Dialogic® Diva® Media Boards and an Asterisk® IP-PBX

Technology Brief

To connect to the PSTN, Asterisk® systems require a telephony board or a media gateway. This technology brief discusses the benefits of using Dialogic® Diva® Media Boards with an Asterisk system.

Because most Diva Media Boards have powerful Digital Signal Processors (DSPs) onboard and can move processor-intensive, low-level tasks to these DSPs, significant reductions in server CPU load are possible. These reductions can positively impact overall performance and scalability in systems, such as those using Asterisk software. The larger a system, the more important DSP- based solutions become.

For smaller systems, "CTI" boards (Dialogic® Diva® BRI-CTI Media Board and Dialogic® Diva® PRI/E1/T1-CTI Media Board) can be used. These boards do not have DSPs and are available at a very competitive price. Important features, such as echo cancellation and DTMF detection, can be implemented in software running on the host CPU.

Diva Media Boards can also be used as VoIP gateways via Dialogic® Diva® SIPcontrol™ Software, but a discussion of Diva SIPcontrol is beyond the scope of this technology brief. Contact your Dialogic sales representative for more information on Diva SIPcontrol, or read about Diva SIPcontrol online.

Interfacing with Asterisk

Diva Media Boards can interface with an Asterisk-based telephony system via a channel driver (chan_capi), as illustrated in Figure 1:

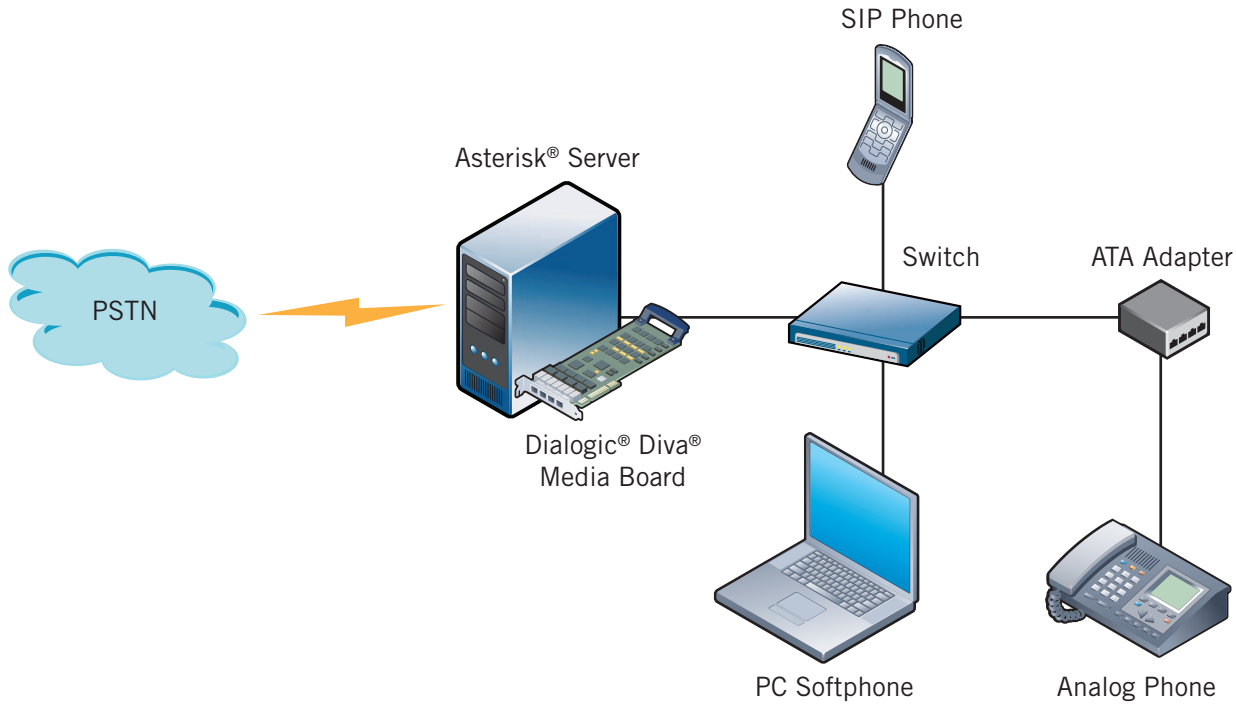

Figure 1. Dialogic® Diva® Media Board in an Asterisk-Based System

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Dialogic® Diva® Media Boards Offload Work from CPU

Along with providing a connection to the PSTN, Diva Media Boards with DSPs detect DTMF, MF, and PULSE signals, and recognize and generate fax, modem, busy signals, dial tones, and other intrusion tones on the DSPs included on the boards. This can allow CPU-intensive, low-level tone-related telephony processing to be offloaded from the Asterisk host CPU to the DSPs.

Most Diva Media Boards with DSPs support a G.168 Echo Canceller (EC) with a 128 ms tail length. A tail length of 256 ms is available on the CTI boards via a software EC or on Diva V-xPRI/E1/T1 Media Boards (1, 2, 4, and 8 span) via DSP hardware. Echo cancellation impacts Automatic Speech Recognition (ASR), Interactive Voice Response (IVR), normal conversation, and conferencing – all cases in which echo can be unacceptably intrusive. With older telephone lines and long distance calls, experiencing several echoes with different offsets is common. The EC implemented on Diva Media Boards is extremely efficient in removing these multiple echoes.

Conferencing

Diva Media Boards can enable high-quality conferencing for up to 360 active speakers in one onboard conference, without CPU load. While hundreds of active speakers are rarely required in a conference, a large conferencing capability provides "piece of mind" to developers of conferencing applications. With Diva Media Boards, the user of the conferencing application, rather than the application itself, can decide how many active speakers to allow. Conferencing is handled on DSPs and can span several Diva Media Boards using cross-board conferencing resources via Direct Memory Access (DMA) on the PCI or PCIe bus.

Cross-board conferencing, cross-board switching, and VoIP connections are available between different types of Diva Media Boards (analog, E1/T1, and BRI) to maintain high-quality interconnected lines. Fax and modem connections forwarded via a Diva Media Board are of comparably high quality.

Diva Media Boards offer a variety of additional conferencing features, including Automatic Gain Control (AGC), noise suppression, and active speaker recognition. AGC is also useful when recording voice streams, providing all recordings with the same volume level. DTMF clamping, which removes DTMF tones from the voice stream, can help improve the audio signal during a conference and avoid unnecessary tone processing.

Diva Media Boards include a Part.168 Audio Signal Limiter to keep loud signals from disturbing the other participants in a conference. This signal limiter is implemented on DSPs on the Diva Media Boards, not on the Asterisk server's CPU.

Conserving CPU Resources

Diva Media Boards provide techniques for conserving CPU resources when used with an Asterisk IP-PBX. For example, since Asterisk servers handle each voice channel as a separate thread, the number of threads that need to be managed by the CPU and operating system during concurrent calls can be very high. The architecture of Diva Media Boards and their rich processing tools can address this limitation.

VoIP Support

The DSPs on the Diva Media Boards can generate RTP streams that enable an Asterisk server to drive many types of VoIP devices, such as SIP phones, without requiring an expensive multi-CPU system to do resource-consuming calculations.

Protocol Independence for Asterisk®

An Asterisk system is protocol-independent if it incorporates Diva Media Boards. Because the software used with Diva Media Boards enables abstraction, each Diva Media Board used in a system can run its own signaling protocol (QSIG, E1/R2, CAS, RBS, 5ESS, SS7, or others), allowing protocol independence and a mix of signaling protocols in one Asterisk server.

Features Supported on an Asterisk® System

The following list shows some of the features that are supported on an Asterisk system that includes Diva Media Boards:

- QSIG
- Path Replacement Invite
- Path Replacement Forward
- Path Replacement
- Two B-Channel Call Transfer
- Single Step Call Transfer
- Blind Call Transfer
- Calling/Called Names.

Diva Media Boards also support the SS7 Signaling Protocol (ISUP), allowing the option of connecting an Asterisk-based PBX directly to an SS7 network.

Additional Features

Diva Media Boards support a broad range of additional features that include:

- Rich Hunt Group Mode support, which is transparent to Asterisk
- Automatic detection of the QSIG dialect in use (ISO, ECMA, vendor specific extensions, and others)
- Emulation of Supplementary Services, even when calls are connected via different Diva Media Boards. Cross-board emulation is automatically handled via call tromboning (Line Interconnect) and/or Cross Board Switching, and is transparent to Asterisk. Network- or vendor-specific Supplementary Services are also made available to Asterisk.
- Explicit Call Transfer (ECT) emulation for independent network connection. For example, calls to QSIG and 5ESS lines can be handled even if the callers are on different lines. In QSIG networks, ECT emulation uses completion path replacement and completion notification to release local resources.
- Support for different “message waiting” procedures

Technical Specifications

Diva Media Boards can provide rich voice and other functionality if implemented in an Asterisk server, as well as to other applications running on the same server, including RAS servers, fax servers, POS servers, and other services related to phone lines.

Up to eight Diva Media Boards supporting up to 480 channels can be combined in a single server and used with Asterisk. Consult the datasheets for Diva Media Boards listed below (by connection type) for additional information about specific features, including certification.

A Note on CTI Boards

Two Diva Media Boards in the sections below (Dialogic® Diva® BRI-CTI Media Board and Dialogic® Diva® PRI/E1/T1-CTI Media Board) are entry-level boards referred to as CTI boards. They offer important functionality (for example, DTMF, Line Interconnect, software EC) at a very competitive price. However, the CTI boards do not provide more advanced features, such as AGC, noise suppression, large conferences, and fax. These more advanced features are available with the other Diva Media Boards listed, which are equipped with DSPs.

For Connection to Analog Lines:

- Dialogic® Diva® Analog-2 and UM-Analog-2 Media Boards
- Dialogic® Diva® Analog-4 and UM-Analog-4 Media Boards
- Dialogic® Diva® Analog-8 and UM-Analog-8 Media Boards

For more information, see the Dialogic® Diva® Analog Media Boards datasheet.

For Connection to ISDN BRI Lines (mainly used in Europe and Japan):

- Dialogic® Diva® BRI-CTI Media Board (PCI only)
- Dialogic® Diva® BRI-2 and UM-BRI-2 Media Boards
- Dialogic® Diva® 4BRI-8 and UM-4BRI-8 Media Boards

For more information about the BRI-CTI Media Board, see the Dialogic® Diva® BRI-CTI Media Board datasheet. For more information about the other boards in this list, see the Dialogic® Diva® BRI Media Board datasheet.

For Connection to single E1, T1, J1 or ISDN PRI Lines:

- Dialogic® Diva® PRI/E1/T1-CTI Media Board
- Dialogic® Diva® PRI/E1/T1-8 Media Board (PCI only)
- Dialogic® Diva® V-PRI/T1-24 Media Board
- Dialogic® Diva® V-PRI/E1-30 Media Board
- Dialogic® Diva® UM-PRI/T1-24 Media Board
- Dialogic® Diva® UM-PRI/E1-30 Media Board
- Dialogic® Diva® PRI/T1-24 Media Board
- Dialogic® Diva® PRI/E1-30 Media Board

For more information, see the Dialogic® Diva® PRI Media Board datasheet.

Technical Specifications *(continued)*

For Connection to single or multiple E1, T1, J1 or ISDN PRI Lines:

- Dialogic® Diva® V-1PRI/E1/T1-30 Media Board (PCIe only)
- Dialogic® Diva® V-2PRI/T1-48 Media Board
- Dialogic® Diva® V-2PRI/E1-60 Media Board
- Dialogic® Diva® V-4PRI/T1-96 Media Board
- Dialogic® Diva® V-4PRI/E1-120 Media Board
- Dialogic® Diva® V-8PRI/E1/T1-240 Media Board (PCIe only)

For more information, see the Dialogic® Diva® V-xPRI Media Board datasheet.

Dialogic® Diva® System Release Software for Linux supports the latest SUSE, Red Hat, Debian, and Fedora versions as well as other known distributions (OpenSuse, Slackware, Mandrake, Gentoo, Ubuntu).

Diva System Release Software is available for download from the Dialogic website, along with an online demo system, accessible by clicking on the View the Demo! link. The demo system shows the general Diva Media Board configuration and Asterisk-specific configuration (chan_capi). The demo also provides detailed information about the features that an Asterisk solution with Diva Media Boards can offer.

The demo system is usually configured with different types of Diva Media Boards (Diva Analog, Diva BRI, Diva PRI) and the "virtual board" provided by Dialogic® Diva® softIP for SIP Software. You can change the demo configuration, run traces, start-stop the boards, view statistics, and consult online documentation.

The online CHAN CAPI Readme file contains many Dialplan snippets that show the configuration of specific features, such as activating the noise suppressor, removing DTMF tones, establishing large conferences (up to 360 active speakers), handling of the QSIG protocol, and configuring fax handling.

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