

telephony

Product Bulletin

Convergence 101 Tutorial Series: Telephony

What is telephony?

Telephony is the science of translating sound into electrical signals, transmitting them, and then converting them back to sound. There are three key elements for telephony: a sending device, a transmission medium, and a receiving device. It is also the ability to transmit sounds (such as a conversation) with clarity. If we can't understand the words spoken by the other person or cannot detect the emotion with which these words are expressed, we're not satisfied. Telephony must be extremely reliable. We cannot function in business or our personal lives without it. We also expect to have functions such as transferring a call to

someone else, initiating a conference call, putting a call on hold, etc. Telephony also includes the applications that help us manage phone calls—e.g., voice messaging, call center, etc.

There are basically two types of telephony—traditional telephony that utilizes the public telephone company infrastructure to make and receive phone calls and IP Telephony or Voice over IP, which utilizes an IP data network (private or Internet) instead of the public infrastructure. The focus of this document will be the fundamentals of traditional telephony.

Why is it important to convergence?

Telephony is a key element of convergence and is the primary reason for the hype surrounding convergence. Business telephony applications are the face of convergence to users and a critical component of any converged solution.

Voice or telephony traffic is incredibly sensitive to latency and jitter on the network. Converged networks must provide timely and reliable delivery of voice traffic to ensure quality calls. This is the key to any successful converged solution implementation in an enterprise.

Key terms/elements

Public Switched Telephone Network (PSTN)—Worldwide voice telephone network accessible to all those with telephones and access privileges.

Central Office—Phone company facility where subscribers' lines are joined to switching equipment (e.g., DMS) for connecting subscribers to each other, locally and long distance.

Station—Also referred to as a "line"; describes a connection between a phone and a switch.

Trunk—Describes the connection between two switches, primarily the connection between a PBX and a central office switch (i.e., connection between private network and public network).

Centrex—A business telephone service offered by a local phone company. Centrex is a single line service delivered to individual desks/users with added features. Centrex is an alternative to buying/leasing a PBX or key system and is often most cost-effective for very small sites and very large campuses. Call handling with Centrex is virtually the same as with a PBX except that most of the components are in the central office.

Key system—Typically used in small businesses or branch offices. Telephones have multiple buttons or keys permitting the user to select outgoing or incoming central office lines directly (by pressing the button/key). You don't have to dial a "9" to access an outside line. On a key system, an intercom refers to a talk path between two users on that key system. A key system does not generate dialtone (dialtone comes from the central office). It only provides a way for a call to be answered and distributed to the appropriate party.

PBX (Private Branch Exchange)—A premises-based solution (as opposed to central office hosted) that is owned/leased by the customer and is a smaller version of a telephone company central office switch. The PBX switches or connects lines to trunks. It has an attendant console and offers a plethora of call handling features to users. It is connected to a common group of trunks from one or more central offices to provide service to a number of individual phones, such as in a hotel, university, business, or government office. Most PBXs can support up to thousands of users and can be networked to other PBXs (of the same vendor type) to provide some level of transparency between locations and ease of use.

Analog—A type of signal transmission that varies with the tone and sound volume and is analogous to the original sound. It appears as a wave, carried by continuously fluctuating electrical currents. As a signal (of any type) is transmitted through the network, it loses strength (attenuation) and picks up interference. With analog transmission, analog amplifiers are used in various parts of the network to strengthen the signal. The problem with analog signaling is it is impossible to determine what it exactly should be and the analog amplifier amplifies the signal and the accompanying noise.

Digital—A type of signal transmission. Digital signals represent the information they transmit as a series of electrical pulses which correspond to the binary code digits of "1" for on and "0" for off. A repeater regenerates the digital signal and the noise is ignored, because it is not in the form of on/off pulses. Therefore, a fresh clean digital signal is transmitted to the next repeater.

Pulse Code Modulation (PCM)—Industry-standard process used to convert analog voice signals to digital signals. To create a digital signal of voice, many samples are taken. Voice conversations occupy 4000 Hz frequency and to accurately reproduce voice, the conversation is sampled at two times the maximum frequency (4000 Hz) or 8000 samples per second. Since the samples are transmitted so frequently, they run together to create the effect of continuous sound. Voice may be converted to a digital format in the phone itself, it may be converted in the phone system, or it may be passed as an analog signal all the way to the PSTN before being converted. This is all dependent on the phone system being used.

Time Division Multiplexing (TDM)—A technique for transmitting a number of separate data, voice, and/or video signals simultaneously over one communications medium. In TDM, you sample each voice conversation (8,000 samples per second), interleave the samples, send them on their way, and then reconstruct the conversations at the other end. Each sample is transmitted at a different moment in time and consumes the entire bandwidth of the pathway for that moment. TDM can be used for either analog or digital transmission. One measure of capacity in a system (e.g., T1) is the number of simultaneous conversations (timeslots) it can handle (create). The basic goal of time division multiplexing is to save money—put more conversations onto fewer lines/pathways.

Portfolio components

Meridian—The world's leading portfolio of enterprise PBXs that provides advanced voice services, computer/telephony integration, and sophisticated unified messaging services for applications ranging in size from 30 to 16,000 ports with the Meridian 1, and up to 30,000 lines with Meridian SL-100.

Norstar—The best-selling small site communications system in the world is a fully-featured, applications-rich voice communications platform perfect for small to medium-sized businesses and enterprise branch offices. Norstar scales to 192 stations and provides an unparalleled choice in application options, including voice mail, desktop messaging, call centers, mobility, and computer telephony integration (CTI).

Communication Server 1000—A server-based, full-featured IP PBX, providing the benefits of a converged network plus advanced applications and over 450 world-class telephony features. Fully distributed over IP LAN and WAN infrastructure with built-in reliability and survivability, Communication Server 1000 can scale to 15,000 stations and supports business-critical applications, including unified messaging, customer contact center, IVR, wireless VoIP, and IP phones.

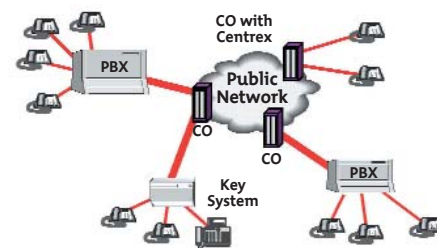
Business Communications Manager—Delivers small/medium-sized businesses and branch offices with 20 to 200 users. The only converged voice/data solution in the industry, providing a choice of IP-enabled or pure-IP strategy. It offers services such as telephony, unified messaging, multimedia call center, interactive voice response, IP routing and data services such as firewall, wireless, and more.

Communication Server 2100—The largest IP Softswitch available, scaling from 5,000 to 200,000 users, ideally suited for very large campus or geographically dispersed environments. Communication Server 2100 provides all the robust feature and application services expected of an enterprise communication system while adding new IP features and capabilities.

Competitive advantages

Nortel Networks has a proven track record in delivering telephony solutions to the enterprise with carrier-class reliability and quality. Our best practices approach to system and network design now serves as the benchmark for reliability in the industry. Nortel Networks also has a rich heritage in delivering the most feature and application-rich telephony solutions to the enterprise customer, with unparalleled investment protection.

Solution diagram



Nortel Networks is an industry leader and innovator focused on transforming how the world communicates and exchanges information. The company is supplying its service provider and enterprise customers with communications technology and infrastructure to enable value-added IP data, voice and multimedia services spanning Wireless Networks, Wireline Networks, Enterprise Networks, and Optical Networks. As a global company, Nortel Networks does business in more than 150 countries. More information about Nortel Networks can be found on the Web at:

www.nortelnetworks.com

For more information, contact your Nortel Networks representative, or call 1-800-4 NORTel or 1-800-466-7835 from anywhere in North America.

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