COSC 6360: Operating Systems
MATERIALS ON THE FIFTH FALL 2015 QUIZ

This fifth quiz will replace the final examination. It will not be comprehensive.
You are responsible for all the materials discussed in class since the last quiz, as they are summarized the PowerPoint presentations. I expect you to understand these summaries and to be able to comment around them.

File Systems
• You are responsible for the materials discussed in the slides.

Energy Efficiency
• We discussed the general organization of a FAWN array and the implementation of a FAWN KD system. We discussed in some detail the organization of its in-memory hash table and the way data in flash memory are accessed. We did not cover the actual implementation of data store maintenance functions and all replication-related issues.

Virtual Machines
• You are responsible for all the topics discussed in class.

Mystery Paper
• You are responsible for the materials discussed in the slides.

Selected Revision Questions
1. What is the purpose of the shingle translation layer of a SMR disk?
2. How does FAWN organize its data in flash memory? Why?
3. FAWN in-memory hash tables only contain 15 bits of each 160-bit key. What is the main advantage of this approach? What is its main disadvantage?
4. What is the purpose of allocating several randomly selected virtual nodes to each FAWN node?
5. How does the paravirtualization approach used by Xen differ from other virtualization approaches? According to Xen’s authors, what is the main advantage of the approach? What is its main disadvantage?

Concise answers
1. It lets the SMR disk offer a conventional interface to the OS by hiding the idiosyncrasies of its recording technology.
2. FAWN data in flash memory are organized as a log of entries such that all insert and delete operations only affect the end of the log. This solution was chosen because flash memories perform sequential writes much faster than random writes. Storing only 15 bits of each 160-bit key in main memory reduces the in memory footprint of FAWN hash tables but results in additional access to the flash drives.
3. It spreads the workload of a failed physical node among several physical nodes.
4. Unlike full virtualization, paravirtualization presents a virtual machine abstraction that is "similar but not identical to the underlying hardware." Its big advantage is a faster performance. Its big limitation is the need to modify the guest operating system.