ViewCast®

Computer System Selection for Osprey® Video Capture Cards

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Introduction

If you are going to purchase or build your own computer for video capture and streaming, there are some basic guidelines to consider. There is a wide variety of options in the computer world and nothing in computer technology stands still. Speed of the computer is no longer the minimum guide to selection. While horsepower certainly makes a difference in the applications, the motherboard architecture plays the key role in getting video data to the application.

Osprey® 700e HD and Osprey 820e System Requirements

The Osprey 700e HD and Osprey 820e high-definition (HD) video capture cards require intense bandwidth across the system bus, CPU, and memory. The host computer system capabilities (CPU, RAM, and motherboard) must be capable of processing this amount of data. The following system requirements are required to achieve desired HD performance.

- Install the Osprey video capture card in a PCI Express® (PCIe®) slot with direct lanes to the CPU or a Northbridge or IOH.
- The selection of CPU is critical. To process full HD video on both channels of the Osprey 820e, the minimum processors required are dual i7-3930K@3.2GHz. Use the table below as a suggested guide when selecting a CPU.

Table 1. Guide for Selecting a CPU

CPU	Similar to Motherboard	RAM (GB)	CPU Benchmark (from PassMark)	Estimated video processing capability*	
				720p HD Streams at 60 fps	*1080p HD Streams at 60 fps*
Dual i7-3930K @3.2GHz	EVGA Labs SR-X	12	14904	6	2
Dual E5645 @ 2.4GHZ	ATX 12"x10", Xeon Tylersburg	12	7183	3	1+
i7-980 @ 3.33GHz	Intel DX58S0	12	10313	2	1
i7, 2860QM @ 2.5GHz	Mini ITX QM 67 chipset	8	7892	1 +	
i7-870 @ 2.93GHz	Intel DP55KG	12	6106	1	

* Estimates derived when using Windows Media Encoding

Other important guidelines include:

- On the BIOS screen
  - ***Always*** disable C-States
  - Only enable hyper threading if the CPUs have 6 cores or more
- Set Power Options as follows:
  - Power Scheme to Presentation
  - Turn off Monitor to Never
  - Turn off hard disks to Never
  - System Standby to Never
- Configure Performance Options as follows:
  - Visual Effects adjusted for best performance
  - Memory Usage to System Cache (for Windows XP only)

Background Info for System Selection Parameters

The video and audio capture process transfers data from the Osprey video capture card to the system memory in real time. The Osprey card architecture does not buffer the video and therefore reduces the capture delay to a minimum. Although video capture delay is minimized, the real-time data transfer requires that the overall computer system be selected carefully. Factors in data transfer include type of expansion board interface (PCI, PCI-X, PCIe), motherboard chipset, location of the bus, processor speeds, memory size, memory speed, and other activities that are competing for bus transfer bandwidth. Resource requirements of the applications can also affect capture performance because it is competing for resources. The key to optimum video transfer performance is to have the fastest path to memory as possible. With the latest Intel and AMD memory connections, the path between the processor and memory has vastly improved. Use of this latest architecture is recommended. More detail of the internal architecture is given in the following sections if you desire additional detail.

Some overall system selection considerations are:

Intel

- Use a newest architecture such as i7 processors
- Systems that use DDR3 memory have an Integrated Memory Controller
- Chipsets such as the X58 take advantage of faster interconnect transfer speeds
- If using a non i3, i5, or i7 processor, try to find a system which has a PCIe available to expansion cards on the Northbridge
- Although there are exceptions, server motherboard tend to be optimized for performance while desktop motherboard are optimized for cost and embedded industrial motherboards are optimize for low power. Low power typically equates to slower speeds.

AMD

- Use the Direct Connect Architecture (AMD64 processors, including the AMD Opteron™ and AMD Athlon™ 64 processors)

These suggestions do not mean that the other architectures will not work, in most cases they will. Also, most chipsets offer multiple ways to interconnect the subsystems so you cannot always make a decision based solely on chipsets.

Other helpful selection suggestions:

- Consider server motherboards, some have adaptive risers that give PCI and PCIe slots access to the Northbridge or IOH.
- Avoid the low-cost consumer motherboards. They may be packed with built-in audio, graphics and other features but the expansion slots may be relegated to the slowest interface.
- Prebuilt systems offer you little control over the motherboard selection. Prequalification and testing is highly recommended for customers that are required to purchase certain brands.
- A PCIe x 4 or larger slot is more likely to be connected to the hub closer to the processor and memory.

- If a different vendor is listing a motherboard or system as incompatible because of the speed or location of bridges, then it would be likely an Osprey card would have issues as well.
- Consider server solutions that are better suited for video processing applications. One such offering from Dell is the R5500.

System Architecture

A computer system architecture has many components and interconnects. Although memory is an important factor, the concern with Osprey capture cards is the expansion bus in relation to the memory and processor.

Osprey capture cards use the computer interface known as Peripheral Component Interconnect (PCI). PCI can be present in three main configurations, PCI™, PCI-X™, and PCIe®. PCIe can be subdivided into the number of lanes required. Currently all Osprey PCIe cards are 1 lane. PCI-X cards which have a 64bit interface can be used in a PCI (32 bit) slot but PCIe cards cannot be used in PCI or PCI-X slots.

Table 2. Interconnect types for Osprey cards

Osprey card	Interconnect type
100, 210	PCI
230, 440, 530	PCI-X
240e, 450e, 700e HD	PCIe

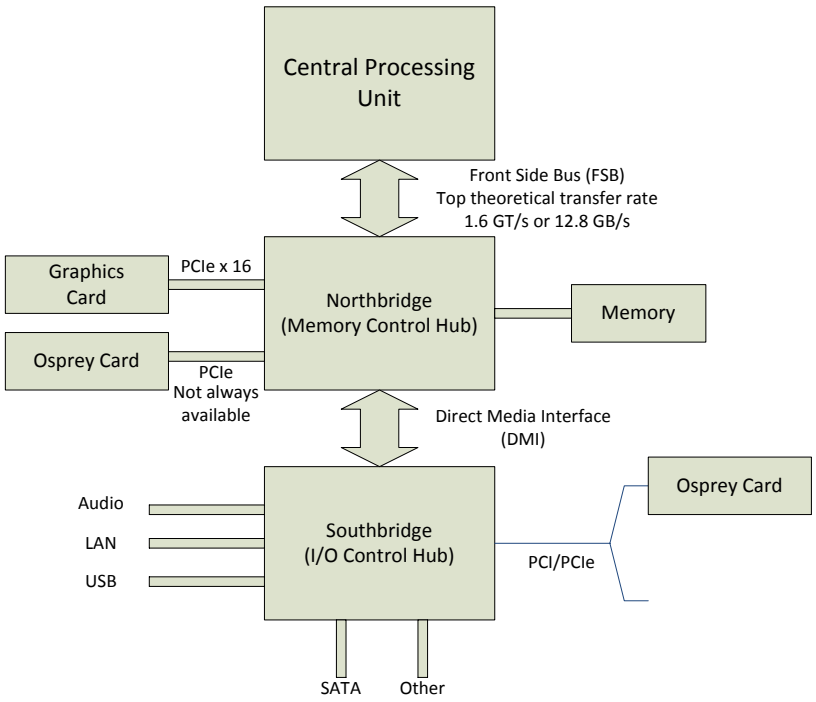
One trend that is not in favor of the PCI-X Osprey card is that motherboard manufacturers are eliminating the slot from the board and only putting in the older PCI slot. The PCI slot is half the speed of the PCI-X. Sometimes components are placed on the motherboard in line with the PCI socket which interferes with a PCI-X card from being inserted in the connector.

There are two main architectures that determine how far the PCI expansion bus is from the processor and memory. The older computers use the term Northbridge and Southbridge for the hub points while the new Intel computers use IOH and ICH. AMD uses PCIe bridge and I/O Hub.

Northbridge/Southbridge

In Intel computer architectures previous to 2009, the bus was controlled through a Northbridge and Southbridge. The Northbridge is the memory controller and the Southbridge was the I/O controller. The processor path to the Northbridge is the Front Side Bus (FSB) and can vary in speed.

Figure 1. Typical Northbridge/Southbridge configuration

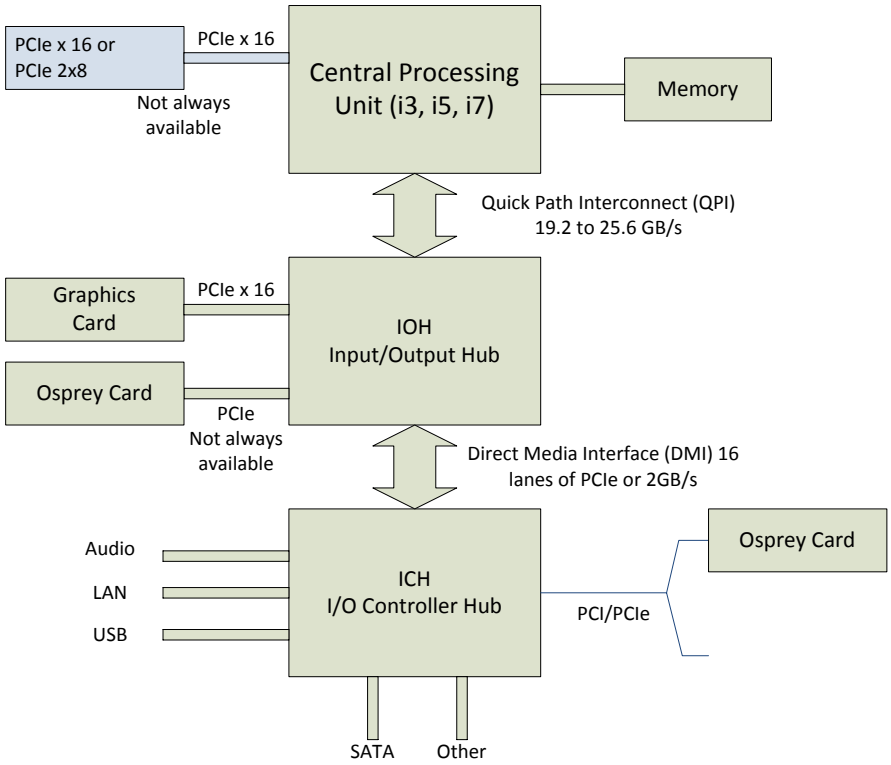


Depending on the exact chipset used and the motherboard layout, the PCI bus on which the Osprey card resides could be on the Southbridge (see Figure 1). In some motherboards, there are PCIe slots located on the Northbridge that can be used for the Osprey card. A connection via the Northbridge is the ideal location because of two factors, the proximity to system memory and less contention for communication bandwidth. When designing Niagara systems, the motherboard selection and testing is extremely important. The time and expertise of proper system component selection adds considerable value to Niagara systems over one of a kind system.

Integrated Memory Controller

In 2010, the modern Intel architecture uses Integrated Memory Controllers in the Central Processor to interface to memory. AMD has done this for several generations. What this means is that the processor itself has a built in memory controller so that it can attach directly to memory. This speeds up the processor to memory transfer and improves overall system performance. This direct memory connection architecture is present in Intel i3, i5, and i7 processors and AMD processors. The i7 architecture which puts Northbridge functions in the processor also allows a direct PCIe to the processor however the specific configuration may only allow a graphics card to be in that location. In i7 series for Intel, the Northbridge is replaced with an Input/Output Hub and the Southbridge is replaced with an I/O hub. The path between the processor and the IOH is called the Quick Path interconnect. AMD calls their path the HyperTransport™.

Figure 2. Typical Integrated Memory Controller Configuration



The path to the PCIe interface (Figure 2) looks similar in layout but is different in the speed of the paths. The Quick Path interconnect is twice the theoretical speed of the Front Side Bus and the processor has the memory as a separate direct path. The AMD architecture appears similar.

In testing performed by Intel using a PCIe Osprey card, the data transfer occurred faster on a system using the ICH/IOH controllers whether or not the PCIe was located on the ICH (Southbridge) or the IOH controller. As noted previously, not all motherboards are designed the same but when considering a PCIe capture card system, the newer systems from Intel and AMD can make difference. Architecturally, the further from memory the I/O device is, the more likely you are to have speed problems.

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