Computing with Events

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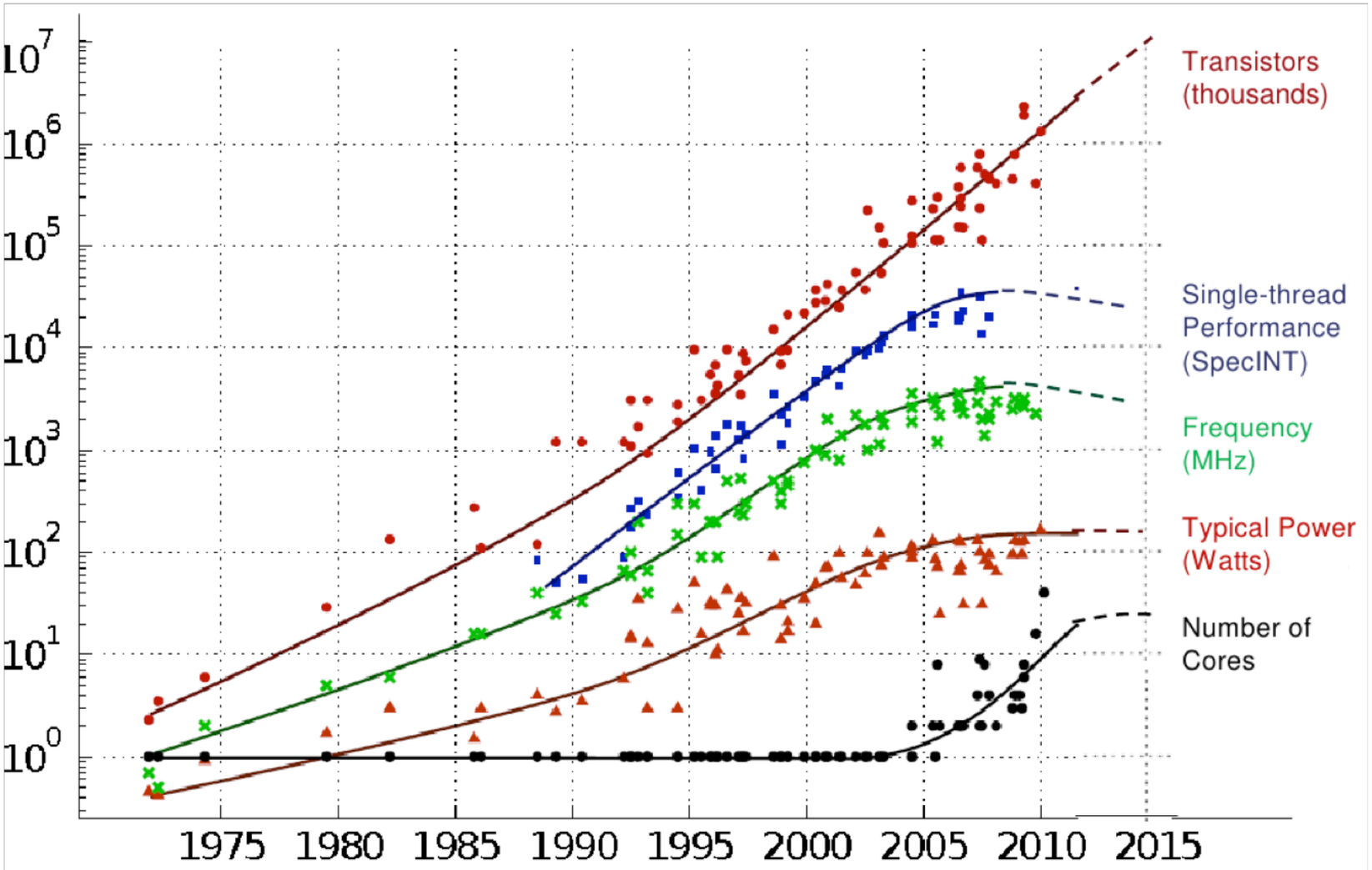
Microprocessor trends…



Data collected by: M. Horowitz, F. Labonte, O. Shacham, K. Olokutun, C. Batten; extrapolations by C. Moore

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Trend: *CPUs to GPUs to FPGAs to "accelerators"*

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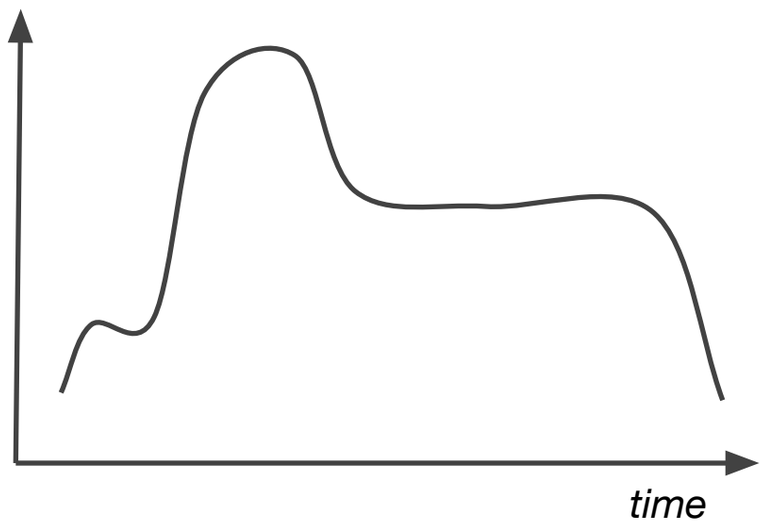
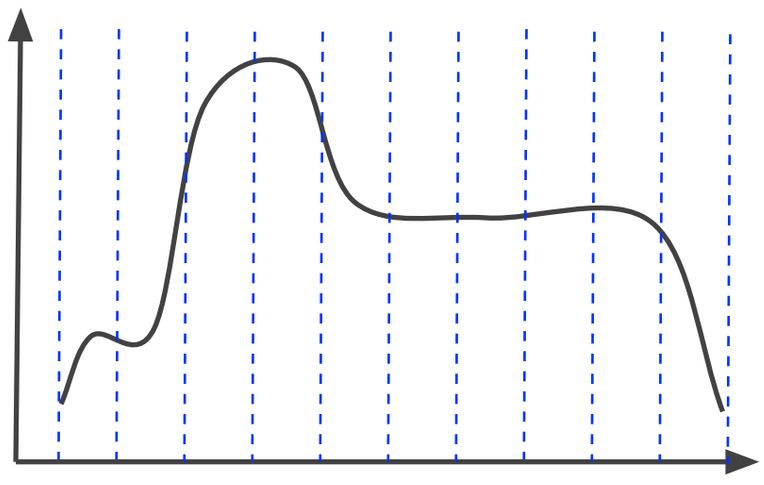
What is an event?

- Events
  - ❖ Change in state
  - ❖ Important change in state
  - ❖ … new information
- Event streams:
  - ❖ Sequence of events, potentially time-stamped
  - ❖ Way to represent/approximate some continuous phenomenon





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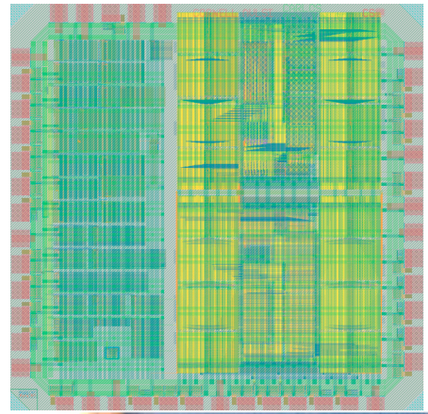
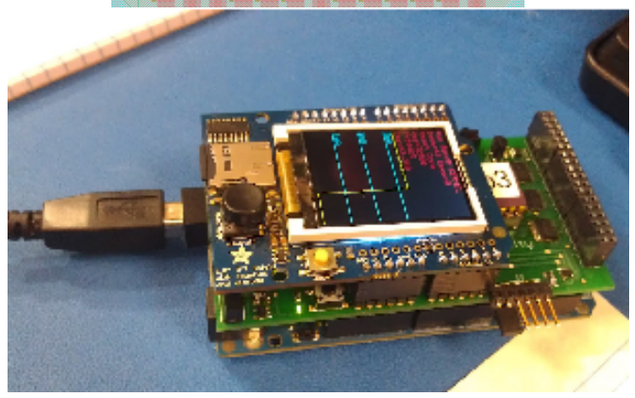
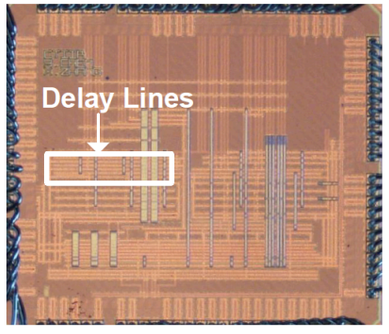
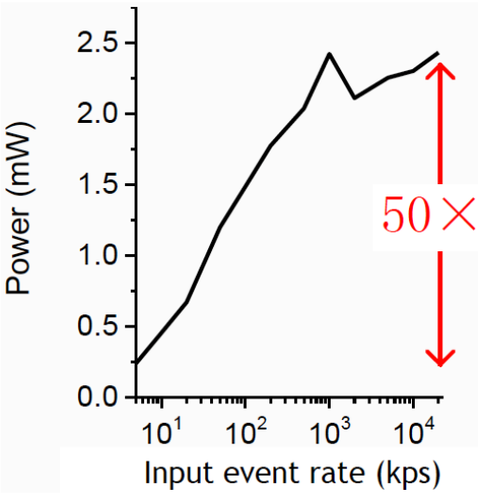
Event-driven computing

- Make the entire *computation* event-driven
- Hardware
  - ❖ Ideal digital circuits are already event-driven
    - ▸ “Gates” propagate input changes to their output
  - ❖ Asynchronous computation preserves the event-driven nature at the system level
    - ▸ More efficient in terms of energy consumption
    - ▸ More efficient in terms of communication cost
- Software
  - ❖ “Delta dataflow” networks propagate changes through the computation
  - ❖ Algorithms that use non-uniform sampling









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