INTERNATIONAL PRIVATE TELECOMMUNICATIONS NETWORKS

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INTRODUCTION

Over the last 15 years there has been increasing interest shown by large multinational corporations, particularly in the financial services industry, in developing private international telecommunications networks - or "leased circuit networks" as they are sometimes called. Such networks consist of a number of leased circuits, supplied by the PTTs (or, in some countries, by international carriers), linking privately owned switching or multiplexing equipment on the corporation's premises. A private network may carry telephone traffic, message traffic, continuous-flow data traffic, or mixtures of these.

In this paper I aim to describe the various motivations that multinational banks and other financial service companies have for building such networks, what benefits are enjoyed by the end users, and what current trends are in the use of private networks in preference to public networks. Wherever possible I will give specific examples of uses of private networks based on Citicorp's experiences.

MOTIVATION TO BUILD A PRIVATE NETWORK

There are, broadly speaking, three possible motivations for building a private network: first, to save money; second, to have access to a type of communication which is either not available in certain countries or is very unreliable; and third, to be able to present services to end users in a more convenient form than could be achieved with a public network.

A private network provides its owner with cost savings if the total costs of operation, including the leased circuits, privately owned equipment, and the costs of premises and staff associated with the network, are less that the costs that would have been incurred if the public networks had been used. Since the public networks generally base their charges on usage, while there is a fixed minimum cost of operating a private network, there is a break-even usage point below which a private network does not save money. The pricing of leased circuits by the PTTs tends to be based on the potential value of those circuits for carrying telephone traffic, and is set at a level which makes it somewhat difficult to get beyond the break-even point, even in a fairly large multinational corporation.

When viewing private networks from a purely cost-saving angle, the PTTs' pricing strategy has the following consequences for a would-be private network builder:

- It is somewhat difficult to cost-justify a private voice network;
- It is relatively easy to cost-justify a private telex/message network;
- It is very difficult to cost-justify a private data network.

I will outline Citicorp's experiences in building these three types of network:

Citicorp's private voice network

An effort was started in 1978 to build an international private voice network, covering Europe, the trans-atlantic route, and South America. By 1980 the initial network was in place, covering 20 of the 94 countries in which Citicorp does business, and there were hopes of extending it beyond this. However, the savings turned out to be relatively small - about $1 million a year. Also, the network consumed management effort out of proportion to its value, because of users' continuing complaints about end-to-end quality. The only reason that we have retained the network is that we believe that things will get better. In a few years' time the gradual integration of voice and data on digital circuits will enable us to increase the savings we achieve, by merging the private voice network with the private data network. At the same time it will reduce the amount of effort required to ensure acceptable end-to-end transmission quality on telephone calls via the network. In fact, we hope to take the first step in this integration process early next year by combining all voice, message, and data capacity on a 2.048 megabit per second link between New York and London on the new TAT8 optical fibre cable.

Citicorp's private message network

Although the primary reason for building this private message network in 1975 was not economic, it turned out that the network quickly broke-even, since public telex prices are relatively high in relation to the amount of communications capacity that they consume. Citicorp's message network carries about 150,000 messages a day, and costs about 15 million dollars a year to run. But it carries messages that would cost about 30 million dollars a year to send over the public telex network.

Citicorp's private data network

Citicorp started building its private international data network in 1980, and completed it by 1984. At that point it served 74 countries, with access points in 74 capital cities plus 71 provincial cities. Today it costs about 30 million dollars a year to operate. It only reached the break-even point five years after it was started, and has remained economically viable only by continued internal "marketing" efforts to stimulate its use, thus spreading the cost over more users. Our experience, and that of many other organisations also, is that international data communication represents the least attractive challenge for an organisation aiming only to save money with a private network. The public data networks tend to be priced rather low in relation to the amount of communications capacity they use, possibly because the PTTs want to promote the growth of data services.

NON-FINANCIAL BENEFITS - GLOBAL COVERAGE

The second justification for a private network is global (or at least widespread) coverage, that is, to have access to a type of communication which is either not available in certain countries or is very unreliable.

There are still quite a few countries that have somewhat unreliable public telex networks, so a private message network can give a bank a big advantage in such countries by enabling it to get important transactional messages into and out of the country promptly. This is particularly the case in parts of South America and Africa. Even where countries have reliable public telex networks, a private message network provides a few added features not available in the public telex network. In particular, a private message network can have a built-in audit trail for all messages, so that an undelivered message can be spotted, traced, and re-sent. By contrast, it is impossible to establish an effective system of serial-numbering for inbound and outbound telex messages, because each location communicates with many others.

As regards data networks, there are quite a few countries that have no public data network yet, and a few others that claim to have one but in fact have inadequate links to the rest of the world. When Citicorp completed building its international data network in 1984 it served 74 countries. Only 37 of them had operational public data networks. As a result, the private network brought Citicorp's electronic banking services to 37 countries for the first time.

NON-FINANCIAL BENEFITS - PACKAGED PRESENTATION OF SERVICES

The third motivation for having a private network is to be able to "package" or present services in a more convenient form to the end users than could be achieved using public networks. This is mainly applicable to data networks. I will explain this benefit with reference to Citicorp's private data network.

Before doing so, however, I first need to describe in more detail what the data network consists of and how it works. Citicorp's global data network is built around a mixture of switching statistical multiplexers, supplied by CASE - a UK company - and somewhat higher-capacity packet switches, supplied by Telenet of the USA. Customers and internal users who are outside the main Citicorp buildings gain access to the network by placing a telephone call through the domestic telephone network of the country in question and connecting a data modem to the line. The modem is connected to, or contained in, the user's terminal or personal computer (PC). The user "signs on" to the network using an identification code and password, and he is then in a position to establish a session with any one of over 100 computer systems, depending on what service he requires.

Internal users within the main buildings have terminals that are directly wired to the network. Also, computers connected to the network can establish calls to one another in order to exchange data, as well as receiving calls from terminals. Certain computers have permanent connections established between them.

Now I shall return to the subject of how such a network provides benefits over public networks, beyond those already described.

It would be possible to give each customer a set of instructions for how to access all of Citicorp's electronic banking services via the public data network. Such instructions would give the 14-digit "addresses" of each computer as used on public data networks. However, such an approach is far from "user friendly".

By contrast, when a customer dials into Citicorp's private data network and signs on, the network then provides fast and simple access to each electronic banking service by means of two-digit codes (e.g. 33 for the electronic banking service in Paris, 44 for the service in London, 81 for the service in Tokyo, and so on). At the end of one session the customer can disconnect from the first service and connect to a second service with just a few keystrokes. There is no need to dial into the network again, as is the case with some public networks. Also, if the customer forgets the codes, he can call up a menu of services and codes very easily.

In cases where customers or staff travel from country to country using Citicorp's electronic services, the procedures for signing on to the private network are the same in every location. All the user needs is the telephone number for the network in each location. The user's identification code and password are valid worldwide. By contrast, public networks have different operating procedures in each country, and it would be necessary to pre-subscribe to every public network to be able to fly into a country and use the local public network immediately. Also there would be a different identification code and password to remember for each country's network.

So, in this respect a private network can function as a "shop window" for customers, presenting a set of electronic services in a standard and easy-to-use way, with directories and help functions that are specific to the desired end points of the communication (i.e. Citicorp electronic services in this example).

USES OF PRIVATE NETWORKS

I mentioned very briefly some of the uses that are made of private networks like Citicorp's. Now I shall describe some of the uses in more detail.

The private message network, which serves 80 of the 94 countries in which Citicorp does business, carries all the branch to branch messages that would otherwise go via public telex. Over half of these are wholesale financial transactions, initiated under instructions from corporate customers. Almost all such transaction messages enter a computer system at the destination end and are processed automatically, without human intervention. The value of most of these transactions is high. The aggregate value of all the transactions passing over Citicorp's private network link between London and New York every month is, I am told, equal to the entire money supply of the world.

For communication with correspondent banks, Citicorp uses SWIFT or, for non-SWIFT members, public telex. In order to streamline the processing of all inbound transactions, the transactional messages carried on the private message network are created in a machine-readable format based on SWIFT's formats. However, to extend the range of functions available internally, a number of special message types have been added. The complete internal message scheme, known as "Citidex", is support by all major computer systems throughout the wholesale side of Citicorp. This means that new services can be rapidly established by arranging for the appropriate two or more computer systems to start exchanging the appropriate Citidex messages.

As I mentioned earlier, the primary use of the private data network is for customers to access electronic banking services from terminals or PCs in their offices.

A typical customer's session would involve the following steps:

- The customer dials into the Citicorp network via the domestic telephone network;
- He signs on to the network;
- He sets up a service session with the local electronic banking service;
- He sets up a service session with an overseas electronic banking service, say, in Tokyo;
- He repeats the last step as often as required, for example, calling New York, Frankfurt, Buenos Aires;
- He disconnects from the network.

Each service session would last about five minutes. So, within half an hour, the customer would have a clear picture of his total position with Citicorp across all his accounts in all currencies. At several points during the day he would repeat this process, to initiate transactions, and finally to concentrate funds in the most advantageous currencies and accounts.

Although what I have just described is the model for the original idea of an electronic banking service, in recent years there has been a move towards providing pure information, not linked to specific transactions. To complement real-time quotation services like Quotron or Reuters, Citicorp has developed services that take information from a number of sources, such as stock exchanges, currency exchanges, financial news services, and so on, and package them is a user friendly way so that they will be useful to corporate treasurers making day-by-day financial decisions. The global data network is used both to move data from its original source to a processing centre and to distribute the final service to the customer.

Other services that have been deployed across the 74 countries served by the network include services which are a mixture of informational and transactional services. For example, multinational customers are provided with multi-currency netting services for transactions between their businesses units and subsidiaries worldwide. Each location inputs to the netting system all the separate invoices for each other location. The netting system carries out currency conversion for the closing day each month, then calculates (and executes) a set of net payments to achieve complete settlement between all locations.

DEVELOPMENT OF GLOBAL CONSUMER BANKING SERVICES

Most of the examples I have used so far have related to wholesale and investment banking. This is because many of the uses of the private data network have so far arisen from these businesses. However, there are some international consumer banking services supported by the network and there are plans to expand these significantly in the next few years.

The international consumer banking services are primarily aimed at holders of Citicorp cards - Visa, MasterCard, Diners Club, and debit/cash cards. The aim of using the private data network is to give every customer rapid access to a standard set of services, no matter where he is. These services will include getting cash from any Citicorp cash machine worldwide, gaining rapid on-line approval for any credit card transaction or other point-of-sale operation worldwide, and access to information about all his accounts, even where these are in several countries. In order to do this it is necessary to not only connect the many computer systems that support consumer business to the private data network, but also to have a well-defined set of message standards so that all these systems can communicate with one another.

In order to achieve this a standard set of software modules is being deployed in all Citicorp consumer-banking systems worldwide over the next two years. At the same time the data network will be upgraded from the present mixture of statistical multiplexers and packet switches to a more standardised packet switching arrangement. This will make it possible for all major computer systems to be connected to the network using an X.25 interface. This in turn will enable each computer system to set up an X.25 "virtual circuit" to any other system in about two seconds, in order to exchange messages about a consumer transaction. After the transaction is complete the computer will release the circuit. We believe that this is the best approach for this type of transaction, which tends to have a low data content and is unpredictable as to source and destination.

With the present network the time taken to set up a call is too long for cash machine and point-of-sale transactions (from 4 to 8 seconds). When added to the processing time in the computer in the country where the customer is using the service, plus the international transit time of the message itself (about 1 second), and the processing time in the customer's home country (up to 4 seconds), this keeps the customer waiting too long. With a packet switching network it will be possible to cut the average time by about 3 seconds and keep the worst-case time under tighter control.

Another advantage of extending packet switching to most of the private data network is that it will then become easier to interconnect it with public data networks at the country level. This will make it possible for wholesale banking customers to access the network via the domestic public data network of the country in which they are located, as an alternative to dialling up through the telephone network.

The development of global support for Citicorp's consumer-banking customers will be complemented by a growing number of inter-operability agreements with other financial institutions worldwide. In the USA, as in many countries in Europe, full mutual acceptance of all institutions' credit and debit cards in one anothers' cash machines is fast approaching. By the time it arrives, Citicorp hopes to be close to supporting all its US agreements at its facilities in other countries.

THE ROLE OF SEMI-PRIVATE NETWORKS

The financial services industry has been one of the leading developers of international semi-private or consortium networks and associated organisations, such as SWIFT, BASE, and INAS, as well as many national networks such as CHIPS in New York or CHAPS in London. The main reason for this is that financial institutions, although in one respect competitors, are also one anothers' best customers, with the transactions from correspondent business amounting to as much as half the total transaction volume for some banks. This creates a level of inter-dependency that is seen in only a few other industries (for instance, the airlines), and this in turn generates both the need for a communal network and the mutual trust necessary to enter such a venture.

Many of the PTTs, particularly in Europe, seem to view networks like SWIFT as an invasion of their exclusive privilege to provide public networks and services. They seem to feel that they were caught off-guard when the requirement for such networks arose because they did not have an immediate solution to the banks' problem. But they would now like to substitute their own networks for the shared networks. They may even feel that the existing shared networks are the "thin end of the wedge" and that, if they do not do something soon, every industry will be building its own shared network.

Personally, I believe that such views are misguided. They fail to take account of the almost unique inter-dependencies in the financial services industry that make such networks both possible and desirable, while almost all other industries would have insufficient inter-dependencies to make such networks possible. Also, the physical networks themselves (the leased circuits and the switching equipment) are, in the long run, less important than (a) the operational agreements between the participant institutions and (b) the message format standards that have been jointly developed as a result of setting up the networks.

THE FUTURE

As the public data networks become more reliable and better inter-connected, and as the global ISDN (Integrated Services Digital Network) evolves, the leased circuits in the current shared and private networks will start to be replaced by public switched services. This is what I see happening in Citicorp's private network in the next five years. The shared or private networks with then consist of a collection of "communications engines" around the world, that integrate public switched services into "logical networks", in contrast to the present "physical networks".

If my view is correct, then my advice to the PTTs would be to stop worrying about the need to create industry-specific networks to serve the financial institutions, the airlines, and a very small number of other industrial groups, and instead concentrate on building efficient and cost-effective public networks. This will eliminate two of the three motivations for building private and shared networks: cost-saving and coverage. In the meantime I believe that it will become possible to move the third motivating factor - packaged presentation of services - from the network itself to a "communications engine" which lies between the end user and the public network, or is switched into the connection as and when needed.

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