



Technical Brief

**NVIDIA nForce MCP
StreamThru Networking/Broadband
Architecture**

*N*VIDIA

I. Networking and Data Streaming Take Center Stage

With the advent of high-speed broadband connections, computer users have been quick to embrace the Internet's potential. From watching breaking news stories via streaming Web casts, to downloading the latest music and films, to perusing new worlds in a multiplayer game, it has been clear that the Internet offers great experiences for everyone. Unfortunately, with the influx of DSL and cable installations, many end-users across the country soon realized that, despite the increased bandwidth, traditional PC technologies are ill-equipped to handle their increased demands for video, audio, and other on-demand information. Due to internal technologies that don't support isochronous/time-dependent data transfers, and Ethernet, which have problems transmitting consistent data during heavy peak periods, many potentially exciting Internet experiences are transformed into time-consuming and frustrating endeavors.

NVIDIA®'s nForce™ Platform Processing Architecture has been designed to remove such bottlenecks, radically improving networking and communications experiences. nForce includes an advanced isochronous transport system, dubbed StreamThru™, a networking and broadband architecture that noticeably improves time-dependent applications such as media streaming, file downloading and multi-player games. In fact, only with StreamThru can you save up to 30 minutes transferring a 400MB video file or enjoy the tune of a new MP3 before a typical PC even finishes the download.

II. Non-Isochronous vs. "Isochronous Aware" Systems

Figure 1 (below) shows today's PC core-logic block diagram. The architecture does not support isochronous data transfers regardless of whether it uses a PCI NIC card or an integrated 10/100Mbps MAC. This is because the overall system architecture, particularly the interface between the traditional "Northbridge and Southbridge", does not support the concept of isochronous (ISO) data stream.

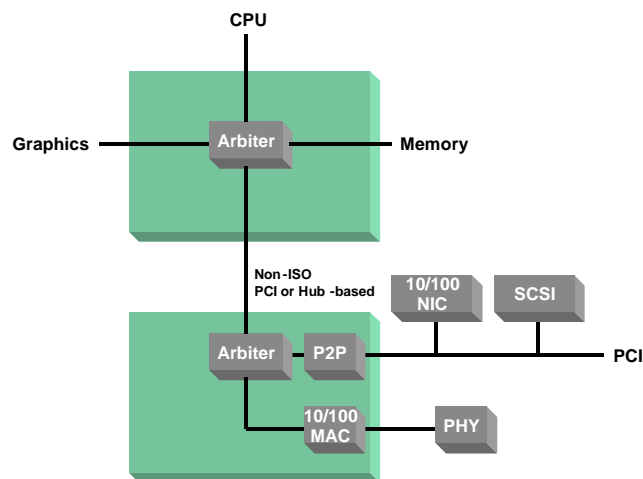


Figure 1: Typical Non-Isochronous Architecture

Unfortunately, today's PCI-centric PCs fall into this category, resulting in packet transfer errors, jittery video, and unnecessarily slow downloads, unrelated to actual broadband connection speeds. Ethernet is also a culprit, thanks in part to its utilization of a Carrier Sense Multiple Access/Collision Detect (CSMA/CD) technique in which a node will "hear" whether there is bus traffic before it starts to send packets. If another node begins a transmission a collision will occur, with both backing off a random amount of time to avoid subsequent collisions. When there is light network traffic, CSMA/CD is highly efficient. However, in order to maximize throughput, the destination node must receive its data with minimal delay, requiring the need for guaranteed isochronous latency and a dedicated bandwidth of 100Mbps. Without these guarantees, it's necessary for the system to retry transactions, resulting in more required bus bandwidth. At heavier loading, Ethernet efficiency drops off dramatically due to the increased back off and resending of packets, and if a destination node cannot receive the streaming data fast enough, it will need to hold off the transmitting node, worsening the traffic jam. Because of this, time-dependent applications such as online games and streaming video files, often suffer from sub-par frame rates, jittery images, and out-of-sync audio.

As illustrated in Figure 2 below, NVIDIA's StreamThru networking architecture is a complete isochronous transport system. The NVIDIA nForce-integrated 10/100 Media Access Controller (MAC) is interfaced to an isochronous-aware internal bus, AMD®'s HyperTransport™ link controller, and a

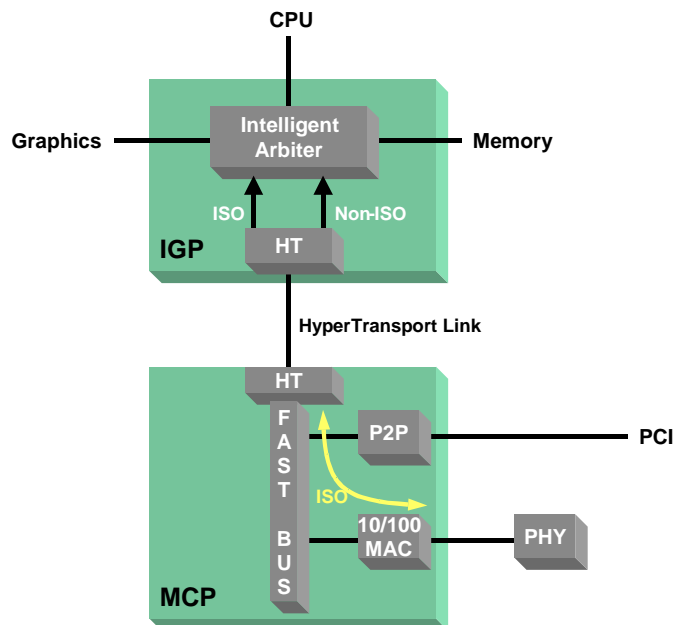


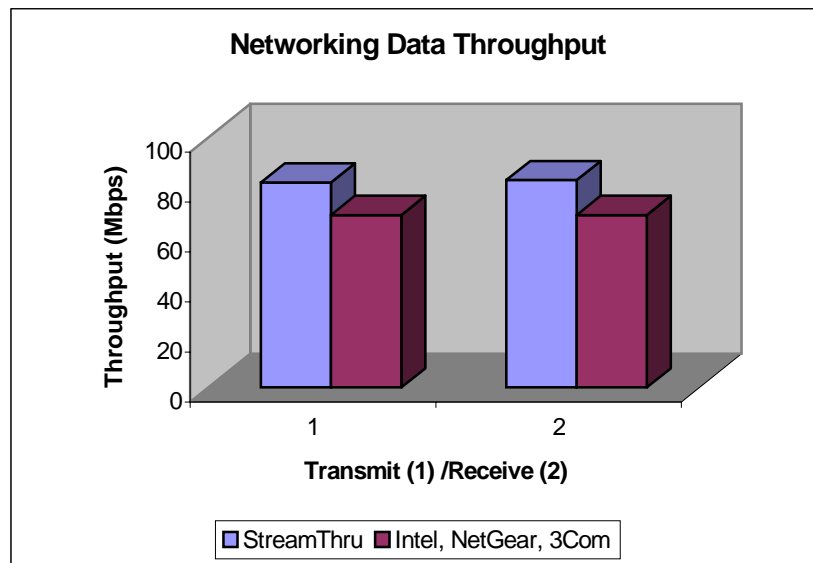
Figure 2: NVIDIA's StreamThru Architecture

single-step arbiter. The HyperTransport link between NVIDIA's Platform Processors, the nForce Integrated Graphics Processor (IGP) and the nForce Media and Communications Processor (MCP), supports multiple virtual channels of isochronous data streams. The HyperTransport link controller on the

IGP side will dispatch both ISO and non-ISO requests to an intelligent arbiter, which guarantees memory latency and bandwidth delivery for both the read and write data paths, resulting in markedly improved media streaming, packet transfers, and data downloads.

III. StreamThru Enhances Performance

The following chart shows the networking data throughput as measured by *netiQ Chariot* under a Windows 2000™ environment. *netiQ Chariot* is the industry-leading benchmark used for testing network performance. It drives real-world application loads to deliver performance numbers representative of the actual networked environment.



NVIDIA platform is tested with 1GHz Athlon, 128MB DDR-133 memory under Windows2000
Intel Pro/100, NetGear FA301, 3COM 3C905 are tested on AMD760 platform with 1GHz Athlon, 128MB DDR-133 memory under Windows2000

IV. Conclusion

Thanks to its complete isochronous transport system, NVIDIA's StreamThru architecture enhances not only broadband and network performance, but also other time-dependant applications such as digital video, audio and online multiplayer games. For the first time, and only when using systems based on NVIDIA's nForce Platform Processing Architecture, users can enjoy maximum efficiency from their broadband and networking connections delivering full multimedia performance without compromise.

Appendix A – Glossary

CSMA/CD: Carrier Sense Multiple Access / Collision Detect

Ethernet: A popular networking standard. Refers to IEEE 802.3 specification for details

GPU: Graphics Processing Unit.

ISO: Isochronous

Isochronous: A process where data can be delivered with guaranteed bandwidth and latency

HomePNA: Home Phonenumber Networking Alliance

HyperTransport: AMD HyperTransport Technology

MAC: Media Access Controller

Mbps: Megabits per second

NIC: Network Interface Card

Non-ISO: Non-Isochronous

P2P: PCI-to-PCI bridge

PHY: Physical layer

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