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America Online
Ameritrade
AT&T
Avaya
B3G Telecom
BellSouth
Best Buy
British Telecom
Broadcom
Broadreach Networks
BroadVoice
Broadvox
BSquare
Buffalo Tech
Cable & Wireless
Cablevision
CDC Group
Charter
Choice Hotels
Cingular
Circuit City
Cisco
CITEL
COLT
Comcast
CompUSA
Conexant
Consumer Empowerment
Cox
Daum
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EarthLink
EAT
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Ericsson
ETRI
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Flarion
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Hughes Network Systems
Hutchison
iBasis
IEEE
i-mate
InterActiveCorp
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IP-Wireless
ITRI
ITU

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Kineto Wireless
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Monster Worldwide
Moto
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Netflix
Nextel
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Nokia
Nortel Networks
NTT
O2
Office Depot
Packet 8
PChome Online
Pew Internet & American Life Project
Plantronics
Popular Telephony
Proxim
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Quality Inn
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Research in Motion
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Travelodge
TrellisWare Technologies
UMA Consortium
United Online
UTStarcom
Verizon
Verizon Wireless
Virgin Trains
VLI
Vocera
VoiceGlo
VoicePulse
Vonage
Wi-Fi Alliance
Windbond Electronics
Wireless VoIP Consortium
Xandros

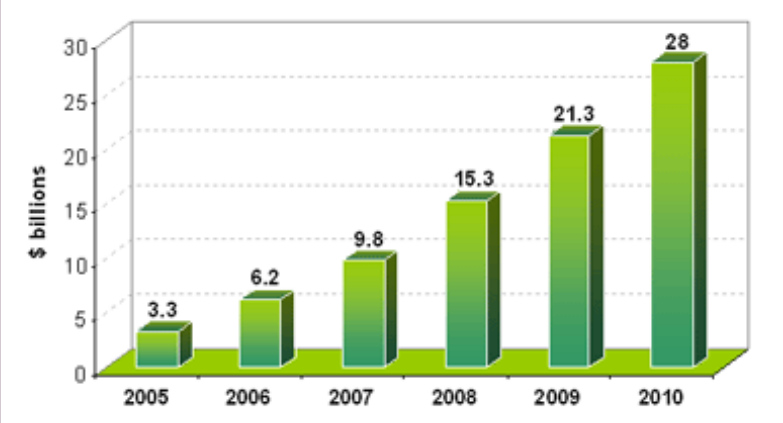
1. Introduction

1.1 Executive Summary

1.1.1 Rapid growth in VoIP traffic

Voice over Internet Protocol (VoIP) makes up a relatively small percentage (25%) of overall communications revenue, but the technology is growing rapidly. In 2005, global VoIP revenue will grow to more than $80 billion, with North America contributing around 3% of revenues (see Chart 1).

Chart 1. North American VoIP revenues, 2005-2010



Source: visiongain

We estimate the global VoIP customer base to be around 15-20 million users in 2005, with almost three million users in the US.

By 2010, there could be a 10%-20% migration of traffic from PSTN to VoIP.

1.1.2 Enterprise segment driving VoIP migration

Business users were the first to start migrating to IP telephony. In 2003, over 5.5 million IP PBX lines were installed worldwide. According to estimates, more than a third of all business phones shipped during Q2 2003 were IP-enabled. In 2003, Cisco sold its two millionth IP telephone. In April 2004, its shipments increased to three million IP phones overall. To continue, IP telephony is gaining momentum in small business markets, with consumer IP telephony following suite.

1.1.3 Consumer issues with VoIP

The low cost of VoIP is the major driving factor for its adoption. Another factor of strong VoIP acceptance among consumers in the US is the fact that household broadband penetration has passed 30%. At 30%-plus penetration levels, most marketers feel that a service has moved beyond early adopters and into the mass-market phase.

The continued classification of VoIP as an information service in the US exempts VoIP providers from paying a broad range of fees traditional telecoms companies have to pay federal and state governments.

However, the recent E911-compliance requirements imposed by FCC will add costs to customers' bill. Visiongain expects that VoIP providers will be also required to make their networks ready for a lawful intercept and contribute to the Universal Service Fund. This could prove to be an expensive and technologically challenging undertaking, which can push smaller VoIP players out of business. Companies with big customer bases and substantial operating capital are poised to dominate the VoIP market in the US.

Table 1. US major instant messaging service providers

Company	Subscribers
AOL	45m*
Yahoo	19m
MSN	14m

**23m AOL subscribers + 22m users who use AOL's free IM service*

Source: visiongain

1.1.4 Three types of companies will dominate VoIP market

The interest in VoIP showed by big industry names such as AOL and Yahoo indicates the increased importance of VoIP. We believe the VoIP market will be dominated by three types of players:

- Cable companies;
- Wireline carriers; and
- VoIP entrants.

For the first two, VoIP service is an important offering in their "triple-play" and serves as a differentiating and customer-retention tool. VoIP entrants represented with ISPs, MVNOs, WISPs, wireless operators or VoIP start-ups see VoIP as a new source of revenue. They are likely to cannibalize wireline incumbent revenue. Wireline carriers risk to lose not only customers, but also billions of dollars in revenue generated by inter- and intra-state access charges.

1.1.5 A marginal opportunity for portable VoIP

As for the wireless carriers, portable VoIP, enabled by Wi-Fi and wireless broadband, is unlikely to cannibalize wireless incumbent revenue. Though VoIP over private 802.11 networks is beginning to gain early adoption among enterprises, VoIP over P-WLAN has yet to gain real traction. Inhibitors include the small size of the addressable P-WLAN subscriber base and a lack of 802.11 support in mobile phones.

These factors, combined with the ready availability of suitable alternatives in the form of wireless and wireline phones, translate into a marginal opportunity for portable VoIP. Wireless broadband will complement the ongoing deployments of 2.5G and 3G networks by wireless carriers, who will potentially expand to the wireless broadband technologies over time. The requirement to have a licensed spectrum will bar wireless broadband insurgents from getting a sizeable market share in order to cannibalize the revenue of existing carriers, except in some niche markets.

1.2 VoIP evolution: from fixed to wireless

1.2.1 IP telephony

The importance of VoIP is increasing all the time. It is already widely used in fixed networks, using VoIP-capable fixed phones or PC VoIP clients.

VoIP promises to deliver:

- Advanced call routing;
- Computer integration;
- Unified messaging;
- Integrated information services;
- Long-distance toll bypass; and
- Encryption.

The interesting thing about VoIP is that there is not just one way to place a call. There are three different "flavors" of VoIP service in common use today:

- **ATA** - The simplest and most common way is through the use of a device called an ATA (analog telephone adapter). The ATA allows a user to connect a standard phone to the computer or Internet connection for use with VoIP. The ATA is an analog-to-digital converter. It takes the analog signal from the traditional phone and converts it into digital data for transmission over the Internet.

- **IP Phones** - These specialized phones look just like normal phones with a handset, cradle and buttons. But instead of having the standard RJ-11 phone connectors, IP phones have an RJ-45 Ethernet connector. IP phones connect directly to the router and have all the hardware and software necessary right onboard to handle the IP call. Soon, Wi-Fi IP phones will be available, allowing subscribing callers to make VoIP calls from any Wi-Fi hot spot.

- **Computer-to-computer** - This is the easiest way to use VoIP. A user does not have to pay for long-distance calls. There are several companies offering free or very low-cost software that can be used for this type of VoIP. All that is needed is the software, a microphone, speakers, a sound card and an Internet connection, preferably broadband. Except for the normal monthly ISP fee, there is usually no charge for computer-to-computer calls, no matter the distance.

Chances are that most callers already make VoIP calls any time they place a long-distance call. Phone companies use VoIP to streamline their networks. By routing thousands of phone calls through a circuit switch and into an IP gateway, they can significantly reduce the bandwidth they're using for the long haul. Once the call is received by a gateway on the other side of the call, it is decompressed, reassembled and routed to a local circuit switch.

1.2.2 Wi-Fi Technology

The focus of Wi-Fi has started to revolve in terms of the technology's potential with VoIP.

Table 2. Typical hotspot locations

- Hotels
- Airports
- Aeroplanes
- Convention centres
- Restaurants
- Bars
- Marinas
- Schools
- Parks
- Health clubs
- Laundry mats
- Retail outlets
- Stations and ports
- Libraries and community hotspots
- Enterprise guesting areas
- Fast food
- Shopping centres
- Golf clubs
- Health clubs

Source: visiongain

Wi-Fi, short for wireless fidelity, is another name for broadband wireless local area network (WLAN). Referring to the entire IEEE 802.11 family of specifications, Wi-Fi operates in the license-free 2.4 and 5.8 GHz frequency bands. It delivers high-speed data rates of 1-54 Mbps, depending upon the technology variant used, over relatively short distances of up to 100 meters (300 feet).

Wi-Fi works as a cordless phone does, transmitting a wireless signal from a base station to a device. This wireless networking technology that allows multiple devices, such as notebooks and PDAs, to share a single high-speed Internet connection. It can also be used to network a group of PCs without wires.

There are a variety of terms that are used to cover the same phenomenon. Wireless LAN (WLAN), Wi-Fi, or 802.11x are all essentially the same technology. The 802.11x is the only one of these terms that has more than one meaning and the x signifies a number of other variants - a, b, g and so on. These variations will be explored in greater detail later in this report.

Wi-Fi technology is making a huge impact in the electronic equipment market. Wi-Fi is quickly becoming a standard interface in laptop PCs and is also showing up in PDAs, broadband routers and even TVs.

WLAN is experiencing strong growth, aided by lower pricing points and standardization of technology. In fact, deployments of WLAN are exploding in several key markets, which include residential homes, small-medium offices, enterprises, academic campuses, transportation facilities, health care and industrial sites.

The Wi-Fi service market is crowded with multiple types of vendors and service models. With fixed, mobile and broadband operators all looking to capture customer revenue share, Wi-Fi hotspots continue to emerge across retail outlets, hotels, airports, train stations and restaurants (see Table 2). Installing a hotspot is inexpensive, but generating enough revenue to drive profitability is quite challenging. Wi-Fi end-users are exposed to highly variable pricing models, with some free access service points available in certain venues.

1.2.3 Birth of the voice over Wi-Fi (VoWiFi) market

The emergence of voice over wireless LAN (VoWLAN) and hybrid cellular/Wi-Fi phones poses a further dilemma for mobile operators. Two different markets exist here - the Wi-Fi-only phones and the dual-mode handsets. The first set are finding a niche in the enterprise and vertical markets space, while the latter may be positioned as both a business and consumer proposition. The similarity between the two types of devices is that they both present an opportunity and a threat to mobile operators, one they will quickly have to develop a strategy for.

So far, Wi-Fi has centered around providing data access and downloads. But Voice over Wireless LAN (VoWLAN) is starting to see growth and is set for rapid expansion as Wi-Fi enabled mobile phones start to hit the market in 2004/2005. Globally, around 10,000 dual-mode Wi-Fi/cellular phones were sold in 2004. VoWLAN has been mostly targeted at vertical industries such as healthcare, retail and manufacturing. The rapid growth of Wi-Fi infrastructure along with new developments such as soft-phones, communication standards such as Session Initiation Protocol (SIP) and the emergence of dual-mode Wi-Fi and cellular handsets indicate that VoWLAN is headed for mainstream markets.

Wi-Fi and cellular are converging at both a service and a device level.

1.3 Focus of this report

The purpose of this report is to investigate the developments of the VoIP market in the US, with a special focus on wireless VoIP. This report looks at residential VoIP service offerings by fixed-line operators, cable companies and VoIP start-ups. The report explores some of the pros, cons and obstacles with bringing this technology to market with a detailed overview of recent government regulations in the VoIP area. Business models will be looked at, as will the strategies and solutions of the major players in the market. Recommendations are provided to help companies understand the market threats and opportunities.

US VoIP Market

In the process, this study will provide an overview of the broadband and Wi-Fi markets in general, analyzing the implications for mobile services. The impact of VoWLAN is also looked at and discussed, as are pure VoWLAN phones.