multiprocessor system can be reduced to a considerable amount by switching the operating voltage and frequency of the processor to a lower value, without compromising the temporal constraints and by switching off the unused peripherals of the processor. Energy saving in the order of µJ is also crucial for a single processor core, as big and complex networked embedded systems consist of thousands of processors/ controllers. Thus, the cumulative energy saving of the entire system will be definitely a considerable amount and is requisite for embedded systems, especially portable embedded devices.

From Table III and Table VIII, it could be seen that there is a difference in the amount of energy saving obtained by software simulation and hardware validation. A graph showing the comparison of both approaches is depicted in Figure 10 to 13. This difference is due to the absence of environmental factors like: temperature effects, overhead associated with the latency, communication and synchronization and non inclusion of enormous peripherals in the controller board and many other physical parameters in the simulation analysis.

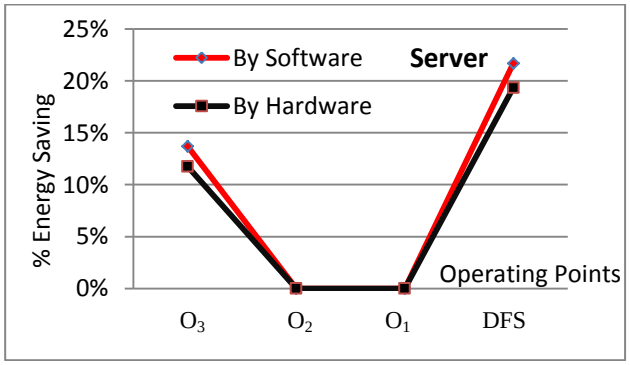

Figure 10: Comparison of energy saving in Server by software simulation and hardware validation

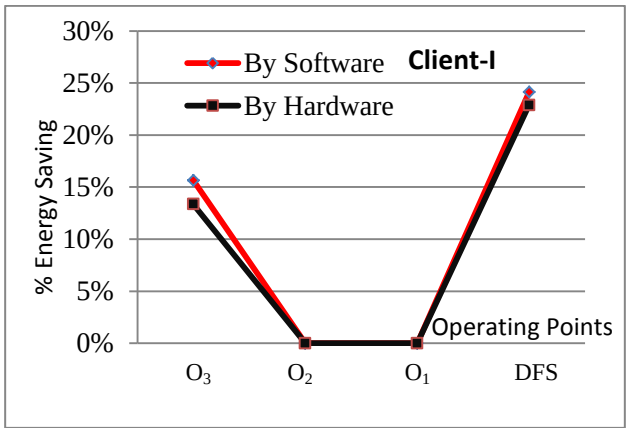

Figure 11: Comparison of energy saving in Client-I by software simulation and hardware validation

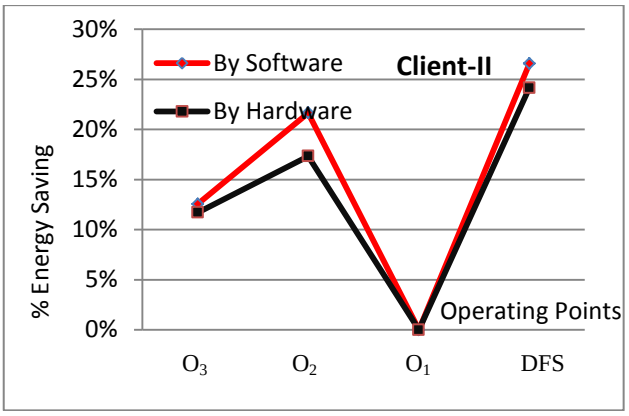

Figure 12: Comparison of energy saving in Client-II by software simulation and hardware validation

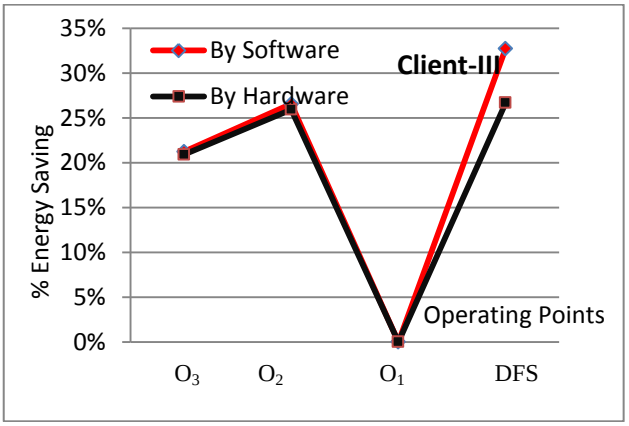

Figure 13: Comparison of energy saving in Client-III by software simulation and hardware validation

10 Conclusion

The widespread use of multiprocessor system for application development claims for the need of energy constrained system. The energy issues being the most crucial one, demand more attention while implementing portable systems. This paper presents a software simulation and an experimental validation of energy consumption reduction in a distributed networked multiprocessor system. The chosen application of "*Power-aware embedded system for temperature monitoring and control in safety critical applications*" is implemented in hardware using four ARM7 LPC2148 microcontrollers. A shared memory architecture using *Client-Server model* is followed for the implementation. Energy consumption reduction is achieved by the use of energy aware task-processor allocation algorithm for multiprocessor systems based on task dependencies and precedence relations and by dynamic voltage and frequency scaling technique along with cutting off the supply to the unused peripherals of the controller by

configuring the registers of the LPC2148 micro controller. The results show an evidence of substantial energy saving viable by DVFS technique in distributed networked multi processor systems.

On-going efforts include optimization of multiprocessor system for energy minimization by different approaches like: GA, PSO etc. Also, efforts to solve multi-objective function optimization will be taken up in future.

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