

# Cyclone FPGAs Drive Industry's First Low-Cost OEM Solution for High-Performance Data Streaming over GigE

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**Company:**  
Pleora Technologies

**Industry:**  
Machine Vision

**End Products:**  
Video-to-Gigabit  
Ethernet

**Altera Product:**  
Cyclone FPGAs

Gigabit Ethernet (GigE) is the third generation of Ethernet, the dominant global protocol for local-area network (LAN) communications. Like earlier Ethernet generations, GigE equipment has 10 times more bandwidth than its predecessor and, as volumes grow, is becoming increasingly affordable.

But the GigE chapter of the 25-year Ethernet saga is also a bit different. With GigE, Ethernet now has enough bandwidth—Gbit per second—to serve as a viable communications platform for a host of applications outside its traditional LAN stronghold. GigE is a good fit for any application that streams data at high speeds, such as broadcasting, machine vision, automated imaging, and high-end surveillance systems.

Most of the systems used today for applications like these incorporate specialized, high-performance data transport and switching products, which are usually costly and difficult to integrate. GigE's high-speed data rate and low-cost platform make it an attractive alternative to specialized equipment. Moreover, GigE offers the ease-of-use and networking flexibility that helped make Ethernet the world's reigning LAN protocol.

There are technical challenges, of course. Data that travels over GigE must be formatted as Internet Protocol (IP) packets. If the data is in another format—video, audio, or other data types—the system needs protocol conversion technology that can pump out IP packets at GigE rates. To deliver high-end performance, data must be transferred with low, predictable latency (or end-to-end delay). There can also be no risk of data loss.

Working with the Cyclone™ EP1C6 FPGA, Pleora Technologies has developed the industry's first low-cost GigE solution that meets these challenging requirements. Pleora's iPORT™ Connectivity Solution delivers wire-speed, low-latency data transport over standard GigE connections, while guaranteeing packet delivery.

## Three-Part iPORT Solution

The iPORT Connectivity Solution has three elements. The heart of the solution is the iPORT PT1000-ST Protocol Engine, a small-footprint OEM board (see Figure 1) that integrates easily with a wide range of system architectures.

The iPORT engine efficiently converts almost any type of data, including voice and video, into IP packets for GigE transport. Driven by the Cyclone FPGA, it delivers the full 1-Gbit per second GigE data rate while achieving the lowest, most consistent latency in its class—typically less than 200 microseconds from data source to PC memory. The engine's interface captures data as wide as 24 bits at clock rates of up to 80 MHz. Since the solution is FPGA based, the interface can be customized for almost any application.

The second element of the solution is the iPORT IP Device Driver. This software loads quickly and easily onto standard PC network interface cards/chips, where it performs an advanced direct memory access (DMA) function. The driver streams data to PC memory using almost none of the machine's CPU, leaving about 99 percent of these resources available for running applications.

Pleora offers two versions of the driver. The iPORT High-Performance IP Device Driver delivers top performance for demanding applications. The iPORT Universal IP Filter Driver achieves high-throughput streaming with simultaneous access to corporate networks.

The third element is the iPORT Software Development Kit (SDK), which provides users with the building blocks needed to interface iPORT products to just about any custom application or third-party applications software, such as Labview.

## Cyclone Helps Cap Pricing

As one of two core components in the PT1000-ST Protocol Engine, the FPGA dominates the cost of the board. The low pricing of Altera's Cyclone devices has helped Pleora achieve the price points needed to enter competitive markets in medical imaging, machine vision, intelligent traffic systems, and surveillance/military.

The Cyclone device has enough capacity to support Pleora's advanced application, and its flexible memory architecture has helped Pleora lower production costs by improving iPORT design efficiencies. In these respects, the Cyclone FPGA has been a key enabling technology for Pleora's success.

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Pleora is also taking advantage of the Cyclone device's remote programmability to build good customer relationships. Many of Pleora's customers are developing custom systems, and requests for new features must be addressed quickly. Pleora meets this need cost-effectively by delivering new loads to Cyclone FPGAs in field-deployed iPORT engines over standard GigE connections.

## Broader Architectural Options

In addition to providing a cost-effective alternative to specialized communications gear, the iPORT™ Connectivity Solution allows OEMs and systems integrators to improve efficiencies by leveraging GigE's unmatched networking flexibility and ease of use.

The PT1000-ST Protocol Engine supports most GigE networking topologies, including switched GigE interconnect between multiple devices and PCs, data multicasting to more than one PC, and distributed processing across more than one PC.

Furthermore, all GigE platforms—point-to-point links or packet-switched configurations—use well-understood, industry-standard equipment, such as Category 5 copper cabling, ordinary PC interface

cards/chips, and straightforward LAN switches. This equipment is widely available and easy to integrate. By contrast, building systems with specialized gear is typically a slow, tedious process plagued by multi-vendor integration issues.

## 10GigE

The low-latency, wire-speed GigE transport solution offered by Pleora has one other key benefit, a migration path to even higher-speed solutions. The fourth Ethernet generation, 10GigE, which operates at the blazing speed of 10 Gbits per second, is already running over fiber. Meanwhile, work on a physical interface (PHY) for 10GigE over copper is proceeding nicely. Under the current timeline, the copper specification, known as IEEE 802.10GBASE-T, will be ratified in 2006. Pleora is already working on technology that will leverage this higher-speed commercial platform.

Pleora Technologies is a leading supplier of software and hardware products for high-performance data streaming over GigE networks. To contact Mr. Chamberlain, email [george@pleora.com](mailto:george@pleora.com). For more information, visit [www.pleora.com](http://www.pleora.com).

Figure 1. iPORT PT1000-ST Protocol Engine

