Future Communications

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1. INTRODUCTION

The major trend for development of Future communications, as we can see, is basically the transformation of data communications from analog to digital format from waves of varying voltage to bits and packets of data zipping through fiber optic lines and other media. Digitization promises to bring thousand or even more fold increases in bandwidth, the amount of data that can be crammed through a line per instant. Already, television distributors, computer companies and Telco are test-marketing cable modems, digital subscriber lines (DSLs) and gigabit Ethernet. Layered atop this are the cornucopia of wireless communications technologies, from cellular phones to personal communications services. Trend of telecommunications and services in the future such as :-

1.Continued rapid growth in wireless communications

2.Convergence of wireless phones and the Internet

3.Telecommunications deregulation and the breaking down of barriers among telecommunications industries

4. Internet-based telephony

5. increased use of satellites and satellite caching of Internet data

6. Expansion of broadband access options and fiber optic networks, WDM technology

7. Bundling of cable TV, telephone, Internet .

The telecommunications industry encompasses the movement of voice, video and data over distances long or short. It is comprised of local exchange, wireless service of all types including cellular phones, pagers and palm-type devices, satellite broadcast ,fiber optics, copper wire, undersea and coaxial cable, the Internet, microwave and private networks, long distance service and video-conferencing.

2. CONVERGENCE

Several technologies are poised to enable voice/data convergence. Among them are Optical networking, which increases network capacities by converting them from transmitting electrical signals to light impulses. With the development of light wave multiplexing one fiber is split into several wavelengths. What once carried one call can then carry hundred. Intelligent network, a technology that is heavily software engineering-oriented, involves creating databases to exploit network potential is another telecommunication facilities more commonly required by corporate users.

Telephone service and e-mail are beginning to converge. Companies offer local telephone numbers allover the world for customers who spend a lot of time traveling. The customer gets a personalized phone number in the area code of choice. Fax and voice messages are translated into e-mail. The user then checks e-mail to get faxes, voice mail and e-mail all in one place. If the person cannot get to a computer, the messages can be accessed over the phone.

Telcos, using internet telephony technology, allows people to place inexpensive telephone calls over a computer, telephone or fax machine to any telephone or fax machine worldwide, allowing a savings of up to 95% when calling internationally.

CDPD (cellular digital packet data} allows a portable computer to transmit data over the existing cellular telephone network. Dedicated channels are set aside specifically for CDPD use. However, when not being transmitted over their own channel, the CDPD calls must share the line with cellular calls, which take precedence over CDPD.

WAP (Wireless Application Protocol} is an important enabling technology of the Wireless Internet. W AP is a set of specification for wireless application development which can be adapted on different handsets and different bearers. Currently, the most common bearer for WAP is GSM (Global System for Mobile Communication} which is a 2G system (Second Generation Wireless System}. However, the throughput of GSM is from 9.6kbps to 14.4kbps only which is relatively slow when compared with other communication links, like 56kbps of PSTN (Public Switched Telephone Network}.In order to support more users and richer contents, a new generation of wireless communication systems is needed such as the 3G and even the higher generation.

GPRS (General Packet Radio Service} facilitates several new applications that have not previously been available over GSM networks due to the limitations in speed of Circuit Switched Data (9.6 kbps} and message length of the Short Message Service or SMS (160 characters}. GPRS will fully enable the Internet applications you are used to on your desktop from web browsing to chat over the mobile network. Other new applications for GPRS profiled later include file transfer and home automation the ability to remotely access and control in-house appliances and machines. Theoretical maximum speeds of up to 171.2 kilobits per second (kbps} are achievable with GPRS using all eight timeslots at the same time. This is about three times as fast as the data transmission speeds possible over today's fixed telecommunications networks and ten times as fast as current Circuit Switched Data services on GSM networks. By allowing information to be transmitted more quickly, immediately and efficiently across the mobile network, GPRS may well be a relatively less costly mobile data service compared to SMS and Circuit Switched Data.

3. INTERNET BASED TELEPHONY

Internet telephony is a system of technology that allows a computer user to make a call to a regular telephone via the Internet. Consumers have been using telephones in conjunction with computers for years. For example, every time you call your bank for touch-tone banking services, go through touch-tone telephone prompts to find the time of the showing of a movie or enter an extension number on a telephone, you are using a computerized telephony system. Internet telephony simply uses advanced technology to take the telephone/computer connection to enhanced levels by allowing two-way voice communication that used VOIP (Voice Over Internet Protocol} technology.

Since the Internet is an "always on" global system of computer-to-telephone line connections, it is possible to use Internet telephony to dial long distance, even overseas, phone calls at no charge. However, current phone lines and technology may make the Internet-based call a lower speed, lower quality connection. Speed advantages are possible in new phone technology. For example, ATM, asynchronous transfer mode, allows voice, video and data signals to be transmitted digitally over advanced phone switches at speeds from 25 million to 1 billion bits per second, much faster than traditional analog phone lines that only move at 2 million bits per second.

Research centers on shifting communications from traveling over today's phone circuits to moving across an Internet platform (IP}, a network that is generally cheaper and faster than phone

lines, computers run on IP networks, which transmit packets of information.

Another major part of the communications universe is the application and direction of data. Switches, routers, embedded systems and application-specific integrated circuits (ASICs} are all features of the communications infrastructure the network of connections that deliver data. Positions in this area can range from engineering management of a local area network to maintaining web pages for an online service. Today, this area of Internet development is experiencing steady growth even as the communications infrastructure could hardly keep up with the rising demand.

CAT is currently operating VOIP service with more than 108 countries in the world and also acquired an A TM network to serve its corporate customers through a joint project among ASEAN countries which has been named as the ACASIA Group to provide the first intelligent ATM network in ASEAN. This is a comprehensive global telecommunication service that allows fast and effective communications and beside these services CAT will be soon ready to operate a country wide A TM network of its own which will enhance the scale of service even further both domestically and internationally.

4.WIRELESS COMMUNICATION FOR 3G

3G is the new generation of wireless communication and its development is based on the initiative of ITU (International Telecommunication Union) called IMT - 2000 (International Mobile Telecommunication 2000). Since most of the 3G systems are evolved from different incompatible 2G systems like CDMA (Code Division Multiple Access), GSM (Global System for Mobile Communication) and TDMA (Time Division Multiple Access), therefore the IMT -2000 standard will ensure the compatibility and interoperability of different systems in 3G. 3G is broadband and packet-based. It can be used to transmit text, digitized voice, video, and multimedia at data rates up to 2Mbps in a fixed or stationary wireless environment and 384kbps in a mobile environment. Moreover, 3G also offer a consistent set of services to mobile users no matter where they are located in the world.

3G is not only a breakthrough of bandwidth, it will also change the way of using Wireless Systems. Since 3G uses packet-switched connection and the Internet Protocol (IP), it means that the terminal is virtually always connected to the network and the higher bandwidth will allow more new services, such as video conferencing and multi-media streaming. The 3G can also provide the V HE (Virtual Home Environment) in which a roaming user can have the same services to which the user is accustomed when at home or in the office through a combination of transparent terrestrial and satellite connections.

Using 3G, people can access all kinds of digital information, like music, photos, video and television. Moreover, video-conferencing, electronic payment, positioning services are also possible. Furthermore, 3G will also introduces more business opportunities, likes mobile on-line shopping and mobile on-line payment.

The new terminals for 3G Mobile phone has been the fastest-selling communication device in the last two decades. It is predicted that by 2002 there will be one billion mobile users around the world. There is a prediction that 30-50 percent of B2C (Business-to-Customer) e-commerce will be conducted through mobile devices in 2002. The 3G terminals would have more varieties than those of 2G, mostly in the form of mobile phones but with larger screens for displaying Internet pages or the face of the person being talked to. There will be smaller "smart phones" with web browsing and e-mail capabilities. Moreover, videophones, wrist communicators, palmtop computers, and radio modem cards for portable

computers will also be available. New innovative voice-based interfaces will allow people to control their mobile communication services with voice commands the complimentary technologies of 3G.

CAT is currently under way to develop its CDMA one mobile network into CDMA2000 1 X of the IMT 2000 generation and beyond in order to provide higher speed data communication to customers and in addition, Mobile Internet service will be provided to serve the ever growing demand.

5. INTERNET VIA SATELLITE

The exploding demand for internet bandwidth cannot be accommodated by the existing terrestrial infrastructure. Expanding the terrestrial network requires long-term planning and huge investments. Internet via satellite offers a flexible and fast solution for this problem. In addition,
scalability of the satellite solution reduces investment risks. Satellite networks allow users to fit a solution to their real and changing requirements. The evolution of the Web in the last 10 years has made some form of Internet protocol (IP) connection common, be it a local area network (LAN) connection, dial-up, DSL or cable modem. Using the Internet is now almost customary for interactive videoconferencing, streaming audio and video, and real time applications besides the usual Web surfing and the data traffic that drove its creation. Voice over Internet protocol (VOIP) is up and coming as an IP application. The major advantages of using VOIP include the pervasive nature of IP connections that lead to the development of many applications to utilize it. This, in turn, has driven the trend toward all IP networks which will include satellite links for many networks. In fact, the huge demand for Internet connectivity has resulted in a corresponding increase in IP traffic carried via satellite. It has also led to the development of numerous special purpose satellite IP delivery systems, which transport IP packets directly, without encapsulation in a WAN protocol like frame relay or ATM using relatively small VSAT systems. While, today, broadband IP solutions dominate the voice over satellite (V SAT) market for data delivery, such systems will increasingly be used also to carry VOIP traffic. In fact, there are some distinct advantages to using VOIP with satellite IP delivery over terrestrial IP networks. The greatest benefit is distance insensitive connectivity, one of the prime drivers behind the development of satellite communications. Satellites provide connectivity within the satellite coverage footprint, with every site theoretically capable of reaching all other sites in the network, regardless of the terrestrial distance between them. Terrestrial networks are limited to the land bound connections running between nodes reaching from one end of a large region to another may involve crossing dozens of interconnect points. The land lines eventually end, and IP service or any service beyond the terrestrial infrastructure must wait for the copper line to be installed. Satellite networks deploy quickly and cost effectively provide seamless connectivity with existing broadband terrestrial networks. The flexibility afforded by modern broadband satellite networks cannot be duplicated with terrestrial networks. Satellite networks allow users to fit a solution to their real requirements, even if those requirements change over time. A number of flexible satellite IP networking products are available, so selecting the appropriate IP telephony equipment for the network topology and configuring it to account for the unique nature of satellite links is only a matter of time.

Broadband internet protocol requirements have given the satellite industry anew life. Although the catalyst for this renewal is the growth in the Internet, satellite solutions must also support telephony requirements. This is particularly true in the developing regions,

where delivery of dial tone for voice services will not be supplied by an alternate public switched voice network. Such satellite networks may also address the basic communications requirement, telephony, and not just the desire for internet access. In many ways, IP telephony and satellite IP networks are a perfect fit, with satellite networks able to provide quick telephone connectivity to anyplace in the satellite footprint. IP telephony can be a practical and cost-efficient voice solution when implemented in a broadband IP network with appropriate optimization, including delay management and efficiency improvement. In high-end, corporate networks, integrating IP telephony and IP data services with a mesh satellite IP network is an option worth investigating.

6. WAVELENGTH DIVISION MULTIPLEXING (WDM)

Wavelength Division Multiplexing (WDM) refers to an optical transmission technique where multiple optical signals are transmitted on a single optical fiber using different wavelengths. In today's high-end WDM systems designed for long-distance communications, each optical signal (often referred to as a channel or a wavelength) can operate at 2.5 Gbps and up to 10 Gbps. Currently available systems support from 32 to 64 channels or wavelengths and vendors are promising 96 or even 128 channel systems in the near future. This enables a single fiber to carry several hundred gigabits and up to a few terabits of information. The term Dense Wavelength Division Multiplexing (DWDM) is often used to describe systems supporting a large number of channels, with "large" not clearly defined. In contrast, the use of two or four channels on a fiber is sometimes referred to as "coarse" WDM.

7. ADVANTAGES OF DWDM IN EXPANSION OF FIBER OPTIC NETWORKS

DWDM (and WDM) is protocol and bit rate independent so data signals such as ATM, SONET, and IP can be transmitted through the same stream regardless of their speed differences. Each individual protocol remains intact during the transmission process because there is no need for optic-electric-optic conversion with DWDM. The fact that the signals are never terminated within the optical layer allows the independence of the bit-rate and protocols, thusly allowing DWDM technology to be easily integrated with the existing equipment in the network. This gives service providers the flexibility to expand capacity within any portion of their networks. No other technology allows this. Service providers are also able to partition dedicated wavelengths for customers who would like to lease just one wavelength instead of an entire fiber. Service providers may also begin to increase the capacity of the TDM system currently connected to their networks.

WDM technology has greatly enhanced the capability of high speed data communication systems especially for long-haul links and as such significantly reduce the costs. This is due to several reasons. First of all, the optical signal still attenuates and requires a boost. WDM signals can use an optical amplifier that does not require costly electrical regeneration. The system uses EDFAs in the amplification of signals and can be spaced at a distance of up to 1000km. This is the second main advantage. These amplifiers do not need to de-multiplex and process each signal. The optical amplifier simply amplifies the signals. It has no need to reshape, retime, or retransmit the signals, and the process does not need to convert the optical signals to electrical signals and back again. Combine the simple amplification with the increased distance between the amplifiers, and

dramatic savings can be seen. One optical amplifier on a 40-channel DWDM system or a 150-channel DWDM system can replace 40 or 150 separate regenerators. This factor can be increased even more, since the distance between amplifiers is greater than between regenerators. Also, because the signal is always transmitted as light, the amplifiers do not slow the link. Another cost saving applies to long-haul carriers that already implement WDM over their links. The upgrade from the existing system to a system employing DWDM is relatively simple and cost effective One reason this upgrade is simple has to do once again with the amplifiers used to boost the signal. That is because the EDFAs already in place for WDM systems can amplify the DWDM signal as well.

One final cost advantage of DWDM over other systems is the ability to easily transmit several different protocols and speeds over the same link. While the traditional TDM system, SONET, required a total separate link or complicated conversion software to link routers and hubs with different protocols together. DWDM can send different protocols and different speed links over separate optical channels and one fiber can carry multiple protocols easily and cost effectively.

The DWDM technology has also been applied to several undersea cable systems and networks, one of the networks mentioned called South East Asia Middle East and Western Europe no.3 (SMW-3) cable is used by CAT to serve international traffic world wide by interconnecting with other networks. These undersea cable networks have capacities in the range of terabits and can serve global communication almost unlimited.

8. CONCLUSION

Future Communication will see rapid growth in wireless communications to IMT2000 (3G), Convergence of wireless phones and the Internet such as WAP ,IP Mobile communication global opportunities in telephone service via internet telephony (VOIP). Expansion of broadband access options and fiber optic networks using DWDM and photonic switching technology. Increased use of satellites and satellite caching of Internet data that used IP switch on satellite for internet access via satellite. Broadband internet protocol requirements have given the satellite industry a new life. Although the catalyst for this renewal is the growth in the internet, satellite solutions must also support telephony requirements. This is particularly true in developing regions, where delivery of dial tone for voice services will not be supplied by an alternate public switched voice network. Such satellite networks may also address the basic communications requirement of telephony, and not just the desire for Internet access.

Being in telecommunications service industry CAT has made all effort to serve its countrywide customers with more than sufficient of choices in equipment and services and the most up to date technology in the row. These include the planning and implementation of the basic infrastructure and intelligent networks such as international telephone exchanges DATA exchanges, access networks and options, new modern satellite earth stations, country wide fiber optic and digital microwave radio transmission networks and the international medium and long haul submarine cable network in addition to the existing international satellite network via Intelsat. The implementation takes CAT from the second half of the last decade up until now and still continuing towards the next few years. There always be perpetual impact on the time for completion of the networks and facilities cause by the changes in technology and the growing competitions. Nevertheless under the environment after telecommunications deregulation, stronger competitions are envisaged, such situation is coming near and CAT realizes that there are challenges awaiting to compete in the

near future, therefore CAT, at all time has done its best to keep up to date its network and services in order to stand abreast of the rapid changing technologies and the up coming competition. To be capable of efficiently response to the diversified needs of the customers CAT also launched other new services besides several services already served, these are such as the VOIP service, the Public Internet Booth for every district in the country, the CDMA mobile phone service, the international ATM service, the broadband IPLC services and a few more to be offered in the near future.