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How Dynamic Site Acceleration Works: What AT&T and Akamai Offer

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There has been a lot of talk lately of telcos and carriers entering the content distribution market to offer products that allow content owners to deliver large and small objects, video streaming, and value-add services like application acceleration and dynamic site acceleration (DSA). For most telcos, the mentality has always been to build everything in-house. As a result of this way of thinking, it takes telcos a long time to come to the market with new products and services.

For some time, AT&T was following the typical telco way of thinking and building its own technology in-house for some of these content distribution services. But over the past year, AT&T has changed how it brings digital media solution products and services to the market and has licensed best-of-breed solutions from multiple partners and deployed them on the AT&T Network. This is a smart move that has allowed AT&T to deliver immediate value to its customers with the quality, scale and security of the AT&T Network, not to mention the marketing resources and sales muscle that AT&T brings to the picture. And by licensing technology from specialists in the market, like content application specialist Cotendo, AT&T is deploying technology platforms that have already been proven in the market.

Those that track the content delivery industry are already familiar with the idea that Content Delivery/Distribution Networks (CDNs) are trying to diversify their revenue by adding "value-add services," such as DSA, to their portfolios. But what is DSA, what are the differences between DSA offerings in the market today, and what's the business case for the service?

Simply put, DSA is a suite of technologies and/or products that make websites reliant on dynamically-served content perform better, load faster and, ultimately, make more money. Traditional CDNs improved performance by caching critical content closer to end-users. However, the personalization (Facebook), micro-blogs (Twitter), geolocation (FourSquare), real-time info (Google Instant), and customization (MyYahoo) inherent in Web 2.0 have made caching content far less useful. Further, SaaS and enterprise applications (B2B and B2C) have made the case for dynamic, transactional content, as well as the demand for ecommerce and Web retailers—focusing on personalized recommendations, and transactional and secure check-out and shopping carts.

DSA augments or, in many instances, replaces caching by creating new ways to quickly deliver online content or deliver online services and transactions faster. This, in turn, translates into a better user experience, more user clicks and interactions, higher conversion rates, and better search engine visibility. Researchers from Microsoft and Google found that a two-second site loading slowdown resulted in 2 percent fewer queries, 3.75 percent fewer clicks, and significant decreases in user satisfaction. Various market sources have shown that for many use cases, even a second's delay could adversely affect conversions and lead to significantly high site abandonment rates and lost eyeballs that might go to a competitor's site. This is precisely why Google has an entire team of engineers dedicated to shaving milliseconds off load times for search results and is the rationale for DSA.

With some calling the next generation of interactive Web experiences Web 3.0, the ability to accelerate dynamic content has become even more important than ever to

content owners. Web browsing sessions are now coming from lots of different mobile devices, and that content being delivered back to the viewer is more customizable than ever. As a result, DSA services are becoming more popular because they allow content owners to balance the task of delivering a highly personalized experience with the growing user demand for greater website performance.

What makes up a DSA offering? Traditional DSA services often include most or all of the following technologies, most of which are dealing with optimizing bit delivery across the network:

- **TCP optimization:** Algorithms designed to enable bit delivery to quickly recover when affected by network congestion and packet loss, or compensate for slow starts and other common TCP-related bottlenecks.
- **Route optimization:** Technology that optimizes the route of the request from the end-user to the origin and ensures the reliability of the connection by routing it through a CDN and going through routes that are constantly measured to ensure a faster and more reliable route. True DSAs optimize all parts of the route, including first mile (origin to CDN), middle mile (within the CDN cloud), and last mile (CDN edge to user).
- **Connection management:** Includes persistent connection provision and HTTP multiplexing. The DSA will maintain reusable and optimized HTTP connections from the edge servers to the origin servers, and between the edge servers, rather than initiating a new connection for every request. This can dramatically speed up content delivery, as delivery of content and set up of a new connection can take three to four times longer than delivery of the same content over an existing connection.
- **On-the-fly compression:** Modern browsers reconstitute compressed objects, allowing for compression of text objects (HTML, CSS, JS) to 20 percent of their original size. Most dynamic, uncacheable content is compressible (think Facebook or Twitter feeds). Compression by origin servers is very compute intensive, however. True DSA services compress text objects shortly after they leave the origin servers. This results in less load on the origin servers, less data moving across the Internet to the end-user, and faster content delivery without requiring additional bandwidth or hardware.
- **SSL offload:** A mechanism to speed up the critical secure transaction process, such as a check-out at an online store. This traffic is highly personalized and dynamic, and is also a regular point of abandonment by end-users. CDNs with SSL offload offerings take over the critical secure transactions and speed them up by moving the transaction closer to the end-user while simultaneously reducing the processing load of the origin server by performing the key calculations and encryption for new connections, which, like all encrypted operations, are compute intensive.

- **Prefetching:** First-generation CDNs built services that parse through a served HTML file and will prefetch from the origin server the cacheable objects embedded in the file. A CDN can prefetch only cacheable content. Dynamic content by definition is contextual and can only be requested by the user. Technologies such as AJAX and HTML5 have also made prefetching fairly obsolete. In contrast, current generation CDNs address cacheable objects by providing tight integration between their DSA and caching services, and developing advanced caching technologies that ensure higher cache efficiencies and minimal cache misses.
- **Whole-site delivery:** Most Web pages are a hybrid of dynamic and static content. Site operators increasingly prefer to deliver the entire site through a CDN to improve performance and to manage key components of each site experience. Whole-site delivery has different flavors at different vendors, and differs by the efficiency of identifying cacheable and dynamic content, and whether it applies DSA techniques to the dynamic part or simply fetches from origin.

While there are numerous companies providing services labeled as DSA, AT&T/Cotendo and Akamai offer the most comprehensive DSA technologies and products. It is important to know the differences between the two services, and that can be a bit tricky. Akamai has dominated the space since 2007, when it acquired Netli, the first company to truly deliver DSA as part of a CDN service and not attached to a dedicated appliance. Cotendo launched in 2009 and has quickly acquired more than 200 customers, including some marquee names like Facebook and Answers.com. Both companies have viable DSA offerings that include all the above-mentioned technologies.

Akamai represents an older, big-iron approach to DSA. It has a large network with hundreds of PoPs located very deep inside of ISPs. However, not all of Akamai's PoPs are DSA-capable and many are used primarily for other CDN and video delivery platforms that still account for the largest portion of Akamai's huge traffic volume. In general, Akamai still focuses on base-level network delivery and reliability problems with technologies such as SureRoute, path failover and more. However, in many cases these once critical problems/bottlenecks are no longer as severe due to the improved efficiency of modern networks and reliable networks providers that focus on solving them (AT&T, Level 3, among others), especially in the U.S. and Europe.

Also, it is important to note that Akamai has grown by acquisition, so not all of its various technologies (from Akamai, Speedera and Netli) work seamlessly together. Inefficient integration between caching services and DSA make configuration very complex and reduce the overall acceleration potential. In terms of configurability and tunability, Akamai does not really accommodate the real-time Internet and the modern world of dynamic content, and customers say it can take hours for changes to take place on the Akamai network.

Using Cotendo's technology, AT&T takes a different and more modern approach to DSA. Rather than focus on only improving network performance, AT&T is also focused on providing intelligence above the network layer. At its core, AT&T's DSA offering is a suite of services aimed at improving the four key elements of performance: DNS, connection, first byte (get to origin), and content delivery. AT&T provides advanced DNS services that accelerate DNS requests and is able to provide this service from every PoP, since this is really the only service that its technology partner Cotendo specializes in.

AT&T's recently announced feature, called Cloudlet™*, moves the application processing to the edge, which reduces origin app server capacity requirements and improves the delivery of dynamic content. Since Cloudlet enables customers to better understand the context of the content request, Cloudlet can increase responsiveness and performance to users, while decreasing the processing load on the origin server for a better overall delivery and user experience.

AT&T also implements an advanced application integration layer, trying to make DSA more accessible to customers. This layer enables efficient handling of both cacheable and non-cacheable content, but also enables smart caching of content that would otherwise not be cacheable. The layer does this by analyzing request streams and making the cache more contextual by, for example, caching geo-targeted results using a Cloudlet and offloading some of the logic from the origin server back to the CDN. This can dramatically help with introduction of new services that may make caching become even less efficient, reverting previously cacheable requests to become dynamic.

For example, location-based services that present relevant recommendations based on the user's location (IP address or location information in case of mobile), cannot be cached on a traditional CDN as cache can't distinguish between different locations (or parameters of the request). Another example is decisions based on device types, like redirecting a request coming from a mobile device to a different origin/site or serving different content to optimize for the device. All of these decisions are typically done on the origin.

These types of offerings typify the next wave of DSA as website operators seek more granular controls and real-time analytics capabilities from CDNs in order to drive more timely decisions around site optimization and traffic handling, among other topics. DSA and application acceleration are the future of the CDN business, and providers like AT&T are hard at work spending a lot of engineering resources and R&D dollars on making these services more efficient and valuable to content owners.

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