Nets and Ops - Part 1

1. EAT = a + p S a = base access time p = page fault rate s = service a page fault

a = 150 nano = 150 X 10^-9

p = 1.0 X 10^-5 = 0.00001

S = S\_min=150 micro + 5milli

**Conversion**

a = 150 nano

p= 0.00001

S= Smin=150 micro + 5milli = 5 X 10^-3 = 5000 X 10^-6 = 150 + 5000 = 5150 X 10^-6 = 5150000 nano

**Calculation**

p X S = 0.00001 X 5150000 = 51.5

a + p = 150 + 51.5 = 201.5

**Answer to 3 significant figures**

202

1. Degradation = 100 \* (EAT - a)/a

**Calculation**

EAT – a = 202 – 150 = 52 nano

100\*(EAT - a) = 100\* 52 = 5200

100 \* (EAT - a)/a = 5200 / 150 = 34.7%

**Answer to 3 significant figures**

34.7%



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Memory size | Cost | Cost w/ SSD | Page-fault rate (p) | Degradation w/ HDD | Degradation w/ SSD |
| 2x 0.5 GiB | $0 (current state of machine) | $34 | 1.0E^-5 | 34.7% | 9.33% |
| 2x 1 GiB | $10 | $44 | 0.5E^-5 |  |  |
| 2x 2 GiB | $20 | $54 | 0.25E^-5 |  |  |
| 2x 4 GiB | $40 | $74 | 0.125E^-5 |  |  |
| 2x 8 GiB | $80 | $114 | 0.0625E^-5 |  |  |
| 2x 16 GiB | $160 | $194 | 0.03125E^-5 |  |  |

S = S\_min + K / D

a = 150 nanoseconds  
S\_min = 150,000 nanoseconds  
k = 500,000,000

Standard Configuration:

D = 100MiB  
S = 5,150,000 nanoseconds  
  
5,150,000 – S\_min = 5,150,000 – 150,000 nanoseconds = 5,000,000 nanoseconds

5,000,000 = k/ D = 5,000,000 = k / 100MiB/s (D is known because the default configuration of the machine includes a HDD rather than SSD)

k = 5,000,000 x D = 5000,000 x 100 = 500,000,000

k = 500,000,000  
  
S\_min = 150,000 nanoseconds  
k = 500,000,000  
D = Hard Drive = 100 MiB

1GB Ram + SSD

D = 400MiB/s

S=150,000 + 500,000,000 / 400 = 1,400,000

EAT = 150 + (0.00001 x 1,400,000) = 164

Degradation = 100 x (164 – 150) / 150 = 9.3%