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Paper 21

CONTENT DELIVERY NETWORK'S PIONEERING LEADER- A CASE STUDY ON AKAMAI TECHNOLOGIES INC.

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Abstract

Akamai Technologies, Inc. a content delivery network company founded by Dr. Leighton and Mr. Lewin on August 20, 1998. Akamai's headquarter is situated in Cambridge city of Massachusetts state in the United States. In 20 years of inception Akamai has grown as a pioneering leader in CDN field and also started providing solutions pertaining to Web Performance, Media Delivery, Network Operator and Security field. Applications, Software and Content Delivery over the internet, enterprise professional services etc. are some of the services rendered by Akamai Technologies. The cause for inception of Akamai Technologies was from an academic research that hatched the algorithms which could route and reproduce web content intelligently over the distributed server network. With Dr. Leighton and Mr. Lewin, Randall Kaplan and Jonathan Seelig teamed up to incorporate Akamai. Dr. Leighton was serving as a head of the Algorithms Group of Computer Science Laboratory at MIT. The content delivery network of Akamai is one among the few biggest distributed computing platforms in the world. Akamai CDN serves15-30% of all Internet traffic. The business runs a global networked servers and resources on these servers are rented to clients who are looking for significant improvement in the performance of their website. Performance gain will be achieved by distributing user's web content from nearby places. Akamai has a worldwide presence with around 7,500+ staff with annual revenue of $2.7 billion. As of July 31, 2019, the Company has deployed globally-spread content delivery network (CDN) comprising of 2, 39,000 servers approximately in almost 139 countries and closely 1,600 networks all around the world. Akamai ranked number 1 in the 2019 Boston Business Journal for the second year in a row as the Massachusetts Largest Cyber Security Company. The goal of Akamai is to ensure faster Internet experience without compromising security and reliability. In this paper, we analyze Akamai Technologies business and operational strategies along with services and products strategy, new product development strategies sustainability strategy and CSR strategy. Some recommendations are also provided based on the SWOC analysis to accelerate sustainable development.

Keywords: Akamai, Case study, CDN, Content Delivery Network, Performance and Security Solutions.

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1. INTRODUCTION :

End to end reliability or performance is not assured in the world of Internet [1]. Internet communications, on the other hand, are always susceptible to a number of obstructions that badly influence efficiency, including high latency, packet drops and network outages [2].The two common challenges faced by internet users are congestion issues in the Internet infrastructure and the high latency resulting in slow browsing. Tim Berners-Lee World Wide Web inventor had foreseen this challenge that would impact Internet customers two decades ago and challenged his colleagues who were working in the Massachusetts Institute of Technology (MIT) to devise a totally fresh and effective way of providing contents over Internet. Dr. Tom Leighton recognized that applied mathematics and algorithms could find a solution to Internet congestion, and in early 1995 he assembled a team of scientists to address the issue. Danny Lewin went to work with Dr. Leighton at the MIT in the fall of 1996. Together with the fellow scientists, Dr. Leighton and Mr. Lewin developed the algorithms which could route and reproduce web content intelligently over the large distributed server network. Dr. Leighton and Mr. Lewin began to determine whether their technology could be used commercially in 1997, resulting in the birth of Akamai Technologies on August 20, 1998[3]. Content Delivery Networks have been designed to enhance the efficiency of static content internet pages. The evolution of CDN technology resulted in delivering the big videos, dynamic websites, online games and apps to distinct device kinds [4]. Today Akamai Technologies provides internet content, applications and software, mobile and security solutions, IoT Edge Cloud as well as professional business services. The content delivery network of Akamai is one among the few biggest distributed computing platforms in the world. Akamai CDN serves 15-30% of all Internet traffic. The business runs a global networked servers and resources on these servers are rented to clients who are looking for significant improvement in the performance of their website. Performance gain will be achieved by distributing user's web content from nearby places [5]. Akamai has a worldwide presence with around 7,500+ staff with an annual revenue of $2.7 billion. As of July 31, 2019, the Company has deployed globally-spread content delivery network (CDN) comprising of 2,39,000 servers approximately in almost 139 countries and closely 1,600 networks all around the world.

2. OBJECTIVES OF THE STUDY :

In this paper, we analyze Akamai Technologies business and operational strategies along with services and products strategy,new product development strategiessustainability strategy andCSR strategy [6-8]. Some recommendations are also provided based on the SWOC analysis to accelerate sustainable development.

3. METHODOLOGY :

An attempt has been made in this research paper to carry out research on the basis of secondary data from publications, journals, conference proceedings, Company websites, Research network websites, Focus group discussions, Various Analysis Frameworks like SWOC Analysis, Competitive Analysis, Financial Analysis, the Internet articles, prior research paper focusing on the multiple elements of the operations of products and services.

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4. SOLUTIONS AND SERVICES :

Akamai Technologies is a Content Delivery Network (CDN) and cloud service provider based in Cambridge, Massachusetts, USA, providing internet content, applications and software, mobile and security solutions, as well as professional business services. Akamai's application delivery networks can accelerate whole web based applications,Media distribution networks providing live and on-demand media of high quality, and Edge Computing networks facilitate distributed deployment of network-enabled applications.

The solutions offered by the company include,

- Akamai Security Solutions

Akamai Security Solutions provide the scale to deter the massive Distributed Denial-of-Service (DDoS) and web application attacks without decreasing efficiency, as well as information on the recent threats and knowledge to adapt to changing tactics and attack vectors.

- Akamai Web Performance Solutions

Akamai Web Performance Solutions offers high speed personalized web experiences, allowing customers to improve possibilities for income, gain agility in IT and scale worldwide.

- Akamai Media Delivery Solutions

Akamai Media Delivery Solutions enables to engage audiences worldwide by delivering content such as high- definition video content, software updates, games, social media, news, etc. to the highest quality wherever and whenever consumers want — without building expensive infrastructure — to scale up the development and complexity of distinct kinds of connected devices.

- Akamai Network Operator Solutions

Akamai's network operator solution allows new clients and business services to optimize internet traffic and price control [9].

- Akamai Professional Services

Akamai Internet specialists around the world with over ten years of professional expertise providing world-class support, problem solving and customized service – ensuring optimized internet achievement for all their clients.

Akamai Solutions are listed in the Table1 below,

Table1: Akamai Solutions

Akamai Solutions	Description
Ion	Automated Intelligent performance enhancer improves user experience on both system and mobile devices.
Dynamic Site Accelerator	It speeds and secures interactive websites by using real-time network optimizations and sophisticated caching methods.

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IP Application Accelerator (IPA)	Speed up IP based apps to global enterprise customers to guarantee maximum efficiency, accessibility, and cost reduction.
China CDN	Extends the global presence of Akamai to capitalize on the unprecedented development of Chinese internet users.
Fast DNS	Cloud-based DNS to improve efficiency, accessibility and resilience DDoS attack
Image Manager	Increase the involvement of customers with lovely, quick digital experiences.
Cloudlets	Use controls and capacities to expand investment with Akamai to simplify internet activities and enhance user experience
Global Load Balancing Traffic Management	As name indicates it balances load across cloud and multiple data centers settings.
Identity Cloud	Build unified, data-rich client profiles — extremely safe and meets compliance requirements — while providing strong perspectives to assist deliver personalized client experiences.
mPulse	Bring stakeholders from business and IT into line with important market initiatives, priorities and measurements
DataStream	Smart insight into the efficiency of the CDN
CloudTest	Tool to perform stress test on web applications and mobile applications to ensure that apps work as per the requirement under high load condition.
API Gateway	Increase scalability and efficiency of API management by unloading to the edge
OTA Updates	Secure, over - the-air updates on worldwide scale of connected cars and IoT devices.
IoT Edge Connect	IoT information collection and application messaging in real-time, with scale safety.
Kona Site Defender	Extensive use of the Web and API
Web Application Protector	Simple tool to protect websites against assaults by Distributed Denial of Service and web applications threats.
Client Reputation	Additional defense layer for Kona Site Defender based on latest customer behavior
Enterprise Application Access	Complete user activity audit and reporting
Enterprise Threat Protector	Proactively mitigates threats from zero day malwares.
Prolexic Routed	Fastest DDoS Terabit Scale Attack mitigation

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Zero Trust Security	Users, devices, apps and information move out of the company premises and control area
Fast DNS	DNS service hosted on Cloudforenhanced performance, endurance against Distributed Denial of Service attacks.
Kona DDoS Defender	Managed Distributed Denial of Service security service for web applications and important websites
Site Shield	Defend the origin of websites and internet infrastructure by cloaking
DNS Security and Services	The mapping system uses DNS to ensure fast and high quality Internet content delivery
API Capabilities	API-specific skills for efficiency, scale, unload and reliability
Bot Manager	Stops the most advanced bots
Scalable Cloud Security	Facilitates consistent and error free watching experience with secure data, applications andwebsites.
Identity Cloud	Mission-critical client identity and access management to provide the end user with trusted digital experiences
SPS Secure Business	Value-added service to subscribers that deters security threats and enables them to filter inappropriate content in their workplace.
SPS Secure Consumer	Value-added service to households that protects them from web threats such as phishing and malware and enables them to customize their internet access to suit their preferences and values.
SPS ThreatAvert	An automated defenses against threats like bots and DNS-based DDoS
SPS Reach	Use in-browser messages to communicate with subscribers and to advise them while they are involved online.
SPS Secure Public Wi-Fi	Deliver cyberthreat protections and support Acceptable Use Policies for small and midsize businesses that offer guest or public Wi-Fi
DNSi CacheServe and AnswerX	Implement feature-rich DNS resolvers that enhance network responsiveness, handle unwanted traffic, and allow premium home and business services.
DNSi Big Data Connector	Integrates security data and live streamed DNS data into open big data platforms to enable reporting and analytics for operations, forensics, and management teams
DNSi AuthServe	Enable high-performance, always-on-name services on a huge scale to guarantee visibility of internet, video, VOIP and other apps on the Internet for everyone

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Aura Licensed CDN	Operator CDN Software Licensed Suite Enables IP video services, improves QoE and lowers network expenses
Licensed Multicast Solution	Reduces network expenses by normalizing traffic volumes for live simulcasts during peak demand.
Aura Managed CDN	Managed Operator CDN suite facilitates to deploy an extremely scalable, turnkey CDN.
Aura Object Store	Use a extremely scalable, persistent media content store to originate CDN content
Akamai Network Partnerships	Work with Akamai to provide subscribers with superior quality of service

5. FINANCIALS :

Akamai's capacity to attract recurring income commitment for their web-performance and security solutions, boost media related traffic on their network and build fresh products are some of the important factors that affect the economic success of Akamai. Akamai's ability to attract recurring income commitments for its web-based performance and security solutions, boost media traffic on its network, and create new solutions and products are some of the key variables affecting Akamai's financial success. For most of Akamai's products, their clients are dedicated to minimum one-year contracts that enable them to have a consistent and stable basic income level [10]. As per the financial reports issued for the first quarter of 2019, Akamai generated a revenue of $707 million, an improvement of 6 percent over the Q1 of 2018 was $669 million.

The Table2– Akamai Financial Data, presents financial details from 2014 to 2018.

Table 2: Akamai Financial details

Financial Year till 31 December	**2018**	**2017**	**2016**	**2015**	**2014**
Income	$2,714,474	$2,489,035	$2,347,988	$2,197,448	$1,963,874
Capital and Revenue Expenses	2,351,975	2,174,746	1,881,478	1,731,298	1,474,355
Revenue from business	362,499	314,289	466,510	466,150	489,519
Profit	298,373	222,766	320,727	321,406	333,948
Profit attributable per share	1.78	1.30	1.83	1.80	1.87
Profit attributable per diluted share	1.76	1.29	1.82	1.78	1.84
Liquid assets	2,101,171	1,279,528	1,616,329	1,524,235	1,628,284
Total Assets	5,461,770	4,648,916	4,432,190	4,181,684	4,001,546
Convertible senior notes - Due 2019	686,552	662,913	640,087	624,288	604,851
Convertible senior notes - Due 2025	874,080	-	-	-	-
Long term Debt	185,121	166,840	156,329	110,319	117,349

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Shareholders fund	3,191,860	3,362,469	3,270,218	3,120,848	2,945,335

Various acquisitions took place over the years described in the chart above. The outcomes of which are provided from the date of acquisition prospectively. The comparability of the consolidated economic information described above may be affected by these purchases.

Media and Carrier recorded $330 million revenue which is growth of 5% year afteryear. Web department generated $376 million revenue which is increase of 7% year after year.

6. SUSTAINABILITY STRATEGY :

Akamai's environmental sustainability initiative focuses on addressing the effects of their energy consumption, greenhouse gas (GHG) emissions, and e-waste generation on the environment. Environmental stewardship is also becoming increasingly important for Akamai's clients, and their achievement helps them attain sustainability objectives in their supply chain.Looking through the sustainability lens offers a fresh view, stimulating new methods of thinking about activities, markets, and supply chain, and inspiring innovation.For the greatest impact, Akamai's sustainability programs concentrate on several main fields such as carbon efficiency network, renewable energy, electronic waste management, and corporate offices with the lowest environmental impact. Akamai's goal is to mitigate their worldwide operations environmental effect, infusing measurable sustainability practices into the organization.

In 2009, Akamai began its corporate sustainability program with a focus on gathering energy data linked to energy savings and carbon intensity reduction programs. Their various categories of criteria for managing carbon effects were extremely complicated, including:

- Various worldwide geographical centers and a complicated organizational hierarchy composed of owned, co-located and third-party data centers
- Requirements for tracking power and carbon data at asset level (servers, switches, etc.) at owned and rented locations added another complexity layer.
- Employee travel with more than 30,000 flights per year with the need to monitor carbon per flight
- Report on large amounts of information and display outcomes instantly
- Manual data collection process
- Inability to alter or customize workflows and automate overhead data center calculations such as cooling, heating, etc.

Akamai managed to overcome all the abovechallenges by making major changes to their processes, such as

- Started to manage carbon effects at the level of granular assets rather than the general level of operation, which enabled Akamai to monitor the effects of individual equipment at each of its thousands of data centers
- Implemented on-the-fly and instantaneous impact workflows and calculations for data center infrastructure (cooling, heating, etc.)
- Enabled to upload thousands of airport coded flights in bulk or individually with immediate results calculation based on large circular distances and flight routes

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- Maximizing the use of virtual machines and allocating low voltage laptops, Macintosh and monitor to decrease power consumption for staff.
- By promoting teleworking with advanced video conferencing solutions andteam-working tools there by reducing travel attempts
- By improving efficiency in corporate offices and reducing material consumption and waste.
- Engaging network data center vendors to enhance their operations energy, carbon and water efficiency etc. are some of Akamai Technologies measures taken.

A Cleaner, More Efficient Network is accomplished by lowering server energy consumption and related greenhouse gas emissions by providing renewable energy and growing server energy efficiency and productivity.Being an e-Stewards Enterprise Akamai is the socially and environmentally accountable management of their decommissioned electronic resources by upgrading reuse, reselling and recycling systems in collaboration with e-Stewards certified suppliers. Akamai shares its sustainability objectives, strategies and advancement on its business page and through collective annual disclosure to the CDP by keeping transparency and accountability.The environmental management system of Akamai is structured in accordance with the ISO 14001 PDCA model and covers its global operations and services. Akamai's inventories starting from Scope1 to 3 follow various International standards. It is ensured that Greenhouse gas emissions are ISO 14064-3 compliant.

7. CORPORATE SOCIAL RESPONSIBILITY :

There is a committed group of individuals working on their community outreach programs continuously at Akamai. Returning is one of the key principles of Akamai and an essential part of their Diversity & Inclusion programs. Akamai thinks that people are stronger when individuals from distinct cultures, backgrounds, and personalities come together as a team. Everyone thinks differently, so they see challenges and the way they can be solved differently. Therefore, everybody's outreach is part of a corporate efforts to ensure that everyone actively contributes to the community's well-being. Akamai think in making technology available to all because it's essential for everyone. The Corporate Social Responsibility programs of Akamai range from big to small and revolve around three key pillars: education, community development, and inclusion. In India, Akamai run Math for Fun program, through which they have partnered with about 900 colleges to provide some 50,000 learners with a basic math base. This program is aimed at children aged 9 and 10. Maths for Fun aims at giving young people the abilities to make them employable early in their education. Feedback from their studies showed an enhancement in multiple aspects of mathematics by more than 35 percent. Other examples of outcomes from CSR programs by Akamai include having reached nearly 500 colleges in and around Bangalore with menstrual hygiene education. They built washrooms to offer the advantages of cleanliness to young individuals. Akamai also conducted a skill training program for 150 youth with different skills, preparing them for significant job possibilities. Akamai staff are always volunteering in these CSR programs. They find it an advantage for staff to feel that they are giving back to the society. This could be in-person, engaging actively with participants in their CSR programs, or raising cash for activities like local floods through a compilation.

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8. CUSTOMERS AND STAKEHOLDERS :

For the largest companies in the world, Akamai provides digital experiences and protects them against attacks, threats, etc. Akamai Technologies smart edge solution encompasses all from the cloud to business, so clients, their business can function quickly, smartly, and safely.Akamai has a highly skilled customer support and round the clock monitoring team to support portfolio of edge security, web and mobile performance, business access and video distribution solutions and OTT solutions.Some of the key customers of Akamai are listed here,Adobe, Airbnb, Asus, Bangkok Bank, Best Buy, Hotstar, IBM, MTV Networks, NASDAQ OMX Group, NDTV, Sophos, US Army, US Airforce, Viacom, WorldNow etc.Akamai selects suppliers based on their capacity to consistently deliver the highest general value in terms of high quality goods, professional services, competitive pricing, and established track record for continuing and proactive client support.

9. COMPETITORS :

The content delivery network domain is quite competitive. For decades, some CDNs have been around while others are still quite fresh. There are important variations, however, which distinguish each CDN from the others. Akamai has been around in the CDN field for more than 20 years and is a trusted name. Akamai's solution market is extremely competitive and distinguished by quickly altering technology, evolving sector norms and frequent fresh product and business innovations. Akamai can expect competition from current rivals as well as fresh market entrants to boost their offers.

Below are the top 5Akamai Technologies competitors [11]:

1. **Level 3 Communications, Inc.**

Level3 has its own worldwide Tier1 network. Level3 CDN lies on top of that. Tier-1 Network has POPs in various geographic areas. Their product focuses on the distribution of video and huge objects. Level3 content delivery network is interconnect' s element of Google Cloud content delivery network.

2. **Limelight Networks, Inc**.

Limelight is providing services related to content delivery network ever since 2001. Its advanced POP network spread across the globe. Limelight offers digital content delivery, real time streaming and on-request video, cloud security, and advanced computing services.

3. **CloudFront**

CloudFront is Amazon Web Services ' Content Delivery Network, the world's largest cloud service provider. CloudFront provides numerous CDN products including APIs and has POPs spread throughout the world. CloudFront has a thorough documentation to make life easier for developers.

4. **Verizon Digital Media Services**

Verizon Digital Media Services is the division of Verizon. Established in 2011, VDMS purchased EdgeCast CDN for its streaming video technology in 2013 and launched Lynk. VDMS focuses on streaming video and aims to be a major OTT service provider

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5. **Cloudflare**

Cloudflare offers distinctive performance capacities for a worldwide CDN with a powerful concentration on security. The firm has a worldwide infrastructure constructed using higher end latest technology devices of the next generation — no legacy software or hardware.

Product comparison of all the six CDN service providers can be seen in below table3.

Table 3:CDN feature list

Product	Level 3	Limelight	CloudFront	Verizon	Cloudflare	Akamai
Dynamic content delivery	No	Yes	Yes	Yes	Yes	Yes
Small file delivery	Yes	Yes	Yes	Yes	Yes	Yes
Large file delivery	Yes	Yes	Yes	Yes	Yes	Yes
Live video	Yes	Yes	Yes	Yes	No	Yes
Video on demand	Yes	Yes	Yes	Yes	Partially	Yes
Image Optimization	No	Optional	No	No	Yes	Yes
DNS	No	Yes	Yes	Yes	Yes	Yes
WAF	No	Yes	Yes	Yes	Yes	Yes
Anti-DDoS	Yes	Yes	Yes	Yes	Yes	Yes
Private CDN	No	Yes	No	No	No	Unknown

In the future, Akamai may have more competition as telecommunications companies like AT&T add content distribution capabilities to their telephone networks. As such, the competitive reactions of Akamai in the future are likely to be more drastic.

10. ANALYSIS

Akamai Management is happy with the great beginning of the year as revenues, margins and income exceed expectations. The outstanding performance was stimulated due to the steep increase in their security and media business. Their ability to enhance effectiveness while continuing to invest in innovation and fresh products in order to drive future development also contributed towards the financial growth [12].SWOC Analysis is a well-known tool used to understand the company's present condition by evaluating Strengths, Weakness Opportunities & Challenges [13].

Below is SWOC Analysis details of Akamai Technologies [14].

Strengths

1. Excellent client base, consistent income

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2. Distributed products Portfolio enables a range of markets to be served
3. Competitive advantage over strong network capability
4. Sturdy research and development with solid finances
5. More than 7,500 staff working for the company
6. Facebook, Apple, Twitter are among their clients

Weaknesses

1. Revenue depends heavily on the United States market
2.Shortterm liquidity issues
3. Akamai is geared more towards enterprise customers
4. New feature releases may take more time than smaller, more agile CDNs
5. Akamai's bandwidth costs are expensive

Opportunities

1. Increase in bandwidth requirements for cloud computing to be used
2.Inorganic growth
3.Cyber and Information security – an ever green domain

Challenge

1. Strong competition in the industry from old and newcomers
2.The data privacy guidelines
3.Rapid technological progress

11. SUGGESTIONS FOR FURTHER IMPROVEMENT :

We propose following suggestions for further enhancement on the basis of the above assessment.

- Affordable bandwidth cost would attract SMBs and boost income as a result.
- By paying equal attention to non-enterprise clients, it will help Akamai to sell its solution among mid-level industries.
- Quick turn around and take a more solid approach to developing and releasing fresh features would keep Akamai on an equal footing with its competitors.

12. CONCLUSION :

Over a span of two decades, the firm that founded to fix the internet slowness challenge has become a multi-solution supplier firm and now Akamai has solutions to more than thirty distinct kinds of problems in the internet world. Akamai made an entry into CDN field in the late 90's and started focusing on increasing the website speed of their clients. Over time, Akamai has improved their technology and purchased various businesses to deliver other kinds of CDN services. Several external development activities, purchases of Nine Systems, Netli, Speedera Networks and Cotendo have been carried out by Akamai since its establishment. It is obvious that by embracing both organic and inorganic methods, Akamai is expanding its grip on the field of digital experiences.

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