RAID

RAID

- RAID or Redundant Array of Independent Disks, is a technology to connect multiple secondary storage devices and use them as a single storage media.

- RAID consists of an array of disks in which multiple disks are connected together to achieve different goals. RAID levels define the use of disk arrays.

RAID

STANDARD RAID LEVELS:

RAID 0 – Striping

RAID 1 – Mirroring

RAID 2 – Redundancy Through Hamming Code

RAID 3 – Bit Interleaved Parity

RAID 4 – Block Interleaved Parity

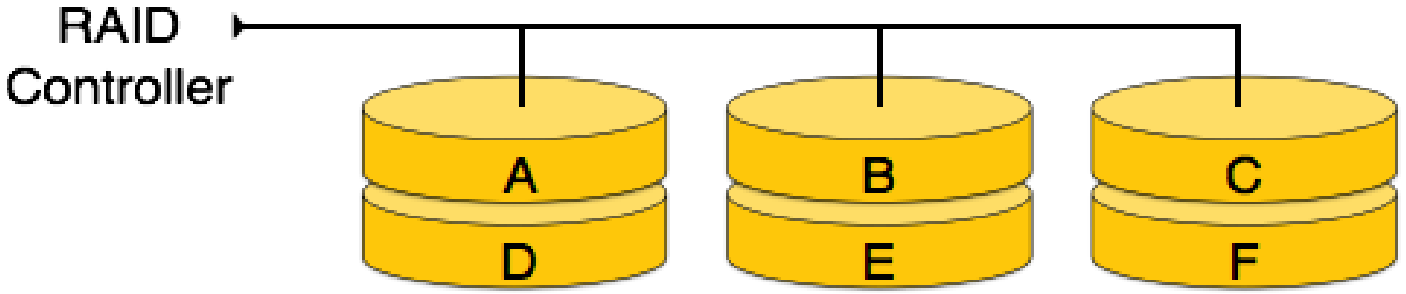
RAID 5 – Striping and Parity

RAID 6 – P+Q Redundancy

RAID

RAID 0

- In this level, a striped array of disks is implemented.
- The data is broken down into blocks and the blocks are distributed among disks.
- Each disk receives a block of data to write/read in parallel.
- It enhances the speed and performance of the storage device.
- There is no parity and backup in Level 0.



RAID

RAID 0:

Advantages:

- In this level, throughput is increased because multiple data requests probably not on the same disk.
- This level full utilizes the disk space and provides high performance.
- It requires minimum 2 drives.

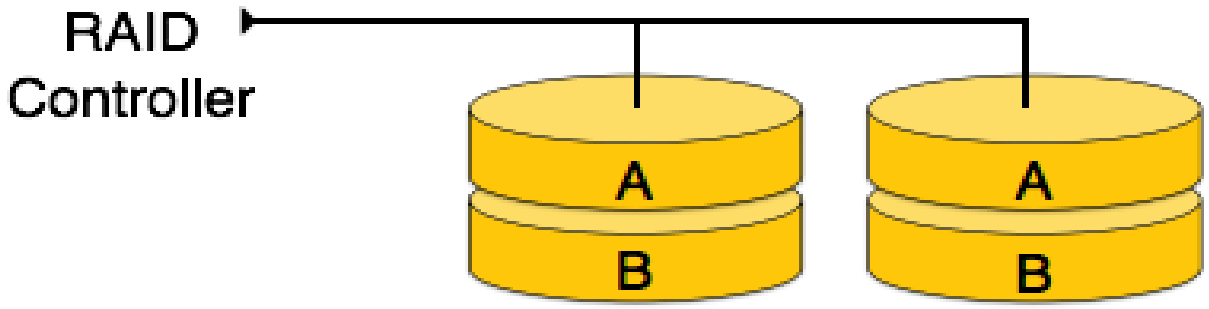
Disadvantages:

- It doesn't contain any error detection mechanism.
- The RAID 0 is not a true RAID because it is not fault-tolerance.
- In this level, failure of either disk results in complete data loss in respective array.

RAID

RAID 1:

- RAID 1 uses mirroring techniques.
- When data is sent to a RAID controller, it sends a copy of data to all the disks in the array.
- RAID level 1 is also called **mirroring** and provides 100% redundancy in case of a failure.



RAID

RAID 1:

Advantages:

- The main advantage of RAID 1 is fault tolerance. In this level, if one disk fails, then the other automatically takes over.
- In this level, the array will function even if any one of the drives fails.

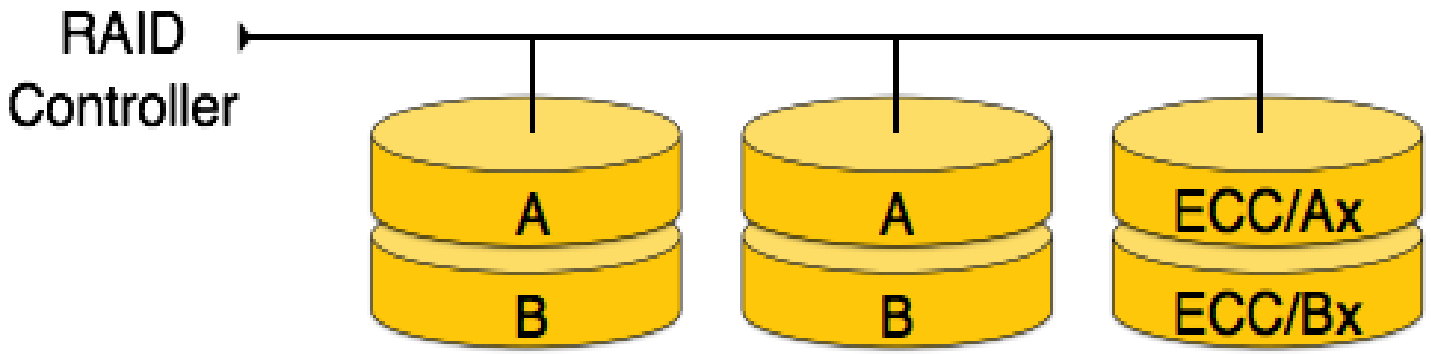
Disadvantages:

- In this level, one extra drive is required per drive for mirroring, so the expense is higher.

RAID

RAID 2:

- RAID 2 records Error Correction Code using Hamming distance for its data, striped on different disks.
- Like level 0, each data bit in a word is recorded on a separate disk and ECC codes of the data words are stored on a different set disks.
- Due to its complex structure and high cost, RAID 2 is not commercially available.



RAID

RAID 2:

Advantages:

- This level uses one designated drive to store parity.
- It uses the hamming code for error detection.

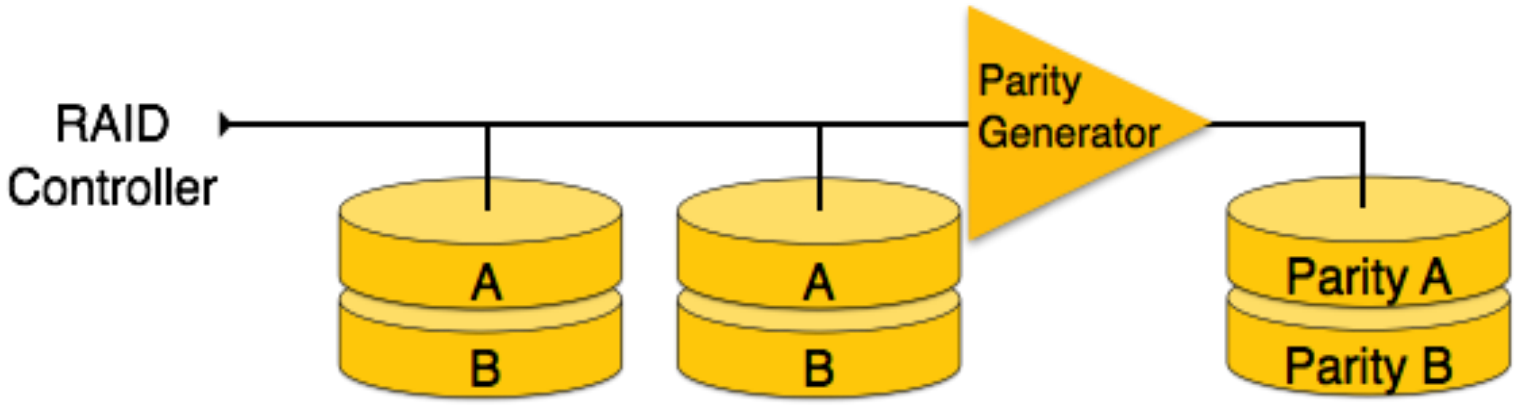
Disadvantages :

- It requires an additional drive for error detection.

RAID

RAID 3:

- RAID 3 stripes the data onto multiple disks.
- The parity bit generated for data word is stored on a different disk.
- This technique makes it to overcome single disk failures.



RAID

RAID 3:

Advantages:

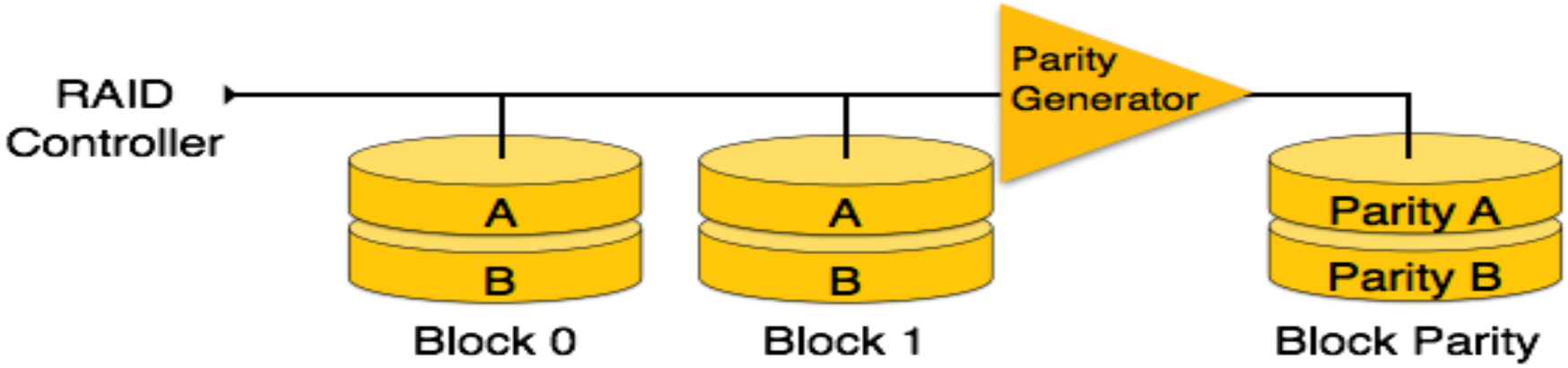
- In this level, data is regenerated using parity drive.
- It contains high data transfer rates.
- In this level, data is accessed in parallel.

Disadvantages:

- It required an additional drive for parity.
- It gives a slow performance for operating on small sized files.

RAID

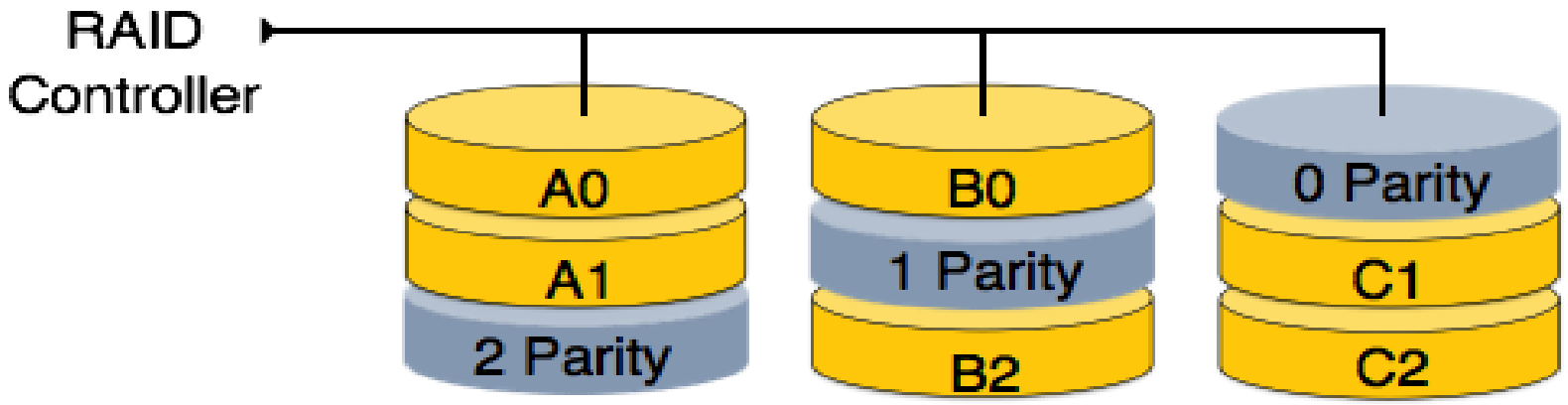
- **RAID 4:**
- In this level, an entire block of data is written onto data disks and then the parity is generated and stored on a different disk.
- Note that level 3 uses byte-level striping, whereas level 4 uses block-level striping. Both level 3 and level 4 require at least three disks to implement RAID.



RAID

RAID 5:

- RAID 5 writes whole data blocks onto different disks, but the parity bits generated for data block stripe are distributed among all the data disks rather than storing them on a different dedicated disk.
- It consists of block-level striping with DISTRIBUTED parity.



RAID

RAID 5:

Advantages:

- This level is cost effective and provides high performance.
- In this level, parity is distributed across the disks in an array.
- It is used to make the random write performance better.

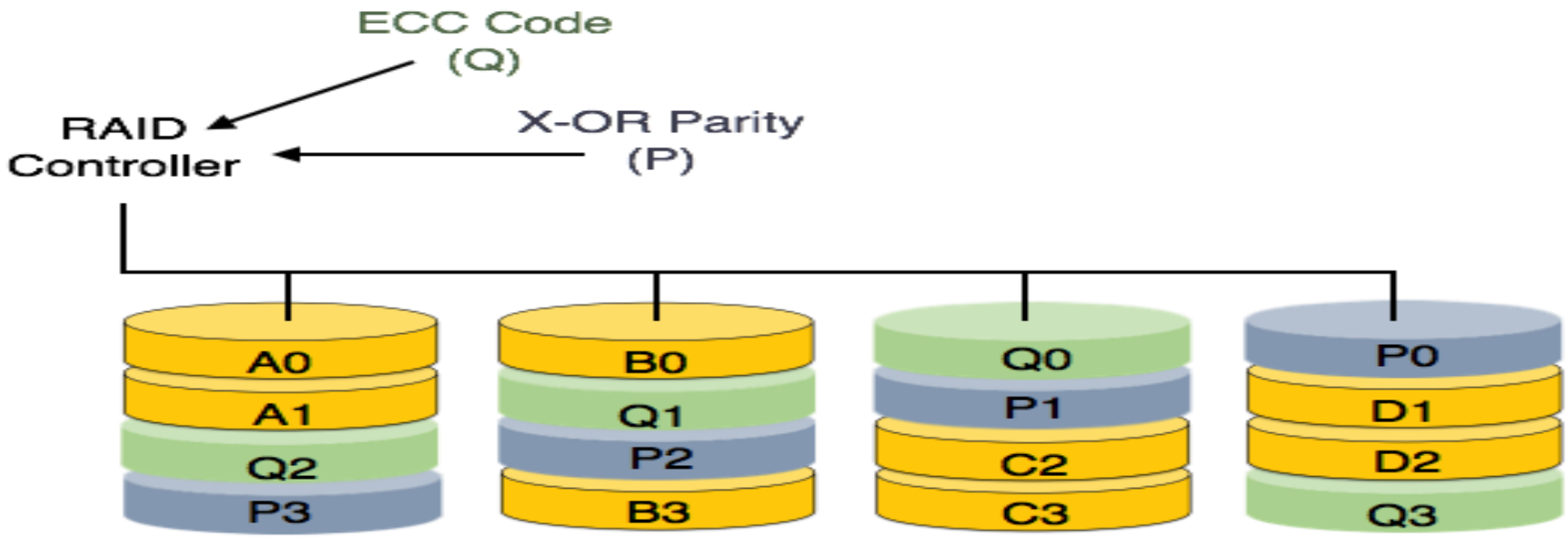
Disadvantages:

- In this level, disk failure recovery takes longer time as parity has to be calculated from all available drives.
- This level cannot survive in concurrent drive failure.

RAID

RAID 6:

RAID 6 is an extension of level 5. In this level, two independent parities are generated and stored in distributed fashion among multiple disks. Two parities provide additional fault tolerance. This level requires at least four disk drives to implement RAID.



RAID

Advantages:

- This level performs RAID 0 to strip data and RAID 1 to mirror. In this level, stripping is performed before mirroring.
- In this level, drives required should be multiple of 2.

Disadvantages:

- It is not utilized 100% disk capability as half is used for mirroring.
- It contains very limited scalability.

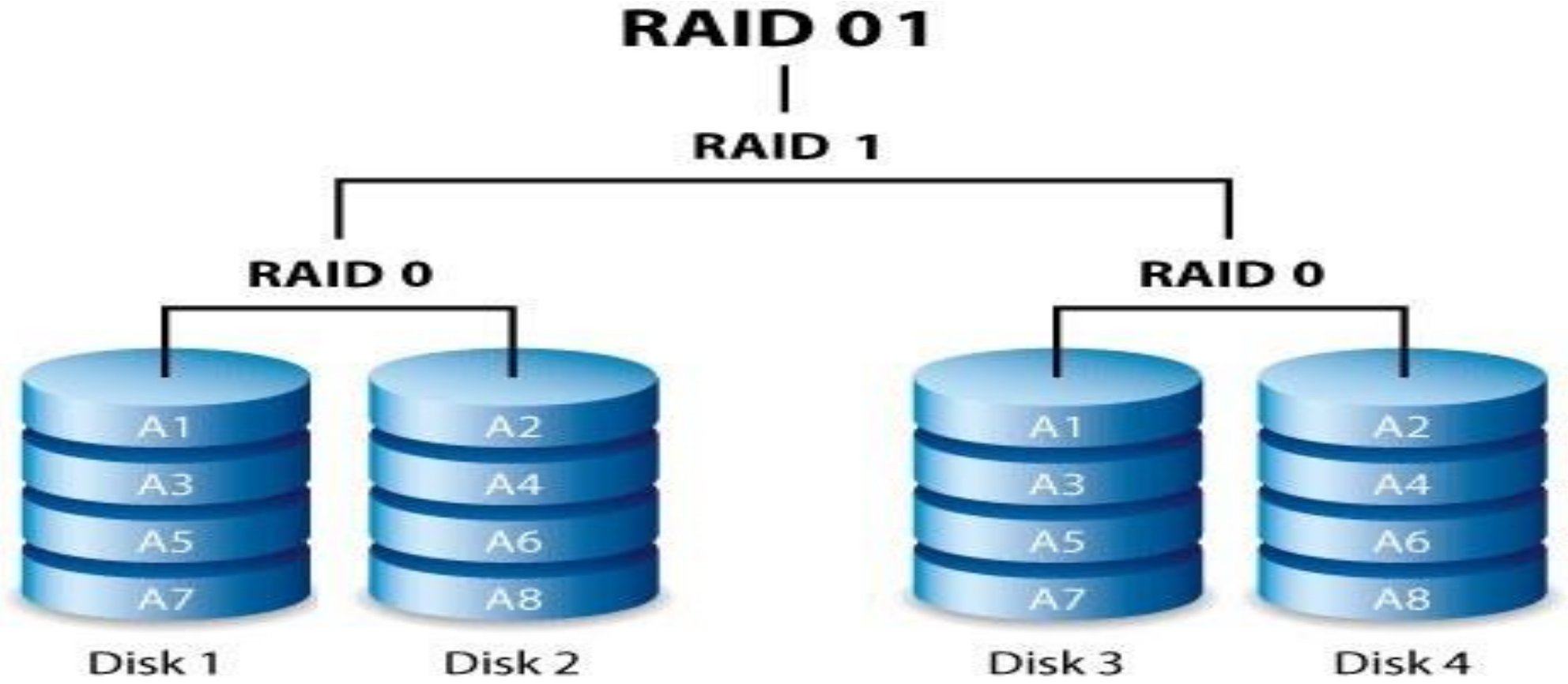
NESTED RAID LEVELS

RAID 01 OR RAID(0+1):

- **RAID 01**, also called **RAID 0+1**, is a RAID level using a mirror of stripes, achieving both replication and sharing of data between disks.
- The usable capacity of a RAID 01 array is the same as in a RAID 1 array made of the same drives, in which one half of the drives is used to mirror the other half.
- At least four disks are required in a standard RAID 01 configuration, but larger arrays are also used

NESTED RAID LEVELS

RAID 01 OR RAID(0+1)



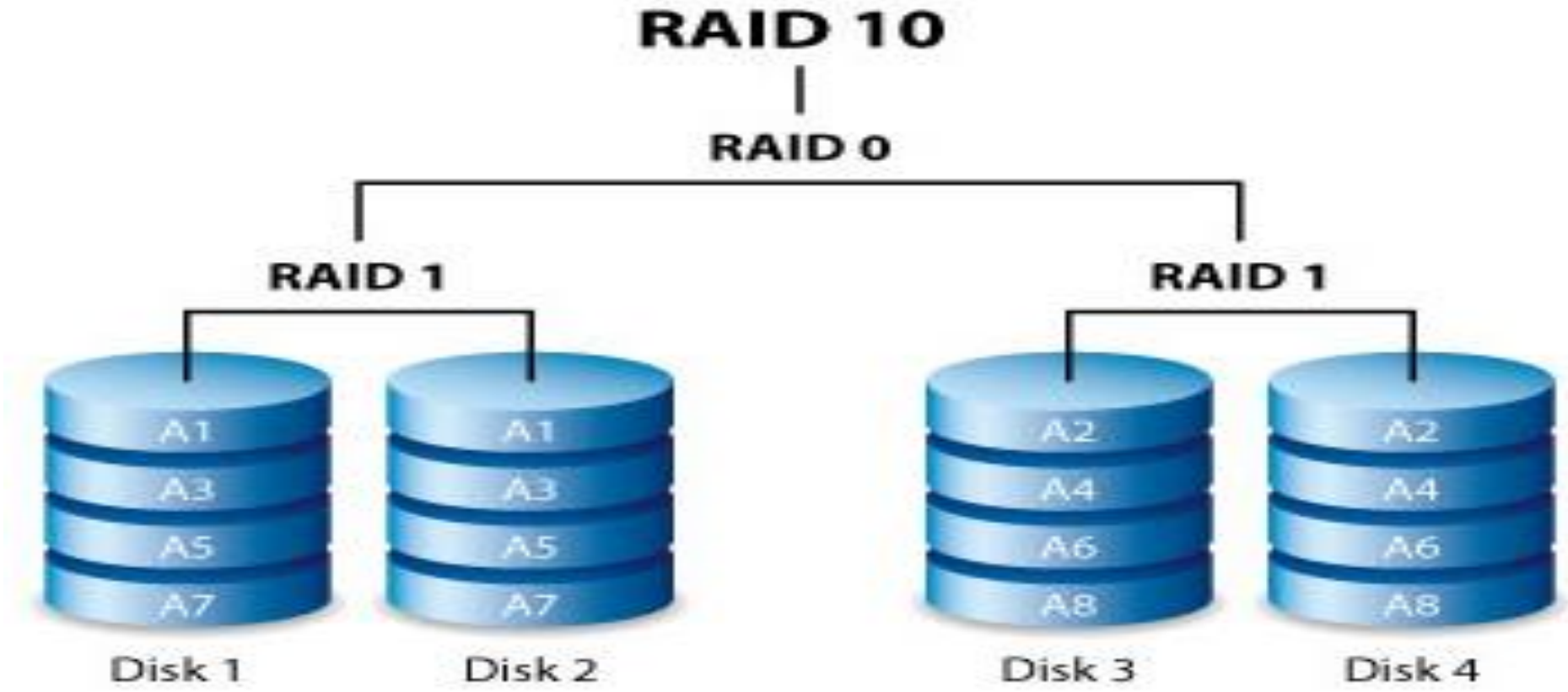
NESTED RAID LEVELS

RAID 10 OR RAID(1+0):

- **RAID 10**, also called **RAID 1+0** and sometimes **RAID 1&0**, is similar to RAID 01 with an exception that two used standard RAID levels are layered in the opposite order; thus, RAID 10 is a stripe of mirrors.
- RAID 10, as recognized by the storage industry association and as generally implemented by RAID controllers, is a RAID 0 array of mirrors, which may be two- or three-way mirrors,[6] and requires a minimum of four drives

NESTED RAID LEVELS

RAID 10 OR RAID(1+0)



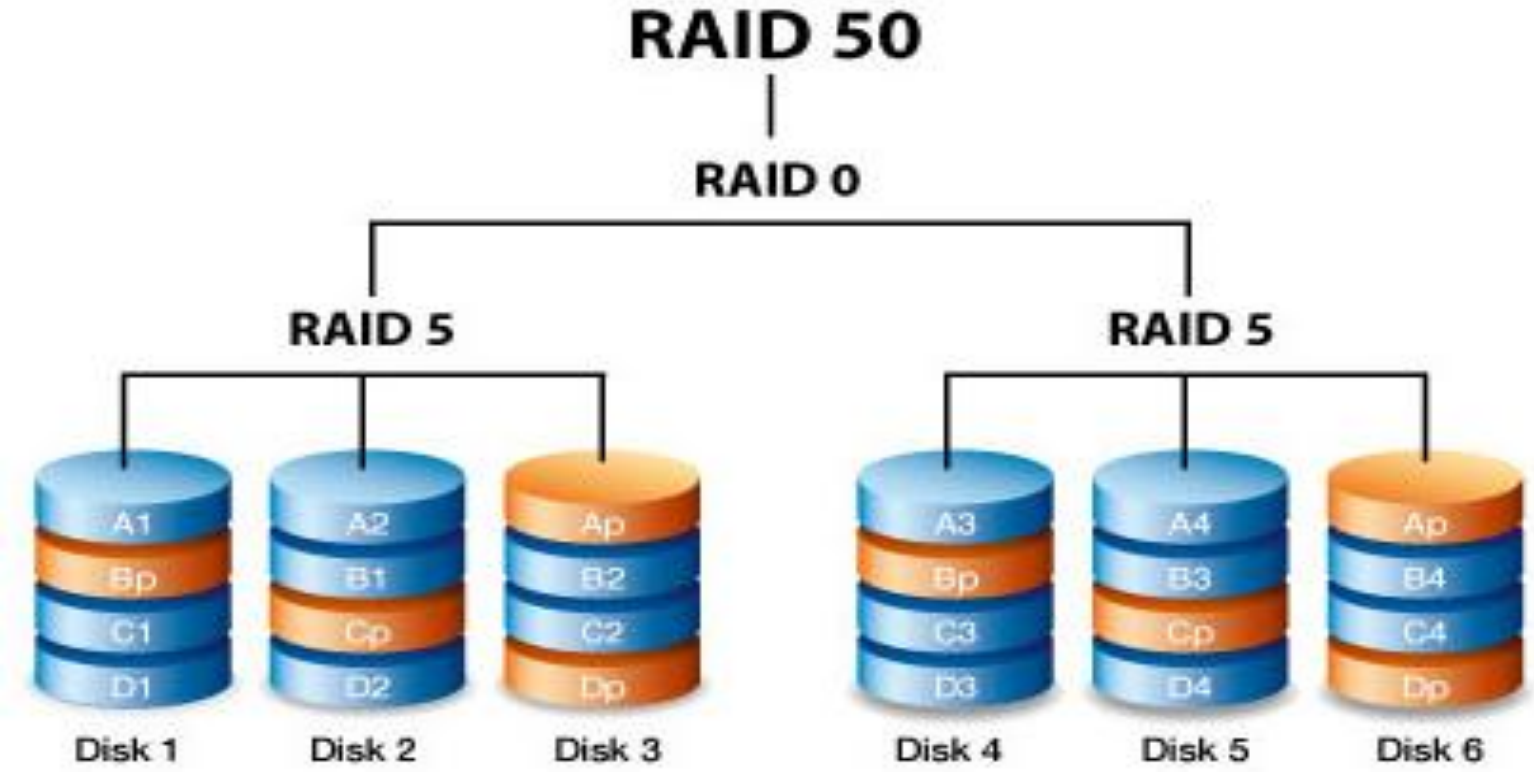
NESTED RAID LEVELS

RAID 50 OR RAID(5+0):

- RAID 50 combines RAID 0 striping with RAID 5 parity.
- Due to the speed of RAID 0 striping, RAID 50 improves upon RAID 5 performance, especially during writes.
- It also offers more protection than a single RAID level.
- Use RAID 50 when you need improved fault tolerance, high capacity and impressive write speeds.
- A minimum of six hard drives is required for a RAID 50 array.
- A RAID 50 array with a high number of hard drives increases the time to initialize and rebuild data due to the large storage capacity.

NESTED RAID LEVELS

RAID 50 OR RAID(5+0):



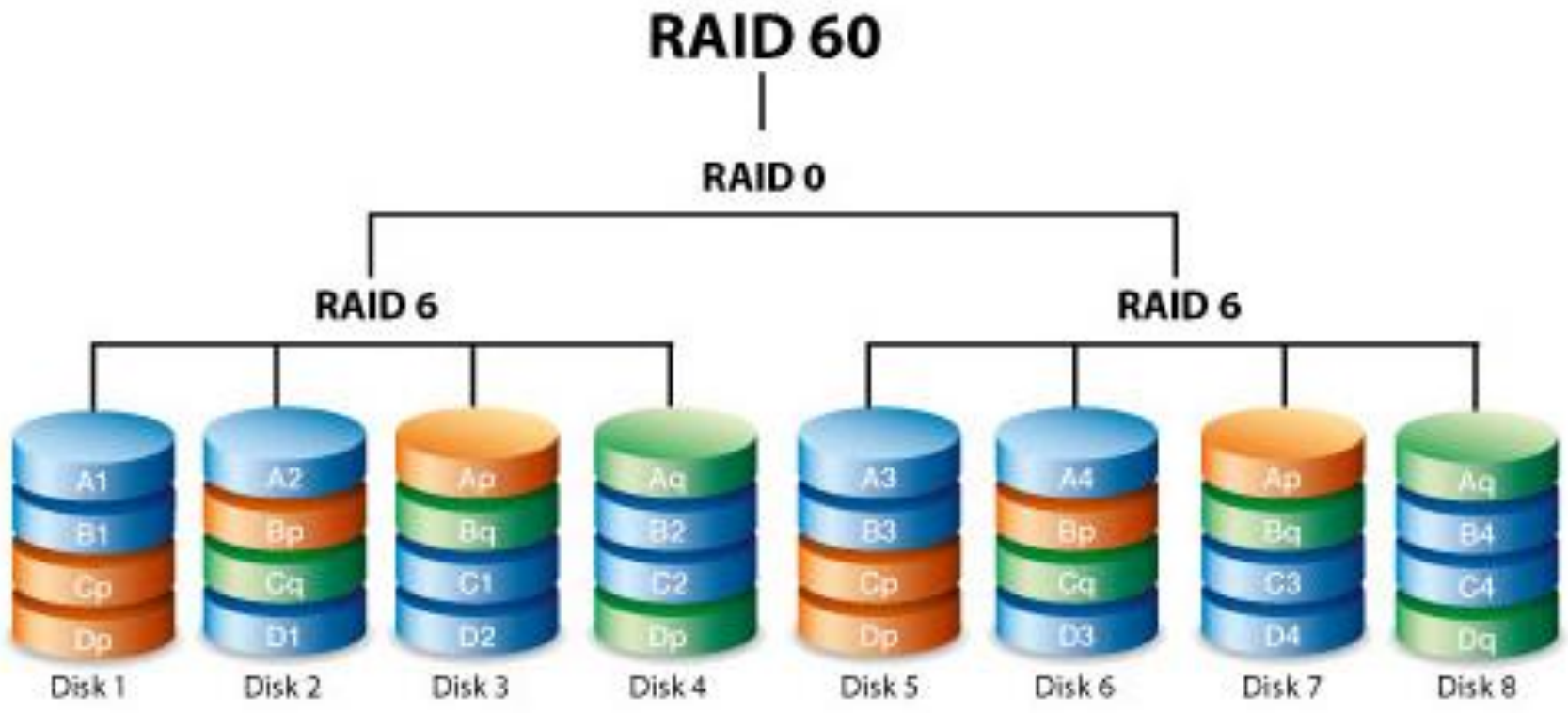
NESTED RAID LEVELS

RAID 60 OR RAID(6+0):

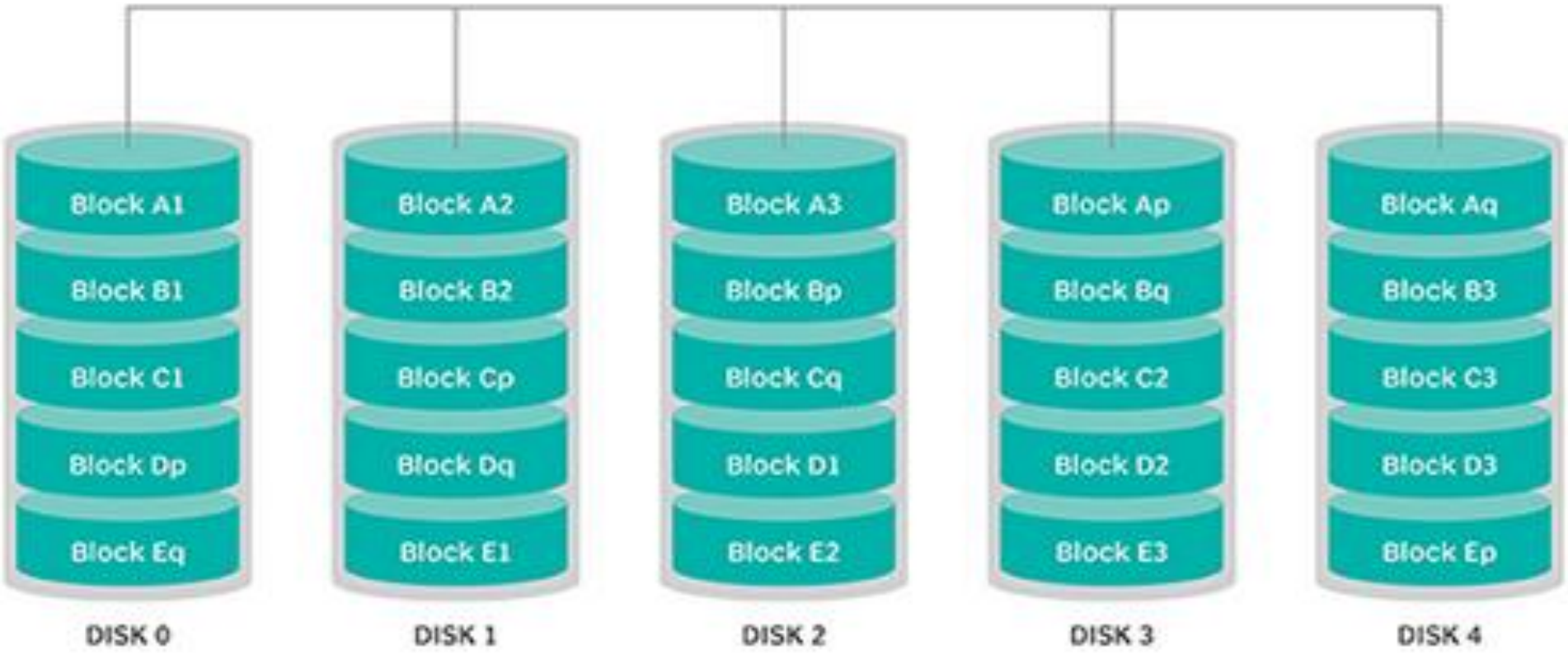
- RAID 60 combines RAID 0 striping with RAID 6 double parity.
- Due to the speed of RAID 0 striping, RAID 60 improves upon RAID 6 performance.
- It also offers more protection than a single RAID level.
- Use RAID 60 when you need improved fault tolerance, high capacity and impressive write speeds.
- A minimum of eight hard drives is required for a RAID 60 array.
- Since a RAID 60 array has a high number of hard drives, the time to initialize and rebuild data is longer than a single RAID level.

NESTED RAID LEVELS

RAID 60 OR RAID(6+0):



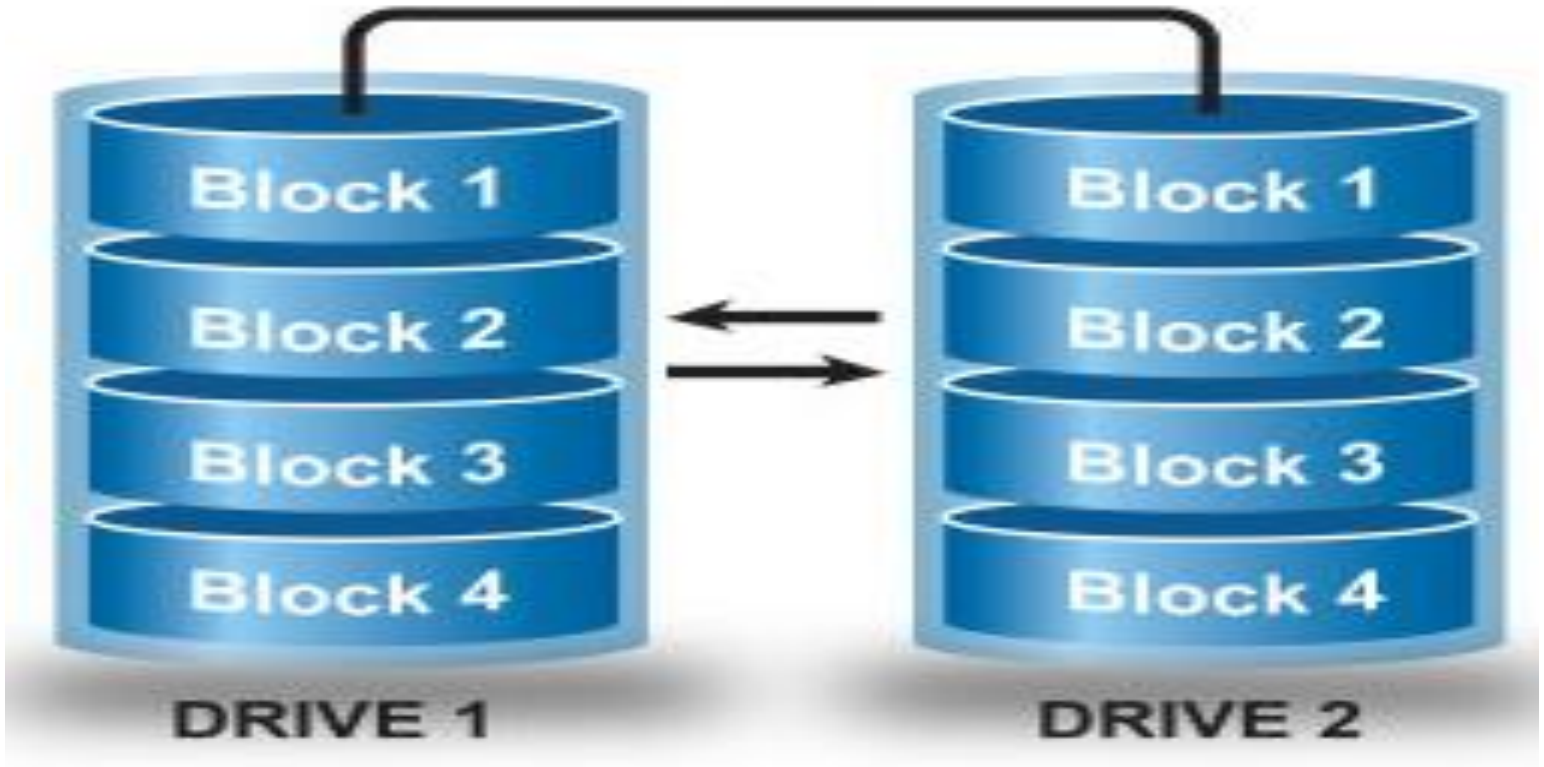
IDENTIFY THE RAID LEVEL



IDENTIFY THE RAID LEVEL

RAID 6

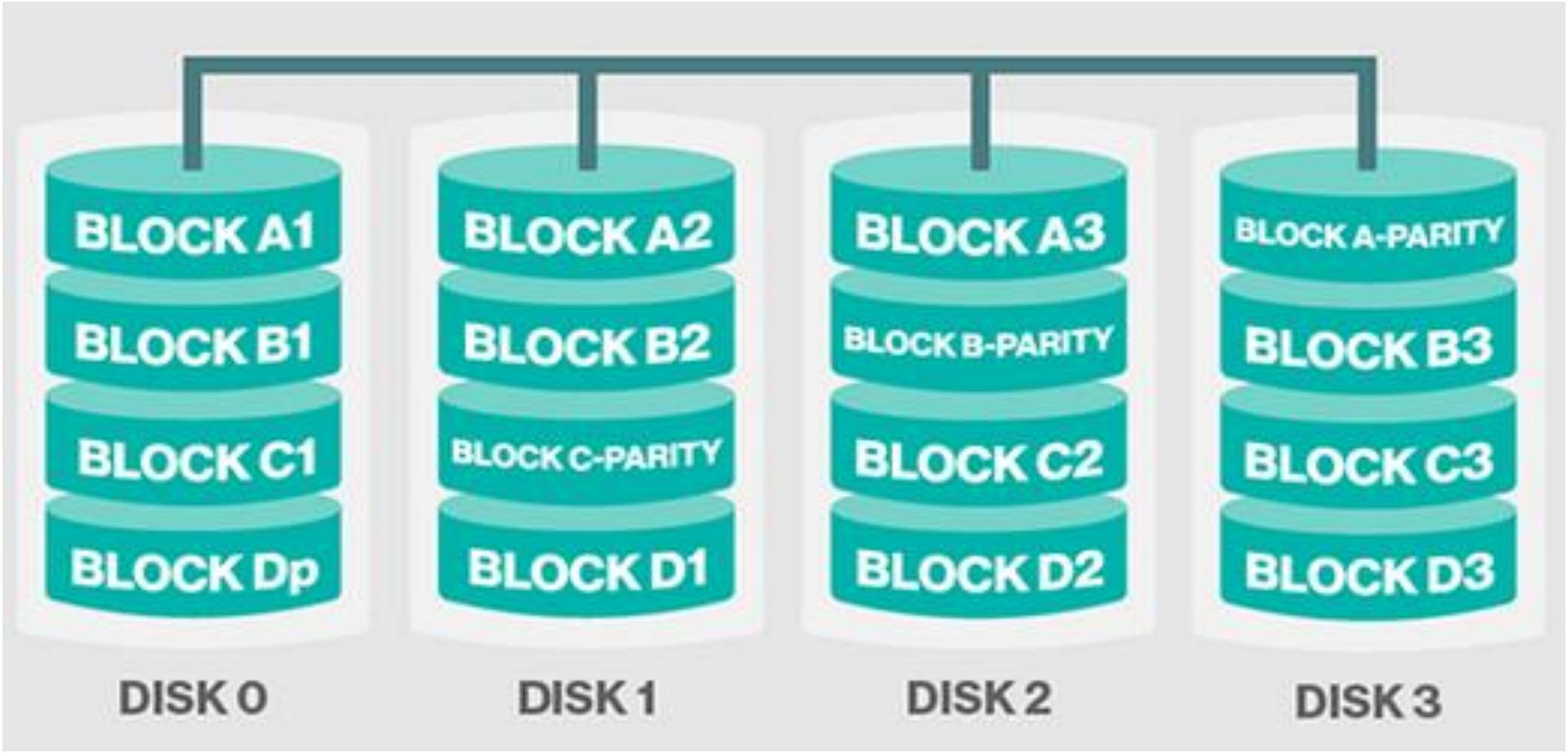
IDENTIFY THE RAID LEVEL



IDENTIFY THE RAID LEVEL

RAID 1

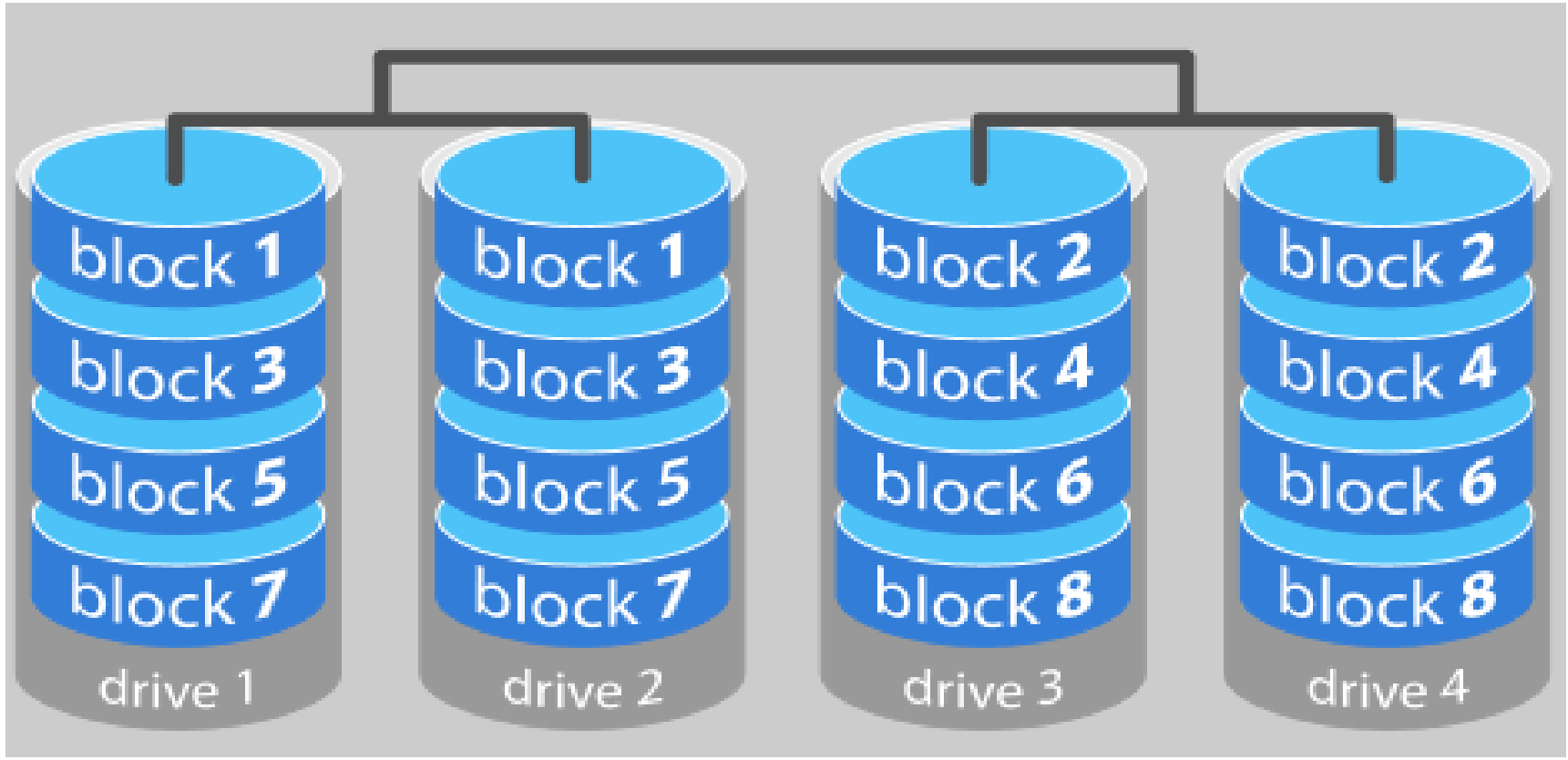
IDENTIFY THE RAID LEVEL



IDENTIFY THE RAID LEVEL

RAID 5

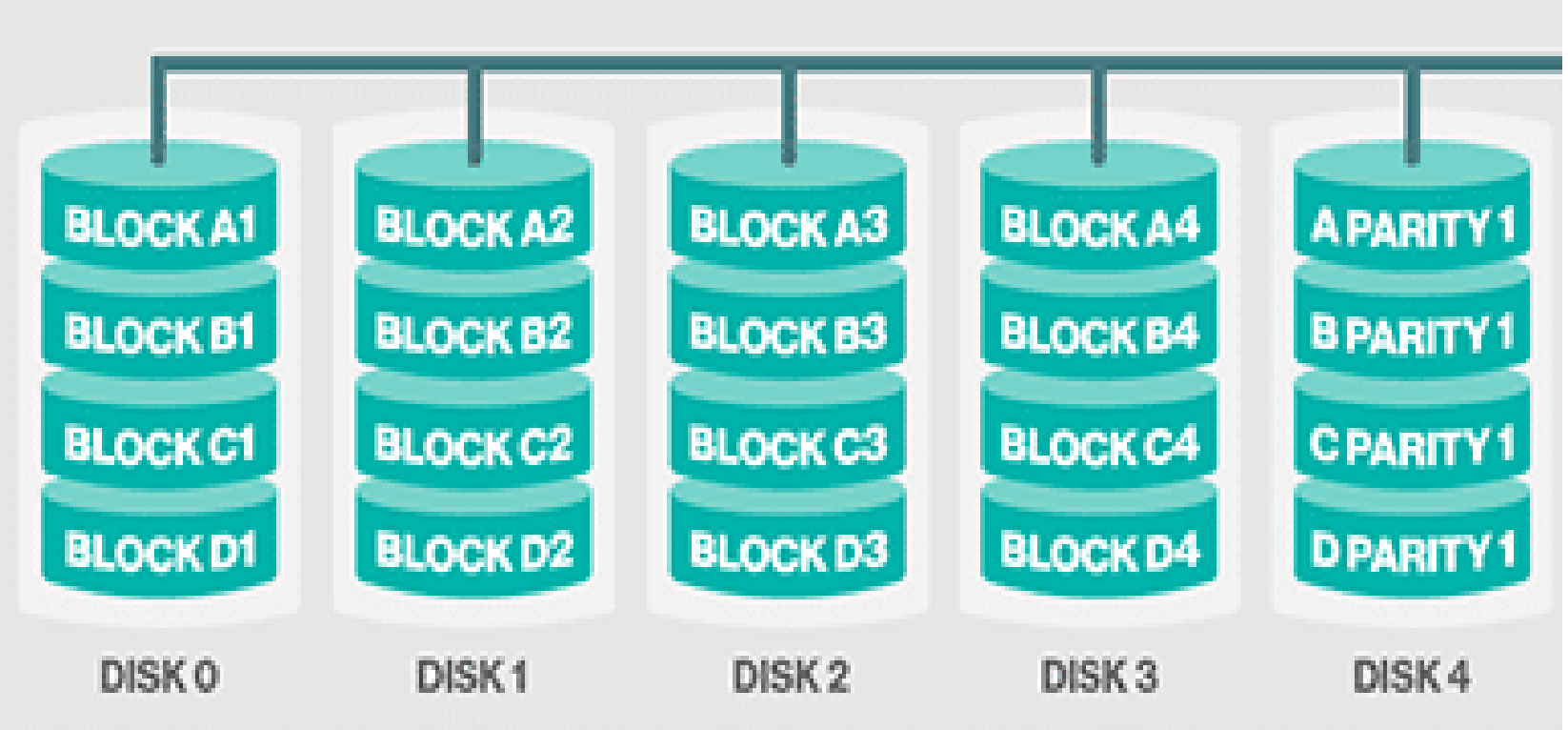
IDENTIFY THE RAID LEVEL



IDENTIFY THE RAID LEVEL

RAID 1+0

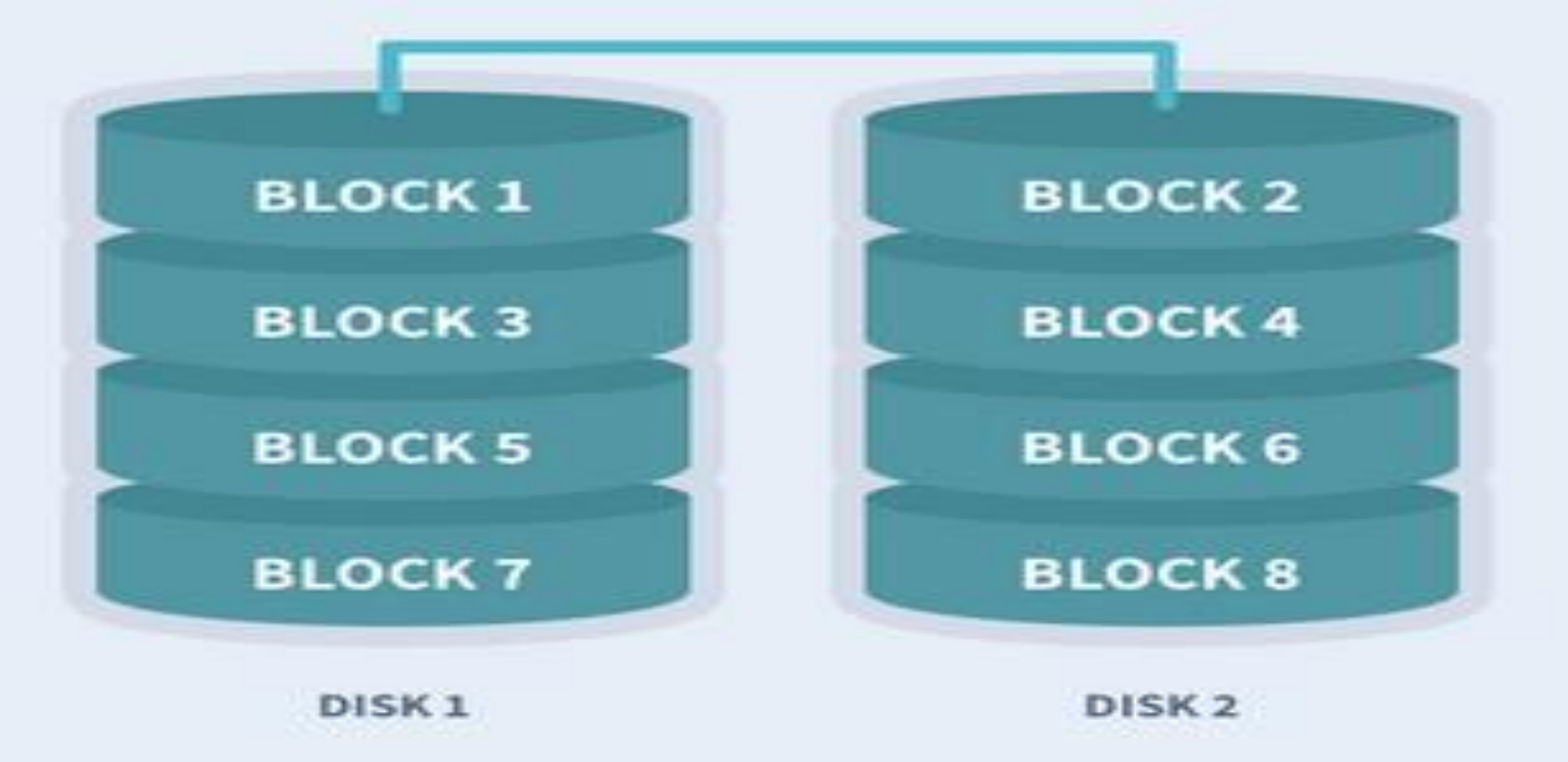
IDENTIFY THE RAID LEVEL



IDENTIFY THE RAID LEVEL

RAID 3

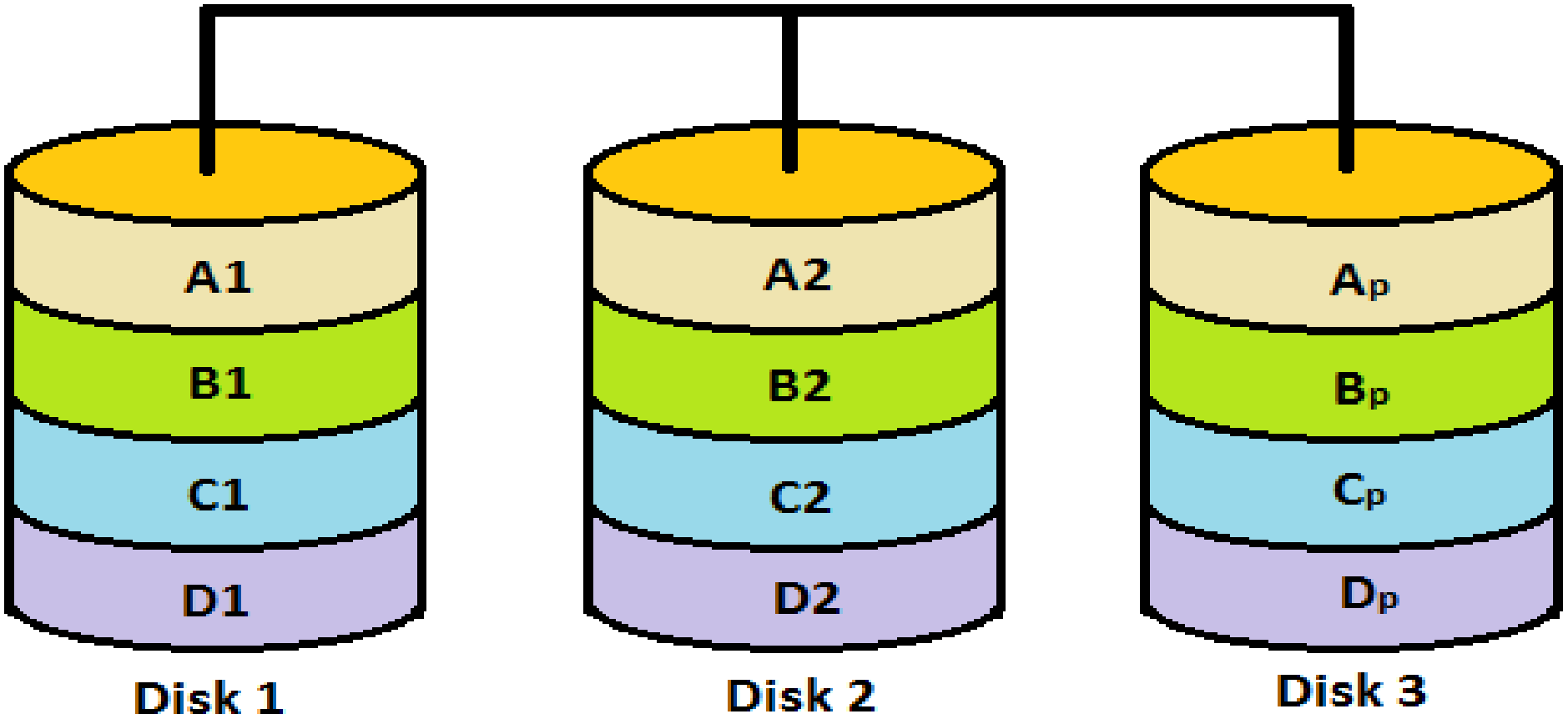
IDENTIFY THE RAID LEVEL



IDENTIFY THE RAID LEVEL

RAID 0

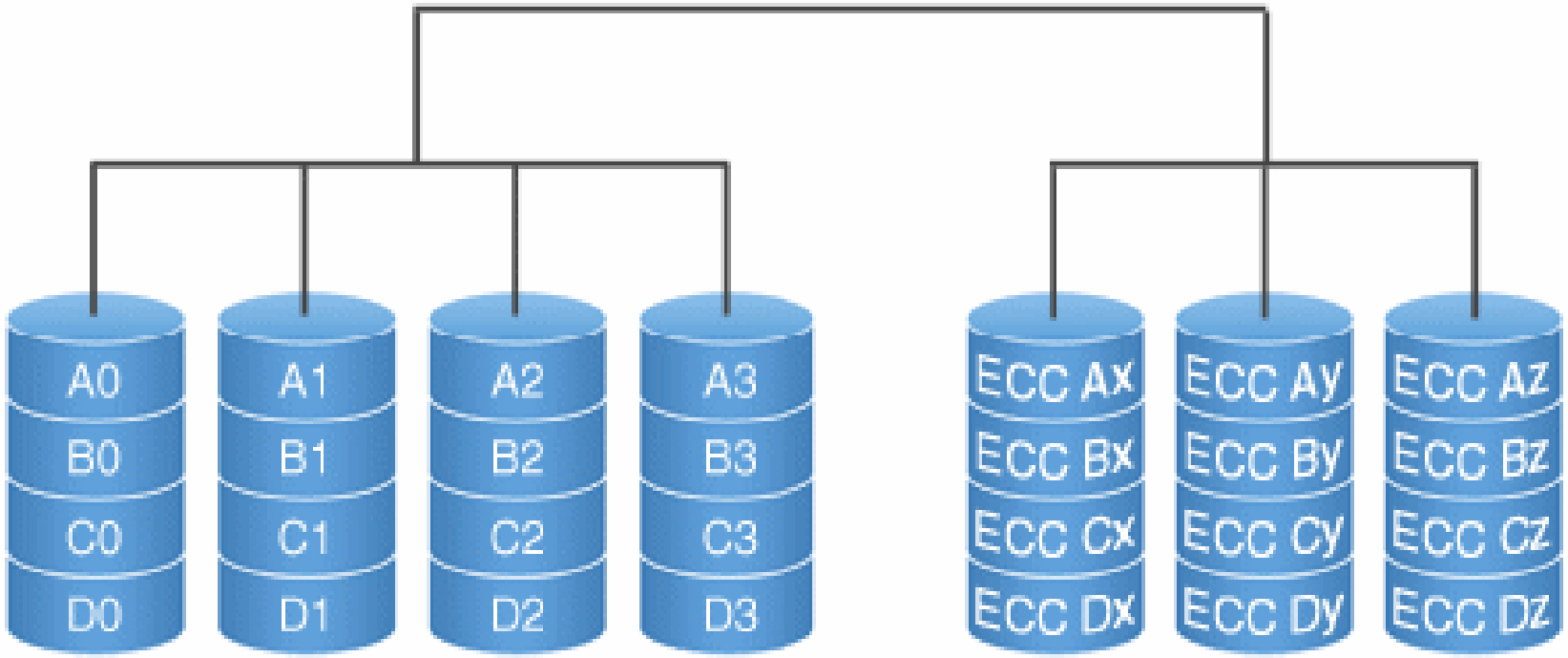
IDENTIFY THE RAID LEVEL



IDENTIFY THE RAID LEVEL

RAID 3

IDENTIFY THE RAID LEVEL



IDENTIFY THE RAID LEVEL

RAID 2