DISCUSSION RECORD

Session No. 44 – DATA TRAFFIC

PAPER No. 442
Author: C GRANDJEAN

Question by B VESTMAR
The correct functionning of the Saturation Routing Principle relies heavily on the signalling channels not being overloaded and that signalling messages are transmitted without delay.

My question is:

1. In the network described in your paper, what is the signalling load per link under normal traffic conditions, and under overload conditions?

2. Under heavy overload conditions, could a high, but realistic number of user call re-attempts result in overloads on the signalling channels; if so, what is the "critical load" on the signalling channels?

Answer
This problem of signalling traffic is in fact very important and has been studied carefully. Traffic simulations at the network level have been performed to measure response times. The results are quite satisfactory for the application considered as the signalling traffic offered is very small as compared with the signalling traffic capacity of the signalling channels, even under overload conditions for which an estimate of call re-attempts has been included.

Question by H INOSE
The traffic load to the common signalling channel may be subject to such factors as the calling rate of subscribers, the average link distance and the network scale. Could you give some numerical values for these factors by which reasonable grade of service for signalling is provided?

Answer
See reply to B Vestmar's question. I would just like to add the following comment.

The traffic load offered to the common signalling channels depends only on the number of call attempts per unit of time. This load practically does not depend on the network scale itself as the "search" message and the "end" message are transmitted for each call attempts over every junction of the network (except mentioned restrictions for the search message) which is by far the major part of the signalling traffic load.

Question by L KLEINROCK
It is interesting to note that the method referred to by you as "saturation routing" is applicable also to other than line-switching networks (e.g. for packet-switching networks), so long as the "subscribers" are mobile. I wonder if you take advantage of the short paths you find through saturation routing for future required connections between the same or "nearly" subscriber pairs.

Answer
We don't use in RITA previous results of path search to route future calls, for three reasons:

1. The required signalling is much lower than the capacity (48 kB/s) of the signalling channels.

2. Additional memory would be necessary in each exchange to store and to handle previous results of path identifications (most of them should be stored as we don't know which one will be useful).

3. Additional memory is also needed to store, at least for some subscribers, the identity of the exchange to which they are connected which we tried to avoid. But I do agree that such a method could apply economically in other systems in which the signalling traffic capacity should be, for instance, minimized or simply reduced at the expense of an increase in the memory size.

PAPER No. 443
Authors: N HATTORI and K YAMADA

Question by H INOSE
Please describe your plans if any, in utilizing the distinctive differences in holding time and traffic intensity distributions between the international telex, telegraph and telephone in organizing efficient international switching systems.

Answer
As actual concrete examples, we have not any plan at present, which utilizes the characteristics of the mutual relations.

However, as previously mentioned, the characteristics of the international telex calls have been considered in designing the capacity of the speed control buffer memories of the telex exchange and others.

Nowadays, the communication service systems have individual switching system.

When we consider a switching system which treats many kind of services, it is possible to expect efficient usage of central processor by loading the calls of different kind of services whose busy hours do not coincide considering their mutual relations.

PAPER No. 444
Author: G FREDRIKSON

Question by H INOSE
One of the major objectives of a data concentrator is to attain high usage of the high speed output trunk with relatively small amount of buffer capacity, or in other words, to attain high ρ while maintaining small values of K. Do you have any idea of reducing the discrepancies of your approximate calculation which may arise in such cases?

Answer
To make the answer short and simple, I might just say that I don't think that this approximate model can give correct values for interesting parameters in the cases mentioned in the question. The reason is that the number of places in the buffer queue is assumed to be infinite. But I would like to add that it is favourable to attain low probabilities of message loss, of the order 10^{-6} and less, in a store and forward data network. Figure 1 in my paper demonstrates clearly that high values of ρ and small values of K give message loss probabilities that can not be accepted. Corresponding values of ρ and K that give sufficiently low values of loss probabilities, are satisfactory dealt with by the infinite buffer queue approximation.

Question by F SCHREIBER
The main difference of the queue-system here compared to the classical single server queue with constant holding time seems to be the binomial-input-process as compared to the Poisson-input-process in the classical solution.

The binomial and the Poisson probability formulas can replace each other under certain conditions in the sense of approximation. Also the Poisson formula can be expressed in discrete form.

What has been the main reason for the author to choose for this concentrator-problem the binomial-process instead of the Poisson-process as in the classical papers?

Answer
The main reason for choosing a binomial input process is as follows:

It describes a discrete input process in the sense that the concentrator only receives messages at discrete time marks. The message arrival distribution function is thus dependent upon technical parameters of the concentrator in question. A constant probability of a message arrival at each time mark will invariably lead to a binomial input process. When the interval between the time marks $\Delta t \to 0$, the input process will be transformed into the Poisson process. The choice of the binomial input is also based on the fact that this distribution, in a natural way, contains such parameters as the number of terminals, transmission rate ratio between in- and outgoing channels and the maximum number of messages that can arrive in a given time interval.

PAPER No. 446
Author: O ESPVIK

Question by H INOSE
1. Could you please give the sample size of your simulation experiments and the confidence limits of the experimental results?

2. How much programming efforts can be saved by the use of GASP II rather than the direct use of FORTRAN?

Answer
1. The sample size of each simulation is 15000. Some of the runs have, however, been performed with both higher and lower sample sizes to determine the equilibrium conditions and to get an idea of the confidence of the results - which seem to have a variation within 5 %. Each one of the ten curves is constructed from 8 simulations.

2. The GASP II system saves the programmer of basic work like filehandling of the event sequence and general statistical treatment of the events and their attributes. For the most simple models I see no advantage of using GASP II, and for models of very great complexity the programmer should get access to computer installations with GPSS and/or SIMULA facilities. GASP II covers the field between these two extremes.