COMP 431 Internet Protocols & Services

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Worksheet 6, February 2

1) Consider a web page for the company *banana.com*. The HTML file for their main web page, *www.banana.com*, is 20,000 bits and contains the following embedded URLs:

*http://www. banana.com/banner-ad.jpg* (15,000 bits)

*http://www.apple.com/juicy-apple.jpg* (10,000 bits)

*http://www.orange.com/orange-growers-ad.jpg* (10,000 bits)

*http://www.apple.com/buy-apples-ad.jpg* (10,000 bits)

*http://www. banana.com/team-banana-ad.jpg* (10,000 bits)

*http://www2. banana.com/pie-recipe.jpg* (5,000 bits)

To analyze this problem assume:

* The round trip propagation delay from the browser to all servers in the *banana.com* domain is 50 *ms*, the round trip propagation delay from the browser to all servers in the *apple.com* domain is 10 *ms*, and the round trip propagation delay from the browser toall servers in the *orange.com* domain is 20 *ms*.
* All network links connecting the browser to each server operate at 100 Mbps.
* The size of the HTTP request is negligible as are the headers in the HTTP response.
* A data-link layer frame can carry at most 10,000 bits.
  + See an issue with banana.com and banner ad. We’ll need to send multiple segments. Doesn’t affect simplistic analysis on the application layer, but will be important with transportation layer

1. How long would it take to download the *banana*.*com* home page and all the embedded objects if the browser used non-persistent connections?
   1. 480.8ms

RTT + .5\*RTT + Transmission time of request + .5\*RTT + Transmission time of response

1. How long would it take to download the *banana*.*com* home page and all the embedded objects if the browser used persistent (non-pipelined, non-parallel) connections?
   1. 370.8ms

Handshake and base page + 1st request/response exchange (rtt + trans time)

1. How long would it take to download the *banana*.*com* home page and all the embedded objects if the browser used pipelined (non-parallel) connections?
   1. 310.6ms
2. How long would it take to download the *banana*.*com* home page and all the embedded objects if the browser used up to 4 parallel, non-persistent connections? \*Sequential flights of four. Easiest.
   1. 220.4ms (Thread pool)
   2. Sequential flights

2RTT to banana.com + basepage(bits)/transmissionspeed(bits/s)+2rtts to banana.com + banner add/trans speed (largest factor of first flight) + 2rtt to (next longest)…