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A digital contract countersign service platform oriented to supply chain market

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ABSTRACT

In order to solve some bottleneck problems such as slow countersign flow, inconvenient contract storage, high management costs in traditional contract, this paper defined the concept of digital contract from the two perspectives of technology and user experience. Analyzed the innovative features of digital contract which are different from the paper contract and the electronic contract. And then put forward the business architecture and system architecture of the digital contract countersign service platform oriented to supply chain market. Finally, discussed the key technologies for implementing the digital contract countersign service platform.

KEYWORDS

Digital contract; Contract countersign; Countersign network; Supply chain market.

INTRODUCTION

Martin Christopher, famous British supply-chain expert, once said, " instead of enterprise there is only supply chain on the market, the competition of the 21st century is not the competition between enterprises and enterprises, but the competition between supply chain and supply chain"[1]. In the face of great market opportunity and competition, enterprises must attach attention to supply chain strategies[2] and join in different supply chains to keep rapid growth and long-term competitive edge. Generally, manufacturing enterprise is the core, builder and dominant of a supply chain. To structure a powerful supply chain, manufacturing enterprise chooses supplier from raw material market and sells products to end users through some intermediate links, such as trade market, retail market and so on. The whole supply chain needs the support of logistics, communications, finance and software markets.

With the development of computer, network, communications and network security technologies, the enterprises in supply chain and service markets implement conventional and e-commerce activities one after another[3,4]. There always exists transaction relationship between enterprises and enterprises in supply chain market, between enterprises and enterprises in service market, between enterprises in supply chain market and enterprises in service market, and between enterprises and individuals (consumers or individual households), and the rights and duties of each side are definite in contracts. common contracts include sales contract, lease contract, carriage contract, storage contract, deposit contract, technical contract, borrow and loan contract, commission contract and so on[5].

Contract is legally efficient, in which contract subject, contract object, right and duty are all contained. Traditional paper contract has many disadvantages (slow countersign flow, inconvenient contract storage, high management costs). Digital contract is a kind of visual electronic contract, which can not only solve the problems existing in paper contract, but also be of incomparable advantages (quickness and convenience, safety and high efficiency, and more value-added services). Meanwhile, the improvement of CA authentication technology and electronic seal technology and the implement of Law of Electronic Signature in China provide technical support and legal protection for digital contract countersign and management.

THE DEMAND ANALYSIS

The status of contract countersign

Contract countersign is the process of signing contract between subjects. Traditional contract countersign has following shortcomings.

(1)Low efficiency. Contract countersign involves two or more subjects and many links. Traditional countersign requires artificial drafting, circulation, expediting and countersign, which lead to low efficiency.

(2)High costs. In the preparation stage, the promoter of countersign need to print and copy many paper contracts, which is quite paper-consuming and material-consuming. At the same time, it costs much to inform participants and it takes them much money and time to get to the assigned place to complete contract countersign.

(3)Single pattern. Traditional countersign is an artificial pattern. The participants sign their names and affix their seals in person. This pattern is quite inconvenient. With the development of the Internet, mobile communication and graphics technologies, some new patterns, such as countersign on line, on cell phone and on writing pad, should be generalized and popularized.

(4)Less contract template. Specific to different contract type and participants, the promoter needs different template. Traditional templates are not rich and standard enough that the contract template has to be revised several times in the drafting stage, which can affect the process of countersign.

(5)Inconvenient contract storage. Usually, contract involves rights and duties of each side, and of legal efficiency, so it should be kept carefully. The storage of paper contracts requires special room and person. The cost of storage and management is very high. In addition, the inquiry of paper contract is difficult and time-consuming work.

Digital contract and countersign network

Digital contract and electronic contract

Electronic Contract is also called e-commerce contract, which refers to an agreement signed by two or more parties, through electronic information network, to establish, modify or end property civil rights and duties[7]. Scholars in law profession consider that Electronic Contract is an online transaction agreement signed by e-commerce participants, through electronic management and data exchange system, to establish, modify or end property civil rights and duties[8]. Now, there is no generally accepted definition of Electronic Contract in scholars and law profession. Most concepts are put forward from perspectives of law and the comparison between electronic contract and traditional contract, not from angles of technology and use.

As a brand new contract form, Electronic contract contains the same information as traditional contract, that is to affirm rights and duties of each party in the form of document. The founding, too, should has two elements of offer and commitment, and the meaning and function have no change, but the form, the carrier, the process of concluding, the way of storage and inquiry are all different from that of traditional paper contract.

Electronic contract can only come into force with electronic signatures of all parties on it. In order to promote e-commerce, international organizations and countries in the world make laws and regulations to define the concept and legal effectiveness of electronic signature.

Electronic Signature usually has broad and narrow definitions, from two perspectives of “technology neutral” and “technology specific”. It has been defined in The Uniform Electronic Transactions Act (1999, America), The Electronic Communications Act (2000, England), UNCITRAL Model Law on electronic signature (2001, United Nations Commission on International Trade Law), and Electronic Signature Law (2005, China). Above definitions are made from “technology netural” perspective and generally recognized at home and abroad. Instead of digital visualization of traditional written signature, generalized electronic signature is electronic signature on electronic document by means of cryptographic technique. Narrow electronic signature is a signature using certain electronic signature technology. Electronic signature technology usually refers to digital signature, which is one kind of electronic signature, of specific implication. It is the electronic signature made through asymmetric encryption technology, which can be used to prevent electronic information falsification and information transmitting by false person. This kind of signature has been widely used since it is developed most mature at present. Electronic Seal is the application of PKI digital signature technology in the traditional seal electronization process and graphical electronic signature technology, which is of security, visualization and intuition. With Chinese characteristics, it is in line with the using habit of Chinese users and embodies the penetration of Chinese traditional culture into computer technology. Commonly, electronic seal system consists of Ukey and related software system. Ukey owns CPU, rapid storage and enciphement mechanism, used to store departmental and personal digital certificate and seal information. Ukey can hook up to computer through USB connector and electronic seal software can offer application developers the port catering to business, which can realize seamless fusion with application program, shield complex details about implementing security technology, play a role in managing key, reading the certificate domain information, encryption and decryption, signature and verification and it’s fast and convenient to realize digital signature verification and other business applications[11].

Based on above analysis of Electronic Signature, Digital Signature and Electronic Seal, this paper defines Digital Contract from the perspective of technology and application.

Digital Contract is a visual electronic contract on the basis of intelligent document and electronic seal technologies, which is the virtualization, electronization and visualization of traditional paper contract. Users package their own secret key, digital certificate, electronic signature and electronic seal into an Ukey, and insert it to log on application system when needed, to accomplish signature and seal on digital contract. Digital contract is different from traditional written contract and generalized electronic contract in form, carrier, process of concluding, storage and inquiry, which can offer people better user experience.

Digital contract countersign network

According to different countersign objects and main type of e-commerce, we can classify it into B2B countersign (between enterprise and enterprise) and B2C countersign (between enterprise and individual). According to different status of each side, it can be classified into the dominant countersign and non-dominated countersign. Dominant countersign applies to the countersign between dominant enterprise and non-dominated enterprise or enterprise and individual. The promoter leads the process of countersign and the participant is in subordinate position. Non-dominated countersign applies to that between enterprise and enterprise, in which the promoter and the participant are both in equal position.

Various kinds of contractual relations exist in large-scale enterprises (manufacturing enterprise, monopoly enterprise, construction enterprise, etc.), specialized markets (building materials, home furnishing, hardware, dress, subsidiary agricultural products, automobile and electronic products), chain supermarkets (Wal-Mart, Carrefour, Metro, Sams, BETU, RT-Mart, etc.), superstores and advanced office buildings. Different types of contractual relationship connect many subjects together.(as shown in TABLE 1)

TABLE 1 : Need markets, countersign subjects and forms of different types of contract

contract type	main need market	countersign subject	Main countersign form
sales contract	manufacturing enterprise, chain supermarket, superstore	seller, buyer	non-dominated countersign
leasing contract	specialized market, chain supermarket, superstore, advanced office building	leaser, leasee	dominant countersign
utilities contract	utilities monopoly	provider, user	dominant countersign
carriage contract	logistics enterprise, transport enterprise	shipper, carrier	non-dominated countersign
warehousing contract	specialized market	borrower, lender	dominant countersign
communication service contract	communications market	provider, demander	dominant countersign
loan contract	bank, venture investment enterprise	borrower, lender	dominant countersign
contract for construction project	construction enterprise	employer, contractor	non-dominated countersign
technical contract	large-scale enterprise, software enterprise	entrusting party, provider	non-dominated countersign

Some of contract subjects are enterprises, some are individuals or individual households, so there must are B2B countersign and B2C countersign inside each market and all countersigns interweave to a net, in which enterprise or individual is pitch point. Among pitch points, there are different types of contract relationship between enterprise and enterprise or enterprise and individual. The enterprises in supply chain and service markets are not isolated but connected with each other.

Under normal conditions, commercial trades among markets are spontaneous and unsystematic, which leads to information isolation and trade bottleneck. Establishing a digital contract countersign platform oriented to supply chain market can not only electronize traditional contract countersign, but also interconnect information of all trade markets to break bottleneck and construct a countersign network in local, even in the whole country.

Digital contract countersign and its advantages

Digital contract countersign is the visualized application of electronic contract countersign in e-commerce. In addition to the strong point of signature visualization, it has some other advantages.(TABLE 2)

TABLE 2 : Comparison of digital contract countersign and paper contract countersign in advantages

Type	contract drafting	contract circulation	contract countersign	contract inquiry
paper contract countersign	manual entry, lack of template; it takes 30 minutes to draft a contract.	after printed, the contract is delivered by persons, which takes several hours, even several days.	countersign requires pen, seal and inkpad, and it takes several minutes to finish signature and seal.	It is time-consuming and inconvenient to save and inquire paper contract.
digital contract countersign	the template can be chosen or customized. It takes less tan 10 minutes to draft a contract.	without printing, the contract can be delivered on line in several seconds.	without pen, seal and inkpad, only electronic signature and electronic seal are necessary.It takes several seconds to finish signature and seal.	the contract is stored in electronic form, which is easy and fast to inquire.

- Quickness and convenience. Digital contract is a virtualized, electronic and graphical contract. It can circulate quickly and it's convenient to inquire, census and store.
- Safety and reliability. The electronic seal on digital contract has been encrypted by data and identified by CA, which ensures the safety and reliability of digital contract countersign.
- low costs. Digital contract support various kinds of countersign forms, such as on line, on cell phone, on written pad and so on. All that is needed for all parties is to choose the most suitable form on the same network platform and save their contract, which can lower the costs of paper, consumable items, communications, transportation and storage.
- Abundant contract templates. Digital contract is a visual electronic contract, so a large number of templates with different types and normative format can be put into computer system in advance. Users can make their own choices or customize templates they need based on internally installed ones.
- Convenient storage and inquiry. Digital contract is stored in computer system in the form of visual electronic document, which requires less storage space. It is easy to manage and inquire.
- Integrated service. Digital contract is designed on account of intelligent document and electronic seal technologies, which is helpful to extract contract content and operate it. And it's easier to integrate more value-added services, such as data mining and mobile application.

The process analysis of digital contract countersign

The process of digital contract countersign follows five steps.

(1)Preparatory phase. The initiator of countersign uses different types of templates to draft digital contract and then create countersign groups to rally participants. According to business situations, countersign process and beginning and ending dates are worked out.

(2)Launch phase. The initiator distributes contracts to group members and inform participants matters concerned via countersign announcement. The participants can check the announcement to get information related to contract countersign.

(3)Administration phase. The initiator can inquire launched countersign to know about its circulation situation and status and expedite the participants who don't start. Once receiving the countersign announcement or expediting announcement, the participants should browse contract content and prepare for signature.

(4)Countersign phase. The participants sign and seal a digital contract through cell phone, computer, or written pad to complete contract countersign.

(5)Contract storage and management phase. After the countersign is finished, system will inform participants the information about countersign abstract and inquiry website by means of short message and e-mail. The initiator can put contracts on records the way he/she needs for management. The participants can inquire, download and print these contacts.

At preparatory phase and countersign phase, dominant countersign and non-dominated countersign are different in process. To dominant countersign, the initiator can sign and seal a contract once it is brought out and launch the countersign. Then, the participants directly seal the contract that has been signed by the initiator. To non-dominated contract, because the status of each side is equal, the initiator can not sign the contract at preparatory phase. Instead, all parties should sign and seal the contract simultaneously at countersign phase. Dominant countersign has less commerce and shorter period, and non-dominated countersign is in contrast.

PLATFORM SYSTEM STRUCTURE

Based on the analysis of contract countersign status quo and digital contract countersign network oriented to supply chain market, the business structure and system structure of countersign service platform are to be discussed.

Business Structure

Service objects of digital contract countersign service platform range from the whole supply chain market to service market, including manufacturing enterprises, suppliers in raw material market, dealers and wholesalers in trade market, retailers (chain supermarket and superstores), logistics, communications, finance and software enterprises in service market and individual households and consumers in all kinds of markets. The main service functions of platform are to countersign, manage and inquire contracts, including CA identification, signature and seal, consultation service, communication service, payment service and logistics service.

The mission of platform is to reach two goals. One is to construct a contract countersign network in an area or nationwide range through the application of digital contract countersign platform to realize countersign on line, expediting, storage, on-line inquiry and payment and short note. The other is to provide all parties of on-line digital contract countersign with various services, such as rich contract templates, multiple countersign forms, legal advice, business negotiation and transportation and distribution. In the meanwhile, the integrative function of the platform should be made full use of to offer all parties more business opportunities and value-added services. (Figure 1)

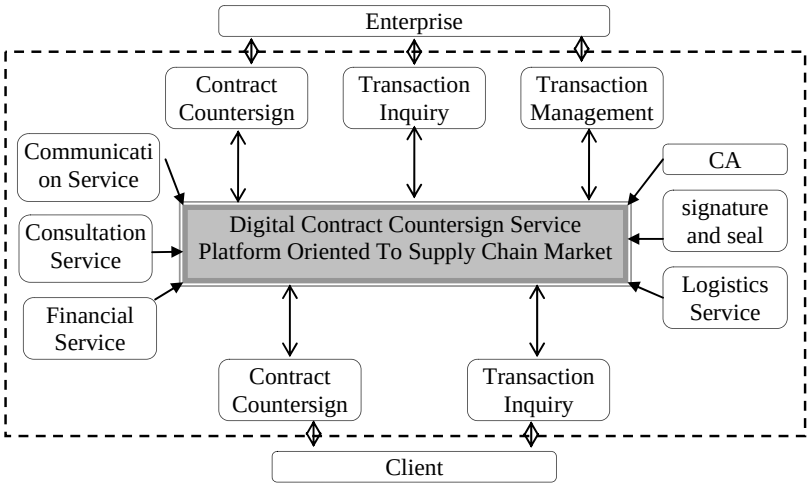

Figure 1 : Business structure of digital contract countersign service platform

System structure

Digital contract countersign service platform is an on-line business platform. In order to implement contract countersign operation on line, the data layer of the platform can supply some data resources—enterprise database, contract template library, digital contract base, supply and demand information base, and so on. The system engine layer contains statement and chart engine, OLAP engine, workflow engine and search engine, which can offer ample API and support Web Service and HTTP. The service and component layer covers CA identification service, electronic seal service, statement and chart component, workflow component, E-mail component and authority management component. The business presentation layer includes contract template management, countersign launch, countersign management, contract countersign, contract management, client management and inquiry statistics, etc. Users access the platform through unified work gateway. The access ways include desktop PC, laptop, IPAD, smartphone and written pad. (Figure 2)

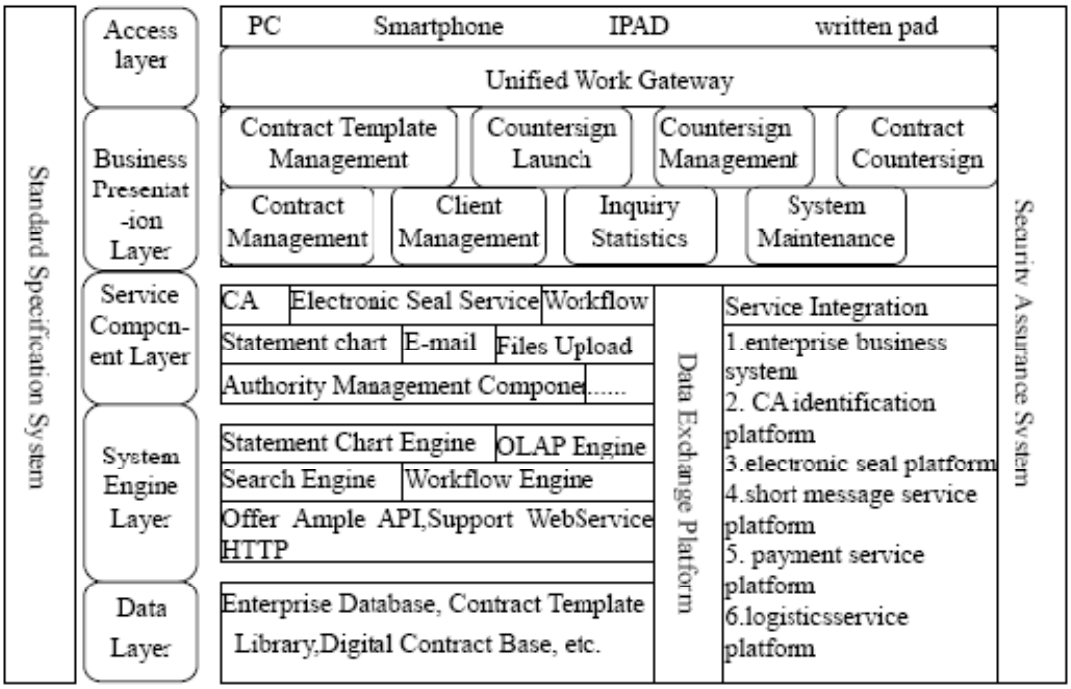

Figure 2 : System structure of digital contract countersign service platform

Digital contract countersign service platform is also a service platform. Via data exchange platform, it can link to business systems of all dominant enterprises and trading market, electronic seal service platform, CA identification service platform, logistics service platform, short message service platform and consultation service platform to establish a consolidated software and hardware environment of service. The audiences of this platform come from regional and national supply chain markets and related service markets. The number of users are huge and it brings boundless business opportunities. The users can release some information on the platform, such as advertisements, bid and tender, business cooperation and business agency.

GORDIAN TECHNIQUE

The technique applied to platform implementation mainly contains electronic seal technology, digital certificate technology, smart form technology, dynamic condition structure technology of business process, component and service technology, short message technology and system integration technology.

(1)Electronic seal technology. Digital contract countersign requires signature and seal on the contract. The platform can use electronic seal technique to sign and seal digital contracts of multiple data formats (MS-Word, MS-Excel, PDF, WPS and Web). The data can be digitally identified after signature and seal.

(2)Digital identification technology. It can be utilized to make CA identification for user's electronic seal and signature to affirm the legality and effectiveness of user's identity.

(3)Intelligent document technology. The platform makes use of this kind of technology to bring out electronic template to present digital contract in the form of intelligent document or form. After the countersign is launched by the initiator, the platform will automatically distribute digital contracts to all participants, which can improve the efficiency and realize the application of digital contracts at different levels. In addition, base on intelligent document technology, electronic seal and signature can be embedded into digital contracts to ensure the validity, effectiveness and security.

(4)Dynamic condition structure technology of business process. The technology can customize countersign process for countersign business to realize the circulation of digital contracts. So the personalized countersign business demands of all parties can be met without any delay. Its main content covers the design of countersign process and the realization of workflow engine.

(5)Component and service technology. The platform adopts the technology to package functions in common use to component and Web Service to support platform function expansion and system evolution.

(6)Short message technology. The technology is used to solve the problem how to send platform system information via short message platform provided by third-party short message service operator and finish countersign short message expediting and confirmation.

(7)System integration technique. It is used to realize data butt joint and business integration between the platform and business systems of all countersign subjects, electronic seal platform, digital identification platform, on-line payment platform and short message service platform.

CONCLUSION

From the perspective of service, this paper puts forward the conceptual model of supply chain market and the definition of digital contract, analyses the status quo of contract countersign and then constructs digital contract countersign network oriented to supply chain market. In the paper, the business processes of dominant countersign and non-dominated countersign are compared and the system structure, system structure and gordian technique of digital contract countersign service platform are discussed.

Next, the research focus will turn to the construction of digital contract countersign cloud service platform based on cloud computing and the realization of its key technologies. With the development of the function, service and security system of the platform, users will be more likely to trust the platform. The platform can adopt spatial information gridding (SIG) technique to set up a distributed network service platform. Digital contract countersign acts as primary center and all dominant enterprises and specialized market systems act as branch center to realize the data sharing between the platform and users. In this way, users can customize information need and the platform can automatically match supply and demand information to meet users' demands through cloud computing.

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