The zEC12 I/O subsystem design provides great flexibility, high availability, and excellent performance characteristics, as follows:

- High bandwidth:
  - The zEC12 uses PCIe as an internal interconnect protocol to drive PCIe I/O drawers.
  - The zEC12 uses Infiband as the internal interconnect protocol to drive I/O cages and I/O drawers and CPC to CPC connection. Infiband supports I/O bus data rate up to 6 Gbps.

- Connectivity options:
  - The zEC12 can be connected to a range of interfaces such as FICON/Fibre Channel Protocol for storage area network connectivity, and for InfiniBand connectivity by using FICON, FC (PCI), 10 Gigabit Ethernet, Gigabit Ethernet, and 1000BASE-T Ethernet for local area network connectivity.

- For CPC to CPC connection, the zEC12 uses Parallel Sysplex Infiband (PSIFB), ISC-3 coupling links.

- Concurrent I/O upgrade:
  - You can concurrently add I/O cards to the server if an unused I/O slot position is available.

- Concurrent I/O drawer upgrade
  - Additional PCIe I/O drawers can be installed concurrently without preplanning if there is free space in one of the frames.

- Dynamic I/O configuration:
  - Dynamic I/O configuration supports the dynamic addition, removal, or modification of channel path, control units, and I/O devices without a planned outage.

- Pluggable optics:
  - The zEC12 Express8S, zEC12 ExpressS, and zEC12 Express4 features have Small Form Factor Pluggable (SFP) optics to permit each channel to be individually serviced in the event of a fiber optic module failure. The traffic on the other channels on the same feature can continue to flow if a channel requires servicing.

- Concurrent I/O card maintenance:
  - Every I/O card plugged in an I/O cage, I/O drawer, or PCIe I/O drawer supports concurrent card replacement in case of a repair action.

Summary of supported I/O features:

- Up to 176 FICON Express3 channels
- Up to 320 FICON Express8S channels
- Up to 96 OSA-Express3 ports
- Up to 96 OSA-Express4 ports
- Up to 48 ISC-3 coupling links
- Up to 16 IntFiber fanouts:
  - Up to 32 12x Infiband coupling links with HCA2-0 fanout, or
  - Up to 16 12x Infiband coupling links with HCA2-0 L (1xIFB) fanout, or
  - Up to 32 12x Infiband coupling links with HCA2-0 L (1xIFB) fanout, or
  - Up to 64 1x Infiband coupling links with HCA2-0 L (1xIFB) fanout

Coupling links: The maximum number of external coupling links combined (ISC-3 and IFB coupling links) cannot exceed 112 for each zEC12.

The zEC12 I/O structure when using I/O cage:

- The zEC12 supports a PCIe I/O and Infiband infrastructure. PCIe features are installed in PCIe I/O drawers. In addition, when carried forward on an upgrade from a 2966 or 2105 EC, up to two I/O drawers, which were introduced with the IBM z10 BC, and one traditional I/O cage are also supported. Devices connected to the I/O subsystem can be configured to share channels.

- For I/O constraint relief, three subchannel sets, are available per CSS. Up to four CSSs, each with 256 channels.

- Each I/O domain supports up to four I/O cards (FICON, OSA, Crypto, or ISC). Up to 32 I/O cards are connected to the PCIe I/O drawer through the backplane board.

- The PCIe I/O bus infrastructure data rate is up to 8 Gbps. PCIe switch ASICs Application-Specific Integrated Circuit (ASIC) is used to fanout the host bus from the processor node to the individual I/O card. Up to 128 channels (64 PCIe features) are supported via the 112 channels (256 features) offered with the I/O cage.

- The PCIe I/O drawer supports up to 32 I/O cards organized in four hardware domains per drawer.

- Each domain is driven through a PCIe switch card.

- Always two PCIe switch cards provide backup path for each other through the passive connection in the PCIe I/O Drawer backplane. So that in case of a PCIe I/O card or cable failure, all 16 I/O cards in the two domains can be driven through a single PCIe switch card.