Are 3rd Parties Slowing Down the Mobile Web?

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Webpages are Content Heavy

- Dozens of eye-catching high quality images
- Javascript and CSS scripts need to execute before page rendering
- **Keep users engaged** and **attract more users**
  - Use online social network plugins
  - Track user browsing activities
  - Display online advertisements
- External services to monitor website performance
  - NewRelic, AppDynamics, Google Analytics
Speeding Webpages in the Wild

● Content Providers (Netflix, Facebook, e-commerce websites, others)
  ○ Make contracts with content delivery networks (CDNs)
    ■ To act as surrogate infrastructure - 1\textsuperscript{st} party
    ■ Bring static content closer to users
    ■ Speed up websites

● CDNs can only speed up what they serve
  ○ But not the resources that they do not serve
    ■ We refer to such resources as 3\textsuperscript{rd} party
Analyzing Webpage Structures

- Using open source HTTP Archive dataset
  - Analyzed top 16000 Alexa webpages
  - # unique 3rd party domain names
  - # HTTP requests made
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- Amount of data downloaded from 3rd party servers
3\textsuperscript{rd} Party Impact on Page Load Time

- Basepage HTML resolves to one or more 1st party (CDN) hostnames

- 3\textsuperscript{rd} party resources
  - Require DNS lookups
    - 1 round trip between a client and local resolver
  - TCP (+SSL) handshake
    - 1 to 3 round trips
    - TCP Slow Start phase
  - If 3rd party servers are distant
    - Long RTTs, low throughput, and loss
    - Slower page load times
Third Party Trailing Ratio

- Developed a new Web Performance metric
  - Fraction of PLT that represents time to download 3rd party resources only.
    - Time when 3rd parties are downloading and during which no 1st parties are overcasting in the waterfall diagram.
    - Identified 3rd parties on webpage critical path
Real User Measurements

- Utilized Gomez Mobile Testbed to perform measurements
  - Loaded 60 webpages 400 times
- 3rd parties do not impact PLTs of about half of the webpages
  - 3rd parties not on critical path.
- For others, **impact up to 50%** in the median case
  - 3rd parties lie on critical path
- **Impact varies** as 3rd party download times vary
Conclusions and Ongoing Work

- Demonstrated impact of 3rd party resources on webpage load time
  - Up to 50%
  - Developed performance metric, 3rd party trailing ratio

- In the future will perform large scale measurements to evaluate Web performance in wired last-mile and cloud datacenter networks
  - Identify 3rd party vendors that impact PLT the most.

- Explore techniques to redirect 3rd party requests onto 1st party infrastructure
  - To eliminate additional DNS resolutions
  - Eliminate TCP (+SSL) handshakes
  - Use scaled up TCP congestion windows
Thank you

Questions?

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