Energy-efficient parallel software for mobile hand-held devices

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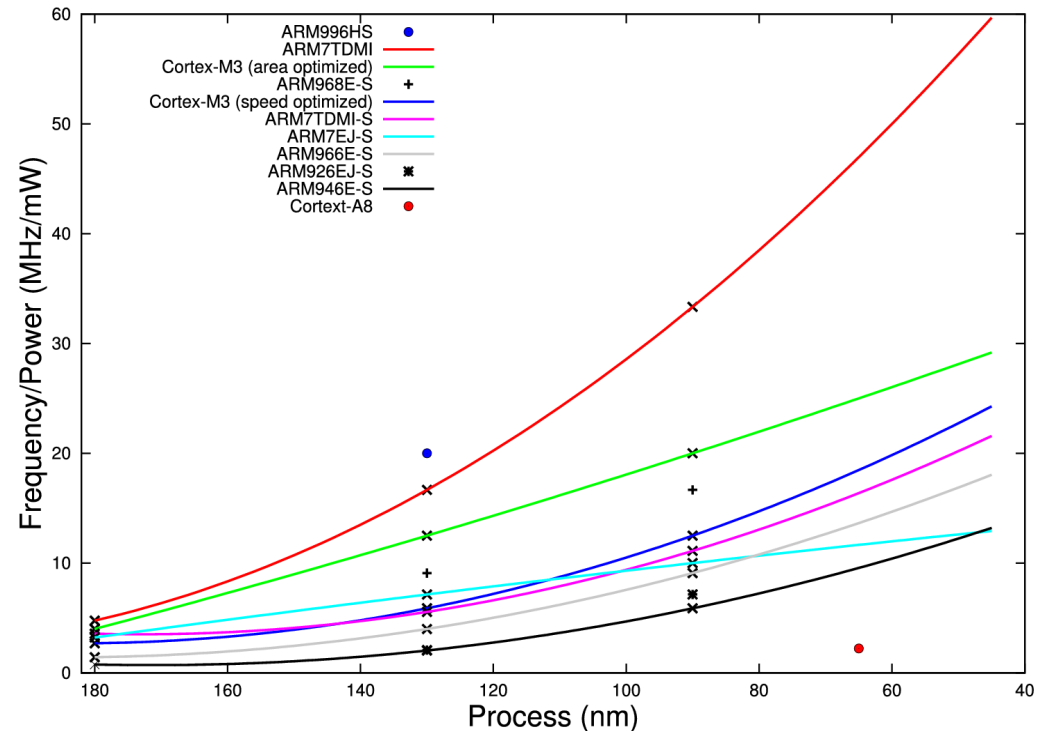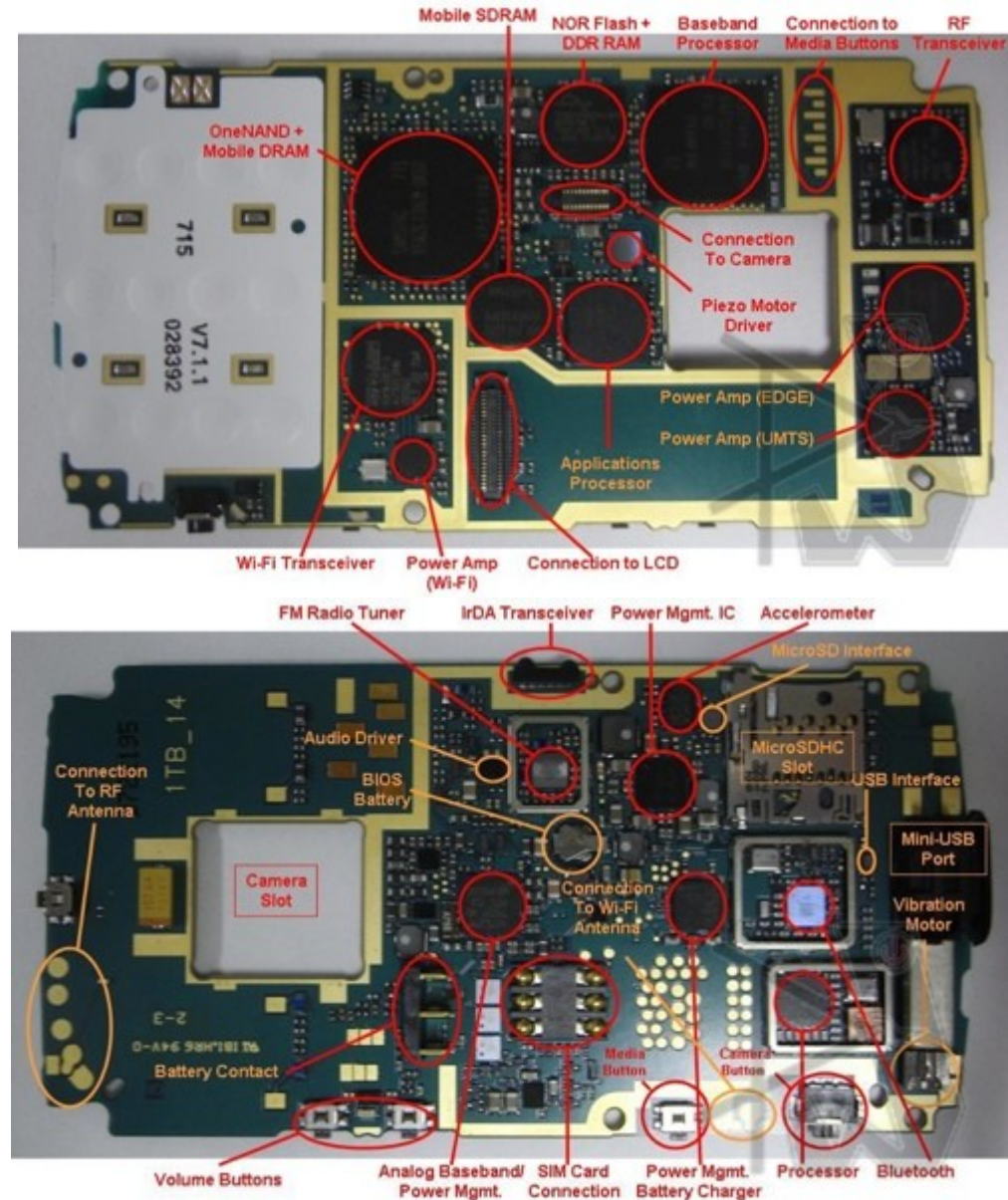
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Mobile-phone view to parallel SW

- ## Parallel == efficient?
  - Not always

- ## Observability limit
  - Simulators: challenge and opportunity

- ## Rapid feedback
  - Along fast emulation
  - With parameterized models

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Is mobile device special?

- **Small size**
  - But rich set of HW
  - Heterogeneity

- **High volume product**
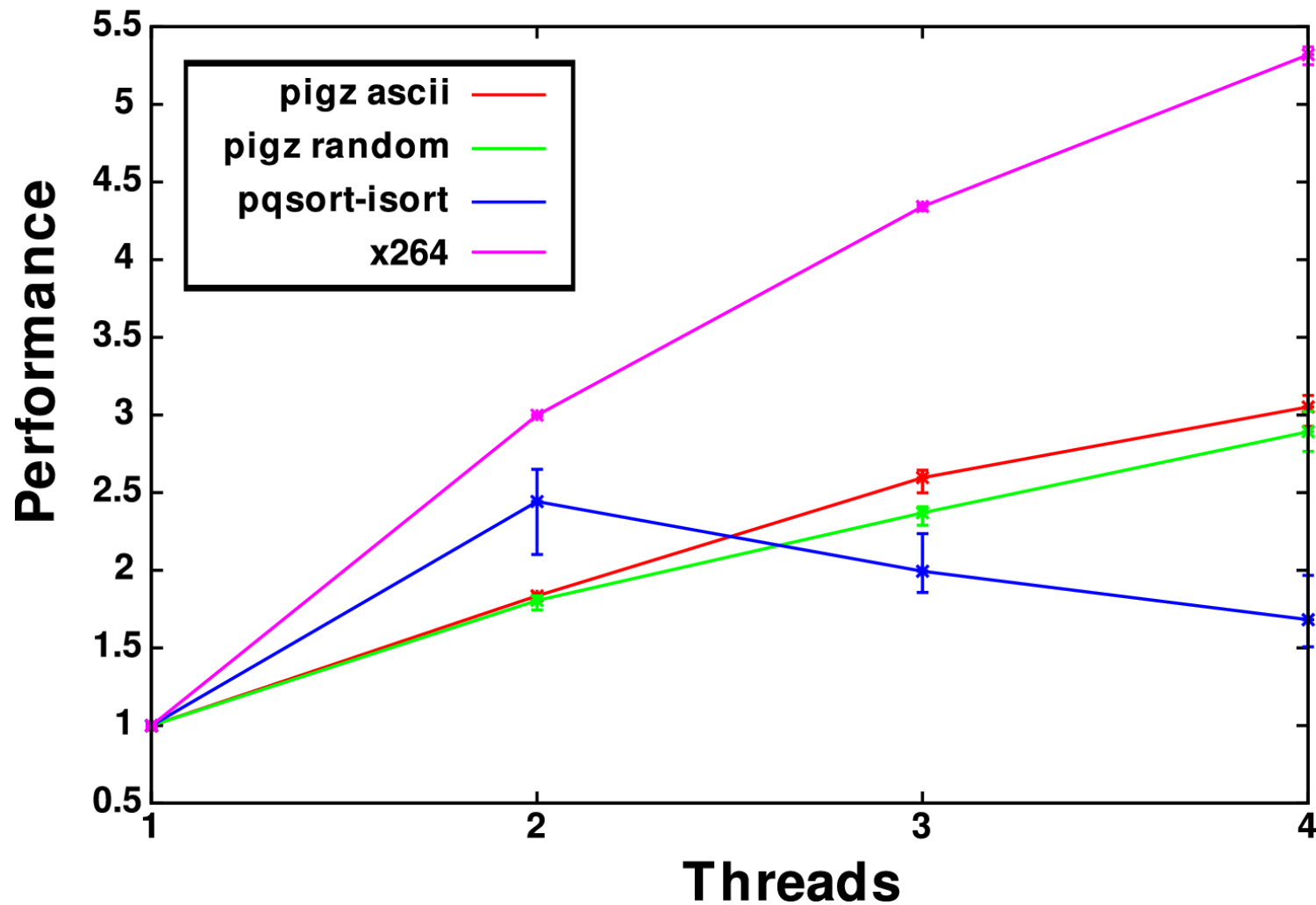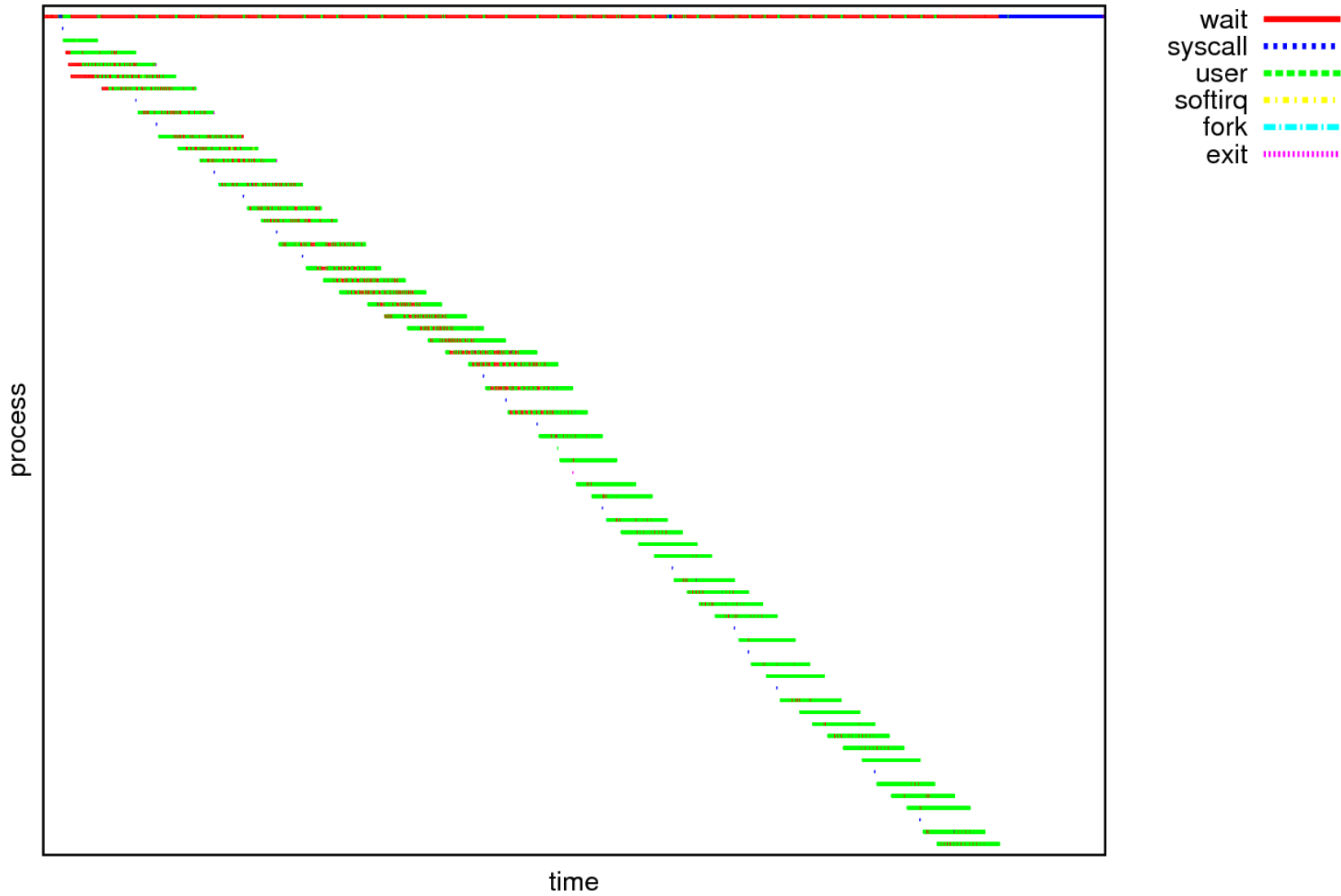 - Cost optimized

- **Limited energy**
  - Power optimized

http://www.phonewreck.com/2008/11/20/nokia-n95-teardown/

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Is mobile software special?

- Typically host ≠ target
  - Cross development
  - Simulators
- Observability wall
  - Especially energy
  - Simulators functional
  - Limited I/O on target

Execution Universe · Host Universe · Target Device Execution · Run · Edit · Install · Build · Rootstrap · Run · Install · Simulated Execution · Cross-compilation Universe

http://maemo-sdk.garage.maemo.org/user-guide.html

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Performance of parallel software?

Nice behavior

x264 - four threads

Legend:
- wait
- syscall
- user
- softirq
- fork
- exit

Axes: process (y-axis), time (x-axis)
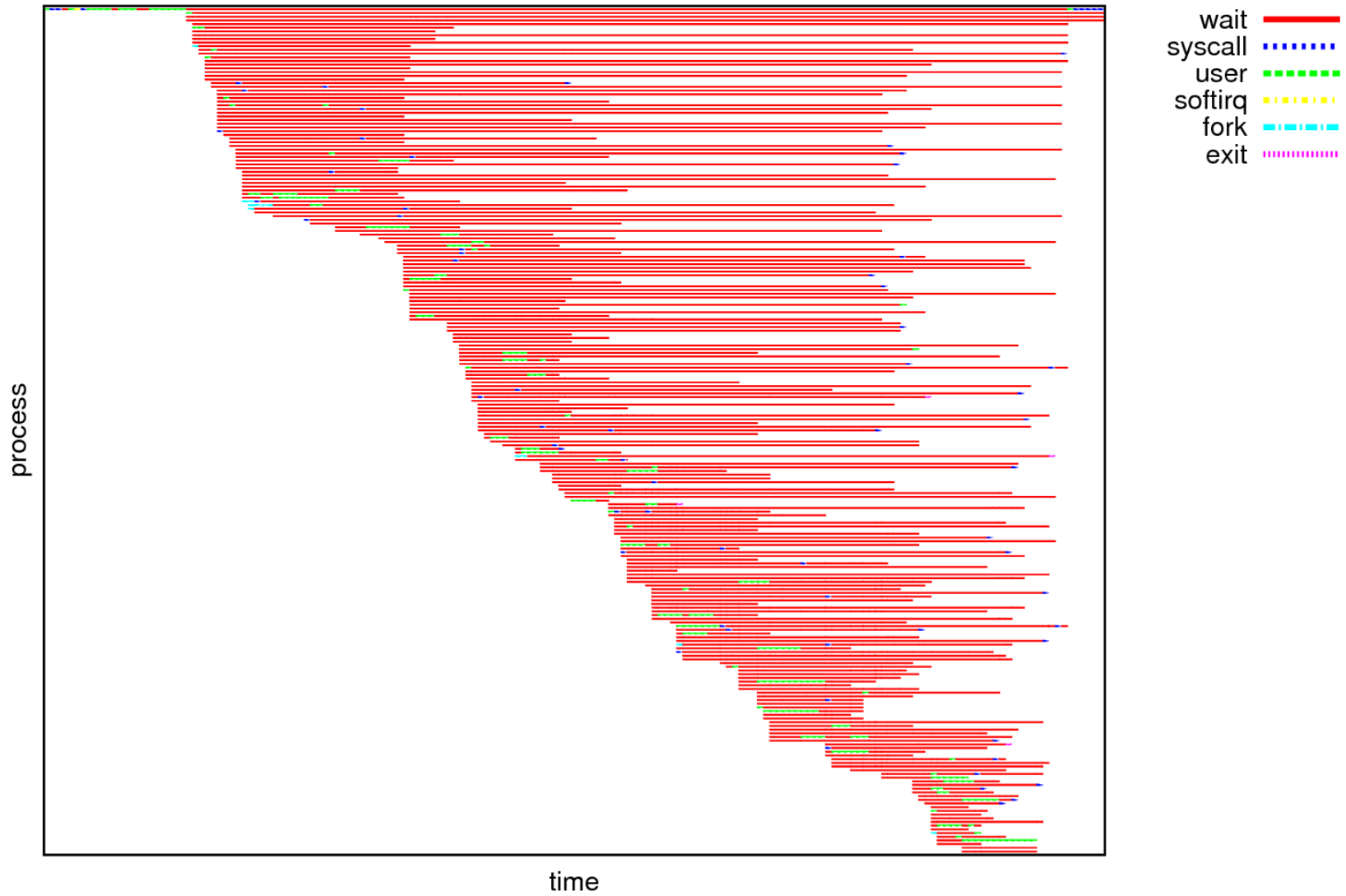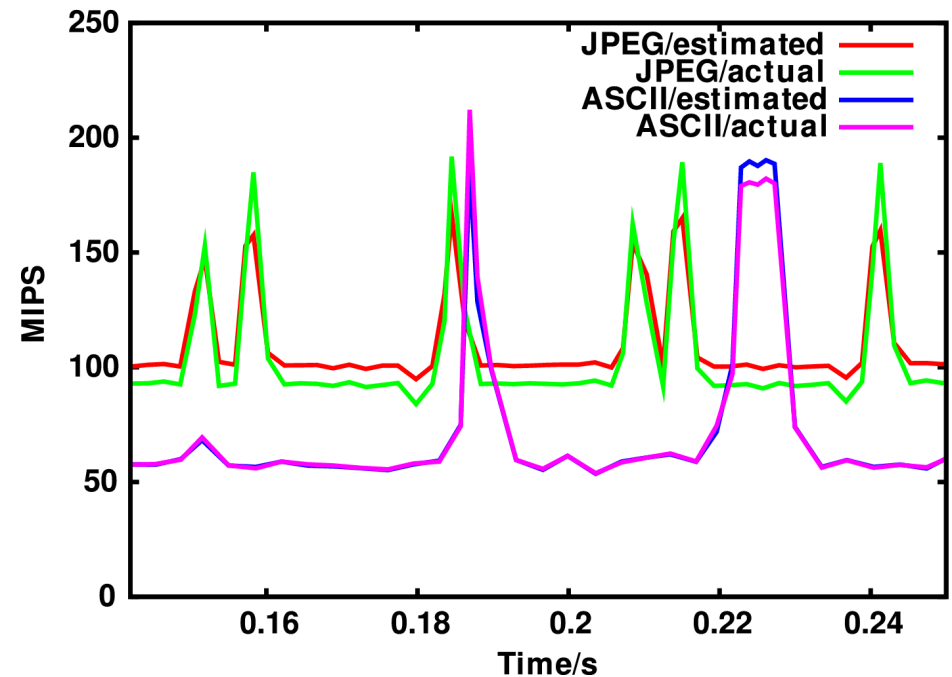
Bad behavior

parallel quicksort - four threads

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Understanding program behavior

- Real behavior

  - Noisy, complex, …

  - Hard to model, but also

  - *Hard to understand*

- Abstract models

  - Simple, parameterized

  - *Easy to understand*

- But, accuracy?

  - Can be very good

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How to achieve this?