Comparison of effort for simple debug steps

In below table we compare the time taken for some simple debug steps using only a waveform viewer with the time taken for the same steps performed with the help of PDA along with a waveform viewer. We do this for popular protocols such as USB3, AXI3 and DDR2.

Simple Debug Steps	Waveform Time	PDA Time	Effort Reduction
Decoding a USB3 DPH packet **Waveform:** 1. Thinking effort/time: a. Referring to the spec to get the packet structure may take 2-5 mins b. Identifying what needs to be done in waveform viewer may take 1-2 min 2. Tool effort/time: finding the first DP in the waveform and actually decoding the DPH fields will take another 5 mins. Scrambling of data would also complicate the decode. **PDA:** 1. Thinking effort/time: Low effort since tool software presents decoded data 2. Tool effort/time: All we need to do is filter the 'Type' column to show DPH only and we can see all the decoded fields in their respective columns	8-11 mins	10 sec	~97%
Counting number of USB3 Data packets **Waveform:** 1. Thinking effort/time: a. Referring to the spec to identify framing symbol bit-pattern will take another 1-2 mins b. Formulating a logical expression in the waveform viewer to get all DPs, this may take 2-3 mins 2. Tool effort/time: Traversing through the waveform and counting the DPs might take a lot of time depending on the number of DPs. For a simple example it took 2 min 18 sec **PDA:** 1. Tool effort/time: Filter by DPH and scroll down to the end to check the number of DPHs , alternatively make use of DPHDPP stats app to get the number of DPHs and DPPs.	6+ mins	20 sec	~94%
Identify all phases of an AXI3 Write transaction **Waveform:** 1. Tool effort/time: To find the phases that constitutes an AXI3 transaction we need to match the WIDs with AWIDs and BIDs (for write transaction). This becomes more difficult when there is deep pipelining and IDs are same for all transactions. **PDA:** Tool effort/time: Hierarchical view directly clubs the address, data and response phases together for a transaction.	5+ mins	10 sec	~96%
Perform protocol level diff of USB3 packets **Waveform:** 1. Thinking effort/time: To come up with an algorithm for performing protocol level diff will be very time consuming. 2. Tool effort/time: This debug step can't be done in the waveform viewer directly. Packets will have to be extracted manually, logged into a file and then compared with a diff tool. **PDA:** 1. Thinking effort/time: Need to identify the endpoint number and direction that we want to compare between reference and current signal dump files 2. Tool effort/time: PDA supports diff feature directly Timing results are obtained by using diff on our example for BULK IN endpoint type.	45+ mins	50 sec	~99%
Find contents of memory/register inside an address range at any given time **Waveform:** 1. Tool effort time: We need to search for all memory accesses inside the address range and log the contents till a particular time. This can be very time consuming. **PDA:** 1. Tool effort/time: supports a memory view feature which shows all the memory address	30+ mins	10 sec	~99%

contents with time.			
Find how a USB3 transfer is broken into USB3 packets **Waveform:** 1. Tool effort/time: We need to look for a packets belonging to a particular endpoint address and try to figure out where did the transfer start and end. This can't be done easily in a waveform viewer for large transfers. Scrambling of data would also complicate the decode. **PDA:** 1. Tool effort/time: PDA's hierarchical view displays how a USB3 transfer is broken into packets These numbers are for a BULK IN transfer.	30+ mins	40 sec	~97%
Find last data written to a particular address on DDR2 **Waveform:** 1. Thinking effort/time: a. Referring to Spec to identify address decode, command decode and command sequence will take ~7-8 mins. b. We need to use the address signals to get the bank and row address for the Activate command and column address during Write. (5-8 mins) 2. Tool effort/time: Create a logical expression for marking the correct transaction's address/cmd phase followed by looking at the waveform to identify the last access and its corresponding data phase. (may take more than 2 mins to get to the last write data value) **PDA:** 1. Tool effort/time: We just need to look for last write command for given address. This can be done by column filtering on CMD type (Read / Write) along with Address.	10 mins	20 sec	~96%
Match a USB3 DP with its TP **Waveform:** 1. Tool effort/time: To match a Setup DPH with a TP looking at their endpoint and sequence numbers: This will require decoding of endpoint and sequence number fields in DP and TP packets. Additional complication arises if there are flow control packets (NRDY/ERDY) exchanged or if the DP is retried at protocol level. **PDA:** 1. Tool effort/time: PDA has an application to match DP with ACK TP can be used to do this quickly for all DPH.	10+ mins	20 sec	~96%
Count number of Read transactions seen on an AXI3 interface **Waveform:** 1. Tool effort/time: Create a logical expression that asserts to 1 whenever there is a valid address phase on the AXI3 interface. Count the number of clock cycles during which this logical expression is asserted. **PDA:** 1. Tool effort/time: Filter the AXI3 transactions table to show only Read transactions	5 mins	10 sec	~96%
Find the number of IN transfers for each endpoint in USB3 **Waveform:** 1. Tool effort/time: This can't be done manually using waveform viewer for large number of transfers. **PDA:** 1. Tool effort/time: Filter the table for USB3 transfers to show only IN transfers for a particular endpoint number. The number of rows in the filtered table is equal to number of transfers for that endpoint.	Very long	19 sec	100%