System Design Considerations for Matrox Developer Products

(Multi-stream HD solutions)

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Software Engineering Department

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Introduction

Whether you are designing a server, clip-store/still-store, character generator, NLE or studio-in-a-box, the components that will make up your solution will depend on your particular workflow requirements and budget.

This document provides information to consider when you are selecting components. It does not discuss budgetary constraints or make cost comparisons among various components; that is left up you.

The document gives guidelines for selecting:

- motherboards and systems
- processors
- on-board vs. external storage controllers
- storage

Matrox has validated a number of computers, motherboards, and storage subsystems, which are listed on our Private Developer Support web pages. We recommend you use components chosen from these lists so that we can provide optimal support if required. Should you decided to use other components that are unfamiliar to us, we may be limited in our ability to help you troubleshoot your system.

Selecting a system or motherboard

The system that will house the DSX card must be running Windows XP Professional (32-bit or 64-bit version)/ Windows XP embedded/ Windows Server 2003 (without service pack). It must have a PCI-X 100/133 slot available, adequate cooling, and a power supply large enough to meet the requirements of the Matrox DSX card and other peripherals in the system. It must also have at least 1 GB of RAM, although we highly recommend 2 GB of RAM for HD solutions.

One very important factor to consider when selecting a motherboard or system is the PCI-X bandwidth available. PCI-X bandwidth will vary between motherboards.

Intel-based motherboards

When selecting a new motherboard based on the 5000X chipset, we recommend one where the PCI-X bus is implemented on the ESB2 southbridge, not one where the PCI-X bus must go through a PCIe-to-PCI-X (PXV) bridge. Systems that use either or both architectural approaches include HP xw8200, HP xw8400 and motherboards such as the SuperMicro

X7DAE. For example, on HP xw8400 system the PCI-X 100 bus is implemented directly on the ESB2 southbridge, whereas the PCI-X 133 bus must go through a PXV bridge.

Our tests have shown that selecting the PCI-X bus that is implemented on the ESB2 southbridge will yield better bandwidth when reading from host memory since read operations avoid an extra “hop” through the PXV bridge to get to system memory.

The write bandwidth will depend entirely on the speed of the PCI-X slot (i.e. 100MHz or 133MHz). For more detailed information on which PCI-X slot to use for the DSX card to ensure optimal performance, please refer to the OEM system compatibility list on the Private Developer Support web page of the Matrox website.

http://www.matrox.com/video/support/developer/private_support/

AMD-based motherboards

A similar PCI-X bandwidth issue exists when selecting an AMD-based motherboard or system. Older systems used the AMD 8131/8132 PCI-X tunnel chip, which went directly from the PCI-X bus to the HyperTransport link and therefore provided a very fast, low latency access to system memory. Systems with such architecture include the HP xw9300 and motherboards such as the Tyan Thunder K8WE (S2895) and some from IWill.

Unfortunately, many of the newer AMD-based motherboards and systems use an NEC PCI-to-PCI-X bridge which severely limits the available PCI-X read and write bandwidth when compared to the AMD 8131/8132 based motherboards or systems. Examples of such systems and motherboards include the HP xw9400 and the Tyan Thunder n6650W (S2915).

In order to ensure the best PCI-X bandwidth performance, we recommend using an AMD platform that uses the 8131/8132 PCI-X tunnel chip, not the NEC bridge.

Selecting a processor

Your choice of processors is a key factor in the performance of your Matrox DSX system, particularly when it comes to certain CPU-intensive functions such as:

- Encoding and decoding compressed video, particularly in HD (DVCPRO HD and MPEG-2 I-frame/IBP HD)
- Compositing multiple graphic layers using the host-based compositor
- Realtime color correction
- Realtime chroma and luma keying
- Realtime speed changes
- Realtime transitions (Matrox wipes, dissolves, additive dissolves)
- Realtime SD/HD software scaling

The DSX hardware has been optimized to run on both AMD and Intel processors and to take full advantage of their unique architectures. Both single- and dual-core processors are supported.

When selecting processors, it is vital to consider the workflow. If you plan to work mostly with compressed SD and HD video, selecting top-of-the line processors may give you additional realtime capability that should significantly increase the performance of your solution. However, if you will be working mostly with uncompressed video, which is not as CPU intensive, you may want to invest in larger, faster storage rather than high-end processors. For solutions working mostly with compressed HD material, we recommend dual-core processors to ensure realtime performance.

For a complete list of motherboards and systems, as well as information on the number of ingest and playout streams supported by these solutions, please refer to the OEM system compatibility list on the Private Developer Support web page of the Matrox website.

Selecting a storage controller

The on-board storage controller of many motherboards shares the PCI-X bandwidth with the Matrox DSX hardware device installed in the PCI-X (133 MHz) slot, thereby reducing the overall available bandwidth for the Matrox DSX hardware device.

We, therefore, recommend using an external PCI Express SCSI controller to guarantee that the Matrox DSX hardware device will have the total available PCI-X bandwidth to transfer data between system memory and on-board memory.

On the new Intel-based motherboards specifically, we recommend using the external SCSI controller in a PCI Express slot on the MCH/northbridge to improve overall system performance.

Selecting storage

When deciding on storage, there are two main factors to consider – the data rate the storage subsystem can sustain and the overall storage capacity.

To evaluate your needs, you must first take into account the data rate of the formats you will be working with. The table below provides the approximate data rate for a variety of formats. Multiply the data rate per stream by the number of realtime video streams supported by your solution to approximate the overall demand on the storage. For example, three streams of DV require a minimum throughput of 75 megabits per second (Mb/sec) plus some additional room for overhead.

	Data rate per stream (Mb/sec)	Hours of footage per terabyte
8-bit Uncompressed HD	960	2
8-bit Uncompressed SD	160	13
DVCPRO HD	100	22
MPEG-2 I-frame HD	100	22
MPEG-2 IBP HD	100	22
DVCPRO50	50	44
DV/DVCAM	25	88
HDV	25	88

Once you have chosen a storage subsystem that meets your throughput needs, you must decide how much storage your workflow requires. The more storage you have, the more hours of footage you can maintain online for instant access. The table above provides an approximation of the number of hours of video you can store on one terabyte in the various formats.

A wide range of storage subsystems is suitable for use with Matrox DSX platform depending on your particular requirements. For realtime compressed SD or HDV streaming, a couple of inexpensive SATA drives striped together can be an effective choice. At the other end of the spectrum, a Fibre Channel RAID would be used for realtime uncompressed HD streaming.

For a complete list of evaluated storage solutions for use with the Matrox DSX hardware platform please refer to the “Matrox DSX Storage Solutions” on the Private Developer Support web page of the Matrox website.


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