This application note describes how video capture over IEEE 1394 is supported within the Matrox Imaging Library (MIL) release 7.5 and its derivatives, and assumes that the reader has a basic understanding of MIL. This document is intended to expand on the information included in the MIL Board Specific Notes manual. For the remainder of this document, the term MIL will be used to designate Matrox Imaging Library (MIL) release 7.5 and its derivatives.

The IEEE 1394 standard

IEEE 1394, also known as FireWire or i.Link®, is an industry standard high-speed digital serial link. It is an established I/O bus standard for the PC platform, made available through adaptor cards or directly on the PC motherboard (Figure 1). IEEE 1394 is a prominent standard for connecting a video source, such as a camera, to a PC[1] (Figure 2), both today and in the future.

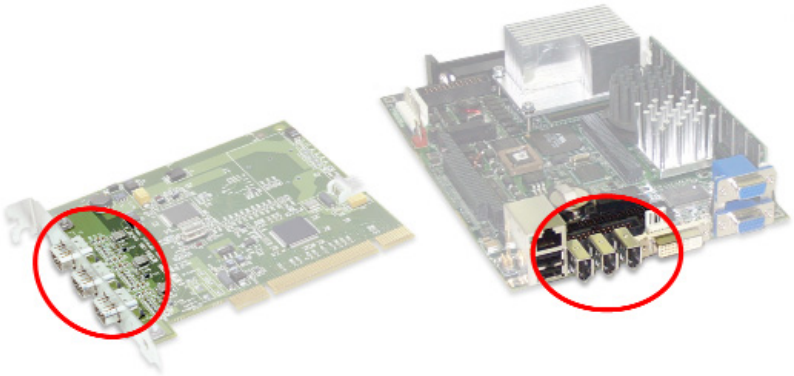

Figure 1: Matrox Imaging IEEE 1394-ready products - Matrox Meteor-II/1394 adaptor board (left) and 4Sight-II motherboard

The IEEE 1394 standard supports bi-directional communication for device control and transfer of device data such as video. IEEE 1394 supports two types of data transfer modes depending on the nature of the data. The Asynchronous data transfer mode provides guaranteed delivery of control/inquire type commands, while the Isochronous data transfer mode provides guaranteed bandwidth for time critical data such as live video. IEEE 1394 uses a simple standard connector and cable design to transport digital data and optional power over a single cable (Figure 3).

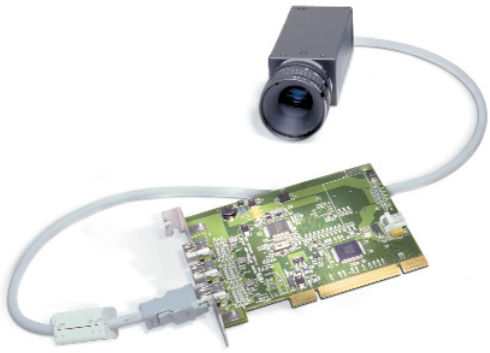

Figure 2: IEEE 1394 camera connected to Matrox Meteor-II/1394 adaptor board

Figure 3: IEEE 1394a connector and cable

1. Also used for interfacing between PCs, peripherals and consumer electronic products

MATROX IMAGING

One bus with several protocols

Just like the Ethernet (IEEE 802.3) local area network technology, IEEE 1394 supports more than one communication protocol. The most common protocols include AV/C, SBP-2 and IIDC (DCAM). The AV/C protocol is designed for professional and consumer audio/video equipment including DV camcorders. The SBP-2 protocol is designed for storage devices, printers and scanners. The IIDC (DCAM) protocol is designed for industrial and scientific video cameras. The IIDC (Instrumentation & Industrial Digital Camera) specification was created and is maintained by the Digital Camera Sub Working Group (DC-SWG) within the Instrumentation and Industrial Control Working Group (II-WG) of the 1394 Trade Association. While there are many communication protocols, MIL only supports video capture from IEEE 1394 cameras compatible with the IIDC 1394-based digital camera specification, and does not support any other IEEE 1394 standard or proprietary protocols.

MIL and the Windows® IEEE 1394 driver architecture

MIL supports video capture from IEEE 1394 cameras compatible with the IIDC 1394-based digital camera specification under Microsoft® Windows NT® 4.0, Windows® Me, Windows® 2000 and Windows® XP. Support is made possible through the installation of the MIL Driver for IEEE 1394 IIDC (i.e., Matrox Meteor-II/1394) during the overall MIL installation process. However, since there is no native support for IEEE 1394 under Windows NT® 4.0, MIL will install the entire driver stack for using IEEE 1394 (Figure 4). Under Windows® 98, Me, 2000 and XP, MIL installs its driver within Microsoft®'s driver stack (Figure 5). In doing so, MIL obtains sole access to IEEE 1394 IIDC devices and these devices are no longer accessible through Microsoft®'s streaming class driver. However, devices using other IEEE 1394 protocols (e.g., AV/C and SBP-2) are still accessible through standard Windows® interfaces.

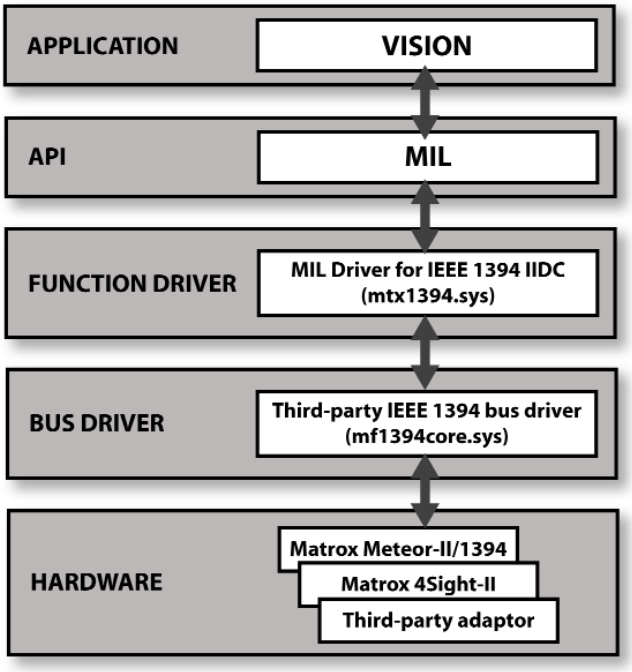

Figure 4: MIL's support for IEEE 1394 under Windows NT® 4.0

MATROX IMAGING

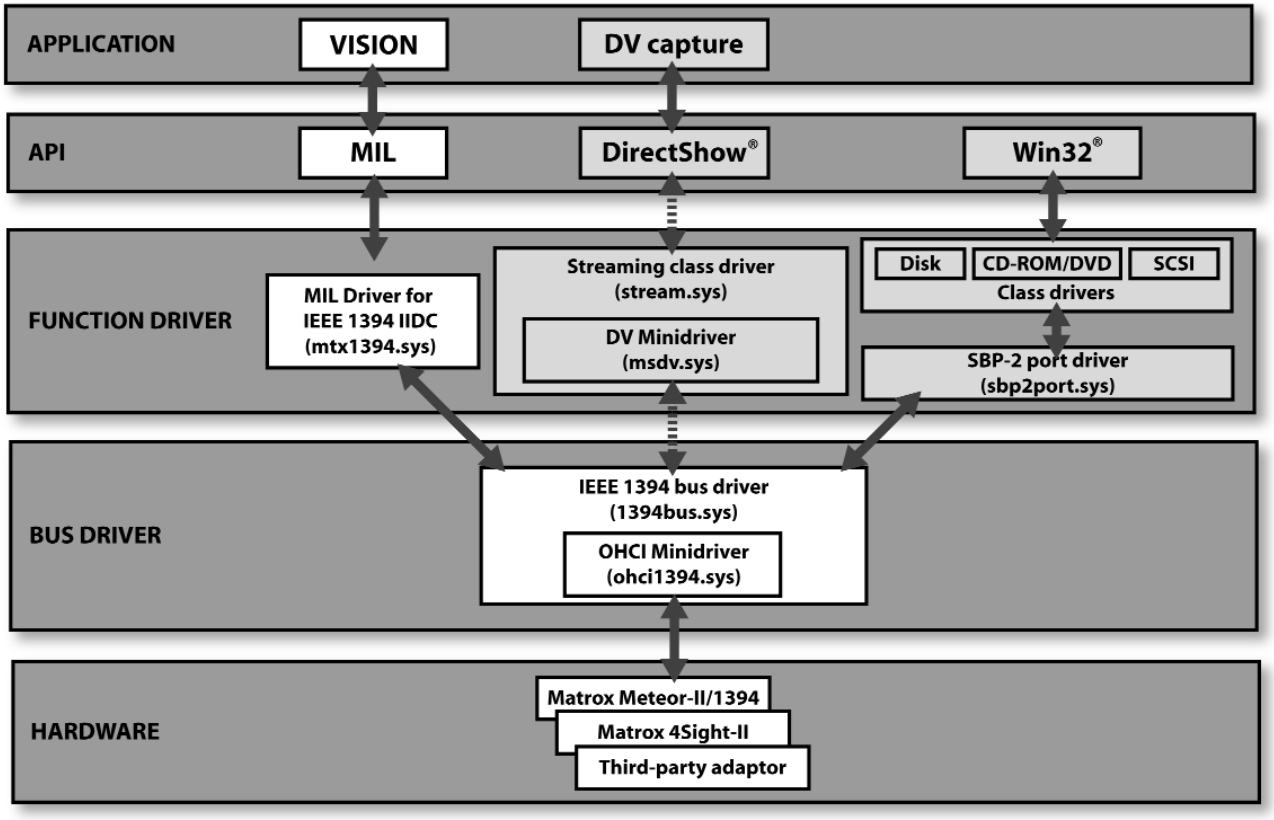

Figure 4: MIL's support for IEEE 1394 under Windows® Me, 2000 and XP

IIDC support under MIL

MIL supports various formats and modes as defined in the IIDC 1394-based digital camera specification. Support is available for the YUV411, YUV422, RGB, Mono and Mono16 modes of the VGA and Super VGA formats (Format_0, Format_1 and Format_2) and the partial image size format (Format_7). However, MIL does not support the YUV444 mode. Resolution for the supported formats are listed in Table 1.

Table 1: Resolutions for the supported video formats and modes

Format	Resolution
0	320 x 240 and 640 x 480
1	800 x 600 and 1024 x 768
2	1280 x 960 and 1600 x 1200

MATROX IMAGING

Working with multiple IEEE 1394 video cameras

IEEE 1394 is designed to support a tree-like network topology consisting of up to 63 devices arranged in a daisy-chain and emanating from a physical/link layer controller. However in practice, only a maximum of four cameras per physical/link layer controllers is supported, bandwidth permitting (see Available bandwidth). In addition, a maximum of four physical/link layer controllers per PC is supported except under Windows® NT 4.0 where only one physical/link layer controller is supported. Note that typically there is only one physical/link layer controller per adaptor board or motherboard.

References

- IEEE 1394 Trade Association (www.1394ta.org)
- IIDC 1394-based Digital Camera Specification
- MIL Board Specific Notes manual

Available bandwidth

At 400 Mbits/sec, IEEE 1394 provides 50 MB/sec of raw bandwidth. In practice, protocol overheads reduce the amount of bandwidth available for application data such as video. As a rule of thumb, only about 70% of the raw bandwidth is available for video data (isochronous transmissions).

For more information, please call: 1-800-804-6243 (toll free in North America) or (514) 822-6020 or e-mail: imaging.info@matrox.com or http://www.matrox.com/imaging

Corporate headquarters:

Canada and U.S.A.
Matrox Electronic Systems Ltd.
1055 St. Regis Blvd.
Dorval, Quebec H9P 2T4
Canada
Tel: (514) 685-2630
Fax: (514) 822-6273

Offices:

Europe, Middle East & Africa
Matrox VITE Limited
Sefton Park
Stoke Poges
Buckinghamshire
SL2 4JS
UK
Tel: 01753 665511
Fax: 01753 665599

France
Matrox France SARL
2, rue de la Couture
Silic 225
94528 Rungis Cedex
Tel: (0) 1 45-60-62-00
Fax: (0) 1 45-60-62-05

Germany
Matrox Electronic Systems GmbH
Inselkammerstr. 8
D-82008 Unterhaching
Tel: 089/62170-0
Fax: 089/614 9743

MATROX IMAGING