



SECOND QUIZ ANSWERS

COSC 6360
September 30, 2019



White quiz



First question

- What should be the inheritance attribute of a mapped file?



First question

- What should be the inheritance attribute of a mapped file?

- Shared*



Second question

- How can Mach differentiate between mapped files that are read-only and those that are writable?



Second question

- How can Mach differentiate between mapped files that are read-only and those that are writable?
 - ***Through the protection attribute of the address range that contains the mapped file.***



Third question

- A computer has 8GB of RAM, 4KB pages and a relatively big TLB with 1,024 entries. What is the coverage of this TLB in megabytes?



Third question

- A computer has 8GB of RAM, 4KB pages and a relatively big TLB with 1,024 entries. What is the coverage of this TLB in megabytes?

- **$1,024 \times 4\text{KB} = 4\text{MB}$**



Fourth question

- How can we check which base pages of a superpage are still active?



Fourth question

- How can we check which base pages of a superpage are still active?
 - **By performing a speculative demotion of the superpage.**



Fifth question

- Consider a sloppy counter consisting of two local counters, `countA` and `countB`, and a global counter `global_count`. Assuming that the current values of the three counters are:
 - **`countA = 3`** **`countB = 0`** **`global_count = 6`**
- What would be the values of the three counters after core A increments the value of the sloppy counter by one?
 - **`countA = __`** **`countB = __`** **`global_count = __`**

Fifth question

- Consider a sloppy counter consisting of two local counters, `countA` and `countB`, and a global counter `global_count`. Assuming that the current values of the three counters are:

□ **`countA = 3`** **`countB = 0`** **`global_count = 6`**

- What would be the values of the three counters after core A increments the value of the sloppy counter by one?

□ **`countA = 2`** **`countB = 0`** **`global_count = 6`**

Core A can do a local update.

Fifth question

- Consider a sloppy counter consisting of two local counters, count_A and count_B , and a global counter global_count . Assuming that the current values of the three counters are:
 - $\text{count}_A = 0$ $\text{count}_B = 2$ $\text{global_count} = 9$
- What would be the values of the three counters after core B then increments the value of the sloppy counter by one?
 - $\text{count}_A = \underline{\quad}$ $\text{count}_B = \underline{\quad}$ $\text{global_count} = \underline{\quad}$

Fifth question

- Consider a sloppy counter consisting of two local counters, count_A and count_B , and a global counter global_count . Assuming that the current values of the three counters are:
 - $\text{count}_A = 2$ $\text{count}_B = 0$ $\text{global_count} = 6$
- What would be the values of the three counters after core B then increments the value of the sloppy counter by one?
 - $\text{count}_A = 2$ $\text{count}_B = 0$ $\text{global_count} = 9$

Core B must update the global counter.



Sixth question

- What is the main conclusion that Boyd-Wickizer et al. draw from their analysis of Linux scalability to many cores?



Sixth question

- What is the main conclusion that Boyd-Wickizer et al. draw from their analysis of Linux scalability to many cores?
 - ***[T]here is no scalability reason to give up on traditional operating system organizations just yet.***



Seventh question

- A system of physical clocks consists of two clocks, namely, one that is slow and loses 3 minutes every hour and another that is fast and advances by 3 minutes every hour.
- Assuming that the clocks are managed by Lamport's physical clock protocol, what will be the time marked by each clock at **3:00 PM** given that:
 - Both clocks indicated the correct time at noon;
 - The processors on which the clocks reside continuously exchange messages between themselves; and
 - The message transmission delays are negligible.

Seventh question

Actual time	Fast clock	Slow clock
12:00pm	12:00pm	12:00pm
1:00pm	1:03pm	1:03pm
2:00pm	2:06pm	2:06pm
3:00pm	<u>3:09pm</u>	<u>3:09pm</u>

As the two process continuously exchange messages, the slow clock is constantly updated by the fast clock.



Eighth question

- What is the best explanation for the relatively ***high overhead*** of Nooks?



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- What is the best explanation for the relatively ***high overhead*** of Nooks?
 - ***The so-called lightweight context switches between the kernel address space and the extension address space result in TLB flushes.***



Green quiz



First question

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First question

- How can Mach differentiate between mapped files that are read-only and those that are writable?
 - ***Through the protection attribute of the address range that contains the mapped file.***



Second question

- What should be the inheritance attribute of a code segment?



Second question

- What should be the inheritance attribute of a code segment?

- Shared*



Third question

- A computer has 8GB of RAM, 4KB pages and a TLB with 512 entries. What is the coverage of this TLB in megabytes?



Third question

- A computer has 8GB of RAM, 4KB pages and a TLB with 512 entries. What is the coverage of this TLB in megabytes?

□ **$512 \times 4\text{KB} = 2\text{MB}$**



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 - **By performing a speculative demotion of the superpage.**



Fifth question

- Consider a sloppy counter consisting of two local counters, `countA` and `countB`, and a global counter `global_count`. Assuming that the current values of the three counters are:
 - **`countA = 0`** **`countB = 2`** **`global_count = 8`**
- What would be the values of the three counters after core A increments the value of the sloppy counter by one?
 - **`countA = ___`** **`countB = ___`** **`global_count = ___`**

Fifth question

- Consider a sloppy counter consisting of two local counters, `countA` and `countB`, and a global counter `global_count`. Assuming that the current values of the three counters are:
 - **`countA = 0` `countB = 2` `global_count = 8`**
- What would be the values of the three counters after core A increments the value of the sloppy counter by one?
 - **`countA = 0` `countB = 2` `global_count = 9`**

Core A must update the global counter

Fifth question

- Consider a sloppy counter consisting of two local counters, count_A and count_B , and a global counter global_count . Assuming that the current values of the three counters are:
 - $\text{count}_A = 0$ $\text{count}_B = 2$ $\text{global_count} = 9$
- What would be the values of the three counters after core B then increments the value of the sloppy counter by one?
 - $\text{count}_A = \underline{\quad}$ $\text{count}_B = \underline{\quad}$ $\text{global_count} = \underline{\quad}$

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 - $\text{count}_A = 0$ $\text{count}_B = 2$ $\text{global_count} = 9$
- What would be the values of the three counters after core B then increments the value of the sloppy counter by one?
 - $\text{count}_A = 0$ $\text{count}_B = 1$ $\text{global_count} = 9$

Core B can do a local update



Sixth question

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 - ***[T]here is no scalability reason to give up on traditional operating system organizations just yet.***



Sixth question

- What is the main conclusion that Boyd-Wickizer et al. draw from their analysis of Linux scalability to many cores?



Seventh question

- A system of physical clocks consists of two clocks, namely, one that is slow and loses 5 minutes every hour and another that is fast and advances by 5 minutes every hour.
- Assuming that the clocks are managed by Lamport's physical clock protocol, what will be the time marked by each clock at **3:00 PM** given that:
 - Both clocks indicated the correct time at noon;
 - The processors on which the clocks reside continuously exchange messages between themselves; and
 - The message transmission delays are negligible.

Seventh question

Actual time	Fast clock	Slow clock
12:00pm	12:00pm	12:00pm
1:00pm	1:05pm	1:05pm
2:00pm	2:10pm	2:10pm
3:00pm	<u>3:15pm</u>	<u>3:15pm</u>

As the two process continuously exchange messages, the slow clock is constantly updated by the fast clock.



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