PIRE 2009 Project Proposal

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Project Title: Storage Power Management: A Block Layer Perspective

Problem Statement: In many environments, specially RAID systems, some disks may consume power for nothing. Requests can be localized in some disks, while others keep spinning waiting for infrequent requests. An approach would be to indirect requests, for example write requests, to disks already turned on while spinning down the original intended disk. The problem is what disks to spin down, and what requests to indirect.

Motivation and Impact: Power consumption within the disk-based storage subsystem forms a substantial portion of the overall energy footprint in commodity systems and server environments.

Current Status: Data for motivation purposes has been prepared at FIU and IRL based on analysis of traces for web and mail workloads. Some ideas about block and disk candidates selection have been proposed by Raju Rangaswami and Akshat Verma. Additionally, the issues of data consistency due to request indirection was also addressed in some early designs.

Research Roadmap:
- Propose a detailed design of the system
- System implementation
- Experimentation based on replayed traces

Relation to PIRE Core Research Projects: The project fits into the CI Enablement Layer, most specifically the Communication Virtual Machine box.