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
d) ADD
e) MULTIPLY

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