

CSL862: Minor 1

Sep 9, 2010

Max Marks: 20

State your assumptions, if any. Answer all **8** questions.

1. **Economics**

Assume, you are a Web-2.0 startup hosting a worldwide web-service. The maximum traffic expected by your website can be handled by <100 servers. In your experience in the last few months, you have had to keep >90 servers on 24x7 to be able to serve all your customers. Should you use Amazon's EC2 or should you buy your own hardware to host your webpage? Show expected cost (in rupees or dollars) in both situations – clearly state your cost assumptions (your assumptions should be plausible). [2]

2. What is a “Cloud”

We have seen three completely different models of cloud-computing, exemplified by Amazon EC2, Microsoft Azure, and Google AppEngine. What is the primary advantage of each of them with respect to the others? We are looking for macro-level comparisons: e.g., cost/performance/programmability tradeoffs. Briefly, explain how scalability is achieved in all three environments. [3]

3. **Virtualizable or not**

Explain the statement: "x86 instruction set architecture was not designed to be virtualizable."

[2]

4. JVM Exception Handling

Recall that the UCSD/Exception benchmark tests the performance of exception handling in Java. Explain, why the JIT compiler performs 2x slower than an interpreted execution on this benchmark. [2]

5. Xen and the Art of Paravirtualization

A primary goal of Xen-like para-virtual VMMs is performance-isolation. Cite some important design decisions in Xen aimed at achieving this goal. [3]

6. Hosted vs. Bare-metal Virtualization

a. Explain the statement: "In the hosted virtualization architecture, the guest OS is at the mercy of the host-OS". Give concrete examples. [2]

b. Explain 2 advantages of hosted architecture over bare-metal architecture [2]

7. Live Migration

Explain, why live migration may never complete for a pathological guest workload. [2]

8. Memory Virtualization

Explain the statement from the Xen paper: “Efficiently virtualizing hardware page tables is more difficult than virtualizing a software-managed TLB. [2]