CS100: CPADS

Video

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Graphics Cards

- **Many companies make graphics cards**

  - ASUS, MSI, EVGA, XFX, etc.
    (and apparently none of them use lowercase letters in their name)

- **Most companies that make graphics cards, don't actually make the graphics chip (the GPU)**

  - Different companies design the GPU
    (just like Dell/HP/Sony don't make CPUs)

- **Graphics cards come in a wide range of prices and capabilities**

  - Higher performance = $$$

GPU (Graphics Processing Unit)

- **A processor designed specifically to accelerate graphics processing**

  - Parallel architecture

  - Several times more transistors than typical CPUs

    - NVIDIA's GK110 GPU include 7.1 **B**ILLION transistors

    - Intel Core i7 Quad contains about 750 Million transistors

  - More performance = more parallelism = more transistors = more $$$

  - Designed to support particular versions of DirectX and OpenGL (related to card family)
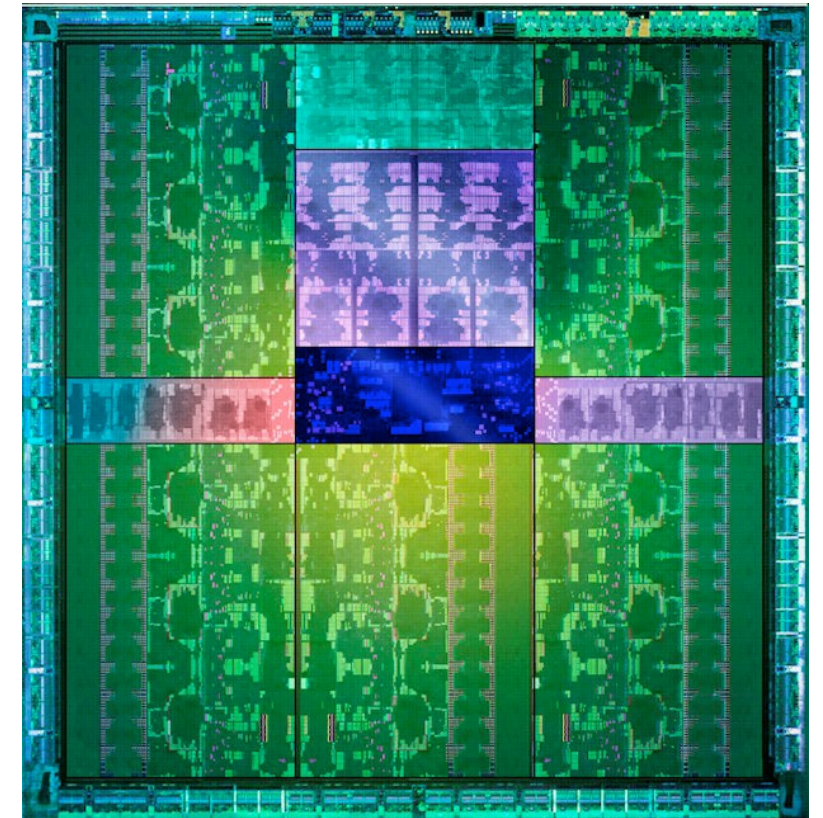
GPU (Graphics Processing Unit) (Cont.)

- **Performance of GPU is typically measured in billions or trillions of FLOPS (i.e. gigaflops/terraflops) by manufacturer**

- **Benchmarks are typically reported in FPS (Frames Per Second)**

- **Only a few companies that make GPUs**

  - NVIDIA, AMD, Matrox, Intel
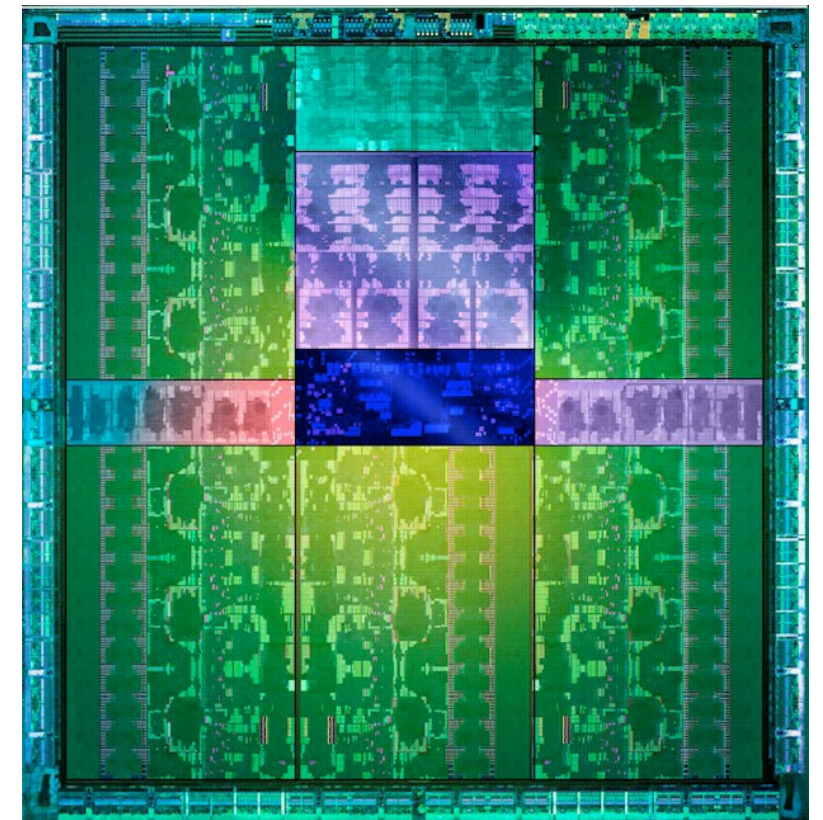
Video Memory

- **Graphics cards contain their own memory**

  - Older cards use standard DDR/DDR2

  - GDDR3/GDDR4/GDDR5 for more powerful/modern graphics cards

- **Memory sizes range from 64 MB – 6 GB**

  - More memory = higher resolutions at greater color depth

Graphics Card Interfaces : AGP

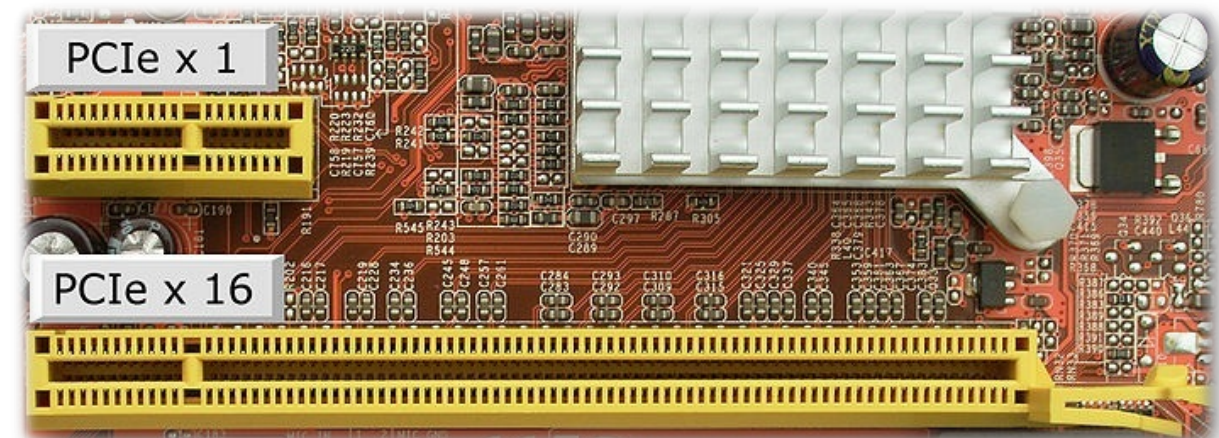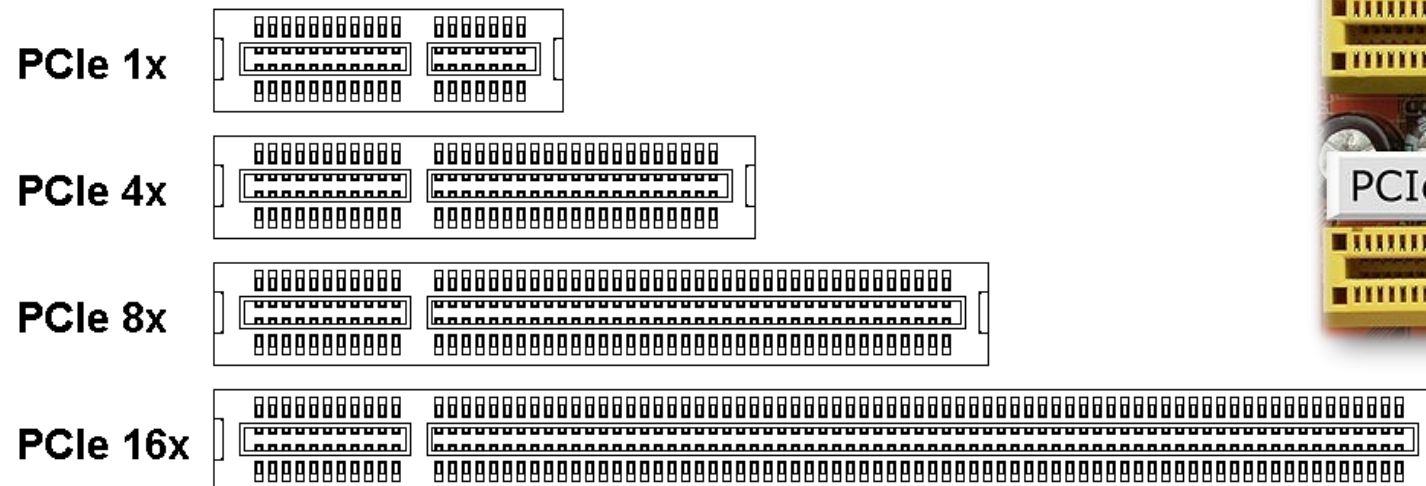- **AGP (Accelerated Graphics Port)**

  - Pretty old -- (~1997 - 2004)

  - Different speed ratings

    - AGP 1x | 266 MB/s

    - AGP 8x | 2133 MB/s

  - Superseded by PCIe
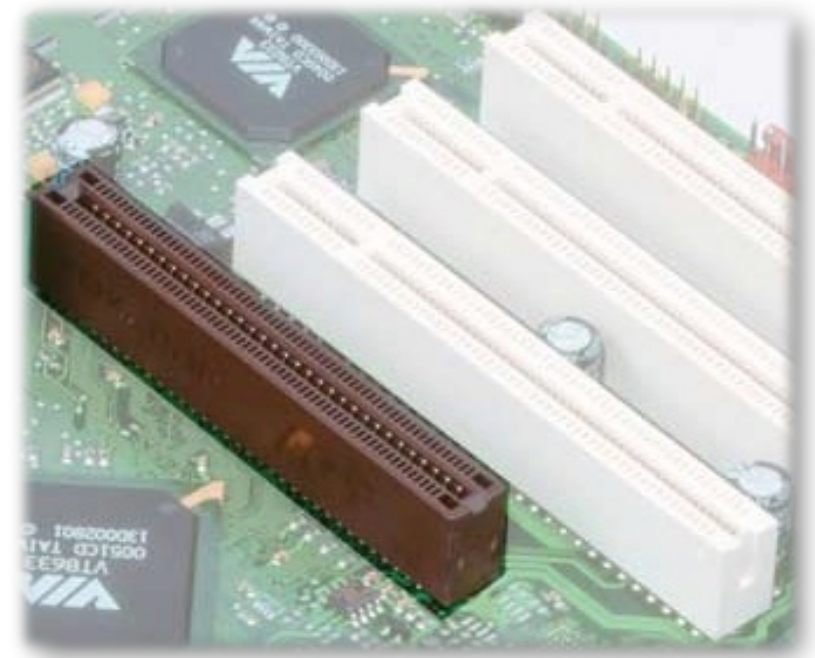
# Graphics Card Interfaces : PCIe

- **PCI Express (PCIe)**

  - ~2004 - ??

  - Many versions and speed ratings (x1, x4, x8, x16)

    - v1.x | 250 MB/s (Per Lane)

    - v3.0 | 1000 MB/s (Per Lane)

  - e.g. x16 Slot in PCIe v3.0
          16 Lanes * 1000 MB/s/lane = 16,000 MB/s = 16 GB/s

Scalability: SLI / CrossFire

- **Idea: when one graphics card isn't powerful enough ... add more!**

- **NVIDIA and ATI (now AMD) each have their own technology that allows multiple graphics cards to be linked together**
  - NVIDIA calls it SLI
  - ATI (now AMD) calls is CrossFire

- **Some graphics cards may even have dual GPUs on a single card, combine two of these to get a Quad SLI beast**

- **Requirements:**
  - Motherboard must support SLI/CrossFire
    - Motherboard chipset must support it
    - Must have multiple PCIe x16 slots (one for each graphics card)
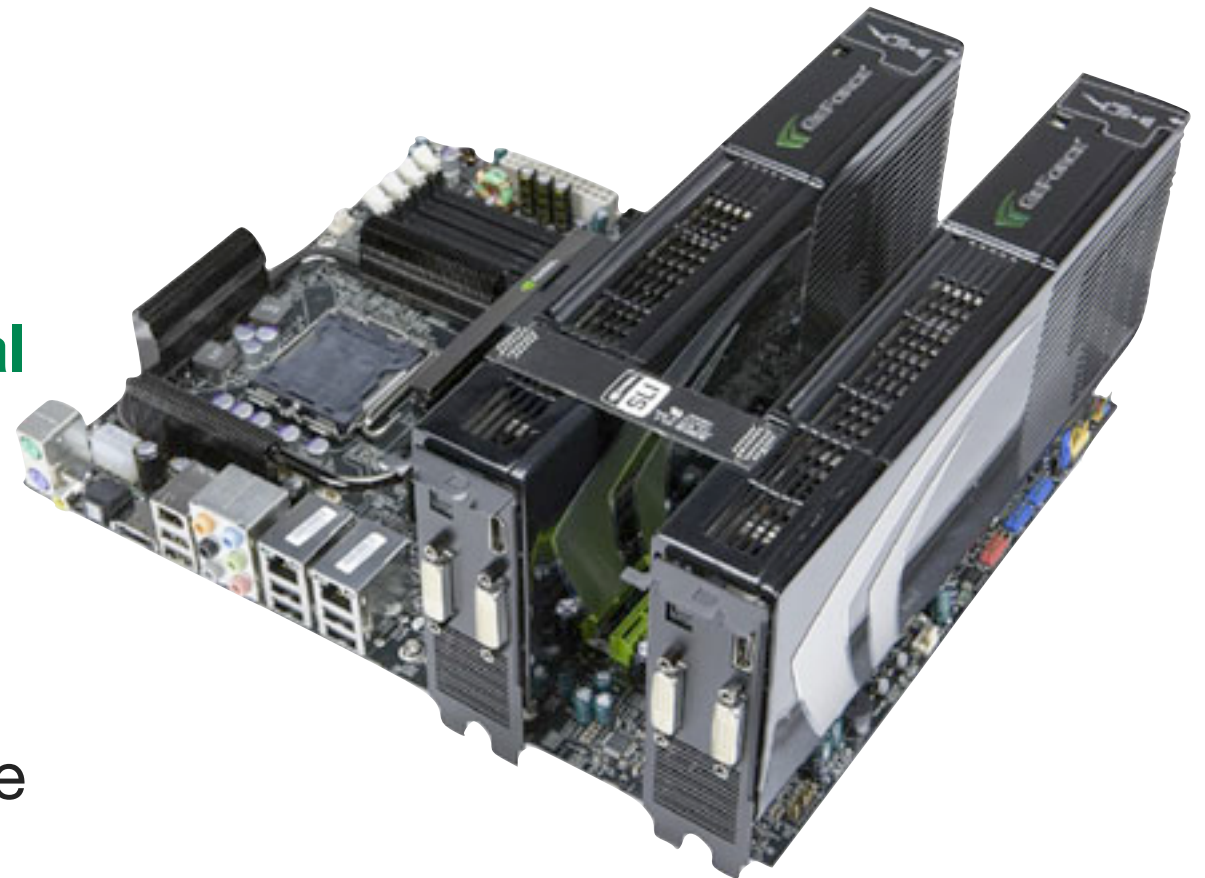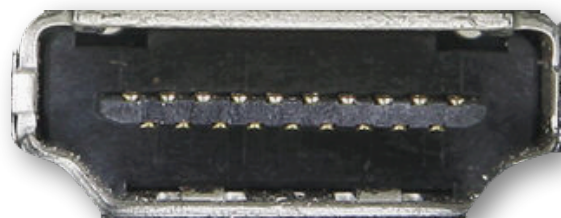
Graphics Card Connectors

VGA - Analog (old school)
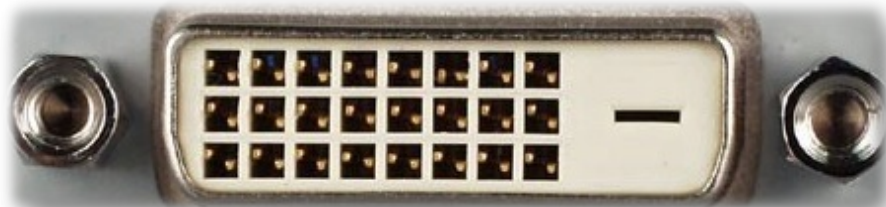
DVI - Analog/Digital

Displayport - Digital

HDMI - Digital
(includes HDCP)