ThinkAir: the power of mobile cloud computing

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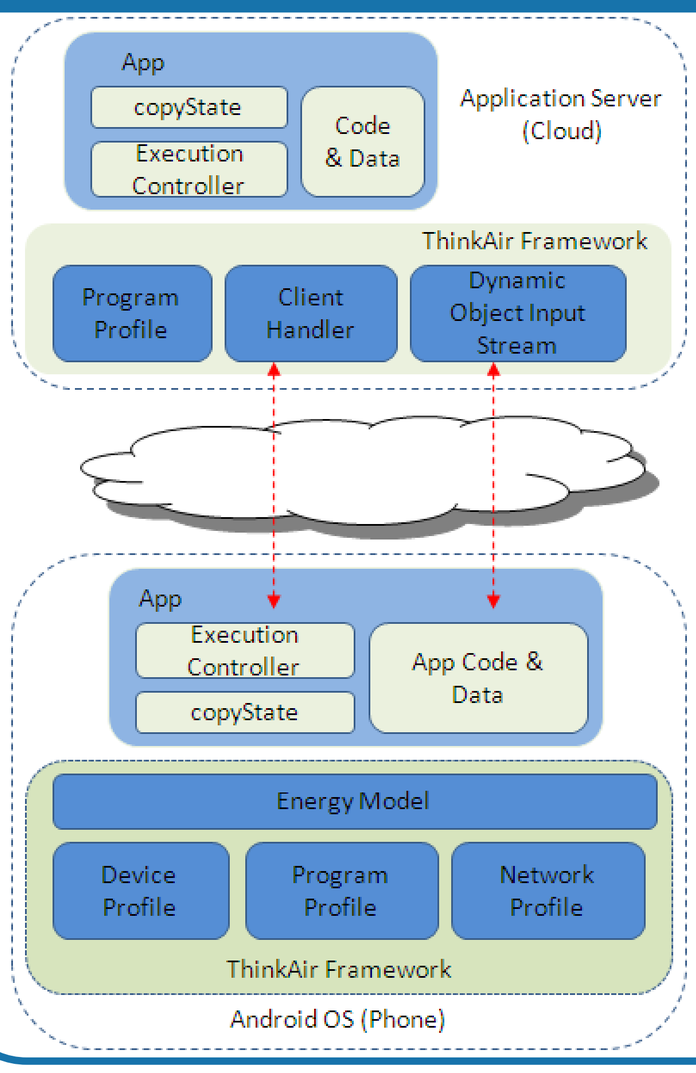
What it is

ThinkAir is a mobile cloud computing framework which allows developers to increase the power of smartphones by using code offloading. It is built for the Android platform and using VM technology it can bridge mobile devices to any cloud computing provider to augment the device's resources.

ThinkAir enables:

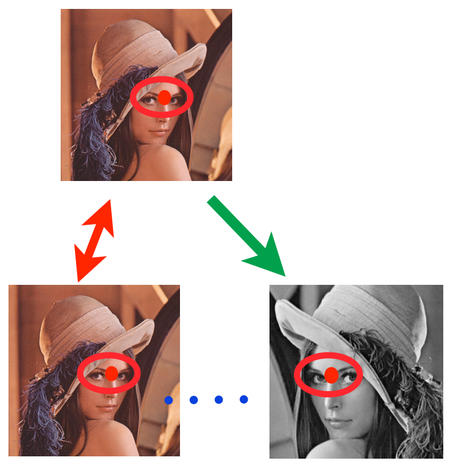
- automatic **computation offloading** from mobile devices to the cloud
- performing **on-demand resource allocation**, and exploiting **parallelism** by dynamically creating, resuming, and destroying VMs when needed.

The ThinkAir framework

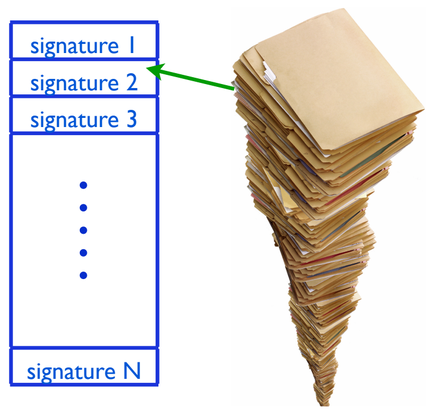


Example applications

All solutions to the N-Queens Puzzle



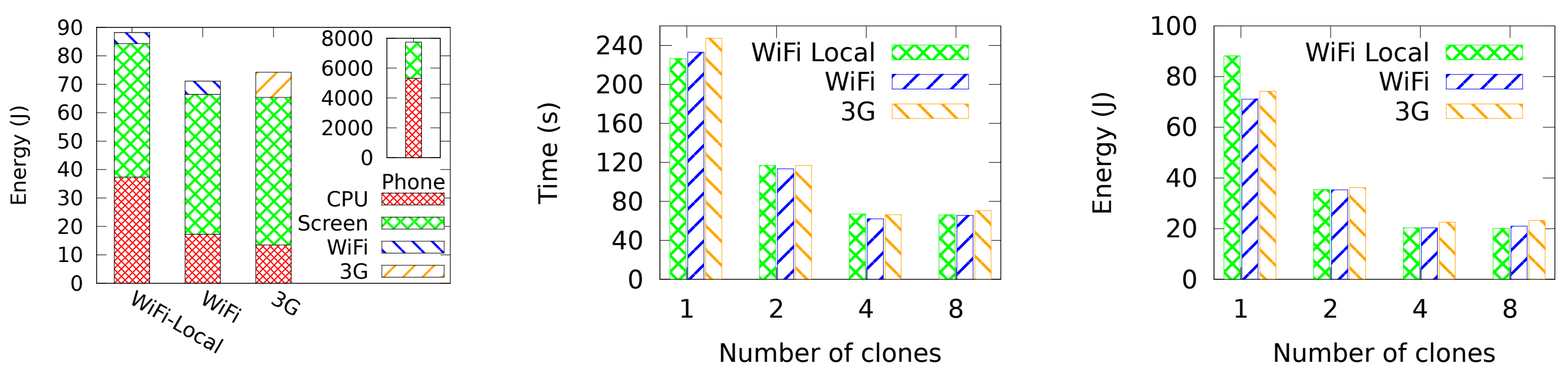
Number of faces in a picture and duplicate photos



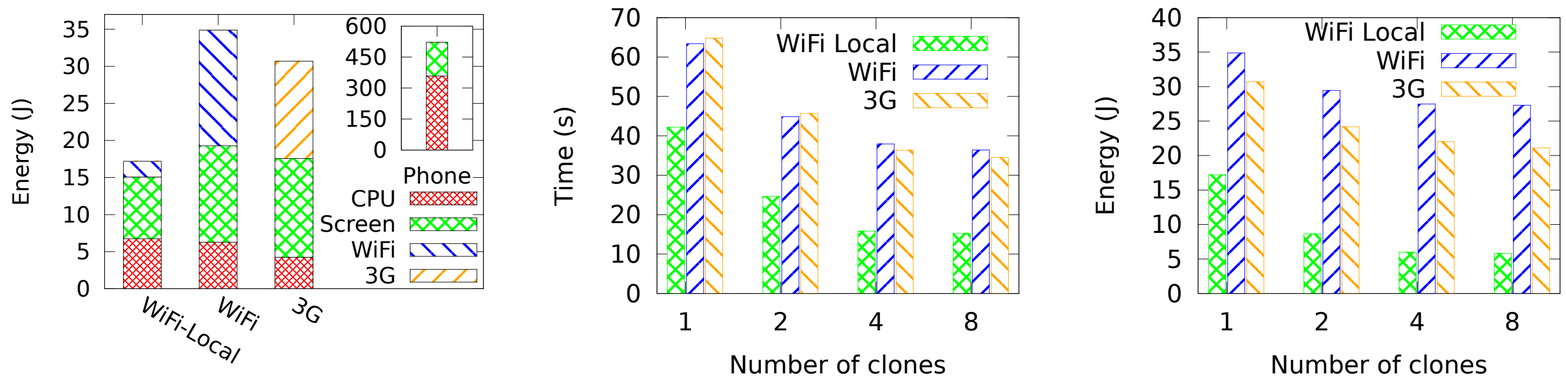
Count viruses in a filesystem

Preliminary results

Phone: app executed entirely on the *phone*
WiFi Local: code offloaded to *"private cloud"*
WiFi: code offloaded to *public cloud* using WiFi
3G: code offloaded to *public cloud* using 3G

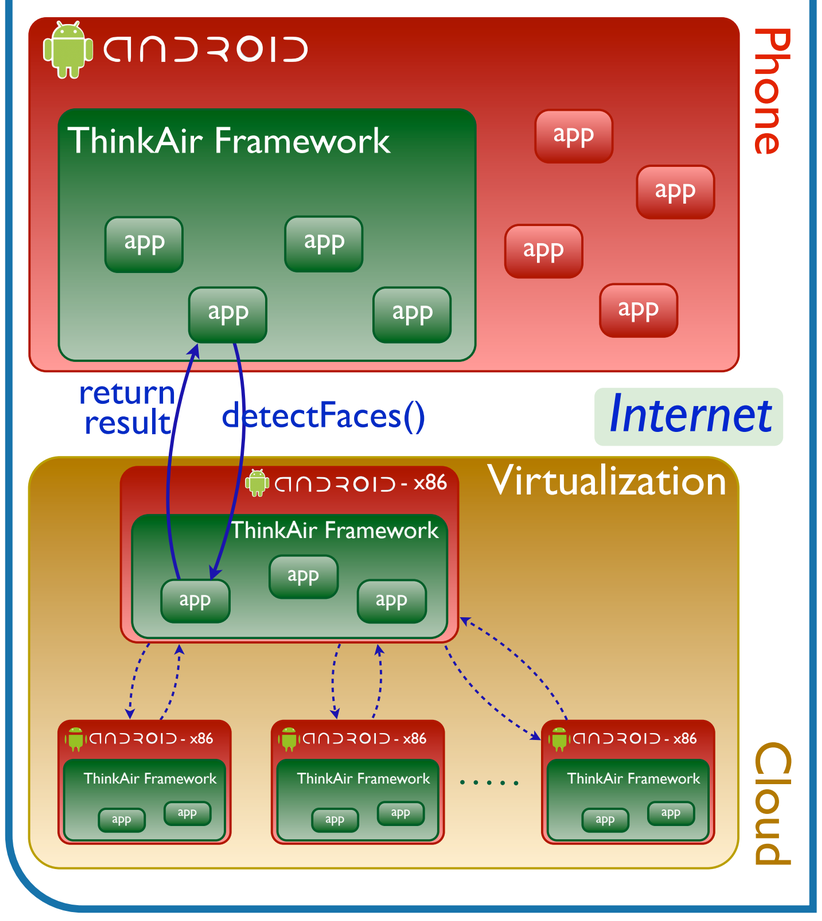


Left to right: Energy consumed by each component on the phone for **8-queens puzzle** in different scenarios, Time taken and Energy consumed on the phone executing 8-queens puzzle using N = {1, 2, 4, 8} clones.



Left to right: Energy consumed by each component on the phone for **Face detection** in different scenarios, Time taken and Energy consumed on the phone executing Face detection using N = {1, 2, 4, 8} clones.

On-demand resource allocation



Related works

[1] Eduardo Cuervo, Aruna Balasubramanian, Dae-ki Cho, Alec Wolman, Stefan Saroiu, Ranveer Chandra, and Paramvir Bahl. MAUI: making smartphones last longer with code offload In *MobiSys '10: Proceedings of the 8th international conference on Mobile systems, applications, and services. 2010.*

[2] Byung-Gon Chun, Sunghwan Ihm, Petros Maniatis, Mayur Naik, and Ashwin Patti. CloneCloud: Elastic Execution between Mobile Device and Cloud In *Proceedings of the 6th European Conference on Computer Systems (EuroSys 2011).*

Work in progress and further directions

More accurate resource usage estimation and prediction using symbolic evaluation techniques

Focus on offloading for real-time, interactive applications - low latency requirement

Domain-specific offloading optimisations: image processing, streaming video information extraction (for AR)

Development of simple to use developer interface to the efficient offloading solutions