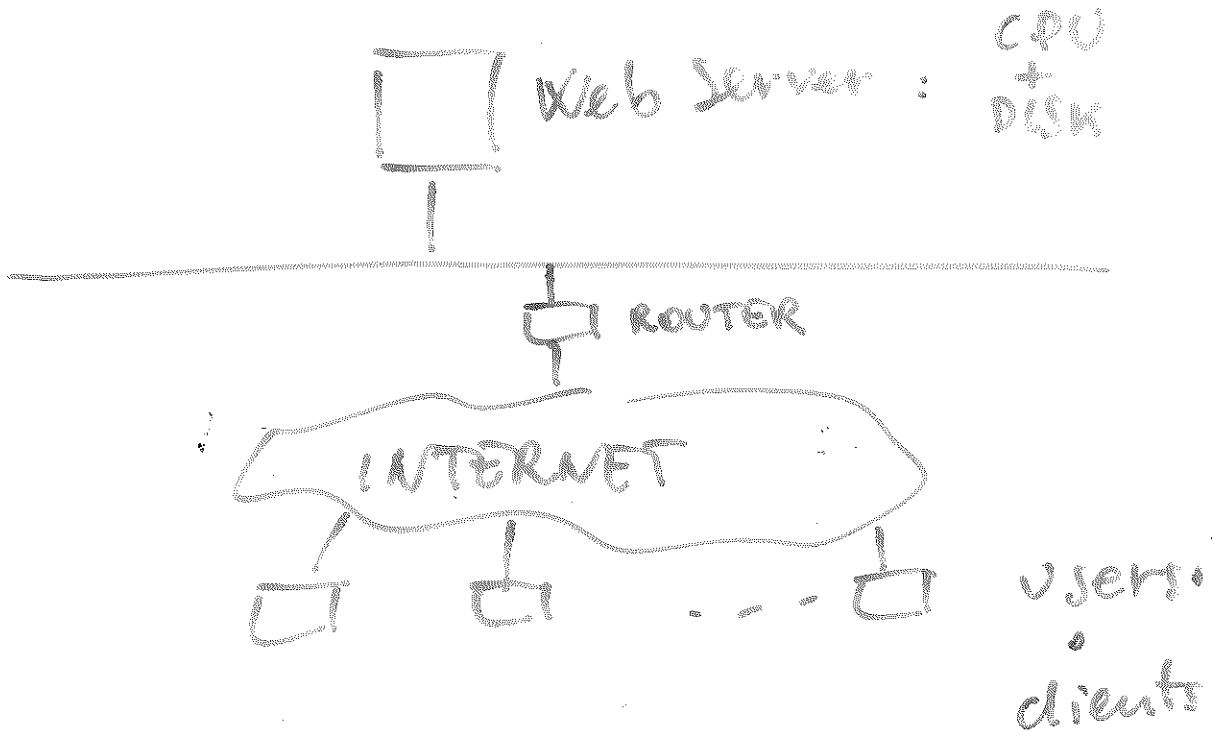
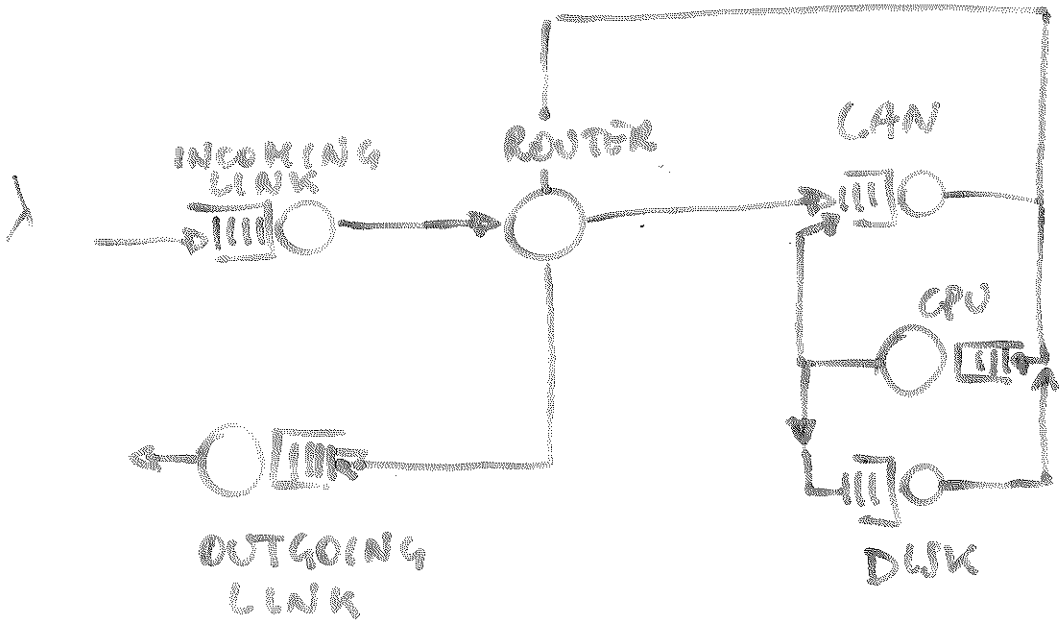
- SINGLE WEB SERVER
- MIRRORED WEB SERVERS:
  - WITHOUT FILE SYSTEM
  - WITH FILE SYSTEM

SINGLE WEB SERVER





DIFFERENT DOCUMENT SIZE

=

DIFFERENT SERVICE DEMAND

=

MULTI CLASS $(r: 1 \ldots R)$

$$\lambda_r = \lambda \times \text{PercentSize}_r$$

INPUT PARAMETERS

- Same of previous examples

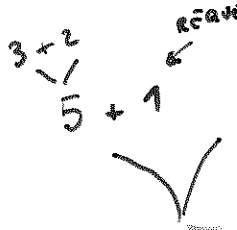
+

- CPUTimePerHTTPRequest$_r$ (in sec.)
- DiskTime: Disk time per KB transferred (msec)

SERVICE DEMANDS

$$D_{Link,r} = NetworkTime(AverSize\ HTTP\ Rep,\ Link\ Bandwidth) +$$

$$3 \times NetworkTime(0.00001,\ Link\ Bandwidth)$$



$$D_{router,r} = \lceil NDatagrams(1024 \times Document\ Size) + 6 \rceil \times Router\ Latency \times 10^{-6}$$

$$D_{LAN,r} = NetworkTime(AverageSite\ HTTP\ Rep,\ LAN\ Bandw.)$$

$$+ NetworkTime(1024 \times Document\ Size\ r,\ LAN\ Bandw.)$$

$$+ 5\ NetworkTime(0.00001,\ LANBandwidth)$$

$$D_{out,r} = NetworkTime(DocumentSize_r, LinkBandwidth) + 2 \times NetworkTime(0.0001, LinkBandwidth)$$

$$D_{CPU,r} = CPUTimePer\#TTSPRequest_r + f(\bar{n}) \times CPU_{OVH}$$

$$\bar{n} = \sum_{r=1}^{R} (n_{CPU,r} + n_{disk,r})$$

$$D_{disk,r} = DocumentSize_r \times DiskTime/1000$$

$CPUTimePerHTTPRequest_r$

intrinsic service demand

$f(\overline{m}) \times CPU_{OVH}$

load-dependent service demand:

- protocol type
- message size
- # of simultaneous connections
- operating system overheads:
  - network buffer management
  - data structure manipulation
  - error checking
  - checksum computation

$\overline{n}$ è funzione dei f_{DISK} e f_{CPU} che non si conoscono al momento della costruzione del modello

⇓

APPROCCIO ITERATIVO

1) Risolvere il modello multiclasse "aperto", assumendo $CPUOvh = 0$ e ottenere $\overline{n}$

2) Ricalcolare il nuovo valore di D_{CPU}

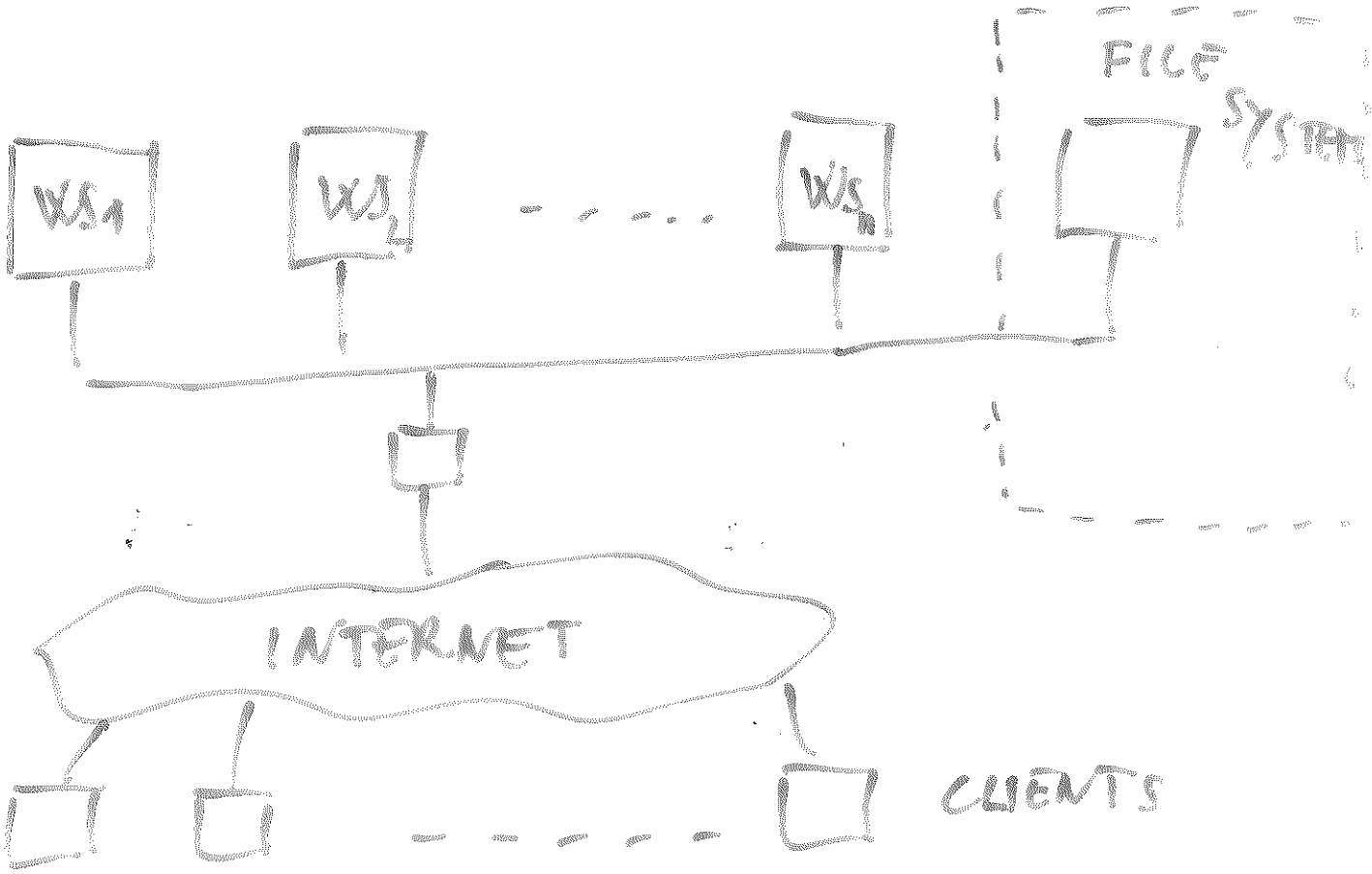
$D_{CPU} = CPUTimePerHTTPRequest + f(\overline{n}) CPUOvhd$

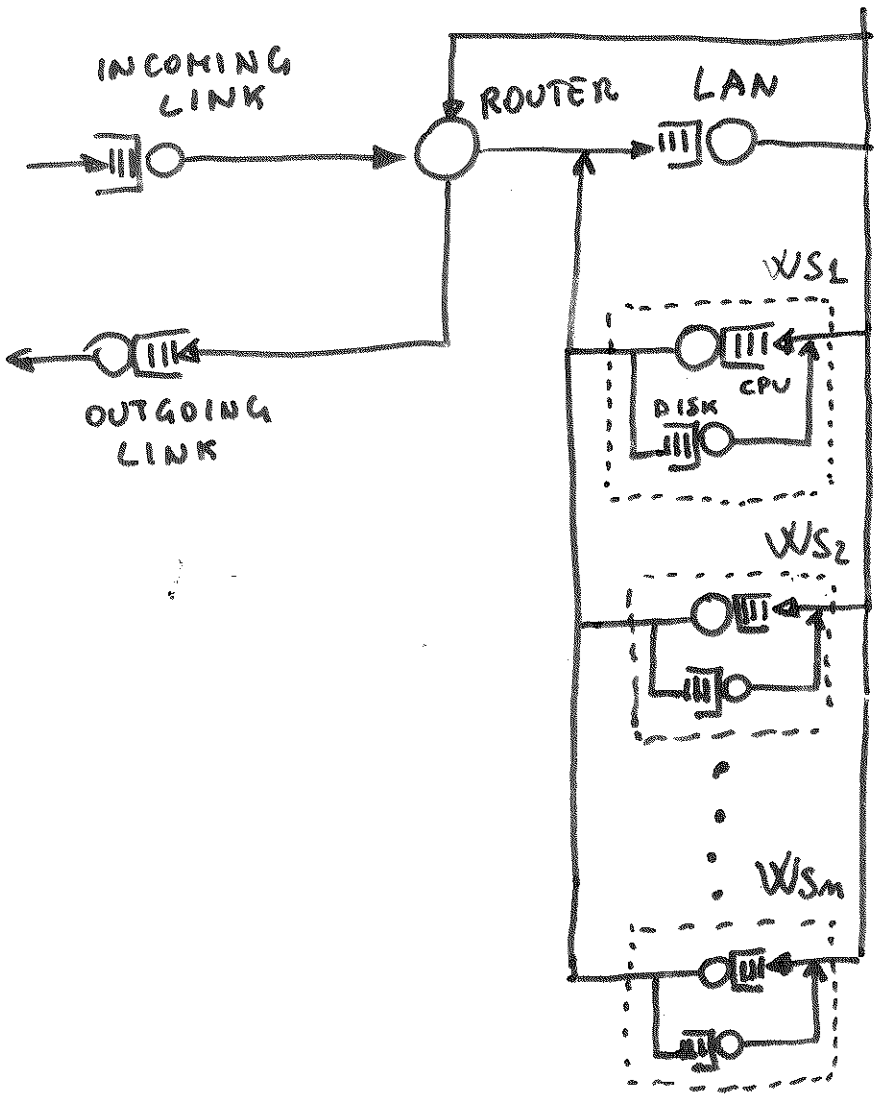
3) Risolvere di nuovo il modello usando il nuovo valore di D_{CPU} e ottenere un nuovo valore di $\overline{n}$

4) Calcolare la differenza tra i due valori di $\overline{n}$, se più piccolo di un certo valore (p.e. 10^{-6}) fine altrimenti si ritorna al passo 2)

(esempio n° 10.7) (esempio n° 10.8)

"MIRRORED" WEB SERVER





hp:
Balanced
load

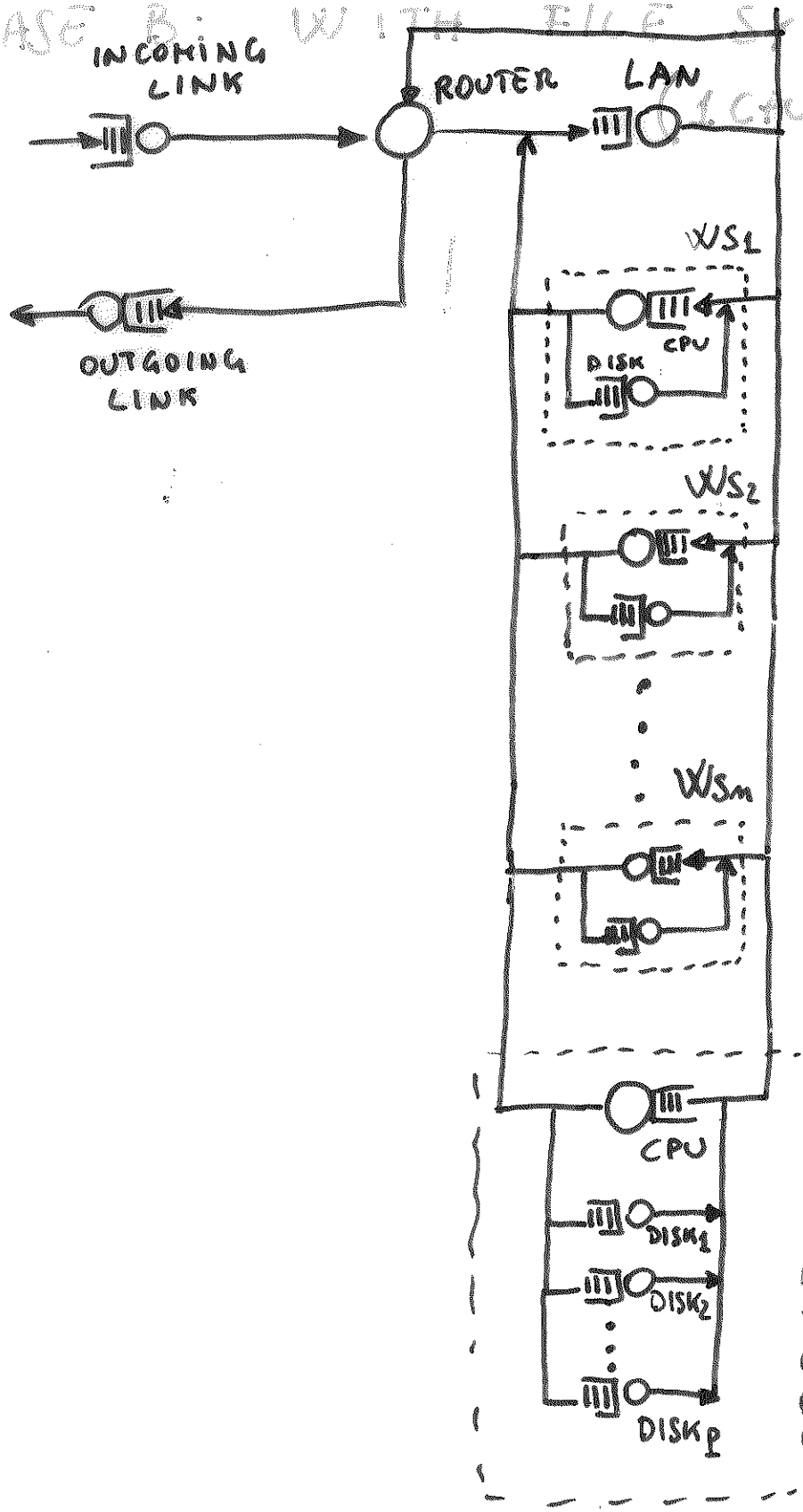
CASE A: WITHOUT FILE SYSTEM

$$D^{m}_{cpu,r} = \frac{D_{cpu,r}}{n}$$

$$D^{m}_{disk,r} = \frac{D_{disk,r}}{n}$$

CASE B: WITH FILE SYSTEM

(1 CPU + P DISKS)



hp: Balanced load

FILE SYSTEM with P DISKS

CASE B: WITH FILE SYSTEM
(1 CPU + P disks)

$$D^{m,1}_{LAN,r} = \text{NetworkTime}(\text{AvgSizeHTTPRequest}, \text{LANBandwidth})$$
$$+$$
$$2\ \text{NetworkTime}(1024\ \text{DocumentSize}_r, \text{LANBandwidth})$$
$$+$$
$$5\ \text{NetworkTime}(0{,}000001, \text{LANBandwidth})$$

$$D_{FSCPU,r} = \text{DocumentSize}_r * \text{CPUTimePerFSRequest}$$
(time + KB accessed)

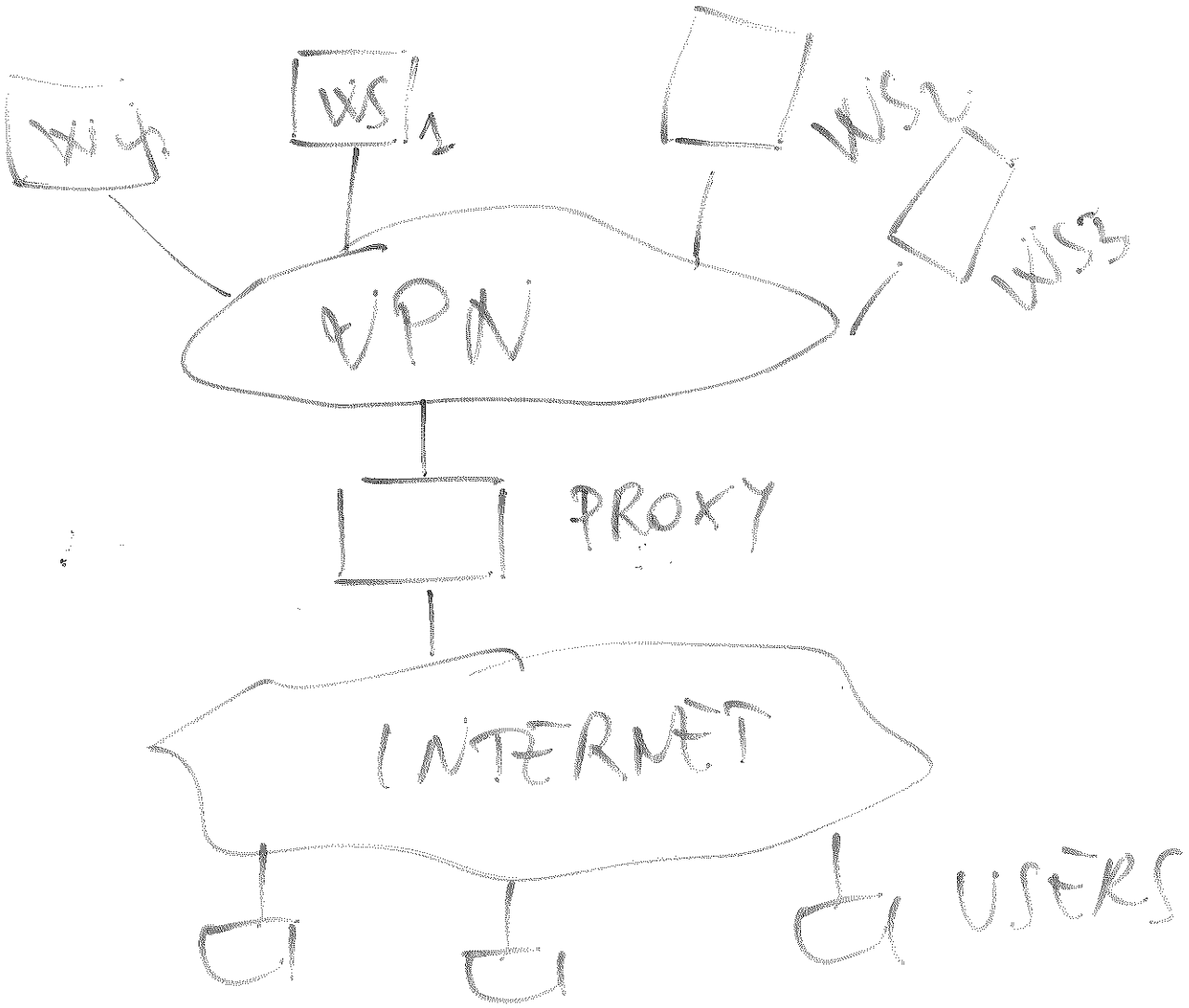
$$D_{FSdisk,r} = \frac{\text{DocumentSize}_r * \text{DiskTime}/1000}{P}$$

Table 10.6. Workload Parameters for Ex. 10.8

Class	Average File Size (KB)	% of Requests	CPU time per HTTP request (sec)
1	5.0	25	0.00645
2	10.0	30	0.00816
3	38.5	19	0.01955
4	350.0	1	0.14262
5	1.0	25	0.35000

Table 10.7. Results for Ex. 10.8

Iteration	$\overline{n}$	% Error	Response Times (sec) per class				
			1	2	3	4	5
1	2.6110	–	0.147	0.279	1.034	9.286	0.863
2	2.9113	10.32	0.170	0.302	1.061	9.350	0.989
3	2.9508	1.34	0.173	0.306	1.065	9.358	1.006
4	2.9560	0.18	0.173	0.306	1.065	9.359	1.008
5	2.9567	0.02	0.173	0.306	1.065	9.359	1.008



FAR FARE MODELLO