RAID 1 vs. RAID 0: Which level is best for data protection?

RAID 1 and RAID 0 are two of the most basic RAID levels. While one offers better performance, backup admins may choose the level that provides redundancy to better protect data.

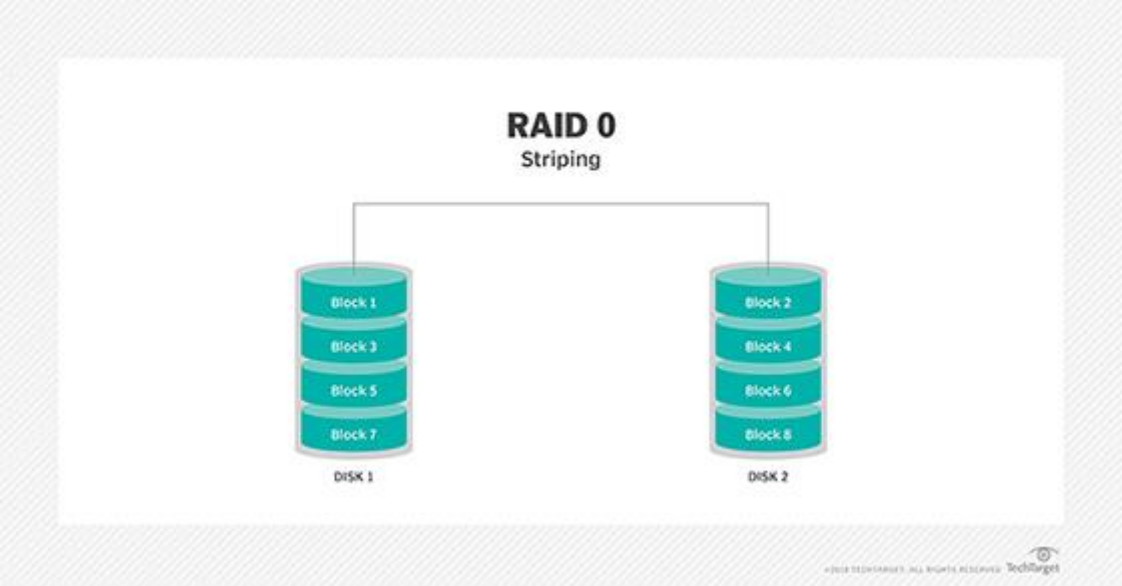
The right RAID level is a crucial decision for storage admins. When it comes to data backup, the RAID level will determine the level of redundancy and protection against failure.

RAID, or redundant array of independent disks, refers to the way in which multiple disks are arranged and work together to host a single volume. The different arrangements of these disks are RAID levels.

When an administrator chooses a RAID level, they usually do so based on the hardware requirements and the RAID level's characteristics. These affect storage capacity, performance and fault tolerance. Two of the most basic RAID levels are RAID 0 and RAID 1. If admins cannot choose between the benefits of these levels, there are other options.

What is RAID 0?

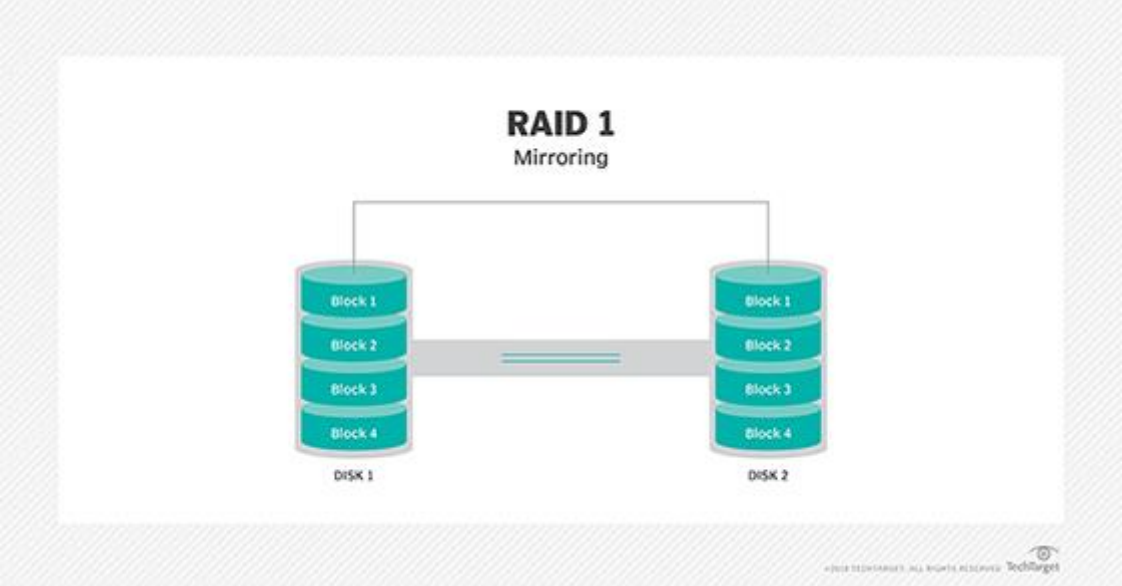
RAID 0 is also known as a *stripe set*. It works by distributing data across two or more disks in a way that maximizes both storage capacity and performance. Suppose that a file was written to a RAID 0 array consisting of three disks. One-third of the file would reside on each of the three disks. The advantage to RAID 0 is that, because three disks are used, the file can be written and read three times more quickly than with a single disk.



The primary disadvantage to using a RAID 0 set is that stripe sets do not offer any redundancy, meaning that there is no protection against disk failure. If any one of the disks in a RAID 0 array were to fail, then the entire stripe set will fail.

What is RAID 1?

RAID 1 is known as a *mirror set*. RAID 1 arrays usually consist of two disks, although some mirror sets include additional mirrors. These two disks act as exact duplicates of one another. All write operations are directed to both disks so that the two disks are always in sync with one another. Unlike RAID 0, RAID 1 provides protection against disk failure. The storage volume will remain accessible even if one of the disks in the mirror set were to fail. However, a mirror cannot withstand the failure of multiple disks unless multiple mirrors are present.



It is also worth noting that, because each disk in the mirror set contains a complete copy of the data, the set has an overhead level of 50%. This means that the mirror set's usable storage capacity is equal to that of a single disk. Likewise, the RAID 1 set's performance is also the same as it would be for a single disk.

RAID 1 vs. RAID 0?

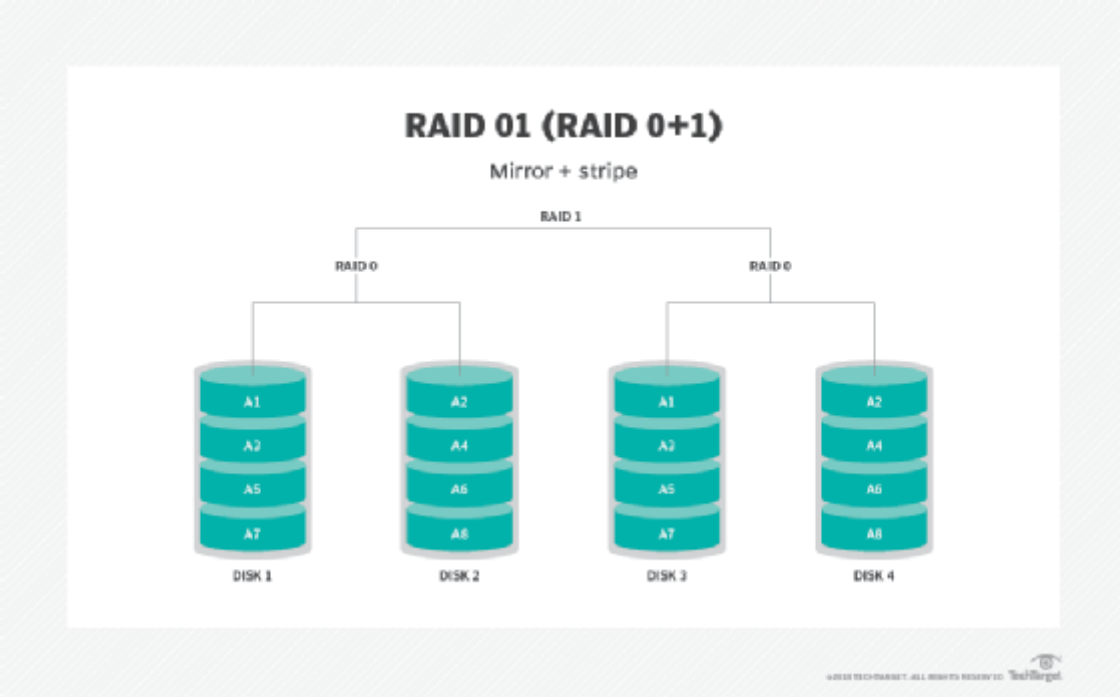
When choosing between RAID 1 and RAID 0, organizations must decide what is the most important to them: performance, capacity or fault tolerance. RAID 0 offers the best performance and capacity but no fault tolerance. Conversely, RAID 1 offers fault tolerance but does not offer any capacity of performance benefits. While performance is an important factor, backup admins may prioritize fault tolerance to better protect data.

Those who determine their requirements and would prefer the best of both worlds might consider using nested RAID. Nested RAID is the combination of separate RAID levels to get the benefits of both.

There are two architectures that can be created by combining RAID 0 and RAID 1. These include RAID 01 (RAID 0+1) and RAID 10 (RAID 1+0). Although these architectures are similar to one another, they are not the same thing.

RAID 10 and RAID 01 provide identical capacities and performance, and both architectures have the same amount of storage overhead, prioritizing redundancy over capacity. The difference is that RAID 10 provides better fault tolerance in most cases because it is not limited to two groups. Suppose that a RAID 01 array suffered two simultaneous disk failures and the disks were in two different groups. Because there are only two groups total, the entire array would fail. Conversely, each disk in a RAID 10 array is a mirrored pair, so the simultaneous failure of two disks would not bring down a RAID 10 array unless the failed disks just happened to be mirrored partners of one another.

RAID 01 is a mirrored stripe set. In other words, there are two groups of disks, each acting as a stripe set. Any write operations that are sent to the first group are also sent to the second group, thereby creating two synchronized, identical stripe sets. This approach delivers the performance of RAID 0 along with the fault tolerance of RAID 1. Like RAID 1, however, 50% of the total storage capacity is lost to provide redundancy.



RAID 10 is similar to RAID 01 but with one subtle difference: Rather than being a mirrored stripe set, it acts as a stripe of mirrors. Every disk in this architecture is mirrored to another disk. This means that the RAID 10 architecture consists of a single stripe set in which all the disks are mirrored pairs.