Jon Peddie

The History of the GPU - New Developments

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Foreword

Real-time 3D graphics and consumer gaming markets have been responsible for driving tremendous innovations to feed the insatiable appetite of high-resolution, photo-realistic gaming technologies. Capturing the interest of computer scientists and creative hardware developers around the world, the development of the GPU has led to advancements in the computational capabilities and memory systems to feed them. Advanced algorithms and APIs to manage large, complex data systems—along with the move to general-purpose programming models with exploitation for general-purpose computing, high-performance computing, cryptocurrency, and artificial intelligence—have further propelled the GPU into an unprecedented pace of development.

In the early 1990s when I first became involved with the commercialization of 3D graphics technology, Jon Peddie was already a well-known graphics market analyst. I joined a team of very seasoned hardware and software developers at GE Visual Systems in Daytona Beach, where large-scale military and NASA training systems were developed. We created some of the first consumer commercial uses of the technology with Sega Models 1 and 2 hardware, initially sporting 180 k polygons per second and 1.2 M pixels per second with a resolution of 496×384 in the arcade gaming space. After acquisition by Martin Marietta and then Lockheed Martin, real 3D was formed where I was part of a small team that developed Intel 740 3D architecture that started Intel's 3D rendering roadmaps. Jon has shared some unique perspective on I740 development and Intel's entry into 3D graphics that a quick search will reveal. His second book of this series will cover industry trends and struggles during this period. I joined ATI Technologies in 1999, later acquired by Advanced Micro Devices, Inc. (AMD) where I have had the pleasure of advancing the Radeon product line, console gaming systems, and our latest RDNA/CDNA products that power some of the most exciting developments of the century. Over the years, I have regularly read JPR research report by Jon to understand his broad prospective of relevant emerging trends in our industry. I have had the pleasure of meeting with Jon on several occasions at product introduction events and industry conferences to chat about trends, motivations, technical detail, and the successes in real-time graphics.

In Jon's third book of a three-book series on the History of the GPU, he shares an interesting and knowledgeable history of the chaotic and competitive time that forged today's leaders in the 3D gaming hardware industry. Jon draws on the breath of his relationships formed over the years and his knowledge to break these contributions into six eras of GPU development. In each chapter, Jon not only covers innovations and key products, but also shares his perspective on company strategy, key leaders, and visionary architects during each era of development. I hope that you will thoroughly enjoy this series and the final book while learning about the tremendous growth of technology and the hard work, risk, and determination of those who have contributed to today's GPU success.

Michael Mantor
AMD Chief GPU Architect
and Corporate Fellow

Preface

This is the third book in the three-book series on the History of the GPU.

The first book covered the history of computer graphics controllers and processors from the 1970s leading up to the introduction of the fully integrated GPU first appearing in game consoles in 1996, and then the PC in 1999. The second book in the series covers the developments that led up to the integrated GPU, from the early 1990s to the late 1990s.

The GPU has been employed in many systems (platforms) and evolved since 1996.

This final book in the series covers the second to sixth eras of the development of GPU on the PC platform, and other platforms. Other platforms include workstations, game machines, and others, such as various vehicles—GPUs are used everywhere in almost everything.

Each chapter is designed to be read independently, hence there may be some redundancy. Hopefully, each one tells an interesting story.

In general, a company is discussed and introduced on the year of its formation. However, a company may be discussed in multiple time periods in multiple chapters depending on how significant their developments were and what impact they had on the industry.

History of the GPU		
Steps to Invention Book 1	Eras and Environment Book 2	New Developments Book 3
1. Preface	1. Preface	1. Preface
2. History of the GPU	2. Race to build the first GPU	2. Second Era of GPUs (2001-2006)
3. 1980-1990 Graphics Controllers on Other Platforms	3. GPU Functions	3. Third to Fifth Era of GPUs
4. 1980-1989 Graphics Controllers on PCs	4. Major Era of GPUs	4. Mobile GPUs
5. 1990-1995 Graphics Controllers on PCs	5. First Era of GPUs	5. Game Console GPUs
6. 1990-1999 Graphics Controllers on Other Platforms	6. GPU Environment-Hardware	6. Compute GPUs
7. 1996-1999 Graphics Controller on PCs	7. Application Program Interface (API)	7. Open GPUs
8. What is a GPU	8. GPU Environment-Software Extensions	8. Sixth Era of GPUs

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I mark the GPU's introduction as the first fully integrated single chip with hardware geometry processing capabilities—transform and lighting. Nvidia gets that honor on the PC by introducing their GeForce 256 based on the NV10 chip in October 1999. However, Silicon Graphics Inc. (SGI) introduced an integrated GPU in the Nintendo 64 in 1996, and ArtX developed an integrated GPU for the PC a month after Nvidia. As you will learn, Nvidia did not introduce the concept of a GPU, nor did they

develop the first hardware implementation of transform and lighting. But Nvidia was the first to bring all that together in a mass-produced single chip device.

The evolution of the GPU however did not stop with the inclusion of the transformation and lighting (T&L) engine because the first era of such GPUs had fixed function T&L processors—that was all they could do and when they were not doing that they sat idle using power. The GPU kept evolving and has gone through six eras of evolution ending up today as a universal computing machine capable of almost anything.

The Author

A Lifetime of Chasing Pixels

I have been working in computer graphics since the early 1960s, first as an engineer, then as an entrepreneur (I founded four companies and ran three others), ending up in a failed attempt at retiring in 1982 as an industry consultant and advisor. Over the years, I watched, advised, counseled, and reported on developing companies and their technology. I saw the number of companies designing or building graphics controllers swell from a few to over forty-five. In addition, there have been over thirty companies designing or making graphics controllers for mobile devices.

I've written and contributed to several other books on computer graphics (seven under my name and six co-authored). I've lectured at several universities around the world, written uncountable articles, and acquired a few patents, all with a single, passionate thread—computer graphics and the creation of beautiful pictures that tell a story. This book is liberally sprinkled with images—block diagrams of the chips, photos of the chips, the boards they were put on, and the systems they were put in, and pictures of some of the people who invented and created these marvelous devices that impact and enhance our daily lives—many of them I am proud to say are good friends of mine.

I laid out the book in such a way (I hope) that you can open it up to any page and start to get the story. You can read it linearly; if you do, you'll probably find new information and probably more than you ever wanted to know. My email address is in various parts of this book, and I try to answer everyone, hopefully with 48 hours. I'd love to hear comments, your stories, and your suggestions.

The following is an alphabetical list of all the people (at least I hope it's all of them) who helped me with this project. A couple of them have passed away, sorry to say. Hopefully, this book will help keep the memory of them and their contributions alive.

Thanks for reading

Jon Peddie—*Chasing pixels, and finding gems*

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