Xi Rao

COMP4320

Assignment 2

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1.

The IP Address of The HTTP server is unknown. The application layer protocol DNS is required for the conversion between host and IP address. The corresponding transport layer protocol of DNS is UDP which is a lightweight transport protocol that does not provide unnecessary services, but only minimal services Application layer protocol HTTP corresponding to the transport layer protocol is TCP, and Web documents cannot tolerate loss, while TCP protocol can provide reliable data transmission.

2.

Access DNS to get IP address time: $RTT_1 + \cdots + RTT_d$;

Response time: $2RTT_x + d_t$;

When a client and server establish a TCP connection, transmission control information is exchanged through a three-shake process. The first two of the three handshakes take up an RTT, and the client, combined with the third handshake pass, sends an HTTP request packet over the connection. Once the packet arrives at the server, the server starts using TCP to transmit the HTML object. The response time is two RTTS plus the time it takes to transfer HTML.

Response time: 2 [RTT] _x+d_t;

Total time: T=$RTT_1 + \cdots + RTT_d + 2RTT_x + d_t$。

3.

Total time = get IP address time + establish connection time + get object time:

a. $T_a = RTT_1 + \cdots + RTT_d + 2RTT_x + 2RTT_x * 7 = RTT_1 + \cdots + RTT_d + 16RTT_x$;

b. $T_b = RTT_1 + \cdots + RTT_d + 2RTT_x + 2RTT_x * 2 = RTT_1 + \cdots + RTT_d + 6RTT_x$;

c. $T_c = RTT_1 + \cdots + RTT_d + 2RTT_x + RTT_x = RTT_1 + \cdots + RTT_d + 3RTT_x$.

4.

T_{prop} is the transfer time of the object

Parallel non-persistent connections: Total time to receive: objects:T_1 =(180/320+T_{prop}+180/320+T_{prop}+180/320+T_{prop}+200000/320+T_{prop})+(180/(320/8)+ T_{prop} +180/(320/8)+ T_{prop} +180/(320/8)+ T_{prop} +200000/(320/8)+ T_{prop})=5761.6875sec+8T_{prop};

Persistent connection:

T_2 = (180/320+ T_{prop} +180/320+ T_{prop} +180/320+ T_{prop} +200000/320+ T_{prop})+ 8*(200000/320+T_{prop})=5626.6875sec+11T_{prop};

Transmission latency is negligible in this case, T_1 is 135sec more than T_2, and persistent connections are faster than parallel non-persistent connections.

5.

a. Yes. Because John uses parallel instances of nonpersistent HTTP to have more connections, thus getting more link bandwidth.

b. John still needs a parallel connection, because if he doesn't, he'll get less link bandwidth when other users connect in parallel.

6.

a. average response time:

α =L/R=560000/15000000=0.037，

Average access delay =0.037/(1-0.037*25)=1.48sec;

Average total response time: 2.5sec+1.48sec=3.98sec.

b. Access Link's traffic intensity was reduced by 25% and the average access delay was still 1.48sec. For the cached part, the response time is 0, and for the unhit part, the average response time is 2.5sec+1.48sec=3.98 sec.

Total response time is 25%*0+75%*3.98sec=2.985sec.