CSL 707

Assignment #1
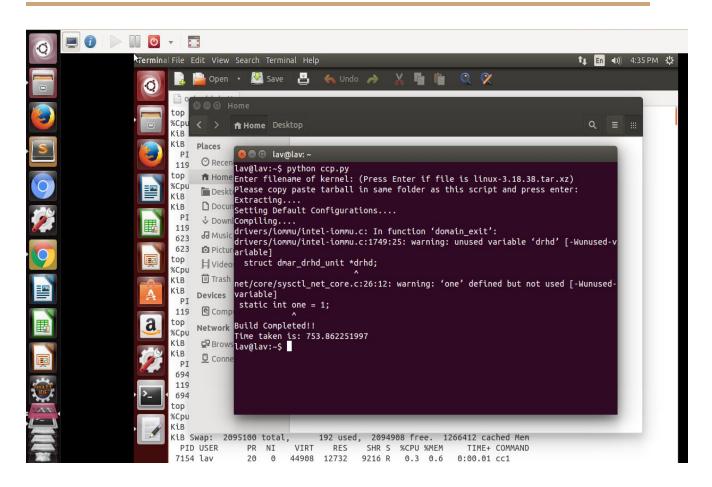## Shinde Lav Chandrakant

2013CSB1032

Introduction

This main aim of this assignment was to compare the performances of a real physical machine versus a virtual machine in the task of compiling a linux-kernel on the basis of CPU utilization, Memory utilization and Time taken. A python script was written to execute the task of compiling the kernel and measuring the key statistics of the file and putting them in a document for further analysis.

Machine Specifications

	Physical Machine	**Virtual Machine**
Total RAM	4GB	2GB
Total CPUs	4	2
Disc Type and Speed	HDD and 5400 RPM	Virtual Disk
OS installed	Ubuntu 14.04.5	Ubuntu 14.04.5
File System Type	ext4	ext4

Results

The results of running the python script to compile the kernel were obtained in both the cases and were stored in separate files named output-physical.txt and output-virtual.txt

These results are nothing but the stats of CPU usage and Memory usage obtained at frequent intervals during the entire process. The results were found as expected that the compilation would be faster on a physical machine rather than on the virtual machine because of the overheads involved but surprisingly the difference is very less. The results are further discussed in the observations with rationale explaining as to why such figures were obtained

The results were taken using the top command which gives all the statistics which were required to draw meaningful conclusions. The time was measured by using python's time library which is supposed to give a very accurate calculation of time using the system clock. The time is displayed in the terminal at the end of execution and the other results are documented in the files mentioned above. While documenting results only meaningful data from the top was stored in the files such as load averages, memory usage and data specific to the process involved in the task of compilation of the kernel.

Other processes were filtered out so that it requires less space and gives meaningful conclusions.

Observations

1) <u>**On a Real Machine**</u>
   - The time taken is approximately 702.6494 seconds i.e. approximately **11.7 minutes**
   - The **average load** on the CPUs was observed to be about **0.72** in a span of 15 minute average
   - Only the effect of the process was clearly visible in the 5 minute average which came out to be approximately 1.01
   - This value is out of all the 4 CPUs on the computer which makes the maximum value 4. So we can say approximately 25% utilization of all the CPUs occurred for building the kernel
   - Thus we can clearly see that a little over one core was required to build the kernel that to without the turbo boost of the CPU. The clock speed was 2.7 GHz
   - The **RAM** memory usage was very less, occupying about **0.9 to 1 %** of the total **4 GB** RAM on the system

2) <u>**On a Virtual Machine**</u>
   - The time taken is approximately 780.7627 seconds i.e. approximately **13 minutes**
   - The average load on the CPUs was observed to increase from **0.36 to 0.76** in a span of 15 minute average
   - Only the effect of the process was clearly visible in the 5 minute average which came out to be 1.02
   - This value is out of all the 2 CPUs on the computer which makes the maximum value 2. So we can say approximately 50% utilization of all the CPUs occurred for building the kernel

- Thus we can clearly see that a little over one core was required to build the kernel that to without the turbo boost of the CPU. The clock speed was 2.7 GHz
- The **RAM** memory usage was greater, occupying about **2.2 to 2.3 %** of the total **2 GB** RAM on the system

Conclusions

The difference in performance was not very large and is almost comparable. The virtual machine seems to handle all overheads efficiently. The time taken was only a little less in the physical machine than the virtual one. The Memory usage however was significantly larger on the virtual machine as compared to the physical machine.

This clearly shows that the virtual machines are well optimized at handling overheads and can perform almost at par with the physical machines.