The Parallel Browser:
Synthesis + Parallelization of Layout Engines

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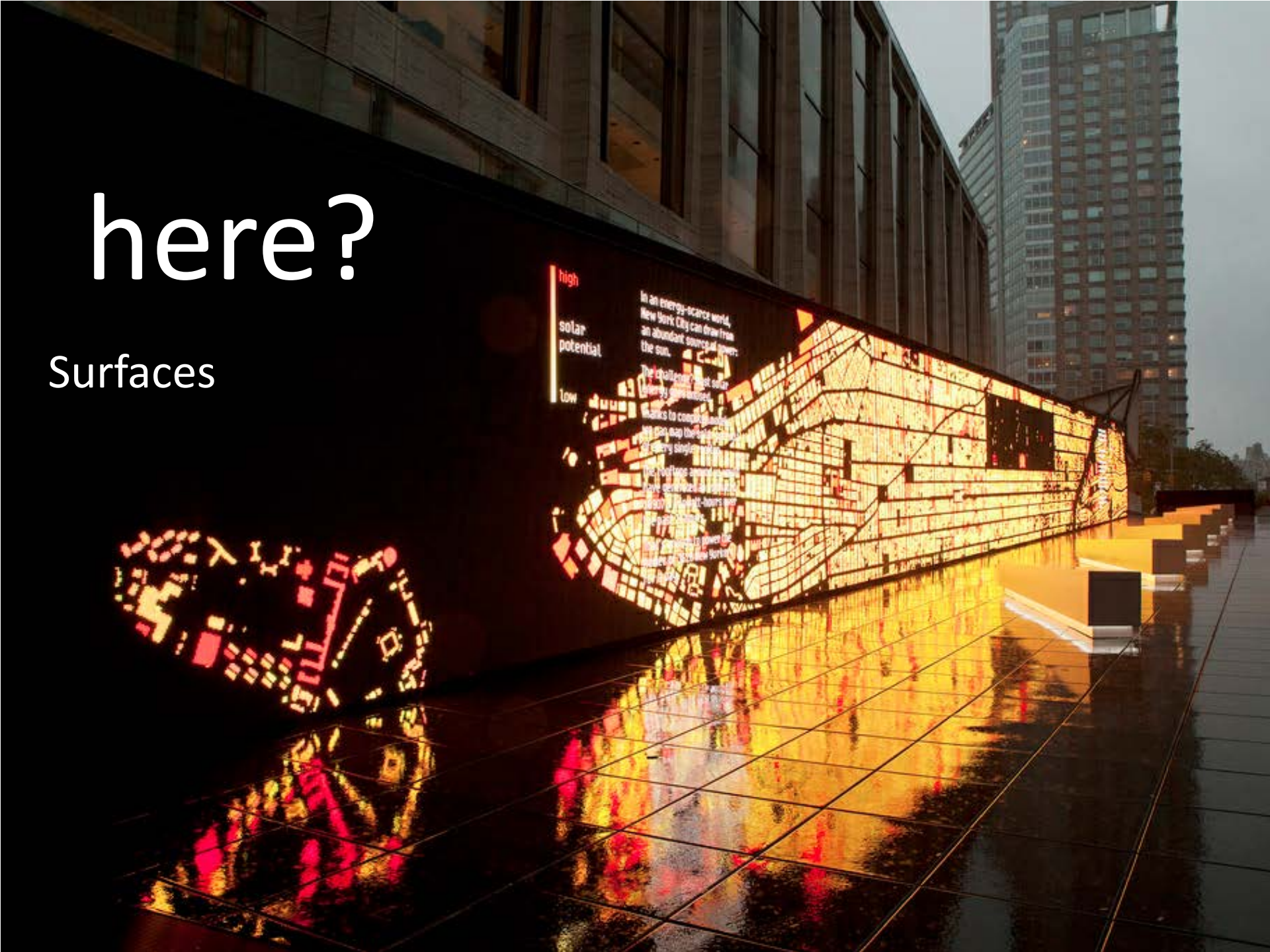
PLDI
6.13.2012
Beijing, China

Where’s the browser?

here?

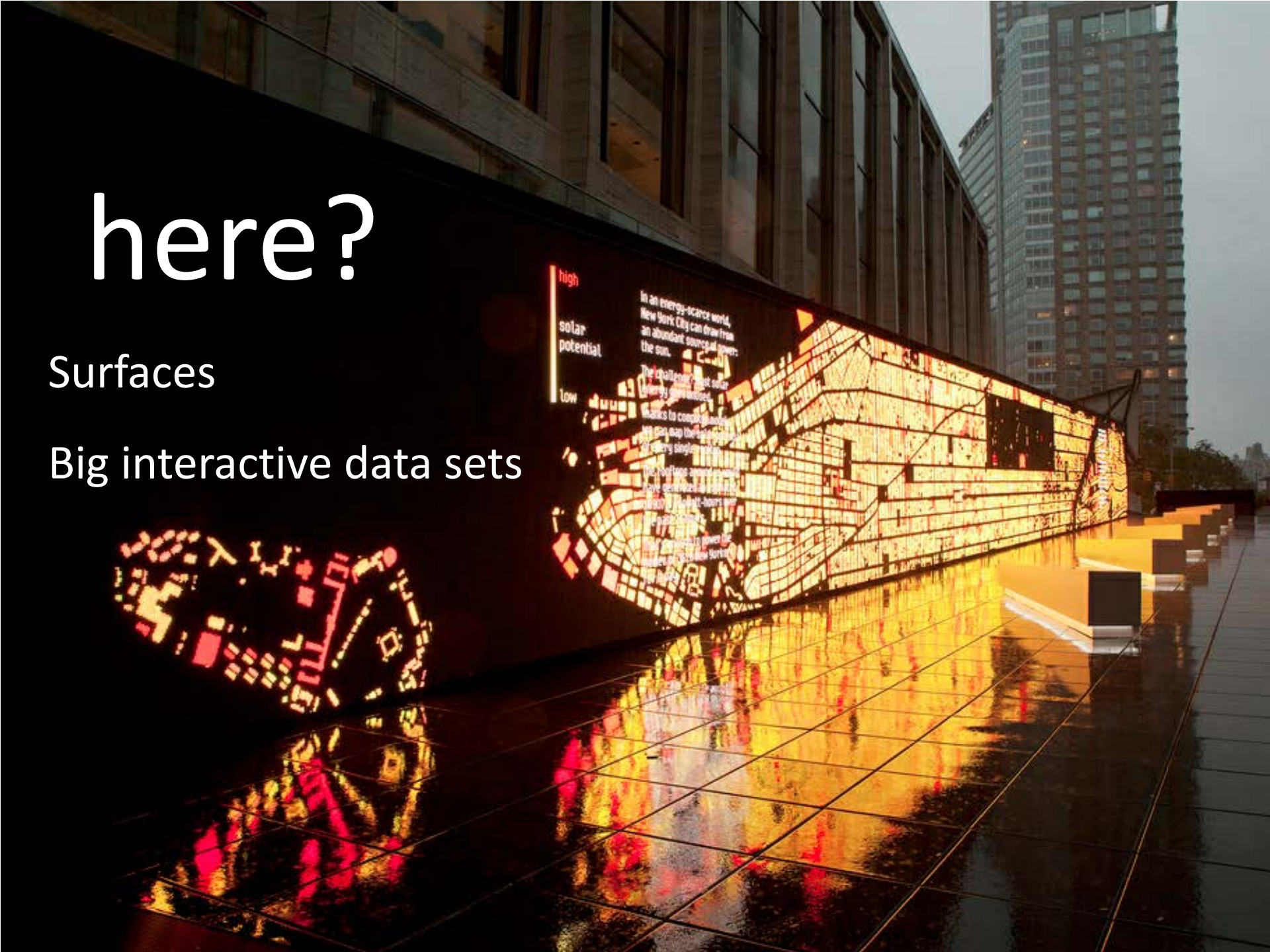
Surfaces



here?

Surfaces

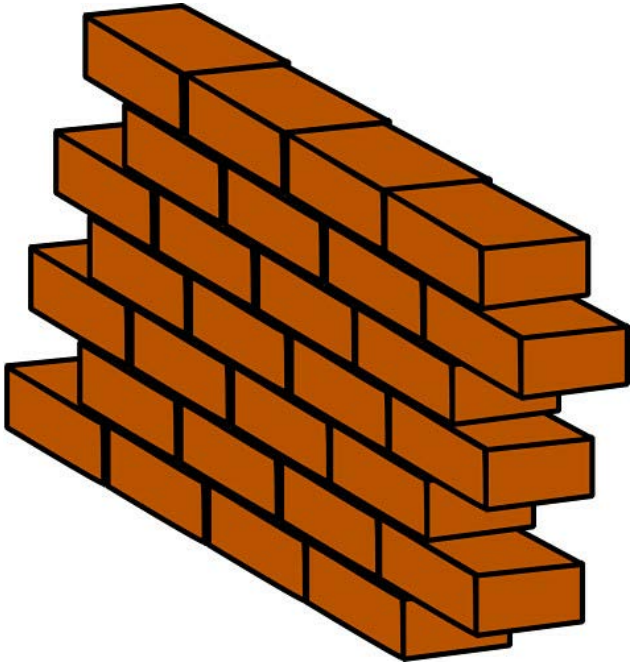
Big interactive data sets



can we put it there?

can we put it there?

Power Wall



sequential perf = *f*(power)

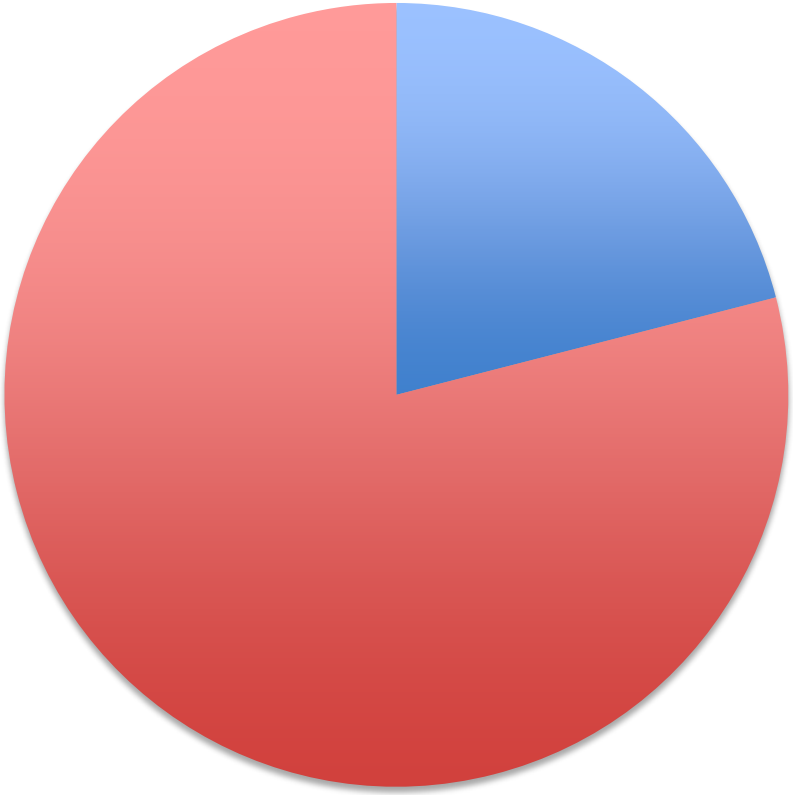
2012 phones

2012 phones

Tegra 3, S4, OMAP5, …

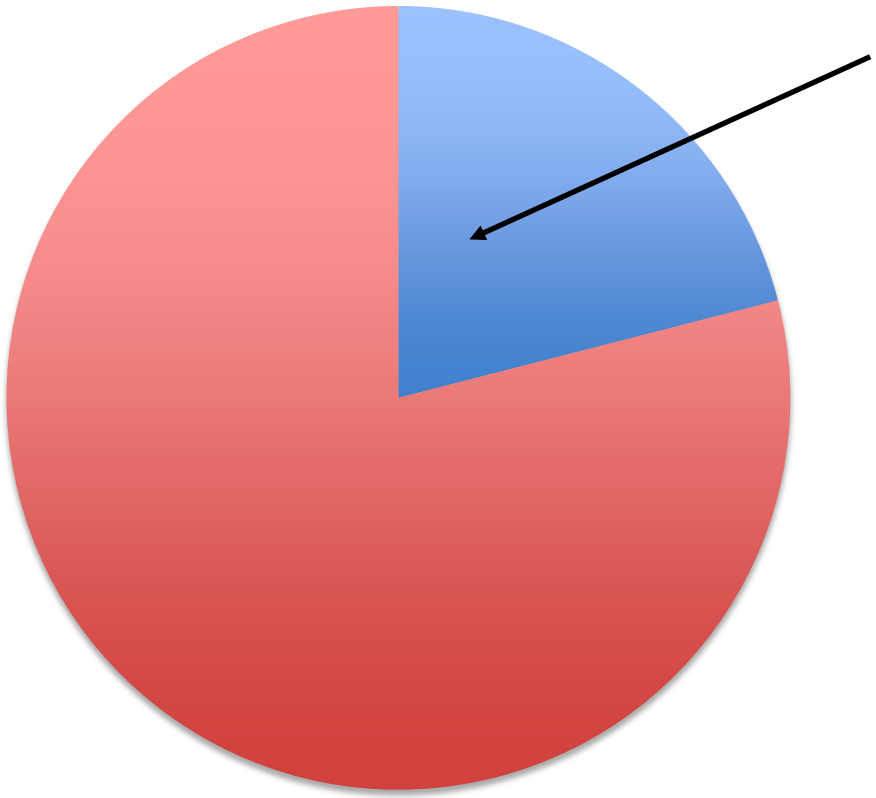
4 core CPU
128b-wide SIMD
12 core GPU

CPU Profile of the Top 25 Sites



http://blogs.msdn.com/b/ie/archive/2010/08/30/performance-profiling-how-different-web-sites-use-browser-subsystems.aspx

CPU Profile of the Top 25 Sites

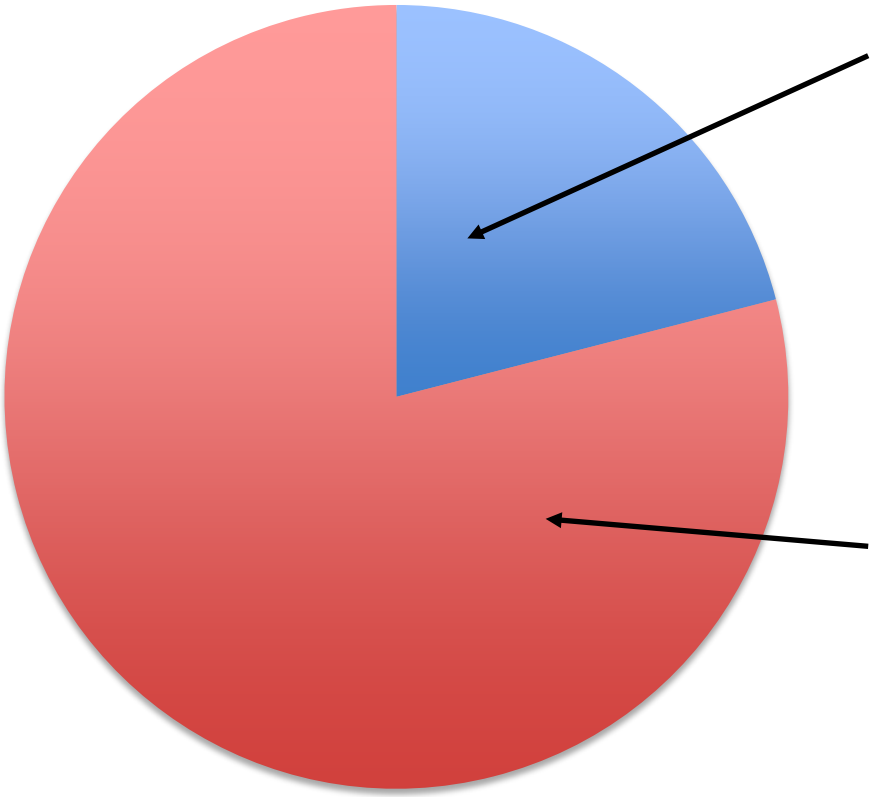


JavaScript: 20% CPU

~30 talks

http://blogs.msdn.com/b/ie/archive/2010/08/30/performance-profiling-how-different-web-sites-use-browser-subsystems.aspx

CPU Profile of the Top 25 Sites



JavaScript: 20% CPU

~30 talks

Not JavaScript: 80% CPU

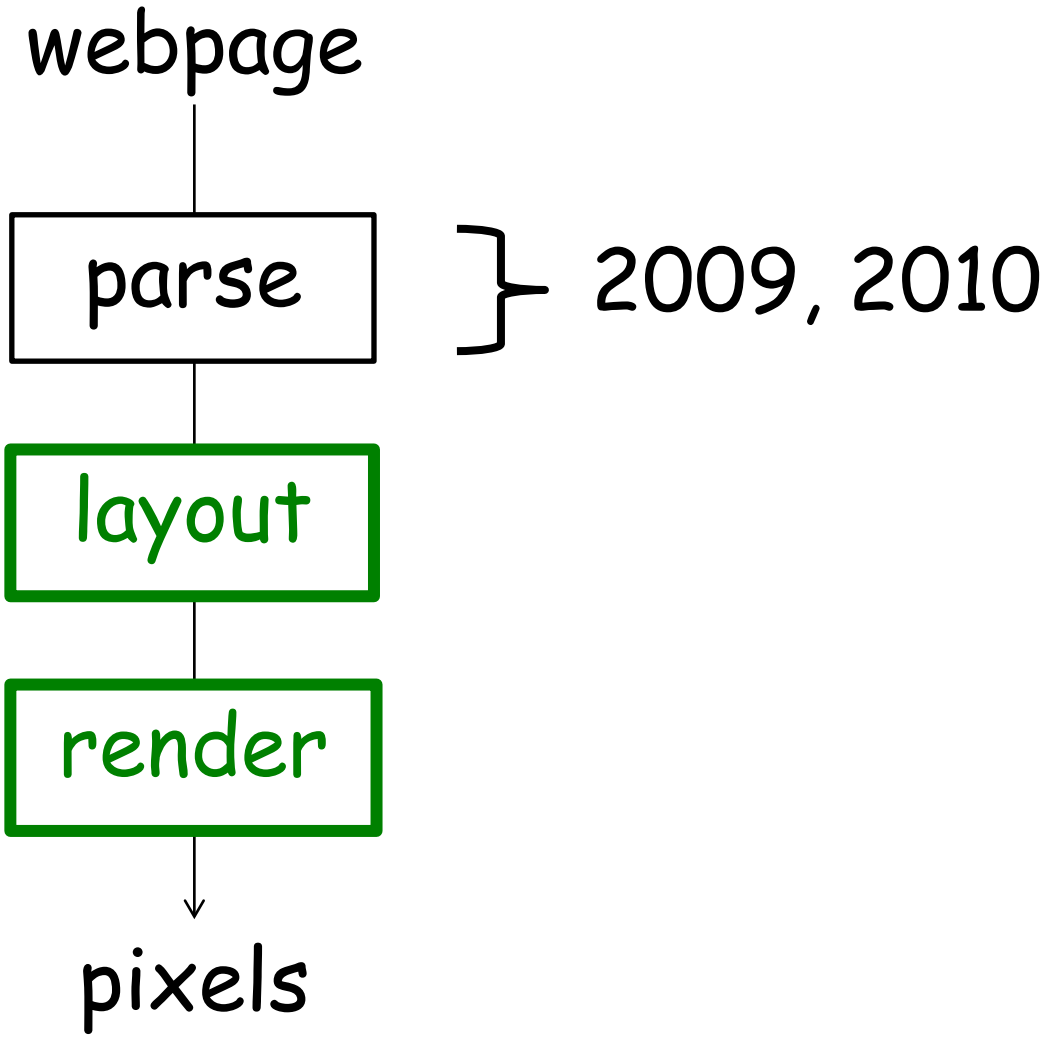
~2 talks

~0 performance solutions

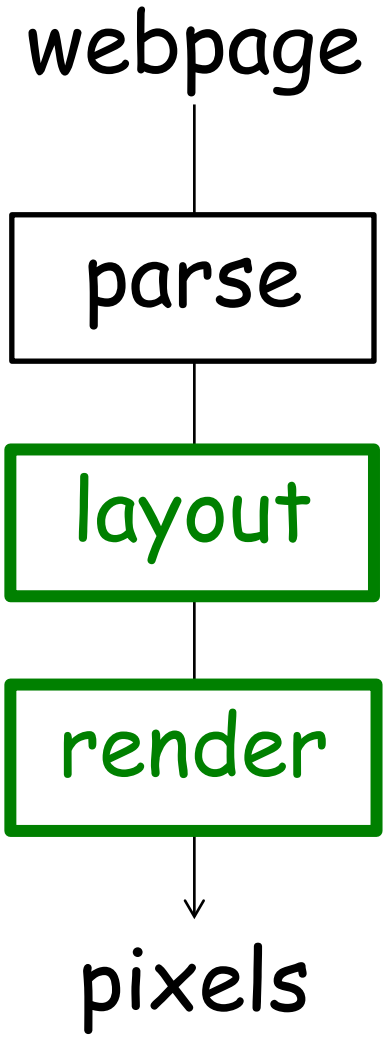
http://blogs.msdn.com/b/ie/archive/2010/08/30/performance-profiling-how-different-web-sites-use-browser-subsystems.aspx


CSS
IS
AWESOME

The Parallel Browser



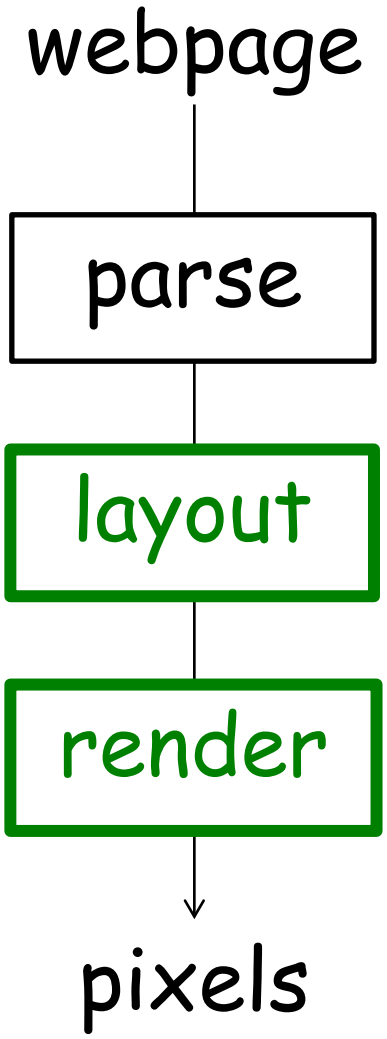
The Parallel Browser



Fail.

The Parallel Browser

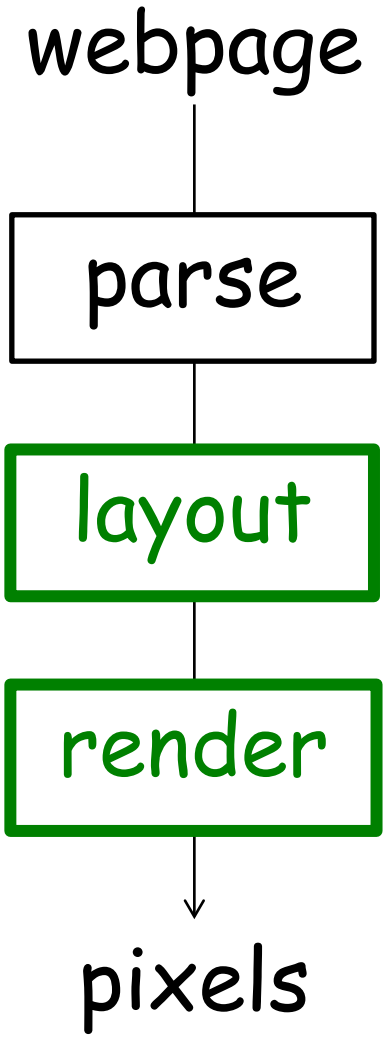
CSS spec



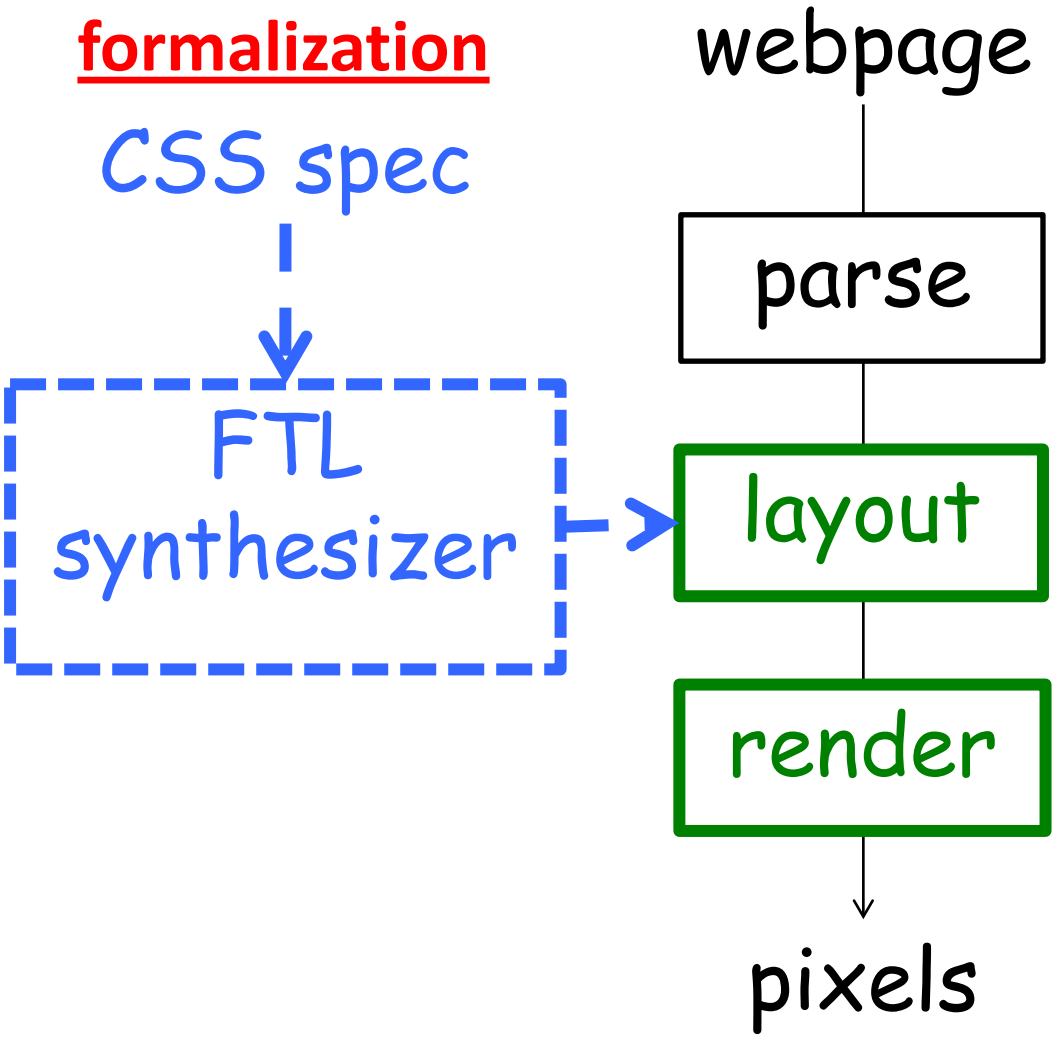
The Parallel Browser

formalization

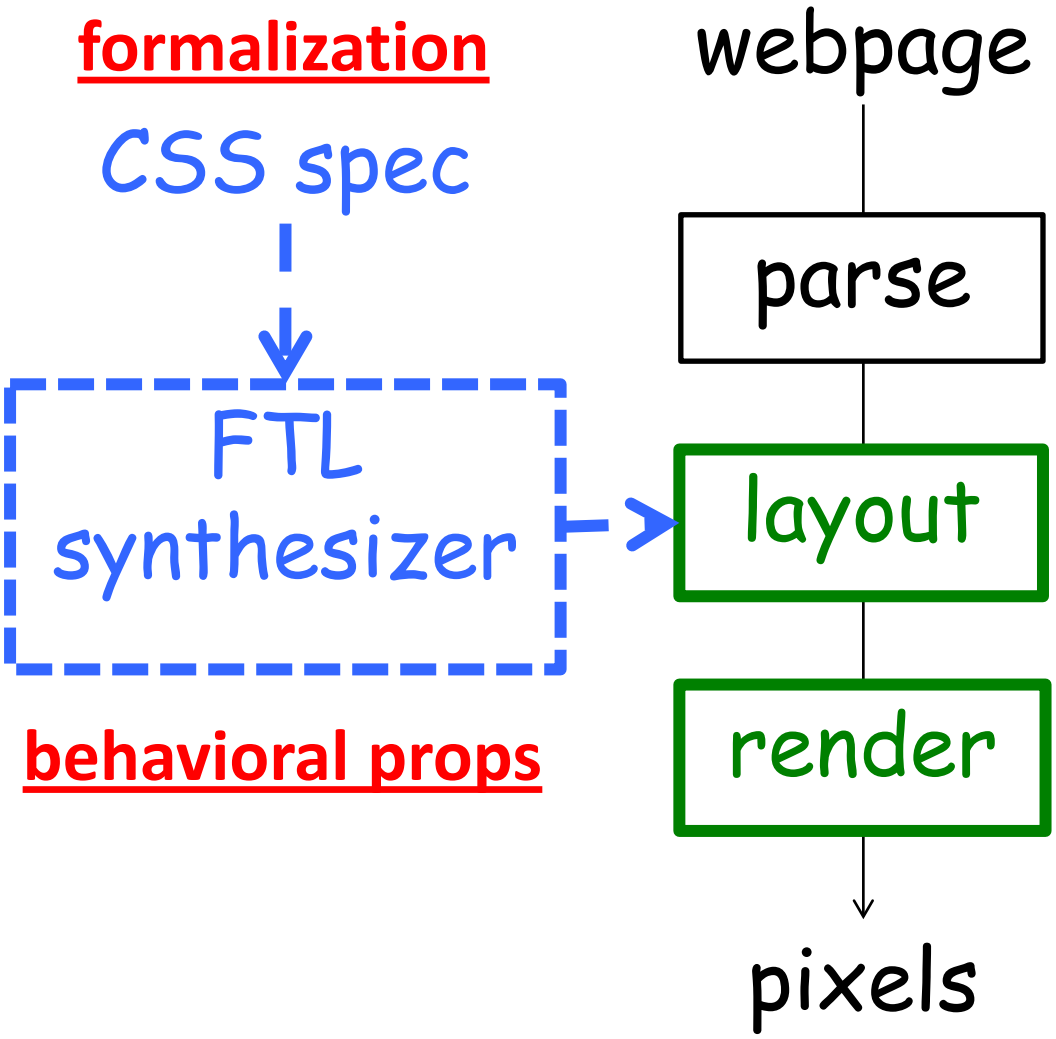
CSS spec



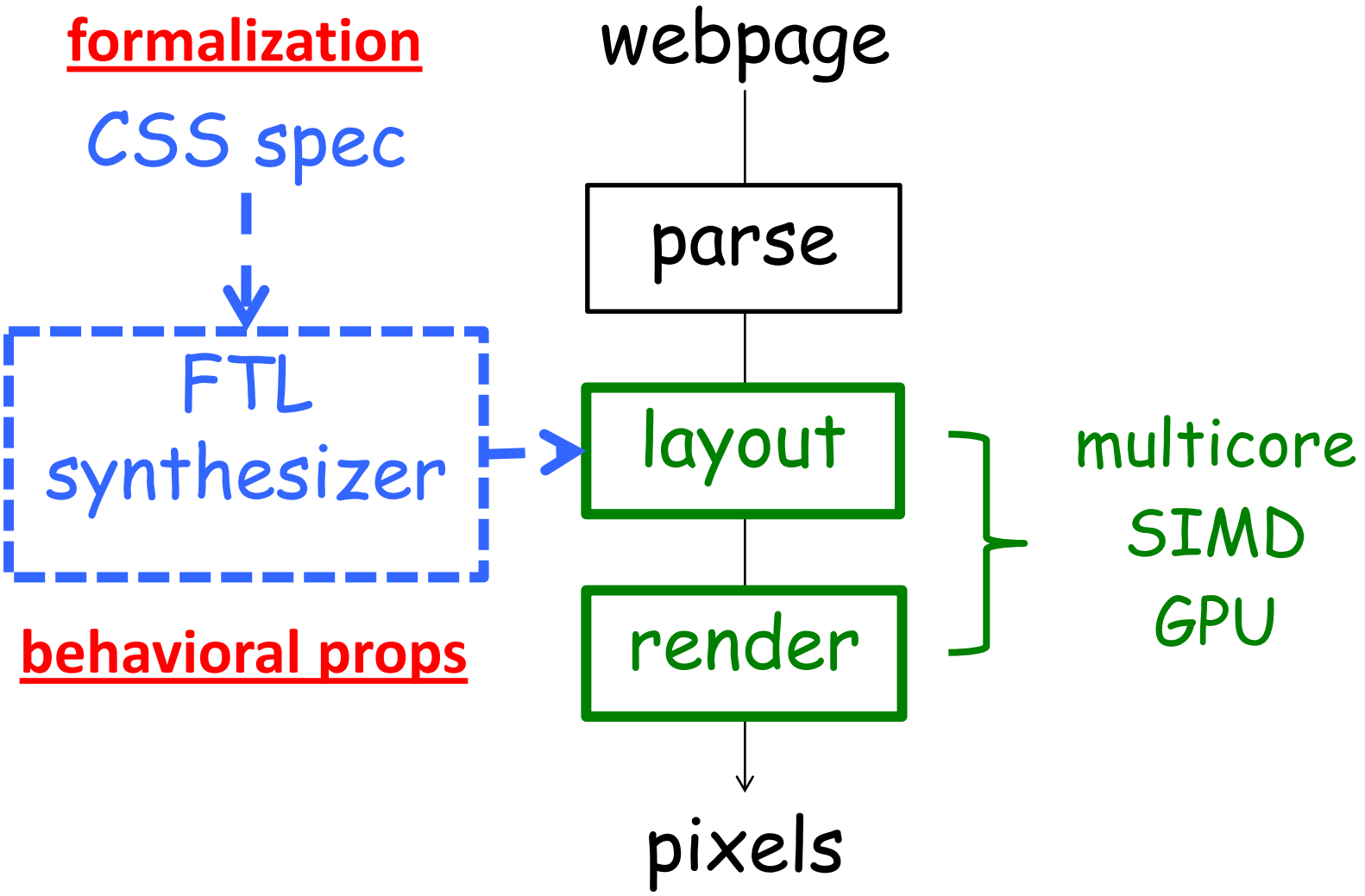
The Parallel Browser



The Parallel Browser



The Parallel Browser



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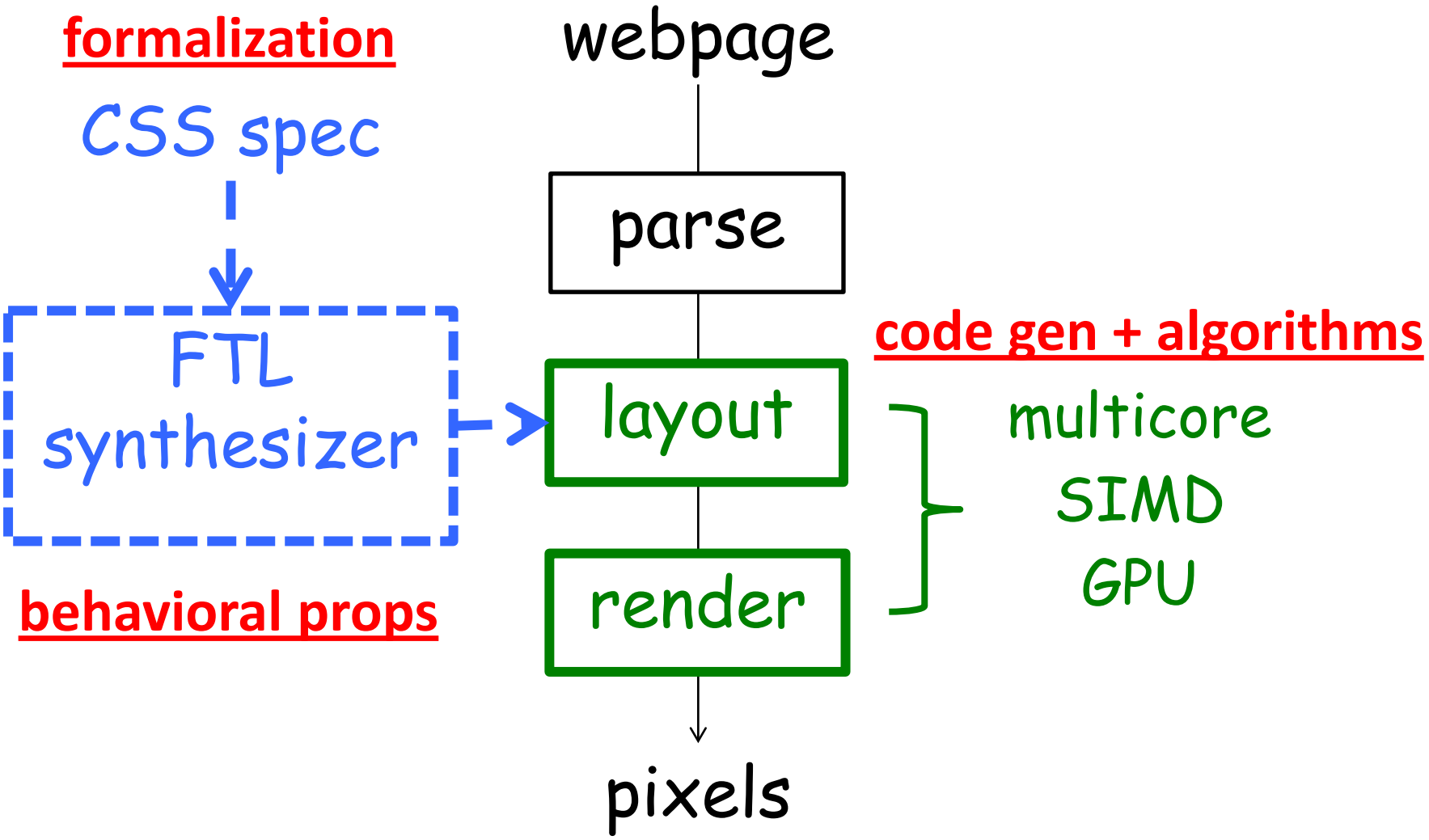
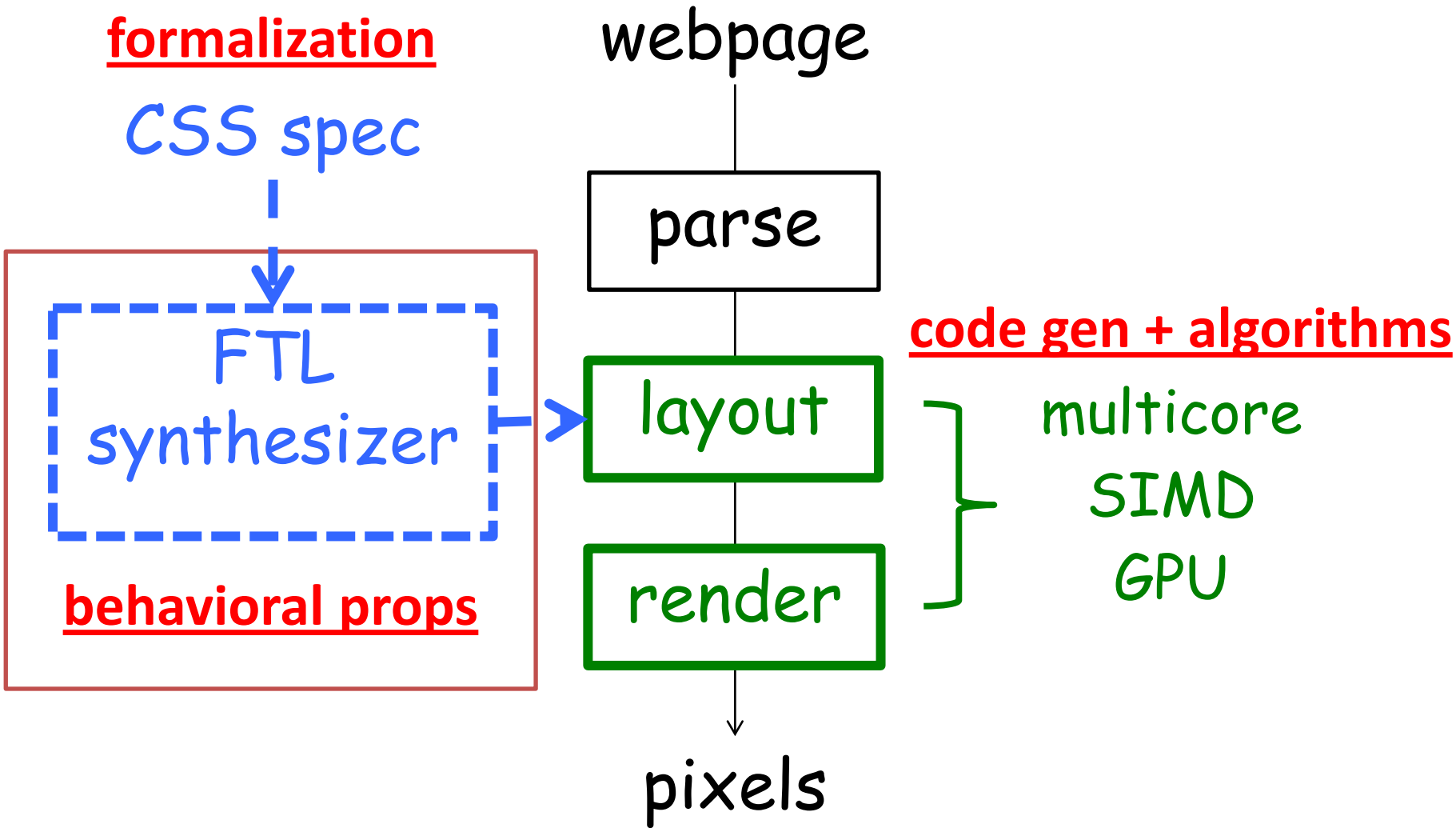
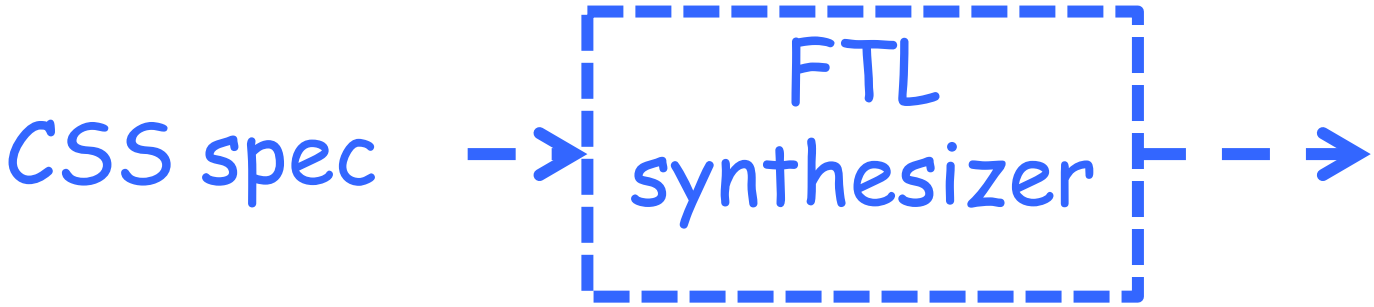
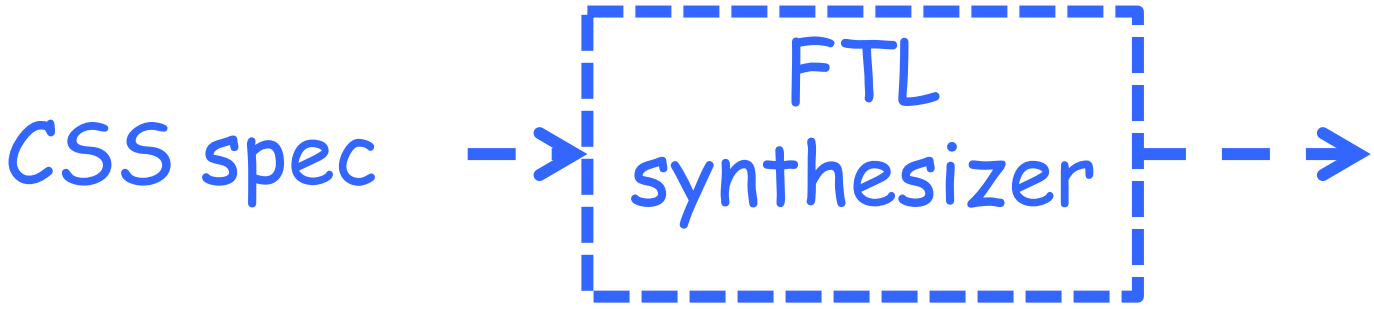


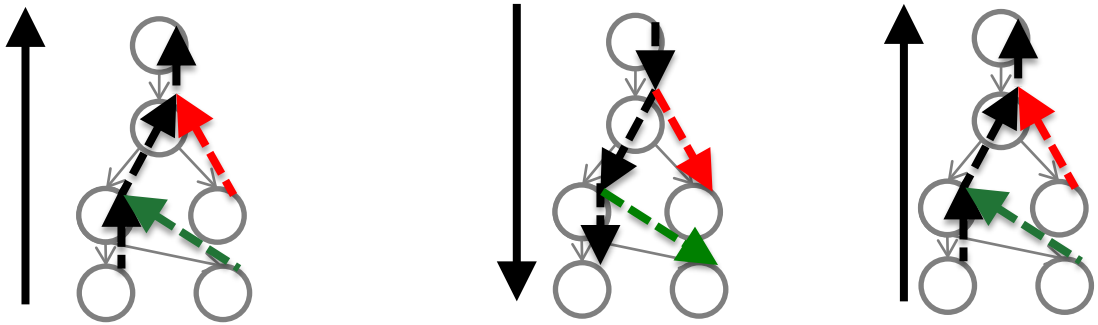
The Parallel Browser




CSS spec
FTL
synthesizer



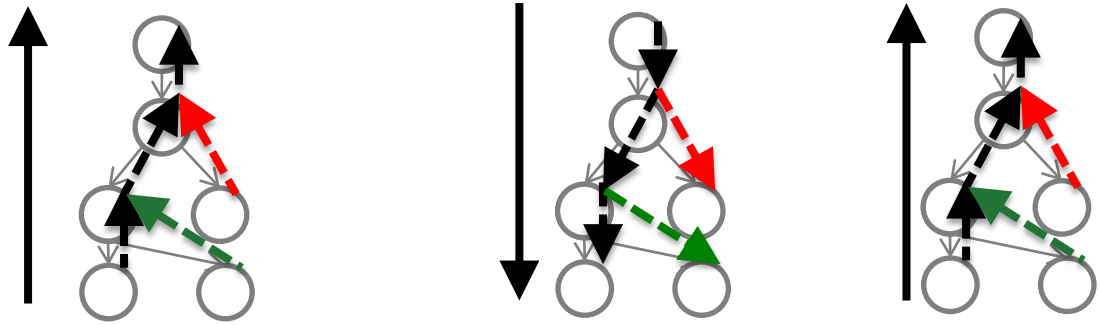
sched: botUp{w,h} ; topDown{x,y} ; botUp{r}



synthesize sequence of traversal template instantiations

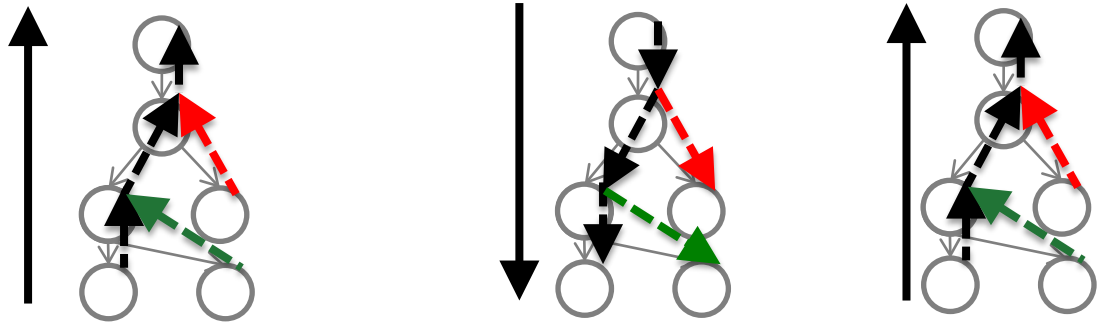
Can <u>specify behavior as input</u> instead of as output:

sched: botUp{w,h} ; topDown{x,y} ; botUp{r}



Can specify behavior as input instead of as output:

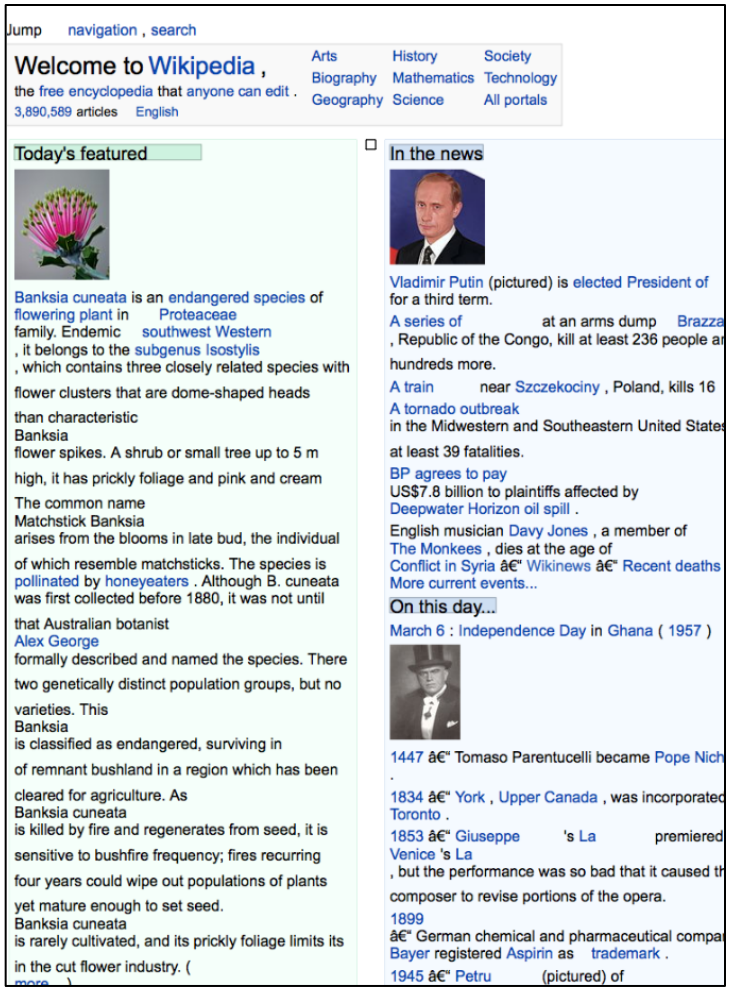
```
sched: botUp{w,h} ; topDown{x,y} ; botUp{r}
```



Parallelization querying, refinement, and autotuning

```
sched: (botUp{w} || botUp{h}) ; ?{?} ; inorder{?}
```

End-to-end Results



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Biography Mathematics Technology
Geography Science All portals

Today's featured

Banksia cuneata is an endangered species of flowering plant in Proteaceae family. Endemic southwest Western , it belongs to the subgenus Isostylis , which contains three closely related species with flower clusters that are dome-shaped heads than characteristic Banksia flower spikes. A shrub or small tree up to 5 m high, it has prickly foliage and pink and cream The common name Matchstick Banksia arises from the blooms in late bud, the individual of which resemble matchsticks. The species is pollinated by honeyeaters . Although B. cuneata was first collected before 1880, it was not until that Australian botanist Alex George formally described and named the species. There two genetically distinct population groups, but no varieties. This Banksia is classified as endangered, surviving in of remnant bushland in a region which has been cleared for agriculture. As Banksia cuneata is killed by fire and regenerates from seed, it is sensitive to bushfire frequency; fires recurring four years could wipe out populations of plants yet mature enough to set seed. Banksia cuneata is rarely cultivated, and its prickly foliage limits its in the cut flower industry. (more)

In the news

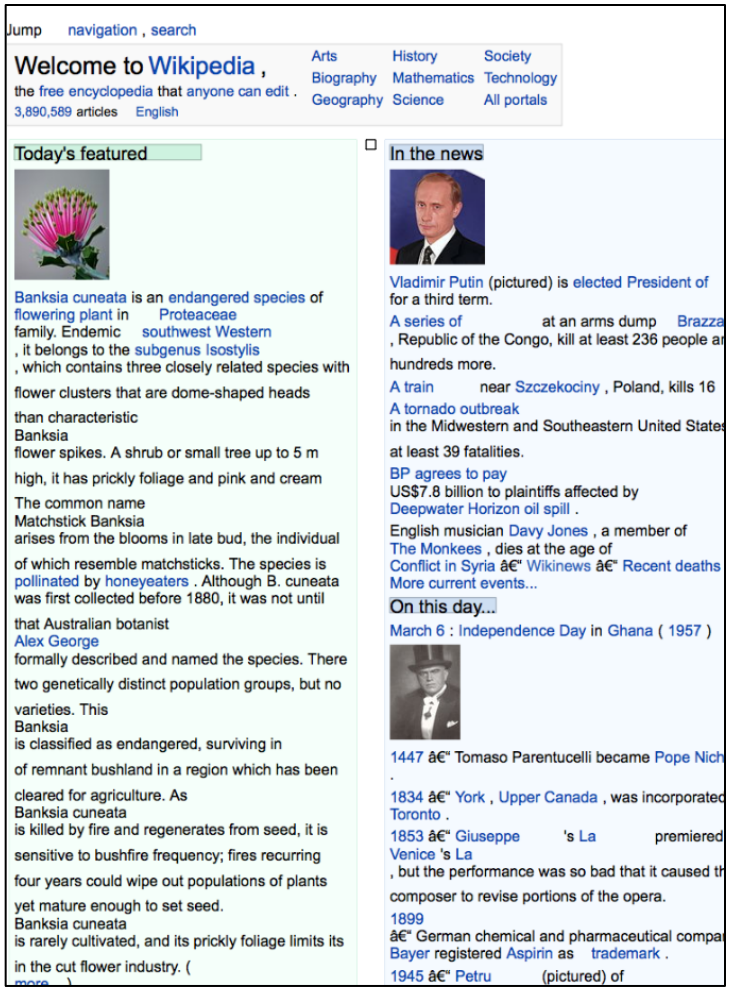
Vladimir Putin (pictured) is elected President of for a third term.
A series of at an arms dump Brazza , Republic of the Congo, kill at least 236 people a hundreds more.
A train near Szczekociny , Poland, kills 16
A tornado outbreak in the Midwestern and Southeastern United State at least 39 fatalities.
BP agrees to pay US$7.8 billion to plaintiffs affected by Deepwater Horizon oil spill .
English musician Davy Jones , a member of The Monkees , dies at the age of
Conflict in Syria â€" Wikinews â€" Recent deaths
More current events...

On this day...

March 6 : Independence Day in Ghana (1957)

1447 â€" Tomaso Parentucelli became Pope Nich .
1834 â€" York , Upper Canada , was incorporated Toronto .
1853 â€" Giuseppe 's La premiered Venice 's La , but the performance was so bad that it caused th composer to revise portions of the opera.
1899 â€" German chemical and pharmaceutical compa Bayer registered Aspirin as trademark .
1945 â€" Petru (pictured) of

End-to-end Results



Multicore

7x speedup on 8 cores

SIMD

4x speedup, 4x energy

GPU

1 million nodes @ 30fps

Recap

- **Parallelize 80% case**

- **Spec -> synthesizer -> specialized algorithms**

- **Future: smart UI tools that actually work?**