Browsing the Web on 1 Watt: Fast and Correct Webpage Layout from First Principles

Going Small Isn’t Easy
SunSpider micro-benchmarks

MacBook Pro
3 seconds

iPhone
44 seconds

Browsers are CPU Bound
Page loading on Safari with a MacBook Pro

Parallel Layout Engine Design

CSS style rules
p img { width: 100px; }
.photos div { padding: 20px; font: 50%; }

HTML document
<p><img/></p>
<div class="photos"><div/></div>

(multicore) parsers

multicore selector matcher

multicore cascader

style tree

Net Selector Match Speedup

multicore BSS layout constraint solver

Tree visit 1:
fonts, percents, ...

Tree visit 2:
min/pref widths

Tree visit 3:
widths, ...

• semi-static work stealing
• autotuning (layout, locks, …)

Next steps:
• Tuning schedule selection
• Value speculation
• Learning semi-static work stealing parameters
• DSL expressiveness extensions
• Full CSS specification
• SIMD tree visitors