



Better Bandwidth: Using Route-Optimized Next-Generation CDN to Increase Quality and Performance

Today's Internet traffic bears only a passing resemblance to the nature of Internet traffic ten years ago. The demand for richer and more interactive content over the Web is increasing every day. The challenges to doing business effectively on the Internet have never been more complex. As a result, it is even more important to determine the right solution for your content delivery needs in order to stay competitive and relevant in this environment.

Responding to this growth, more than 40 new Content Delivery Network (CDN) providers have entered the content delivery space. There are several content delivery approaches to consider when determining the right solution for your business needs.

Decentralized Content Delivery (Edge Caching Approach)

Best described as a traditional decentralized delivery, the edge caching approach is used to store and deliver on-demand small payloads of static images and content. It is typically used for web page-intensive businesses, as well as sites utilizing small photographic files and few needs to go back to the origin server for customized information.

The edge caching method consists of deploying numerous edge servers globally to as many Internet Service Providers (ISPs) as possible and utilizing partnered cache servers to help eliminate cache misses on the edge. If the edge server hit by the end-user doesn't have the requested content, the partner edge server is then checked for that same content. If the content exists, http pipelining is used between the partnered cache servers. If the content is not present on the edge server, then it must be retrieved from the origin server, and the static content is then stored or cached for edge delivery. Subsequent requests for that content at that edge server can then be delivered from the cache. Performing path metrics techniques are used to speed delivery of content from the edge server back to the origin server to resolve the ultimate cache miss.

This approach is a well-performing model when it comes to small files and images, but less than ideal for large files that can range from 100 MB to a gigabyte+ in size, and when dynamic content or streaming is involved. The amount of customer content that can be stored at a given edge server is relatively small, making frequent requests back to the origin server for the desired content necessary.

Centralized Content Delivery Approach

The second method of content delivery is a more centralized approach. Business applications where this approach is utilized include large file sizes with minimal end-user performance requirements beyond basic completion of downloads.

Unlike the edge caching approach where small clusters of servers are deployed at edge locations, this model deploys large server clusters in fewer strategically-located data centers. A popular tactic is to store a customer's on-demand content on the network itself and then serve it up to end-users via geographically relevant data centers. At these data centers, the CDN provider peers with other ISPs



via large connections to get the content as close as possible to the end user's home network.

With this approach, there is no caching employed, as all content resides (in storage) at the data center. This approach eradicates the cache miss issues of the traditional approach.

The centralized content delivery approach lacks any intelligent route optimization. If the provider chosen to deliver the content is experiencing network issues, it hinders the user experience if it is directly connected to a given end-user's provider. In this case, the end-user will be subjected to the same problems that any typical user has on the Internet. With this peer-based approach, Border Gateway Protocol (BGP) determines the path to take. BGP cannot react to performance impairment intelligently, nor can it detect high latency or packet loss. Additionally, it is unable to detect regional or network-wide performance impairments. Without the ability to override the inefficiencies of BGP, this CDN approach is an improved model over the traditional edge caching model, but there is still room for improvement.

Route-Optimized Hybrid Content Delivery Approach: The Next-Generation CDN

The route-optimized hybrid approach is a blend of the two previous models. It incorporates large geographically distributed caches and a small number of large content storage locations. It differs from the other approaches in that its large, geographically-distributed caches are strategically located at "route-optimized" locations throughout the provider's network. By integrating route optimization technology within the CDN, this approach overcomes the issues that arise when the content is being delivered by a poorly performing network. This technology continually analyzes the traffic situation on every major Internet backbone and then dynamically detects the best route for the content to take. Advanced analytics are used to probe and benchmark all known points on the Internet through each bandwidth carrier and continuously adjust the routes that the content uses to reach the end-user. Similarly, these same analytics allow for the adjustment of additional locations in which popular content is cached, so that popular files may end up on many servers, as opposed to less popular or larger sized files that may only exist on a handful of servers. It also directs the end-user to the most appropriate data center for streaming or downloading content based on capacity and availability, improving delivery performance at the source by avoiding overload at one location (thus eliminating stuttering videos or plain stops in the stream).

Businesses looking to employ web-based applications such as rich media content, large file transfers, on-demand and live streaming, and unique content for personalization would all benefit from a route-optimized centralized content delivery approach.

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Internap's patented route optimization technology, Managed Internet Route Optimizer™ navigates content around network congestion, poorly performing links and disabled providers ensuring the best possible end-user experience.

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