

Developing a Platform Strategy for Akamai Cloudlet Applications

by

Ming Jiang

B.S. Computer Science, Huazhong University of Science and Technology, 2004
M.S. Computer Science, Worcester Polytechnic Institute, 2008

SUBMITTED TO THE SYSTEM DESIGN AND MANAGEMENT PROGRAM
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

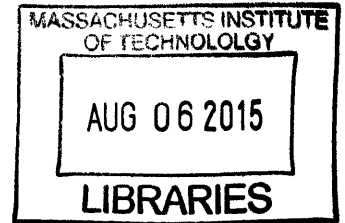
MASTER OF SCIENCE IN ENGINEERING AND MANAGEMENT

AT THE

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

January 2015 [February 2015]

ARCHIVES



©2015 Ming Jiang, All rights reserved

The author hereby grants to MIT the permission to reproduce and to distribute publicly paper and electronic copies of this thesis document in whole or in part in any medium now know or hereafter created

Signature redacted

Signature of Author...

Ming Jiang
System Design and Management Program, MIT
January 25, 2015

Signature redacted

Certified By.....

Michael Cusumano
Sloan Management Review Distinguished Professor of Management and Engineering Systems, MIT
Thesis Supervisor

Signature redacted

Accepted By.....

Patrick Hale
Senior Lecturer, Engineering Systems Division, MIT
Director, System Design and Management Program

THIS PAGE INTENTIONALLY LEFT BLANK

Developing a Platform Strategy for Akamai Cloudlet Applications

by

Ming Jiang

Submitted to the System Design and Management Program on January 30, 2015
in partial fulfillment of the requirements for the degree of
Master of Science in Engineering and Management

Abstract

Akamai, a high tech company based in Cambridge Massachusetts, is a market leader in global Content Delivery Network (CDN) industry. To fully leverage opportunities and also tackle challenges in market, the company has been keeping innovating new products and providing new services to keep existing customers while attracting new ones.

One of company's strategic plans is to extend company's current products and services into an industry platform, such that Akamai can leverage other companies' resources to better serve broader customer base to achieve sustainable growth. One product identified by the company that has the potential to be extended into industry platform is called Cloudlet. Cloudlet is a series of new applications launched by Akamai in 2014. Those applications aim to solve business and operational challenges that customers have but do not belong to traditional CDN services.

The research topic of this thesis is to develop platform strategies that could extend Cloudlet into a platform. To achieve this goal, the writer started with reviewing related literatures and identified existing frameworks to conduct systematic analysis on challenges the company may encounter in different aspects. Also, the writer gained first hand experience by working in Cloudlet product management team and initiated a series of interviews with different stakeholders inside the company for different perspectives. Also the writer has conducted two case studies regarding successful cloud services to identify best practices that Cloudlet team inside Akamai can leverage. Finally, a list of strategic actions is proposed for Cloudlet platform transformation with analysis on how these actions can best attract customers and motivate stakeholders internally and externally.

Thesis Supervisor: Michael Cusumano

Title: Sloan Management Review Professor of Management and Engineering Systems

Department: Massachusetts Institute of Technology, Sloan School of Management

Acknowledgements

I would like to first express my appreciation to Pat Hale during my studies at MIT. We are so privileged to have someone like you who are always ready to listen to and help all students.

I would like to thank my thesis advisor, Professor Michael A. Cusumano, not only for your guidance on thesis but also mentorship on software businesses, platform strategy and high tech entrepreneurship.

It is impossible to complete this thesis without supports from the management team of Akamai. The product management internship in Akamai Cloudlet team enabled me to gain first hand experience and conduct research needed for this thesis. The conversation with the management team of Akamai Web Experience Business Unit and broader access to the personnel in different departments helped me better understand the technology and business sides of Akamai. Specifically, I want to thank Maya Bustan, Zoltan Poleretzky and Ravi Maira for their guidance on strategies, challenges and insights of Akamai's business.

I want to express my deepest gratitude to my wife, Yingying Lang. Without her patience, sacrifices and unconditional support, I would not be able to complete my studies. A special word of thanks also goes to my family for their continuous support and encouragement.

The amazing experience at SDM program and MIT community not only equipped me with skills and knowledge for career development but also reshaped my approach to analyze and solve problems. I will always cherish the memories of past two years.

Ming Jiang,
January 2015

THIS PAGE INTENTIONALLY LEFT BLANK

Table of Contents

Chapter 1 – Overview	11
1.1 Background	11
1.2 Motivations	12
1.3 Research Questions and Approach	13
1.4 Thesis Roadmap	13
Chapter 2 – Literature Review	15
2.1 Software Business Models	15
2.1.1 Three kinds of business models.....	15
2.1.2 Companies Growth Strategies.....	16
2.1.3 Shifts from Products to Services (as Life-Cycle).....	16
2.2 Platform Strategies	17
2.2.1 Platform Definitions.....	17
2.2.2 Platform Leadership Analysis Framework.....	19
2.2.3 Strategies to Grow into a Platform Leadership Position.....	21
Chapter 3 – Akamai Technologies	23
3.1 Company History	23
3.2 Current Product Portfolios	23
3.2.1 Web Services.....	24
3.2.2 Enterprise Services.....	25
3.2.3 Security Services.....	25
3.2.4 Media Services.....	26
3.2.5 Network Services.....	26
3.2.6 Summary.....	26
3.3 Market Positions	27
3.3.1 Revenue Analysis.....	27
3.3.2 Competitions.....	29
3.4 New Challenges and Opportunities in Technology	31
3.4.1 Web Surfing From Mobile Devices.....	31
3.4.2 Fragmentation of Mobile Devices.....	32
3.4.3 Responsive Web Designs.....	35
3.5 New Challenges and Opportunities in Business	36
3.5.1 Traditional Media market: Decreasing margin.....	36
3.5.2 DevOps: Emerging Demands and Best Practices from Enterprises.....	36
3.5.3 Western Europe and Pacific Asia: Increasing market potential Outside US.....	37
3.6 Cloudlet	38
3.6.1 Akamai Web Experience (WebEx) Business Unit.....	38
3.6.2 Cloudlet: Basic Concepts.....	39
3.6.3 Cloudlet: Motivations and Challenges.....	40
Chapter 4 – Cloud Computing Platform Strategy Case Studies	42
4.1 Introductions to Amazon Web Services (AWS) and Salesforce	42
4.1.1 Salesforce.....	42
4.1.2 Amazon AWS.....	44
4.1.3 Differences between the two platforms.....	46
4.2 Platform Lever 1 – Scope of the Firm	48

4.2.1 Salesforce	48
4.2.2 Amazon AWS.....	49
4.3 Platform Lever 2 – Product technology.....	50
4.3.1 Salesforce	51
4.3.2 Amazon AWS.....	52
4.4 Platform Lever 3 – Relationships with external complementors.....	55
4.4.1 Salesforce	56
4.4.2 Amazon AWS.....	59
4.5 Platform Lever 4 – Internal organization	60
4.5.1 Salesforce	60
4.5.2 Amazon AWS.....	61
4.6 Summary	62
Chapter 5 – Platform Strategies for Cloudlet.....	63
5.1 Potential Business Model for Cloudlet Platform and Partners.....	63
5.2 Four Levers Analysis for Cloudlet	63
5.2.1 Scope of the Firm	63
5.2.2 Product Technology.....	66
5.2.3 Relationships with external complementors.....	67
5.2.4 Internal organization	69
5.3 Conclusion	70
Bibliography	72

Table of Figures

FIGURE 1: IP TRAFFIC FORECASTS BY CISCO VISUAL NETWORKING INDEX.....	11
FIGURE 2: PRODUCTS AND SERVICES IN SALES OVER TIME.....	16
FIGURE 3: NETWORK EFFECTS IN PLATFORM ECOSYSTEM	18
FIGURE 4: STRATEGIES TO BECOME A PLATFORM LEADER.....	21
FIGURE 5: AKAMAI PRODUCT PORTFOLIOS.....	24
FIGURE 6: AKAMAI REVENUE PROJECTIONS	27
FIGURE 7: AKAMAI REVENUE IN PRODUCT CATEGORIES.....	28
FIGURE 8: AKAMAI REVENUE IN DIFFERENT REGIONS.....	29
FIGURE 9: CDN PROVIDERS COMPARISON IN REVENUE AND CONTRACTS	30
FIGURE 10: INDIA INTERNET TRAFFIC BY TYPE	31
FIGURE 11: GLOBAL SMARTPHONE MARKET SHARE BY PLATFORM	33
FIGURE 12: ANDROID DEVICE FRAGMENTATION.....	34

FIGURE 13: ANDROID OS VERSION FRAGMENTATION34
FIGURE 14: ANDROID DEVICE SCREEN SIZE FRAGMENTATION35
FIGURE 15: GLOBAL CDN REVENUE PROJECTION37
FIGURE 16: APPEXCHANGE STATISTICS BY 2014.....43
FIGURE 17: APPEXCHANGE APP INSTALLATIONS FROM 2006 TO 2013 SEPTEMBER.....44
FIGURE 18: AMAZON WEB SERVICES BUSINESS STRATEGY45
FIGURE 19: AMAZON "OTHER" REVENUE GROWTH46
FIGURE 20: THREE CLOUD COMPUTING MODELS47
FIGURE 21: AMAZON WEB SERVICES OVERVIEW.....50
FIGURE 22: AMAZON WEB SERVICES ARCHITECTURE.....54
FIGURE 23: AMAZON WEB SERVICES DATABASE PRODUCTS55
FIGURE 24: RECOMMENDATIONS FOR CLOUDLET PLATFORM STRATEGIES.....71

To Yingying & Charles:

THIS PAGE INTENTIONALLY LEFT BLANK

Chapter 1 – Overview

1.1 Background

Internet traffic has been increased explosively in the past decade. According to Cisco Visual Network Index statistics (Cisco , 2014), the global Internet traffic has grown from 100 GB per day to 28,875 GB per second in 2013. For special events, traffic can soar tremendously. For example, during World Cup 2014, the video streaming and IP broadcast of this event was estimated to generate 4.3 Exabyte of IP traffic, three times the amount of monthly IP traffic currently generated by Brazil (Colt, 2014).

The rapid growth of global Internet traffic will remain in the near future, shown in Figure 1 (Cisco , 2014). This brings up significant challenges for all websites to deliver massive online contents to all Internet users with great web experience. Another layer of complexity is that Internet users nowadays are using a wide range of devices, from traditional PCs to the latest version of mobile devices such as tablets and smartphones with various sizes of computing capabilities and screen sizes, which makes it much harder to deliver and display contents appropriately to users.

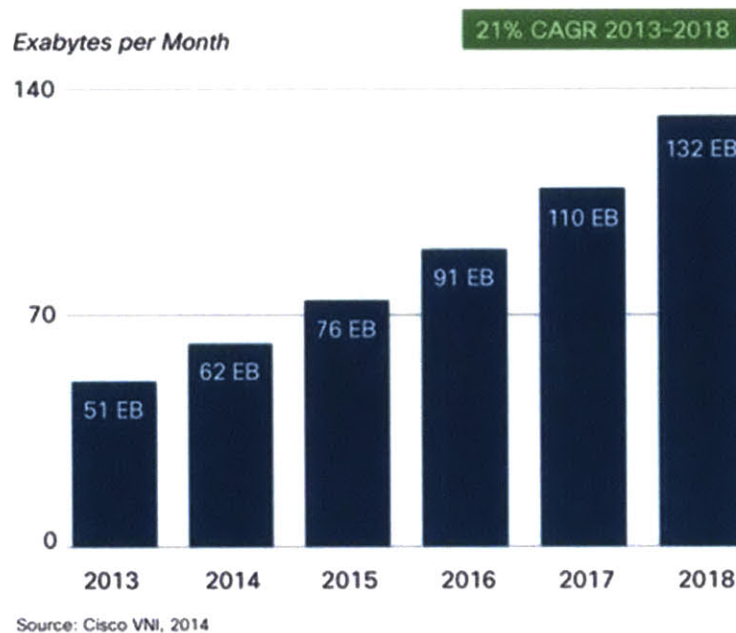


Figure 1: IP Traffic Forecasts by Cisco Visual Networking Index

To make it even more challenging, Internet users are getting more impatient when waiting for webpages to load. According to a white paper from Zona research, consumers in 1999 are willing to wait up to 8 seconds for webpage load (Zona Research, 1999, p. 4). Because of unacceptable download speeds, the research estimated that \$362.2 MM per month, or around \$4.3B per year, in commerce sales might be lost per month in US by then. Nowadays, 47% of consumers expect a webpage to load in no more than 2 seconds, and 40% will abandon websites that take more than 3 seconds to load (Work, 2011). For an E-Commerce site making \$100,000 per day, one-second page load delay potentially cost \$2.5 MM in lost sales per year.

Akamai Technologies is a company that facilitates enterprises and organizations to provide great web experience to end-users, with its Content Delivery Network (CDN) technologies. With more than 160,000 servers in 95 countries within over 1,200 networks, Akamai delivers between 15-30% of all Web traffic (Akamai Technologies, 2014). Because of its leading technology and market position, the company has remained double digit growth in revenue in the past five years. In 2013, Akamai had annual revenue of \$1.58B, and the senior management set an ambitious goal of reaching \$5B revenue in 2020. To achieve that, Akamai needs to grow even faster in its business.

1.2 Motivations

With the ever increasing online contents and traffic, the company has identified great opportunities generated from market needs and emerged from latest technology trends, which will be discussed in detail in Chapter 3.

On the other hand, however, the company is also facing challenges, both internally and externally. Internally, the company needs to setup required processes and organization structures in order to support the rapid business growth, and also grasp opportunities in the future. With more established processes, however, the company needs to keep spirit of innovation and agility. Externally, the company are seeing more and more competitions, not only from new entrants in market but also from previous partners. In addition, due to the technology maturity, the traditional CDN technologies soon become commoditized and result in dramatic price cut.

Facing the above opportunities and challenges, the company has been actively developing innovative new products and expanding customer base. In addition, the company is also developing platforms that allow and promote external stakeholders to leverage the company's technologies. Such a strategy, as we will see in Chapter 2, not only ensures that the company can stay focused on its core competitiveness, but also enables the company to fully leverage industry intelligence. Subsequently, the company launched Akamai Open Platform Initiative in 2013 to enable customers and partners to use, integrate and control Akamai technologies in their own business context more easily (Akamai Technologies, 2013). Also, Akamai actively developed business and technical partners in order to scale up its revenue.

In 2014, the company launched another category of products, Cloudlet, with high potential and great vision. Cloudlets are developed to solve particular business and operational challenges that customers may share. For example, many E-Commerce customers struggled to process all transaction requests during holidays such as Black Friday, in which the number of end user transaction requests simply go beyond the capabilities of their servers to handle. In such cases, E-Commerce customers witness a high percentage of abandonment of requests from end users because of long time waits. A Cloudlet called "visitor prioritization" can help E-Commerce customers decrease abandonment in above scenarios by providing a user-friendly waiting room experience for end users whose

requests cannot be processed immediately. This not only improves end user experience but also makes direct impacts on revenue generated in busy seasons.

Cloudlets attracted customers attention immediately after its initial launch in 2014, and many new product ideas are sent to the Cloudlet product team from internal organizations such as Customer Support, partners and also external customers. Such requests, though exciting, bring up two challenges. First of all, Akamai and also the Cloudlet team is not in the best position to develop appropriate Cloudlet applications for customers in different verticals, as we do not have all the needed expertise. Secondly, there are limited resources inside the company and the Cloudlet team simply cannot develop all the exciting ideas. It is commonly agreed that Cloudlet should be developed into a platform, which can be adopted by technical partners and also customers to develop specific applications cater to their needs.

1.3 Research Questions and Approach

To transition the Cloudlet into a platform, however, requires the Cloudlet team to develop clear strategies for the product and platform development. For example, what are the sustainable ways to enable, incentivize and govern technical partners of different sizes and in different verticals to use the Cloudlet platform? Also, to best align the interests of internal and external stakeholders, what are the processes and organization structures need to be employed? Last but not the least, what are the potential obstacles and challenges the Cloudlet team may encounter, and what are the options we can identify in the light of best practices learnt from industry?

The following three research methods are employed to answer above questions, the. First of all, the author work inside the product management team of Cloudlet for six months to gain first hand experience. Besides, the author interviewed and discussed with peer product and marketing managers, director of engineering directors, VP and director of Platform Strategy, Finance analysts, and architects and engineers of Customer Support and Professional Services to gain perspectives from different stakeholders. Secondly, literature, industry report and company internal reports are reviewed and analyzed to gain further insights. Last but not the least, two similar cloud services in industry that are leading platforms, Salesforce and Amazon Web Services are examined to identify strategies and best practices that Cloudlet team can leverage.

1.4 Thesis Roadmap

The thesis will be structured in the following way:

Chapter 1 gives an introduction to Akamai, along with brief descriptions of challenges and opportunities in CDN industry. Background information, motivations and also methods of this research will also be presented.

Chapter 2 reviews literatures that explore challenges, strategies and best practices for companies in various development phases, especially in enterprise software industry. We

will also demonstrate Gawer and Cusumano's platform leadership analysis framework, which will be used in Chapter 4 and Chapter 5.

Chapter 3 describes history of Akamai and its current product portfolios, followed by revenue and competitor analysis. Subsequently, we will describe challenges and opportunities the company is facing, and how Web Experience Business Unit inside Akamai set its own strategic goals correspondingly. Finally, Cloudlet, a product that aligns with such goals, will be introduced and challenges to extend it into a platform raised.

Chapter 4 examines in detail two leading platforms in cloud service industry, Salesforce and Amazon Web Services, through the platform leadership analysis framework. These case studies examine how these two companies expand their existing capabilities and products into platforms, and what are their specific decisions in different levers.

Chapter 5 investigates current and potential challenges of Cloudlet in different levers, and how the product management team can best leverage conclusions and best practices from Chapter 4. Finally, we will identify areas Cloudlet team should explore further to develop a platform strategy for Cloudlet.

Chapter 2 – Literature Review

In this chapter, we will review literatures whose topics are related to the research questions raised in Chapter 1. We will first present literatures about the business models and growth strategies in enterprise software industry. Then we will focus on researchs related to the platform strategy, including characteristics of industry platform, platform leadership analysis framework and ways to become a platform leader.

2.1 Software Business Models

2.1.1 Three kinds of business models

In his 2004 book (Cusumano M. A., *The Business of Software*, 2004, pp. 25-71), Cusumano discusses three types of business models in enterprise software industry: products companies, services companies and hybrid solution companies.

The primary focus of products companies, such as Microsoft and Adobe, is to “sell fully standardized product-packaged software”. Cusumano calls this “the printing press model” because “replicating software packages is similar to printing money or books”. As This also implies that the profit margin of such companies can be very high.

The primary focus of services companies, such as PricewaterhouseCoopers or IT divisions of IBM, is “to sell services other firms”. Also, “services range from consulting and systems integration to product customization and maintenance of custom systems”. Such a large scale of integration and customization are usually labor-intensive, which usually implies lower margin on average, when compared with products companies.

The primary focus of hybrid solutions companies is to sell “a mixture of products and services, with maintenance upgrades or special product enhancements that must be supported in the future”. Such companies usually owns a set of stable customer base with long-term contracts.

Nowadays we have witnessed quite some new business models in current enterprise industry. Software-as-a-Service, specifically, has become a popular model of providing software functions to customers., instead of sending them a CD or DVD that contains a copy of the software. Using SaaS model, customers do not need to install the software on premise and save greatly in system integration and configuration. Most importantly, using SaaS model, customers can customize or deploy the user interfaces or components of software products to some extent, which makes the boundaries between products and services a bit blurry. Also products provided though SaaS model usually come with a subscription pricing model. This means that product companies can now also generate recurring revenues, just like services companies.

The differences between products companies and services companies, however, still hold in current enterprise software industry. The products companies, at its core, are those that provide standardized version of software functions to customers. Most importantly, they

can serve new customers with very low marginal cost. As we will see in the following sections, current enterprise software product companies, either selling products in traditional ways or using SaaS model, still encounter the same challenges.

2.1.2 Companies Growth Strategies

There can be three following strategies for rapid growth of a company (Von Krogh & Cusumano, 2001): scaling, duplicating and granulating. Scaling is to invest more in marketing and sales and sell more products to more customers. Duplicating is to sell the same or very similar products to new geographic markets or similar product markets. Granulating refers to create new business units to target new product opportunities. One of many successful examples can be SAP, which started to create new business units to take advantage of emerging technologies and markets after pushing scaling and duplicating its sales of ERP applications to the limit. As long as the targeted new businesses and products are related to the core products and technologies, diversification generated by such granulation can be a great way to grow.

2.1.3 Shifts from Products to Services (as Life-Cycle)

Cusumano also argues that products companies will inevitably transition into services companies or hybrid solutions companies. Figure 2 (Cusumano M. A., *The Changing Software Business: Moving From Products to Services*, 2008, p. 18) shows revenue split in products and services of a sample of software companies from 1996 to 2000. The decline of percentage of revenues that come from products can be observed not only as an industry trend, but also in many specific companies such as Oracle.

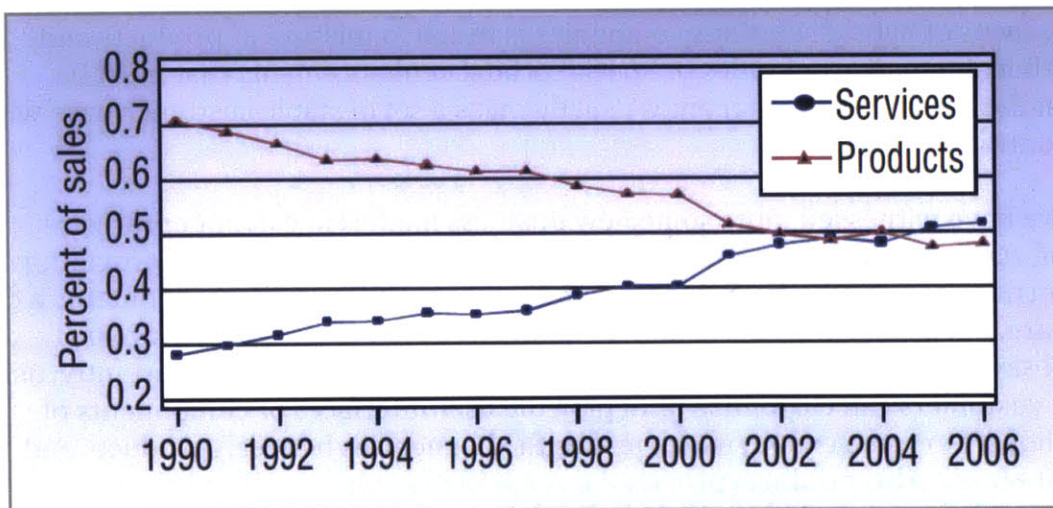


Figure 2: Products and Services in Sales over time

Such a shift in industry is partly due to the recession followed by the Internet boom in 2000. For a specific company, there can be another two reasons. The first reason can be the market for standard products have been saturated. Therefore, in order to seek customers

that do not accept standard version and requires customization, the company started to step into services business. A worse scenario is that there is very few or no new customers and the company are relying on long term contracts of services or upgrades on existing customer base. Either scenarios implies that services will contribute more to the revenue percentage wise. The second reason can be price decrease. Technologies may be comoditized quickly and players start to compete with each other on price cut. Note this second scenario may also leads product companies to provide value-added services to existing customers.

As a result, a software product company that stays long enough in a market may inevitably fall into services company. Its revenue may continue to grow, however, the profit margin will start to decline, because new customers or revenues now require proportional marginal cost. This is very different from the scenario of providing standard solutions only in which the marginal cost can be almost zero.

2.2 Platform Strategies

Companies have identified various strategies to keep fast growth or high profit margin (to some extent) during the transition from product companies into hybrid solutions companies or services companies. For example, companies like IBM decouple service contracts from product contracts such that the growth of contract services become independent of their product businesses. Companies that can achieve this may ensure faster growth overall, but its products could still face the same challenges discussed in the above section.

Another strategy is to productize some identified popular customizations among customers. Such productizations help reduce headcounts required to serve customers who require some customization. Another variation of this strategy is to provide some kind of easy tools to enable customers to customize or configure the product themselves, especially in SaaS model. As we will see in next chapter, one benefit that Akamai gained from launching Cloudlet applications is to enable enterprise customers to specify the application behaviors in a much easier. This in turns requires less work from customer support team and in turn increase profit margin of the corresponding business unit. However, the scope of such strategies are limited to how many customizations can be productized.

A popular and powerful strategy is to develop a platform and ecosystem around the company products. In this chapter, we will present the platform strategy in detail.

2.2.1 Platform Definitions

Traditionally, a platform is defined as “product platform” that refers to components with which companies can develop a set of similar products sharing similar functions and modules. Product platforms are used inside the company only and requires architecture designs to be highly modularized.

In their 2002 book, Gawer and Cusumano (Gawer & Cusumano, Platform Leadership, 2002, pp. 2-3) uses this word to refer to “industry platform”. Industry platform are technologies, services or product components developed by one company, but are adopted by other companies in industry to develop complementary services or products. Industry platforms differ from product platforms in the following two points.

First of all, the industry platform has little value to the end users without complementary products or services developed by other companies, e.g. complementors. Therefore, platform providers need to not only enable but also encourage other companies to use such platforms.

Secondly, a successful industry platform will cause network effects, shown in Figure 3 (Cusumano M. , 2010, p. 25): increasing users that use the platform will attract more other companies to develop more complementary products and services over the platform. Increasing products and services over the platform, in turn, will attract more users to adopt the platform.

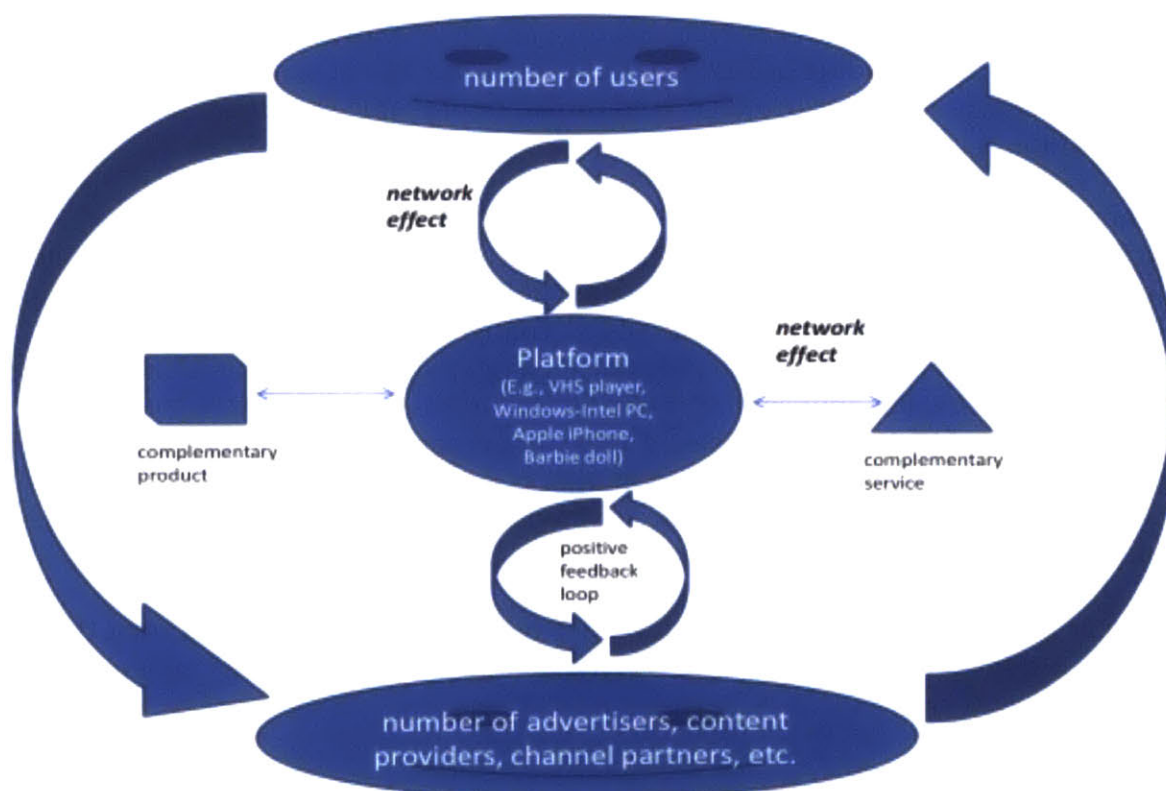


Figure 3: Network Effects in Platform Ecosystem

A Platform provider that can generate positive network effects in the ecosystem around it definitely puts itself in great position for at least two reasons. First of all, the platform

provider can leverage the resources and expertise from complementors to make its own platform more powerful and attractive to end users. Also, the integration and synergies generated from platforms and complementors will make the ecosystem more powerful than just the sum of functions provided by platform and the complementors. Secondly, a platform provider that can successfully attract enough complementors will make it hard for imitators and followers to compete, because those potential competitors cannot provide the functions of the similar scale to the users.

2.2.2 Platform Leadership Analysis Framework

Platform leaders are referring to companies that become leaders in industries by successfully implementing platform strategies. Due to different company capabilities, business vision and market dynamics, platform strategies vary greatly even among platform leaders. To analyze different companies in a structured way, Gawer and Cusumano established a framework that consists of four levers (Gawer & Cusumano, Platform Leadership, 2002, p. 40), which are elaborated as follows:

(1) Scope of the Firm

The first lever discusses what complements platform leaders decide to develop in-house and what to leave to complementors to develop. There are three factors to consider when companies define the scope of the firm.

First of all, platform providers need to define the scope based on current capabilities. Complements developed by the platform providers should best stimulate the adoption of the platform and align with the company's core competences. Otherwise, the company will be challenged by the developments of the complements and also placed itself in competitive positions with complementors.

Secondly, platform providers need to develop a vision of their platforms in the future. A clear vision will help platform providers identify the core competences of the company and understand what roles complementors play in the ecosystem around the platforms they create.

Thirdly, platform providers need to investigate current markets for complementary products or services that already exist. If the market is not mature in this aspect, product providers may need to develop some complementors in-house in order to attract initial users, or create incentives to motivate other companies to become complementors of the platform.

As the above three factors keep changing, decisions about the scope of the firm are more like continuous discussions inside the company rather than a one-time analysis. As decisions made on this lever will greatly affect the other three levers, scope of the firm can be the most critical decisions inside a platform strategy.

(2) Product Technology

The second levers refer to decisions made in product architectures, interfaces and also intellectual property. For architectures, platform providers need to decide on the level of modularity. High level of modularity enables external complementors to adopt the available functions of the platform, even though it may require sacrifice on the system efficiency. For interfaces, platform providers need to be open such that complementors can utilize the platform, but be careful at the same time not to disclose its proprietary information regarding their intellectual properties, if there is any.

(3) Relationships with External Complementors

Platform providers can have competitive, collaborative or mixed relationships with their complementors. In order to attract more complementors to the platform, the platform providers need to stay neutral.

Affected by decisions made in the first two levers and changes in internal and external factors, however, platform providers may decide to develop some complementary products or services themselves. This will in turn put them into competitive positions with current complementors. Whether a platform provider should step into complementors' businesses should be relied on if such decisions can ultimately stimulate more end users. In addition, how to split the revenue and best motivate the complementors need to be defined. Decisions on this lever are greatly affected by the first two levers.

(4) Internal Organizations

To best support the decisions made on the first three levers, platform providers need to examine internal organizations to make sure it can best support their overall platform strategies. Specifically, they need to look into the following three aspects.

The first aspect is organization structure. It is critical to ensure that internal organizations are structured in a way such that each unit should not have conflicted goals or interests. The second aspect is process and culture. In addition to organization structures, processes can help enforce expected communication, clarify

responsibilities and standardize project procedures. Also, platform providers should foster a culture inside the company that promotes innovation and sustain the core competences of the company. Last but not the least, the platform provider should keep a holistic view of the platform and the ecosystem around it. Also, the company should keep mind that platform should stay neutral. This helps to build trust between the platform provider and their complementors, and foster more complementary products and services in the long run.

2.2.3 Strategies to Grow into a Platform Leadership Position

The previous sections presented a framework to analyze different aspects of a platform leader and what needs to be considered for a platform provider that wants to be a leader. Gawer and Cusumano also propose two strategies that help platform providers to grow into a leadership position in two specific areas, presented in Figure 4 (Gawer & Cusumano, How companies become platform leaders, 2008).

Strategic Option	Technology Actions to Consider	Business Actions to Consider
<p>Coring How to create a new platform where none existed before</p>	<ul style="list-style-type: none"> • Solve an essential "system" problem • Facilitate external companies' provision of add-ons • Keep intellectual property closed on the innards of your technology • Maintain strong interdependencies between platform and complements 	<ul style="list-style-type: none"> • Solve an essential business problem for many industry players • Create and preserve complementors' incentives to contribute and innovate • Protect your main source of revenue and profit • Maintain high switching costs to competing platforms
<p>Tipping How to win platform wars by building market momentum</p>	<ul style="list-style-type: none"> • Try to develop unique, compelling features that are hard to imitate and that attract users • Tip across markets: absorb and bundle technical features from an adjacent market 	<ul style="list-style-type: none"> • Provide more incentives for complementors than your competitors do • Rally competitors to form a coalition • Consider pricing or subsidy mechanisms that attract users to the platform

Figure 4: Strategies to become a Platform Leader

Coring strategy can be applied in emerging markets where an essential system problem (usually a technical one) has yet been solved. If a company can provide a technical solution for such problem, and also provide appropriate incentives to motivate other companies to create value-added complementary products and services based on such technologies, then the company can potentially become a platform leader.

Tipping strategy, on the other hand, can be applied in markets that have already witnessed a number of platforms. Companies need to attract complementors and also end users to adopt their platforms by leveraging its technical capabilities and also providing economic incentives. On technical side, companies can develop complements that are extremely useful to end users, and then complementors may adopt the platform because of large customer base. The developed complements can also be very helpful for other companies to develop new functions, and then attract end users because of increasing number of functions available in the ecosystem. On business side, platform providers can make their platform cheaper than their competitors, or allocate larger share of revenues to complementors.

Chapter 3 – Akamai Technologies

In this chapter, we will first review the history of Akamai and its current product portfolios. Then we will examine the company's current status, including its market position and trend of its revenue growth. We will also discuss different kinds of competitors of the company, and how they compare to each other in the market. After that, we will examine some emerging challenges and opportunities, both in technology and business, for the company.

After we gain a clear understanding of the big picture, we will examine the Web Experience Business Unit in more detail, which owns some of the fastest growing businesses and products with highest product margin inside the company. After analyzing the strategic goals developed by this department, we will look into a new kind of Akamai product, Cloudlet, which attracted market attention soon after its release and has potential to extend into an industry platform.

3.1 Company History

Akamai was founded by MIT Professor Tom Leighton and his student Daniel Lewin in 1998. At that time, Tom Leighton was working on a problem raised by his colleague Tim Berners-Lee, a member of the MIT faculty, leader of the W3 Consortium and also the inventor of the World Wide Web, to improve internet content delivery with distributed algorithms.

Instead of working on traditional web performance methods such as big data center investment, website mirroring across multiple hosting geographical locations or higher bandwidth network constructions, Leighton and Lewin proposed an innovative solution that focused on accelerating the delivery of some large objects, such as videos and images, across the network. This resulted in a Content Delivery Network solution (Gartner, 2014), which is a distributed network that can offload traffic from client servers and provide optimized caching and routing of content to end users.

This idea soon caught attention of investors and the company went public in 1999. Within the first week of its initial public offering, the market value reached \$145 per share, due to the company's high potential and contracts with famous brands.

3.2 Current Product Portfolios

Akamai products, illustrated in Figure 5 from Informa 2012 Report (Drake, 2012, p. 4), has expanded enormously since the company establishment and can be categorized into following five categories: web services, enterprise services, security services, media services and network services. In this section we will summarize product information of each category available from Akamai official websites and Informa 2012 Report.

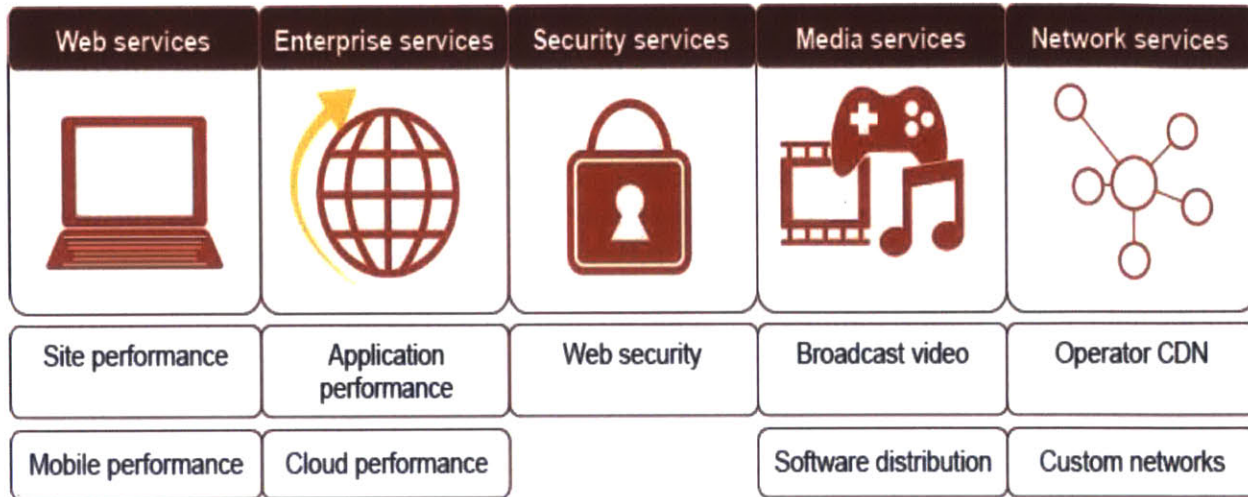


Figure 5: Akamai product portfolios

3.2.1 Web Services

The Akamai product line in web services is called “AQUA”, it mainly consists of product DSA, e.g. Dynamic Site Accelerator and its successor Aqua Ion (Akamai Technologies). Major customers of this product line are usually in E-Commerce segment.

Contents inside a web page can be categorized into static contents and dynamic contents. Static contents refer to those that won't change during user visits. Dynamic contents refer to those that can only be generated based on user actions on the webpage. Traditionally, most of contents are static. With pre-defined user actions, web page may generate some dynamic contents and the whole webpage will get reloaded in order to show such new contents.

Correspondingly, traditional CDN solutions, including Akamai's initial product offerings, aim to optimize the caching and routing of static contents, such that the user requests for such static contents do not need to be forwarded to client servers. Instead, a nearby CDN server will have a copy of such static contents and it will take much shorter time for users to download. Nowadays, however, users are expecting a rich and more interactive experiences. Therefore, more and more contents of a webpage are dynamically generated, based on user behaviors. This also indicates that more and more contents, as they are dynamic, are not cached in CDN servers. This in turn undermines the web performance improvements from CDN providers.

Dynamic Site Accelerator (Akamai Technologies) aims to provide solutions to improve user experience when interacting with webpages that consist of many dynamic contents. First of all, it tries to continuously pull and cache newly-generated site contents into global CDN servers. Secondly, it tries to direct end user requests to client servers with fast and more reliable routing. By leveraging its existing infrastructure and new algorithms, Akamai claims that DSA can help customers experience “globally consistent performance up to five times faster than your original infrastructure”.

Aqua Ion, the successor of DSA, aims to provide more advanced “situational optimizations” for contents delivery. End users always expect fast, reliable and secured online experience, regardless of what devices, browsers, network connections they may use in different locations and scenarios. Websites that cannot achieve that will incur higher rates of abandonment, which in turn leads to lower revenue and higher cost. Aqua Ion aims to deliver optimizations of content delivery in different situations, considering factors such as devices, network connections and applications.

In addition, Akamai also provides a free tool, RUM(Realtime user measurement), that helps customers to measure how Akamai solutions help improve their website performance compared to scenarios without Akamai services. This tools becomes more and more critical to present the values company created for their customers.

3.2.2 Enterprise Services

The Akamai product line in enterprise services is called “TERRA”. It mainly consists of Akamai products Terra Web Application Accerlerator, Terra Alta Accerlerator and Cloud Catalyst (Akamai Technologies, 2012). Products in this category aims to improve performances of enterprise applications. Major customer base reside in public cloud service providers.

Terra Web Application Accerlerator (Akamai Technologies) leverages Akamai exsiting distributed infrastructure and improves the enterprise application in performance, availability and security. Terra Alta Accerlerator, on the other hand, is a more advanced application delivery platform that can delivery enterprise applications globally with consitent performances. IN addition, it enables seamless migration of applications across data centers, whose process is transparent to end users.

Terra Cloud Catalyst is a cloud-based service that enables public cloud providers to offer Akamai’s content delivery network services to their customers. Public cloud service providers always own limited number of data centers and suffer from scalability and efficient content delivery. In addition, customers of such cloud service providers expect additional functions such as customized URLs, failover and streaming video, which traditional public cloud services are usually lack of. Cloud Catalyst is a product that specifically targets such cloud service providers by leveraging the Akamai existing capabilities.

3.2.3 Security Services

Akamai product line in security services is called “Kona”. It mainly consists of Kona Web Application Firewall (WAF) and Kona Site Defener. There have been more and more concerns related to web security and end users are expecting secured web experiences. Especially Akamai, as a content delivery network service provider, has already been handling all kinds of requests, security services can be seamlessly integrated into over Akamai products as additional steps to detect and block threats during user request

handlings. Because of the growing market demands, Kona has attracted a lot customers across various market segments such as enterprise, E-Commerce, government departments and media.

Kona Web Application Firewall (Akamai Technologies) is a cloud based service that protects websites from threats such as SQL injection and remote file inclusion. Kona Site Defender, on the other hand, can detect and mitigate attacks such as Denial-of-Service (DoS) and Distributed Denial-of-Service (DDoS).

3.2.4 Media Services

Akamai product line in media services is called “Sola”. It mainly consists of Sola Vision, Sola Sphere and Sola Media Analytics. Sola is one of Akamai’s most well-established products, which aims to optimize the caching and routing of large objects such as music, videos and games. Most customers of this product come from media industry.

Sola Vision provides content protection and transcoding to multiple formats and resolutions, while Sola Sphere stores and delivers contents across networks. To facilitate customers to monitor services and also gain insights on end user behaviors, Sola Media Analytics is developed along with the above two products.

3.2.5 Network Services

Akamai product line in network services is called “Aura” (Akamai Technologies). It mainly consists of CDN solutions made available to network operators.

Since its establishment, Akamai has developed collaborative relationship with network operators. Akamai developed a program called Akamai Accelerated Networks Partner (AANP) that allows network operators to be a partner of the company, which allows Akamai to deploy its caching servers on their networks. Through partnerships with network operators, Akamai not only deployed more than 100,000 servers in over than one thousand networks globally, but also leveraged those network operators as resellers of company product. One of initial product offerings was Managed CDN (MCDN), a CDN solution that allows Akamai to fully own and operate CDN services for network operator.

However, it has been a trend that network operators want to develop their own CDN. Correspondingly, Akamai provide licensed CDN solutions, in addition to previous MCDN. With Akamai licensed CDN solutions, network operators still have the capability to integrate their network with Akamai’s global CDN services.

3.2.6 Summary

Akamai offers a wide range of products with clear strategies behind them. Media Services is of its major products with longest history. With improved products, Akamai expanded its customer base to more and more segments such as E-Commerce, government and

enterprises. In addition, Akamai identified two adjacent markets with high potential: security and dynamic content delivery. Correspondingly, Akamai developed products in web services and security services, that can seamlessly integrate with previous products. Expanded products turn out to be the key to company's continuous growth, as we will examine in more detail in next a few sections.

3.3 Market Positions

3.3.1 Revenue Analysis

In this section, we will categorize revenue in terms of customer base, products, geographic locations and also customer traffic size, to uncover key factors that drive the revenue growth and critical market segments that Akamai has to focus on.

As show in Figure 6 (Trefis), the company has been generating revenues with steady growth, which is estimated to remain in the foreseeable future. It is worth to note that industry analyst estimates around \$3.6B revenue in 2020, according to the market growth and current company capabilities, while the goal set by the company, however, is to reach \$5B by then.

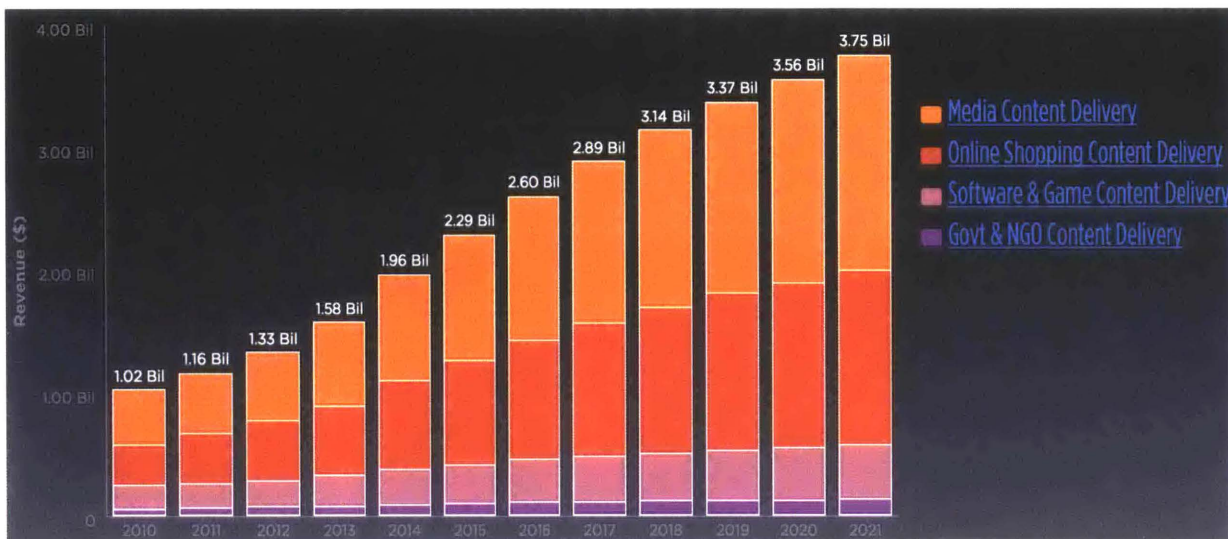


Figure 6: Akamai revenue projections

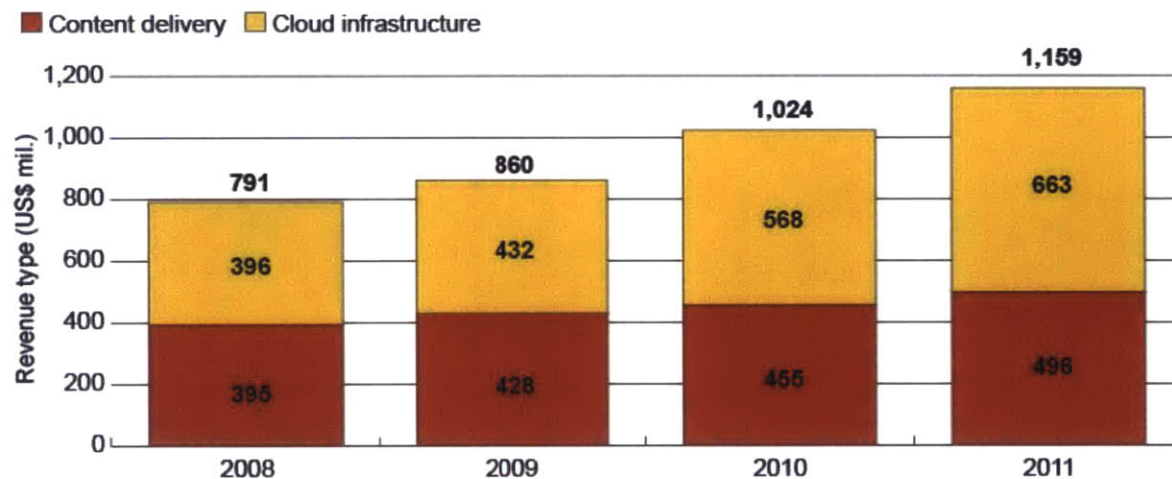
Closer examinations on revenue streams reveal four major market segments: Media, E-Commerce (e.g. Online Shopping), Software&Game, and Government&NGO. Among them, Media and E-Commerce are the most critical ones.

Businesses in Media segment has the longest history among what company offers to customers. However, the average margin that Akamai can gain from each customer is declining. This is largely due to the price competitions among CDN providers: as there have been enough competitors and the technology of caching and routing large static objects

have been very mature, products in this sector have become commoditized. On the other side, due to the growing web traffic and consequently higher demand of online video streaming delivery, revenues in this segment will keep going.

E-Commerce, on the other hand, has higher potential for two reasons. First of all, E-Commerce is growing rapidly and the number of Akamai customers in E-Commerce is estimated twice the number of customers in Media. Secondly, the margin of products in this segment is much higher than it is in Media segment. This is because the corresponding cost is much lower, due to lower bandwidth required for E-Commerce related content delivery compared with watching high solution videos online. In addition, Akamai has many value-added products and services, such as Dynamic Site Accelerator (DSA) and Front-end Optimization (FEO) that not all CDN services provide, available which E-Commerce customers favor greatly.

The above analysis implies that the new functions has attracted more customers and also gained higher margin, compared with traditional content delivery network services. This actually can be demonstrated in Figure 7 (Drake, 2012, p. 8). As we can see, revenue from content delivery products and services have been growing slowly, while new products and services that leveraged the existing infrastructure capabilities of the company contribute to the most part of the company's revenue increase.



Source: Akamai

Figure 7: Akamai revenue in product categories

In terms of geographical areas, Akamai still gains the largest share of revenue from US till 2010, around 72%, presented in Figure 8 (Drake, 2012, p. 8). The revenue from US, Europe and rest of the world have been relatively stable percentage wise since 2008.

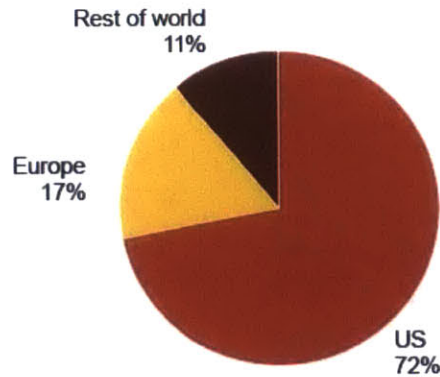


Figure 8: Akamai revenue in different regions

In addition, Akamai has witnessed more competition in small to medium customers as Amazon Web Services CloudFront is competing on price cuts. Meanwhile, there are strong revenue growth from mid size even large customers. This is because of the increasing online traffic, and also growing demands for new products and services beyond traditional CDN solutions.

Summary

From the above analysis regarding Akamai’s revenue in recent years, we have made the following conclusions. First of all, the company has maintained steady growth in their revenue in all major industries, in which Media and E-Commerce are the two most critical verticals. Businesses in Media is most well-established and is still at the core of the company, while E-Commerce businesses are growing fast with much higher margin. Secondly, revenue growth from traditional CDN businesses have been stagnant. Though there are more online traffic for video and images, the price charged to delivery such contents have been decreasing, offsetting the increase on quantity. Thirdly, Akamai still gain much of its revenue from US market. Last but not the least, Akamai is losing small customers due to its premium pricing strategy but revenues from mid to large size customers are growing.

3.3.2 Competitions

Figure 9 from Forrester CDN reports in 2014 (Grannan, et al., 2014) demonstrates market positions of different CDN providers in terms of customer base, average contract and annual revenue. Apparently, Akamai is the market leader in almost all aspects. On the other hand, it is facing competition from the following three kinds of vendors.

Vendor	\$1B+ enterprise customers (logos)	Total customers	Average contract value (USD/month)	Self-provision option (Y/N)	Annual revenue (\$USD millions)	CDN revenue (\$USD millions)
Akamai	500*	5,000	\$25,000*	N	1,578	1,578
CDNetworks	50*	4,500	\$10,000	N	100-150*	100-150*
Limelight Networks	50*	1,295	\$11,000*	N	173	173
Edgecast/Verizon	50*	7,000	\$10,000	N	120,550	100*
Level 3	50*	2,500	\$20,000	N	6,300	100+*
Amazon Web Services	75*	20,000+*	\$500*	Y	74,450	100*
Microsoft (Azure CDN)	50*	15,000*	\$6,000	Y	83,347	150*
CloudFlare	75*	2,000,000	\$5,000 for enterprise customers	Y	10-15*	10-15*
Instart Logic	5*	40-60*	\$4,000*	N	15*	15*

Figure 9: CDN providers comparison in revenue and contracts

The first kind is direct competitors. Such competitors can be further divided into two kinds: global CDN providers and regional ones.

For global CDN providers other than Akamai, there are Limelight, EdgeCast and Level 3 for example. Akamai is still the leader especially in this market, largely due to its wide global availability and first move advantage in market. Other global providers usually have far less servers globally or much less customers.

Regional CDN providers focus on regional markets. For example, ChinaCache and ChinaNetCenters are two Chinese CDN providers who are leaders in Chinese market.

The second kind is network operators. As we described in previous sections, Akamai does not own its own IT infrastructure. Instead, the company partnered with network operators, which allows Akamai to deploy its service in those operators' own network. In addition, such network operators acted as resellers of Akamai's solutions to their own customers. Such a partnership strategy greatly helped Akamai to expand its global footprint at the initial stage. However, network operators have been increasingly interested in developing their own CDN services. As they already own the networks, they have strong advantages to provide such services. Other CDN providers, such as EdgeCast and Limelight Networks, have actively targeted such operators with managed or licensed CDN products. Akamai has not actively promoted its product in this field.

The third kind of competition is from those companies who have developed, or decide to develop, their own CDN capabilities in-house. For example, one recent new CDN provider is Amazon Web Service CDN solution called CloudFront. As Amazon has built its own strong

IT capabilities, it has decided to make it available to other companies. Just like many other Amazon products, CloudFront provides decent solutions with extremely low prices, which takes quite a lot small to medium players. Especially for startups, the integrated services provided by AWS to effectively develop and deploy cloud service products with low prices have become more and more popular. In addition, Yahoo, Alibaba and Google all have their own CDN solutions in house, and have potential to step into CDN markets just like Amazon.

To sum up, the CDN markets have become more and more crowded. Being a market leader, Akamai are facing challenges from competitors with different competitiveness, some have position advantages in regional areas and some have great infrastructure capabilities to leverage.

3.4 New Challenges and Opportunities in Technology

Emerging technologies and the new trend of user behaviors are generating new challenges and also opportunities for content delivery network service providers. In this section, we will describe some new trends that are highly relevant to Akamai and its peers in content delivery network market.

3.4.1 Web Surfing From Mobile Devices

It has been an obvious trend that more and more internet users go online using mobile devices instead of PCs. In 2012, there were already more internet traffic coming from mobile devices than from desktops in India (Meeker, 2012, p. 18), shown in Figure 10:

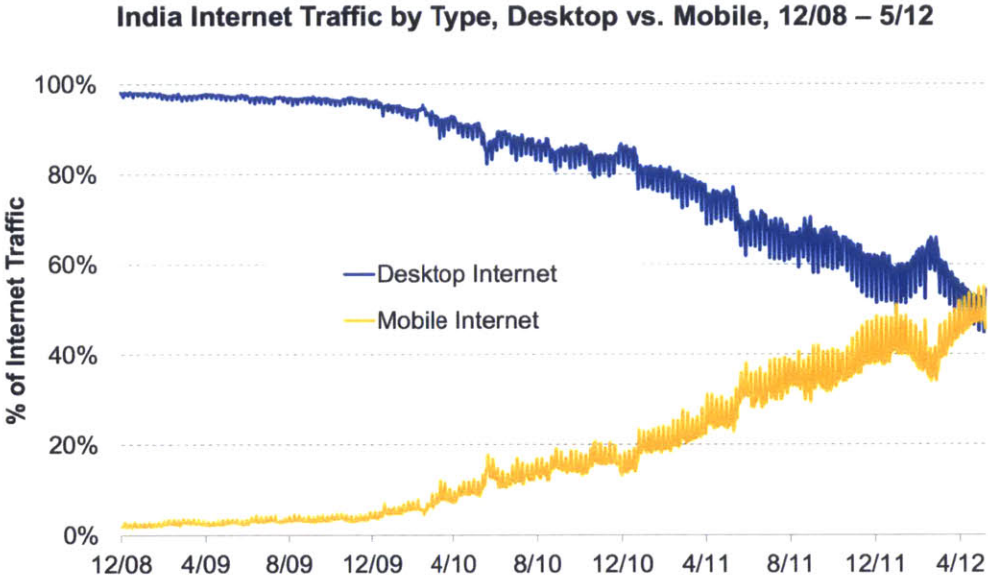


Figure 10: India Internet traffic by type

Similar trends are also observed in China in 2012 (Wee, 2012) and in US in 2014 (O'Toole, 2014). People also have different behaviors and expectations when using mobile devices:

they tend to be more impatient when waiting for mobile applications or browsers to display contents received from servers. There are at least two reasons.

First of all, when using mobile devices, many users are outdoors looking for information that they need immediately, such as cheaper gas stations and parking lots, closest restaurants or directions to the famous museums.

Secondly, people usually has an assumption that it should be easier and faster to load same contents smaller screens, compared to larger screens in desktops. This assumption, however, does not hold. When there is no wireless available (which are very likely to happen when users are most impatient as they are outdoors), smartphones nowadays usually need to use 3G technologies to connect to internet, which less a slower raw speed compared to wireless connection. Even when a desktop and a mobile device connects to internet with the same wireless connection, mobile devices tend to be slower because of battery limitations and less powerful hardwares due to size restrictions. Therefore, how to improve mobile user experiences are a great challenge for not only website and mobile application developers, but also for content delivery networks.

3.4.2 Fragmentation of Mobile Devices

As more and more consumers start to browse online contents from mobile devices, more and more mobile apps are developed to cater to users' needs. In order to make sure mobile device users can have best experiences when using apps and browsers on different mobile devices, such mobile applications need to display contents appropriately on screens. However, there are a huge number of different sizes of the mobile device screens, which makes the optimization of contents delivered to and displayed on mobile devices very challenging.

Two major mobile operating systems dominate current mobile device markets: iOS developed by Apple and Android by Google. This implies that many mobile applications need to have at least two versions, one developed on iOS and the other on Android, in order to enable users of different mobile devices to use such applications.

iOS is used exclusively for hardwares produced by Apple. As Apple has only a limited product lines of its mobile hardwares, including iPhone, iPod and iPad, that how to display contents appropriately on Apple devices are easier to manage. According to Apple reports in 2012 September, over 400 million iOS devices had been sold by June 2012 (Vere, 2012). There are over 1.2 millions of applications available for such iOS devices (mainly iPhone and iPads) with more than 60 billion times of downloads.

Android, on the other side, is developed by Google based on Linux and its source code is released by the company under open source licenses. In addition to Google itself, many other companies use Android for their own smartphone products, such as Samsung, Amazon, Huawei and Lenovo. In July 2013, there are over 1 million Android apps available with over 50 billion downloads (Phonearena, 2013). According to Figure 11 (EDWARDS,

2014), there are much more Android devices sold than iOS devices. Actually, according to Google I/O 2014, there are over 1 billion active monthly Android users.

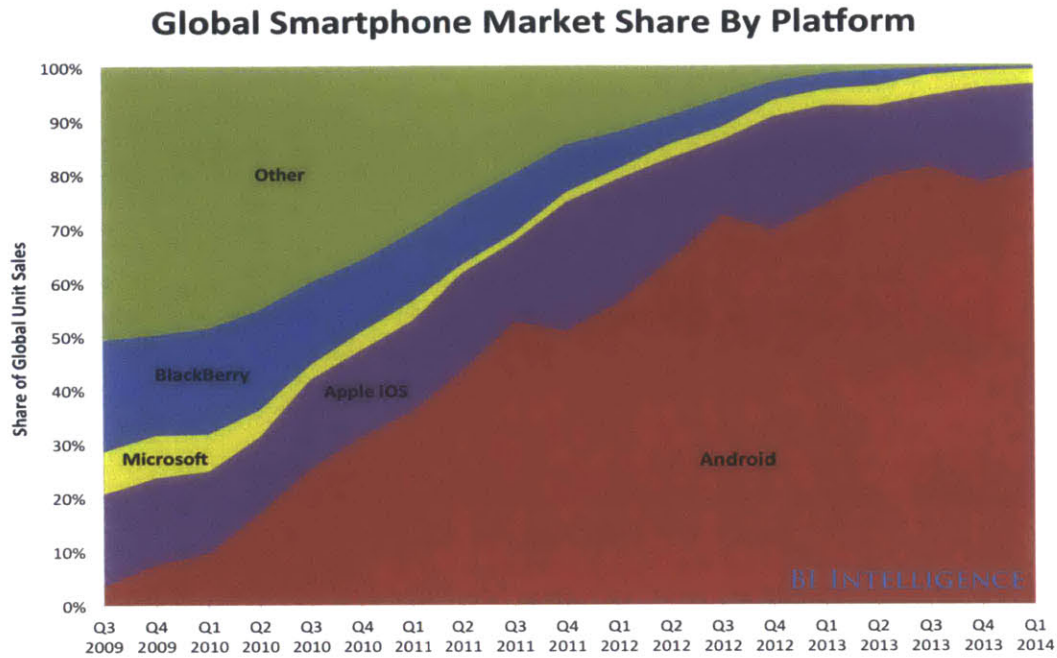


Figure 11: Global smartphone market share by platform

More importantly, as many smartphone manufacturers use Android as mobile operating system and then define the shapes and sizes of their own mobile products, there are no popular standards for sizes and shapes in this market. According to OpenSignal 2014 reports (OpenSignal, 2014) that surveyed 18,769 different kinds of Android devices, the Android devices are highly fragmented by brands shown in Figure 12.

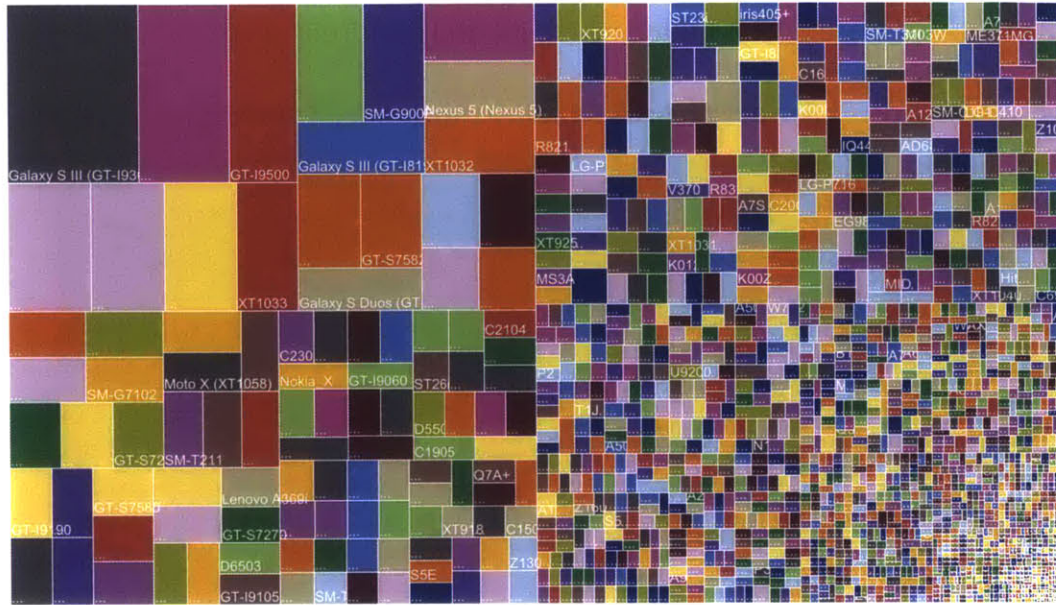
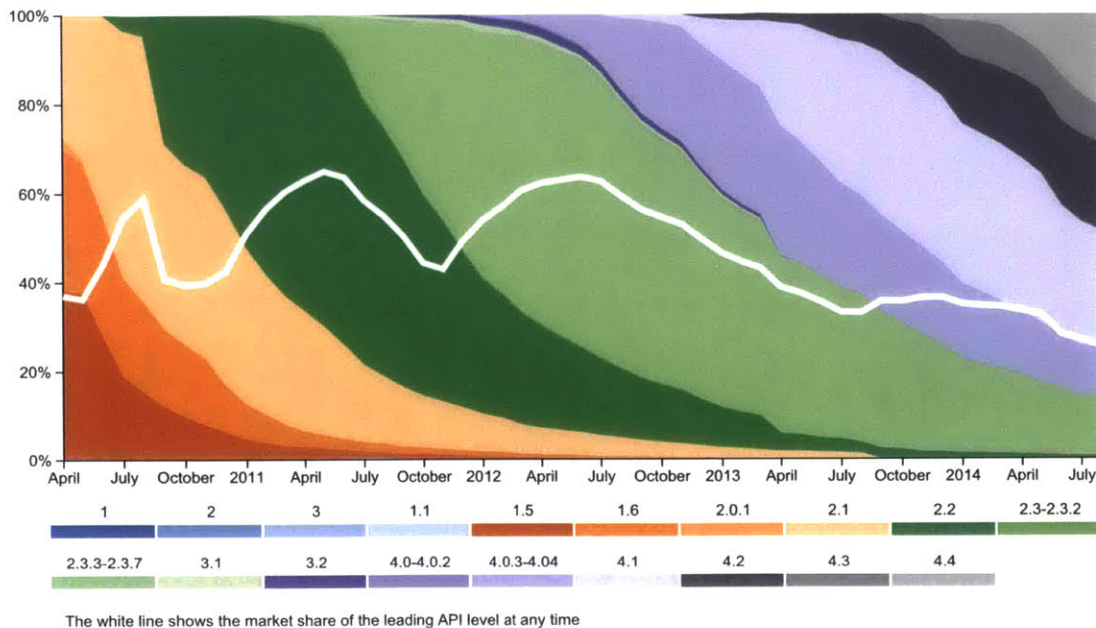


Figure 12: Android device fragmentation

Additional layers of complexities comes from screen size and versions of Android that mobile applications need to support. Different sizes of screens require different kind of contents and corresponding different ways to display them. In addition, Android system itself has many versions, and there are no restrictions on which version different brands and devices should use. Therefore, it is also a headache to support multiple versions of the Android operating system that applications need to run over. According to the same OpenSignal 2014 Reports, Android devices are also highly fragmented from these two perspectives, illustrated in Figure 13 and Figure 14:



The white line shows the market share of the leading API level at any time

Figure 13: Android OS version fragmentation

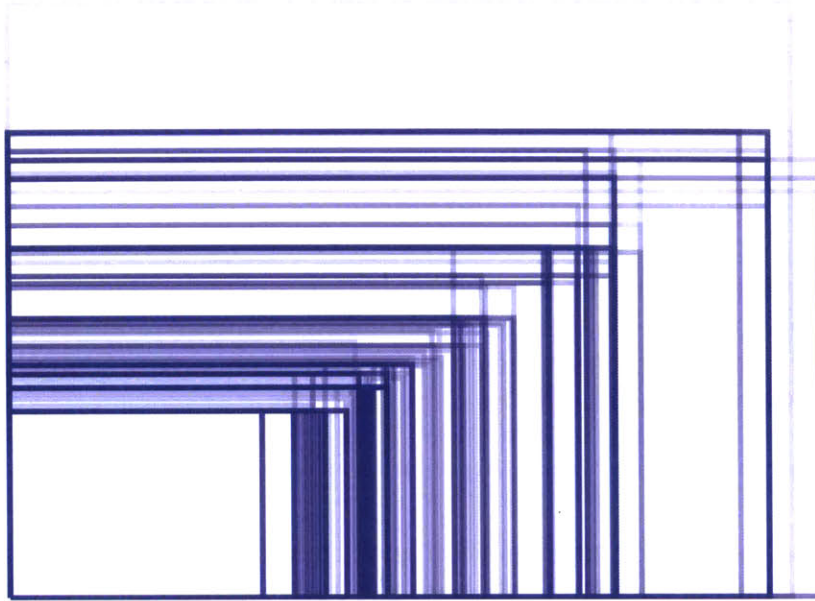


Figure 14: Android device screen size fragmentation

Such fragmentations in device markets, in addition to the fact that mobile devices can be much slower in internet connections compared to cable and traditional wireless connection, require new and additional optimizations on content delivery network services, especially in content delivery and front end optimizations. For example, it is expected that content delivery network services can optimize and remove some objects that won't be visible in certain kind of mobile devices. In addition, content delivery network providers can decrease the resolution of an image or change its size to better adapt to the size and shape of the mobile devices. As mobile devices are mostly much smaller than desktop screens, such an optimization can decrease the data size needed to transfer without hurting user experiences.

3.4.3 Responsive Web Designs

In order to handle the complexities of displaying contents appropriately different devices, there is a new kind of web design called Responsive Web Design (RWD). Proposed by Ethan Marcotte in 2010 (MARCOTTE, 2010), RWD means that web pages should respond to sizes of screens on which they are loaded, and change they are displayed accordingly. This requires more flexible user interface layouts, more intelligent use of CSS3 (Cascading Stylesheet, a file that dictates how contents on webpages should be displayed). In the past four years since the idea got proposed, there are already over 12% of top 100,000 websites in the world using RWD practices, according to a survey generated by Guy Podjarny, Akamai Web Experience CTO (Podjarny, 2014).

To better support mor eand more websites adopting responsive web designs, content delivery network service providers can provide additional services in caching, network and website application optimizations. For example, Akamai's front end optimization

technologies described in previous section can optimize HTML and Javascript code, reduce the amount of requests sent to the server and shorten page rendering time (Akamai, 2013).

3.5 New Challenges and Opportunities in Business

3.5.1 Traditional Media market: Decreasing margin

As we discussed in previous sections, due to competition and technology maturity, products and services in this area have been commoditized and are competing on prices. Therefore, the price cut seems to offset the growth trend of online traffic in videos and images, resulting in stagnant revenues in recent years.

3.5.2 DevOps: Emerging Demands and Best Practices from Enterprises

DevOps is a new software development method and also operation process that emphasizes on the communication and collaboration between R&D and operations departments in high tech companies (Loukides, 2012).

In traditional companies, the software development processes are independent and isolated from IT operations team of the company. Nowadays, more and more products and services of high tech companies are actually available online. Especially with Agile software development methodologies, there can be multiple releases of the products or services available in a short period of time. According to a Flickr report in 2009 (John Allspaw, 2009), they need to have 10 deployments of new website versions in one day. To support such a continuous deployment, it in turn requires high collaboration of the two originally independent departments (e.g. R&D and IT operation), and tight integration of their own operations, in order to achieve faster deployment of products and services to market and shorter troubleshooting time during website bug fixes and crashes.

DevOps not only calls for new internal processes and positions inside enterprises, but also creates new challenges and opportunities for content delivery network services. For example, in order support continuous deployment, it would be ideal if DevOps engineer can quickly and easily turn on a new server with new releases for new visitors, while ensuring older versions of website is still available for current visitors till they are done with their transactions.

Another incentive for customers to request new solutions related to DevOps from Akamai is to consolidate service providers. With more and more services and products needed, it has been increasingly complicated and expensive to manage a large number of service providers and integrate different solutions into a streamlined processes, which usually involves complicated configurations and manual steps. Especially for existing Akamai customers, Akamai has been the service provider that handles end user requests and therefore most of the traffic, as well as owns cloud storage and computing capabilities. Therefore existing customers of Akamai are requiring more services from the company

such that they can eliminate small enterprise solution providers, which in turn will save them IT related costs in headcounts, expenditure and maintenance.

3.5.3 Western Europe and Pacific Asia: Increasing market potential Outside US

According to Informa CDN 2012 report, Asian Pacific and Western Europe CDN markets are projected to grow tremendously, demonstrated in Figure 15 (Informa, 2012, p. 4). As Akamai has already been a market leader in US, it is critical to expand its business in Europe and Asia in order to keep its leadership in global market.

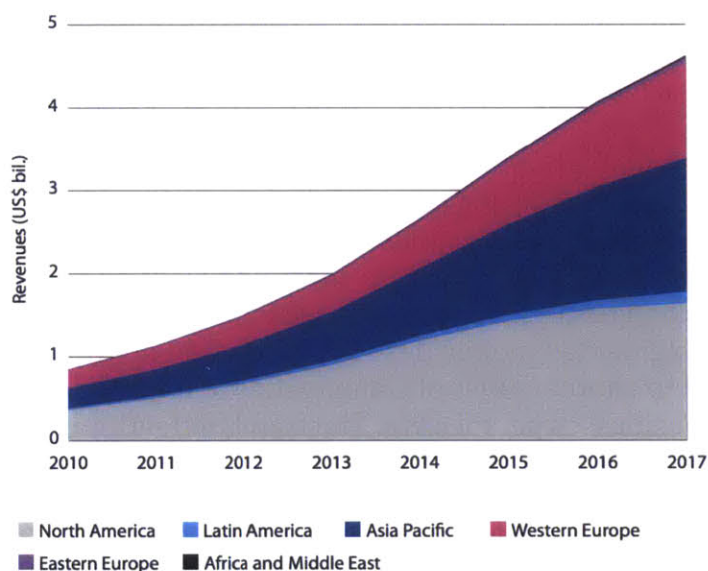


Figure 15: Global CDN revenue projection

Such an expansion, however, is much more challenging than it first appears. Especially for China market in Pacific Asia area, Akamai has had difficulties to enter due to government regulation reasons. In addition, there are more and more local players in China CDN markets. ChinaCache and ChinaNetCenters are current leaders in China with rapid growth. Secondly, both Baidu and Alibaba, two Chinese internet giants, have CDN solutions, and Baidu already made its CDN solution, Jiasule, publicly available. Last but not the least, telecommunication operators are starting to step into this market. In October 2014, China Telecom and Unicom Hong Kong announced a joint venture on content delivery networks (Reuters, 2014). China Telecom has been actively promoting and improving its CDN services since it founded its cloud computing unit in 2012. It released its first CDN product in 2013, and developed partnership with Akamai and also Alibaba to improve its content delivery services for its users.

Summary

In order to continue its revenue growth with double digits, Akamai needs to expand its products and also customer bases. Though traditional CDN markets are facing decreasing margin and increasing competition, the market started to raise promising market demands for new products and services with high potential. How to increase its revenue in areas outside US, especially in Asia Pacific, however, remains to be investigated further.

3.6 Cloudlet

3.6.1 Akamai Web Experience (WebEx) Business Unit

There are three major business units inside Akamai: Media, Security and Web Experience. Media Business Unit and Security Business Unit are responsible for developing products in Sola and Kona respectively. Web Experience (WebEx) Business Unit is responsible for products in web services, e.g. Aqua. Web Experience Business Unit takes charge of developing products such as Dynamic Site Accelerator and Aqua Ion.

As we have presented in previous sections, Customers of CDN providers, especially E-Commerce customers, are asking for more new products and services beyond traditional CDN solutions. Such new market demands are the results of trends in technology and also market. From technology trend perspective, more and more end users are surfing web with mobile devices, which in turn ask for efficient content delivery solutions in mobile context. In addition, highly fragmented mobile device markets and multiple mobile operating system versions add to another layer of complexities to improve end user web surfing experiences. From businesses perspective, The trend of DevOps is asking for more services that Akamai should expand into. Also, Akamai needs to expand into markets outside US more aggressively.

Facing these challenges and opportunities, the Web Experience Business Unit set the following six strategic goals:

A. Performance Improvement

The focus of this goal is on mobile scenarios. Akamai also acquired Contendo for its innovation in mobile acceleration and mobile application optimizations.

B. Improve Self-Serviceability

There is a large professional service (PS) team that is dedicated to help customers customize, maintain and update CDN products and services. Such a technical support is critical for customer experience, however labor intensive at the same time. Company needs to hire more professionals in order to support more customers, and this in turn brings down the company's profit margin.

Therefore, Web Experience Business Unit decides to develop applications that are more self-serviceable, such that it is easier for customers themselves to install, customize and deploy new products they buy from Akamai.

C. Monitize beyond Performances

Customers, especially E-Commerce customers, are looking for products that can provide functions additional to web experience improvements. Such additional functions include those that help integrate collaborations between R&D department and operation department, more intelligent traffic handling based on business scenarios. Also, more and more traffic handling functions are now handled by non-IT professionals. For example, marketing departments may want to do some A/B testing to identify ads that are better received. Such A/B testing traditionally requires cooperation between marketing team and IT team. Demands to come up with an intuitive, better to use products to enable marketing team to do A/B testing without IT help have been increasing.

D. Enhance Partnership

In order to scale and reach the goal of \$5B in 2020, Web Experience Business unit needs to work harder on partnership development, especially technical partnership.

E. Increase Growth outside US

This goal aligns with the conclusion based on analysis of company revenue. Especially for regional CDN providers, they usually have traditional CDN services such as website content delivery. However, most of them are not good at improving user experience in mobile context and also providing value-added new products. Therefore, Web Experience Business Unit should actively seek opportunities that could attract customers in regions with high growth potential with Aqua products.

F. Improve Innovation and Processes

Just like any other organizations, Web Experience Business Unit has always been seeking innovation in both technology and businesses. In addition, the business unit is also trying to improve processes, not only because of efficiency but also to better adapt to new product and service development.

3.6.2 Cloudlet: Basic Concepts

Cloudlet is an idea generated by Contendo (Rayburn, 2011) (Forbes, 2011), a previous CDN solution provider with expertise in mobile acceleration acquired by Akamai in 2011. As we described in previous section, traditional CDN solutions involve a global footprint with a large number of data centers. When end user sends a request to customer website, a data center closest to this end user will handle the request and try to deliver contents that are cached locally, instead of forwarding the requests to customer servers.

For any user request that involves business decision making, however, has to be routed to the customer servers. With Cloudlet idea, Contendo proposes to deploy business logic modules in all edges (e.g. data centers and servers closest to end users), such that business decisions can be made locally to avoid long respond time from customer servers, as the figure below presents. Such business logic are usually standard processes for some specific business scenarios with some variables that can be customized by customers.

3.6.3 Cloudlet: Motivations and Challenges

Cloudlet soon caught attention inside Akamai and also Web Experience Business Unit. The organization decides to develop a series of applications, called as Cloudlets, each to solve a specific business problem, usually in IT and Operation, that are beyond performance related issues. There are at least the following three reasons that make Cloudlet with high potential:

First of all, Cloudlets are targeting new market problems that have not been tackled by other CDN competitors. As traditional CDN market have become saturated and started to compete on price, Cloudlet enables the company to step into new markets strategically.

Secondly, Cloudlets can help the organization and also company to increase profit margin by productizing customizations. As traditional CDN market has saturated, company cannot sell single standard versions of products anymore. This means that the company needs to hire more headcounts to help specific customers on customizing standard solutions for specific business use. However, such customizations do not scale and bring down company's profit margin. Cloudlets, on the other hand, could help create templates for popular customizations and enable customers themselves to define and tune variables based on templates to make the solution works best for specific business context.

Thirdly, as each cloudlet is targeting one single business scenario, it should be easy for customers to understand what each cloudlet is for, and decide if such cloudlets are needed. This will also foster a low touch mode to sell the products, which in turn brings down the sales cost.

With the above exciting motivations, however, one challenge remains to be tackled: how do we decide what are the business scenarios have the highest demand and margin, such that a corresponding Cloudlet needs to be developed? Cloudlet team, along with Akamai, do not have expertise in all verticals and it is hard to justify which business scenarios are more interesting.

Cloudlet teams have argued that Cloudlet should be extended as a platform, to enable trusted partners, such as value added channel partners, technical partners and even customers themselves to decide what are the Cloudlets to develop. But what are the platform strategies that Cloudlet team need to develop in order to foster such a Cloudlet platform? Specifically, what needs to be developed internally and what are the product technologies remain to be specified? More importantly, how should we motivate or

incentivize partners to use our platform to develop exciting Cloudlet ideas? All those problems remain to be investigated further.

Chapter 4 – Cloud Computing Platform Strategy Case Studies

In Chapter 3, we presented the market position, challenges and also opportunities of Akamai and also Web Experience Business Unit. We have also examined how the launch of Cloudlet applications will help the company and the business unit to achieve strategic goals. During 2014, the cloudlet team and the department witnessed the ability of Cloudlets to gain profits from the markets as a product. However, product managers of Cloudlets and VP of Partnership Strategy have also noticed the challenges of transforming Cloudlet into a platform in the long run.

To better understand the possible solutions of such challenges and tradeoffs, in this chapter, we will examine two established platforms, both of which provide cloud computing platforms that enable complementors to develop software applications: Salesforce and Amazon AWS, two of the earliest and most successful cloud computing platforms established in industry. Salesforce is a great example of how a company with great products is transforming into a platform. AWS, on the other side, is a great example of transforming internal IT infrastructure into a public cloud-computing platform, and expanding into complementing markets to provide integrated services.

The roadmap of this chapter will be as follows. We will provide a brief introduction of the two platforms we studied. After that, following Gawer and Cusumano's platform leadership analysis framework, we will analyze and discuss different sides of platform strategies deployed by two firms in four levers, followed by a brief summary.

4.1 Introductions to Amazon Web Services (AWS) and Salesforce

4.1.1 Salesforce

Salesforce is a global cloud computing company founded in 1999 and went public on NYSE under the stock symbol of CRM in 2004. The company is best known for its Customer Relationship Management (CRM) product, used for sales groups to manage their customer relationships. The available functions range from address books to complicated potential customers tracking system from lead to sale. Specifically, Salesforce's CRM service include and expands to the following major categories:

- (1) Sales Cloud: a real-time sales collaborative tool called Chatter
- (2) Service Cloud: this tool enables corporate customers to create and track cases, and automatically route and escalate if necessary. On the other side, it also provides customers the ability to track cases and contracts.
- (3) Marketing Cloud: In 2013, Salesforce acquires ExactTarget, a leading provider of cross-channel, digital marketing solutions. Combining ExactTarget with Salesforce marketing automation solutions, Marketing Cloud allows customer data routed into Sales Cloud and Service Cloud in the form of leads, contacts and customer service ceases, which gives companies a complete view of their customers.

In order to serve more potential customers that can leverage Salesforce CRM products, Salesforce established Salesforce1 Platform, a family of cloud service platforms that enable developers, from Salesforce or third party, to create enterprise applications that can be either standalone or integrated into Salesforce applications. At the beginning, most of the apps developed on Salesforce1 platforms are tightly integrated with Salesforce CRM products. Salesforce then launches a list of features to support applications for general purposes. It also acquired Heroku, a cloud services on which developers can develop apps for consumers instead of enterprise customers. A recent survey indicated that though apps developed on those platforms has been increasing continuously, only 26% of the apps on the platform are now integrated with Salesforce CRM products. In addition, Salesforce launched AppExchange (Infosys, 2006), which is a marketplace for cloud computing web applications built for Salesforce customers.

Among the above functions, AppExchange, Salesforce1.com will be the focus of our discussion when analyzing Salesforce as a platform. Salesforce1.com is the platform on which developers, inside and outside Salesforce, can develop apps. AppExchange is the marketplace for enterprise software apps. Its original intention of AppExchange is to enable third party software vendors to develop applications that can be highly integrated with their own CRM software to serve existing Salesforce customers. Customers can find available applications on this platform and directly install it into their own Salesforce accounts. This enables Salesforce to remove the high cost of customer acquisition and distribution so that complementors can focus on developing solutions to real business problems.

Figure 16 (Salesforce), displayed on AppExchange homepage in December 2014, shows that there are more than 2500 apps available with almost 3 million installations:

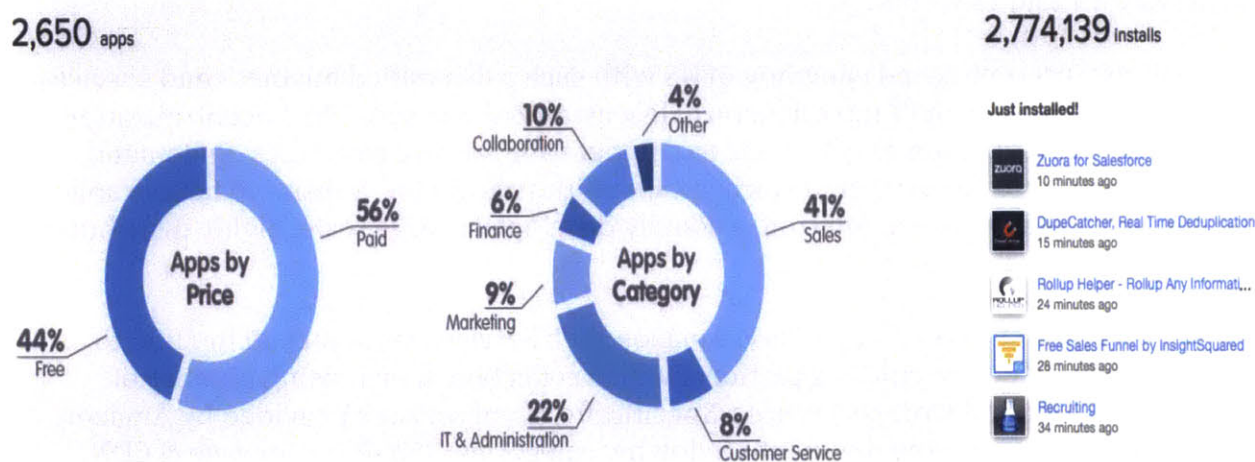


Figure 16: AppExchange statistics by 2014

Figure 17 (Brennan, 2013) describes the history of number of apps in AppExchange installed by customers, which demonstrates a rapid growth.

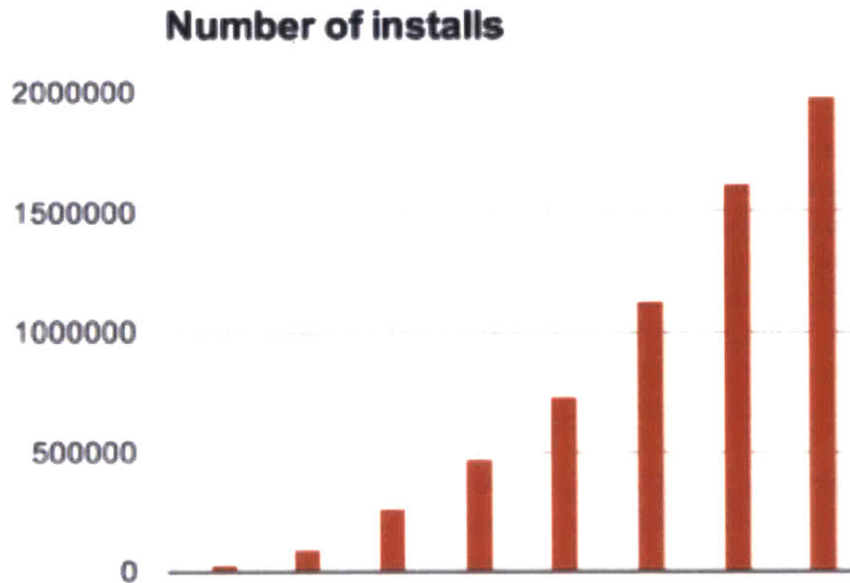


Figure 17: AppExchange app installations from 2006 to 2013 September

4.1.2 Amazon AWS

Amazon is an E-Commerce company which started as an online bookstore but soon diversified into a wide range of goods and services, including but not limited to selling DVDs, videos, MP3, software, video games, apparels, furniture, food, toys and jewelry. The company also produces consumer electronics, such as Amazon Kindle e-book readers, Fire tablets, Fire TV and Fire Phones.

As the largest internet-based company in US with such a diversified business and services, Amazon needs to have an IT infrastructure decentralized and scalable. Decentralization enables internal R&D team to get access to compute and storage resources on demand, while scalability in computing and storage capabilities allows the website to handle spike time during holiday seasons. Amazon gradually developed a large scale, highly distributed and transactional IT infrastructure.

With such an infrastructural capability, Amazon Web Service was launched in 2006 to serve as a public cloud computing platform with a collection of increasing number of remote computing and storage services. Specifically, cloud services provided by Amazon Web Services can be broken down into following categories. Database, Storage & CDN, Analytics, Compute & Networking, Deployment & Management, and App Services.

AWS value proposition, explained by Amazon Web Services Senior Vice President Andy Jassy in 2012, include the following six categories (Vellante, 2014):

- (1) *Shift CAPEX to OPEX*: traditionally, organizations need to invest heavily in IT infrastructure, including the procurement and maintenance of hardware devices and software applications. A large portion of such capital expenditures need to be paid off upfront, which is not preferred from cash flow perspective. In addition, if organizations need to stop using the service, expenses will become sunk cost. Using AWS service with a subscription fee model avoids such large initial cost, and organizations can stop using the service anytime.
- (2) *Lower Costs*: enterprise customers can save tremendously on cost of IT infrastructure procurement, maintenance and updates. an IDC study sponsored by Amazon Web Services claimed that the total cost of ownership (TCO) savings can reach 70
- (3) *Elastic*: Amazon Web Services can adapt to workload changes by adding or decreasing allocated computing and storage resources
- (4) *Speed and Agility*: enterprise customers can deploy software applications faster and easier
- (5) *Avoid Non-differentiated Heaving Lifting*: Enterprise customers can avoid purchasing unnecessary equipment, setting up redundant data center spaces and all the associated bookkeeping.
- (6) *Go Global in Minutes*: Amazon has infrastructure in 9 geographic regions with 38 points of presence for content distribution. This enables any application to service global customers instantly

To achieve those value propositions, Amazon Web Services also presented their business strategy in Figure 18 (Vellante, 2014):

Amazon's Strategy

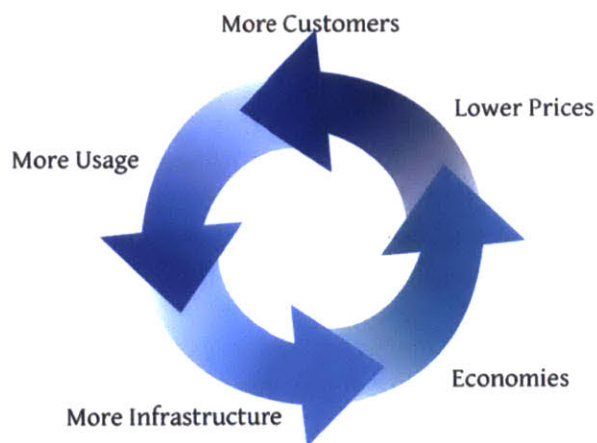


Figure 18: Amazon Web Services business strategy

Inside such a business strategy, more usage is the key to success, because it enables AWS to continue to expand its own infrastructure capabilities and lower down the cost. Along with their value propositions, this business strategy determines greatly every aspects of the four levers of their platform strategy, which will be illustrated in the following sections.

Till 2012, AWS claimed hundreds of thousands of customers in 190 countries, including startups Pinterest, Instagram and Dropbox, as well as large entities like Netflix, Shell and Adobe. The company also hosts more than 300 government agencies worldwide and 1,500 academic institutions in its cloud. However, Amazon does not disclose AWS revenue separately. In its annual report, AWS revenue is lumped in “other” category that stands for Amazon peripheral businesses. Revenues showed in this category has grown rapidly during the past decade as demonstrated in Figure 19 (Kepes, 2014), indicating the fast growth of AWS.



Figure 19: Amazon "other" revenue growth

4.1.3 Differences between the two platforms

Definitions of “platform” vary in different context. In this thesis, most of the time we are referring to platform as “an evolving system made of interdependent pieces that can each be innovated upon”, according to the definition given in *Platform Leadership* written by Gawer and Cusumano. Both AWS and Salesforce are great examples of platforms. In this chapter, we will analyze how these two platforms in the four levers described in Chapter 2.

In cloud computing industry, however, “platform” conveys different meanings, such that AWS and Salesforce fall into different market segments (Appendix). There are three layers of cloud computing services:

- (1) Software-as-a-Service (SaaS) refers to cloud services that leverage web to deliver software applications whose functions can be managed by clients from a light interface, usually a browser or mobile app, without installing a local software applications. SaaS is the layer on the top over the other two layers, facing end users directly.
- (2) Platform-as-a-Service (PaaS) refers to cloud services that provide cloud components to software. Such components are usually frameworks to develop or customize

applications, which makes development, testing, and deployment of applications easier and faster. Cloud services of PaaS model are a layer below SaaS cloud services but above cloud services of IaaS.

- (3) Infrastructure-as-a-Service (IaaS) refers to cloud services that enable users to access, monitor and manage remote data center infrastructures, such as compute, storage and networking. Cloud services of this model are a layer below PaaS cloud services. IaaS usually provides virtual machines only and users need to do complicated configurations.

As Salesforce provides CRM products through web, it is of SaaS model. Salesforce1.com and Heroku two development platforms, both of which are of PaaS model because they extend the CRM products with easy deployment and integration, API for third party to leverage and deep customization for customers to use. Therefore Salesforce, as a firm, is of SaaS model but extending to PaaS model.

On the other hand, AWS is of infrastructure-as-a-Service model as the original intension is to enable third party developers to fully leverage its own IT infrastructure including storage, compute and network. After that, AWS started to provide development tools, application life-cycle management and other services that facilitate the complicated software development, which are all features of Platform-as-a-Service model. Therefore, AWS has evolved into a mix of IaaS and also PaaS (Sullivan, 2013).

Figure 20 from Forrester 2013 Q2 Public Cloud Platforms report (Forrester, 2013) illustrates the relationship between these three models visually:

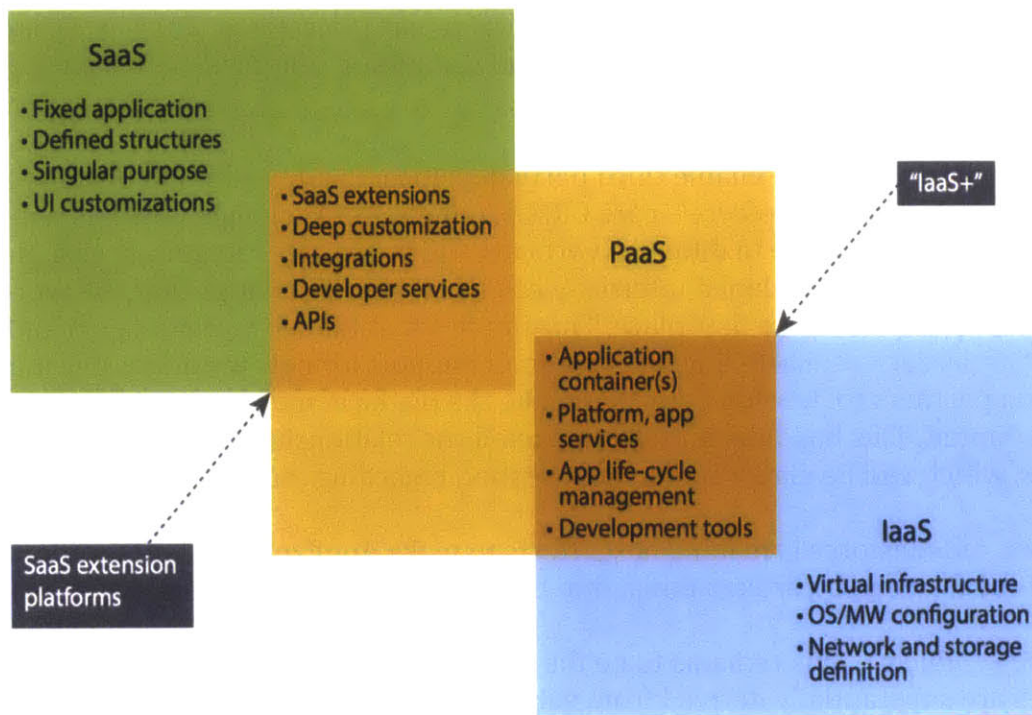


Figure 20: Three cloud computing models

In the above figure, SaaS extension platforms are referring to the trend that SaaS vendors are pushing into platforms with extensibility features. Salesforce is a great example of this segment. On the other hand, "IaaS+" is referring to the IaaS vendors embracing abstract development layers, such as AWS.

4.2 Platform Lever 1 – Scope of the Firm

Platform leaders need to determine what needs to be developed in-house and what else to let complementors develop. This is the most important decision a platform leader or wannabes need to make. To make a sound decision, platform providers need to consider its own capabilities, resources, and the state of the market. In addition, they need to develop a clear vision of what product or platform they want to develop in the future.

Such a decision is not a one-time only discussion. Rather, platform providers need to continuously reshape the scope of the firm, depending on the competitor behaviors, market dynamics and new technology emergence. Salesforce and AWS have very different capabilities and positions in market, which affects their decisions on lever 1 greatly.

4.2.1 Salesforce

Salesforce1.com is a cloud platform on which developers can develop software applications. Salesforce's AppExchange is often described as "the eBay of enterprise software" (Kuchinskas, 2006). Marc Benioff, the founder and CEO of Salesforce, explained that he wants to develop a platform with a "marketplace or directory of apps that are public" (Grant, 2013). In Salesforce 2014 annual report (Salesforce, 2014, p. 3), it describes itself as a "leading provider of enterprise cloud computing solutions, with a strong focus on customer relationship management, or CRM".

With an initial attention to enable third party developers and vendors to develop apps that can be integrated into Salesforce's core CRM products, AppExchange now has witnessed many applications that are in different verticals and in broader categories. As a platform, the CRM applications developed internally can be seen as killer apps that attract customers to adopt the platform at the first place. This implies that though Salesforce expands to some adjacent areas such as marketing and customer support for new products, it is mainly relying on partners to develop apps that make the platform more attractive and more widely adopted. This has substantially impacted the relationship between Salesforce and partners, which will be elaborated in next section regarding their lever 2 strategies.

Therefore, as Salesforce is making best efforts to make AppExchange widely adopted, the scope of the firm can be broken down into the following two categories:

Core CRM products – This remains to be the most lucrative component of the business as revenues are substantially derived from subscriptions to the company's CRM enterprise cloud computing application services. Secondly, these products attract customers to come

to the AppExchange, which in turn increased the adoption rate of the platform. It is worth to note that though Salesforce expands to marketing area, it mainly relies on the acquisition of ExactTarget rather than developing the whole solution internally.

Platform Development – This includes Salesforce1 that allows apps development and AppExchange that enables customer deployment, installation and transactions. In addition to platform infrastructure enhancements and capability improvements, this also includes tools developed to enable developers to best leverage the platform capabilities, marketing and sales channels setup to help third party apps get promoted to existing Salesforce customers, and programs established to encourage existing and new partners to develop apps for the platform. This will be further elaborated in the following sections.

Salesforce's lever 1 strategy is greatly affected by the company's existing capabilities. As they have attracted sales and marketing professionals in various industries as end users, it is natural for them to expand into other needs of existing end-users shall have, such as marketing and customer support. On the other hand, they are not strong in their infrastructure capabilities. Actually Salesforce do not own data center themselves, according to their 2014 10K report (Salesforce, 2014, p. 7): they are leveraging third party data centers. As a result, they do not intend to expand to any IaaS services, at least till this moment. Therefore, their strategy is to expand to adjacent verticals in their product portfolios, and then use their products as killer apps, along with existing customer base, to promote the adoptions of their cloud computing platform services.

4.2.2 Amazon AWS

As we demonstrated in the last section, AWS set a cloud computing business strategy that can best facilitate the development and deployment of the software application while greatly cut down the cost for their customers to deploy and deliver such applications through AWS cloud services. Therefore, AWS needs to attract as many application developers as possible, in order to bring down the cost of its own cloud infrastructure.

This requires AWS, just like their IaaS competitors, to provide tools and services to accelerate the the software applications in cloud services by hiding the complicated configurations required for AWS underlying IT infrastructure and simplifying the steps to deploy applications through AWS cloud services. This also helps AWS to differentiate themselves from other IaaS providers. All IaaS cloud services provide very similar capabilities in networking, storage and compute resources. As such resources gradually become commodity-like services, the market have witnessed dramatic price cut from various IaaS providers for fierce competition: Google cloud services cut prices 38% in 2014 and AWS has dropped its price 44 times since 2006 (Though price cut is partly due to the low cost value proposition defined by AWS, competition in market is also a major factor). To provide such tools and services naturally leads AWS to expand from IaaS model into PaaS model, as we described in previous sections.

Therefore, what AWS decides to do inside the firm include the following two categories:

- (1) Infrastructure capabilities: AWS will continue to expand its infrastructure resources. With expanding customer base, they are able to bring down the marginal cost and continue to cut cost
- (2) applications that can facilitate developers to fully leverage the infrastructure capabilities. Such features are usually utility tools and services that abstract the complexities of infrastructure complexities or provide optimized services (such as databases or load balancing) to best leverage AWS infrastructure

Such a decision not only is determined by AWS's strategy and business model, but also aligns well with AWS's existing capabilities. AWS already owns leading IT infrastructure, which enables easy infrastructure resources expansion. In addition, with a large and strong software development team, AWS already obtains technical expertise to develop features that can best leverage its own infrastructure capabilities for developers to use. As AWS serve as a great IT infrastructure for Amazon retail and other consumer businesses, they understands the needs of developers and IT administrators the best, such that they can identify and develop applications well-suited in customers' needs.

Figure 21 demonstrates the current services AWS provide (Varia J. V., 2014, p. 7):

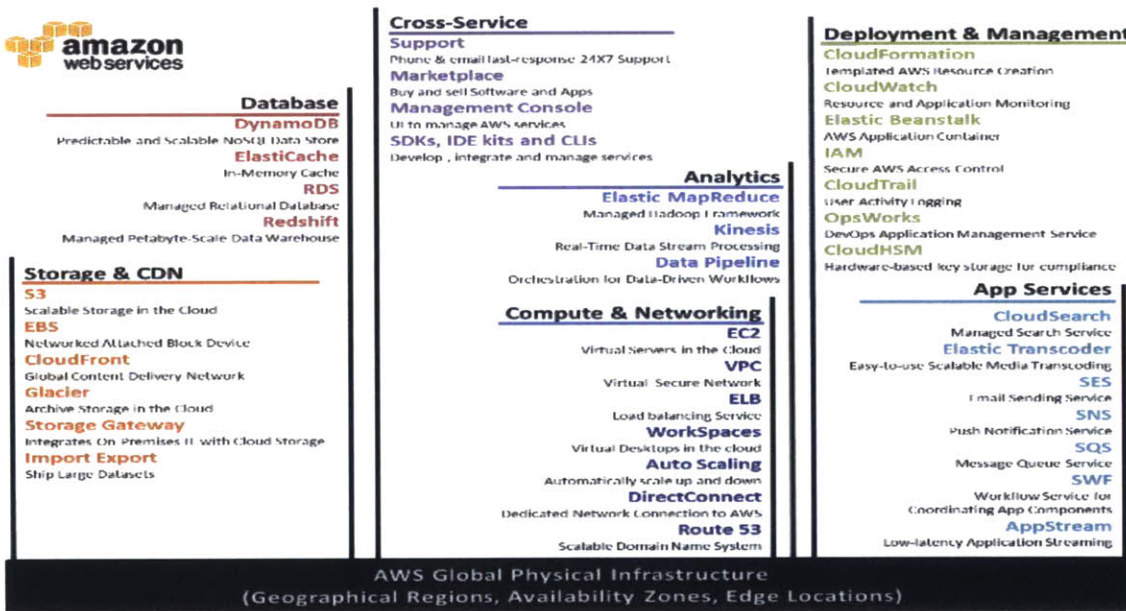


Figure 21: Amazon Web Services overview

4.3 Platform Lever 2 – Product technology

Platform providers need to determine their strategies in product technology, specifically architecture, interfaces and IP. As leading cloud computing platforms, AWS and Salesforce share a lot of similar decisions in the design of their system architecture, interfaces and IP. For example their systems and components are both modularized, interfaces well designed and documented for third party application development. In addition, they both try to hide

information of their proprietary technical assets. However, interfaces to Salesforce and modularization to AWS are particularly critical, due to their business strategies and decisions made on lever 1, and we will discuss them in this section.

4.3.1 Salesforce

Salesforce has a strong market position in CRM product, provided as a cloud service. By expanding itself into a service as a platform, there is no doubt that the main reason for existing and new complementors to adopt Salesforce platform is that they can leverage the available functionalities of its core CRM products.

In addition, as Salesforce was initially established as a SaaS provider in CRM products, it does not own strong infrastructure capabilities. As we mentioned in previous chapter, Salesforce leverages third party data centers to serve their own customers (Note Salesforce does have their database service as a software layer). This implies that when existing or new complementors want to develop a new app, it is highly likely that the data of their apps are stored in external data storage systems. It is also quite possible that they have developed some functions or applications hosted by an external system, but would like to reuse such functions or applications when they develop new applications on Salesforce. If they need to redevelop all such functions or import all data into Salesforce cloud service in order to leverage Salesforce CRM products and platform, the cost can be too high and thus blocks the adoption of the platform.

Therefore, Salesforce needs to make sure that their products and platform can be adopted easily, and external data and applications can be adapted or integrated into apps developed on Salesforce platform. This in turn requires a clearly designed and documented interfaces of the company's cloud services.

To facilitate data integration, Salesforce provides Salesforce Apex Callouts interface to call an external remote web services for real time integration. Also Salesforce provides an easy-to-use ETL (one kind of data integration tool that can extract the data from multiple sources, transform the data with user-specified operators and load the output to another data source) tool by leveraging Salesforce SOAP or REST APIs.

To facilitate application integration, Salesforce has been promoting the concept of "mashup" (Shamrock, 2013). A mashup means that a commercial application that can call a different another application while perserving the context of the original application. It is a way that developers can integrate applications and data hosted in external systems into apps on Salesforce. Salesforce provides the following three kinds of interfaces for different mashups. Firstly, developers can build a user interface using Visualforce in Salesforce. It is the same as HTML web apps developed in other platforms. Secondly, Salesforce, collaborated with big software vendors, provide interfaces to call many popular cloud services directly from Salesforce. This is usually done by having many popular SaaS provider, such as Dropbox, Skype and Paypal, to provide a Salesforce version of their service in Sales AppExchange platform. By installing those apps and calling available

interfaces, developers can easily integrate all SaaS functions provided by Salesforce and other popular service provider into their own apps, without worrying about the complicated configuration, maintenance and technical support. Thirdly, Salesforce provides an interface to allow developers to embed external web pages directly within the UI of an Salesforce app, no matter such webpages are developed in other technologies or hosted in other services. They usually show as a new tab in their Salesforce account and customers do not necessarily need to realize the source of the data or application that they are viewing.

To sum up, a class of clearly defined, well documented and easy to use interfaces greatly help increase the adoption of the Salesforce platform, because complementors can easily leverage existing built-in functions, integrate external data sources and call external applications inside their Salesforce apps.

It is worth to note that as Salesforce is an proprietary system, their complementors have a higher risk to become dependent on it, compared with an open platform (Waltl, 2013). This is because for a closed platform, provides controls access to the platform core via API. Therefore, complementors are relying on Salesforce to keep the API comprehensive in functionality and stable across various crisis and releases. There has been actually a rising concern regarding how open the Salesforce technology can be. On the other side, partners also want to protect their own IPs from Salesforce. How to deal with complementors will be discussed in detail in level 3 strategy.

4.3.2 Amazon AWS

Before we explain why modularity is critical to AWS architecture, we need to first discuss one of AWS's most critical business and also product strategy, that is to provide and accommodate a large variety of technology options to developers. Some cloud services have restrictions on what kind of operating systems or programming languages they support. AWS, on the other hand, intends to provide as many options as possible for developers when they are making decisions on what technologies to use on AWS. They make it explicit that AWS strive to support all kinds of operating systems, programming frameworks and languages and databases.

There are two major reasons for such a strategy. First of all, different applications require different technical options in Operating System, programming languages and other technologies. The more technologies AWS are able to accommodate, the more applications can be developed on this platform. Secondly, when developers choose a platform to develop their applications, they are afraid to be locked into any specific technologies, such that they are not able, or need to invest a lot, to change technologies they adopted initially. If the technology they want to shift to happen to be one not supported by the platform, much more development efforts need to be invested. In the worst scenarios, they need to find another platform to host their applications. Therefore, the options and ranges of technologies supported by the platform become a major factor

for developers to consider when choosing a platform, even when a platform supports all technologies an application currently requires.

Such a strategy, in turn, requires a high level of modularity of the system for three reasons. First of all, modularity makes it comparatively easy to add another technology AWS want to support into the infrastructure. With an less-modular or integrated system, it is very expensive to add another technology alternative inside the system, as there are usually many interdependent pieces inside the system that may get affected. Adding one more feature may increase the complexity of the system exponentially and affect its robustness negatively. Secondly, modularity enables complement developments in parallel and independently. As AWS intends to provide all kinds of technology options to their customers, they usually develop some in-house and rely on complementors to develop others. A system with a high level of modularity allows complementors to understand clearly the boundaries of the components and the communications between this component and rest of the system. Further, a high level of modularity has a clear description of the function of every component, which means the components can be tested and verified in a way that multiple stakeholders can agree. Thirdly, modularity makes it easier for customers to move their existing SOA-based solutions to AWS, because they can migrate discrete component of existing applications. Especially for larger organizations, they can first migrate some non-essential parts of their applications into the cloud. After they have examined the reliability of the cloud platform and have other parts ready, they can start moving more components to AWS without committing the whole system on cloud at the first place.

The most updated architecture of AWS can be seen in Figure 22 (Roy, 2014). The bottom is the layer of its physical global infrastructure and above it the infrastructure layer (labeled in the figure "Foundation Services"). It includes resources such as storage, compute, network and database. The upper two layers are different functions and features added to facilitate developers to best leverage the AWS infrastructure and streamline their development processes.

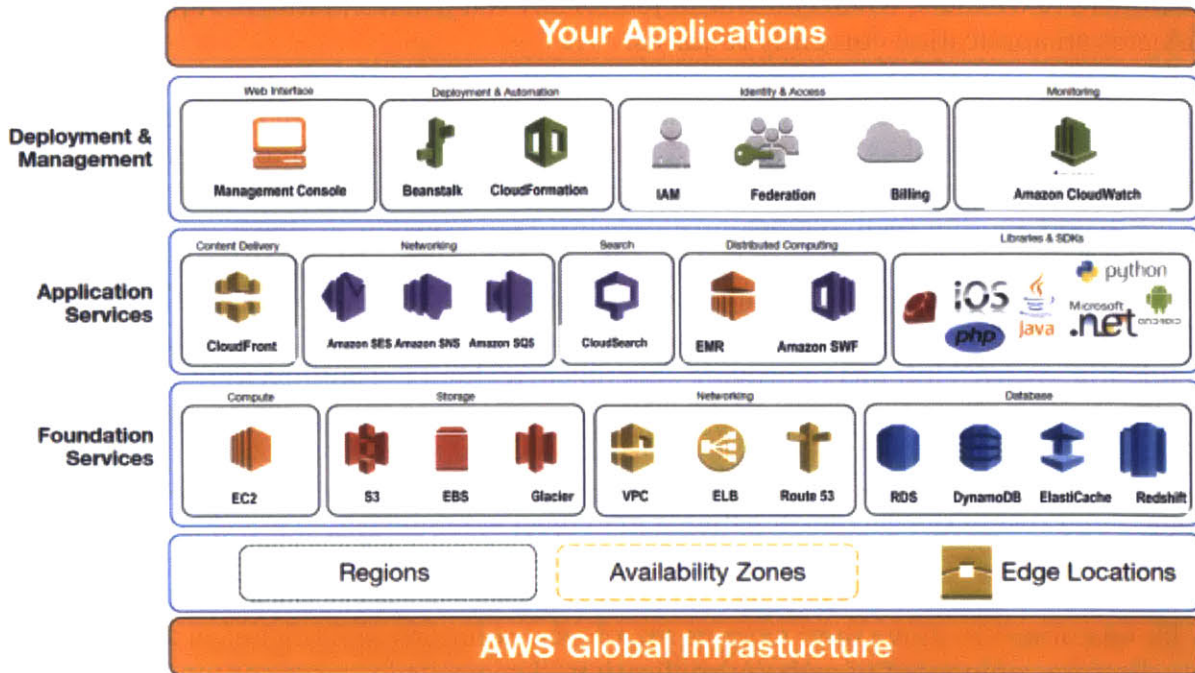


Figure 22: Amazon Web Services Architecture

Take databases support on AWS as an example (Amazon Web Services). According to the AWS online documentations, AWS supports not only traditional relational databases such as MySQL, Oracle and PostgreSQL, but also NoSQL databases such as MongoDB (users can set it up on AWS Elastic Compute Cloud platform). This helps any existing projects to smoothly adopt AWS cloud services without changing their data structures and databases.

In addition, AWS also launches its own database services, such as Amazon Aurora relational database service. For NoSQL database services, Amazon launches DynamoDB for highly scalable service and Amazon SimpleDB for smaller datasets. Details can be found in Figure 23 from AWS documents (Amazon Web Services).

Amazon Web Services provides a number of database alternatives for developers. You can run fully managed relational and NoSQL services or you can operate your own database in [the cloud](#) on Amazon EC2 and Amazon EBS.

If You Need	Consider Using
A relational database service with minimal administration	Amazon RDS , a fully managed service that offers a choice of MySQL, Oracle, SQL Server, PostgreSQL, or Amazon Aurora database engines, scale compute & storage, Multi-AZ availability, Read Replicas, and more.
A fast, highly scalable NoSQL database service	Amazon DynamoDB , a fully managed service that offers extremely fast performance, seamless scalability and reliability, low cost and more.
A fast, petabyte-scale data warehouse	Amazon Redshift , a fully managed service that makes it simple and cost-effective to efficiently analyze all your data using your existing business intelligence tools
A NoSQL database service for smaller datasets	Amazon SimpleDB , a fully managed service that provides a schemaless database, reliability and more.
A relational database you can manage on your own	Your choice of relational AMIs on Amazon EC2 and EBS that provide scale compute & storage, complete control over instances, and more.

Figure 23: Amazon Web Services database products

Coupled with external complements, such in-house database service has at least four benefits. First of all, it ensures that projects with different needs (such as relational or NoSQL, big datasets or smaller databsets) can all find corresponding optimized data services. Secondly, developers working on new projects do not need to worry deploying and configuring database services, if they do not have a strong preference on any third party tools. This, again, greatly ensures that developers can focus on their project designs and implementations instead of infrastructure headaches. Except for an AWS account, there is not much extra work on deployment or maintenance for using such in house services. Thirdly, the cost is ensured to be the lowest. Because third party will charge customers the same or more what AWS charge them, and directly using AWS service ensures the cost is the lowest. Last but no the least, as such applications are native on AWS services, customers who adopt them will stick AWS service and can upsell them future applications.

Inevitably, such AWS database services casuses tensions between AWS and other database service provider such as Oracle, MongoDB and Microsoft SQL server. We will discuss the relationships between AWS and its complementors in lever 3 strategy.

4.4 Platform Lever 3 – Relationships with external complementors

A platform leader, by definition, means that there are external complementors that develop to the platform, which makes the platform more valuable to the end users. However, the relationship between platform leaders and their complements can be dynamic and complicated. On one hand, platform providers have the incentive to foster a collaborative relationship with their complementors, as complements are usually what differentiate them from direct competitors and attract end users. On the other hand, as the scope of the firms keep changing due to competition, market dynamics and new technologies, platform leaders may decision to step into businesses that their complementors currently reside. This put the platform leaders in competing relationship with their complementors. To balance the interests and foster a long term relationship, it is important for platfor providers to develop corresponding strategies.

With a close examinations on what kind of complementors AWS and Salesforce have, and what kind of supports they provide to complementors, we find many in common and some different. This section will first present the common patterns identified in complementors and support provied, followed by discussions on the differences regarding how AWS and Salesforce deal with complementors respectively.

4.4.1 Salesforce

As discussed in previous sections, Salesforce strongly believes that the success of third party applications on Salesforce platform is the key to success of itself. Inside Salesforce, they continuously improve their core CRM products. Outside the house, Salesforce decides to leverage partners, e.g. complementors, to develop applications that do not belong to areas in their core products. Consequently, Salesforce has been trying to foster a strong collabrative relationship with its complementors.

Note Salesforce actually set a relatively high bar for third party software developmers or vendors to become a partner with a careful application and review process, and fees charged to be reviewed and kept listed on AppExchange (Kanaracus, 2013) (Salesforce, 2014). However, as long as one does become a qualified complementor, a wide range of tools and supports are available.

There are four kinds of complementors and Salesforce have been leveraging various strategies to foster and facilitate all of them:

The first kind of partners are those who have developed well-known or critical software, including Salesforce itself's CRM products. To have a plugin or specific version of their apps available on AppExchange platform is key to attract customers and other complmentors. For example, one of the most popular app on AppExchange is LinkedIn for Salesforce, which allows end users to explore LinkedIn profiles along with other information stored in Salesforce such as Salesforce account information (Rouse, 2012). Another similar popular AppExchange listed app is Outlook Integration for Salesforce, with which users can view Salesforce data directly in Microsoft Outlook. Other apps such as Skype that allows users to

make phone calls over the Internet while working within the CRM application and an Adobe application that allows users to securely share documents online using pdf formats are all killer apps that highly promote the platform. In fact, when Salesforce launched AppExchange in 2006, there are around 70 apps available at the beginning, all of them are high demanded apps that make the platform immediate useful to all existing and potential Salesforce end users.

The second kind of complementors are IT consulting firms of various sizes, such as PwC, Tata Conculancy, Deloitte and Accenture. In addition to functioning as a channel to sell existing apps, those consulting firms have great reputations in different verticals and have been continuously developing customized apps for their customers. Therefore, developing a strong relationship with those consulting firms will greatly increase the adoption rate of the platform, and number of apps developed over it. For example, Salesforce established a partnership with Tata Consultancy Services, such that the latter will develop and deploy business applications on AppExchange. Such applications will extend the functions of existing Salesforce apps.

The third kind of complementors are IaaS providers, such as AWS and HP. As Salesforce itself does not own much infrastructure capabilities, it has been trying to adapt the platform to different public cloud infrastructure service provider, and even private clouds. In November 2013, Salesforce declares a strategic partnership with HP to launch a new service called Salesforce Superpods for private cloud (Henschen, 2013). In such a service, HP will provide the all the hardware, on which a dedicated Salesforce instance will run. This gives large organizations their own instance and a higher level of control on service provided then those on Salesforce's traditional multi-tenant public cloud.

The fourth kind of complementors are startups and individual developers. Salesforce has invested greatly to such complementors in different aspects. First of all, AppExchange ecosystem has provide easy integration and deployment processes along with programming tools over the system. Secondly, AppExchange provides customer supports, sales and marketing processes to newly developed apps such that it can be easily promoted and more likely to be tested or adopted by customers. Thirdly, Salesforce even tried to work as VC to startups whose apps are developed on Salesforce platform. This not only enables many startups to have enough resources to develop apps on platforms, but also allows Salesforce to actively lead the direction of what kind of apps should be developed by providing appropriate incentives.

For example, when Salesforce tried to expand its presence in Europe, it collaborated with European venture capital firms such as Notion capital to launch a \$6.6 MM Innovation Challenge for startups (Meyer, 2013). By presenting their apps that could run Salesforce platform, startups with high potential received funds to continue their developments. One of successful examples is ServiceMax (Wainwright, 2013), who received \$2 MM funding from a VC in "AppExchange Challenge" during Dreamforce conference in 2008, and has since then raised more than \$52 MM with more than 200 employees and served many customers such as Dupont and Pentair.

Many companies, such as ZenDesk, CastIron, EchoSign and Marketo, greatly leveraged the Salesforce AppExchange platform to make their current achievements. For successful startups or those with high potential, Salesforce may become an investor itself or even acquire it. For example, Kieden Corp developed a tool that tracks Google keyword advertising metrics back into the Salesforce system. Salesforce actually acquires it because of its high potential and how greatly it can integrate with Salesforce's existing products. Note Salesforce did not intend to develop similar products and services in-house. As they invest in this startup and keep a great relationship, they have deep insight on the potential and growth of this startup. Coupled with enough funding, they can settle a deal to acquire to not only own the product and service, but also channels and customer base.

In addition to the above various strategies for specific complementors, Salesforce have provided the following two kinds of supports to ensure the success of their complementors on Salesforce development and AppExchange platforms:

Development Support

To facilitate the development of complementors' app and streamline the deployment process are two of the most critical supports a cloud service platform should provide. Salesforce provide built-in features in their platforms to facilitate complementors. For example, though Salesforce is a closed in terms of its own proprietary system, it is open in providing partner information. Actually, all of its partners are visible in AppExchange platform, and all subscribers can subscribe to third-party products directly from independent software vendors.

In addition, all applications on AppExchange are available to "test drive" for free which offer limited functionality. According to Salesforce, its customers have conducted more than 75,000 test drives of AppExchange applications during its preview mode and its first week of availability there have been 1500 installations.

What is more, Salesforce makes internal development tools available for customers to customize and build brand new applications. It also release a multi-tenant, on-demand programming language called Apex (Beal, 2006). Apex code and application allows businesses to focus on development rather than infrastructure. Apex enables customers to write highly intelligent transactional applications that run on Salesforce's multi-tenant service without any infrastructure investment. The language is similar to Java and built to run on Salesforce.com's service. Customers can write Apex codes to create business triggers and write specific procedures. It also includes an application program interface (API) to access and manage complex data relationships.

Last but not the least, as we mentioned in lever 2 strategy, Salesforce allows apps to be developed outside of Salesforce's own platform, but still gets embedded into Salesforce service via available APIs. Such apps are called composite apps, which actually becomes the major portion of all available apps on AppExchange., compared with those native apps, .e.g. those built 100% on Salesforce's platform.

Non-Development Support

Salesforce created a series of certifications and trainings such that developers can be equipped all necessary skills to start working on their apps and leverage the platform. In addition, With Salesforce online community, developers can discuss with each other for specific questions and share knowledges.

What is more, Salesforce holds an annual conference called Dreamforce (Salesforce, 2014). With 150,000 people registered and seven million online followers, this conference serves not only a way to present updates on new features of the platforms and best practices in different verticals, but also a platform for many demos startups to show their ideas and prototypes developed on Salesforce platform.

Last but the not the least, Salesforce provides professional service and strong customer support to existing apps, including those developed by complementors. From this perspective, AppExchange is beyond merely “eBay of apps”, because it takes care of not only the transaction, but also service delivery, maintenance and necessary supports and services after the transactions.

4.4.2 Amazon AWS

With a close examinations on complementors of AWS, there are two major kinds of complementors: those complementors that are cloud services of PaaS model, and those of SaaS model. There are some other kinds of complementors who provide development tools, security and management applications that AWS categorize them separately.

As we discussed in previous sections, AWS is initially a cloud service of IaaS model. Therefore, unless developers of enterprise customers have a deep knowledge of configuring and managing infrastructure resources, they need to leverage different kind of cloud services of PaaS model to create an environment that hides infrastructure complexities and facilitates development processes. Another kind of complementors are those provide tools related to software development, such as Github that provide source control management.

Because AWS tries to provide integrated services over its own infrastructure to facilitate the development of software applications, it has stepped into businesses of these above two complementors. For example, AWS as an infrastructure service provider can host Salesforce as a platform service. Now with its own applications such as RDS, Elastic Beanstalk, search and messaging queues, AWS itself has started to become a PaaS and competing with Salesforce. In addition, in 2014 AWS re:Invent annual conference, AWS launched AWS CodeCommit, a similar function to Github.

This obviously causes tensions between AWS and its complementors. The intension of AWS stepping into complementors’ businesses, however, do not seem to be revenue-oriented (at least not entirely). There can be at least four reasons that lead to this decision. First of all,

there are some needs of customers not filled yet by existing complements. For example, AWS provides various kinds of database services that provide specific solutions for different size of datasets customers are dealing with. Secondly, many IaaS competitors are providing services optimized on their own infrastructure. For example, Microsoft database services run best on Windows Azure infrastructure platform. Amazon has incentives to provide optimized services that best leverages the infrastructure capabilities of its own to attract developers. Thirdly, customers do not need to worry integrating third party services on AWS and maintaining it. Last but not the least, there are enough customer spaces to ensure the co-existence of AWS in-house complements and external alternatives, according to application features and customer preferences. To sum up, AWS can stimulate more customer usages by stepping into those complementors' businesses.

We also noticed that AWS has also made actions to coordinate with complementors. For example, one of their actions is to inform partners in advance what they intend to develop, such that partners can plan ahead of time. Nevertheless, many customers inevitably will prefer native solutions provided by AWS, which in turn will threaten the growth of AWS partner ecosystem. While AWS already owns a large customer base, which may continuously attract partners to join AWS Partner Network, e.g. APN (Amazon Web Services, 2012), the relationship between AWS and its PaaS complementors are complicated and remains to be examined further in the future.

The second major kind of complementors who develop applications of SaaS model. Due to its strong IaaS capabilities, AWS has hosted a list of successful and famous companies such as Pinterest, Foursquare and Airbnb (Amazon Web Services). This is a major category of complementors AWS seeks to expand greatly (Rama, 2014), because those applications are essential to attract end users to AWS platform. During 2014, AWS has announced providing fund to prototypes of applications with potentials. In addition, AWS removes some of the barriers to entry such that smaller partners are easier to win cloud contracts from customers.

Similar to Salesforce, AWS also provides different levels of support to complementors. For development support, AWS has provided a list of development tools for developers and allows customers to test drive the applications for free. For non-development support, AWS also has its series of certificates and training programs.

4.5 Platform Lever 4 - Internal organization

As we discussed in lever 3 strategy, the relationships between platform leader and its complementors can be complicated. In order to balance the interests of two sides and provide appropriate support to complementors, it is critical to setup internal organization structures correctly. To achieve that, platform providers need to define the structure, process, culture and mindsets of the organization.

4.5.1 Salesforce

Salesforce has strived to setup internal organization structures to help external complementors in different stages of their application development.

For smaller complementors in initial stage developing apps, Salesforce has provided a business incubator called AppExchange Central as part of AppExchange in CA since 2007. It allows entrepreneurs to rent office space and work with Salesforce employees to develop app. This certainly increases transparency in company's technology and available best practices. In addition, Salesforce announced in September 2014 that it had setup a venture capital arm to fund startups creating apps for mobile phones. This fund not only provides funding to apps with potential, but also provides guidance to developers by selecting apps of specific categories or goals.

For complementors with apps that need customer feedbacks, Salesforce launched Trialforce in 2013 (Salesforce, 2013), which provides the infrastructure for complementors to easily create demo versions of their software targeting specific customers in different regions or industries. This also aligns with Salesforce's goal to focus on the growth of AppExchange in various vertical applications. Being able to get quick feedback on the early stage help justify the potentials of the apps in development.

For complementors whose products are ready to ship, Salesforce has announced a new plan to send 65 go-to-market experts in various fields to work with partners to deploy services in vertical industries (Krakora, 2013). Salesforce has also done quite a lot co-marketing events that promote complementors to their customers.

In addition to facilitate the complementors' apps development and business growth, Salesforce has actively taken lead to direct and guide what kind of apps should be developed. They established a new business unit called New Industries Business Unit whose task is to create ecosystem of partners and deliver transformational solutions for enterprise customers in six global industries – financial services/insurances, healthcare/life science, retail/consumer products, communications/media, public sector and automotive/manufacturing (Salesforce, 2014).

The above internal organization establishment, coupled with strategies in other three levers, has enabled Salesforce to develop a strong ecosystem for its platform.

4.5.2 Amazon AWS

As we have discussed in previous chapters, AWS has developed their own application development and deployment tools that are optimized on AWS platform, therefore there is unlikely Chinese Wall setup internally between the platform team and internal complement development teams.

For AWS, its goal is to provide an easy to use platform for customers to best leverage the underlying IT infrastructure that Amazon previously built. Therefore it has developed AWS

Partner Network(APN) that help promote the usage of the platform. APN contains two kinds of partners: consulting partners and technology partners. Technology partners include SaaS partners, PaaS partners, Development tools and Security partners. During re:Invent conference held by AWS in 2014, AWS has announced that the organization will provide more benefits to SaaS technology partner, among other technology partner such as PaaS partner, Development tools or Security technology partners. The benefits include more free usage of AWS to develop applications, more trainings and marketing support.

4.6 Summary

In order to be a platform leader in the market, organizations need to set a clear business goal and a vision for the future. Based on that, platform leaders need to develop strategies for the four levers described above that align with each other, and evolve with the market dynamics and new technology emergence.

Salesforce fully leveraged its core CRM product to attract initial complementors to adopt its platform. Then it provided development and non development support to ensure the easy adoptability and adaptability of their platform from complementors' perspective. What's more, it aggressively invested in startups who build apps on Salesforce platform, from VC funding too business incubator. For complements that should be integrated into its core business, Salesforce would acquire them. Note many such startups are funded by Salesforce, so Salesforce has already setup a great relationship from the beginning. All those strategies not only guided the directions of what complements should be built, but also developed strong trust with complementors.

Amazon AWS, on the other side, faced more complicated situations. As an initial platform leader who provides infrastructures as services, it has strong competitors such as Microsoft, IBM and Google. In order to differentiate itself and make its platform easier to use for its customers (e.g. developers), it has stepped into businesses of some complementors such as those provide PaaS and development tools. On the other side, it has identified SaaS partners to be critical for the success of the platform, and has provided incentives and benefits for SaaS partners especially in various verticals that AWS does not possess enough capabilities.

Chapter 5 – Platform Strategies for Cloudlet

5.1 Potential Business Model for Cloudlet Platform and Partners

Current Cloudlet applications are developed internally and sold as products using a subscription model. The business model of Cloudlet platform, however, remains to be examined. Following Salesforce’s practices, Akamai could charge license fees to partners based on how many applications they develop and how many customers they serve. Prices of externally developed complements to customers are at the discretion of partners, but should mostly fall into a “\$/customer/period” subscription model. In addition, Akamai may need to charge an initial or annual fee for code review, basic quality and security check, and also technical supports for published Cloudlet applications.

Cloudlet team should also ensure that partners are not using Cloudlet platform as a general IaaS or PaaS service. Though Akamai infrastructure, in its nature, can function as a general platform of IaaS and PaaS model, Akamai has no intention to step into these markets because of not only low margins but also required competencies the company has yet intended to develop. The screening of partners and maybe higher licensing fee may help filter out companies who want to use Cloudlet platform as PaaS.

5.2 Four Levers Analysis for Cloudlet

We have presented the platform leadership analysis framework proposed by Gawer and Cusumano in Chapter 2. Using this framework, we analyzed two leading platforms in cloud services industry, Salesforce and Amazon Web Services. In this section, we will discuss platform strategies for Cloudlet applications using this framework. In addition, we will evaluate the applicabilities of best practices identified in the above two case studies.

As we introduced in Chapter 3, Cloudlet is a series of Software-as-a-Service applications developed by Akamai that tackle business and operational challenges for customers. Target customers are organizations who use CDN services to deliver their services to end users. The core idea is to deploy the business logic that can handle end user requests on a closest CDN server, instead of routing such requests through the network to customer websites. Therefore, the waiting time for end user requests are greatly reduced and web experience improved.

5.2.1 Scope of the Firm

The most critical problem of this lever is what complements to develop in-house and what to leave to complementors to develop. To answer this question, let us first examine the three factors that will affect the strategies on this lever: company capabilities, business vision and current market.

Company Capabilities: There are two core capabilities of Akamai that enable the company to develop Cloudlet applications and platform. The first core capability is its established

infrastructure (160,000 plus servers in 95 countries over 1200 networks) with proven technology and records to efficiently deliver contents of customer websites to end users, regardless the location, used devices and network environment of the end user. Because of this capability, Akamai is able to achieve its leading position in global CDN market and win a large customer base in different industries.

The second core capability is the deep understanding of different customer needs and technologies developed to satisfy those needs. With growing customer base, Akamai has established a large organization called Professional Services whose goals are to provide a wide range of supports and services to customers, including technical support, maintenance, technology updates, system integration, product customization and solution development required in specific business scenarios. Such customizations, due to its labor-intensive nature as described in Chapter 2, inevitably brings down the profit margin of Akamai as a product company. On the other hand, however, it helps Akamai to gain insights of customer needs for companies of different verticals, traffic size or regions.

The above two core capabilities make Cloudlet product and platform development possible inside Akamai both on technology and business side. Based on such technology and insights, Cloudlet team are able to identify some frequently requested customizations of Akamai solutions into initial pipeline of Cloudlet applications, productize them into initial launches of Cloudlet applications and justify the possibility of extending Cloudlet into a platform in industry.

The “Visitor Prioritization” Cloudlet introduced in Chapter 3 can be served as a great example for this point. When E-Commerce websites who use Akamai services realize that during holiday peak time, their own servers simply cannot handle all end user transaction requests, they start to ask Akamai not to route all end user requests immediately to their servers. Instead, they ask Akamai to route requests that they cannot process immediately to a “waiting room”, usually a webpage asking customers to wait for a while. To improve customer experience, the “waiting room” webpage can contain some contents that entertain end users or even some coupons to keep end users. Such requests of re-routing end user requests to a customized “waiting room” have become so popular that Professional Services group have implemented them many times. Though Akamai charges a premium price for such customization solution, the margin is actually low because of costs in development and dedicated resources spent in consultancy. By productizing such customization into a Cloudlet application, Akamai are able to charge customer a lower price with higher margin, because of dramatic labor cost in consulting and software development.

Such capabilities, however, are limited to resources available inside the company. Currently the core Cloudlet team is a small team including product management, software development, project management and marketing. Though Cloudlet team is leveraging the Professional Services, sales and marketing arms of the company, it is a big challenge to justify, prioritize and develop all business needs identified as potential Cloudlet applications in different market segments.

Business Vision: For Cloudlet applications, the cloudlet team is expecting to see a wide range of Cloudlet applications for customers of different verticals, sizes and regions. In addition, Akamai expects to develop a low touch mode of selling Cloudlet applications: instead of leveraging salesforce and customer support, customers are expected to logon an online marketplace of all available Cloudlet, developed by Akamai and complementors, for different but specific business needs. Functions of all Cloudlet applications should be easy for customers to understand, pay and install by themselves. As analyzed, such applications not only help increase company profit margin and generate new revenue streams, but also provide value-added functions above web performance related CDN functions that can improve customer stickiness. Most importantly, Akamai expects a thriving ecosystem of complementors adopting Cloudlet platform to develop complements, which can benefit Akamai in the following two fields at least:

First of all and most critically, wide adoption of potential Cloudlet platform can help Akamai dominant the market most effectively. With more players in CDN market, it has become challenging to keep existing customers and attract new customers. Attracting more complementors to develop complements can lead to more customers. The synergies and integrations among those complements can help customer to streamline the business process, consolidate third party service providers and cut down IT and operational costs, which all help Akamai keep customers stay with Akamai services and products. Such positive network effects will make Akamai business more sustainable in the long run.

Secondly, the flexibilities of developing and customizing Akamai services efficiently may become critical to attract new customers. For example, Europe market has established mature CDN capabilities and it is hard for Akamai to gain larger market share with the same traditional technologies. With new value-added functions that can be developed on Cloudlet platform, Akamai solutions can become more attractive to European customers.

Therefore, it is critical for Akamai to create a thriving ecosystem of complementors adopting Cloudlet platform and create complementors as many as possible.

Current Market: Currently there are few complementors that use Akamai technologies to develop their own solutions, such as some value-added resellers. But there has not been any complementors exist for Cloudlet platform. This implies that the Cloudlet team needs to educate the market and provide some initial Cloudlet applications on the platform as examples for other complementors and as killer apps to attract end users.

To conclude, the success of extending Cloudlet into a platform depends on a thriving ecosystem of complementors adopting this platform, and Akamai should try their best to stimulate the adoption of the platform from potential complementors by leveraging Akamai's existing customer based and already identified business needs. Complements the Cloudlet team should develop may contain the following two kinds. The first kind of complement are killer apps that attract end users and educate complementors. The second kind of complement are components that those "enablers", serving as useful comoponents that can enable new complementors to develop. For example, many potential Cloudlet applications require request rerouting functions. Instead of trying to develop all scenarios

that would require such function, the cloudlet team can develop an easy to use component complementors can call to re-route end user requests in specific way to one or more customizable destinations.

5.2.2 Product Technology

Decisions that need to make on this lever involves product/platform architecture and interfaces design, in addition to Intellectual Patents strategies. We will discuss them respectively for Cloudlet platform:

Architecture: Best practices in platform strategies indicate a high level of modularity to facilitate the easy adoption of the platform and component reuses. The platform strategy of Cloudlet, however, has a broader impact on Akamai Technologies than initially expected.

Cloudlet applications are initially developed by Web Experience Business Unit. The product developed by this business unit is to improve customer experience, especially web performance in different situations such as different devices and website designs. Therefore Cloudlet's initial definition is another layer above traditional Web Experience products to solve business and operational challenges that go beyond web performance. When more and more potential Cloudlet ideas got generated in the pipeline, the Cloudlet team found many candidates are related to functions in security and media content delivery. Such products are taken charge of by Media and Security Business Units. Therefore, not only the company needs to redefine what a cloudlet actually means when its function is related to Security or Media, but also need to examine how the infrastructure and product design in products from these two business units can support the Cloudlet platform.

From discussions between product teams of Cloudlet and Security, one comment from senior management of Security products are their products can be rearchitected to be more customizable by providing more granulated modules. Currently, there are different versions of Security products made available upon different customer needs. One possible option to rearchitect Security product is to provide a base version of different product options, and make all different features and function options as "Security Cloudlet" that customers can go to the online Cloudlet marketplace to review, buy and install themselves, instead of using salesforce to discuss with customers on choices of different versions. This indicates that separate functions, though maybe small, should be separate modules to become independent Cloudlet applications. This further breakdown of modules may lead to system inefficiency because of increased communications between modules and condition validations inside every module.

Therefore though agreement of high level of modularity is reached, tradeoffs between efficiency and granularity remain to be further examined.

Interfaces: Open and clearly documented interfaces will greatly encourage the use of the platform technologies. Leveraging the best practices learnt from Salesforce, Cloudlet team can emphasize on the ease of integrating Cloudlet applications to other Akamai products

and popular third party cloud services. With more and more cloud services focusing on different functions available to enterprise customers, it has become a common challenge for enterprise IT departments to customize, configure and integrate services from different parties. Another layer of challenge is that when one service gets updated, the configuration of this service and integration with other services need to be taken care of too. In fact, many Akamai customer requests are related to configuring and deploying third party services on Akamai networks. It will be beneficial if applications on Cloudlet platform can easily “mashup” with popular third party services, just like Salesforce. By leveraging knowledges from Professional Services and existing customer base, Cloudlet team may be able to develop interfaces that can enable easy integration with third party cloud services that are popular or required to integrate with Akamai Cloudlet applications frequently.

In addition, Cloudlet is expected to extend into a platform above existing product portfolios of Akamai, which may have different frameworks and components. Cloudlet platform should therefore function as a façade that can leverage but hide different internal frameworks while providing consistent interfaces for application development.

5.2.3 Relationships with external complementors

Decisions on this lever are greatly affected by decisions made on the first two levers. A Platform provider needs to consider if the relationship between itself and complementors need to be collaborative or competitive.

Competitive or Collaborative: Because of decisions made on previous two levers, Akamai should develop collaborative relationships between Cloudlet platform and its complementors. The company should also provide incentives to motivate the adoption of this platform. For value-added resellers and mobile operators, Akamai can provide more trainings regarding available functions of Cloudlet platform and discounts. Also, Akamai may invite partners with great relationships to together develop some Cloudlet applications that can best leverage the capabilities and knowledges on two sides. For startups and individual developers, Akamai could examine future collaboration with venture capitals for early stage investments. This not only allows Akamai to make impacts and gain insights against innovations in market, but also fosters a good relationships with such startups for further collaboration or even acquisitions.

In addition, Cloudlet team should fully leverage Akamai’s online community and Akamai Edge annual conference in the following four aspects. Firstly, Cloudlet team should encourage communications between peer complementors of Cloudlet platform. Help among complementors regarding technical issues will help save company resources to provide appropriate reports. Also, discussions between complementors will often result in positive synergies. Secondly, Cloudlet team should also encourage communications between complementors and customers. Serving as the first line of support, complementors can learn how their complements should get improved. This also helps Akamai to cut technical support cost. Thirdly, Cloudlet team should encourage communications between customers. For enterprise software market, customers often want to learn what other organizations are adopting the platform and products for some case studies. Usually the

sales and marketing team will ask around for similar customer profile to facilitate the case study and can take time to convince potential customers. Direct comments from existing customers to potential ones are more convincing to potential customers, and such discussions can also help decrease time and resources allocated in sales cycle. Last but not the least, the cloudlet team should gather information and gain customer needs on potential Cloudlet applications and feedbacks on existing ones using tools like surveys or polls.

Note such collaborative relationships are not meant to be unchanged. They are proposed because the platform should focus on encouraging the adoption at the initial stage. When market dynamics changed or new situations emerge, either technology or business wise, Cloudlet team should reevaluate the relationships to best stimulate end user adoptions and growth of this ecosystem.

Industry standards: Also, Gawer and Cusumano mentioned in their 2002 book (Gawer & Cusumano, Platform Leadership, 2002, pp. 39-76) that Intel invested in creating industry standards and rally among complementors to follow such standards. Cloudlet team could also keep this in mind for future opportunities.

Complementor relationship development can be critical to best promote the platform and incentivize companies to become complementors, especially during the initial launch of the platform. As we reviewed in Chapter 2 for possible ways to grow into platform leadership positions, platform providers can deploy either “coring” or “tipping” strategies. As Akamai has developed a core technology capability to develop and facilitate the development of Cloudlet applications, company should make best efforts to tip the market to stimulate platform adoption. To leverage best practices summarized in Figure 4 (Gawer & Cusumano, How companies become platform leaders, 2008), Akamai can consider the following three kinds of actions:

First of all, Akamai can provide more incentives to complementors. Akamai can provide more trainings, technical support, knowledge sharing, co-marketing opportunities or even funding support just like Salesforce to attract companies to develop Cloudlet applications. In addition, company can waive license fee or other charges initially to motivate external complementors to adopt the platform.

Secondly, Akamai can rally a coalition with complementors or peers to promote certain industry standards or core technologies of Cloudlet.

Thirdly, Akamai can consider pricing or subsidy mechanisms that attract users to the platform. Cloudlet applications have the potential to be self-serviceable, which means low touch sales mode and minimum technical support needed during application download, install, deploy, maintenance and also updates. This means that with even lower price Cloudlet can bring in high profit margin. Akamai can first provide discounts, temporary free usage or versions with limited functions to attract users to the platform and try out Cloudlet

applications. This serves not only a platform promotion strategy but also market education efforts.

5.2.4 Internal organization

Decisions on this lever should enable internal organizations to best support decisions made on previous three levers. With closer examinations of current Cloudlet team and applications, recommendations in the following three aspects are proposed for decisions on this lever.

Organization Structure: Currently the Cloudlet team is inside the Web Experience Business Unit and current Cloudlet applications are mostly targeting customers of this department. The Cloudlet team have noticed that more and more Cloudlet application ideas in the pipeline are related to website security and media content. As products in these two fields are implemented by other Business Units, the Cloudlet team may need to be expanded correspondingly, recruiting members who used to work in Security and Media Business Units for example, to better coordinate the Cloudlet applications across different product lines.

Process and Culture: Regarding processes, the cloudlet team has identified two challenges. The first challenge is how to promote the Cloudlet brand in-house and also externally. As Cloudlet just got launched in 2014, not many customers are familiar with this new product. Also employees in Sales, Marketing and Professional Services are not all familiar with Cloudlet applications and may not provide best advices to customers. The second challenge is how to efficiently prioritize Cloudlet applications inside the pipeline. As the Cloudlet team is developing initial complements for Cloudlet platform, it is critical to identify applications with great potential (killer apps) that can drive enormous customer needs and generate interest on future Cloudlet platform. This requires feedbacks and comments from internal organizations such as Professional Services and Sales, as well as external customers, to better justify what ideas to implement. The process of collecting feedbacks from internal organizations, however, takes longer time than expected. As more Cloudlet ideas need to be evaluated, the prolonged processes of collecting feedbacks may delay the Cloudlet application development cycle.

To tackle the above two challenges, writer and the Cloudlet product management team have proposed to establish "Cloudlet Fellow" program. The idea is to segment existing customers by verticals, regions and traffic sizes, and then identify a subset of accounts that can best represent this market segment (usually the subset represents at least 20% of total accounts in this segment). Akamai employees in Sales and Professional Services who are responsible for those selected accounts are appointed "Cloudlet Fellow"s. Apparently number of Cloudlet Fellows in different segments can vary. For example, there should be more Cloudlet Fellows in American medium-size E-Commerce segment than those in African small-size Media segment. Cloudlet Fellow program has at least three benefits. First of all, Cloudlet Fellows own deep understandings of customers in specific segments and can best advise them regarding appropriate Cloudlet applications. Secondly, Cloudlet Fellows

will serve as go to person for questions about Cloudlets among their peers. Thirdly, as customer accounts taken charge by Cloulet Fellows cover at least 20% of each market segment in terms of verticals, regions or traffic sizes, their feedbacks regarding market potentials of possible Cloudlet applications can be valuable for Cloudlet product management to prioritize ideas in the pipeline. In addition, when Cloudlet platform is launched, Cloudlet Fellows can serve as evangelists for the platform and also provide guidance to partners who want to develop complementors above the platform.

In addition, as we discussed in lever 3, the Cloudlet team can also leverage online community to get inputs regarding existing and potential Cloudlet ideas.

System Mindset and Neutrality: The Cloudlet team should keep a holistic view of Cloudlet applications and platform especially how it can best leverage the overall product portfolio of the company. Also appropriate incentives should be provided to ensure that adoption of Cloudlet platform should be the highest priority and not to conflict with interests of different business units and product teams.

5.3 Conclusion

Cloudlet has great potential to be a platform widely adopted in industry. In this chapter we have analyzed challenges of launching Cloudlet platform in different aspects and proposed recommendations in four levers from previously introduced Platform Leadership Analysis Framework, summarized in Figure 24.

Levers	Factors to consider	Recommended actions
Lever 1: Scope of the firm (what to develop in-house and what to leave to complementors)	<ul style="list-style-type: none"> • Company Capabilities • Business Vision • Current Market 	<ul style="list-style-type: none"> • Develop popular Cloudlet that serves as complements to attract customers • Develop components that can enable and facilitate the development of new Cloudlet applications from complementors
Lever 2: Product Technology	<ul style="list-style-type: none"> • Architecture • Interfaces • Intellectual Patents 	<ul style="list-style-type: none"> • High level of (granulated) modularity • Façade that can leverage different back-end technologies • Interfaces that enable “Mashup”s
Lever 3: Relationships with External Complementors	<ul style="list-style-type: none"> • Collaborative or Competitive • How to play multiple roles in different scenarios 	<ul style="list-style-type: none"> • Develop collaborative relationships with complementors • Facilitate discussions between different stakeholders (complementors, customers and Cloudlet team) • Re-evaluate relationships according to market dynamics and technology innovation • Develop industry standards when appropriate
Lever 4: Internal Organizations	<ul style="list-style-type: none"> • Organization structure • Process and Culture • System view and neutral mindset 	<ul style="list-style-type: none"> • Expand Cloudlet team to have members with experiences from different business units • Establish Cloudlet Fellow program • Provide appropriate incentives to promote the platform and grow ecosystem first rather than focus on separate profit margins of different business units and product lines

Figure 24: Recommendations for Cloudlet Platform Strategies

Bibliography

Akamai. (2013). *How to deliver fast, engaging responsive web design sites*. Retrieved January 10, 2015, from www.akamai.com:
http://www.akamai.com/dl/akamai/wp_responsive_web_design.pdf

Akamai Technologies. (2013, October 9). *Akamai Unveils Open Platform Initiative at Akamai Edge 2013 Customer Conference*. Retrieved December 12, 2014, from www.akamai.com:
http://www.akamai.com/html/about/press/releases/2013/press_100913.html

Akamai Technologies. (n.d.). *Aura Licensed CDN*. Retrieved January 10, 2015, from www.akamai.com: http://www.akamai.com/dl/product_briefs/aura-licensed-cdn-network-operator.pdf

Akamai Technologies. (n.d.). *Cloud Computing Services for Enterprise Applications, Content Delivery and Cloud Security Solutions*. Retrieved December 10, 2014, from www.akamai.com:
<http://www.akamai.com/html/solutions>

Akamai Technologies. (n.d.). *Deliver Web Applications Securely and Reliably*. Retrieved December 10, 2014, from www.akamai.com: <http://www.akamai.com/dl/akamai/fact-sheet-application-acceleration-services.pdf>

Akamai Technologies. (n.d.). *Dynamic Site Accelerator*. Retrieved December 9, 2014, from www.akamai.com: <http://www.akamai.com/html/solutions/dynamic-site-accelerator.html>

Akamai Technologies. (n.d.). *Dynamic Site Accelerator*. Retrieved January 10, 2015, from www.akamai.com: <http://www.akamai.com/html/solutions/dynamic-site-accelerator.html>

Akamai Technologies. (2014). *Facts & Figures*. Retrieved January 10, 2015, from www.akamai.com: http://www.akamai.com/html/about/facts_figures.html

Akamai Technologies. (n.d.). *Kona Web Application Firewall*. Retrieved January 20, 2015, from www.akamai.com: <http://www.akamai.com/html/solutions/web-application-firewall.html>

Akamai Technologies. (2012). *Terra Cloud Catalyst*. Retrieved 12 10, 2014, from uk.akamai.com: <http://uk.akamai.com/dl/brochures/Terra-ProductBrief-CloudCatalyst.pdf>

Akamai Technologies. (n.d.). *Web Performance Solutions*. Retrieved December 10, 2014, from www.akamai.com: <http://www.akamai.com/html/solutions/web-performance-solutions.html>

Amazon Web Services. (n.d.). *AWS Case Studies*. Retrieved January 9, 2015, from aws.amazon.com: <http://aws.amazon.com/solutions/case-studies/>

Amazon Web Services. (2012, 4 3). *AWS Partner Network (APN) Frequently - Asked - Questions*. Retrieved 12 10, 2014, from cloudfront.net:
https://d36cz9buwrultt.cloudfront.net/APN_FAQs_040312.pdf

Amazon Web Services. (n.d.). *Running Databases on AWS*. Retrieved January 10, 2015, from aws.amazon.com: http://aws.amazon.com/running_databases/

Apprenda. (n.d.). *IaaS, PaaS, SaaS (Explained and Compared)* . Retrieved December 8, 2014, from [apprenda.com](http://apprenda.com/library/paas/iaas-paas-saas-explained-compared/): <http://apprenda.com/library/paas/iaas-paas-saas-explained-compared/>

Beal, B. (2006, October 9). *Salesforce writes its own language*. Retrieved December 17, 2014, from searchcloudapplications.techtarget.com: <http://searchcloudapplications.techtarget.com/news/1222246/Salesforcecom-writes-its-own-language>

Brennan, T. (2013, September 18). *The Top 7 Reasons why the Salesforce AppExchange is under hyped*. Retrieved December 10, 2014, from diginomica.com: <http://diginomica.com/2013/09/18/top-7-reasons-salesforce-appexchange-hyped/#.VHL0-r769UQ>

Candrlic, G. (2013, May 6). *China and Asia Content Delivery Network (CDN)*. Retrieved January 10, 2015, from [globaldots](http://www.globaldots.com): <http://www.globaldots.com/china-and-asia-content-delivery-network-cdn/>

Christensen, C., & Raynor, M. (2003). *The innovator's solution: Creating and sustaining successful growth*. Harvard Business Press.

Cisco . (2014, June 10). *The Zettabyte Era: Trends and Analysis* . Retrieved January 10, 2015, from www.cisco.com: http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/VNI_Hyperconnectivity_WP.html

Colt, S. (2014, June 10). *The World Cup Is Going To Shatter Internet Traffic Records Read more: <http://www.businessinsider.com/world-cup-internet-traffic-2014-6#ixzz3PNvjaXiR>*. Retrieved December 20, 2014, from www.businessinsider.com: <http://www.businessinsider.com/world-cup-internet-traffic-2014-6>

Cusumano, M. (2012, Spring). 15.358 The Business of Software and Digital Platforms, Course Notes. Cambridge, MA: MIT Sloan School of Management.

Cusumano, M. A. (2004). *The Business of Software*. Cambridge, MA, USA: Free Press.

Cusumano, M. A. (2008). The Changing Software Business: Moving From Products to Services. *IEEE* , 18.

Cusumano, M. (2010). *Staying Power*. Oxford University Press, USA.

Cusumano, M., Kahl, S., & Suarez, F. F. (2006). "Product, process, and service: a new industry lifecycle model. 29.

Drake, C. (2012). *Case Study: Akamai's Content Delivery Network Strategy*. Informa. Provided by Akamai

EDWARDS, J. (2014, 5 31). *The iPhone 6 Had Better Be Amazing And Cheap. Because Apple Is Losing The War To Android* Read more: <http://www.businessinsider.com/iphone-v-android-market-share-2014-5#ixzz3PEA8ViRs>. Retrieved 12 10, 2014, from <http://www.businessinsider.com/iphone-v-android-market-share-2014-5>

Forbes. (2011, 12 22). *Akamai to Acquire Contendo for \$268M*. Retrieved December 10, 2014, from www.forbes.com: <http://www.forbes.com/sites/marketnewsvideo/2011/12/22/akamai-to-acquire-contendo-for-268m/>

Forrester. (2013). *The Forrester Wave™: Enterprise Public Cloud Platforms, Q2 2013*. Forrester.

Gartner. (2014, July 23). *Technology Overview for Content Delivery Network Services*. Retrieved January 10, 2015, from www.gartner.com: <http://www.gartner.com/technology/reprints.do?id=1-2011BMS&ct=140818&st=sg#h-d2e140>

Gawer, A., & Cusumano, M. (2008, January 1). *How companies become platform leaders*. Retrieved December 5, 2014, from sloanreview.mit.edu: <http://sloanreview.mit.edu/article/how-companies-become-platform-leaders/>

Gawer, A., & Cusumano, M. (2012). *Industry Platforms and Ecosystem Innovation. DRUID 2012, Innovation and Competitiveness, Dynamics of organizations, Industries, Systems and Regions*. Copenhagen, Denmark: Copenhagen Business School.

Gawer, A., & Cusumano, M. (2002). *Platform Leadership*. Harvard Business School Press.

Gawer, A., & Henderson, R. (2007). Platform owner entry and innovation in complementary markets: Evidence from Intel. *Journal of Economics & Management Strategy* . 16 (1), 1-34.

Grannan, M., Karcher, P., Rymer, J. R., Gualtieri, M., Kindness, A., Facemire, M., et al. (2014). *CDNs Extend To Web Performance Optimization And End-To-End Cloud Services*. Forrester.

Grant, R. (2013, September 10). *Marc Benioff at Disrupt: there would be no Salesforce without Steve Jobs* . Retrieved December 9, 2014, from venturebeat.com: <http://venturebeat.com/2013/09/10/marc-benioff-at-disrupt-there-would-be-no-salesforce-without-steve-jobs/>

Henschen, D. (2013, November 19). *Salesforce.com, HP Partner For Private Cloud 'Superpods'*. Retrieved December 20, 2014, from www.informationweek.com: <http://www.informationweek.com/software/enterprise-applications/salesforcecom-hp-partner-for-private-cloud-superpods/d/d-id/1112681>

Informa. (2012). *Content delivery networks: Market dynamics and growth perspectives*. Retrieved January 11, 2015, from [www.informatandm.com: http://www.informatandm.com/wp-content/uploads/2012/10/CDN-whitepaper.pdf](http://www.informatandm.com/wp-content/uploads/2012/10/CDN-whitepaper.pdf)

Infosys. (2006, November 13). *An introduction to salesforce.com's appexchange*. Retrieved December 10, 2014, from [oreilly.com: http://archive.oreilly.com/pub/a/network/2006/11/13/an-introduction-to-salesforcecoms-appexchange.html](http://archive.oreilly.com/pub/a/network/2006/11/13/an-introduction-to-salesforcecoms-appexchange.html)

John Allspaw, P. H. (2009). *10 Deploys per Day*. Retrieved December 8, 2014, from [www.slideshare.net: http://www.slideshare.net/jallspaw/10-deploys-per-day-dev-and-ops-cooperation-at-flickr](http://www.slideshare.net/jallspaw/10-deploys-per-day-dev-and-ops-cooperation-at-flickr)

Kanaracus, C. (2013, August 9). *Salesforce.com to impose massive fee hike for app store security review*. Retrieved December 9, 2014, from [www.pcworld.com: http://www.pcworld.com/article/2046280/salesforcecom-to-impose-massive-fee-hike-for-app-store-security-review.html](http://www.pcworld.com/article/2046280/salesforcecom-to-impose-massive-fee-hike-for-app-store-security-review.html)

Kepes, B. (2014, July 29). *Just How Big Is Amazon's Cloud Business?* Retrieved December 10, 2014, from [www.forbes.com: http://www.forbes.com/sites/benkepess/2014/07/29/just-how-big-is-amazons-cloud-business/](http://www.forbes.com/sites/benkepess/2014/07/29/just-how-big-is-amazons-cloud-business/)

Krakora, D. (2013, December 6). *Salesforce.com Partner Ecosystem Gains Depth*. Retrieved December 10, 2014, from [www.partner-path.com: http://www.partner-path.com/2013/12/salesforce-partner-ecosystem/](http://www.partner-path.com/2013/12/salesforce-partner-ecosystem/)

Kuchinskas, S. (2006, January 17). *Salesforce Finally ships AppExchange*. Retrieved December 10, 2014, from [www.internetnews.com: http://www.internetnews.com/ec-news/article.php/3578066/Salesforce+Finally+Ships+Appexchange.htm](http://www.internetnews.com/ec-news/article.php/3578066/Salesforce+Finally+Ships+Appexchange.htm)

Loukides, M. (2012, June 7). *What is DevOps?* Retrieved December 10, 2014, from [radar.oreilly.com: http://radar.oreilly.com/2012/06/what-is-devops.html](http://radar.oreilly.com/2012/06/what-is-devops.html)

MARCOTTE, E. (2010, May 25). *Responsive Web Design*. Retrieved December 10, 2014, from [alistapart.com: http://alistapart.com/article/responsive-web-design](http://alistapart.com/article/responsive-web-design)

Meeker, M. (2012, May 30). *INTERNET TRENDS*. Retrieved January 10, 2015, from KPCB: http://kpcbweb2.s3.amazonaws.com/files/58/KPCB_Internet_Trends_2012_FINAL.pdf?1340750868

Meyer, D. (2013, May 2). *Salesforce finally solidifies European data center plans*. Retrieved December 10, 2014, from [gigaom.com: https://gigaom.com/2013/05/02/salesforce-finally-solidifies-european-data-center-plans/](https://gigaom.com/2013/05/02/salesforce-finally-solidifies-european-data-center-plans/)

OpenSignal. (2014, 8). *Android Fragmentation Visualized*. Retrieved 12 2014, from [opensignal.com: http://opensignal.com/reports/2014/android-fragmentation/](http://opensignal.com/reports/2014/android-fragmentation/)

O'Toole, J. (2014, February 28). *Mobile apps overtake PC Internet usage in U.S.* Retrieved December 20, 2014, from money.cnn.com:
<http://money.cnn.com/2014/02/28/technology/mobile/mobile-apps-internet/>

Parker, G., & Van Alstyne, M. (2005). Two-sided network effects: A theory of information product design. *Management Science* , 51 (10), 1494-1504.

Phonearena. (2013, 7 24). *Android's Google Play beats App Store with over 1 million apps, now officially largest.* Retrieved 12 10, 2014, from www.phonearena.com:
http://www.phonearena.com/news/Androids-Google-Play-beats-App-Store-with-over-1-million-apps-now-officially-largest_id45680

Pisano, G., & Verganti, R. (2008). Which kind of collaboration is right for you. *Harvard Business Review* , 86 (12), 78-86.

Podjarny, G. (2014, January). *RWD Ratio in Top 100,000 websites – refined.* Retrieved June 20, 2014, from www.guypo.com: <http://www.guypo.com/rwd-ratio-in-top-100000-websites-refined/#more-3464>

Rama, G. (2014, 11 20). *AWS Expands Partner Program Benefits.* Retrieved 1 10, 2015, from <http://virtualizationreview.com/articles/2014/11/20/aws-expands-apn-benefits.aspx>

Rayburn, D. (2011, December 22). *Why Akamai's \$268 Million Purchase Of Cotendo Was A Really Smart Move.* Retrieved February 28, 2013, from BusinessInsider.com:
http://articles.businessinsider.com/2011-12-22/tech/30545651_1_akamai-stock-acceleration-at-t

Reuters. (2014, 10 24). *China Telecom, Unicom to build content delivery firm: Chinese paper.* Retrieved 11 15, 2014, from www.reuters.com: <http://www.reuters.com/article/2014/10/24/us-china-telecom-china-unicom-hk-jointve-idUSKCN0ID0B820141024>

Rochet, J., & Tirole, J. (2003). Platform competition in two-sided markets. *Journal of the European Economic Association* , 1 (4), 990-1029.

Rouse, M. (2012, October). *Salesforce AppExchange.* Retrieved December 10, 2014, from searchcloudapplications.techtarget.com:
<http://searchcloudapplications.techtarget.com/definition/Salesforce-AppExchange>

Roy, N. (2014, April). *amazon web services global infrastructure.* Retrieved December 8, 2014, from blog.blazeclan.com: <http://blog.blazeclan.com/wp-content/uploads/2014/04/amazon-web-services-global-infrastructure.png>

Salesforce. (n.d.). *AppExchange is the Business App Store: Mobile Apps for Business.* Retrieved from appexchange.salesforce.com: <https://appexchange.salesforce.com>

Salesforce. (2014). *Dreamforce'14 Why Attend.* Retrieved January 10, 2015, from www.salesforce.com: <http://www.salesforce.com/dreamforce/DF14/why-attend.jsp>

Salesforce. (2014, April 2). *Salesforce announces new industries strategy* . Retrieved December 12, 2014, from www.salesforce.com: <http://www.salesforce.com/company/news-press/press-releases/2014/04/140402.jsp>

Salesforce. (2014). *Salesforce Annual Report 2014*. Retrieved from http://investor.salesforce.com/files/doc_financials/2014/AnnualReport.pdf

Salesforce. (2014, November 25). *Salesforce Partner Program Policies*. Retrieved January 10, 2015, from www.salesforce.com: http://www.salesforce.com/partners/partner_policies.pdf

Salesforce. (2013). *Salesforce, 2013: Overview of Trialforce*. Retrieved December 20, 2014, from www.salesforce.com: http://www.salesforce.com/us/developer/docs/packagingGuide/Content/trialforce_conceptual_overview.htm

Shamrock, T. (2013, August 20). *The Top 6 Ways to Integrate with Salesforce.com* . Retrieved December 10, 2014, from www.cloudsherpas.com: <http://www.cloudsherpas.com/partner-salesforce/the-top-6-ways-to-integrate-with-salesforce-com/>

Sharma, A., Krishnan, R., & Grewal, D. (2001). Value creation in markets: a critical area of focus for business-to-business markets. *Industrial Marketing Management* , 30 (4), 391-402.

Sullivan, D. (2013, September 10). *PaaS Provider Comparison Guide: Amazon ASWS as a PaaS*. Retrieved December 7, 2014, from www.tomsitpro.com: <http://www.tomsitpro.com/articles/amazon-aws-paas-iaas-cloud-computing,2-608.html>

Trefis. (n.d.). *Akamai: Overview*. Retrieved January 10, 2015, from www.trefis.com: <https://www.trefis.com/company?hm=AKAM.trefis&from=search#>

Varia, J. (2011, January). *Architecting for the Cloud: Best Practices*. Retrieved December 10, 2014, from media.amazonwebservices.com: http://media.amazonwebservices.com/AWS_Cloud_Best_Practices.pdf

Varia, J. V. (2014, January). *Overview of Amazon Web Services* . Retrieved December 9, 2014, from media.amazonwebservices.com: https://media.amazonwebservices.com/AWS_Overview.pdf

Vellante, D. (2014, March 2014). *Cloud Computing 2013: The Amazon Gorilla Invades the Enterprise*. Retrieved December 10, 2014 , from wikibon.org: http://wikibon.org/wiki/v/Cloud_Computing_2013:_The_Amazon_Gorilla_Invades_the_Enterprise

Vere, K. D. (2012, 7 24). *iOS leapfrogs Android with 410 million devices sold and 650,000 apps*. Retrieved 12 10, 2014, from www.adweek.com: <http://www.adweek.com/socialtimes/ios-device-sales-leapfrog-android-with-410-million-devices-sold/528539?red=im>

Von Krogh, G., & Cusumano, M. (2001, January 15). *Three strategies for managing fast growth*. Retrieved January 10, 2015, from sloanreview.mit.edu: <http://sloanreview.mit.edu/article/three-strategies-for-managing-fast-growth/>

Wainwright, P. (2013, May 2). *AppExchange matures as vendors grow up*. Retrieved December 10, 2014, from diginomica.com: <http://diginomica.com/2013/05/02/appexchange-matures-vendors-grow-up/#.VIGygXlxgVq>

Waltl, J. (2013). *IP Modularity in Software Products and Software Platform Ecosystems*.

Wee, W. (2012, August 20). *China's Mobile Internet Users Surpass Desktop Users*. Retrieved January 11, 2015, from www.techinasia.com: <https://www.techinasia.com/china-mobile-internet-users-statistics-behavior/>

Work, S. (2011, April). *How Loading Time Affects Your Bottom Line*. Retrieved January 10, 2015, from blog.kissmetrics.com: <https://blog.kissmetrics.com/loading-time/?wide=1>

Yoffie, D., & Cusumano, M. (1999). Judo strategy: The competitive dynamics of Internet time. *Harvard Business Review*, 77, 70-82.

Zona Research. (1999, April). *The Economic Impacts of Unacceptable Web-Site Download Speeds*. Retrieved December 10, 2014, from http://www.webperf.net/info/wp_downloadspeed.pdf