TSSI TD-ScanPRO Optimizes Timing Across Multiple ATPG Files

1. Introduction

DFT teams often deliver many ATPG files in the standard file format such as WGL or STIL for testing the same device. Each ATPG file has its own timing and pattern. Some timings are common across all the ATPG files. Some are not. For instance, the timing for scan shift cycles is different from launch and capture cycles.

Most conversion tools generate a corresponding NI STS timing file (.digitiming) and NI STS pattern file (.digipat) per input ATPG file, which is fine for testing one timing/pattern pair at a time. However, executing all patterns is best to have a single master timing for all test patterns.

The benefit is the optimal usage of the precious time-set resources on the tester, and also the saving of re-loading different time-sets for each pattern execution.

2. Using TD-ScanPRO's "Orbitx" and "Incremental" Conditioners

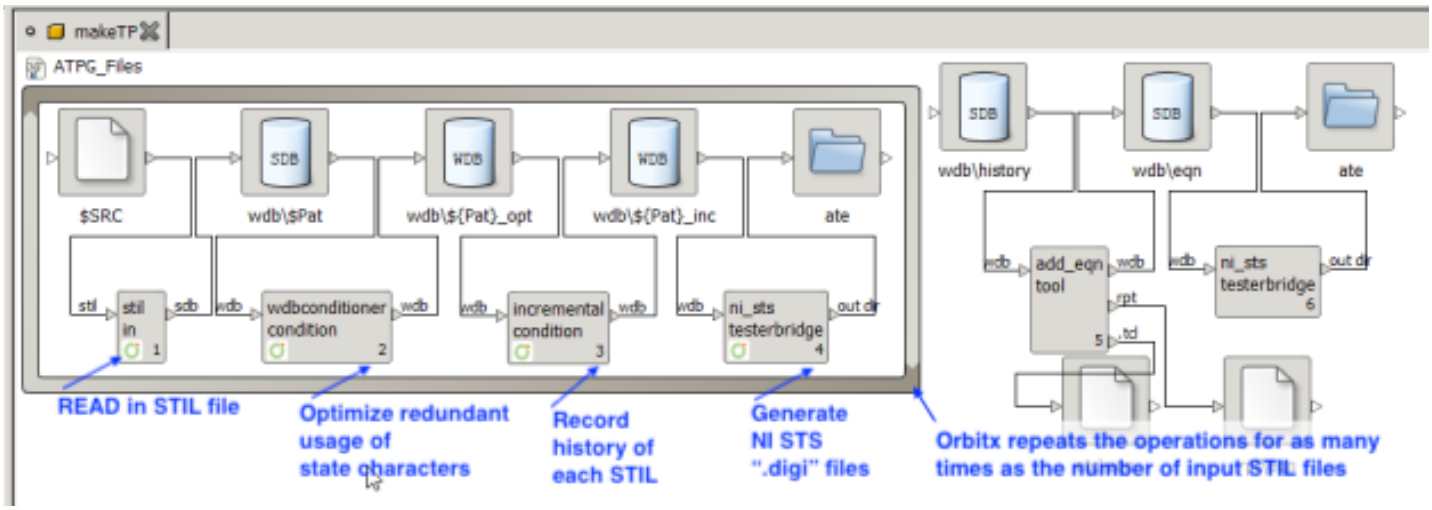

Figure 1: A Sample Setup of TD-ScanPRO Scenario Using Orbitx and Incremental Conditioners

Shown in Figure 1 are operations to convert 4 ATPG STIL files:

1. The "STIL In" operation to read in an ATPG file in the STIL format
2. The "wdbconditioner" operation is optional, but highly recommended, to pre-condition the STIL file for the optimal usage of state characters, which varies from one ATPG tool to another. TSSI TD-ScanPRO covers all variations.
3. The "Incremental" conditioner is the key step to record timing history found in each and every incoming STIL file to "learn" the timing behavior across all files
4. The "NI_STS" Testerbridge generates an NI STS pattern for each incoming STIL file
5. The "Orbitx" object that encompasses the 4 operations repeats them as many times as the number of incoming STIL files fed into the flow
6. The Add Equation ("add_eqn") operation is optional but useful in adding variables to timing for spec-based operations on the tester such as Shmoo.
7. The last "NI_STS" Testerbridge step, outside of the Orbitx loop, takes the History database ("wdb/history") as an input to generate a single master timing that serves all of the incoming ATPG patterns

3. The Resultant Files

Figure 2 shows the NI STS files generated by the described TD-ScanPRO's flow above after processing 4 input STIL files.

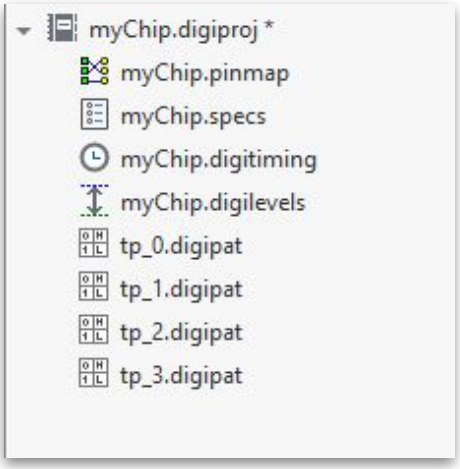

Figure 2: The resultant files from processing 4 input STIL files

There are 4 NI STS patterns loaded into the NI Pattern Editor: tp_0.digipat, tp_1.digipat, tp_2.digipat, and tp_3.digipat. There is only one NI STS timing file, myChip.digitiming (as shown in Figure 3), that serves all 4 pattern files.

tp_1.digipat | tp_2.digipat | tp_3.digipat | tp_0.digipat | myChip.digitiming

Name	Period	Pin Item	Edge Multiplier	Drive Format	Drive On	Drive Data	Drive Return	Drive Off	Compare Strobe	Comr
par_WFT	ControlSet1.tper_0	G1_all_inputs	1x	NR	0 s	0 s		40 ns	0 s	
par_WFT	ControlSet1.tper_0	all_outputs	1x	NR	0 s	0 s		ControlSet1.tper_0	ControlSet1.po01_1	
par_WFT	ControlSet1.tper_0	pclk	1x	RL	0 s	ControlSet1.pclk_1	ControlSet1.pclk_2	40 ns	0 s	
par_WFT	ControlSet1.tper_0	sclk	1x	RH	0 s	ControlSet1.sclk_1	ControlSet1.sclk_2	40 ns	0 s	
par_WFT_1	ControlSet1.tper_0	G1_all_inputs	1x	NR	0 s	0 s		40 ns	0 s	
par_WFT_1	ControlSet1.tper_0	all_outputs	1x	NR	0 s	0 s		ControlSet1.tper_0	ControlSet1.po01_1	
par_WFT_1	ControlSet1.tper_0	pclk	1x	RL	0 s	ControlSet1.pclk_1	ControlSet1.pclk_3	40 ns	0 s	
par_WFT_1	ControlSet1.tper_0	sclk	1x	RH	0 s	ControlSet1.sclk_1	ControlSet1.sclk_3	40 ns	0 s	
par_WFT_2	ControlSet1.tper_0	G1_all_inputs	1x	NR	0 s	0 s		40 ns	0 s	
par_WFT_2	ControlSet1.tper_0	all_outputs	1x	NR	0 s	0 s		ControlSet1.tper_0	ControlSet1.po01_1	
par_WFT_2	ControlSet1.tper_0	pclk	1x	RL	0 s	ControlSet1.pclk_1	ControlSet1.pclk_4	40 ns	0 s	
par_WFT_2	ControlSet1.tper_0	sclk	1x	RH	0 s	ControlSet1.sclk_1	ControlSet1.sclk_4	40 ns	0 s	
scan_WFT	ControlSet1.tper_0	G1_all_inputs	1x	NR	0 s	0 s		40 ns	0 s	
scan_WFT	ControlSet1.tper_0	all_outputs	1x	NR	0 s	0 s		ControlSet1.tper_0	ControlSet1.po01_1	
scan_WFT	ControlSet1.tper_0	pclk	1x	RL	0 s	ControlSet1.pclk_1	ControlSet1.pclk_2	40 ns	0 s	
scan_WFT	ControlSet1.tper_0	sclk	1x	RH	0 s	ControlSet1.sclk_1	ControlSet1.sclk_2	40 ns	0 s	
scan_WFT_1	ControlSet1.tper_0	G1_all_inputs	1x	NR	0 s	0 s		40 ns	0 s	
scan_WFT_1	ControlSet1.tper_0	all_outputs	1x	NR	0 s	0 s		ControlSet1.tper_0	ControlSet1.po01_1	
scan_WFT_1	ControlSet1.tper_0	pclk	1x	RL	0 s	ControlSet1.pclk_1	ControlSet1.pclk_2	40 ns	0 s	
scan_WFT_1	ControlSet1.tper_0	sclk	1x	RH	0 s	ControlSet1.sclk_1	ControlSet1.sclk_2	40 ns	0 s	
scan_WFT_2	ControlSet1.tper_0	G1_all_inputs	1x	NR	0 s	0 s		40 ns	0 s	
scan_WFT_2	ControlSet1.tper_0	all_outputs	1x	NR	0 s	0 s		ControlSet1.tper_0	ControlSet1.po01_1	
scan_WFT_2	ControlSet1.tper_0	pclk	1x	RL	0 s	ControlSet1.pclk_1	ControlSet1.pclk_3	40 ns	0 s	
scan_WFT_2	ControlSet1.tper_0	sclk	1x	RH	0 s	ControlSet1.sclk_1	ControlSet1.sclk_3	40 ns	0 s	
scan_WFT_3	ControlSet1.tper_0	G1_all_inputs	1x	NR	0 s	0 s		40 ns	0 s	
scan_WFT_3	ControlSet1.tper_0	all_outputs	1x	NR	0 s	0 s		ControlSet1.tper_0	ControlSet1.po01_1	
scan_WFT_3	ControlSet1.tper_0	pclk	1x	RL	0 s	ControlSet1.pclk_1	ControlSet1.pclk_4	40 ns	0 s	
scan_WFT_3	ControlSet1.tper_0	sclk	1x	RH	0 s	ControlSet1.sclk_1	ControlSet1.sclk_4	40 ns	0 s	

Figure 3: The single master NI STS time-set serves all 4 patterns

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