Improving the support for ARM in IgProf

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IgProf

- profiler
  - program measuring mainly performance and memory usage of other programs at run-time
  - find performance bottlenecks
  - parts of the code worth optimising

What has been done?

1. IgProf ported to 64-bit ARM

2. fast stack trace in libunwind ported to

- 64-bit ARM

- 32-bit ARM

3. bonus: simple energy profiling module

Function instrumentation

- the profiler gets between the function call and the function itself

- collect function parameters and the return value

- collect the number of calls

application	IgProf	C library
... malloc(...) ...	hook for malloc	malloc
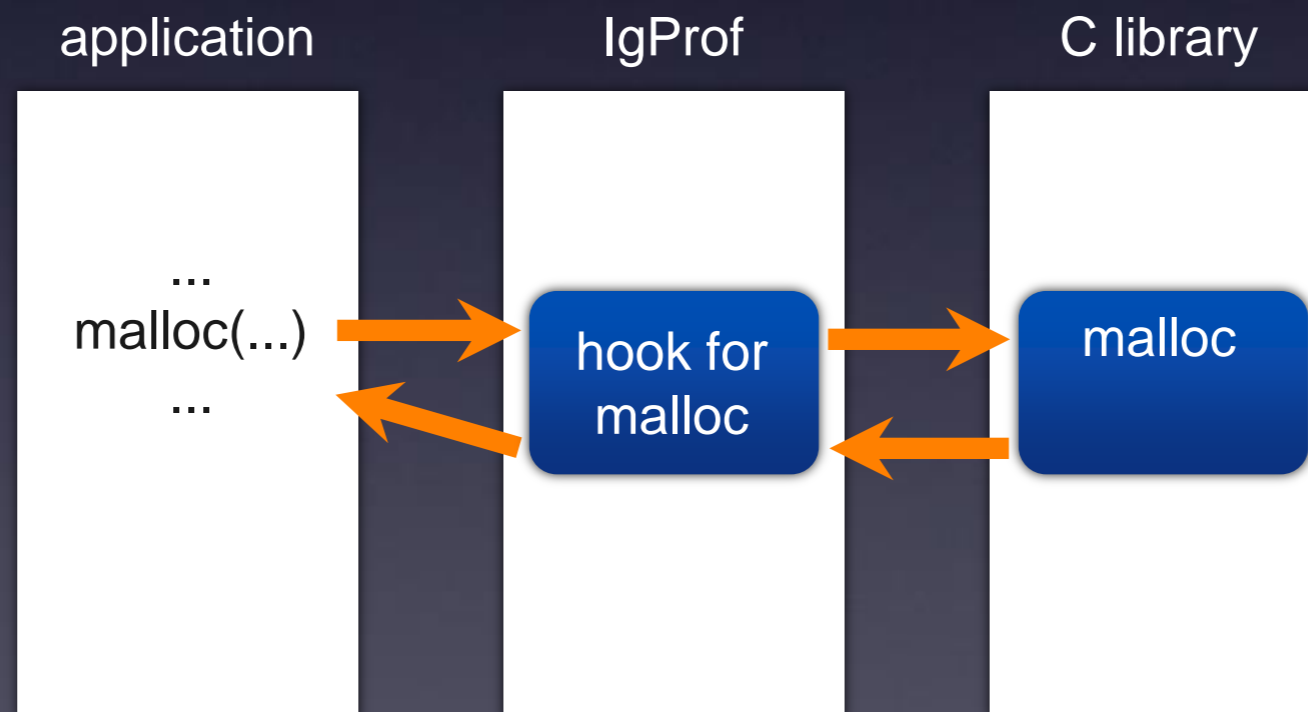
Function instrumentation
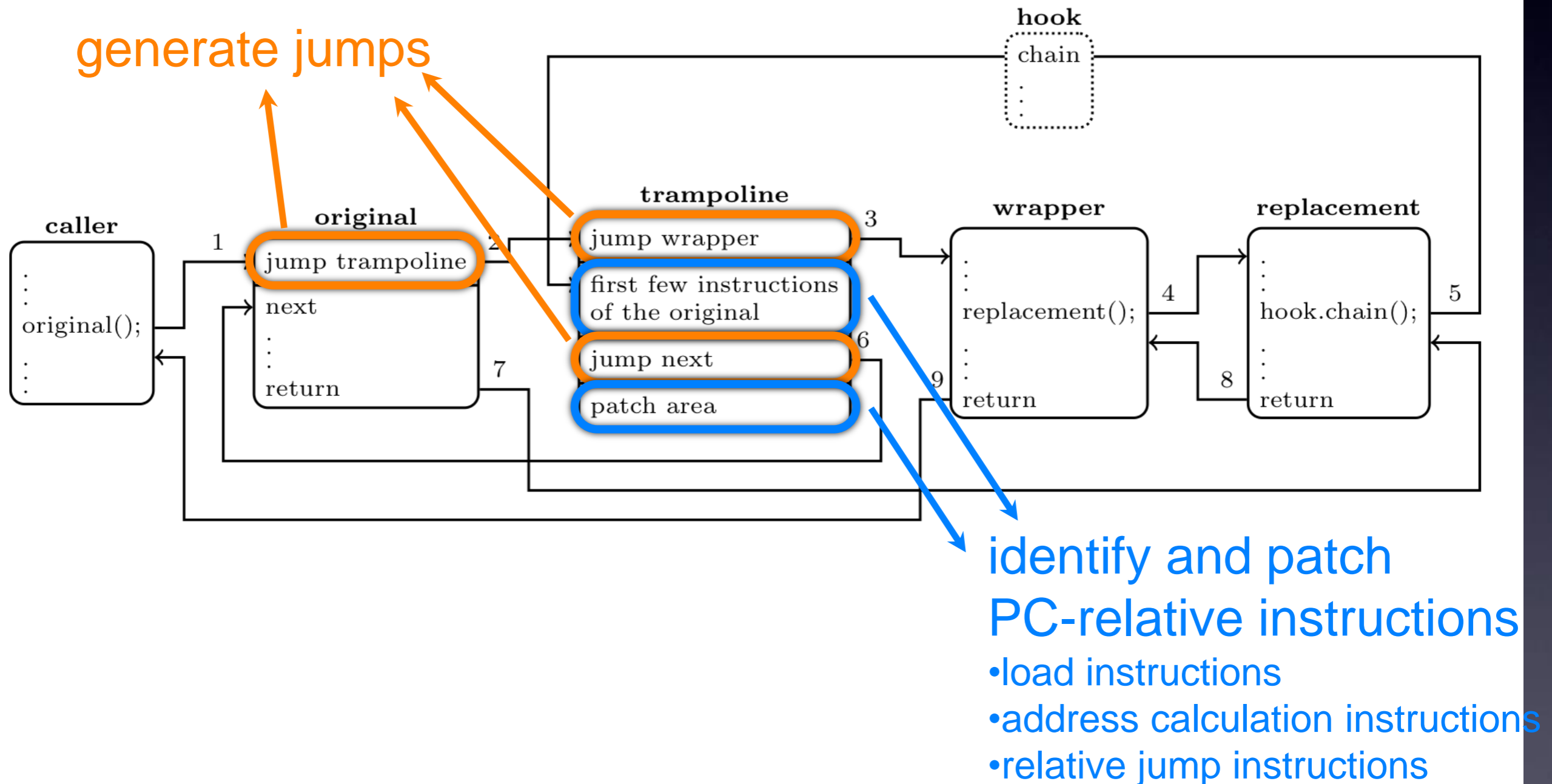
Stack tracing

- An example:
  - function *a* calls function *b*, function *b* calls function *c*
  - the stack trace: [*c, b, a*]

- Stack tracing in libunwind:
  - uses unwind information
  - calculates the state of the registers in the previous frame
  - for stack tracing only the PC register is interesting

The stack:

| a |
| b |
| c |

the stack grows downward
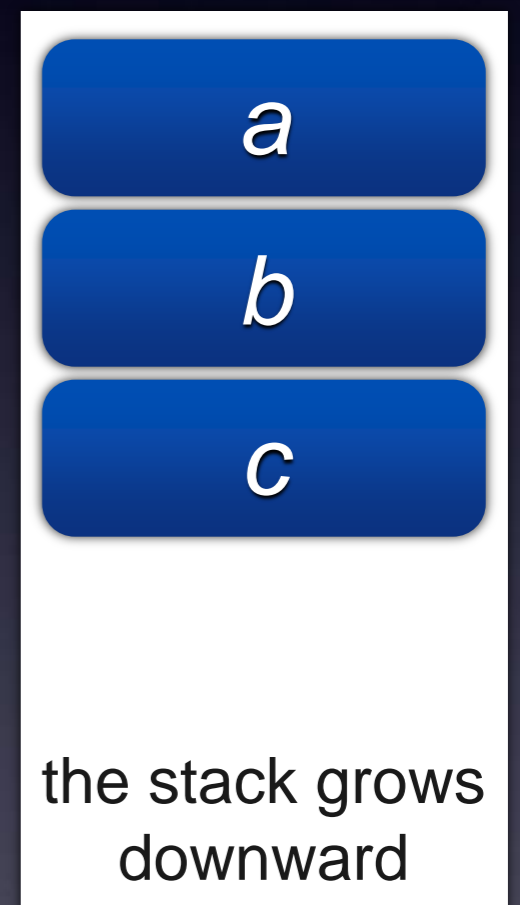
Fast stack tracing in libunwind

- only a subset of the state in each frame is needed to calculate the PC

- cache the information about *how* to calculate the subset of the state

- port to ARM
  - differences in the architectures and calling conventions
    - where the return address is stored (on the stack, in a register, both)
    - which register is used to find the previous frame (stack pointer, frame pointer, some other register)

Results

- stack tracing only

  - time(standard stack trace) = 20…30 * time(fast stack trace)

- memory profiling with IgProf

  - time(IgProf + standard stack trace) = 7…8 * time(IgProf + fast stack trace)

Energy profiling module

- gets energy measurements from the RAPL (Running Average Power Limit) interface on recent Intel processors

- through the PAPI library

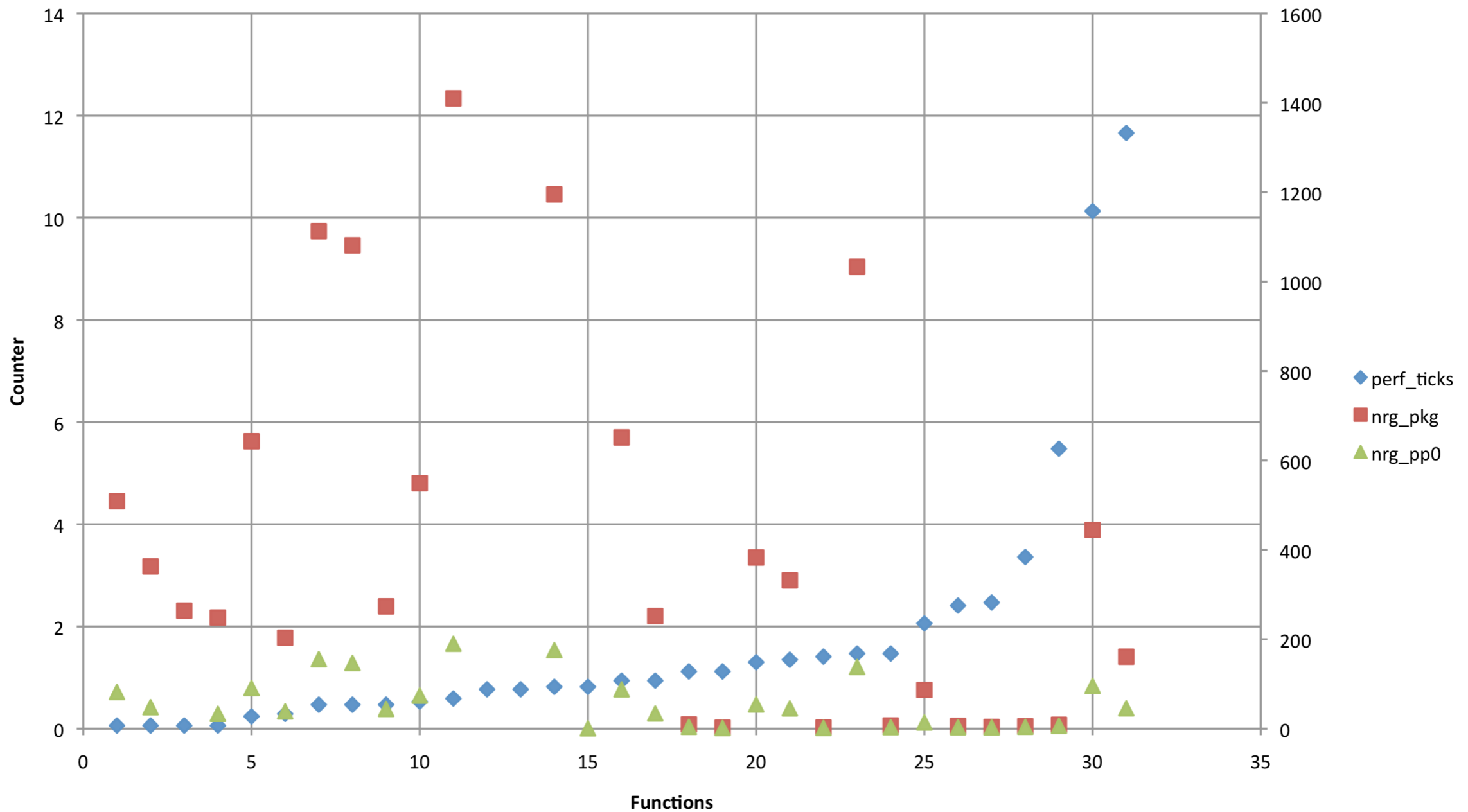- based on sampling

- highly experimental

Principle of operation

- The amount of energy consumed since the previous sampling event is attributed to the current location of execution
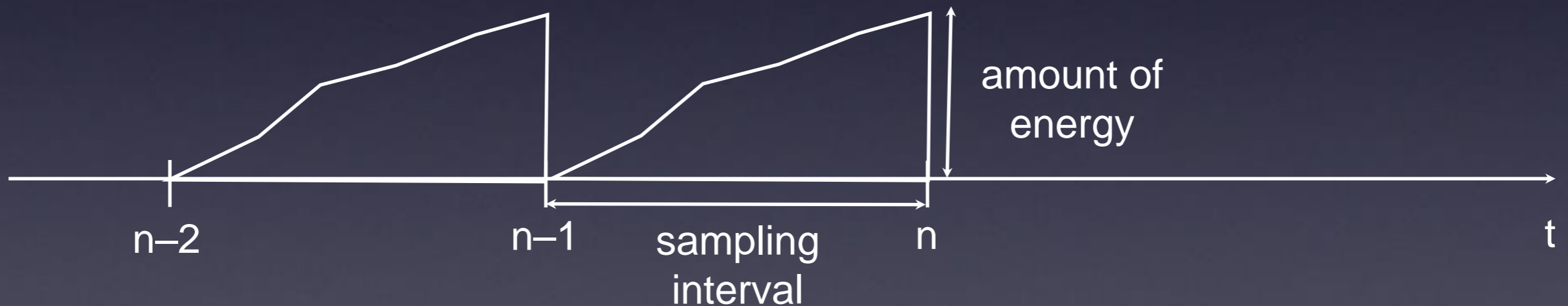
Example energy profile

Thank you!

- questions

- comments