



The Aflexi Architecture

White Paper
October 2010

Overview

General market

CDN market is held by two main players Akamai and Limelight, both commanding market shares of 38% and 25.6% respectively in 2008.

Frost and Sullivan forecast there would be 1.15 billion broadband subscribers globally by 2012; thus consumers demands for higher quality multimedia/interactive website content. Modern gadgets and mobile devices today comes with high quality built in cameras. Consumers are able to upload and view video anytime, anywhere.

Cisco predicted that in 2014, the Internet will be four times larger than it was in 2009; Internet video will contribute to more than 40 percent of consumer Internet traffic by the end of 2010. Video is taking off in a big way, CDN will play a big role in ensuring the growth can be sustained.

Hosting providers

Consumers will spur creation of new sites that are heavily relying on user-generated content, of which are taken via sophisticated gadgets that creates high quality content. The web hosting industry can tap into the high demand for hosting of rich media such as videos and music so that they can evolve with the market.

CDN has a high barrier of entry because deploying a CDN requires technology and deep financial backing to compete in the market. Webhosts relies heavily on third party software for automation and entering the CDN market is simply an expensive venture to be even considered of.

The current way out for webhosts offering CDN services is to resell for established CDN players. Reselling model is bound to minimal commitment, prices being controlled by commitment structure and last but not least, risk of losing the market positioning.

Content Publishers

With the traffic expected to grow exponentially, content publishers find it a daunting challenge in scaling the website easily at the expense of high cost for expansion.

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The alternative to scale easily is by hosting the web content in a cloud environment that allows content owners to scale easily, anytime while relying on CDN to distribute the web content speedily globally.

Aflexi's Solutions

Aflexi's CDN software is a result of more than 40,000 hours of continuous R&D and improvements to the automation in deploying and selling CDN in 30 minutes.

The R&D revolves around few assumptions:

1. Hardware capabilities continue to improve exponentially with prices going south.
2. Bandwidth price is on a downward trend.
3. More web hosting services built and run on virtualization technology as hardware capabilities continue to improve.
4. The next Internet traffic growth will mainly generated from consumer websites.

With the assumptions, Aflexi built an automation that:

1. Fully automated CDN software that web hosting company can plug and play with minimal intervention.
2. The CDN software must be efficient to run on a virtualized system.
3. Integrates with major hosting control panel and billing system.
4. Provides a seamless way for Content Publisher to migrate content to a CDN.
5. Provides a platform for webhost to share infrastructure optionally to reduce operation overhead cost.

With these in mind, Aflexi developed the CDN software solution tailored especially for the web hosting industry.

The System Architecture

The Aflexi's CDN software consists of major four pillars, CDN Management Portal (CMP); Business Logic Layer (BLL); Back End System (BES), and the Delivery Services (DS). The former three services are hosted on Aflexi infrastructure whilst the DS are run and managed by the webhosts, also known as Operators.

The following diagrams describe the Aflexi system architecture as a high level overview.

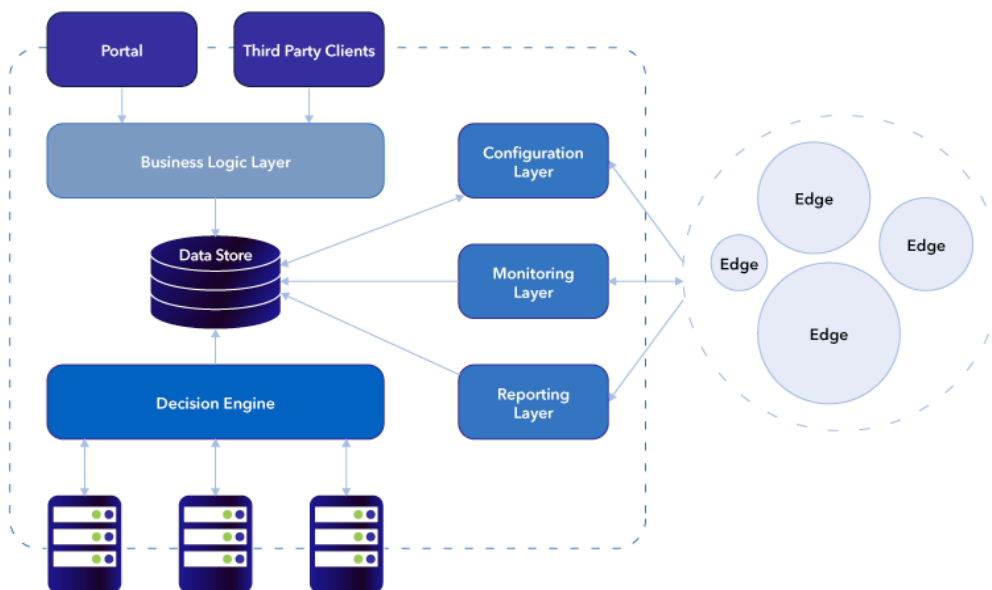


Diagram 1: The Aflexi Core

Business Logic Layer

The Business Logic layer is the brain of the entire system, it serves as the intermediary between the CMP and BES, as well as the controlling agent based on the logics and inputs provided by the stakeholders. It is architecturally an event-driven system with non-blocking and fail-safe capability, therefore enables quicker response time to incoming requests and given an unexpected event to interrupt an executing background task, it is always automatically restored.

Web Service Interface

The Web Service interface enables integration from internal systems and third-party systems to the Business Logic Layer. It currently supports remote API calls through XML-RPC.

Data being received will be validated and processed, then stored in the Data Store instantly to be used by the Back End System.

Data Store

All configurations and data collection from the BLL will feed to Aflexi Data Store that will be accessed by the Back End System. The BES does not take data directly from the BLL to ensure that it only takes command of a completed processed requests by BLL and it separates the coupling of the two system in any event that BLL fails, the BES can operate properly.

Back End System

The Back End System oversees the formation of CDN with the assistance of six major components (1) Configuration Layer (2) Monitoring Layer (3) Reporting Accounting Layer (4) Decision Engine (5) Provisioning of Delivery Services (6) Edge servers

Configuration Layer

The Configuration Layer is used to generate configuration for the Delivery Services based on the input stored in Data Store by the Operators or Aflexi default system configuration. The configuration consists of resource and services settings. It allows the Back End System to automate the installation or uninstallation of services with the specified configuration.

Monitoring Layer

Monitoring Layer keeps Aflexi updated with the health of the Delivery Services. The monitoring is achieved through active and passive monitoring, whereby Aflexi actively checks on all the entities of DS while DS also send 'heartbeat' back to Aflexi constantly. All these data will be stored in Data Store so that BLL may retrieve data and expose to the data through the web service interface.

Reporting Accounting Layer

Another function of Monitoring Layer is to retrieve resources logs from DS and pass on to BLL to generate traffic reports. The traffic reports get updated every five minutes.

Edge Servers

The Edge Servers are run by the Operators. The BES automates the provisioning of services with Puppet that automatically updates the edge servers at a periodic time interval or whenever a new version of Aflexi software is released.

The topic of 'Edge servers' is presented in another Aflexi technology white paper "How Aflexi Edge Servers Work".

Decision Engine

The proprietary decision engine efficiently processes queries through the DNS lookups of the visitor's origin and returns a set of carefully chosen Edge servers for the requested resource. Taken as inputs are the time, visitor IP address, and CDN site ID; the engine then interfaces with the geolocation database to obtain geographical location information on the visitor's IP. It selects a set of candidate Edge servers and policies from the system

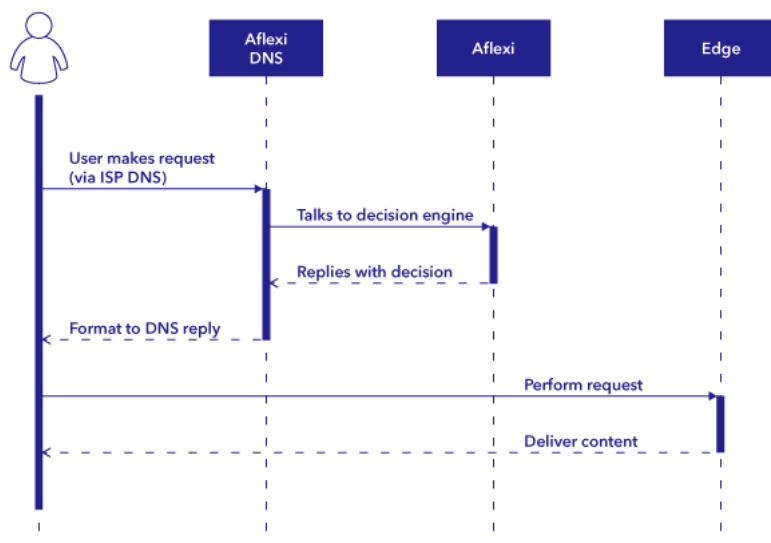


Diagram 2: Aflexi's Decision Engine

state database, together with their performance status and TTL (time to live). The best available selection of Edge servers are chosen and are told to start serving the visitor.

Policies are implemented in a lightweight programming language such as Python. The publisher policy is evaluated over available input to select an operator. Then, the operator policy is evaluated over available input to choose a set of Edge servers.

Name servers (NS Servers) communicate with a routing layer and delegate a particular set of Edge servers to serve mirrored content. They in turn passively send back information to the monitoring layer for monitoring information to be presented within the CDN management portal. This is quintessentially the decision engine, its mechanics presented in the next section.

CDN Management Portal

Management of the CDN is done via the CDN Management Portal. The CMP is an intuitive self-service portal that allows the stakeholders to configure resources or services through the browser.

The stakeholder of the CMP are categorized into Operators and Publishers:

1. Operators can be known as the service provider for CDN.
2. Publishers host their content at the CDN of the Operator.

To ensure total integration, publishers access the CMP via a dedicated URL provided by their operators. Another function of Monitoring Layer is to retrieve resources logs from DS and pass on to BLL to generate traffic reports. The traffic reports get updated every five minutes.

Operators

The Operator CMP interface allows configuration of the following:

1. Provision and setting up Edge servers configuration.
2. Provision Publisher and setting up package configuration.
3. Default CDN configuration.
4. Reporting

Publishers

The Publisher CMP interface is a self-service portal that does:

1. Provision and setting up CDN resource configuration
2. Reporting
3. File purging

All these configurations will be processed by BLL and apply the appropriate action, for example of server or resource suspension due to bandwidth limit exceeded.

Traffic Reports

Detailed bandwidth usage are available to view in graph and download in excel format. Traffic report can be scaled down to date range, edge servers, locations, publishers and CDN resource.

Useful CDN Tools

Plenty of useful CDN tools can be found in this CMP:

1. Instant Purge – Remove the outdated cache from the CDN
2. CDN Enabler – Adapt the web content into the CDN using .htaccess
3. CDN Integration Test tool – Checks if the website is properly “CDNized” or CDN enabled

Private Labelling

Private labeling enables Operator to operate the entire CDN to look like a proprietary technology. The CDN Management Portal can be themed to match with the brand identity by modifying the user interface of the CMP as though it is the Operator’s technology, and it is a good way of system integration.

The CMP is mainly CSS oriented, so changing the look merely requires a call to a remote CSS file that follows the specification. Hence, a specialized series of templates are provided for modifications by the Operator.

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In spite of CMP is a Aflexi hosted portal, the feature allows Operator to choose the preferred URL for Publishers to login to the themed CMP that will look and feel integrated as part of the operator's own product offering.

Integration Into Hosting Control Panel Systems

To have a complete seamless management experience, there was a need to integrate Aflexi's distributed CDN technology as a module or an add on to existing well known hosting control panel systems.

Hosting control panels

cPanel

The Operator is able to enable access to the CDN in WHM by assigning a CDN-enabled package to specified account. On top of that, shared hosting and CDN bandwidth can be shared to offer a hybrid package.

The Publishers manage CDN sites in the cPanel without accessing CMP.

Plesk

A specialized module integration with the Plesk system is currently being developed as of December 2010.

Billing systems

WHMCS

Operator that uses WHMCS are able to automate the sign up process of CDN services and other features that WHMCS offers including but not limited to auto account suspension for overdue invoice, account upgrade and downgrade.

Third party integration

API (<http://api.aflexi.net>)

For Aflexi CDN Operators who would want to write their own CDN control panel interface, an API of certain exposed features of the system are exposed for connection via a standard HTTP end point. They present data in the XMLRPC format that is easy to parse using virtually almost any programming language that supports XML RPC parsing natively or through add-ons.