

# SOA-based conceptual model for continuous auditing: A discussion

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*Abstract:* Continuous auditing has long been proposed to shorten the audit cycle as far as possible and enhance the timeliness of the audit. At present, the research of continuous auditing faces a series of problems, such as the accuracy of data collection, real time, comprehension and flexibility of audit. Applying SOA to the auditing system will help to solve these problems. The SOA-based model for continuous auditing proposed in the paper is carefully studied and discussed; it is expected to have a significant influence on the further research of continuous auditing.

*Key-Words:* Continuous auditing; SOA; real-time audit; conceptual model, audit system

## 1 Introduction

In today's fast paced business world, electronic commerce, electronic data interchange (EDI), and the internet are dramatically changing business practices and record keeping. Doing business on the World Wide Web enables organization to connect into the online world and improve all aspects of their business. In this high-technological environment, real-time information systems facilitate real-time accounting systems and real-time communication between entities. It is necessary to provide real-time assurances to decision makes. [1]

Real-time assurances can only be provided by continuous auditing technologies. However, the current research of continuous auditing faces some problems, such as, how to ensure the accuracy of collected data, how to ensure the real time and comprehension in the auditing process and how to improve the flexibility of the auditing process.

In order to solve these problems, in this paper we propose a continuous auditing model based on SOA (Service Oriented Architecture). The main advantages of SOA is as follows: [2]

- Alignment of IT with the business
- Maximal reuse of IT assets
- IT infrastructure flexibility

The aim of the paper is to make a conclusion about how a generic and comprehensive continuous auditing system could make use of SOA to test real-time and comprehensive audit and its performance on transactions.

The remainder of this paper is organized as follows: Section 2 describes definition and model of continuous auditing. Section 3 provides hurdles to establishing continuous auditing system .Section 4

provides a discussion on the SOA. Section 5 provides a conceptual model of the continuing audit based on SOA, and Section 6 provides evaluation of the conceptual model. The last section is about the summary and conclusion.

## 2 Definition and model of continuous auditing

### 2.1. What is a CA?

According to the CICA/AICPA research report, CA is "a methodology that enables independent auditors to provide written assurance on a subject matter using a series of auditors' reports issued simultaneously with, or a short period of time after, the occurrence of events underlying on the subject matter". [3] A CA (Continuous audit) relies heavily on information technology .While the CA concept is over a decade old; now the CA becomes more feasible with the rapid advancements in technology. This technology includes broad bandwidth, web application server technology, web scripting solutions, ubiquitous database management system with standard connectivity, and so on.

### 2.2. Model of the continuous auditing

The whole network, local area network and internal network has been widely used, so using a digital agent to achieve continuous audit is an effective method.

Several continuous auditing models were proposed, but most are merely conceptual .Few have been implemented in real-time systems. The

Continuous Process Auditing Systems (CPAS) is one of early classic models. CPAS was developed at AT&T Bell Laboratories. The main feature of CPAS is that it is a methodology for internal auditing of large “paperless” real-time systems. This model appears to have formed a basis for the latter models. [4]

Later, most development of the continuous auditing systems has adopted a "CPAS-like" design. For example, the intelligent agent is used in continuous audit. Fig. 1 the intelligent agent is used in continuous audit

In principle, the continuous auditing agent technology uses the stand-alone system to continuously monitor the client system. These systems extract data and then compare data with the standards. Once exceptions are found, it may trigger alarms. Then exception reports are sent to the audit staff, and relative measures are taken to achieve the audit goal.

### 3 Hurdles to establishing Continuous

#### auditing system

Current continuous auditing study has made great achievement, but there are still some problems:

#### 3.1. Accuracy

The research of continuous auditing all has a pre-condition, that is, we assume the clients can use their own accounting systems actively and input accurate data without optional modification. But the fact is different. Some sensitive data is not entered into the system (Some clients are doing a secret accounts for themselves), or after the transaction their data is revised again. Once clients do so, they can't make sure the accuracy of the information and there is no significance for the results.

#### 3.2. Real time and Comprehension

Some continuous auditing systems adopt a "CPAS-like" design which is popular currently, but the problem of this design is that the synchronization is not good. It monitors some key data and compares

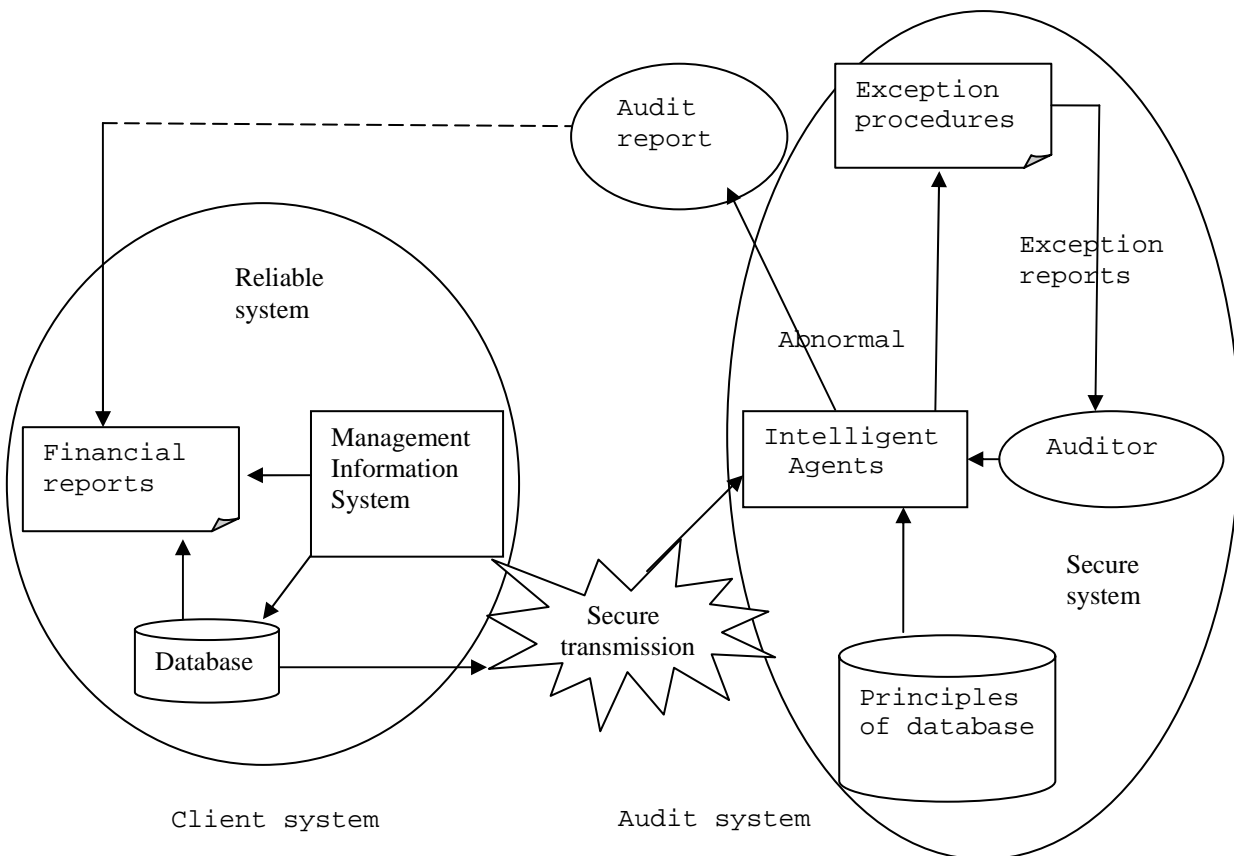


Fig. 1 the intelligent agent is used in continuous audit

extracting data with standardize data, but it only works roundly when there will be some exceptions. That means we can't monitor and analyze real-time information roundly

### 3.3. Flexibility

Nowadays most continuous auditing systems are for one industry or just for some large-scale enterprises, so the flexibility is poor. For example, in 2001 Woodroof and Searcy proposed a CA model in the field of debt, which became the first formal CA conceptual model; Fund radar is a special continuous auditing system invented to audit mutual funds. The reasons for that are follows: (1) the difference between the industries exists. The basic problem is the business language has not been standard. (2) The difference in the information system itself exists. The auditor's systems are heterogeneous systems, and data is not available.

## 4 Introduction of SOA

SOA is a methodology. Just as the concept of an object is central to object-oriented architecture, SOA is based on the concept of a service. A Service Oriented Architecture (hereafter referred to as SOA) is an architectural pattern that describes a system that is composed of discrete services that interact with clients and each other accomplish various tasks. Each service contains operations that usually perform a small unit of work that corresponds to a high level definition of a given task. [5]

The main advantage of SOA, as follows: IT provide better and faster business value, rapid response capabilities, and reuse. SOA is based on the concept of a service. SOA can then be regarded as an approach to build distributed systems that deliver application functionality as Web Services to end-user applications.

SOA are the three major modes: service registry model, enterprise service bus model and service scheduling model. Here we only introduce the service registry model. This model consists of three roles: a service application (service requestor), a service provider (service provider), and a registration service (service registry), such as the role of relationship: Fig. 2 service registry model. [6]

A service provider: offers a service by defining its interface and implementing the service functionality.

A service requestor: offers a request of the service and invoke the service.

A service registry: describes the service, broadcast it, and binds that service into its application.

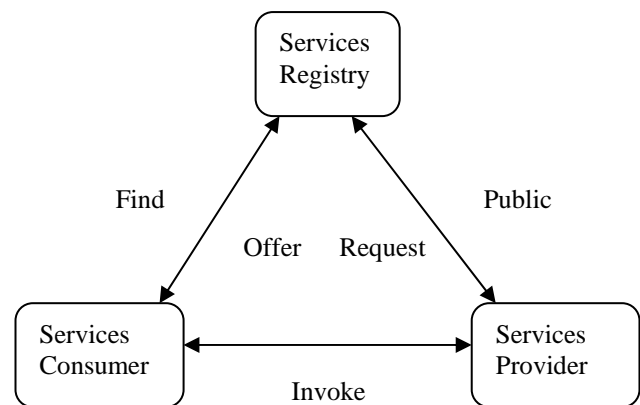


Fig. 2 service registry model

## 5 A continuous audit conceptual model based on SOA

Traditionally, the most prominent continuous auditing models are based on a database of transactions in the client's system, which have a web interface (in the auditor's system) for the auditor to use. [1] Due to the changing audit environment, we need a model that would be capable of running on a distributed client/server network and is based on a process of transactions in the client's system. The user interface will be abstracted from the information system. All data-flow will go through a standard interface, and then enter the management information system. Data is extracted from the standard interface, not from the data that has been changed in the database of the client's system.

Fig.3 depicts the continuous auditing model based on SOA. According to Fig.3, the chief components of the continuous auditing model are follows: the various interconnected Web servers — client, auditor, and third parties: (1) Client system: User Interface, Management Information System ;( 2) Audit System: The Shadow Subsystem, Audit Module, Audit Report, WSDL Interface, and Enterprise Service Bus (EBS) ;(3) Third parties: Banks, Dealers, Suppliers and so on. The model consists of a web service registry. The server central registry is in the auditor system, and client system and third parties are server provider or server user. The following paragraphs develop each of these components.

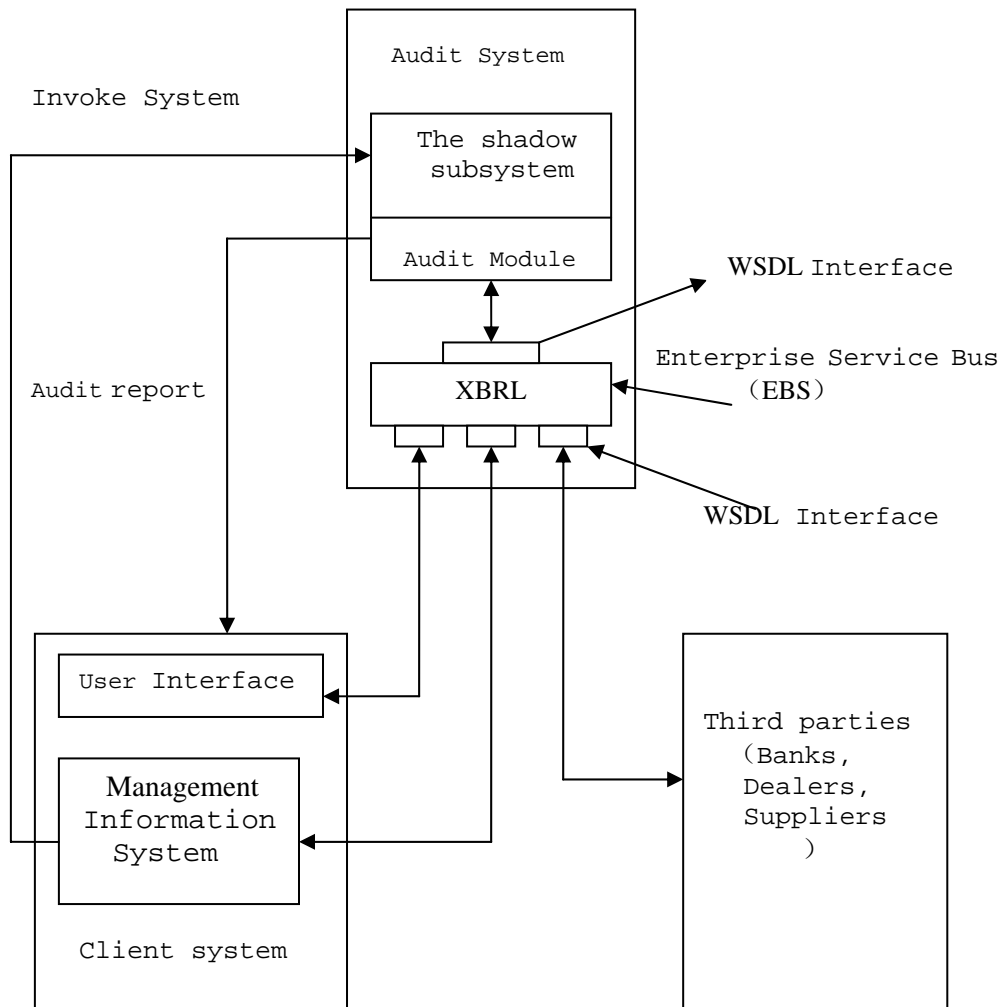


Fig. 3 A continuous audit basic model based on SOA

**5.1. The client system**

In the web service registry model, the client system can be seen as a server provider or a server user. As a service provider, the client system offers a service of defining its interface and implementing the service functionality. For example, the client system provides an audit business, and this business audit can be abstract as a service, so that any authorized user can use it. In the client system, the user interface will be abstracted form the management information system. When the clients themselves want to use their own system, the client system will be seen as a server user. Before the clients use their own systems, they must send a request to their own system.

The user interface connects with the management information system indirectly. First, the user interface must access into client system by WSDL Interface. Then only by gaining authorization of the audit system, the user would be allowed to access into the management information system.

**5.2 .The audit system**

In the web service registry model, the audit system can be seen as a server central registry. The server central registry describes the service and broadcasts it.

The audit system consists of the shadow subsystem, audit module, audit report, WSDL interface, and enterprise service bus (EBS). The shadow subsystem invokes the management information system. The variety of the management information system will be stored in the shadow subsystem. At the same time, the relative system can check the reliability of the system compared with the rules in the shadow subsystem (possibly using continuous SYSTRUST).

WSDL is an XML document that describes Web service interface: methods, parameters and service location. Web service client developer needs information about the Web service to implement

Web service invocation code: service location, methods, and parameters. And this information is captured in the WSDL file. In the web service registry model, each entry is connected with the WSDL interface. [4]

Enterprise service bus (EBS) is a place to provide interactive services.[6] In the enterprise service bus (EBS), the interactive service use XBRL (eXtensible Business Reporting Language) which was created to describe business reporting information. XBRL is useful for preparing, publishing, exchanging, acquiring and analyzing accounting and business data, and it provides a standard for on-line reporting of financial information between different software applications. [4] One of the main features of XBRL is that it allows organization to prepare one set of financial information in a format which is not proprietary to any specific software application. In the future any continuous auditing system which uses XBRL can access to data on any software platform and run any software in any country.

Audit module is also connected to the EBS by WSDL interface. The rules based on the criteria would be employed in the Audit module. When the transactions between the client system and third parties happen, the audit module will monitor the data-flow in real time. [7] At the same time, the audit module invokes the relative client system to test the transactions. If anomalies occur, an audit report is displayed to the auditor and sent to the client system.

Audit reports are available whenever a user accesses the management information system. And they are dynamically dated according to the timestamp created when the user accesses the management information system. The audit reports include three levels of assurance. Level 1 assurance relates to the reliability of the management information. Without Level 1, no further analysis is performed. Level 2 offers an opinion on the fairness of real-time financial statements. Level 3 assurance is concerned with the covenant and agreement. [8]

### 5.3 Third parties

Third parties consist of banks, dealers, suppliers and so on. In the web service registry model, third parties can be also seen as server provider or server user. The third parties represent the various suppliers or customers who have agreed to participate in a continuous auditing relationship with the auditor and the client. These third parties could represent vendors (suppliers of merchandise) and financial institutions (suppliers of capital), as well as customers; thus,

confirmation of account balances (accounts payable, cash and accounts receivable) could be done electronically and automatically.

## 6 Evaluation of the conceptual model

### 6.1 Work flow

The whole work flow of the SOA-based continuous auditing system as follows: The audit module, user interface of client system and the third parties are all connected to the Enterprise Service Bus of the auditing system through standard WSDL interface. First, the third party and client must register in the auditing system. Then the audit module will use the "mirror" method to copy information of client system into the database of the shadow subsystem. In order to ensure the reliability of the client's management information system, SysTrust is used to continuously evaluate the control risk. Before clients enter their own information management system or make transaction with the third party on-line, both of them must hand in the application to the auditing system. Then the auditing system public the description of the service and bind them according to the protocol. When a transaction happened, the business data are transformed into XBRL in the EBS. At the same time, the audit module continuously monitors the business data-flow and gets the data in real-time. Then the audit module assigns out the corresponding management information system from the database of shadow system to carry on the audit. When exceptional case happened, the audit module can make the response rapidly. The audit module will produce an audit report in the first time and send it to the auditing system. As occasion requires, it can even terminate this transaction.

### 6.2 Evaluation

In the continuous auditing system based on SOA, the user's interface is abstract from the system, and the enterprises need to register and apply before they use their systems. Thus, users can not modify data casually, and we can ensure the accuracy of the original data. The entire system consists of the third party as its component, so checking data becomes much easier. The most importance is to provide a standard WSDL interface with enterprise service bus and interact using eXtensible Markup Language (XBRL) in enterprise service bus. We needn't consider whether the client system is heterogeneous, or whether we have to use the same business language, so it will be easy to solve the problems of

heterogeneous systems. The client systems will be saved in the shadow subsystems by using a "mirror" method. And then we can detect the real-time data roundly and audit the data by invoking the relative systems. After that we could ensure that we have a real-time and comprehensive system.

## 7. Summary and conclusion

This study proposes a continuous auditing model that introduces SOA. The main advantage of SOA, as follows: IT provide better and faster business value, rapid response capabilities, and reuse. We discuss how web service registry model can be introduced to facilitate continuous auditing for the next generation of accounting systems. The Components of the model, including EBS, WSDL Interface, and the shadow subsystem, is described, and XBRL is then discussed. After that, a continuous auditing model based on SOA is proposed, which resides in the auditor's accounting system. The continuing audit model can solve a series of problems such as the accuracy of collected data, real time, comprehension and flexibility.

The continuous auditing model based on SOA is t is for online information systems and the scope of application is rather narrow. There are several hurdles that must be overcome .One hurdles is controlled Access. In the continuous auditing model based, the users only gain authority of the audit system, and then access to their management information system. The clients are uneasy to access their system. This will cause their dissatisfaction. Another hurdle is cost. It will cost more money to establish the Shadow subsystem and uniform standards. How to share the cost between the audit system and the client system that is a problem . [9]

However, with the increasing popularity of the network and the development of information technology, the accounting information system in the future will be designed in XML format. We can predict that if we use the theory of SOA in the field of continuous audit, we will gain great value from it.

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