



Project Evaluation

R.A.I.D. SYSTEMS

By:
Alexis Herrera
Marfa Kleber
Felipe Cadavid



Introduction

- **Project Objective:**

- Evaluate the performance of different RAID levels (RAID 0, 1, 5)
- Compare read/write speeds, data redundancy, and rebuild times.

- **Motivation:**

- Need to improve data storage systems to handle increasing volumes of information, but also conserve reliability and security behind the data

Theoretical Framework

- **RAID (Redundant Array of Independent Disks):**
 - Combines multiple physical disks into a logical unit.
 - Common RAID levels:
 - RAID 0: Data striping without redundancy.
 - RAID 1: Data mirroring for maximum security.
 - RAID 5: Data striping with parity for a balance between capacity, protection, and performance.



Methodology

- **Configuration and Evaluation:**
 - Use of virtual disks and tools like ``mdadm`` and ``fio``.
 - Simulating workloads to analyze performance and redundancy.
- **Specific Objectives:**
 - Compare read/write speeds of RAID 0, 1, and 5.
 - Evaluate redundancy capabilities of RAID 1 and 5.
 - Measure RAID 5 rebuild times after simulated failures.

RAID Configuration (DEMO)

Attribute	/dev/md0 (RAID0)	/dev/md1 (RAID1)	/dev/md2 (RAID 5)
Version	1.2	1.2	1.2
Raid Level	raid0	raid1	raid5
Array Size	1019904	510976	1019904
Used Dev Size	N/A	510976	509952
Raid Devices	2	2	3
Total Devices	2	2	3
Active Devices	2	2	3
Working Devices	2	2	3
Failed Devices	0	0	0
Spare Devices	0	0	0
Layout	-unknown-	N/A	left-symmetric
Chunk Size	512K	N/A	512K
Consistency Policy	none	resync	resync
Events	0	17	18
Number 0	7:0 (active sync /dev/loop0)	7:2 (active sync /dev/loop2)	7:4 (active sync /dev/loop4)
Number 1	7:1 (active sync /dev/loop1)	7:3 (active sync /dev/loop3)	7:5 (active sync /dev/loop5)
Number 2	N/A	N/A	7:6 (active sync /dev/loop6)

Results

RAID Level	Read IOPS	Write IOPS	Read Throughput (MB/s)	Write Throughput (MB/s)
RAID 0	82.9k	81.0k	340 MB/s	332 MB/s
RAID 1	62.1k	43.7k	254 MB/s	179 MB/s
RAID 5	95.1k	26.4k	389 MB/s	108 MB/s



Results

- RAID 0:
 - High read/write speed.
 - No redundancy.
- RAID 1:
 - Moderate performance with excellent redundancy.
 - Recommended for environments requiring high data integrity.
- RAID 5:
 - Better read performance.
 - Good balance between performance and redundancy.
 - Lower write performance due to parity calculations.



Conclusions

- Trade-offs:
 - RAID 0: Maximum performance without data protection.
 - RAID 1: Redundancy and security with moderate performance.
 - RAID 5: Balance between performance and data protection.
- Recommendations:
 - RAID configuration selection should be based on specific workload requirements and operational needs.