4 TELECOMMUNICATIONS SERVICES
The telecommunications service users are well defined into two groups, the residential service user and the business service user. The tariff for the two groups are different as discussed in the previous section.

4.1 Residential service
4.1.1 The current situation
The telephone terminal has undergone a change of status in the recent years. It has become a part of a competitive and diverse market. Besides basic telephone the telecommunications market also offers answering machines, cordless phones, mobile phones, and phone cards. In the broadcast services, the main services include radio broadcasting, TV broadcasting, on the air or via satellite and cables, and more recently interactive Internet channels.

Residential customers now benefit from the new services available on the copper-pair cables such as ISDN and HDSL. The biggest impact is on the Internet services. However the current interconnection situation is only narrow-band interactive network and broadband one-way network (on the down link). The growth in the text and information services is mostly due to the Internet and by the fact that more and more households now have personal computers that has communications capabilities.

4.1.2 The future of residential service
The telecommunications network will be the most important means of emotional contacts for the residential service users. There is a range of telecommunications networks, each carrying many different services for home connections. The networks and the services they provided will be an integral part of the general home environment in the future. (4)

Even though data is destined to take over voice as the main traffic on the telecommunications networks, voice services will still continue to rule in interpersonal relations at least in the near future. The various on-line and broadcast services will combine audio, pictorial, written and visual media
gradually. Residential users will want to control their communications by easy selection of media, programmes and contacts. They will also choose the desired service quality level by using flexible schemes provided by the access connection providers, network operators and service providers. The service providers might or might not be the same organisation. The changes in the telecommunications services will be seen in the service quality, additional new services, pricing methods and new customised facilities. (2), (4)

1. Basic voice service
   Digital telephone terminals will be widely used. The whole network will be fully digitised up to the end point of every home. This will enhance the quality of the voice service.

2. E-mail and voice mail systems
   The usage of e-mail and voice mail systems will increase tremendously. The demand for e-mail and voice mail, combined with the desire for mobility, will create a universal messaging system, which can be accessed from everywhere through any communication channel. The system will require individual authentication systems activated from various media.

3. Image enhancement
   The beginning of next century will bring with it the consumer videophone and family teleconferencing. The progress in image compressing technique and the availability of broadband networks to every home will lead to the effective provision of this type of service.

4. Customised services and facilities
   More intelligence in the telephone terminals and in the networks will prompt the development of affordable customised services for an individual user. There will be many different services, which include:
   - Routing services to ensure that the called party is contacted directly in everywhere. Universal Personal Telecommunications which every user will have same personal number or user identification for all voice and data communications requirement. The users wish of to be contacted
anywhere at any time using same number will eventually be realised but not in a near future.

- Conversion and inter-working services will become crucial to service providers. Open services, open networks and multifunctional terminals form a mix that requires more node intelligence to be deployed, if everyone is to be able to understand everyone else.
- Translation services, which on a global scale, will ease communications with people who at present have difficulty using other languages in which they have only a very limited vocabulary.

Residential services cannot proliferate unless users have the facilities to control them from wherever they are. To do so, the operators must educate their customers so that they will:

- Know the functions of all the services available,
- Access the services anytime, anywhere,
- Make changes to these functions and services,
- Obtain written or spoken notification of the changes instantly,
- Have their information tightly secured.

The challenge to the PTO such as Telekom Malaysia is to develop a way to fulfil the above needs of the residential customers. To the equipment vendor, such as Lucent, the biggest challenge is in the software development. All the needs listed down above, except the first one, are software related. Equipment vendors are competing with each other in developing new hardware and software that can better satisfying the above users needs.

The other crucial change with regard to the current situation will be the general availability of interactive services. Information services combining sound, text and video image will take a significant of market share. However, economic considerations will initially steer the operators and vendors towards short interactive product and services such as news-on-demand, home shopping, lifestyle on-line information, etc. Longer time services such as video-on-demand and video-telephone will be more costly and inefficient for the foreseeable future.
Directories for interpersonal and on-line services will be evolutionised and will become easier to use. This is inevitable because new services cannot really take off unless everyone can instantaneously find the names and details of the people they want to contact. Subscribers, service providers and business directories will all change as digital technologies for voice, data and image develop.

Lower prices, better cost control and the desire for personal facilities for each individual will lead to faster growth in the access to broadband networks which is the infrastructure for the new services. Operators such as Telekom Malaysia have to upgrade their broadband networks to provide more bandwidth for the residential users. It is very likely that the dominant protocol for the broadband network access is based on IP. Telekom Malaysia has to be more knowledgeable about Internet and IP services in order to compete with new comers, who are more readily to adopt new technology. Traditional telecommunications equipment vendor such as Lucent has to develop more IP based products in the network access for residential users.

4.2 Business services
4.2.1 The current situations
Business services are developed for a broad category of users whose needs may differ widely. The business users range from individual professional to the multinational corporate executives. The demand of current business services is very high as can be seen in the following points:
- Business users generate the biggest traffic volume

While the number of business subscriber access points is approximately a quarter that of residential connections, traffic volumes are very much greater. Business telephone calls represents approximately 50% of all traffic and three quarters of international telephone traffic. Virtually all of today’s fax traffic is generated by business. Most of the mobile phone traffic is business-driven. The business sector is the main and in some case the only user of leased lines, data communications and ISDN. (4), (12)
The traffic growth rates are very high
Some analysts forecast that the economic trends, the boom in the service sector, the globalisation of industry and the international trade will drive the telecommunications traffic growth rates above those of national products. The highest growth rates will be in mobile and data communications.

The services change very fast
Telephone and telecommunications equipment is fundamental to the organisation's business process. Telecommunications has become a strategic issue in business decision. Networks involving the customers and vendors are the most important element in the production and marketing for many business sectors such as airlines, banks, and the press. New services are introduced at very rapid paces to satisfy business users' needs. The processes involved in the production of goods and creation of services are heavily interdependent and depend heavily on information technology.

Until very recently, corporate telecommunications systems were designed as an extension of public services and networks. This is particularly true in the telephone systems, which were developed under standards produced by the international bodies and heavily influenced by national operators and the equipment vendors. But the situations have been changing now. New telecommunications services developed mostly by the demand of users. With more PCs and distributed computing become available the initiative for new services has shifted to the data communications. The trend is very likely to accelerate as more and more business is done on-line via the Internet, Intranet, Extranet, and electronic commerce.

4.2.2 The future of business services
In a period that will be marked by an unprecedented increase demand for data services there will be almost as many users and on-line computer terminals as there are telephones. Each company and business group will choose its own methods of communications. The network operators and service providers have to provide the necessary adaptation to satisfy the
business users. Compared with traditional voice communications, this represents a complete upheaval.

Communications within a firm change radically when it grows from a small regional company to a multinational operation. In big companies, the organisation of the telecommunication system will be closely linked to the organisation’s industrial processes. Except for the sophisticated specialised systems which are industry dependent, overall corporation operations require a standardised and open communications system, that includes telephone services, e-mail, voice mail, office automation services and access to general information sources and the Internet. Smaller business and the professionals have no particular difficulties with internal communications. However, they do need access to the services of the people they work with, who often have different computer applications and use different communications protocols.

(2), (4)

Vendors’ investment in telecommunications and computer hardware and software is required to keep pace with operators’ offerings of broadband services. Decision-makers of the vendors will need a clearer view of telecommunications service provider’s technical and pricing strategies. Operators also must focus not only on the prime objective of lowering costs, but must also help business users plan upgrades to their processing and information transfer resources.

4.2.3 Business voice services
Telephone calls still make up the vast majority of business communication traffic even though the data service is poised to take over voice as the main traffic. Telephone calls will still be important and it will be user-friendlier and support higher mobility. Voice mail will become more interactive and development of virtual secretarial service will be realised in near future as voice recognition system developed. Voice synthesis and recognition techniques will enable written messages to be retrieved automatically from mailboxes. A universal messaging system will emerge as demanded by business users.
The addition of image capability to the telephone will initially affect only the elite few and the specialists. Dedicated broadband networks will be required for the videophone communications. Mobile videophone will be developed as the technologies of portable computer, mobile phones, image processing and broadband wireless communications converged.

The medium for carrying voice will be changed significantly as broadband services are finding the ways into the office premises. Voice over IP (VoIP) and Internet Telephony will become more popular due to its apparent cheapness. However, as the prices for voice communications will not be lower than the costs the network operators incurred for their own use, long distance call price will dropped to a level that erode away the initial advantage of public VoIP. Nevertheless the data services for other applications such as video-on-demand and other interactive applications will eventually carry voice as part of the transmission throughput.

4.2.4 Business data services
Written text is still the benchmark language in decision-oriented transfers between companies. Fax will continue to make progress when the fax over IP (FoIP) technology matures, finding its way into the PC of every employee. Most employees will have their own network connectable portable PC for local reading, files processing as well as database and mailboxes accessing. All business functions - research, development, production, distribution, marketing, selling, finance, accounting, logistics, administrative management, - will use distributed computing tools. However, the PC will not become a universal adjunct to the telephone unless telecommunications operators provide a range of widely available connection services with facilities for calls between large numbers of people. The PC is unlikely to eliminate paper or the fax in the near future but advances in electronic filing and document archiving should reduce the role of paper to that of a decision-support document that normally only a few pages long.
The basic minimum in office communications equipment will be multimedia. This equipment will open the office to services running on all kinds of servers. However, this kind of openness cannot be developed unless managers and users can control it through entitlement systems for each employee based on identification, supervision and monitoring. Here, the expansion of telecommunications will need to be measured against budget realities.

The data transfer sector of a PTO such as Telekom Malaysia will undergo profound changes. These are linked to the changes that affect information process (power of microprocessor, signal processors and mainframe computers), storage and display capacities. Data communication services should have the following features:

- high bit rates which requiring optical fibre access;
- ability to switch variable bit rates;
- combination of voice, data and images;
- inter-working between different systems;
- combination of real time and off-line working,
- impeccable quality and unimpeachable security
- high volume discount pricing

There are three strategies which business users can choose to develop their communications needs:

- Independence, by creating an extensive private network to handle all internal telecommunication services. Services from network operators are needed only for leased lines between branches and communications with third parties;
- basic reliance on the network operators, by obtaining maximum flexibility from the virtual private network (VPN) service,
- reliance on value-added company to set up internal and external telecommunications services combined with IT services.

The choice made will depend on the communications and information requirement; the required level of independence; the costs; the pace of change and the difficulties in maintaining the human skills needed. Telekom
Malaysia must realise these and be prepared to satisfy all three different types of business users.

4.3 Changes in services provided by operators
Telecommunications operators and service providers will faced competition from two sides:
- from customers, some will try to form their own independent telecommunication services for their own used;
- from new operators who will come with deregulation;
The competitive outcome will hinge on the interaction between the intelligence of the interpersonal terminal and the intelligence of the network.

4.3.1 Leased line service
Leased lines support the internal networks of manufacturing and marketing groups for a significant proportion of their voice and data communications. This is a segment of the operators' offerings that has already seen big price reductions. The future leased line services will be high bit rate and low cost, and the bit rates are varied based on demand.

4.3.2 Switched bearer services
Communications systems must be able to interconnect services in different speed. This will require ATM (Asynchronous Transfer Mode) switching systems that are capable of very high-speed switching. It is predicted that more data will be sent and received through packet switched services in the future. Most of the packet switched services will be Internet Protocol (IP) related and will be carried out by a very high-speed IP router which is different from ATM switch. However, the ATM system will remains as the core of business services in the near future because of its higher Quality of Service (QoS) and stability over IP router. Digitisation and the need to route service flows combining voice, data and images will required point-to-point and switched services derived from a universal ATM network infrastructure. (2), (8)
4.3.3 Virtual Private Network (VPN) services

VPN can be tailored to the various business organisations especially the small businesses and professional users who do not have the technical skills and financial resources to build their own networks. The development of VPN will focus on:

- improving private/public network transparency,
- the ability to interconnect the multimedia (voice, data, image) services from different transmission channels and heterogeneous sources;
- technical and price flexibility;
- the availability of customer premises administration tools

Estimates of the VPN market size vary considerably, but it will dwarf the frame relay market, already the largest public data network market worldwide. Furthermore, IP-based VPNs could be sold to business buyers in a more tactical way. VPNs could be used to support data network solutions for business problems that today require too fast a response or too short a period of usefulness to justify private networks. (8)

4.3.4 Quality of Services (QoS)

The success of voice and data networks depends on quality of service (QoS) provided. QoS is defined as the measure of a network's ability to match service with user and application requirements. It is a set of mechanisms designed to improve predictability of network service. The key to providing QoS is the ability to differentiate traffic and to provide differentiated service levels based on the types of traffic.

QoS manipulate switch queues so that when congestion occurs, priority "VIP" traffic is serviced quickly, while less important traffic experiences delays and drops. Classification of users' traffic is based on class of service criteria. After being classified voice and data are serviced by a pre-defined queuing discipline that determines their final service level. The ability to charge a higher premium for higher quality of service would evolutionise the economic model of the new public networks and bring more profit to the PTO, such as Telekom Malaysia.