Power-Aware Database Disk Storage System

Presented By:

Dr. Yicheng Tu

Department of Computer Science and Engineering

University of South Florida

Motivation

- Data centers consume considerable amount of energy (61 billion kWh, 45 billion US dollars in 2006).

- The major consumer of the data centers is the database disk storage component (25%- 35%) called *Disk Farm*.

- The Green Computing Movement: Dynamic Power Management (DPM) techniques are commonly used for saving energy in disks storage systems.

UNIVERSITY OF
SOUTH FLORIDA
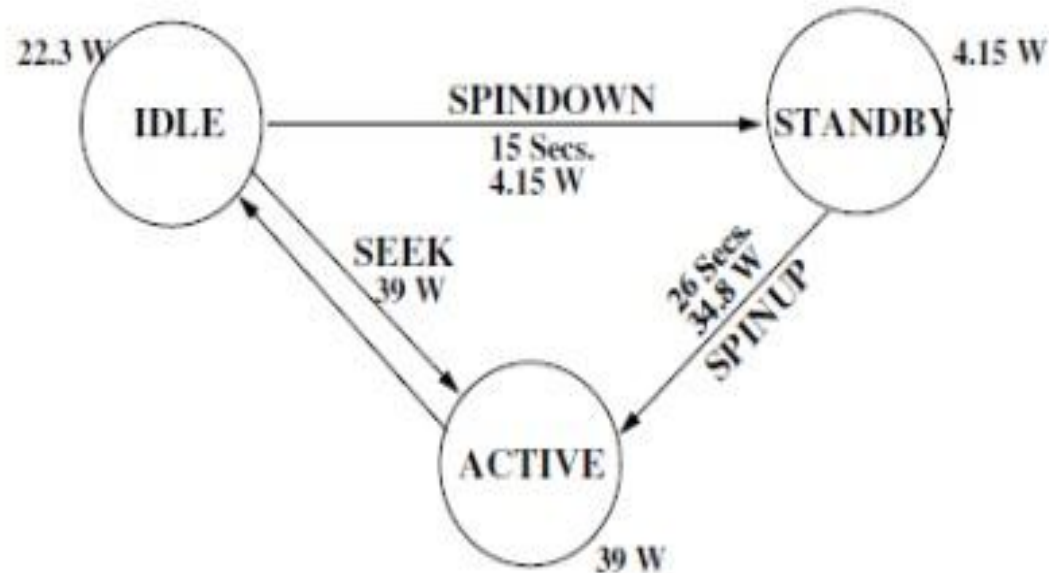COLLEGE OF ENGINEERING

Dynamic Power Management

- Key idea:

  - ✓ Most frequently accessed data (*hot data*) stored on *hot disks*

  - ✓ Transition other disks into sleep mode (*cold*)

- DPM algorithms determine dynamically when

  (1) the disk should be transitioned to *cold* state

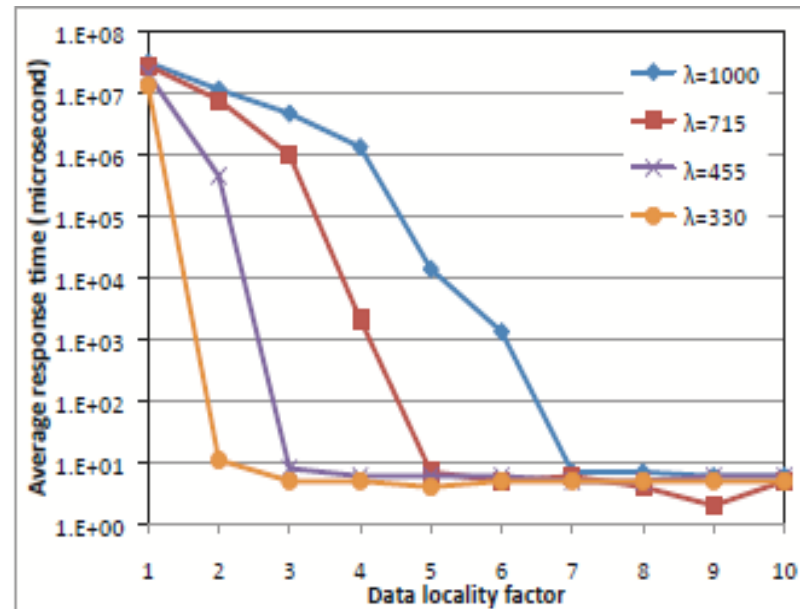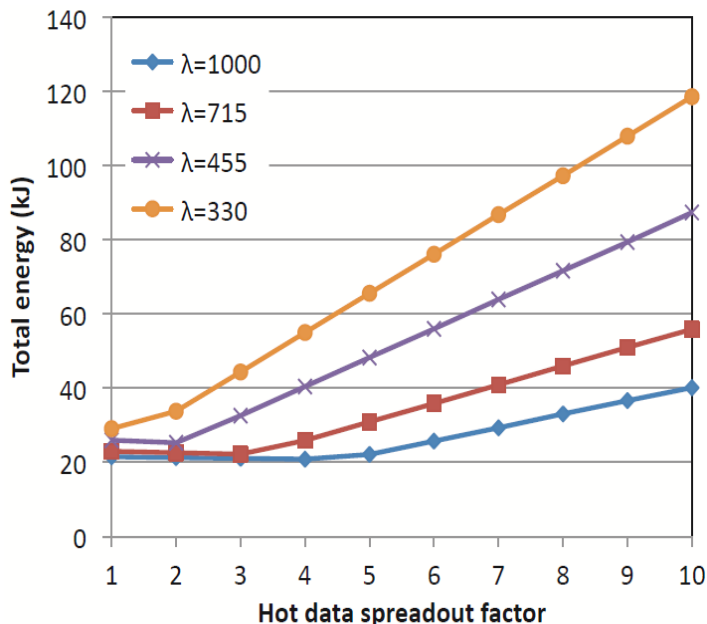 (2) certain data should be stored in particular *hot* disks
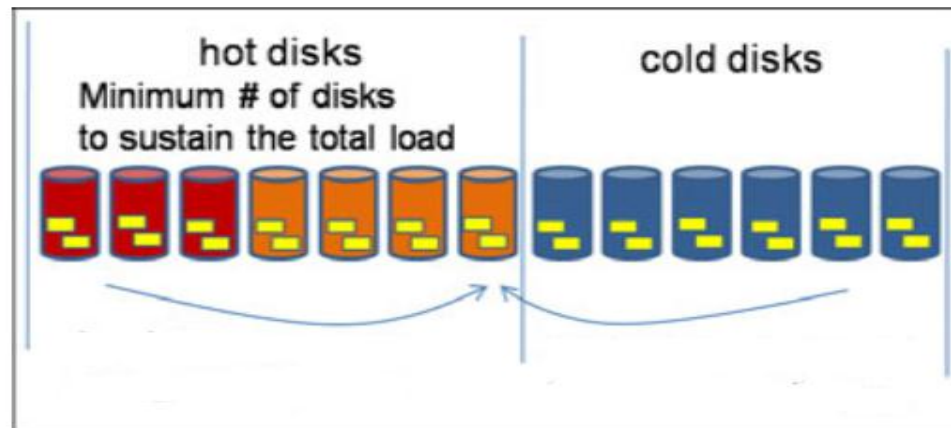
Hard Disks Specifications

Mode	Rotation Speed (RPM)	Power (W)
Active	12000	39
Stand By (sleep)	3600	4.15

Experimental Simulation Results

- F: hot data spread out factor, λ: workload intensity
- F =1: the worst performance vs. the most power saving
- F= 10: the best performance vs. the worst power saving
- Mid-range F: reasonable power-performance trade-off

✓ *Main Green Result: A 25-72% energy savings can be achieved with little performance degradation.*