



Event-driven electronics – Rajit Manohar (Yale)

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Event-driven electronics

- Event-driven all the way down to the underlying digital circuits
“Asynchronous”, “Data-driven”, “Self-timed”, “Clockless”
- Approach can also be extended to analog electronics and analog-to-digital conversion
Analog-to-digital: “Continuous time signal processing”, “Level-crossing analog-to-digital conversion”
Imagers: “Dynamic vision sensors”, “Silicon retina”, “neuromorphic computing”
- An open-source ecosystem for event-driven electronics
Separate technology-specific v/s technology-independent parts, enable collaborations



Why?

- Process new events that carry information when possible, not raw data
 - Large gap between raw data rate versus event rate
- Technology opportunity
 - New design automation tools being developed (ready this year)
 - Approach has matured over the past ~30 years
 - First asynchronous microprocessor: 1989; first clocked microprocessor: 1971
- Many companies have this on their roadmap; you get to show them the way!



How?

- Create building-blocks in an open-source framework for asynchronous circuits
- Converge on shared infrastructure and target technologies
 - Components, tools, technologies
 - Training on developing the technology-specific components (avoiding the n-way NDA issue)
- Yale is developing open-source tools; we are currently in discussions with BNL on event-based imagers to get started



Synergies

- Similar ideas used for
 - Microprocessor design
 - FPGA design
 - Neuromorphic computing
 - Continuous-time signal processing



Conclusion

- Event-driven computing is a natural way to process information when there is a large gap between the raw data rate and the event rate
- An opportunity for an open-source ecosystem for event-driven electronics from Day 1
- Ironically, the lack of a large industry ecosystem means the door is currently open!