Client X.509 Certificate Authentication and User Enrollment

Overview

The X.509 User Certificate Authentication feature is a user realm that establishes user identity with a X.509 client certificate. The user identity is established for a particular user on a specific device and application.

This feature provides SSL client-side certificate authentication and user enrolment capabilities. SSL client-side certificate authentication consists of establishing a two-way SSL handshake the between MobileFirst client and server which, in turn, enables the client and server both to present their identities and therefore establish mutual trust through the SSL/TLS protocol.

You can enrol new users to the MobileFirst Platform Mobile Application Management system and your PKI of choice with the user enrolment capabilities. A basic embedded PKI is provided with this feature which is meant to get you started quickly for educational and non-production environments only. For production environments, this feature makes it easy to integrate with your existing PKI. You can use either the PKI Bridge Java interface or built-in MobileFirst adapters to delegate certificate management functions down to an external PKI system.

In this tutorial, you learn how to enable and configure the User Certificate Authentication.

Agenda:

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- Understanding how user certificate authentication works
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- Configuring IBM WebSphere Application Server Liberty profile (Liberty)
- Configuring the authenticationConfig.xml file
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- Installing the root CA on iOS and Android
- Installing and testing the application
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Prerequisites

You must have a general understanding of MobileFirst user realms and adapters.
It is assumed that you follow these instructions by using an application that currently supports form-based authentication.

- The form-based authentication module uses non-validating login modules. These login modules are

not recommended for production environments

- Use other user authentication realms, like WASLTPA in production.

Understanding how user certificate authentication works

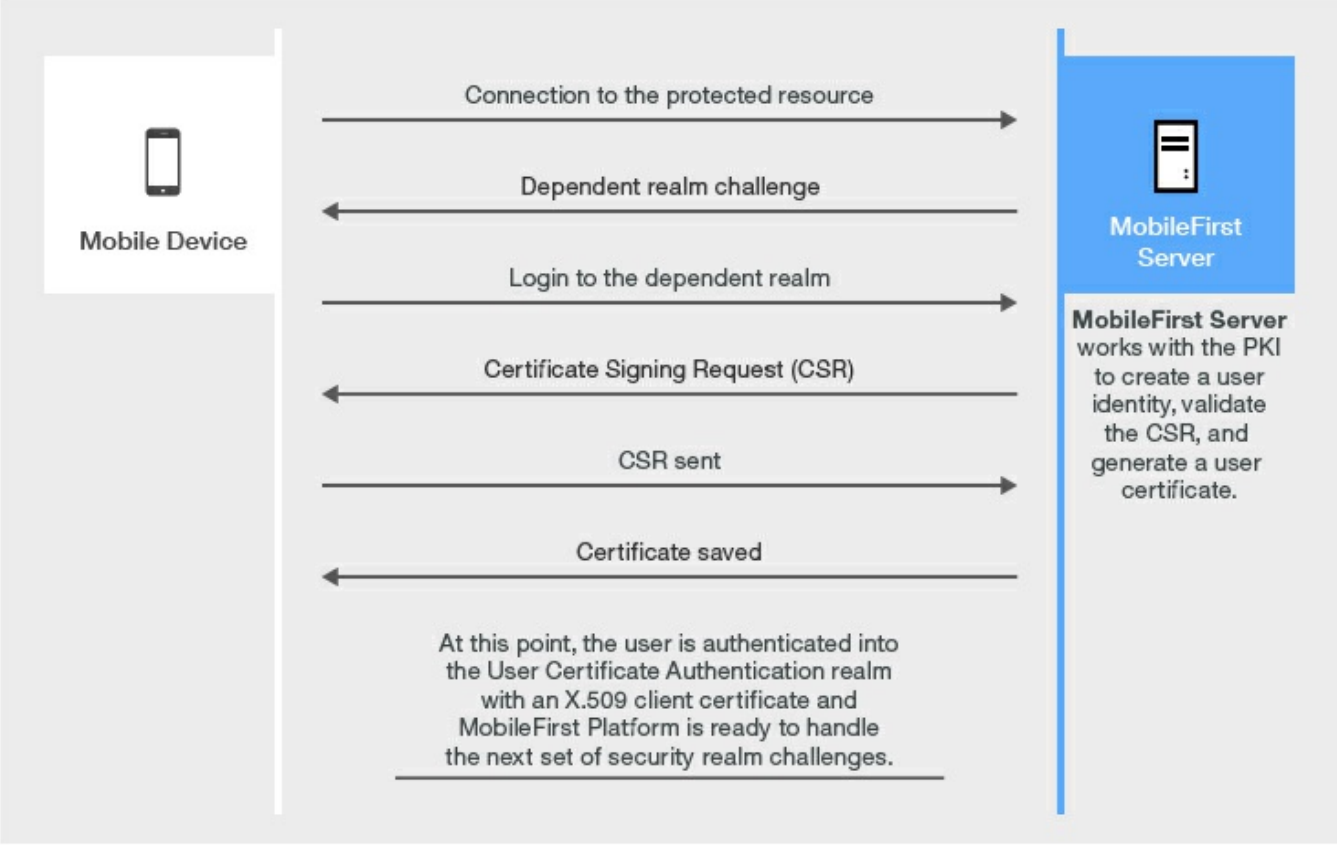
User certificate authentication is the process in which a X.509 certificate is issued by an existing PKI through the MobileFirst server to a specific user on a specific application and device. The relevant user information is obtained during the user enrolment process with the specified dependent user realm.

The user enrolment process relies on a dependent user realm to help it establish the initial user identity to which the X.509 certificate is issued.

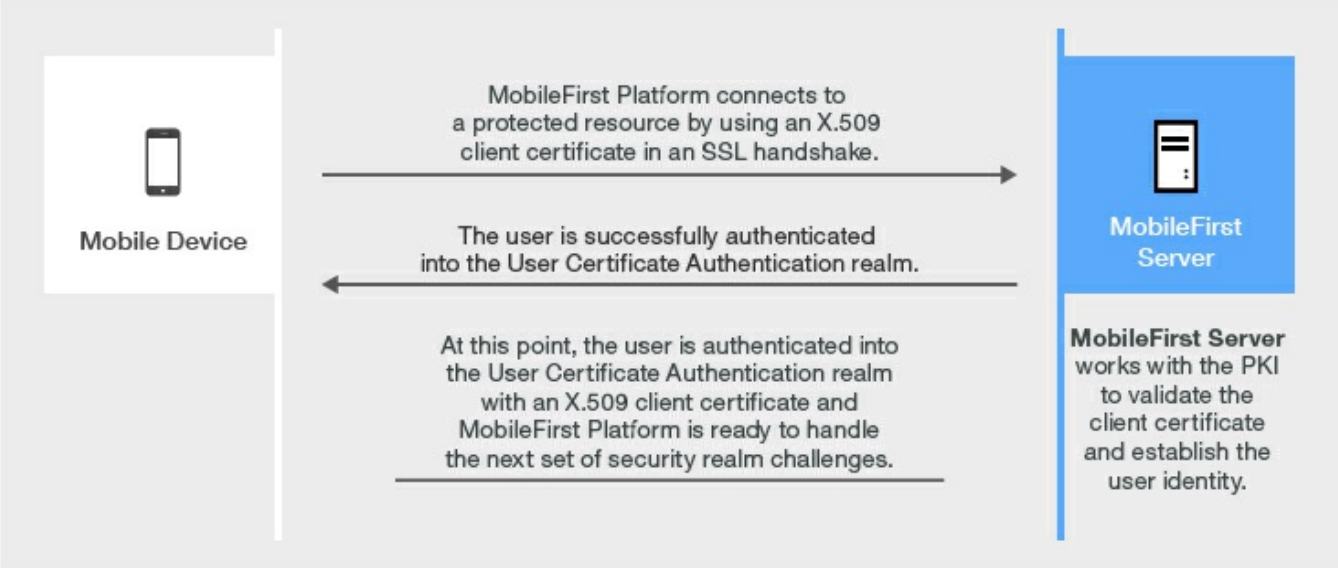
IBM MobileFirst Platform Foundation then provisions the device with the X.509 client certificate for use in subsequent connections to the server.

The first time a user connects to the MobileFirst server, that user must authenticate through the dependent realm to initiate the enrolment process. After a user is enrolled into the User Certificate Authentication realm, subsequent connections to the server occur through the two way SSL/TLS handshake, where the client certificate is presented as the SSL client entity.

User enrollment flow



Client certificate authentication flow



X.509 certificate and certificate authorities (CAs)

For security reasons, during testing, it is not recommended to use an established CA that uses an embedded PKI in your infrastructure. It is possible to create a self-signed CA that can sign both a server certificate and user certificates.

This module uses the OpenSSL command-line utility.
OpenSSL is included in most Linux distributions and in Mac OS X. Windows users can obtain an OpenSSL binary from the OpenSSL website.

The commands that are shown in this module work on Linux and Mac OS X. For Windows, use the equivalent MS-DOS commands.

Create an OpenSSL configuration file

1. Create an empty directory and navigate to that path in your system terminal.
2. Create a basic OpenSSL configuration file that is named `openSSL.cnf`.
3. Move this file to the directory that you created.

If you want different policy requirements, see the OpenSSL configuration documentation for instructions on how to configure the various options.

`openSSL.cnf` sample file:

```
[ req ]
    default_bits          = 2048                  # size of keys
    default_keyfile       = key.pem               # name of generated keys
    default_md            = sha1                  # message digest algorithm
    string_mask           = nombstr               # permitted characters
    distinguished_name    = req_distinguished_name

[ req_distinguished_name ]
0.organizationName = Organization Name (company)
organizationalUnitName = Organizational Unit Name (department, division)
emailAddress = Email Address
emailAddress_max = 40
localityName = Locality Name (city, district)
stateOrProvinceName = State or Province Name (full name)
countryName = Country Name (2-letter code)
countryName_min = 2
countryName_max = 2
commonName = Common Name (hostname, IP, or your name)
commonName_max = 64

[ policy_match ]
countryName             = optional
stateOrProvinceName     = optional
localityName            = optional
organizationName        = optional
organizationalUnitName  = supplied
commonName              = optional
emailAddress            = optional
```

Create a root CA

Append the following section to the `openSSL.cnf` configuration file to set up the root CA requirements.

```
[ root_authority ]
basicConstraints        = CA:TRUE
subjectKeyIdentifier    = hash

[ root_authority_ca_config ]
dir             = ./rootca
certs           = $dir/certs
new_certs_dir   = $dir/newcerts
database        = $dir/index.txt
certificate     = $dir/root_ca.crt
private_key     = $dir/root_ca_key.pem
serial          = $dir/serial
RANDFILE        = $dir/.rand
policy          = policy_match
```

Instructions for Linux and Mac OS X

Instructions for Windows

Create a signing CA

To set up the signing CA configuration options, edit the `openssl.conf` file that you created earlier and append the following configuration:

```
[ signing_authority ]
basicConstraints            = CA:TRUE,pathlen:0
subjectKeyIdentifier        = hash
authorityKeyIdentifier      = keyid:always, issuer:always

[ signing_authority_ca_config ]
dir             = ./signingca
certs           = $dir/certs
new_certs_dir   = $dir/newcerts
database        = $dir/index.txt
certificate     = $dir/signing_ca.crt
private_key     = $dir/signing_ca_key.pem
serial          = $dir/serial
RANDFILE        = $dir/.rand
policy          = policy_match
email_in_dn     = false
```

Instructions for Linux and Mac OS X

Instructions for Windows

Create a server certificate

Edit the `openssl.cnf` file that you created earlier and append the following configuration to set up the server certificate configuration options.

```
[ server_identity ]
basicConstraints        = CA:TRUE
subjectKeyIdentifier    = hash
authorityKeyIdentifier  = keyid:always;issuer:always
```

Instructions for Linux and Mac OS X

Instructions for Windows

Create a certificate chain for the server certificate

Instructions for Linux and Mac OS X

Instructions for Windows

Export a PKCS12 file for the signing CA

Export the private key and certificate for the signing CA into a `.p12` keystore file so that the embedded PKI can sign the user certificates with the signing CA.

```
openssl pkcs12 -export -in signingca/signing_ca.crt -inkey signingca/signing_ca_key.pem -out signingca
/signing_ca.p12 -passin pass:passSigning -passout pass:passSigningP12
```

Export a PKCS12 file for the server certificate

Export the private key and certificate for the server into a `.p12` keystore file so that the server can send the client a valid server certificate.

```
openssl pkcs12 -export -in server_chain.crt -inkey server/server_key.pem -out server/server.p12 -passo
ut pass:passServerP12 -passin pass:passServer
```

Configuring IBM WebSphere Application Server Liberty profile (Liberty)

Enable the `ssl-1.0` and `appSecurity-2.0` features in the `server.xml` file:

```
<featureManager>
  <feature>ssl-1.0</feature>
  <feature>appSecurity-2.0</feature
>
</featureManager>
```

Liberty requires setting up the keystore and truststore to establish trust for the generated client certificates. For more information, see the WebSphere Application Server Network Deployment documentation (http://pic.dhe.ibm.com/infocenter/wasinfo/v8r5/index.jsp?topic=/com.i
bm.websphere.wlp.nd.doc/ae/rwlp_ssl.html).

1. Set up your server keystore to use the `server.p12` file that was generated earlier.
2. Set up your truststore to use the `signing_ca.p12` file that was generated earlier.
3. Configure your server HTTP endpoint and allow (but do not require) client-side certificates. To make this configuration available, set the `clientAuthenticationSupported="true"` property in the Liberty SSL element.

The following example shows the updated SSL configuration:

```
<!-- default SSL configuration is defaultSSLSettings -->
<sslDefault sslRef="defaultSSLSettings"/>
<ssl clientAuthenticationSupported="true" id="defaultSSLSettings" keyStoreRef="defaultKeyStore" trus
tStoreRef="defaultTrustStore"/>
<keyStore id="defaultKeyStore" location="server.p12" password="passServerP12" type="PKCS12" />
<keyStore id="defaultTrustStore" location="signing_ca.p12" password="passSigningP12" type="PKCS
12"/>
```

Configuring the authenticationConfig.xml file

1. Uncomment the `UserCertificate Login Module` section of the `authenticationConfig.xml` file, as shown below.

```
<!-- Login Module for User Certificate Authentication -->
<loginModule name="WLUSERCertificateLoginModule">
  <className>com.worklight.core.auth.ext.UserCertificateLoginModule</className
>
</loginModule>
```

2. Uncomment the `wl_userCertificateAuthRealm` section, as shown below.

```
<!-- Login Module for User Certificate Authentication -->
<realm name="wl_userCertificateAuthRealm" loginModule="WLUserCertificateLoginModule">
  <className>com.worklight.core.auth.ext.UserCertificateAuthenticator</className>
  <parameter name="dependent-user-auth-realm" value="SampleAppRealm"/>
  <parameter name="pki-bridge-class" value="com.worklight.core.auth.ext.UserCertificateEmbe
ddedPKI"/>
</realm><br />
```

3. Update the value of the `embedded-pki-bridge-ca-p12-file-path` element to the full path of your signing CA `.p12` file.
4. Update the value of the `embedded-pki-bridge-ca-p12-password` element to the `passSigningP12` password that was used to create the `.p12` file.
5. Update the value of the `dependent-user-auth-realm` realm to the dependent realm that you want to use (`SampleAppRealm`).
   You cannot change the realm name (`wl_userCertificateAuthRealm`).

   The following examples shows the updates made above.

```
<!--For User Certificate Authentication -->
<realm name="wl_userCertificateAuthRealm" loginModule="WLUserCertificateLoginModule">
  <className>com.worklight.core.auth.ext.UserCertificateAuthenticator</className>
  <parameter name="dependent-user-auth-realm" value="SampleAppRealm"/>
  <parameter name="pki-bridge-class" value="com.worklight.core.auth.ext.UserCertificateEmbe
ddedPKI"/>
  <parameter name="embedded-pki-bridge-ca-p12-file-path" value="YOUR_BASE_DIRECTOR
Y/signing_ca.p12"/>
  <parameter name="embedded-pki-bridge-ca-p12-password" calue="passSigningP12"/>
</realm>
```

6. Define a security test that uses `wl_userCertificateAuthRealm`.

```
<!--For User Certificate Authentication -->
<customSecurityTest name="customx509Tests">
  <test realm="wl_antiXSRFRealm" step="1"/>
  <test realm="wl_authenticityRealm" step="1"/>
  <test realm="wl_directUpdateRealm" mode="perSession" step="1"/>
  <test realm="wl_userCertificateAuthRealm" isInternalUserID="true" step="1"/>
  <test realm="wl_deviceNoProvisioningRealm" isInternalUserID="true" step="2"/
>
</customSecurityTest>
```

Configuring the application-descriptor.xml file

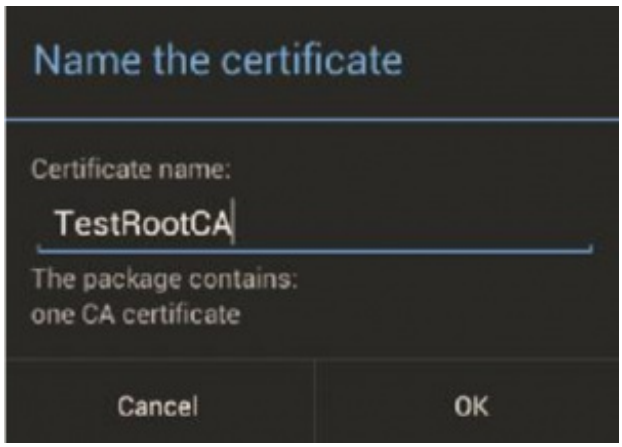
1. Ensure that you added the iOS or Android environment to your MobileFirst application.
2. Protect your application or environment with your custom security test.

```
<!--For User Certificate Authentication -->
<android securityTest="customx509Tests" version="1.0">
<iPhone bundleId="com.SampleApp" securityTest="customx509Tests" version="1.0">
```

3. Build and deploy your application and adapters to MobileFirst Server.

Installing a root CA on iOS and Android

You must install the root CA that you generated in the previous steps onto your client devices for your devices to trust MobileFirst Server over SSL. Email or host the `root_ca.crt` file, and then open the file on your device. The iOS and Android devices ask for approval when you manually attempt to install certificates.



Installing and testing the application

1. Deploy your application to MobileFirst Server by selecting **Run as > Run on *server_name***.
2. Update the deploy target for HTTPS.

1. Select **Run as > Build Settings and Deploy Target**.
2. Select **Build the application to work with a different MobileFirst Server**.
3. Enter the server HTTPS address: `https://host:https port#`
4. Enter the context path: `/path`.

3. Build the application with the updated deploy target by selecting **Run as > Build All Environments**.
4. Run the application on the specified environments.

Sample application

Click to download (https://github.com/MobileFirst-Platform-Developer-Center/UserCertificateAuthentication/tree/release71) the MobileFirst project.

To confirm a successful configuration, ensure that you see a log-in form the first time that you try to access a protected resource. If `WL.Client.connect()` is uncommented in the `main.js` file, the log-in form is displayed when the application starts. Otherwise, `WL.Client.connect()` must be invoked before you call an adapter procedure to see a log-in form after the adapter is called.

After you log in through the dependent realm, a successful response from the adapter invocation indicates that the user was successfully enrolled.

On subsequent connections to the server, you are no longer asked to log in and the adapter calls continue to return successfully.

> For more information, see the "User certificate authentication" topic in the user documentation.