HiperSockets can also be used for Dynamic cross-system coupling, which is a z/OS Communications Server feature that creates trusted, internal links to other stacks within a Parallel Sysplex.

## Shared Memory Communication - Remote Direct Memory Access

zEC12 GA2 was the first IBM Z server generation to support Remote Direct Memory Access over Converged Ethernet (RoCE) technology. This technology is designed to provide fast, reduced CPU consumption and memory-to-memory communications between two IBM Z CPCs.

RoCE Express features reduce CPU consumption for applications that use the TCP/IP stack (sockets communication), such as IBM WebSphere Application Server that accesses a Db2 database. It is transparent to applications and also might help to reduce network latency with memory-to-memory transfers that use SMC-R in supported z/OS releases and Linux on Z.

IBM Z server generations continue to enhance the RoCE architecture. The 10GbE RoCE Express feature (carry forward only) supports sharing among 31 LPARs running z/OS or Linux on Z, while the RoCE Express2 and RoCE Express2.1 (10 GbE and 25 GbE) support 4x the number of LPARs and performance improvements. RoCE Express2 and RoCE Express2.1 support 63 Virtual Functions (VFs) per port for up to 126 VFs per PCHID (physical channel ID).

The 10GbE RoCE Express2, 10GbE RoCE Express2.1, and 10GbE RoCE Express features use SR optics and support the use of a multimode fiber optic cable that ends with an LC Duplex connector. Both support point-to-point and switched connections with an enterprise-class 10 GbE switch. A maximum of eight RoCE Express features can be installed in PCIe+ I/O drawers of z15.

The 25GbE RoCE Express2 and 25GbE RoCE Express2.1 also feature SR optics and supports the use of 50-micron multimode fiber optic that ends with an LC duplex connector. These features support point-to-point and switched connections with 25GbE capable switch (support only for 25 Gbps, no down negotiation to 10 Gbps).

## Shared Memory Communications - Direct Memory Access

SMC-D enables low processor usage and low latency communications within a CPC that uses a Direct Memory Access connection over ISM. SMC-D implementation is similar to SMC-R over RoCE; SMC-D over ISM extends the benefits of SMC-R to operating system instances that are running on the same CPC without requiring physical resources (RoCE adapters, PCI bandwidth, ports, I/O slots, network resources, and 25/10 GbE switches).

Introduced with z13 GA2 and z13s, SMC-D enables high-bandwidth LPAR-to-LPAR TCP/IP traffic (sockets communication) by using the direct memory access software protocols over virtual Internal Shared Memory PCIe devices (vPCIe). SMC-D maintains the socket-API transparency aspect of SMC-R so that applications that use TCP/IP communications can benefit immediately without requiring any application software or IP topology changes.

z15 continues to support SMC-D with its lightweight design that improves throughput, latency, and CPU consumption and complements HiperSockets, OSA, or RoCE without sacrificing quality of service.

SMC-D requires an OSA or a HiperSockets connection to establish the initial TCP communications and can coexist with them. SMC-D uses a virtual PCIe adapter and is configured as a physical PCIe device. Up to 32 ISM adapters are available, each with a unique Physical Network ID per CPC.