Computer System Selection for Osprey Video Capture

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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.

SYSTEM SELECTION PARAMETERS

The video and audio capture process transfers data from the Osprey 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 i7 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 new 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 motherboard. 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.

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.

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 interfere 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.

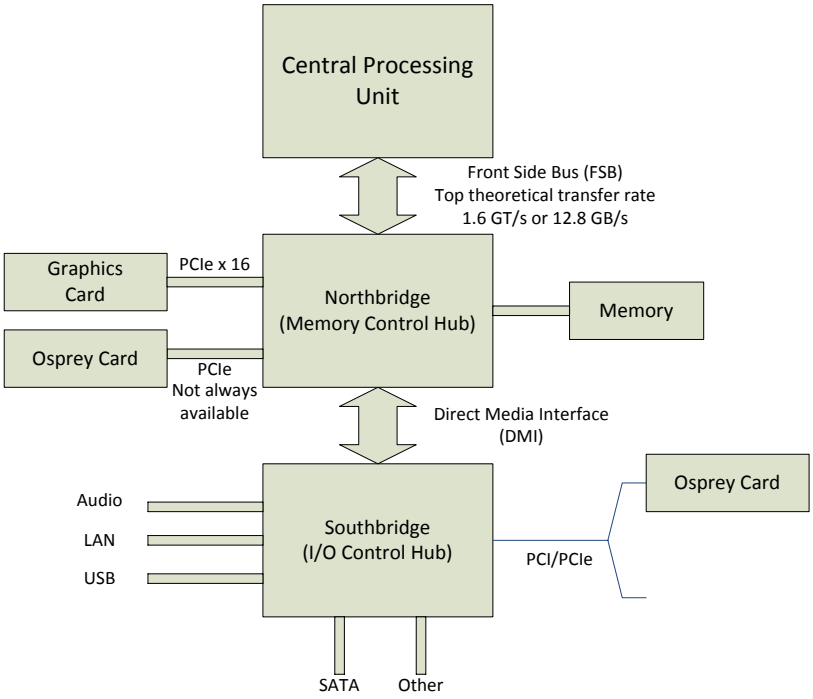


Figure 1, Typical Northbridge/Southbridge configuration

Depending on the exact chipset used and the motherboard layout, the PCI bus on which the Osprey card resides could be on the Southbridge as shown in 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™.

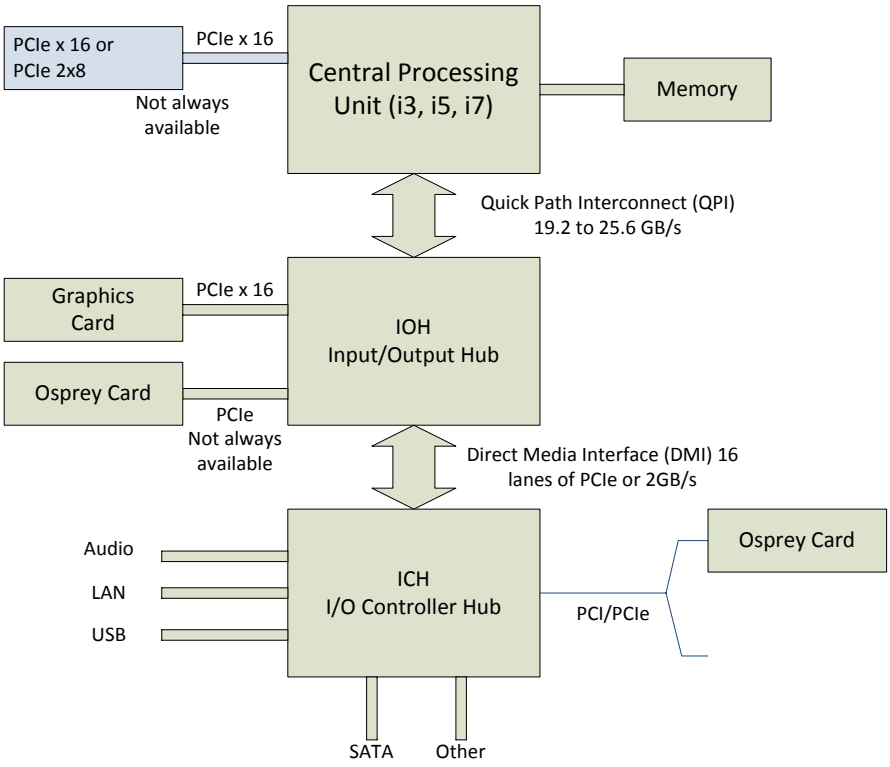


Figure 2, Typical Integrated Memory Controller Configuration

As you see in figure 2, the path to the PCIe interface looks similar in layout but is very 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 looks very 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 not 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.

CUSTOMER REPORTED ISSUES TO VIEWCAST

MOTHERBOARDS

NEC Mate Type ME MY30D/E-A using Intel Chip set : Q57 did not work with Osprey 230
Reported by Nobi Shimizu on September 6, 2010

NEC Mate Type MB MY30D/B-A using Intel Chip set : H55, same product series as Q57 did not work with Osprey 230
Reported by Nobi Shimizu on September 6, 2010

GM45 motherboard by Sonic
Reported by Bruce Imsand of Maxvision on September 7, 2010

Note: the GM45 series motherboards were evaluated by ViewCast when designing portable encoders and were taken out of consideration due to performance limitations. As discussed earlier, low power (mobile) typically equates to low speed.

SYSTEMS

HP 8100
Reported that is does not use true PCI bus, but use the PCIe bus to emulate PCI.
Reported by Nobi Shimizu on August 23, 2010

GLOSSARY

Most terms collected from Webopedia and Wikipedia.

Term	Acronym	Definition
AMD		Advanced Micro Devices, Inc. (AMD) (NYSE: AMD) is an American multinational semiconductor company based in Sunnyvale, California, that develops computer processors and related technologies for commercial and consumer markets. Its main products include microprocessors, motherboard chipsets, embedded processors and graphics processors for servers, workstations and personal computers, and processor technologies for handheld devices, digital television, automobiles, game consoles, and other embedded systems applications. AMD is the second-largest global supplier of microprocessors based on the x86 architecture and also one of the largest supplier of graphics processing units.
Architecture		(n.) A design. The term architecture can refer to either hardware or software, or to a combination of hardware and software. The architecture of a system always defines its broad outlines, and may define precise mechanisms as well.
Bandwidth		In computer networking and computer science, bandwidth … is a bit rate measure of available or consumed data communication resources expressed in bits/second or multiples of it (kilobits/s, megabits/s etc.).
Bridge		Connecting one circuit to more than one circuit.
Buffer		A temporary storage area, usually in RAM. The purpose of most buffers is to act as a holding area, enabling the CPU to manipulate data before transferring it to a device.

Term	Acronym	Definition
Central Processing Unit	CPU	The brain or computing part of a computer Processes, manages, and manipulates instructions from hardware, software, and human operators. The component of a computer system that includes circuitry that controls interpretation and execution of instruction. Comprised of the arithmetic-logic and control units.
Data Rate	DR	The number of kilobits per second required to replay the compressed video at the intended frame rate and quality.
Embedded System		An embedded system is a computer system designed to perform one or a few dedicated functions often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today.
Encode		When you record a live video, the video email system encodes it. It does this by using a process that significantly compresses the video file while maintaining video quality.
Encoder		A hardware device or software that changes a signal (such as a bitstream) or data into a code. The code may perform such actions as compressing information for: Transmission or storage Encrypting or adding redundancies to the input code Translating from one code to another Examples include: Compressing audio/video into a smaller form Multiplexing to combine inputs into one output Functioning as a rotary encoder to convert rotary

Term	Acronym	Definition
		position to an analog electronic signal Functioning as a linear encoder to convert linear positions to electronic signals
Expansion board		A printed circuit board that you can insert into a computer to give it added capabilities. Expansion boards are also called adapters, cards, add-ins, and add-ons.
Frame Rate		The number of video frames process per unit of time, usually frames per second.
Frame Size		The pixel width and height of video image.
Front Side Bus		In personal computers, the front-side bus (FSB) is the bus that carries data between the CPU and the northbridge.
HyperTransport		HyperTransport (HT), formerly known as Lightning Data Transport (LDT), is a technology for interconnection of computer processors. It is a bidirectional serial/parallel high-bandwidth, low-latency point-to-point link that was introduced on April 2, 2001
I/O Controller Hub	ICH	
I/O Hub	IOH	
Local Area Network	LAN	A computer network covering a small physical area, like a home, office, or small group of buildings, such as a school, or an airport. The defining characteristics of LANs, in contrast to side-area networks (WANs), include their usually higher data-transfer rates, smaller geographic range, and lack of a need for leased telecommunications lines.
Memory		Colloquially, computer memory refers to the physical devices used to store data or programs (sequences of

Term	Acronym	Definition
		instructions) on a temporary or permanent basis for use in an electronic digital computer.
Motherboard		The main circuit board of a microcomputer. The motherboard contains the connectors for attaching additional boards. Typically, the motherboard contains the CPU, BIOS, memory, mass storage interfaces, serial and parallel ports, expansion slots, and all the controllers required to control standard peripheral devices, such as the display screen, keyboard, and disk drive. Collectively, all these chips that reside on the motherboard are known as the motherboard's chipset.
Niagara Encoders		ViewCast Niagara® streaming media encoders deliver the quality, features and ease-of-use convenience that professional broadcasters demand. These pre-configured, plug-and-play solutions enable users to quickly capture and broadcast premium quality audio and video in multiple formats and at multiple bit rates – all simultaneously.
Northbridge		The northbridge, also known as a memory controller hub (MCH) or an integrated memory controller (IMC) in Intel systems (AMD, VIA, SiS and others usually use 'northbridge'), is one of the two chips in the core logic chipset on a PC motherboard, the other being the southbridge. Separating the chipset into the northbridge and southbridge is common, although there are rare instances where these two chips have been combined onto one die when design complexity and fabrication processes permit it. The northbridge typically handles communications among the CPU, RAM, BIOS ROM, and PCI Express (or AGP) video cards, and the southbridge. Some northbridges also contain integrated video controllers, also known as a Graphics and Memory Controller Hub (GMCH) in Intel systems. Because different processors

Term	Acronym	Definition
		and RAM require different signaling, a northbridge will typically work with only one or two classes of CPUs and generally only one type of RAM.
Personal Computer	PC	A small relatively inexpensive computer for an individual user. A computer based on microprocessor technology that allows manufacturers to put an entire CPU on one chip.
PCI		Short for Peripheral Component Interconnect, a local bus standard developed by Intel Corporation.
PCIe		PCI Express (Peripheral Component Interconnect Express), officially abbreviated as PCIe (or PCI-E, as it is commonly called), is a computer expansion card standard designed to replace the older PCI, PCI-X, and AGP standards. PCIe 2.1 is the latest standard for expansion cards that is available on mainstream personal computers. PCI Express is used in consumer, server, and industrial applications, as a motherboard-level interconnect (to link motherboard-mounted peripherals) and as an expansion card interface for add-in boards. A key difference between PCIe and earlier buses is a topology based on point-to-point serial links, rather than a shared parallel bus architecture.
QuickPath Interconnect		The Intel QuickPath Interconnect (QuickPath, QPI) is a point-to-point processor interconnect developed by Intel to compete with HyperTransport. Prior to the announcement of the name, Intel referred to it as Common System Interface (CSI). It replaces the Front Side Bus (FSB) for Xeon, Itanium, and certain desktop platforms. Intel first delivered it in November 2008 on the Intel Core i7-9xx desktop processors and the X58 chipset. It is used in the Nehalem-based Xeon 5500, first delivered in March 2009, and it will be used on new Nehalem-based Xeon processors and Tukwila-

Term	Acronym	Definition
		based Itanium processors. The QPI is an element of a system architecture that Intel calls the QuickPath architecture that implements what Intel calls QuickPath technology. In its simplest form on a single-processor motherboard, a single QPI is used to connect the processor to the IO Hub (e.g., to connect an Intel Core i7 to an X58).
Real Time		Occurring immediately. The term is used to describe a number of different computer features. For example, real-time operating systems are systems that respond to input immediately. They are used for such tasks as navigation, in which the computer must react to a steady flow of new information without interruption. Most general-purpose operating systems are not real-time because they can take a few seconds, or even minutes, to react. Real time can also refer to events simulated by a computer at the same speed that they would occur in real life. In graphics animation, for example, a real-time program would display objects moving across the screen at the same speed that they would actually move.
Riser Card		A riser card is a printed circuit board that picks up a multitude of signal lines (often bussed) via a single connector (usually an edge connector) on a mainboard and distributes them via dedicated connectors on the card. Riser cards are often used to allow adding expansion cards to a system enclosed in a low-profile case where the height of the case doesn't allow for a perpendicular placement of the full-height expansion card. A riser card is a board that plugs in to the system board and provides additional slots for adapter cards. Because it rises above the system board, it enables you to connect additional adapters to the system in an orientation that is parallel to the system board and

Term	Acronym	Definition
		save space within the system case.
Southbridge		The southbridge, also known as an I/O controller hub (ICH) in Intel systems (AMD, VIA, SiS and others usually use 'southbridge'), is a chip that implements the "slower" capabilities of the motherboard in a northbridge/southbridge chipset computer architecture. The southbridge can usually be distinguished from the northbridge by not being directly connected to the CPU. Rather, the northbridge ties the southbridge to the CPU. Through the use of controller integrated channel circuitry, the northbridge can directly link signals from the I/O units to the CPU for data control and access.