THE TOLLY GROUP

No. 204115 February 2004

Avaya Inc.

IP Telephony and Messaging Solutions

Accessibility Evaluation vs. Cisco Systems

1989 - 2004 15 Years TOLLY

Test Summary

Premise: *U.S. laws, as well as sound business practices, require organizations to accommodate the needs of employees and customers who have difficulty using traditional telephone systems. Users with impaired vision require audible messages that convey the status of their telephones. People who are hard-of-hearing, deaf, or speech-impaired must be able to use TTY/TDD devices in conjunction with the organization's telephone system. Tight telephone/TTY integration and TTY messaging are essential for employees and for people calling into the organization from outside locations.*

AVAYA INC. commissioned The Tolly Group to evaluate the accessibility features of its IP telephony and messaging systems and compare those capabilities to those offered by Cisco Systems, Inc.'s AVVID solution. Tests spanned functions of interest to users with visual, hearing and/or speech impairments and covered technologies such as TTY integration with IP telephony and messaging systems as well as telephony-oriented text-to-speech. The product suite from Avaya included Avaya Communication Manager

Test Highlights

- Allows tight integration between TTY/TDD device and either digital or IP phones
- Allows full range of TTY messaging functions with either IP or digital phones without requiring separate telephone numbers for voice and TTY
- Provides both dynamic and on-demand spoken phone status information for visually impaired users

Tolly Verified Certifications Earned:
Accessibility – TTY Messaging with VoIP Infrastructure

Certification ID	Certification	Avaya	Cisco
10708	TTY Default Mode for Messaging	Pass	Pass
10709	"Single Number Reach" – Optional TTY Greetings and Prompts	Pass	Fail
10710	TTY Login to Message System	Pass	Fail
10711	Voice Carry Over (VCO) Messaging	Pass	Fail
10712	Hearing Carry Over (HCO) Messaging	Pass	Fail
10713	Message Header Information via TTY	Pass	Fail
10714	Break into TTY Prompt with "Touch-tone" Response	Pass	Fail

For detailed descriptions of any of these certifications, visit www.tolly.com.

Source: The Tolly Group, February 2004

Figure 1

Tolly Verified Certifications Earned:
Accessibility – Basic Telephony with TTY

Certification ID	Certification	Avaya		Cisco
		Digital phone	IP phone	IP phone
10703	Voice Carry Over (VCO)	Pass	Pass	Pass
10704	Hearing Carry Over (HCO) Messaging	Pass	Pass	Fail
10705	Non-disruptive Mute in VCO or HCO	Pass	Pass	Fail
10706	Simultaneous TTY and Touch-tone Operation	Pass	Pass	Fail
10707	Speed-dial Keys for TTY Initiation	Pass	Pass	Fail

For detailed descriptions of any of these certifications, visit www.tolly.com.

Source: The Tolly Group, February 2004

Figure 2

running in the S8700 Media Server, Avaya G600 Media Gateway, Intuity™ AUDIX® messaging system, 2420 Digital, 4620 IP and 4624 IP phones, analog interfaces to accommodate TTY devices and Avaya's Universal Access Phone Status software. The Cisco system consisted of CallManager, Unity messaging system, 7960 IP phone, and analog interfaces for TTYs. For text-to-speech, the VTGO-PC Advanced softphone from IP blue Software Solutions was used.

TTY tests evaluated availability of basic telephony features and also integrated use of TTY with voice messaging systems. To evaluate support for users with visual impairments, telephone status text-to-speech was evaluated. The tests described herein complement a set of competitive TTY robustness tests detailed in document 204102. Testing was performed from December 2003 through February 2004.

Test results for TTY show that Avaya is able to leverage its long-standing support for "logical bridging" to provide a high degree of integration between its IP telephony (and digital telephony) environment – including messaging – and TTY. Conversely, Cisco's lack of support for bridging deprives its TTY users of even basic functionality when used with its IP sets.

It is important to gauge how well a TTY device works in concert with IP telephones since regulations require that individuals with disabilities "shall have access to the full functionality and documentation for the product, comparable to that provided to individuals without disabilities" (See Sidebar 1). We interpret this to mean that if the advantages of IP phones are afforded to employees without disabilities, those with disabilities should also be given equal access to the functionality of IP phones.

For visually-impaired users, Avaya's software companion to its VoIP phone (Universal Access Phone Status) provides for a wealth of status information. While Cisco does not offer a comparable solution under its own brand, it recommends IP blue's VTGO as a companion softphone to the Cisco IP phone. Together, these products offer a subset of what Avaya can offer.

Results

TTY Messaging with a VoIP Infrastructure

Under its "Tolly Verified" program, The Tolly Group developed seven certifications related to integrating TTY and messaging with a VoIP infrastructure. Details of each can be found in the "Tolly Verified" section of The Tolly Group's Web site (http://www.tolly.com). The tests exercise a range of functions that provide for tight integration and handset flexibility among the VoIP and TTY devices and the messaging system. While most of the tests exercise functionality present in the messaging system, some of the tests also rely on the telephone system's "logical bridging" capability between the IP phone and the analog TTY. (See Figure 1.)

Both Avaya and Cisco messaging systems provide a configuration option allowing an unanswered phone to be answered by the messaging system using TTY prompts (TV 10708). This is the only certification where Cisco received a "pass" grade. Where Avaya's messaging system provides for a single "mailbox" to support, dynamically, either voice or TTY, thus providing "Single number reach," Cisco requires that a single "mailbox" be statically configured either for voice or for TTY. Thus, for TV 10709, "Single Number Reach," Avaya receives a "pass" and Cisco a "fail."

Avaya Inc.

IP Telephony and Messaging Solution

Accessibility for People with Disabilities

The remaining messaging tests were concerned with flexible, integrated use of both the directly connected TTY device and a collocated, logically bridged IP phone. (See sidebar below regarding the mandate for "directly connected" TTYs.) These include: TTY Login (TV 10710), Voice Carry Over (TV 10711), Hearing Carry Over (TV 10712), Message Header via

Federal Accessibility Regulations

Pertinent federal regulations:

- ***Section 255, Telecommunications Act of 1996***
  - Empowers the Federal Communications Commission to establish and enforce disability access provisions in telecommunication equipment and services.
  - "Individuals with disabilities shall have access to the full functionality and documentation for the product, comparable to that provided to individuals without disabilities."
- ***Section 508, Rehabilitation Act Amendments of 1998***
  - Adds mandatory accessibility requirements to Federal and State procurement regulations.
  - Establishes detailed disability standards which products must meet.

What do these new laws add to the Americans with Disabilities Act?

- Provide metrics by which to assess whether "reasonable accommodation" is being provided.
- Enforcement mechanisms include FCC-imposed standards and mandatory feature requirements in government procurement regulations.
- For the mandate for "direct" or electrical coupling of the TTY to the telephone system, see Section 508, Part 36 CFR 1194.23(a).
- See: http://www.section508.gov/index.cfm?FuseAction=Content&ID=3.

Source: The Tolly Group, February 2004

Sidebar 1

Tolly Verified Certifications Earned: Accessibility – Blind/Visually Impaired			
Certification ID	**Certification**	**Avaya**	**Cisco**
10696	Audible Notification – "Message Waiting" On	Pass	Fail
10697	Audible Notification – Line "On-hold"	Pass	Fail
10698	Audible Notification – Line "Off-hold"	Pass	Fail
10699	Audible Notification – Line Appearance of Incoming Call	Pass	Pass
10700	Audible Notification – Station Status "On Demand"	Pass	Fail
10701	Caller ID – Text to Speech	Pass	Pass
10702	Caller ID – Text to Speech – "On-Demand" Privacy	Pass	Fail

For detailed descriptions of any of these certifications, visit www.tolly.com.

Source: The Tolly Group, February 2004 *Figure 3*

TTY (TV 10713) and Break Into TTY with Touch Tone (TV 10714).

Because of the capability of the Avaya Communication Manager to provide seamless logical bridging (that is, IP, digital and/or analog phones can be logically connected to function as a single end-station), the Avaya solution passed all of those tests. Cisco currently does not provide logical bridging of its IP phones to the TTY device and thus failed to pass any of these tests. It should be noted that, for TTY devices that support an additional analog port, some messaging functions like Voice Carry Over can be made available by attaching an analog telephone to the TTY device. Given that the focus of this test was integration with VoIP infrastructure, that is, parity with other IP phone users, the analog solution was not included.

TTY Basic Telephony

These "building block" tests focused on integrating TTY into basic telephony. These also provide the basis for functionality exercised in the messaging tests and thus the results are consistent between the two sets of tests.

Basic telephony integration means providing the user with a choice of "mixing" use of both TTY and an IP or digital telephone. For example, someone who can speak but not hear well could use "Voice Carry Over" to speak to the other party but read replies on the TTY. This configuration provides the TTY user with full access to the features available primarily through these higher function telephones compared to the limited capability provided when the user is limited to a TTY connected to an analog port.

Providing this functionality requires that the telephone switching software provide a seamless logical (or physical) bridge between the TTY and VoIP phone such that they can function as one. Cisco does not provide this function and thus could only pass one of the Tolly Verified basic telephony with TTY tests[1]. The Avaya Communication Manager provides bridging and thus Avaya passed all five tests. For Avaya, these tests

[1]Because Cisco's IP phone cannot be "bridged" to a TTY device, the only alternative for a TTY user in a Cisco environment would be to plug an analog phone directly into the TTY device if the TTY device had a jack to facilitate this. While outside the scope of this VoIP-oriented study, some subset of TTY integration functions can be achieved, but most functionality associated with IP sets would be lost.

were carried out twice — once using the VoIP phone and again using a proprietary digital phone (DCP) as the logical partner to the TTY. (See Figure 2.)

Visually-Impaired: Text-to-Speech

These tests evaluated how each vendor provided text-to-speech IP telephone status information to assist visually-impaired users. For Avaya, its 4624 IP Telephone was paired with its Windows-based Universal Access Phone Status software. Cisco does not offer its own branded text-to-speech option. For this study, a Cisco-certified soft-phone from IP blue Software Solutions was used to provide text-to-speech capability for the Cisco IP Phone 7960.

The seven tests were focused on determining how well the solution could represent the telephone status. Both solutions provide "caller ID" information via text-to-speech (TV 10701). Only Avaya, however, allows the user the capability of "on-demand" privacy. That is, the capability of manually requesting that caller ID information be announced (TV 10702). Both solutions also announce which line appearance an incoming call is on (TV 10699). However, where Avaya announces the line appearance and the button number, the Cisco/IP blue solution only announces the line number.

Avaya announced when the message waiting light changed from "unlit" to "lit" (TV 10696) but the Cisco/IP blue solution did not. When the line was placed on hold, Avaya provided an audible notification (TV 10697), but the Cisco/IP blue solution did not. Avaya also provided an audible notification when the line went "off hold," that is, when the user who was on hold hung up (TV 10698). The Cisco/IP blue solution provided an incorrect message, "ringing stopped," and thus did not pass the test. Finally, engineers determined whether a user could request the status of all lines, buttons and lights on the telephone (TV 10700). Avaya provides this function but the Cisco/IP blue solution does not.

Analysis

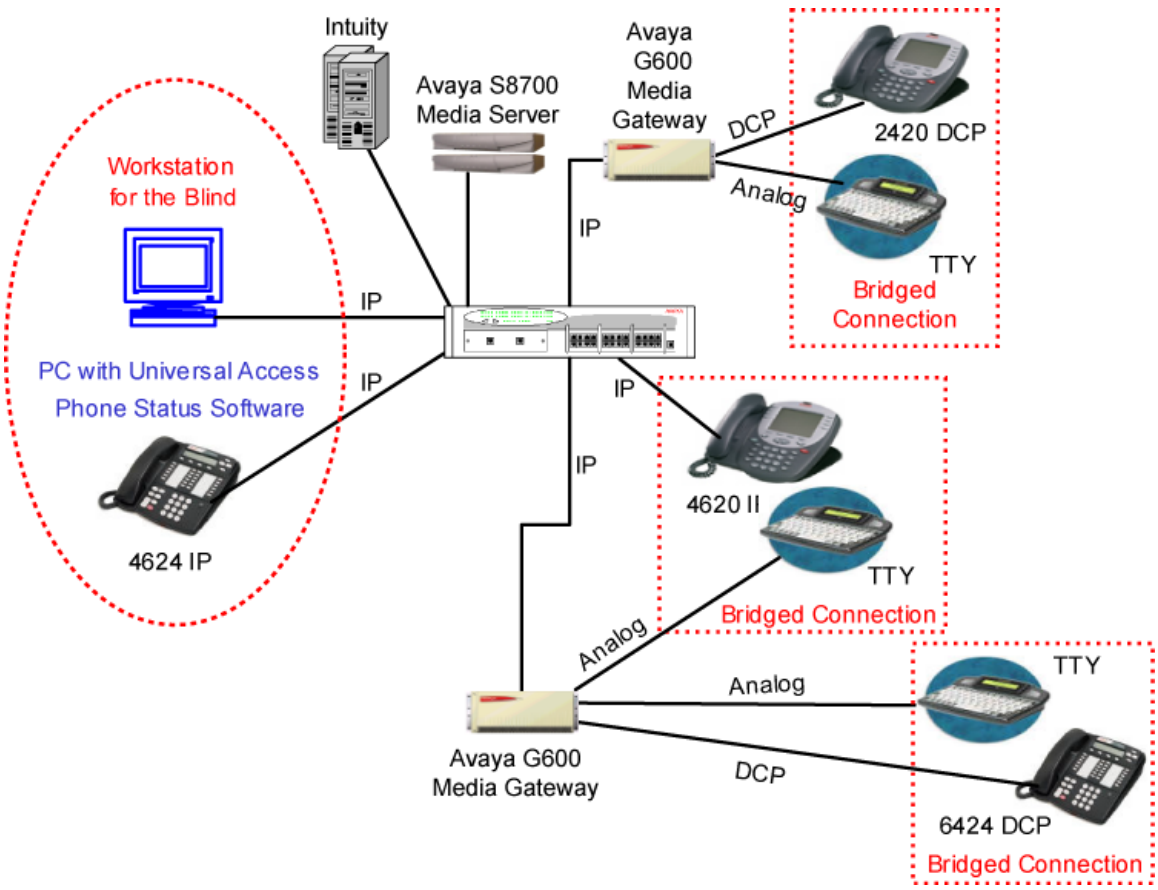
Meaning of Basic Telephony – TTY/Text-To-Speech

Federal regulations provide a mandate for the employer to provide essentially equal access to communications devices for users with disabilities as they do for users without disabilities. This means that if users without disabilities have access to IP or other digital telephones with productivity enhancing capabilities such as large displays and feature access buttons, similar consideration should be given to people with disabilities.

For those who are TTY users, this means that a co-resident IP/digital phone can be used in conjunction with the TTY device. For example, one should be able to dial a call using a speed-dial button on the phone but then use the TTY for actual communication. Avaya's solution, using the company's station bridging capability, meets these objectives.

For users with visual impairments, one must think of all of the visual elements that are included in a high-end IP or digital telephone set, and then provide an audible equivalent to that. Therefore, it is important to not only tell the user about every change of state as it occurs, but also give that user an ability to query the phone to determine all of the states. Which lines are on hold? Is call forwarding active? Are there any messages on the voice messaging system? Avaya's Universal Access Phone Status was designed to meet all of these needs of a user with impaired vision. Additionally, it should be noted that Avaya's solution is developed and supported by Avaya and is available at no extra charge. Cisco's solution is from a third party and involves an additional cost and third-party support.

Avaya Test Bed



Source: The Tolly Group, February 2004

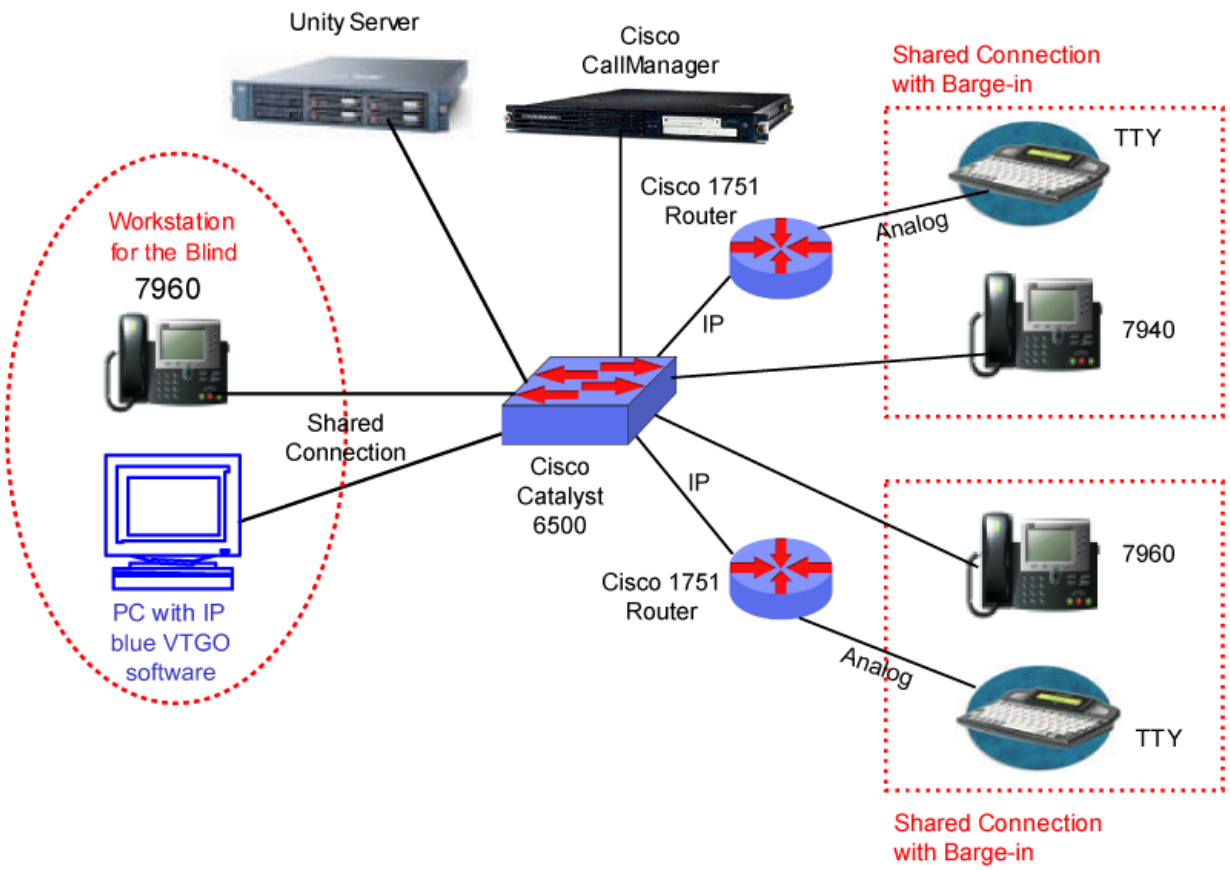
Figure 4

Meaning of TTY Messaging:

It is important to note that not just people with disabilities communicate with TTYs. Many hearing people also have a need to communicate with people who use TTYs. Therefore, it is important for them to be able to receive messages via TTY in the same mailbox that they receive voice messages. Having this capability eliminates the need to have two different telephone numbers – one for voice and one for TTY, and to check two separate mailboxes to retrieve messages. Avaya's messaging system meets this need of having a single mailbox answer both voice and TTY calls.

Since most TTY devices cannot deliver touch-tones once they are put in TTY mode, the typical TTY user must rely on a collocated phone to respond to prompts from the message system. In today's converged world where the IP or digital telephone takes on more and more functionality, true equal access would mandate the presence of an IP or digital phone to be the collocated phone to be used for not just touch-tone entry but to provide all of the other features that users are coming to expect. Cisco's inability to support true bridging between the IP set and the TTY is a serious flaw in meeting these needs. Hence, most core capabilities expected of a messaging system are unavailable to a TTY user who uses an IP phone as the companion phone to the TTY device.

Cisco Test Bed



Source: The Tolly Group, February 2004

Figure 5

Test Configuration and Methodology

TTY Tests

For Avaya, the TTY device was directly connected to a port on a Media Processor Board TN2302AP which provided analog-to-VoIP conversion. This board is housed in the G600 Media Gateway chassis. Call-control functions were provided by the Avaya Communication Manager 2.0 running on the S8700 Media Server. These devices were connected, as appropriate, to an IP infrastructure built using Avaya LAN switching products. Both Avaya IP and digital phones were connected as appropriate. No proprietary features were used. An Avaya Intuity AUDIX system Version 5.0.77 provided the messaging services. (See Figure 4.)

For Cisco, the TTY device was directly connected to an analog port of the voice interface card (VIC) of the 1751 Router. The router was, in turn, connected into a port on a Cisco Catalyst 6500. Call-control functions were provided by Cisco's CallManager Version 3.3 (3) sr1. Messaging services were provided by Cisco's Unity Server Version 4.0 (3). (See Figure 5.) Cisco 7960 and 7940 IP telephones were connected as appropriate.

Text-to-Speech

Both Avaya and Cisco tests were run using the basic voice environments described above. For Avaya, the 4624 IP telephone was paired with

Release 1.1 of its Universal Access Phone Status PC software. For Cisco, a 7960 IP telephone was paired with IP blue Software Solution's VTGO-PC Advanced, Version 2.8.0.0.

Since all tests conducted were "Tolly Verified" tests, details of the methodology can be found on The Tolly Group's Web site at http://www.tolly.com.

Equipment Acquisition and Support

All competitive equipment was acquired through normal product distribution channels. The Tolly Group contacted executives at Cisco Systems and invited them to provide a higher level of support than available through normal channels. While Cisco Systems initially accepted the offer, the company failed to respond when test details were forwarded. Representatives of IP blue, used in a small portion of the tests, did respond. Results were shared with them. Cisco Systems phone technical support was used to configure/tune the device for the test suites executed by The Tolly Group and it is believed that all tests illustrate the maximum functionality delivered by Cisco to date. For a more complete understanding of how The Tolly Group attempts to work with competitive vendors, see our Fair Testing Charter posted on http://www.tolly.com.

The Tolly Group gratefully acknowledges the providers of test equipment used in this project.

Vendor	Product	Web address
PacketStorm Communications Inc.	PacketStorm Ver. 6.1	http://www.packetstorm.com

Tolly Group Services

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Project Profile

Sponsor: Avaya Inc.
Document number: 204115
Product class: IP Telephony solution for accessibility
Products under test:

- Avaya Communication Manager 2.0
- Avaya Media Processor Board TN2302AP
- Avaya S8700 Media Server
- Avaya Intuity AUDIX system Version 5.0.77
- Cisco 1751 Router
- Cisco CallManager Ver. 3.3 (3) sr1

Testing window: December 2003 to February 2004
Software status: Generally available

For more information on this document, or other services offered by The Tolly Group, visit our World Wide Web site at http://www.tolly.com, send E-mail to sales@tolly.com, call (561) 391-5610.

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