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13. Consider Figure 2.28, for which there is an institutional network connected to the Internet. Suppose that the average object size is 900,000 bits and that the average request rate from the institution's browsers to the origin servers is 1.5 requests per second. Also suppose that the amount of time it takes from when the router on the Internet side of the access link forwards an HTTP request until it receives the response is two seconds on average (see section 2.9). Model the total average response time as the sum of the average access delay (that is, the delay from Internet router to institution router), and the average Internet delay. For the average access delay, use $\Delta/(1 - \Delta\beta)$, where Δ is the average time required to send an object over the access link and β is the arrival rate of objects to the access link.
- Find the total average response time.
 - Now suppose a cache is installed in the institutional LAN. Suppose the hit rate is 0.4. Find the total response time.
16. Consider the following alternative design for a CDN network. A content provider `foo.com` wants the CDN `cdn.com` to distribute all its objects, including its HTML base objects. To this end, `foo.com` asks `cdn.com` to create and manage the authoritative DNS name server for `foo.com`. In this alternative design, do any HTTP requests reach the origin server for `foo.com`? Why or why not? What are some advantages and disadvantages of this alternative design?