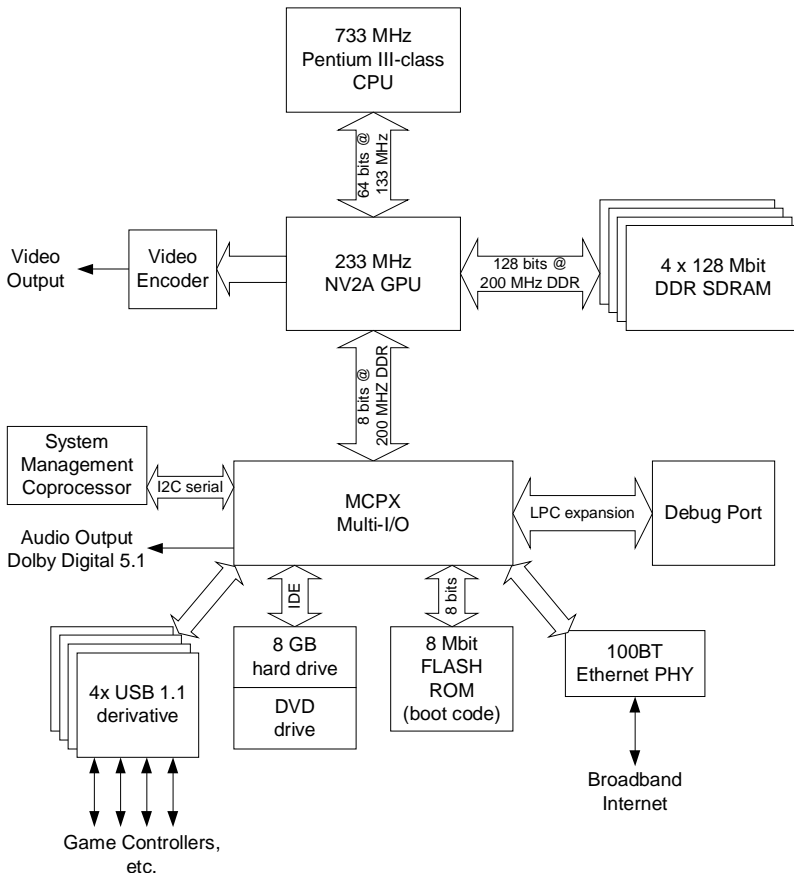# Xbox Architecture

Before diving into the pattern matching examples, we will need a pattern reference. Let's take this opportunity and study the Xbox internal architecture as the pattern reference, and eventually compare the Xbox architecture to a PC and to another video game console.

High-Level Organization

The Xbox has a Pentium-III class processor running at 733 MHz as its CPU. The "S-Spec" number on the CPU is closest to that of a Mobile Celeron. The CPU is connected via a standard P6 133 MHz Front Side Bus (FSB) to a graphics processing unit (GPU) plus northbridge combo chip called the NV2A by nVidia. Its closest PC relative is the nForce IGP chip by nVidia. Since the northbridge logic and the GPU are combined into a single

Figure 2-5:
     High level architectural view of the Xbox.

chip, the CPU and graphics processors can share a common bank of memory. This is called a "unified memory architecture" (UMA). Compared to a traditional split video/main memory architecture, a UMA costs less to build because it eliminates the dedicated video memory. However, UMA has lower performance in certain situations because UMA introduces memory access contention between the main processor and the graphics processor. In order to alleviate some of this contention, the system memory is frequently split into multiple banks. The nForce IGP, for example, splits the memory into two banks that can be independently accessed by both the GPU and the CPU through a switching network.
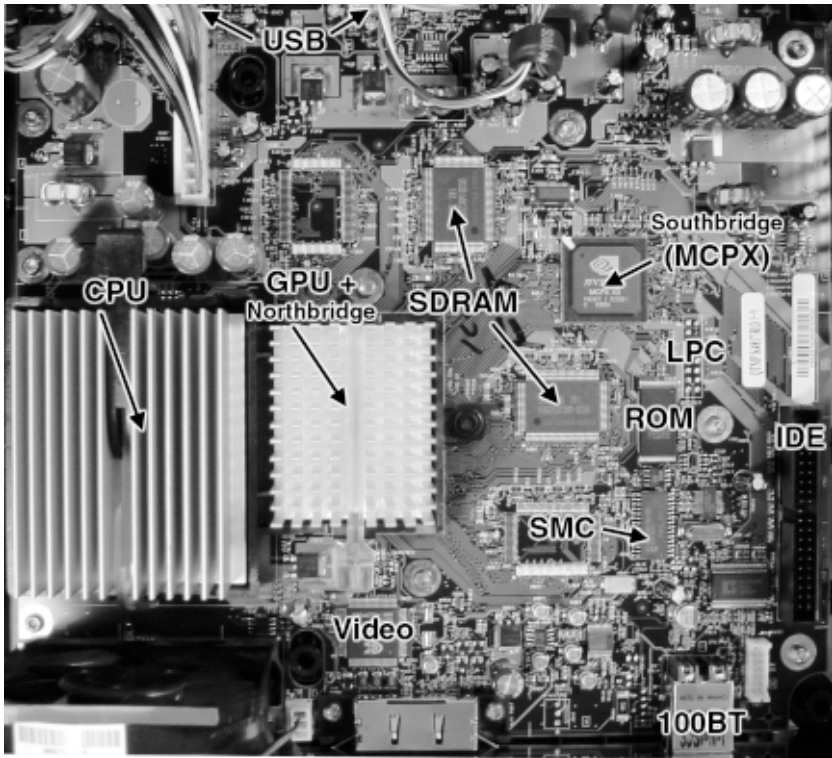
Figure 2-6:
Photograph of an Xbox motherboard with the major components labelled.

The GPU is connected to a kitchen-sink chip called the "MCPX" via a fast, narrow bus called a HyperTransport bus. The MCPX combines a southbridge chip plus almost all of the Xbox peripherals, including USB controllers, a legacy boot ROM interface, a Dolby digital audio processor, a mass storage IDE controller, an ethernet controller, and interfaces to system management functions.

The connectivity of all the major blocks that compose an Xbox are illustrated in Figure 2-5, and Figure 2-6 illustrates the location of these blocks on an actual Xbox motherboard.