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# A Survey on Authorization Systems for Web Applications

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***Abstract:*** *Web services are the most important point of usage for the modern web architecture. The Service oriented architecture (SOA) used in web services offers a simple platform for integrating heterogeneous distributed web applications and service. The distributed and open nature of the present system makes it vulnerable to security issues such as Web service Description Language (WSDL) spoofing, Middleware Hijacking, etc. Assuring security for the web services to solve all security flaws is difficult. Authorization is an important aspect for assuring security. Authorization failure can create much vulnerability for the system security using web services which are distributed in nature. In this paper a survey of the authorization techniques for web services based application.*

***Keywords:*** *web services, authorization, access control in web services, attacks on web services*

## I. Introduction

The emerging web architecture is mainly composed of distributed and heterogeneous Web Services (WS). Web services are a reliable way to offer online products and services through internet [1]. Web services are the platforms for heterogeneous distributed computing requirements. The main design goals for web services are interoperability, openness and easy usage [2]. Modern web services are follows the service oriented architecture (SOA) [3]. SOA is completely Extensible Mark-up Language

(XML) oriented. In SOA, model a user can get the details of the services from service directory and by using this description the user can get a service form web service provider. In SOA [4] the communication between different services providers are through the Simple Object Access Protocol (SOAP) messages which are purely XML based. This Common XML based communication model enables the user to communicate between different platforms freely and independently. [5] Many standards are defined for the smooth functioning of SOA such as Web Service Description Language (WSDL) for interface description, Universal Directory, Discovery and Integration (UDDI) for service directory. WS-security ensures many additions to SOAP protocol for satisfying the necessary security requirements Traditional measures to address the security threats are not adequate to address the threats related with the modern web services or internet applications. [6] Modern web services are based on the service oriented architecture. In the case of Service oriented architecture the relation between users and service providers will be mostly dynamic in nature. Also heterogeneous applications or services can be integrated together for providing the services. This makes the system more vulnerable to many security threats.

### 1.1. Web services and security

Security is a crucial factor of consideration for usage and adoption of Web service technology to the existing web architecture.[7] Web services provide a mean to find and integrate heterogeneous services through online, based on a directory service. The distributed and open nature of web services makes the system vulnerable for many security threats.[8] Like any other secure system the primary security requirements are integrity, confidentiality and availability. Any attempt to compromise any of these is an attack. Security threats for the web services can be analyzed based on the known attacks against web services. The web service is composed of different Layers namely Application layer, Middle ware layer, protocol infrastructure [9]. According to Vorobiev et.al [1]. Attacks against web services can be classified into 5 categories such as Discovery attacks, Application attacks, Semantics attacks, SOAP attacks and XML attacks. Different well known attacks against web services are listed below.

- CDATA Field Attacks
- XML based attacks
- Probing attacks
- Oversize Payload
- WS-Addressing Spoofing
- Middleware Hijacking
- Coercive Parsing attacks
- Semantic WS attacks
- BEPL state deviation

XML based attacks uses XML as a career of attack.it includes subclasses including Parsing Attacks, XML Injection and XPath Injection Attacks.[11]Attacks can be performed by modifying the XML structure after sending the stream to system (web server) or by sending extremely complicated but legal xml documents to system to exhaust the resources. Another possiblity of attack is through malicious SOAP requests. Injection attacks such as SQL injection attacks, XPATH injection attacks can create serious problems with the availability factor of web services [12]. WSDL is another important point of interest for attackers. [13] WSDL defines all avaliable services and parameters for the customer and an attacker can easily target this vulnerability. [14]In Semantic WS, Denial of Service (DoS) attacks can be done if an attacker creates big or very complicated ontologies or schemas in order to hang a parser. This makes the resources unavailable for the legitimate users.

### 1.2. Authorization

The purpose of the authorization is to limit the operations of a legitimate user in the system [16]. Authorization verifies the previlages of the user in the system and grants permission for the user to access the requested service.Many of the security threats related with web services is shown in table 1. There exists defence mechanisma for the attacks which depends mainly on improving the authorization of the system.

**Table 1. Attacks on web services**

| S.No. | Attack | Defence Mechanism |
|---|---|---|
| 1 | XML based | Authorization |
| 2 | XML Injection | Schema Validation |
| 3 | Coersive Parsing | Schema Validation |
| 4 | Middleware Hijacking | Authorization |
| 5 | Semantic WS attcks | Schema validation |
| 6 | C-Data field attacks | Validation |
| 7 | State deviation | Behavioral analysis |
| 8 | WS-flooding (tranport,oversize payload,schema poisoning) | - |

### 1.3. Common Authorization models for web services

Common access control models

- **Discretionary access control models(DAC)**

Discretionary access control system is one of the most popular authorization models used today. This is based on applying rights on object for the client users by the owner of the object. [17] The main attractive feature of this model is the flexibility that it offers for the access control. As the user can assign access rights for the objects polices can be defined into the fine grained level easily.

- **Mandatory access control model(MAC)**

Main Idea behind this model is that to assign differ security levels for the subjects by a centralized authority. Owner can’t change the policies .With mandatory access control model it is not easy to represent the natural relation between the subjects [18].

- **Role-based access control model(RBAC)**

In this model of access control it is needed to identify the roles in the system and assign the roles to the users. This role based access control system simplifies the management overhead. [19] And also it is well suited with the dynamically changing environments. The mapping can be done either in centralized or non-centralized manner.eg. Trusted third party.

- **Trust-based access control models**

Trust based on using the technique of trust negotiation to map globally meaningful statements regarding a previously [16] unknown client into security tokens that are meaningful to resources deployed in the Trust service’s security domain.

- **Capability based access control**

This model is not a commercially successful model. In this access control model a subject is associated with a list that describes the objects for which a subject is authorized. This list is called the capability list. Sadhu et al. [16] describes this model .The possession of a capability allows access to resources. Once a capability is distributed, it is difficult to revoke it

## II. Authorization Models For Web Services

Few proposed authorization frameworks are discussed below. Authorization system varies the way in which the access control polices can define and the authorization request are performed. Different methods use different means to transfer the proofs between the subjects.

### 2.1. Attribute based Access Control

This paper [21] proposes an access control based on three types of attributes named subject attributes, Resource attributes, Environment attributes. This proposed system consists of a Policy Enhancement Point (PEP) which accepts the Authorization requests and performs the authorization based on the attribute authorities and policy authorities. The authorization decision will be made by the Policy Decision Point (PDP). Extended Access Control Mark-up Language (XACML) is used to support the transfer of decisions between the users and subjects. A policy store consists of all the policy rules regarding the objects in the system.

### 2.2. Access Control Enforcement for Web Services by Event-Based Security Token Processing

This is a XACML based Authorization system [22] for authorizing the customer based on the SOAP and HTTP header parameters. This authorization technique mainly tries for the early detection of the unauthorized requests based on the signatures <Signature Value> of the different header attributes. A timestamp is added to SOAP header for the detection and avoidance of replay attacks. This authorization checks the header early so that the oversized payload attacks can be detected. Security token encloses the user details.

### 2.3. Web Service Authorization Framework

This framework [23] accepts user based parameters during authorization session. In the service level the user authorization process will check for the policy or rules, if any rules found in that level the rule will be checked with the request. Else if rules are not found in the Service level the authorization system will check at the component level for the rules .If any rules are not found the access will be rejected. A servlet filter is used for implementing the Authorizing server. This authorizing server performs the parsing of SOAP requests and checks with the existing rules

### 2.4. Role based access control using LDAP[24]

This type of access control is useful to large enterprises. With the properties of both the access control mechanisms the LDAP can be used to implement Role based Access Control. The features of LDAP both user-pull and server-pull architecture can be used. In user pull architecture the user will pull the roles from the role server where the roles are assigned to the users. In server –pull architecture the server will pull, the roles from the role server as needed and the user does not need the access to their roles. With the features of both the access controls the Light Weight Access Control can be used to implement the RBAC using the server-pull architecture. Initially the client has to authenticate themselves to the server to get the roles which the server will take from the role server. The roles are given to the clients which are authenticated with the name, passwords or the IP address. These roles are later used for the implementation of the Role Based Access Control.

### 2.5. Interactive Access Control for Web Services

This authorization system[25] consist of a Policy Evaluator which is standard representation of different policies of different partners, a Policy Orchestrator which defines the partners which are involved in a web service which is requested, and an authorization server which performs the location and integration of different policy evaluator. Authorization includes a set of declined credentials and presented credentials.

### 2.6. Intrusion tolerant Authorization System for internet applications

In this authorization system authorization is done based on Symbolic references [26]. User requests will be authorized and the proof of authorization will be generated as permissions and capabilities. This can proofs can be verified in the server for verification. For composite operations also this system is capable of perform the authorization. The request will authorized by a distributed server for avoiding the single point of failure. The system uses Asynchronous binary byzantine agreement for avoid the single point of failure .XACML is used for the delivery of the proof into the server.

### 2.7. Role based access control for the World Wide Web

Admin Tool for the creation of the users, roles and the permission granting. An end-user interaction with the RBAC or web start with the creation of RBAC session.[27] At the time of session creation the end user is assigned with Active Role Set (ARS) and it will determine the operations that the end user can perform. The role will be existing till the time of session. The users are provided with a subset of assigned roles for the easy selection of the roles. Since the end-user authentication and the RBAC session are separate operations the web can work with any authentication mechanism. So RBAC/Web have the advantage of the role based access control for intranet network and can be combined with the existing system without any server modification.

Comparison of different authorization techniques for web services

Many quality metrics are proposed by the National Institute of Standards and Technology (NIST) [28] for the assessment of access control systems .Parameters includes steps required for assigning and reassigning the user capabilities, steps required for assigning and reassigning the object access control entries into the system, degree to which the system supports the concept of least privilege, Separation of the duty etc. A few parameters which is depends on the web services are selected to compare the different authorization techniques. Separation of duty is means the ability for delegating of authorities to others, usually for completing composite operation. Fine grained level authorization can be used to authorize the objects for composite operations. Authorization systems can be either static or dynamic. Dynamic authorizations systems can accommodate the user while the system is running. Steps required for assigning and re-assigning the policies to the system is another parameter for finding the performance of the system.
Comparison results are tabulated below:

**Table 2. Comparison of various authorization Techniques for Web Services**

| | Separation of Duty | Fine- Grained Authorization | Nature of the System* | Performance of AC# enforcement | Steps Required to assign and reassign capabilities | Method used for transferring capabilities | Can be integrate with SOA based web services |
|---|---|---|---|---|---|---|---|
| [21] | - | yes | Dynamic | - | less | - | yes |
| [22] | no | no | Dynamic | - | - | Tokens | yes |
| [24] | yes | yes | Dynamic | good | less | XACML | yes |
| [24] | yes | no | static | - | more | - | no |
| [25] | - | yes | static | medium | - | - | yes |
| [26] | - | yes | static | | more | XACML | no |
| [27] | yes | no | static | - | more | - | no |

*nature of the authorization system specifies whether its is static or dynamic (access control)

# Access Control

## III. Conclusion

Web service is the major architecture used for resource and service identification and usage in recent times due to its ease of use. With the growth in the web services technology the security threats also increases for assuring the security of the web services authorization is an important factor. Many security vulnerabilities' can be avoided by proper authorization and secure access controlling. Most of the proposed systems are doing authorization based on the role based model. For an authorization system to be compatible with SOA, the system should be able to authorize the dynamic arrival of the users. Also the system should be capable of communicating with SOA based services. Most of the systems do not have the capability to dynamically authorize the requests.

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