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TELEGRAPH MESSAGE SWITCHING

THE SOUTH EAST PILOT INSTALLATION

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One of the responsibilities of the Directorate of Telecommunications is to study the requirements of its customers and either arrange for the required services to be provided from its own resources or give advice on how the services can best be provided from the Post Office, Industry etc. Occasionally a project necessitates a study within the Home Office in order to plan a system which will be provided from outside resources. Our current study of telegraph message switching for the South East of England is a typical example of the latter. Plans are well advanced for the design of a 'store and forward' telegraph switching system as an experimental installation covering Home Office users in Surrey, Sussex, Kent, Hampshire, Home Office Headquarters buildings in London and some prisons and Immigration offices. The experience gained with this system will be used in the planning of a national network. It introduces techniques hitherto unused within the Home Office but which have proved to be very efficient and versatile in industry and other Government Departments.

The project was started by considering the existing speech and telegraph private lines communications networks such as are found in many police forces today. In the main these networks take the form of a star with headquarters at the centre and lines radiating to divisional headquarters; sub-divisional links usually radiate from the divisional headquarters. In other words communications generally follow the hierarchical structure of the force. Occasionally lateral circuits are provided to adjacent organisations but these are usually confined to speech circuits. Communication with other forces is generally obtained via the GPO public speech and telex networks.

The same structure applies to Fire Service networks. Except for the Government Control Emergency Network, the Home Office itself has a very limited private network; most of the Headquarters Departments and outstationed organisations such as Prisons and Immigration relying on the public network. It is of course perfectly reasonable that the Police and Fire Service networks should take this form since this is what is needed for them to carry out their operational responsibilities. It is when one departs from the "operational" need to the solely "administrative" requirement that cost justification becomes a major consideration.

An individual organisation may have a community of interest with another organisation which itself does not justify private communications, but it could well be that if we add traffic collected from other sources, a private circuit might be justified. With this in mind the Directorate of Telecommunications has recently completed a comprehensive study to determine whether a fully integrated common user network would be a viable proposition. The study could have been contracted out to industry and this is still a possibility when we come to consider future developments, but for this pilot scheme it was thought advisable for the Directorate, with specialist assistance from the Police Planning Branch and CSD, to undertake the initial phases.

One of the first jobs to be tackled was the long tedious business of gathering data about the traffic flowing in the study territory. This work related to outgoing calls from any telephone or teleprinter terminal, whether in a Police or Fire force, a prison, an immigration office, a Regional Wireless Depot or Supply and Transport Depot etc, to any other similar location within or outside the study territory. This information has been collated and from it we have been able to design common user networks for both speech and telegraph. An integrated telephone network presents little difficulty since many private

automatic branch exchange systems (with through dialling facilities) exist. By joining these together probably through strategically placed switching centres it should be possible to establish a network over which an extension user can call another extension user in a different force or organisation without recourse to an operator or the public network. Automation of the telegraph network however entails starting almost from scratch and this will be examined to see how it can be achieved.

Most existing telegraph systems in use by Police and Fire forces require operators at intermediate points to transfer "through" messages from one circuit to another. Obviously under any system it will be necessary to have operators to originate and receive messages but, if we can eliminate the need for manual transfer at intermediate points and ensure that once a message has been put into the system it is processed and delivered to all addresses without further manual attention, we should be able to show a saving on staff costs and furthermore improve the efficiency of the system. The type of message switching system we plan to instal consists of a computer, suitably programmed to accept telegraph traffic, store it (if necessary) and forward it to the appropriate addresses as soon as the circuits to the addresses are free. The facilities offered vary greatly, the main considerations being the customer's requirements and of course how much he is prepared to pay.

With the system being planned, the following operating procedure is carried out:

The message is typed on a teleprinter 'off-line' and a tape prepared.

Typing straight to line is possible but undesirable for two reasons:-

a. The operator is not able to make corrections until the end of the message and errors at the start of a message are likely to produce service difficulties.

b. It is wasteful of line time since manual operation is slower than automatic operation.

When the typist has completed the tape it will be passed through an automatic transmitter and sent over a line to the message switching centre at the maximum transmission speed (66⅔ words per minute in the case of a 50 baud circuit). This is all that is required from the operator and the message switching equipment taking over, examines the message received, decides where it is to be sent (from the instructions included in the address) and carries out the instructions. If it meets engaged condition on any of the lines, the message switching equipment will store the message in respect of those addressees until such time as the line is free. Ultimately, and the time may only be a matter of seconds, the message will be received in all the stations to which it has been addressed.

The system is designed to handle both operational and administrative messages, and the presence of the latter in the network will in no way delay urgent operational traffic.

In an automatic system some safeguards are necessary and these are usually taken care of in the facilities provided. The following are examples of some of the facilities available:-

1. Priority working (3 levels with break-in facilities for top priority messages.

2. Group addressing (A single address code can indicate that a message should be delivered to a number of addresses)

3. Channel validity check

4. Comprehensive supervisory facilities

5. Variety of speeds) The message switching centre can be an interface
6. Variety of codes) between terminals using differing speeds and telegraph codes

7. Shared line facility (polling) - (a number of terminals can be made to share a single line to the centre)

8. Simplex or Duplex operation (or a mixture of both)

9. Fall-back

The arrangements necessary to safeguard the system in the event of failure are termed "fall back". Obviously in a system which serves operational users there must be fall back arrangements and these can take the form either of a reversion to the existing system or duplication of parts or the whole of the new system. To revert to the existing system is likely to be a cumbersome operation and requires that space be made available permanently for equipment which is seldom in use. The alternative is expensive but operationally more desirable and efficient.

The location of a centre is fairly critical since there are a number of factors which must be considered eg:

1. Availability of suitable accommodation.

2. It should be central in the territory to be served (to minimise line costs).

3. GPO communications from the serving exchange should be good.

4. Standby power must be available.

5. Easy access for maintenance (GPO, Home Office and the firm supplying the equipment).

6. It would be an advantage if it could replace an existing system or systems.

7. Availability of staff to supervise the system (preferably one person needed at all times).

It is very difficult to be specific on the financial aspects of message switching at this stage. If we were contemplating the transfer of a large manual telegraph system to automatic working, staff savings alone would be considerable. However the initial system proposed is small and the staff savings will be proportionately small. There is little doubt that efficiency in the form of a speedier service should be very real. As more customers subscribe to the system and greater utilization is made of both lines and equipment, cost effectiveness will be greater. It is more than likely that Departments within the Home Office achieve staff savings and improve efficiency within their own organisations by using the facilities offered.

The position reached at the time of writing this paper is that the tenders for the pilot scheme are being examined. The choice will be made later this year and the contract placed in 1972. It is hoped to see the installation in service within 18 months of that date. With the experience gained we shall be in a position to proceed to a national system.