Native or Web? A Preliminary Study on the Energy Consumption of Android Development Models

Wellington Oliveira, Weslley Torres,
Fernando Castor, Bianca H. Ximenes
{woj; wst; castor; bhxmm}@cin.ufpe.br

Federal University of Pernambuco (UFPE), Brazil

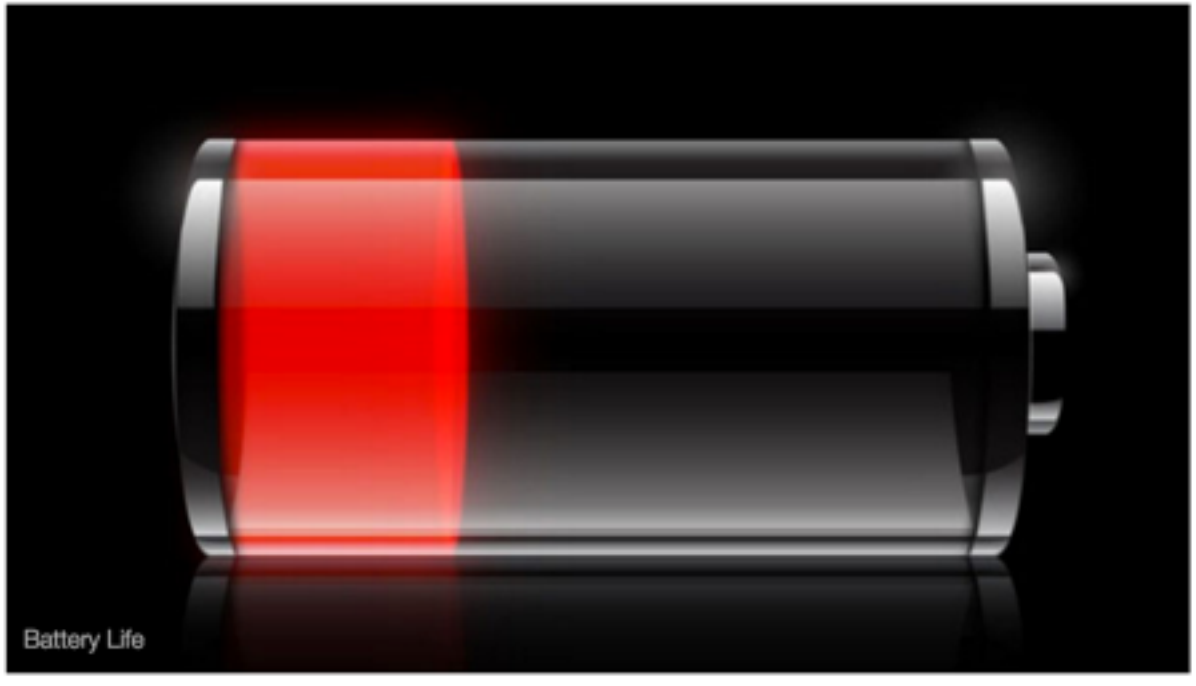
Centro de Informática UFPE

Universidade Federal de Pernambuco

Better battery life most wanted smartphone feature, study finds

by Luke Johnson

18 December 2013



Staying power not raw power is what consumers are after as a consumer study finds better battery life is the most coveted smartphone feature of all.

By **BRIAN MASTROIANNI** / **CBS NEWS** / *February 10, 2016, 12:17 PM*

Facebook app is killing your phone's battery life

VS

HTML

Native apps

1x1 clock, Anagram Solver, Allsimon/Alldebrid, AndroidRun, android-obd-reader, thialfihar/apg, bpear96/ARChon-Packager, applocker, google/google-authenticator-android, Sash0k/bluetooth-spp-terminal, boardgamegeek, jchmrt/clean-calculator, bitfireAT/cadroid, callmeter, Car Report, CineCat, Clover, CountdownTimer, Cowsay-android, CricketsAlarm,DeepScratch, derandom, dotty, Drinks, DroidBeard, Earmouse, esms, EasyDice, EnigmAndroid, external-ip,falling for reddit, Fish,Flashlight, FreeOTP, frostwire-android, GetBack GPS, Gobandroid, HandyNotes, Hash It!, HeartRateMonitor, HeaterRC,HUD, ICSdroid, IntentRadio, JAWS, Matrix Calc, MAXS Module LocationFine, MAXS Module Ringermode, Migraine Tracker, Movian Remote, MobileOrg, MyOwnNotes, MultiPing, NetMBuddy, Network Discovery, Number Guesser, No Stranger SMS, OI About, OI Notepad, OpenMensa, Page Plus Balance, Photo Bookmark, Permissions, Pocket Talk, PocketSphinx Demo, Prism, Quest Player, RedScreenActivity, ReLaunch, S Tools, sanity, Search Light, SecDroid, Send to SD card, ShoppingList, Simply Do, Sky Map, Sokoban, SparkleShare, Speedo, StockTicker, Sudowars, TaigIME, Temaki, Timber, Toe, Torch, Tri Rose, Twister, Visualizer, Voodoo,CarrierIQ Detector, WebSMS Connector: GMX, weechat, WiFi Warning, WiGLE,Wifi Wardriving, WWWJDIC for Android, Yaacc, YubiClip, YubNub Command Line. 24 Game, OpenWnn Legacy, PrBoom For Android, Lumicall, Mitzuli

Web apps

ankidroid/Anki-Android, clipcaster, Overchan, RainTime, smeir/berlin-vegan-guide

From a random sample of 109 apps from F-Droid (http://www.froid.org)

RQ1. Is there a more energy-efficient approach?

RQ2. Is it possible to reduce the energy consumption of an app built using a single approach by making it hybrid?

Nexus 5 (2013), Android 5.1

6GB of flash memory, 2GB of RAM memory, chipset Qualcomm MSM8974 Snapdragon 800, CPU Quad-core 2.3 GHz Krait 400 and Li-Po 2300 mAh batt.

Used both **Java and JavaScript versions** of benchmarks and apps

Each version of each benchmark or app executed 8+ times

Project Volta to collect the data.

HTML

&

=

HTML

&

=

APACHE CORDOVA™

Mobile application development framework

+30.000 questions with “cordova” tag on StackOverFlow

Support for Android, iOS, Windows Phone, BlackBerry 10, webOS, Firefox OS and Amazon FireOS

Base for several other frameworks like **PhoneGap, Ionic, Monarca...**

The Computer Language Benchmarks Game

Source	Benchmark or App
Rosetta Code	BubbleSort, Combinations, Count in factors, CountingSort, GnomeSort, Happy Numbers, HeapSort, HofstadterQ, InsertSort, Knapsack Bounded, Knapsack Unbounded, Man or Boy, Matrix Multiplication, MergeSort, nQueens, PancakeSort , Perfect Number, QuickSort, SeqNonSquares, ShellSort , Sieve of Eratosthenes, Tower of Hanoi e Zero-One Knapsack
The Computer Language Benchmark Game	BinaryTree, Fannkuch, Fasta M Core, Fasta S Core, Nbody, RegexDna M Core, RegexDna S Core, RevComp e Knucleotide, Spectral, BinaryTree

Nanz, Sebastian, and Carlo A. Furia. “A comparative study of programming languages in Rosetta Code.”, ICSE 2015.
Lima et all. “Haskell in Green Land: Analyzing the Energy Behavior of a Purely Functional Language”, SANER 2016.

RQ1. Is there a more energy-efficient approach?

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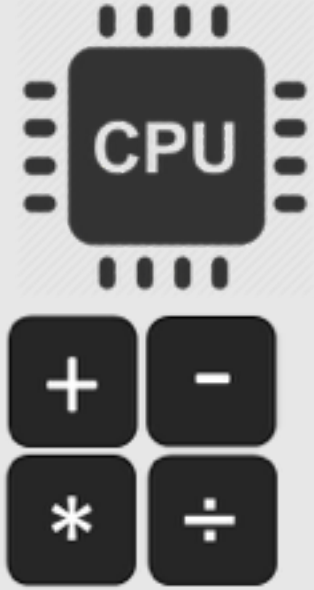
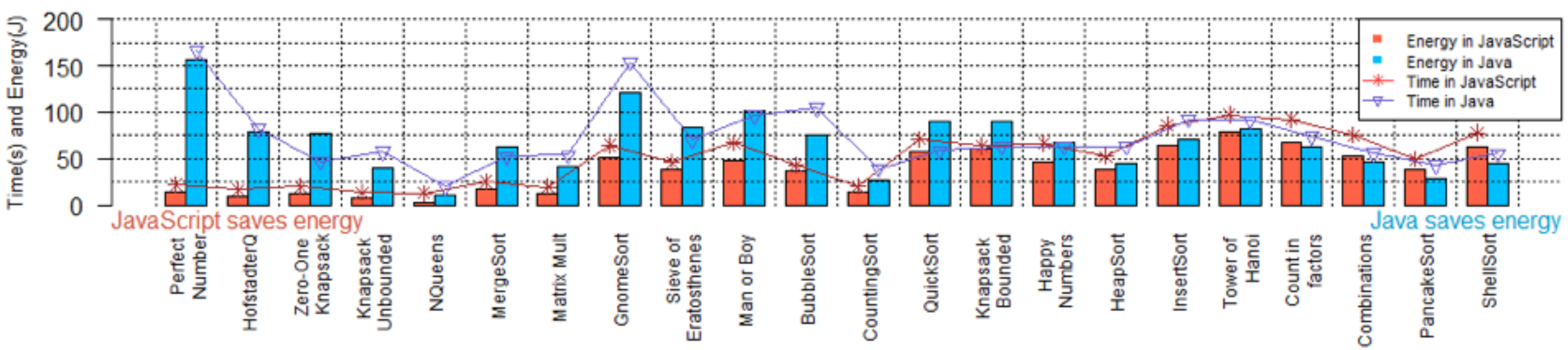
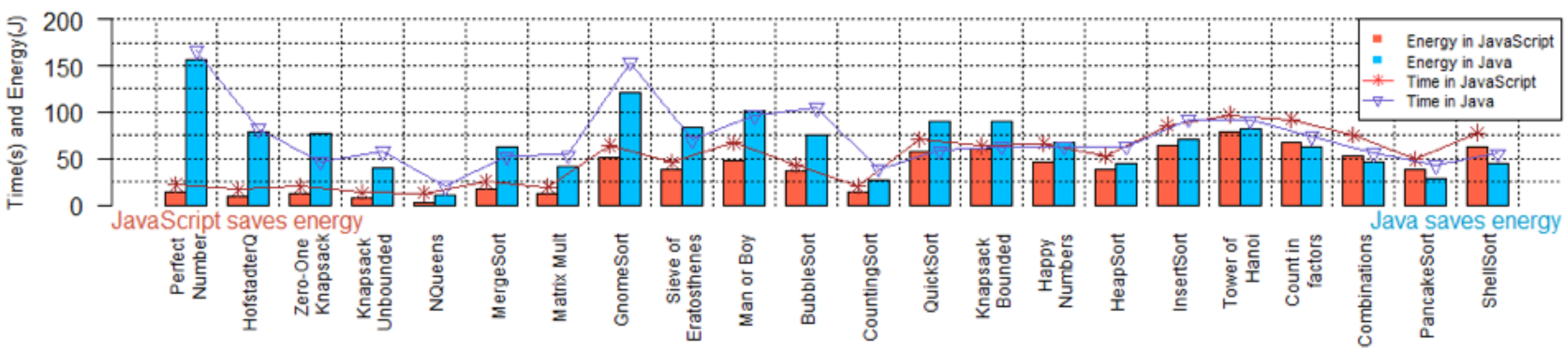
For **86% of the benchmarks**, specially more computation-bound

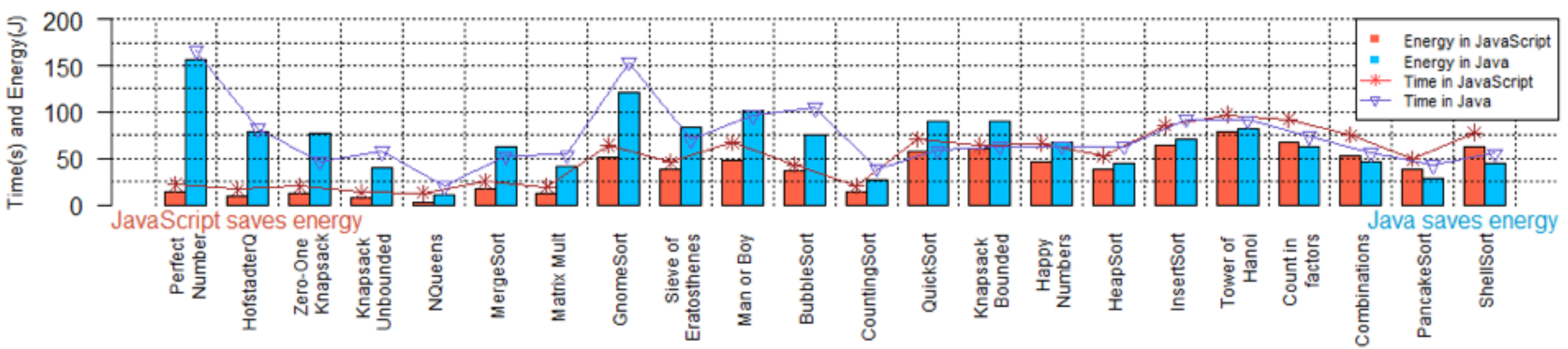




Java Rosetta Code benchmarks: a median **2.09x more energy**, **1.52x more time** than their JavaScript counterparts

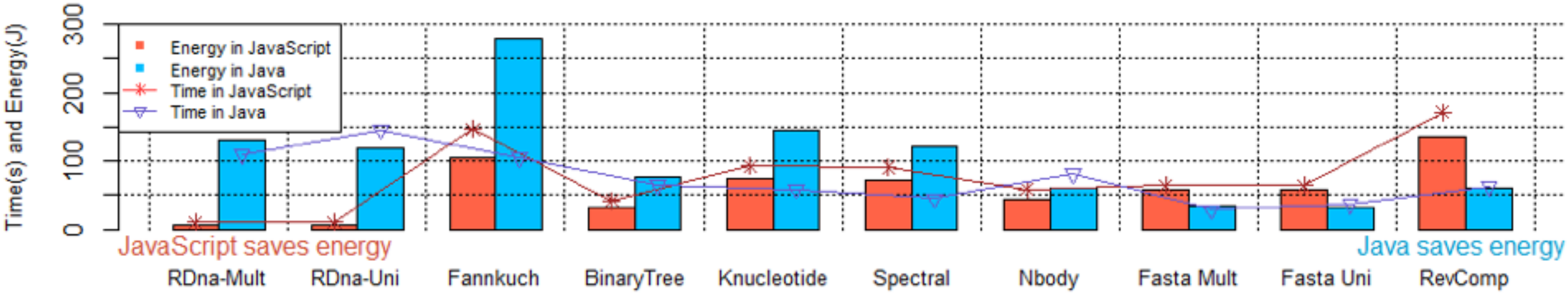


19 out of 23 benchmarks: **less energy in JavaScript**

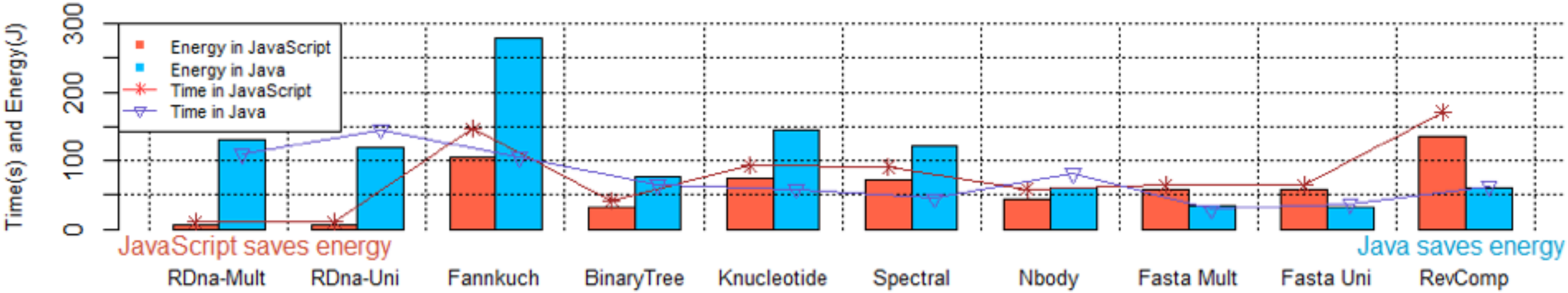


6 out of 23 benchmarks had a superior performance in Java

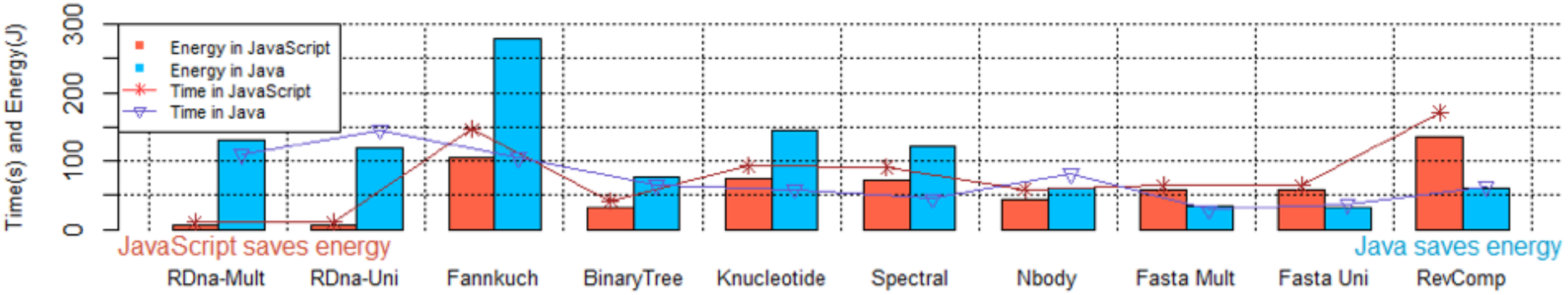
4 had a superior energy-efficiency



Java CLBG benchmarks: a median **1.82x more energy**, **0.67x median time** of JS benchmarks



7 out of 10 CLBG benchmarks: **less energy in JavaScript**.



6 of 10 benchmarks had superior performance in Java

3 of 10 had a superior energy-efficiency

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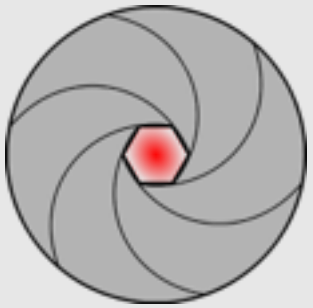
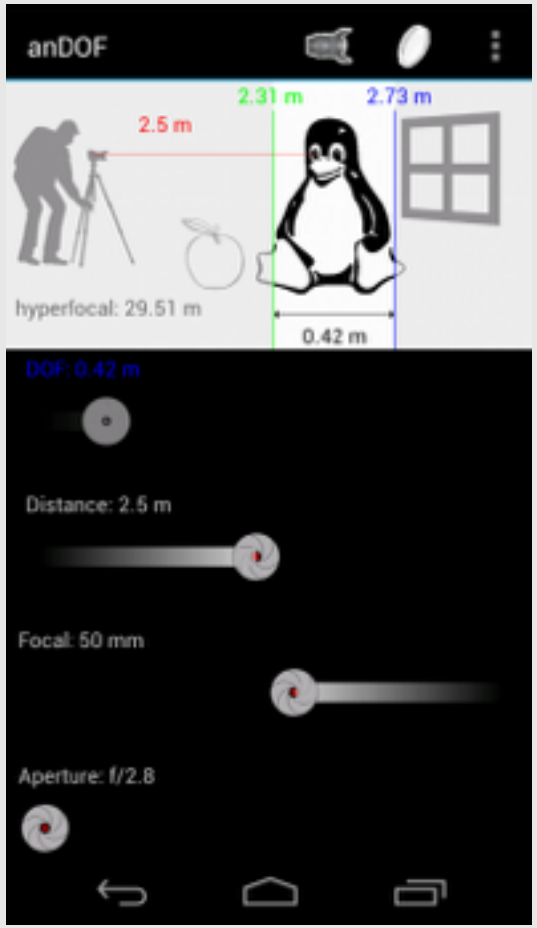
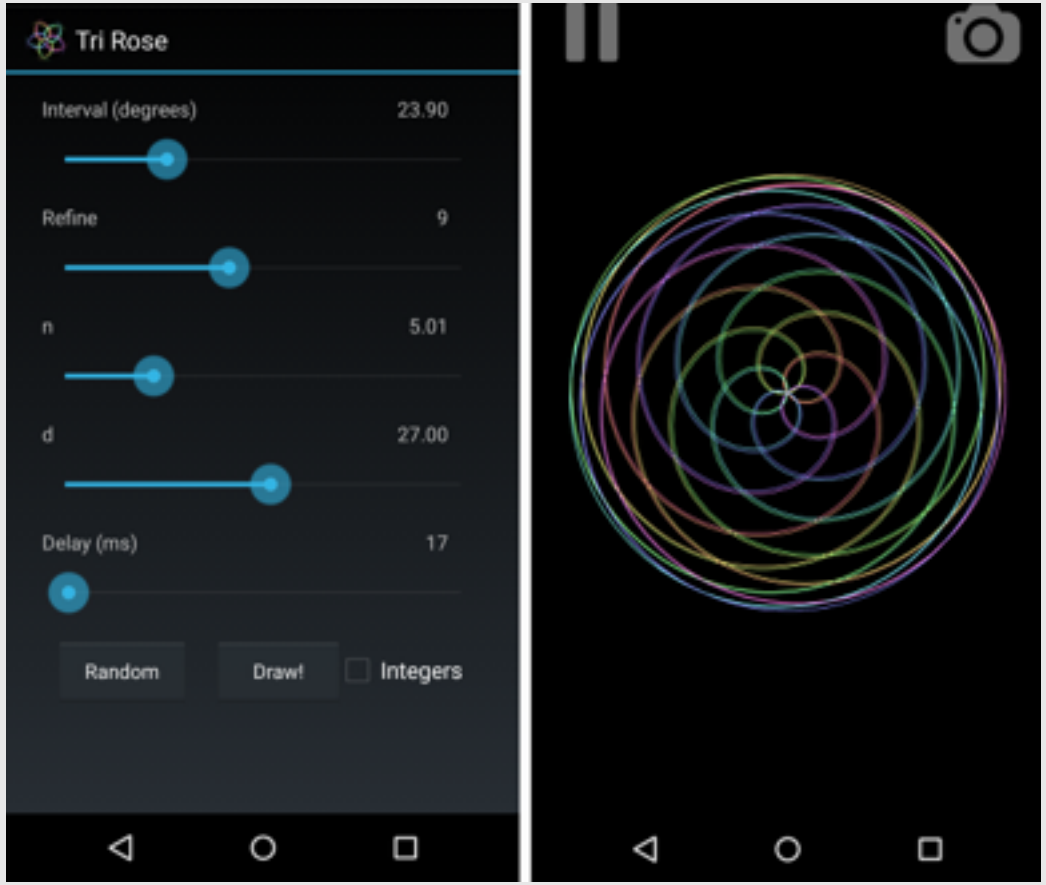
F-Droid

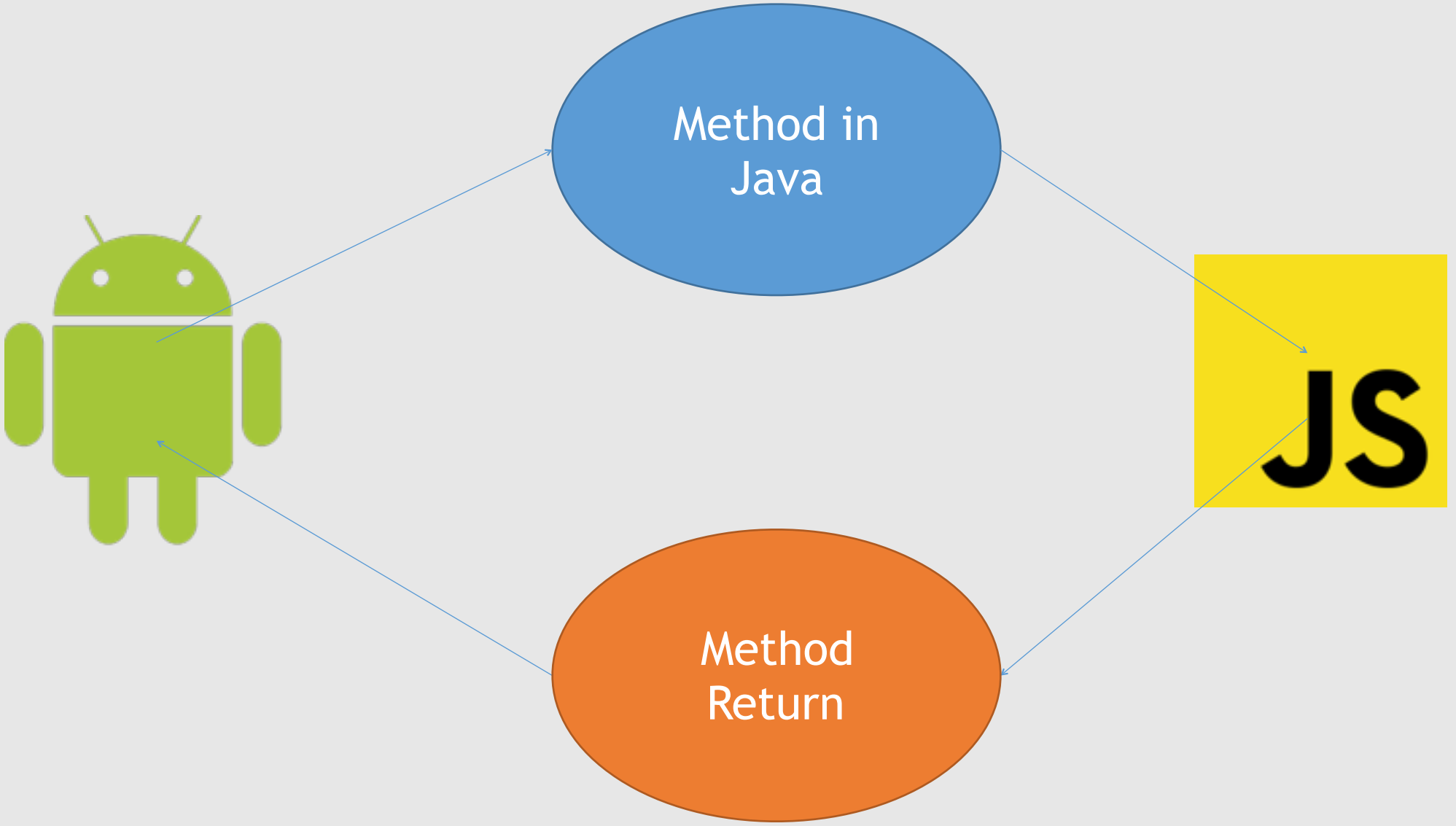


anDOF

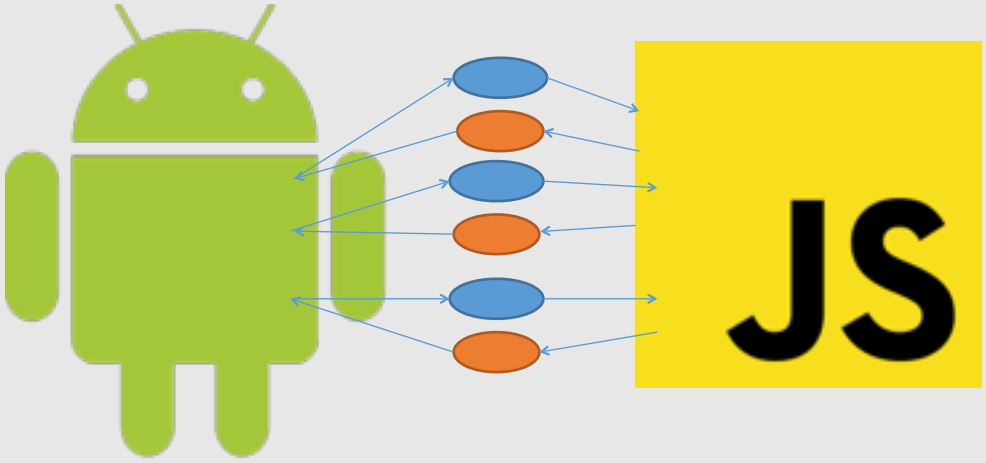




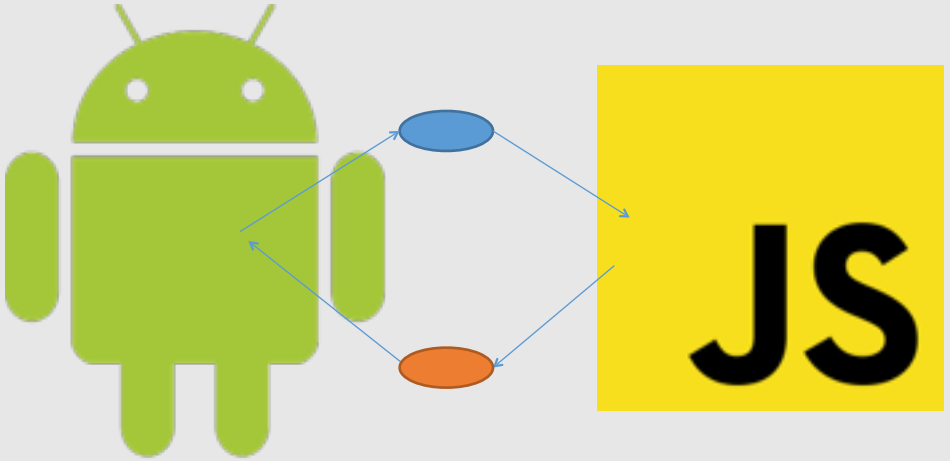
Tri Rose


Method in
Java
JS
Method
Return

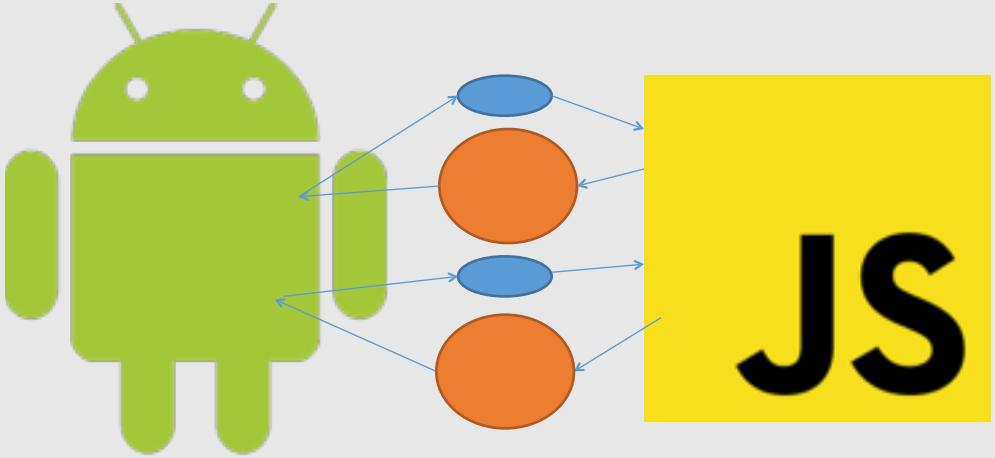
Stepwise

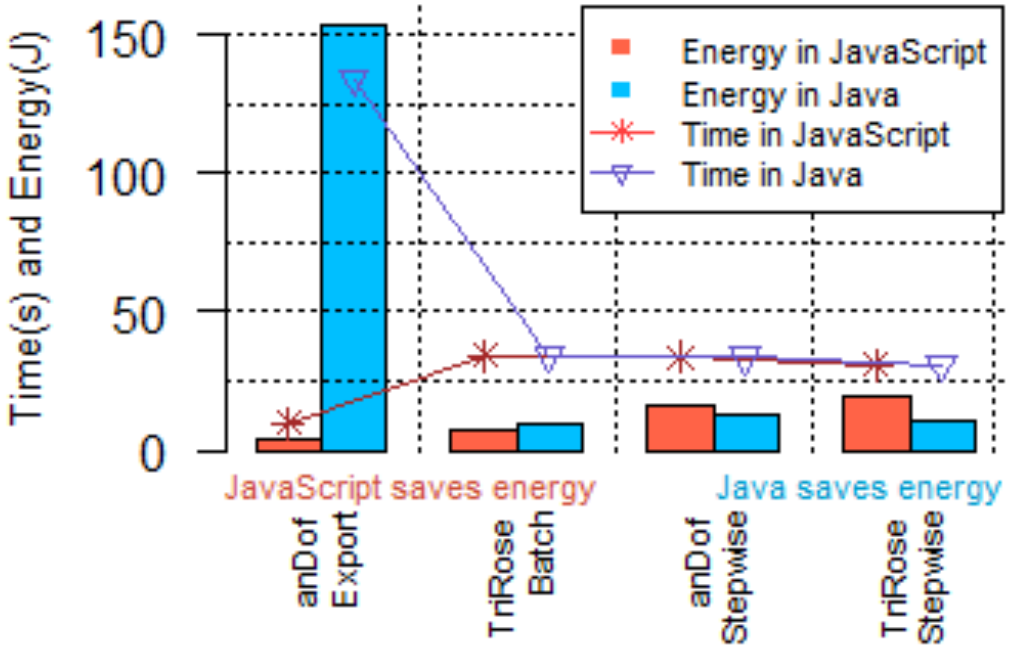


Export

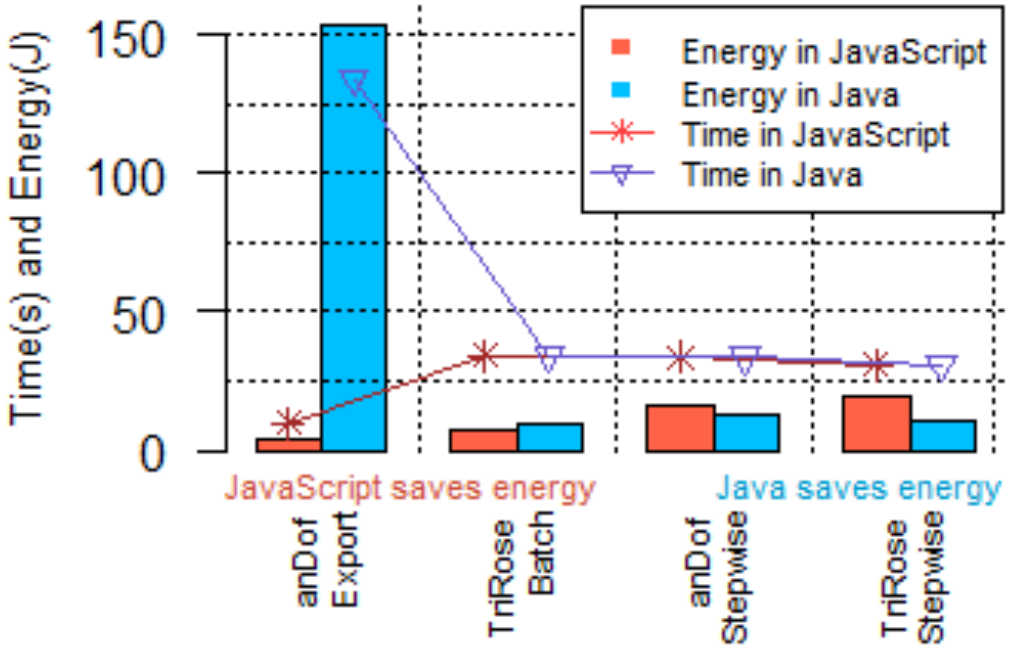


Batch

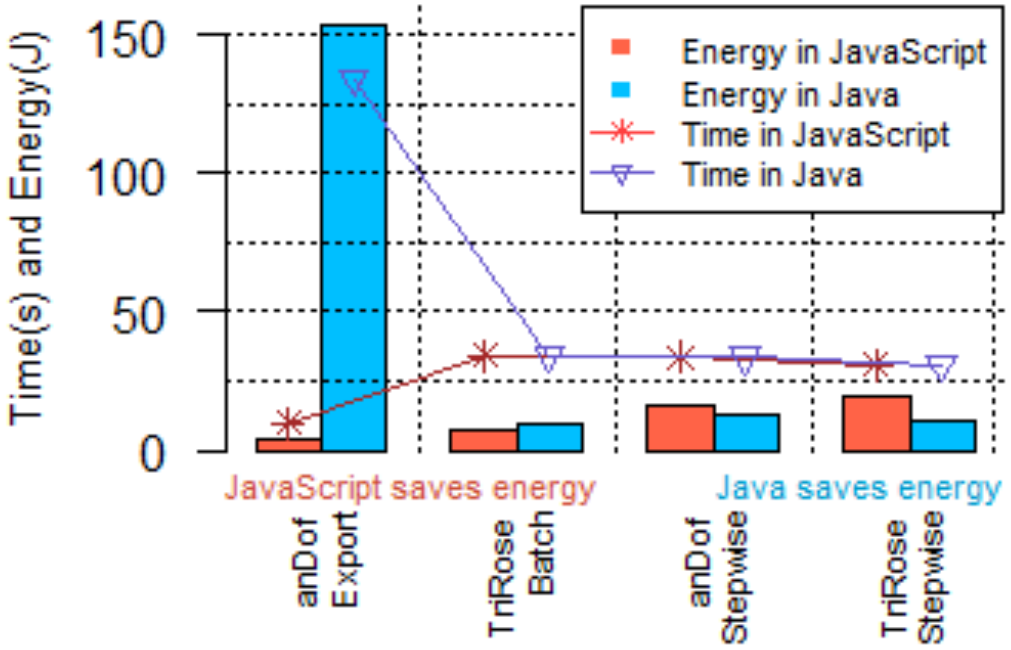




Hybrid apps had **better performance and energy-efficiency** using **Batch** and **Export**



Java version using **Batch**: **30% more energy** than hybrid



JavaScript files: 160 LoC (anDof) and 100 LoC (Tri Rose)

Less than 10% of the code of each app.

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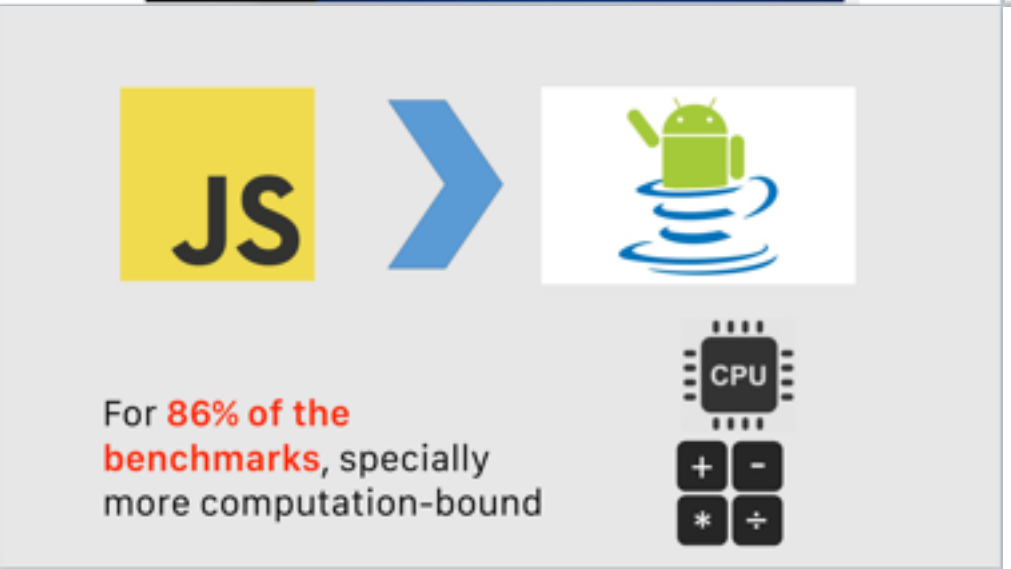

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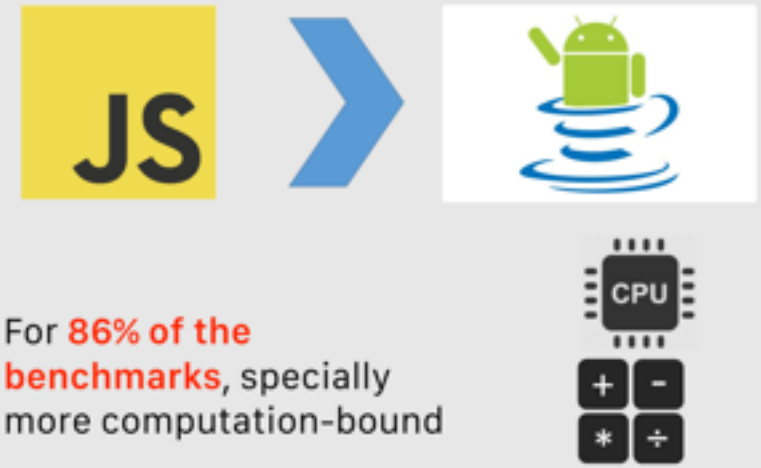

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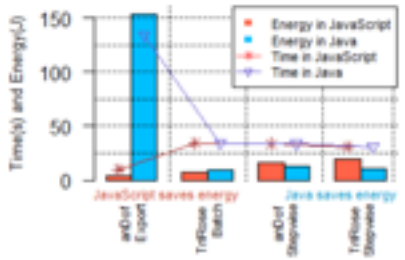

JavaScript had better performance and energy-efficiency using **Batch** and **Export** for the analyze apps

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Contact:
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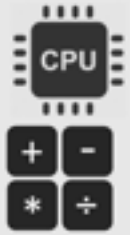

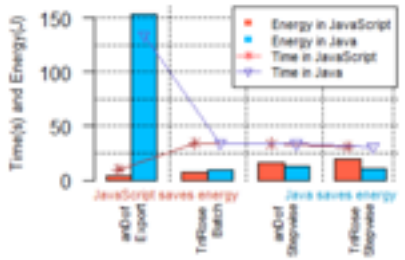

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Still a long way to go…

We still don’t know the **causes** for the results

Only **one** (potentially unreliable) **measurement approach**

Apps potentially **not representative**

Only **one** phone

Benchmarks are most definitely **not apps***

P. Ratanaworabhan, B. Livshits, B. Zorn. JSMeter: comparing the behavior of javascript benchmarks with real web applications. Proceedings of the Usenix Conference on Web Application Development, 2010.