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WE17.1

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■ Calculator

Video explanation of solution is provided below the problem.

Operating Systems

4 points possible (ungraded)

BetaSoft, Inc, the leading provider of Beta OS software, sells an operating system for the Beta similar to that described in lecture. It uses a simple round-robin scheduler, and has no virtual memory -- all processes share a single address space with the kernel. The OS timeshares the Beta CPU among N processes using a simple, familiar scheduler shown below.

Several of Betasoft's customers use the Beta for long, compute-bound applications, and have asked for a tool to help them find where their programs are spending most of their time. To accommodate these requests, BetaSoft has implemented a supervisor call, SamplePC, which allows a diagnostic program running in one process to sample the values in the PC of another. Betasoft proposes to write such a program, called a profiler, that takes many samples of PC values from a running program and produces a revealing histogram.

The SamplePC SVC takes a process number p in R0, and returns in R1 the value currently in the program counter of process p. The C portion of the SVC handler is given below:

1.	Give the missing	code fragment	shown above as	???. Do not include	any white space in	vour response.
					arry write space in	YOUI ICODOIIOC.

PotoSoft writes a sim	nla profilar using	the above SVC	and uses it to	maaa

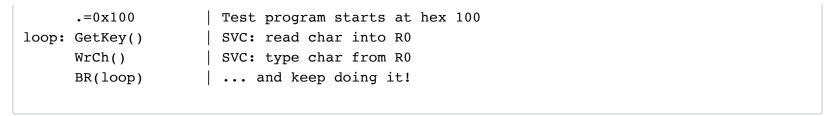
BetaSoft writes a simple profiler using the above SVC and uses it to measure a compute-bound process consisting of a single 10000-instruction loop. Noticing a surprisingly large number of repeated values in the sampled PC data, they cleverly deduce that their profiler is making many SamplePC calls during each time quanta for which the profiling process is scheduled, returning redundant samples from the process being measured.

2. Does adding a call to Scheduler() to the **SamplePC_h** code eliminate the observed problem?

```
✓ Yes✓ No
```

BetaSoft ignores your solution (keeping the original **SamplePC_h** code), arguing that they'll just collect enough samples that the redundant values won't affect the histogram significantly. They produce a working profiler program that takes many samples of another process's PC and produces a histogram showing code "hot spots". Although the profiler proves useful on compute-intensive application code, BetaSoft tries running it on a simple echo loop running in a process:

echo loop, as a test for profiler tool:



3. When run on the above process, what does the profiler report as the most common value of the PC? Answer "NONE" if you can't tell.

Often-reported PC value, or "NONE": 0x

The final BetaSoft profiler program itself is mostly a big loop, consisting of a single SamplePC SVC instruction located at **0×1000**, plus lots of compute-intensive additional code to appropriately format the collected data and write it into a file. Out of curiosity, BetaSoft engineers run the profiler in process 0, and ask it to generate a histogram of sampled PC values for process 0 itself.

4. Which of the following best summarizes their findings?

All of the sampled PC values point to kernel OS code.
The sampled PC is always 0×1004 .
The SamplePC call never returns.
O None of the above.

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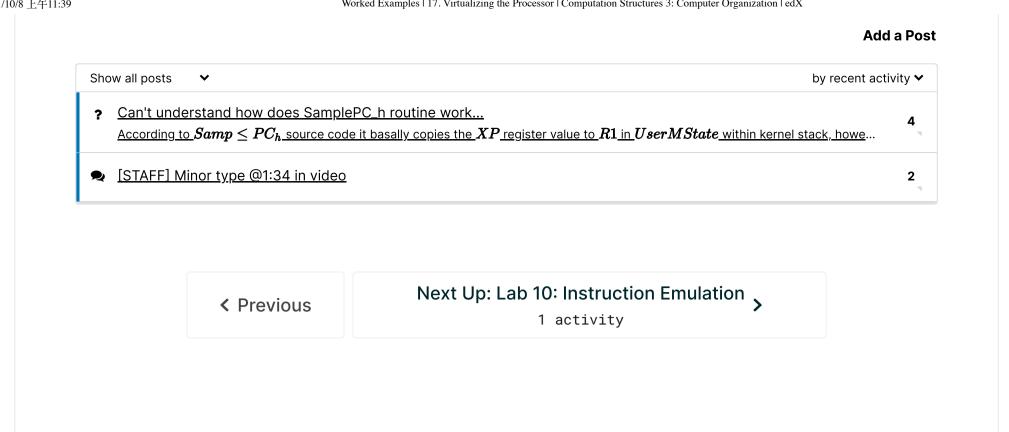
(Caption will be displayed when you start playing the video.)

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