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PCIe Riser Extension Assembly

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Title: PCIe Riser Extension Assembly

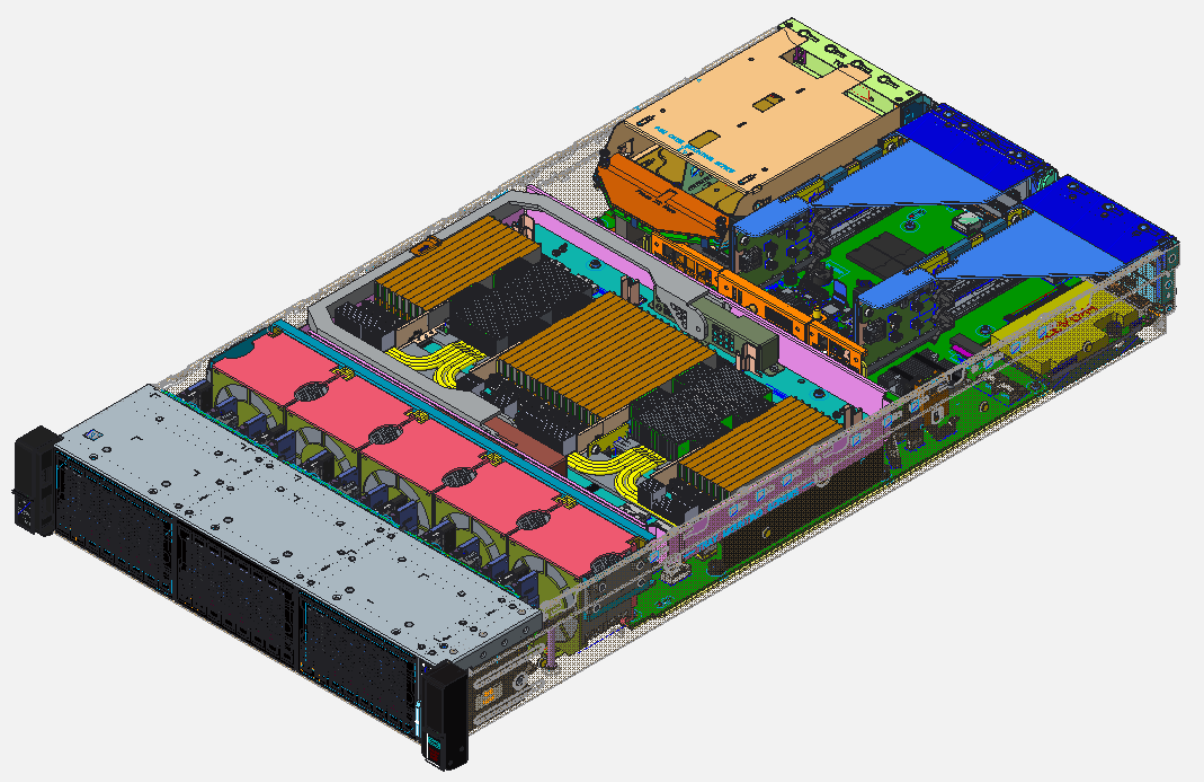
Abstract:

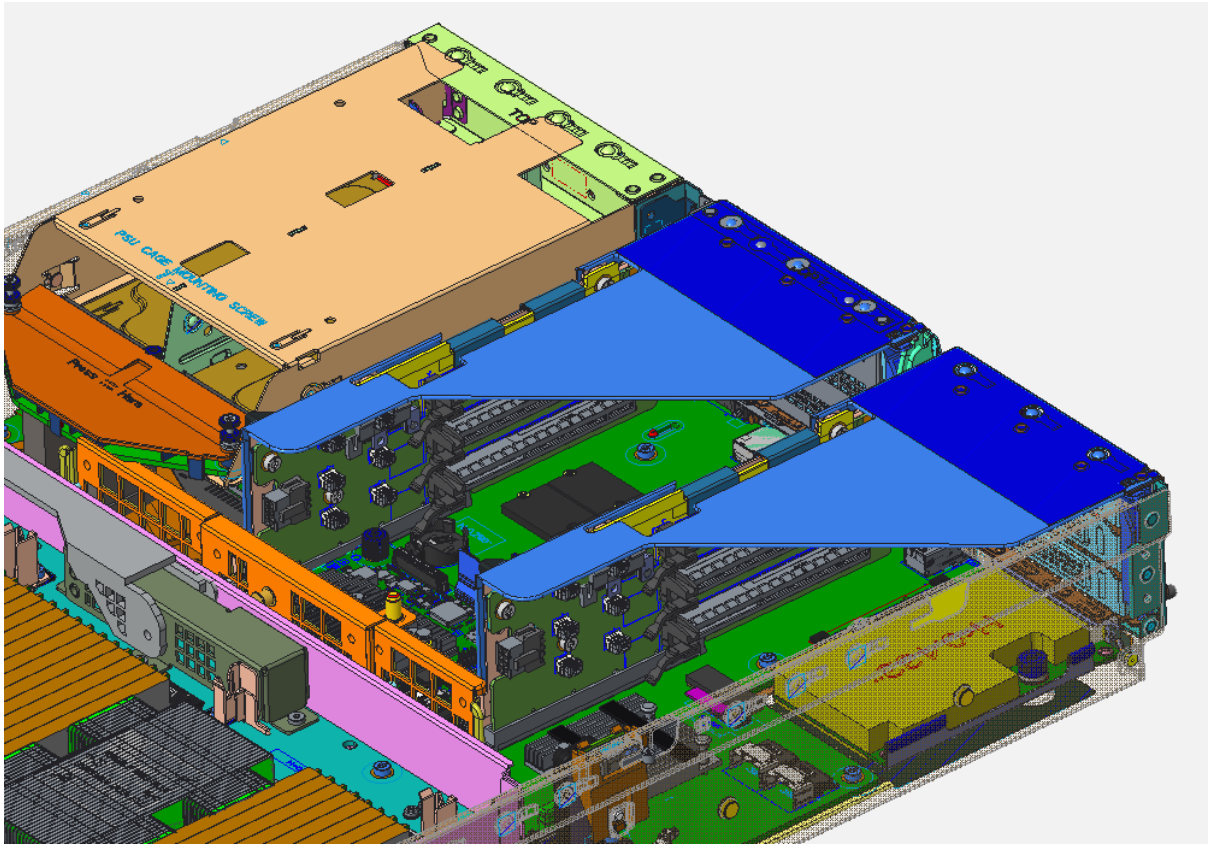
The PCIe Riser Extension provides geometric flexibility and the capability to expose all PCIe lanes from four processors on a single four socket motherboard to the chassis ends that may be a significant distance away, yet meet the electrical specifications required. The PCIe Riser Extension utilizes standard commercially available connectors and cabling to achieve this task.

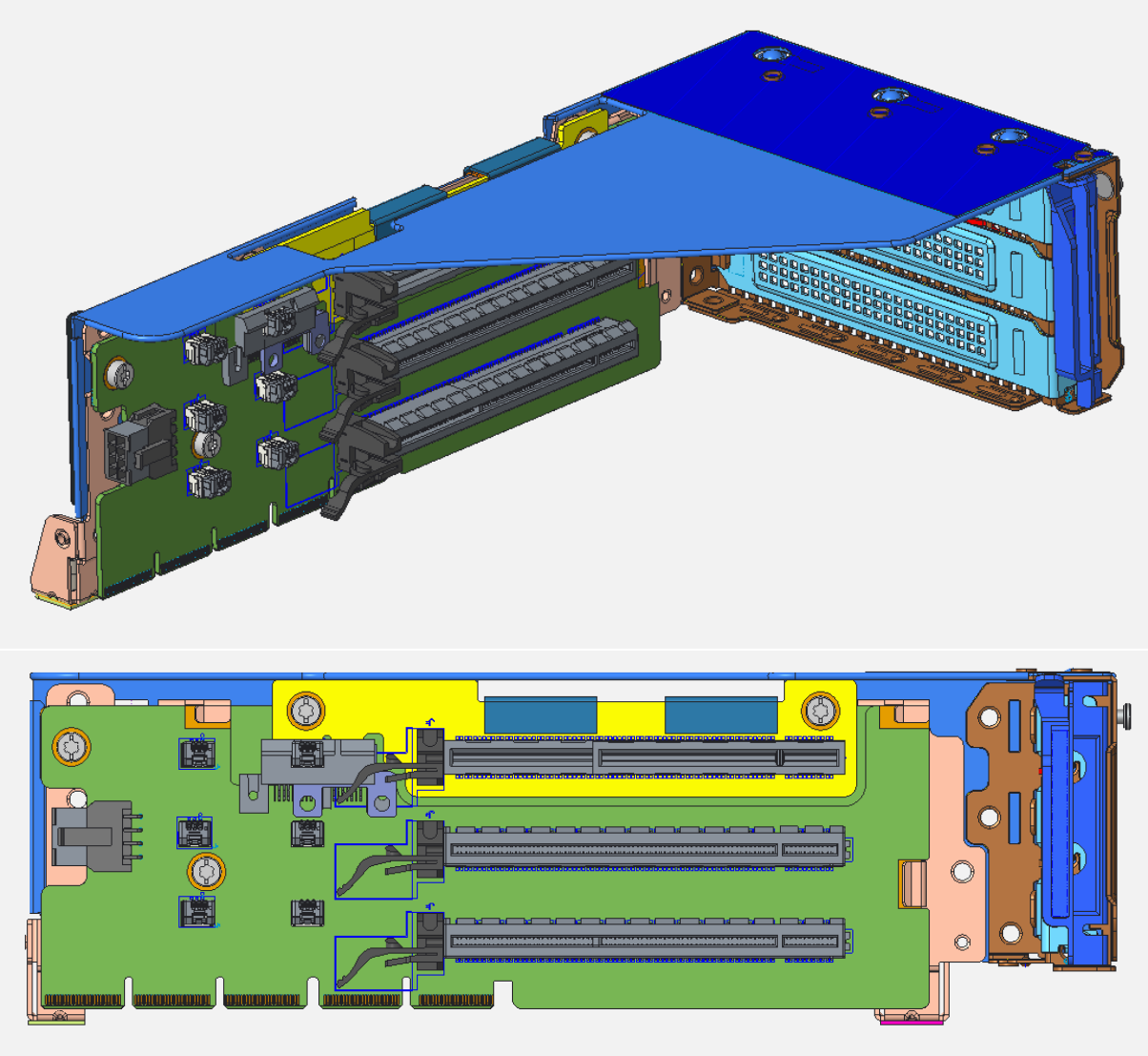
Description:

Most PCIe risers plug directly into the motherboard, and PCIe signals and power flow from the motherboard into the PCIe riser PCA, and eventually to the PCIe cards plugged into the PCIe riser. The PCIe riser location within the chassis, and the distance from the CPU is determined by the PCIe channel electrical requirements and what can physically fit in the chassis. Numerous analysis and trades offs are completed to arrive at the location of the PCIe riser in the server chassis.

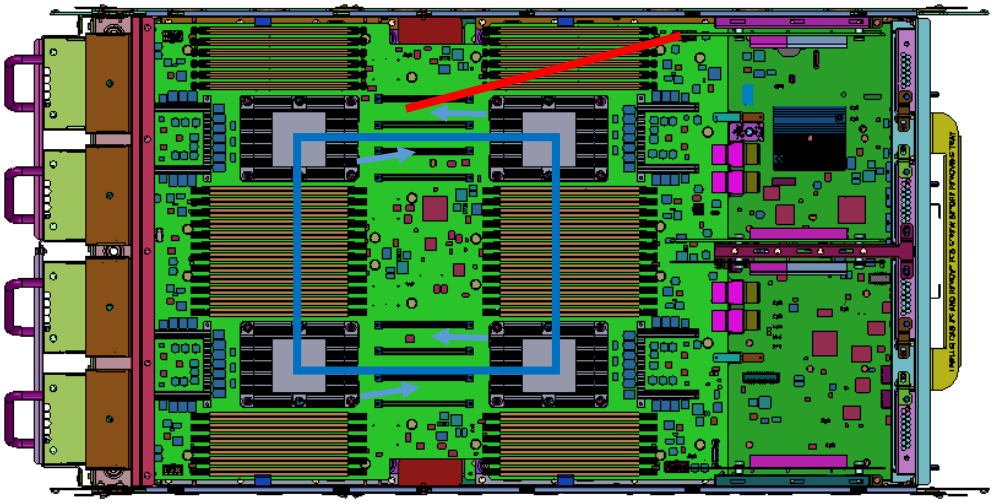
The pictures below illustrate how the two PCI riser assemblies for the ProLiant DL560 G10 plug into the motherboard.



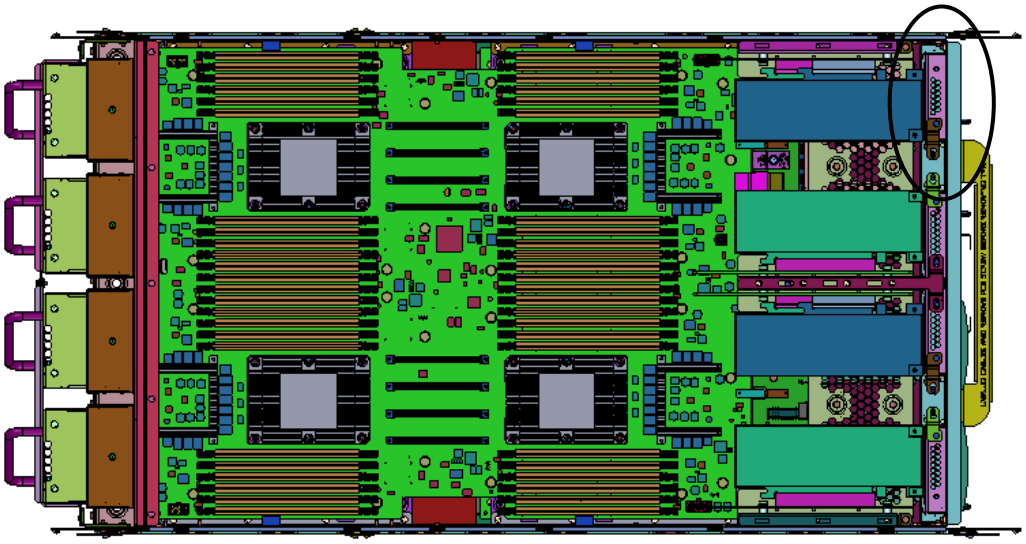

PSU CASE MOUNTING SCREW



The SD Flex motherboard contains four CPUs on the PCA, arranged in a pattern that allows the UPI channels to be connected as required, the CPUs arranged in this configuration is essentially a requirement. This also results in the PCIe channels all routing toward the center of the motherboard. Twelve x16 PCIe channels are routed to the small middle section of the motherboard. A connection from that point to a PCIe riser is required, so PCIe cards can be exposed to the rear of the chassis, as is typically done in server design.



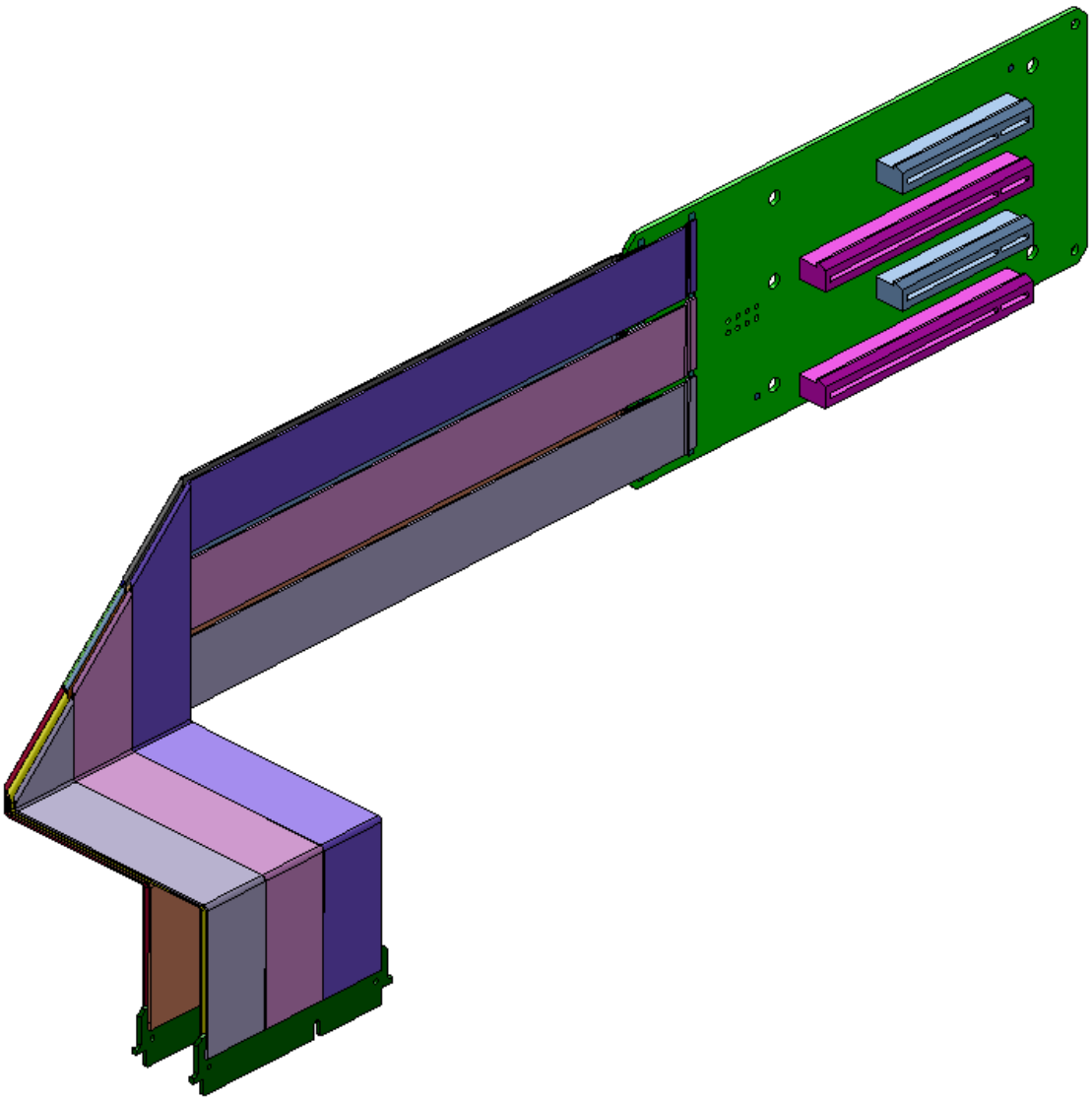
Four CPU UPI channels are connected in ring illustrated by the square shown, channels exit all four CPUs towards the middle of the motherboard. Arrows indicate PCIe channels exiting all CPUs towards the center of the motherboard as well. The red line represents a cable originating from the connectors on the motherboard and extending to the PCIe riser PCA.



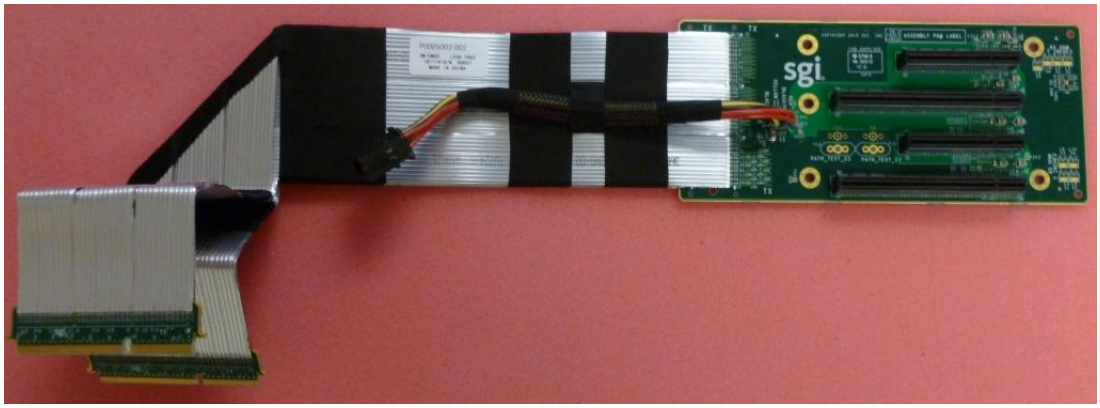
PCIe cards shown plugged into the four PCIe riser assemblies. The PCIe card faceplates are located at the chassis rear. The motherboard size, motherboard location in the chassis, the PCIe card location, and PCIe riser assembly locations define both a physical and electrical length between the CPUs and PCIE cards. The electrical length must be held to within specification in order for the PCIe cards to function correctly. Routing all twelve x16 PCIE lanes to the four risers shown and meeting the electrical specification and physically fitting in the chassis is what the PCIE Riser Extension Assembly addresses.

The SD Flex PCIe riser assembly is different, such that the riser assembly PCA does not plug into the motherboard directly. All the signals and power are brought in through cables. This allows the PCIe riser assembly to be positioned in locations within the server chassis that are not possible when plugging into the motherboard. Having the signal and power cables directly attached to the PCIe riser PCA (no connectors between the cables and PCA) may not be a novel concept itself. The

combination of the direct attached cables to the PCIe riser PCA, the PCIe riser PCA not directly plugging into the motherboard, allowing the PCIe riser to be positioned in a location otherwise not possible, and meeting the electrical signalling requirements is unique.



Picture of SD Flex PCIe Riser Extension Assembly with cables, connector for plugging into the MB, and PCA with four PCIe slots, two x16 and two x8 connectors. Not shown is the power cable, which is also a part of the assembly.



SD Flex PCIe Riser Extension Assembly shown with the power cord

The PCIe Riser Extension Assembly is physically constructed using two identical HPE designed paddle card PCAs connected to a single HPE designed PCIe riser PCA using 3M twinax cable. The PCIe paddle cards plug into the center section of the motherboard in the vicinity of all four CPUs using 3M SPD08 180 pin paddle card connectors. The PCIe riser PCA has two x16 and two x8 PCIe connectors to fully expose all PCIe lanes brought to the riser. There are three different riser assembly versions; left, right, and center, and depending on the server chassis configuration, various combinations of these three riser assemblies are used. Each of the three versions utilize the same PCAs with the 3M twinax cable folded in different ways and with different twinax cable lengths to allow for physically locating the risers in the chassis. Using various combinations of the different PCIe riser versions allow a user to have as much or little I/O exposed as needed. A maximum configuration of up to 16 low profile PCIe cards, eight x8 and eight x16, is possible. Users can also have four x16 high power double wide ¾ length GPU cards and four low profile PCIe cards (two x8 and two x16) in a GPU configuration. This same configuration would allow for eight full height PCIe cards, four x8 and four x16 PCIe cards, and four low profile PCIe cards two x8 and two x16 PCIe cards. There are several variations to these configurations possible by removing the number of PCIe riser present in the chassis. All of this is done with the same two HPE designed PCAs in every location with the same wiring and PCA routing, just using various combinations of the three riser versions.