

“Developing a MIL-STD 1553B to PCI 32/33 Bridging Applications”

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Abstract

The MIL-STD-1553B bus has been deployed for data communications purposes since the 1970’s in a variety of high-reliability applications, such as civilian and military aircraft, ground- and sea-based military vehicles, and in spacecraft. Its major benefit is dual redundant signal paths, which makes it suitable for mission-critical systems. Although the data transmission rate of 1Mb/sec may seem pedestrian in today’s world, many applications under development today have data communication needs for which 1Mb/sec is more than adequate.

In parallel, the adoption of mainstream commercial devices, which use interfaces such as PCI, is creating a challenge for designers of military and aerospace systems. Frequently, circuits or sub-systems that use different interface technologies will need to be connected together. Devices that bridge interface standards such as MIL-STD 1553B and PCI are needed. However, there is such a diverse range of bridging needs that it is not economically viable for a standard components vendor to produce a single-chip IC that meets every designer’s needs. A more flexible approach is required. The use of an FPGA with soft IP cores implementing the MIL-STD 1553B and PCI interfaces is an approach that has proven successful.

In this paper we examine the development of MIL-STD 1553B Remote Terminal to 32-bit, 33MHz PCI and MIL-STD 1553B Bus Controller to 32-bit, 33MHz PCI bridges, each using an FPGA with off-the-shelf IP cores. We cover the design flow, the design of key blocks in the bridging application, performance and utilization of the FPGA implementations, and lessons learned.