

# Minimizing power usage

UNIT-2-Chapter 3

Green Computing

# Minimizing Power Usage

Power problem

Monitoring power usage

Reducing power usage

Low power computers

Components

# A] Power problems

We need to save the power

1. To run the equipment (because at some point we may not have energy to run the equipment )
2. To save money
3. To save the planet



# Energy and Cost saving ways

Energy-Saving Action	Savings (kW)	Savings (%)
Lower-power processors	111	10
High-efficiency power supplies	141	12
Power management features	125	11
Blade servers	8	1
Server virtualizations	156	14
Cooling best practices	24	2
Variable-speed fan drives	79	7
Supplemental cooling	200	18

# B] Monitoring Power Usage

## B.1 Servers

To monitor the power usage we need to use power monitoring software. Several vendors offer tools that help monitor datacenter power.

For example, IBM's PowerExecutive provides the tools needed to monitor and manage power consumption accurately. It can measure real-time power consumption and heat emission by individual server, server group, or location. It allows for the optimization of energy use and the lowering of power consumption when low utilization can provide cost savings. These power monitoring and management capabilities are an important tool in achieving energy efficiency in the datacenter.

It helps to find

- ▶ Understand the datacenter's thermal traits.
- ▶ Locate overlapping areas of cooling capacity.
- ▶ Consider “what-ifs” with the placement of the datacenter

## B.2 Low Cost Options

- ▶ There are also some very low-cost solutions for checking power on your workstations and standalone devices.

### 1) Kill a Watt

The Kill A Watt device is a US\$25 product that you plug into the wall and then plug your computer or monitor into the device. The result is that it will show you how much power your device is using

### 2) Calculator

Tech Republic offers a free worksheet to help you determine various costs for monitor power. It allows you to do the following:

- Determine how much you spend on electricity to power your existing monitors.
- Compare new LCD and CRT monitors to determine which option is less expensive.
- Compare different models of the same type of monitor to determine which one carries the lowest total cost, when power is considered.
- Compare the same monitor under two different operating scenarios. For example, see how much cost savings you could achieve by implementing a monitor's sleep mode instead of leaving it running at full power when not in use.

## C] Reducing power Usage

- 1) Data de duplication
- 2) Virtualization
- 3) Storage
- 4) Management
- 5) Bigger drivers
- 6) Involving utility company

## C.1]Data de-duplication (back up our data)

- ▶ It is a tool for reducing storage and bandwidth consumed from disk-based backup
- ▶ By eliminating the need to constantly back up the same file over and over again, backup storage consumption is reduced 10 to 50 times
- ▶ Reducing the number of data copies reduces storage capacity needs and storage power consumption.
- ▶ Because less data is being replicated, money is saved because network traffic and storage capacity are not being overused.



## C.2] Virtualization

- ▶ From total consumption of power Maximum power is user by servers
- ▶ Virtualization regulates application's traffic between servers and data storage devices

## C.3] Storage

- ▶ As Direct attached storage requires lot of power to operate, we can use SAN (Storage Area Network) to save this power or to reduce the power usage

## C.4] Management

- ▶ In a company computers are used for few hours and rest of time machine are idle. So administrator team can use different tools to manage power settings for such situations.

### C.5] Bigger Drives

- ▶ Serial ATA (SATA) drives use about 50 percent less power per terabyte (TB) than Fiber
- ▶ Channel drives. They are also higher in storage density, which also helps reduce power consumption.
- ▶ For instance, if you replace 11 legacy drives with a modern, high-capacity drive, you get a 16 percent increase on capacity and use 81 percent less power

### C.6 Utility company involvement

- ▶ You should also try to involve your utility company in your efforts to reduce power costs.

They can offer power-savings tips as well as other services that can save you money.

**a) Monitoring :** One way you can monitor how much power you use is simply by contacting your utility company. They can provide you with historical information about how much power was consumed, and they can help you figure out what you're currently using.

**b) Sellback Opportunities :** Generate energy, save power and sell it back to utility company. We can use tools/devices like

1. Invertors
2. Meters
3. Photovoltaic panels

# D] Low power computers

- ▶ Computer manufacturers are starting to offer low-power models that consume less power than other computers.
- ▶ Some of the offerings for Windows machines as well as some Linux options are
  1. **PCs:-** Windows-based PCs are the backbone of industry
  2. **Intel:-** The new processor boosts a PC's speed, reduces power requirements, saves on battery life, helps the environment, and comes in a smaller package for more fashionable and compact computer designs.
  3. **HP:-** HP has introduced its own low-power PCs, including the rp5700. The PC touts a specialized design with additional cooling features.
  4. **Linux:-** Many companies offer their own low-power Linux options. Many of these are not only inexpensive to run, but downright cheap to buy.

**4.1] NorhTec:-** The Bangkok-based NorhTec offers a tiny PC capable of running Puppy and other lightweight Linux distributions.

Other features are

1. Fanless design
2. 128MB SDRAM
3. Input/output ports
4. IDE
5. • 10/100 Mbps Ethernet
6. • 3 USB V1.1 ports
7. • Optional RS232
8. • CompactFlash slot for expansion
9. • 2.5-inch hard drive mounting

## 4.2] Excito

- ▶ Swedish company Excito offers a low-power, quiet Linux file and print server based on Debian Linux.

## 4.3] Bubba

IT is based on a 200MHz ARM processor and comes equipped with an 80GB to 500GB drive plus a customizable OS featuring a torrent/http/ftp download manager. The Bubba server was designed to be left on all the time, without using much power or generating a lot of noise. It draws a maximum of 10 watts.

Bubba's hardware specs include:

1. • 200MHz ARM processor
2. • 64MB RAM
3. • 3.5-inch, 7200rpm 80GB, 320GB, or 500GB IDE hard drive
4. • 1 x 10/100 Ethernet
5. • USB 2.0 type A to printer or memory stick connection
6. • USB 2.0 type B to PC connection
7. •  $7.2 \times 4.5 \times 1.7$  inches
8. • 3.7 pounds

Bubba's features

1. basic file management
2. Samba file/print sharing
3. Mail transport agent
4. IMAP server
5. webmail—
6. An interface is also provided for firmware upgrades.

# E] Components

## E.1] Servers

1. Usage
2. Case study

## E.2] Computer Settings

1. Polling
2. Turn off unused devices
3. Use large buffers

## E.3] Storage

1. Green drives
2. MAID
3. RAID
4. Monitors

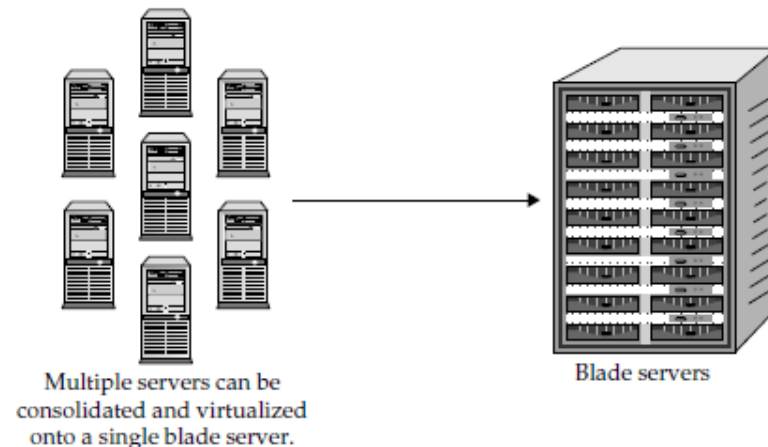
## E.4] power switch

## E.1] Servers

- ▶ We can use **Blade servers** to reduce the amount of energy used by servers
- ▶ Blades are entire computers contained on a card that can be inserted into a larger device
- ▶ Rather than one server taking an entire rack, 20 blades can be installed into one unit.

### Usage

- ▶ Blade servers consume about 10 percent less power than equivalent rack mount servers because multiple servers share common power supplies, cooling fans, and other components.
- ▶ Blades are popular because they not only reduce the amount of space needed, as but also because they use less power.



## E.2] Computer Settings

- ▶ Computers' monitor power settings is a great place to minimize energy usage

### Polling

- ▶ The computer automatically checking to see if a given action has been taken—draws power from idling computers, because it automatically wakes the computer up to check for a given event.
- ▶ Every time an application polls for something, the CPU wakes from an idle state and consumes power.
- ▶ You might not be able to eliminate all your polling tasks, but you can manage them.

### Turn Off Unused Devices

- ▶ If a computer or other device is not going to be used in the foreseeable future, turn it off. Failing that, at least set up the computer so that it hibernates after a certain period of nonuse.

## Use Large Buffers

- ▶ If your organization is one where media is played from a CD, DVD, or hard drive, make sure that applications' buffers are set large enough to store as much of the media in memory as possible.
- ▶ Doing this reduces the hard drive, DVD, or CD drive from spinning as much and thus saves power.



## E.4] Storage

- ▶ Storage is another big area in the realm of power consumption. Although you want to have a measure of redundancy protecting your data, it's simply wasteful and inefficient to have hundreds of drives spinning away when a couple dozen will do the trick.

### 1. Green drives

- ▶ Green hard drives are drives that reduce the amount of power they use through a variety of mechanisms, including unloading the heads during idle time to reduce aerodynamic drag.
- ▶ The drives calculate the optimum seek speed to use just the amount of power necessary.
- ▶ Western Digital is a major producer of green hard drives and estimates that its green drives can cut US\$10 per drive, per year in electricity costs.

## 2. MAID

- ▶ A massive array of idle disks (MAID) is a system that employs hundreds or thousands of hard drives for near-line data storage.
- ▶ MAID is designed for write once, read occasionally (WORO) applications.
- ▶ drives are spun up only on demand to access data stored on them. Because only a small amount of the data is being accessed, these disks can be powered as needed
- ▶ MAID differs from RAID in that it has increased storage density and is much less expensive, thus saving power and the need for cooling.
- ▶ The MAID architecture really developed because of the introduction of SATA drives that are designed to be powered up and down

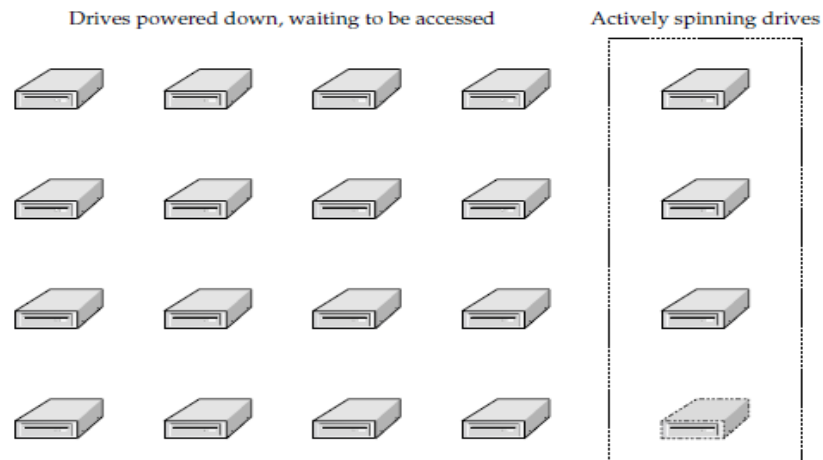
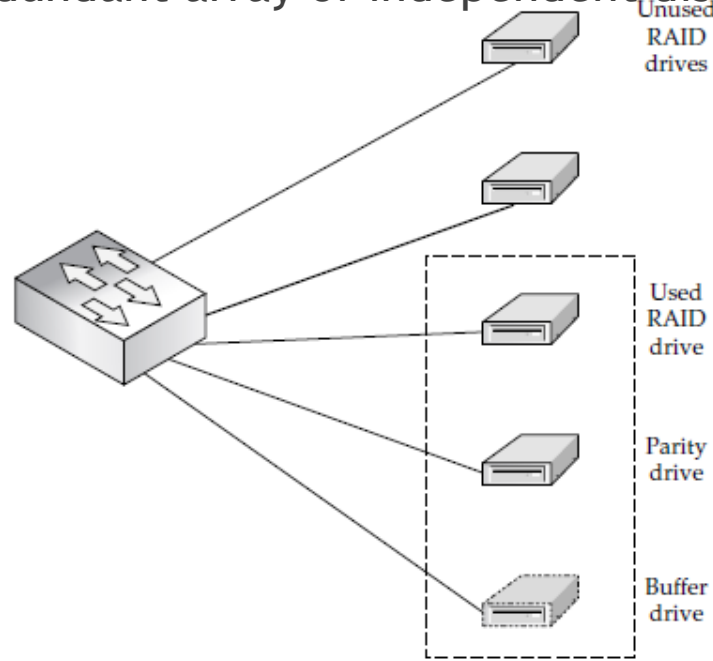


FIGURE 3-6 In a MAID deployment, only a quarter of the disks are spinning at any one time.

### 3. Power managed RAID((redundant array of independent disks)



- ▶ Power-managed RAID provides parity protection, but with only some of the RAID disks actually turned on.
- ▶ When data is written, only the parity and associated data drives are powered up. When data is read, only the disk being read needs to be powered up.
- ▶ Nondisruptive and sequential read/writes are accomplished by staging the data to an always-spinning drive, while the next drive is being powered up.

## 4. Monitors

- ▶ Adjusting your monitors to automatically enter sleep mode after a period of nonuse is a quick-and-easy way to reduce costs.
- ▶ LCD displays aren't necessarily less power hungry than CRTs.
- ▶ managing the colors on your monitors— especially backgrounds—can save money.
- ▶ Turn off your monitor