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SIGGRAPH SHOWS GRAPHICS GROWTH

The 3D Market Gets Lively in New Orleans

By Peter N. Glaskowsky {8/21/00-02}

After several years of rapid growth in the PC 3D markets, the past year has been marked by a major consolidation. The workstation market has been especially hard hit and is now down to just a few healthy participants, plus a few more with uncertain chances. Apple's Macintosh, which once dominated in professional applications for 2D graphics, is today best known for the consumer-friendly iMac.

At Siggraph 2000 held in New Orleans in July, there were clear signs that all these markets may be rebounding from their recent low points. New products and strategic relationships suggest that the 3D industry is entering a period of increased prosperity, brought on in part by a reduction in the number of participants—and a corresponding reduction in wasted R&D funding.

Milestones Passed in 3D-Workstation Market

A major milestone in 3D-chip performance was reached by NVIDIA, with its announcement of the Quadro 2 GTS, a version of the company's GeForce2 GTS (see *MPR 7/24/00-02*, "NVIDIA Expands GeForce Line") adapted for professional users. The chip is the first to render one billion pixels per second, with four dual-textured pipelines running at 250MHz. The faster clock speed is the primary hardware difference from the 200MHz GeForce2 GTS, although the new chip will also come with drivers optimized for professional applications.

NVIDIA also announced a deal with add-in card maker Elsa (*www.elsa.com*), in which Elsa's workstation graphics-card designers will now work for NVIDIA. The resulting board-level products will be marketed by NVIDIA solely to workstation OEMs, while Elsa has exclusive rights to all other workstation sales channels, such as system integrators and distributors. The agreement does not affect NVIDIA's non-workstation products.

NVIDIA told *Microprocessor Report* that the engineers transferred from SGI earlier this year (see *MPR 9/13/99-msb*, "SGI Reorganizes, Allies With NVIDIA") have completed their work on 3D-graphics products for SGI. These engineers are now working on future single-chip NVIDIA products for the mainstream and PC-workstation markets.

SGI also made news in the workstation market by signing a deal with Intergraph that gives SGI exclusive rights to Intergraph's Zx10 Windows NT workstations. In return, Intergraph promised to buy $100 million in SGI products and services over the next three years.

SGI will market the Zx10 under its own brand, effectively eclipsing the disappointing 230, 330, and 550 workstations it introduced earlier this year (see *MPR 5/29/00-04*, "SGI Unveils Generic x86 Workstations"). While SGI used only commodity parts for its systems—such as Intel core logic and NVIDIA graphics—the Zx10 workstations are based on faster proprietary core logic and are available with 3Dlabs' high-end Wildcat graphics cards. SGI's 230, 330, and 550 workstations will remain available, but we expect the Zx10 to do better in the market, especially with SGI's backing.

Maybe It's Safe to Go Back in the Water?

Niche 3D add-in card maker Appian Graphics, which specializes in graphics boards that can drive multiple monitors, has become the first company to enter the 3D-chip business

since 1998. The new Appian AGX is based on the 3Dlabs Permedia technology; the AGX's 3D core is comparable to that in 3Dlabs' GLINT R4. The Appian chip enhances the original 3Dlabs design with dual 330MHz RAMDACs, two 24-bit digital output ports, a faster (150MHz) 128-bit SDRAM/SGRAM controller, and other features. The chip is a multifunction PCI device, allowing Windows 2000 to recognize its dual-monitor capability. Other chips that can drive dual displays appear as one display device to Windows 2000, causing centered dialog boxes to be split across the screens.

The Appian AGX is implemented in a 0.25-micron, five-layer-metal process and has 13.5 million transistors. Packaged in a 569-pin BGA, it consumes 6W of power from a core supply of 2.5V; the chip is compatible with 3.3V and 1.5V I/O. Appian (*www.appian.com*) will offer the chip in its own cards for Windows systems this fall, with Mac and Linux products to come later.

At the show, 3Dlabs (*www.3dlabs.com*) made several announcements of its own. The company rolled out both the new Oxygen GVX420 card with the Gamma G2 geometry engine plus dual GLINT R4 rasterizing chips and the GVX1 Pro card with one G2 and one R4. (These chips were first announced by 3Dlabs at the 1998 Microprocessor Forum; see *MPR 11/16/98-05*, "3Dlabs Flies With Jetstream.") The GVX420 ($2,499) will ship this month with 128M of local memory and dual-display support; the 64M, single-display GVX1 Pro will sell for $1,199 starting in September.

Formac (*www.formac.com*) introduced a Mac product based on 3Dlabs' older GVX210 board, which combines one Gamma G2 with two GLINT R3 chips. The 64M ProFormance 4 board, which will ship in 3Q00, becomes the highest-performance Mac-compatible graphics card for professional applications. Professional 3D content-creation tools, such as Newtek's Lightwave, are already available on the Mac; Alias|Wavefront's Maya—generally regarded as the best 3D-modeling program on the market—is due out next year for Mac OS X; and low-cost dual-processor PowerMac systems were recently announced by Apple. All these developments are regaining the attention of graphics-chip makers for the Mac.

As expected, 3Dlabs closed its acquisition of Intense3D, the Intergraph spinoff that makes the Wildcat series of graphics cards (see *MPR 9/13/99-04*, "New Chips, New Ideas at Siggraph '99"). At Siggraph, 3Dlabs showed off the next-generation Wildcat II, a product that will set new records for 3D-CAD performance when it ships later this year. In demonstrations of preproduction boards, the Wildcat II achieved a score of more than 85 frames per second on the industry-standard ProCDRS-02 benchmark. This score is twice that of the Wildcat 4110, the Intense3D product launched at Siggraph last year at a "comparable" price. The Wildcat II will replace the Wildcat 4110 and augment the Wildcat 4210 at the high end of the combined 3Dlabs product line.

Because of forthcoming products like Wildcat II, the SPEC organization's Graphics Products Characterization (GPC) group (*www.spec.org/gpc*) rolled out a revised version of the ProCDRS-02 benchmark. The primary change in the new benchmark is an increase in the complexity of the 3D models used in the tests. The increased complexity will reduce displayed frame rates, which were threatening to exceed the capabilities of commonly used monitors. For the time being, results from the new version 6.1.2 of the benchmark will supplement results from version 6.1.1. Eventually, the new version will replace the old.

Specialty 3D Products Defend Niches

In another announcement, 3Dlabs said it will collaborate with RTViz, a division of Mitsubishi Electric, to more tightly integrate the companies' respective products. RTViz makes the VolumePro family of 3D-volume rendering boards (see *MPR 10/25/99-08*, "VolumePro 1000 Expands 3D Vision"), the only such products on the market. VolumePro boards require a separate 3D accelerator to perform the final step of the volume-rendering process and provide compatibility with conventional 3D and 2D GUI software. The linkup thus makes 3Dlabs the preferred supplier of 2D/3D accelerators for use with VolumePro cards. The company is now working to optimize the drivers for its Oxygen boards to work with VolumePro, but the companies are likely to work even more closely together in the future.

Advanced Rendering Technology's AR250 (see *MPR 9/15/97-02*, "New 3D Engines Redefine the Market") and new AR350 chips own another segment of the 3D market: ray-tracing acceleration. The new AR350 integrates two AR250-class cores on a single chip and runs at a higher frequency than its predecessor by virtue of its more advanced process technology. The AR250 was designed for parallel configurations, so it was relatively easy for ART to create the new chip.

At Siggraph, ART (*www.art-render.com*) also introduced the RenderDrive RD5000, a ray-tracing rendering subsystem in a box targeted at high-end users in the movie and broadcast industries. The RD5000 combines an unspecified number of AR350 chips, 768M of DRAM, and a 7G hard-disk cache. ART says the RD5000, when it ships in October for $24,995, will be about 40 times faster at typical ray-tracing operations than an 800MHz Pentium III system.

Although the company is on only its second generation of chips, it is already looking forward to the day when real-time ray tracing becomes feasible. This capability will allow ART to expand into the real-time visualization market, giving the company its first taste of the intense competition that characterizes most of the 3D industry.

Another company leapt into the visualization fray at Siggraph, one with a more widely recognized name: Sony. Sony demonstrated the GSCube, a new 3D content-development system based on the PlayStation 2 architecture (see *MPR 4/19/99-01*, "Sony's Emotionally Charged Chip"). The GSCube combines 16 graphics units with two layers of video mixers to drive a single display with HDTV resolution—1,920 × 1,080 pixels—refreshed 60 times per second, twice the frame rate of the HDTV standard.

Each graphics unit is similar to a single PlayStation 2 (PS2), with one Emotion Engine and one Graphics Synthesizer I-32 chip. The I-32 chip used in the GSCube is an enhancement of the PS2's Graphics Synthesizer, with eight times the integrated DRAM: 32M per chip. The larger on-chip memory is sufficient for HDTV rendering, since each HDTV frame has about six times as many pixels as an NTSC frame. Each unit also has 128M of local DRAM, four times the amount found in a PlayStation 2.

Sony says the GSCube has a total of 97.5 GFLOPS of peak floating-point throughput, 50.3GB/s of local memory bandwidth, and an astounding 755GB/s of frame-buffer bandwidth. The last figure is the product of the 2,560-bit interface to the on-chip frame-buffer memory in the Graphics Synthesizer, the chip's 147.5MHz clock speed, and the total of 16 such chips per system.

The system can draw 1.2 billion polygons and 37 billion pixels per second in 32-bit color. Demonstrations of the system at Siggraph clearly showed the GSCube's ability to render film-quality 3D animation in real time. At the Sony booth, companies including Eon Entertainment, Square Co., and PDI/DreamWorks showed works in progress running on the GSCube. Sony has also made deals with software providers such as Softimage, Criterion Software, and Intrinsic Graphics to provide tools and applications for the GSCube.

Though the system is in some ways a competitor to high-end visualization systems such as SGI's Onyx 3000, with its Infinite Reality graphics subsystem (see *MPR 8/7/00-01*, "SGI Updates Systems, CPU Plans"), the GSCube is also an excellent complement to such products. The GSCube should offer a better price/performance ratio for playback and simple content-creation uses, although the Onyx and similar systems have superior tools support and much better scalability. Indeed, Sony showed the GSCube running as a peripheral to an SGI Origin 3000 supercomputer, a configuration that could be the hot ticket for Sony's most demanding customers.

But Wait, There's More

Other pro-3D vendors also made significant product introductions at Siggraph. FGL Graphics, a division of S3, introduced two new members of the Fire GL family of graphics boards. Like the Fire GL1, the new Fire GL2 and Fire GL3 are based on graphics chips from IBM. The new boards use the IBM GT1000 geometry engine and RC1000 rasterizer. The 64M Fire GL2 will sell for under $1,200 when released later this fall; the 128M Fire GL3 will be priced under $2,000 and support a second display. FGL Graphics (*www.BeTheCreator.com*) says the new boards will achieve ProCDRS-02 scores over 70fps on the v6.1.1 benchmark. Raw performance numbers were given as 27M polygons/s and 200M single-textured, trilinear-filtered pixels/s.

HP announced Linux support for its visualize fx^5 and fx^{10} workstation graphics boards, as well as preconfigured Linux workstations in the company's pl and xl series, both of which are available with visualize graphics. The visualize fx^5 and fx^{10} boards, introduced in June, are updates of the company's earlier visualize fx products.

Sun demonstrated its Expert3D board, introduced in April and supported on the company's Ultra 60 and Ultra 80 workstations and in multiboard configurations on Sun's Enterprise 450 Workgroup Server. Three boards together can drive various commercial "visualization centers"—systems that project high-resolution graphics onto large screens to create seamless panoramic displays—at resolutions as high as 5,760 × 1,200 pixels. A number of companies at Siggraph were showing visualization centers, some large enough to display a full-size image of an automobile.

Intel and Macromedia announced at the show that the two companies will codevelop 3D extensions for Macromedia's Shockwave Player, an interactive Internet streaming media application. The extensions will use adaptive geometry technology (also known as multiresolution meshing; see *MPR 6/21/99-04*, "A Concise Review of 3D Technology") to adapt 3D-object detail to the available bandwidth and processing resources.

The Intel/Macromedia effort overlaps somewhat with the work of the Web3D Consortium (*www.web3d.org*), Hypercosm (*www.hypercosm.com*), and other organizations developing 3D technology for the Web. Given that 3D is rarely used on the Internet today, however, more competition is probably a good thing.

This year's Siggraph was most notable for the signs of growth in markets that have had a rough time over the past few years—workstation graphics, Apple's Macintosh, and the 3D-chip business itself. New products and new vendors in these markets suggest that the recent declines are just part of the cyclic nature of the computer industry. We hope these markets will continue to recover, and we look forward to what Siggraph will bring next year.