For the last few generations of computers and communication systems, the predominant system interconnect has been a parallel bus structure, exemplified by the ubiquitous PCI bus. The speeds of these buses have increased to keep up with system demands. However, limitations in the number of connections and length of runs still exist, causing a demand for higher availability and guaranteed Quality of Service (QoS). This demand has spurred the development of switch fabrics and serial interconnects, such as StarFabric, which can handle different data types and deliver native QoS. Additionally, because StarFabric comprises a network of switches with point-to-point connections, it can offer a virtually limitless number of nodes.

System designers have come to appreciate that switch-fabric serial interconnect solutions provide greater architectural freedom, eliminating the performance bottlenecks, physical scaling, and system partitioning limitations of bus-based architectures. In addition, these interconnect solutions give rise to new types of architectures such as the functionally disaggregated system.

Disaggregation allows the architect to completely separate each system element into its own node in a switched fabric. As such, all system function elements, including processor elements, I/O boards, storage elements, and system management boards, directly connect to the serial switched interconnect. This model provides the freedom to mix and match system components to most optimally meet the needs of specific applications and users.

Disaggregation provides many benefits, including:

- High availability: A designer can make every element (including the fabric) of a system redundant.
- Ease of upgrade: As the performance or capacity demands on a functional element increase, a designer can simply upgrade to more or higher performing elements.
- Longer product life cycle: A designer can extend the life cycle of systems almost indefinitely through functional upgrades, and can add new functionality to existing disaggregated systems.

System disaggregation, however, places substantial requirements on the underlying interconnect technology. First, the interconnect technology must support processor-to-processor communication. This includes support for multiple processor types, such as x86, PowerPC, etc., and a range of other processing devices including microcontrollers, DSPs, NPUs, and application-specific processors such as security accelerators.

Second, the interconnect must provide for processor-to-device communication. As noted earlier, the types of devices that the interconnect must support are vast, including networks, storage, and many other application-specific I/O devices. The interconnect should be capable of handling control as well as data-plane traffic. For this reason, the system requires seamless support for PCI.

Finally, these systems process and move massive amounts of data. Thus, the interconnect must provide very high throughput. Today, 2.5-Gbit/sec links are required, and in the future, 10-Gbit/sec links will be the standard.

StarFabric is the first example of a production-quality, off-the-shelf switch interconnect that meets the requirements of system disaggregation. As disaggregation evolves to higher performance and higher speed interconnects, StarFabric will become the model for the PCI Express and Advanced Switching (AS) standards activities. With full PCI compatibility and four times the physical layer speed available with StarFabric, the PCI Express Base specification allows reuse of all software, but is limited in addressing model and scalability. The AS specification complements the Base specification by providing a higher level of capabilities already available in StarFabric’s advanced features, such as peer-to-peer multiprocessing, message passing, and multiple address domains.

StarFabric chip-level components shipping today include the StarFabric six-port Switch and the PCI-to-StarFabric Bridge. Samples of the TDM-to-StarFabric Bridge are currently available. Designers have incorporated these components into an array of PCI cards, CompactPCI cards, and SBCs. Backplanes, chassis, and enclosures support these components, forming a rich and complete StarFabric solution.

Although originally developed by StarGen, the StarFabric Trade Association owns and manages the StarFabric architecture. The StarFabric Trade Association is an open-membership, non-profit industry organization that includes more than 25 leading communications and systems manufacturers. Tim Miller currently serves as president for the association. For more information, visit www.starfabric.org.