AKAMAI'S LOCALIZATION CHALLENGE

Jeremy Callinan

University of the People

BUS 5910 Management Capstone

Dr. Joaquin Angles

Written Assignment - Unit 8

8/11/2019

Abstract

Akamai Technologies developed some of the first technology to allow for Web 2.0: content delivery networks, cloud platforms, and modern Internet caching strategies, at the same time building the largest content delivery network (CDN) in the world. As the Internet evolved, Akamai also had to evolve, and expand globally – their customers were mostly in the United States, despite them developing the initial technology. Competitors to their CDN business emerged, starting overseas before Akamai could establish a presence there. These competitors not only included other companies offering similar services locally from their countries, but also cloud providers Google, Microsoft, and Amazon. These competitors were also threatening to take away potentially all of Akamai's business by making CDNs obsolete. Customers could use these global cloud platforms to create their own CDNs, potentially with faster scalability and other features that Akamai doesn't provide. This paper examines Akamai's fight to retain their market share, and compete with Google, Microsoft and Amazon as customers switch to cloud computing.

Introduction

Akamai Technologies is one of the pioneers in Internet traffic optimization. Akamai was one of the first to develop Content Delivery Networks, including caching technologies including consistent hashing, which revolutionized content delivery, enabling distributing requests among a changing group of web servers. Content Delivery Networks are the backbone of today's Internet, leveraging high-layer network intelligence to most effectively delivery the management of data (Aljumaily 2016).

Being able to easy scale a content network without losing the quality of service enabled the modern Web 2.0 and 3.0 – including features Internet users have come to rely on every day. These content caching technologies enabled video services like Netflix, streaming for games and events, and online collaboration tools that allow for 4K to 8K video, along with real-time video and chat, all through the same Internet connection to multiple users. Many businesses, including the entirety of all financial services, and all businesses that require fast content delivery, rely on Akamai's technology (though potentially provided by a competitor) to ensure fast and reliable connections (Lessard 2017, Raskin 2013).

Akamai, the Hawaiian word for "smart" or "clever," was founded in 1998 by Tom Leighton, a professor of applied mathematics from MIT, and Danny Lewin, a recent graduate in computer science from the Israel Institute of Technology. The company's founding came after Tim Berners Lee, the "father" of the World Wide Web, challenged his MIT colleagues to come up with a solution to what would soon be the Internet's congestion problem, what he called the 'hot spot' problem – when too many people logged on to a website, and crashed it (Lessard

2017, Raskin 2013) . Therefore, quality management personnel at CDNs are focused on metrics like Quality of Experience (QOE) and Time to First Byte (TTFB), two that can be used to analyze performance of various network architectures (Anderson 2012, Aljumaily 2016, Čandrlić 2012).

It was widely known in computer-science circles that the Internet was not designed to be a fast-performing service, especially over long distances. Leighton took on Berners-Lee's challenge and in 1998 launched Akamai (Raskin 2013. Global expansion began in 2000 when Akamai opened sales offices in the United Kingdom, Germany, and France; over the next 11 years, the company grew its footprint around the world, gathering 29% of its revenue from outside of the United States (Lessard 2017).

Section One - Problem Statement – Localization of CDNs

From its initial inception, Akamai's company headquarters in Cambridge, Massachusetts directed all decisions about the company. Cambridge developed products, set all the sales goals for all the teams across the globe, and collected the monthly fees from its customers. These sales teams from across the globe often pushed back on these sales goals, as they felt they could never reach those targets with Akamai's set pricing structure.

They believed in their local area, they needed different pricing to be able to capture the market the way Cambridge wanted, and meet those sales goals. Cambridge, however, had no process in place for mediating pricing disagreements like this, therefore no described way to get the product and sales teams to compromise and come to an agreement. One Akamai Executive stated the company operated with a "U.N. of pricing as a business process" (Lessard 2017), an

apt description of a much-needed feature. Akamai was incorrectly assuming it could set pricing globally from its headquarters, with localization of that pricing. This was the same deficiency for any conflict, all the decision making, and resolutions had to go through Cambridge, which delayed information, and introduced information loss in the process (Lessard 2017).

This problem also exhibited itself in issues with market awareness between the U.S. and global teams. The teams in Cambridge generally were unaware of the local reality of selling and servicing products like network services in non-U.S. markets. "The mental model for everything," Charley Dublin, V.P of Engineering at Akamai explained, "was build or buy the technology in the U.S. then pitch it to local markets." (Lessard 2017)

Akamai needed to reorganize under a new model with localized teams for specific functions, such as sales, marketing, service and support, and retaining other functions globally such as product management and engineering. Akamai looked at restructuring its business to organize each business function in its most efficient place, either globally or locally. To do this, Akamai had to view its business through the lens of business structure and organization.

Each option, global or local, should be evaluated for the problems inherent in each, benefits, and how these choices effect Akamai's competitive advantages and business opportunities. In terms of competition, these decisions should also be analyzed through the global and local lens. In general, all the reorganization decisions that Akamai is facing should be analyzed through the following set of 'lenses' or frames: organizational theory, human resources,

project/program management, accounting/finance, operations management, business law and ethics, leadership, and globalization.

Charley Dublin was taking on new responsibilities as the V.P of Engineering in 2011 as Akamai was the largest CDN in the world, with 60% market share and $1.6 billion in revenue. Akamai was facing increasing competitive pressure by new local entrants in non-U.S. markets where Akamai was expanding, as well as "arbitrage" by several of its major multinational customers (Lessard 2017).

Dublin had had his eye on the company's localization challenge for some time. In 2009, right as Akamai began setting financial growth goals outside of the United States, Dublin laid out the issue for senior management showing how the company's market share dropped off with distance from the United States. In certain key non-U.S. markets, Akamai's once dominant market share position was being consumed by local competitors who just four years earlier didn't exist (Lessard 2017).

As Dublin said to other senior management, "We can't say we are a global company until and unless we orient our metrics to account for the local perspective." Akamai's CEO charged Dublin and the international leadership team to come up with a solution (Lessard 2017).

Section Two – Literature Review - A Detailed Background of The Content Delivery Network Industry

E-commerce quickly rose to overtake brick and mortar businesses in many cases, in the United States, as in many other countries, as Internet connectively and broadband became widely available. At the same time, streaming services such as Netflix and Hulu replaced traditional television viewing, shifting more traffic and required bandwidth to the Internet (Kumar 2014, Ozalp 2019).

Content Delivery Networks created a cost-effective, easily scalable solution to manage web traffic effectively for a business, including being able to react to the quick changes in traffic that may occur on the Internet. and easily managed solution to the problem of consistent, fast performance for everyone that is an online customer (Bhawsar 2019).

These customers could be in a rural or metropolitan area, scattered across many miles, or potentially across oceans, time zones, which all always expect access to their services, expecting 'high nines', or essentially requiring uptime percentages in the 99% percentile. These customers require this service regardless or any local or global issues affecting their network. This means Akamai's CDN needs to be resistant to cyber-attacks such as flooding or DDOS (Distributed Denial of Service) attacks, or network infrastructure problems such as outages from weather conditions, as these may cause Internet traffic to suddenly be re-routed to another area quickly, changing the dynamic of necessary servers and bandwidth to support a local area (Anderson 2012, Nolle 2019, Kumar 2014).

As e-commerce became ubiquitous, customers began to expect websites to not only to work correctly and quickly every time they make a transaction, but as the Internet (and its

customers) evolved, they may also may leave and visit a competitors website if the competitors' site is faster by as little as ¼ of a second (250 milliseconds) (GlobalDots CDN Buyers Guide 2019).

The benefits of a CDN for a customer include faster performance than they could achieve on their own, and better security from attacks. CDN itself is an umbrella term that includes video streaming, software downloads, web and mobile content acceleration, licenses and managed content delivery, transparent caching, lead balancing, analytics, and cloud intelligence.

CDNs achieve these services reliably to customers by maintaining multiple Points of Presence or 'edges'- the same copy of data will exist identically in multiple geographically dispersed locations, including any changes needed in this data. The CDN accomplishes this by providing a two-way communication network between the servers, eclipsing the functionality of a classic client-server network topology (Anderson 2012, Čandrlić 2012).

A standard client-server configuration, what would have traditionally been used for web site hosting, would have one central server, that is accessed by multiple clients. Changes on that one server are then instantly noticed by the clients, barring any caching services used. This client-server configuration is easy to maintain but does not allow for easy updating (Pallis 2006, Čandrlić 2012).

Instead of a standard client-server topology, CDNs use a client, surrogate, and origin server (Anderson 2012, Aljumaily 2016). The surrogate servers (distributed around the world) cache the origin servers' content, then routers and network elements that deliver content requests

to the optimal location and the optimal surrogate server; and an accounting mechanism that provides logs and information to the origin servers (Pallis 2006), completed the loop so analytics and quality of service applications can be implemented.

Under a CDN, the single flow under client-server communication is replaced by two communication flows: one between the client and the surrogate server, and another between the surrogate server and the origin server. This distinction into two communication flows create two unique and important benefits: it reduces congestion (Pallis 2006, GlobalDots 2019).

Reducing congestion is particularly important to deal with the extreme bandwidth pressure seen on popular servers and when viral videos or memes cause momentary spikes in Internet traffic to different servers that typically don't see that volume of traffic. It also increases content distribution therefore redundancy and availability. To maintain (worldwide) distributed copies of identical content, the practice for a CDN is to locate its surrogate servers within strategic data centers (relying on multiple network providers), over a globally distributed infrastructure. Also, customers are saving the significant cost of implementing and maintaining their own server solution (Pallis 2006, GlobalDots 2019).

Section Three – Case Elements – The Evolution of the CDN Industry and The Cloud Era

For the first five years of its existence, Akamai was the entire CDN industry, creating and patenting many of the first technologies to allow for Internet caching and fast performance. Customers trusted their content hosting to Akamai in the United States. However, as the Internet

expanded in the late 2000s, there were dozens of local CDNs in small, non-U.S. markets where Akamai operated that focused on distributing locally created and curated content cheaper (Lessard 2017).

More specifically, there were roughly 50 CDNs competitors for Akamai to contend with in the world. The largest standalone CDNs were U.S.- based Limelight with operations in 55 countries and revenue of $171 million, and South Korea's CDNetworks which operated in 31 countries and recorded $99 million in revenue (Lessard 2017). These competitors could all provide similar services as Akamai did, and undercutting them in price (plus understanding local markets better) is a serious threat to Akamai's business model.

In 2008, Wall Street was predicting that the CDN space would be challenged by telecoms, which, after all, owned the last mile to content consumers. Telecoms like Verizon owned the hard-to-replace 'last mile' and collected large profits from land and wireless contracts. They had the financial means also, to just acquire CDNs if it turned out they were unable to compete. In one example in Japan's market, in 2011 telecom KDDI purchased CDNetworks for $167 million (Lessard 2017).

However, in 2011, industry observers thought new competition could come from the Operator Carrier Exchange (OCX), founded by a group of telecommunication companies to connect members' networks. This would be an attempt to compete directly with CDNs without requiring members to build out their respective network infrastructures (Lessard 2017). Although the business model had yet to be developed, a CDN federation like OCX was expected to pose a significant threat to standalone CDNs like Akamai.

But Akamai found itself less threatened by telecoms (who were still focused on their current customers and markets) and more by key customers who either decided to build their own CDN, or take it a step further, and attempt to obsolete the CDN.

Amazon moved into the CDN space in 2006 after it developed its own server network and began offering a simple CDN service as part of its cloud services through its Amazon Web Service (AWS) subsidiary (Lessard 2017).

The CDN industry was also witnessing a growing number of companies building in-house capabilities, doing away with vendors like Akamai. Microsoft had been one of Akamai's most lucrative customers. However, in 2009 they started Microsoft Azure, and began deploying server farms around the world to bypass Akamai's content delivery services. In addition, large IT companies began to realize it was more advantageous to develop in-house capabilities than outsource their content delivery needs (Lessard 2017).

At the same time, former customers like Microsoft, Google and Amazon have now created their own CDNs, advancing the product to new cloud services, offering:

1 **Platform as a Service (PaaS)** - supplies all the resources required to build applications and services completely by using internet without having to download or install software.
2 **Software as a Service (SaaS)** – used by Salesforce most famously, software as a service is the model in which an application is hosted as a service to customers who access it via the internet.
3 **Infrastructure as Service (IaaS)** – this model is responsible for providing virtualized computing resources, network resources (Kumar 2014)

4 Customized Cloud Types:

4.1 Public Cloud - In this deployment model services and infrastructures are made available to different types of customers and used publicly by general people/users. Examples of public cloud services are Microsoft Azure, Amazon Enterprise Cloud (EC) 2, and Google's App Engine.

4.2 Private Cloud - In this type of cloud the computing resources are used and operated exclusively by one organization only.

4.3 Community Cloud - In the community model, the infrastructure is shared by several organizations with the same policy and compliance considerations.

4.4 Hybrid Cloud - This deployment model helps business to take advantage of secured applications and data hosting on private cloud, while still enjoying cost benefits and 'hedging their bets' against the sharing of their most private, or valuable data (Kumar 2014, Aljumaily 2016).

Possible Alternatives

Akamai has several possible alternatives to combat change in the CDN industry and the emergence of the cloud era. They could also go the M&A (Mergers and Acquisitions) route, like Cisco, Level 3, and many other companies had taken – purchase the local and new talent, instead of developing it yourself. Large tech companies like Microsoft, Apple and Google have always used this route also, as eternally, small teams may be able to develop technology quicker and more effectively, which can then be purchased to deploy and sell globally.

Akamai could also focus on global, centralized management instead of localization. Akamai also had many global customers and there were some operational processes and

structures that needed to remain global. Akamai also had to think about effectively integrating its global core with its effort to become more locally focused.

Section Four – Case Solution

Shifting other services beyond web hosting to Akamai for hosting, such as game streaming, a growing industry with products coming from Google (Stadia), Nvidia, Apple and Intel, software and game development and testing platforms, and other platforms that could be cloud hosted, freeing companies from the need to provide and maintaining computing infrastructure (Anderson 2012, DerGurhan 2019, Murnane 2019).

MarketsandMarkets forecasts the CDN services market will grow from $7.5 billion in 2017 to $30 billion in 2022, as CDN providers focus on security, compression, video, web optimization and data duplication features (DerGurhan 2019).

Akamai can use this environment to develop the next generation of cloud based CDNs with AI and machine learning to optimize performance and further improve bandwidth utilization.

This also removes local limitations inherent in that model, while having infrastructure designed and maintained, and kept up to date by world class experts, in a secure facility. This also keeps companies from dealing with issues during live events, such as servers being 'brought to their knees' by live events and multiplayer games, and client devices need only display the content and collect user input (Murnane 2019).

Section Five – Case Conclusions

First, Akamai needs to implement their 'Theater' based localization for sales, service and support, utilizing this local human resource management model, and a local organizational structure, removing the oversight from Cambridge. In developing a localization proposal for senior management, Dublin had to help determine where Akamai had to be "local", how quickly the company needed to become local, and the extent to which Akamai needed to be local in the places it operated. For instance, German and French salespeople could not work the same number of hours as their American counterparts, requiring local adjustments to sales goals and objectives (Lessard 2017).

A High-Level Implementation Plan

Akamai had to work on these "Theater" units also collecting and communicating local awareness of products available on markets, instead of relying on Cambridge knowing what is happening in all the different markets in the world. Correcting this with specific local cross-functional teams to keep an eye on local markets should save Akamai time and money when markets change, and new products are introduced.

In 2010, for example, Akamai spent money and time acquiring technology in one market, that was commonplace in another. Akamai spent $12 million acquiring Velocitude in 2010, a U.S. company that specialized in helping companies in e-commerce and other mobile web development categories, transforming website content into user and viewer friendly content for mobile devices (Rao 2010), even though the Japanese already had this same technology for eight years (Lessard 2017). Soon after the acquisition, a product manager from Cambridge introduced Velocitude's technology to Akamai's Japan unit and pushed it to accept a set of pre-determined

sales targets. The response of the general manager (GM) of Japan was, "Sorry, I'm not taking any sales targets for this product." In fact, a technology like and, by many accounts, superior to Velocitude's had existed in Japan for nearly 10 years. As Japan's GM told Dublin, "We've had this technology since 2002. We don't need it." (Lessard 2017, Rao 2010).

Competitor Nitrogen is classifying Akamai as legacy product, capital intensive because it requires servers all over the world, Nitrogen moves away from the commoditized network optimization layer and leases the best telecom pipes in different locations, and then provides their service at the application layer (Nair 2019).

Akamai also had many global customers and there were some operational processes and structures that needed to remain global. Akamai also had to think about effectively integrating its global core with its effort to become more locally focused.

Akamai has many opportunities to expand its CDN base to other new markets. Mobile CDNs also are a great opportunity for Akamai, and its competitors, experiencing growth in the US, Europe, Asia, India, Central and South America in the next five years (Bhawsar 2019). As more applications are integrated and development is integrated with operations ("DevOps"), dynamic micro services, Continuous Integration and Continuous Delivery, along with performance and security, will define the next generation of CDNs (Ramsinghani 2019). Akamai themselves have discussed moving to the 'edge', value added services, as the CDN market itself will continue to grow (Ozalp 2019). Data transfer fees, for CDN, hosting, and cloud customers, may be under attack via groups like the "Bandwidth Alliance" (Captain 2019), so shifting to more developer focused platforms makes sense. It is possible that future Internet platforms (as micro-platforms evolve to Web 3.0), the entire Internet could be based on cached content and

cached processes. The Internet could become a single giant CDN or cloud, with a gateway through which users access content, and other technologies like functional routing and virtual private networks could make high bandwidth, high value services commodities very quickly (Nolle 2019).

References

Anderson, Karl and Muslim Elkotob *Challenges and opportunities in content distribution networks: A case study*. (December 2012) Retrieved June 23, 2019 from https://www.researchgate.net/publication/261242108_Challenges_and_opportunities_in_content_distribution_networks_A_case_study

Aljumaily, Mustafa *Content Delivery Networks Architecture, Features, and Benefits*. (April 2016) Retrieved June 23, 2019 from https://www.researchgate.net/publication/305722381_Content_Delivery_Networks_Architecture_Features_and_Benefits

Bhawsar, Nidhi Mobile CDN Market Projected to Show Strong Growth. MarketNewsReports.US Retrieved July 19, 2019 from https://marketnewsreports.us/11368/mobile-cdn-market-projected-to-show-strong-growth-akamai-technologies-att-ericsson-internap-chinacache/

Captain, Sean https://www.fastcompany.com/90242105/cloudflare-ibm-microsoft-slash-high-data-transfer-fees-not-aws

Čandrlić Goran *The History of Content Delivery Networks (CDN)* Dec. 21, 2012 GlobalDots Retrieved June 5, 2019 from https://www.globaldots.com/the-history-of-content-delivery-networks-cdn/

DerGurhan, Jean *Growing CDN services market changes to meet cloud needs.* (2019). Tech Target. Retrieved 24 June 2019, from https://searchnetworking.techtarget.com/feature/Growing-CDN-services-market-changes-to-meet-cloud-needs

GlobalDots *CDN Buyers Guide* Retrieved June 2, 2019 from https://contact.globaldots.com/cdn-buyer-guide/

Kumar, Nitin Shrawan Kumar Kushwaha and Asim Kumar *Cloud Computing Services and its Application* Advance in Electronic and Electric Engineering. ISSN 2231-1297, Volume 4, Number 1 (2014), pp. 107-112 Retrieved July 3, 2019 from https://www.ripublication.com/aeee_spl/aeeev4n1spl_15.pdf

Lessard, Donald and Cate Reavis Akamai's Localization Challenge Retrieved June 22, 2019 from https://mitsloan.mit.edu/LearningEdge/CaseDocs/16-175.AkamaiLocalizationChallenge.pdf

MIT News *Two Teams win top prize in MIT $50K* May 13, 1998 Retrieved July 7, 2019 from http://news.mit.edu/1998/50k-0513

Murnane, Kevin *Game Stack Turns Microsoft's Data Centers Into Game Development Platforms* Forbes Online July 7, 2019 Retrieved July 7, 2019 from https://www.forbes.com/sites/kevinmurnane/2019/07/07/game-stack-turns-microsofts-data-centers-into-game-development-platforms/#5ce4b7b937eb

Nair, Dipti B2B SaaS startup Nitrogen aims to disrupt two multi-billion dollar markets - ecommerce and CDN (July 8, 2019) Retrieved July 16, 2019 from https://yourstory.com/2019/07/b2b-saas-startup-nitrogen-cdn-ecommerce

Nolle, Tom Future internet infrastructure to utilize fiber, edge hosting, CDNs. (2019). SearchNetworking. Retrieved 30 July 2019, from https://searchnetworking.techtarget.com/tip/Future-internet-infrastructure-to-utilize-fiber-edge-hosting-CDNs

Ozalp, Ahmet Future of CDN - Next 10 Years - Ahmet Ozalp, Akamai Technologies - Di…. (2019). Slideshare.net. Retrieved 17 July 2019, from https://www.slideshare.net/DigiWorldIDATE/ahmet-ozalp

Pallis, George and Athena Vakali *Insight and Perspectives for Content Delivery Networks* Communications of the ACM January 2006/ Vol. 49 No. 1 Retrieved July 1, 2019 from http://opim.wharton.upenn.edu/~kartikh/reading/pallis_CACM.pdf

Ramsinghani Mahendra Discontent and disruption in the world of content delivery networks – TechCrunch. (2019). TechCrunch. Retrieved 17 July 2019, from https://techcrunch.com/2017/06/01/discontent-and-disruption-in-the-world-of-content-delivery-networks/

Raskin, Molly Knight *The Genius Who Perished on Flight 11* Psychology Today Sept. 2, 2013. Retrieved June 5 2019 from https://www.psychologytoday.com/us/articles/201309/the-genius-who-perished-flight-11

Rao, Leena *Akamai Acquires Mobile Web Development Company Velocitude* TechCrunch June 10, 2010 Retrieved June 3, 2019 from https://techcrunch.com/2010/06/10/akamai-acquires-mobile-web-development-company-velocitude/