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When is the page rendered?

Q: How fast is your web page?
One answer: How long does it take the user to see all visible content?

Above the Fold Time (AFT): Time when content that stops changing and is above-the-fold reaches its final state.
Browser events

Page load time (PLT): start of navigation until browser Onload event (IE DocumentComplete) for document

Can overestimate above-the-fold time

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Below the fold (not visible) content pushes out Onload
att.com underestimate

Above-the-fold content loaded by JS and Flash occurs after Onload
Browser events are not cross-browser

Difference is not primarily a rendering difference. But JS blocking for Onload in FF, non-blocking for IE.
Estimating AFT (1)

Naïve: AFT = time of the last pixel change above-the-fold

Challenge: Animation/video = pixels keep changing
Estimating AFT (2)

• Specify an upper bound, the AFT cutoff time, on the page load
  – Function of connection speed/quality, i.e. 45 s for DSL
• Classify pixels as static or dynamic
  – Static = pixels that change < 5 times and don’t change after AFT cutoff
  – Dynamic = pixels that change ≥ 5 times and keep changing after AFT cutoff
  – Capture video for period > AFT cutoff to identify dynamic pixels with confidence
• AFT = latest change of a static pixel before the AFT cutoff
AFT for att.com
Black = unpainted pixels
White = static pixels
Blue = dynamic pixels
Green = last static pixels to change → AFT

Rotating content panel = dynamic pixels
AFT is defined by the Pause button.
Button rendered once panel is initialized.
Alexa Top 200 Home Pages,
% of Pixels Rendered by # of Pixel Changes

90% pixels rendered in the Alexa Top 200 home pages change fewer than 5 times.

Similar pattern for DSL and Dialup, despite more progressive rendering on Dialup.
Test a website's performance

http://www.ebay.com

Test Location: Dulles, VA USA (IE 6,7,8,9)
Browser: IE 8

Advanced Settings:
Connection: DSL (1.5 Mbps/384 Kbps 50ms RTT)
Number of Tests to Run: 1
Repeat View: First View and Repeat View
Keep Test Private: off
Label:

Test Settings
- Capture Video
- Measure Above-the-fold rendering time (AFT) (experimental - be patient, each run takes at least 4 minutes)

AFT Cutoff: 45 Seconds
Ignore changes smaller than: 800 Pixels

Video will appear in the Screenshot page of your results
wait 4 minutes...
Key Screen Shots.

In this example, OnLoad (DocumentComplete) does not include lower right panel.

AFT often agrees with Onload/DocumentComplete or Fully Loaded (= all resources fetched).
not ignoring small changes

Black = unpainted pixels
White = static pixels
Blue = dynamic pixels
Red = Pixels that change < 5 times with last change after the AFT cutoff → AFT is N/A.

Page has “daily deal” timer: 11h 41m 46s
Minutes are updated after AFT cutoff.
Wrap up

• Applications of AFT
  – Visual measure of page performance
  – Cross-browser metric
  – Validation of other metrics (i.e. JS metrics)

• Limitations of AFT
  – Only applicable to lab setting
  – Does not reflect user perceived latency based on functionality

• AFT heuristics always need further iteration
  – http://www.webpagetest.org/forums/
Ambiguous Cases for Estimating AFT

• One time animation: pixels that change ≥ 5 times but don’t change after the AFT cutoff.
  – Should one time animation be included in AFT?
  – Current algorithm: No.
• Pixels that change < 5 times with last change after the AFT cutoff.
  – Perhaps AFT cutoff needs to be extended
  – tmz.com example
• AFT may be decided by small (perhaps not user visible) changes.
  – Previous ebay.com example
tmz.com example

DSL, AFT Cutoff=25 s

Red = Pixels that change < 5 times with last change after the AFT cutoff → AFT is N/A.

Cause:
Like button forces frame flow re-render (pushes content down) at 40 s.

Solution:
Increase AFT cutoff from 25 s to 45 s to include this re-render in AFT.