

Keynote VoIP Competitive Intelligence Study Overview

August 2007, Keynote Systems reports the results of Wave 4 of its Voice Service Quality 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 4, Keynote has previously released three Voice Service Quality Competitive Intelligence Studies, in July, 2005, January, 2006, and September, 2006. Each of these studies evaluates critical performance factors that affect the consumer's experience with each voice service. The Wave 1, Wave 2, and Wave 3 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.

Analysts estimate that residential adoption of VoIP service is bound to grow exponentially from 6.9 million homes in 2006 to over 23.7 million homes in 2010. The SMB and enterprise market forecasts are equally aggressive. Even so, VoIP reliability and audio clarity remain important factors that limit the widespread adoption of VoIP in consumer markets. Indeed, Keynote found in its first study that VoIP providers on average were able to complete calls only 96.9% of the time with a Mean Opinion Score (MOS) of less than 3.5 - considerably worse than the standard for traditional phones of 4.0! It should not be surprising then that 52% of respondents in a recent survey by Harris Interactive indicated VoIP call quality as a key barrier to adoption. How can VoIP providers in the residential and SMB market overcome consumer perception of poor reliability and call-quality and live up to the dial-tone quality that consumers have come to expect over the years? 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 twelve consumer voice service providers as part of this competitive intelligence study. These providers all offer service in the San Francisco metropolitan area or the New York metropolitan area, or both:



Wave 4 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 best sounding and highest quality voice audio to their customers.

Summary of Wave 4 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.

The full report provides detailed answers to questions like:

- Is VoIP service as reliable as traditional PSTN (Public Switched Telephone Network) service?

- Which VoIP service provider has the best sounding call audio?
- Which VoIP service provider had the highest percentage of calls with Dropped Audio?
- Are residential consumers using VoIP better off on cable modems or DSL?

The following sections offer highlights of the findings key performance factors:

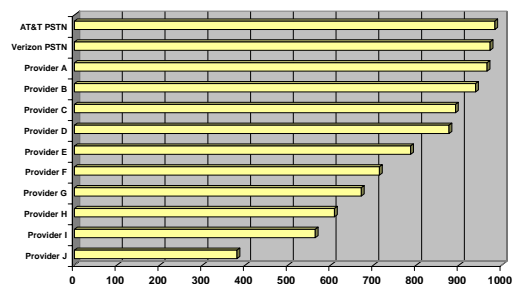
General Observations

- Only two of the twelve service providers in the study were able to deliver a dial tone 100% of the time.
- Most VoIP Service Providers measured an average one-way audio delay between 150 and 250 ms. The worst measured over 279 ms average delay.
- Most Service Providers measured an average Mean Opinion Score somewhere between 3.7 and 4.0. The best measured average was 4.24; the worst was a 3.06.
- PSTN service providers had superior Reliability and Audio Quality performance, outperforming PacketCable and VoIP providers.
- Most VoIP service providers still have many calls with temporal clipping or audio holdover causing service degradation.

Reliability Overview

- In the wave 3 study report, PacketCable service providers were more reliable than the competition. In wave 4, PSTN service providers have turned the tables and now lead all other PacketCable and VoIP services in Reliability.

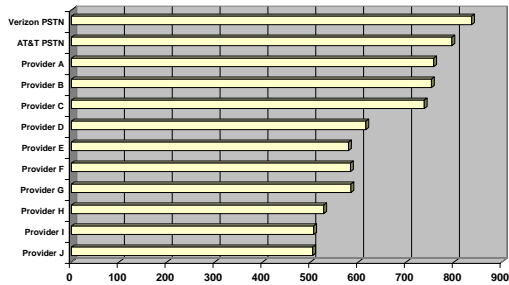
Total Reliability Performance Points



Audio Quality Overview

- In the wave 3 study report, PacketCable service providers had slightly better overall Audio Quality than the competition, but that is no longer the case. In wave 4, Keynote reports that the PSTN service providers now outperform the competition when it comes to delivering great sounding call audio with minimal delay.

Total Audio Quality Performance Points



About Keynote Systems

Keynote Systems, The Internet Performance Authority®, is the worldwide leader in e-business performance management services. Over 2,100 corporate IT departments and 19,000 individual subscribers rely on Keynote's growing range of measurement and monitoring, service level and customer experience management services to improve e-business performance by reducing costs, improving customer satisfaction and increasing profitability. Keynote Test and Measurement products provide enterprises with the tools to align IT and e-business goals. Keynote's SLM solution suites offer comprehensive approach to the problem of managing e-business service levels effectively for IT, application deployment and support personnel and e-business executives. To learn more about Keynote's Competitive Intelligence Study, visit: http://www.keynote.com/solutions/ci_voipStudies.html or contact us at sales@keynote.com (1-800-KEYNOTE).

Study Results Availability

The study results are available in two formats:

- An overview report, which reveals general industry trends and highlights the performance of only the best voice service providers. The insight gained from this competitive intelligence helps executives identify general areas of service improvement that will have the maximum impact on customer experience.
- A detailed report that analyzes each of the twelve 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.