Demystifying Hardware Bottlenecks in Web Quality of Experience

Mallesham Dasari, Conor Kelton, Javad Nejati, Aruna Balasubramanian, Samir R. Das

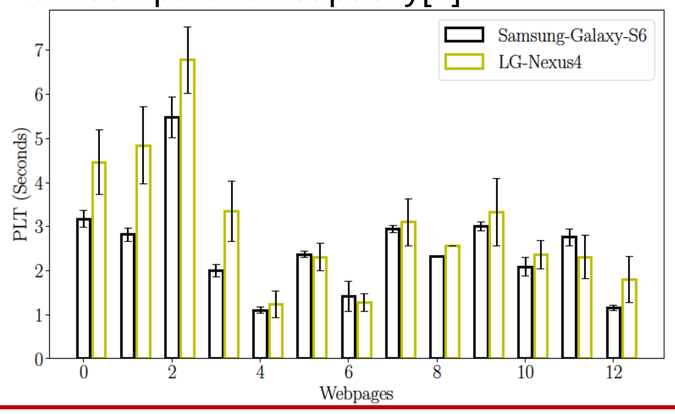
Computer Science Department, Stony Brook University

Stony Brook University

WINGS Lab

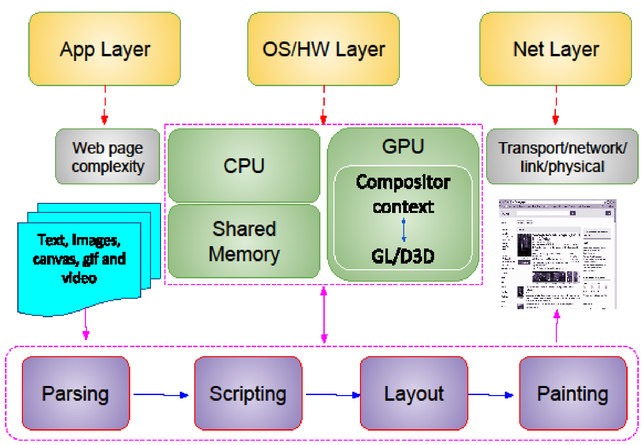
Motivation

- Computation is the bottleneck for many smartphones
- Making the problem worse, over 68% of smartphones in developing regions have low computation capacity[1]



Background

- The page load process is made of the App, the Hardware, and the Network layers



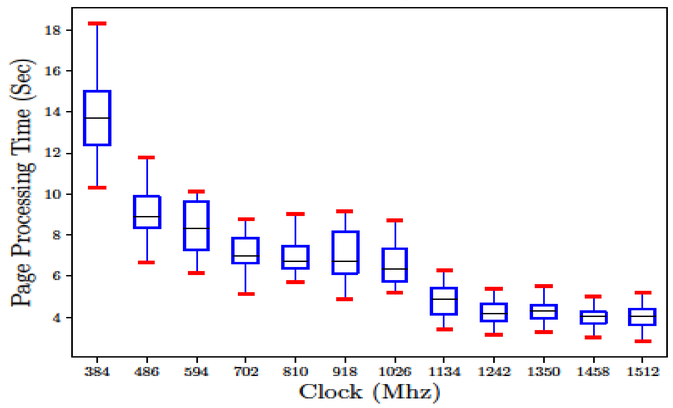
- Architecture of browsing path during page load process

Problem Statement

1. Detailed study of the **compute bottleneck**
2. Explore the use **of GPU offloading** to reduce the bottleneck

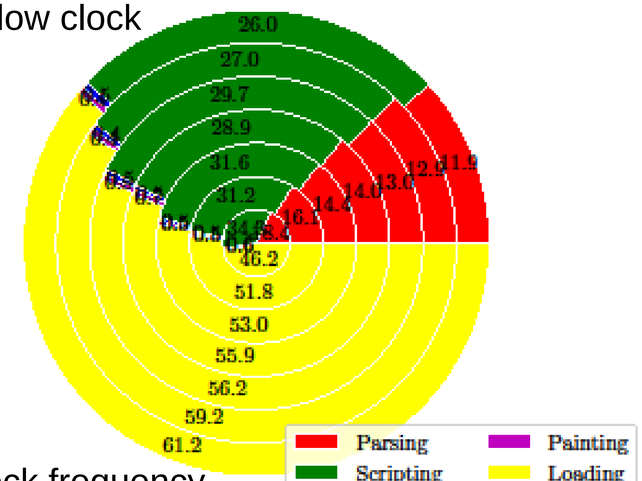
Effect of OS/Hardware Parameters

- Set-up: Top ranked 20 webpages, Locally hosted, Google Nexus4, WProf tool
- Parameters: Android frequency governors, CPU clock, and Memory



- A median of 11 seconds difference from high-low clock

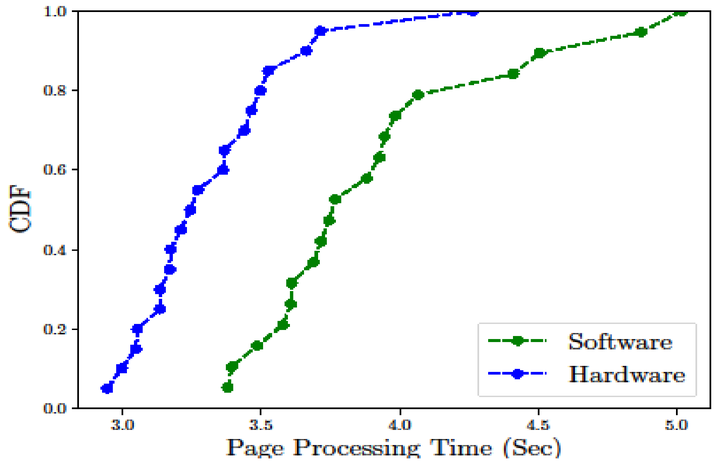
15% effect of memory on PLT

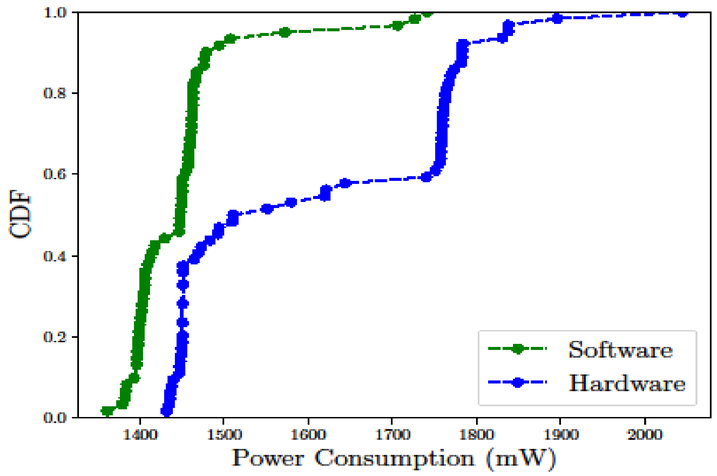


- As clock frequency increases, the network bottleneck decreases

GPU Offloading Trade-off

- Tool: Snapdragon Profiler to measure GPU usage and power consumption
- 22% of increase in power consumption for 0.5 seconds reduction in page processing





Ongoing and Future Work

- Currently, identifying critical bottlenecks and extraneous points in browsing path
- Preparing a light-weight browsing framework for low-end mobile devices

1. http://hwstats.unity3d.com/mobile/. 2017