

A cloud serving based electronic book platform: research and implementation

Wei Dong^{1, a}

¹College of Electrical and Information Engineering, Southwest University for Nationalities,
Chengdu 610041, China.

^abrant.dong@163.com

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Abstract. Nowadays the world is undergoing a digital revolution, and e-books are becoming an increasingly significant category of digital resource. In this paper, we propose a cloud serving based online electronic book (e-book) platform. On this platform, e-books resource can be distributed and then can be provided to readers to browse, read, share and purchase. At the same time, with software systems of this platform, publishers can make their books online and provide cloud based service to all clients. With such demands, a platform is designed and implemented. The platform comprises of several software systems, which are built to facilitate reader and publisher to utilize e-book resources according to their respective demands. Since nowadays it is an age of mobile internet, great emphasis is placed on the mobile platform, such as Ios and Android. Moreover, to cope with some well-known issues, such as piracy, some special designs is been made. To validate our design, some experiments are conducted in this platform and results show that our system works quite well. With e-book resources becoming more and more important in our daily life, our platform is expected to improve work efficiency greatly.

Introduction

The last few years has seen a massive growth of applications for smart phone operating systems such as Android [1], IOS [2]. Seeing this huge trend, book publishers would like to put their books online, instead of just selling their books in a book store. However, there are many challenges to be faced to develop a real e-book system. First, piracy is a big issue for e-book [3]. Unlike real books, e-book can be copied and shared to friends very easily. If no policy or method adopted to prevent users from propagating e-books casually, publishers will lost a large amount of profit and will be reluctant to adopt the platform for e-book selling. On the other hand, e-books readers expect to purchase e-books with cheaper prices than the traditional books. Consequently, there must be a balance to achieve for both sides, i.e., publishers and e-book readers. In the worst case, a malicious user may get e-books by illicit means and pays nothing for e-books. Under such cases, the profit of publishers drops dramatically and the rights of books' authors are been compromised. So, the first and maybe the most important challenge is that some anti-piracy policies must be made. Second, there are many e-book formats. To make a platform compatible to all e-book formats is an impossible task. On the other hand, although some e-book formats, such as PDF, are very suitable for desktop environment, they are not suitable for mobile devices. The main reason for this phenomenon is that varied mobile devices have varied resolutions and sizes. These formats, which were originally designed for desktop computers, simply don't support devices like smartphones, tablets, and e-readers. Consequently, for publishers and readers, a single standard must be adopted. EPUB format is a technical standard published by the International Digital Publishing Forum (IDPF). It has several advantages. First, it support re-flowable document and it optimize text for fixed-layout display and smart devices. Second, like an HTML web site, the format supports inline style, just as CSS style in HTML. Moreover, other features such as bookmarking, passage highlight, notes, content search and resizable fonts are fully supported. However, the EPUB format is an open standard and many software and devices support

this format, which may result in piracy. If a platform only supports the EPUB format, then a malicious user can copy the e-book easily.

In this paper, we propose a cloud serving [4] based online electronic book (e-book) platform. The platform consists of several software systems. In this platform, publisher can publish e-book and reader can browse and purchase e-book. Most importantly, some anti-piracy mechanisms are adopted in this platform. And we adopt a new e-book file format, which is based on the EPUB standard [5]. Since the new e-book format is based on EPUB standard, it naturally inherits all advantages of this standard. And the modification we did is to prevent piracy effectively.

The rest of this paper is organized as follows. In section 2, the design is described. Section 3 is the test of the system. It is concluded in section 4.

Design of the cloud serving based electroic book platform

The purpose of the cloud serving based electroic book platform is to let a publisher can publish e-books and a user can access online e-book resources. Since there are a variety of devices that a user may utilize to access the platform, it is necessary to design a universal way for differenct uers and differenct clients to access the e-book resources. The main reason for a univernal way to access the e-book resources is the scalability issue. A user may read e-book by smart devices, such as smart phone, tablets, Android TV, or just by desktop computer. Moreover, there are a variety of software sytems a user may employ to access the platform for e-book resources. Software systems may include Android/Ios application, web browser, tablet application or third party applications. So it is high necessary to design a univernal way to define a interface for different devices and different software systems to access the e-book resources. To achive this goal, two domains are divided which is illustrated in Figure 1. The two domains which include the applictions domain and the platform domain design a univernal interface for all resource request. Since HTTP API has many advantages and has a good scability, HTTP API is adopted between these two domains.

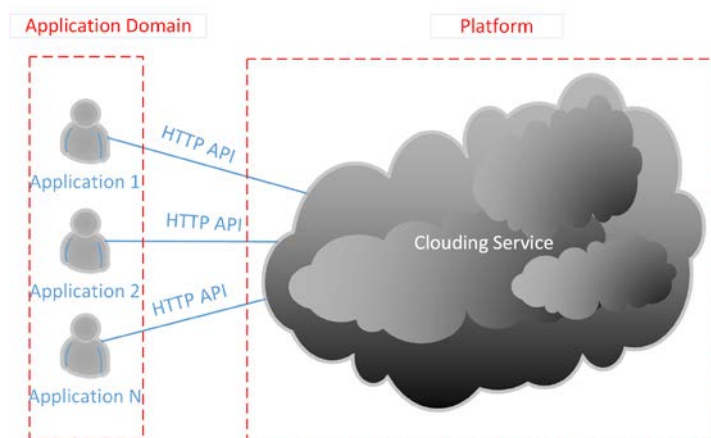


Fig.1. System architecture of the short message services management system

To request online e-book resource, any software on any device is just to issue an HTTP request, and resource is returned as a means of HTTP response.

From the sytem artitechture's point of view, the platform is deviced into three parts. Figure 2 shows how these three parts are orginized. The first part is the client software, in which a user utilizes to acess online ebook resources. As we mentioned before, client software includes a variety of software systems, such as Android applictions, Ios applications, web pages, etc. The second part, which is also the kernel part of the platform, is the server software. Between server software and client software HTTP protocol is adopted. And we employ Restful API [6]. For an online resouce, there are four types of opreation, ie. GET, PUT, DELETE, and POST. And these four types of operations comprise all opertaions of a resource. While client software is designed for users, server software is use to fullfill user's request. All resouces are organized in the server side. There are five

servers in this side and it includes web server, database server, file server, CMS server and big data server. Since resource are all request by HTTP request, web server is employed to fullfill the request and resource are return to clietns as HTTP response. All e-book files are stored on file server. It is deserved that for security concern, file server is only accessed inside the server. Any resource request through HTTP API must be directed to web server, which does a series of sanity checks to grantee a resource is return to a valid user. Database server stores all the resoucre records and user records etc. Big data server is utilized to analyze user's reading habits, popular e-books, and popular authors etc. Consequently, if a user is login to the platform, some resources are recommaned to the user according to the user's reading habits and most of the readers' reading habits. Big data server collects information from two angles. Frist, it collects every user's browsing history and then deduces what book a reader may intertest in. And it can deduce what book a user would like to purchase in the future. Second, it collects the statistical habits of all users and then it can get the most popular books, most poluar topics and most popular authors. Consequently, from these two aspects of information, advertisement can be put on the client software. In this means, a user can purchase useful e-books and a publisher can make more profits.

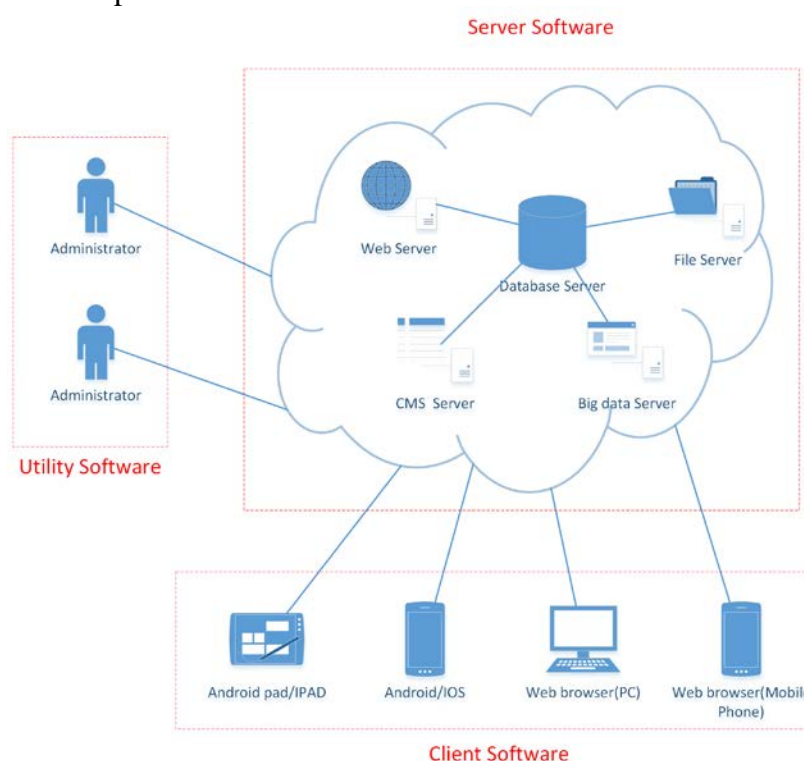


Fig.2. System architecture of the cloud serving based electroic book platform

The utility software is for the administrator and he/she can utilize utility software to publish new e-book, publish some coupons etc. Anyway, administrator does some management function.

System Implementation and Test

The platform is implemented as in Fig 3. As can be seen from this figure, user requests will be directed to load balance server, so all user's request can be equally distributed among all servers. In the load balance server, Linux and Ngnix are deployed [7]. And servers in the server farm are all installed with software Linux, Ngnix, Mysql and PHP. The size of server farm is a key factor of the system, which can be adjusted according to the load of the platform. If the load is too high, some servers will be added in the server farm. On the other side, if the load is too low, some servers will be removed from the server farm.

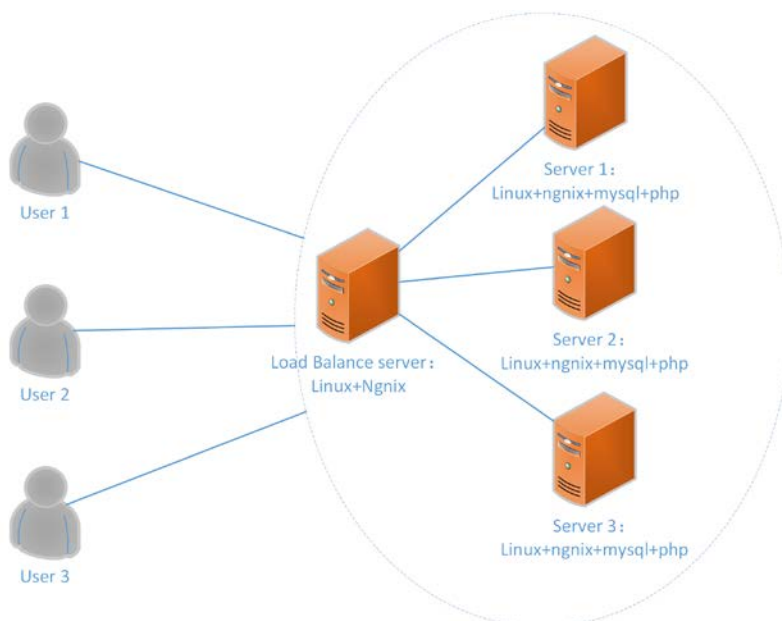


Fig.3. Deployment of the cloud serving based electroic book platform

In the client side, MVC technique [8] is employed, which is illustrated in Figure 4. The process of MVC from a user's point of view is explained as follows. First, a user issues a resource request. The controller will handle this request, and it will fetch the data from the database. And then controller will render the view with the data fetched and respond it to the user. The advantage is obvious, the logic, data, and view are independent from each other and each part can be updated separately.

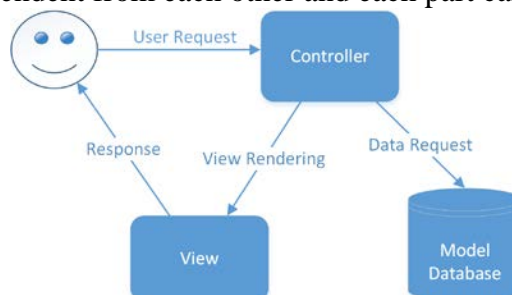


Fig.4. MVC design patterns of client software

In the client side, MVC technique is employed, which is illustrated in Figure 4. The process of MVC from a user's point of view is explained as follows. First, a user issues a resource request. The controller will handle this request, and it will fetch the data from the database. And then controller will render the view with the data fetched and respond it to the user. The advantage is obvious, the logic, data, and view are independent from each other and each part can be updated separately. The book format designed in this platform is illustrated in Figure 5. It consists of three parts, which includes the encrypted content, other checking information and MD5 checksum. The second part is employed check user's sanity, such as device ID, user ID, etc. MD5 checksum is used to prevent a user from tampering the content of the e-book. Because of the three parts, a sharing e-book from other user cannot be opened for reading and thus prevent piracy.



Fig.5. a new e-book format based on EPUB standard

To validate our design and implementation, several experiments are conducted. The results shows that a publisher can publish its book online and a user can easily access e-book resources from this platform. Moreover, test results show that a copied e-book cannot be accessed by another user.

Summary

The last few years has seen a massive growth of applications for smart phone operating systems such as Android, IOS and e-books are becoming an increasingly significant category of digital resource. In this paper, a cloud serving based e-book platform is designed. By utilizing this platform, a publisher can publish its book online and a reader can browse, reading and purchase e-books. To prevent e-book resources from piracy, a new book file format is designed. The new book file format is based on the EPUB book standard, and inherits the advantages of EPUB standard. Moreover, other feature of this e-book format can make piracy difficult. And a universal way for e-book resources access is designed and any user can access its resource by just issuing a HTTP request. Consequently, our software design has a good scalability. We conduct some experiments with this system and test results shows that our system works quite well. With e-book resources becoming more and more important in our daily life, our platform is expected to improve work efficiency greatly.

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