



Technology Paper
on
VoiceAxxess
VOIP/PBX System
(Voice Over Internet Protocol/Private Branch Exchange)

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Introduction

What is VOIP?

VoIP (voice over IP - that is, voice delivered using the Internet Protocol) is a term used in IP telephony for a set of facilities for managing the delivery of voice information using the Internet Protocol (IP). In general, this means sending voice information in digital form in discrete packets rather than in the traditional circuit-committed protocols of the public switched telephone network (PSTN). A major advantage of VoIP and Internet telephony is that it avoids the tolls charged by ordinary telephone service. This exciting development has gone through over a decade of experimentation, development and design. Today this very useful application is being widely received because the performance of installed systems is matching the quality that is being delivered by landline telephone systems.

This is bad news for telephone companies but tremendous news for people in poorer regions of the world. For years telephone companies could not cope with the demand for landline phone connections because laying lines was an expensive proposition. Today VOIP Systems can be set up within days, and people can get a VOIP account within minutes after that! No more waiting for months or years for telephone services.

The Growth Of VOIP

Indeed, so good is the performance of VOIP systems that Enterprise adoption of it “is on the upswing, in the U.S. market. The market for IP voice gear will reach \$5 billion by 2006, as IP phone systems start replacing aging circuit-switched PBX systems over the next several years. On the consumer front, the VOIP industry will hit between \$8 billion and \$15 billion by 2008.”

While VOIP telephony services will grow rapidly in the USA, the market in the rest of the world will grow even faster simply because the number of telephone accounts set up per capita is so low. The reason mobile phones flourish even in poorer countries such as Uganda, Nigeria, Cambodia, Indonesia is because getting connected via landlines is so difficult!

Advantages of VOIP

What are some disadvantages of VOIP? There are more advantages than disadvantages. The performance of VOIP services will not be good if bandwidth is low and latencies are extensive. For acceptable performance a minimum of 40 kbit/sec bandwidth is required and latencies of less than 600 milli-seconds. If these minimums are not met then the quality of the conversation would be unacceptable. VOIP will also not work during power outages. Also it is important to note that VOIP may not work seamlessly connect with Emergency Dispatch Centers because the identity the location of VOIP Phones may not be recognized by the Emergency Dispatch service. Further most VOIP feature does not offer white page listings.

VOIP Phones or IP Phones or H.323 Phones or SIP Phones¹ work like regular phones. You can use them to make calls, talk to other parties and even retrieve voice mail

¹ Some VOIP Phones are built with ITU's protocol called H.323 Standard. There is a conflict between H.323 and SIP. They are not interoperable devices. Session Initiation Protocol (SIP) is a standard introduced by the Internet Engineering Task Force in 1999 to carry voice over IP. Since it was created by

messages from laptops or desktops. Some models have an indicator alerts the user when new voice mail has been dropped into their box -- and can forward calls to other lines, such as cell phones or a regular phone.

Is VOIP Regulated?

The Federal Communications Commission (FCC)² in the US has worked to create an environment to promote competition and innovation to benefit consumers. Historically, the FCC has not regulated the Internet or the services provided over it. On February 12, 2004, the FCC found that an entirely Internet-based VOIP service was an unregulated information service. On the same day, the FCC began a broader proceeding to examine what its role should be in this new environment of increased consumer choice and what it can best do to meet its role of safeguarding the public interest.

Whether VOIP is regulated in your region needs to be researched. However there are many places, even in Africa, where VOIP is flourishing.

VoiceAxxess – Enterprise VOIP

Advanced Interactive is pleased to offer **VoiceAxxess** an Enterprise VOIP/PBX application. Some industry people call this kind of technology **Voice On Broadband** (VOB). VoiceAxxess is an inexpensive system and can be set up independently or installed with Advanced Interactive's **Axxess Servers**.

The Enterprise grade of this system allows for commercial voice activity and even enables organizations to sell its services to users. When configured with existing Private Branch Exchange (PBX) a wider range of services is possible.

VoiceAxxess allows users to do the following types of voice applications:

1. Authorized users can make telephone calls using the product within the Axxess Server installation network (i.e. Host) using IP Phones and SoftVOIP³ Software such as through PCs;
2. Authorized users can call Long Distance from the Host area to a major population area or another area code at a low cost;
3. Authorized users can call Long Distance from the Host area to other Hosts (or Points of Presence) where other Axxess systems are installed⁴ including our subscribed networks that reaches most parts of North America, Western Europe and Asia;

the IETF, it approaches voice and multimedia from the Internet, or IP, perspective. H.323 emerged around 1996, and as an International Telecommunication Union standard was designed from a telecommunications perspective. Both standards have the same objective - to enable voice and multimedia convergence with IP protocols. As the older standard, H.323 has been embraced by many of the early VOIP players, so it has the advantage of being implemented first. SIP more easily allows applications to be developed because of its origins and has been gaining in popularity, especially in North America and with new entrants into the VOIP market. Big companies like Microsoft and Cisco have embraced SIP. In interoperability between the two, the industry is making slow but sure progress. Interoperability must first happen between vendor implementations of the same protocol (SIP-to-SIP and H.323-to-H.323) and then between protocols. Many vendors now support both protocols, as their customers want flexibility to choose based on different needs.

² <http://www.fcc.gov/ipwg>

³ SoftVOIP means a VOIP Program in a computer that allows it to make a VOIP call.

⁴ The number of Points will grow as we have more installations.

4. Any authorized user can call the Host from outside through the Internet (using IP Phones or through SoftVOIP calls);
5. Teleconferencing among parties in the points-of-presence installations;

Simply put, these services are for:

1. VOIP Phones to talk to VOIP Phones;
2. Regular phones through ATA⁵s to talk to VOIP Phones;
3. Regular phones to talk to SoftVOIP Phones (phones on PCs);
4. SoftVOIP Phones to talk to SoftVOIP Phones;
5. VOIP phones to call the regular phones (PSTN);
6. VOIP Phones to call mobile phones;



SoftVOIP Phone



VOIP Phone

VoiceAxxess System Features

1. Enterprise voice applications;
2. Inexpensive to own and operate;
3. Works with all SIP and H.323 VOIP Phones⁶;
4. Allows for calls within a village or campus;
5. Allows for long distance calling to places that have our VoiceAxxess Systems and other



ATA

subscribed VOIP Gateways such as iBasis, AT&T, Vonage, Lingo and Primus, etc.;

6. Allows for teleconferencing with other parties that have our VoiceAxxess Systems;
7. Voice mail for all users – if calls are not received the call will track the intended party from regular phone to mobile phone and Email;
8. Auto Attendant – a voice activated message will greet each call, and automatically direct the caller;
9. Caller ID - the calling party's phone number can be displayed;
10. Call Hunting – if you are not answering the intended phone, the call will hunt for your cellular phone, and if you do not answer it, then it will leave a voice message in your email;
11. Call Waiting – if you are on a call, the next call could queue and activate after your first call terminates;
12. 3-Way Calling;
13. Distinctive ringing tones;
14. Last number redial;
15. Call holding;
16. Billing system – provided for voice service providers;

⁵ ATA = Analog Telecommunications Adaptor

⁶ Session Initiation Protocol (SIP) is an Internet Engineering Task Force (IETF) standard protocol for initiating an interactive user session that involves multimedia elements such as video, voice, chat, gaming, and virtual reality. H.323 is an ITU Standard. The industry is deciding which protocol will be accepted.

Quality-of-Service (QoS)

Implementing QoS is an important step taken to help ensure the VOIP network offers a quality of voice performance acceptable to customers. QoS uses technologies such as compression and priority routing so that voice applications would get the bandwidth needed to perform across the Internet.

With VoiceAxxess users could be assigned a VOIP phone number (e.g. 693-xxx-xxxx for Mr. Abdul Malik in Kuala Lumpur, Malaysia or 892-xxx-xxxx for Mrs. Wang Siukwan in Hong Kong and so on). These users call other phone numbers the regular way. And they can reach almost any number by subscribing to international VOIP networks such as Vonage, Primus or Lingo.

This very important feature is now integrated with our Axxess Servers. Depending on the volume of usage, you may increase more bandwidth. Doing so would mean better voice performance.

Another part of our quality of service is that we specify HP Servers as part of our turnkey system. HP Servers come with 36-month on-site warranty service.

VoiceAxxess Topology

With VoiceAxxess tied to broadband Internet access it is possible to enable rural communities to have inexpensive voice services through VOIP Phones.

What is necessary is to install VoiceAxxess Servers in a central location in a community, connect this server to a broadband Internet connection, and then through Axxess Servers homes, businesses and community centers would be able to use the VOIP services.

A Typical Community to Urban Area VOIP Connection

Picture a rural Community Administration Office where we will install a VoiceAxxess Server. If there is a PBX there we will connect it to the VoiceAxxess Server. If a PBX is not available, then we will use VoiceAxxess's PBX built-in Server. Connecting to the PBX would mean telephone calls would be able to be routed to phone devices that use the Public Service Telephone Network (PSTN). That means regular phones will be able to use the VOIP features of VoiceAxxess. This connection would mean users could call long distance at a very low cost to places covered by the VOIP Network.

Budgetary VoiceAxxess System Price (US Dollars)

Description	Quantity	Price (each)	Total
Hardware			
ProLiant ML350 G4 Non-Hot Plug SCSI Tower Model Intel® Xeon™ Processor 3.00GHz/800MHz FSB, 1 GB Total PC2700 (2x512 MB), Integrated Dual Channel Ultra 320 SCSI Adapter, 4 Bay non-hot pluggable hard drive cage, 36 GB Ultra 320 Non-Hot Plug 10,000 RPM Hard Drive, 1.44 MB Floppy DD, 48x IDE (ATAPI) CD-ROM Drive, NC7761 Gigabit NIC (embedded), HP NC1020 GB Server Adapter. 3 year on-site warranty.	1	Market Price	
VOIP Phone - SIP protocol (each)	1	about 90	
Analog Telecommunications Adaptor (ATA) (each)	1	about 80	
Software			
VoiceAxxess Server System - includes VoiceAxxess Software with a VOIP Server and a PBX Server, installation, configuration and training.	1	3850	3850

Notes: Travel and lodging, duties, taxes, licenses are not included.

With this kind of system, authorized users, when traveling in those urban areas, would then also be able to call the VoiceAxxess server in the community at very low cost. They will also be able to call from the community to the chosen urban area's regular and cellular phones. In addition, authorized users in urban areas can call the same area code numbers and enable them be able to call PCs or regular telephone numbers in the community.

The diagram above shows how regular phones, IP Phones and SoftVOIP phones in the rural community can call Vancouver using the Internet, thus bypassing the costly telecommunications lines.

Multiple VOIP-to-VOIP calls could be done. The system may not be limited to the aforementioned 4 telephone lines. More lines could be added.

Calls from a computer on the Internet to another computer in the community would also be possible. Users would have to purchase a headset with a noise-canceling microphone with volume control that connects to Laptops or PCs to create SoftVOIP Phones.

VoiceAxxess with CommunityAxxess

Although VoiceAxxess is a stand-alone system it can be integrated with Advanced Interactive’s CommunityAxxess System. Together they provide high -speed Internet and telecommunications. CommunityAxxess has a lot of other communications services that are compelling for communities. *(For more information on CommunityAxxess please contact us for a CommunityAxxess Technology Paper.)*

Budgetary VoiceAxxess Information

From the table below you can see that a VoiceAxxess Server will be necessary. From this Server you can connect regular and IP Phones so that users can use the network like a telephone network. Basically it is possible to have a good VOIP System for as little as \$5,000 (depending on the number of phones you require).

Users at community homes could also purchase IP telephones and use them instead of their PCs. The cost of a VOIP Phone is in the range of \$90 to \$300 depending on features.

Budgetary VoiceAxxess System Price (US Dollars)			
Description	Quantity	Price (each)	Total
Hardware			
ProLiant ML350 G4 Non-Hot Plug SCSI Tower Model Intel® Xeon™ Processor 3.00GHz/800MHz FSB, 1 GB Total PC2700 (2x512 MB), Integrated Dual Channel Ultra 320 SCSI Adapter, 4 Bay non-hot pluggable hard drive cage, 36 GB Ultra 320 Non-Hot Plug 10,000 RPM Hard Drive, 1.44 MB Floppy DD, 48x IDE (ATAPI) CD-ROM Drive, NC7761 Gigabit NIC (embedded), HP NC1020 GB Server Adapter. 3 year on-site warranty.	1	Market Price	
VOIP Phone - SIP protocol (each)	1	about 90	
Analog Telecommunications Adaptor (ATA) (each)	1	about 80	
Software			
VoiceAxxess Server System - includes VoiceAxxess Software with a VOIP Server and a PBX Server, installation, configuration and training.	1	3850	3850
Notes: Travel and lodging, duties, taxes, licenses are not included.			

It is our knowledge that many organizations spend a great deal of money calling the same parties regularly. Some of our customers spend about \$1,500 per month calling parties in the same area code. If they invested about \$5,000 the rate of return would be very high and the payout period would be a little more than three months.

VOIP as a Sustainable Tool

Most remote communities are underserved by telecommunications companies. Long distance rates are high and service may also be unstable. If you are providing VOIP services to your community, then you are doing community members a good service. People would pay for such services. The profit garnered by such services may be

sufficient for you to offer longevity to the Axxess related services such as high-speed Internet, e-Learning, etc. to the residents.

Post-Paid Versus Pre-Paid

With the VOIP feature installed in an Axxess System, you essentially become a closed community telecommunications carrier even though you are using the Internet to facilitate voice communications. Most carriers log calls and charge customers by sending them a monthly bill. Doing so would incur expenses in mailing out the bills to each customer, and waiting for the bills to be paid. A great deal of work is involved in collecting the billings. Often customers repudiate charges, and that invokes a lot of clerical work. VoiceAxxess provides a billing system. Therefore activity of assigned numbers can be tracked, metered and hence, billed.

Although we provide a billing system with the installation, a better way to handle this aspect of the business is not to have a post-paid system. Giving credit to customers and collecting on the debt is an expensive way of doing business. We suggest that you institute a pre-paid system⁷. It is a simple and very effective system. Simply put, you issue pre-paid cards to your customers, they load money into the cards, and as they make calls they enter the card password into the telephone keypad and you have an accounting record of the usage of the VoiceAxxess system. Usage costs are automatically deducted from the pre-paid amount. You do not have to chase the customer for payment nor do you have to send out monthly bills.

The attractive part of a pre-paid card system is that you have an opportunity to benefit from breakage. Breakage may be described as the amounts of money left in cards through lost, expired or damaged cards. On an average, between 10 to 15 percent of pre-paid monies fall into the breakage category. Over time, breakage may amount to a substantial amount of money. In addition, pre-paid card systems allow you to work with the float i.e. the amounts of monies customers prepay into the cards.

The pre-paid card systems may also be introduced to retail stores in your community that wish to accept your pre-paid cards for goods and services. We have built a switch that can process these transactions. These retail stores would require a Point Of Sale Terminal to process the cards. Note that there will be transaction fees charged by the pre-paid card system provider.

Managed Server Management Service

To ensure that your VoiceAxxess System works most of the time (up to 99.99% uptime), we insist that each System be accompanied with our stellar Managed Server Service. The monthly service fee is US\$100 per VoiceAxxess Server.

Summary

VOIP is gaining rapid acceptance and adoption all over the world. It is inexpensive to implement and operate. VoiceAxxess is a turnkey system. It has most of the compelling features you require for voice communications. We have extensive experience in setting up of networks especially in remote parts of the world. Working with us for your VOIP network would be an easy relationship.

⁷ Powered by MoneyBar Technologies Inc, our associate.

~~We look forward to working with you.~~

Appendix 1 - VOIP Glossary

Broadband Connection

Broadband is a high-speed (100 kbps or more) connection to the Internet. Such connections are offered by Telcos, Cablecos (Cable Modem Access), and Internet Service Providers

Customer Premise Equipment (CPE)

CPE is telephone equipment that resides in a customer's location. This equipment ranges from a simple phone and answering machine to business switchboard systems as a PBX's (Private Branch Exchange) and Key Systems. Centrex offers equivalent functionality to the PBX, but is not a CPE. It is sold on a per telephone/feature basis and is serviced from the service provider's central location.

Digital Subscriber Line (DSL)

DSL is the generic name for a range of digital services (aDSL, hDLS, iDSL, sDSL, raDSL, vDSL, uaDSL). These services are usually provided by the local telephone companies and are on a paid for subscription basis. DSL can deliver simultaneous high-speed data (Internet connection) and standard voice services over the same phone line. DSL uses the existing copper wires from the standard telephone service, the high-speed DSL signal is send from the provider's central office to the DSL modem on the customer premise. The DSL line is shared by the standard telephone and the DSL modem. In order for the DSL signal not to interfere with the phone signal, a filter is connected to the phone line that leads to the customers phone equipment.

IP Virtual Private Network (IP VPN)

An IP VPN is used to securely exchange data between 2 locations. It uses a partitioned private network (tunnel) that is constructed over the public Internet backbone. An IP VPN can be between dedicated locations or between remote users in a corporate network (Wide Area Network (WAN) or Local Area Network (LAN)). The technology ensures privacy of data through authentication of remote users and encryption of data that travels along a "tunnel" created between the site and the user.

Local Area Network (LAN)

The LAN is a data network that connects computers, printers, faxes and other devices in a small geographic area, usually within one building.

Long-Distance Services

Long-distance services allow customers to make telephone calls that terminate in a local service area other than the area from which the call originates. These calls include international and regional long-distance calling. Long-distance calls are often routed over a series of connected but separately owned and operated PSTN networks. Switching equipment routes the calls and records traffic volume in terms of Minutes Of Use, in order to settle intra-carrier revenue distribution.

Minutes of Use (MOUs)

Voice telecommunication traffic is measured in terms of minutes of connection. Advanced Interactive's revenue is based on the volume of minutes that we originate, terminate or transport over our network.

Private Branch Exchange (PBX)

A PBX is a customer premise communication switch. It connects customer phones with the telephone company's central office using dedicated lines (trunks). It manages a company's incoming, outgoing and internal calls. Most current PBXs have software enabled features such as call forwarding, call pick-up, auto-attendant and call park.

Public Switched Telephone Network (PSTN)

The PSTN is the standard telephone network used to carry calls worldwide. The PSTN is built on circuit switched technology platform using analog signals. The Internet and VoIP uses packet-switched network platform that uses digital signals.

Softswitch

A softswitch is usually embedded in a carrier gateway switch and provides call-control and routing functions for network voice and data traffic. It can also be used to create new services. Most Softswitches have carrier-class features such as SS7 capability, support for multiple applications and scalability.

T1 Line

A T1 line has the capacity for 24 voice and data channels at 64 Kbps each. It is a North American standard for leased digital lines from a telephone company or ISP. A T1 connection can be split into half's or quarters to reduce cost if full capacity is not required. Similarly E1 (or E-1) is a European digital transmission format devised by the ITU-TS. The E1 signal format carries data at a rate of 2.048 million bits per second and can carry 32 channels of 64 Kbps each. E1 carries at a somewhat higher data rate than T-1 (which carries 1.544 million bits per second) because, unlike T-1, it does not do bit-robbing and all eight bits per channel are used to code the signal. E1 and T-1 can be interconnected for international use.

Voice over Broadband (VoB)

VoB is a subset of VoIP. VoB refers to provisioning voice and data services via a broadband connection (including DSL and Cable) rather than a dial-up Internet connection. VoB allows for higher quality voice services and enhanced converged network services such as video calling.

Wide Area Network (WAN)

A WAN is a data network that serves users across a broad geographic area. Usually between 2 or more locations. WANs usually are an extension of a corporate Local Area Network (LAN), to another LAN outside the building over a data communication link.