

C.A.D. Initiatives

- ◆ Specification Gap: **e.g., What will be the critical design problem?**
 - ◆ GTX
 - ◆ GTX models include canned optimizations = canned design space explorations
- ◆ Development and Delivery Gap: **e.g., How to deploy DT better/faster?**
 - ◆ Bookshelf
- ◆ Measurement Gap: **e.g., Did achievable design improve?**
 - ◆ Metrics
 - ◆ Definition of success
- ◆ (Next up: Education? Measuring research process?)
- ◆ **Shared Context Is A Force Multiplier**

Living Roadmap

- ◆ Network, telecommunications, embedded computing systems
 - ◆ Synchronous buses → 1Gbps, differential signaling → 10Gbps
 - ◆ Network, optical interfaces have multipliers of 10x, 4x (faster than device density, speed)
 - ◆ Train wrecks: chip-to-package and system-level interconnects (materials, signaling standards, implementation costs), power, design TAT, cost
- ◆ Appropriate metrics are “non-traditional”: density, cost, performance, power, and RAS (reliability, availability, and serviceability)
 - ◆ Density: connections and bandwidth per $\text{cm}^{(2,3)}$, watts/m^3
 - ◆ Performance: How many interconnect/ $\text{cm}^{(2,3)}$? How long are traces? What types of signals, and what voltage levels, will meet signaling rate needs?
 - ◆ Cost: decompositions (mother, switch/routing, control, port interface, application), and dimensions (per (gE, FC, DWDM, ...) port, Gbps, MIPS, \$...)
 - ◆ RAS: unintentionally / intentionally (for func) dropped bits/packets dropped, failure rates
- ◆ Many models to build and integrate: **SOC integration** (what is integratable, at what cost), **analog circuits/DT** (how badly do these fail to scale), **design quality and cost**, **power** (circuits, multi-Vdd/Vt/tox / biasing, GALS/GSLA, ...), **manufacturing interface** (variability, NRE, layout densities, ...)
- ◆ GTX within DT: What are the key design technology needs?
 - ◆ Application roadmap (= ITRS System Drivers Chapter = complement to ITRS ORTCs)
 - ◆ Application product ROI = value/cost (= attributes not yet well-defined/-measured)
 - ◆ Impacts of Design Technology (== Metrics initiative)

Bookshelf

- ◆ Goal is to produce component-based, application-specific design methodologies and flows
 - ◆ How will the methodology space be explored, and flows prototyped?
 - ◆ Where are the reusable components?
- ◆ Open-source (understandable, reusable), malleable DT components
 - ◆ Centered on back end, completely missing AMS capabilities, ...
- ◆ Common data model and access mechanism (and repository?)
 - ◆ OpenAccess source code release
- ◆ Design Drivers very close to vertical benchmarks (= existing Bookshelf slot)
 - ◆ Recent overtures from IBM, LSI w.r.t. OpenAccess, working vertical benchmarks
 - ◆ Potential work with Fabrics on snap-on flows, etc.
- ◆ **KEY: Common DT Infrastructure**
- ◆ Other: synergy with education in VLSI design, design technology

Metrics

- ◆ Goal: measure and improve
 - ◆ Systems
 - ◆ Processes
- ◆ Relevant system attributes / metrics
- ◆ System value
- ◆ System cost (design, production)
 - ◆ From system ROI, have a platform from which to evaluate technology ROI
- ◆ Technology cost (research, advanced research, development, ...)

- ◆ Supporting technologies / infrastructures (data mining, parameter identification, model fitting)

- ◆ Other: Research process
 - ◆ What is the impact of FCRP ? (# newspaper articles? # papers? Coauthorship statistics? Survey results? Scientific health of (Design/Test, Interconnect, etc.) communities?) == part of original "Measure and Improve" goals



“Living ITRS-2001” in GTX

- ◆ First time ever: consistency checks, unified assumptions for power, frequency, die size, density, performance
- ◆ Creates linkages between Design, Assembly/Packaging, Defect Reduction, Process Integration / Devices / Structures, Test, Overall Roadmap Technology Characteristics, ...
- ◆ Models and studies are linked with ITRS-2001 distribution
- ◆ Improves flexibility, quality, transparency of roadmapping
 - ◆ Allows semiconductor industry to better allocate R&D investment: “Who should solve a given red brick wall?”
- ◆ 2002 goal: Increase fraction of ITRS captured within GTX