

# SSD-based Energy Efficient Cloud Storage

Salma Rodriguez

Florida International University

*srodr063@fiu.edu*

November 25, 2012

# Motivation

## Solid State Technology

High capacity EEPROM devices for caching disk data reduces energy consumption on storage server by moving data on disk to the more energy-efficient flash memory.

## Distributed SSD Caching

We want to reduce energy consumption on distributed systems by exploring the properties of dynamic spin control of storage server disks and replication.

# Disk Spin: Implementation

**Algorithm 1** Spinning the disk up or down dynamically

```

1: procedure SPIN UP OR DOWN
2:   while true do
3:     if disk is spinning then
4:        $k \leftarrow$  current time in seconds
5:        $c \leftarrow$  time since last cache miss
6:       if  $c + 20 \leq k$  then
7:         spin down the disk and change state to spinning
8:       else ▷ disk is not spinning
9:         if DM Cache is blocking on a cache miss then
10:          spin up the disk and change state to not spinning
11:          unblock DM Cache
    
```

# Consistent Hashing

Idea: replicate data evenly with as little disruption as possible when nodes join and exit a network.

## Theorem

*For any set of  $N$  nodes and  $K$  keys, with high probability:*

- 1. Each node is responsible for at most  $(1 + \epsilon)K/N$  keys*
- 2. When an  $(N + 1)$ st node joins or leaves the network, responsibility for  $O(K/N)$  keys changes hands (to or from the joining or leaving node)*

Here  $\epsilon$  may vary but has an upper bound of  $O(\log N)$ .

# References



Author's name (1987)

Title of the paper.

*Journal Name* 55(4), 765 – 799.