USING SPECULATION TO ENHANCE JAVASCRIPT PERFORMANCE IN WEB APPLICATIONS

Jan Kasper Martinsen, PhD student (BTH), Håkan Grahn, Professor (BTH) and Anders Isberg (Sony Mobile)
Important results

- The benchmarks are not representative for the JavaScript execution in web apps
- Thread-Level Speculation significantly speeds up execution for JavaScript in web apps
- The effects of running on 4, 8 and 48 cores
JavaScript Benchmarks are unrepresentative

- The set of benchmarks seems to have been ported from already exiting benchmarks
- Not relevant workload for web apps
  - We rarely do numerical operations
  - Large loops are rare
  - Eval is used extensively
JUST-IN-TIME (JIT) compilation slows down the execution

- Much effort have been spent on making JavaScript execute faster
- The effects of the efforts have been measured on the set of benchmarks!
- Since they are unrepresentative, efforts such as just-in-time compilation makes JavaScript execute slower in web apps
Just-in-time compilation (jsc) vs google v8 (Chromium)

SPEEDUP

Google, Facebook, YouTube, Wikipedia, BlogSpot, MSN, Linkedin, Amazon, WordPress, Ebay, Bing, Imdb, Myspace, BBC, Gmail
The real behaviour in web apps

• Web applications make JavaScript function calls extensively
  – For instance as events in the web apps
• We take advantage of this with Thread-Level Speculation
A simple concept...

• When we make a JavaScript function call, we execute it in parallel, as a thread
• The programmer (of web apps) does not need to care!
• We support nesten speculation
• Many function calls!
• But...
Conflict detection - rollbacks

(a)

Thread

0 1

1 write(x=7)

2 read(x=7)

3

4 commit

5

6

(b)

Thread

0 1

1 write(x=7)

2 write(x=5)

3 read(x=7)

4 read(x=5)

5 conflict detection

6 rollback & restore
Thread-Level Speculation
Just-in-time compilation (jsc)
google v8 (Chromium)
Why does it work?

• Web Applications are event driven!
  – Not a large number of loops in JavaScript
  – Less dependencies…
  – Speculation on function calls
    • Large number of threads
    • Few rollbacks
Youtube: Number of threads

407 THREADS!
Youtube : Number of rollbacks

...25 rollbacks!
Main observations

• Many speculations (20,000++)
  – Few rollbacks (less than 1%)

• We do not know when a rollback will occur...

• High memory usage
  – Up to 1527MB
Future work

- More, interesting new results!
- PhD defence, spring 2014 😊
- [http://www.bth.se/com/jkm](http://www.bth.se/com/jkm)