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Subject: LDAP Support for SpectrumSCM

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Preface: This document has been updated to reflect enhanced parameters introduced with the new SpectrumSCM release 2.4. Such updates are annotated with a $^{(2.4)}$ superscript to aid the reader.

1.0 Introduction: Over the past few years, the Lightweight Directory Access Protocol (LDAP) has gained wide acceptance as the directory access method for the Internet and organizational intranets. A directory is a specialized database that is used for storing information regarding various users, applications or resources on a network. A company-wide implementation of an LDAP directory service provides a one-stop solution for any application, running on any platform, that needs access to company specific information like employee details, customer information, licenses, security keys etc. Of late, LDAP is gaining popularity as a centralized authentication system for users on a network. Storing user names and passwords in an LDAP directory as opposed to a local application-specific database not only provides for enhanced security but also provides users with the convenience of using a single username and password for accessing company-wide resources and applications. Of course, the security benefit realized by using a centralized LDAP authentication scheme depends on how secure the centralized database is.

An LDAP directory service is based on the client server architecture in which an LDAP client sends requests to an LDAP server that processes the request and returns the appropriate response. The server hosts the LDAP information database that is used for storing and retrieving information. The directory service is generic in nature and can be used for storing and retrieving any kind of information. The basic unit of information in a LDAP directory is an "entry". Each entry may represent an organization, user, resource or any object of interest. Entries are composed of attributes which contain information about the object. Every attribute has a name and one or more values. Entries are organized in a hierarchical, tree like structure. Each entry is uniquely identified by a "Distinguished Name" (DN). The DN acts as a primary key for the entry and is derived from the DN of its ancestor in the tree. The DN of the highest node in the tree is called the Root DN.

An LDAP server may implement its own schema or a standard schema defined as in RFC 2252. Mainstream implementations of LDAP include Netscape

Directory Server, Sun One Directory, Microsoft's Active Directory and Novell's Directory Service and Open LDAP. Though LDAP defines operations for updating the stored information, it is optimized for read operations. The most common LDAP operations can be classified into two categories:

Query - This includes operations for searching a particular entry in the directory or for bulk retrieval of a set of entries that satisfy a search criterion.

Authentication - This includes operations to establish and end a session between an LDAP client and server, and access control. LDAP provides different levels of security ranging from unauthenticated anonymous access, simple authentication to secure authentication using SASL/SSL.

2.0 LDAP Support for SpectrumSCM: SpectrumSCM (version 1.3.7 and above) is LDAP enabled and is fully compliant with LDAP v3. LDAP support for SpectrumSCM includes the following features:

LDAP Authentication: This allows users of SpectrumSCM to authenticate against a centralized LDAP database as opposed to the SpectrumSCM database. LDAP authentication provides enhanced security for user credentials (passwords) by storing them in a secure centralized database instead of a local application specific database. Thus the confidence level for user password becomes a function of how secure the LDAP database is. This is particularly useful for organizations whose security policies prohibit them from storing user credentials in application-specific databases. LDAP authentication also provides users with the added convenience of using a single user name and password for all LDAP enabled applications.

LDAP Import: This feature allows an administrator to import details regarding a particular user from the LDAP database. Users in SpectrumSCM are defined by the following attributes: userid, name, phone, email, location. The LDAP import facility allows an administrator to import these details from an LDAP database while adding/modifying users.

LDAP Search: This feature allows a user (with the required privileges) to search the LDAP database for users satisfying a particular search criteria. Users can be searched based on their name, phone number, email address or location. The search result can be used for bulk addition of users into the SpectrumSCM database. The import and search features are useful in organizations that store user-specific details on a company-wide HR database or on a publicly available LDAP server.

Security: LDAP support for SpectrumSCM defines different levels of security ranging from anonymous binding, simple password protected binding to strong SSL based mechanisms. SSL support for LDAP provides confidentiality protection for authentication through the use of certificates and integrity protection by encrypting the data transmitted over the wire. SSL support for LDAP uses SSL v3.0 or TLS v1.0. The LDAP server should support the above mentioned mechanisms before they can be used with SpectrumSCM.

3.0 Using LDAP Support for SpectrumSCM: Configuring SpectrumSCM for LDAP support is quick and easy. The *scm.properties* file includes a few parameters that need to be configured before the LDAP related features for SpectrumSCM can be used. The parameters are as follows:

LDAP.useAuth - This parameter specifies whether LDAP authentication for SpectrumSCM should be enabled. This controls whether users login information is verified with the SpectrumSCM database (useAuth No), or with the LDAP database (useAuth Yes).
Keywords: YES, NO
Default: NO

LDAP.useImport - This parameter specifies whether the LDAP import and search features should be enabled.
Keywords: YES, NO
Default: NO

LDAP.useSSL - This parameter specifies whether SpectrumSCM should use SSL protection for communicating with the LDAP server.
Keywords: YES, NO
Default: NO

LDAP.server - This parameter specifies the LDAP server's address
Examples: ldap.xyz.com, directory.verisign.com, 192.168.100.7

LDAP.port - This parameter specifies the port number for the LDAP server.
Default: 389 for LDAP, 636 for LDAP with SSL

LDAP.dn - This parameter specifies the distinguished name (DN) used for LDAP authentication and binding. UU in the DN string acts as a placeholder for the login string entered by the user when he/she attempts to login to SpectrumSCM
Example: uid=UU,dc=SpectrumSoftware,dc=net

(2.4) 2 extensions have been provided to this mechanism under the 2.4 release. Firstly, multiple DNs are now supported. These can be provided through the – **LDAP.dn2**, **LDAP.dn3** type syntax. Where LDAP.dn would be the primary server, dn2 would be the secondary, dn3 the tertiary etc, etc. The SpectrumSCM server will attempt to validate the users information against the LDAP servers in sequence until a successful match is found OR no further DN specifications were made.

(2.4) LDAP.useNameAsUU

Keywords: true, false
Default: false

On some LDAP systems such as Microsoft's Active Directory the distinguished name is not based off of the login id but rather the display name or some other similarly long winded representation. Since the LDAP server requires the full DN for authentication this led to Spectrum users having to use the long-winded logins.

By using the "useNameAsUU" (setting it to true), the login will proceed as follows -

a) The user supplied login id will be looked up in the SpectrumSCM database. If not found the login will fail.
b) The user name as specified under the SpectrumSCM User Admin screen, will be populated into the UU field specified in the LDAP.dn parameter above.
c) The LDAP authentication will be processed as normal and succeed (or fail) as appropriate.

LDAP.searchbase - This parameter specifies the search base for the LDAP server i.e. the starting point for all searches. In most cases, it is the DN of the top-most entry in the hierarchy defined by the LDAP database.
Default: NULL

Parameter	**Example**
LDAP.uid.mapping	uid
LDAP.name.mapping	cn
LDAP.phone.mapping	telephonenumber
LDAP.mail.mapping	mail
LDAP.location.mapping	loc

The above parameters are used to map between the attributes defined in the LDAP server's schema and the information required by SpectrumSCM. *Ldap.uid.mapping* is a required parameter while other parameters are optional. The *LDAP.uid.mapping* attribute maps the LDAP login name to the Spectrum SCM user ID. The value of this attribute in the LDAP directory MUST match the user ID used in Spectrum SCM.

Note: For most Microsoft Active Directory implementations the LDAP.uid.mapping is set to **SamAccountName**.

The example attributes are based on the standard LDAP schema defined by RFC 2252. Once the above parameters are correctly specified, SpectrumSCM should be able to communicate with the specified LDAP server. The authentication and import/search features can be used separately or can be used in conjunction. In either case, the integrity of the information transmitted between the Spectrum SCM server and the LDAP server can be protected by enabling SSL.

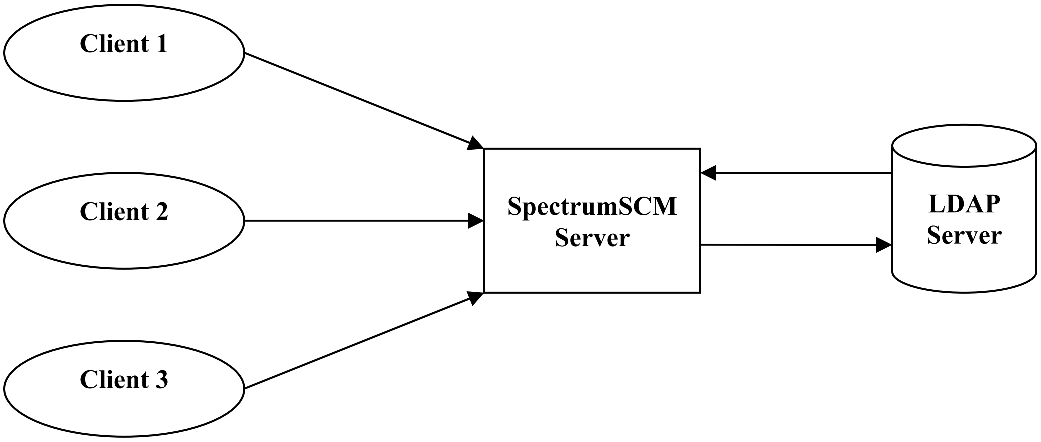
(2.4) **LDAP.useLocationForDN**
Keywords: true, false
Default: false
To support organizations with widely disparate DN's and to accelerate the login process instead of having to search through N different LDAP.dn parameters, you can choose to import/cache the distinguished name values in the users "location" field.

If this option is turned on, the **LDAP.location.mapping** field should be set to point the the distinguished name attribute. For example:

```
        LDAP.location.mapping      distinguishedName
Or      LDAP.location.mapping      dn
```

These values can then be easily imported using the search and import features described below.

4.0 Architectural Diagram:



5.0 Frequently Asked Questions:

a. <u>How do I use LDAP authentication ?</u>
Configure the LDAP parameters in the scm.properties file. Make sure that the user IDs can be mapped to entries on the LDAP server. Turn LDAP authentication ON (w or w/o SSL). Restart the Spectrum server. Use your LDAP user name and password to login.

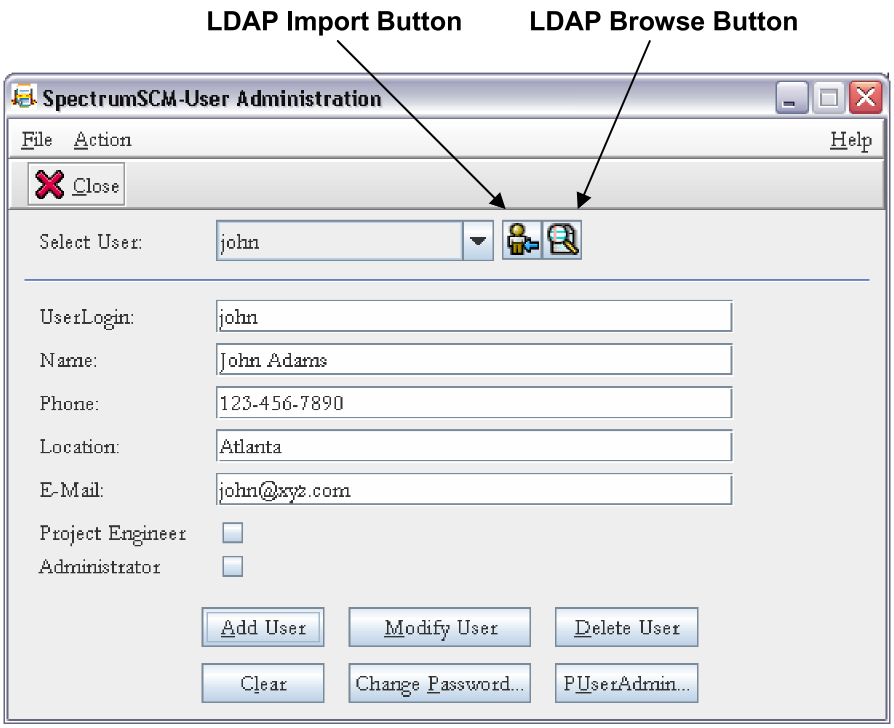
In general you probably want to set up all the parameters with the authentication initially turned off. In this way you can verify through the use of the import facility that the parameters have been set correctly. Once the authentication is turned on, if the parameters are not set correctly (incorrect LDAP.dn for example) you will not be able to login.

b. How do I use LDAP authentication with SSL ?
Make sure that the JRE on the client machine will accept certificates signed by the Certificate Authority used by the LDAP server's certificate. Turn on SSL support by specifying YES against the LDAP.useSSL parameter. CA certificates can be installed using the 'keytool' program provided by JAVA as follows:

```
# cd JAVA_HOME/lib/security ...
# keytool -import -file ca.cert -keystore cacerts
```

JAVA_HOME is the JRE install directory. *ca.cert* is the CA certificate file. The *cacerts* (or similar) keystore can be found in the /lib/security directory under JAVA_HOME

c. How do I use LDAP import ?
The name field acts as the main input box for the import feature. Use the LDAP import icon to import user details from the LDAP server. Details are imported based on the mappings specified in the *scm.properties* file



Select User: john

UserLogin: john

Name: John Adams

Phone: 123-456-7890

Location: Atlanta

E-Mail: john@xyz.com

Project Engineer □

Administrator □

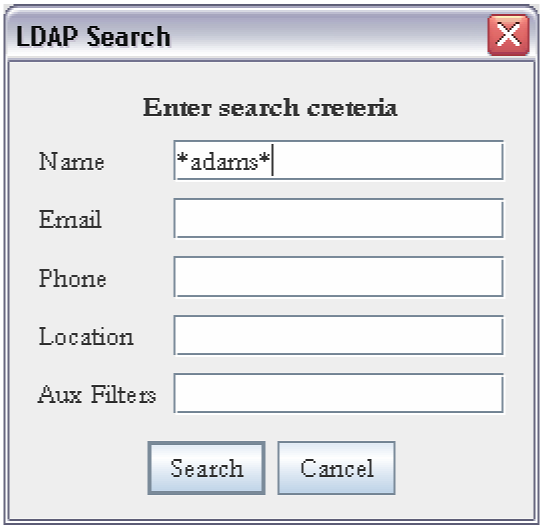
Screen Shot: SpectrumSCM User Admin with LDAP Support

d. What part does the mapping play ?
The mapping parameters are used to map between the attributes defined in the LDAP server's schema and the user details in the Spectrum database. Spectrum users are defined by five attributes (uid, name, mail, phone, location). The uid mapping is important for LDAP authentication. Each user on the LDAP user must have a unique ID which can be defined by some attribute name say 'user_id'. This attribute must map to the uid attribute used as the UserLogin in SpectrumSCM. Thus (for this example) the mapping would be configured as:

```
LDAP.uid.mapping          user_id
```

Other attributes are mapped in a similar manner, but these are optional.

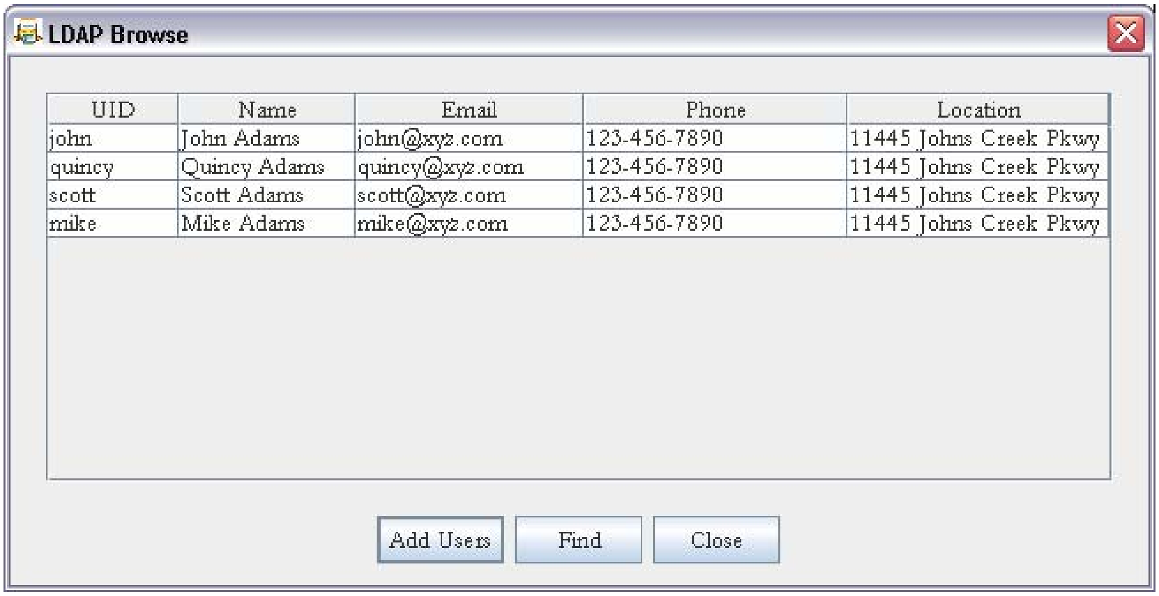
e. How do I use the search feature ?
Click the LDAP search icon. If you are not yet authenticated, you will be prompted for authentication. Enter the search criteria. Note, the syntax is specifed by the LDAP standards and searches based on the LDAP.searchbase parameter as specified above.



Name *adams*

The results table (shown below) will allow you to add users in bulk. If you are using a public server with thousands of entries, there is a possibility of exceeding the server limit if your search criterion is not refined.

You can additionally use the “Find” button to search through the returned results table to lcate specific items of interest.



UID	Name	Email	Phone	Location
john	John Adams	john@xyz.com	123-456-7890	11445 Johns Creek Pkwy
quincy	Quincy Adams	quincy@xyz.com	123-456-7890	11445 Johns Creek Pkwy
scott	Scott Adams	scott@xyz.com	123-456-7890	11445 Johns Creek Pkwy
mike	Mike Adams	mike@xyz.com	123-456-7890	11445 Johns Creek Pkwy

Screen Shot: LDAP Search Panel and Results Table

f. Can I use a public server ?
Of course, you just need the proper configuration parameters. However, in most cases you cannot use a publicly available server for authentication unless you happen to have an account with the server. You can definitely use the server to import information. As an example, here are the settings for the Verisign Server

LDAP.useAuth	NO
LDAP.useImport	YES
LDAP.useSSL	NO
LDAP.server	directory.verisign.com
LDAP.port	DEFAULT
LDAP.uid.mapping	mail
LDAP.name.mapping	cn
LDAP.phone.mapping	telephonenumber
LDAP.mail.mapping	mail
LDAP.location.mapping	loc

Comment out the LDAP.dn and LDAP.searchbase parameters

g. Where can I find out more about what went wrong ?
If the client side dialogs do not give provide a clue to what went wrong, check the server log file.

h. Why does SSL authentication seem a bit slow ?
SSL authentication employs an encryption, decryption, message code checking and other mechanisms. The speed depends upon the key length

used. Longer the key, higher is the level of security and slower is the processing speed.

i. How do I use the UU keyword in scm.properties ?
The UU is a placeholder for login that you enter. If your LDAP.dn parameter has been set to uid=UU,dc=SpectrumSoftware,dc=net and you enter 'john', the fully resolved distinguished name (DN) that is passed to the LDAP server is uid=john,dc=SpectrumSoftware,dc=net. As another example, if you are used to entering the full DN set the LDAP.dn parameter to UU

(2.4) If you are using the useNameAsUU option and your DN is –
cn=John Adams,dc=SpectrumSoftware,dc=net
Then you can still log in as 'john' and the LDAP.dn would be specified as –
cn=UU,dc=SpectrumSoftware,dc=net

j. Can I give wildcards in my searches ?
Yes you can give LDAP compliant wildcards. The most common is *.

k. What if multiple entries match the input value while importing an LDAP user ?
The tool will always accept the first value in the set if multiple entries are found.

l. I'm using Microsoft Active Directory, how do I find out what my Distinguished Name is ?
You'll need access to the Active Directory, or through someone (an Administrator thas does). The steps below were taken from a Windows Server 2003 installation, different Windows versions will probably have differing access methods.

Go to the Start Menu -> Administration Tools and select **Active Directory Users & Computers**. Use the Action menu -> Find utility to find yourself. If your distinguished name is not shown in the table use the **View** menu -> **Choose Columns** to select the **X500 distinguished name** and add it to the view.

For additional information on SpectrumSCM please visit our website at www.spectrumscm.com.
Or contact Spectrum Software at 770.448.8662