

## Intergraph: Computer Pioneer

*Innovations in hardware, processors, and networking*

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*operations more efficiently, it is the InterPLOT 52 III 1964 that is the first true standalone workstation.*

### 1980

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In 1980, Intergraph released the first computer graphics terminal to use raster technology. The black-and-white raster display technology gave new meaning to the most sought-after capability in computer graphics display – *interactive response*. The debut of dual 1280 x 1024 pixel displays established the industry standard for high-resolution displays -- the same *de facto* standard as today. Graphics data could be continuously repainted over the entire surface of the screen. Users could view design changes as they made them – **interactively** – without the interruption of complete screen update.



M&S Computing changed its name to Intergraph, a reflection of the focus on **Interactive Graphics**.

#### *industry milestones:*

- IBM and Bill Gates met to discuss an operating system for the “Acorn” – **the new PC**.
- Digital Equipment Corp. introduced the **VAX-11/750**
- Intergraph introduced a patented **Floating Menu tablet** that held user command menus and could be moved freely about a large digitizing surface such as maps and drawings.

### 1981

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In 1981, Intergraph introduced a color terminal that featured a 4096-color palette. This option supported simultaneous use of as



many as 128 colors in a given drawing, enabling the operator to differentiate elements in a complex drawing or in drawing overlays. Intergraph transformed Digital's VAX and MicroVAX general-purpose computers into a graphics computer by adding a file processor, graphics processor, and a communications processor.

#### *industry milestones:*

- In 1981, **IBM introduced the IBM PC**. It was built from off-the-shelf parts (open architecture) and used the Intel 8088 microprocessor.
- Intergraph introduced a **2-megabit/second LAN** -- a predecessor to Ethernet, using the same CSMA/CD collision avoidance algorithms Ethernet would later use.
- Intergraph became a publicly traded company: <Nasdaq: INGR>
- Intergraph introduced the industry's first **1280 x 1024 non-interlaced color monitors**.

## 1982

In 1982, Intergraph's systems had three processors, nearly 1 MB of memory, and increased display capabilities. The LSI-11 was replaced with the Motorola 68000, which served as a traffic cop. With a dedicated graphics processor, it was one of the first terminals with the ability to do display list processing for rotation of 3D elements in real time, dynamic pan, and continuous zoom in or out.

#### *industry milestones:*

- In 1982, Sun Microsystems was incorporated with four employees. **Sun introduced its first workstation**, based on the Motorola 68000 microprocessor.
- Intel introduced the **286 (also known as 80286) microprocessor**.
- Intergraph's terminals included a **Graphics Processor** for 3D element rotations, surface shading, perspective calculations, continuous zoom in and out, and polygon processing. It operated in parallel with the central computer, freeing it for other work.

## 1983



database.

**1983: Intergraph started shipping the award-winning InterAct and InterPro.** The InterAct, with its sculptured surfaces, won two of the three national design awards for new products. These advanced terminals were powered by the latest VAX and MicroVAX processors from Digital. The terminals used microprocessors to control the display of the graphics image locally but still relied on the VAX processor to manage the Intergraph application products that created and manipulated the graphics

*industry milestones:*

- Compaq, which was founded in 1982, shipped its first portable PCs – **53,000 of them.**

**1984**

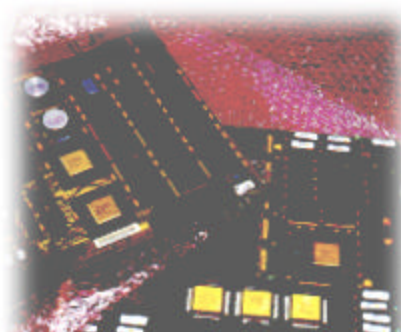
**At the AUTOFACT industry tradeshow, Intergraph introduced the InterPro 32, the company's first 32-bit standalone workstation.** This multipurpose professional workstation functioned as an Intergraph graphics workstation, an engineering workstation running under UNIX, and a terminal emulator for several industry-standard terminals. A true 32-bit workstation, it came standard with 2 MB of memory, a 26-MB hard disk, and a 1.6 MB floppy disk. In a remarkably small package, it featured:



- A 32-bit National Semiconductor 32032 microprocessor as the UNIX engine
- An Intel 80186 microprocessor as the I/O processor
- An Intergraph Raster Operations Processor for color graphics operations
- A 1-million pixel frame buffer and video generation circuitry to format image information and send it to the monitor for display

*industry milestones:*

- Apple introduced the **Macintosh.**
- Digital Equipment Corp. introduced the **VAXstation I**, their first 32-bit single-user workstation.
- Compaq introduced their **Compaq Deskpro desk model PC.**
- IBM introduced the **PC/AT**, based on the Intel 286.
- **MIPS Computer Systems Inc.** was founded.

**1985**

**Intergraph began the search for a more powerful processor for the next generation 32-bit workstation.** At the Advanced Processor Division (APD) of Fairchild Semiconductor, Howard Sachs, the team leader, had come from Cray and wanted to take mainframe architecture and focus it into a very small set of silicon. Sachs and his team had been designing and developing the Clipper since 1982 and showed the Clipper module to Bruce Imsand, Intergraph's VP of Engineering. Fairchild needed a workstation developer as an Alpha site, and Intergraph's InterPro 32 was the

perfect match. Intergraph became the Alpha site, working with Fujitsu to build the first Clipper chip – the C100.



Out of the ideas of the Fairchild team would come patent applications filed in 1985. Eight years later in 1993, this same technology would become an essential element of Intel's Pentium microprocessor family:

- Quadword Boundary Cache System
- Method and Apparatus for Addressing a Cache Memory
- Apparatus for Maintaining Consistency of a Cache Memory with a Primary Memory
- Cache - MMU System
- Cache Providing Caching/Non-caching Write-through and Copyback Modes for Virtual Addresses and including Bus Snooping to Maintain Coherency

#### *industry milestones:*

- Intel introduced the **386**.

## 1986

**In 1986, at the Design Automation Conference, Intergraph introduced the InterPro 32C – the industry's first workstation with a processing speed of 5 million instructions per second (MIPS).**

This RISC-based computer was powered by the Clipper C100 chip from Fairchild Semiconductor and offered workstation performance that was five times more powerful than the VAX-11/780. Two separate 4K byte cache memory management units were linked to the CPU chip via a dual, dedicated 32-bit bus architecture. The unique combination of cache design and size provided for unparalleled instruction processing speed. The Clipper processor utilized the UNIX System V operating system. The second processor, an Intel 80186, was the I/O processor. And an Intergraph Raster Operations Processor executed the graphics commands and display operations.



#### *industry milestones:*

- Intergraph introduced the industry's first workstation to reach **5 million instructions per second (MIPS) processing speed**.
- IBM introduced the **IBM RT PC line of workstations**, using the RISC architecture.
- Intergraph received the **U.S. Senate's Productivity Award**, presented annually to an

American company considered to be the model of productivity.

## 1987

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**By 1987, Intergraph had designed 15 workstation models and 3 servers around the Clipper.** By 1987, the C100 chipset was a mature product, with robust compilers and system software that come only with two years of development time.

However, by April 1987, Intergraph ran into trouble when Fairchild failed to provide enough computer chips for the workstations. Intergraph lost approximately \$25 million in revenue while waiting for the Fairchild order.

In October, ending the uncertainty over Fairchild's future, Intergraph purchased Fairchild's Advanced Processor Division, acquiring all Clipper assets. Among the assets were the patent applications filed by Fairchild that would become Intergraph patents.

## 1988

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**In 1988, Intergraph introduced the industry's first 27-inch, 2-megapixel display and the InterPro 3070 workstation, which was based on the Clipper C300.** The C300 offered a number of improvements over the C100, especially in processor speed and in floating point performance. In 1986, the C100 processor ran at 33 MHz, and in 1988, the C300 processor ran at 50 MHz (and even 80 MHz in some implementations). By comparison, Sun's initial (1987) SPARC implementation was at 16 MHz, and MIPS Corporation's initial

(1986) implementation was at 8 MHz. From 1987, when Intergraph acquired the Advanced Processor Division of Fairchild, through 1993, Intergraph would offer a broad variety of workstations based on the increasingly more powerful Clipper processors. The workstations ranged from 5 to 20 MIPS in processing power and were available for the desktop or for a production environment.

## 1989

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### *industry milestones:*

- Sun introduced the **SPARCstation 1** system.
- Intel introduced the **486**.
- Digital Equipment Corporation introduced the **VAX 9000** mainframe.

- Compaq introduced the **first notebook PC**, the Compaq LTE.
- **Apollo Computer** was bought by Hewlett-Packard.

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Page last modified: July 29, 2001  
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