ACDN: a Content Delivery Network for Applications

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Content delivery networks (CDNs) currently deliver mostly static and streaming content. However, proxy caches can improve the delivery of these content types as well. A unique value of CDNs could be in improving access to dynamic content, which cannot be cached by proxies. We refer to such a CDN as an Applications CDN, or ACDN. An ACDN will allow a content provider not to worry about the amount of resources provisioned for its application. Instead, it can deploy the application on a single computer anywhere in the network, and then the ACDN will replicate and migrate the application as needed by the observed demand. This demo shows a functional prototype of an ACDN.

An ACDN has a fundamental difference with a traditional CDN oriented towards static content. A traditional CDN server is willing to satisfy any request for any content from the subscriber Web site, either from its cache or by obtaining the response from the origin server. In contrast, an ACDN server must have the requested application, including executables, underlying data, and the computing environment, to be able to process a request. Deploying an application at the time of the request is impractical; thus the ACDN can distribute requests only among the servers that currently have a replica of the application; at the same time, the applications must be placed on ACDN servers asynchronously with requests. Thus, ACDN must provide solutions for the following problems that traditional CDNs do not face:

Application distribution framework:
An ACDN needs a mechanism to decide which ACDN servers, and periodically makes autonomous content placement decisions for local applications. There is also a central replicator that facilitates exchange of load reports between servers and periodically computes a request distribution mechanism in an ACDN must be aware of where in the system applications are currently deployed.

Application distribution framework:
Request distribution algorithm:
The problem of maintaining consistency of an individual static page object can be solved trivially in traditional CDNs by cache replacement algorithms. However, consistency maintenance problem for the application is not solved in traditional CDNs. If an application changes at the primary server, the primary server must have the requested application, including executable, underlying data, and the computing environment, to be able to process a request. Deploying an application at the time of the request is impractical; thus the ACDN can distribute requests only among the servers that currently have a replica of the application; at the same time, the applications must be placed on ACDN servers asynchronously with requests. Thus, ACDN must provide solutions for the following problems that traditional CDNs do not face:

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Application distribution framework:
Content placement algorithm:
In order to deploy an application on a server, the subscriber must run the initialization script if any. Therefore, one creates an application replica on a server by simply accessing the above cgi-bin script with the URL of the application metafile as the argument.

The metafile also provides an effective solution to the consistency maintenance problem. Whenever some object in the application changes at the primary server, the primary server must have the requested application, including executable, underlying data, and the computing environment, to be able to process a request. Deploying an application at the time of the request is impractical; thus the ACDN can distribute requests only among the servers that currently have a replica of the application; at the same time, the applications must be placed on ACDN servers asynchronously with requests. Thus, ACDN must provide solutions for the following problems that traditional CDNs do not face:

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The metafile is treated as any other static Web page and has its own URL. Using the metafile, replicating an application can be done entirely over standard HTTP. Each server is given a cgi-bin script that accepts as a parameter the URL of the metafile. This script obtains the metafile using its URL, obtains all application files, and then executes the initialization script if any. Therefore, one creates an application replica on a server by simply accessing the above cgi-bin script with the URL of the application metafile as the argument.

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