TOTAL PHASE

Boosting USB 3.0 Design Quality and System Designer Efficiency



The Beagle™ USB 5000 v2 SuperSpeed Protocol Analyzer, an interactive digital protocol analyzer for USB 3.0 (also known as "SuperSpeed USB") from Total Phase, Inc., can greatly enhance a system designer's productivity across a broad range of design and debug stages. USB 3.0 developers can quickly complete their new designs, verify proper product operation, and easily add features to their products with the time savings provided by the Beagle USB 5000 v2 analyzer.

Nowhere are these benefits more important than with today's latest USB 3.0 designs operating at 5 Gbps. Engineers have to grapple with data rates roughly ten times faster than standard USB 2.0, simultaneous bi-directional traffic, multiple low-power states, and a host of additional issues associated with higher speeds such as narrow signal margins and power supply tolerances.

Setting up a lab environment to collect the information needed to identify the problems with the design under test can take an engineer hours or even days.

The Beagle USB 5000 v2 analyzer from Total Phase helps make this process shorter and more reliable with its rapid setup and fast data collection.

Managing A Sea of Data

The Beagle USB 5000 v2 analyzer enables a highly interactive and efficient workflow that is different from traditional protocol analyzers. Traditional analyzers force the user to Capture, Download, Parse, then View (CDPV) bus data, resulting in long delays before any information is displayed. With its large hardware buffer and ability to stream data to the analysis PC during a capture, the Beagle USB 5000 v2 analyzer transforms the debugging process into a real-time, interactive workflow. Captured protocol data are constantly streamed to the analysis PC and then parsed and displayed immediately, thanks to the real-time view in Total Phase's Data Center™ Software. Compared to the typical CDPV analyzer, the Beagle USB 5000 v2 analyzer can save several hours of debug time.

While the debugging process may seem simple by this abstract description, in the real world it can be extremely complex given the breadth and depth of the digital information involved. Users can exercise USB 3.0 devices with known data streams and use the Beagle USB 5000 v2 analyzer to directly and immediately measure all the traffic between the host and device. Consider the case of a USB 3.0 external hard drive and a host PC. At the instant the hard drive is connected to the PC, there is an initial "handshake," or enumeration, and then data can be freely transferred between the two host PC and the hard drive. Finding errors in this vast array of digital data can be tedious and time-consuming. However, if there is an error in either the enumeration or the transmission of data, the Beagle USB 5000 v2 analyzer and its real-time analysis feature is uniquely suited to provide the visibility and immediate feedback to the user.

Even though most systems employ higher-level protocols with CRC checking and packet re-transmission in the event of errors, the simple fact is that any error can have a subtle impact to overall device and system operating efficiencies, which in turn can create competitive disadvantages. Effective system designers will want to detect and correct as many sources of low-level data errors so their designs can operate with the highest level of system performance.

Detailed Benefits of Real-Time Protocol Analysis

With devices creating and sending huge streams of data, designers need to separate the raw bus data into higher-level units of information based on the overall set of bus protocols involved. The Beagle USB 5000 v2 analyzer's real-time analysis feature makes this task extremely simple for advanced USB 3.0 designs as well as for older USB 2.0 designs.

Bus data are captured as soon they are detected, then are buffered locally and streamed to the analysis PC. Trace data are then parsed and decoded into the higher-level protocol commands simultaneously as they arrive at the analysis computer. The USB class-level decoded data are displayed immediately on the user's monitor. Traditional CDPV analyzers differ in that there can be a long wait time before the user sees the bus data. However, with the Beagle USB 5000 v2 analyzer, there is virtually no waiting period between the capture, display, and parsing of the data, giving the user true, interactive real-time analysis.

Let's look at some sample comparisons using a 512 MB capture of USB 2.0 data. For the sake of this comparison, it is assumed that both the CDPV analyzer and the Beagle USB 5000 v2 analyzer take the same time to configure and start a trace capture. We also assume they also transfer data at the same rate. As Figure 1 shows, a typical CDPV analyzer will require the user to wait nearly 2 minutes before any trace information can be viewed on their host system.

While some newer CDPV analyzers may combine steps C and D, the user is unable to commence analysis until the capture and download have fully completed, allowing the parsing to finally commence.

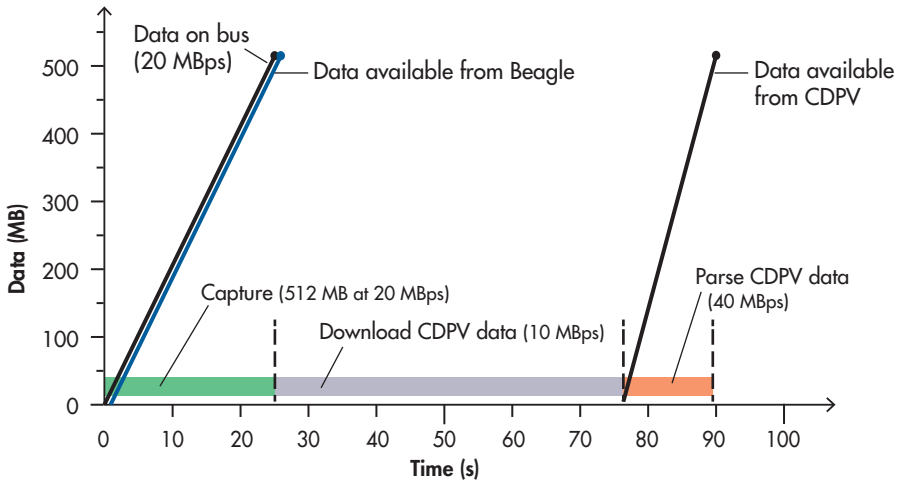
Compare these results with the information shown in Figure 1 for the Beagle USB 5000 v2 analyzer. Notice that the downloading and parsing of new trace information can start as soon as trace data is being captured. With its highly efficient real-time protocol analysis software, the Beagle USB 5000 v2 analyzer can display new information in less than a second after it appears on the bus under test!

During a typical debug session, the user may iterate this same process over a hundred times. With its unique real-time display and parsing of data, the Beagle USB 5000 v2 analyzer can offer a significant reduction in the debugging time for USB developers. Due to its highly interactive nature, users will be encouraged to run broader and more comprehensive analysis sweeps that can result in fewer design errors reaching the production stage.

SuperSpeed Downlink

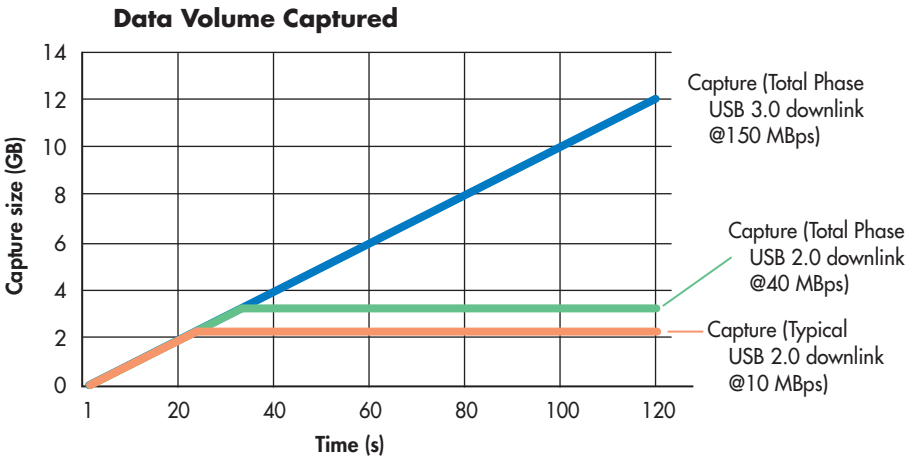
While the real-time nature of Total Phase's solution coupled with a USB 2.0 downlink already provides the fastest time to productivity of any analyzer available, the SuperSpeed downlink on the Beagle USB 5000 v2 analyzer provides a USB 3.0 interface to the analysis PC. By taking advantage of USB 3.0's speed and bandwidth, data captured on the analyzer's hardware buffer are streamed to the analysis PC's buffer faster than ever before. Figure 2 compares the data volume available for analysis between a typical CDPV analyzer, a Beagle USB 5000 v2 analyzer with Total's Phase's USB 2.0 downlink, and a Beagle 5000 v2 analyzer with the new blazing USB 3.0 downlink.

Figure 1: Typical 512 MB Capture of USB 2.0 Data



The Beagle analyzer allows analysis to begin immediately as the captured data is made available on the bus, while a typical CDPV analyzer requires a wait of almost 2 minutes before true analysis can begin.

Figure 2: Comparison of Data Captured for USB 2.0 and USB 3.0 Downlink Analyzer



For all calculations, streaming data rate = 100 MBps, analyzer hardware buffer = 2 GB

Conclusion

Enhancing productivity is within reach by utilizing the Beagle 5000 v2 USB Protocol Analyzer from Total Phase. Coupling a blazing USB 3.0 downlink with the ability to begin debug sessions as soon as the "Start Capture" button is pressed enables a level of speed, scope, and precision not available with competitive analyzers. Comparatively, CDPV analyzers can prolong debugging time, by requiring users to wait before seeing their application's data, or even causing prematurely terminated captures. The real-time, interactive analysis offered by the Beagle USB 5000 v2 analyzer and the Data Center software allows developers to spend less time waiting for data, and more time on actual application development.

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