



HYBRID PRE-SI PLATFORMS FOR PRODUCTION SOFTWARE READINESS

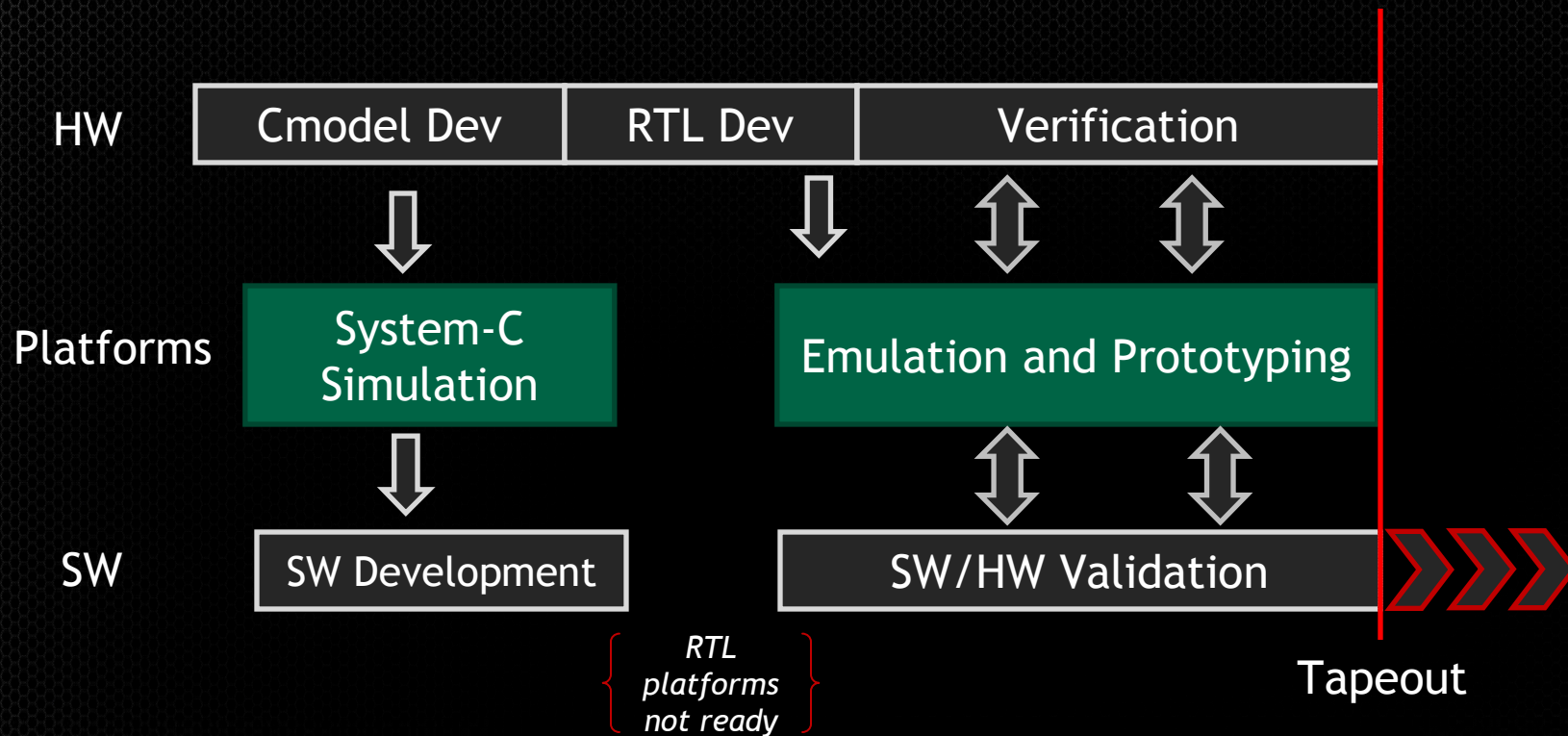


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Why Hybrid?

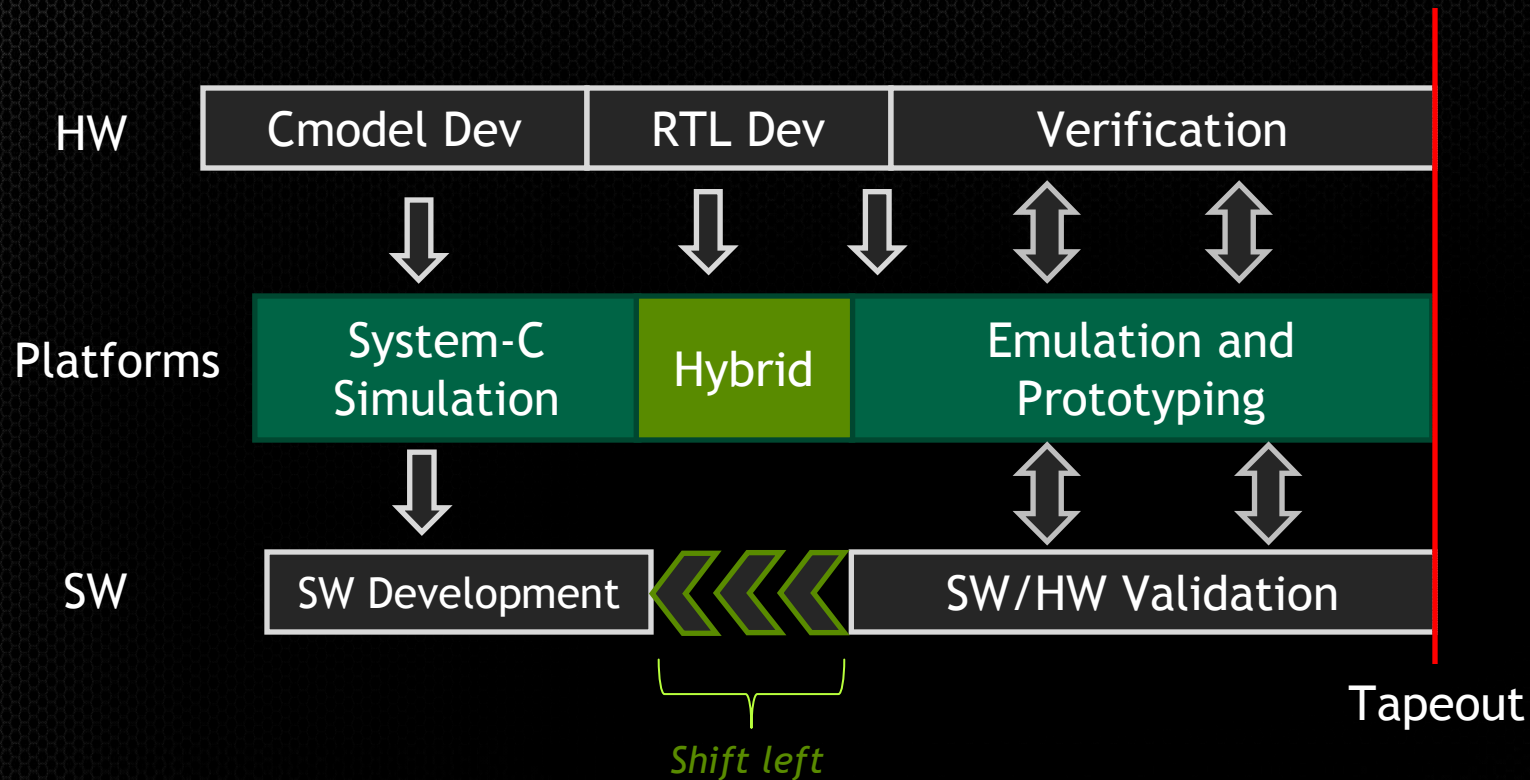
- Schedule
 - Get stuff started earlier
- Speed
 - Get stuff done sooner

Traditional Pre-Si Flow



- Emulators and FPGAs driven by full-chip RTL schedule
- Missed coverage adversely affects SOL production

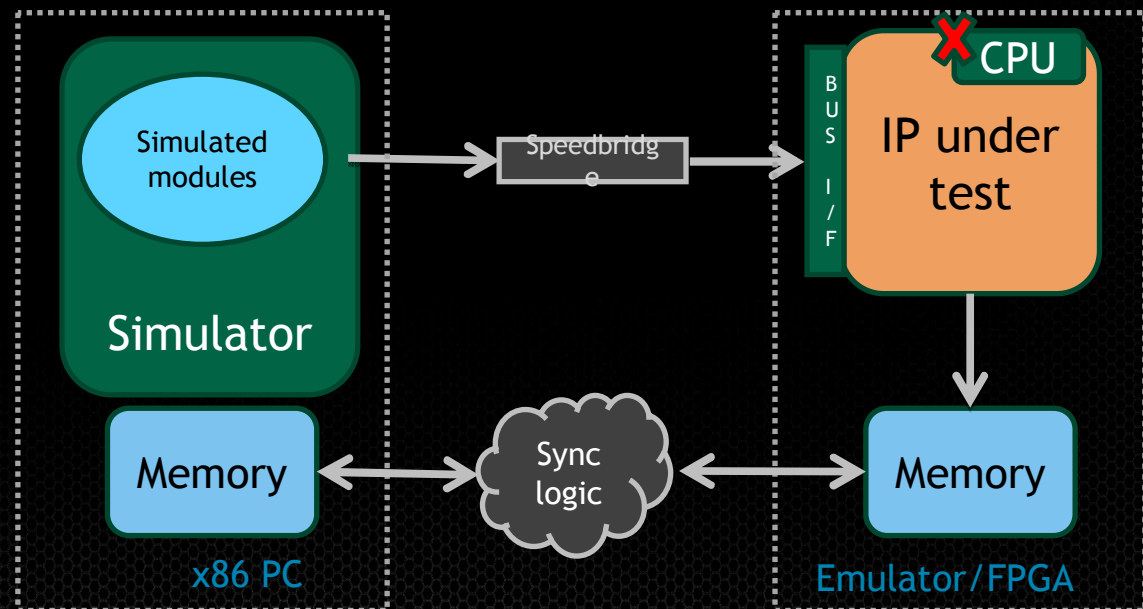
Hybrid Pre-Si Flow



- Hybrid platforms driven by IP RTL schedule
 - Earlier availability
- Substitute IP RTL in system-C simulator
- Finish SW/HW validation in time

Hybrid Speed Advantage

- Address bottlenecks of traditional full-chip pre-si platforms
 - Emulate mission critical IPs (GPU...)
 - High speed simulation of the rest including CPU
- Boot OS in reasonable wall-clock time



NVIDIA Tegra Example

- Goals

- Complete OpenGL based validation by Tapeout
 - 14K tests in ~8 weeks
 - ~3K hours run-time
- Boot accelerated UI in reasonable time
 - < 1 hr

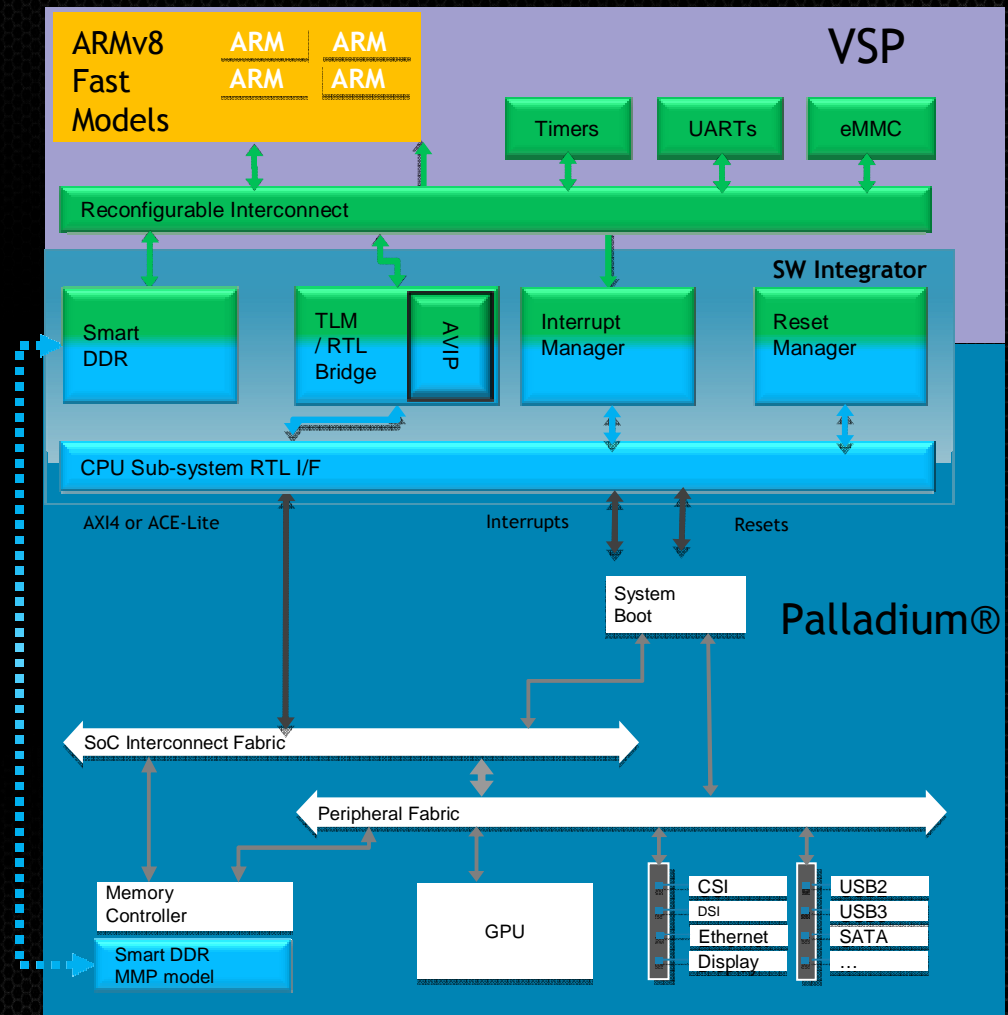


- Platform solutions explored

- Palladium emulation
 - UI boot extrapolated to be day(s)
- Custom FPGA platform
 - Complicated RTL partitioning
- Cadence VSP in a hybrid configuration with Palladium

Cadence® VSP Hybrid

- Full-chip environment
 - OS boot
 - Production SW Stack
 - Production use cases
- Unified Memory
- Fast access to Palladium emulated memory
 - SmartDDR®
 - Requires MC tweaks
- Ability to add standard simulation models (TLM2)

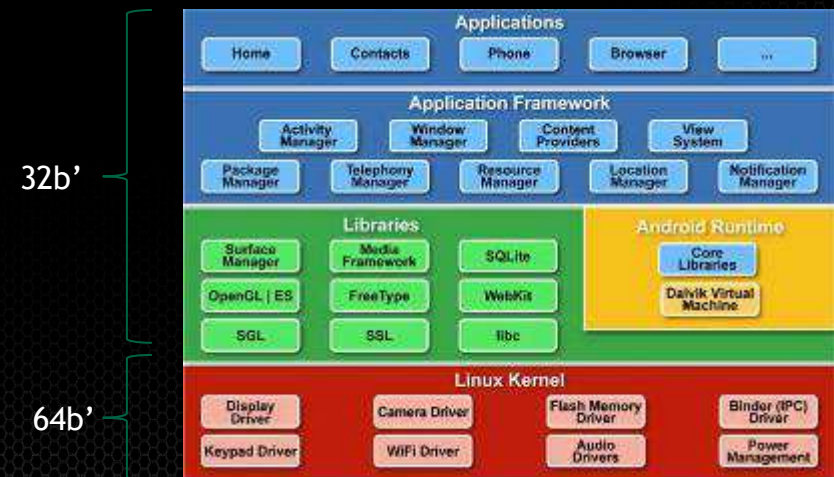
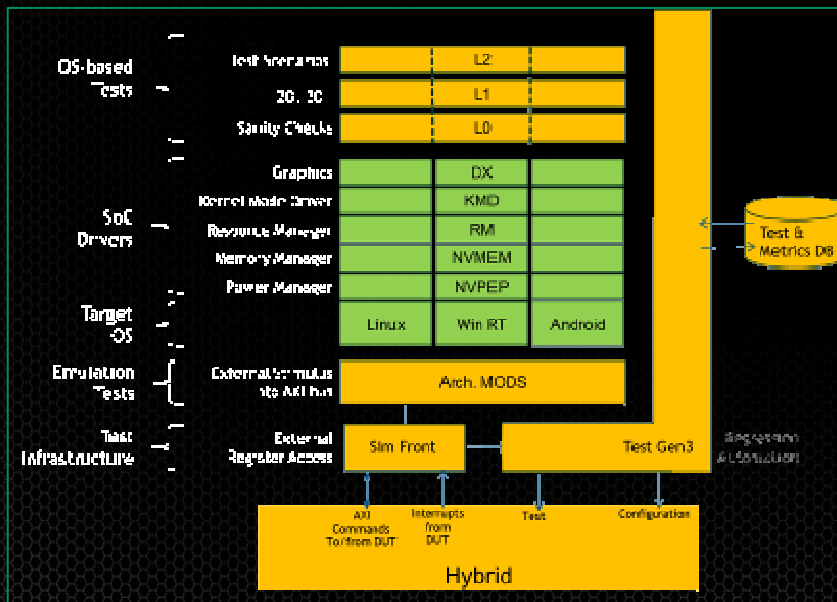


VSP (SystemC TLM)

PXP (RTL)

NVIDIA Tegra Results

- Used for multiple Tegra SOCs
 - Kernel boot = 2 mins. Android UI = 90 mins
 - 20x faster than traditional emulation
- Met OpenGL Tapeout validation KPI
 - 60% faster than traditional emulation (GPU limited)
- Resolved 32b' user <-> 64' kernel interface bugs (Tegra K1/Android K)



NVIDIA Tegra Futures

- SW development and validation on unit IP platforms
 - Extend VSP to validate more IPs
 - Unit FPGA - custom and/or industry standard
- Pre-Si SW perf/w tuning
 - Cycle/timing accurate models with system-C Hybrid
- Always-on Pre-Si and Si SW flow
 - Seamless transition between platforms
 - Minimal platform specific SW code

