Sistemas de Computação em Cloud

Date: 21/October/2015 Duration: 1h45m

Note: Some questions are not totally specified/detailed. That is deliberate, and you should assume reasonable hypothesis on the "missing information" and then answer them.

Q-1 [2 pts] Consider the three major infrastructures/components that are used in a Data Center (DC): computation, storage and networking. The time it takes to access a "data item" may be described as a function of i) latency and ii) bandwidth of the "communication channel" that links two components (e.g., links the disk device to its "controller"/HBA) and iii) the response time of the component itself (e.g., the access time for a disk).

a) [1 pts] Define latency. Indicate the quantity (mass, space, velocity, time, etc.) and the unit (m, m/s, s) that you should use to express it. [Note: in case of a magnitude, the unit is still the important factor – e.g., for 10 nm (nanometres) the unit is m(eters)].

b) [1 pts] Idem, for bandwidth.

Q-2 [4 pts] **For each of the paragraphs** (a) e (b) below, describe and defend/justify (it will certainly help if you think of/quote a specific "application") **using no more than one page for each paragraph** (and ideally ½ page),

a) [2 pts] The use of **internal** disks in servers.

b) [2 pts] The use of **external** disks in servers.

Q-3 [4 pts] In a situation where a group of servers does access **external** disks, **characterize such an infrastructure** and how they use it (i.e., how they access the disks, what items they read/write. Again, it will certainly help if you think of/quote a specific "application") in each of the following cases:

a) [2 pts] The infrastructure is a NAS.

b) [2 pts] The infrastructure is a SAN.

Q-4 [2,5 pts] Consider the three major infrastructures/components that are used in a Data Center: computation (1. processors; 2. memory) , storage (3. disks) and networking (4. NICs; 5. switches). For each numbered (from 1 to 5) item above, which technologies and/or solutions may be used to offer fault tolerance?

Q-5 [2,5 pts] Consider the three major infrastructures/components that are used in a Data Center: computation, storage and networking in a virtualised environment where Type I hypervisors (a.k.a. *bare-metal* or native) are used.

a) [1,5 pts] What is an hypervisor? [Note some authors consider the term *Virtual Machine Monitor* (VMM) as a synonym of hypervisor; if you wish, you may adopt that definition]

b) [1 pts] What are the differences between Types I and II? [Your answer should also include a description of use-cases]

Q-6 [3 pts] Consider two Data Centers each belonging to a different organisation. In one case, (i), the infrastructure - computation, storage and networking - is managed by the TI department with a virtualization software stack similar to the VMware vSphere suite (ESXi hypervisor and vCenter management) or Citrix (XenServer hypervisor and XenCenter management). In another case, (ii), the infrastructure - computation, storage and networking - is also managed by the TI department, but now with a IaaS cloud stack similar to the OpenStack or VMware vCloud suites.

Describe, to the best of your knowledge, each environment (i) e (ii) addressing, if they exist, similarities, differences, advantages, inconveniences – in short, all you can say that may help the reader in understanding the difference between a virtualised infrastructure and an IaaS cloud.