CHAPTER 6
CONCLUSION

6.1 Conclusion

This research work has been presented an in-depth analysis of energy consumption at a core model of cloud computing in order to visualize the risk factors which is responsible for draining energy in datacenters. A trade-off analysis between energy and performance for estimating SLA violations along with virtual machines has been conducted in this research work. Also focused on CPU power saving in terms of VM provisioning in the cloud computing. The uniqueness in this research work is the implementation of the proposed DVFS algorithm along with traditional DVS scheme. The prototype design of DVFS has been layered into task allocation, group creation and processing element. The case study considered in this research work has been designed on Gridsim.

The parameter used in this thesis has been mapped with case study using similar components of VM, queue, DVFS algorithm and PE. The case study has taken from the exiting private cloud architecture. The experiment has been conducted with various nodes ranging from 10-50 and VMs ranging from 100-500. The resource broker has been initiated a role in finding power lists of various PEs as well as VMs. This experiment has considered lower to higher values of operating frequency and voltage. The results from the experiment shows the measure of PE has been maximized when operating at 1.4 GHz and measure of PE has been reduced when operating at 0.6 GHz.

The DVFS enabled design has been analyzed with 3 different energy aware polices i.e. minimized DVFS, sigma advanced DVFS and adjusted DVFS. The observations that reveal the acceptance rate of adjusted DVFS was very much equivalent.
when compared to the static technique but minimized much power in the case of small arrival rate of PEs. Sigma advanced DVFS has maximum acceptance rate with uniform power utilization when compared to minimized DVFS approach.

This proposed research work has been simulated in three tier tree datacenters. This proposed DVFS algorithm has been monitored the energy consumption of the servers, switches and other components in the datacenter. It has been designed to capture every communication processes at the packet level within the datacenter. The proposed system has been evaluated on java platform with 32 bit machine using windows OS of 1.84 GHz processor. A total of 1536 servers, 32 racks (each holding 48 servers), 8 aggregation switches were involved in this proposed experiment.

The interconnected servers inside the racks have been used 1 GE links and 10 GE links have been used to interconnect the core switches and aggregation network. The propagation delay of all of the links was set to 10ns. The size of the message has been considered in this research work is 15KB and it is occupied 10 ethernet packets. A communication link has been created for connecting application servers within the rack.

The YOUTUBE has been considered as multimedia application server. This research has been considered only uplink to application servers. The observation has been shown from the experiment that the average load of the rack switches uplink was around 0.95 GE and the average load of an operating server was around 0.9 GE. The proposed technique has been achieved the work consolidation for power efficiency while preventing computing servers and network switches from overloading. The optimization has checked through JOULEX.
Both experiment and analytical results of the proposed technique illustrate the energy consumption of the datacenter is reduced to half when compared to traditional and frequently used round robin schedule and when compared to the previous DFVS schema adds around (a) 3.2\% to datacenters consumption (b) 3\% to servers energy consumption (c) 1.7\% to switches energy consumption. The trivial increase in energy consumption is justified by the requirement of additional computing and communication resources detected by the proposed techniques. Therefore, the proposed DVFS algorithm is suitable for efficient resource provisioning along with SLA and definitely the datacenters can augment their profit by dropping dynamic energy consumption.

6.2 Constraint

The proposed study was evaluated in highly controlled research environment as performing sophisticated experiments on real time giant datacenters is almost near to impossible. However, the effect of the traffic, protocols used, considerations of downtime formulation, service level agreement, as well as provisioning schema was entirely simulated using available cloud simulators (GridSim). But, simulating the considered research variable (energy) in cloud simulator and extracting the throughput from it doesn’t give the actual visualization of what exactly happens in real time traffic in cloud environment. However, the reliability of the mathematical evaluation considering the effectiveness of DVFS system is well assured and promising, but it is not experimented over wide real time test cases of dynamic internet environment considering cloud services. Currently, the proposed study is only limited to Software as a service consideration, whereas Infrastructure as a service and Platform as a Service are yet to be evaluated, which may be the scope of future direction. The stress was less on service domain as the proposed study is purely concentrated on the energy preservation schema. Extending the current study over various set of services as well as extensive testing over wide applications over datacenter can exponentially increase the reliability of the proposed study.
6.3 Future Work

This proposed research work has been investigated power aware profitable VM provisioning and DVFS provisioning algorithm. Based on the conclusion drawn, the future work can be extended with further analysis and improvement of the proposed DVFS schemes.

- Adaptive DVFS scheme can be modified with different queuing models.
- This proposed research work has only considered uplink communication transmission. The future work can consider the downlink communication transmission as well.
- This proposed research work has used only multimedia application to estimate performance. The future work can estimate the performance of different applications running on virtual machine.
- The future work can consider the impact of cooling system to avoid the CO2 emission in datacenters by developing a temperature aware scheduling algorithm for multi-core computer cluster.