

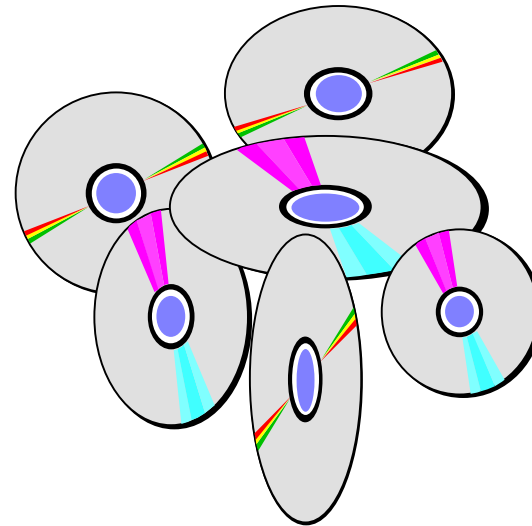
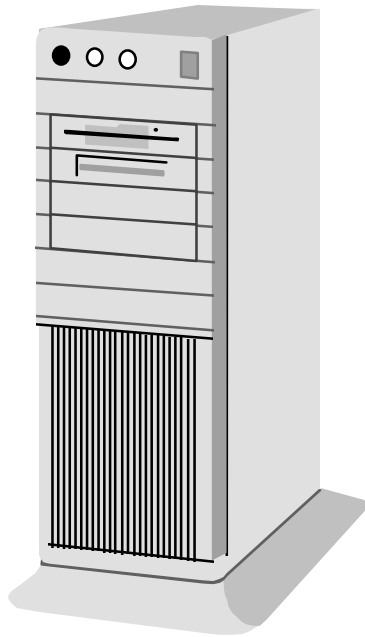
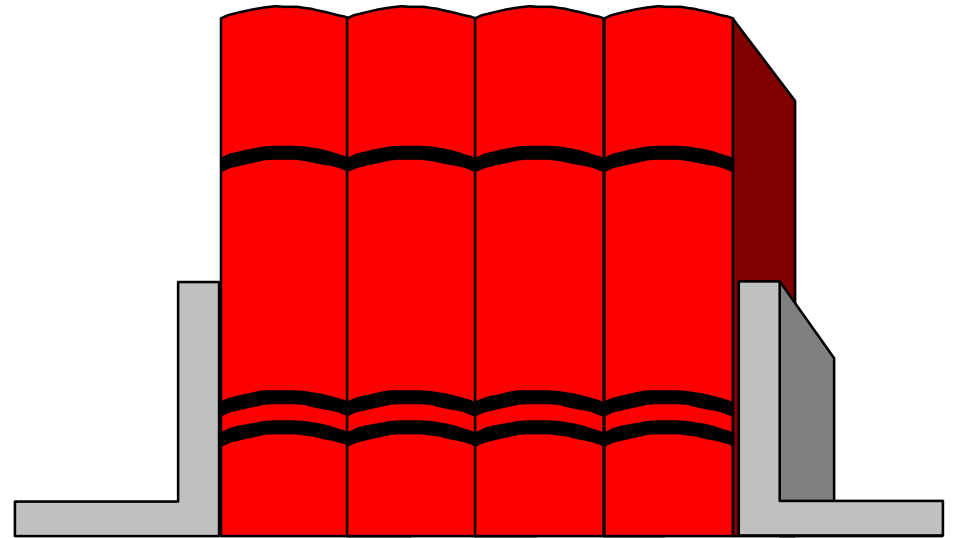
# ***RAID***

*(Redundant Array of Independent Disks)*

*The Basics*

# Definitions

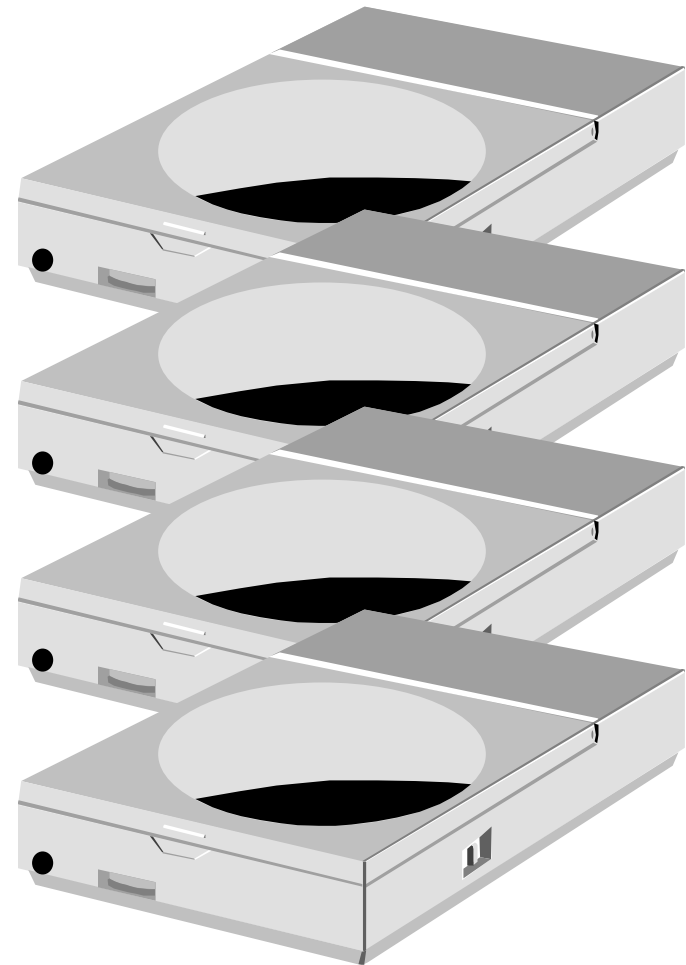
- ◆ RAID
- ◆ Disk Striping
- ◆ Disk Mirroring
- ◆ Reconstruction
- ◆ Hot Swap
- ◆ Parity



# *Definitions: RAID*

## ◆ RAID

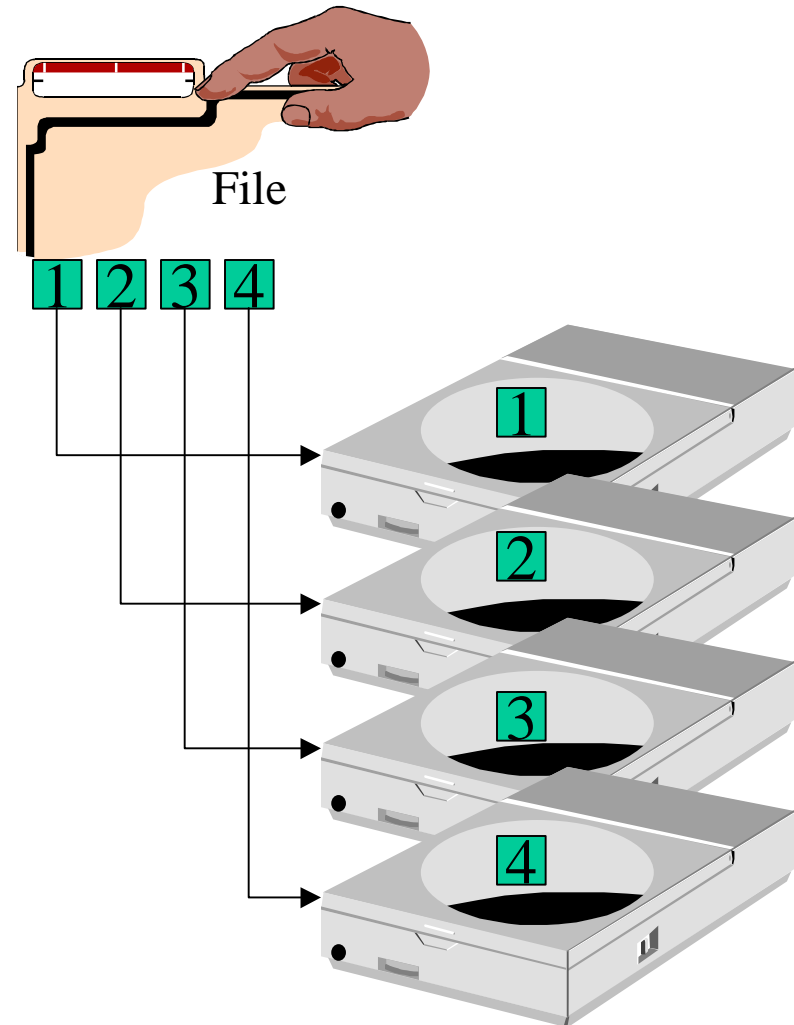
- Redundant Array of Inexpensive (or Independent) Disks
- Array of multiple small, independent hard disk drives that yields performance exceeding that of a Single Large Expensive Disk (SLED).
- A RAID disk subsystem improves I/O performance on a server using only a single drive.
- The RAID array appears to the host server as a single storage unit.
- I/O is expedited because several disks can be accessed simultaneously.



# Definitions: Disk Striping

## ◆ Disk Striping

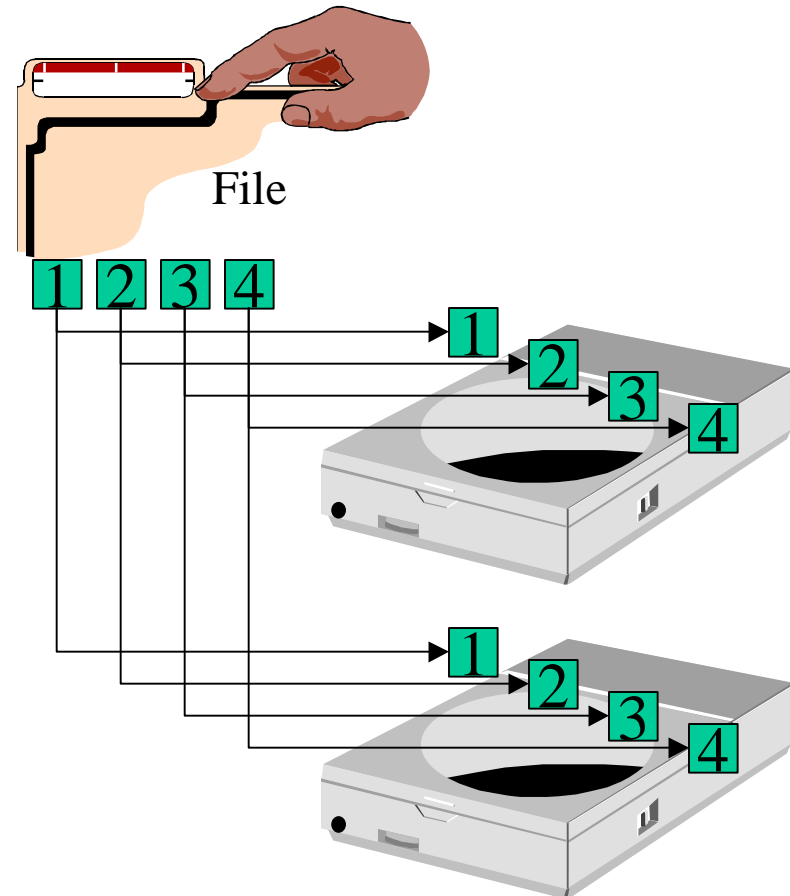
- Segmentation of logically sequential data, such as a single file, so that segments can be written to multiple physical devices in a round-robin fashion.
- This technique is useful if the system can read or write data faster than a single disk can supply or accept it.
- While data is being transferred from the first disk, the second disk can seek for the next block.
- Data striping is used in most databases and RAID devices.



# Definitions: Disk Mirroring

## ◆ Disk Mirroring

- Writing duplicate data to more than one (usually two) hard disk to protect against data loss in the event of a device failure.
- It is a common feature of RAID systems, called RAID 1



# Definitions: Reconstruction

## ◆ Reconstruction

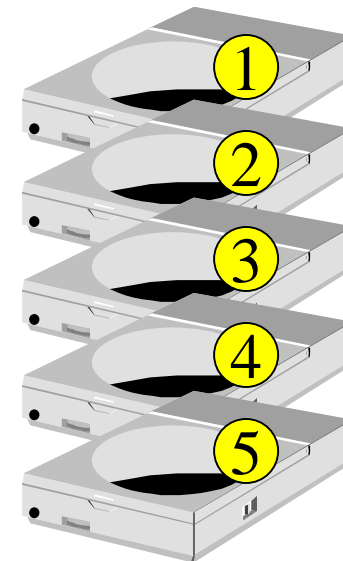
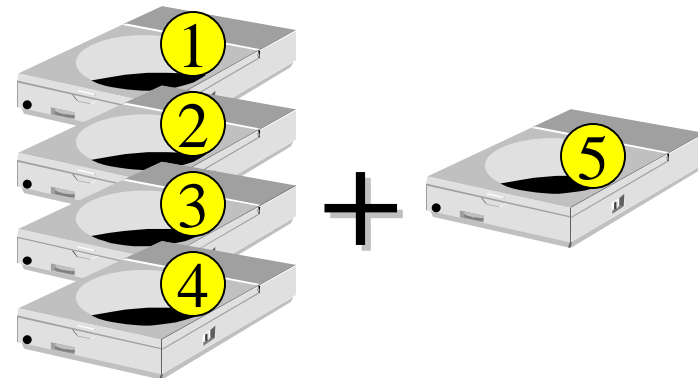
- The act of remaking a logical drive after changing RAID levels or adding a physical drive to an existing array.

### — Logical Drive:

- A virtual drive within an array that can consist of more than one physical drive.
- Logical drives divide the contiguous storage space of an array of disk drives or a spanned group of arrays of drives.
- The storage space in a logical drive is spread across all the physical drives in the array or spanned arrays.

(Logical) Drive F:

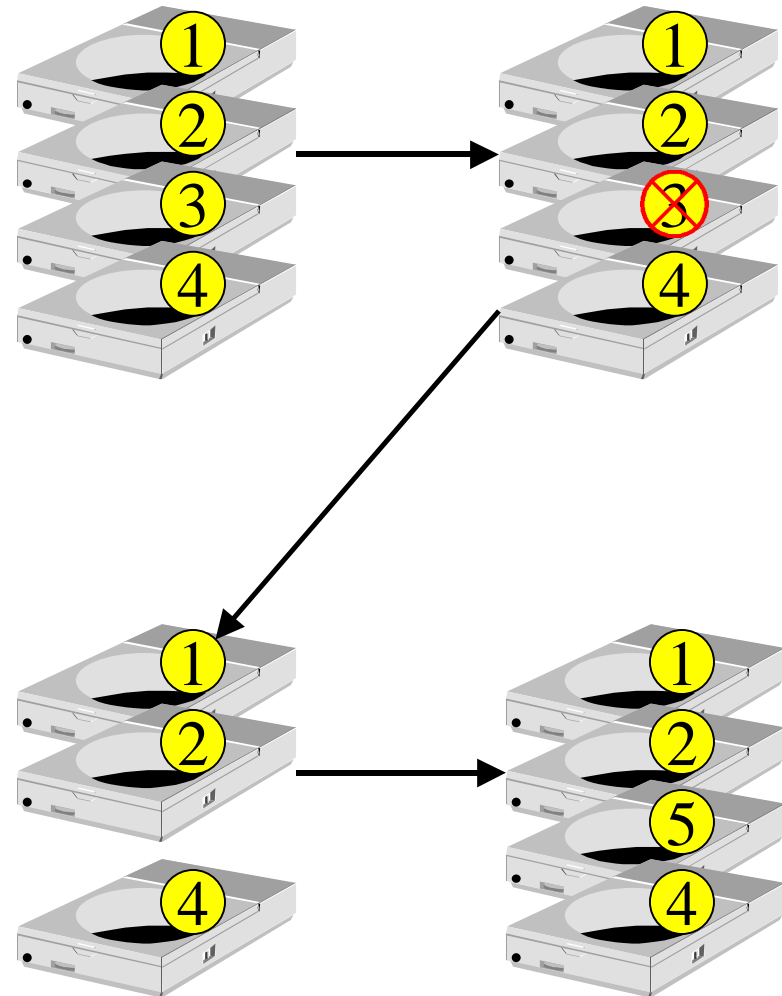
① = Physical Disk



# Definitions: Hot Swap

## ◆ Hot Swap

- The substitution of a replacement unit in a disk subsystem for a defective one, where the substitution can be performed while the subsystem is running (performing its normal functions).
- Hot swaps are manual.
- Hot swap drives allow a system administrator to replace a failed disk drive in a server without powering down the server and suspending network services.

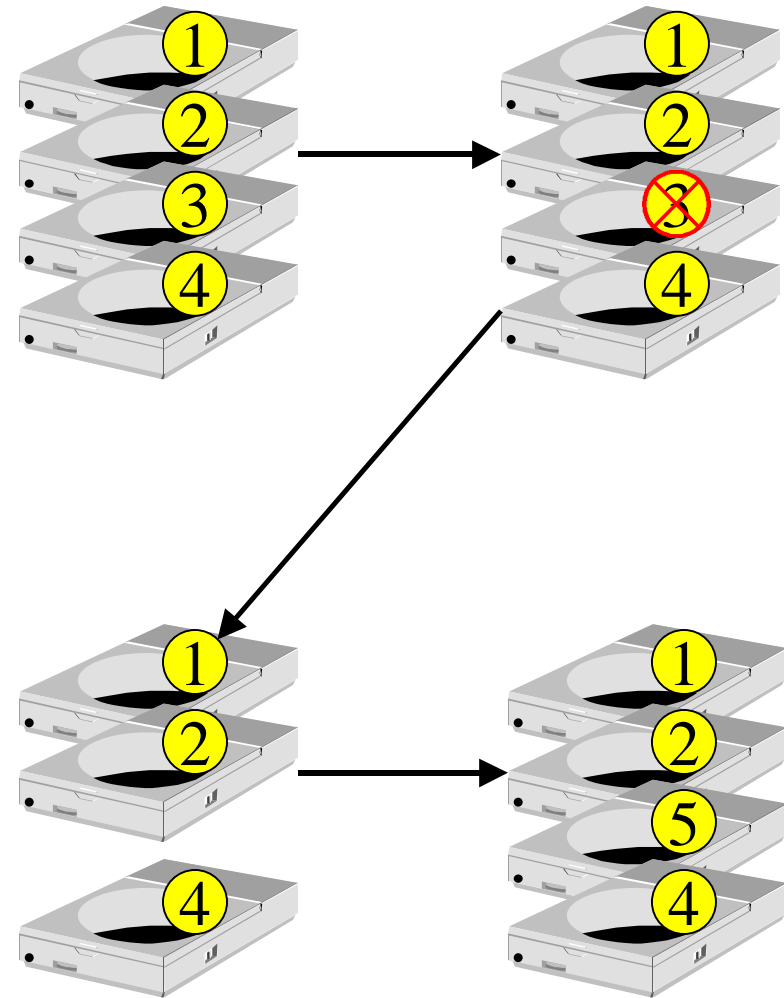


# Definitions: Hot Swap (Cont.)

## ◆ Hot Swap

- The hot swap drive simply pulls out from its slot in the drive cage because all power and cabling connections are integrated into the server backplane.
- Then the replacement hot swap drive can slide into the slot.
- Hot swapping only works for RAID 1, 3, 5, 10, 30, and 50 configurations.

## ◆ ONLY DEFECTIVE DRIVES CAN BE HOT SWAPPED



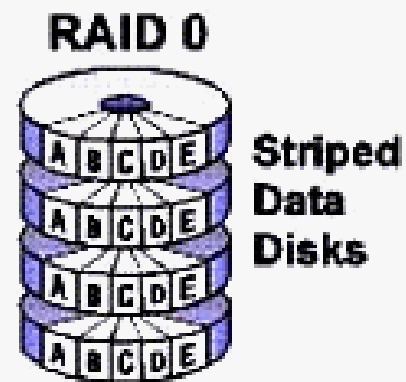
# *Definitions: Parity*

## ◆ Parity

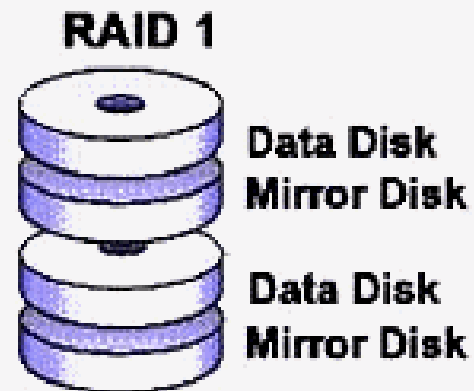
- An extra bit added to a byte or word to reveal errors in storage (in RAM or disk) or transmission.
- Parity is used to generate a set of redundancy data from two or more parent data sets.
- The redundancy data can be used to reconstruct one of the parent data sets. However, parity data does not fully duplicate the parent data sets.
- In RAID, this method is applied to entire drives or stripes across all disk drives in an array.
- Parity consists of dedicated parity drive, in which the parity of the data on two or more drives is stored on an additional drive, and distributed parity, in which the parity data are distributed among all the drives in the system.
- If a single drive fails, it can be rebuilt from the parity and the corresponding data on the remaining drives.

# General RAID Levels

- ◆ **RAID 0**
  - Striping



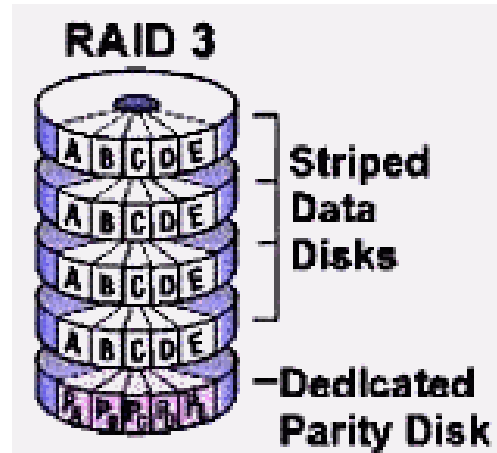
- ◆ **RAID 1**
  - Mirroring



# General RAID Levels

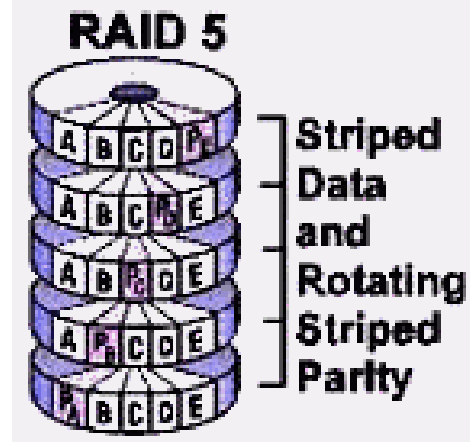
## ◆ RAID 3

- Striping with Dedicated Parity Drive



## ◆ RAID 5

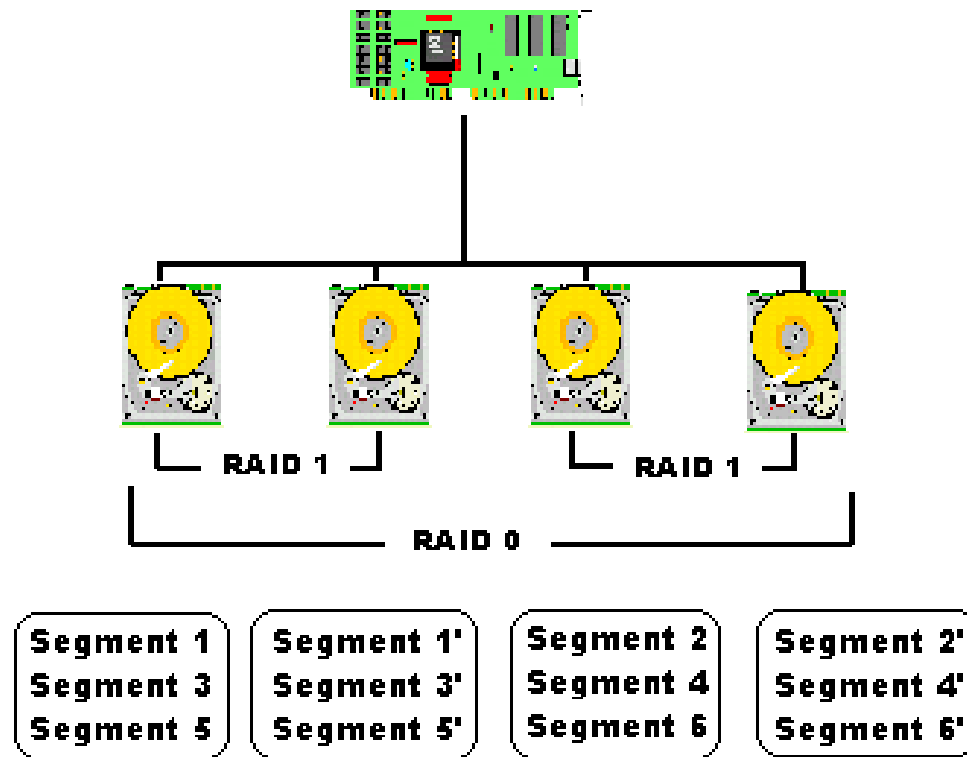
- Striping with Distributed Parity



# Advanced RAID Levels

## ◆ RAID 10

— Two RAID 1's Striped

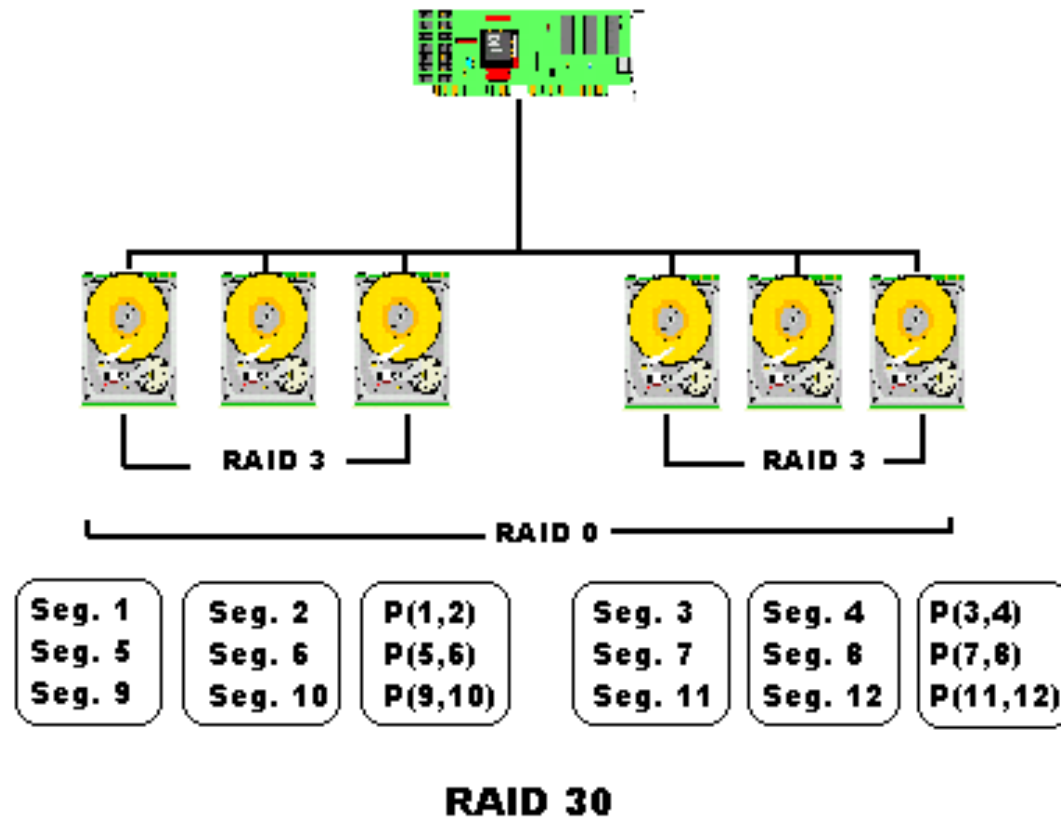


**RAID 10**

# Advanced RAID Levels

## ◆ RAID 30

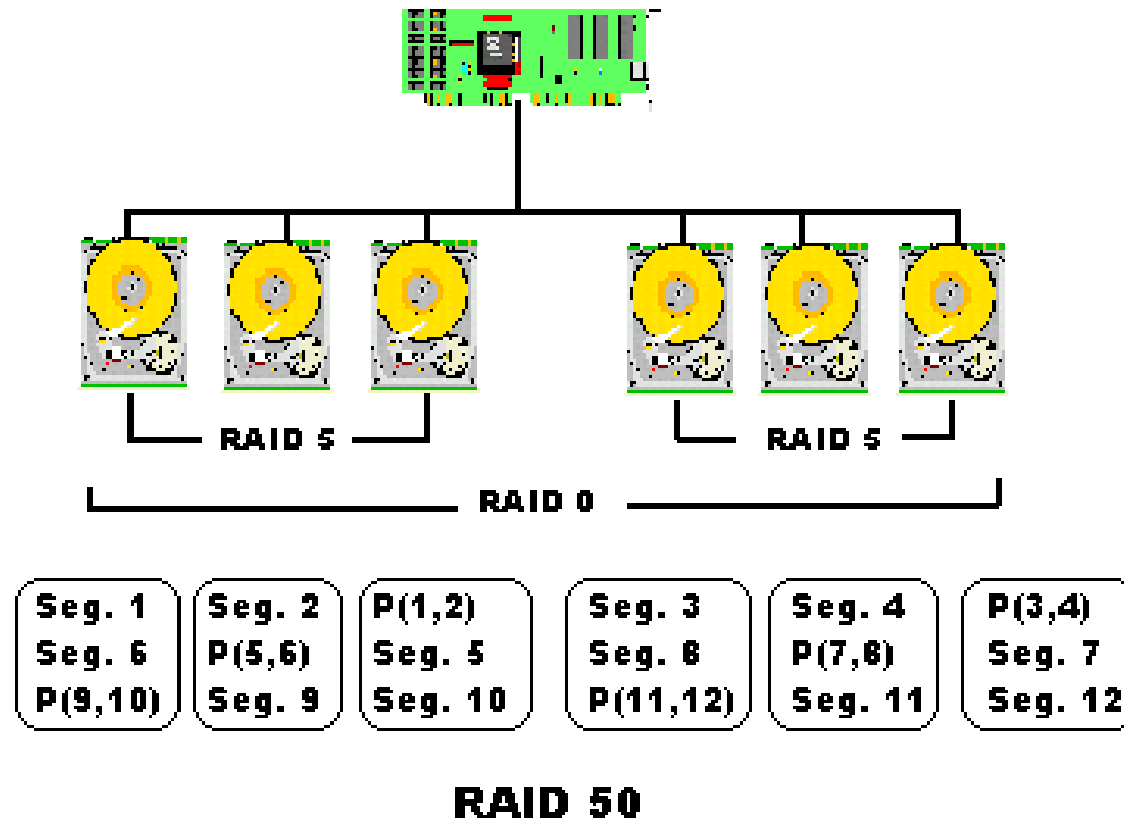
— Two RAID 3's Striped



# Advanced RAID Levels

## ◆ RAID 50

— Two RAID 5's Striped



# *RAID Review*

## ◆ **What is RAID?**

- Redundant Array of Independent Disks
- Allows Several Hard Drives to Act As a Single Drive to the Operating System
- Can be either Software or Hardware
  - Software uses Processor Time and offers less protection
  - Hardware allows system to run normally without slowing down

## ◆ **How does AMI fit in?**

- With BIOS and Motherboard experience, RAID was next logical step for AMI
- AMI produces Hardware RAID Solutions

## ◆ **Who do we compete against?**

- Primary competitors in RAID Market are:
  - Mylex
  - DPT
  - Adaptec