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GATEWAY INFNET-CERNET PERFORMANCES

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GATEWAY INFNET-CERNET PERFORMANCES

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ABSTRACT

The transmission rate for different file organizations via a network Gateway from INFNET to CERNET and viceversa, are presented. Calculations about the probability to find the system busy are given, using the Markov process theory.

Experimentation about protocol conversion for file transfer and Job submission from a DECNET based network, INFNET (Istituto di Fisica Nucleare - Italy) to the IBM computers in CERNET (CERN computer network), has been completed in the last month.

A PDP 11/40 minicomputer at CERN, supporting hardware and software CERNET and DECNET, is used as a Gateway. On each other INFNET node only the standard DECNET program runs.

At present, the following facilities are implemented:

1. List of the IBM Catalog and Data set elements.
2. File transfer from and to IBM with automatic recall (From and to CERNET-VAX's under implementation.
3. Job submission to the IBM with printout retrieval, if a fixed output queue is specified in the control job cards.
4. Access to the Wylbur system, making a remote login on the gateway.
5. Access to any node of the INFNET network from CERN making login on the gateway.

In Table I the Gateway memory map (128 kwords total) is presented. A copy of the IBM task is activated each time a link with the IBM is requested. Three possible links can coexist in memory. Dimension of the XFL task (the standard program to access IBM from a PDP in CERNET) is also given for comparison.

TABLE I - PDP-Gateway memory gap.

Task dimension	Description
236100	System task and drivers
22300	CERNET drivers
40100	DECNET drivers
25700	POOL and COMMON partition for DECNET
44200	CERNET file manager
40100	DECNET ancillary control process
20000	IOPAGE
305100	Free
51400	XFL task
73500	IBM task

Tests about transmission rates for different file organizations are given in Table II. The corresponding XFL time is reported for comparison. The difference between the two

TABLE II - Rate transmission.

File description	DECNET rate (kbytes/sec)	XFL rate (kbytes/sec)
Source files of about 40 bytes record length. Data set created first time on IBM. Transmitted on text mode.	1.2	1.6
Files with fixed record length of 512 bytes. Data set created for first time. Transmitted in block mode.	1.9	2.5
Copy from IBM to gateway of files with fixed record length of 512 bytes.	3.1	4.8
Copy to IBM with scratch of the precedent version. Files with fixed record length of 512 bytes.	3.5	5.0

gives the time lost making protocol conversion. This time is heavily dependent on the file organization. The rate given is referred to the total transmission time including open and close link.

Some predictions about the probability to find the Gateway busy can be given using the Markov process theory.

The parameters used in calculation are the following:

M Number of users making a single request

T Time of day during which the Gateway is on

$\lambda(M) = M/T$ Average arrival rate of users

τ_o Access time to IBM file

τ Disk block (512 bytes) transfer time

N_b Number of blocks transferred for a single user

$\tau(N_b) = \tau_o + N_b\tau$ Service time for a single user

$\mu(N_b) = 1/\tau(N_b)$

$\chi = \lambda(M)/\mu(N_b)$

π_K The probability to have K user requests at the same time.

The probability to have the system in the idle state can be given by:

$$\pi_o = \frac{1}{1 + \chi + \frac{1}{2}\sum_{K=2}^{M} \frac{1}{3^{K-2}}\chi^K} .$$

The probability to have $K = 1, 2, \ldots, M$ user requests will be

$$\pi_1 = \chi\pi_o , \qquad \pi_K = \frac{1}{2}\frac{1}{3^{K-2}}\chi^K\pi_o \qquad (K = 2, 3, \ldots, M) .$$

In Fig. 1 the probability to find the system busy $\pi = 1 - \sum_{K=1}^{3} \pi_K$ is presented as a function of χ, taking the parameter $\lambda = 12$ requests for hour.

For $\chi = 1$, corresponding to a service time of 5 minutes, the different probabilities will be

$$\pi_o = 36.4\% , \quad \pi_1 = 36.4\% , \quad \pi_2 = 18.2\% , \quad \pi_3 = 6\% , \quad \pi_4 = 3\% .$$

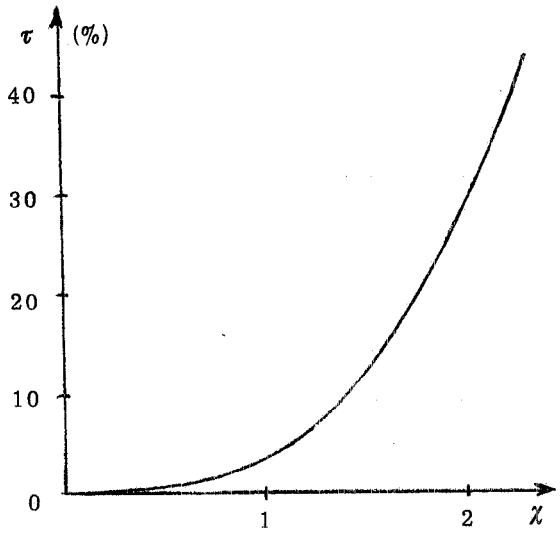

FIG. 1 - Probability to find the system busy. $\chi = 1$ represents the situation in which there 12 request/hour, 5 minutes each.