Do you get what you pay for?

Using Proof-of-Work Functions to Verify Performance Assertions in the Cloud

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Benchmarking the Cloud

- Classic SLAs don’t work with VMs
  - No uptime
  - No response time

Every value measurable from the outside may depend on your application

- Solution: Measure with neutral benchmark
Just use a benchmark?

Technology: Internet Explorer 9 Caught Cheating In SunSpider

Posted by CmdrTaco on Wednesday November 17, @08:43AM from the well-that's-not-nice dept.

dkd903 writes

"A Mozilla engineer, Microsoft – Internet Explorer, The SunSpider, a very popular open source benchmarking tool.

Read More...

Technology: More 'Application-Specific' Optimizations in NVidia Drivers

Posted by michael on Friday June 06 2003, @08:00AM from the but-it's-not-cheating-so-there dept.

EconolineCrush writes

"Futuremark and NVIDIA have been embroiled in a spat over various cheat/optimizations in 3DMark03 for several weeks now. Last week, the soap opera appeared to be over; Futuremark and NVIDIA released a joint statement in which Futuremark clarified that NVIDIA was optimizing its drivers for 3DMark03 rather than cheating. This story, however, appears to be far from over. Tech Report has uncovered a new series of optimizations in NVIDIA's Detonator FX drivers that affect image quality in even Futuremark's latest 3DMark03 build. What's more, if you rename the 3DMark03 executable, the optimizations disappear."

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Attack Vectors

- **Evil cloud operator**
  - Can monitor executed code
  - Can modify data in RAM and HD
  - Can change executed code

- **Attack vectors**
  - Benchmark Skip
  - Pre-calculation
  - Code and data exchange
  - Additional ressources
Proof-of-Work Functions

General idea:
Hard to solve, but easy to check result

Properties
- Costs
  - Stability
- Security
  - Concurrency
- Advantage
- Parameterability
- CPU-bound vs. memory-bound
Example PoW function

- Extracting square roots
  - Find $x^2$ in the congruence class modulo $p$

- Forge a digital signature
  - Weakened algorithms
  - Known attacks on old algorithms

- Hash collisions
  - Find a string with a hash starting with $x$
Proof-of-Work function based benchmark

- Cloud-VM solves challenges
- User verifies solution and runtime
- Micro benchmark run on productive VM

Attacks blocked:
- Benchmark Skip ✓
- Pre-calculation ✓
- Code and data exchange ✓
- Additional resources ❌
Evaluation: Correlation

HashCashLin
Average Execution Time

SPEC2006 Benchmark Results
Total Execution Time

Time in Nanoseconds

Time in Seconds

Tested Computer
Evaluation: Variance

Standard Deviation Comparison

on Lenovo Tp60 XP
Evaluation: EC2 ≠ Evil Cloud
Conclusion and Outlook

- New micro benchmark to verify performance
- Based on Proof-of-Work functions
  - Hard to solve, easy to check result
- Blocks 3 of 4 attacks
- Sufficient correlation with reference benchmark
- Future work: Weave into application
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