

Content Delivery Network

Case Study on AkamaiCDN

Content Delivery Network (CDN)

A content delivery network (CDN) is a system of distributed servers (network) that deliver webpages and other Web content to a user based on the geographic locations of the user, the origin of the webpage and a content delivery server.

Basic Tasks:

- Remote Access
- File Transfer

Web Caching and Content Distribution

Web caching—A group of neighbor users can set up a proxy server close to them with the assumption of time and space locality in their requests. Such a user-oriented approach is known as Web caching.

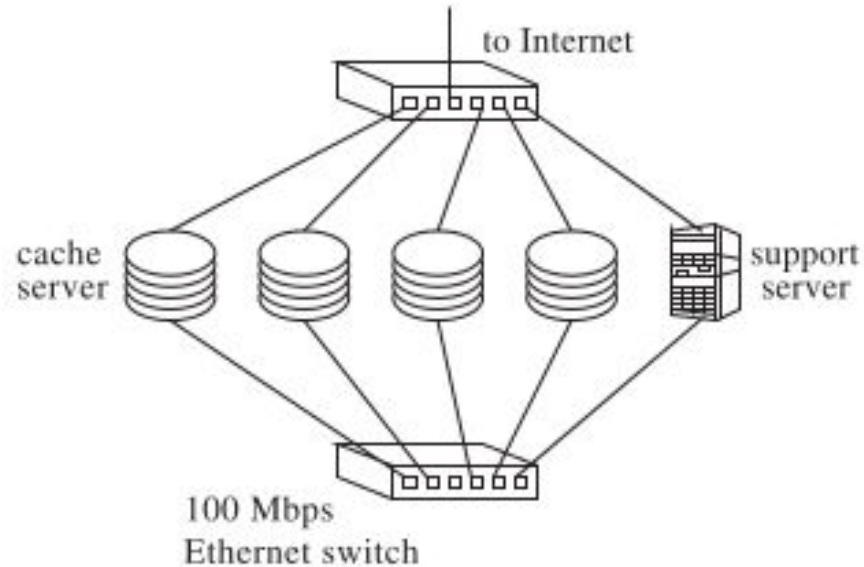
Content Distribution: Origin servers are partially or fully replicated on-demand or a priori; they are placed locally or remotely over the Internet.

Akamai's Content Delivery Network

Akamai server :

- * Intel CPU- based off-shelf and rack-mounted computer that runs a modified Linux operating system.
- * installed in Internet Data Centers
- * replicates the designated origin server in an a priori or on demand manner with other optimizations.
- * Akamai servers are usually configured into a group (or a cluster, in Akamai's term).

Akamai Server Group



DNS-based server selection schemes:

Akamai has three types of DNS servers:

- 1) `zx.akadns.net` for site delivery
- 2) `zx.akamaitech.net` for object delivery
- 3) `nxg.akamai.net` for object deliver

zx.akadns.net for site delivery

- akadns.net has deployed multiple DNS servers (listed in Table 1) scattered around major US access networks.

Table 1
akadns.net DNS servers

Server	IP address	Access network	Location	Remark
ZA	216.32.65.105	exodus.net	Washington, DC	N/A in 2003
ZB	216.52.46.145	bbnplanet.net	Denver, CO	
ZC	63.241.199.50	att.net	Dallas, TX	
ZD	206.132.160.36	glbx.net	Santa Clara, CA	
ZE	12.47.217.11	att.net	Parsippany, NJ	
ZF	63.215.198.79	level3.net	San Jose, CA	
ZG	204.248.36.131	sprintlink.net		
ZH	63.208.48.42	level3.net	St. Louis, MO	

akadns.net SOA record

Table 2
akadns.net SOA record

SOA	Value in 2002 (s)	Value in 2003 (s)
Serial	50	1,048,012,862
Refresh	50	60,000
Retry	50	60,000
Expire	50	60,000
Minimum	50	300

akadns.net and a Time-to-Live

Table 3
akadns.net NS and A TTL

Ask		Answer		
Name	Server	Refer	NS-TTL (s)	A-TTL (s)
net.	{a..m}.root-servers.net	{a..m}.gtld-servers.net	172,800	172,800
akaDNS.net.	{a..m}.gtld-servers.net	z{a..g}.akadns.net	172,800	172,800
yahoo...	z{a..g}.akadns.net	—	90,000	90,000
www...	z{a..g}.akadns.net	—	—	300

Specifics:

- 2 akadns.net DNS records are maintained by gTLD DNS servers which are not under Akamai's control.
- gTLD servers always return a list of akadns.net DNS records in a simple round robin order.
- The resolved addresses of akadns.net DNS servers are cached at local DNS servers with an initial time-to-live (TTL) of 2 days, or 172,800 seconds (in Table 3).
- An akadns.net DNS server with a shorter response time for a local DNS server has more opportunities to serve DNS queries from that domain in the future.
- no matter when a slave DNS server contacts the master DNS server, it always finds a fresher copy of zone records to be synchronized
- To map a generic host name such as www.yahoo.akadns.net to an IP address dynamically, Akamai tries to eliminate DNS caching by assigning a very short TTL (5 min) to A records (Table 3).
- However, the NS record for yahoo.akadns.net is relatively stable, with a TTL of 25 h, which leaves enough time for local DNS servers to try all yahoo.akadns.net DNS servers to find the one with the shortest response time.