
Hyland™

Alfresco
Tech Talk Live #157

Hyland™

April 24, 2024

Agenda

- Community news
- Troubleshooting Made Easy: Deciphering Alfresco mTLS Configuration

Alfresco TechQuest

September 10-12, 2024

- Where: Lisbon, Portugal
- Topics:
  - AGS, ADF, APS
  - Out-of-Process extensions
  - Migration: Solr to Elasticsearch & ACS Embedded Workflows to APS
  - Hyland Experience Insight and Automate

Registration is open: https://university.hyland.com/pages/techquest-alfresco

Resources

Alfresco

- Web and API based SMTP testing @GitHub
- Sample space for opensource.hyland.com @ GitHub
- Blog post in Docker page for GenAI Stack @GitHub
- Alfresco mTLS Debugging Kit @GitHub
- GitHub Pages for Alfresco Ansible Deployment @GitHub

Resources to come

- Adapting your logging configuration to log4jv2
- Upgrading your addons to Jakarta EE 10 and Spring 6
- Upgrading to Apache Tomcat 10
- Using Control Center App with Community Edition
- *What else?*

Collaboration

Contributions

- OOTBee Support Tools compatible with ACS 23.x by @Afaust
- Share action for Alfresco OCR by @abhinavmishra
- Starter project for ADF and ACS by @DenysVuika

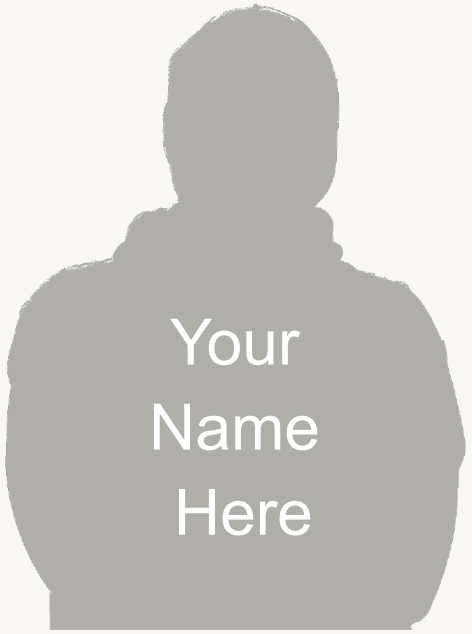
Conferences

OpenSearchCon Europe 2024, 6-7 May 2024

Berlin, Germany

Hyland will be exhibitor, swing by and say hello!

TTL Speakers Wanted!



- Take the opportunity to showcase your work to the community
- About Alfresco, Nuxeo and associated technologies
- Best practices, integration, scaling, cloud, AI…
- In your native language

Today’s Talk

#157

Troubleshooting Made Easy: Deciphering Alfresco mTLS Configuration

Angel Borroy
Developer Evangelist
Hyland

TTL #157

Troubleshooting Made Easy: Deciphering Alfresco's mTLS Configuration

Hyland™

Angel Borroy

Developer Evangelist

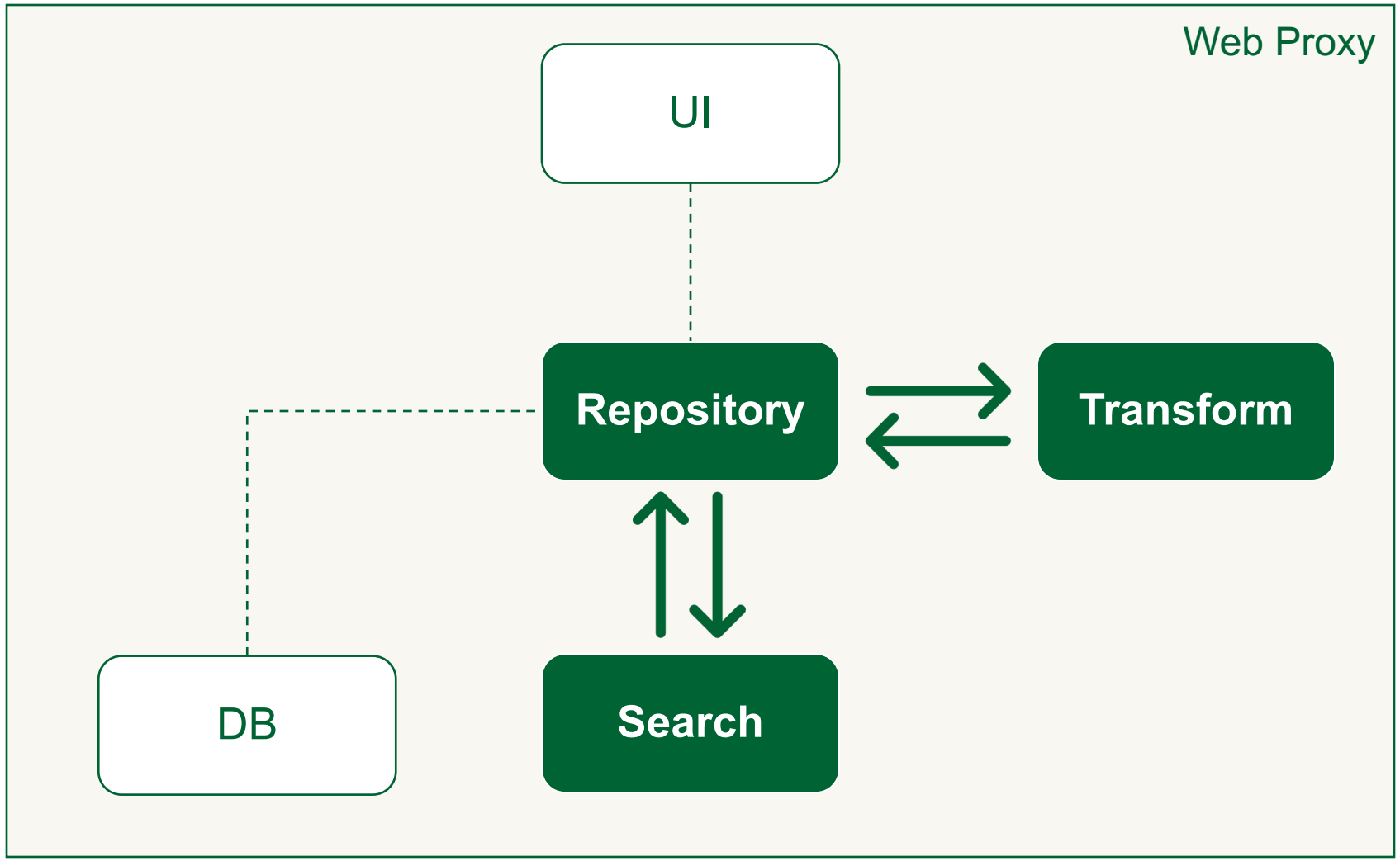
April 24, 2024

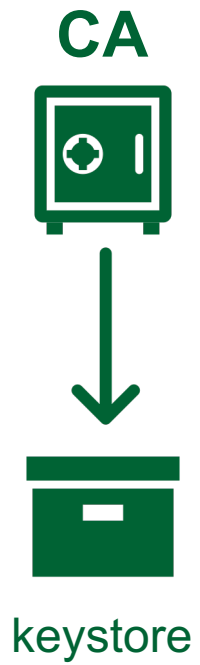
Agenda

- Alfresco mTLS
- Cryptographic Best Practices
- Communication Repository <> Search
- Troubleshooting Tools
- Hands on, using EC certificates

Alfresco mTLS

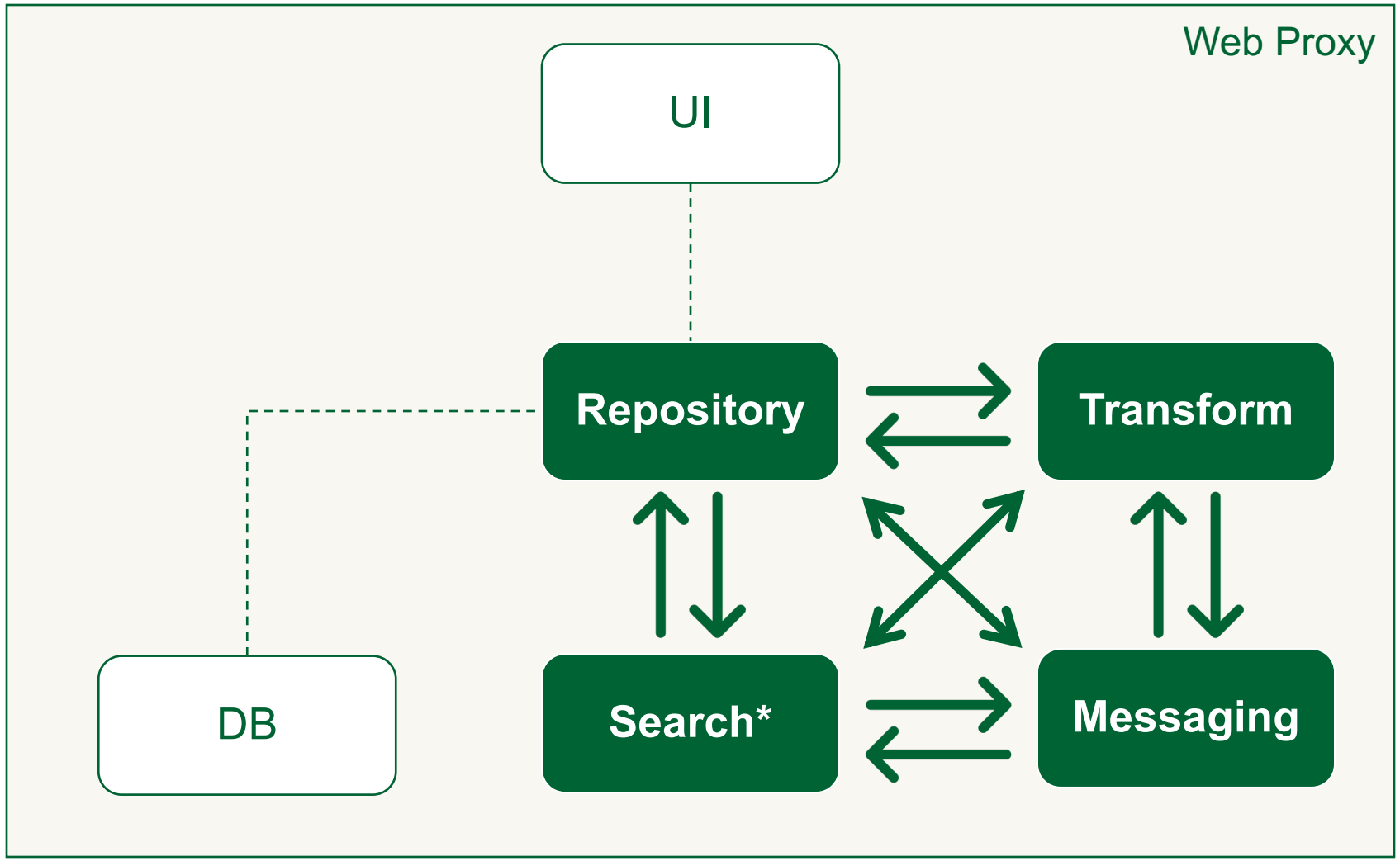
Alfresco mTLS





COMMUNITY

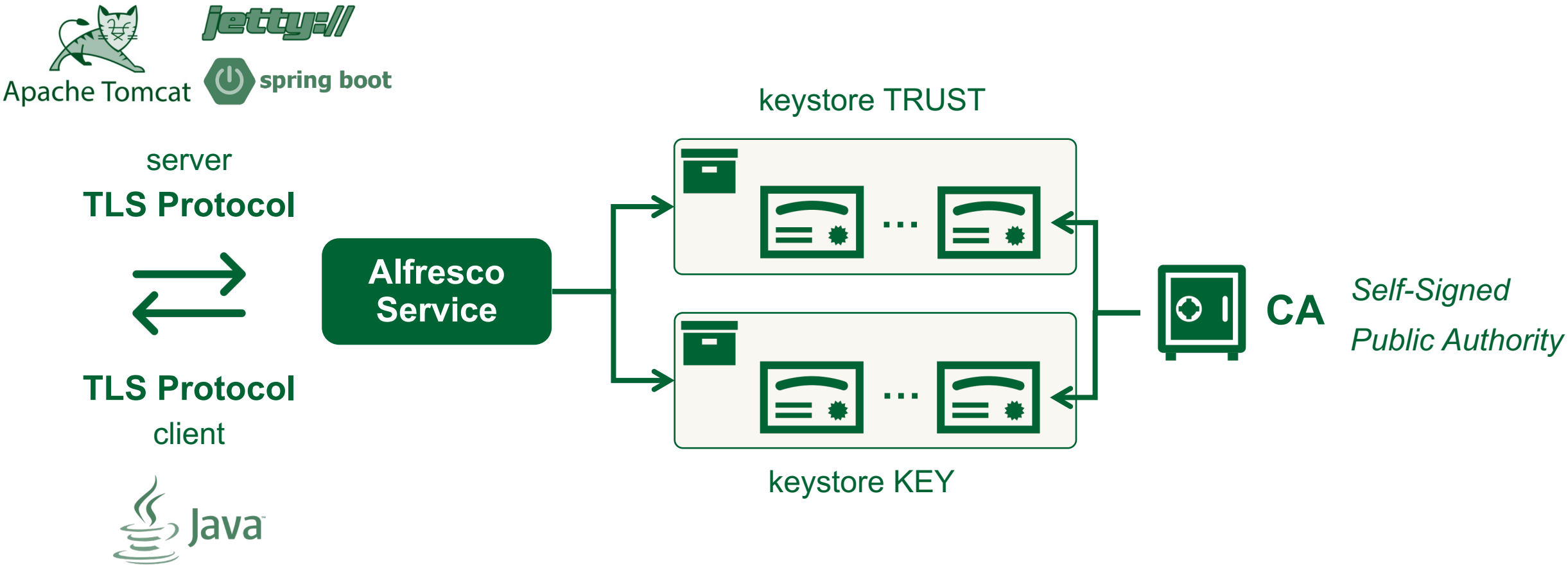
Alfresco mTLS



** When using Search Enterprise with Elasticsearch or OpenSearch*

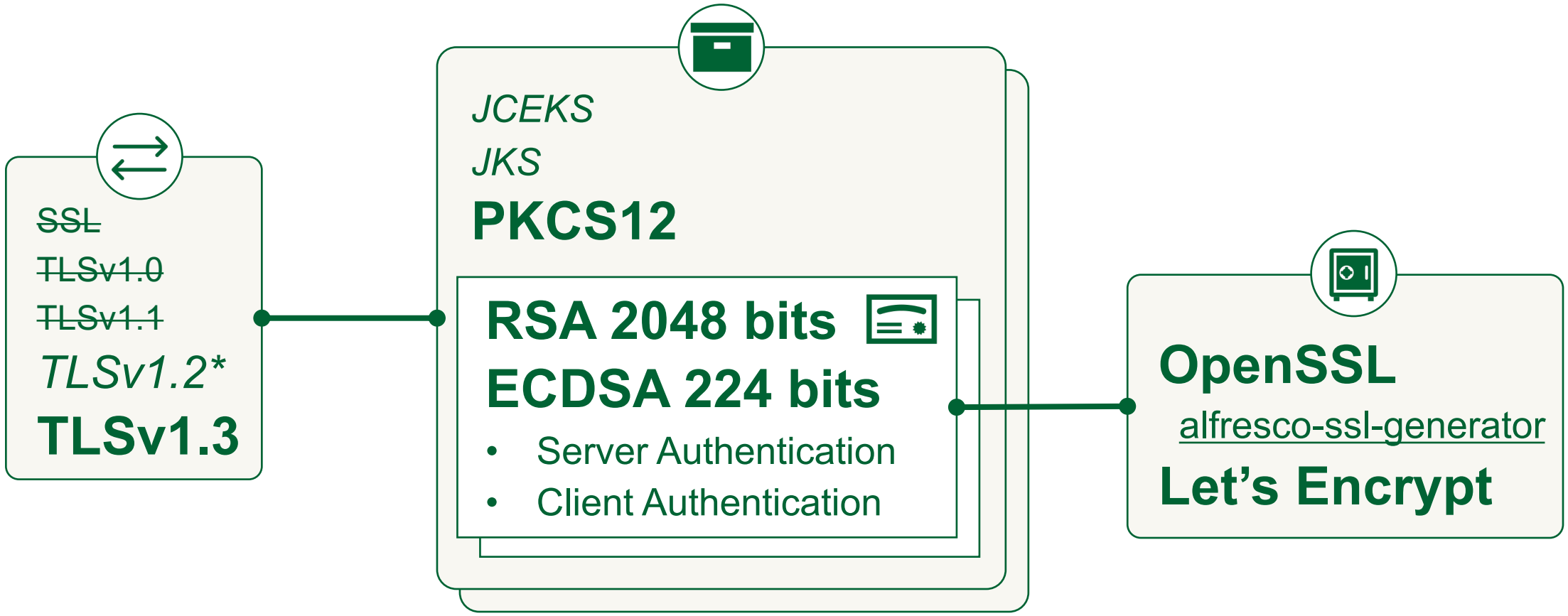
ENTERPRISE

A Closer Look



Cryptographic Best Practices

General Guidelines



TLS Protocol

Use **TLSv1.3**

- Apache Tomcat, set `protocols` to TLSv1.3 in `Connector.SSLHostConfig`
- Jetty, set TLSv1.3 in Java property `jdk.tls.client.protocols`
- Spring Boot, set TLSv1.3 in `SERVER_SSL_ENABLED_PROTOCOLS`

Alternatively use **TLS 1.2** with *ECDHE* and *AES-GCM* hardcoded

- `TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384`
- `TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384`

When multiple TLS versions are available in the server, the client will select one

- The default for security handshakes in JDK 17 is TLS 1.3

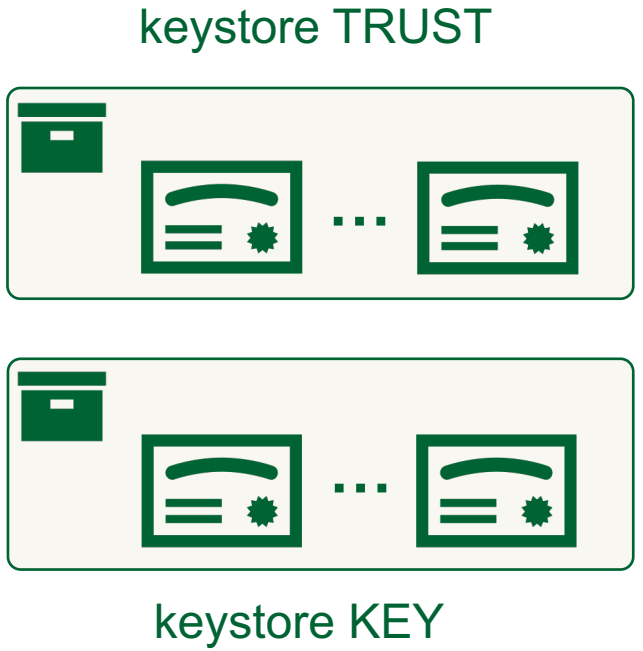
Keystore Type and Certificates

Use Keystore Type **PKCS12**

- Avoid using *non-standard* formats like `JKS` or `JCEKS`

Certificates

- Algorithm
  - **RSA**, widely supported across different platforms and libraries
  - **ECDSA**, equivalent security with shorter key length, more performant and efficient for mTLS
- Minimum key length
  - 2048 bits for RSA
  - 224 bits for EC
- Usage
  - Server Authentication – OID 1.3.6.1.5.5.7.3.1
  - Client Authentication – OID 1.3.6.1.5.5.7.3.2



Certificate Authority

Self-Signed

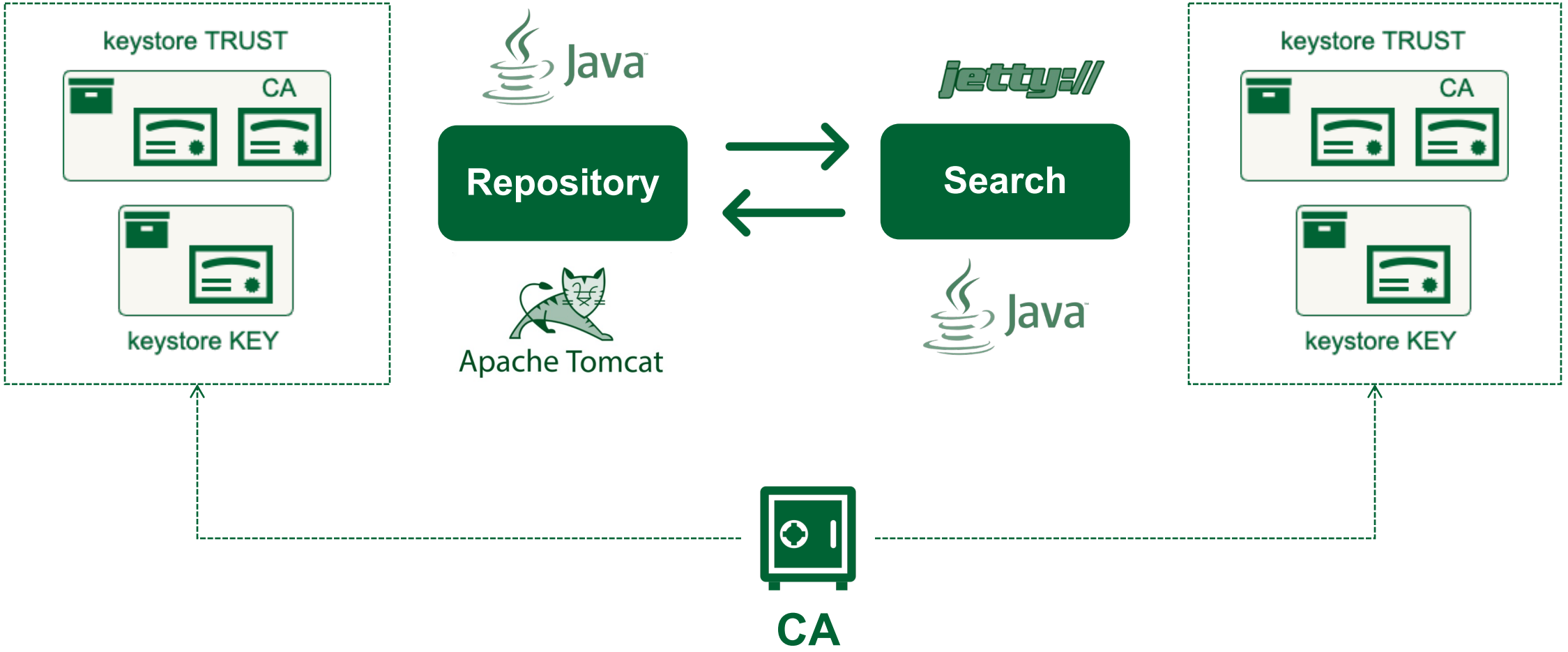
- Use Alfresco SSL Generator project, which depends on OpenSSL for certificate generation
- Use alternative software able to issue certificates according with the previous recommendations
  - Later in this session, smallstep will be used

Public Authority

- Use OpenSSL with Let's Encrypt, set up a *cron job* to re-fetch certificates regularly
  - Requires active Internet connection to Alfresco containers
- Use a web hosting provider, like AWS

Comm Repository <> Search

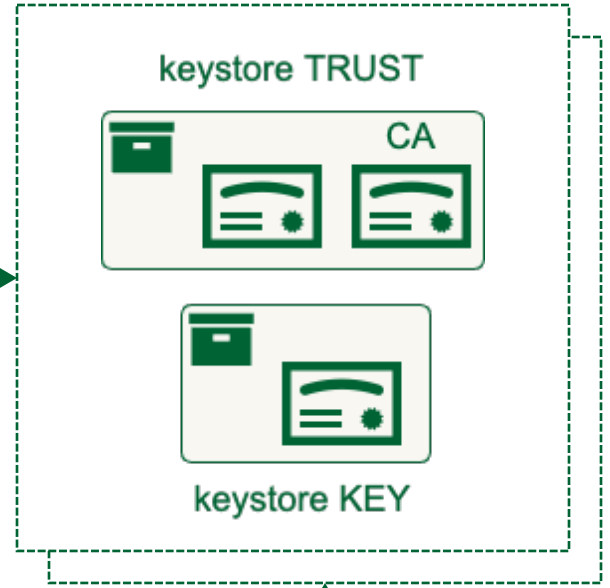
mTLS between Repository and Search



Creating Certificates and Keystores

Use `community.sh` script from Alfresco SSL Generator

```
$ ./community.sh
$ tree keystores
keystores
├── alfresco
│   ├── ssl.keystore
│   └── ssl.truststore
├── solr
│   ├── ssl.repo.client.keystore
│   └── ssl.repo.client.truststore
└── client
    └── browser.p12
```

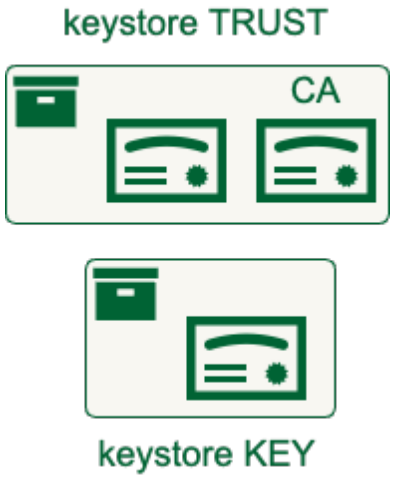


Solr Admin Web Console

Repository Keystores

```
$ keytool -v -list -keystore keystores/alfresco/ssl.truststore
Alias name: alfresco.ca
Owner: CN=Alfresco CA, OU=Alfresco, O=Hyland, L=Cleveland, ST=OH, C=US
Issuer: CN=Alfresco CA, OU=Alfresco, O=Hyland, L=Cleveland, ST=OH, C=US
Alias name: ssl.repo.client
Owner: CN=Search, OU=Alfresco, O=Hyland, ST=OH, C=US
Issuer: CN=Alfresco CA, OU=Alfresco, O=Hyland, L=Cleveland, ST=OH, C=US
```

```
$ keytool -v -list -keystore keystores/alfresco/ssl.keystore
Alias name: ssl.repo
Owner: CN=Repository, OU=Alfresco, O=Hyland, ST=OH, C=US
Issuer: CN=Alfresco CA, OU=Alfresco, O=Hyland, L=Cleveland, ST=OH, C=US
```



RSA 2048 bits

- Server Authentication
- Client Authentication

Repository Configuration (server)

Add following `Connector` to `${TOMCAT_DIR}/conf/server.xml` file

```
<Connector port="8443" protocol="org.apache.coyote.http11.Http11NioProtocol"
    SSLEnabled="true" scheme="https" secure="true"
    defaultSSLHostConfigName="localhost">
      <SSLHostConfig hostName="localhost" protocols="TLSv1.3"
          certificateVerification="required"
          truststoreFile="ssl.truststore"
          truststorePassword="truststore" truststoreType="PKCS12">
          <Certificate certificateKeystoreFile="ssl.keystore"
                       certificateKeyAlias="ssl.repo" type="RSA"
                       certificateKeystorePassword="keystore"
                       certificateKeystoreType="PKCS12"/>
      </SSLHostConfig>
</Connector>
```

Apache Tomcat

Repository Configuration (client)

Add environment variables containing passwords

```
-Dssl-keystore.password=keystore
-Dssl-truststore.password=truststore
```

When using the same password for keystore and keys, no aliases setting is required

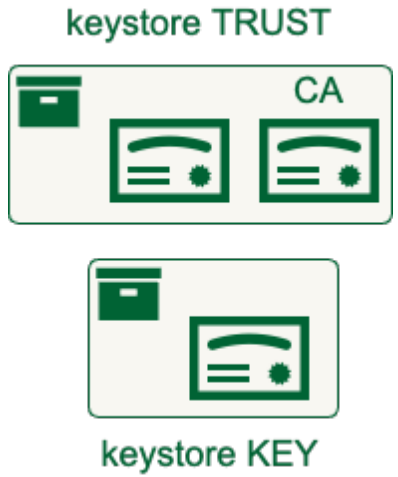
Set Alfresco Repository Java Properties

```
solr.host=localhost
solr.port.ssl=8983
solr.secureComms=https
encryption.ssl.keystore.type=PKCS12
encryption.ssl.keystore.location=/usr/local/tomcat/keystore/ssl.keystore
encryption.ssl.truststore.type=PKCS12
encryption.ssl.truststore.location=/usr/local/tomcat/keystore/ssl.truststore
```

Java

Search Keystores

```
$ keytool -v -list -keystore keystores/solr/ssl.repo.client.truststore
Alias name: ssl.repo
Owner: CN=Alfresco CA, OU=Alfresco, O=Hyland, L=Cleveland, ST=OH, C=US
Issuer: CN=Alfresco CA, OU=Alfresco, O=Hyland, L=Cleveland, ST=OH, C=US
Alias name: alfresco.ca
Owner: CN=Repository, OU=Alfresco, O=Hyland, ST=OH, C=US
Issuer: CN=Alfresco CA, OU=Alfresco, O=Hyland, L=Cleveland, ST=OH, C=US
```




```
$ keytool -v -list -keystore keystores/solr/ssl.repo.client.keystore
Alias name: ssl.repo.client
Owner: CN=Search, OU=Alfresco, O=Hyland, ST=OH, C=US
Issuer: CN=Alfresco CA, OU=Alfresco, O=Hyland, L=Cleveland, ST=OH, C=US
```

RSA 2048 bits

- Server Authentication
- Client Authentication

Search Configuration (server)

Java Environment Variables

```
-Dsolr.jetty.truststore.password=truststore
-Dsolr.jetty.keystore.password=keystore
-Djdk.tls.client.protocols=TLSv1.3
```

OS Environment Variables (or modify `solr.in.[sh|cmd]` file)

```
SOLR_SSL_KEY_STORE: "/opt/alfresco-search-services/keystore/ssl.repo.client.keystore"
SOLR_SSL_KEY_STORE_PASSWORD: "keystore"
SOLR_SSL_KEY_STORE_TYPE: "PKCS12"
SOLR_SSL_TRUST_STORE: "/opt/alfresco-search-services/keystore/ssl.repo.client.truststore"
SOLR_SSL_TRUST_STORE_PASSWORD: "truststore"
SOLR_SSL_TRUST_STORE_TYPE: "PKCS12"
SOLR_SSL_NEED_CLIENT_AUTH: "true"
```

Search Configuration (client)

Add environment variables containing passwords

```
-Dssl-keystore.password=keystore
-Dssl-truststore.password=truststore
```

When using the same password for keystore and keys, no aliases setting is required

Set `solrcore.properties` Java Properties (in each core *or* in template)

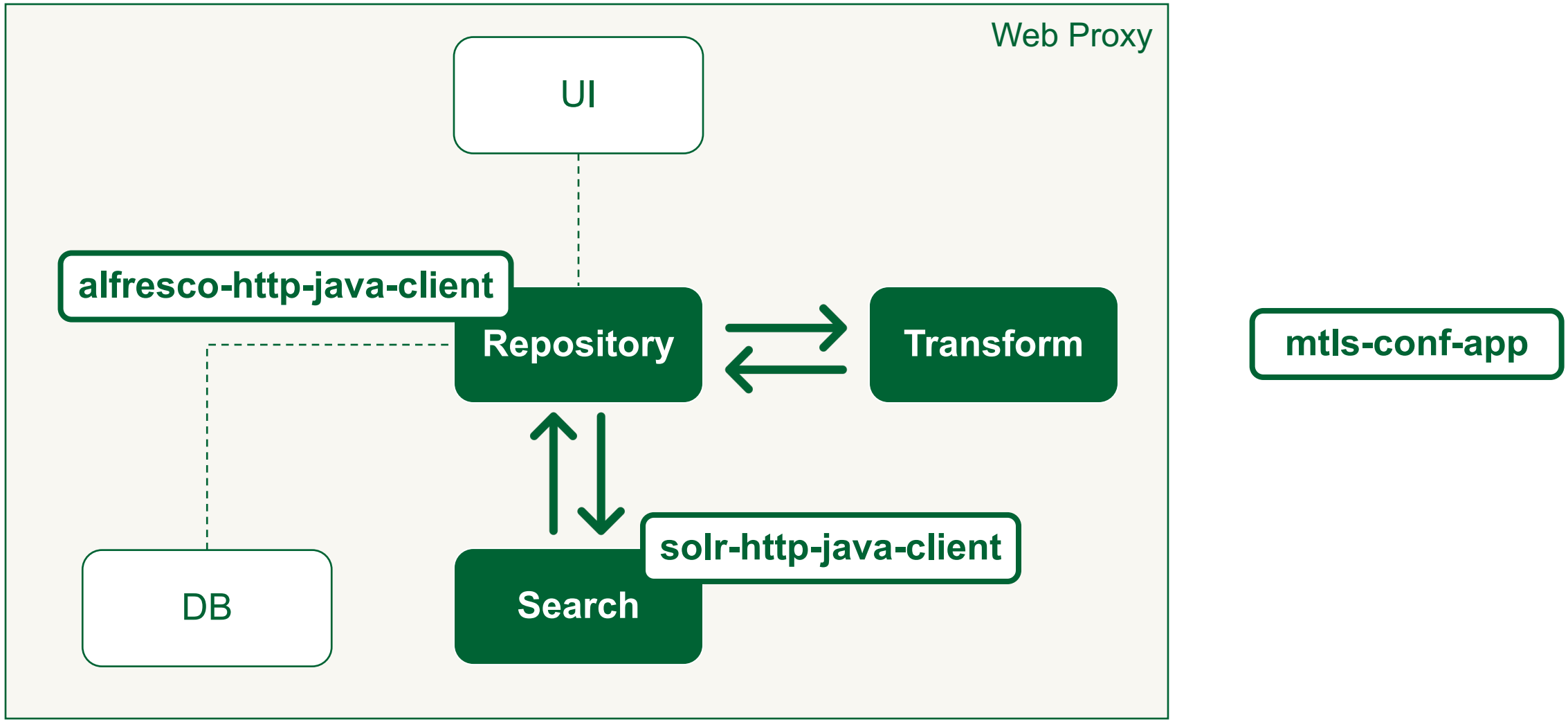
```
alfresco.host=localhost
alfresco.port=8443
alfresco.secureComms=https
alfresco.encryption.ssl.keystore.location=/opt/alfresco-search-services/keystore/ssl.repo.client.keystore
alfresco.encryption.ssl.keystore.type=PKCS12
alfresco.encryption.ssl.truststore.location=/opt/alfresco-search-services/keystore/ssl.repo.client.truststore
alfresco.encryption.ssl.truststore.type=PKCS12
```

Sample deployment with Docker Compose

https://github.com/aborroy/alfresco-mtls-debugging-kit/tree/main/docker

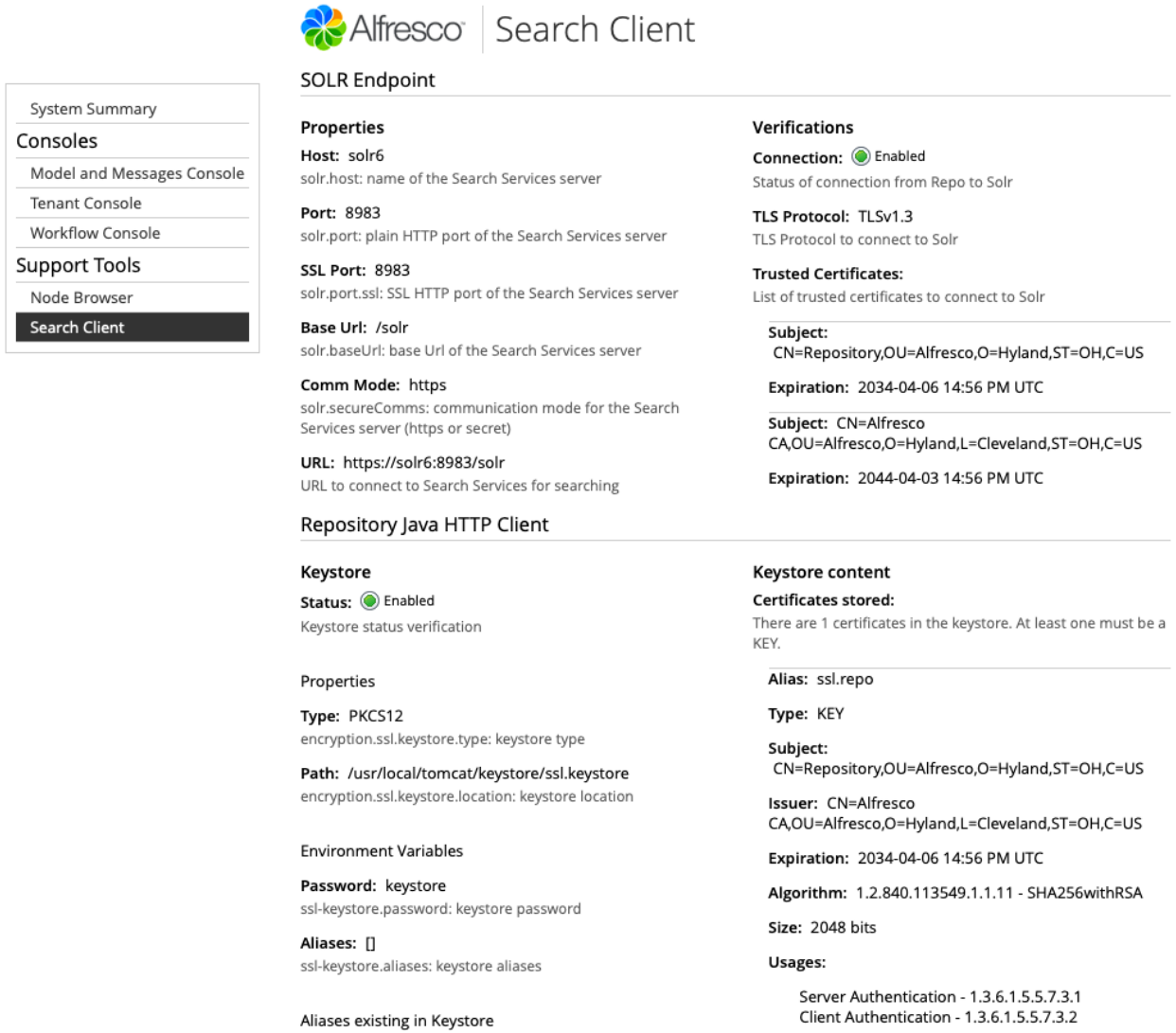
Troubleshooting tools

Available tools



https://github.com/aborroy/alfresco-mtls-debugging-kit

Alfresco Repository



Admin Web Console

Deploy as addon

alfresco-http-java-client.jar

crypto-utils.jar

Source code

https://github.com/aborroy/alfresco-mtls-debugging-kit/tree/main/addons/alfresco-http-java-client

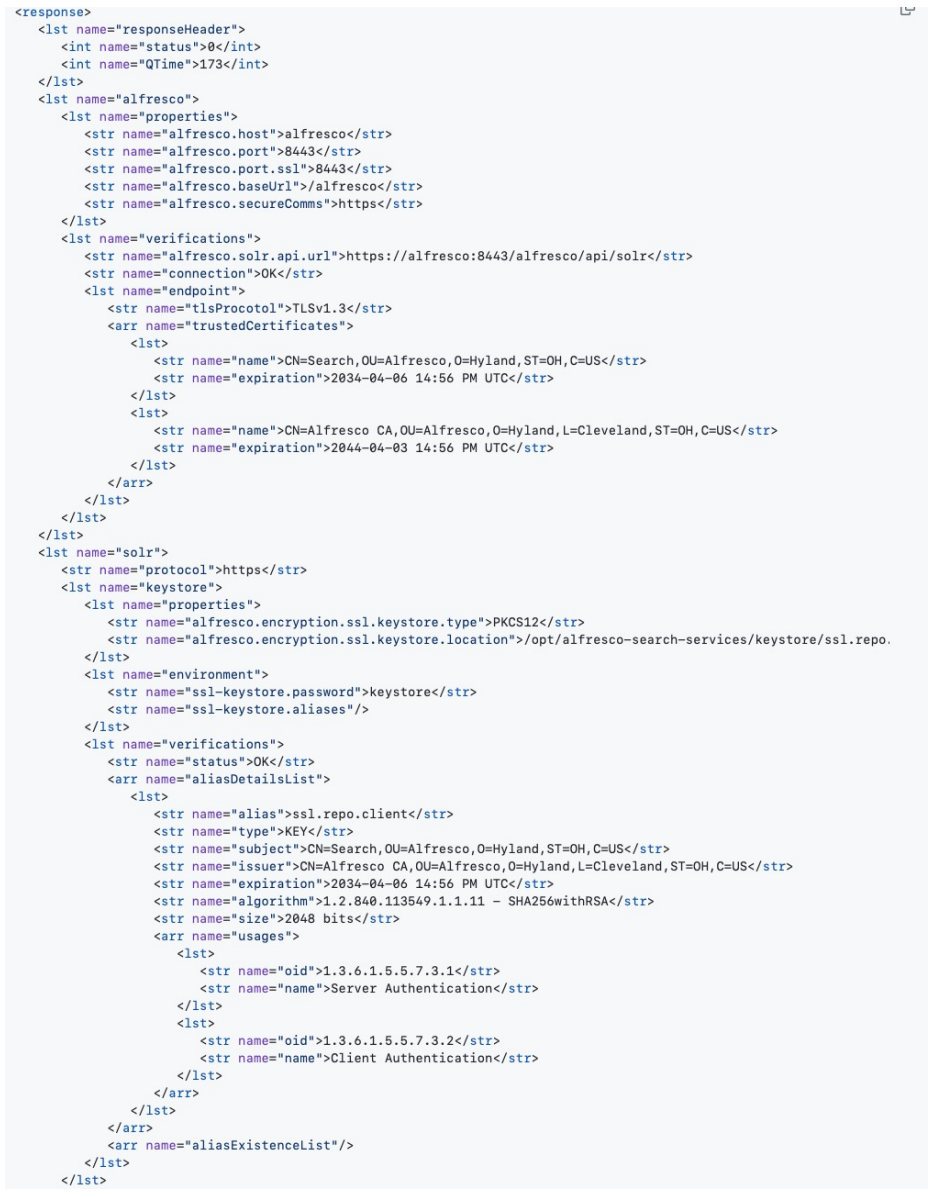
App URL

http://localhost:8080/alfresco/s/admin/admin-search-client

Credentials

ADMINISTRATOR, default `admin`/`admin`

Alfresco Search Services




```
<response>
   <lst name="responseHeader">
      <int name="status">0</int>
      <int name="QTime">173</int>
   </lst>
   <lst name="alfresco">
      <lst name="properties">
         <str name="alfresco.host">alfresco</str>
         <str name="alfresco.port">8443</str>
         <str name="alfresco.port.ssl">8443</str>
         <str name="alfresco.baseUrl">/alfresco</str>
         <str name="alfresco.secureComms">https</str>
      </lst>
      <lst name="verifications">
         <str name="alfresco.solr.api.url">https://alfresco:8443/alfresco/api/solr</str>
         <str name="connection">OK</str>
         <lst name="endpoint">
            <str name="tlsProcotol">TLSv1.3</str>
            <arr name="trustedCertificates">
               <lst>
                  <str name="name">CN=Search,OU=Alfresco,O=Hyland,ST=OH,C=US</str>
                  <str name="expiration">2034-04-06 14:56 PM UTC</str>
               </lst>
               <lst>
                  <str name="name">CN=Alfresco CA,OU=Alfresco,O=Hyland,L=Cleveland,ST=OH,C=US</str>
                  <str name="expiration">2044-04-03 14:56 PM UTC</str>
               </lst>
            </arr>
         </lst>
      </lst>
   </lst>
   <lst name="solr">
      <str name="protocol">https</str>
      <lst name="keystore">
         <lst name="properties">
            <str name="alfresco.encryption.ssl.keystore.type">PKCS12</str>
            <str name="alfresco.encryption.ssl.keystore.location">/opt/alfresco-search-services/keystore/ssl.repo.
         </lst>
         <lst name="environment">
            <str name="ssl-keystore.password">keystore</str>
            <str name="ssl-keystore.aliases"/>
         </lst>
         <lst name="verifications">
            <str name="status">OK</str>
            <arr name="aliasDetailsList">
               <lst>
                  <str name="alias">ssl.repo.client</str>
                  <str name="type">KEY</str>
                  <str name="subject">CN=Search,OU=Alfresco,O=Hyland,ST=OH,C=US</str>
                  <str name="issuer">CN=Alfresco CA,OU=Alfresco,O=Hyland,L=Cleveland,ST=OH,C=US</str>
                  <str name="expiration">2034-04-06 14:56 PM UTC</str>
                  <str name="algorithm">1.2.840.113549.1.1.11 - SHA256withRSA</str>
                  <str name="size">2048 bits</str>
                  <arr name="usages">
                     <lst>
                        <str name="oid">1.3.6.1.5.5.7.3.1</str>
                        <str name="name">Server Authentication</str>
                     </lst>
                     <lst>
                        <str name="oid">1.3.6.1.5.5.7.3.2</str>
                        <str name="name">Client Authentication</str>
                     </lst>
                  </arr>
               </lst>
            </arr>
            <arr name="aliasExistenceList"/>
         </lst>
      </lst>
```


Solr REST API Action

Deploy as plugin

alfresco-http-java-client.jar

solr-http-java-client.jar

config/solr.xml

Source code

https://github.com/aborroy/alfresco-mtls-debugging-kit/tree/main/addons/solr-http-java-client

App URL

https://localhost:8983/solr/admin/cores?action=HTTP-CLIENT&coreName=alfresco

Credentials

Client certificate, like `browser.p12`

Command line

Spring Boot command line application

Run as program

$ java -jar target/mtls-conf-app.jar

```
ERRORS for ENDPOINT:
Current truststore seems to be wrong. It does not include TRUST certificates provided by the endpoint.
ERRORS DETAIL:
sun.security.provider.certpath.SunCertPathBuilderException: unable to find valid certification path to requested target
```

Source code

https://github.com/aborroy/alfresco-mtls-debugging-kit/tree/main/apps/mtls-conf-app

```
# Use configuration values for Alfresco or Solr.
# Ensure this computer has access to endpoint (host:port) and to keystore and truststore location.
# Parameters can be also overridden from command line by using "-Dspring." prefix. For instance, "-Dspring.endpoint.host=localhost"

# Alfresco property "solr.host" | Solr property "alfresco.host"
endpoint.host=localhost
# Alfresco property ["solr.port", "solr.port.ssl"] | Solr property ["alfresco.port", "alfresco.port.ssl"]
endpoint.port=8983
# Alfresco property "solr.baseUr" | Solr property "alfresco.baseUrl"
endpoint.context=/solr

# Alfresco property "encryption.ssl.keystore.type" | Solr property "alfresco.encryption.ssl.keystore.type"
keystore.type=PKCS12
# Alfresco property "encryption.ssl.keystore.location" | Solr property "alfresco.encryption.ssl.keystore.location"
keystore.location=/Users/angel.fernandoborroy/Downloads/zz-mtls/alfresco-mtls-debugging-kit/docker/keystores/alfresco/ssl.keystore
# Environment variable "ssl-keystore.password" (for Alfresco and Solr)
keystore.password=keystore

# Alfresco property "encryption.ssl.truststore.type" | Solr property "alfresco.encryption.ssl.truststore.type"
truststore.type=PKCS12
# Alfresco Property "encryption.ssl.truststore.location" | Solr property "alfresco.encryption.ssl.truststore.location"
truststore.location=/Users/angel.fernandoborroy/Downloads/zz-mtls/alfresco-mtls-debugging-kit/docker/keystores/alfresco/ssl.truststore
# Environment Variable "ssl-truststore.password" (for Alfresco and Solr)
truststore.password=truststore
```

Hands on, using EC certificates

Lab

Use ECC 256 bits certificates for ECDSA with step-ca

- Around *10% faster* than RSA 2048 bits for Alfresco mTLS
- Less bandwidth consumption
- Higher security (as RSA 2048 is equivalent to ECC 224)

Source code: https://github.com/aborroy/alfresco-mtls-debugging-kit/tree/main/step-ca

```
# Start step-ca container, default CA will be created in “step” folder
$ docker compose up
# Install step CLI
$ brew install step
# Get CA password
$ cat step/secrets/password
ZuSJLBo6uRtlvzGe0z1i5ReqU2tpncl19RBUIf5V
```

Lab

```
# Create a certificate for alfresco, use “keystore” password to protect the key
$ step certificate create alfresco alfresco.crt alfresco.key \
--profile leaf --not-after=8760h --bundle --ca step/certs/root_ca.crt \
--ca-key step/secrets/root_ca_key

# Create a certificate for solr, use “keystore” password to protect the key
$ step certificate create solr solr.crt solr.key \
--profile leaf --not-after=8760h --bundle --ca step/certs/root_ca.crt \
--ca-key step/secrets/root_ca_key
```

Lab

```
# Build Keystore and Truststore for alfresco
$ openssl pkcs12 -export -in alfresco.crt -inkey alfresco.key \
-out alfresco.pkcs12 -name alfresco -noiter -nomaciter
$ keytool -import -alias solr -file solr.crt -keystore \
alfresco-truststore.pkcs12 -storetype PKCS12 -storepass truststore
$ keytool -import -alias ca -file step/certs/root_ca.crt -keystore \
alfresco-truststore.pkcs12 -storetype PKCS12 -storepass truststore
# Build Keystore and Truststore for solr
$ openssl pkcs12 -export -in solr.crt -inkey solr.key \
-out solr.pkcs12 -name solr -noiter -nomaciter
$ keytool -import -alias alfresco -file alfresco.crt -keystore \
solr-truststore.pkcs12 -storetype PKCS12 -storepass truststore
$ keytool -import -alias ca -file step/certs/root_ca.crt -keystore \
solr-truststore.pkcs12 -storetype PKCS12 -storepass truststore
```

Lab

```
# Get alfresco client certificate to access Solr (or re-use alfresco.pkcs12)
$ openssl pkcs12 -export -out browser.p12 -inkey alfresco.key -in alfresco.crt

# Modify compose.yaml to use the new keystores
```

Alfresco

- keystore=alfresco.pkcs12
- truststore=alfresco-truststore.pkcs12
- cert-alias=alfresco
- cert-type=EC

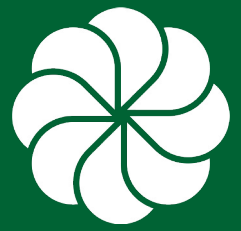
Solr

- keystore=solr.pkcs12
- truststore=solr-truststore.pkcs12

Lab

```
# Bonus verification
$ nmap --script ssl-enum-ciphers -p 8983 localhost
|   TLSv1.3:
|     ciphers:
|       TLS_AKE_WITH_AES_256_GCM_SHA384 (secp256r1)
|       TLS_AKE_WITH_AES_128_GCM_SHA256 (secp256r1)
|       TLS_AKE_WITH_CHACHA20_POLY1305_SHA256 (secp256r1)
$ nmap --script ssl-enum-ciphers -p 8443 localhost
|   TLSv1.3:
|     ciphers:
|       TLS_AKE_WITH_AES_128_CCM_SHA256 (ecdh_x25519)
|       TLS_AKE_WITH_AES_128_GCM_SHA256 (ecdh_x25519)
|       TLS_AKE_WITH_AES_256_GCM_SHA384 (ecdh_x25519)
|       TLS_AKE_WITH_CHACHA20_POLY1305_SHA256 (ecdh_x25519)
```

Cryptographic Best Practices



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Thanks!