UNIT 10 INTEGRATED COMMUNICATION NETWORKS FOR BANKS

Objectives

After studying this unit you should be able to :

- Explain the concept of Converged networks and the technological ability to combine voice and data and video at the desktop
- Define Wireless Application Protocol (WAP) and explain its basic concept, benefits, architecture, and its use in banking and finance

  Understand what are Virtual Private Network (VPN), its protocols, deployment and its role in financial sector
- Familiarise what are Multimedia and its application framework in financial sector.

Structure

10.1 Introduction

10.2. Convergence of Networks

10.3 Wireless Application Protocol

10.4 Virtual Private Networks

10.5 Multimedia Systems

10.6 Summary

10.7 Self-Assessment Questions

10.8 Further Readings

0 . 1 INTRODUCTION

Today's financial business is technology driven. Technology is a source of competitive strength and is used as a competitive strategy to reach the customer at his doorstep. In this scenario, Bank and Finance personnel sliould be aware of technical opportunities in order to meet the customer expectation. The main objective of this unit is to impart the awareness about various technologies and their application in Banks and Financial Institutions.

10.2 CONVERGENCE OF NETWORKS

The arrival of the Internet has changed the competitive climate significantly. Reduced barriers to entry have increased competition with shorter times to market, new channels of communication with customers and new price points. As a result, organizations like bank's and financial institutions nced to address two key issues to retain and improve their competitive position: improve their customer understanding and relationship and introduce new efficiencies into the business to reduce their cost base.

Technology changes are enabling businesses to deliver these goals. The Internet has opened up a whole range of new channels through which customer relationships can be conducted from web enabled call centers to Interactive TV. Additionally, companies/ bank's/financial institutions are creating sccurc Virtual Private Networks Extranets and extended Intranets to provide their partners, customers and suppliers with direct access to specific corporate resources creating new value through an exchange of information. Customers can now use web sites to get easier access than ever to information about products and services.

Convergence is defined as the melding of consumer electronics, television, publishing, telecommunications, and computers for the purpose of facilitating new forms of

information-based commerce. There two types of convergence — multimedia convergence and cross-media convergence. Multimedia convergence applies to the conversion of text, voice, data, image, graphics, and full-motion video into digital content. Cross-media refers to the integration of various industries-entertainment, publication, and communication media-based on multimedia content. Convergence of content translates all types of information content-books, business documents, videos, movies, and music — into digital information. Convergence of transmission compresses and stores digitized information so it can travel through existing phone and cable wiring. Convergence of information access devices have tlie sophistication to function as both computers and televisions.

The Internet has opened up the potential for the development of converged voice and data networks. Current voice and data sharing technologies keep the two separate at application level: you can run voice or data over tlie network hut the user accesses only one. The new generation of applications leverages this ability to combine voice and data and video at the desktop. The emphasis today is on taking the current and developing network technologies and leveraging the ability to support converged applications at the desktop to improve both internal efficiencies and customer communication. Converged networks offer huge opportunities both for consolidated infrastructure costs within business: the ability to make long distance calls over the Internet is just one example of the way in which converged networks arc creating a new paradigm for corporate operations.

However, converged networks offer so much more than an opportunity to reduce the costs associated with voice calls. With combined voice and data running across a network, organizations like bank's and financial institutions can start to use a new breed of applications that significantly enhance the productivity of the individual, applications such as unified messaging which combine voicc, fax and email, and web enabled call centers that form a key part of the cuslomer delivery channel.

Technologies Supporting Convergence

Network infrastructures that were once separate and distinct voice and data, wired and wireless, premise and wide area are merging together. Advances in communications and networking technology arc creating the bandwidth to make real convergence practical. Some of them are :

I. Optical Technology

Optical networking can carry the entire per second traffic of Internet on single strand of fiber. In an eight-year period there would bc a 1,000-fold increase in fiber capacity from 2.5 gigabits to 400 gigabits to terabits doubling the amount of embedded fiber. Backbone networks will handle 2,000 times the amount of fiber.

2. Asynchronous Transfer Mode (ATM) Technology

ATM is a high-speed, connection-oriented, cell-based transmission scheme that offers bandwidth on demand for voicc, data, and video telephony applications. ATM networks are being created to switch integrated voicc, data, and video signals at multiples of 155 Mbps through multigigabit "hubbing devices" called ATM switches. ATM was developed primarily to answer the need for variable bandwidth commonly known as bandwidth on-demand. For instance, video on-demand will not bc continuous streams of data from the vendor to the customer. Instead, the vendor will download the movie to the set-top box in a large burst in fixed time intervals and so must have access to a network that provides bandwidth on-demand. The ATM concept aggregates a myriad of services on to a single access arrangement. Some of the applications include the following :

- Host-to-Host computer data links
- Video conferencing circuits
- LAN-to-LAN bridges or routed traffic
- Multimedia networking services set by high speed devices

3. Digital Subscriber Line (DSL) Technology

Introductions in compression technology - most notably xDSL - Digital Subscriber Line - are opening up a whole new range of options for people who need multimedia telecom delivered to remote offices. HDSL (High-bit rate DSL) delivers 2Mbps across normal

copper telephone lines. ADSL (Asynchronous DSL) will deliver 8MBps to remote customers. Since it delivers significantly more bandwidth in one direction than the other it is very suitable for Internet access. In three years video over the telephone will be a reality.

4. Integrated Services Digital Network (ISDN) Technology

The telecommunications industry has developed a roadmap for the evolution of digital switched communication services based on ISDN (Integrated Services Digital Network). ISDN standardizes connection interfaces, transmission protocols, and services. ISDN is ideal for intermittent access to the Internet lor high-volume data applications like video. There are two types of ISDN connections Basic rate interface TSDN (BRI) and Primary rate interface (PRI). The BRI maximizes the transmission capability of existing copper wires, allowing for the simultaneous transmission of voice and data over a single twisted pair connection. It allows a maximum speed range of 44-128 Kbps. The ISDN PRI is an international standard for sending voicc, video, or data over T-1 (1.544 Mbps) phone lines, in digital format, with 24 separate 64-#bps channels.

5. **Wireless** Application **Protocol(WAP)/General** Packet Radio **Services(GPRS)**

The Wireless Application Protocol (WAP) is a communication architecture designed for wireless networks. WAP is a protocol and an open industry standard that tries to make Internet mobile and Cellular communication more useful by incorporating Internet access. A WAP gateway serves as a proxy agent for all WAP-enabled phones in the network, and accesses the original server through HTTP methods. The WAP specification includes an XML(Extended Markup Language) - based markup language, scripting language, microbrowser specification, and framework for wireless telephony applications, lightweight protocol stack, and secure connections. WAP's power lies in a system's ability to communicate without needing a PC. Perl, ASP, PHP, Java scrvlcts are the few technologies through which a WAP service can be created. To access a WAP service a WAP-enabled telephone or emulator is needed.

Cellular service providers can use the WAP technology to offer value-added services for transactions that require small authentication, and can be conducted from a hand-held device. This includes mobile banking, payment of bills, school fees, purchase of cinema tickets, e-trading, e-reservations, c-transactions, and e-stocks. WAP also allows communication of video and graphics to the wireless appliances like mobile phones, and pagers thereby, making it possible for users to actually browse the Internet.

General Packet Radio Services (GPRS) is a communication technology, which enables the functionality of the mobile phone by seamless and faster communication of pictures, data, and video. The bulk of the long-distance services in the network are served primarily via microwave and international long distance via satellite. The technology has the use of high- and low-band with scrviccs for voicc, high-speed data, low-speed data, video, LAN-WAN connectivity and WAP services. Most wireless data schemes use "packet" techniques for transferring data. Packet radio is communications method that transmits packets of data over a network via RF (Radio Frequency) signals. Packet radio networks are closely associated with wireless technology. Packet Radio communications lets mobile users communicate with their corporate networks using computing devices such as portable computers, pagers and other wireless communications like WAP etc.

In a packeting process a speciál trans-receiver known as an RF modem breaks down data into 128 byte pieces, or packets. A stream of packets are transmitted into the air. The packets in the air are picked up by radio towers and forwarded to the proper addressee. Each packet is numbered, so that the message can bc reassembled at the receiving end. Packet radio technology has the following advantages :

- The frequencies are less susceptible to interference and noise.
- Transmission costs are based on data packets.
- No roaming charges are applicable.
- Transmissions are digitally encoded for greater security.

Voice and Data Integration

Voice networks have been created over the past half-century to deliver a range of

sophisticated services. They are renowned for high quality, reliability, ease of use, manageability, a range of features and billing. Development has been slow as typifies a mature market and the technology devices have been proprietary, further constraining faster development. Data networks typically deliver high speed, fast innovation and rapid price reductions. Data networks are based on open, standard technology which provides easier integration of products and supports rapid innovation. Traditionally voice and data networks have been separate . These two separate networks are now converging; a move that has been fuelled by the dramatic increase in data traffic that has occurred over the past few years. The Internet, together with bandwidth demanding multi-media applications, faster PCs, and faster connectivity, has created a data rich environment. As a result, the telecommunications companies are now re-architecting their networks which were initially designed to support the traditional growth patterns associated with voice traffic to meet the huge increase in data. The new high-speed networks being created by the carriers are based on IP - the protocol of the Internet.

Voice over IP means that voice calls can be made over a data network, thus converging the two separate networks into one. Voice over IP does not mean that all the calls have to go via the Internet and has,-until now, been just point to point communication unable to deliver the richness of telephony services which have become integral to the way communication is supported. Call divert, call waiting and caller line irlentification, for example, are important tools. Voice over IP has now come of age, and can dcliver all the richness and functionality associated with telephony services. On any leased line of an internal WAN connection, an intranet that will support free internal calls using IP can be made functional. However, it is fundamental to remember that there is more to convergence than tlie Internet. IP networks will coexist with a wide range of other private and service provider networks for voice, data and wireless, and optical.

The adoption of IP as the core protocol opens up the potential for Voice over IP to be broadly adopted. Additionally, voice calls can be placed through the Internet via an Internet Service Provider (ISP), leveraging tlie local call rates used for Internet access not only for standard voice calls but also for conference calls and video conl'crencing. Convergence is more complex than simply running voice over existing data network. Converged networks will eventually be able to deliver the same quality and reliability of voice service and they are beginning to move closer to the sound quality that customers have come to expect in the voice world.

Applications of Convergence

Applications of convergence inoludcs the following :

i) Unified messaging that combines voice, fax and e-mail.

ii) Deliver reliable remote access for mobile employees.

iii) Customer focused call ccntcrs, integrated with web sites and Interactive TV to support electronic commerce.

iv) Voice over IP between branch offices to exploit lower cost voice and fax calls.

v) Virtual Private Networks to link key customers and improve supply chain Management.

The above application ability enables organizations to create short and-long tenn architectural and migration plans for voice, data and integrated multi-media networks, focusing on the implementation of convergence solutions to achieve strategic business value.

It is simply not an option for most organizations to abandon today's systems. Indeed, many elements of current network infrastructures will continue to exist and deliver value for some time. There will bc many diverse elements to the network of the future: wired, wireless, copper, optical, IP, TDM, ATM. There will be voice communications, messaging, call centers, wireless communications, data communications, virtual private networks, e-commerce, Intranets and Extranets.

As the technology develops, so will the networks, for example,

- Voice networks will become more intelligent at handling mixed voice and data calls

and supporting new server-based productivity applications, such as multi media messaging and Web enabled call centers.

- Data networks will become more reliable, more manageable and more addressable, making it as easy for individuals to find and communicate with each other through desktop computers as it is to reach each other on the telephone.

And, while cost reductions over initial benefits, cost is not the major issue since cost savings will disappear in the long run as voice tariffs come down. It is important, therefore, that organizations focus on leveraging this technology to improve service through enhanced working practices and delivering overall benefit to customers and employees through applications solutions that seamlessly integrate with legacy systems.

Currently technology suppliers are in the process of creating the components of the infrastructure that will support combined voice and data networks. For example, systems are being developed to support combined Local Area Networks (LANs) and telephones from a single connection point to support voice and fax over IP between branch offices. Therefore, vendors are developing producls that will work with an organizations existing infrastructure, delivering gateways that will enable the integration of a legacy Private Brnnch Exchange (PBX), taking voice traffic away from the Public Switched Telephone Network (PSTN) and onto an IP based network. This will enable an organization to run voice traffic at a significantly reduced cost to the traditional PSTN based tariff. This technology can also be used to support inter-office faxing, again reducing communications costs for an organization. Fax is a good pilot application for this technology since quality is not a significant issue.

There are issues about quality to address, particularly over the backbone, but in the interim it is important that an organization looks for voice ready data products for any new investment in data network technology made to ensure immediate exploitation of the application opportunities prcsentcd by convergence as fast as possible once they arise. Many organizations will opt to use an Internet Service Provider (ISP) to deliver into office communication and, with voice requiring high levels of quality and reliability, there will bc a clear need to develop tight Service Level Agreements with these ISPs to ensure high levels of service.

The most common way of making a Voice over IP call is through a PC. This requires:

- A PC with a modem that supports voice and data or that is connected to a network that includes multi-service resources.

  A microphone and headset attached to the PC. A separate microphone and speakers can also be used, especially for conference calls.

- The relevant voice and data transmission software
- A subscription to an Internet telephone service.

Once all of these components both backbone and local area - are in place, organizations will begin to start leveraging the technology with applications such as unified messaging which combine voice, email and fax. E-mails can become voice-mails, either using the speaker on the PC or through the telephone, with the option to turn e-mails into faxes to ensure that messages are displayed in the way most suitable for that user at a particular time.

Call Centers

One of the key developments in the delivery of enhanced customer relationships over the past decade has been the introduction of call centers. The development of Computer Integrated Telephony (CIT) has supported increased sophistication in the way organizations can handle both tele-sales and telephone based customer support. CIT enables customer information to be combined with the telephone call to ensure the operator can deliver high quality customer service through access to up to date, relevant information. The call centers will remain strategically important to customer facing business units despite the emergence of the web as a self-service medium. Self-service media such as the web are complementary to call centers. Web enabling the call center can have a direct, positive impact on the customers.

The Voice over IP opens up new opportunities for enhancing customer relationships. For

example, a customer browsing the web may require additional information or human interaction to make a purchase. With a 'click to call' button, the user can either register a need for a call from the call center or go straight online with a call center operator who not only has the same web page on their screen but can then take control of the customer's screen to drive the interaction forward.

The two reasons for the continued importance of the call ccnter are :

- Call centers arc where businesses talk directly to their customers, discovering their requirements, persuading them to do business, and ensuring that their demands are satisfied.
- Call centers also have a crucial advantage over self-service media they allow businesses to be proactive in ways that would be rejected or ignored if sell-service media were used.

A web enabled call center is a strong catalyst for e-commerce strategy. Linking online strategy with the call center has two direct effects on e-commerce :

1. A web enabled call center makes the online process more effective by augmenting the e-commerce process with live agent support.
2. Web enabled call center makes e-commerce strategies more effective at tapping into the online revenue stream, by introducing a pro-active element.

Acitivity 1

I. Define Convergence'?

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2. Identity the convergence applied to networks.

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3. What is meant by VoIP?

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4. Give two reasons for the importance of Call Center.

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10.3 WIRELESS APPLICATION PROTOCOL

Wireless Application Protocol (WAP) is an application environment and set of communication protocols for wireless devices designed to enable manufacturer, vendor, and technology-independent access to the Internet and advanced telephony services. WAP bridges the gap between the mobile world and the Internet as well as corporate

intranets and offers the ability to deliver an unlimited range of mobile value-added services to subscribers-independent of their network, bearer, and terminal. Mobile subscribers can access the same wealth of information from a pocket-sized device as they can access from the desktop.

WAP is a global standard and is not controlled by any single company. Ericsson, Nokia, Motorola, and Unwired Planet founded the WAP Forum in the summer of 1997 with the initial purpose of defining an industry-wide specification for developing applications over wireless communications networks. The WAP specifications define a set of protocols in application, session, transaction, security, and transport layers, which enable operators, manufacturers, and applications providers to meet the challenges in advanced wireless service differentiation and fast/flexible service creation. There are now over one hundred members representing terminal and infrastructure manufacturers, operators, carriers, service providers, software houses, content providers, and companies developing services and applications for mobile devices.

WAP also defines an application environment (WAE) aimed at enabling operators, manufacturers, and content developers to develop advanced differentiating services and applications including a micro-browser, scripting facilities, e-mail, World Wide Web (WWW)-to-mobile-handset messaging, and mobile to tele-fax access. Figure 10.1 shows a fully functional WAP-enabled devices with the main components like Wireless device, WAP gateway and the Internet, whose functions are explained hereunder:

Wireless **Device** : It is a hand-held mobile device similar to a cellular phone called WAP phone. Nokia and Ericsson are the few companies who manufacture WAP phones. The WAP phone has a micro-browser and a dialer to dial into a WAP site.

WAP Gateway: Gateway provides interconnections to various networks such as Internet. Generally the gateway is provided by an WAP Service Provider similar to Internet service providers (ISP). The gateway facilitates communication between businesses having accounts with different networks running a variety of protocols and systems.

Internet : Internet (Interconnected Networks) is the Information superhighway network infrastructure. The internet environment is a unique combination of postal service, telephone system, research library, supermarket, and talk show center that enables people to share and purchase information. Internet provides wide range of computer-based services, such as e-mail, EDI, information publishing, information retrieval, and video conferencing.

Based on the Internet model, the wireless device contains a micro-browser, while content and applications are hosted on Web servers.

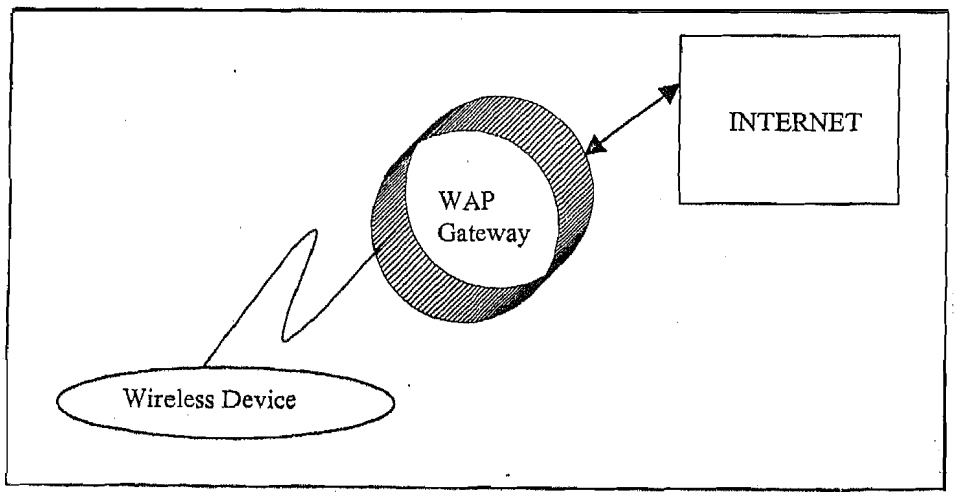


Fig. 10.1 : WAP-Enabled Devices

Wireless Service Protocol (WAP) Technology

Internet standards such as Hypertext Markup Language (HTML), Hypertext Transfer Protocol (HTTP) and Transmission Control Protocol (TCP) are in efficient over mobile networks, requiring large amounts of mainly text-based data to be sent. Standard **HTML** cnntcnt cannot be effectively displayed on the small-size screens of pocket-sized mobile phones and pagers. WAP utilizes binary transmission for greater compression of data and is optimized for long latency and low bandwidth. WAP sessions cope with intermittent coverage and can operate over a wide variety of wireless transports. In the past, wireless Internet access has been limited by the capabilities of hand held devices and wireless networks. WAP utilizes Internet standards such as XML (Extended Markup Language), User Datagram Protocol (UDP), and Internet Protocol (IP).

Wireless Markup Language (WML), and wireless markup language script (WMLScript) are used to produce WAP content. They make optimum use of small displays, and navigation may be performed with one hand. WAP content is scalable from a two-line text display on a basic device to a full graphic screen on the latest smart phones and communicators. As content providers applications will bc written in wireless markup language, which is a subsct of extensible markup language (XML). Using the same model as the Internet, WAP will enable content and application developers to grasp the tag-based WML that will pave the way for scrviccs to be written and deployed within an operator's network quickly and easily.

WAP Architecture .

WAP will provide multiple applications, for business and customer markets such as banking, corporate database access, and a messaging interface (see Figure 10.2).

Pig. 10.2 : WAP/Mobile Device Display

The request from the mobile device is sent as an URL through the operator's network to **the** WAP gateway (see Figure 10.3), which is the interface between (he operator's network and the Internet.

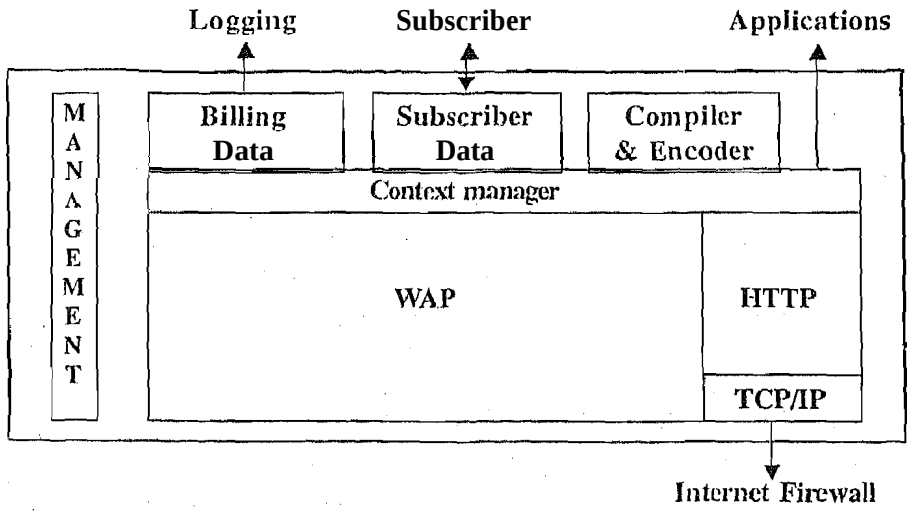
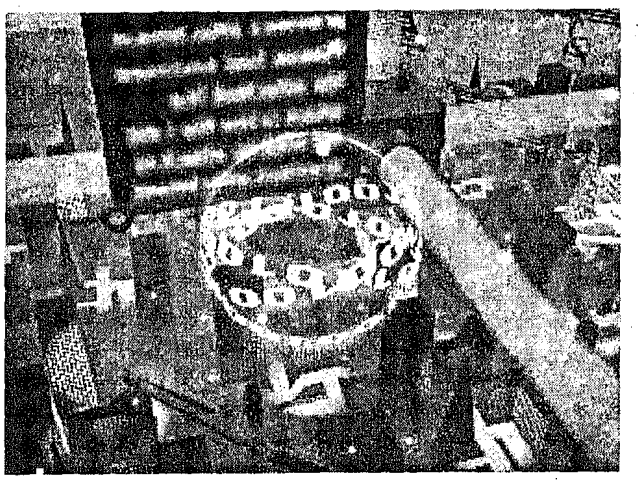


Fig. 10.3 : Architecture of the WAP Gateway

The HTTP interface serves to retrieve WAP content from the Internet requested by the mobile device. **WAP** content (WML and WML Script) is converted into a compact binary form for transmission over the air (see Figure 10.4).



Pig. 10.4 : WAP Content in Compact Binary Form

The **WAP** microbrowser software within the mobile device interprets the byte code and displays the interactive **WAP** content (see Figure 10. 2)

Application of WAP in Financial Sector

For wireless network operators, WAP promises to cut costs, and increase the subscriber base both by improving existing services, such as interfaces to voice mail and prepaid systems, and facilitating an unlimited range of new value-added services and applications, such as account management and billing inquiries. New applications can be introduced quickly and easily without the need for additional infrastructure or modifications to the phone. This will allow operators to differentiate themselves from their competitors with new, customized information services. WAP is an interoperable framework, enabling the provision of end to end turnkey solutions that will create a lasting competitive advantage, build consumer loyalty, and increase revenues.

As WAP is a global and interoperable open standard, content providers have immediate access to a wealth of potential customers like Banks and other Financial Institutions. Who will seek such applications to enhance the service offerings. End users such as Banks/ Financial Institutions of **WAP** will benefit from easy, secure access to relevant Internet information and services such as unified messaging, banking, and entertainment through their mobile devices. Intranet information such as corporate databases can also be accessed via WAP technology. Because a wide range of handset manufacturers already supports the WAP initiative, users will have significant freedom of choice when selecting mobile terminals and the applications they support. Users like banks/financial institutions will be able to receive and request information in a controlled, fast, and low-cost environment, a fact that renders WAP services more attractive to customers who demand more value and functionality from their mobile terminals. Internet will set many of the trends in advance of WAP implementation.

Banks arc providing their services over mobile phones. WAP has been used by hanks to promote mobile commerce (m-commerce) in india. Bank's have adopted and invested in WAP to enable m-commerce as their delivery channel for providing services. Although WAP as an access tool is also being promoted by other content and e-mail providers, banks are seen to be the main drivers of WAP technology for m-commerce. Some of the services offcrcd by banks to WAP users include the following:

- Real-time equity and Forex quotes
- Portfolio Information
- ATM (Automatic Teller Machine)/Branch locator
- Travel/Ticketing information

The concept of WAP revolves around compressing convergence into one instrument. The ultimate goals of banks will be transactions through various payment channels like credit cards.

It is expected that mobile terminal manufacturers will experience significant change as a result of WAP technology-a chance that will impact the look and feel of the hardware they produce. The main issues faced by this arm of the industry concern the size of mobile phones, power supplies display size, usability, processing power, and the role of personal digital assistants (PDAs) and other mobile terminals. The handsets themselves will contain a micro-broswer that will serve to interpret the byte code (generated from the WML /WMLS content) and display interactive content to the user. The services available to users will be wide-ranging in nature, as a result of the open specifications of WAP, their similarity to the established and accepted Internet model. Information will be available with the ability for users to interact with services via both voice and data interfaces.

Real-time applications and services demand small and key pieces of information that will fuel the success of WAP in the mobile marketplace. Stock prices, news, weather, and travel arc only some of the areas in which WAP will provide services for mobile users. Essentially, the WAP application strategy involves taking existing services that are common within a fixed-line environment and tailoring them to bc purposeful and user-friendly in a wireless environment.

Some of the advantages that WAP can offer are:

- Open standard, vendor independent,
- Network-standard independent,
- Transport mechanism-optimised for wireless data-bearers,
- Application downloaded from the server, enabling fast service creation, and introduction, as opposed to embedded software .

Activity 2

1. What is WAP'?

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2. Identify the three components of WAP.

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3. Give some of the WAP services offered by banks.

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4. List advantages that WAP can offer.

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10.4 VIRTUAL PRIVATE NETWORKS

What is VPN?

Industry vendors and service providers twist and stretch this acronym as needed to fit product offerings. Unfortunately, a single, practical working definition of 'VPN' remains elusive like beauty, the true meaning of VPN is in the eye of the beholder. The goal of all VPN products is to enable deployment of logical networks, independent of physical topology.

The virtual part of VPN is allowing a geographically distributed group of hosts to interact and be managed as a single network, extending the end-user dynamics of LAN without concern as to the true location of hosts within the VPN. The private part of VPN is - provision of security characteristics such as privacy, integrity, and trust among hosts participating in a virtual network.

The broadest definition of a VPN is 'any network built upon a public network and partitioned for use by individual customers'. This results in public frame relay, X.25, and ATM networking being considered as VPNs. These types of VPNs are generally referred to a Layer 2 VPNs. The emerging form of VPNs arc networks constructed across shared IP backbones, referred to as 'IP VPNs'.

Generally accepted definition of VPN consists merely of encryption and virtual authentication, but a complete VPN includes the following three critical components:

- Security: Including access control, authentication and encryption technologies to guarantee the security of network connection, authenticity of users, and privacy and integrity of data communications.
- **Traffic** Control : Including handwidth management, quality of service and hardware-based VPN acceleration to guarantee the reliability and performance of the VPN, and,

  Enterprise Management: Including true policy-based management to guarantee the integration of VPNs within the enterprise security policy, local or remote centralized management of that policy, and scalability of' the solution.

The combination of these three components is absolutely necessary to enable practical implementation of Virtual Private Networks.

In common usage a VPN is a group of two or more computers connected together with limited public-network access, that communicates 'securely' over a public network. VPN may exist between

Network-to-network (LAN-to-LAN),

Host-to-network (Host-to-LAN), or

Host-to-host (Server-to-Server).

Security features differ from product to product.

VPN Technology

VPN Products : There are three categories of VPN products:

1. **Hardware** based systems : These are encrypting routers. These routers reduce the processor overhead on the servers.
2. Firewall-based **VPNs** : These provide the firewall's security mechanisms, including restricting access to the internal network. They also perform address translation; satisfy requirements for strong authentication; and server up real-time alarms and extensive logging.
3. Software-based VPNs : These products are used where both endpoints of the VPN are not controlled by the same organization, or when different firewalls and routers are implemented within the same organization. These are generally harder to manage than encrypting routers.

But as the VPN market evolves, the distinctions between VPN architectures are becoining less clearly defined. VPN product family includes solutions that address aspects of VPNs: Software based VPN gateway products, plug-and-play VPN appliances, client-based VPN software, VPN acceleration cards, and turnkey PKI product.

VPN Protocols :

PPTP : Point-to-Point Tunneling Protocol from Microsoft

L2F : Layer 2 Forwarding from Cisco

L2TP : Layer 2 Tunneling Protocol (PPTP+L2F) from IETF

IPSec : IP Security operates at layer 3 of the OSI model in host-to-host mode.

L2TP has become accepted tunneling standard. Tunneling is a process of sending packets to a computer on a private network by routing them over some other network, such as the Internet.

VPN **deployment** : A client that supports VPN protocol, connects to a Network Access Server (NAS) at the ISP facility. NAS is also referred to as front-end processor/dial-in server/point-of-presence (POP) server. Alter the client has made the initial PPP connection to the ISP, a second clial-up networking call is made over the PPP connection. Dnta sent using this connection is in the form of IP datagrams that contain PPP packets, referred to as encapsulated PPP packets. The second call creates the VPN connection to PPTP server on the private enterprise LAN, this is referred to as tunnel. Tunnels are virtual point-to-point connections that offer authentication, encryption, and access control between tunnel endpoints. Tunnels can exist at several protocol layers.

Essentially, a VPN is a mechanism for using a public network, such as the Internet, as a conduit for sending encrypted data between two secure endpoints, But the method by which a VPN is crented can range from very simple to fairly complex. In the simplest of configurations, a VPN can be implemented with little more than an unmanaged Internet connection and some software on the sending and receiving end. On the other hand, the implementation can be a sophisticated arrangement of hardware VPN. gateways, or VPN-enabled firewalls, strong security via smart cards or security tokens and network bandwidth management. Different vendors often provide different approaches to both the physical implementation and the inner workings of security and manageability, and with just about every networking vendor labeling its products "VPN," sorting out the differences can be confusing.

Today's VPN services fall into the following two categories :

1. Managed VPN services — that include CPE (Customer Premise Equipment) and network connectivity, plus 24x7 management and service-level monitoring. For a higher monthly recurring charge, these providers not only build your VPN, they operate it for the buyer.
2. Turnkey VPNs.— These providers sell or rent Customer Premise Equipment (CPE) for use with their local access facilities and backbone network connectivity. Customers install and manage CPE and configure their own VPN.

VPN Build or Buy : To build or buy is a question these days as the strain on resources increases and the number of VPN service providers grows. While outsourcing isn't necessarily cheaper than building your own VPN—in fact, it's likely to be more expensive.

. The advantages of outsourcing include:

— protection from obsolete technology,

— less demand on your IT staff,

— in most cases, a guarantee of adequate performance, and

— security from the provider.

Outsourcing to a knowledgeable provider can also offer a sense of security that comes from having an expert available for troubleshooting.

Market confusion is one reason why many IT managers are opting to outsource all or part of thcir VPNs to third parties. The four elements that are to be evaluated while outsourcing VPN are - quality of service, reliability, security and manageability.

There are many factors to consider when evaluating a VPN service, some of them are given below:

I. What kind of client will you deploy?

2. What kind of authentication do you do?

3. With rcferencc to POP, what is the port availabilitylreliability?

4. What is the server availability'!

5. What is your backbone?

6. What is the end-to-end latency/throughput?

7. What is the effective throughput of the proposed service'?

8. Can I get a service level agreement (SLA) w.r.t. performance'?

9. What is your history of service outages for the last few months?

10. Who administers client support and help desk'?

11. How will you support me in addressing user connection issues'?

12. Is tiered support available for the help desk?

13. Do you offer remote diagnostics and monitoring?

14. What is the nature of your reporting, nccounting and billing?

15. What kind of CPE equipment is deployed'?

The role of VPN in financial sector

Networks and communications are mission critical. Corporalions, banks and financial institutions depend on smooth, efficient, reliable voice and dala communications within a site and its customers and suppliers. Such reliance on communications is particularly acute in the branch office of bank's and other organizations. Interacting with customers, suppliers, and competitors, branch offices are the organization's link to the outside world. Customers, suppliers, and employees depend on the communications facilities of the brunch office. Branch offices need robust solutions designed for their requirements. Many industries like bank's and other financial institutions depend on a network of independently owned remote offices to generate sales, ensure customer satisfaction, and settle claims. Bank branches serve as a hub for customer service and sales outlets, while also serving as a gateway to the financial payments system. For these and many other industries, effective communications have become essential for gaining and sustaining competitive advantage. In fact, in response to increased competition in many of these industries, banks and financial institutions are decentralizing key processes and information flows further into their branch office network. Many organizations are moving away from centralized applications and rolling out client/server MIS applications to remote offices. The increased dependence on branch office communications has become a key IT issue. IT is under constant pressure to lower operating, staffing, and capital expense while providing rock-solid systems. Branch office service and support are typically a disproportionately large piece of an IT budget. Remotely managing and supporting branch offices are expensive tasks. In response to this dilemma, many small offices have already begun integrating thcir voice and data traffic onto a single "pipe" to reduce access costs. The Internet provides WAN communications more cheaply and more globally than a leased line, Asydchronous transfer mode (ATM) network. Internet cannot provide the security, bandwidth, or quality of service (QOS) guarantees which are associated with private networks for which bank's and companies in financial sector are looking forward to. In addition the Internet supports only TCP/IP (Transaction control Protocol/ Internet Protocol), while most networks accommodate a variety of protocols. Hence if a corporate or a banks net is run over Internet it costs less but gets an inferior service.

VPN or "extranet" is a technology which serves primarily as a means of extending the reach of private networks for dial-in access. It provides security, performance, availability, and multiprotocol support ol' a private network over the inexpensive Internet. An important application is connections with customers and business partners for companies in financial sector. VPNs may address locations where traditional private network connections cannot be economically justified. Trends show that banks and companies in financial sector are interested in Internet-based VPNs. The cost of a VPN may be less than half that of a private dial-in access solutions. Bank's and companies in financial sector use in-house communications servers, modem banks, and toll-free numbers to support dial-in access. Using VPN, banks and financial companies can off-load most of the expenses and hassle associated with dial-in connectivity. Users simply dial in to the closest Internet Service Provider(ISP). The ISP manages the modem banks and communications servers. The ISP forwards the dial-in traffic to a central corporate site via the VPN. At the central site like a bank's Corporate/Head office maintains a single connection to the Internet, usually via a high-speed digital line. Dial-in traffic looks like ordinary Internet traffic coming in on the high-speed digital access line. Functionally, remote users have the same connection to the corporate network with a feeling as if the users were sitting at their desks at the central site.

For intra-and inter-company VPN traffic, considerations such as security, availability, reliability, and performance may force organizations like hank's to consider exactly where their traffic flows and what other traffic uses the same networks. Primary among considerations is security. Security issues include the following :

Privacy - Transmissions cannot be read

Authorization - Users have the right to access certain resources

Integrity - Data isn't tampered with

Non-repudiation - Senders are who they say they are

Assurance of service - The ability to send or receive data cannot be denied

Except for denial of service all the above concerns can be addressed through encryption and digital kcys. As costs associated with kcys and encryption includes processing power, network bandwidth, special hardware, and time and cxpertisc to manage the system organizations like banks are choosing private networks which are less expensive to invest and achieve a higher level of security as Internet traffic is more vulnerable for attacks. For instance, if the same physical lines carry Internet and private network traffic, both types of traffic may be equally vulnerable to "invasion of privacy" via a network monitor. In this context encrypted VPNs are more secure than private lines.

Activity 3

1. What is VPN?

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2. List out the VPN products.

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3. Identify the VPN Protocols.

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4. List out factors to consider when evaluating VPN.

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10.5 MULTIMEDIA SYSTEMS

What is Multimedia ?

The simultaneous use of data in different media forms like voice, video, text, animations, etc. is called Multimedia. Digital video and audio media are the most demanding of the new media that are being added to the repertoire of computing and communications systems. These types of media are frequently referred to as Continuous Media (CM), The term multimedia computing commonly refers to the use of multimedia data types in computer applications and systems, and multimedia communications denotes communication systems which support the real-time transmission of continuous media.

A dialog system is called **a** multimedia-system if it combines several communication media at the same time such as the following :

- Speech and sound
- Text and drawings
- "Naturally" produced static images (television-stills, slides)
- "Naturally" produced moving images (video, film)
- Synthetically produced photorealistic moving or still images
- Real-time interactive graphics.

Application of Multimedia

The integration of multimedia techniques gets more and more important with the improvement of visualization software, standardized transmission protocols and a worldwide available and powerful telecommunication infrastructure. A regular ISDN-connection (one channel, 64 K Bit) allows a periodical exchange of still images and packed audio data every few seconds. This is sufficient for many teleservices and tele-commissioning applications. Online process monitoring with audio- and video-components or teleconferencing requires higher bandwidths. With multimedia emerging, applications in the following areas have appeared:

- Entertainment
- Home Shopping
- Health care
- Education
  Engineering
- Finance and Banking

Entertainment

The use of interactive media for entertainment, like sophisticated games and movies, has three stages:

1. Video-on-demand
2. Interactive Television/Cinema
3. Group collaboration and teaming

1. Video-on-demand : The amount of programming available to audiences will increase in a drive to video-on-demand services. Video-on-demand is developing as an effort by the cable television industry, the telephone industry, and broadcasters to provide greater flexibility in what programming is shown and when. The video-on-dernand model takes advantage of some form of two-way communication between the home and the video source, which could he a phone line with sufficient bandwidth to carry a compressed video signal. The home may be furnished with a low-cost box, which accepts signals from a hand-held control and which transmits the appropriate status to the video control center. The viewer uses the hand-held control to navigate a selection menu and choose a program. Shortly after the selection is made, the program begins playing. During the course of the movie the viewer is able to pause, reposition, and use other VCR-like control.

2. Interactive Television/Cinema : The use of interactive television facilities for video-on-demand will make it possible to incorporate audience participation into existing programming. The script writer must ensure that every path connects in a coherent way to the previous scenes.

3. Group Collaboration and Teaming : Participation will move from a highly controlled audience mode to open-ended group collaboration and teaming, from many-to-one and many-to-many. 'The Next President' is an example of collaborative on-line game which lets thousands of users participate in a simulated election campaign. The example illustrates the evolution of entertainment towards participation and collaboration.

Home Shopping

Now-a-days many homes have access to cable television channels and Internet in which a variety of retail goods are marketed. Potential customers can rnnke a purchase by dialing their telephone and using their 'credit cards. Two possible directions that this application might take are:

1. Interactive television : In the model based on the convergence of TV and the computer, greater interactivity and an increase in the number of available channels will permit home shopping to he conducted to many retailers throughout the community.

2. Video-telephony : In the model based on the convergence of the TV and the telephone, subscribers would dial the retailer of interest, but would connect to the live video salesperson or prerecorded video showcase.

Healthcare

Multimedia technology permits visual data to be more easily viewed, shared, and processed. Environments in which imaging applications are prominent are good candidates for use of multimedia technology. Certain segments of the health-care industry are exatnples of this, and several systems involving rnultimcdia communications and computers have been tested. The use of imaging techniques such as X-rays, MRI (Magnetic Resonance Imaging), etc. is growing in healthcare. The collection, maintenance, processing, and distribution of these records can be significantly improved by using computer-based storage and high-bandwidth communications. Once these records are integrated with the on-line patient information and easily shared by both local and remote physicians, a large number of benefits result in reduced costs and improved care. Major hospitals can use high-bandwidth communications from smaller hospitals to increase referrals to complex procedures and attract wider usage of advanced facilities. The communication facilities help to strengthen the relationship between the teaching hospital and the client hospitals, which become more dependent on the higher-quality service.

Multimedia communications can provide significantly greater access to specialists, particularly valuable for complex treatments. Information sharing and video conferencing are key components of multimedia communications.

Education

The ability of multimedia inaterials to convey by picture, sound, animation, or movie what is otherwise hard to express, to capture for reuse on any occasion remote lands, and

singular events, and with the use of the computer, to provide the information in a form that can be engagingly interactive and easily recast by any aspiring communicator is the explanation for the popularity and particularly long history of multimedia technology's role in education.

Educational titles have been one of the dominant product areas for multimedia computing. Generally educational multimedia software contains a database (stored on videodisc) having many collections with variety of cultural, historical, and scientific themes; the total database consists of several media objects, with accompanying keywords, citations and descriptive material. Specific tools for searching, editing, and–composing, with the media objects as the raw materials, are included with the software.

Engineering

The new multimedia technologies are leaving their marks not only in public but also in industrial applications, for example process control systems. Tele-commissioning, tele-operation and tele-service based on multimedia user interfaces are of growing importance in automation and process control engineering.

The method to accelerate the design and manufacture of complex systems and products is known as concurrent engineering. One of the key precepts of these practices is the coordinated activity of engineering, manufacturing, and management activities of a project thorough all phases of its development. The benefits of this approach are reduced time-to-market and improved product quality. The use of multimedia communications tools is one of two uses of multimedia technology that play an enabling role for concurrent engineering. These tools permit product groups to communicate in distributed environments, sharing application and data, using on-line group decision support tools, and interacting in group conference calls.

Engineering and manufacturing groups rely increasingly on CAD (Computer Aided Design) and CAM (Computer Aided Manufacture) software to design, manufacture and maintain their products. Together with technical publishing software, these tools permit design specifications and technical documentation to be created and accessed on-line. The second enabling role of multimedia technology is to supplement these existing tools with a richer information processing environment. For example audiovisual product information, voice annotations of design documentation, and on-line interactive help manuals can be supported by the availability of on-linc multimedia information. The richer information content indirectly enables the concurrent engineering process by providing a more effective and direct form for expressing an idea. The practice of concurrent engineering can be enhanced by use of computer and communication technologies. In particular, multimedia technologies permit work groups to collaborate in a richer information environment. The distributed multimedia workstation environment combines a cross-campus video network, existing applications software, and shared applications to allow multimedia documents to be shared during group video conferences. The two roles of multimedia technology in concurrent engineering are :

- Engineering and manufacturing as a visually rich domain is a natural beneficiary of multimedia information processing.
- Group communications, when conducted via the computer workstation, allows the participants to refer to and share any on-line materials that might be appropriate to the discussion.

Finance and Banking

Multimedia application in Finance and Ranking, touchscreen kiosks have entered the business. More number of banks as part of e-banking are setting up touchscreen kiosks at places such as important corporate centers, retail supermarkets, air-ports etc, A crucial advantage of multimedia technology is the shift to visually oriented interface. Replacing tables and text with pictures can make the information and the interaction process more direct for users.

Framework for Multimedia Systems

The framework of Multimedia systems is an overall picture of the development of

distributed multimedia systems from which a system architecture can be developed. The framework highlights the dominant feature of multimedia systems; the integration of multimedia computing and communications, including traditional telecommunications and telephony functions. As shown .in Figure 10.5 low-cost multimedia technology is evolving to provide richer information processing and communications systems.

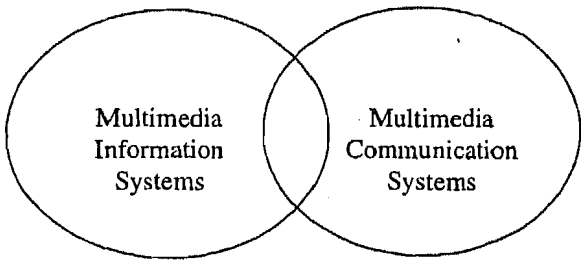

Fig. 10.5 : Convergence of multimedia information and communications systems

Low cost multimedia systems though tightly interrelated, have distinct physical facilities, logical models, and functionality. Multimedia information systems extend the processing, storage, and retrieval capabilities of existing information systems by introducing new media data types, including image, audio, and video. These new data types offer perpetually richer and more accessible representations for many kinds of information. Multimedia communications systems extend existing point-to-point connectivity by permitting synchronized multipoint group communications. Additionally, the communication media include time-dependent visual forms as well as computer application conferencing.

The framework consisting of four interrelated models is shown in Figure 10.6. The four interrelated models of distributed multimedia systems are :

1. **Multimedia Distributed Processing Model :** This model includes System services, Application toolkits, and Application frameworks.
2. **Multimedia Information Model :** This model includes Data modeling for storage, Retrieval and Processing.
3. **Multiservice Network Model :** This model includes Communication model with a network architecture, Network Protocols and Interfaces.

   Networks for distributed multimedia system support a wide range of traffic requirements, including traffic with real-time requirements. Such networks are described as multiservice. The requirements for the network architecture include QOS (Quality of Service) guarantees that are sufficient for real-time transport,multiway connections, and high performance. Design of Multiservice networks consists of Public Switched Network and Internet.
4. **Multimedia conferencing model** : This model provides Multiparty communication, Real-time interchange of media, electronic mail, and telephony.

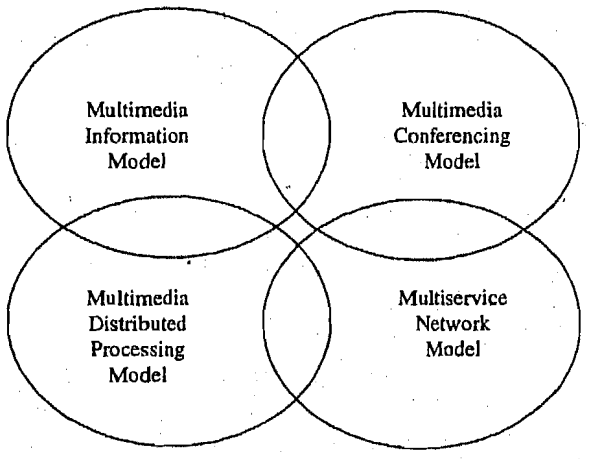

Fig. 10.6 : The framework of four Interrelated models

In the figure 10.6 the information model and distributed processing model are the two components of Multimedia Information system (MMIS).

Multimedia Conferencing

Multimedia conferencing, as a technology for supporting communications with multiple parties and media, is more than an evolution of traditional specialized teleconferencing systems. Video teleconferencing uses dedicated equipment and line, specially designed conference rooms, and a range of video qualities in which motion artifacts and audio delays were common. These systems arc typically used by large organizations like banks and financial institutions which needed to provide frequent interaction between number of geographically distributed sites. The investment in conferencing equipment could be justified by the increased organizational interaction and the reduction in travel expenses. Conferencing systems are frequently used for point-to-point conferences between predefined locations. Conferences were typically scheduled ahead of time. Participants went to specifically configured meeting rooms to attend conference and videophones.

Activity 4

1. What is Multimedia?

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.2. Lit out the various applications of Multimedia.

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3. What are the four interrelated models of Multimedia?

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10.6 SUMMARY

Convergence is defined as the melding of consumer electronics, television, publishing, telecommunications, and computers for the purpose of facilitating news forms of information-based commerce. There are two types of convergence — multimedia convergence and cross-media convergence. Multimedia convergence applies to the ,conversion of text, voice, data, image, graphics, and full-motion video into digital content. Cross-media refers to the integration of various industries-entertainment, publication, and communication media-based on multimedia content. The Internet has opened up the potential for the development of converged voice and data networks. Converged networks offer huge opportunities both for consolidated infrastructure costs within business: the ability to make long distance calls over the Internet is just one example of the way in which zonvcrged networks are creating a new paradigm for corporate operations.

There are various technologies supporting convergence namely Optical technology, Asynchronous technology, WAP and GPRS technology, **DSL** technology and ISDN technology etc. Traditionally voice and data networks have been separate . These two separate networks are now converging; a move that has been fuelled by the dramatic increase in data traffic that has occurred over the past few years. The Internet, together with bandwidth demanding multi-media applications, faster PCs, and faster connectivity, has created a data rich environment. Voice over IP means that voice calls can be made

over a data network, thus converging the two separate networks into one. Applications of convergence includes Virtual Private Networks, Voice Over IP, Messaging that combines voice, Fax and e-mail, Remote access, Call centers. Call centers are where businesses talk to their customers, discovering their requirements and giving proper guidance, solutions and support.

Wireless application protocol (WAP) provides a markup language and a transport protocol that open the possibilities of the wireless environment and give players from all levels of the industry the opportunity to access an untapped market that is still in its infancy. WAP is an enabling technology that, through gateway infrastructure deployed in mobile operator's network, will bridge the gap bctwecn the mobile world and the Internet, bringing sophisticated solutions to mobile users. Some of the services offered by banks to WAP users include Real-time equity and Forex quotes, Portfolio Information, ATM/branch locator, Travel/Ticketing information.

Virtual Private Network is allowing a geographically distributed group of hosts to interact and be managed as a single network. VPN is based on the concept of tunneling is a technology which is currently being considered primarily as a means of extending the reach of private networks for dial-in access. Banks and Financial companies are installing VPN in order to cut costs and for its robust security and performance reasons.

There arc significant technical, regulatory, and market issues facing the arrival of integrated multimedia environments, but the frameworks for multimedia computing and multimedia communications arc well understood. The process by which these systems are realized will be evolutionary, and various multimedia computing and communications standards will play an important role in the pace of market growth because of the importance of interchangeability to multimedia information use.

10.7 SELF ASSESSMENT QUESTIONS

1. Discuss various technologies supporting convergence.
2. Explain in detail Voice and Data Integration.
3. Discuss various applications of convergence.
4. Explain the functions of Call Center.
5. Discuss various applications of WAP in financial sector.
6. Explain WAP architecture.
7. What is meant by VPN deployment? Explain.
8. Explain the role of VPN in financial sector.
9. Discuss Framework of Multimedia systems.

10.8 FURTHER READINGS'

1. Ravi Kalakota & Andrew B. Whinston, *2000, "Frontiers of Electronic Commerce",* Addison Wesley/Pearson Education Asia Pte Ltd.
2. Pete Loshin & Paul A. Murphy, 1999, *"Electronic Commerce",* Jaico Publishing House.
3. Muneesh Kumar, 1998, *"Business Information Systems",* Vikas Publishing House Pvt. Ltd.
4. John F. Koegel Buford, *2000, "Multimedia Systems",* Pearson Education Asia.
5. Internet Web Sources.