

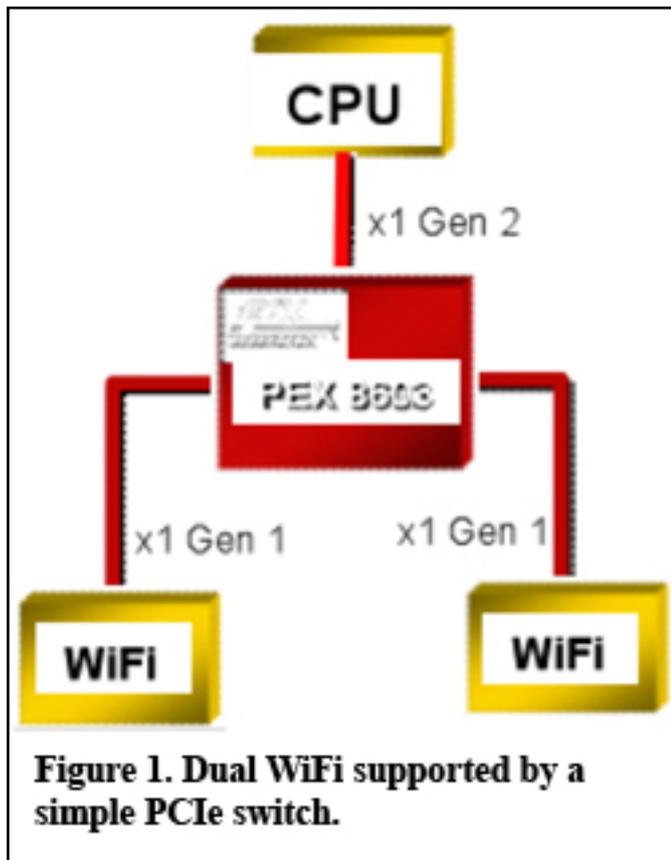
## **PCI Express Claims Another Market Segment: Wireless LANs**

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PCI Express (PCIe) has become wildly successful throughout virtually all market segments – from servers, storage, and graphics to embedded systems, communications, and consumer products. PCIe technology has become so omnipresent that even designs that were slow to adopt the technology -- WiFi modules, set-top boxes, cable modems, and home gateways -- now have PCIe designed in as a common feature.

The latest trend in the WiFi module market is dual-WiFi, which calls for support of both 2.4 GHz and 5.0 GHz bands. The 2.4 GHz band supports Internet data and voice, while 5.0 GHz supports file transfers and video streaming. Since the 2.4 GHz band supports everything from a phone line, Bluetooth and other equipment, it is extremely cluttered and makes file transfers painfully slow and HD streaming virtually impossible. End-users simply won't embrace products hampered by slow technology.

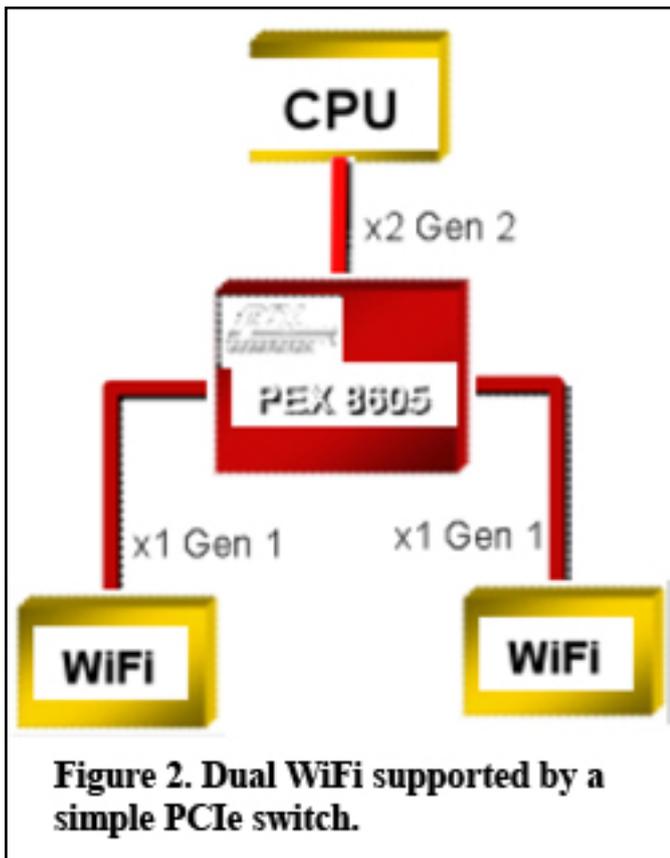


## PCI Express To The Rescue

Most processors used in the wireless market come with native support for a single x1PCIe interface. However, designers increasingly are demanding wireless cards that support dual-WiFi -- a need that a PCIe switch fills. Figure 1 shows how a simple PCIe switch with only three lanes solves this problem.

The PCIe switch provides a simple fan-out from the CPU to the dual-WiFi devices. With a PCIe Gen 2 interface running at 5 Gbps, the switch will ensure that there are no bandwidth bottlenecks. For designers still concerned about any potential bandwidth issue, Figure 2 illustrates a solution.

In Figure 2, the PCIe switch provides a x2 Gen 2 interface with a total bandwidth of 10 Gbps. This will ensure that there is no scenario under which a bottleneck could occur. Obviously, the CPU needs to support a Gen 2 PCIe interface, and the good news is that most of the CPUs used in this space are moving towards incorporating the Gen 2 interface.



For those designers not concerned about bandwidth but are interested in expanding the usage of the PCIe switch to add a PCIe expansion slot or support USB 3.0, the PCIe switch can do that as well, as shown in Figure 3.

A PCIe switch in such a competitive market must satisfy the “Three Ps” essential in such consumer designs: package, power and price. Since the boards and systems in some segments are size-limited, it is crucial for the PCIe switch to come in the smallest-possible package. Power also is extremely important in these designs, since many feature no heat sinks or airflow. Finally, it is essential that these designs require no unnecessary components, which would drive the total system cost up while adding to their power draw.

The flexibility of PCIe switches, such as those from PLX Technology, is really critical for wireless applications.

While it is possible that there are designs not requiring a PCIe switch to support dual WiFi, such designs often fail to deliver an optimal user experience. For example, some WiFi devices offer support for both 2.4 GHz and 5.0 GHz in the same device, but such devices limit the usage to one or the other of these bands and don’t allow simultaneous use. This drawback is compounded by the issue of whether the operating system is able to switch between the two bands automatically and how demanding the qualification work will be to assure that the design works in all operating systems and operating conditions. For a minimal addition to the BOM in the form of a PCIe switch, end-users can get a great experience with two-separate WiFi devices supporting 2.4 GHz and 5.0 GHz bands individually, and a PCIe switch bridging these WiFi devices to the processor.

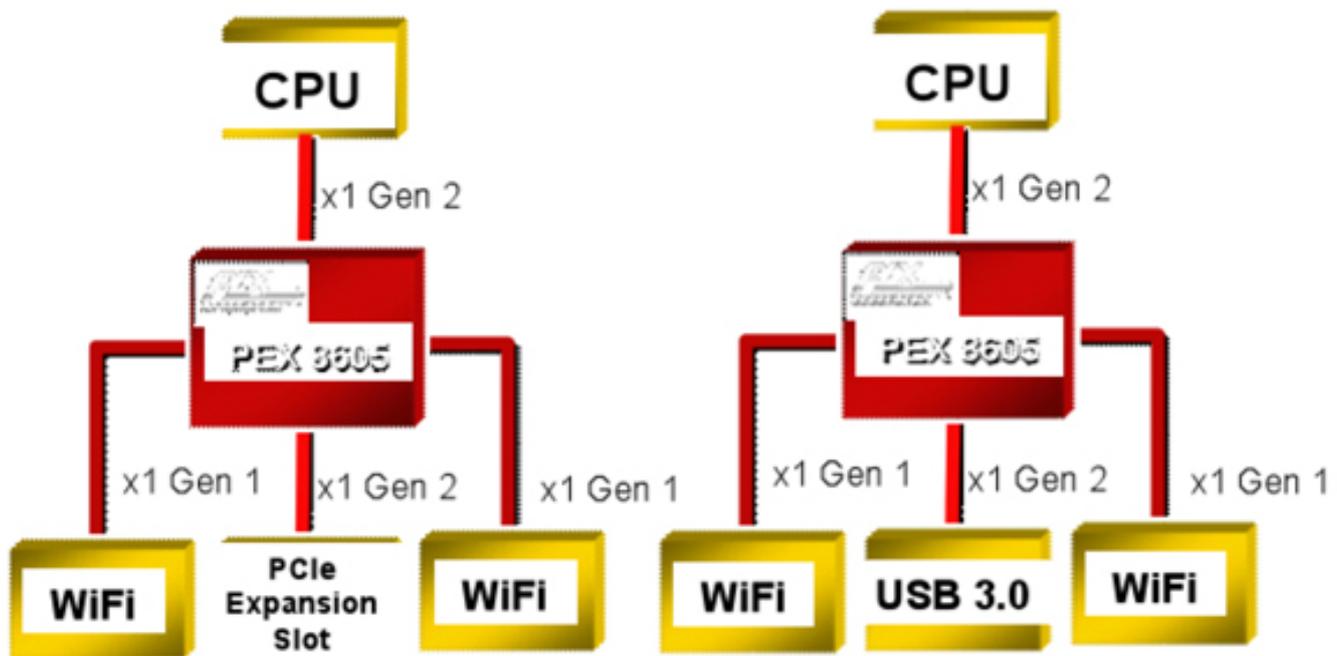


Figure 3. Dual WiFi and support for USB 3.0 or PCIe expansion slot

## Conclusion

With PCIe technology having become as versatile as it now is, it is perhaps not a surprise that it can support dual WiFi, providing the consumer with an unparalleled user experience. With processor makers now including PCIe Gen 2 in CPUs, this user experience is about to get even better. In addition to dual WiFi, designers also can incorporate USB 3.0 and/or any other PCIe-enabled devices they want to connect via the expansion slot.

To satisfy the requirements in the WiFi module market, vendors such as PLX Technology are bringing to market devices that are both power- and space-efficient, while also flexible and high in performance. These switches presently are being designed into the full range of products cited earlier. CPU and PCIe silicon vendors will continue to speed the evolution of the ecosystem, thus giving designers the necessary elements to further deploy the PCIe Gen 2 standard, along with the emerging PCIe Gen 3 standard.

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