FULCRUM microsystems

PivotPoint™ FM1010

Application Example — Efficient OC-48 ATM Line Card Solution

The slow down in build-out of the telecom infrastructure over the past few years has resulted in resurgence in growth in traditional circuit-switching technology and infrastructure – carriers are once again embracing their traditional revenue-generating technologies of ATM, SONET and Frame Relay. And, with their next stage of build out, carriers are seeking higher-density, more cost-efficient line card solutions.

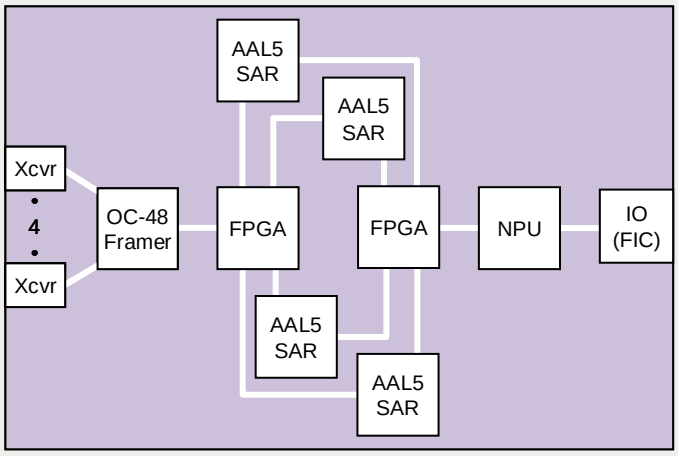
For ATM, OC-48 represents the current sweet-spot in the core. As the backplane in core routers is often not cell based, the design of an ATM line card can be quite complex. In addition to ATM SARs and SONET framers, an NPU is also required for IP classification and forwarding. As the drive to denser line card design continues, the traditional ATM line card design is reaching its limit. The PivotPoint FM1010 provides an improvement in efficiency by interconnect a new generation of higher-density and lower-cost components, and providing intelligent reconfiguration of the resources to match emerging market requirements.

Today's Custom OC-48 Line Card

Currently, many 4 X OC-48 line card designs are based on standard components with FPGAs used for interconnection between all the devices in the data path.

In actual fact, the FPGAs must often provide both an interconnection and buffering function. The buffering is required to compensate for the latency that the FPGA adds to the design, which adds to the design complexity and overall system cost.

Traditional 4x OC-48 Line Card



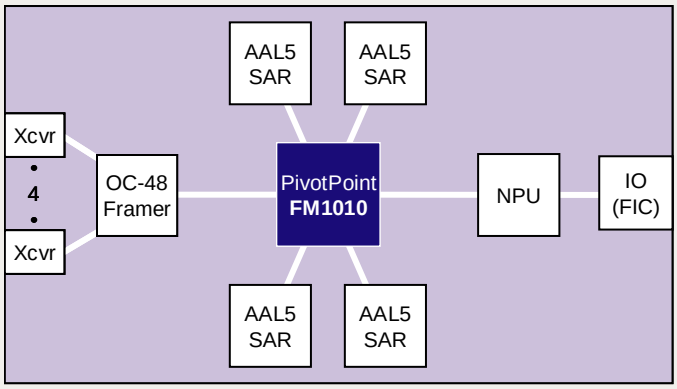
In addition, the SAR, NPU, and Framer will likely be operating at different clock rates which further increases complexity and latency to the FPGA for clock rate matching and related additional buffering. As a result, the final design is high priced, high power and high complexity. Finally, the configuration is fixed and the latency through the line card is significantly greater than it needs to be – which often impacts quality of service, especially when transporting delay-sensitive data.

Flexibility via PivotPoint Interconnectivity

The PivotPoint FM1010 provides a highly-efficient means of designing a high-density ATM line card while providing a power, cost, latency, and board-area advantage over a traditional FPGA-based design.

The PivotPoint FM1010 greatly simplifies the design process by seamlessly interconnecting Framers, SARs and NPUs equipped with the industry-standard SPI4.2 interface. It features a fully non-blocking switch architecture with up to 3X overspeed and fine-grained port-based flow control which ensures zero buffer overflow. In addition the PivotPoint FM1010 can seamlessly bridge between multiple clock domains, and transparently manages the rate mismatch between the SAR devices and the NPU and Framer eliminating the challenging task of distributing a high-speed clock for devices to share around the system.

Line Card Leveraging PivotPoint



With the PivotPoint FM1010 as the central system interconnect, traffic can be transported from one device to any other device – directly, without having to pass through neighboring devices. The PivotPoint FM1010 dramatically improves system flexibility, while simultaneously reducing cost, complexity, and latency in the system.

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PivotPoint™ FM1010

Application Example — High-Performance Layer 4-7 Services Card

The PivotPoint FM1010 is a highly-efficient solution for seamlessly and intelligently interconnecting multiple chips with SPI-4.2 interfaces. Using advanced switching, the PivotPoint FM1010 converts a fixed-configuration half-duplex daisy-chain of devices with SPI-4 interfaces (such as NPUs, traffic managers, co-processors, search engines, custom ASICs, and FPGAs) into a fully-connected, dynamically-reconfigurable full-duplex resource pool, enabling more efficient use of the silicon resources, and eliminating the custom glue logic that often accompanies complex system designs. PivotPoint enables designers to build modularity into high-speed systems using off-the-shelf components.

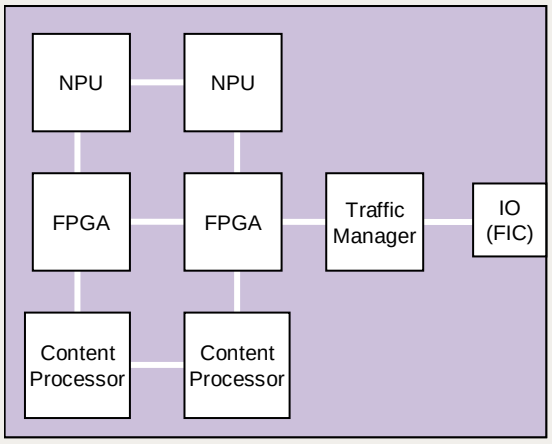
For shared layer 4-7 packet processing applications, the PivotPoint FM1010 adds unprecedented configuration flexibility while improving overall performance, and reducing the cost and complexity of the design.

Traditional Fixed-Configuration Services Card

The majority of Network Processors available today are optimized for layer 2-4 header processing. However, applications such as server load balancing, firewalls and security appliances require deeper packet inspection and processing in layers 4 through 7.

Switch vendors often design a services card as a shared resource within a switch system, since not all traffic requires deep inspection and processing. In this type of architecture, packets requiring layers 4-7 processing are redirected to the services card via the backplane fabric, processed by the services line card, and then delivered to the appropriate output port via the backplane fabric.

First-Generation Services Card



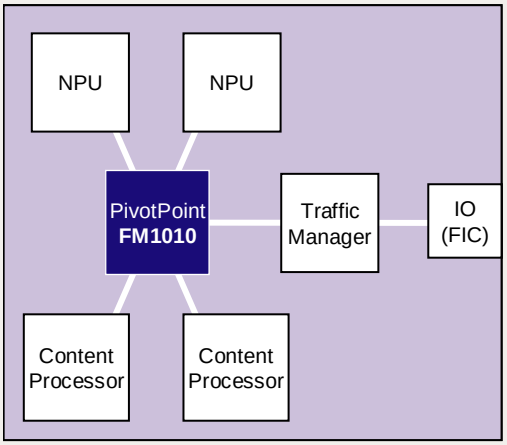
Traditionally, system designers have relied on FPGAs to interconnect the packet processing and content inspection resources. Generally, this results in designs that are high cost, high power, limited performance, and limited flexibility.

PivotPoint-Enabled Flexible Services Card

Deep packet processing is very compute intensive. Several processors are available that are purpose-built for this task. In addition some NPU vendors have enhanced their products to include layer 4-7 processing. As the services line card is often shared amongst several other interconnected line cards, optimization for performance is critical. An effective way to achieve this is to divide the task such that and NPU is used for layer 2-4 header processing while a second, specialized, processor is used for the deep packet processing.

The PivotPoint FM1010 provides a highly-effective method for interconnecting the shared silicon resources, optimizing the performance, minimizing delay, and reducing power and component costs on a shared layer 4-7 services line card.

Services Card Leveraging PivotPoint



The PivotPoint FM1010 is a key building block for simplifying the design and enhancing the operation of sophisticated services line cards, allowing NPUs and custom processors to be seamlessly interconnected without the need for glue logic and with low latency.

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