Content Distribution

- How to distribute content without requiring centralized, heavy-duty servers?

- Examples:
  - BitTorrent
  - Peer to peer content distribution
  - Akamai
  - Content distribution service

Content Distribution vs Caching

- Explicitly manage cache content
  - Sell as service to web site owners for performance

- "Push" content to caches at major Internet providers
  - Make content appear "nearby" (low latency) no matter where the requester is located

- Change cache content when necessary
  - Operates as a proxy cache to refresh content
Akamai Content Distribution Network

- 56,000 servers in 70 countries within nearly 1000 networks
  - 85% of the world's Internet users have a single "network hop" to an Akamai server
- Delivers 15 - 20% of all Web traffic
  - Web traffic at times reaching more than 2 Terabits/sec
  - Hundreds of billions of daily Internet interactions
Akamai Content Types

- Static (HTML, images, PDF, etc.)
  - Expiration time (0 - infinity) assigned by customer
  - On-demand cache invalidation available to customer
  - Special features (authenticated access, transfer encodings, etc.)

- Dynamic
  - Assembles cacheable and non-cacheable elements of page at cache (non-static origin only for non-cacheable)

- Streaming
  - Uses redundant streams and jitter-control to ensure quality playback

Web Site Redirection to Akamai

- DNS CNAME aliases
  - e.g., images.pcworld.com CNAME=images-pcworld.com.edgecache.net

- Modified URLs ("Akamized")
  - Prefix with domain name to Akamai
  - e.g., http://a1694.g.akamai.net/1675/images.pcworld.com/
Akamai -- DNS “Request Routing” (finding the “closest” cache)

Akamai DNS Processing
Akamai Network Operations Center

- Monitors all proxy servers and end-to-end conditions on paths from thousands of network locations to servers
- DNS servers updated with new loads and maps every few seconds
- Monitored conditions:
  - Server load and operational status
  - Routing topology
  - Latency and packet losses per route
  - Available bandwidth per route

How Much Server Diversity Exists?


![Graph showing server diversity over time.](image)