



# Lab Testing Summary Report

August 2002  
Report 270802

Product Category:  
**IP-based Phones**

Vendor Tested:  
**Mitel Networks Corp.**

Product(s) Tested:  
**5140 IP Appliance**



## Key findings and conclusions:

- Rated “Best in Test” in a competitive review of five leading IP phones
- Achieved top scores for ease of use and features
- Demonstrated “toll quality” voice and low latency in tests using G.711 and G.729a vocoding
- Supports phone operations through a PDA

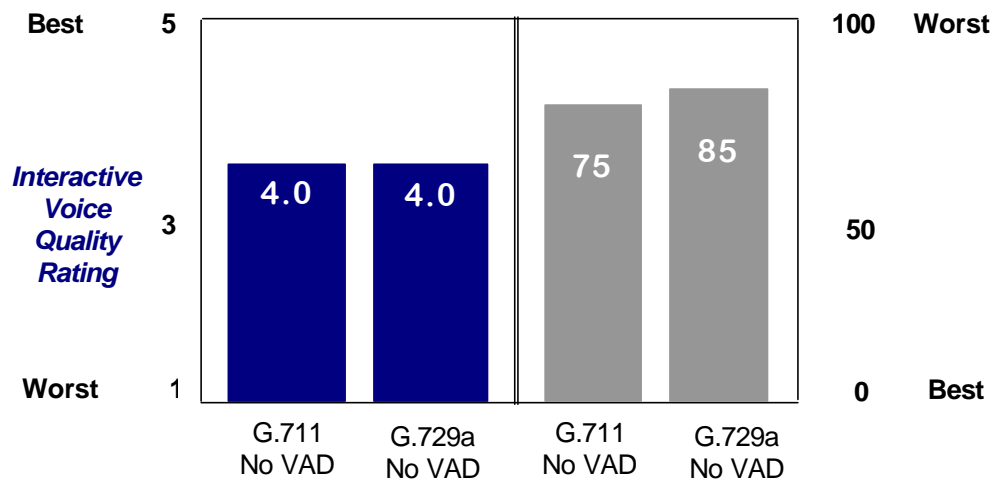
Mitel engaged Miercom to test its 5140 IP Appliance, based on a methodology and test-bed developed by Miercom. The goal of testing was to evaluate how well the Mitel 5140 IP Appliance fared in four categories: Installation and Ease of Use; Configuration; Features and Performance. The telephone was tested using version 2.15 software. The 5140 was tested on the Mitel 3300 Integrated Communications Platform (ICP), version 3.2.2.

The 5140 IP Appliance was tested competitively with four other products. Among this group, the Mitel achieved the best overall score and was lauded for its ease of use and robust features set, including an impressive Visual Voicemail feature. Full results of this competitive test were published in the September 2002 edition of *Business Communications Review*.

### Performance

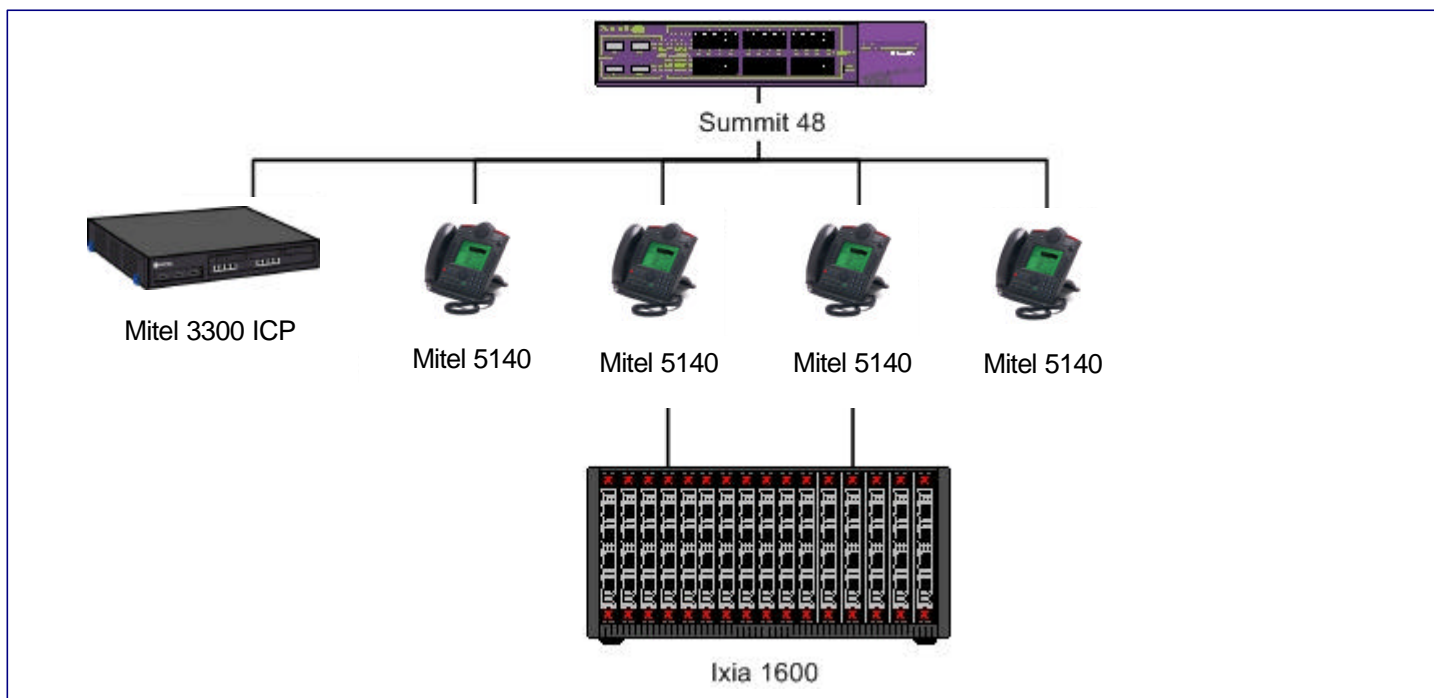
Interactive voice quality on the Mitel 5140 IP Appliance was rated a “4” (out of a possible 5 points). Scores of 4 and above are considered toll

### Interactive Voice-Quality Ratings vs. Latency\*



We measured latency in a local phone-to-local phone on a flat LAN. Latency was measured one way.

## Test-bed Setup



**About the testing...**Mitel submitted four 5140 IP Appliances and a Mitel 3300 Integrated Communications Platform (ICP) for testing. (All vendors submitted IP phones and a PBX or call manager for testing.) The devices were connected via an Extreme Networks Summit 48 10/100 Ethernet switch. An Ixia 400 Traffic Generator was used to stress the PC Ethernet port on the phone to assess the phones' ability to maintain acceptable call quality during heavy line utilization. Resilience to Denial-of-Service attacks was tested against a pingflood, synflood, udpflood and jolt2 attack, and voice quality and phone stability were noted. For the interactive ratings, at least three lab testers, in rotation, conducted real-time, two-way conversations using IP PBX system phones over separate connections. They also conducted countdown tests to determine the effects of latency, and an "alphabet" test to determine the quality of bi-directionality. The testers also noted any echoes, clipping, background noises, etc. All interactive ratings were on a five-point scale (with scores of 4 or above rated as toll quality and scores of 3 or above rated as acceptable for most business applications).

We measured latency for G.711 and G.729 with VAD (if available) in a local phone-to-local phone (same LAN) environment. To measure voice-packet sizes and ToS settings, we used Agilent's Internet Advisor Ethernet network analyzer, which was connected to the Extreme switch. A voice path was constructed to begin and end at a PC running CoolEdit 2000, an audio editing program from Syntrillium Software Corp. The loop was configured by plugging a lead from the PC directly into the microphone input of the transmitting phone, then using a line splitter to bring the sound file back to Cooledit from both the transmitting and receiving phones on separate channels. After a WAV file was played, Cooledit recorded the sound as it came from the two phones. The difference of the timestamps on the recordings yielded the one-way latency metric,

### Performance – continued

quality, which is acceptable for all business and commercial telephony applications and contains no clipping, background noises or other impediments that would affect the quality of the call. These scores were obtained when tests were conducted with G.711 vocoding (and no voice activity detection, VAD) and with a G.729 low-bit rate vocoder. The ratings shown on the Page 1 chart reflect the average of three separate testers rating interactive quality.

While we expected latency measurements on the IP telephones tested to be fairly consistent and under 100 milliseconds (the point at which call quality begins to degrade), this wasn't the case. Latency among the five IP-based phones tested ranged widely—from a high of 196 milliseconds (ms) to a low of 50 ms. The Mitel 5140 IP Appliance performed in the middle of the range — at 75 ms when tested using G.711 and only 85 ms when tested with a G.729a low-bit rate vocoder. (Testing was done without VAD, which the Mitel 5140 does not support.)

## Performance - continued

The 5140 IP Appliance performed well under load. We attempted to overwhelm a call in progress on the 5140 with traffic coming from the computer to which the phone was attached. Call quality did not suffer, even when the PC port was heavily utilized.

## Ease of Use

In this assessment, Miercom engineers rated the ease with which various tasks were accomplished—from “task impossible to perform without a manual” to “performing the function was easy and highly intuitive.” Mitel showed very well in this category, mostly on the strength of its Desktop Administration Tool (DAT), a PC-based application that is used for phone administration. DAT supports a scrollable list of features to add to personal keys along with a visual display of the phone that shows where to put the features.

The 5140 incorporates many feature buttons flashing on its display, and Mitel has managed to keep it all reasonably well organized.

## Configuration

In this category, we assessed the physical attributes of the 5140 IP Appliance, both as an end-user device and as an IP network entity. The 5140 IP Appliance sported the highest resolution (320 x 240 pixels) of the five phones tested and also employed a “Feature in Use” indicator for those who forget what we’re doing from time to time. The Mitel phone supports six pre-assigned keys and eight that are programmable by the end user or administrator.

Other key configuration “hits” included support for 802.3af inline and brick power with redundant power sources; support for dual Ethernet ports (one for the network and one for a PC), which both support link and activity lights; and hands-free headsets.

## Features

A key factor in users’ decisions to migrate to IP-based telephony products is whether they offer

## Mitel 5140 IP Appliance: Key Features

<b>Supporting PBX system tested</b>	3300 Integrated Communications Platform (ICP), v3.2.2
<b>Call control protocol</b>	Proprietary MiNet
<b>Feature delivery protocol</b>	Proprietary MiNet
<b>Vocoders</b>	G.711, G.729a
<b>Display</b>	320 x 240 pixels, graphical (HTML-based interface)
<b>User-programmable buttons</b>	Eight; require PC
<b>Phone bandwidth preservation/QoS</b>	802.1 p/q; TOS; applied at integral two-port hub
<b>Inline power</b>	Yes; supports 802.3af and “phantom” power
<b>Advanced IP-based features</b>	Voicemail contents viewable on display; PDA integration via special applications; limited text messaging; Web-browsing from phone; voice recognition
<b>Price (US list; phone only)</b>	\$650

the same features available on traditional phones. We evaluated whether the 5140 IP Appliance supported 37 telephony features that Miercom has determined are those most frequently required in corporate environments. These include such things as call retrieval, call forwarding, call blocking, call transfer, call waiting, automatic callback, etc. Among the features assessed, the Mitel 5140 supported 77 percent of the features we sought.

What does an IP phone offer that more traditional phones do not? Among the five IP phones tested, Mitel easily had the most satisfactory answer. Most impressive was Visual Voicemail, a feature that allows users to view voice mail headers on their phone screens. Who called, when, what ANI/extension they called from and other details are neatly listed. Mitel also supports limited text messaging from the phone. The 5140 also offers searchable directory fields, and its built-in infrared port allows execution of phone operations from a PDA, similar to dialing a contact.

## Meets Expectations

Based on competitive tests of five leading IP-based telephones recently conducted by Miercom and published in *Business Communications Review* (BCR), the Mitel 5140 IP Appliance was rated “Best in Test.” The Mitel phone offered the most impressive set of IP-based features, which included a Visual Voicemail feature that allows users to view voice mail headers on their phone screens. A Desktop Administration Tool (DAT), a PC-based application used for phone administration, greatly facilitated ease of use. The Mitel 5140 IP Appliance also demonstrated toll quality interactive voice and low latency.



In the unanimous opinion of the testers, the Mitel 5140 IP Appliance, tested with the Mitel 3300 Integrated Communications Platform, fully meets the expectations and requirements of the target user community for which it was designed and is hereby presented the “NetWORKS As Advertised” award.



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**Mitel 5140 IP Appliance**

## About Miercom’s Product Testing Services...

With hundreds of its product-comparison analyses published over the years in such leading network trade periodicals as *Business Communications Review*, *Network World*, and *Internet Week*, Miercom’s reputation as the leading, independent product test center is unquestioned. Founded in 1988, the company has pioneered the comparative assessment of networking hardware and software, having developed methodologies for testing products from ATM switches to VoIP gateways and IP PBXs. Miercom’s private test services include competitive product analyses, as well as individual product evaluations. Products submitted for review are typically evaluated under the “NetWORKS As Advertised™” program, in which networking-related products must endure a comprehensive, independent assessment of the products’ usability and performance. Products that meet the appropriate criteria and performance levels receive the “NetWORKS As Advertised” award and Miercom Labs’ testimonial endorsement.

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