Abstract

Service Oriented Computing (SOC) is becoming very popular and is being used to support many of the day-to-day workflows in large organisations. One of the major advantages with SOC is that it can be executed in heterogeneous and distributed environments. Since security is an essential and integral part of Web services, the SOC has to manage and execute the Web services in a secure way. In this thesis, different important concepts of secure Web services are investigated and presented.

The research work initiated with a study on the Security issues in Web services. In this thesis a study is done mainly on the security issues like integrity, digital signature, authorization and auditing in Web services. Firstly, a study is done on the limitations of Web service security on SOAP messages in providing end-to-end integrity in a document production workflow environment. The study has proposed a solution to overcome the limitations where a trusted central arbiter is used as an in-line TTP. Secondly, a study is done on the signature replacement attack where in a 2-tuple digital signature scheme if the signature element is replaced then there is no way to verify it. This attack is also equally true for XML signature scheme which is used in Web service security today. A solution has proposed with a BPEL process which acts as a central arbiter in the proposed special protocol. Thirdly, the issue of synchronization of authorization flow with a work object flow is presented and discussed. The study has shown how a work object flow is synchronised with the authorization flow using a central arbiter in Web services paradigm. The synchronization is achieved by exploiting the obligation provisions in XACML which provides authorization for Web services. Finally, a non-linear model called Extra-Tree is proposed to organize execution traces of Web services in a distributed computing environment in the form of a tree. The major advantage of this model is that the execution traces of Web services can be retrieved from the coarse-grained level to the fine-grained level of the tree as per the requirement.