



The World Leader in High Performance Signal Processing Solutions



FMCAD 2009

Tushar Ringe
Analog Devices





Verification Successes

- 3rd Generation 32bit floating point SHARC DSP family
- Multi-Pronged Verification
- Formal verification on critical blocks like External Mem Intf/External Bridge
- Many Deep state bugs caught using FV
- Closure metric well defined, tracked and executed
- First-Pass Silicon



Verification Failures

- Top 5 reasons for functional failures :
 - Incomplete Verification Plans for blocks due to schedule pressures
 - Lack of formal verification on critical blocks resulting in missed deep state bugs. Eg : CORE-DMA conflict resolution error under some very corner case scenario
 - Lack of clarity in block specs a deterrence for using formal verification
 - Not enough functional coverage cases defined resulting in uncovered cases
 - Inaccurate Verilog modeling for some cells resulting in erroneous operations



How to get positive ROI from FV tools

- Choose a control-dominated block. FV on Jump control Unit caught lots of bugs while on Data Mapping Unit, no bugs were found
- End-to-End properties gives best ROI
- Making designers write in-line assertions during the code development
- Cut down on time wasted during stabilizing input constraints
 - Partitioning at well defined interfaces
 - Active designer involvement in describing input constraints
- Cut down on COI by reducing property. Rather than checking priority logic for 64 interrupts, check for 16.
- Use of assistant coverage goals to improve convergence for semi-formal tools



Other Applications of FV

- Generating test-cases for interesting scenarios in design
 - In Instruction Fetch Unit, generate test-case where back to back instr are predicted jumps and stall is asserted.
- Bug Reconstruction and Bug Fix validation during post-silicon debug
- Performance validation for worst-case throughput/latency related issues
 - *intrpt_generated* |-> ##[1:20] *intrpt_serviced*;
- Equivalence checking between two blocks of with same function but different implementation
- Validating that re-timing didn't introduce bugs