

Improving Website Performance with Content Distribution Networks

Introduction

Today's Internet users are drawn to the sites that deliver the richest experience. Static images and text are being replaced by streaming media and interactive applications. And it's no wonder why. According to DoubleClick, online users click on video ads five times as often as static images. Today's applications can deliver a very personalized experience for users, but that kind of experience comes with a price. It's led to the development of ever more bandwidth-hungry sites and a critical need for better mechanisms to support the rapid and efficient distribution of Internet content.



These changes reach beyond the content itself, since the proliferation of broadband connections and the steady advance of Internet technology are driving real changes in social behavior. The improved quality of streaming video has made it a viable alternative to broadcast television, a development that has serious implications for the placement of advertising dollars. Many people, particularly younger people, now opt to watch TV shows online – either directly or through some kind of download – instead of during their initial broadcast. More and more computer games are adding online play options, connecting PCs and game boxes to the outside world.

People now expect to find all manner of things on the Internet, including streaming video, downloadable program files and self-service databases. Spending time online is now second nature to many people, and users have zero tolerance for slow load times and low media quality. They'll click away rather than wait. The companies that succeed will be the ones that can meet or exceed the expectations of the Internet community, even though it will include some of the most demanding customers.

Different companies have different needs when it comes to their Internet presence, but they all share the goal of maintaining or improving customer satisfaction. Computer hardware manufacturers want to provide rapid downloads for drivers and documentation. News organizations want to keep their readers engaged so they'll spend more time on the site and thereby maximize advertising revenue. Gaming companies want to provide high-performance connections, for online play as well as for patch distribution and updates. Professional sports organizations want to broadcast tournaments to keep the fans interested, while simultaneously generating additional advertising dollars. Recording companies need to follow their customers as they move away from buying traditional recordings in favor of downloading music files.

Ecommerce in particular is a world of constantly increasing expectations. Internet shoppers want to interact with the product offerings, swapping out different colors, styles and options, before making a purchase decision. That kind of interactive experience is very demanding from a content distribution perspective, and shoppers won't trade speed for a rich experience; response time for each "click" is still critical.

Looking at the Details

The Internet operates on an end-to-end principle, with data moving back and forth between hosts and clients. The data itself is broken into "packets," and each packet includes addressing information to ensure proper delivery. The packets travel independently through the "cloud" of the Internet, and are reassembled when they reach their destination; the longer the transit path, the greater the risk of packet loss and network delays. The level of overall Internet traffic is also a factor. As traffic loads increase, response time can deteriorate to a point that users find unacceptable.

With the demands of today's websites, expectations can't be met with a do-it-yourself, single-server architecture. What's needed is a Content Distribution Network (CDN), in which geographically distributed "nodes" deliver the same content as a company's primary server.

Users are served from the node that's closest to their own location, enabling faster delivery. Prepackaged content can thus be delivered in a distributed way, eliminating the need for large server farms.

By reducing the load on origin servers, Content Distribution Networks can improve the performance, reliability and capacity of a website. They also lead to a more stable environment that is less susceptible to disruptions and more resilient in business continuity terms.

CDNs include an origin server, from which the content originates, and a variable number of nodes, which serve as distributed mirrors of the origin server. The number of nodes and servers in a CDN varies; some might have thousands or even tens of thousands. Different CDN providers have geographic footprints aimed at particular markets. CDNs can be application-based (making routing decisions at the level of domains and DNS locations) or network-based (making decisions at the level of routers, links and other IP parameters).

A CDN provides a seamless content delivery mechanism that's transparent from the users' perspective. Nodes work with each other to satisfy requests for content, moving data behind the scenes to optimize the delivery process. CDNs can improve the capacity, reliability and performance of a site by reducing the load on the origin server. Some studies have shown that the transfer of static content to a CDN can improve end-user response times by 20% or more.

Content requests from users are directed to the "optimal" node, and optimal can be considered as a matter of speed, a matter of cost or some combination of the two. In terms of speed, the request would be routed along the shortest path – the fewest hops or the fewest number of network seconds. The fewest hops do not necessarily mean the quickest path, though, in cases of node congestion or failure. In such cases, providers with routing intelligence will send content along the fastest path, even if it's not the shortest path. In terms of cost, the request could be routed to less expensive or underutilized servers. CDNs should have sufficient intelligence to make tradeoffs that consider both of these factors.

CDNs offer additional value, over and above improved performance. A distributed content environment is inherently more stable, and less vulnerable to Distributed Denial of Service (DDoS) attacks. A distributed content environment is also better from a business continuity perspective: traffic can be redirected dynamically in the event of a

node failure. That makes it much less likely that the site will ever appear to be down from a user perspective. The simplicity of using a CDN provider also simplifies overall network management.

Choosing a Provider

Deploying a Content Distribution Network requires network engineering and traffic management skills that are usually more specialized than those of internal IT staffs. Ongoing management of a CDN demands a dedicated, sustained investment in technology, operations and administration. While some companies have requirements that justify building out their own CDNs, most are better served by a CDN provider. When selecting such a provider, there are some technical things to consider:

- Is the offer application-based or network-based?
- Does the provider offer IP-aware intelligent routing technology that can cope with node congestion or failure?
- How many servers and nodes are there, and where are the servers located relative to the target audience?

Selecting a CDN provider also involves some business considerations:

- How stable is the vendor and how long has it been in business?
- What is the pricing and rate structure? Some vendors offer low initial rates, which escalate sharply when traffic increases past a pre-defined level.
- What type of comprehensive Service Level Agreements are available?

Doing business on the Internet allows companies to touch their customers in ways that would have seemed impossible a generation ago. Today's Internet users are discriminating and technology savvy, with high expectations for website performance. Even the best content can be undermined by a distribution network that fails to meet these expectations. To meet user demand, content must be delivered when and where it's needed.

For more information contact an AT&T Representative or visit www.att.com/icds.