

# Efficient Computing in a Safe Environment

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# Research Questions

**RQ1. What are the energy and Run-time performance implications of Meltdown and Spectre mitigation mechanisms?**

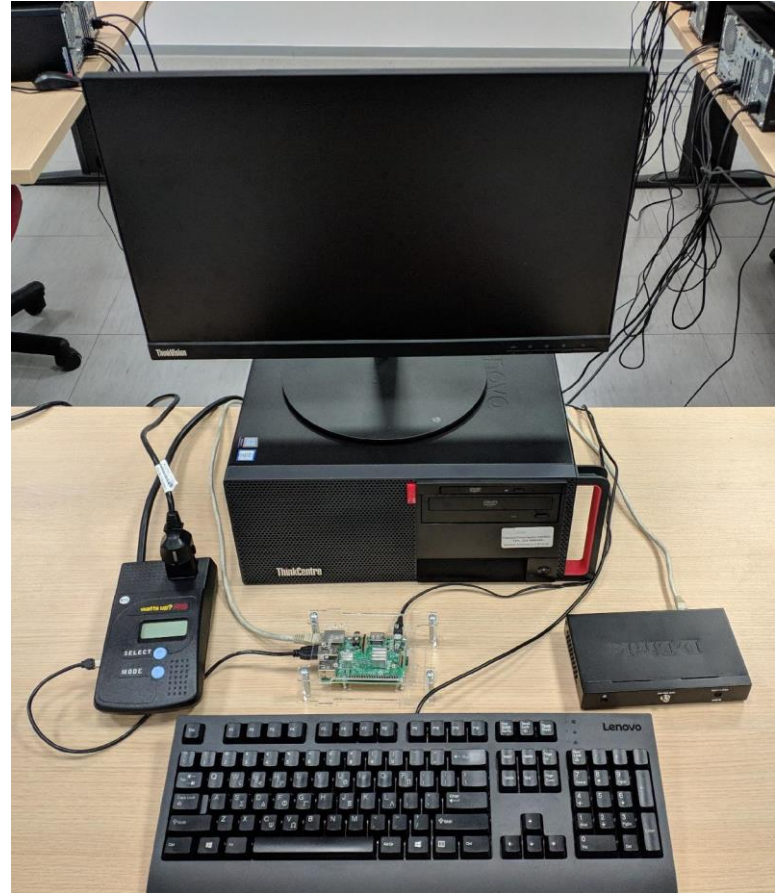
**RQ2. Which application type's energy and Run-time performance are affected the most by Meltdown and Spectre mitigation mechanisms?**

# Phoronix Test Suite Benchmarks

Phoronix Benchmarks	
Benchmark Type	Operation(s)
Apache & Nginx	AB Apache Command
OpenSSL	aes blowfish camellia cast idea dsa ecdsa ghash hmac whirlpool
OS Bench	create files create processes create threads launch programs mem_alloc
CacheBench	memcpy memset mixed read write
MC Perf	add append delete get prepend replace set

# Setup

- Lenovo ThinkCentre M910t.
- Fedora 28 and Linux Kernel 5.0.9-100
- Watts Up Pro (WUP)
- Raspberry Pi 3B



Watts Up Pro power meter interface utility for Linux <https://www.wattsupmeters.com/forum/i...>

📌 25 commits

🌿 1 branch

📦 0 releases

👤 2 contributors

Branch: master ▾

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pyrovski accept devices in form of "/dev/ttyUSB0" and "ttyUSB0"

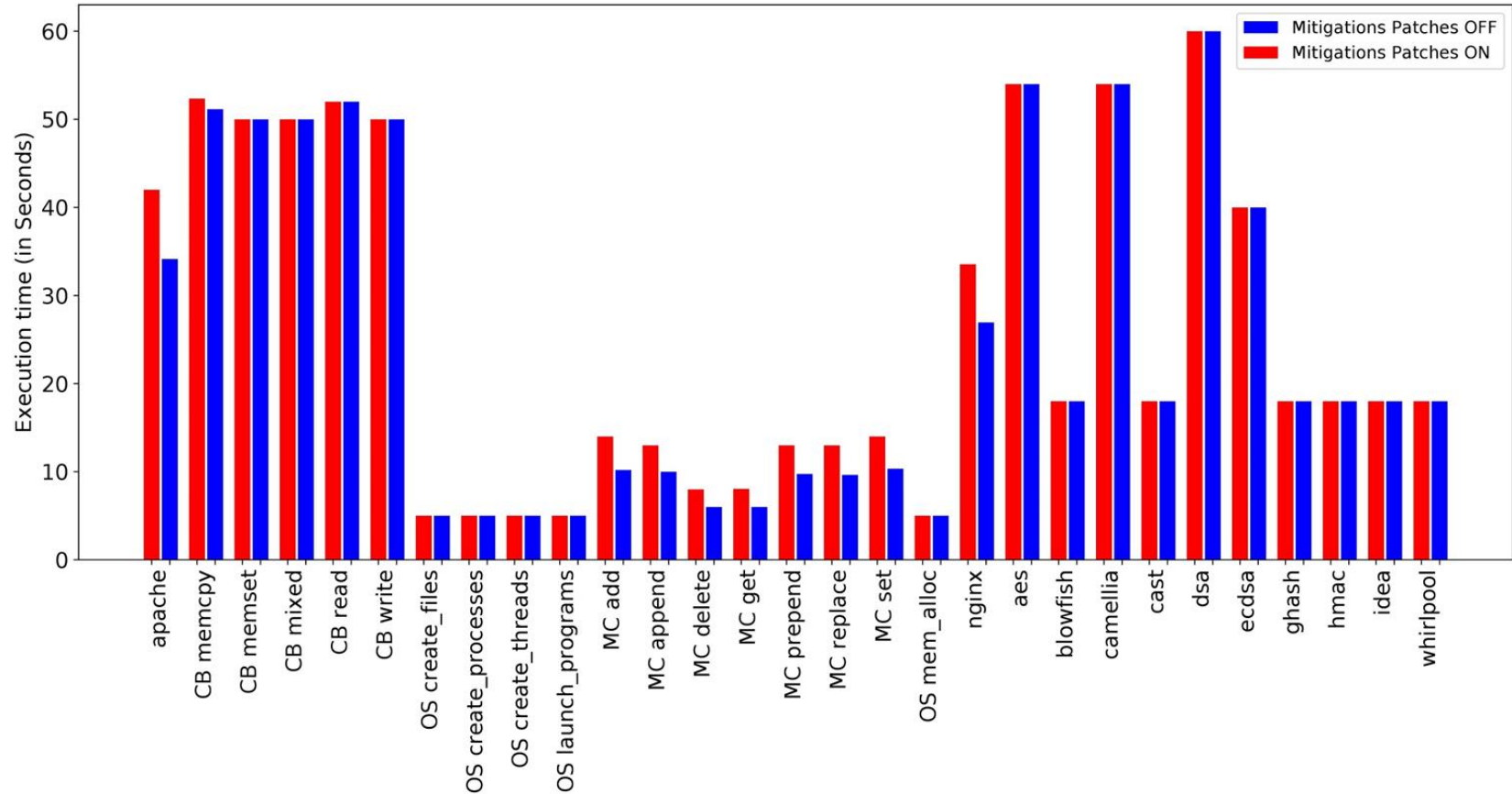
Latest commit 9bee506 on Oct 8, 2015

📄 .gitignore	update .gitignore	6 years ago
📄 AUTHORS	add authors file	6 years ago
📄 Doxyfile	add .gitignore and Doxyfile	7 years ago
📄 config.c	split into multiple source files	7 years ago
📄 config.h	split into multiple source files	7 years ago
📄 globals.c	split into multiple source files	7 years ago
📄 globals.h	split into multiple source files	7 years ago
📄 makefile	rename library in install target	6 years ago
📄 readme.txt	Update readme.txt	5 years ago
📄 test_library.c	fix implicit declaration compiler warnings	5 years ago
📄 util.c	accept devices in form of "/dev/ttyUSB0" and "ttyUSB0"	4 years ago
📄 util.h	fix implicit declaration compiler warnings	5 years ago

# Removing Experimental Noise

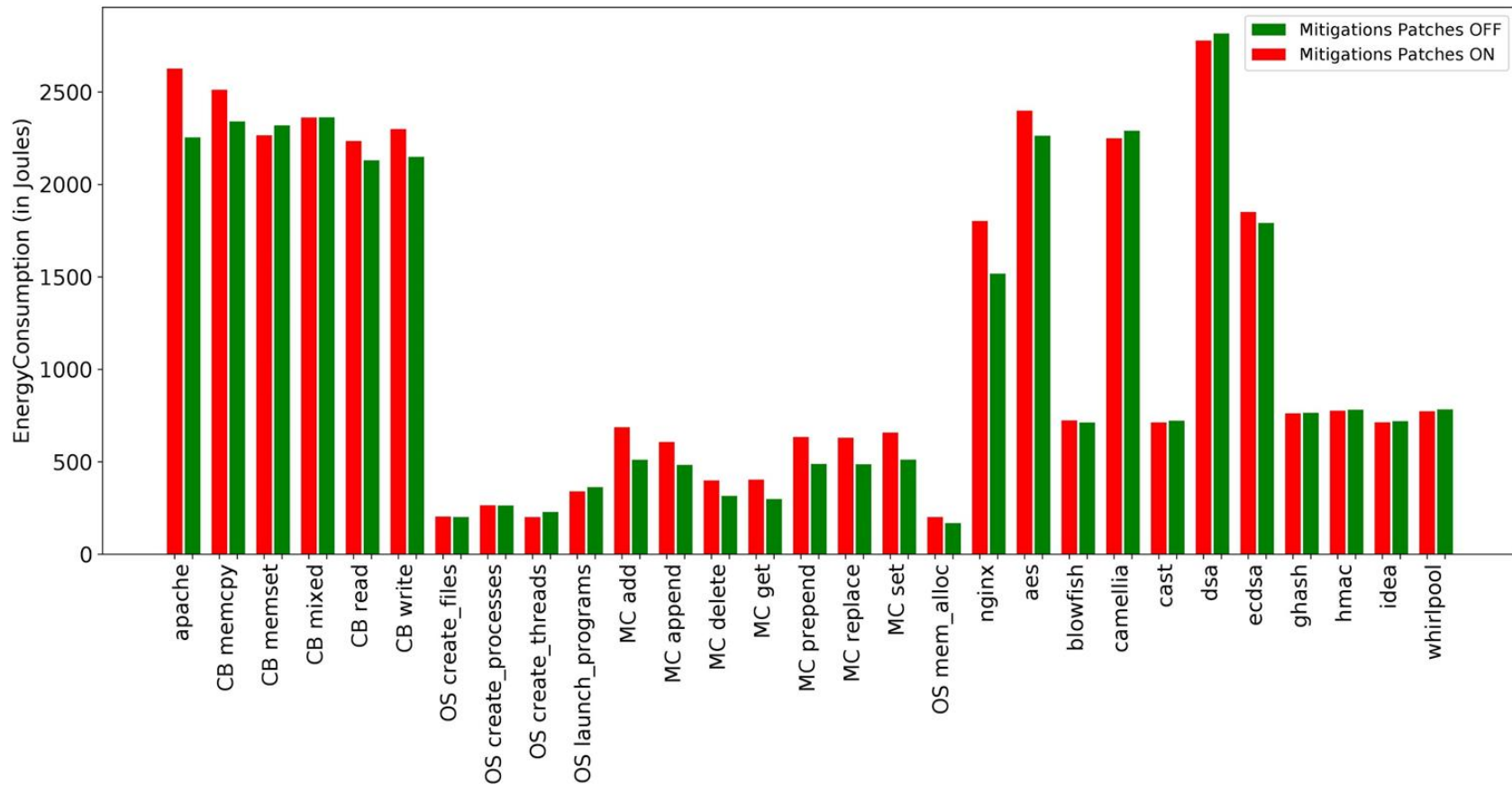
- Shut down background processes and daemons.
- Let a small time window of 30" between each test to avoid power tails.
- Execute each test 20 times to be statistically correct.

# Results - Run-Time Performance





# Results - Energy Consumption



# Conclusion

**RQ1.** **Higher** energy consumption and run-time performance overhead of up to **26%** and **27%** respectively.

**RQ2.** Apache & Nginx as well as memory operations were significantly affected by both run-time performance and energy consumption. Moreover, crypto algorithms had an **increased** throughput of up to **17%**.

# Future Work

- Study other vulnerabilities *e.g. ZombieLoad, Fallout, Ridl* in terms of run-time performance overhead and energy consumption.
- Create a software that dynamically determines which type of operations an app uses and turns off and on mitigation patches accordingly.

# Contact Information



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Research Source Code

