Discussion Record

SESSION NO. 12 - ANALYSIS OF BUSY SIGNAL SYSTEMS

Chairman - C.W. PRATT (Australia)
Discussion Leader - L.E.N. DELBROUCK (Canada)

Paper No. 122
Author: J.W. COHEN (Belgium)

A. LOTZE (Germany): The Stuttgart Teletraffic Research Team knows from more than 12 years experience in link systems that an approximate method which yields good results for two special link systems can be no means be generalized only on this basis for other structures having three or more stages.

Therefore my question is: Did you investigate by calculation and simulation further preselection link systems having three and more stages as well as meshed wiring which means, according to Fig. 2.2, (g3 = k1-k2)?

J. MICHAUX: The answer is no. Further preselection systems without meshed wiring are open to simulation and analysis but it is believed that the results will be similar, i.e. too high first-order conditional blocking probabilities. The consideration of meshed wiring however requires a deep modification of the calculation method; a straightforward extrapolation of the results to this case does not appear justified a priori.

Paper No. 124
Author: J.W. COHEN (Netherlands)

L.E.N. DELBROUCK: Is there a two sided distribution, one that takes positive and negative values, so that if you use it to displace a poisson process, the result that you get is no longer poisson?

J.W. COHEN: I do not think so.

V.B. IVERSEN (Denmark): I think it may be shown that Erlang's formula for the loss system M/G/K is also valid for a time-dependent arrival process [Poissonian \( \lambda(t) \)] if the offered traffic \( a \) is replaced by

\[ [1 - B(a)] \lambda(a) \, du \]

Are any results known for time-dependent arrival processes?

(The above result may be shown by the theory of point processes and is due to the fact that a rejected call has no influence on existing calls or future arrivals.)

J.W. COHEN: For the time dependent arrival process results are known for the infinite trunk group, and are discussed explicitly by Conny Palm in his thesis. Whether your statement above applies for the finite trunk group is unknown to me; maybe you can find some more literature on this problem in the Journal of Applied Probability. In recent years this journal had a number of articles on Erlang's formula.

J.L. DE KROES (Netherlands): In your systems you can reverse the time, in which the end of the calls become the beginning, and the beginning the end; the systems stay consistent systems. I wonder if this property can contribute to the insight in property of invariance of holding time distribution?

J.W. COHEN: Yes indeed; if the process considered is stationary then the process and its reversed processes have the same statistical properties, and from this phenomenon it is indeed possible to show that only the first moment of the holding time distribution plays a role. For further details see my paper.

A. JENSEN (Denmark): I would like to draw your attention to papers from the group of colleagues around Prof. Lee of China (Academia Sinica). From my stay in China this summer I remember a paper on Palm's problem with a general solution. You will find it in English, or with English summary, in the Chinese periodical.

J.W. COHEN: Many thanks, interesting information.

Paper No. 125
Author: P. LE GALL (France)

A. HELM (Australia): During your presentation you mentioned the fact that a system of TEST CALLS produces an estimate of time congestion which is based only on the first attempt. You also said that there is needed an observation system which effectively looks at all attempts to complete a potential communication.

Do you have such a system - or systems - which automatically observes live-traffic and which can estimate the population of repeated attempts and the reason or reasons for repeated attempts?

P. LE GALL: With the "test calls" method, we observe at any time, and not particularly at an arrival time. So, we evaluate the time congestion (first attempt failure rate) and not the call congestion (mean failure rate) or its complement: the efficiency rate.

In France, to observe this last parameter we have a special equipment, called "ATTILA", which permanently observes all the call attempts offered to a given direction, with an entire called number and a right routing number (given by the translators), and the receipt of the answer signals (given by the outgoing junctions). The results are registered by a computer which gives the proportion of "effective" call attempts: the efficiency rate.
L. CHOWDHURY (India): An attempt is considered effective if an answer signal is received. However the communication may not be successful due to the following reasons
1. Wrong number.
2. Required person available on some other telephone.
3. Speech connection not satisfactory etc., etc.
This induces a repeat call.
Can their traffic also be accounted for in the new theory proposed?

P. LE GALL: With an automatic observation equipment we may observe all the call attempts with an entire called number (for a closed numbering plan), and a right routing number (detected by the translators). The outgoing junctions give the information about the "charge - no charge" signal and about the answer signal's receipt ("effective" call attempt). Usually, we may only observe a "completed" call attempt (resulting in a conversation) by a manual procedure, which gives a too small sample. This is the reason for which we only take into account the "efficiency rate" and not the "completion ratio", in special experimental observations and in usual management observations.

Paper No. 126
Author: D. BAZLEN and W. LORCHER (Germany)

C. KAPPEL (Germany): Regarding your Fig. 15 it is surprising that the same preceding selector stage model with cyclical wiring and sequential hunting with home position yields different losses. Can you explain this effect?

D. BAZLEN: This figure shows results for a Standard and an O'Dell grading having k = 10, n = 120 and g = 24. The preceding stage model under consideration is CH, i.e. cyclical wiring and sequential hunting with fixed home position.

In the first example of model CH which yields high losses we consider a preceding stage with go = 10 and ko = 24. According to the cyclical wiring only the first ten multiples of the grading have eg first choice outlets from the preceding stage. This results in an unbalanced traffic and this means in every case high losses. In the second example of model CH which yields small losses the preceding stage has go = 20 and ko = 24. Now nearly all multiples of the grading have first choice outlets from the preceding stage, the traffic offered to the grading in this case is therefore more balanced. Thus, although the number of outlets of the grading multiples is now 20 (instead of 10 in the first example), we get smaller losses.

J. G. KAPPEL (U.S.A.): Fig. 12 of your paper shows results that are reversed from those shown in the remainder of the paper. That is, the O'Dell and Simple gradings have lower blocking than the Standard and Perfect gradings, in Fig. 12. Is an input-to-outgoing trunk arrangement such as this actually realised in an F.R.G. switching system?

D. BAZLEN: No! We have tried to perform our investigations in a general way, that is:
1. We investigated different grading types such as Standard gradings, Simple gradings etc. with different amounts of k and n.
2. We investigated different preceding selector stage models with different hunting and wiring modes.

According to these general investigations we found this special configuration with I < k, which is in no case of practical interest. But since the result was surprising we found it worthwhile to be presented in our paper.

R. SCHELLER (Germany): You consider the case that the preceding selector stage consists of one multiple with parallel wiring and sequential hunting with home position. You show that in this case I or I = k the loss of the grading is equal to the loss of a full accessible trunk group with k = n = 17. Can you explain this result?

W. LORCHER: Your question is concerned with the structure of the preceding stage according to Fig. 4. The outlets of the one multiple of the preceding stage are wired to the multiples of the grading such that the first ten outlets are wired to the first multiple, the second to outlets to the second multiple, etc. Sequential hunting with home position is assumed, i.e. hunting starts with the first outlet, then second outlet is hunted, etc.

Furthermore the results of Fig. 16 (dashed line) are based on a standard grading with g = 9, k = 10 and n = 45 [c.f. Fig. 3b]. The number i of inlets per multiple is equal to the number k of outlets (i = k = 10).

Example given, the first ten calls occupy the ten outlets accessed by the first multiple. This implies that outlets of other multiples are blocked via the grading [c.f. Fig. 3b] eg three outlets of the second multiple. The next ten outlets of the preceding stage are wired to multiple two, from this only seven outlets are idle. Thus a total of only 17 occupations is possible. Because three inlets of the second multiple remain not occupied, but blocked via the grading, a further call is directed in each case to the second multiple and gets lost.

It is important to notice that this preceding stage configuration is therefore not applicable.