Redundant Arrays of Inexpensive Disks

Definitions

N := number of disks
C := capacity of 1 disk
S := sequential throughput of 1 disk
R := random throughput of 1 disk
D := latency of one small I/O operation

Metrics: capacity, reliability, performance

Performance Metrics:
- steady-state (seq read, seq write, rand read, rand write)
- one op (read or write)

Problem C: Chunk Size

Give chunk size K, write equations for translating logical address A to a Disk and Sector.

Disk =

Sector =

Problem 0: RAID-0 Analysis

a) Capacity: what is capacity?

b) Reliability: how many disk can fail?

c) Performance: what is steady-state throughput for
   i) sequential reads
   ii) sequential writes
   iii) random reads
   iv) random writes

d) Performance: what is one-op performance for
   i) read
   ii) write

Problem 1: RAID-1 Analysis

a) Capacity: what is capacity?

b) Reliability: how many disk can fail?
c) Performance: what is steady-state throughput for
   i) sequential reads
   ii) sequential writes
   iii) random reads
   iv) random writes

d) Performance: what is one-op performance for
   i) read
   ii) write

**Problem P: What Operators Work for Parity?**

a) XOR
b) OR
c) AND

**Problem 4: RAID-4 Analysis**

a) Capacity: what is capacity?

b) Reliability: how many disk can fail?

c) Performance: what is steady-state throughput for
   i) sequential reads
   ii) sequential writes
   iii) random reads
   iv) random writes

d) Performance: what is one-op performance for
   i) read
   ii) write

**Problem 5: RAID-5 Analysis**

a) Capacity: what is capacity?

b) Reliability: how many disk can fail?

c) Performance: what is steady-state throughput for
   i) sequential reads
   ii) sequential writes
   iii) random reads
   iv) random writes

d) Performance: what is one-op performance for
   i) read
   ii) write