Public Abstract
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Title:IMPLEMENTING X.509 SECURITY CERTIFICATE BASED AUTHENTICATION IN A VIRTUAL ORGANIZATION

In recent years, research institutions have shown great interest in sharing computing resources with other institutions as a cost effective alternative to maintaining dedicated resources for computationally intensive tasks. A set of such research institutions forming an inter-institutional research environment is referred to as a Virtual Organization (VO). However, a Virtual Organization is not limited to research institutions. Any two or more parties with an interest in collaborative research can create a Virtual Organization. An important function of such a Virtual Organization is to authenticate users at all participating computing sites, without the users having to maintain an array of authentication credentials. Shibboleth is an infrastructure used to provide the facility of single sign-on in many Virtual Organizations. However, every participating institution in a Virtual Organization may not have a Shibboleth authentication mechanism for its users. A Shibboleth infrastructure implementation is a huge challenge that entails conformance to the policies of the institution that participates in the Virtual Organization. Therefore in the absence of a Shibboleth authentication mechanism at a userâ€™s home institution, it may not be possible for users of a participating institution to access resources belonging to other institutions in the Virtual Organization.

This thesis addresses the issue of authenticating users who do not necessarily possess Shibboleth credentials, but are authentic users that need access to the resources in a Virtual Organization. In order to authenticate such users, there is a need to involve an alternative method of authentication that does not rely on a username/password credential provided by any particular institution that is a part of the Shibboleth enabled infrastructure. Lately, X.509 security certificates have gained immense popularity as a method for verifying the identity of a person. These certificates can be used to authenticate users on any system that trusts the certificate's signing Certificate Authority. Incorporating support for certificate-based authentication in the Shibboleth infrastructure enables the Virtual Organization to authenticate users that belong to the research environment, but do not necessarily have Shibboleth credentials. Certificate-based authentication can also provide resource access to guests of participating institutions that include, but are not limited to, visiting faculty or consultants to the participating institutions. Thus, certificate-based authentication increases the resource providing capability of the research environment by servicing all the users that are entitled to use resources in the Virtual Organization.