

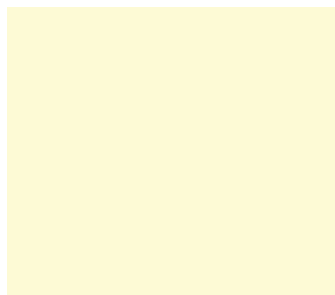
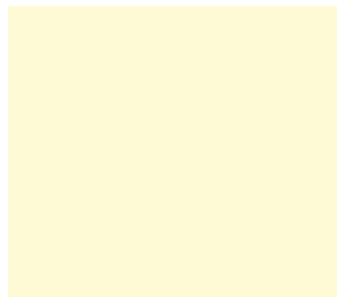
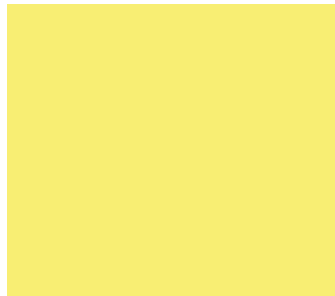
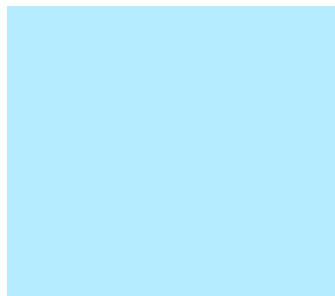
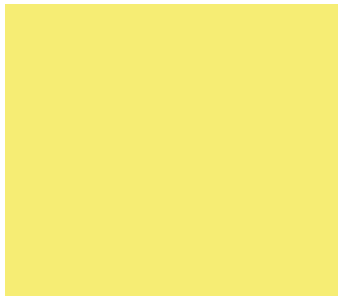
VoIP SERVICE PROVIDERS STUDY

Wave 6

Service Level Rankings



Abstract



Keynote VoIP Service Providers Study Overview

November 2008, Keynote Systems reports the results of Wave 6 of its Voice Service Providers Competitive Intelligence Study to evaluate how end-users perceive the core reliability and audio clarity of leading voice service providers. The study compares the relative performance of PSTN (regular analog) service, Broadband VoIP providers (e.g. Vonage, Verizon VoiceWing, EarthLink trueVoice, AT&T CallVantage etc), and cable voice services (e.g. Time Warner Digital Phone, Comcast Digital Voice). Test calls were placed from residential locations in New York and San Francisco.

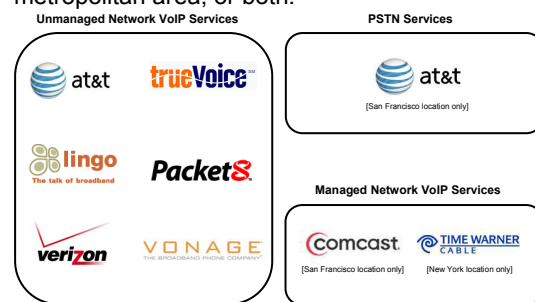
Keynote - an independent, trusted authority on Internet performance – conducts benchmarking studies for various industries, to assess the experience of end-users with key applications. Prior to Wave 6, Keynote has previously released five Voice Service Quality Competitive Intelligence Studies, in July, 2005, January, 2006, September, 2006, August 2007 and April 2008. Each of these studies evaluates critical performance factors that affect the consumer's experience with each voice service. The previous five Wave study reports, widely quoted in industry publications and leading newsletters worldwide, have already helped service providers identify the top performers in the voice services market and helped them to focus on the key service level objectives that will enhance their end-user experience.

Forrester Research analysts have projected that Cable VoIP providers will claim up to 80% of the 28.4 million residential VoIP users by 2013. This forecast includes an expected growth from the approximately 19 million installed lines in 2008. However, voice over IP is not for everyone today, nor will it be for everyone going forward. Consumer awareness and skepticism about new communications services limit today's market. VoIP reliability and audio clarity remain important factors that limit the widespread adoption of VoIP. Keynote's Competitive Intelligence study reveals the facts that help VoIP providers overcome the quality barrier relative to traditional phone service. Keynote evaluates audio quality as well as underlying network performance - whether DSL, or Cable - that affect the end-user experience and compares them across various VoIP service providers and traditional phone service. With this insight, Keynote provides actionable recommendations to help improve end-user facing service quality and capitalize on growing market adoption.

A poor end-user experience is one of the major factors for customer attrition and churn. The data and recommendations provided by these studies have helped voice services providers in addressing one of the key concerns to their profitability – identifying and monitoring customer pain points related to the service level quality of their offering.

Study Participants

Keynote measured and evaluated the performance of the following nine consumer voice service providers as part of this study. These providers all offer service in the San Francisco metropolitan area or the New York metropolitan area, or both:



Wave 6 Study Objectives

- Rank the relative performance of PSTN, PacketCable, and VoIP service providers.
- Identify the industry trends in service level performance.
- Identify the strengths and weaknesses of each service provider and voice service technology.
- Identify the range of performance for each Key Performance Indicator between the best voice service providers and the worst.
- Examine peak and prime-time performance variations.

Overall Best VoIP Service Providers

Keynote ranked VoIP Service Providers in two categories: Reliability and Audio Quality. The Service Availability, Call Completion, Average Answer Time, and Dropped Audio performance factors all contribute to the Reliability ranking. This high-level ranking identifies which voice service providers are providing the most reliable end user experience. The Audio Quality ranking is computed as an aggregate of the performance factors related to audio clarity and audio delay. This high-level ranking identifies which service providers are providing the most reliable and best sounding VoIP service.

Summary of Wave 6 Results

Keynote ranked voice service providers in two categories - Reliability and Audio Quality. Service Availability, Call Completion, Average Answer Time, and Dropped Audio performance factors all contributed to the Reliability ranking. Measured Mean Opinion Score (MOS) and Audio Delay values contribute to Audio Quality ranking.

In addition to the overall ranking of voice service providers, each service is analyzed in depth to identify its strengths and weaknesses. The overall analysis focuses on ten Key Performance Factors. The ten Key Performance Factors are:

Reliability

- Service Availability
- Call Completion
- Average Answer Time
- Dropped Audio

Audio Quality

- Average Audio Delay
- Audio Delay Acceptability
- Audio Delay Variability
- Average MOS (Mean Opinion Score)
- MOS Acceptability
- MOS Variability

Each Key Performance Factor measures a distinct aspect of call performance; as illustrated by the selection of results presented below. It is rare for a single voice service provider or network carrier to excel in all ten aspects. Keynote's Competitive Intelligence Study Report presents detailed analysis and results for each service provider.

General Observations

- The best providers always deliver dial time and connect the call to the number dialed in a timely fashion.
- Only one of the providers in the study failed to provide dial tone 99.9% of the time or better.
- All providers had very small percentages of calls with dropped audio, but only two providers had zero calls with dropped audio.
- One VoIP provider required two seconds more than any other voice provider to connect calls after dialing.
- Most providers had slightly more audio delay and slightly lower MOS in Wave 6 as compared to Wave 5.
- Eight of the nine providers in the study had a better call completion rate in Wave 6 than was evidenced in the Wave 5 results.

Reliability Overview

In the Wave 5 study report, Time Warner Digital Phone was two points behind PSTN service. In Wave 6, Time Warner's Digital Phone maintains its second place ranking, however the reliability has degraded significantly.

| Provider | Reliability Points | Rank |
|---------------------------|--------------------|------|
| AT&T Landline | 996 | 1 |
| Time Warner Digital Phone | 925 | 2 |
| Verizon VoiceWing | 872 | 3 |
| Provider D | 859 | 4 |
| Provider E | 793 | 5 |
| Provider F | 687 | 6 |
| Provider G | 643 | 7 |
| Provider H | 408 | 8 |
| Provider I | 374 | 9 |

Audio Quality Overview

In Wave 4 and again in Wave 5, Keynote reported that the PSTN service outperformed the competition when it comes to delivering great sounding call audio with minimal delay. In Wave 6, we see a return to the top of digital providers, as we expect. VoIP calls are created as digital signals immediately, maintaining quality, while analog signals are not digitized for hundreds of feet, where they have an opportunity to degrade over distance.

| Provider | Performance Points | Rank |
|-----------------------|--------------------|------|
| Comcast Digital Voice | 901 | 1 |
| Verizon VoiceWing | 609 | 2 |
| AT&T Landline | 506 | 3 |
| Provider D | 500 | 4 |
| Provider E | 487 | 5 |
| Provider F | 480 | 6 |
| Provider G | 462 | 7 |
| Provider H | 252 | 8 |
| Provider I | 0 | 9 |

The Audio Quality index ranking is based on Keynote extensions of the [Apdex](#) standard to represent user satisfaction with audio quality:

$$1000 \times \frac{\text{Satisfied count} + \frac{\text{Tolerating count}}{2}}{\text{Total samples}}$$

Each call is determined to be in the Satisfied, Tolerating, or Frustrated performance ranges for MOS and audio delay, based upon industry standard thresholds

Results Availability

The study results are available in two formats:

- An overview report, which reveals general industry trends and highlights the performance of the best voice service providers. The insight gained from this competitive intelligence helps executives identify areas of service challenges and opportunities that will have the maximum impact on customer experience.
- A detailed report that analyzes each of the nine service providers and each of the ten performance factors in greater depth. The detailed presentation includes analysis of the data across service providers, last-mile network connections, and geography. Armed with this intelligence, IT Managers can tune specific aspects of their VoIP service to provide better performance to customers than their competition.

About Keynote Systems

Keynote Systems, Inc., the Mobile and Internet Performance Authority is the worldwide leader in eBusiness performance management services. Over 2100 corporations and 19,000 individual subscribers rely on Keynote's growing range of measurement, monitoring and customer experience management services to improve eBusiness performance by reducing costs, improving customer satisfaction and increasing profitability. Keynote's products provide enterprises with the tools to align IT and Business goals. To learn more about Keynote's Competitive Research studies, please visit: http://www.keynote.com/keynote_competitive_research/

Custom Comparisons

Not included in the study? Need to see where you rate against the top providers? Keynote can create an expansion study to collect the same metrics on your service, and profile your results against the providers in this study.

Service Level Rankings Methodology

