

How Can CDNs Compete More Effectively?

WHITE PAPER

...Can CDNs stay relevant with today's wireless last hop?



BADU
networks

- Improving the way the world connects -

Background

Today's content delivery networks (CDNs) are judged in several different ways. For CDNs to compete effectively, there has to be differentiation, otherwise the CDN runs the risk of falling into a commodity price war for the business -- a losing proposition.

The benefits of CDNs are well known. They have been around for many years and are one of the major reasons that companies are expanding their web presence and global distribution of products on the Web. Originally the biggest competitive differentiator for a content delivery network was "proximity" and global coverage. The more Points-of-Presence (PoPs) a CDN could deploy the more global coverage they could offer. This capital intensive approach worked well for the early CDNs and became a large "barrier to entry" for the followers. Building PoP's in remote geographical regions is expensive and impractical in many cases. Only a few players could afford to invest the money to cover far corners of the world, so many CDNs are stuck with regional coverage. This is a decided disadvantage when customers are choosing which CDN to sign up for.

Businesses can test and deploy on multiple CDNs at the same time to see performance in specific regions and then pick and choose based on price/performance. At the end of a contract (usually 12 months) there is little loyalty. The result is price erosion for all CDN players in the market. This makes it even more important for CDNs to have good coverage in as many places in the world as possible. Global benchmarking companies like Cedexis, CloudHarmony, Gomez, Catchpoint and Keynote are continually measuring the CDN's performance and consistency all over the world.

The CDN market is growing quickly because market prices are eroding. More companies are discovering the benefits of outsourcing and offloading this task to third parties to focus on their core skills. Unfortunately the price erosion makes it harder for a CDN to survive in today's competitive market. Customers use measurement tools and services to gauge how well a CDN can deliver its content head-to-head in a particular region and only the fastest networks can price their service at a premium.

The purpose of this document is to summarize the strategic vision that Badu has for Content Delivery Networks. It describes how our technology can quickly help CDNs deploy new services and speed up legacy delivery in order to compete cost effectively on a global basis. Most importantly, the document presents a way for CDNs to solve the "wireless last hop" performance issue that is growing daily.

The future of CDNs – How to Differentiate

Most CDNs are looking for a way to differentiate their services in order to get away from commodity pricing. A CDN may focus on a particular region to appeal to certain customers or develop a reporting interface that sets it apart.

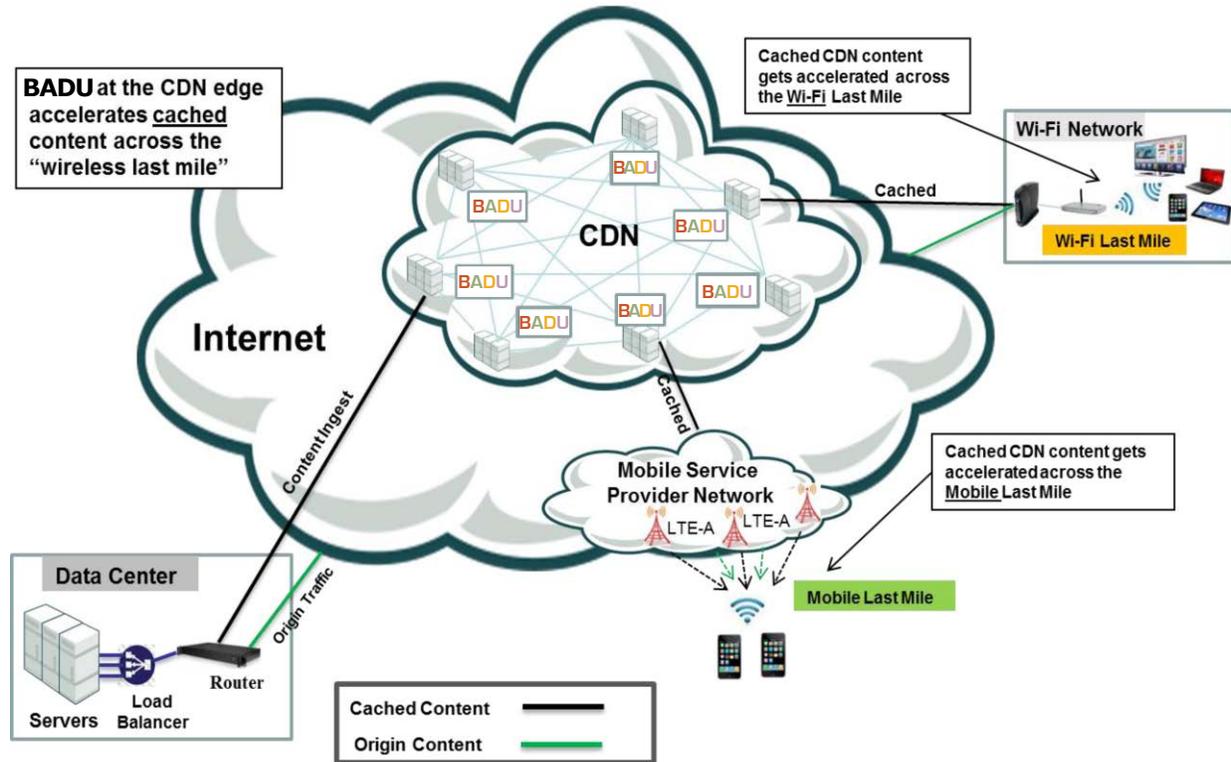
One approach to differentiation is "wireless optimization". Sixty to seventy percent of all Internet traffic travels across a "wireless last hop" on its way to the end user. Today, the impact of this wireless hop is poorly understood and measured. CDN performance has always been measured by standard benchmarks based on "backbone" or "last mile" testing. These are industry standard terms created by global measurement companies like Keynote, Gomez and Catch-Point. These measurements **DO NOT** include the "wireless last mile" which is the very last leg of the network path across a mobile or Wi-Fi network on the way to the end user. Performance can be very good from the "CDN edge" to a home or business Wi-Fi network or to the edge of a mobile service provider radio network, however if the **wireless last leg** is not good, then the *end-to-end performance* to your wireless device is poor. This problem is just starting to be recognized and millions of dollars are being spent trying to solve the "wireless last hop" problem. Unfortunately current approaches have not addressed the real issue with the "wireless last hop" which is latency that changes radically and constantly.

End-to-end performance is only as good as the sum of all of its parts. If the first, middle and last mile are optimized and the "wireless last mile" is not – then the user experience is poor. Who gets blamed for this? Yes, the CDN is often blamed. CDNs have squarely aimed at the middle mile for years and have tried to optimize the first and last mile segments with some success. When you add in the "wireless last hop", a whole set of new problems are created. How does a CDN optimize the "wireless last mile" when this segment of the end-to-end performance measurement is out of its control? Now there is a way.



The BADU unique differentiator

Badu can increase the end-to-end performance – all the way across the mobile last mile to the smart phone you are holding or to the tablet or laptop running on your Wi-Fi network at home or at your local coffee shop. For the first time you can impact not only the last mile from the edge of your CDN but also extend this across the “wireless last hop”. Imagine guaranteeing performance all the way to the end device regardless of whether there was a wireless network involved or not. This is the differentiator that Badu can offer any CDN, transparently.



For legacy CDN traffic there are many places inside of a CDN where Badu WarpTCP can be utilized. It is just a matter of identifying the correct use cases, test and deploy.

Following are a few things that are possible with Badu technology in any CDN or hosting infrastructure:

- Extend the global performance reach of the current network to new geographical regions without investing in infrastructure
- Accelerate the last mile from the edge caches to the end user (long last mile)
- Create a dynamic site acceleration service (DSA) to complement the download, caching and streaming services
- Help deliver a better user experience for mobile applications over any network to any device
- Accelerate the movement of content between edge nodes or storage regions
- Enable video or live streaming at sustained higher bitrates *without* interruption (eliminate re-buffering)
- Minimize the effects of cache misses on web page and streaming delivery

All of these things are accomplished with Badu technology whether it is deployed as an appliance, software or virtual instance. Any of these deployment options are available to fit the specific network.

Extend the global performance reach of the current network

The download and caching markets have become commoditized resulting in very low margins. The name of the game here is traffic volume and cost reduction. Deals are often won by proximity in a geographic region and the best Cedexis, Gomez or Keynote results. If the CDN footprint (number of PoP's) can be smaller and the Gomez and Keynote performance can stay the same or improve, then the CDN has a competitive advantage. The first CDNs spent vast amounts of money to build out their network presence. The newer CDNs cannot afford this capital investment.

With Badu technology, CDNs can serve remote geographical regions from centralized or "super" PoPs.

When Badu technology is deployed in the network, the acceptable performance range around each node is automatically extended by many milliseconds. This effect enables a CDN to deliver content into geographic regions where a new PoP was required before. Now the content can be delivered from a location that is farther away thus saving the capital expense of building a new data center in the region.

Acceptable Performance Range **before** BADU deployment



Service rings represent current acceptable performance range

Acceptable Performance Range **after** BADU deployment



BADU provides better performance to a wider area making each POP more effective

Create a dynamic site acceleration (DSA) service ■ ■

A few years ago Akamai decided to create a new market around dynamic site acceleration (DSA) and released new products like Dynamic Site Accelerator and Web Application Accelerator. These products drive higher profit margins and differentiation in the crowded CDN market. These services are much more profitable than static content CDN services. This segment of the business is growing quickly and other CDN's now have this type of service. Most of the CDNs have already added dynamic services to their existing download and caching businesses to keep up with Akamai. Soon this will be a crowded market as well. *WarpTCP* can help a CDN compete.

The options here are for a CDN to build a dynamic service, which takes a great deal of time and money, or purchase and deploy existing technology in a short amount of time. Badu would enable the latter approach.

This would be accomplished by placing Badu technology at the edge in strategic locations close to the customer, then redirecting the origin dynamic traffic through the closest Badu enabled PoP. This would be the on-ramp for the dynamic content. From that point forward the traffic would be accelerated until it reached the end user. The traffic could be directed across the CDN backbone utilizing TCP Keepalive and other techniques, or across the Internet outside of the CDN network. This enables acceleration of dynamic content and applications from origin web servers. Any CDN could quickly create a premium service that would compete with other dynamic services. Rapid deployment of this service would enable market share growth with a profitable service.

Following are some examples of the benefits delivered by this type of service:

Web Page Acceleration

- Gomez Testing Results Example customer -

Customer Home Page

Location	Un-accelerated in Seconds	Accelerated in Seconds	% Faster
Overall All Locations	4.188	3.286	27%
US Locations	1.936	1.346	44%
South American Locations	5.57	4.408	26%
European Locations	4.829	3.825	26%
Asian Locations	4.417	3.564	24%

Customer Networking Page

Location	Un-accelerated in Seconds	Accelerated in Seconds	% Faster
Overall All Locations	5.882	3.951	49%
US Locations	2.242	1.604	40%
South American Locations	8.174	5.311	54%
European Locations	6.97	4.626	51%
Asian Locations	6.14	4.263	44%

Customer Support Page

Location	Un-accelerated in Seconds	Accelerated in Seconds	% Faster
Overall All Locations	2.93	2.32	26%
US Locations	1.332	0.998	33%
South American Locations	4.034	3.149	28%
European Locations	3.573	2.806	27%
Asian Locations	3.141		21%

Accelerate the movement of content between the edge nodes



This is a general benefit from having Badu in all of a CDNs edge nodes and data centers. Any content that needs to be moved around inside of the network, regardless of the network path, will move faster and more efficiently on the network. Log files, secondary cache files, long tail content, backup and recovery files, etc., will all transfer faster.

Accelerate the last mile from the edge caches to the end user



One thing no managed service provider controls is the "last mile" – in other words the network distance between the closest edge node and the end users browser. Badu is an end-to-end solution (origin to browser). Depending on the latency in the "last mile" from the edge, Badu can help. Any network latency greater than 10ms will see improvement and the longer the last mile, the greater the improvement. If the last mile is from Beijing to Indonesia for example (40-50ms on a good day), Badu would make a noticeable difference. Badu helps to insure against bad Internet days. The Internet is notoriously inconsistent with latency varying from day-to-day. Badu technology helps to smooth out the bad days delivering a much more consistent user experience.

Enable Video or Live Streaming without interruption(eliminate re-buffers)

Badu technology stabilizes the stream and minimizes the effects of packet loss and jitter on the viewing experience. The data stream from server to video player starts faster and is more consistent with minimal delay. Packet loss is not only avoided but also quickly recovered. Any variable bitrate streaming technology benefits from Badu. The highest bit rate is delivered more often and because the stream is more consistent, the bit rate changes less often. A good example of this is a Badu customer who was having problems streaming HD Content from the West Coast of the US to film distributors in Europe across the internet. The application delivers encrypted HD videos which run at high resolution. The TCP streams were unwatchable because of packet loss and delay. The film distributors can now watch full length movies across the Internet with very little disruption. Any latency sensitive applications like streaming or thin client (Citrix ICA, RDP, etc.) would see improvements in user experience with Badu technology when hosted in central or distant locations.



Minimize the effects of cache misses

Most CDNs have a caching strategy that migrates seldom-used content to regional or central origin caches thereby leaving often-used content active in the edge caches. This architecture cuts down on the resources required at the edge of the network. Unfortunately this creates some latency issues when there is a cache miss and the content must be retrieved from a remote data center. Some types of content are stored in central or regional locations to be distributed as requested by the edge servers in real time. This can also cause delays on an active web page. Badu technology minimizes the delay when content is coming from regional or central caches by speeding up transfers. This gives the CDN maximum flexibility in designing its network and caching architecture.

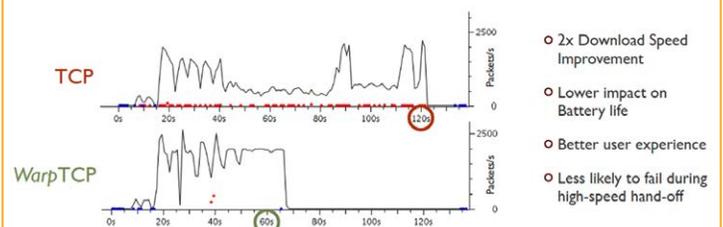


Help deliver a better user experience for mobile applications over any network to any device



Any mobile application utilizing a CDN will benefit from the end-to-end optimization approach of Badu. *WarpTCP* will accelerate any type of content being delivered over the mobile last mile or even to a smart phone using a Wi-Fi network. Regardless of what happens before the content gets to the radio towers on the mobile network (caching, FEO, etc.) the content will be accelerated over any 2G, 3G or 4G network (either the mobile last mile or Wi-Fi network) to the mobile device . The result is a much better user experience on the mobile device.

LTE Network Test Results 100 MByte Download (in Subway) -- Sept 2013



Summary

It is not very often that a technology comes along that can be easily deployed in a large network **AND** can deliver a better user experience to the massive audiences that view content across that network (especially wireless networks).

The CDN market has become extremely competitive with eroding margins and more emphasis on regional coverage. Publically available benchmarks are available that compare regional performance of every CDN. There is constant pressure to reduce the cost of delivering content. Simultaneously, CDNs must increase performance in specific regions to create a unique competitive advantage.

The biggest new challenge to CDNs is how to address end-to-end performance when the "wireless last hop" is included. The majority of Internet traffic in the world now travels across this "wireless last hop". This segment of the end-to-end user experience is poorly measured and not well understood. The strategic value of a CDN increases if performance over this "wireless last hop" can be impacted in a positive way from the network.

Badu technology was designed for some of the largest networks in the world. If deployed in the right place on the network, Badu could become a strategic weapon in any CDNs head-to-head battle with their most troublesome competitor. Badu can help any CDN deliver files and web pages faster in regions such as Asia and South America, and be a difference maker in global Cedexis, Gomez or Keynote testing. End-to-end benchmarking which includes the "wireless last mile" will become a standard as companies realize the impact Wi-Fi networks and mobile devices have on their web site performance. Badu was specifically designed to solve these "wireless last mile" issues.

Badu is easy to test in the network and the results can be recorded in Gomez, Keynote or any number of performance measurement platforms. Badu pays for itself quickly in any CDN and can be deployed in production rapidly with minimal changes to any network.

Contact Badu today for more information and to discuss a free trial.

