Architecting System Performance; Measuring

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Abstract

Measuring is an essential part of architecting performance. Measurements provide quantified insight in actual behavior and performance. In this presentation, we discuss measuring, benchmarking, and instrumentation.

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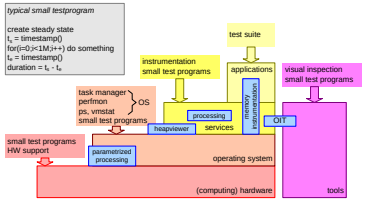
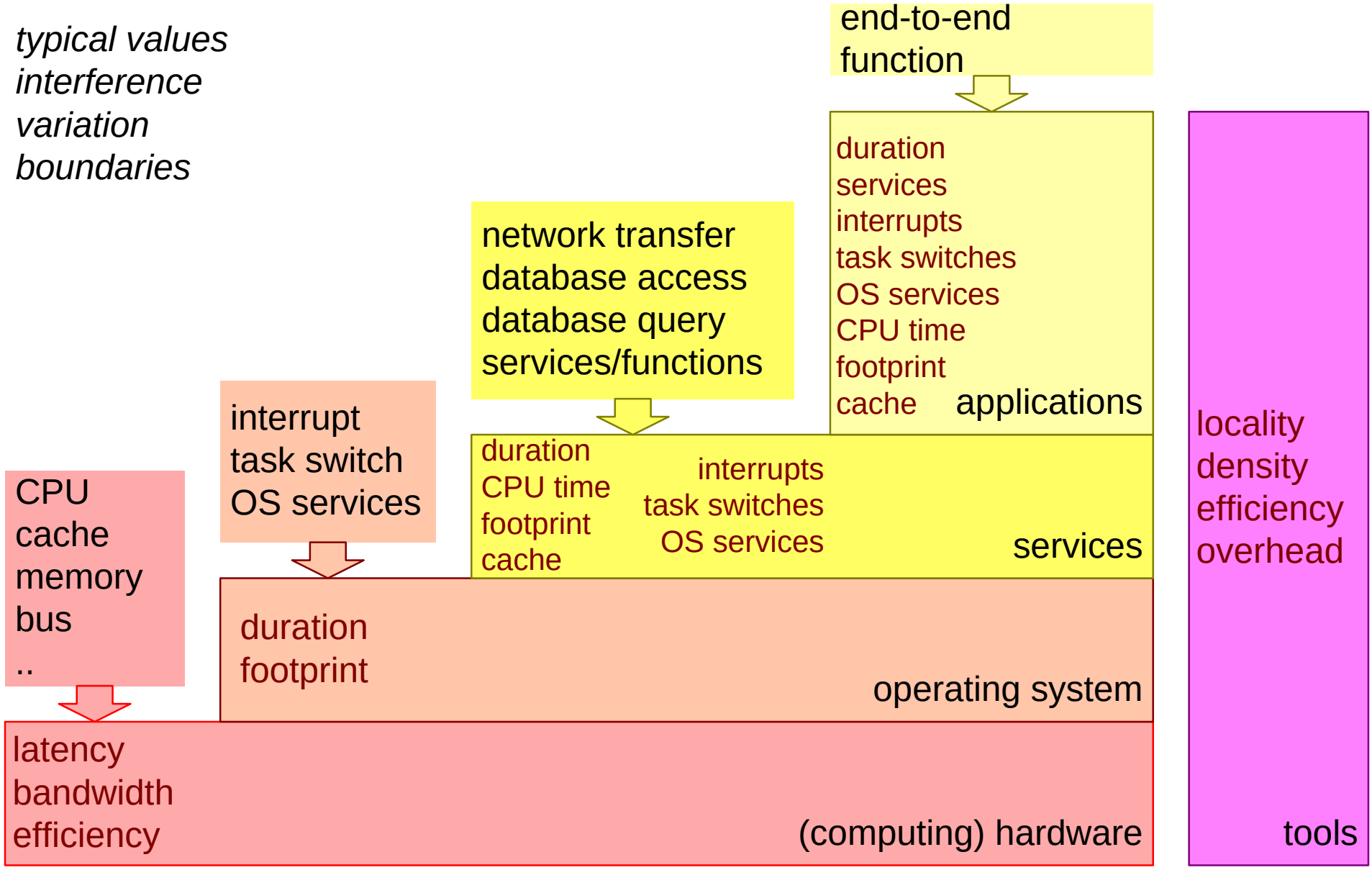
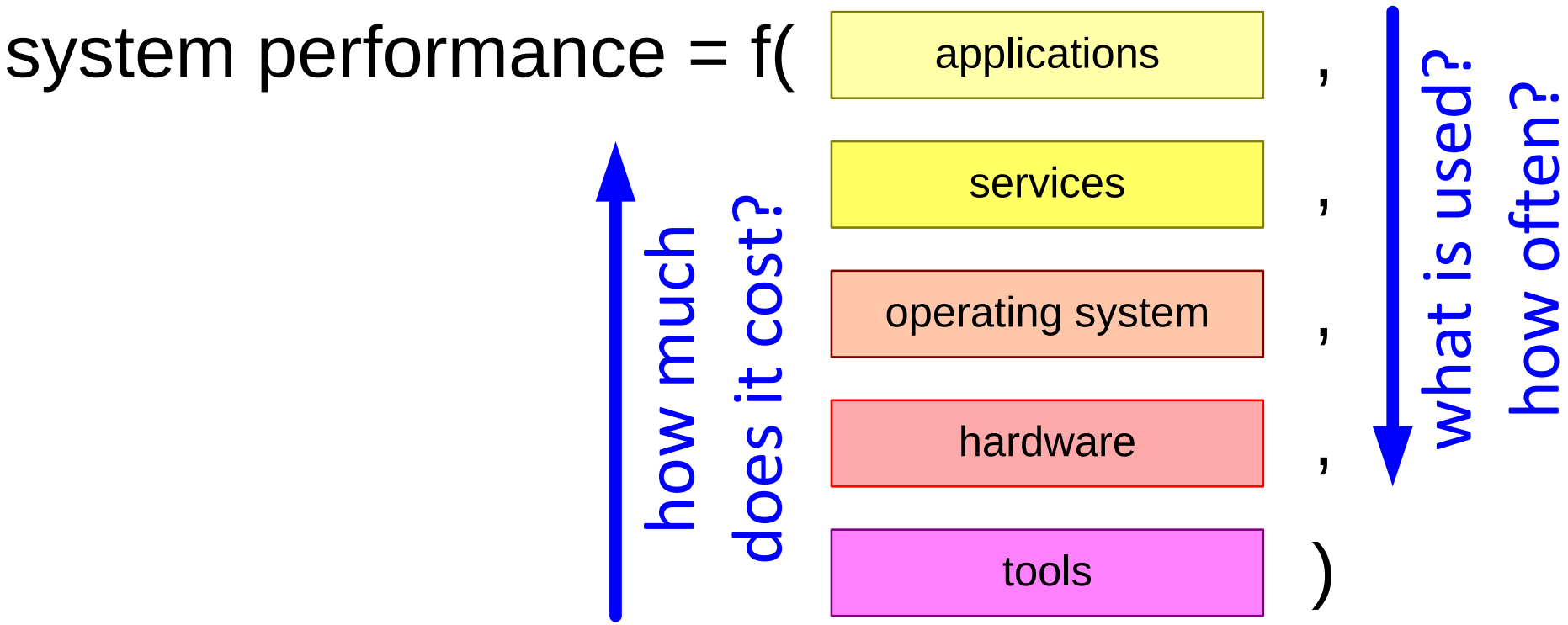


Performance Attributes in the Benchmark Stack



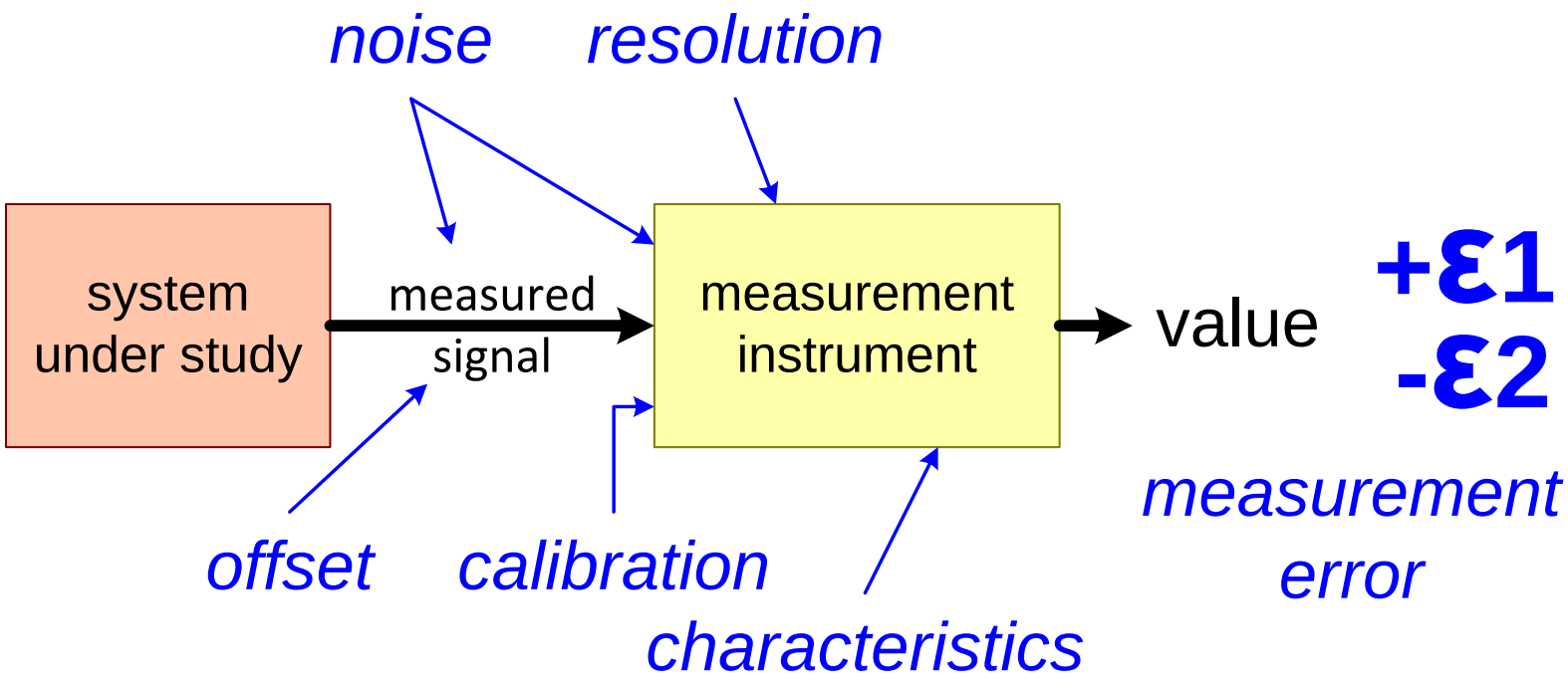
Performance as Function of the Layers



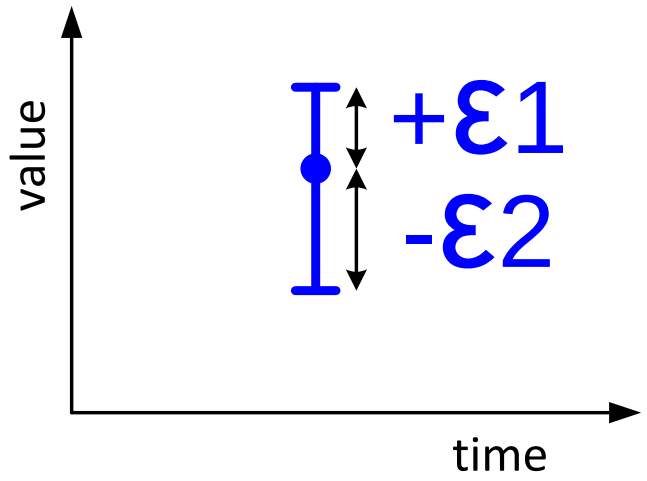
Example μBenchmarks for Software

	infrequent operations, often time-intensive	*often repeated operations*
database	start session finish session	perform transaction query
network, I/O	open connection close connection	transfer data
high level construction	component creation component destruction	method invocation same scope other context
low level construction	object creation object destruction	method invocation
basic programming	memory allocation memory free	function call loop overhead basic operations (add, mul, load, store)
OS	task, thread creation	task switch interrupt response
HW	power up, power down boot	cache flush low level data transfer

Measurement Errors and Accuracy



measurements have stochastic variations and systematic deviations resulting in a range rather than a single value



Be Aware of Error Propagation

$t_{duration} = t_{end} - t_{start}$

$t_{start} = 10 +/- 2\ \mu s$

$t_{end} = 14 +/- 2\ \mu s$

$t_{duration} = 4 +/- ?\ \mu s$

systematic errors: add linear

stochastic errors: add quadratic

Intermezzo Modeling Accuracy

Measurements have

stochastic variations and systematic deviations

resulting in a range rather than a single value.

The inputs of modeling,

"facts", assumptions, and measurement results,

also have stochastic variations and systematic deviations.

Stochastic variations and systematic deviations

propagate (add, amplify or cancel) through the model

resulting in an output range.

Tools and Instruments in the Benchmark Stack