Understanding Telecommunications Networks

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The necessary interconnection of all these types of networks within a country and to networks in other countries was described.

We also introduced the concept of the Internet and how subscribers gain access to it via the PSTN, cable modems over Cable TV networks, ADSL broadband or over private circuits using optical fibre.

Box 2.1 PBXs and Virtual Private Networks

Businesses which have more than a few telephones use a private branch exchange system, known as a PBX, to provide call connections between each telephone (which become 'extensions') and links into the PSTN [7]. The PBX is really a small version of the PSTN exchanges, typically ranging in sizes from 10 up to 5,000 extensions. A private numbering scheme is required to enable extension to extension dialling, also special codes (e.g. 'dial 9') are required to enable calls to be made to the PSTN. Incoming calls from the PSTN have to be answered by a receptionist or operator at a manual console so that the appropriate (privately numbered) extension can be contacted. Alternatively, the extension numbers can form part of the public numbering scheme (see Chapter 10) so that calls from the PSTN can be directly switched by the PBX to the required extension (known as DDI), so avoiding the need for manual intervention where the caller knows the number of the wanted extension. Only the calls to the PSTN are charged. The corporate customer owns and pays for its PBX.

In the case where a company extends over two or more sites (e.g. office or factory buildings) the PBXs on each site can be linked by private circuits, thus enabling calling between all the extensions. This is known as a 'private corporate network' (or just 'private network'). In this case the private numbering scheme extends across all the PBXs and usually each PBX is linked to the PSTN. Charging only applies to calls leaving the private network for the PSTN, although, of course, a rental charge is made by the network operator for the lease of the private circuits.

A virtual private network (VPN) provides an alternative to the use of private circuits between each PBX, as shown in Fig. 2.12(a). The VPN exchange switches calls between the PBXs connected to it (e.g. between PBXs 'a' and 'b') as well as to trunk links to the other PBXs in the VPN corporate network. However, the VPN is provided over public exchanges, either as special business exchanges or as part of the PSTN. Each VPN exchange switches the private network calls of several private corporate networks, although each operates in isolation, using its own numbering scheme. Thus, each corporate network appears to have the benefits of a private set of links between their PBXs, even though connectivity is provided over public exchanges – hence the use of the word 'virtual' in VPN. The VPN customer is charged a subscription for the VPN service based on a certain level of inter-PBX calls (traffic); there are usually charges made when the level of calls between any two PBXs exceeds the agreed threshold.

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Box 2.2 Centrex Service

Centrex is the generic name of a service in which extension-to-extension calls within a customer's site are switched by the public exchange, thus eliminating the need for a PBX [7]. This requires that each extension from the building be carried over the access network to the centrex exchange, which serves many centrex customers, each with their own private extension numbering scheme. Again, calls between the different centrex groups are kept isolated within the exchange, and charging only relates to calls that go out to the PSTN. The service can extend across several centrex exchanges (known as 'networked centrex'), as required to serve the company's private corporate network, as shown in Fig. 2.12(b). (Note that networked centrex is not the same as a VPN since the role of the PBXs is taken by the centrex exchanges.)

Finally, the various specialised networks associated with a PSTN were introduced, namely:

- Operator services network;
- Business services network;
- Intelligent network;
- Private circuit-services network;
- Frame relay network;
- ATM network;
- IP network;
- MPLS network;
- Telex network.

The chapter concluded with a simple model, which aimed to help position the specialised networks with the common access and core transmission networks.

References

1 SCHILLER, J.: 'Mobile Communications', Second edition, *Addison-Wesley*, Harlow, 2003, Chapter 4.
2 FRANCE, P. W. and SPIRIT, D. M.: 'An Introduction to the Access Network', Chapter 1 of 'Local Access Network Technologies', edited by FRANCE, P.W., *IEE Telecommunications Series No. 47*, Stevenage, 2004.
3 BUCKLEY, J.: 'Telecommunications Regulation', *IEE Telecommunications Series No. 50*, Stevenage, 2003, Chapter 5.
4 ANTTALAINEN, T.: 'Introduction to Telecommunications Network Engineering', *Artech House*, Norwood, MA, 1999, Chapter 5.

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