ECE792/CSC791-038 Homework Assignment #2
Virtualization
Due Tuesday, October 16, 2018

No late homework will be accepted; turn in whatever you have completed.

Provide CLI output/Screenshot to support your answer

Problem 1. *(10 Points)* **Reading datasheets.** Read the Cisco cloud service router (CSR 1000V) datasheet.
`https://www.cisco.com/c/en/us/products/collateral/routers/cloud-services-router-1000v-series/`
`datasheet-c78-733443.html` .

What is the CPU/Memory requirement for 500 Mbps, 1000 Mbps, and 5000 Mbps throughput for CSR routers. List three features of CSR for each of the follwoing: a) Networking, b) Security, c) Management interface. What would be per year cost to use two 1000 Mbps CSR in Amazon cloud (Hint: Search CSR in AWS market place)?

Problem 2. *(10 Points)* **Creating VMs.** Create a VM (name the VM as $< your-unity-id >$VM1) and load the following applications in it.

- Traffic generator - iperf

- wireshark.

We will use this VM frequently, in other problems.
Answer the following questions related to the VM you just created.

1. What is the IP address and MAC address of the: a) VM's NIC, and b) hypervisor NIC (default interface)?

2. Ping google.com from your VM. Use wireshark to capture packets at the output interface of the VM as well as at the output interface of the hypervisor. List 4 tuples (srcIP, Dest IP, srcMAC and dest MAC) of a packet going out of the VM and your hypervisor.

   Are these tuples the same or different? If different, explain why.

Problem 3. *(20 Points)* **virsh - managing VMs.** In all tasks, provide the appropriate verification commands to verify that the task was successfully executed.

1. Use libvirt-CLI methods to add a network (name it as $< your-unity-id >$NETWORK2) in bridge mode.

2. Use libvirt-CLI methods to add an interface to your VM to connect to $< your-unity-id >$NETWORK2.

3. Use libvirt-CLI methods to clone your VM (name it as $<your-unity-id>$lab2VM2.

4. List MAC and IP addresses of all interfaces of each VM.

5. Ping one VM from the other using IP from the $<your-unity-id>$NETWORK2 subnet. Use wireshark on the VMs and List down 4 tuples (srcIP, Dest IP, srcMAC and dest MAC) of packet going out at first VM and received at second VM. Are the tuple fields same or different for the packet? if different, explain why.

6. Send UDP traffic between the two VMs using iperf. What is the maximum UDP throughput achieved? Which is the bottleneck resource, CPU, memory or I/O? why? Provide logs of system commands to support your answer.

Problem 4. *(20 Points)* **Ansible.** Write different playbooks to do the following task.

1. An Ansible playbook to a) Create a l2 network and name it **unityid-netl2** b) create two VMs and connect this to L2 network

2. Ansible playbook to collect logs (CPU load averages) from both host and the two guest created in part1 at 1 minute granularity. The collected log should be stored in the file /var/customlogs/logs folder. Log file should be in CSV format with following entry: hostname, cpu1min, cpu5 min, cpu 15min

Problem 5. *(25 Points)* **Python - Libvirt API.** Use the python libvirt API to do the following:

1. *Host Information* Obtain host information of your interest (at least 5 items).

2. *Guest Domain Information* Obtain guest information of your interest (at least 5 items).

3. *Performance monitoring* Write a python application to monitor VCPU and VMEM of all VMs. Your application should the following:

   (a) print all VMs in ascending order, based on CPU /memory usage.
   (b) print and also log in a file an alert message (Vm name, time stamp, CPU usage) if CPU usage crossed a threshold T (take from user input)

   The TA will give CPU or MEM as the argument to your program and your program should return the list of VMs sorted by the given argument.

   ***Bonus* (10 Additional points):** Your program should also make a sorted list of moving averages for all VMs. The polling interval + moving window size should be user defined parameter.

Problem 6. *(10 Points)*

Distributed and Stand alone vSwitch. Read about VMware's Switches - Standard Switch (vSS) and Distributed Switch (vDS). Give a use case scenario where vDS is needed instead of a regular standard vswitch.

Problem 7. *(15 Points)*

What if: Set up a lab experiment to support your explanation to answer the following questions. What breaks if:

1. Two VMs connected to same bridge (bridge mode) have: (a) same mac addresses, (b) same IP addresses.

2. Two VM connected to different bridge (both bridges in 'bridge' mode) have: (a) same mac addresses, (b) same IP addresses.

3. Two VMs connected to different bridge (both Bridges in routed mode) have: (a) same mac addresses, (b) same IP addresses.