

CMPE283 – Virtualization
Final Exam

Name: _____

Select the best answer for each question. Each question is worth 5 points unless otherwise noted.

1. _____ When focusing on improving performance in a VMM, which optimization approach should be followed to achieve the largest performance improvement?

- A. Prefer optimizations that reduce the total number of exits
- B. Prefer optimizations that reduce the number of instructions spent processing each exit
- C. Prefer optimizations that reduce the amount of actual time spent processing each exit
- D. Prefer optimizations that improve nested paging performance

2. _____ Why do ASIDs / VPIDs improve nested paging performance in a hypervisor?

- A. When used, ASIDs/VPIDs allow caching global page mappings across all VCPUs
- B. When used, they provide a hint to the processor when TLB flushes occur
- C. When used, they avoid TLB flushes entirely
- D. Use of ASIDs / VPIDs does not help improve nested paging performance

3. Place the following activities that occur during VM live migration into order, from earliest to latest. **Some activities may not be used, if they are not part of VM live migration. Some activities may be used more than once. Assume a single processor VM is being migrated.**

- A. Migration is paused, final pages are transferred
- B. System administrator configures shared storage for VMs
- C. VMCS content is transferred
- D. Device context is transferred
- E. VMCS content is deleted

Order: _____

4. _____ What would happen if "external interrupt exiting" was disabled on a VCPU and an external interrupt was received by the PCPU?

- A. The interrupt would be dispatched to the currently running VM's clock interrupt handler
- B. The interrupt would be dispatched to the VMM unconditionally
- C. Nothing, if the interrupt was masked
- D. The interrupt would be held, and delivered during the next guest VM entry

5. _____ Which of the following statements regarding IOMMU's is true?

- A. An IOMMU is required when emulating PCI devices such as disk controllers
- B. An IOMMU is used to enforce memory isolation when DMA is used with certain devices
- C. An IOMMU is used to enforce isolation to legacy devices like the keyboard controllers
- D. None of the above (A, B, C) is true
- E. All of (A, B, C) are true

6. _____ Which of the following statements about namespace virtualization is most accurate?

- A. Namespace virtualization is used in all application virtualization solutions
- B. Namespace virtualization should never be used in application virtualization solutions
- C. Namespace virtualization means altering the name of an intercepted resource
- D. Namespace virtualization is only used for file-based resources

7. _____ True/False? All CPUs that support VT-x (Intel VMX) support VT-d?

8. (15 points) What techniques can a hypervisor author employ to reduce TLB pressure when nested paging is in use?

9. (20 points) What techniques should operating system authors use to improve performance when their operating systems are used in virtualized environments? Be specific, more points will be awarded based on the correctness and completeness of your answer.

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en optimizing hypervisor performance, it has been stated that optimizing to reduce the
dits provides the largest amount of performance improvement, as compared with other
niques. Why is this the case?

handle specific exit like nested paging only but e

ad, write and time spect on such processes --- exits are expensive so reducing exit will reduce overhead

plain how ASIDs/VPIDs improve performance when used with nested paging.

ng, give extra hint to VM to flush TLB corresponding to number assigned for VM. More time it spends
ave more hints for it regarding what to flush and what to keep. So it helps in maintaining full TLB.

4. A. What would happen first if "external interrupt exiting" was enabled on a VCPU
external interrupt was received by the PCPU?

- A. Not enough information is provided to answer the question accurately
- B. Control would flow to the currently running VM's interrupt handler for that interrupt
- C. The interrupt would always be dispatched to the VM's non maskable interrupt handler
- D. The guest VM would exit to the VMM ----if executing in VM
- E. The interrupt would be held, and delivered during the next guest VM entry

5. A. Which of the following statements regarding IOMMUs is true?

- A. An IOMMU provides safety when dealing with passthrough devices performing DMA
- B. An IOMMU provides safety when dealing with emulated devices performing DMA
- C. IOMMUs are used for port-based I/O using IN-OUT instructions
- D. None of the above

6. TRUE True/False? Type 1 hypervisors run natively on the host hardware.

FALSE

7. TRUE/False? If VT-d is supported on a host, it must be enabled in order to use
VT-x/VMX.

8. (20 points) Describe how the TLB is used by the processor, VMM, and guest VMs in a mul
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at problems would a hypervisor author need to overcome when creating a VM live-
 um that worked across different host CPU types?

- memory page, register, device state, configuration, all have to match in both the hosts
- pported instruction types b/w 2 machine No difference in supported CPU types
- tures -- only design VMM features that are support minimum features of CPU -- then compare
- ist and if they match then only transfer

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