

Time as performance parameter/metric

- system performance (latency, execution time, response time)
- CPU performance (CPU time)

Patterson & Hennessy: - the most consistent and reliable (robust) metric is time

Otherwise: - measure only real programs

- disk access
- memory access
- i/o activities
- OS overhead

Rely on methods (robust!) of evaluating computer systems
=> predict the performance of a computer regardless of workload

Mixture of programs => workloads

When we talk about testing/evaluating performance =>

Benchmark suites

- the relative performance of a computer
- transitivity

benchmarks

- mix of real programs

- kernels
- toy programs
- synthetic benchmarks

discredited!

SPEC - Standard Performance Evaluation Corporation (spec.org)

- Single processor performance (SPEC92, SPEC95, SPEC2000, 2006, 2017)
- SPEC 2006: - 12 fixed point programs
- 17 floating point programs

desktop benchmarks

Objective for reporting performance results => reproducibility

Server benchmarks - run n x SPEC benchmark suite

- SPEC ratio \neq SPEC time

+ pc.org

Summarizing performance results

Arithmetic average? \times

Weighted average? \times

Geometric mean & reference machine

$$SPEC_{ratio A} = \frac{Performance_A}{Performance_{reference}} = \frac{Execution\ time_{ref}}{Execution\ time_A}$$

$$SPEC_{ratio A} = \sqrt[n]{\prod_{i=1}^n \frac{Execution\ time_{ref i}}{Execution\ time_{A i}}}$$

Standard deviation

$$std\ dev = \sqrt{\sum_{i=1}^n (sample_i - Mean)^2}$$

$$Geometric\ mean = \exp\left(\frac{1}{n} \times \sum_{i=1}^n \ln(sample_i)\right)$$

$$std\ dev = \exp\left(\sqrt{\frac{\sum_{i=1}^n (\ln(sample_i) - \ln(Gmean))^2}{n}}\right)$$

$$\frac{Performance_A}{Performance_B} = \frac{SPEC_{ratio A}}{SPEC_{ratio B}} = \frac{\sqrt[n]{\prod_{i=1}^n SPEC_{ratio A i}}}{\sqrt[n]{\prod_{i=1}^n SPEC_{ratio B i}}} = \sqrt[n]{\prod_{i=1}^n \frac{SPEC_{ratio A i}}{SPEC_{ratio B i}}} = \sqrt[n]{\prod_{i=1}^n \frac{Execution\ time_{ref i}}{Execution\ time_{A i}} \times \frac{Execution\ time_{B i}}{Execution\ time_{ref i}}} = \sqrt[n]{\prod_{i=1}^n \frac{Execution\ time_{B i}}{Execution\ time_{A i}}} = \sqrt[n]{\prod_{i=1}^n \frac{Performance_{A i}}{Performance_{B i}}}$$