



Simulation Versus ?



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Introduction

- Simulation versus acceleration, versus emulation
- Which solution is right for me?
- When we use simulation

Simulation, Acceleration, Emulation

- Not going to argue between the three
- The right solution is a factor of:
 - Complexity and size of the chip/system
 - The goals, the amount of time allocated, Time to Market, and potential impact
 - Module or full chip centric DV plan
 - Is the focus DV or SW dev
 - The methodology, process, and procedures of a company
 - The vision, leadership, and engineers who are going to execute the plan

Acceleration (Circa ~1999)

- Acceleration resulted in 5-10X speed up give testbench overhead.
- Developed light weight TB to leverage HW for 200X (over Sparc 450Mhz)
- Cycle based simulation resulted in 50X
- Built a C model of the XR 12000 fabric wired to N Lincards. One LC accelerated RTL, the rest C models of LC.

Distributed Simulation (Circa ~2002)

- 10 ASIC CRS-1 linecard simulation
- Globally developed, mixed DV languages, libraries
- Decided on developing both a distributed simulation library, and low overhead Perl based DV environment
- ASIC's used as building blocks compiled as independent entities
- Virtual schematic wired up chips at runtime
- Scaled to 32 ASIC fabric simulation
- No emulation/acceleration solution
- Leveraged large compute farm

Emulation (Circa 2005-6)

- 25M gate ASIC
- Emulated with home brew FPGA solution
- 250Khz
- Found bugs after 4 hour run
- SW bringup tested on emulation platform

SOC Simulation for SW Development (Circa 2003-2007)

- New High End SOC Packet Processor
- No full chip RTL for 2-3 years
- Need to Develop SW in the absence of Silicon & RTL
- Developed a C model of the SOC
- Predicted performance within 6-10%
- Control plane + data plane integration in simulation
- Live BGP 1M route updates, VoIP etc
- Embedded SW run on RTL and Silicon flawlessly
- Product enters system test at record pace

SOC Simulation As Basis For Embedded SW Dev

- Need to support tens to hundreds of developers
- Proprietary tools vs open sources: License fees add up!
- IDE for managing and visualizing simulation
- Advanced tracing and analysis
- Sophisticated checks and assertion
- Advanced temporal breakpoints
- Single step forwards and backwards in time

Future Possibilities For SOC simulation

- Break the problem down to two components: processor simulation, custom logic simulation
- Processor Simulation: Fast ISS technology, Instruction Set emulation/translation
- Custom logic: Traditional simulation, FPGA's

