

CCS Overview

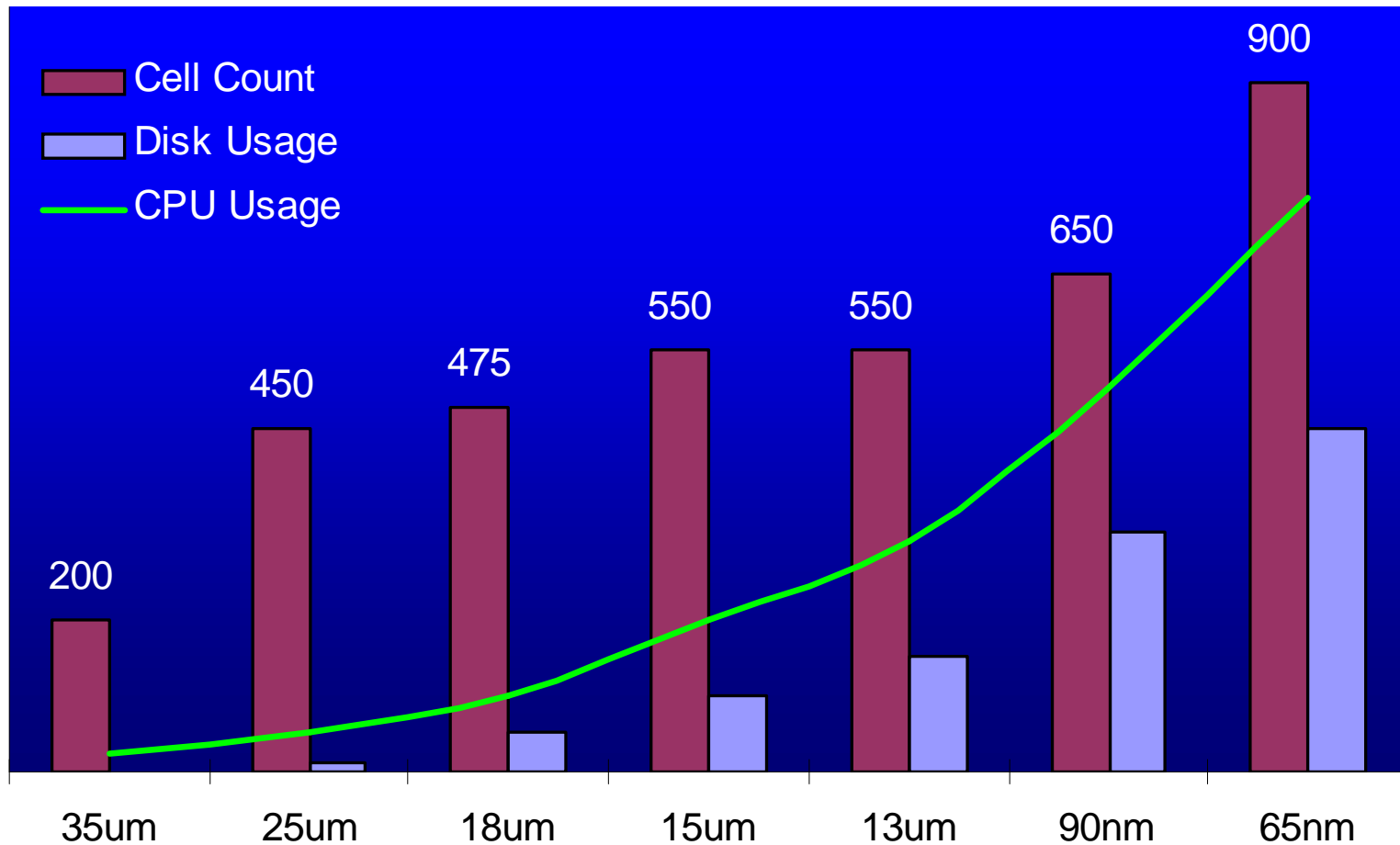
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Why is CCS needed?

- History:
 - Three delay numbers: slow, typ, fast
 - Just too inaccurate
 - Linear delay: $f(\text{cap})$
 - What about slew rates?
 - NLDM: table $f(\text{cap}, \text{slew})$, interpolate between points
 - Which table? How many points?
 - Multiple voltage support complicated
 - Where next?

Library characterization history

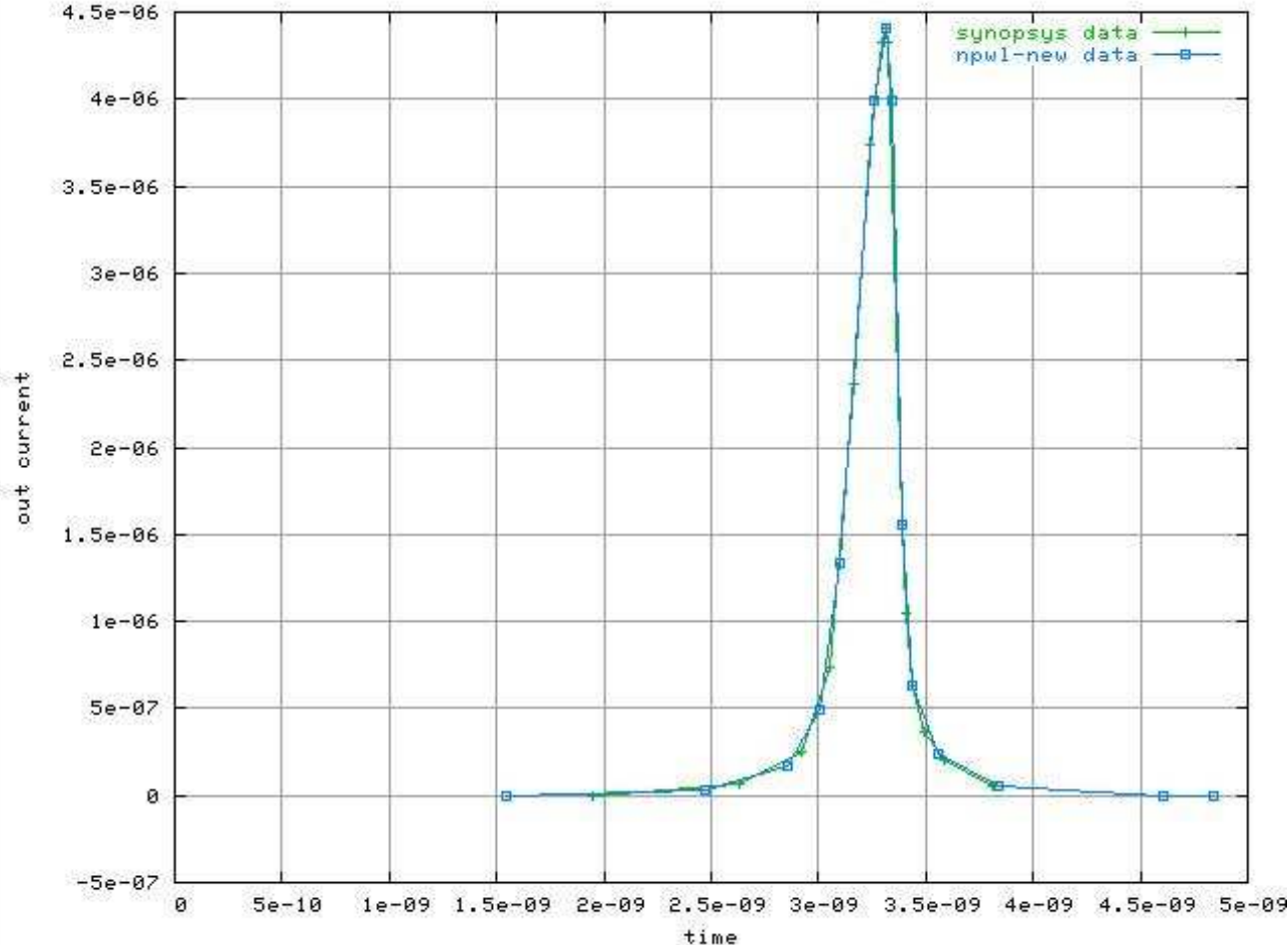


What it takes to characterize CCS

- Working closely with Synopsys CCS team
- Additional models
 - Two stage input capacitance receiver model (Miller effect)
 - Characterized on a per input slew and output load basis
 - Output current waveform for driver model
 - Characterized on a per timing arc, input slew, and output load basis
- NLDM still available
 - Input slew/output load characterized
- Result: comparable effort to NLDM characterization
 - Increased disk usage internally to store waveform data
 - Increased verification requirements

Current waveform reduction

- Computed as part of characterization process



CCS benefits

- Simplicity adding the additional characterization
- Increased accuracy with the driver/receiver model
 - CCS voltage scaling
- More accurate interpolation between characterization points
 - Allows for modeling of local voltage variation
 - Enables tradeoffs of various PVT points
 - For highest accuracy, can recharacterize at target PVT value

Recap

- Why CCS?
 - Newer technology nodes require advanced modeling
 - Designed for maximum accuracy
 - ARM focuses on providing data needed by advanced features of tools used by our customers

- CCS status
 - ARM standard cell library for TSMC 90GT process
 - Beta available since June 2005
 - Production version will be available before the end of the year
 - Other libraries will follow (processes, V_T versions)