Why talk about the PlayStation 2?

• Previous generation:
  - Xbox: > 24 million (May 10, 2006)
  - GameCube: 21.66 million (Sept. 31, 2007)
  - PlayStation 2: 117.89 million (March 31, 2007)

• Current generation (Sept 30, 2007):
  - Xbox 360: 13.4 million
  - Wii: 13.17 million
  - PlayStation 3: 5.59 million

Info from Wikipedia

Sega pledges PS2 support until 2010

• “This generation of hardware will have longer legs than any previous generation, and that’s definitely healthy for the industry.”

• “We expect Sony to price manage the PS2’s shelf life for another two or three years at least. PS2 high profile titles, especially ‘wide market’ and licensed titles, will absolutely be part of the Sega portfolio going forwards.”

From www.maxconsole.net/?mode=news&newsid=21102

PS2 high-level structure

From S. Ewen & L. Lemare, “Console Yourself”
### Special subprocessors

- **IOP Input/Output Processor**
  - Contains R3000 (provides PS1 compatibility)
  - 2 MB memory (same as PS1)
  - Controllers, memory cards, SPU2, DVD drive, USB, “Firewire”

- **SPU2 Sound Processing Unit**
  - 2 DSP cores, 48 channels
  - 2 MB sound memory


### Emotion Engine

- **300 MHz**
- **MIPS III core**
- **Two “Vector Units”**
- **Graphics Interface (GIF) for talking to Graphics Synthesizer (GS)**
- **Image Processing Unit**
  - MPEG2 decoder
  - Macroblock decoding
  - Vector quantization


### Emotion Engine - high-level structure

![Emotion Engine high-level structure](image)


### Vector Processing Units - capabilities

- **16, 16-bit integer registers**
- **32, 128-bit floating point registers**
  - Split into 32 bit words (x,y,z,w)
- **Four FMACs in one clock cycle**
- **1 floating-point division unit**
- **1 integer ALU**

Vector Processing Units - roles

• VPU0: intended for “thought simulation and physical simulation”
  – Outputs to ScratchPad RAM (SPR) for use by GS for VPU1
  – 4K data/4K instruction
• VPU1: intended for graphics pipeline
  – Geometry transformation
  – Vertex lighting
  – Outputs triangles (display list) to Graphic Synthesizer
  – 16K data/16K instruction

Caches and scratchpad

- Similar to old style PC L1 cache
- PS2 has small caches, as it was felt that a lot of dynamic data would not be in the cache for any length of time

From D. Carter, "Introducing PS2 to PC Programmers," AGDC 2002

Vector Processing Units

Typical vsm assembly (dual stream)

```
NOP
mulax ACC,VF02,VF06x
madlox ACC,VF04,VF06a
madlw ACC,VF05,VF06a
mulw.xyz ACC,VF01,VF06w
mulw.xyz ACC,VF01,VF06w,liq QVF06,7(VF02)
```

Typical VCL (single stream)

```
loop:
liq Vert, StartVert(VertPtr)

MatrixMultiplyVertex Vert, fTransform, Vert
div q, vf00[w], Vert[w]
mula.xyz Vert, Vert, q
madd.xyz acc, fScales, vf00[w]
ftoi4.xyz Vert, Vert
```
Graphics Synthesizer (GS)

- Receives display list of triangles from GIF
- Rasterizes triangles into frame buffer
- Handles z-buffering, alpha blending, texture mapping
- Outputs frame buffer to video
- Two sets of drawing environments (internal contexts)
  - GS knows which instructions came from VPU0 and VPU1
  - Merges sequences


PS2 Linux

- $200-$400 on eBay

Picture from presentation by H.S. Fortuna, “Video Game Programming Using The PlayStation2 Games Console,” www.ics.heacademy.ac.uk/events/presentations/91_BCSTalk.ppt