



PDHonline Course E343 (3 PDH)

Introduction to Digital Telephone and VOIP

Instructor: Thomas Mason, P.E.

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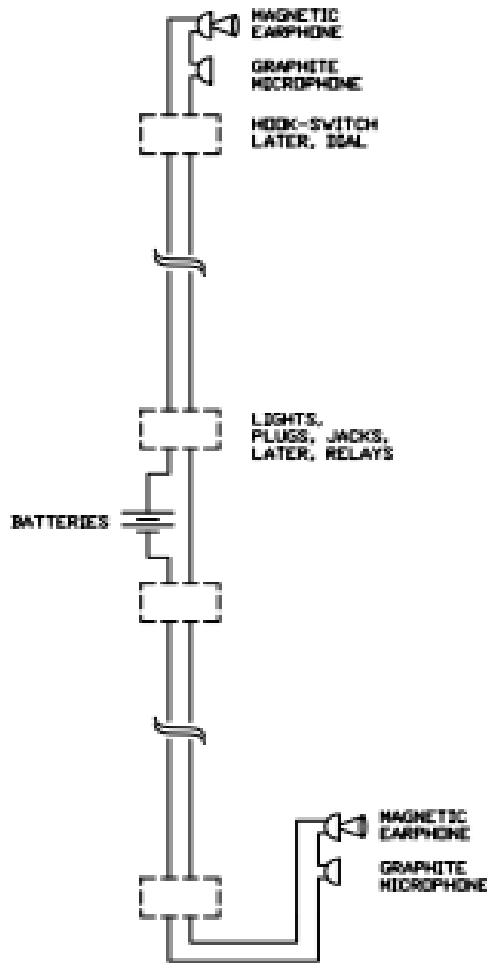
5272 Meadow Estates Drive
Fairfax, VA 22030-6658
Phone: 703-988-0088
www.PDHonline.com

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Introduction to Digital Telephone and VOIP

Thomas Mason, PE

The following is a simplified form of the telephone communications circuit as it existed from 1876 until 1968:



SIMPLIFIED EARLY TELEPHONE CIRCUIT

The voltage from the batteries in the central office cause a small current to flow when the circuit is complete, as shown. (The hook-switch interrupts current, as do the plug/jack combinations at the switchboard.) The graphite microphone permits more current to flow when it is pressed. The sound of a voice presses and releases the microphone many times per second. The graphite microphone responds to approximately 500-3,000 cycles per second.

In a series circuit, the same current flows at all points in the circuit. The changing current through the magnetic earphone causes a diaphragm on the earphone to move back-and-forth, closely following the sound which caused the current flows in the microphone. The moving diaphragm creates sound. This works on both the local and remote earphones.

This is our first sidebar – the early telephone, 1876 - 1968

In the teaching business, we talk of “direct tuition” and “indirect tuition”. Direct tuition is the material you bought, I teach and the State Board of Registration approved. Indirect tuition is additional material that makes the study more interesting. My personal opinion is that the indirect tuition of a course is often more valuable and valuable longer than the direct tuition.

Anyway, to distinguish between the core material and the ancillary material, I use sidebar boxes, like this one.

The original telephone was patented in 1876. The many stories of its development are extremely interesting. Of note for this course, distance oral communication did not exist before this time.

The years of the telephone monopoly in the United States are very interesting. AT&T held the patents and licensed them on an exclusive basis to local telephone companies. AT&T kept inventing improvements to the telephone system but carefully refused to release them to their marketing arm or licensed competitors until an “adequate” profit had been banked on the existing technology.

I know this from personal experience. AT&T licensed Nippon Electric Company (NEC) to build digital telephone switches in 1967 in Japan. Through a quirk of the contract, NEC was able to sell these telephone switches in the United States, while there was nothing equivalent available through controlled channels. I worked for an NEC vendor and supported installation of such a telephone switch at a dairy in Akron, OH.

Up to 1968, non-telephone-monopoly firms were trying to sell answering machines. AT&T and their licensees usually got the courts to rule that such answering machines were “illegal attachments” to the monopoly-owned telephone system. (They owned the wire in your house and the telephone you called out on.)

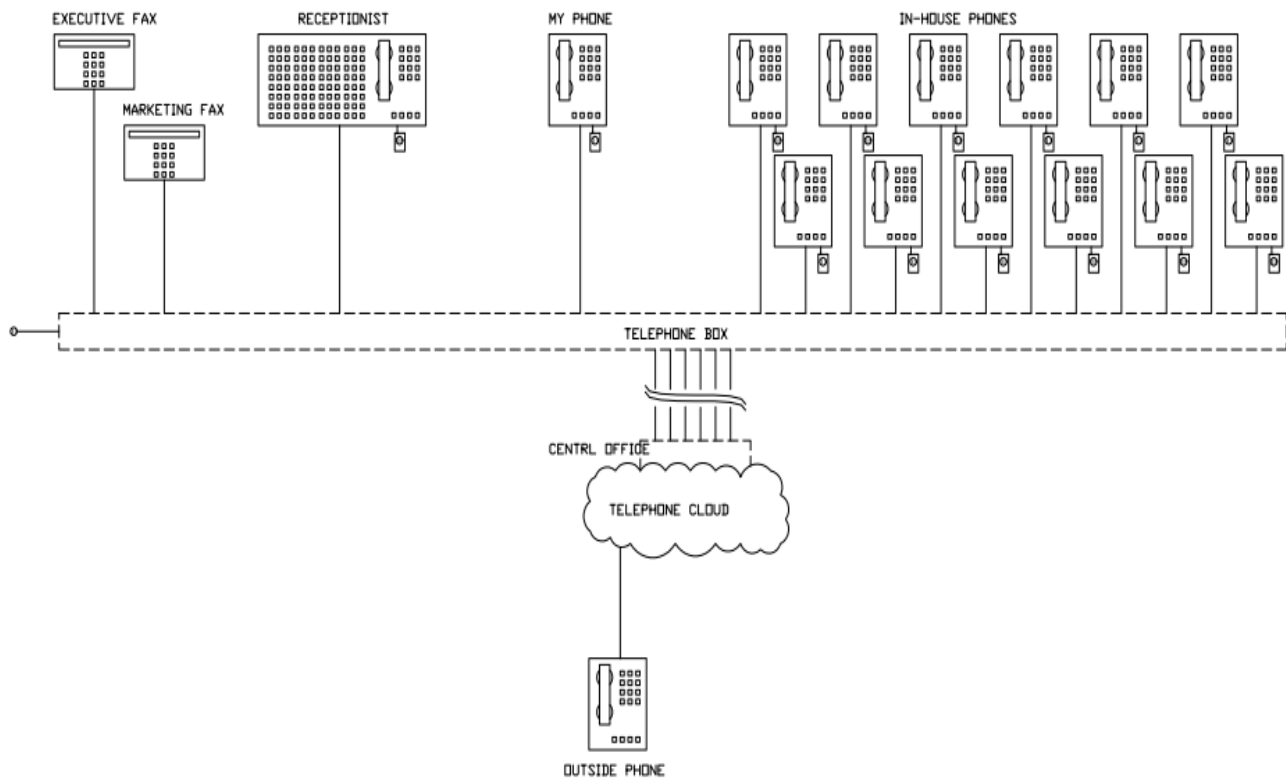
In 1968, the Supreme Court ruled that if appropriate protective devices were placed between the answering machine and the telephone line, the monopoly could not prohibit the answering machine (or anything else you wanted to connect). The plaintiff in the court proceeding was Carterphone and the result is called the 1968 Carterphone decision.

There were two significant effects of this ruling. First, people discovered they were paying about \$1.00 per month for an especially ugly black telephone and now they could buy a pretty pink or blue or even white one for \$10.00 one-time. Second, the required protective device passed only AC. You could not use the phone company batteries to power your telephone. All connected devices had to use amplified circuits.

Almost instantaneously, the telephone monopolies gave up on enforcing the requirement for a direct attachment device, but the Federal Communications Commission (FCC) made standards for telephone equipment to keep it from damaging the service.

So, in 1968, installed telephone systems started evolving rapidly. New start-ups began selling advanced AT&T equipment that AT&T had been withholding. AT&T competitors, Sylvania, Automatic Electric and others started selling knock-offs of AT&T equipment to customers in AT&T areas. It took years for customers believe they could get telephone service from other than the local monopoly. In 2011, a little under half the commercial telephone systems are provided by and installed by the local phone company. The phone companies have given up on residential telephones, but still sell add-ons, like answering machine (service), internet service and catv.

The following sketch is a very generalized schematic representation of a commercial telephone system:



SIMPLIFIED SCHEMATIC TELEPHONE SYSTEM

This drawing is pretty close to the system at a place where I worked from 2000 until mid-2008. They had the big receptionist board, with a button for each phone and for each incoming line. I had a phone. There were lots of other phones. We called each other, called the receptionist, called out and received calls. We had voice-mail and more features, but I never investigated the other features.

Each phone has a dedicated multi-conductor cable, either high-cost proprietary or low-cost LAN. The receptionist station usually has an identical proprietary or LAN cable. Note that it is not necessary to provide a copper circuit for each phone covered by the console because the receptionist has only one talk / listen channel. The console needs a single voice channel and a communications channel capable of telling the telephone box which line to connect to monitor. It needs an internal computer capable of handling the lights and buttons of the console.

There was a box in the computer room that received all the in-house phone wires, received the outgoing telephone wires and had a 120 VAC power connection and no UPS. The box contained a dedicated computer that handled voice-mail, voice mail storage, switching features, billing and monthly reports. It was owned by my employer who had a service contract with the local supplier.

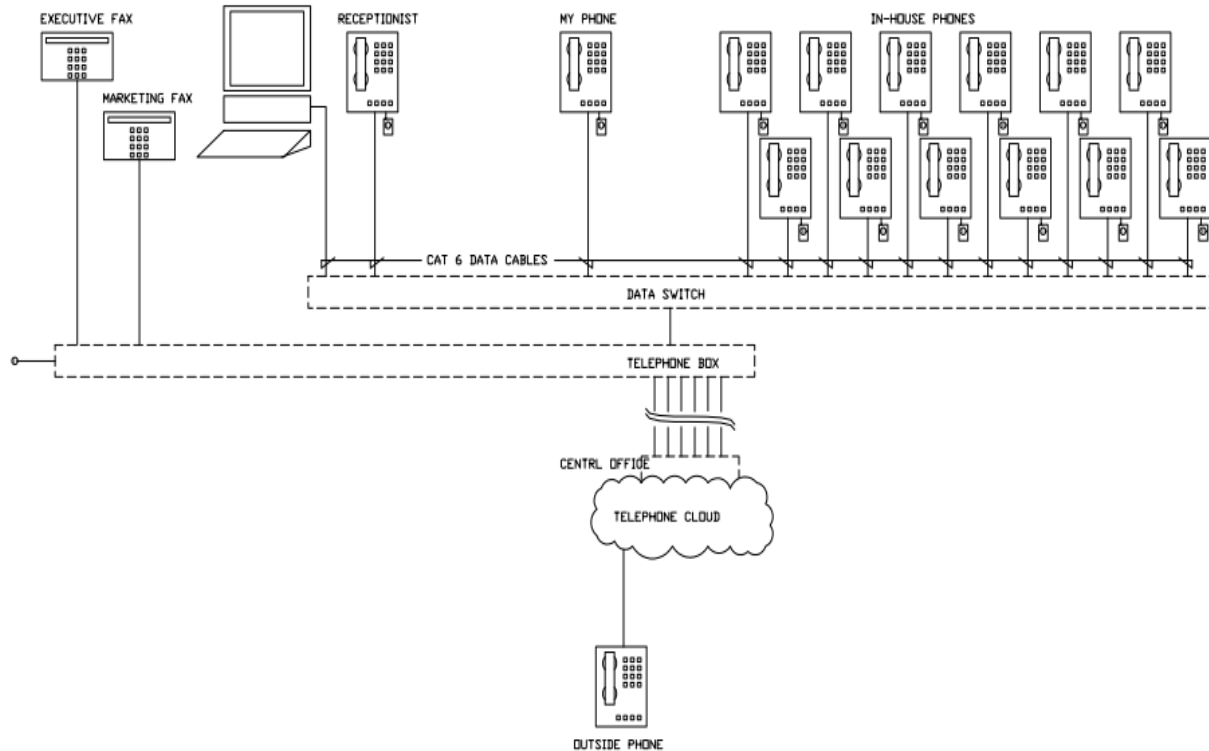
It is not an accident that six outgoing copper telephone circuits are shown. Six circuits worked very well for a 20+ person office with two fax machines

The real system differs from the drawing in two major ways. First, we did not have wall-warts to provide power to each phone. The phones got their power down the telephone wire from the telephone box. The reason I am showing individual power supplies is that this is the early-2011 standard. Late 2011 and following will not have local power supplies. This will be discussed in detail.

The second feature of the real telephone system not indicated on the schematic diagram is the fail-over analog lines. The firm had two fax analog lines which did not go through the telephone box. Until recently, fax machines were not compatible with digital telephone systems. The firm had a separate analog line, not part of the incoming roll-over group. It worked when the digital telephone system didn't (several times a year) and was available for outgoing calls when the digital system was unavailable.

The telephone box included a fail-over feature so that the first incoming line went directly to an analog phone when the box was unavailable. The analog phone was on a senior manager's desk. He was known for working all hours of the day and nights and weekends. Incoming calls were answered and properly responded to when the telephone box was gone. A very, very limited number of critical outgoing calls were permitted under these circumstances.

The following drawing shows a generalized schematic of an early-2011 VOIP digital telephone system:



SIMPLIFIED SCHEMATIC EARLY-2011 VOIP SYSTEM

Notice the differences between this and the previous generalized schematic. In the first, the cables were not identified. They could be proprietary multi-conductor cables or 4-pair local area network (LAN) cables, Category 3, 5 or 6. LAN cable is a commodity product (very competitively priced, 10 cents per foot, readily available, with stringent published specifications). For a VOIP digital telephone system only LAN cables are acceptable. Type 5 has been conventional since 2000, but Cat 6 are the standard in early 2011 and carry no price premium. For reference, Cat 3 cables were used for analog and early digital systems. Proprietary cables are very high-priced cables, typically available only through the vendor, with whatever characteristics the vendor chooses.

VOIP means Voice over Internet Protocol. Internet Protocol is a very common packet signaling scheme used on local area networks. VOIP makes a very low demand on the LAN. It will not interfere with existing engineering or accounting use of the LAN. It interacts badly with graphic applications, such as Adobe Photoshop, streaming video or rendering files.

All of the internal VOIP circuits fit easily on a shared or dedicated 100 Mbps LAN. All of the voice circuits and two fax machines fit on six outgoing telephone voice circuits.

LAN talk, IT politics and budgetary costs

There is a recurring theme in this course regarding technical considerations and political decisions. The conclusion is that you must identify the genuine objective of a decision - usually making a decision maker happy and supporting the entrenched political system. Do not be distracted by technical considerations.

CHOICE OF PROPRIETARY CABLING VS CAT 6 LAN CABLE

Obsolete systems using proprietary cabling can be purchased as current products. It is possible that the manufacturer and local installer will continue to support them for many years. You can be almost certain, however, that there will be limited or no enhancements and parts will become difficult to acquire. This is the business cycle.

Why would you buy proprietary cabling? Only because the decision maker is happy with the proprietary supplier and does not rate future service as having present value.

Cat 6 cable is just more LAN cable. It is being used for VOIP, but the use is not restricted to VOIP. It will support any current or near-future LAN hardware or application. Cat 6 cable is normally used on 100Mbps networks, but is usable on 1,000 Mbps networks. Similarly, a good data switch being used for VOIP is a good data switch for any other LAN application. I always specify 1,000 Mbps data switches because they have better specs for current applications and spare capacity for future needs. There is presently no cost premium for 1,000 Mbps data switches.

WHY WOULD ANYONE CHOOSE A SEPARATE, NEW DATA CABLING PLANT TO SUPPORT VOIP DIGITAL TELEPHONE SYSTEM?

It is the nature of the field of Information Technology (IT) to seek every opportunity to grow, expand the number of services which require their support and to buy excess capacity from preferred vendors. The corollary is that IT, by nature, refuses to examine their system error rates and thru-put bottlenecks.

A new VOIP digital telephone system is a blank check for IT. If they have a viable Cat 5 cable plant, then VOIP is a reason to pull out those cables and install Cat 6 or Cat 7. [Note that Cat 7 has some severe drawbacks, including massively greater individual cable diameter and cost, without corresponding bandwidth improvement.]

VOIP will operate well on existing LAN cabling, unless the cabling is already overloaded. It is a simple test to monitor system bandwidth loading. The rule of thumb is that 40% loading is the acceptable maximum. Additional cabling can be installed at the time of telephone upgrade to VOIP, but it is not normally required by VOIP.

It is not recommended that any technical person argue with the IT demand for cable plant expansion. Their only job security is in the confidence that the executive level has for them. The executives don't want to get involved in design decisions (any more than IT wants to do anything more than spend). In addition, the cost for cable plant expansion is a very small part of the initial cost.

Budget \$10,000 for new Cat 6 cabling for 50 stations. You can get it for less than \$5,000 if you go to a cabling specialist instead of an electrical contractor or your present service provider.

DO PLAN TO BUY DATA SWITCHES FOR VOIP.

The data switch between the cable plant and the telephone box is the is the weakest part of the system (unless you go cheap on the telephone box). High quality data switches sized for the telephone box will cost as much as the data box. This may not be apparent, because the cost of the telephone box is

almost always hidden in a service contract. Budget another \$10,000 for a data switch for 48 circuits. Again, it is possible to get premium hardware for half this cost.

TOO MUCH DETAIL ON DATA SWITCHES.

A 100 Mbps circuit has room for 100,000,000 data bits to flow every second - one after another, with no breaks. Packed flow is not natural on data circuits, though; it is random groups of packets that start at random times. A data switch adds order to this situation. In addition to making connections between connected devices, it provides “store and forward” service. If two sources want to send data to the same destination at the same time, the switch transfers the first and stores the second. It starts sending the second set of data when space is available. Because the circuit has so very much room and because each packet identifies both the source and the destination, the switch avoids a collision and permits maximal utilization of all circuits.

A 1,000 Mbps data switch has a larger data buffer than a 100 Mbps data switch, so it has more capacity to handle large engineering, accounting and graphics files along with the tiny VOIP streams.

WHAT TO SPEND ON INSTRUMENTS?

Digital telephone features are provided by the software in the telephone box. They are easier to access via a well-designed user interface on the instrument (desk phone). Cost ranges from \$30 to \$250 per instrument. Instruments range from generic IP to totally proprietary. For 40 active stations, this is instrument cost of \$1200 to \$10,000. Polycom and Cisco make economy and high-end instruments that are considered industry-standard. Note that the high-end of the range is not out of line for the base system being considered. Again, a selection of different models is most often pursued.

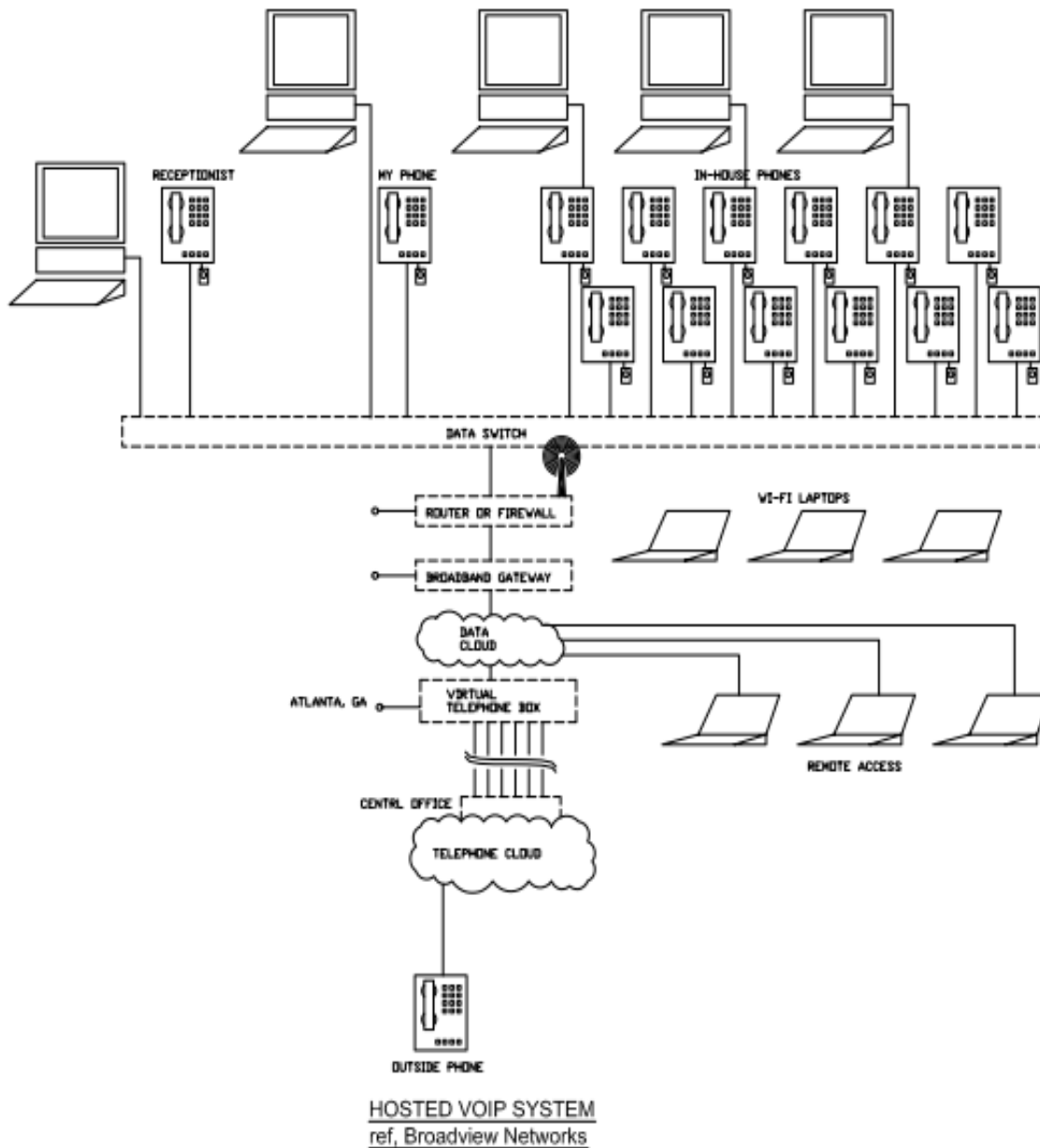
TOO MUCH DETAIL ON INSTRUMENT POWER.

Power over Ethernet (POE) means that a small amount of DC power is transmitted on the LAN cable, along with the data. Proprietary versions have been available for a decade but IEEE made a standard and price competition has entered the market for data switches that provide power to end-of-line devices. The three most popular POE data devices are CCTV cameras, wi-fi WAP's and VOIP.

In early 2011, vendors are claiming that it is reasonable to pay 2x - 4x for a POE data switch over a standard data switch. (This is what they used to say about 1,000 Mbps switch over 100 Mbps switch.) It is expected that prices will drop and wall-warts will disappear. It would be good to buy instruments that accommodate both sources of power.

HOSTED VOIP - (Telephone Box on Their End)

The following drawing is derived from a vendor proposal, showing “hosted VOIP”. It is NOT a recommended form to follow for your installation.



Up to this point, there has been a tacit assumption that the new digital telephone system was replacing the existing digital telephone system. The old system had a telephone box in the computer room, or on the wall in the basement, but somewhere on-premises. Hosted VOIP moves the telephone box to Atlanta, GA (for Broadview Networks) or to some other location chosen by the telephone service provider.

Be warned that all calls from cubicle to cubicle now go to Atlanta and come back. The data requirement for all internal communications is low but critical. As discussed elsewhere in this course, VOIP sharing a circuit with intensive data handling will cause latency and unacceptable voice quality. This is addressed within the site by keeping the data and voice loading separate and fast data switches. It is handled on the external internet circuit by technical magic. There are several ways to modify the

shared data stream to give VOIP priority. They are not expensive for a single circuit and should be the responsibility of the hosted service provider.

Why did he say “magic” and not discuss the technology and implications ?

You are sharp to pick up on this.

There are many available technologies to address this need and all are evolving rapidly. Any discussion would be obsolete by the time you read this course.

It is dangerous to buy emerging technology. This course recommends that you buy “Quality of Service” and task the hosted service provider with choosing and supporting the necessary technology for the link outwards from your site(s).

This danger and the recommended “Quality of Service” support are addressed in the vendor qualification checklist, later.

The good news is that your new telephone box is part of a large system with integrated diagnostics and 24/7 service personnel waiting in the break room for an opportunity to tweak some settings or replace a card or disk server.

The bad news is that your telephone service is now subject to all the different forms of internet failure you have been enjoying on your external internet service. Actually, your telephone service has been subject to these failures all along - the distinction between telephone and data has been becoming vague of late. What is happening is that the day you choose hosted VOIP service you must recognize the hazard. Since 1969, all telephone central office telephone switches have had provision for no-court-order wiretapping by the government. This dial-in service is limited to government snooping only by the goodwill of telephone and internet hackers. All of your voice-calls have been quasi-public for most of your lifetime.

This course will not discuss the apparent hazards of telephone over the public internet nor the vendors' claims of encryption as a solution. We will mention that Microsoft switched over to VOIP many years ago, and no one is more paranoid than Microsoft. As mentioned in the first sidebar, this apparent technical consideration is really a political decision, or, really a non-decision, since all telephone content was already open to easy monitoring by both good guys and bad guys.

On the other hand, the sample hosted VOIP system diagram shows an in-house wi-fi router. This course recommends that very serious consideration be invested before making such a connection. A stand-alone server OUTSIDE the firewall, and substantial wi-fi security should be looked at, along with restricting use of wi-fi to guests - to avoid company-sensitive information from being shared too generally.

Another concept introduced by the sample hosted VOIP system diagram is employee remote access. Be aware that your competitors are already contracting with people in their homes, at nearby offices

and at distant offices to perform core duties of the firm. Competitors are doing it. The vendor who supplied the reference for this drawing includes the capability in the system he sells (service he leases). Your director of marketing can check in real-time on marketing telephone activity from wherever she is, any city in the world. Employees or contract workers can answer incoming 800-number calls from any city in the world. This is a standard feature, included in the \$20-per-phone-per-month charge.

Another free-floating comment is offered, regarding the sample hosted VOIP system diagram. One connection scheme runs the computer data line from each desk through the instrument (desk phone). This is something AT&T included in their first experimental digital phones and survives today in DSL telephone service (one data and two voice channels on a single data circuit). It was a bad idea then and is still a bad idea.

Streaming video requires 1.5Mbps for jerky, low-rez video. 4Mbps provides good video. 1.5Mbps is the promised high-end for most DSL and has been the accepted standard until recently. I don't know how good the dedicated computer in the telephone is at prioritizing voice over data demands for the common circuit. I do know that a fast data switch can keep phone calls from becoming painful while handling large data files and streaming video requirements. Separate data and voice circuits are preferred.

Painful phone calls ?

When VOIP doesn't work right, it shows up as breaks in words and delays between words. Technically, this is "latency". It is immediately painful to encounter latency in real-time communications. You tolerate this on network and satellite tv when they have communications problems. You tolerate it because you weren't watching too closely, anyway. When you are talking about construction delays and price increases with vendors and clients, it is painful.

Bandwidth is inversely proportional to latency. The way local area networks function is by sending packets and receiving packets. When too many people try to send packets at the same time, they collide and both senders wait a random length of time, then resend. Waiting and resending introduce delays. When the delay within a phone call exceeds about 20/1000 of a second, you notice it.

Collisions are normal in network operation, but monitored by a "smart" data switch. Thus, an IT manager should be able to answer the questions, "What latency are we experiencing at peak periods and what is our system loading?" IT managers don't like to look at these statistics and will go to great lengths to avoid answering the questions.

The good news is that a 100 Mbps local network with modern data switches has very low latency unless overloaded or mis-configured. This supports the comment made earlier that VOIP addition to a local area network does not require massive renovation.

SELECTION PRIORITIES – RELIABILITY

Whether formal or informal, all decisions are made by use of a decision matrix. The formal method is reviewed in the following sidebar.

The Decision Matrix

The principle of a decision matrix is to identify the key decision factors, apply importance weights to each and choose a value for each factor for each alternative. This is followed by number crunching the weights and values and getting goals for each alternative.

Next your review the totals. What the matrix tells you is usually not acceptable. This is where the work starts. There is some kind of disconnect among the factors, weights and totals.

In an ideal world a skilled consultant with access to broad information would objectively prepare the matrix and make the recommendation. In the real world, there is a higher level decision maker. He has usually made his preferences known and his reasoning. The first approximation of the decision matrix did not yield the desired result. Now, the task at hand is to tweak the numbers to get an acceptable recommendation.

A sample decision matrix follows:

Example of a Decision Matrix

	Safety	Inflation	Rate of	Management	Stability	Compatibility	Totals
	Risk	Risk	Return	Difficulty		With Current	
						Business	
Real Estate Rentals	9	7	5	9	9	9	112.5
Blimpie Franchise	5	6	4	3	6	9	74.0
Carpet Cleaning Business	3	6	4	3	5	9	64.5
Note Buying Business	6	8	6	6	7	9	97.5
Retail Convenience Store	4	4	3	3	6	9	61.0
Business Consultant	9	5	4	6	8	9	96.0
Investment Advisor	7	7	9	6	7	7	105.5
Web Designer	7	5	5	6	7	6	86.5
Lifestyle Consultant	6	4	7	6	6	9	87.0
Travel Specialist	6	7	7	6	5	9	94.5
Internet Business	8	7	9	8	7	8	114.5

Weight	4	3	3	2	1.5	1
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source: *Business-Analysis-Made-Easy.com*

This course recommends that you separate the decision task into two parts. The first part is reliability and the second part is all-other. The reasoning behind this recommendation is that no commercial enterprise will accept lost productivity and lost sales.

The comparison of reliability of the available digital telephone systems, in turn has two parts, redundancy offered and gullibility of the buyer. Every device has a failure mode and an expected time until that failure emerges. Manufacturers get these values from testing equipment to failure, sometimes at elevated temperature or temperature cycling and in the presence of vibration.

In the Early-2011 VOIP Schematic, a call includes the instrument (phone), in-plant wiring, data switch, telephone box and connection to the telephone cloud. The mathematics of reliability, the total reliability is the product of the reliabilities of the components in series. The following numeric values are fictional, but the computation is as shown:

%		%		%		%		%	
Instruments	x	Wiring	x	Data Sw	x	Tel Box	x	Cloud	= Total
Reliability		Reliability		Reliability		Reliability		Reliability	Reliability
.999	x	.999	x	.999	x	.999	x	.999	= .996

To interpret this, 99.9% claimed reliability translates to 8.8 lost hours per year. Does this agree with your experience with the likelihood and extent of loss of service for your commercial telephone system? Is 8.8 hr of lost productivity and lost customer service acceptable?

The next step of analysis is to evaluate the reasonableness of the numeric loss. If you phone doesn't work, are you dead in the water? No, you trade phones or sit at a spare desk.

If the data switch dies, are all channels dead or just yours? If the failure mode is all channels dead, then it is critical how long it takes to get it repaired. One place I worked had a golden IT manager, son-in-law of one of the owners. He came in at 10AM. No one else had keys or permission to replace printer toner, much less swap out data equipment. Data switch reliability, failure mode and mean time to repair become critical. If we examine reliability as a separate criterion, then a contract service for the data switch and telephone box is much preferable to in-house support, again, depending on hours of commercial operation and hours of in-house service capability.

The second key question on reliability is purchaser gullibility. Are the claimed mean time to failure (MTTF) and mean time to repair (MTTR) engineering or marketing numbers. In general, a phone call to a current user is more meaningful than numbers from glossy literature. Ask if anyone is available to answer the phone on trouble calls and how long it takes to get replacement parts. Numbers from dense text and tables are more trustworthy than glossy literature, as marketing people don't have attention span to read and "correct" these.

The most valid way of making your own evaluation of unit reliability is to get a block diagram and description of failure modes. Look for series connected components and parallel connected components. Series connection is bad; parallel is good. Ask about "tri-state" connections. A tri-state connection fails in non-blocking mode. That is, a redundant parallel component can pick up the functionality without an outage or repair intervention. It is almost certain that your telephone box salesman will not recognize these words. Most have a factory support engineer, however, who can answer questions meaningfully.

If a vendor does not pass the reliability criterion, then he is not providing an acceptable proposal.

(Be aware that the most common failure point in any electrical system is a locally performed wire termination.)

SELECTION PRIORITIES - ALL OTHER

The goal here is to identify features. You must choose the weight for each from your commercial process and how each contributes to the services you provide. It is recommended that you use this check list to qualify providers.

Below is a list of features available as part of a digital telephone system. The descriptions provided are intended to help you identify availability from the catalog description or from the salesman's conversation. Make sure you explicitly identify included features in your purchase specification and Purchase Order. It is a very painful discovery that one of the key selling points of the telephone system is not included, as installed.

<p>up-front cost -</p> <p>scheduled continuing cost -</p>	<p>You can buy your instruments (phones) or you can lease your phones. You can buy your telephone box or you can lease your tel box. You can buy your software features or you can lease your software features. You can buy supporting data hardware and UPS or you can lease supporting data hardware and UPS. You can pay a supplier for support or you can provide support in-house. Regardless, you get a total cost of ownership.</p> <div data-bbox="613 1010 1425 1675" data-label="Figure"> <table border="1"> <caption>Total Cost of Ownership per User-IP Telephony Systems</caption> <thead> <tr> <th>Company</th> <th>< 1,000 units/station</th> <th>> 1,000 units/station</th> </tr> </thead> <tbody> <tr> <td>Cisco</td> <td>\$3,384</td> <td>\$1,384</td> </tr> <tr> <td>Avaya</td> <td>\$2,537</td> <td>\$1,127</td> </tr> <tr> <td>Nortel</td> <td>\$3,365</td> <td>\$1,970</td> </tr> <tr> <td>ShoreTel</td> <td>\$1,223</td> <td>\$865</td> </tr> </tbody> </table> </div> <p>source: <i>ShoreTel IP Telephony A-Z</i></p>	Company	< 1,000 units/station	> 1,000 units/station	Cisco	\$3,384	\$1,384	Avaya	\$2,537	\$1,127	Nortel	\$3,365	\$1,970	ShoreTel	\$1,223	\$865
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ShoreTel	\$1,223	\$865														

scalability - Is there a “sawtooth function” in the pricing? That is, does the cost per phone per month

rise suddenly at an arbitrary point, such as 24-, 48- or 256- phones.

Can the proposed system accommodate a temporary staff increase of 12 persons to complete a State contract?

How does the proposed system expand to integrate and support a branch office in Seattle, WA, with 12-phones?

ad-hoc fees - What unexpected fees do existing customers complain about? Get it in writing, signed and dated, that there are no surprise fees. At least, get a recognition of what surprises are in store for you. It is not a bad thing to pay \$50 for someone to answer the phone at 1 AM with a quick answer to a critical question.

contract termination policies - Recognize the business model of the supplier. He puts in a lot of time (expected commission) to get the order and to get the system working. He expects up-front money and a continuing stream. He knows that situations change and he wants to make sure he doesn't get hurt. His lawyer knows what "Draconian" means and uses the principles in the termination clause. You don't have to sign his form as offered. You can line-through anything you don't like and that part cannot be enforced against you.

instruments - The phone on the desk provides functionality and status. Functionality is addressed in the following features list. Plan to provide two or more distinguishable instruments to acknowledge the status of managers and executives.

ADA-compliance - If you don't presently have a handicapped co-worker, you probably don't think about this. The ADA requirements are easy to meet - if you ask before you buy.

911 support - 911 support is a software function, like anything else. If they thought about it, it is already included. If they didn't think about it, you could be in a world of hurt. This gets tricky in handling remote workers or integrated remote offices.

lotsa buttons - This is the crossover between phone status and functionality. Everything you can imagine is available from a phone with a function key along with a standard keypad. Unfortunately, no one but Abby on NCIS really enjoys memorizing Function key numeric strings. So, we pay more for a phone with lotsa buttons.

soft keys - See lotsa buttons, above. The best instrument form is a few standard buttons, HOLD, FORWARD, DETONATE and a few programmable keys.

instrument power - Wall-warts are surprisingly expensive, very awkward under the desk and avoidable with power over ethernet (POE). At least, ask about choices.

loss-of-power - What does the system do when it loses power? You can almost certainly spend more money and get partial or complete continuous operation. Find out if you need to buy 24VDC batteries or a UPS and if you get a "minimum power" mode and maybe an e-mail or cell phone text notification. How many minutes or hours of operation are supported on battery?

automatic fail-over - This is different from failure-mode operation, next. Automatic fail-over means

that users don't see the failure, but a local or central repair person is notified to replace something on an urgent or scheduled basis. The extent of the automatic fail-over and the detail of the notification distinguish vendor offerings.

failure-mode operation - It is essential to have emergency communications when there is a telephone system malfunction. This has been a standard feature since the first digital phones. A standard form is a few phones that continue to work with no intervention.

fax support - Let's avoid discussing legacy systems. The fax machine will outlive all of us. A good telephone system supports antique faxes and fax-servers integrated into the local area network.

long distance bypass - Phone companies like to make money on long distance calls. Economic long distance calls come through bypass of the phone company. This can be handled in many ways, but look at your long-distance bill as you consider extra-cost features. Reliability and fail-over of long distance bypass are also important. Again, try for a written promise, signed and dated.

branch office inclusion - If you already have branch offices, see how it affects the telephone system price to include them-in or include them-out. There is no good reason a branch office should be different than a remote worker. Or maybe there is a good reason. Look at your present and future needs and ask the salesmen.

automated attendant - It is rare today to get a telephone operator when you call a business. The machine that answers, and advises you that the menu options have changed, is the automated attendant. This can be handled badly or very badly. There is promise that voice recognition software is improving and the service may not chill callers in the future.

call director - Firms with a call service function answer a lot of incoming 800-number calls. There are nuances, but the call director sends the call to the next available operator and/or feeds a canned message to the caller. The level of detail available on reports may be a critical.

wide-band audio (50-7,000 Hz) - CAUTION, this is important. Bandwidth costs money for audio the same way it does for data. If you want wide-band (pleasant) audio, you must pay for it in hardware and storage (voice-mail). Narrow-band (300-3,400 Hz) is a negative marketing tool, both in-house and to clients.

voice-mail - Surprisingly, voice-mail is not a standard feature in all digital and VOIP telephone systems.

voice mail features - Can you remotely update your greeting? Can you have a nights and weekends greeting? Can you store multiple greetings and automatic forwarding? Can you archive stored messages in folders?

voice mail storage, amount and time - Storage costs money. More minutes of messages and more months of retention cost more money

caller id - It takes software support and a display on the instrument to provide caller id.

extended caller info - It takes more software and more display to provide extended caller

information. It is a very valuable marketing tool to link source phone numbers with client firm names. Depending upon the sophistication of the calling telephone system, it may be appropriate to link individual names with the calling number.

hold - No, this is not inherent in a telephone system. It must be programmed into the telephone switch. It must also be listed in the procurement specification and Purchase Order.

music on hold - This is a non-trivial feature for customer goodwill and possible marketing benefits. Your own modifiable message and good music are desirable.

re-dial - Not a high-end feature, but not included without some attention. Call back the last-dialed number or last incoming number.

call-waiting - A little click on the earphone to indicate that a call is waiting. Goes into voice mail if not picked up.

conferencing - The ability to add one or more in-house phones or one or more outside phones to the conversation.

call park - If you get a busy signal, you can “park” and the computer re-dials for you when the extension is free.

call forwarding - Stay on the line and call another extension, then click-in the outside caller. Various forms are available.

group pickup - This is a common feature when a group of persons perform very similar jobs. Anyone in the group can pick up for the person away from his desk.

4-digit dialing - Like programmed function keys, four-digit dialing lets the user economically call in-house using only the extension.

multiple ring tones - This is another hardware / software crossover item. If the instrument supports it, the telephone box can use caller id information to provide a distinctive ring tone.

restricted long distance - It is important to some managers and executives to be absolutely certain that most employees and visitors do not make long distance calls using the Company phone. Most systems offer selective activation of this feature, as for lobbies.

remote access - As used here, remote access means home computers, laptops when traveling and remote offices. When present, employees at remote locations can telephone via computer with all of the office phone features available. At least one telephone supplier will bundle office applications with the phone system to assist communications convergence, including data files and video. This vendor uses the term “remote access” for this offering.

remote monitoring and maintenance - Conscientious supervisors of sophisticated telephone systems need real-time and archival performance data. If you choose to contract for support, it is extremely valuable for the tech responsible to be able to confirm the trouble report and chase down when it began and what else was going on at the same time. Ask about the breadth of monitoring (number of

variables) and depth (sampling interval and number of points stored).

I don't know what remote maintenance means, but it sounds like a good idea for systems with redundant component assemblies.

canned training and FAQ - The cost of initial and ongoing training is substantial. As each customer must provide the same initial and ongoing training, it is reasonable for the supplier to supply or broker this training. It is absurd for the new customer to study the manuals and create the training.

FAQ implies a database of questions that keep coming up, from new users and from users wishing to access features of the system.

normal support - Normal support means activating a line for a new employing and deleting access local and remote for lost employees. Normal support means reviewing performance logs to identify immediate or incipient problems. Sometimes, a failed channel can be replaced by an active channel by changing two patch connections and a configuration modification.

If these tasks are to be performed in-house staff, then training must be provided and time charges anticipated, including premium time and/or comp time.

If these tasks are to be performed on a contract basis, then both continuing and event charges must be anticipated (see ad hoc support, below).

quality of service support - You can expect problems for which it is difficult and sometimes time-consuming to identify the cause. Deteriorated service is an example. The first task is numerically qualifying the problem - this is the concept of "quality of service" (QoS). There are established measures and test equipment, but they are sophisticated and expensive.

As the source of the problem is unknown at inception, neither the internet carrier nor the communications system supplier is readily willing to install such QoS test equipment. By anticipating that problem will arise, the telecommunications supplier will either provide the test equipment as part of the service or for an agreed-upon fee.

When the QoS problem has been qualified, then local or central skilled persons should be able to suggest corrective action. Again, final resolution may be contractually defined as prepaid or for an agreed-upon cost basis.

future features - A digital telephone instrument is a microphone, earphone, connection to the internet and a dedicated computer chip. A cell phone is a microphone, earphone, connection to the internet and a dedicated computer chip. In order for a digital telephone instrument to do everything a cell phone does, you need a high-rez screen and a high-rez camera. A high-rez screen and a high-rez camera sells for about \$50 (Sony, Kodak, Vivitar, etc). Obviously, the step from digital instrument to cell-equivalent phone is a small one.

You will be able to replace an existing \$250 instrument with a new \$250 instrument. If the existing telephone box cpu handles video, it will handle a small number of cell phone features being requested from office VOIP phones. It will require a cpu upgrade, memory upgrade and a disk upgrade to handle many cell features being simultaneously requested by office VOIP phones. A whole new on-premises

telephone box costs a few thousand dollars. Upgrade of a hosted VOIP telephone box is a normal, small upgrade, but will require greater internet bandwidth.

[end of features list]

ATTACHMENTS - Vendor Contact Information

The following e-mails resulted from an inquiry for a technical information provider. No recommendations are made by PDHonline or the author.

Let's talk about Avaya and your phone system

Wednesday, January 26, 2011 9:45 AM

From:

"Rich Kean" <Rich_Kean@avaya.suth.com>

To:

ThosMason@yahoo.com

Hello Thomas

I just wanted to check in with you.

Avaya is a global leader in converged voice and data networks, unified communications, and wireless technology. We are **#1 in the US and Globally** for secure converged IP telephony, Call Center applications, and Unified Messaging Mobile Worker solutions. We are in over a million businesses worldwide from Small business to Enterprise .

I work in coordination with Avaya's Direct and Partner sales teams in your area. I would like to speak with you briefly to understand your current and future objectives so that I can align some information and resources to assist in your decision making process.

From your vantage point, when would it make sense to have a conversation.

I look forward to future discussions.

Thanks,

Rich

For insight to Avaya solutions

Avaya Homepage: <http://avaya.com>

Who is Avaya? <http://www.avaya.com/usa/about-us/>

Avaya Products: <http://www.avaya.com/usa/products/>

Avaya Solutions: <http://www.avaya.com/usa/solutions/>

Avaya Data Solutions: <http://www.avaya.com/usa/topics/avaya-data-networking/>

Avaya Demos: <http://www.avaya.com/usa/results/type--demos/page--1/>

Avaya Case Studies:

http://www.avaya.com/actionmodules/global/march6/inside_intelligence/index.html?cid=inside

Rich Kean

Avaya Customer Relationship Center

Relationship Manager

866-697-5565 ext 460131

rich_kean@avaya.suth.com

Broadview Networks Hosted VoIP Phone System and Service

Wednesday, January 26, 2011 10:37 AM

From:

"Kacher, Michael" <MKacher@BroadViewNet.com>

To:

ThosMason@yahoo.com

Message contains attachments

10 Files (5997KB) |



- [OfficeSuite-FinalAEFI.pdf](#)



- [Broadspeed OfficeSuite Case Study in Internet Telephony Magazine.pdf](#)



- [CustExpect-2010.pdf](#)



- [Customer LAN Design - FlexConnect and Teleworker.pdf](#)

-  [Customer LAN Design - On-Net and MPLS.pdf](#)
-  [OfficeSuite IP Addressing and Security.pdf](#)
-  [OfficeSuite QoS and Security FlexConnect .pdf](#)
-  [OfficeSuite TeleworkerAEFI.pdf](#)
-  [OfficeSuite Solution Supplementary Information.pdf](#)
-  [CorporateBrochure-2010.pdf](#)

Hi Tom,

Thanks for taking the time to speak with me today. I have gathered all the information we have on our VoIP product to help you make the most informed decision possible.

OfficeSuite is our flagship product and a leader in Hosted IP world. Our OfficeSuite product was recently received the 2010 Internet Telephony Award for excellence and we have over 60,000 installed stations. I have attached some literature for you to take a look at it and pass on as you see appropriate.

Couple of things to keep in mind with our Phone System and Service

-No Down Payment/Capital Expenditure- Instead of having to purchase all new equipment and pay an enormous upfront cost, we lease our phones to you to help lessen the blow of bringing in new technology

-Never lose a Voicemail/Never get a busy signal- This brains of this system sit in our high secure data center. Every piece of equipment sits in high ability pairs, to ensure that your call is delivered every time.

-Disaster Avoidance- Even in the event something happens locally to your location, phone calls will still be handled. If you were to lose power for instance, the system would still be handling the calls because of Call Coverage. Call Coverage is a setting that you predetermine in the even something happens where your calls get routed. It could be to individual cell phones, another location, house number, really anywhere. Voicemail would still get handled. To the outsider your business is up and running.

-No Maintenance Contracts- Everything is handled by us and is part of the solution. We handle all maintenance and upgrades, no need for someone technical.

-Remote Access- You can control the system from any computer with a Web browser. Making changes to the system is a simple matter of a few clicks. Have new employee, 1 minute later they are added and with no technical expertise. Wake up and there is 2 feet of snow, log on to the site and change your greeting to reflect that the office will be closed due to the weather.

These are just some of the benefits that Broadview Networks OfficeSuite can bring to your business.

I appreciate your time Tom and look forward to speaking with you down the road once the wheels are put in motion. In the mean time if there are any other questions you have please feel free to reach out to me.

Take care and have a good one.

Michael Kacher **Broadview Networks**
Account Executive

W: 212.991.5982

C: 607.239.3931

mkacher@broadviewnet.com



Response from WhichVoIP.com - GlobalPhone

Wednesday, January 26, 2011 8:13 AM

From:
"Guy Jazyinka" <GJazyinka@GPhone.com>

To:
thosmason@yahoo.com

Hello Thomas,

Your name was forward to me from www.whichvoip.com. My name is Guy Jazyinka and I am with GlobalPhone Corp. - <http://www.gphone.com/Hosted-PBX/Hosted-PBX.aspx> I'd be happy to send you information as well as a quote, all you need to do is answer the following questions.

1) How many employees do you have? How many of them will need phones?

- 2) How many phone numbers (including toll free numbers) do you have or want to have?
- 3) How many locations do you have and how many people per location
- 4) How many of your employees would you consider light, average or heavy phone(minute)users.
- 5) Do you need an Auto Attendant?
- 6) Do you need fax service?
- 7) Do you need VoIP phones. If not, what make of VoIP phone do you currently have. If so, do you have a preference of how many concurrent calls each phone can support?
- 8) Do you need conferencing services. We offer both voice and web conferencing.
- 9) Are there any specific services and features you will require?

GlobalPhone Corp. is a leading business Hosted VoIP PBX and SIP Trunking service provider. We do business with companies all over the world, providing great service that saves our customers as much as 50 percent over their previous telecommunications costs. Our easy-to-manage system can provide you increased functionality with features like auto attendant, voice mail, call center, follow me, calling tool bar, conference calling, and much more. Rates are as low as \$20 per employee per month.

If you'd prefer to discuss over the phone, just let me know when you're free and I'll give you a call, or call me anytime at the number below.




Thank you for considering GlobalPhone for your telecom services.

Kindest Regards,
Guy Jazyuka
www.gphone.com
703-350-4295

Vocalocity Hosted PBX

Wednesday, January 26, 2011 11:39 AM

From:
"Cameron Brown" <Cameron.Brown@vocalocity.com>
To:
"thosmason@yahoo.com" <thosmason@yahoo.com>
Message contains attachments
3 Files (700KB) |

-  [VocalocityPBX Quote DBA.pdf](#)
-  [VocalocityPBX The answers to all your questions.pdf](#)
-  [Vocalocity Signup.docx](#)

Hi Tom!

Thank you for taking the time to speak with me today about setting up your phone system and service with Vocalocity. I hope that I was helpful in clearing up any questions or concerns that you had with regard to Voice over IP and this hosted PBX solution. I know that Vocalocity would be a great solution for your needs!

The attached quote reflects the specifics we spoke about. Take a look to be sure that we are on the same terms as far as what is being offered. I also attached some basic information on the service and phones for you to review and pass along.

More details about Vocalocity can be found on our:

- [Resources Page](http://www.vocalocity.com/resources) [http://www.vocalocity.com/resources]
- [Videos and Testimonials Page](http://vocalocityflix.com/) [http://vocalocityflix.com/]
- [Vocalocity Reviews](http://www.voipreview.org/reviews/vocalocity) [http://www.voipreview.org/reviews/vocalocity]

[<https://vocalocity.webex.com/vocalocity/ldr.php?AT=pb&SP=MC&rID=13018917&rKey=a054151e213d7077>] to see a pre-recorded demo at your own convenience!

Getting started is as easy as filling out and returning the attached signup sheet in addition to the signed proposal. Please let me know if there is anything I can do to earn your business.

I look forward to working with you.

Cameron Brown

Cameron Brown | Inside Sales Representative

1375 Peachtree St. NE, Suite 200 | Atlanta, GA 30309

cameron.brown@vocalocity.com | www.Vocalocity.com

Direct dial (404) 969.4912 | Fax (678) 815.1705

Vocalocity Hosted PBX

Monday, January 31, 2011 9:24 AM

From:

"Brett Liner" <brett.liner@vocalocity.com>

To:

"thosmason@yahoo.com" <thosmason@yahoo.com>

Message contains attachments

1 File (882KB)



- [SDR VocalocityPBX The answers to all your questions.pdf](#)

Dear Thomas,

Thank you for taking the time to speak with me today about your request for information on Voice over IP (VoIP) and what Vocalocity has to offer for your business.

VocalocityPBX is the most cost-effective, feature rich, and reliable phone solution for the small to medium sized business. Never before has a business like yours been offered the luxury of a phone system and service with this level of features and functionality at an affordable price. Enjoy basic business functions such as call transfer, voicemail, and music on hold in addition to VoIP enabled features like voicemail-to-email, downloadable call logs, and virtual extensions for mobile devices.

I attached some basic information including the VocalocityPBX:

- Data Sheet
- Pricing and Features
- Supported Phone List

Please contact me with any questions you may have. I look forward to hearing from you.

Sincerely,

Brett Liner

Account Executive

brett.liner@vocalocity.com

(678) 528-9173

www.vocalocity.com



Vocalocity® Pricing & Features

EXTENSION PLANS					
	Per User/Month	Per Minute	U.S. & Canada*	In Network Calls	Phone Number
UNLIMITED EXTENSION	\$39.99	Free	Free	Free	Direct Inbound Dial Included with each ext.
METERED EXTENSION	\$14.99	\$0.03/min/ext.	\$0.03/min/ext.	Free	Direct Inbound Dial Included with each ext.
UNLIMITED VIRTUAL EXTENSION	\$14.99	N/A	N/A	N/A	Direct Inbound Dial for outbound fivding

ADD-ON FEATURES			
	Monthly	Description	Highlights
MAIN COMPANY NUMBER	\$9.99	This number is attached to the main Auto-Attendant to allow incoming callers to reach the appropriate department or individual by selecting an option from a menu.	<ul style="list-style-type: none"> Different greetings for day or night Unlimited Auto Attendant tiers Dial by name directory
TOLL FREE NUMBER	\$39.99	Toll Free numbers allow you to be reached by anyone in the US and Canada without the caller incurring any long distance charges	<ul style="list-style-type: none"> No per minute charges Perfect for businesses with nationwide customer base
LOCAL OR GEOGRAPHIC NUMBER	\$9.99	Portray a local presence in any additional market by publishing a local phone number in any area code.	<ul style="list-style-type: none"> Local numbers for remote employees Great for geo-targeted marketing campaigns Same functionality as primary number
FAX	\$14.99	Easily send and receive faxes via email and manage all messages in a unified inbox.	<ul style="list-style-type: none"> Unlimited use Paperless fax solutions in a unified inbox.
CONFERENCE BRIDGE	\$14.99 + \$0.03/min.	Full-featured conference bridge, connecting up to 30 people at one time through the easy to use and secure conference bridge.	<ul style="list-style-type: none"> Unique dial-in number Password Protected Save on travel time and expenses
VIRTUAL MAILBOX	\$4.99	Used to gather voicemail messages for a particular function or for employees that do not need full phone service.	<ul style="list-style-type: none"> Collect information; i.e. reservations Create appearance of multiple business units
CALL GROUPS	\$4.99	Designate a number of extensions that will ring simultaneously to share the distribution of incoming calls.	<ul style="list-style-type: none"> Create departments; i.e. Sales, Support Ensure incoming calls are answered
CALL QUEUE	\$14.99 + \$0.03/min.	An advanced queuing system that allows incoming calls to be placed in a queue until they can be answered by an available agent. Callers will hear customized music and messaging while waiting for an agent.	<ul style="list-style-type: none"> Opt-out for callers Real-time monitoring/status Assignment strategy - lbered, random or least used

* Only Continental United States and Canada Included in Plans



Vocalocity® Pricing & Features

ADDITIONAL FEATURES AVAILABLE IN EACH PLAN

<p>Voicemail</p> <ul style="list-style-type: none"> • Password Protected • Unavailable/Busy/Employees Name • Voicemail to Email - receive voicemail as a .mp3 file attached to email • Multiple Mail Folders • Visual Waiting Indicator <p>Online Voicemail</p> <ul style="list-style-type: none"> • Check voicemail through online customer portal • Annotate voicemails with notes for future referencing and searching • Forward voicemails from online interface to any email address <p>Call Waiting</p> <p>Auto Attendant</p> <ul style="list-style-type: none"> • Day and Night Mode - Schedule different greetings according to time of day and day of week • Dial-by-name Directory • Virtual Departments • Play different greeting messages on each incoming phone number • Import Greetings: upload 3rd party professional greetings to use as Auto Attendant greetings <p>Unified Inbox</p> <ul style="list-style-type: none"> • Keep all messages in a single unified inbox - access and manage all messages from your existing inbox • All Message Types - Supports voice, fax, and email messages 	<ul style="list-style-type: none"> • Local Number Portability • Do Not Disturb • Directory Assistance (411) • Emergency Assistance (911) • Call Logs <ul style="list-style-type: none"> • View reports of all incoming and outgoing calls in the system • Export call logs to Excel • Search by specific criteria and date • Call Conference (3 Way Calling) • Never Miss A Call <ul style="list-style-type: none"> • Cell phone integration/Call Forwarding - allows employees to forward calls to cell phones and use PBX functions from their cell phone • Simultaneous Ringing - calls can be forwarded to multiple extensions that will ring simultaneously • Follow Me - Calls can be forwarded to multiple numbers that will ring in a designated sequence • Music on Hold <ul style="list-style-type: none"> • Upload your own music files • Upload advertising or messaging for callers to hear while they are on hold • Caller ID • Caller ID Masking <ul style="list-style-type: none"> • Mask all user's Caller ID with the company number • Block all user's Caller ID • Call Flip <ul style="list-style-type: none"> • Transfer calls to a cell phone to take a conversation on-the-go 	<ul style="list-style-type: none"> • Call Transfer <ul style="list-style-type: none"> • Attended Transfer • Blind Transfer • Dashboard <ul style="list-style-type: none"> • Real-time status of coworkers • Extension to extension click-to-call functionality • Company-wide directory Outlook Integration • Outlook Integration <ul style="list-style-type: none"> • Easily integrate contacts with your phone system • Click to dial straight from Outlook • Quick install, without the need to export and import contacts • Online Customer Portal <ul style="list-style-type: none"> • Administer all account settings online through easy to use interface • Set Permissions/Multiple Roles that allow limited access for end users • View billing history and statements • End Users can manage their own extension settings with individual logins • Softphones <ul style="list-style-type: none"> • Softphone support - compatible with the popular CounterPath Softphones • Custom Tagging <ul style="list-style-type: none"> • Add a unique tag to easily identify origin of incoming calls to each phone number • Voicemail Transcription <ul style="list-style-type: none"> • Our automated system transcribes voicemails and sends you an email with the text of each message
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Prevent Abandoned Calls | Slash Phone Costs with ShoreTel Mobility

Thursday, January 27, 2011 1:38 PM

From: "ShoreTel" <marketing@shoretel.com>

To: thosmason@yahoo.com

(newsletter deleted)

ShoreTel, Inc. © Copyright 2010, All rights reserved.
[Privacy & Legal](#) | www.shoretel.com

960 Stewart Drive
Sunnyvale, CA 94085 USA
(408) 331-3300

From Sam Rising 8x8 Phone Service Quote

Friday, January 28, 2011 10:34 AM

From:

"Sam Rising" <srising@8x8.com>

[Add sender to Contacts](#)

To:

"thosmason@yahoo.com" <thosmason@yahoo.com>

Message contains attachments

1 File (76KB)

Date	Quote Expires	Sales Agent	Quote #	Bill To
1/28/2011	2/27/2011	Samuel Rising (866) 667-1260	QT10276907	DBA Thomas Mason MADISON, WI 53719

Order Summary				
Location	SubTotal	Shipping	Taxes & Fees	Current Charges
#1 Ship To MADISON, WI 53719 Service At Same as shipping address	\$1,250.00	\$0.00	\$132.36	\$1,382.36

Location #1 MADISON, WI 53719						
Items	Qty	Unit Price	Current Charges	Recurring Charges	Your Savings	
Unlimited Extension (NC) (\$39.99) <small>Initial Discount (\$19.99) Monthly Discount for 36 months (\$20.00)</small>	25	\$0.00	\$0.00	\$499.75	\$999.75	
Activation (\$39.99) <small>Initial Discount (\$39.99)</small>	25	\$0.00	\$0.00		\$999.75	
Polycom SoundPoint IP 335 (\$154.99) <small>Initial Discount (\$104.99)</small>	25	\$50.00	\$1,250.00		\$2,624.75	
Virtual Number-No Fees (\$4.99) <small>Initial Discount (\$4.99)</small>	1	\$0.00	\$0.00	\$4.99	\$4.99	
Activation (\$9.99) <small>Initial Discount (\$9.99)</small>	1	\$0.00	\$0.00		\$9.99	
SubTotal			\$1,250.00	\$504.74		
Standard Shipping - Delivery Estimate 2/7/11*			\$0.00		\$474.75	



- [Quote 10276907 Thomas Mason.pdf](#)

Activation (\$9.99)	1	\$0.00	\$0.00	\$9.99
Initial Discount (\$9.99)				
SubTotal		\$1,250.00	\$504.74	
Standard Shipping - Delivery Estimate 2/7/11⁴		\$0.00		\$474.75
Shipping Discount (\$474.75)				
Taxes & Fees²				
E911 Service Fee (US only)		\$49.75	\$49.75	
Regulatory Recovery Fee ³		\$75.00	\$75.00	
State 911 Fee		\$3.75	\$3.75	
Universal Service Surcharge		\$3.86	\$42.97	
Today's Total		\$1,382.36		
You Saved: \$5,113.98				
Due Monthly¹			\$676.21	

This quote is valid through Sunday, February 27, 2011

- 1 Monthly recurring charge includes estimated taxes.
- 2 Taxes & Fees are based on Service Address and may change on receipt of full address details. They include government fees and taxes that we collect and are required by federal, state or local law to remit to the appropriate governmental entity (including, but not limited to, sales, use, excise, public utility, and E911). This section may also include certain fees and costs incurred by us as a result of providing service, such as universal service fees (USF). We elect to collect them in order to recover or help defray the costs we incur. These fees, and what is included in the fees, may vary by locale and may change from time to time without notice. Please note that equipment taxes will be calculated based on Shipping Address.
- 3 We collect the Regulatory Recovery Fee to recover some of the costs we incur to comply with local, state and federal governmental mandates and programs, including, but not limited to, E911, local number portability and number pooling. We may impose the fee whether or not the benefits of any or all of these mandates and programs are available to you in your location.
- 4 Note that ship time will adjust according to when the order is actually placed.

Note: First billing occurs when order is placed, after that 8x8 bills your credit card the second day of each month.

[end of CONTENT]