A Brief Modeling Study on Business and Operation Support System for Cable TV Networks Service Provider Based on ETOM

Lei Ma, YangSheng Hu, QiNan Jia, Jun Zhang, JianFeng He*

School of Information Engineering and Automation,
Kunming University of Science and Technology
Kunming, 650500 China

***Abstract*—**The establishment of a united operation platform with multi-operation management, which basically includes DTV, data traffic, VOD, CMTS, VAS and some multimedia applications, is urgent demanded by Chinese cable TV networks service providers during the conversion of Television digitization which is treated as a part of the information infrastructure nationally. This paper proposes a comprehensive support platform that sustains multi-operation based on backbone business and customer management. The ETOM model that has been broadly applied in business operations by Telecom networks service providers is introduced for the frame design of Business and Operation Support System (BOSS) in this case. The main content covers the excogitation of integrated planning and business models that generally contains Customer Model, Products Model and Billing Model. Through this project, a business support system combined with multi-operation management is formed. Meanwhile, a flexible strategy of internal process and external marketing has been established. This research can provide valuable reference for the fast-growing cable TV networks service providers not only in China, but also in globe.

Keywords: Customer Model；Product Model；Billing Model ；ETOM

1 INTRODUCTION

1.1 Background

Recently, cable TV networks service providers (CTNSPers for short, somewhere occur as terrestrial television stations) in China are mostly concentrating on the conversion of Television digitization through the large scale of STB (set top box) distribution, due to the arising challenges from telecom networks service provider, such as the fast-growing IPTV[1-3]. However, as a traditional industry of broadcasting, the development of cable TV networks service is currently far behind telecom networks. In addition, the emerging wireless TV service based on 3G or Wi-Fi strengthens the ever-increasing competitiveness. Therefore, an effective platform with functions of comprehensive management and operation support is urgently required by cable TV networks operator as well as the transformation to bidirectional (two-way) route of cable TV networks from unidirectional (one-way) [4]. Accordingly, the platform must be integrated with management modules of customer, business and resource.

Previously, SMS (Subscriber management system) is regularly taken as the basic form of operation support system for the management of digital TV networks. Unfortunately, SMS only focuses on simple DTV business, which does not suit for the growing multi-operation business, particularly the development of interactive video market [5]. Consequently, the establishment of a united platform with multi-operation management of DTV, data traffic, VOD (Video on Demand), CMTS (Cable modem Termination System), and VAS (Value Added Service) occurs as an essential path for the survival and sustainable development of Cable TV networks operators.

The united operation platform is mainly focusing on the development of customized ERP (Enterprise Resource Planning) for CTNSPer. It should integrate currently-in-use systems such as Call Center, CA (certification authority) and Bank interface as well. Moreover, the platform can provide extensive interface for Bank, center of reports and other VAS sections, which will lead to a convenient access for new business.

Due to the broad varieties of operations and management, CTNSPers depict obvious difference with telecom networks service providers. Therefore, the customized BOSS for cable TV networks must be attentively studied and applied, without being simply transplanted from a mature telecom BOSS.

1.2 Enhanced Telecom Operation Map (ETOM)

ETOM is originally upgraded from traditional TOM. Compared with TOM, the systemic structure of ETOM has been modified progressively. It focuses on the main process of business operations, such as implementation of operation, assurance, billing procedure and other enterprise related infrastructure and architecture [6].

ETOM appears as a model of operation processing, its service supplies all required procedures of enterprise. The demand based on it can be described from the perspective of NGOSS (Next Generation Operations Support Systems) [7,8]. The business process is initially under the analysis and design. Then, a final solution formed through re-analysis process, and re-design is evaluated by conformity test. Lastly, an eventual solution is applied to satisfy customer's requirement.

The classification of procedure unit and operation activity correlated to the development of business shapes the emphasis of ETOM. Some methods applied to the connection of different units can achieve End to End process of transactions treatment

*JianFeng He (✉)
School of Information Engineering and Automation, Kunming University of Science and Technology, Kunming, 650500 China.
Email: jfenghe@kmust.edu.cn

(including implementation, assurance and billing), in order to serve customers and profit for service provider [9]. Under the frame of ETOM, a resource frame (IT and networking) that directly supports product and operation is contained as well as the organization frame that supports marketing, sales, business and supply chain [10].

Previous study on the development of BOSS for CTNSPer referenced from telecom industry is relatively rare. In this paper, we innovatively propose a customized, flexible and powerful BSS/OSS platform based on ETOM model that can positively contribute to the establishment of BSS/OSS demonstration for CTNSPers.

2 THE SYSTEMIC MODELS

The systemic structure of BOSS for CTNSPer is constructed under the supervision of ETOM model frame. It basically includes the platforms of networking, system support and business operation. Among them, System support platform composes with fundamental operation, core business system, core operation system, external interface, analysis system and auxiliary system. Meanwhile, networking platform covers software and hardware environment required. All operation management and business are based on the networking platform that can be regarded as a part of NE (Networks Element) management. The content of system support platforms can be mapped to the core operation functions in ETOM. The content distributed in customer layer, service layer, resource layer and partner layer can be reflected respectively on basic support system, core operation system and auxiliary system, which have been contained in system support platform.

A modularization is applied to the infrastructure of platform. All sub modules are devised based on the correlated functions. The uninterruptible exchange of information between modules is guaranteed through an interface. The prominent advantage of modularity is expressed by the configuration of building block according to practical requirement.

As can be seen from Figure 1, the system as a whole contains management modules of united customer, billing, warehouse, inventory control, cable modem, leased data line, statistic report, system interface and application portal. The modules with different logical functions are organically combined together for the achievement of association, reliability and communication, which can constitute the integrity of BOSS system. In this research, much time consumption is caused on the design of operation models, among them, customer model, product model and billing model are most challenging and valuable.

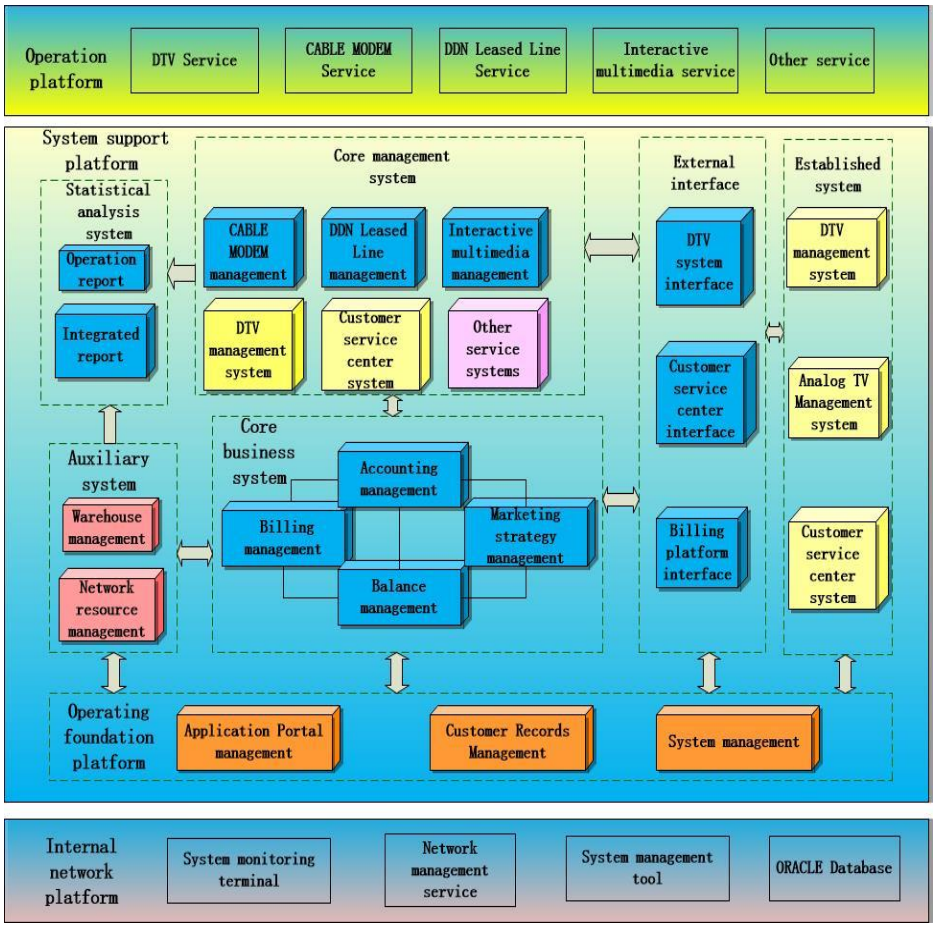

Figure 1 The architecture of BOSS for CTNSPer under the supervision of ETOM

2.1 Customer model

Customer model that generally contains customer, user and account originates from ETOM model. In recent years, customer model is broadly applied to telecom business as a basic model for the establishment of operation support system. User and account are closely relevant to customer that is a concept of entity. The relation between them should be either interactive or independent, and relevance is the relation between attribution and mapping. Customer, user and account appear as three independent entities, which represent totally different information of domain. Customer denotes the info from social domain, user illustrates the info from operation domain, and account demonstrates the info of capital domain. Customer model penetrates whole support system, such as downstage business, backstage billing account, decision making, customer management and service management. In application, the distinction of three entities is essential. However, occasionally, during the establishment of system, the border of entities is blurred. Also sometimes in order to meet the requirement of customers, the concept of customer is obscure, which can seriously cause info chaos in whole support system, such as funding deposit problem, united model confusing problem on personal customer and group customer.

Customer is a social concept, a natural person or a group can be defined as a customer. Meanwhile, group customer can be called a group of customers. Therefore, the property of customer entity should cover all social properties, such as name, gender, age, occupation, address, phone number, certificate number, email and so on. The concept of group customer also exists tenably, and this entity should contain the social properties of group customer. Extra social info will be generated according to the concrete social activities, some additional properties are given to customer by network operator, such as loyalty, credit, class, status, billing and so on. Customer should be created with the generation of the first user affiliated to customer, and be dismissed with the departure of last user. The billing of customer can provide whole picture of all service fulfilled, which is mainly applied to achieve the unity of group and personal customer model, and the billing of customer is calculated from an aggregation of user's scattered bills.

User is an entity of customer generated from the fulfillment of service provided by CTNSPer. After consuming a number of services, a customer will correspond to the equal number of users. From this point of view, property of customer should include product property and feature. The product property must cover function, price and service. For instance, CA card number, charge, STB number, t TV programs fulfilled, date of start, user status and other situations of VAS should be contained in DTV operation.

The concept of account originates from finance, it is an entity applied by networks service provider to deposit the expense of a customer, and its objective is to pay for selected product. The entity should contain the ownership of account, and it can either belong to a personal customer or to a group customer. The account also should include balance, date of account open, account status and so on. A customer can own one or more accounts, and the balance in accounts can be applied for the payment of users that belongs to customer. Optionally, it can be applied for the payment of users affiliated to other customers. A certain rule is indispensible for the setup of association with payment relation mentioned. The model of customer is shown in Figure 2.

A customer can be an independent user, and it also can be a customer with hierarchical relation, which can be illustrated as a tree structure. A customer will turn to a real user after purchasing a product with a topical service, if customer orders two services, consequently, two users can be generated for it. A user owns only one account, however it can be associated with a number of accounts, the associated accounts should belong to the customers correlated with a customer that contains the users mentioned. Each account must support cash and transfer functions. After the service fulfillment, three kinds of account item (NRC, RC and USG) are generated, and different kind of items can be either attached to different accounts or just to one account.

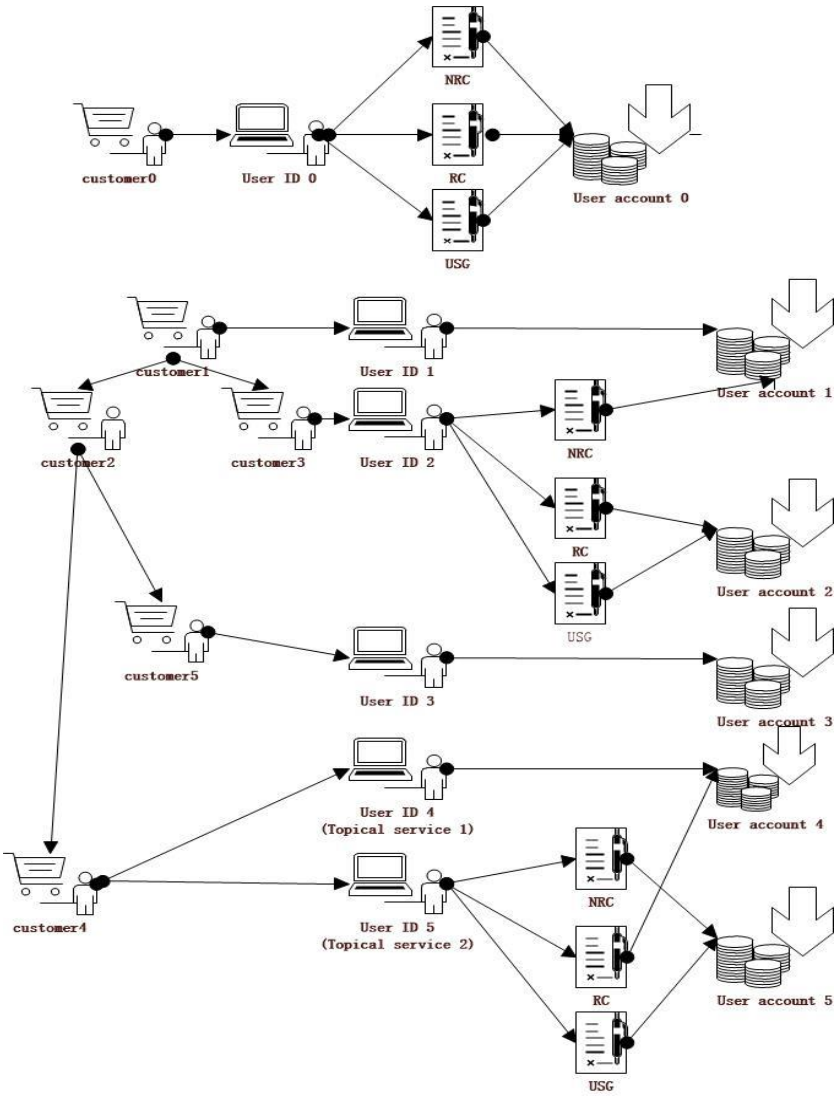

Figure 2 Customer Model

2.2 Product Model

Product management is one of the core modules in operation support system. The product defined in module is the source of basic data generated during the service fulfillment of DTV and data traffic. It is also an evidence of charge after the service has been brought to customer by operator, which partially releases the sales strategy.

In this case, products and bundling [11-13] are defined, after the product model of telecom operator has been analyzed. The product architecture is divided into two layers: bundling and products respectively. The product can be sold by being packed to set menu or sold alone. The charge rate of product or bundling can be configured. The rate consists of NRC (Non-recyclable), RC (recyclable) and Usage to form the price of product or bundling.

The proposed BOSS product model differs from that of telecom operator. Due to the feature of cable TV networks, an operator seldom serves single product (as a product element in the model). Therefore, the concept of combined products is added to the design based on bundling and products. The product combination is defined as a product group formed by product elements of identical kinds of service. The charge rate is displayed by the combination of products and their groups, it doesn't need direct configuration. When a customer purchases a service, the product service immediately occurs as a bundling. The product model can be descripted by Figure 3.

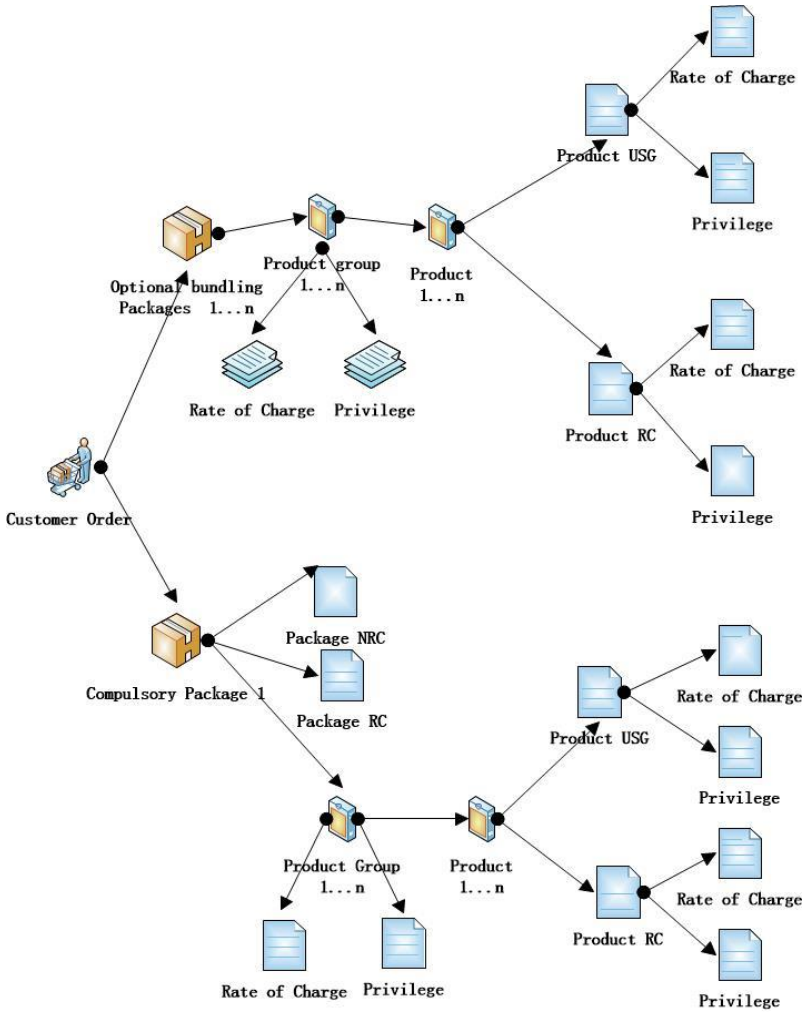

Figure 3 Product Model

Charge includes NRC, RC and Usage, all the fee of service are comprised of them by different combination. In this paper, charge is defined independently, and it's not an affiliated property of product. The charge info has no need to be attached when the product is defined. Instead, relation between product and charge is demanded to be built up in the definition of product group. Consequently, the mechanism that the same product can release different charge in different combination is formed.

2.3 Billing Model

The operation of billing management is regularly carried on through the collection of customer service info. The bills of customer can be generated by the process of bill calculation, bill aggregation, and bill amount to finally generate the ultimate customer bills. During the billing, the activities such as discount and privilege are processed.

The workflow described circumstantially in Figure 4 mainly includes: Collection → Preprocess → Calculation → Aggregation → Amount.

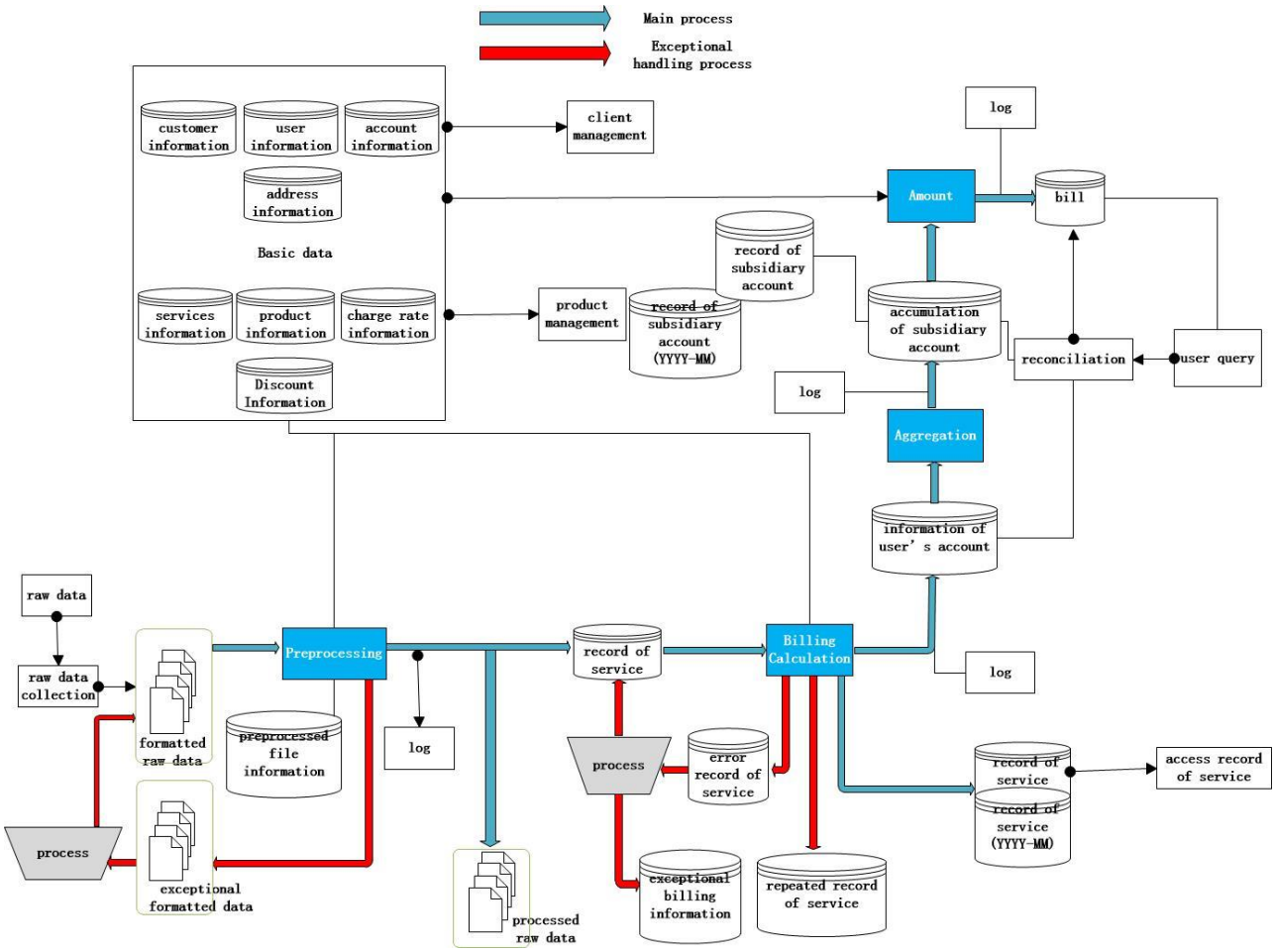

Figure 4 Billing Model

The collection of raw data is accomplished by an interface operation, such as the interface of CNR software through Switch operation. This interface acquires info of service usage, and formats data in order to help the latter preprocessing module to recognize the content of it. During the stage of preprocessing, the collected and formatted raw data is initially analyzed, if raw data is correct, and then it will be saved into database. Otherwise, the raw data will be shifted to folder as abnormal document waiting for further inspection by administrator.

For billing calculation, the service records of user are firstly analyzed, which are compared with basic data defined by system, such as customer and product info. If record is correct, the billing information of user is generated based on the records and basic info. If it's incorrect, for example, user owns the usage record of a fulfilled product, without actually subscribing it. This record should be stored in the list of irregular documents for further special treatment by administrator. Aggregation means the subsidiary accounts schedule with different classification is generated, after the account items of the users have been statistically calculated. The processed transactions above are user's Usage that normally includes duration of service, number of usage and so on. Then, bills of user are eventually formed by the combination of NRC and RC charge.

3 NETWORKS OF BOSS

Figure 5 descripts a topological graph of BOSS networks. It generally contains integrated operation server, billing server, database server, front-end processor interface and so on. The system can be deployed either on one server according to the concurrent number of service supported by running operation or deployed on several different servers according to the load. Functionally, the system primarily contains the management modules of system, product, customer, business, engineering maintenance, billing, account, external interface and personal platform.

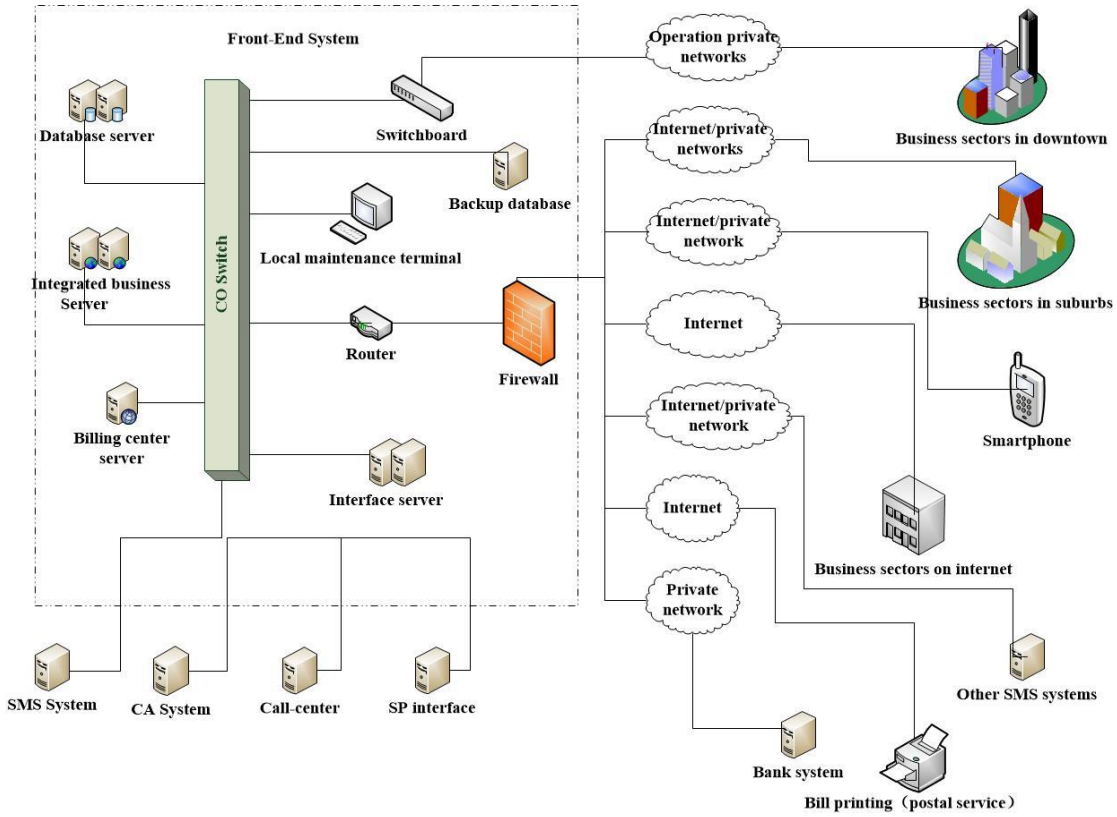

Figure 5 Structure of BOSS networks

4 DISCUSSION

Currently, CTNSPers in China are confronted with opportunities of DTV transformation. With the dramatic increase of pressure from the market, new points of growth are highly demanded. The reconfiguration of management model and integration of operation must be studied and improved. Furthermore, operations are great varied in different area due to various infrastructural and economic conditions as well as the constantly changing requirement from market. Meanwhile, there is no standard BSS/OSS system can be applied universally. In this project, the core modeling and architecture of BOSS for CTNSPer are briefly analyzed and studied, which may possibly provide a practical and valuable demonstration to the operators in globe.

Due to the limitation of the paper, the details description has not been fully involved. For further report, the mathematical modeling analysis and software application are going to be launched.

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