Scala Hardware Recommendations

Even with advanced software like Scala MM100, multimedia puts a tremendous load on a personal computer. This means that your goals for a production are quite likely to run up against the limitations of your hardware.

This document provides more detailed guidance on some of the most important hardware-specific questions than could be presented in the *User's Guide*. If you want to create multimedia productions with the smoothest and most consistent performance and the fewest limitations, follow the suggestions given below when choosing your script creation and playback systems.

Recommended CPUs

Although Scala can run on 25 Mhz 486SX processor, we highly recommend using a 486DX4 100 MHz or faster processor. There are a number of manufacturers of 486-class processors besides Intel. They include AMD, Cyrix, IBM and others. Some promise even higher performance than their Intel counterparts, at a lower cost. If you decide to use an Intel Pentium™ based system, use a 75 Mhz or faster processor. As with the 486, there are a number of manufacturers who make Pentium-class (P5) processors. They include NexGen, AMD, and Cyrix.

What about the latest from Intel, the Pentium Pro (P6)? The P6 is an extremely fast processor, but it is optimized for full 32-bit applications and operating systems. Its performance with 16-bit DOS applications is not impressive. Remember that MM100 runs on top of DOS. Indeed, certain versions of the P6 yield DOS performance similar to a 90 or 100 Mhz Pentium. Thus the P6 offers little advantage, despite its extra cost, for Scala and other DOS applications.

Secondary cache considerations

A secondary cache is specialized, high-speed memory between the CPU and the computer's main memory. (Primary cache is on the processor itself.) Because CPUs can operate so quickly, the main memory on your computer system is typically too slow to keep up with the CPU. The cache is used to store the most often used data, reducing the need to retrieve information from slower main memory.

Some 486 systems include a 32 or 64 KB secondary (L2) cache. While 64 KB is sufficient for use with a 25 or 33 Mhz 486 processor, a 256 KB L2 cache is recommended for processors that run at 66 Mhz or faster.

Systems with an Intel Pentium or P5-class processor typically include a 256 KB secondary cache. However, due to the increased clock speed of some P5 processors—some up to 200 Mhz—even the memory chips used for the secondary cache can be too slow. To increase performance, a new type of memory chip for the cache was developed, called Pipelined Burst Memory, which can increase performance by up to 30%.

We recommend Pipelined Burst Memory for P5 processors running at 100 Mhz or faster. If Pipelined Burst Memory is not an option on the system, then you can increase performance, to a degree, by increasing the amount of static RAM (SRAM) based secondary cache to 512 KB or more for processors running at 133 MHz or faster. Note that Pipelined Burst Memory is available only on P5 and P6-class systems.

RAM Considerations

Scala products require a minimum of 8 MB of RAM. We highly recommend adding additional RAM if you plan on making productions that include a large number of FLC animations or require highest performance playback. Many multimedia systems now come with 16 MB of RAM. This should be sufficient for most applications, but since we are talking about multimedia, even more RAM is recommended. Remember, operating systems like Windows 95 and OS/2 Warp can require approximately 8 MB of RAM for themselves, severely cutting into the amount of RAM available for applications, including Scala.

Following are RAM recommendations for Scala, based on operating system:

MS-DOS: 16 MB

Windows 3.1: 24 MB

Windows 95: 32 MB

OS/2 Warp: 24 MB

Windows NT: 32+ MB

Types of RAM

Many of today's systems can take advantage of different RAM types. Some are faster than others. One of the most popular is EDO (Extended Data Out) RAM, which can increase performance by up to 10%, compared to standard DRAM (Dynamic RAM), especially when using sequential data (such as animations that playback from RAM). Of course, your system's motherboard must have special circuitry to support this EDO RAM. EDO RAM is typically available on many P5-class systems.

System bus considerations

For 486 based systems, we highly recommend using Scala with motherboards that include 32-bit VESA Video Local Bus (VLB) slots. Systems with a VLB compatible video card and I/O controller (the card that connects to the floppy and hard drive, CD-ROM and serial/parallel ports) offer nearly twice the video and I/O performance as systems that have only 16-bit AT (ISA) slots and cards. Newer motherboards and systems often include the I/O controller built-in to the motherboard itself.

For P5 based systems, we recommend using motherboards that include Peripheral Component Interconnect (PCI) slots. PCI offers the best performance when coupled with a P5 class processor. Again, today's motherboards and systems often include the I/O controller on the motherboard.

CPU utilization considerations

While not typically thought of when configuring a normal computer system, CPU utilization is a significant factor in the performance of a multimedia playback system, especially if the multimedia playback content is of a high-speed, high-impact nature (many animations, quick transitions and high-quality audio).

Some peripherals rely on the CPU to do most of the processing. This means that there is less CPU time (expressed in a percentage of total available CPU time) to service other parts of the computer system, especially software. Peripherals that can require CPU time include sound cards, network cards, CD-ROM drives and SCSI controller cards. A device that requires 97% of the CPU will effectively freeze any other system tasks during the times it is active.

If CPU utilization is a significant factor in playback of your multimedia productions, then look for products that offer low CPU utilization factors. Indeed, many of these peripherals include a co-processor (for example, a DSP on a sound card) to off-load processing from the CPU. These products are more expensive, but the benefit is faster, smoother, more consistent multimedia playback.

Graphics card considerations

It is natural to assume that an expensive, high-performance graphics card that offers outstanding Windows or OS/2 performance will offer similar performance with Scala or other DOS based applications. This assumption is not necessarily true. Cards that offer exceptional Windows performance might very well have average or mediocre DOS performance. Again, please keep in mind that Scala runs on top of DOS.

To determine which video cards offer the best balance of DOS and Windows performance, look at the results of performance tests (for example, the Ziff-Davis Labs “PCBench” and “WinBench” benchmarks), as reviewed in computer magazines. In general, “64-bit” cards with 2 MB or more of display RAM offer the fastest performance.

Test results are sometimes published by manufacturers, to help compare their product with their competitors. Look carefully at the DOS performance scores. The better the card performs with DOS applications, the more likely that it will perform well with Scala.

Although Scala includes a number of drivers that work with many popular graphics cards, there is no guarantee that our software will be completely compatible with the card that you are using. Therefore, make sure that the card you are using is VESA compatible. VESA is a widely accepted standard for video hardware/software interfacing. Even if we don’t have a driver for your card, if it is VESA compatible, you can run Scala software using the Scala VESA video driver.

For those graphics cards do not have a VESA BIOS, Scala also offers the Sci-Tech Software Inc. UniVBE Lite VESA Driver utility. UniVBE is a third-party VESA driver that supports hundreds of video card chipsets. So even if the system’s display card does not support VESA, UniVBE will probably support the chipset, allowing the use of the Scala VESA video driver. Although this driver may allow Scala to work on your system, it cannot offer the same level of performance as a Scala driver developed specifically for a given video chip.

MIDI playback considerations

Support of MIDI audio playback in MM100 can only be accomplished by using an MPU-401 AT interface compatible wavetable audio card (for example, the Creative Labs AWE-32™) or module/daughterboard.

Some sound cards, like the Creative Labs Sound Blaster™ 16, include a connector that allows the user to attach an MPU-401 AT-compatible wavetable synthesis module or daughterboard. Popularly called the Wave Blaster™ connector, it was named after the first wavetable synthesis module offered by Creative Labs, the Wave Blaster I.

A number of manufacturers now make Wave Blaster compatible daughterboards. Some of the manufacturers are famous makers of popular electronic keyboards and synthesizers, including Yamaha, Roland, Ensoniq, E-mu and Korg.

Not all wavetable synthesis cards or daughterboards sound the same. Careful auditioning of these products will help you determine which is best for your applications and needs.

SCSI and IDE considerations

SCSI based hard drives, CD-ROM drives and removable media drives (such as SyQuest® or Iomega Zip) are more expensive than their IDE counterparts, but SCSI offers several significant advantages.

First, SCSI is a widely accepted and highly compatible standard in the personal computer industry. It is a more flexible and versatile interface. For example, not only is SCSI used for storage media (for example, hard drives), but a significant number of scanners and high-end printers also use a SCSI interface.

Second, SCSI does not significantly increase the burden on the CPU during intense disk activity (such as playback of an animation or performance of a Scala wipe/transition). This results in smoother and faster performance.

Third, you can attach up to seven devices to one SCSI controller, versus two devices with IDE or four devices with EIDE (Enhanced IDE). SCSI based system are particularly valuable with productions that require sustained high-speed data transfer (for example, playback of a 30 minute MPEG-2 video segment).

SCSI does have its costs, however. First, you typically have to purchase a separate SCSI controller, which takes up a card slot in your system. Second, drivers for the SCSI controller need to loaded be into memory, leaving less for the operating system and applications.

IDE's advantage is that it is significantly less expensive, typically 10 to 15% less than a similarly equipped SCSI system. Also, with the recent Enhanced IDE specification, information is transferred as quickly as a SCSI-2 device. No extra slot is required for a controller, as the IDE connector is on the motherboard or on the I/O controller card, and there are typically no drivers to install. However, there is a significant increased burden on the CPU during intense activity, which may result in less smooth and slower performance. Another disadvantage is that you can only attach up to two devices with IDE and up to four devices with Enhanced IDE.

If you decide to configure your system with SCSI, we recommend that you get a controller card that will take advantage of the fastest system bus slot available. For 486 systems this means VLB or EISA, for P5 class systems, PCI.

Hard drive considerations

Because multimedia is a data-intensive process, we recommend using a high-speed, high-performance hard drive. We also recommend using an "A/V rated" hard drive.

Thermal recalibration

An "A/V rated" hard drive is designed to offer consistent performance during the long reads and writes that are required by multimedia applications. During operation, a hard drive periodically has to stop reading or writing data to perform what is known as a "thermal recalibration". This recalibration is required in order to insure that the mechanisms within the hard drive are aligned properly. Unfortunately, the interruption caused by thermal recalibration can have a noticeable affect on multimedia applications, especially on playback of animations or MPEG video. For example, if the computer is playing an MPEG video and a recalibration occurs, it can cause the MPEG video to freeze or skip frames. A/V rated hard drives have more sophisticated electronics that prevent thermal recalibration from happening during playback or recording of data.

Cache

Most if not all of today's hard drives have a built-in cache. This cache is designed to store the most recent and most often accessed information on the hard drive. In multimedia applications, this cache is also designed to "buffer" data to/from the hard drive and the computer system, preventing freezes, skipped frames or loss of data while recording audio and/or video. Many A/V rated drives have a 256 KB cache. While this is sufficient in most cases, for more consistent and reliable performance, we recommend using a drive that has a 512 KB or even 1 MB cache. These larger caches are typically found on high-capacity drives (2 GB or larger).

If you are considering upgrading your hard drive, you may want to refer to some of the computer or multimedia related magazines that review and evaluate computer hardware. These magazines usually include feature articles that review a group of hard drives and their suitability to a specific application. Pay particular attention to not only how fast the drives are, but how consistently and reliably they transfer data.

CD-ROM considerations

Many of today's multimedia computers come equipped with Quad-speed (4X) or faster (6X, 8X) CD-ROM drives. Unfortunately, their performance varies greatly from manufacturer to manufacturer. In some cases, the speed varies from model to model, even if they are rated at the same speed.

Like hard drives, in relation to multimedia, check to see how consistently and reliably your system's CD-ROM transfers data, especially playback of animations, MPEG video (.MPG files) or sampled audio (.WAV files). Also, check how much CPU utilization is required at sustained data transfer rates. These characteristics are more important than raw speed. Like hard drives, CD-ROM drives also usually have a cache to improve performance, and a larger

cache will give you better multimedia performance. Again, consider these characteristics if you plan on upgrading your CD-ROM drive.

Output to video considerations

There are a number of VGA/SVGA-to-Composite encoders on the market, which convert a computer's graphics output to NTSC or PAL video standards. Typically, the less expensive products only offer consumer quality video. More expensive units offer industrial or even broadcast-quality (RS-170A NTSC or CCIR-601 PAL) output. Scala products will work with most of these encoders, but be aware that some of the encoders work with only a limited number of page resolutions (perhaps not beyond 640 × 480) and refresh modes (typically 50 Hz for PAL and 60 Hz for NTSC).

Manufacturers of encoders include AITech International, Vine Micros (distributed in the USA by TVOne Multimedia Solutions), Extron Electronics, Magni Systems, Digital Vision, Communication Specialties and ADDA Technologies.

Another type of encoder, with additional features, is the video-overlay device commonly known as a "genlock". A genlock not only encodes the VGA or SVGA signals to NTSC or PAL, but also allows the mixing of computer graphics on top of an incoming video signal. Most genlocks require computer control, as some are internal ISA cards that go into one of the system slots. Please check the Scala World Wide Web site (http://www.scala.com) to see if a special Scala EX module (a kind of driver) is available to control a genlock device in which you are interested.

Genlock manufacturers include Digital Vision, Magni Systems, Vine Micros, I.DEN and PowerPixel Technologies.

Laptop/notebook computer considerations

Laptop and notebook computers (portables) have come a long way. Indeed, many of today's portables are specifically designed or configured for multimedia. These multimedia portables are probably best suited for use with Scala products.

Most of the recommendations for portable computers are essentially the same as for desktop systems, with the understanding that cost and available technology place limits on the level of performance that can be expected for a "real-world" system. It can be difficult to find and equip a portable that performs as well as a high-end desktop system, but careful selection can yield a system that will give you excellent multimedia output.

Things to look for:

CPU – A 75 MHz 486 or faster CPU is recommended. Some of the newer notebooks now offer Pentium CPUs with speeds up to 133 MHz.

VESA Video Local Bus (VLB) or PCI VGA display subsystem – These subsystems offer the fastest graphics and are at least twice as fast as a standard portable's VGA display subsystem.

We do not recommend using a portable that offers only 512 KB of video memory. While Scala products will work with this small amount of memory, the display will probably be

too slow for fast, smooth presentations. Most multimedia portables sold today include 1 MB of video memory standard. Please note that there are some chipsets that report only 512 KB of display memory, but actually have 1 MB. Portables with the Western Digital Rocketchip™ are one example.

Secondary Cache – Many of today's portables now include a secondary cache. Look for a system that has at least a 16 KB cache, built in the CPU (in a 486 class CPU) or as part of an external Secondary (L2) Cache. A 256 KB Cache is preferable on high-speed 486 (100 Mhz) or Pentium class portables.

CD-ROM – Double-speed is standard and usable in must situations, but a Quad-speed is preferable. In relation to multimedia, check to see how consistently and reliably the system's CD-ROM transfers data. These are more important factors than speed.

Hard Drive – Portables that feature removable drives or can hold multiple removable drives are recommended. This allows you to have a separate drive that contains your presentation and another containing your general business software and files. This helps prevents mishaps like accidental erasures. A large capacity hard drive is recommended (450 MB or more).

LCD Display – Active Matrix (TFT) is preferable over Dual-Scan (DS) color LCD displays. TFT is more expensive, but offers a substantially clearer display, especially when moving graphics or video is involved.

Audio – Many of today's multimedia portables include Sound Blaster compatible audio. Make sure that the included drivers are fully Sound Blaster 1.0, 1.5, 2.0 or Sound Blaster 16 compatible.

Some high-end multimedia portables offer MIDI wavetable synthesis. Check to make sure that the included drivers are fully MPU-401 AT hardware compliant. The MPU-401 AT is a universal standard for MIDI devices connected to a PC or portable.

MPEG Playback – Today's multimedia portables now offer MPEG playback. Note that Scala works only with those portables that offer MPEG playback in hardware, not software. Make sure that the DOS drivers included are fully OM-1 compliant. The OM-1 standard allows DOS programs to control MPEG playback hardware. However, due to proprietary hardware on some portables, there is no guarantee that the MPEG EX will work with your system's supposedly OM-1 compliant MPEG hardware and/or drivers. Please check the Scala Web site to find out if there is a special EX available to support MPEG on your portable system.