



Solutions for Second Quiz

COSC 6360

Fall 2014



First question

	L1	L2
In Cache	4	3
	5	2
Simul- ated	1	6
	7	9

- Consider a very small cache that can hold only 4 pages and assume that the cache is managed by the ARC replacement policy.

Part A

	L1	L2
In Cache	4	3
	5	2
Simulated	1	6
	7	9

- How would *target_T1* be affected if the next page to be referenced is page 5?

Answer

	L1	L2
In Cache	4	3
	<u>5</u>	2
Simulated	1	6
	7	9

- How would *target_T1* be affected if the next page to be referenced is page 5?
- It will remain the same

Part B

	L1	L2
In Cache	4	3
	<u>5</u>	2
Simulated	1	<u>6</u>
	7	9

- How would *target_T1* be affected if the next page to be referenced is page 6?

Answer

	L1	L2
In Cache	4	3
	5	2
Simulated	1	<u>6</u>
	7	9

- How would *target_T1* be affected if the next page to be referenced is page 6?
 - It will decrease

Part C

	L1	L2
In Cache	4	3
	5	2
Simulated	1	6
	7	9

- How would *target_T1* be affected if the next page to be referenced is page 8?

Answer

	L1	L2
In Cache	4	3
	5	2
Simulated	1	6
	7	9

- How would *target_T1* be affected if the next page to be referenced is page 8?
- It will remain the same

Part D

	L1	L2
In Cache	4	3
	5	2
Simulated	<u>1</u>	6
	7	9

- How would *target_T1* be affected if the next page to be referenced is page 1?

Answer

	L1	L2
In Cache	4	3
	5	2
Simulated	<u>1</u>	6
	7	9

- How would *target_T1* be affected if the next page to be referenced is page 5?
 - It will increase



Second question

- A system of physical clocks consists of two clocks, namely, one that is ***slow*** and loses ***two minutes*** every hour and another that is ***fast*** and advances by ***one minute*** every hour.

Assuming that the two clocks are managed by Lamport's physical clock protocol, what will be the time marked by each clock at three o'clock given that:

- Both clocks indicated the correct time at noon;
- The sole message exchanged between them is a message sent at one o'clock by the processor on which the fast clock resides to the other processor ;
- Message transmission delays are negligible.



Answer

Actual time	Slow clock	Fast clock
Noon	12:00 pm	12:00 pm
1 pm	1:01pm	1:01 pm
2 pm	1:59 pm	2:02 pm
3 pm	2:57 pm	3:03 pm



Third question

- What is the main practical limitation of ***proof-carrying code***?



Answer

- What is the main practical limitation of ***proof-carrying code***?
 - It is very difficult to construct correctness proofs for non-trivial extensions.



Fourth question

- How do *lightweight protection domains* limit extensions access to the kernel memory?



Answer

- How do *lightweight protection domains* limit extensions access to the kernel memory?
 - An extension executing in its lightweight protection domain has
 - **Full access** to the data in its protection domain
 - **Read-only** access to the remainder of the kernel address space



Fifth question

- Which kind of applications will benefit the most from Corey address ranges?



Answer

- Which kind of applications will benefit the most from Corey address ranges?
 - The massively multicore applications whose cores access both private and shared data



Sixth question

- What is the main issue raised by ***dirty superpages***?
- How do Navarro *et al.* propose to solve it?



Answer (I)

- What is the main issue raised by ***dirty superpages***?
 - Since each superpage only has a single dirty bit, the page replacement policy has no way to know which base pages are dirty—and must be flushed out when the superpage is expelled from main memory and which base pages are still clean.



Answer (II)

- How do Navarro *et al.* propose to solve it?
 - Navarro *et al.* propose to avoid this issue by disbanding superpages the first time one of their base pages gets modified.



Seventh question

- When does a RAFT leader know it can safely commit a log entry?
- How is this information transmitted to its followers? (10 points)



Answer

- When does a RAFT leader know it can safely commit a log entry?
 - Once it knows that a majority of the servers have appended that entry to their logs
- How is this information transmitted to its followers?
 - All AppendEntry RPCs—including heartbeats—include the index of the entry that was most recently committed by the server.