernel is “tickless”	• No overhead from timers vs. bare metal • No guest clock slew	• Not a factor in scaling workload
Emulation / translation	• Hypervisor emulates one clock for each VM • Generates one interrupt per scheduler tick * #VMs (i.e., 4 VMs = 4 interrupts per scheduler tick)	• Potentially large overhead from timers vs. bare metal • 4 VMs with 1KHz kernels = 4,000 interrupts/second • Significant possibility for timer slew from overload	• Significant factor in scaling workload • Slew resulting from overload can be very troublesome

Performance Factors

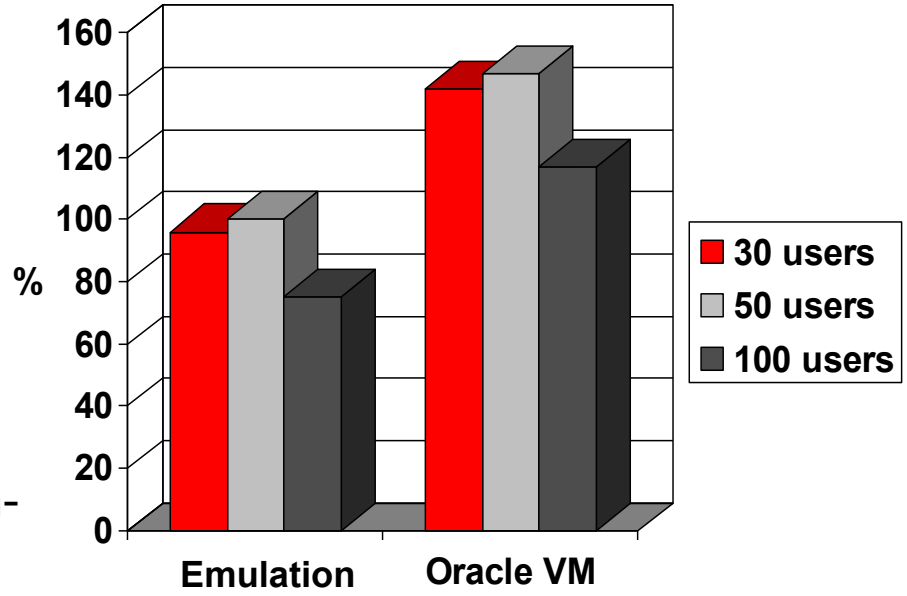
I/O Management Overhead

Virtualization Method	I/O Management Implications & Issues	Impact on Overhead	Implications for Performance
Para-virtualization (PVM)	• Thin virtual device drivers in the PV kernel communicate with back-end drivers in dom0. • Dom0 drivers are essentially normal Linux – readily available • Built into guest OS distribution	• Far less overhead vs. “real” driver for the emulated device	• Better scalability – closer to bare metal performance under load
Emulation / translation	• Must emulate I/O hardware • Proprietary drivers might not be available	• Uses the “real” device driver in the VM – adds emulation overhead	• CPU resources limit I/O throughput • Lower scalability, especially on network I/O

Relative Performance

Paravirtualization vs. Emulation

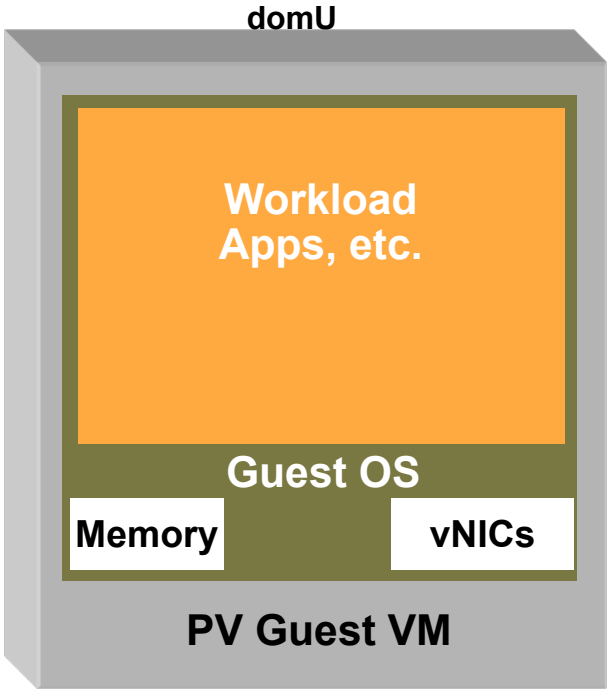
- Swingbench (DB) benchmark
- Software components
  - Enterprise Linux 4
  - Oracle 10g Database
- Physical servers
  - “Apples-to-apples”
  - 1 guest, 1GB mem, 2 vCPUs
  - Server 1: Commercial emulation-based server
  - Server 2: Oracle VM Server



Virtual Machines

Anatomy of a Virtual Machine

- Virtual Disk(s)
  - One or more
- Memory Allocation
- Virtual Network Interface(s)
- Virtual CPU(s)
- vm.cfg



Sample vm.cfg File

(1 of 3)

```
bootloader = '/usr/bin/pygrub'
vif = ['mac=00:21:f6:aa:00:25,bridge=192.168.0.0']
guest_os_type = 'linux'
name = '0004fb0000060000a16c1d729320e272'
OVM_description = ’Oracle 11g DB Server'
OVM_simple_name = 'DB1'
on_poweroff = 'destroy'
boot = 'c'
vfb = ['type=vnc,vncunused=1,vnclisten=127.0.0.1']
```

Sample vm.cfg File

(2 of 3)

```
on_crash = 'restart'
on_reboot = 'restart'
vcpus = 2
cpu_weight = 33000
OVM_os_type = 'Oracle Linux 5'
memory = 16384
cpu_cap = 0
OVM_high_availability = True
```

Sample vm.cfg File

(3 of 3)

```
disk = ['file:/OVS/Repositories/
0004fb000003000025edb8792d63ff7e/VirtualDisks/
0004fb00001200006b5af2c9371a49d0.img,xvda,w']

maxmem = 16384

uuid = '0004fb00-0006-0000-a16c-1d729320e272'

cpus = '0-3'
```

- Editing not encouraged
  - May create mismatch between VM and OVM Manager

Hard Partitioning

- Force a virtual machine to use specific physical CPUs
  - Can materially reduce software licensing costs
- cpus = ‘0,3’
  - Manually edit vm.cfg
  - Oracle VM Manager will support it in the future
- Settings in vm.cfg lost during migration
  - http://www.oracle.com/technetwork/topics/virtualization/ovm-hardpart-167739.pdf

Hardware and Software

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