EMGT 835 FIELD PROJECT:
US - Voice over Internet Protocol Phone Service Providers
Market Analysis

By

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An EMGT Field Project report submitted to the Engineering Management Program and the Faculty of the Graduate School of The University of Kansas in partial fulfillment of the requirements for the degree of Master of Science.

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Acknowledgement:

I would like to thank my parents, who are responsible for my quest of learning.

I would also like to thank my wife and kid for encouraging and supporting my every step all the way. There just aren’t enough words in the dictionary, Viji; so let me just say thanks.

Finally I would like to offer a very special thank you to Bob Zerwekh, Herb Tuttle and Charles Keller whose constructive criticisms made such an important contribution to this project.

Executive Summary:

This report explains the overview of Voice over internet protocol (VoIP) and the challenges the VoIP Phone Service providers face to become market leaders.

The report provides an overview of new services offering, both residential and business customers. The strategic position of some of the key suppliers is identified, with Vonage and AT&T CallVantage being the quality leaders, Packet 8 and Primus the challengers, and sunRocket as the followers.

Top four VoIP Service providers are taken for market research to formulate a comprehensive and clear business case that addresses the strategic direction and future growth of VoIP Service provider. Finally, recommendations are provided for followers the steps they have to follow to become market leaders.

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1. Introduction.

1.1 Purposes

A few years ago, when Vonage started to provide VoIP service in the consumer market, consumer VoIP remained as a niche market as very little growth could be foreseen in the business. Not until 2003, did large phone service providers in the U.S such as AT&T, Qwest and Cable companies like Time Warner, Comcast and Cablevision have started to rollout consumer VoIP service. The competition has heated up and the hype surrounding VoIP has grown. The major purpose of this research is to do a market analysis for five of the top companies such as Vonage, AT&T, Packet 8, Primus and SunRocket.

1.2 Technical

The focus on this paper is to know about Voice over internet protocol (VoIP), history, network architecture for VoIP, advantages and disadvantages, protocol and standards and E 911.

1.3 Market Analysis

This report also does a comparative analysis of residential VoIP Services. There are a growing number of companies offering VoIP services. This paper compares five companies AT&T, Vonage, Sun Rocket, Primus and 8x8. Their overall standing in the market is analyzed using the key success factor which is discussed in detail on Chapter 4.

2 Literature Review.

Title: Voice over IP
Author: Marko Leppanen
Year: 2001
University: Helsinki University of Technology
Department of Computer Science
Marko.Leppanen@hut.fi

The aim of this paper is to give several viewpoints of VoIPs possibilities and restrictions in technical manner. This paper also discusses about standards and protocols of VoIP, benefits and disadvantages of VoIP, quality of VoIP, security issues with VoIP and implementation of VoIP.

Title: VOICE OVER IP
Author: Chris Roberts
Date: March 2005
Centre for Critical Infrastructure Protection
New Zealand
Email: info@ccip.govt.n
Website: http://www.ccip.govt.nz

This paper discusses about the technical details of VoIP, standards and protocols of VoIP, advantages and disadvantages of VoIP, quality of VoIP, components of VoIP and implementation of VoIP.

Title: International and Retail Voice over IP: Living Up to the Hype?
Author: Stephan Beckert, Director of Research
Date: March 21, 2006
TeleGeography Research
Email:sbeckert@telegeography.com

This paper was presented in the web conference at Sprint Reston VA. Stephan Beckert and his colleges discussed Telegeography's latest findings on global voice and data traffic growth, network supply dynamics, and market pricing trends.

Title: Residential VoIP Service Assessment
Author: Diane Myers
Date: August 2005
Stratecast Partners

This paper analysis the U.S Residential VoIP Services competitive Matrix, U.S Voice service subscriber breakout (2000 – 2004), U.S VoIP Service pricing plans and U.S Residential Broadband market share.

This assessment was made based on interviews and analyst events with the 12 companies they analyzed in this report.

Title: Consumer Market for US Residential VoIP Services Accelerates
Author: Kate Griffin
Date: June 27, 2005
Yankee Group
kgriffin@yankeegroup.com

The main objective of this paper was to forecast VoIP Consumer Market and analysis the results to give some recommendations to VoIP service providers.

The following factors and key assumptions were considered in developing the forecast: Continued growth of broadband in the US, An acceleration of current bundling trends, Historical penetration of cable telephony, VoIP pricing and consumer pricing sensitivity and continued movement toward IP services.

Title: Voice over IP Industry Analysis
Author: Katherine Lam
Year: 2004
University: University of Toronto
Master of Engineering in Telecommunications

In this report, two questions are addressed in order to predict the evolution of the consumer VoIP market.

1. Is carrier VoIP disruptive in the consumer market?

2. Will carrier VoIP cross the chasm quickly and easily in the consumer market?

This leads to a better understanding of the evolution of the consumer VoIP market, and provides insights into the future of the overall telecom market. In the process of answering these questions they had done a overall VoIP market analysis, including both enterprise and carrier VoIP.

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These were the links used to gather information for the Market Analysis.

http://www.voip-info.org/wiki/index.php?page=VOIP+sites

http://www.lingo.com/voip/residential/basic_internet_phone_service.jsp

http://www.8x8.com/file.php/117/8x8+Shareholders+Meeting+20050823.pdf

http://www.8x8.com/

http://www.voipreview.org/service.compare.aspx?id=1&id=3&id=31&id=32

http://www.vonage.com, Accessed on March 21, 2006

http://www.primustel.com, Accessed on March 21, 2006

http://www.8x8.com , Accessed on March 21, 2006

http://www.sunrocket.com, Accessed on March 21, 2006

3 Overview of VoIP

Voice over Internet Protocol (VoIP), also known as Internet Voice, is a technology that allows making telephone calls using a broadband Internet connection instead of a regular or analog phone line[1]. Some services using VoIP may only allow calling other people using the same service, but others may allow calling anyone who has a telephone number - including local, long distance, mobile, and international numbers. Also, while some services only work over computer or a special VoIP phone, other services allow to use a traditional phone through an adaptor.

VoIP allows telephone calls using a computer network, or over a data networking like the Internet. VoIP converts the voice signal from the telephone into a digital signal that travels over the internet then converts it back at the other end so can speak to anyone with a regular phone number. When placing a VoIP call using a phone with an adapter, hear a dial tone and dial just as always. VoIP may also allow making a call directly from a computer using a conventional telephone or a microphone.

VoIP allows making toll-free long distance voice and fax calls over existing IP data networks instead of the public switched telephone network (PSTN). Today businesses that implement their own VoIP solution can dramatically cut long distance costs between two or more locations.

For the past century people have relied on the public switched telephone network for voice communication. During a call between two locations, the line is dedicated to the

two parties that are using it. No other information can travel over the line, although there is often plenty of bandwidth available.

Later, as data communications emerged, companies paid for separate data lines so their computers could share information, while voice and fax communications were still handled by the PSTN.

But this is no longer a problem now as today, with the rapid adoption of IP, now have a far reaching, low-cost transport mechanism that can support both voice and data. A VoIP solution integrates seamlessly into the data network and operates alongside existing PBXs, or other phone equipment, to simply extend voice capabilities to remote locations. The voice traffic essentially rides for a reduced cost on top of the data network using the IP infrastructure and hardware already in place.

3.1 Requirements

The primary requirement for VoIP services is a broadband Internet connection, such as DSL or cable or managed broadband access for business customers. Dial-up or satellite connections are usually not supported, but wireless broadband is. The latest versions of Windows and Internet Explorer or competing Internet browsers are needed, and customers requiring home networking options need to purchase routers. Most carriers also require minimum connection speeds, especially if customers are using their broadband connections for simultaneous voice and data traffic. Carriers, however, are

beginning to offer standalone DSL that supports just Internet and VoIP without traditional voice.

3.2 How VoIP Works

Underlying today's enterprise networks is Ethernet, which provides the basic communications infrastructure for letting multiple devices chat over the same network[2]. The protocol that bundles up Ethernet packages and ensures that it's delivered to the right computers (and to the right applications on those computers) is TCP/IP, which stands for Transmission Control Protocol/Internet Protocol. IP, or Internet Protocol, controls the addressing scheme that distinguishes enterprise desktop from source code management server from network laser printer. TCP, or Transmission Control Protocol, tells each computer what to do with each data packet it receives.

Internet Protocol allows the transmission of voice over a data network, making use of companies' existing data connections. In packet-switched networks, which VoIP requires, a file is broken up into smaller groups of data containing information that identifies their origin, destination and sequence in the original file, which is needed for re-assembly at the file's destination.

Technically, VoIP is the routing of voice conversations over an IP-based network, such as the Internet. Voice data is transmitted over a packet-switched network, instead of flowing through traditional dedicated, circuit-switched voice lines. (Standard dial-up

phone service at home, it uses a circuit-based approach, vs. a packet-based networking approach.)

Understanding the difference between traditional circuit-switched telephony—sometimes called POTS (for plain old telephone system) vs. today's newer packet-based VoIP is fundamental for understanding how to integrate voice into enterprise Applications.

3.3 Circuit-switched Networks vs. Packet-switched

Circuit-switched networks are common in traditional telephone systems. In offices, they may have analog trunk lines running into a PBX (private branch exchange), where those signals are sent via dedicated wires to analog or digital handsets, or in a more progressive environment, to VoIP telephones hooked up over the Ethernet network[2].

Analog lines are expensive, because the phone system needs to create a dedicated circuit between the two telephones in the communication. (Generally, the phone system emulates that physical connection using a variety of networking technologies, but the system behaves as if the telephones are hooked up to each directly.) The dedicated connection between these two networks nodes lasts only as long as the communication itself; only the same two nodes can communicate on their dedicated circuit.

The advent of high-speed connections and cutting-edge technologies like VoIP are making circuit-switched networks seem archaic, although they still have a foothold in telecom. Companies may actually use a VoIP scheme to communicate more efficiently

with its phone carriers; the newer VoIP services can offer more flexible service at a better cost.

In VoIP services, packet-switched networking means packets of information or blocks of data (in this case voice data) are individually routed between nodes via data links. Many other nodes can share these links. These data packets are converted to voice communications, with telephones connected to data ports on the IP network. In some cases, they have a dedicated VoIP hooked up to its own Ethernet jack; in other installations, they use a speaker and microphone on a standard PC to place and receive calls.

3.4 Network Architecture for VoIP

Consider the case that a user with a wired terminal or telephone tries to call some other mobile user. Figure 1 shows the network architecture generally used for VoIP service and the arrows in Figure 1 indicate the call flow.

The voice signal generated at a transmitter forms IP packets by using an encoder and a packetizer. The encoder periodically samples the original voice signal and makes a constant bit rate stream. The bit rate is decided by the type of the encoder.

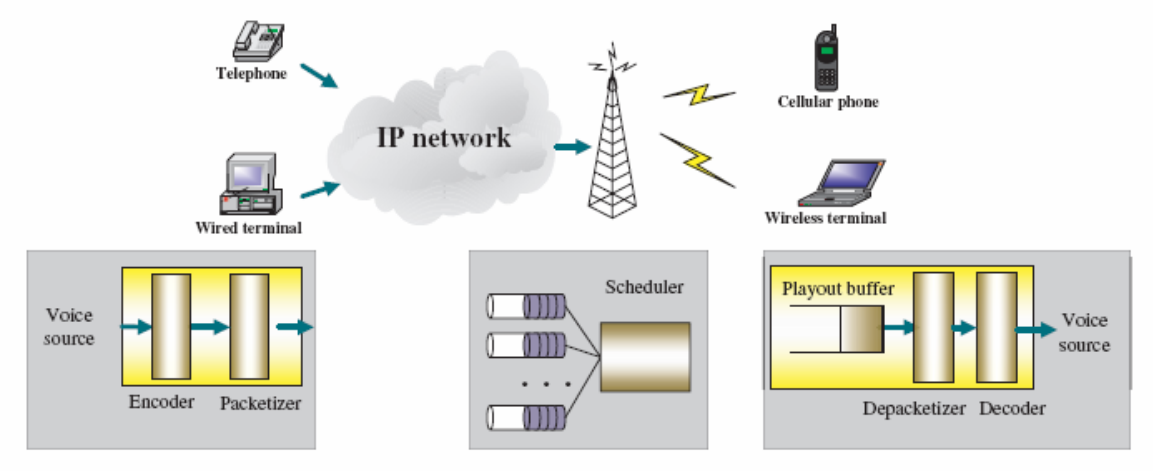

Figure – 1 **Source: IEEE Journal 2004**

3.5 Advantages and Disadvantages of VOIP

S.NO:	ADVANTAGES	DISADVANTAGES
1	Long distance call for customers those use VoIP is much lower than normal phone. This is because PBX network and IP data network combine into one, which saves staff and maintenance costs.	Require technical expertise to install the voice over IP phone adapter.
2.	VoIP saves both time and money for the company. This means more profit to the company.	VoIP is for larger networks, much planning and design is required.
3.	Integrated system management and network maintenance are benefits of VoIP. The PBX and IP network are combined into a single network for management.	Complexity of the IP data communication network, and a single voice/data network failure point.
4.	Voice calling from a laptop of pc by using a VoIP soft phone is possible.	VoIP requires a lot of bandwidth.
5.	Users can setup VoIP conference lines and call-forwarding from the web page.	VoIP requires upgrade of old PBX system.

Table 1 Source: Chris Roberts[4], 2005

Below is the image with the potential benefits of VoIP. This survey was taken by Osterman Research group.

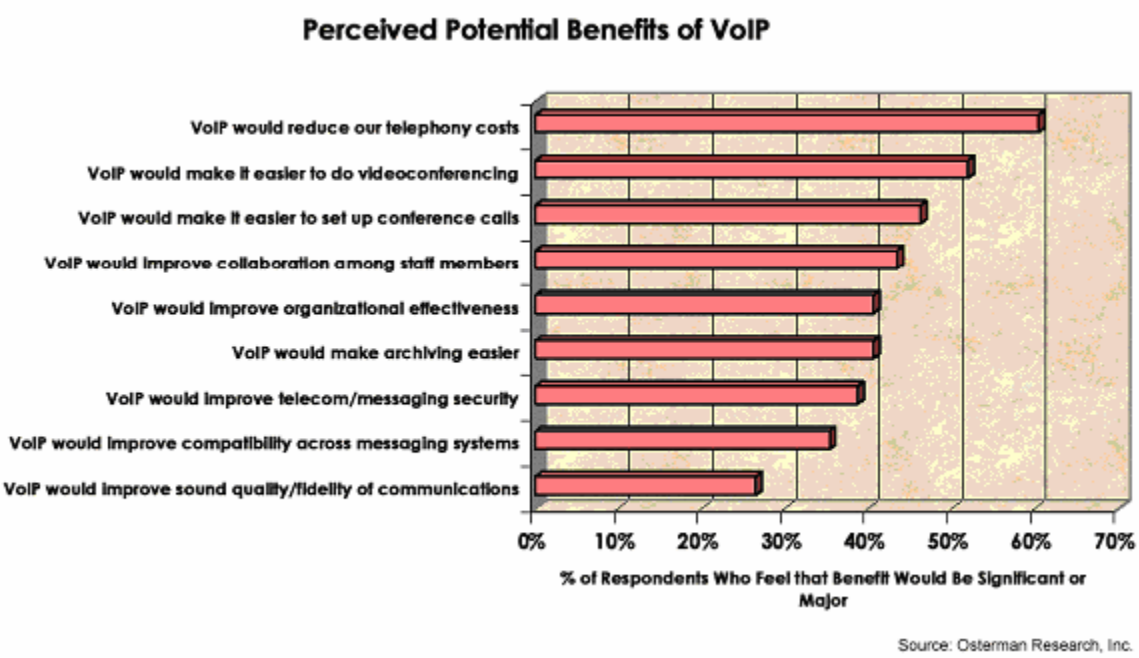

Figure – 2 **Source: Osterman Research group, 2005**

4 VoIP Standards and Protocols

There are a number of standardization bodies working on VoIP. The most important ones are, The International Telecommunication Union (ITU), International Multimedia Teleconferencing Consortium (IMTC) and the Internet Engineering Task Force (IETF). In addition, there are a couple of smaller organizations working on VoIP such as MIT Internet Telephony Consortium, Technical Advisory Committee and Enterprise Computer Telephony Forum (ECTF).[3]

There are two VoIP signaling protocols that are competing against each other: the H.323, an ITU standard and Session Initiation Protocol (SIP), an IETF standard. [3]While there is some overlap of functionality there are differences in approach and terminology. In addition, some vendors are providing proprietary, product dependent implementations. Both protocols can be extended to manage new capabilities. The argument has been advanced that H.323 is more stable because of its maturity but SIP provides better support for some functionality and is easier to implement. Fortunately the ITU and the IETF are now co-operating in developing standards in this area.

4.1 H323

H.323 is a multimedia conferencing protocol, which includes voice, video, and data conferencing, for use over packet-switched networks.[6]

Currently in version 6, H.323 is a standard recommended by the Telecommunication Sector of the ITU. It defines real-time multimedia communications and conferencing over

packet-based networks that do not provide a guaranteed Quality of Service (QoS) such as the LAN and the Internet. It is an "umbrella standard" belonging to the H.32x class of standards recommended by the ITU for videoconferencing applications[3]:

These were amongst the earliest standards to classify and provide solutions to VoIP.

1. H.310 for conferencing over Broadband ISDN (B-ISDN);
2. H.320 for conferencing over Narrowband ISDN;
3. H.321 for conferencing over ATM;
4. H.322 for conferencing over LANs with guaranteed QoS;
5. H.324 for conferencing over Public Switched Telephone Networks.

Earlier versions of H.323 had a large overhead in control signaling, particularly when establishing a session. This has presented some scalability limitations, especially when a large number of simultaneous sessions are presented. Subsequent versions have focused on addressing these issues.

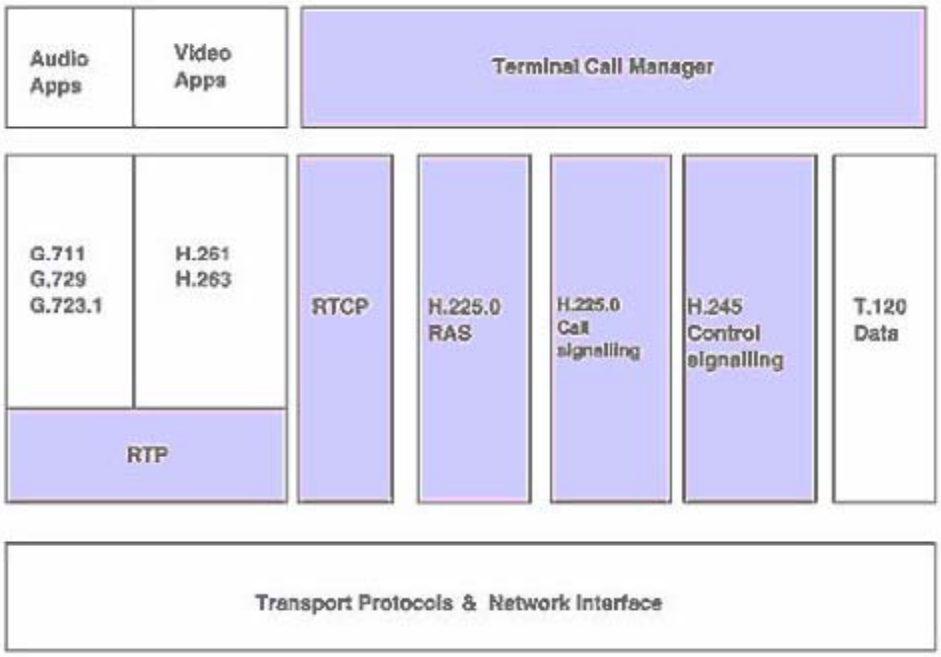

Figure – 3 **Source- Javvin Technologies, Inc[6], 2004**

This figure illustrates the structure of the key protocols in the H.323 architecture.

4.2 Session Initiation Protocol (SIP)

As the Internet developed, the IETF produced a large number of standards and protocols through the Request for Comment (RFC) process[3]. In the VoIP area, some were based on ideas in the H.323 standard and developed through the RFC process. SIP is a protocol to invite individual users to participate in a point-to-point or unicast session and part of the IETF's multimedia data and control protocol framework. It manages the setup and orderly termination of sessions which may include telephone calls, videoconferencing and multimedia distribution.

Sip is text-based and designed to be simple, efficient and extensible. It has inherited some design characteristics from the Hypertext Transfer Protocol (HTTP) and the Simple Mail Transfer Protocol (SMTP).[6]

4.3 Other Standards

Other relevant standards and recommendations include[8]:

1. H.225 defines the lowest layer that formats the transmitted video, audio, data, and control streams for output to the network, and retrieves the corresponding streams from the network.

2. H.235 specifies the security requirements for H.323 communications. Four securities services are provided: authentication, integrity, privacy, and non-repudiation;

3. H.245 specifies messages for opening and closing channels for media streams and other commands, requests and indications;

4. H.248, also known as Megaco (Media Gateway Control), is a current draft standard and a co-operative proposal from IETF and ITU.

5. H.261. If video capabilities are provided, it must adhere to the H.261 protocol with QCIF as its mode;

6. H.263 specifies the CODEC for video over the PSTN;

7. Various audio Codec's are specified under G.711, G.722 G.723, G.723.1, G.726, G.729 and G.729.a23;

8. T120 a protocol for data and conference control.

Over 120 leading computer, telecommunication and technology organizations have indicated their intent to support and implement H.323 in their products and services. This wide ranging support establishes H.323 as the de facto standard for audio and video conferencing over the internet.

4.4 VoIP Protocol

There are a number of other protocols that may be used in VoIP applications. These are the protocol names and description. For more detailed information refer protocols.com.

Signaling	
H.323	H.323
Megaco H.248	Gateway Control Protocol
MGCP	Media Gateway Control Protocol
RVP over IP	Remote Voice Protocol Over IP Specification
SAPv2	Session Announcement Protocol
SGCP	Simple Gateway Control Protocol
SIP	Session Initiation Protocol
Skinny	Skinny Client Control Protocol (Cisco)
Media	
DVB	Digital Video Broadcasting
H.261	Video stream for transport using the real-time transport
H.263	Bit stream in the Real-time Transport Protocol

RTCP	RTP Control protocol
RTP	Real-Time Transport
H.323 Protocols Suite	
H.225 H.225 Annex G H.225E	Covers narrow-band visual telephone services
H.235 H.323SET	Security and authentication
H.245	Negotiates channel usage and capabilities
H.450.1	Series defines Supplementary Services for H.323
H.450.2	Call Transfer supplementary service for H.323
H.450.3	Call diversion supplementary service for H.323
H.450.4	Call Hold supplementary service
H.450.5	Call Park supplementary service
H.450.6	Call Waiting supplementary service
H.450.7	Message Waiting Indication supplementary service
H.450.8	Calling Party Name Presentation supplementary service
H.450.9	Completion of Calls to Busy Subscribers supplementary service
H.450.10	Call Offer supplementary service
H.450.11	Call Intrusion supplementary service
H.450.12	ANF-CMN supplementary service
RAS	Manages registration, admission, status
T.38	IP-based fax service maps

T.125	Multipoint Communication Service Protocol (MCS).
SIP Protocols	
MIME	Multipurpose Internet Mail Extensions
SDP	Session Description Protocol
SIP	Session Initiation Protocol

Table 2 Information Source: protocol.com[9]

The following table provides an overview of the principal VoIP protocols, as described in a Cisco white paper[11]

	H.323	**SIP**	**MGCP/H.248/Megaco**
Standards body	ITU	IETF	MGCP/Megaco— IETF H.248—ITU
Architecture	Distributed	Distributed	Centralized
Current version	H.323v6	RFC2543-bis07	MGCP 1.0, Megaco, H.248
Call control	Gatekeeper	Proxy/Redirect	Call agent/media

		Server	gateway controller
Endpoints	Gateway, terminal	User agent	Media gateway
Signaling Transport	Transmission Control Protocol (TCP) or User Datagram Protocol (UDP)	TCP or UDP	MGCP—UDP; Megaco/H.248—both
Multimedia Capable	Yes	Yes	Yes
DTMF-relay Transport	H.245 (signaling) or RFC 2833 (media)	RFC 2833 (media) or INFO (signaling)	Signaling or RFC 2833 (media)
Fax-relay Transport	T.38	T.38	T.38
Supplemental services	Provided by endpoints or call control	Provided by endpoints or call control	Provided by call agent

Table 3 Information Source: Cisco white paper [11]

5 VoIP Consumer Market

5.1 U.S -VoIP Service Providers

There are two major groups of service providers that are capable of offering consumer VoIP services to residents in U.S. They are[12]:

1. Existing Incumbents

2. New Entrants

And within the existing incumbents, further break it down into three different categories of service providers: ILEC, IXC and MSO. These are the four types of service providers.

Existing Incumbents	
S.No.	**Categories**
1.	Incumbent/Integrated Local Exchange Carrier (ILEC)
2.	Incumbent Multi-Service Operator (MSO)
3.	Inter-Exchange Carrier (IXC)
New Entrants	
4.	Pure VoIP Service Providers (Pure VoIP SP)

Table-4

Although ILEC, IXC and MSO are in the same group of service providers, their business models and approaches to deploying VoIP are completely different.

Given that each category of service provider has its unique specialties, characteristics and

business strategies, it is crucial for us to understand their functional and marketing differences a better insights into the competitive landscape of VoIP in the later chapters. In the following sections, each of these service providers is examined in more details.

5.2 Incumbent/Integrated Local Exchange Carrier (ILEC)

The ILECs, generally known as incumbent/integrated local exchange carries, are the traditional phone companies that provide local phone services. As a result of the breakup of AT&T in 1984, the ILECs gained the exclusive right to provide local phone services to the U.S. customers in certain regions.

The ILECs could also be named as Regional Bell Operating Companies (RBOCs). At the time of the AT&T breakup, there were seven RBOCs. After a series of mergers and acquisitions, the current RBOCs remaining are Verizon, SBC, Qwest and BellSouth. These local phone companies have virtually enjoyed monopolies over their particular regions until 1996, when the Telecom Act was passed to mandate the ILECs to provide necessary interfaces and equipments called unbundled network element platform (UNEP), which allowed the Competitive LEC (CLEC) to provide local service. To further encourage competition, the service rate of this UNE-P was set by the U.S. government at a discounted rate. Since then, ILECs has always fought this rule enacted in the Telecom Act because this rule would hurt their profitability.

Basically, the ILECs own the access network - a portion of the public network that connects the access nodes to individual subscribers. Inside an access network, there are local loops, central offices and inter-office trunks, which are shown in Figure 3 [11]. By definition, local loops are the copper wire connections that run between central office (CO) and subscriber's premises.

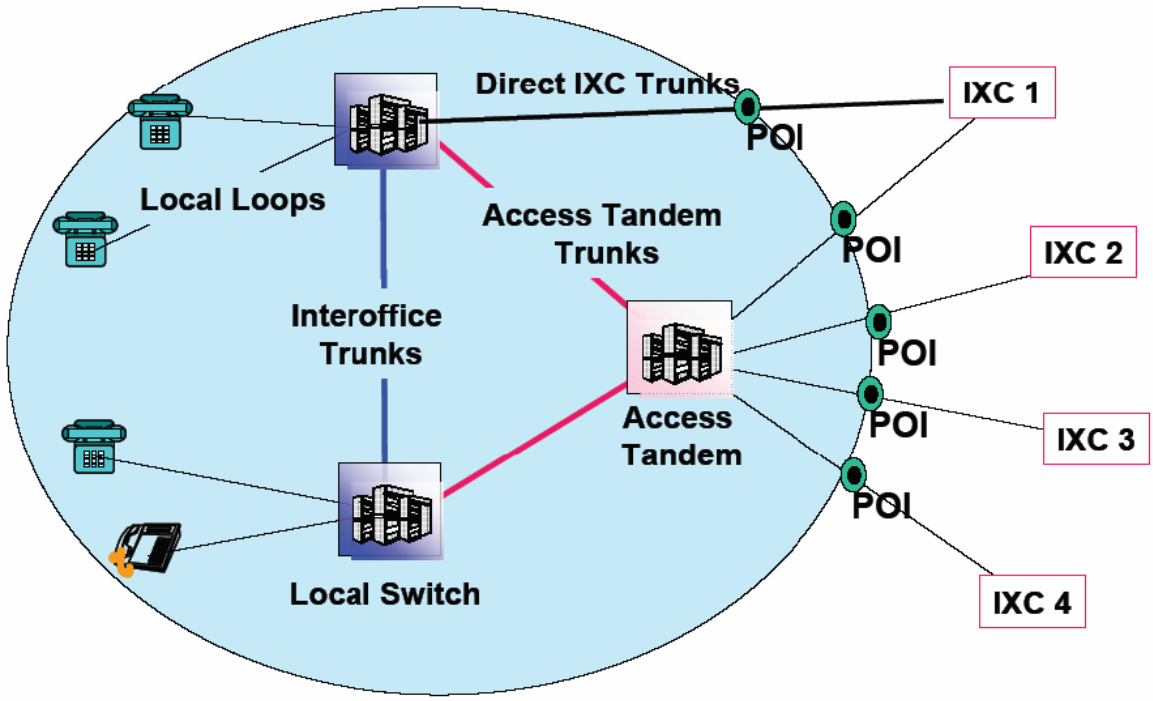

Figure – 4 **Source: VoIP Industry Analysis[12], 2004**

5.3 Incumbent Multi-Service Operator (MSO)

Incumbent Multi-Service Operator (MSO), also known as cable operators, is another type

of service provider that owns the access network. A MSO typically offers multiple services to subscribers such as analog and/or digital cable T.V., broadband connections. They recently start to offer voice services. Similar to the operating style of the ILECs, different MSOs serve customers in distinct U.S. regions and never interact with the others. Thus, there is virtually little competition and the MSOs enjoy monopolies in their own regions.

However, one competitive area that is worth mentioning is the T.V. service. The MSOs have to directly compete with satellite TV operators. Recently, these satellites operators have gained significant momentum in the market place, with their market share up from 7% to 17% during the period of 1998-2003 [12]. These satellites operators took away customers from the cable TV by providing lower-priced T.V. service with rich channel offering.

During the 90's, the MSOs have upgraded their cable network infrastructure to facilitate two-way data and voice transport for cable Internet service. The network infrastructure is shown in Figure 4 [11]. In U.S., there are five large MSOs that dominate the cable market; they are Comcast, Time Warner, Cox, Cablevision and Charter.

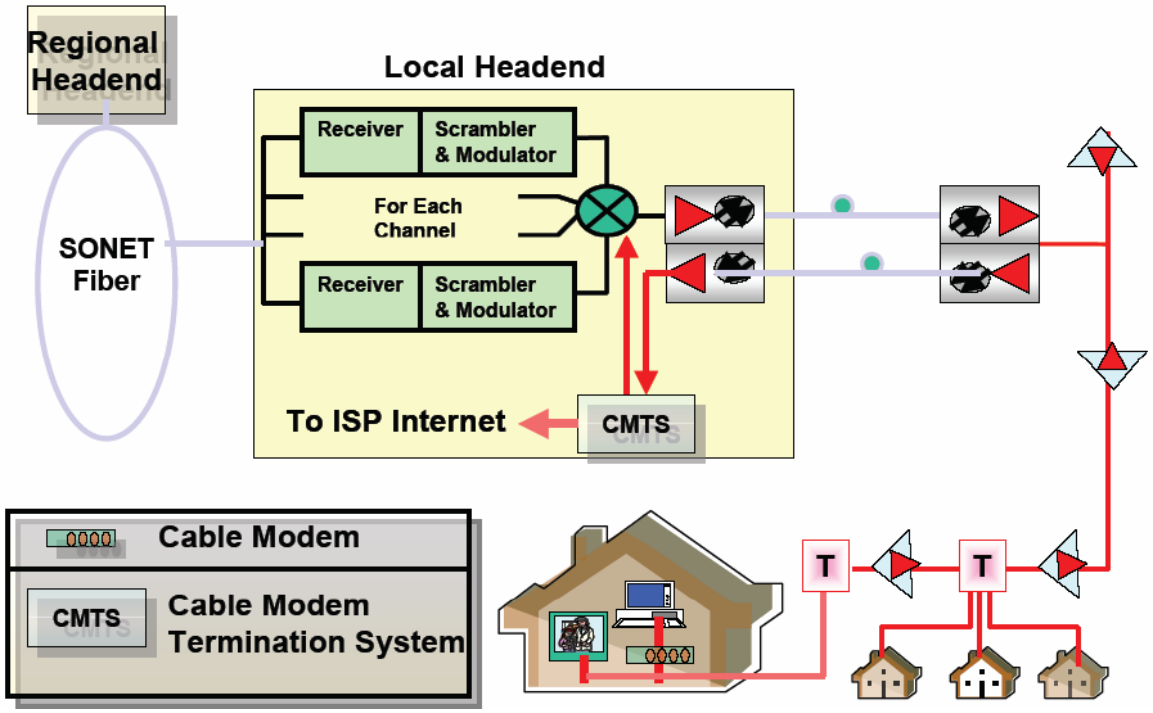

Figure – 5 **Source: VoIP Industry Analysis[12], 2004**

5.4 Inter-Exchange Carrier (IXC)

The inter-exchange carriers (IXC) provide long distance phone services to customers. Before the 1996 U.S. Telecommunication Act, the ILECs were not allowed to provide long distance services, while the IXCs were not allowed to provide any local phone services to customers. After the Telecom Act has been passed, both restrictions were removed. The ILECs were allowed to provide long distance service if they were willing to open up their local phone service markets. An IXC can eventually offer local phone service to customers by registering as a CLEC. Examples of large IXCs in the U.S. are AT&T, Sprint and MCI now (Verizon) after the merger.

Unlike the ILECs who own the access network, the IXCs own the core network. Core network is a type of network with a combination of switching office and transmission plants that connect different switching offices together. In U.S., the core networks contain connections that link several inter-exchange networks of competing IXCs together (Green shade in Figure 5 [11] on and above the access tandems).

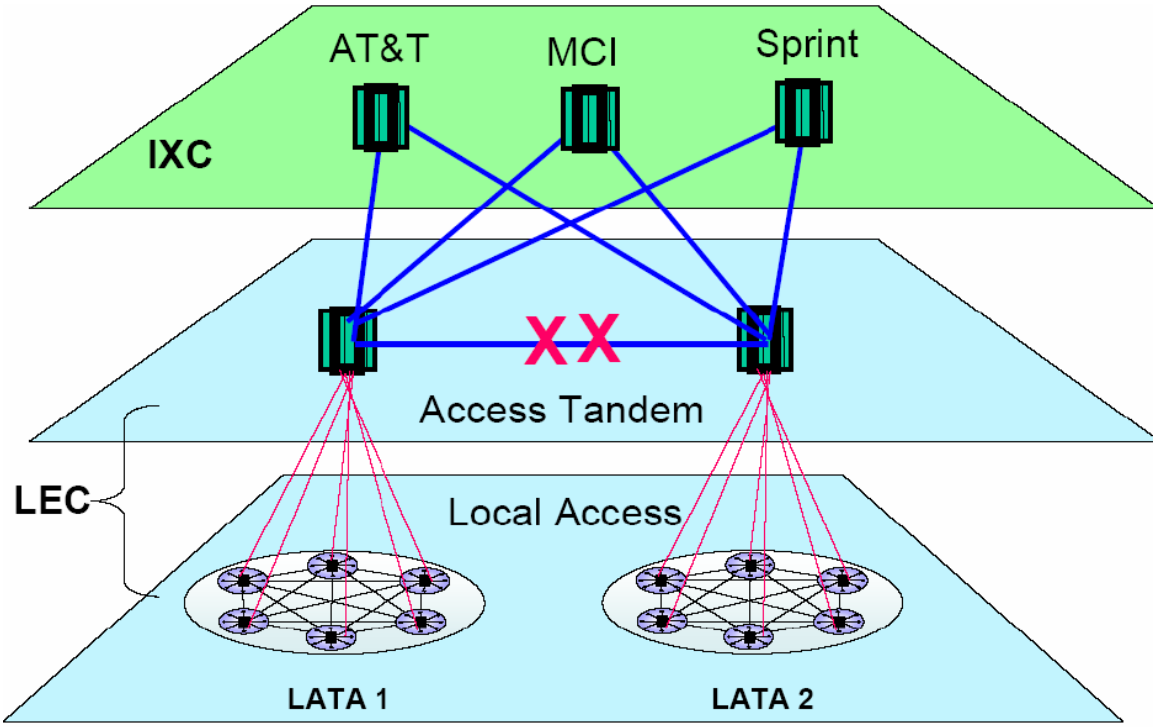

Figure – 6 **Source: VoIP Industry Analysis[12], 2004**

5.5 Pure VoIP Service Provider (Pure VoIP SP)

In the era of circuit switching, enabling modularity in the network infrastructure was almost impossible. Such shortcoming, i.e. the requirement of interdependencies, is eliminated by the introduction of VoIP. This perfectly facilitated the birth of a new type of non-facility-based service provider for voice services - pure VoIP SP.

Some famous examples of pure VoIP Service Providers are Vonage, Primus and 8x8. Looking back in the history of consumer VoIP, pure VoIP Service Providers are actually the first-movers to provide VoIP service. They began offering consumer VoIP services few years ago. Currently, they rule the VoIP consumer market by obtaining the largest market shares in the consumer VoIP market. The most successful service provider so far is Vonage, which possesses more than 55% of market share in this market.

VoIP has dramatically shaken up the voice market simply because of the ease of operation. Service providers do not have to own the network infrastructure in order to provide the service. Since VoIP is just simply an application that runs on IP, a pure VoIP SP can easily provide voice service by operating on top of other provider's network infrastructure. The way they start running their businesses are straightforward: place several equipments such as soft switches, voice gateways and multimedia servers into the network. This opens up golden opportunities for new players to enter the market.

5.6 Categorization of Service Providers

In order to clearly distinguish among different types of service providers, here is a table that summarizes different categories of service providers according to the ownership of network and service infrastructure:

Category	Local/Access Network Facility	Core Network Facility	Local Service Infrastructure	Toll Service Infrastructure
ILEC	✔		✔	
MSO	✔		✔	
IXC		✔		✔
Pure VoIP SP				✔

Table-5 Categorization of Service Providers by Ownership

The figure below provides key demographic data on survey participants, including the types of service providers included in the respondent base, the geographic regions represented by respondents, and the size and scope of included service providers.

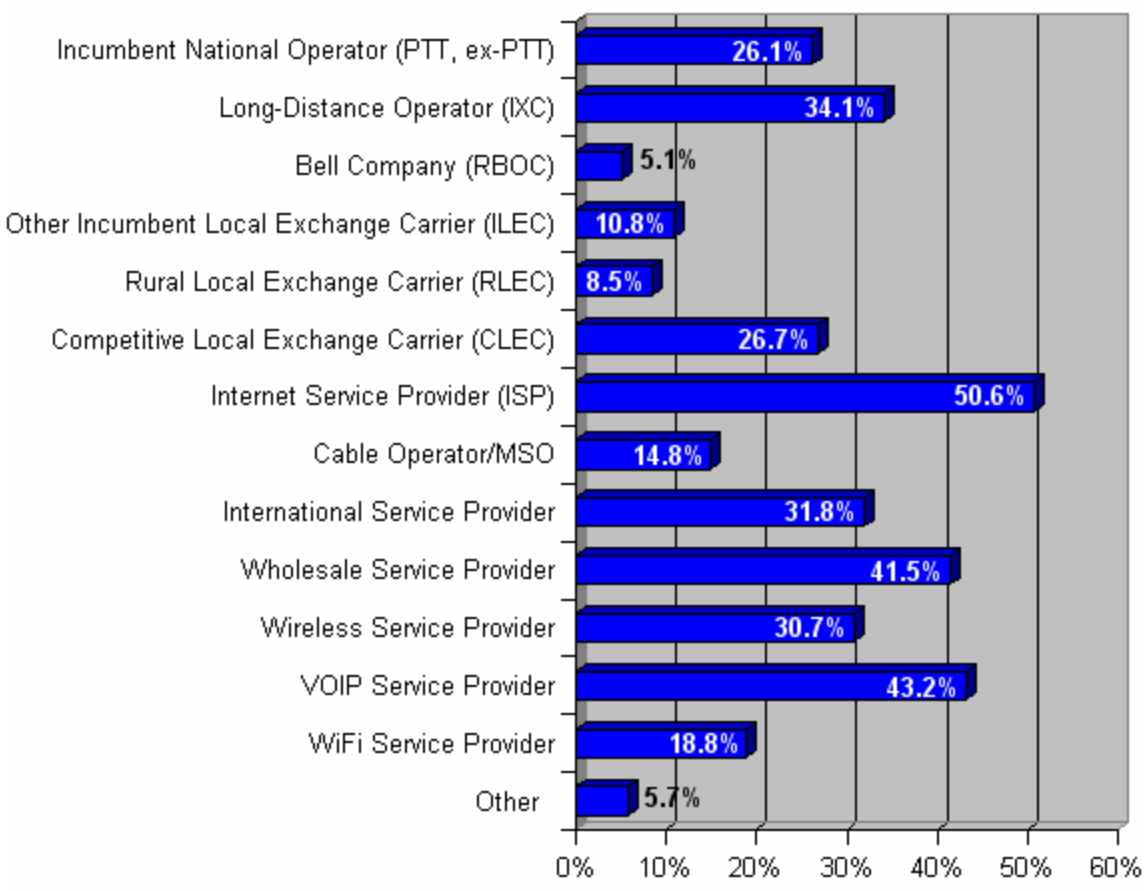

Figure – 7 **Source: Heavy Reading, 2005**

5.7 Active Service Providers on VoIP Service

This is the list of U.S. service providers that are actively deploying or providing consumer VoIP service.

	ILEC	**MSO**	**IXC**	**Pure VoIP SP**
Active Service Providers	Verizon Qwest Sprint	Comcast Time Warner Cox AOL	AT&T	Vonage 8x8 Primus Sun Rocket Net2phone StanaPhone Skype

Table-6 Active Service Providers in Consumer VoIP service

6 VoIP Forecast

In 2004, the VoIP industry shed its infancy and began to test its boundaries. Vonage may have catalyzed the industry in 2003, but last year the cable players began to throw their weight around. As a group, the cable industry captured more than 50% of all US residential VoIP subscribers. Although Vonage remains the industry's dominant player, it experienced steep erosion in market share from more than 60% in 2003 to less than 30% in 2004 as the cable players gained momentum. Driven in large part by the early, and seemingly effortless, success of cable's VoIP telephony offerings, which will increase expectations of the US residential VoIP market. Yankee Group forecasts the number of US consumer VoIP subscribers to grow from 1.1 million in 2004 to 28.5 million by 2009.[19]

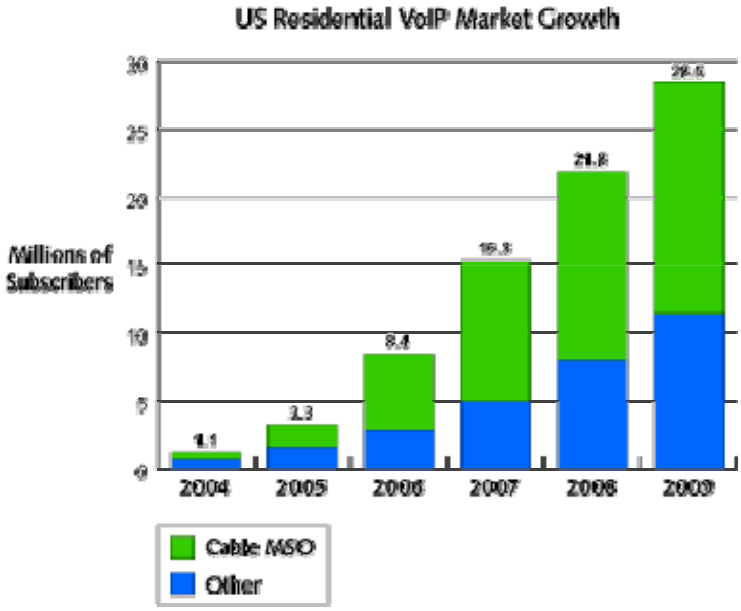

Figure – 8 **Source: Yankee Group, 2005**

As per Stephan Beckert, Director of Research at Telegeography retail VoIP market revenue would grow from 1 billion in 2005 to 4.5 billion in 2010 and the number of US consumer VoIP subscribers to grow from 1 million in 2004 to 24.5 million by 2010.

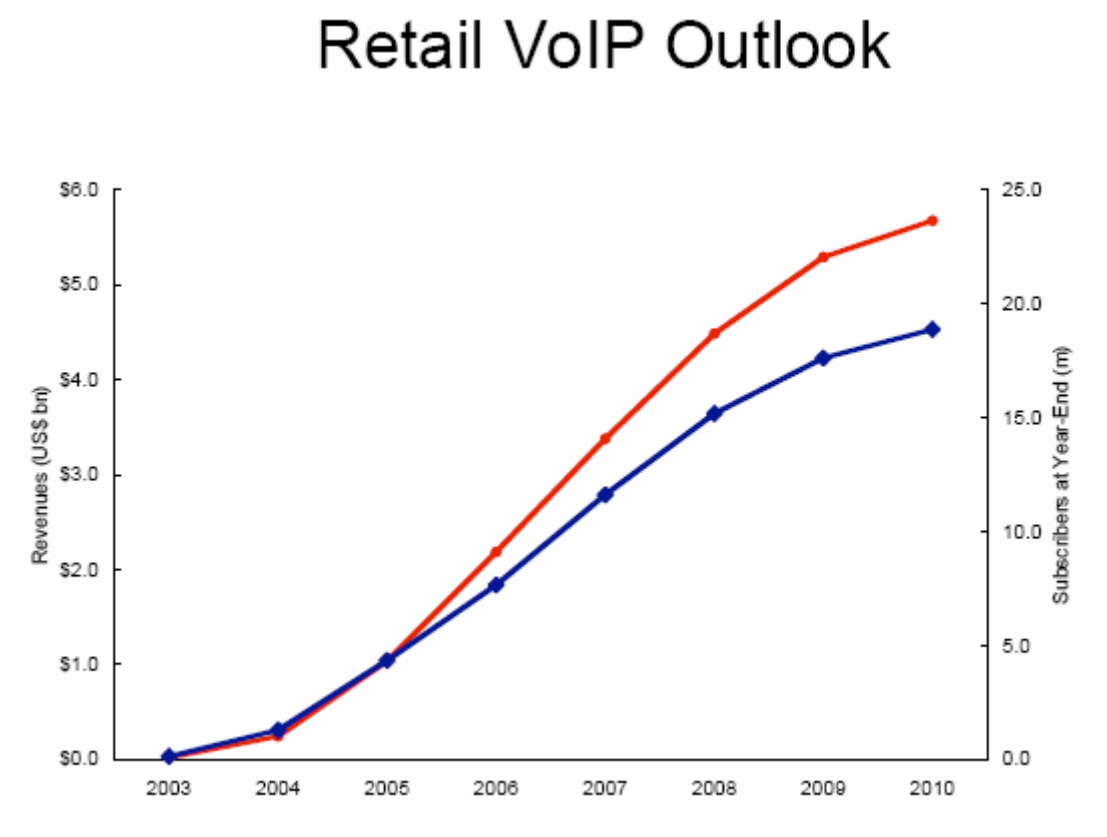

Figure – 9 **Source: Telegeography, 2006**

According to the historic data of VoIP subscribers and revenues it clearly indicates the tremendous growth of VoIP Subscribers from 2003 to 2005.

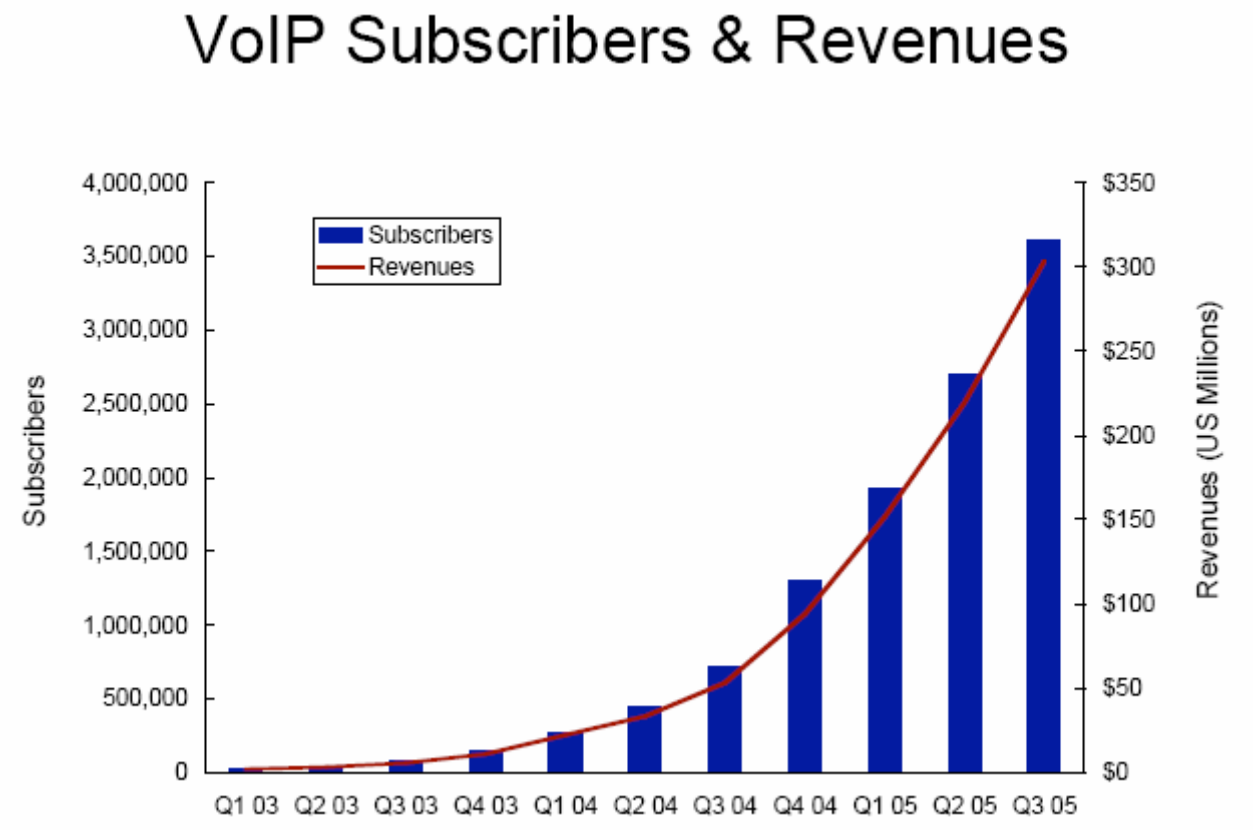

Figure – 10 **Source: Telegeography, 2006**

According to FCC Chairman Michael Powell the use of IP Telephony by US firms is expected to grow to 19% by 2007.

Juniper Research forecasts VoIP adoption will grow from 1% of all US broadband households in 2004 to 17% by 2009, representing 12.1 million households.

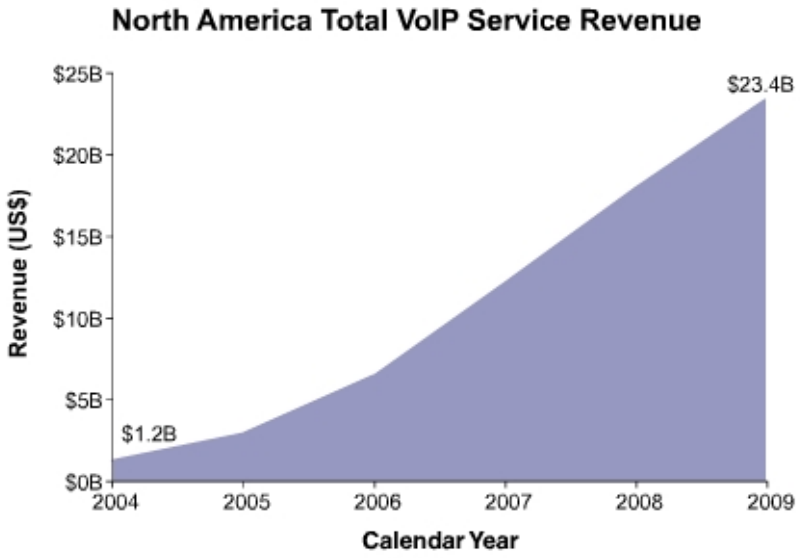

Figure – 11 **Source: CTIA, 2005**

According to Cellular Telecommunications & Internet Association (CTIA) research VoIP service revenue would grow from 1 billion in 2005 to 4.5 billion in 2010.

Over the next few years, packet-switched technology will displace circuit switched technology because of the lower cost of transport, signaling, and management. Even though soft switch technology is relatively new, the costs associated with implementing voice services on soft switches are as little as 40 percent of the costs associated with implementing voice services on traditional circuit-switches, and in the core network that means installing soft switches for 40 to 45 percent of the cost of a circuit switch.

VoIP is indeed having a direct and measurable impact on international carrier revenues. Of the $292 billion international calling revenue in 2005, some $83 billion was lost to VoIP. It is important to realize that VoIP's impact as an international calling rate arbitrage mechanism is a second-order effect.

Only one in six US organizations have converged or are having substantially completed convergence of voice and data networks (Osterman Research February 2005).

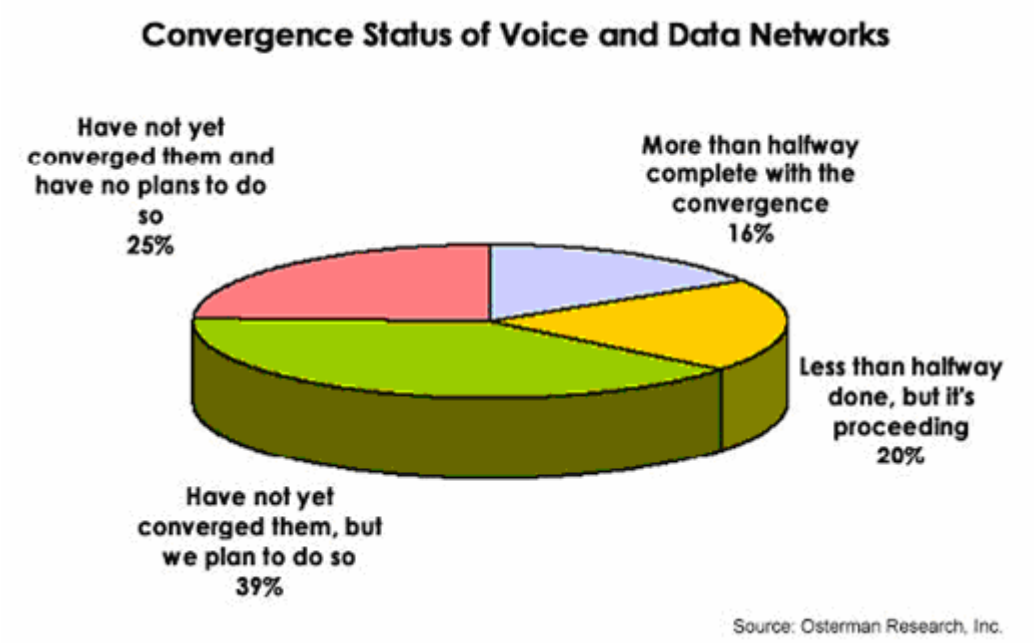

Figure – 12 **Source: Osterman Research Inc, 2005**

One effect of the expected growth in VoIP is a growth in the Internet as there is currently insufficient bandwidth in the Internet to replace the PSTN.

7 VoIP Market Analysis

The market for VoIP services has just begun to emerge and remains relatively small compared to mobile wireless and circuit switched access. There will be an opportunity for smaller providers to carve out a successful portion for themselves through their services. By identifying key success factors, VoIP service provider's ability to succeed long term and their comparative position among their competitors are evaluated.

7.1 Criteria Weights

Several key success factors are identified for both presence criteria and performance criteria that are shared across markets. There are nine presence criteria and six for performance. When performing the market analysis for a specific market, weights are provided for each key success factors to determine importance. This is done by distributing 100 points among each key success factor or strength measure.

Presence Criteria Weights:		
S.No:	**Key Success Factor/Strength Measure**	**Weights**
1.	Vision/Mission	10
2.	Strategy	15
3.	Reputation/Image	10
4.	Business Drivers	15
5.	Industry Focus	10
6.	Investments	05
7.	Share	10

8.	Partners /Channels	20
9.	Geographic Coverage	05
Performance Criteria:		
1.	Customer Services	20
2.	Relative cost position	25
3.	Technological skills	25
4.	Financials	10
5.	Sales / Marketing	20

Table-7

7.2 Sub Criteria Weights

Under each key success factor, sub criteria are identified and defined that are unique to each market. Sub criteria are used to evaluate and compare the strengths and weakness of key success factor.

7.3 Presence Sub Criteria Weights

Vision/Mission:

Evaluation Criteria

Vendors that create strong vision and product capabilities earlier than their competitors will succeed. Over time, as vendors establish positions and products mature, vision will diminish in importance, though market leadership and trend setting will remain key to creating new product capabilities in the face of evolving user demands.

This criteria weight is calculated by evaluating the company's understanding for customer's needs, vision statement, mission statement, expectations, priorities and value.

Vision/Mission		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Understanding Customer need	20
2.	Vision - Future plans	60
3.	General Mission	20
	Total	**100**

Strategy:

Evaluation Criteria:

Strength of vision and strategy is of vital importance in an emerging market such as this. Indeed, appropriately targeting key functionality and articulating product capabilities as they map to user needs is a complex task, because of the range of capabilities supported.[14]

This criterion is more important than vision/mission because with a strategy or plan the company cannot achieve its mission and vision. This is calculated by evaluating the company's market leadership.

Strategy		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	General Strategy	100
	Total	**100**

Reputation/ Image:

Evaluation Criteria:

Reputation is the current sum total of the specific traits attributed to a company by people. A company's reputation is produced by the memory impressions of its perceived actions over time.[13]

This criterion is important because reputation / image create a mental impression to consumers what the company is associated with.

Reputation/ Image		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Reputation/ Image	100
	Total	**100**

Business Drivers

Evaluation Criteria:

Core Competencies: Underlying people, process, or technology-based business capabilities that are defensible, unique, and sustainable.[14]

Intellectual Property: Owned and protected patents, trademarks, copyrights, licenses, or trade secrets that reflect unique ideas, methods, technologies, and processes, and that offer tangible competitive advantage.

Culture: Internal processes, communication methods, leader-sponsored philosophies, or other dynamics that enable better client centricity, speed, responsiveness, efficiency, or market effectiveness.

Business Drivers		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Core Competencies	40
2.	Intellectual Property	40
3.	Culture	20
	Total	**100**

Industry Focus

Evaluation Criteria:

Agreements: Relationships with vertical market trade organizations, standards bodies, or other vendors that enable deeper understanding and customization of technology and services to the particular needs of a market segment.

Expertise Level: Measured, demonstrable tools, techniques, methods, certifications, primary research, tailored approaches, or other analysis and delivery attributes that highlight the relevant skills and expertise brought to a particular market.[14]

Industry Focus		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Agreements	40
2.	Expertise Level	60
	Total	**100**

Investments

Evaluation Criteria:

Complementary Businesses: Ownership, investments, or relationships tied to business areas that are horizontally or vertically complementary to the core market business.

Targeted Growth Areas: Planned and active investment areas tied to business growth.

Degree of Control: Ownership level of investments that determine direction, priorities, and integration with core business activities.

Investments		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Complementary Businesses	20
2.	Targeted Growth Areas	50
3.	Degree of Control	30
	Total	**100**

Share

Evaluation Criteria:

Market Share:

Share of market relative to competitors.

Mind Share:

Market share is noting but the relative market awareness versus competitors.

Share		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Market Share	60
2.	Mind Share	40
	Total	**100**

Partners /Channels

Evaluation Criteria:

Partners/Subsidiaries: Extension of business reach, availability, and delivery via directly controlled entities or partnerships.

Operational Efficiency: Consistency, repeatability, integration, and effectiveness of the distributed organization to function efficiently.

Leverage: Ability to generate growth, profitability, and new customers from non-headquarters regions.

Partners /Channels		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Partners/Subsidiaries	50
2.	Operational Efficiency	30
3.	Leverage	20
	Total	**100**

Geographic Coverage:

Evaluation Criteria:

Reputation/ Image		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Geographic Coverage	100
	Total	**100**

7.1 Performance Sub Criteria Weights:

Customer Services

Evaluation Criteria:

Quality: Service-level performance as measured by key service-area metrics.

Customer Wait Time: Customer wait time to get support over the phone.

Support Documents: Supports documents published in their websites.

Customer Services		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Quality	30
2.	Customer Wait Time	50
3.	Support Documents	20
	Total	**100**

Relative cost position

Evaluation Criteria:

Methods: Alternative price models provided to customers that enable flexibility in the purchase and/or use of products and services like Long distance and International calling plans.[14]

Features:

Policies: Terms and conditions that surround how products and services are priced, invoiced, and obtained.

Relative cost position		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Methods	20
2.	Features	60
3.	Policies	20
	Total	**100**

Technological skills

Evaluation Criteria:

Broadband Assets:

Owning and controlling the access network will enable VoIP providers to offer higher levels of quality of service, in addition to driving synergies between the data and voice network.

Primary Line Capabilities:

If VoIP providers are looking to be successful in displacing circuit-switched voice to middle America, the service will need to be fully comparable in terms of functionality. Being able to offer customers true primary line replacement services, which include battery back-up and E911, will be a requirement.

Company Website:

Company website is one of the technical aspects for evaluation criteria.

Technological skills		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Broadband Assets	40

2.	Primary Line Capabilities	30
3.	Company Website	30
	Total	**100**

Financials

Evaluation Criteria:

Access to Capital: Sources of funding for growth, operations, or investments.[14]

Profitability: Track record of business results as measured by EBIT (earnings before interest and taxes).

Growth Rate: Comparative rate of business growth versus overall market and key competitors.

Financials		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Access to Capital	30
2.	Profitability	30
3.	Growth Rate	40
	Total	**100**

Sales / Marketing

Evaluation Criteria:

Responsiveness: Reactive capabilities to identify, harness, and capitalize on changing market and customer dynamics.[14]

Development Process: Internal methods to develop new technology and services, and to test and offer them to the market as measured in months.

Flexibility: Capabilities to take existing technology, services, systems, personnel, pricing, and other performance attributes and modify them to specific opportunities, threats, needs, and markets.

Sales / Marketing		
S.No:	**Key Success Factor/Strength Measure**	**Weight**
1.	Responsiveness	30
2.	Development Process	35
3.	Flexibility	35
	Total	**100**

Presence Criteria Unweighted Competitive Strength Assessment for VoIP Phone Service Providers.

AT&T, Inc - ATT

Vonage, Inc - VON

8x8, Inc. – PK8

Primus Telecommunications Group, Inc – LIN

Sun Rocket - SUN

Rating scale:

10-21= Bad; 21-30 = Poor; 31-50= Fair; 11-70 = Good; 71-80= Very Good; 90-100=Excellent

Key Success Factor/Strength Measure	ATT	VON	PK8	LIN	SUN
Vision/Mission	48	58	72	60	82
Strategy	55	68	80	65	80
Reputation/Image	35	50	80	45	90
Business Drivers	38	76	81	70	88
Industry Focus	35	70	84	77	84
Investments	40	69	80	76	84
Share	30	68	56	68	70
Partners /Channels	25	70	75	73	76
Geographic Coverage	55	70	85	75	88

Table-8

Presence Criteria Weighted Competitive Strength Assessment for VoIP Phone Service Providers.

Rating scale:

10-21= Bad; 21-30= Poor; 31-50= Fair; 51-70 = Good; 71-90= Very Good; 91-100=Excellent

Key Success Factor/Strength Measure	ATT	VON	PK8	LIN	SUN
Vision/Mission (10)	4.80	5.80	7.20	6.00	8.20
Strategy (15)	8.25	10.20	12.00	9.75	12.00
Reputation/Image (10)	3.50	5.00	8.00	4.50	9.00
Business Drivers (15)	5.70	11.40	12.15	10.50	13.20
Industry Focus (10)	3.50	7.00	8.40	7.70	8.40
Investments (05)	2.00	3.45	4.00	3.80	4.20
Share (10)	3.00	6.80	5.60	6.80	7.00
Partners /Channels (20)	5.00	14.00	15.00	14.60	15.20
Geographic Coverage (05)	2.75	3.50	4.25	3.75	4.40
Total	39	67	77	67	82

Table-9

Performance Criteria Unweighted Competitive Strength Assessment for VoIP Phone Service Providers.

Rating scale:

10-21= Bad; 21-30 = Poor; 31-50= Fair; 11-70 = Good; 71-80= Very Good; 90-100=Excellent

Key Success Factor/Strength Measure	ATT	VON	PK8	LIN	SUN
Customer Services	60	66	65	65	71
Relative cost position	75	64	65	62	65
Technological skills	30	49	63	54	66
Financials	35	56	76	67	71
Sales / Marketing	40	58	86	65	61

Table-10

Performance Criteria Weighted Competitive Strength Assessment for VoIP Phone Service Providers.

Rating scale:

10-21= Bad; 21-30 = Poor; 31-50= Fair; 51-70 = Good; 71-80= Very Good; 90-100=Excellent

Key Success Factor/Strength Measure	ATT	VON	PK8	LIN	SUN
Customer Services (20)	12.00	13.20	13.00	13.00	14.20
Relative cost position (25)	18.75	16.00	16.25	15.50	16.20
Technological skills (25)	7.50	12.25	15.75	13.50	16.50
Financials (10)	3.50	5.60	7.60	6.70	7.10
Sales / Marketing (20)	8.00	11.60	17.20	13.00	12.20
Total	50	59	70	62	66

Table-11

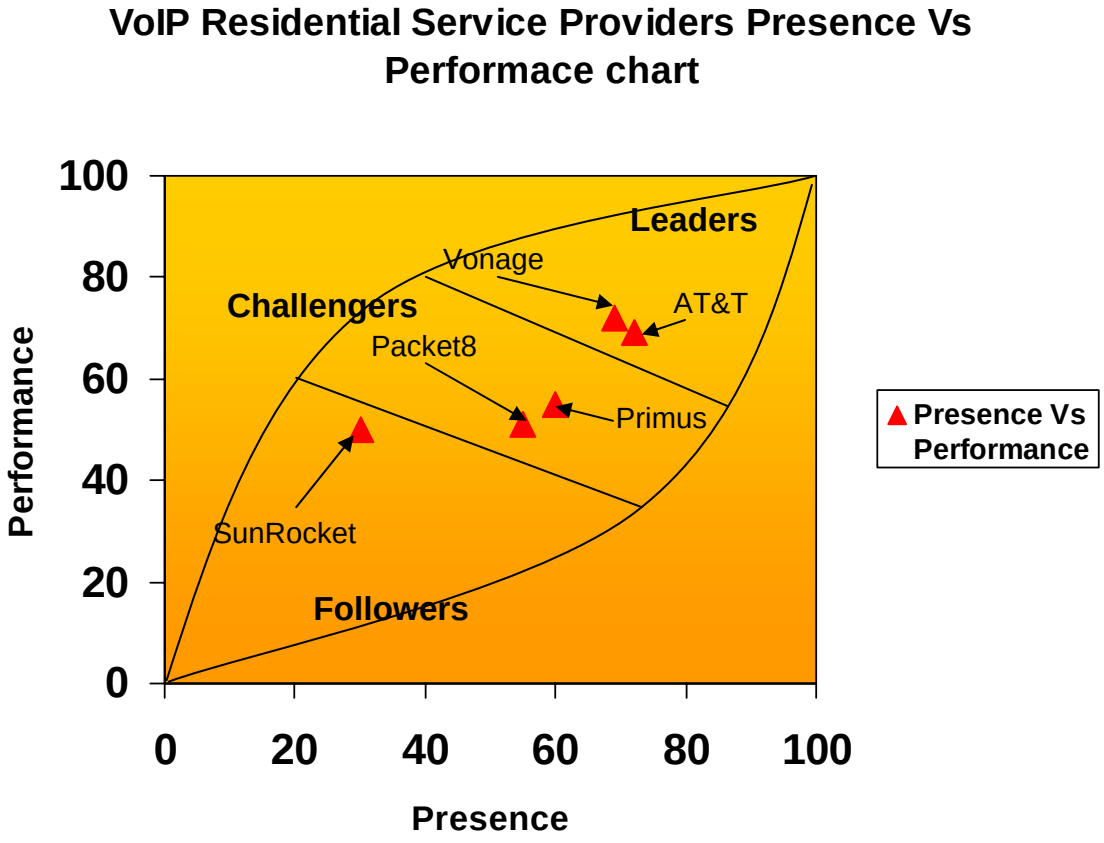

Figure – 13 **Source: Author, 2006**

As per the market analysis Vonage and AT& T are the market leaders of Residential VoIP providers, Primus and 8x8 are the Challengers' and SunRocket is the follower. It is obvious to see that AT&T had scored more in the Presence criteria and Vonage has scored more in the performance criteria.

According to Yankee Group Vonage is losing revenue to the MSO VoIP Service providers like Time Warner and Cox. To sustain in this kind of market they have to improve the customer service and quality of the phone service.

8 Conclusions and Recommendations

This analysis was completed based on publicly available data about Residential VoIP service providers collected through March 9, 2006. The VoIP service provider's scores, based on this data collection time frame, should be viewed as static, reflecting market realities as of then. All VoIP service providers have continued to modify their products, refine their target market, revise their strategies, and update their financial results.

Most VoIP service providers which were evaluated are clustered toward the top of the challenger space, with little room between the many challengers and relatively few leaders. All products reviewed fall in a fairly narrow band along the performance axis, while there is a wider spread in terms of presence. This clustering indicates a maturing market where pure technical performance is rarely a sufficient basis for product selection. Indeed, many products can meet the technical requirements of most customers' needs. Presence criteria are generally more important factors in VoIP product decisions, despite most VoIP service providers continuing emphasis on cost or bundling advantages in their marketing/sales campaigns. The purpose is to determine which VoIP service providers are best positioned to succeed in the long term based on current capabilities.

Voice over IP is a rapidly growing technology being adopted worldwide by today's service provider either running legacy networks or new entrants building next generation IP networks[16]. Business viability and success VoIP Interoperability will come to those who recognize that VoIP is not just about cheaper long distance, but more so about a richer user experience that embodies greater functionality and end-user empowerment.

Reduced price sensitivity and increased profitability comes from richer service applications, which the end user can embrace, and that affords the end users greater control and flexibility, resulting in reduced customer churn. The first company to make their VoIP work 'out of the box' will gain significant advantage, especially in the small and mid-sized business space.

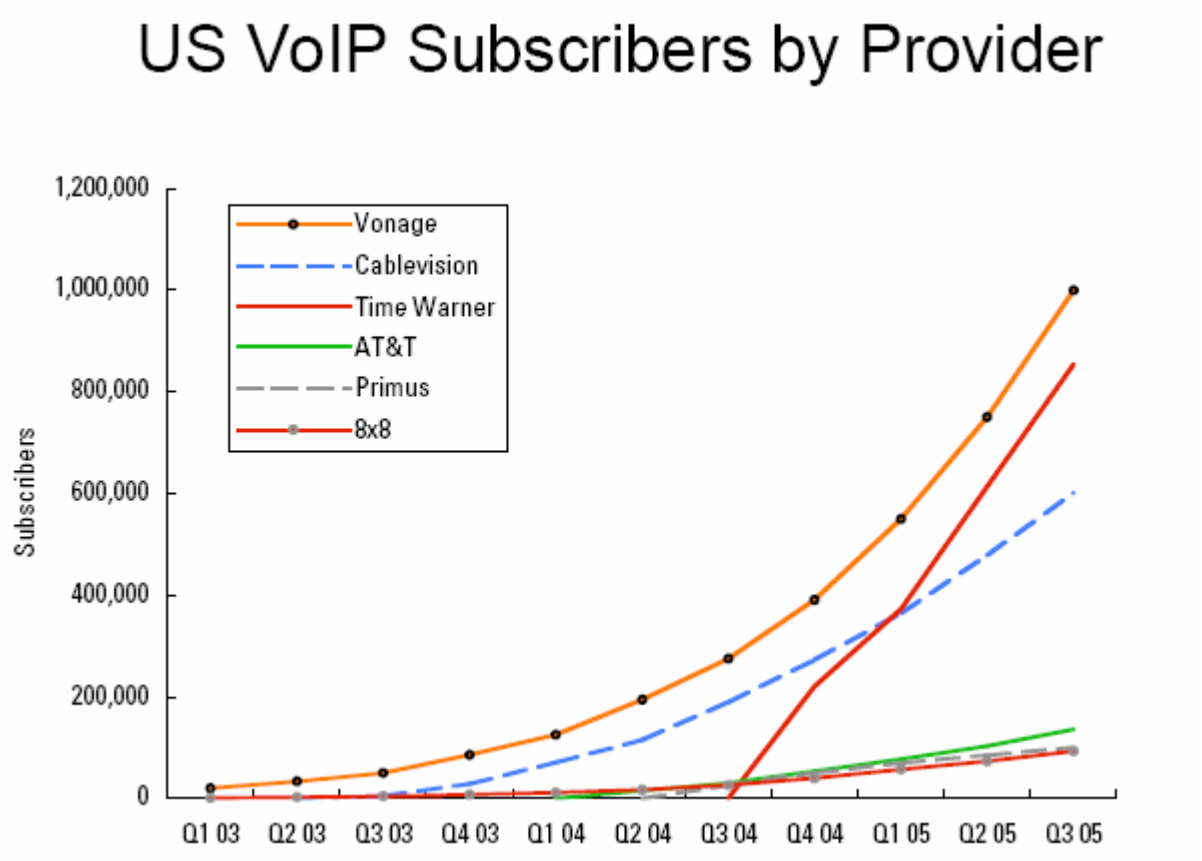

Figure – 14 **Source: Telegeography, 2006**

As per the Director of Research at Telegeography it is clear that Vonage is the current market leader with number of subscribers, as per the market analysis Vonage is the market leader followed by AT&T, Primus, 8x8 and SunRocket

As expected, consumer demand for IP-related services has yet to build. For the next 2 years, the rate of VoIP subscriber growth will continue to depend more on suppliers push strategies (e.g., VoIP education, pricing or triple-play bundles) versus any consumer pull[20]. Regardless of continued consumer ambivalence and regulatory uncertainty, the movement toward IP-based services is inevitable and companies that intend to provide voice services in the long term need to prepare accordingly.

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