

Supporting Real World Voice Rollouts with an EMTA

Dennis Rauschmayer, Ph.D.

Cable Broadband Communications Group, Texas Instruments

(Previously published by CableDatacomNews)

In a PacketCable™ environment, an embedded multimedia terminal adapter (EMTA) is the appliance that connects legacy telephones to a cable operator's advanced IP communications network. Coupled with an embedded DOCSIS® cable modem, the EMTA performs voice compression, packetization, security and call signaling for IP communications services, whether telephony, fax services or narrowband data connectivity. Therefore, the quality and reliability of a cable operator's IP communications service offering is only as good as the EMTA installed in each customer's home.

Before the first EMTA can be deployed on a commercial cable system, it must first successfully pass the rigorous certification testing performed by CableLabs® for North American deployment and tCom labs for European deployment. In addition to the battery of tests performed by the various industry labs, the EMTA is also subjected to a rigorous round of MSO specific tests. The importance of this extensive testing and validation is clear, but what other EMTA product attributes and features are important for large-scale consumer deployment into home environments with a wide range of legacy communication devices? Outlined below are four key items that are being addressed by EMTA technology providers that are especially critical to support a robust, scalable, high-volume voice rollout.

Fax Machines

Fax machine performance can be hindered by a packet network when packet loss conditions exist. Recognizing this problem, the International Telecommunications Union (ITU) developed a fax relay specification known as T.38. This specification describes a mechanism of transmitting fax signals over IP networks by allowing the voice adapter, or EMTA in the case of a PacketCable network, to recognize facsimile calls, intercept the fax signaling and data, and re-transmit the data in data packet format. In this case, the EMTA actually behaves partially like a peer fax machine in that it detects and generates control signals and communicates directly with the initiating facsimile device. The bottom line is that T.38 adds functionality to the EMTA that allows fax transmission to work.

Data Modem Calls

Data modems continue to exist in many different formats throughout the world. Although it may be reasonable to assume that few people will opt to use a dial-up modem instead of the broadband connection that is native with a voice-over-cable service, it is also reasonable to assume that there will be legacy devices with embedded voice band modems to support. Alarm and monitoring systems offer a good example of modem devices that successful voice services must support. Like fax transmissions, data modem calls can be hindered by packet loss in a network. However, unlike the fax machine solution, complete data modem functionality is not practical to put into an EMTA. Recognizing this, the ITU is working on a solution that allows an EMTA to detect a data modem call, set up the proper channel vocoder and provide extra protection to avoid packet loss situations. This specification is called V.VBD, where VBD stands for Voice Band Data. V.VBD in a PacketCable network would rely on the already established G.711 PCM codec to be used for data calls, and it would use RFCs 2198 and 2733 for redundancy and Forward Error Correction (FEC). Altogether, this provides a very robust mechanism to detect data calls and add the proper amount of care in the network so that the data calls are reliably handled.

Low Bit Rate Vocoder Support and Interoperability

Low bit rate vocoders, or LBR codecs for short, substantially reduce the bandwidth required for transmitting voice over a packet network while maintaining acceptable levels of voice quality. LBR codecs are actually very sophisticated software algorithms that run on a digital signal processor (DSP). The current PacketCable specification calls out one mandatory and two optional ITU codecs: G.711 (mandatory), G.728 and G.729E. The G.711 codec utilizes 64 kbit/s for a voice call, G.728 utilizes 16 kbit/s, and G.729 utilizes 11.8 kbit/s. Support for the optional codecs is beneficial as they provide operators with the opportunity to conserve network bandwidth and thus lower operational costs. Interoperability of the codecs on different equipments is necessary to insure that LBR-coded voice quality is not degraded, distorted or garbled. The solution to rigorous interoperability of LBR codecs starts at the software level. Codecs such as the G. codecs from the ITU have gone through a formal process to ensure that bit accurate software models of the codecs are available to the technical community. The availability of codec models allows the creation of test equipment and basic implementations that can be formally validated against one another. As systems are constructed, interoperability testing is again performed at the system level to ensure that no hardware or other system artifacts have disturbed the basic interoperability.

Server Interoperability

Server interoperability, from an EMTA's point of view, entails ensuring compliance with multiple implementations of the different types of servers in the PacketCable network, including the provisioning server and the call management server. The provisioning server is responsible for communicating configuration and control information to the EMTA. The call management server, sometimes called the call server, sends and receives messages to and from the EMTA to control call setup and tear down. Robust interoperability with these two servers is critical to provide a user with the consistent

quality of service that has come to be expected from the telephone. There are no shortcuts here. The solution to server interoperability is for vendors to spend significant time together testing interoperability to verify that no issues exist under a variety of network configurations. As products are maturing, vendors are addressing these issues, exchanging equipment and working together to verify the interoperation of their products.

Summary

EMTAs are very important to the success of voice rollouts for MSOs. They will be deployed in conjunction with a vast array of legacy phone equipment and contain protocols that communicate with a number of peers in the network. Because the quality of the MSOs' service deployment can only be as good as the quality of the EMTA, choosing an EMTA that elegantly supports a wide range of existing phone equipment and seamlessly interoperates in the network will allow for a pleasant user experience and a robust ramp of IP-based phone services.

About the author

Dr. Dennis Rauschmayer is Director of Marketing of the Cable Modem Products Group at Texas Instruments, designing silicon, software and modem solutions for the Broadband Cable marketplace. Dr. Rauschmayer received a B.S. degree in electrical engineering in 1992 from Wilkes University, an M.S.E.E. degree from The George Washington University in 1994 and a Ph.D. in electrical engineering from Temple University in 1997.

PacketCable, DOCSIS and CableLabs are trademarks of Cable Television Laboratories, Inc.

© 2004 Texas Instruments Incorporated

Important Notice: The products and services of Texas Instruments Incorporated and its subsidiaries described herein are sold subject to TI's standard terms and conditions of sale. Customers are advised to obtain the most current and complete information about TI products and services before placing orders. TI assumes no liability for applications assistance, customer's applications or product designs, software performance, or infringement of patents. The publication of information regarding any other company's products or services does not constitute TI's approval, warranty or endorsement thereof.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265

Copyright © 2006, Texas Instruments Incorporated