Apache Syncope - Getting Started

Version 2.1.15-SNAPSHOT

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This document is under active development and discussion!

If you find errors or omissions in this document, please don't hesitate to submit an issue or open a pull request with a fix. We also encourage you to ask questions and discuss any aspects of the project on the mailing lists or IRC. New contributors are always welcome!

Preface

This guide shows you how to get started with Apache Syncope services for identity management, provisioning, and compliance.

Chapter 1. Introduction

Apache Syncope is an Open Source system for managing digital identities in enterprise environments, implemented in Java EE technology and released under the Apache 2.0 license.

Identity Management (or IdM) means to manage user data on systems and applications, using the combination of business processes and IT. IdM involves considering user attributes, roles, resources and entitlements in trying to answer the following thorny question:

Who has access to What, When, How, and Why?

1.1. What is Identity Management, anyway?

Account

Computers work with records of data about people. Such records contain technical information needed by the system for which the account is created and managed.

(Digital) Identity

A representation of a set of claims made by one digital subject about itself. **It's you!**

Have you ever been hired by a company, entered an organization or just created a new Google account? Companies, organizations and cloud entities work with applications that need your data to function properly: username, password, e-mail, first name, surname, and more.

Where is this information going to come from? And what happens when you need to be enabled for more applications? And what if you get promoted and acquire more rights on the applications you already had access to? Most important, what happens when you quit or they gently let you go?

In brief, Identity Management takes care of managing identity data throughout what is called the **Identity Lifecycle**.

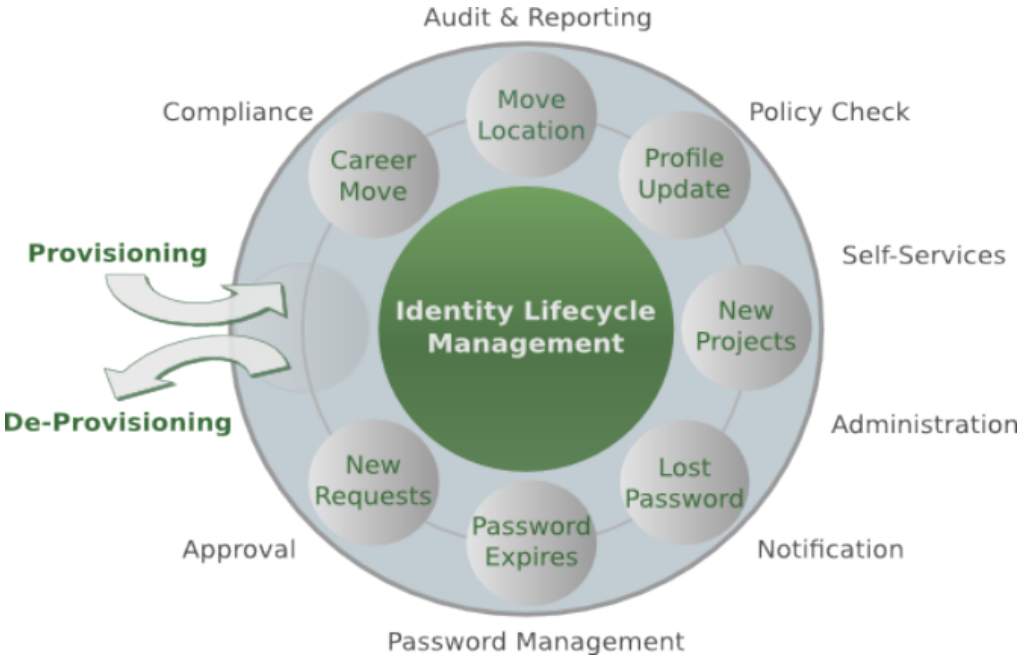


Figure 1. Identity Lifecycle

Users, Groups and Any Objects

With Apache Syncope 2.0.0, the managed identities are not limited anymore to Users and Groups. New object types can be defined so that Any Object's data can be managed through Syncope: workstations, printers, folders, sensors, services, and so on. This positions Apache Syncope at the forefront for bringing Identity Management to the IoT world.

1.2. Identity and Access Management - Reference Scenario

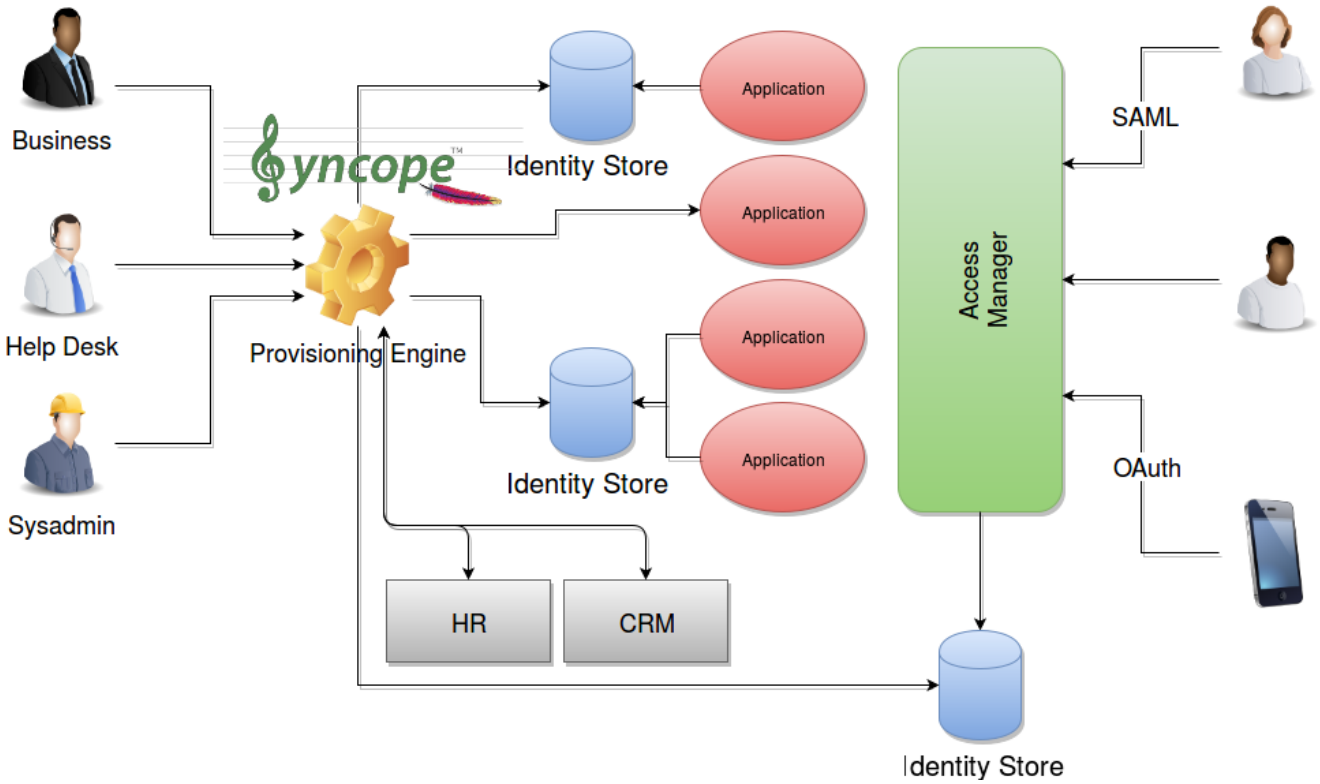


Figure 2. IAM Scenario

The picture above shows the technologies involved in a complete IAM solution:

- ***Identity Store*** (as RDBMS, LDAP, Active Directory, meta- and virtual-directories) - the repository for account data
- ***Provisioning Engine*** - synchronizes account data across Identity Stores and a broad range of data formats, models, meanings and purposes
- ***Access Manager*** - access mediator to all applications, focused on application front-end, taking care of authentication (Single Sign-On), authorization (OAuth, XACML) and federation (SAML, OpenID Connect).

From a technology point of view, **Apache Syncope** is primarily a **Provisioning Engine**.

1.2.1. Aren't Identity Stores enough?

One might suppose that a single Identity Store can solve all the identity needs inside an organization, but there are a few drawbacks with this approach:

1. Heterogeneity of systems
2. Lack of a single source of information (HR for corporate id, Groupware for mail address, ...)
3. Often applications require a local user database
4. Inconsistent policies across the infrastructure
5. Lack of workflow management
6. Hidden infrastructure management cost, growing with the size of the organization

1.3. A bird's eye view on the Architecture

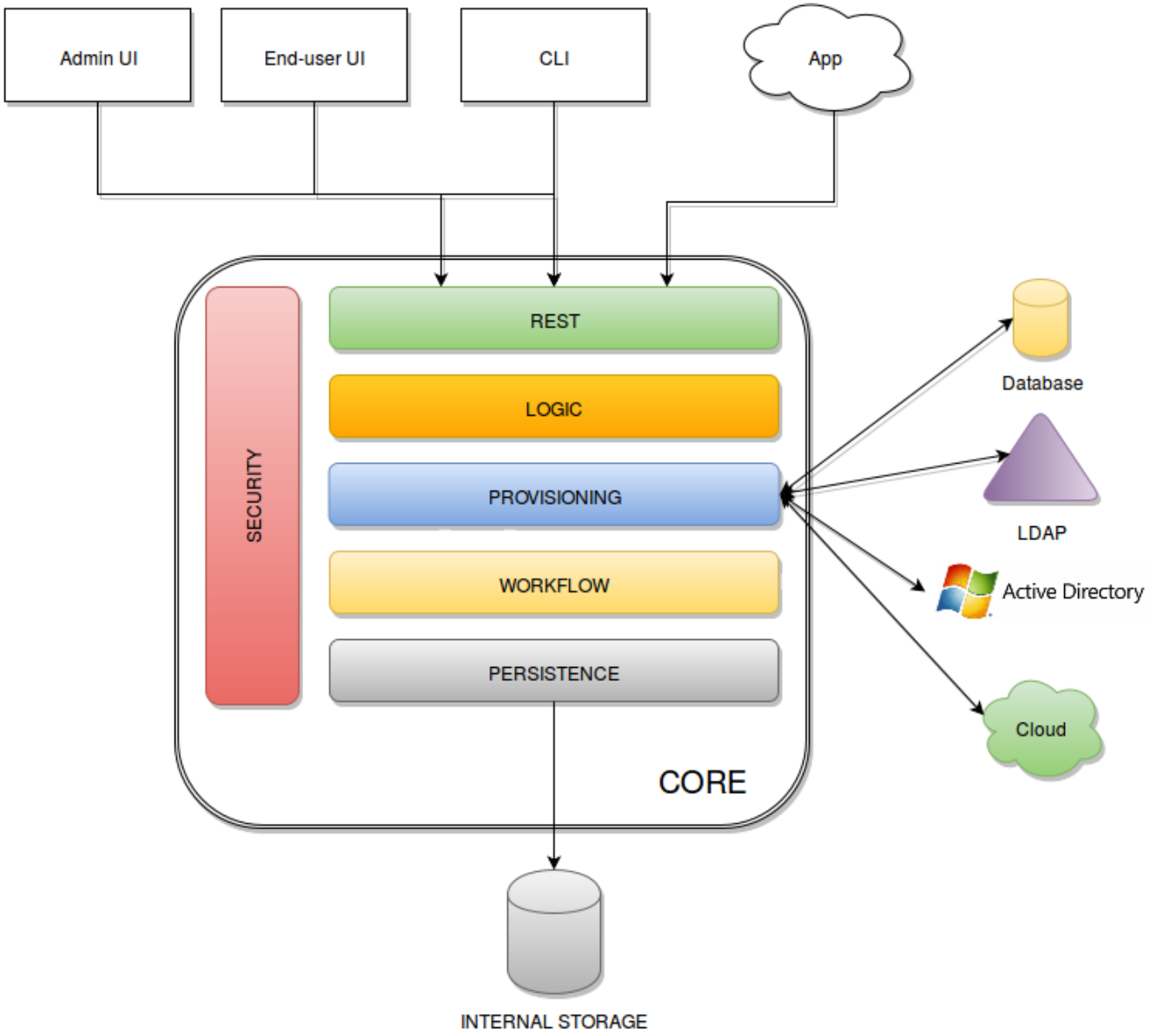


Figure 3. Architecture

Admin UI is the web-based console for configuring and administering running deployments, with full support for delegated administration.

End-user UI is the web-based application for self-registration, self-service and password reset.

CLI is the command-line application for interacting with Apache Syncope from scripts, particularly useful for system administrators.

Core is the central component, providing all services offered by Apache Syncope.
It exposes a fully-compliant JAX-RS 2.0 RESTful interface which enables third-party applications, written in any programming language, to consume IdM services.

- ***Logic*** implements the overall business logic that can be triggered via REST services, and controls some additional features (notifications, reports and auditing)
- ***Provisioning*** is involved with managing the internal (via workflow) and external (via specific connectors) representation of Users, Groups and Any Objects.

This component often needs to be tailored to meet the requirements of a specific deployment, as it is the crucial decision point for defining and enforcing the consistency and transformations between internal and external data. The default all-Java implementation can be extended for this purpose. In addition, an Apache Camel-based implementation is also available as an extension, which brings all the power of runtime changes and adaptation.

- ***Workflow*** is one of the pluggable aspects of Apache Syncope: this lets every deployment choose the preferred engine from a provided list - including one based on Flowable, the reference open source BPMN 2.0 implementations - or define new, custom ones.
- ***Persistence*** manages all data (users, groups, attributes, resources, ...) at a high level using a standard JPA 2.2 approach. The data is persisted to an underlying database, referred to as ***Internal Storage***. Consistency is ensured via the comprehensive transaction management provided by the Spring Framework.
  Globally, this offers the ability to easily scale up to a million entities and at the same time allows great portability with no code changes: MySQL, MariaDB, PostgreSQL, Oracle and MS SQL Server are fully supported deployment options.
- ***Security*** defines a fine-grained set of entitlements which can be granted to administrators, thus enabling the implementation of delegated administration scenarios.

Third-party applications are provided full access to IdM services by leveraging the REST interface, either via the Java Client Library (the basis of Admin UI, End-user UI and CLI) or plain HTTP calls.

ConnId

The ***Provisioning*** layer relies on ConnId; ConnId is designed to separate the implementation of an application from the dependencies of the system that the application is attempting to connect to.

ConnId is the continuation of The Identity Connectors Framework (Sun ICF), a project that used to be part of market leader Sun IdM and has since been released by Sun Microsystems as an Open Source project. This makes the connectors layer particularly reliable because most connectors have already been implemented in the framework and widely tested.

The new ConnId project, featuring contributors from several companies, provides all that is required nowadays for a modern Open Source project, including an Apache Maven driven build, artifacts and mailing lists. Additional connectors – such as for SOAP, CSV, PowerShell and Active Directory – are also provided.

Chapter 2. System Requirements

2.1. Hardware

The hardware requirements depend greatly on the given deployment, in particular the total number of managed entities (Users, Groups and Any Objects), their attributes and resources.

- CPU: dual core, 2 GHz (minimum)
- RAM: 2 GB (minimum)
- Disk: 100 MB (minimum)

2.2. Java

Apache Syncope 2.1.15-SNAPSHOT requires the latest JDK 8 that is available.

2.3. Java EE Container

Apache Syncope 2.1.15-SNAPSHOT is verified with the following Java EE containers:

1. Apache Tomcat 9
2. Payara Server 5
3. Wildfly 14

2.4. Internal Storage

Apache Syncope 2.1.15-SNAPSHOT is verified with the recent versions of the following DBMSes, for internal storage:

1. PostgreSQL (>= 12, JDBC driver >= 42.7.2)
2. MariaDB (>= 10, JDBC driver >= 3.0.8)
3. MySQL (>= 8.0, JDBC driver >= 8.0.28)
4. Oracle Database (>= 11g, JDBC driver >= ojdbc8 12.2.0.1)
5. MS SQL Server (>= 2017, JDBC driver >= 12.4.1.jre8)

Chapter 3. Obtain Apache Syncope

There are several ways to obtain Apache Syncope: each of which has advantages or caveats for different types of users.

3.1. Standalone

The standalone distribution is the simplest way to start exploring Apache Syncope: it contains a fully working, in-memory Tomcat-based environment that can be easily grabbed and put at work on any modern laptop, workstation or server.

Target Audience

First approach, especially with administration console and end-user; does not require technical skills.
Not meant for any production environment.

Getting ready in a few easy steps:

1. download the standalone distribution
2. unzip the distribution archive
3. go into the created Apache Tomcat directory
4. start Apache Tomcat
   - GNU / Linux, Mac OS X

```
$ chmod 755 ./bin/*.sh
$ ./bin/startup.sh
```

   - Windows

```
> bin/startup.bat
```

Please refer to the Apache Tomcat documentation for more advanced setup and instructions.

3.1.1. Components

The set of provided components, including access URLs and credentials, is the same as reported for embedded mode, with the exception of log files, available here under `$CATALINA_HOME/logs`.

Internal Storage

By default, the standalone distribution is configured to use an in-memory database instance. This means that every time Tomcat is shut down all changes that have been made are lost.

If you want instead to make your changes persistent, replace

```
jdbc:h2:mem:syncopedb;DB_CLOSE_DELAY=-1
```

with

```
jdbc:h2:~/syncopedb;DB_CLOSE_DELAY=-1
```

in `webapps/syncope/WEB-INF/classes/domains/Master.properties` (for `Master` domain) or `webapps/syncope/WEB-INF/classes/domains/Two.properties` (for `Two` domain) from the Apache Tomcat directory. This will create H2 database files in the home directory of the user running Apache Syncope.

Please refer to the H2 documentation for more options.

3.2. Debian packages

Debian packages are available for use with Debian GNU / Linux, Ubuntu and their derivatives.

Target Audience

Getting up and running quickly on Debian / Ubuntu.
Difficult to extend beyond pre-sets.

Download

Download the latest .deb packages

Prepare

1. Install Apache Tomcat 8

```
$ sudo apt-get install tomcat8
```

2. Install PostgreSQL packages for your actual Debian / Ubuntu distribution:
   - `postgresql-10`
   - `postgresql-client-10`
3. Use the PostgreSQL JDBC driver with Tomcat

```
$ cd /usr/share/tomcat8/lib/ && sudo wget
https://central.maven.org/maven2/org/postgresql/postgresql/42.7.2/postgresql-
42.7.2.jar
```

4. Replace `JAVA_OPTS` in `/etc/default/tomcat8` with the following:

```
JAVA_OPTS="-Djava.awt.headless=true -Dfile.encoding=UTF-8 -server \
  -Xms1536m -Xmx1536m -XX:NewSize=256m -XX:MaxNewSize=256m -XX:PermSize=256m
-XX:+DisableExplicitGC \
  -Djava.security.egd=file:/dev/./urandom"
```

Install

1. Stop Tomcat

```
$ sudo service tomcat8 stop
```

2. Install Apache Syncope core, console and enduser via the downloaded packages

```
$ sudo dpkg -i apache-syncope-*.deb
```

3. Create a database for use with Apache Syncope

```
$ sudo SYNCOPE_USER="syncope" SYNCOPE_PASS="syncope" sh /usr/share/apache-
syncope/dbinit-postgresql.sh
```

4. Start Tomcat

```
$ sudo service tomcat8 start
```

3.2.1. Components

The following assumes that `protocol`, `host` and `port` reflect your Apache Tomcat installation.

Log files	Available under `/var/log/apache-syncope`
ConnId bundles	Available under `/var/lib/apache-syncope/bundles`
Complete REST API reference	protocol://host:port/syncope/index.html
Swagger UI	protocol://host:port/syncope/swagger/
Administration console	protocol://host:port/syncope-console/
End-user UI	protocol://host:port/syncope-enduser/

3.3. GUI Installer

GUI application for configuring and deploying Apache Syncope on supported DBMSes and Java EE containers.

Target Audience

Getting up and running quickly on any supported DBMS and Java EE container, independently from the underlying operating system.
Difficult to extend beyond pre-sets.

3.3.1. Prerequisites

1. Apache Maven (version 3.0.3 or higher) installed
2. one of the supported DBMSes up and running, and an empty database instance for usage with Apache Syncope (you will be requested for JDBC URL, username and password)
3. one of the supported Java EE containers up and running
4. a datasource with the name `syncopeMasterDataSource` configured in the selected Java EE container and the database instance mentioned above

Ensure that the `syncopeMasterDataSource` datasource is correctly configured before proceeding.

The actual configuration steps vary significantly depending on the selected Java EE container; here are some examples:

1. Apache Tomcat 9
2. Payara Server 5
3. Wildfly 14

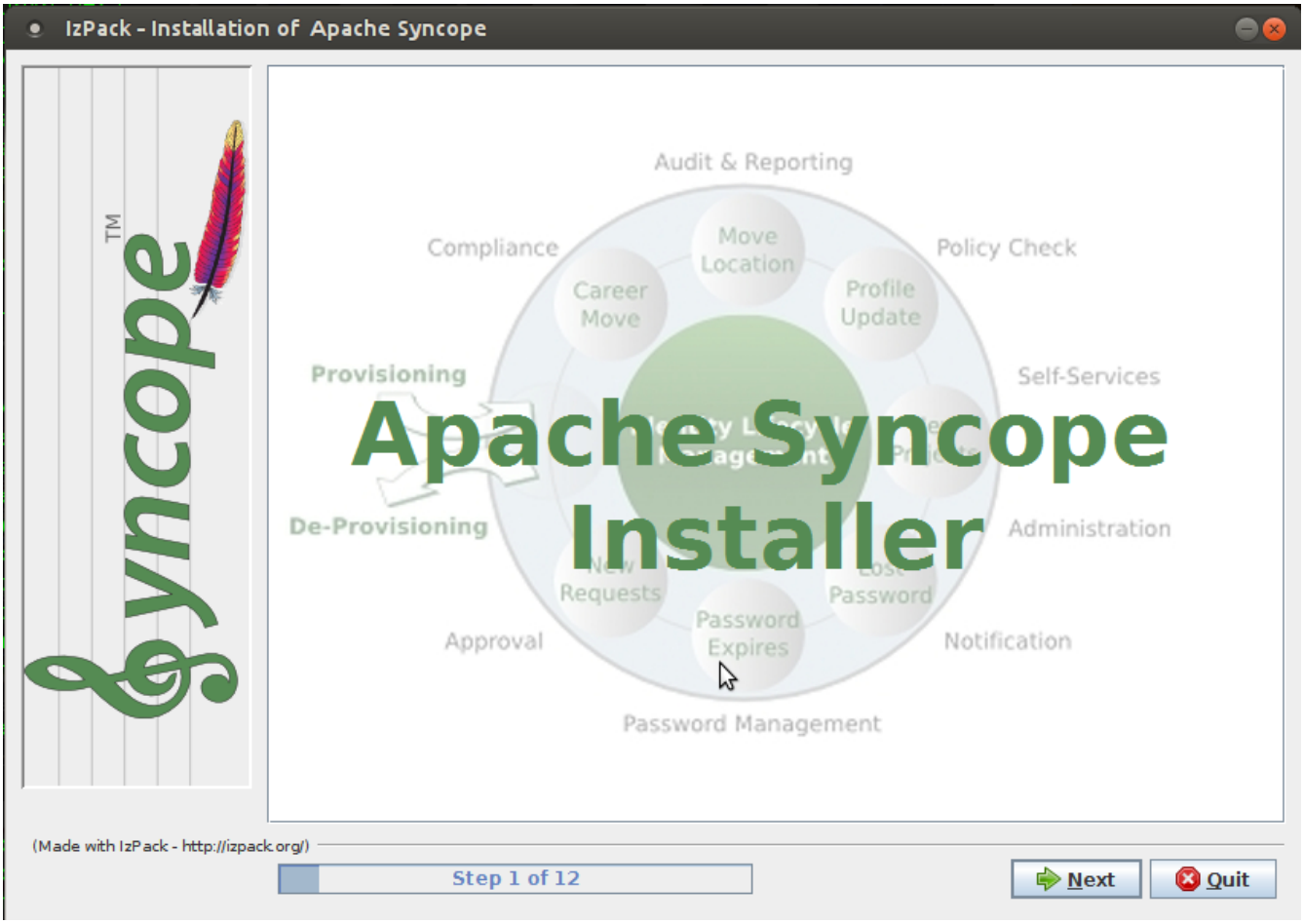
When deploying on Apache Tomcat, don't forget to configure a `manager` user; if not done yet, ensure that the content of `$CATALINA_HOME/conf/tomcat-users.xml` looks like:

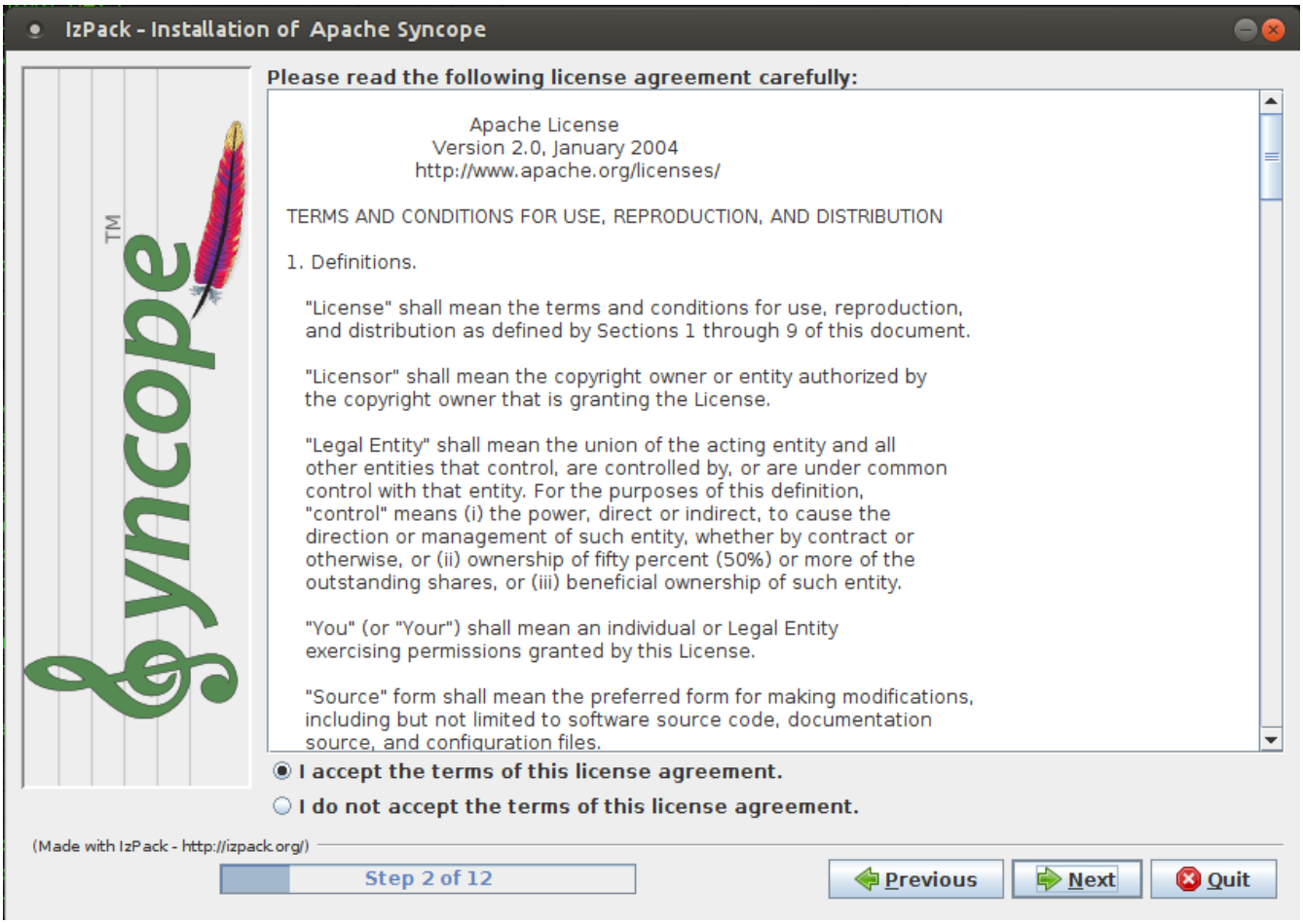
```
<?xml version='1.0' encoding='utf-8'?>
<tomcat-users>
  <role rolename="manager-gui"/>
  <role rolename="manager-script"/>
  <role rolename="manager-jmx"/>
  <role rolename="manager-status"/>
  <user username="manager" password="s3cret" roles="manager-script"/>
</tomcat-users>
```

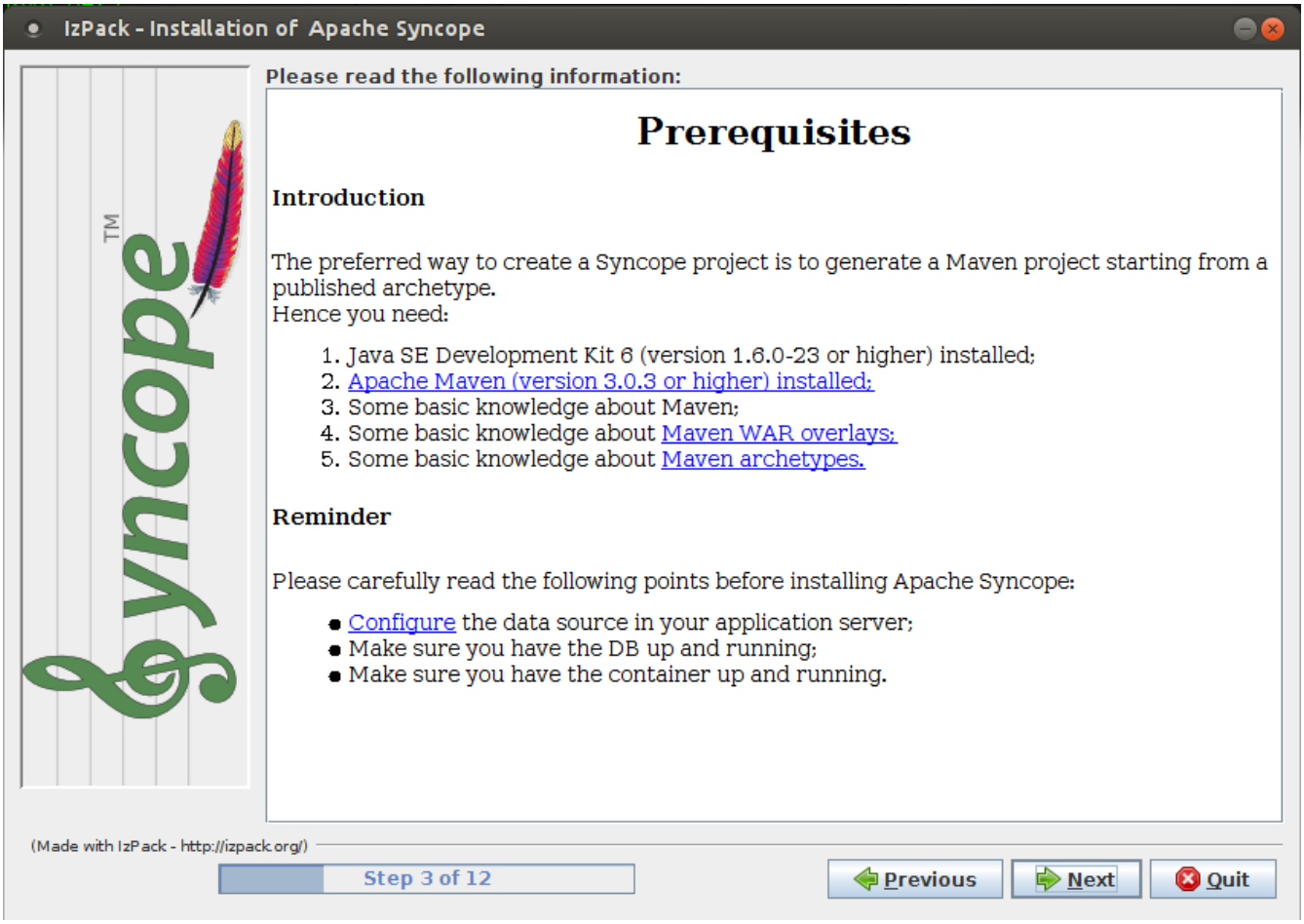
3.3.2. Usage

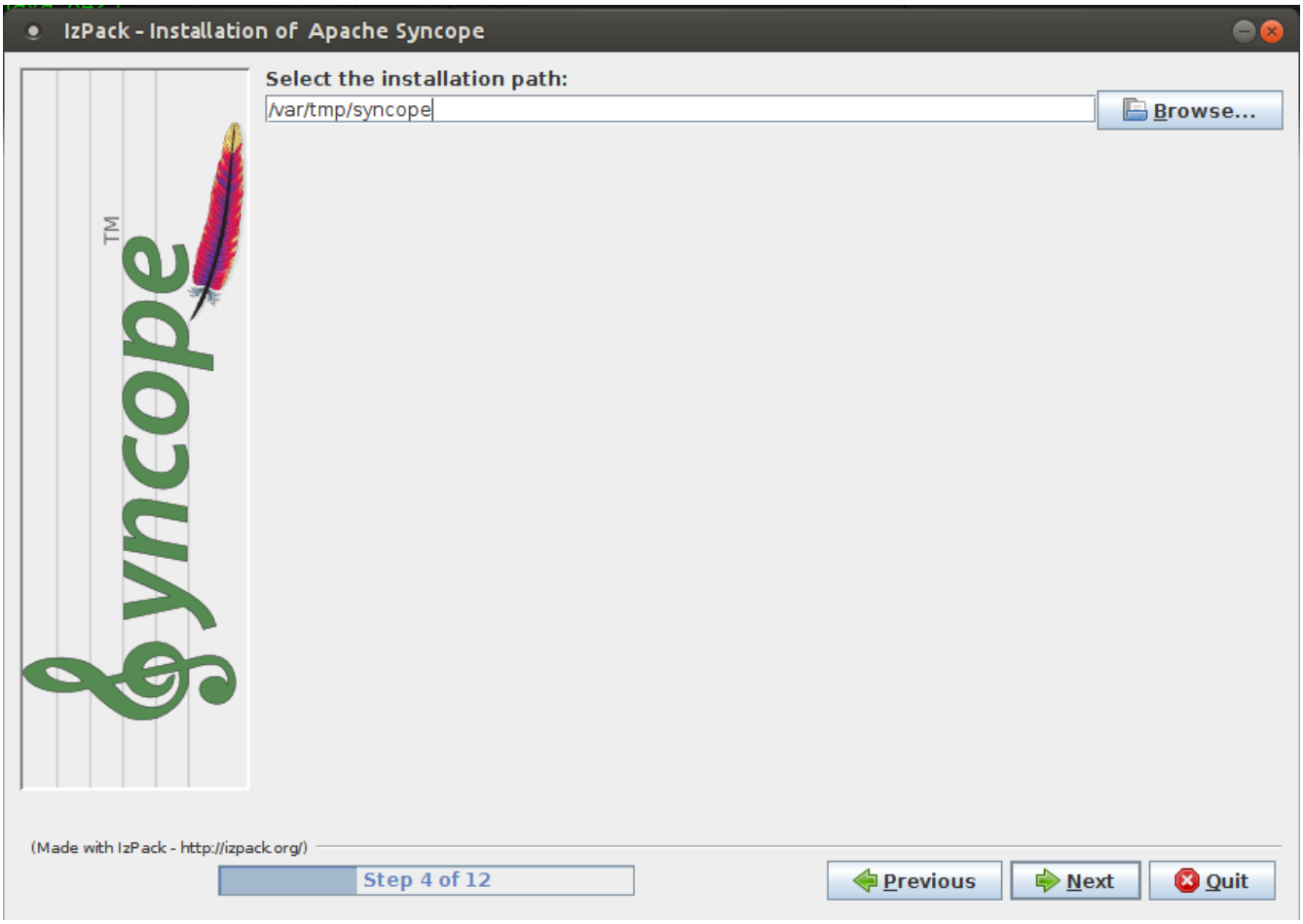
Once downloaded, double-click the JAR file or execute via the command-line:

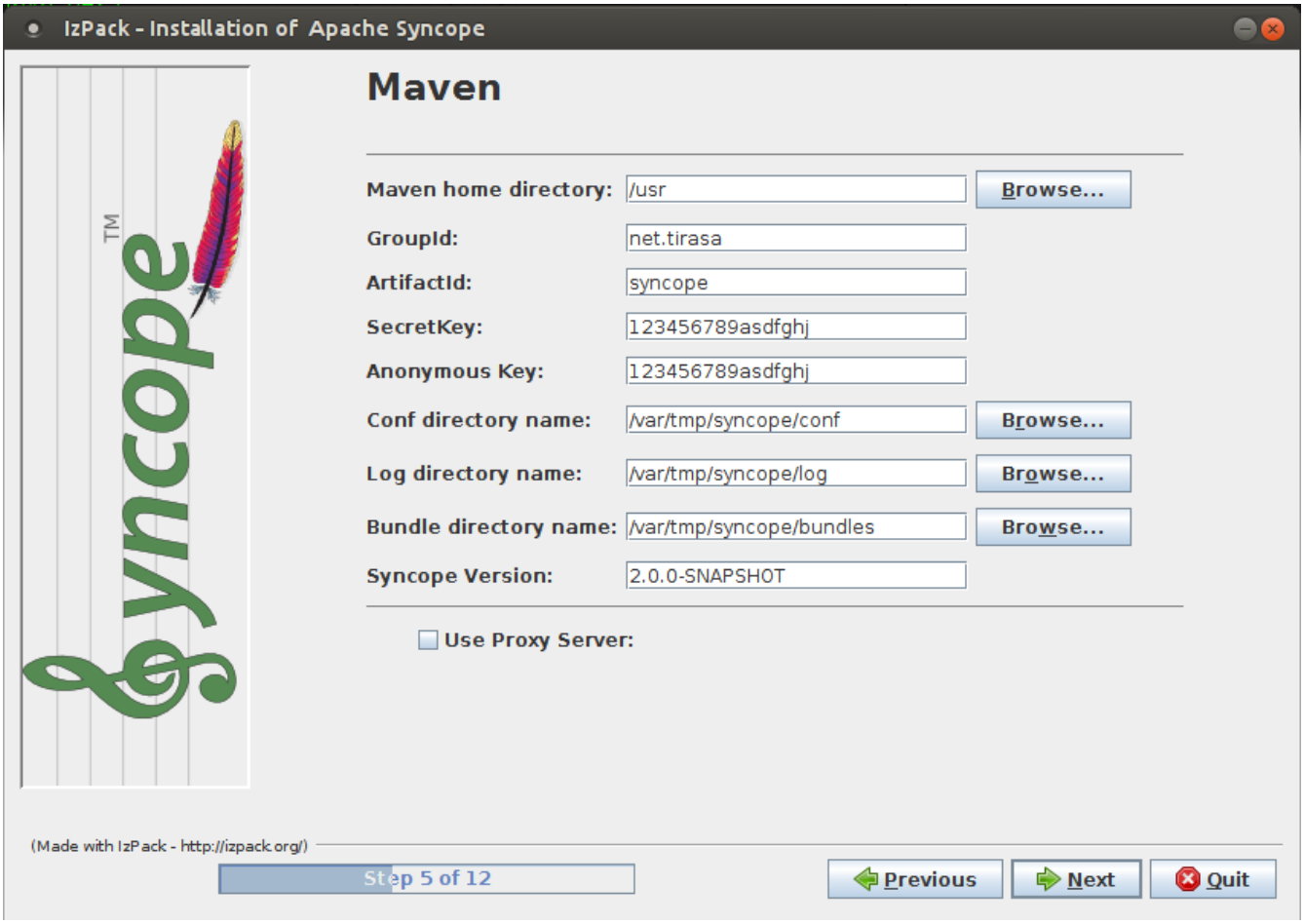
```
java -jar syncope-installer-*-uber.jar
```

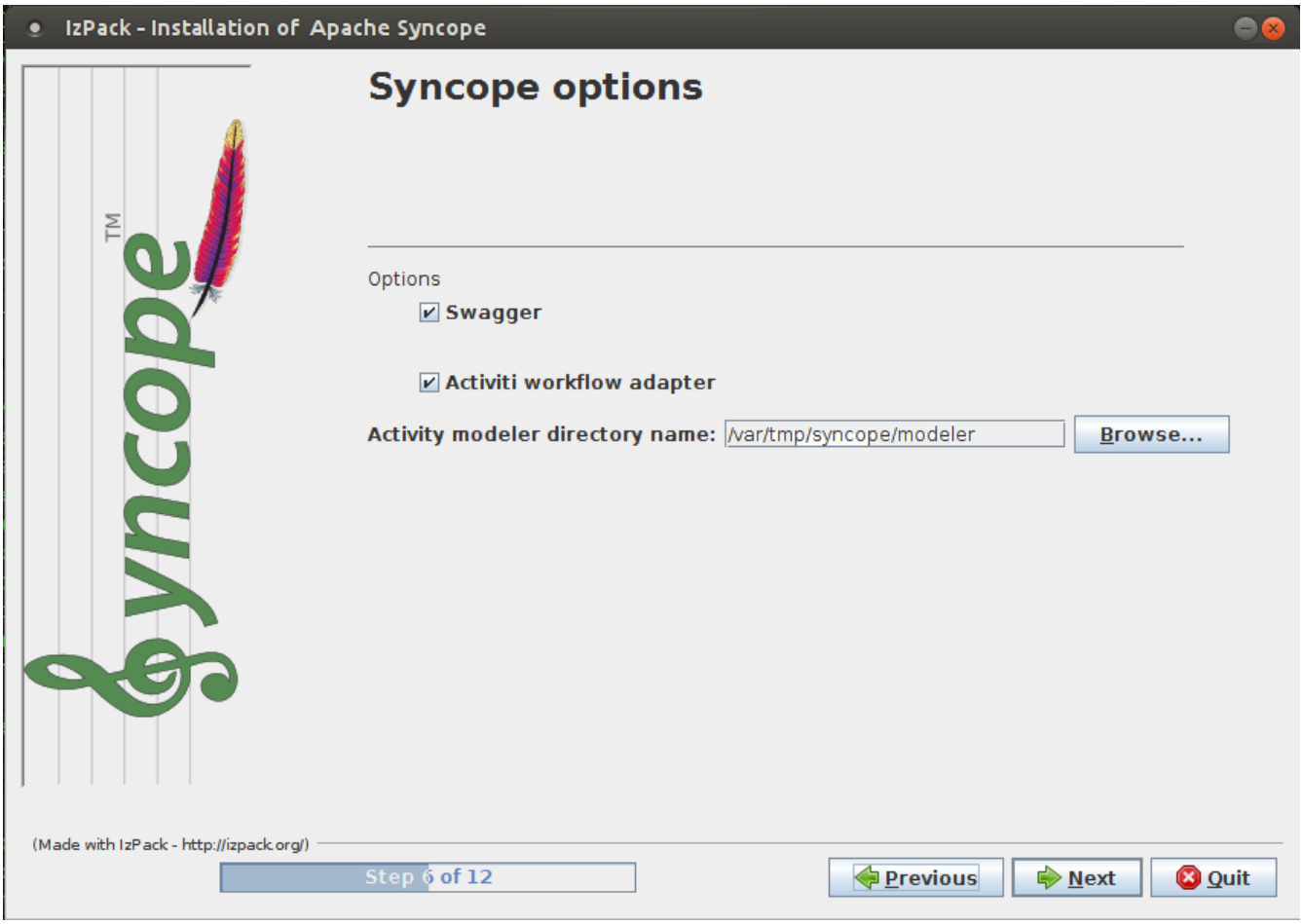

IzPack - Installation of Apache Syncope
Audit & Reporting
Compliance
Policy Check
Move Location
Career Move
Profile Update
Provisioning
Self-Services
Apache Syncope Installer
De-Provisioning
Administration
Password Expires
Approval
Notification
Password Management
(Made with IzPack - http://izpack.org/)
Step 1 of 12
Next
Quit

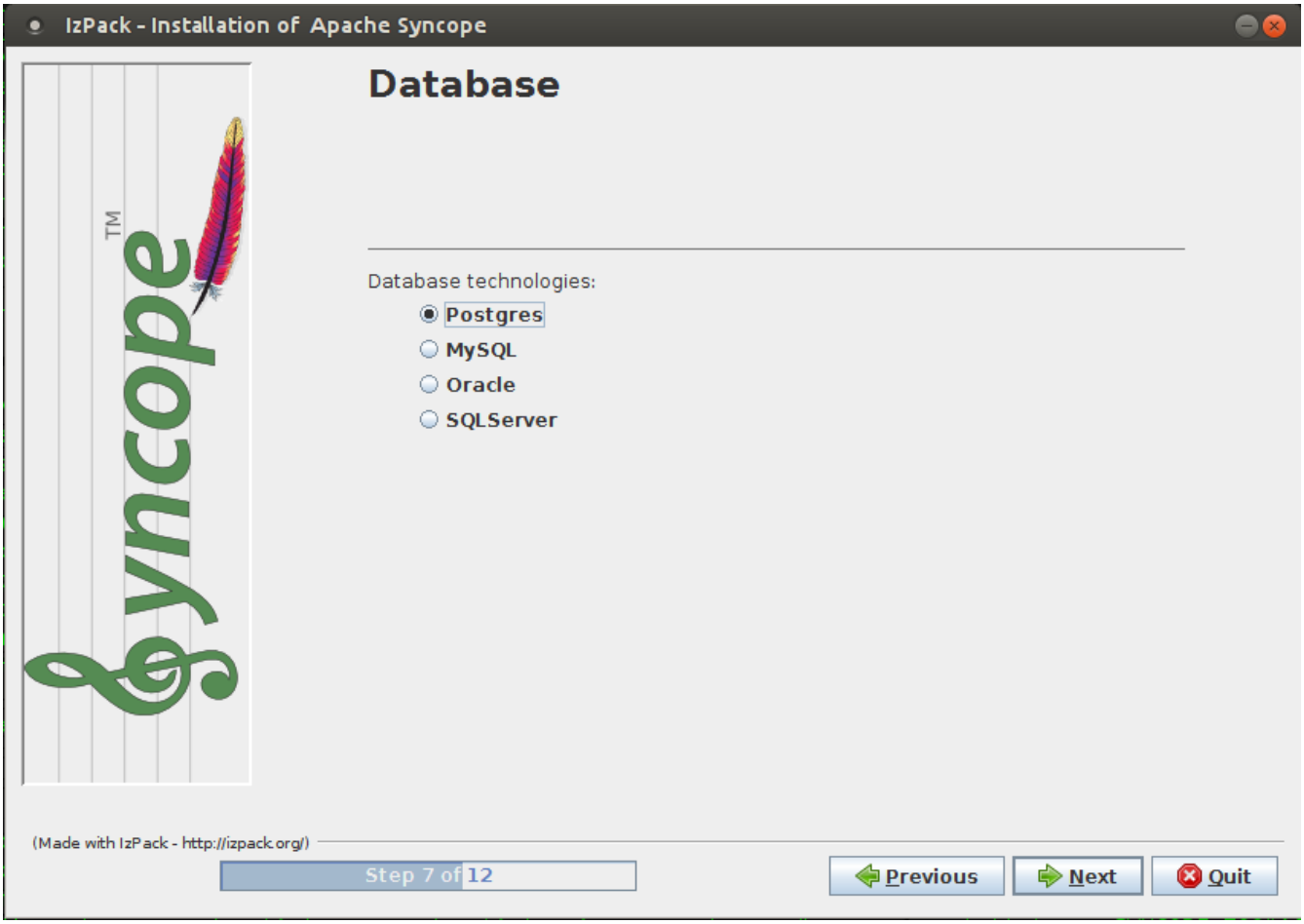

IzPack - Installation of Apache Syncope
Please read the following license agreement carefully:
Apache License
Version 2.0, January 2004
http://www.apache.org/licenses/
TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION
1. Definitions.
"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.
"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.
"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.
"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.
"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.
I accept the terms of this license agreement.
I do not accept the terms of this license agreement.
(Made with IzPack - http://izpack.org/)
Step 2 of 12
Previous
Next
Quit

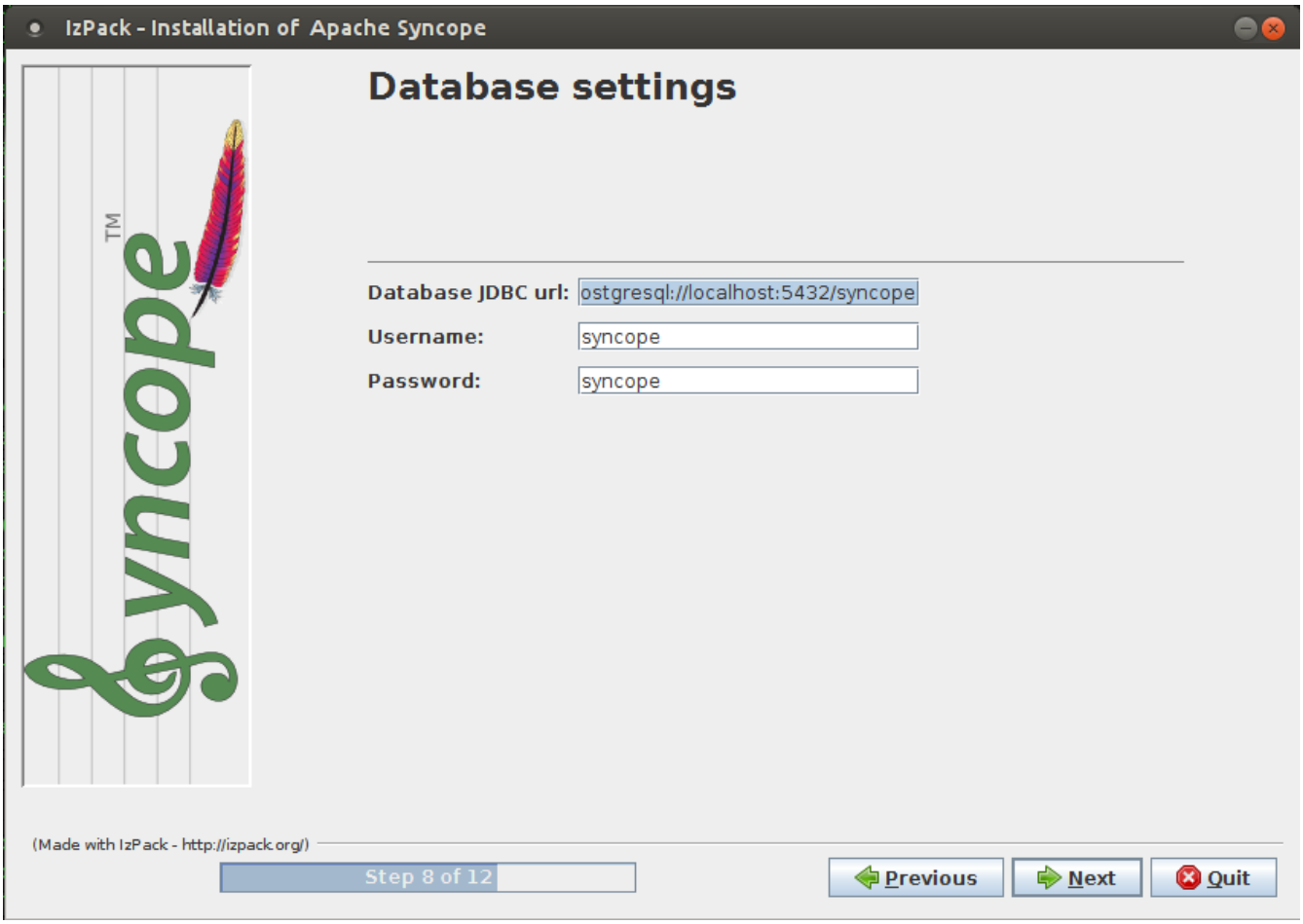

IzPack - Installation of Apache Syncope
Please read the following information:
Prerequisites
Introduction
The preferred way to create a Syncope project is to generate a Maven project starting from a published archetype.
Hence you need:
1. Java SE Development Kit 6 (version 1.6.0-23 or higher) installed;
2. Apache Maven (version 3.0.3 or higher) installed;
3. Some basic knowledge about Maven;
4. Some basic knowledge about Maven WAR overlays;
5. Some basic knowledge about Maven archetypes.
Reminder
Please carefully read the following points before installing Apache Syncope:
Configure the data source in your application server;
Make sure you have the DB up and running;
Make sure you have the container up and running.
(Made with IzPack - http://izpack.org/)
Step 3 of 12
Previous
Next
Quit

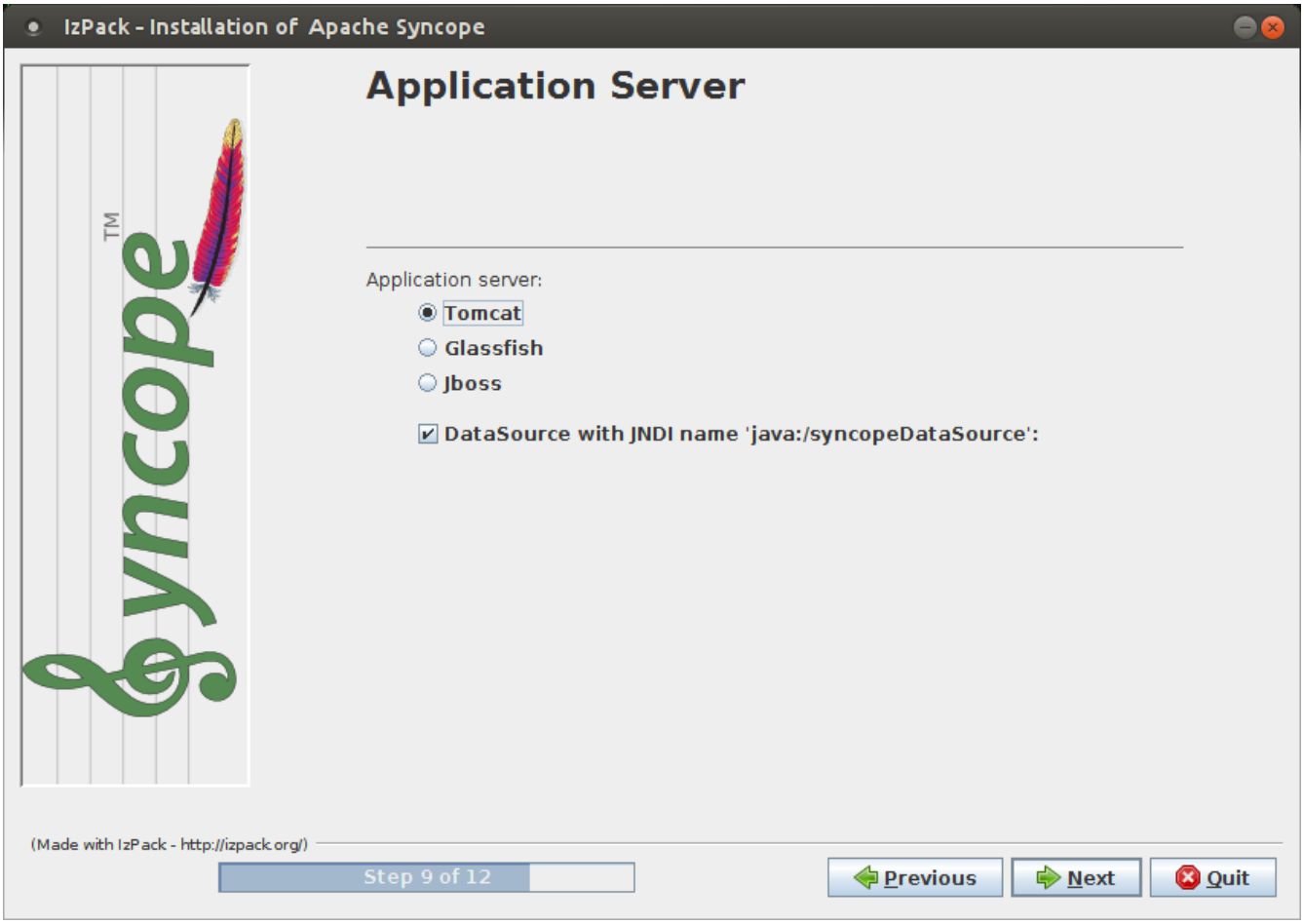

IzPack - Installation of Apache Syncope
Select the installation path:
/var/tmp/syncope
Browse...
(Made with IzPack - http://izpack.org/)
Step 4 of 12
Previous
Next
Quit

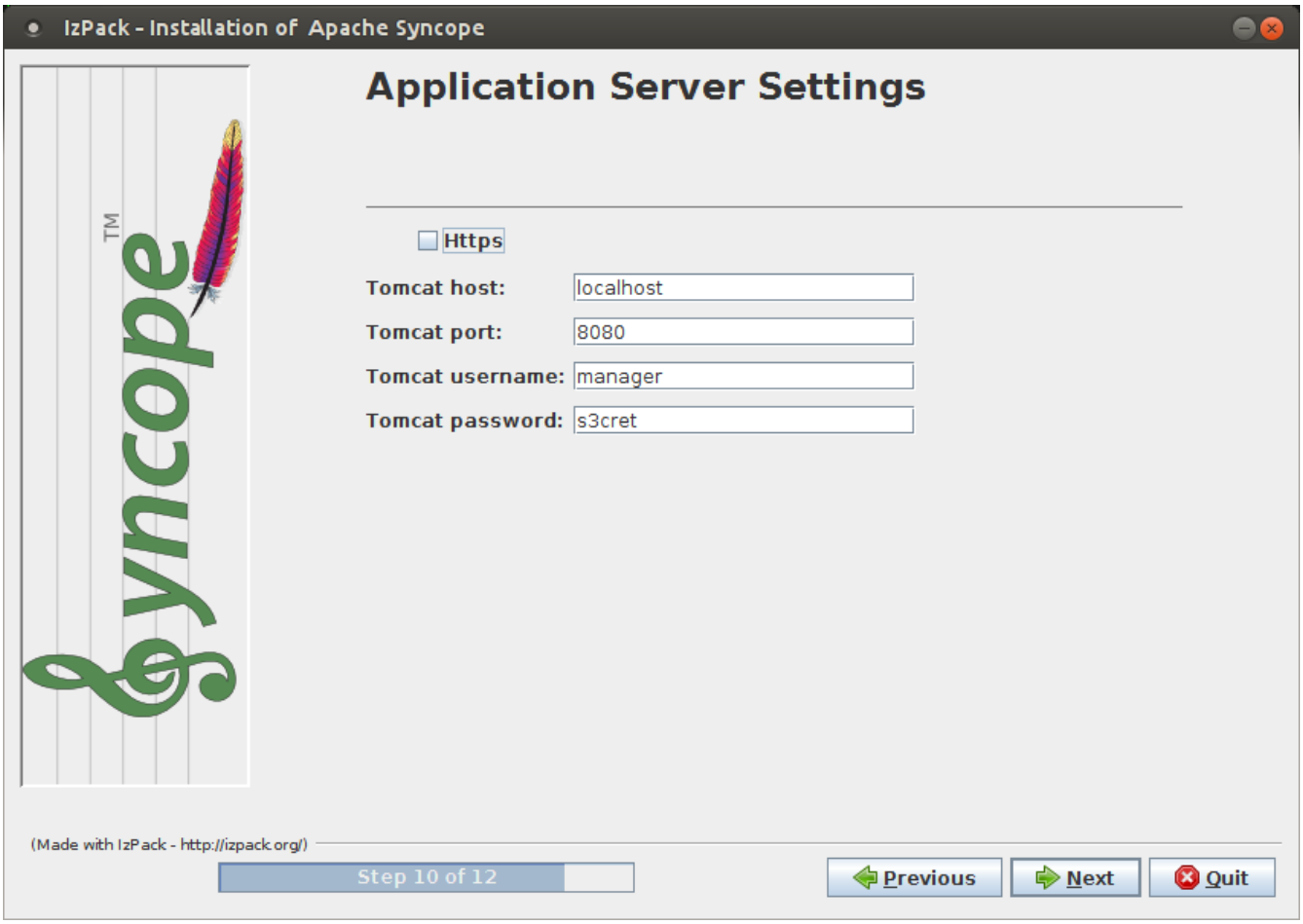

IzPack - Installation of Apache Syncope
Maven
Maven home directory:
/usr
Browse...
GroupId:
net.tirasa
ArtifactId:
syncope
SecretKey:
123456789asdfghj
Anonymous Key:
123456789asdfghj
Conf directory name:
/var/tmp/syncope/conf
Browse...
Log directory name:
/var/tmp/syncope/log
Browse...
Bundle directory name:
/var/tmp/syncope/bundles
Browse...
Syncope Version:
2.0.0-SNAPSHOT
Use Proxy Server:
(Made with IzPack - http://izpack.org/)
Step 5 of 12
Previous
Next
Quit

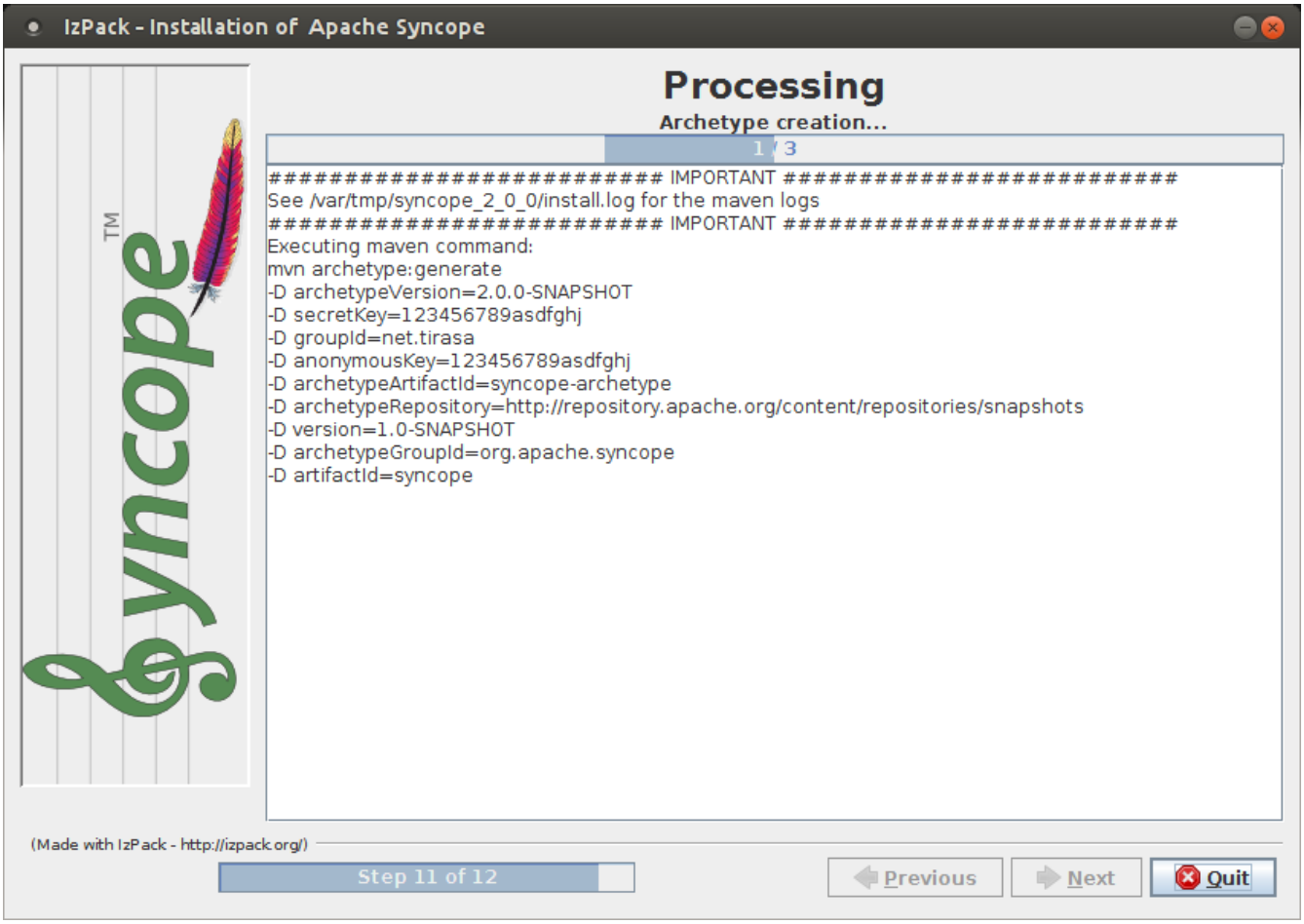

IzPack - Installation of Apache Syncope
Syncope options
Options
Swagger
Activiti workflow adapter
Activity modeler directory name:
/var/tmp/syncope/modeler
Browse...
(Made with IzPack - http://izpack.org/)
Step 6 of 12
Previous
Next
Quit


IzPack - Installation of Apache Syncope
Database
Database technologies:
Postgres
MySQL
Oracle
SQLServer
(Made with IzPack - http://izpack.org/)
Step 7 of 12
Previous
Next
Quit


IzPack - Installation of Apache Syncope
Database settings
Database JDBC url:
ostgresql://localhost:5432/syncope
Username:
syncope
Password:
syncope
(Made with IzPack - http://izpack.org/)
Step 8 of 12
Previous
Next
Quit


IzPack - Installation of Apache Syncope
Application Server
Application server:
Tomcat
Glassfish
Jboss
DataSource with JNDI name 'java:/syncopeDataSource':
(Made with IzPack - http://izpack.org/)
Step 9 of 12
Previous
Next
Quit


IzPack - Installation of Apache Syncope
Application Server Settings
Https
Tomcat host:
localhost
Tomcat port:
8080
Tomcat username:
manager
Tomcat password:
s3cret
(Made with IzPack - http://izpack.org/)
Step 10 of 12
Previous
Next
Quit


IzPack - Installation of Apache Syncope
Processing
Archetype creation...
1 / 3
########## IMPORTANT ##########
See /var/tmp/syncope_2_0_0/install.log for the maven logs
########## IMPORTANT ##########
Executing maven command:
mvn archetype:generate
-D archetypeVersion=2.0.0-SNAPSHOT
-D secretKey=123456789asdfghj
-D groupId=net.tirasa
-D anonymousKey=123456789asdfghj
-D archetypeArtifactId=syncope-archetype
-D archetypeRepository=http://repository.apache.org/content/repositories/snapshots
-D version=1.0-SNAPSHOT
-D archetypeGroupId=org.apache.syncope
-D artifactId=syncope
(Made with IzPack - http://izpack.org/)
Step 11 of 12
Previous
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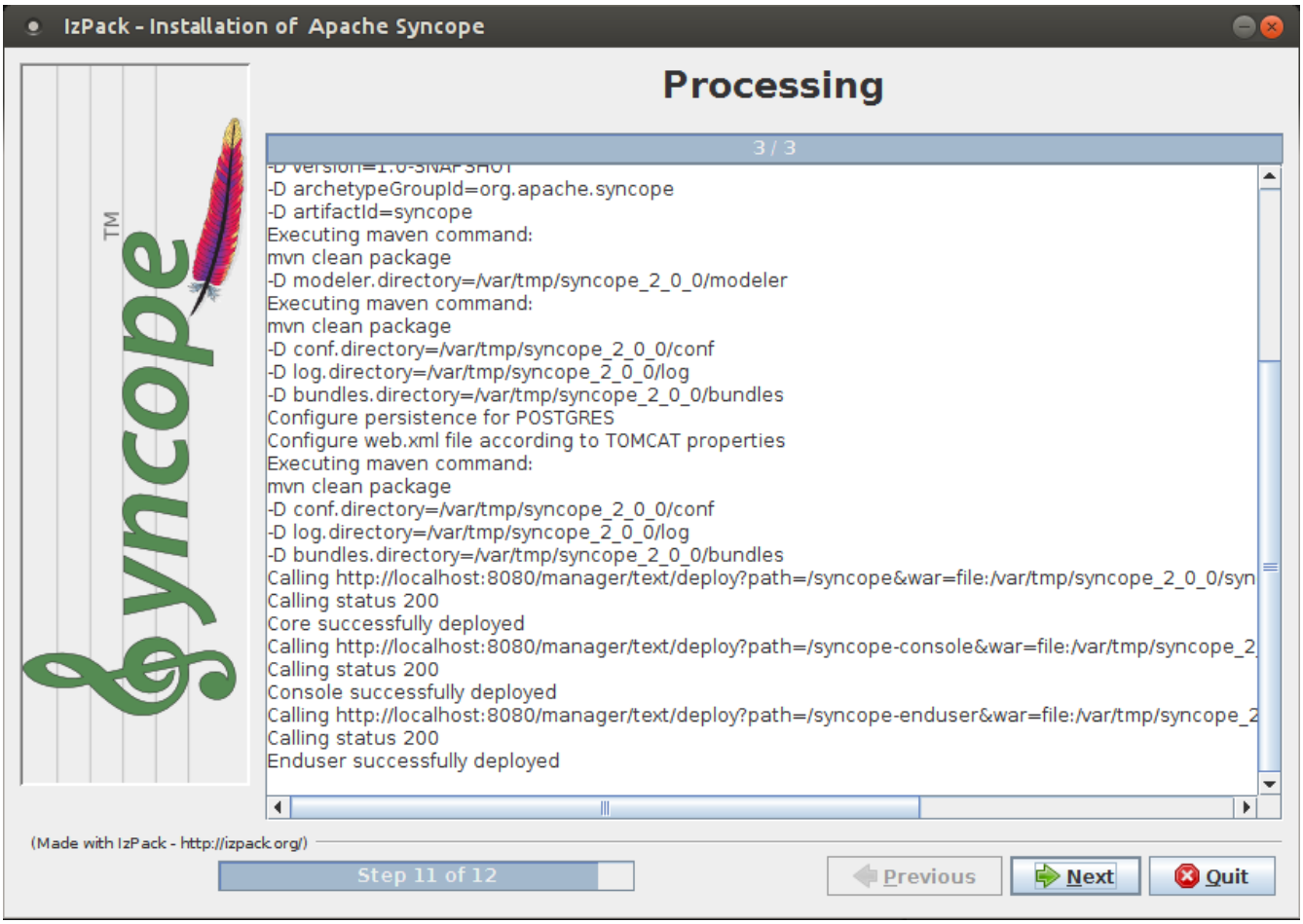
Quit


IzPack - Installation of Apache Syncope
Processing
3 / 3
-D archetypeGroupId=org.apache.syncope
-D artifactId=syncope
Executing maven command:
mvn clean package
-D modeler.directory=/var/tmp/syncope_2_0_0/modeler
Executing maven command:
mvn clean package
-D conf.directory=/var/tmp/syncope_2_0_0/conf
-D log.directory=/var/tmp/syncope_2_0_0/log
-D bundles.directory=/var/tmp/syncope_2_0_0/bundles
Configure persistence for POSTGRES
Configure web.xml file according to TOMCAT properties
Executing maven command:
mvn clean package
-D conf.directory=/var/tmp/syncope_2_0_0/conf
-D log.directory=/var/tmp/syncope_2_0_0/log
-D bundles.directory=/var/tmp/syncope_2_0_0/bundles
Calling http://localhost:8080/manager/text/deploy?path=/syncope&war=file:/var/tmp/syncope_2_0_0/syn
Calling status 200
Core successfully deployed
Calling http://localhost:8080/manager/text/deploy?path=/syncope-console&war=file:/var/tmp/syncope_2
Calling status 200
Console successfully deployed
Calling http://localhost:8080/manager/text/deploy?path=/syncope-enduser&war=file:/var/tmp/syncope_2
Calling status 200
Enduser successfully deployed
(Made with IzPack - http://izpack.org/)
Step 11 of 12
Previous
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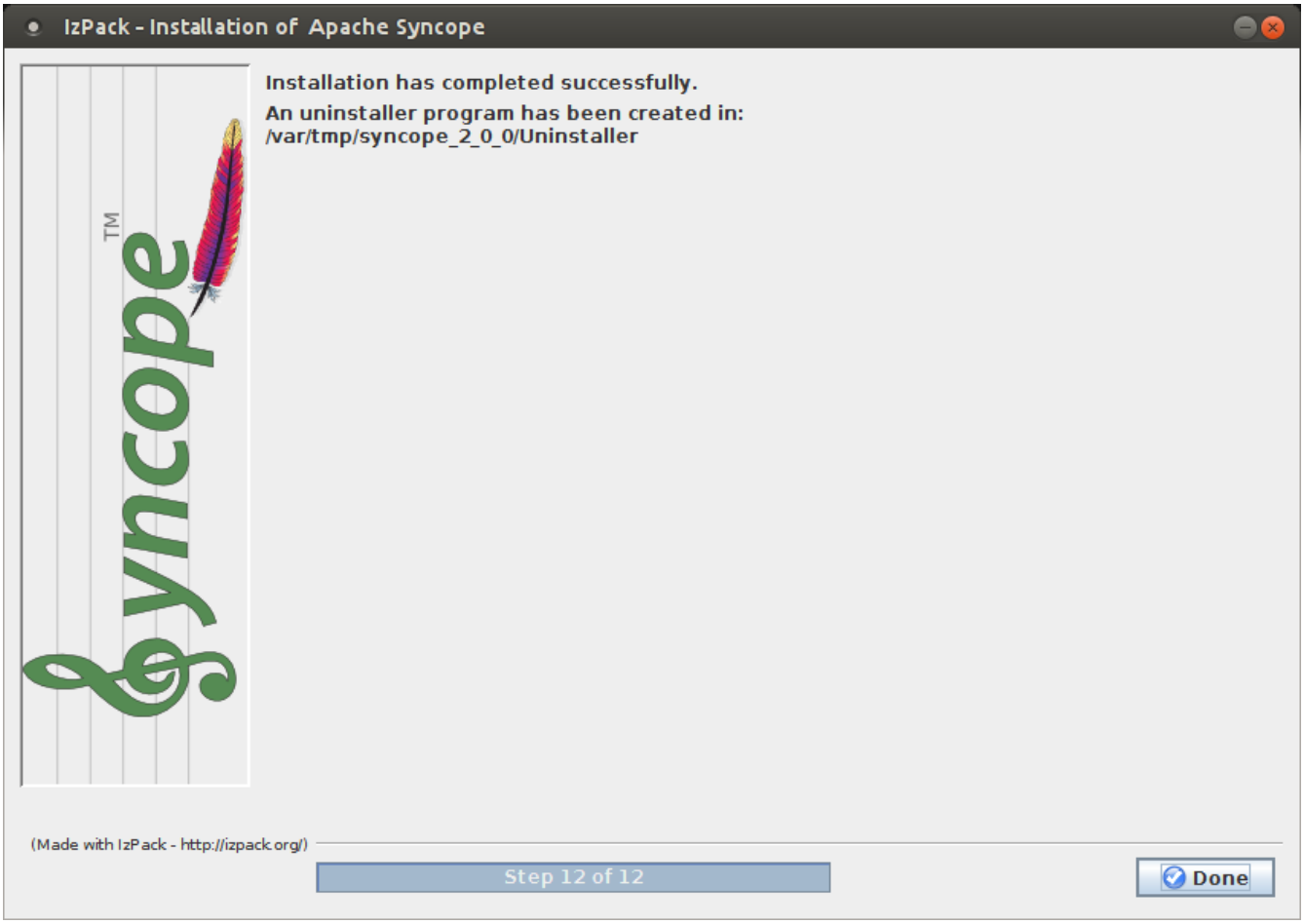
Quit



3.3.3. Components

The following assumes that `protocol`, `host` and `port` reflect your Java EE container installation.

Complete REST API reference	protocol://host:port/syncope/index.html
Swagger UI	protocol://host:port/syncope/swagger/
Administration console	protocol://host:port/syncope-console/ Credentials: `admin` / `password`
End-user UI	protocol://host:port/syncope-enduser/

3.4. Docker

Docker images ready to use, published to Docker Hub.

Target Audience

Getting up and running quickly on Docker.
All configurations available to set, difficult customizations.

Working with these images requires to have Docker correctly installed and configured.

The Docker images can be used with orchestration tools as Docker Compose or Kubernetes.

3.4.1. Docker images

Core

Apache Syncope Core, see above for information.

Port exposed: `8080`.

Environment variables:

- `DBMS`: which type of relational DBMS is to be used as internal storage for Syncope Core; valid values are `postgresql`, `mariadb`, `mssql`, `mysql`
- `DB_URL`: JDBC URL of internal storage
- `DB_USER`: username for internal storage authentication
- `DB_PASSWORD`: password for internal storage authentication
- `DB_POOL_MAX`: internal storage connection pool: ceiling
- `DB_POOL_MIN`: internal storage connection pool: floor
- `OPENJPA_REMOTE_COMMIT`: configure multiple instances, with high availability; valid values are the ones accepted by OpenJPA for remote event notification including `sjvm` (single instance)

Console

Apache Syncope Admin UI, see above for information.

Port exposed: `8080`.

Environment variables:

- `CORE_SCHEME`: URL scheme to connect to Syncope Core; valid values are `http` or `https`
- `CORE_HOST`: host name or IP address to connect to Syncope Core
- `CORE_PORT`: port number to connect to Syncope Core

Enduser

Apache Syncope Enduser UI, see above for information.

Port exposed: `8080`.

Environment variables:

- `CORE_SCHEME`: URL scheme to connect to Syncope Core; valid values are `http` or `https`
- `CORE_HOST`: host name or IP address to connect to Syncope Core
- `CORE_PORT`: port number to connect to Syncope Core

- `DOMAIN`: Syncope Core's domain to work with

3.4.2. Docker Compose samples

Besides the one reported below, more samples are available.

Example 1. Syncope Core, Admin UI and Enduser UI with PostgreSQL

The `docker-compose.yml` below will create and connect 4 Docker containers to provide a full-fledged, single instance, Apache Syncope deployment. All referenced images are available on Docker Hub.

```
version: '3.3'

services:
   db: ①
     image: postgres:latest
     restart: always
     environment:
       POSTGRES_DB: syncope
       POSTGRES_USER: syncope
       POSTGRES_PASSWORD: syncope

   syncope: ②
     depends_on:
       - db
     image: apache/syncope:2.1.15-SNAPSHOT
     ports:
       - "18080:8080"
     restart: always
     environment:
       DBMS: postgresql
       DB_URL: jdbc:postgresql://db:5432/syncope
       DB_USER: syncope
       DB_PASSWORD: syncope
       DB_POOL_MAX: 10
       DB_POOL_MIN: 2
       OPENJPA_REMOTE_COMMIT: sjvm

   syncope-console: ③
     depends_on:
       - syncope
     image: apache/syncope-console:2.1.15-SNAPSHOT
     ports:
       - "28080:8080"
     restart: always
     environment:
       CORE_SCHEME: http
       CORE_HOST: syncope
       CORE_PORT: 8080
```

```
  syncope-enduser: ④
    depends_on:
      - syncope
    image: apache/syncope-enduser:2.1.15-SNAPSHOT
    ports:
      - "38080:8080"
    restart: always
    environment:
      CORE_SCHEME: http
      CORE_HOST: syncope
      CORE_PORT: 8080
      DOMAIN: Master
```

① Database container for usage as internal storage, based on latest PostgreSQL image available

② Apache Syncope Core, single instance, port `18080` exposed

③ Apache Syncope Admin UI, port `28080` exposed

④ Apache Syncope Enduser UI, port `38080` exposed, working with `Master` domain

How to start the containers:

1. Save the example file locally.
2. Download and start the containers:

```
$ docker-compose -f /path/to/docker-compose.yml up
```

The following services will be available:

Complete REST API reference	http://localhost:18080/syncope/index.html
Swagger UI	http://localhost:18080/syncope/swagger
Administration console	http://localhost:28080/syncope-console Credentials: `admin` / `password`
End-user UI	http://localhost:38080/syncope-enduser

3.4.3. Kubernetes sample

A set of example Helm charts is available, that can be used to install Apache Syncope directly in Kubernetes.

Some assumptions are made:

- a working Kubernetes Cluster to install into - if not available, follow this tutorial

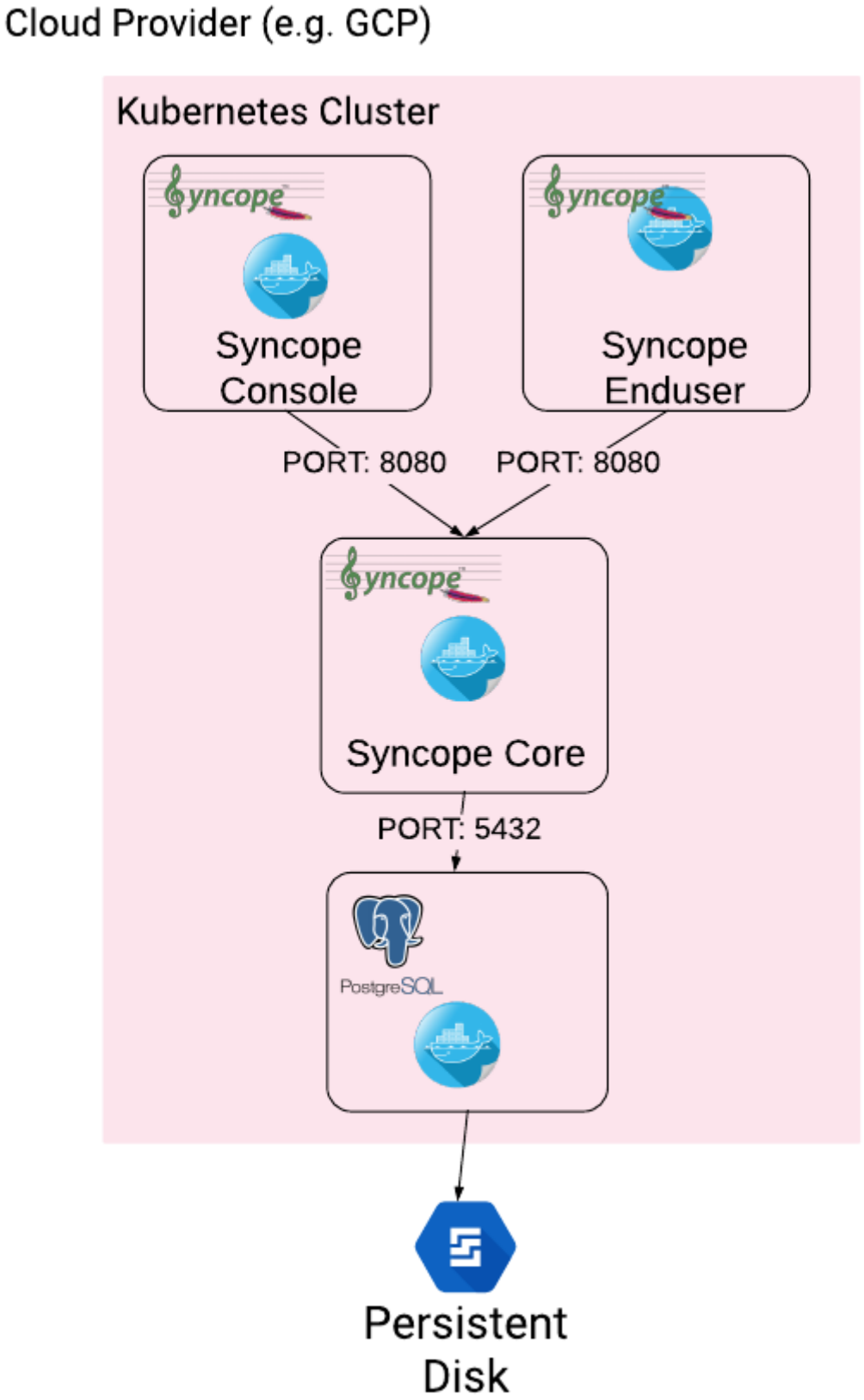
Any other cloud provider or local install (e.g. AWS, Minikube, OpenShift) can

be used

- Helm installed - follow these instructions if you don't
- allow for dynamic provisioning of persistent volumes - otherwise you will need to manually create the volume

The install process is broken into two separate Helm charts; this is due to the fact that Apache Syncope doesn't startup properly if the database used as internal storage is not fully initialized yet:

- `postgres` chart; this will install the PostgreSQL database and configure a persistent volume and persistent volume claim to store the data
- `syncope` chart; this is the actual Apache Syncope install, which will deploy three separate pods (Core, Console, and Enduser)



The installation steps are:

1. Open a terminal and navigate to the `kubernetes` folder, wherever you downloaded it
2. Set your actual values in `postgres/values.yaml`
3. Install PostgreSQL

```
helm install postgres --name postgres --namespace <YOUR_NAMESPACE> -f
postgres/values.yaml
```

Wait until PostgreSQL is initialized (watch logs for confirmation)

4. Set your actual values in `syncope/values.yaml`
5. Install Apache Syncope

```
helm install syncope --name syncope --namespace <YOUR_NAMESPACE> -f
syncope/values.yaml
```

3.5. Maven Project

This is the **preferred method** for working with Apache Syncope, giving access to the whole set of customization and extension capabilities.

Target Audience

Provides access to the full capabilities of Apache Syncope, and almost all extensions that are possible.
Requires Apache Maven (and potentially DevOps) skills.

3.5.1. Prerequisites

1. Apache Maven (version 3.0.3 or higher) installed
2. Some basic knowledge about Maven
3. Some basic knowledge about Maven archetypes.

3.5.2. Create project

Maven archetypes are templates of projects. Maven can generate a new project from such a template. In the folder in which the new project folder should be created, type the command shown below. On Windows, run the command on a single line and leave out the line continuation characters ('\').

```
$ mvn org.apache.maven.plugins:maven-archetype-plugin:2.4:generate \
    -DarchetypeGroupId=org.apache.syncope \
    -DarchetypeArtifactId=syncope-archetype \
    -DarchetypeRepository=https://repository.apache.org/content/repositories/snapshots
\
    -DarchetypeVersion=2.1.15-SNAPSHOT
```

Once the Maven project is generated, add the following right before `</project>` in the root `pom.xml` of the generated project:

```
<repositories>
  <repository>
    <id>apache.snapshots</id>

<url>https://repository.apache.org/content/repositories/snapshots/</url
>
    <snapshots>
      <enabled>true</enabled>
    </snapshots>
  </repository>
</repositories>
```

The archetype is configured with default values for all required properties; if you want to customize any of these property values, type 'n' when prompted for confirmation.

You will be asked for:

groupId

something like 'com.mycompany'

artifactId

something like 'myproject'

version number

You can use the default; it is good practice to have 'SNAPSHOT' in the version number during development and the maven release plugin makes use of that string. But ensure to comply with the desired numbering scheme for your project.

package name

The java package name. A folder structure according to this name will be generated automatically; by default, equal to the groupId.

secretKey

Provide any pseudo-random string here that will be used in the generated project for AES ciphering.

anonymousKey

Provide any pseudo-random string here that will be used as an authentication key for anonymous requests.

Maven will create a project for you (in a newly created directory named after the value of the `artifactId` property specified above) containing four modules: `common`, `core`, `console` and `enduser`.

As stated above, Apache Syncope 2.1 requires JDK 8. In case you need to deploy your project with JDK 11, add the following right after `<build>` in the root `pom.xml` of the generated project:

```
<pluginManagement>
  <plugins>
    <plugin>
      <groupId>org.apache.maven.plugins</groupId>
      <artifactId>maven-compiler-plugin</artifactId>
      <configuration>
        <release>11</release>
      </configuration>
    </plugin>
  </plugins>
</pluginManagement>
```

Please note that, even with such addition, not all components in embedded mode will work as expected; production features are anyway fully functional.

You are now able to perform the first build via

```
$ mvn clean install
```

After downloading all of the needed dependencies, three WAR files will be produced:

1. `core/target/syncope.war`
2. `console/target/syncope-console.war`
3. `enduser/target/syncope-enduser.war`

If no failures are encountered, your basic Apache Syncope project is now ready to go.

Before actual deployment onto a standalone Java EE container, you need to further check the **Customization** chapter of the Apache Syncope Reference Guide.

3.5.3. Embedded Mode

Every Apache Syncope project has the ability to run a full-blown in-memory environment, particularly useful either when evaluating the product and during the development phase of an IdM solution.

Don't forget that this environment is completely in-memory: this means that every time Maven is stopped, all changes made are lost.

From the top-level directory of your project, execute:

```
$ mvn -P all clean install
```

The switch `-P all` is used here in order to build with all extensions available, with paths and settings configured for the embedded mode.

> When building for production, instead, it is recommended to check the **Customization** chapter of the Apache Syncope Reference Guide.

then, from the `enduser` subdirectory, execute:

```
$ mvn -P embedded,all
```

Paths and Components

Log files	Available under `core/target/log`, `console/target/log` and `enduser/target/log`
ConnId bundles	Available under `core/target/bundles`
Complete REST API reference	http://localhost:9080/syncope/index.html
Swagger UI	http://localhost:9080/syncope/swagger/
Administration console	http://localhost:9080/syncope-console/ Credentials: `admin` / `password`
End-user UI	http://localhost:9080/syncope-enduser/
Internal storage	A SQL web interface is available at http://localhost:9080/syncope/db.jsp Choose configuration 'Generic H2 (Embedded)' Insert `jdbc:h2:mem:syncopedb` as JDBC URL Click 'Connect' button
External resource: LDAP	An Apache DS instance is available. You can configure any LDAP client (such as JXplorer, for example) with the following information: host: `localhost` port: `1389` base DN: `o=isp` bind DN: `uid=admin,ou=system` bind password: `secret`
External resource: SOAP	An example SOAP service is available at http://localhost:9080/syncope-fit-build-tools/cxf/soap
External resource: REST	An example REST service is available at http://localhost:9080/syncope-fit-build-tools/cxf/rest

External resource: database	H2 TCP database is available. A SQL web interface is available at http://localhost:9082/ Choose configuration 'Generic H2 (Server)' Insert `jdbc:h2:tcp://localhost:9092/mem:testdb` as JDBC URL Set 'sa' as password Click 'Connect' button

3.6. CLI

The command-line interface (CLI) client is an utility tool meant for interacting with Apache Syncope deployments from shell scripts.

Deprecation

Syncope 2.1 is the last major version providing CLI.

As an alternative you can consider using the popular curl tool to invoke the Syncope Core REST API services.
For reference, the Swagger UI extension, when enabled, will provide for each request the corresponding `curl` command with all parameters.

Once downloaded and uncompressed, you will find a `lib` directory and two scripts: `syncopeadm.sh` and `syncopeadm.bat`, which will be used depending on the operating system.

The installation process creates `cli.properties`, which contains all the required information to invoke the Syncope Core REST API services. The file content looks like the following:

```
syncope.rest.services=http://localhost:9080/syncope/rest
syncope.admin.user=admin
syncope.admin.password=QePSFVTnzwQowM4ohhaUYcE6aW47MVZ/
```

where:

syncope.rest.services
: the base URL where the Apache Syncope REST API services are listening;

syncope.admin.user
: the username which will be used to invoke the Syncope APIs;

syncope.admin.password
: the password for the admin user configured above.

As shown above, the password value is encrypted for security reasons.

Help message

```
Usage: install [options]
  Options:
    --help
    --setup
    --setup-debug
```

3.6.1. Installation

After the file is unzipped you can start with CLI client using the `syncopeadm` file. If you have tried to run a CLI command before the installation process, the script will return

```
 - Error: It seems you need to first setup the CLI client. Run install --setup.
```

So, as suggested, you have to run the install command to use the CLI:

```
$ ./syncopeadm.sh install --setup
```

A successful result will be:

```
You are running: install --setup

################################################
#                                              #
# Welcome to Syncope CLI installation process #
#                                              #
################################################

Path to config files of Syncope CLI client will be: ./
- File system permission checked

Syncope server schema [http/https]: http
Syncope server hostname [e.g. localhost]: localhost
Syncope server port [e.g. 8080]: 9080
Syncope server rest context [e.g. /syncope/rest/]: /syncope/rest
Syncope admin user: admin
Syncope admin password: password
Installation parameters checked on Syncope core version: 2.1.15-SNAPSHOT

################################################
#                                              #
#           Installation successful            #
#     now you can use Syncope CLI client       #
#                                              #
################################################
```

During the installation you have to provide:

Syncope server schema
: the http protocol used by the Apache Syncope core, it will be http or https;

Syncope server hostname
: the hostname where the core is deployed;

Syncope server port
: the port where the services are listening;

Syncope server rest context
: the context where the rest services are deployed (/syncope/rest is the default);

Syncope admin user
: the user with the permission to call the Syncope APIs;

Syncope admin password
: the user password.

3.6.2. Troubleshooting

Various error messages are possible on installation. Here are some sample error messages:

Syncope unreachable (or wrong address):

```
Provided address: http://localhost:9080/syncope/rest

##################################################
#                                                #
#       Provided address is unreachable!         #
#         Check it and if it is wrong            #
#        START the installation AGAIN!           #
#                                                #
##################################################
```

Authentication failed:

```
##################################################
#                                                #
#   Username or password provided are wrong      #
#        START the installation AGAIN!           #
#                                                #
##################################################
```

As the message suggests you have to start the installation again when this error occurs.

3.6.3. Debug

To work with the debug environment provided by Syncope we added a particular installation option for it. It enough to run the script with the --setup-debug option

```
$ ./syncopeadm.sh install --setup-debug
```

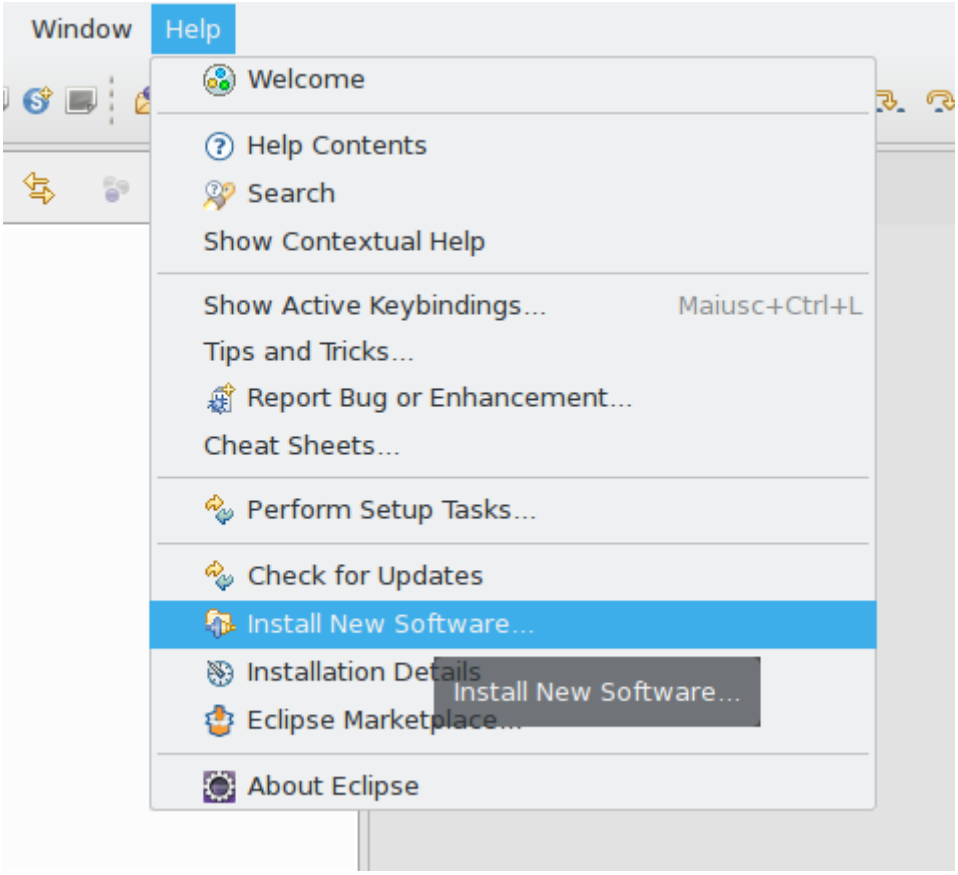
```
You are running: install --setup-debug

################################################
#                                              #
# Welcome to Syncope CLI installation process #
#                                              #
################################################

Path to config files of Syncope CLI client will be: ./
- File system permission checked

Installation parameters checked on Syncope core version: 2.1.15-SNAPSHOT

################################################
#                                              #
#           Installation successful            #
#     now you can use Syncope CLI client       #
#                                              #
################################################
```

3.7. Eclipse IDE Plugin

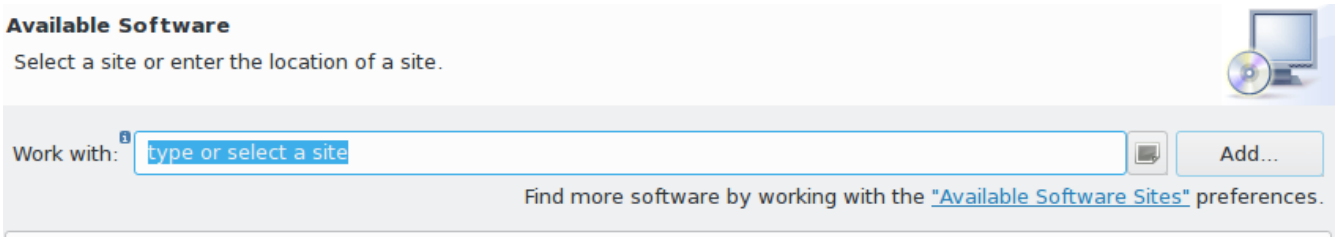
The Eclipse IDE plugin allows remote management of notification e-mail and report templates.

3.7.1. Installation

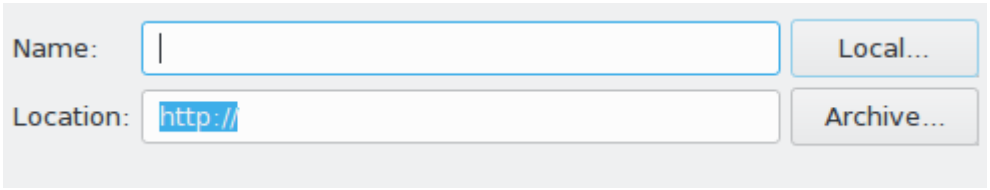
After download, start the most recent Eclipse IDE distribution then go to `Help > Install New Software`:

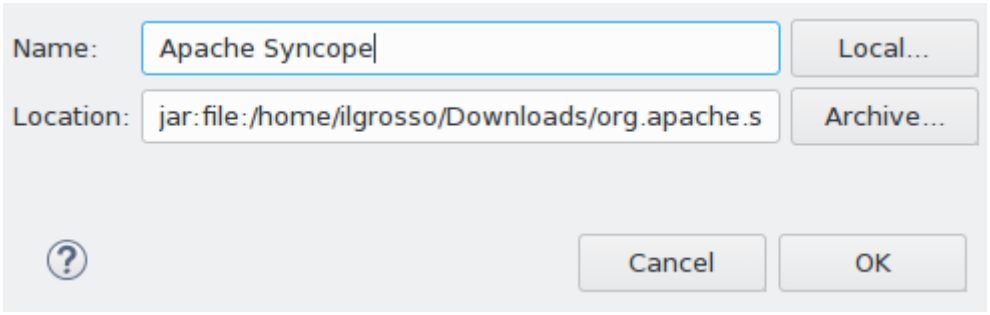


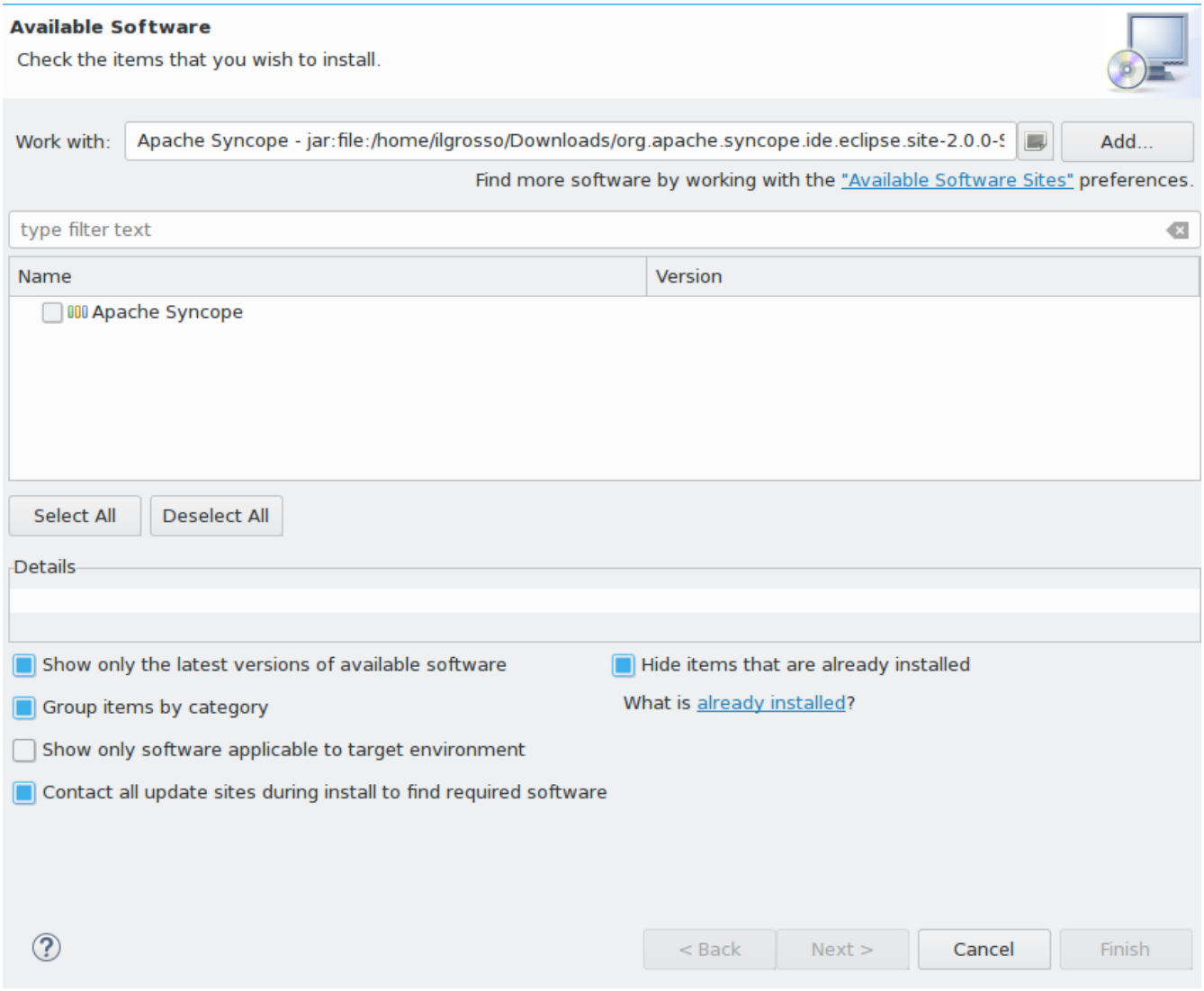
Click on `Add`:



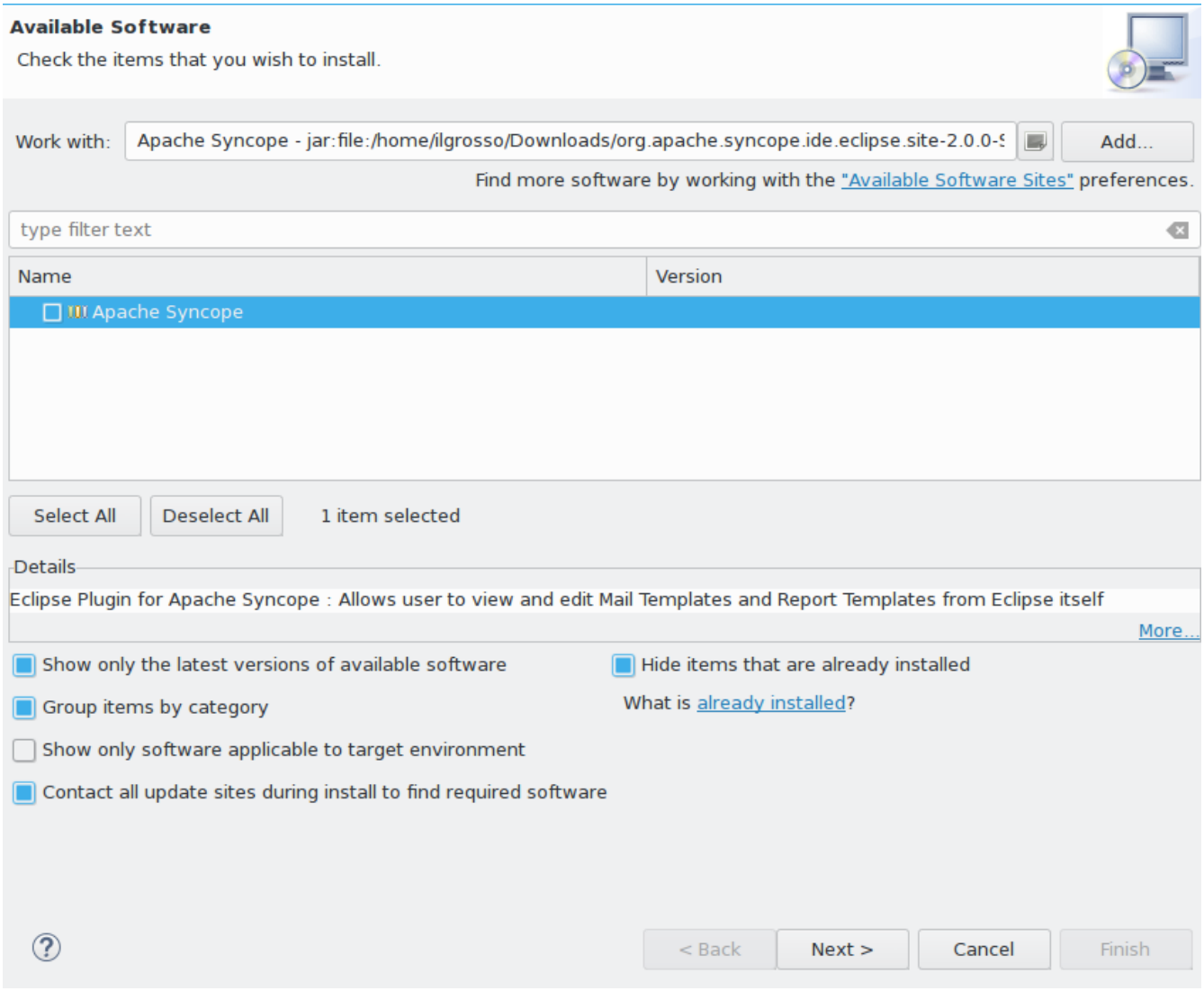
Click on `Local` then `Archive` and find the downloaded zip file:



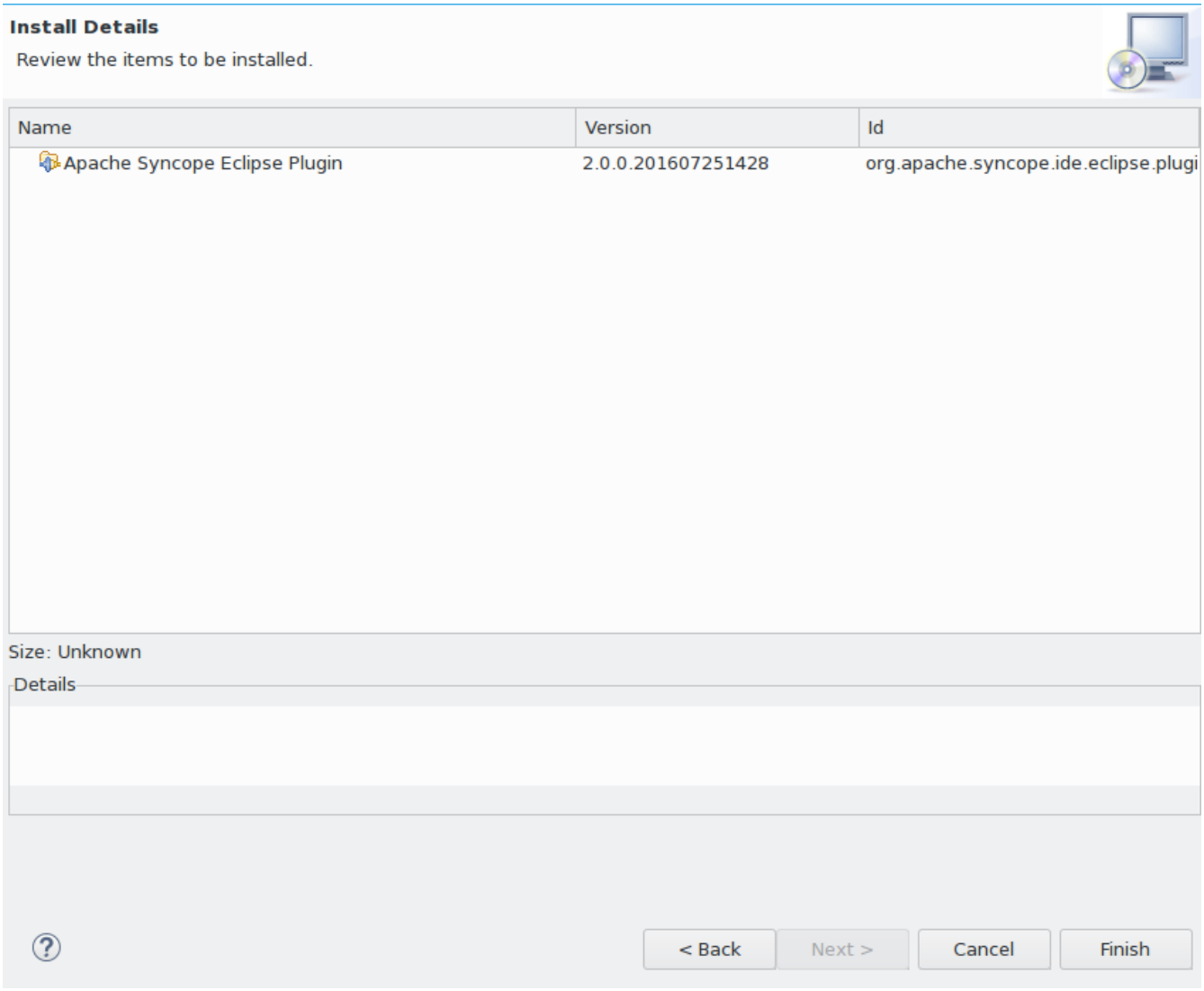


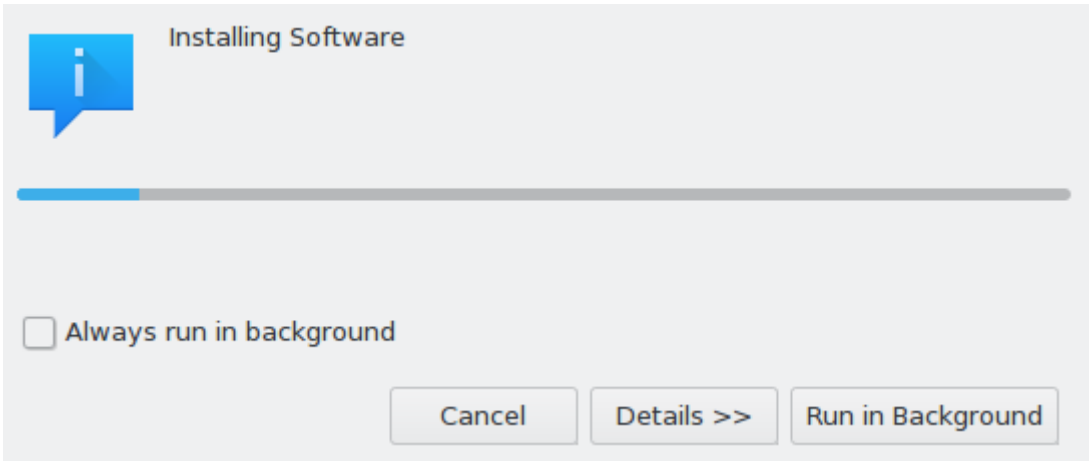


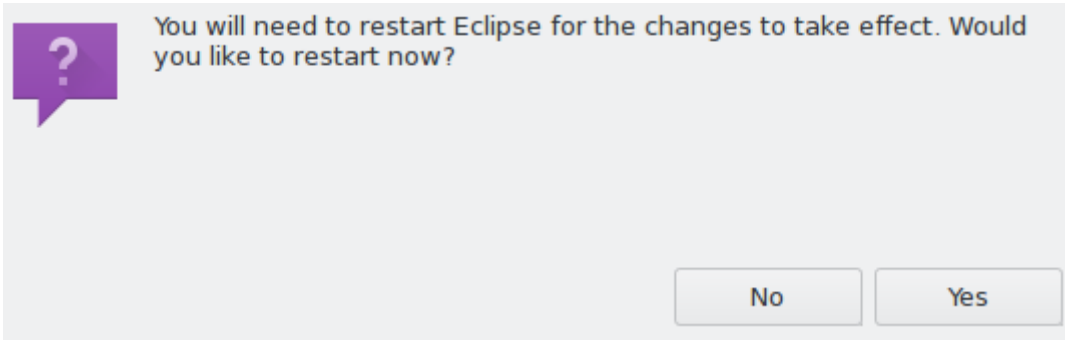
Select `Apache Syncope` and click on `Next`:



Click on `Finish` and wait for installation to complete:

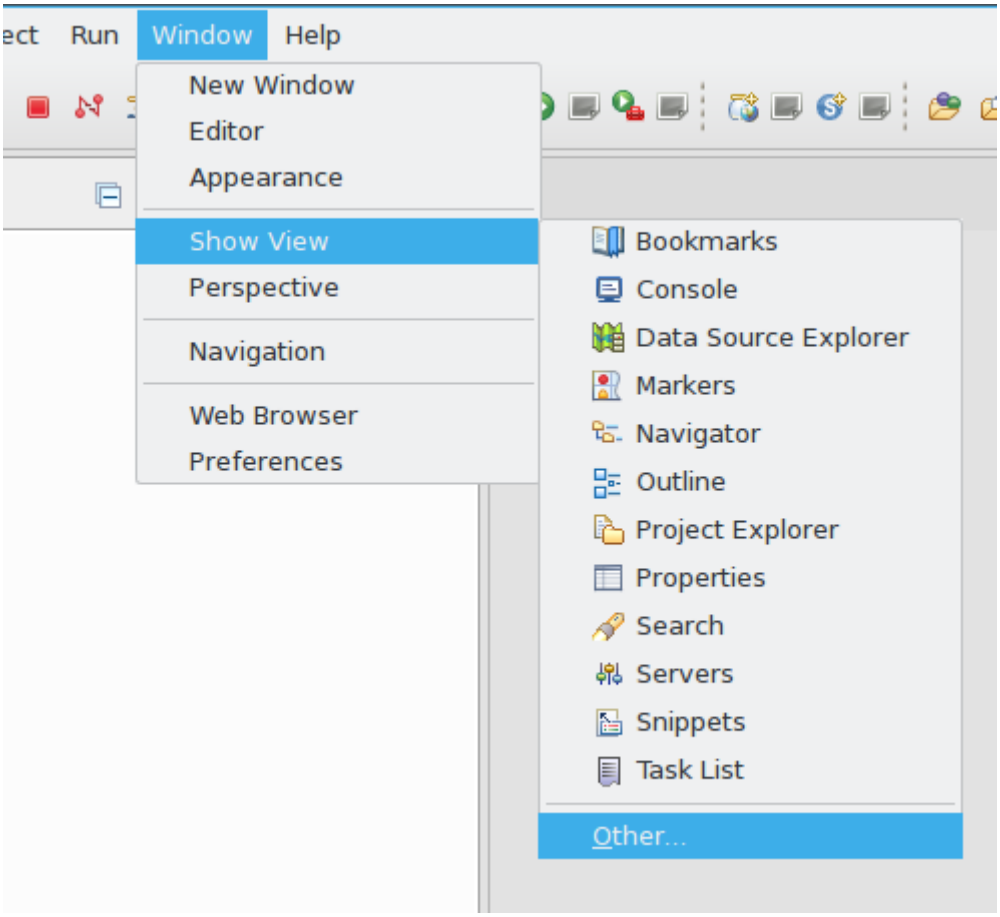

Install Details
Review the items to be installed.
Name
Version
Id
Apache Syncope Eclipse Plugin
2.0.0.201607251428
org.apache.syncope.ide.eclipse.plugi
Size: Unknown
Details
< Back
Next >
Cancel
Finish


Installing Software
Always run in background
Cancel
Details >>
Run in Background

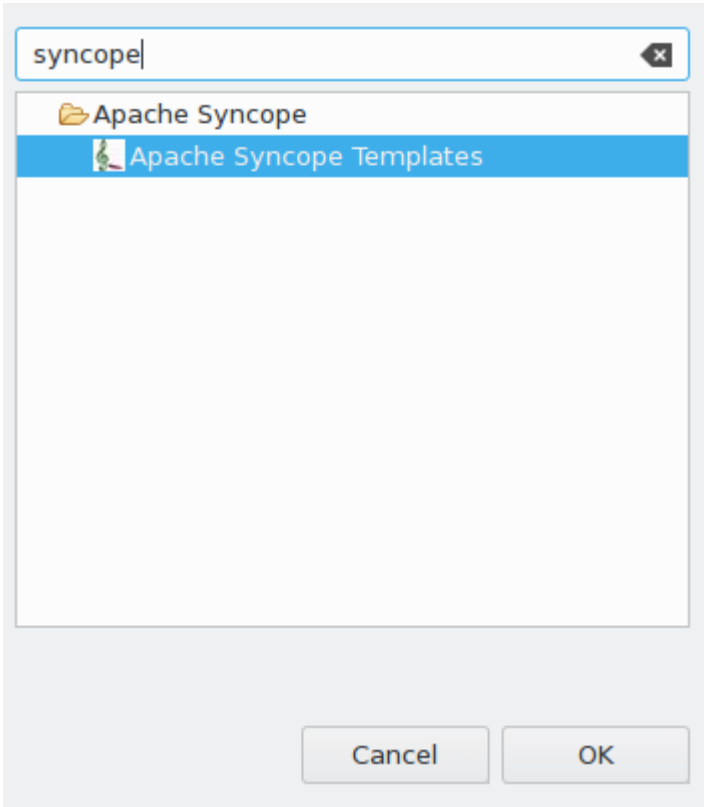

You will need to restart Eclipse for the changes to take effect. Would you like to restart now?
No
Yes

3.7.2. Setup

After Eclipse IDE restart, go to `Window` > `Show View` > `Other`

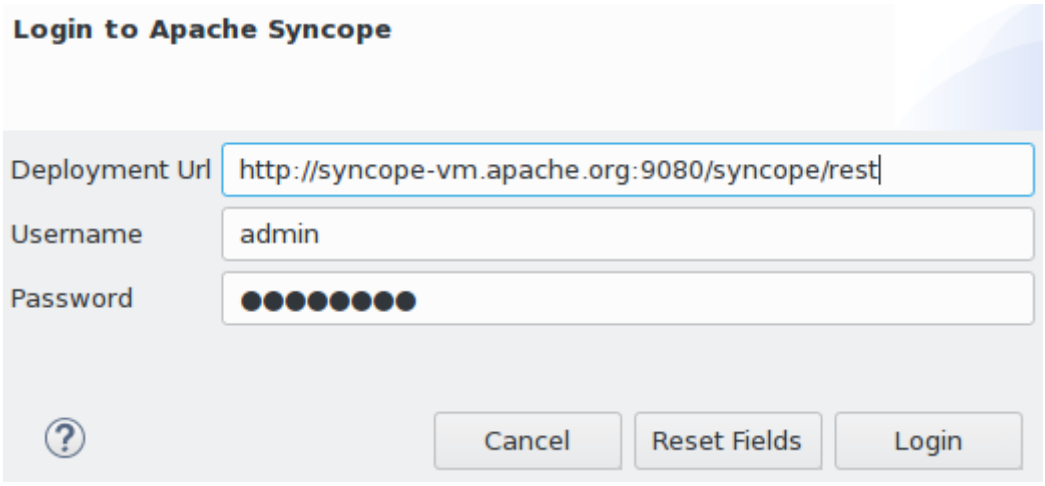


Select `Apache Syncope Templates`:



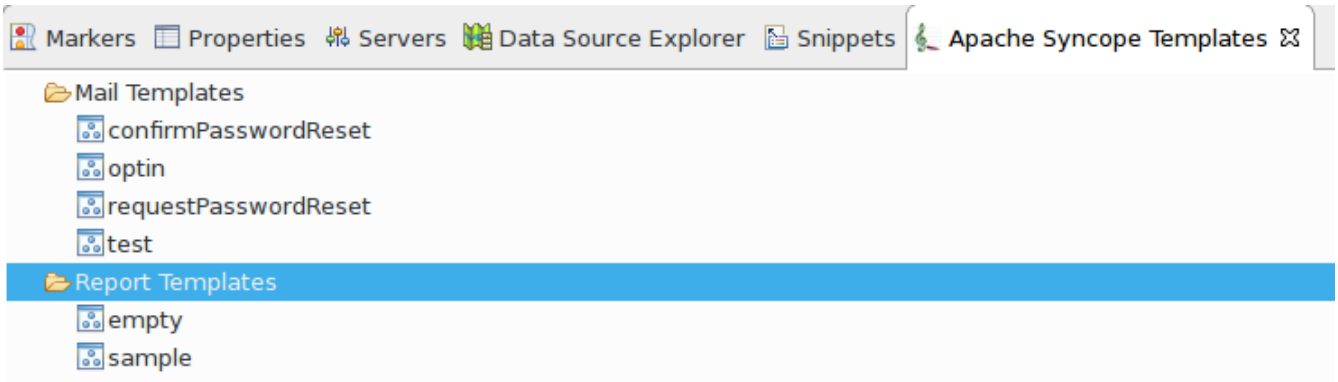
In the new view, click on `Login`:

Provide the base URL for Apache Syncope deployment, username and password:



If the information above is correct, two folders should now appear:

By double-clicking on each folder, the list of available templates is shown:



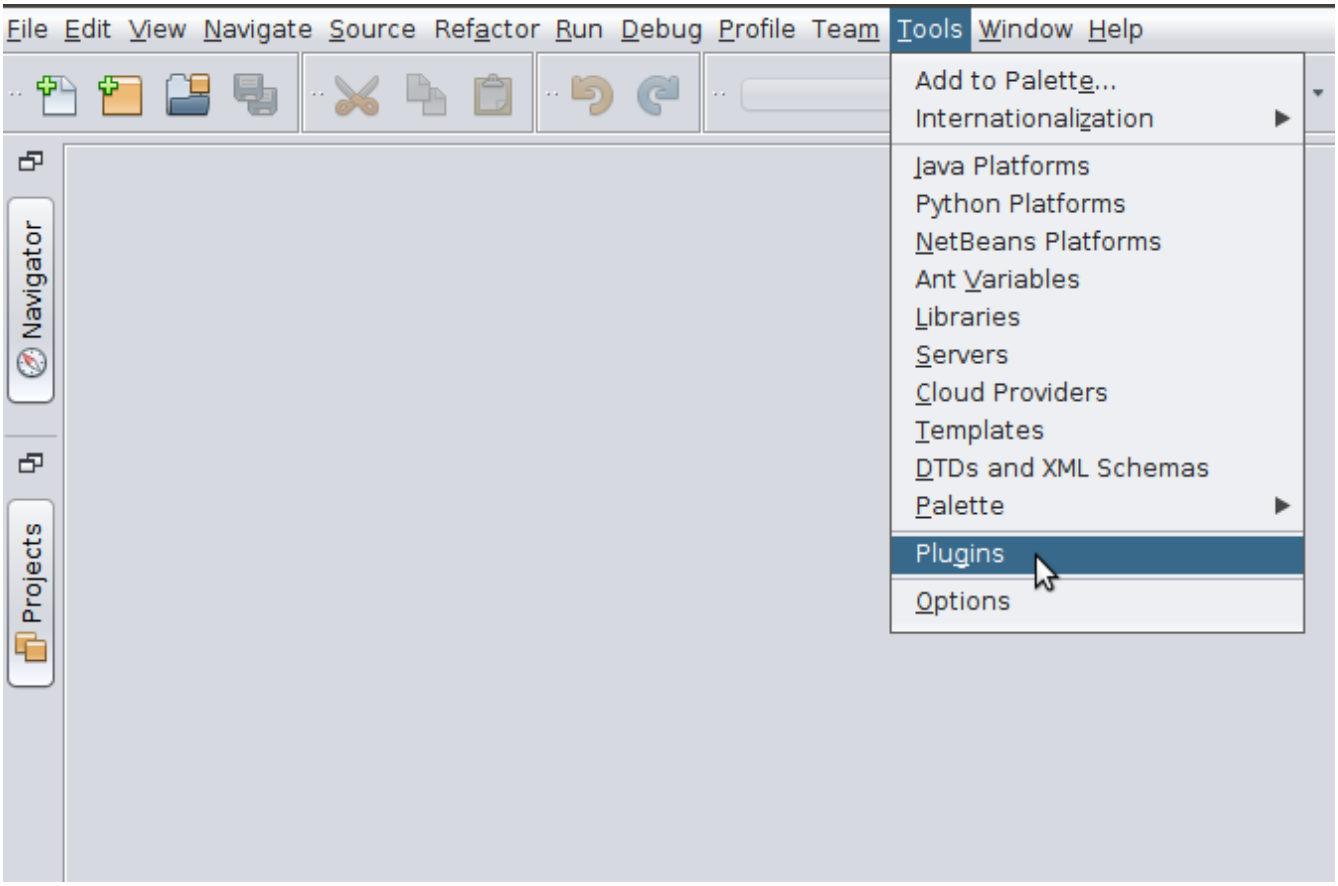
Each template is now ready for authoring or removal; new templates can also be created.

3.8. Netbeans IDE Plugin

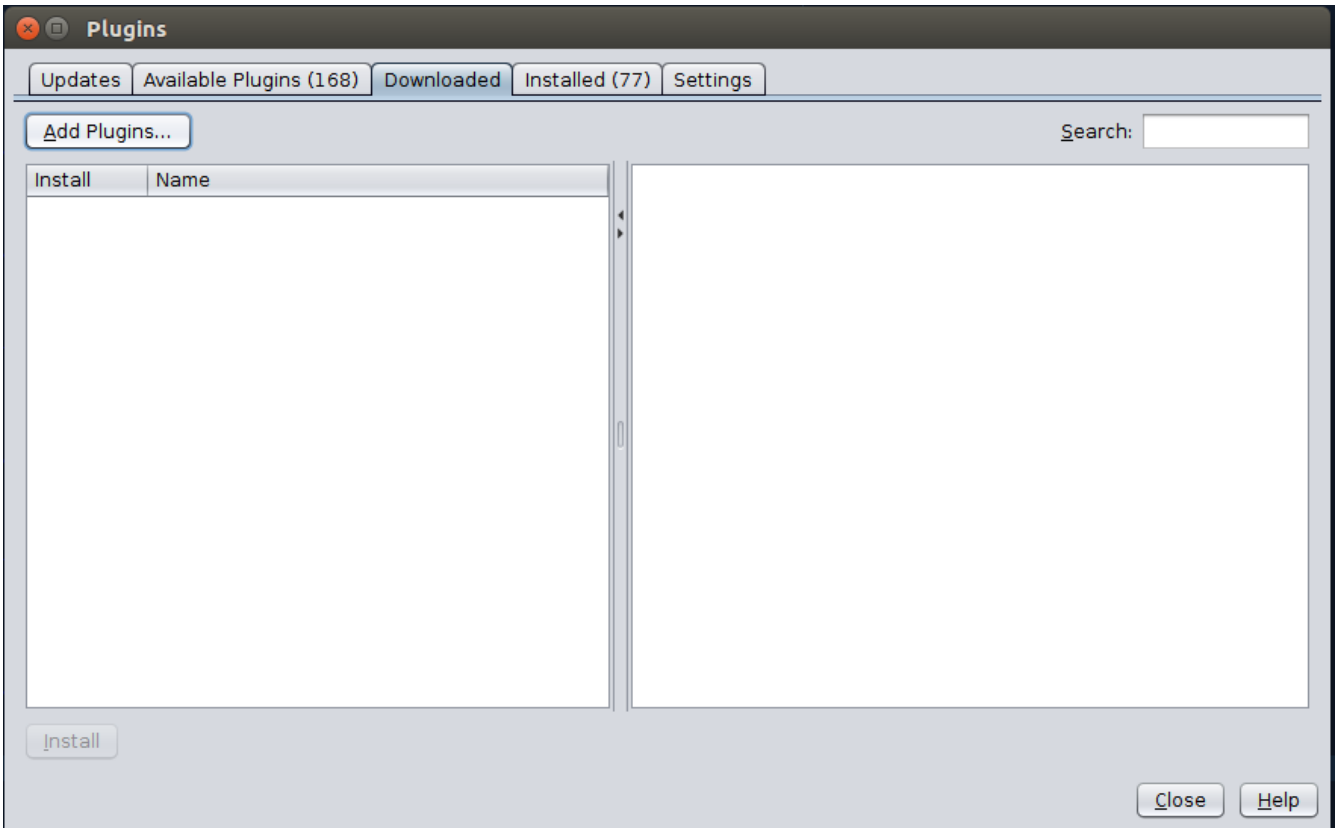
The Netbeans IDE plugin allows remote management of notification e-mail and report templates, and remote editing of Apache Groovy implementations.

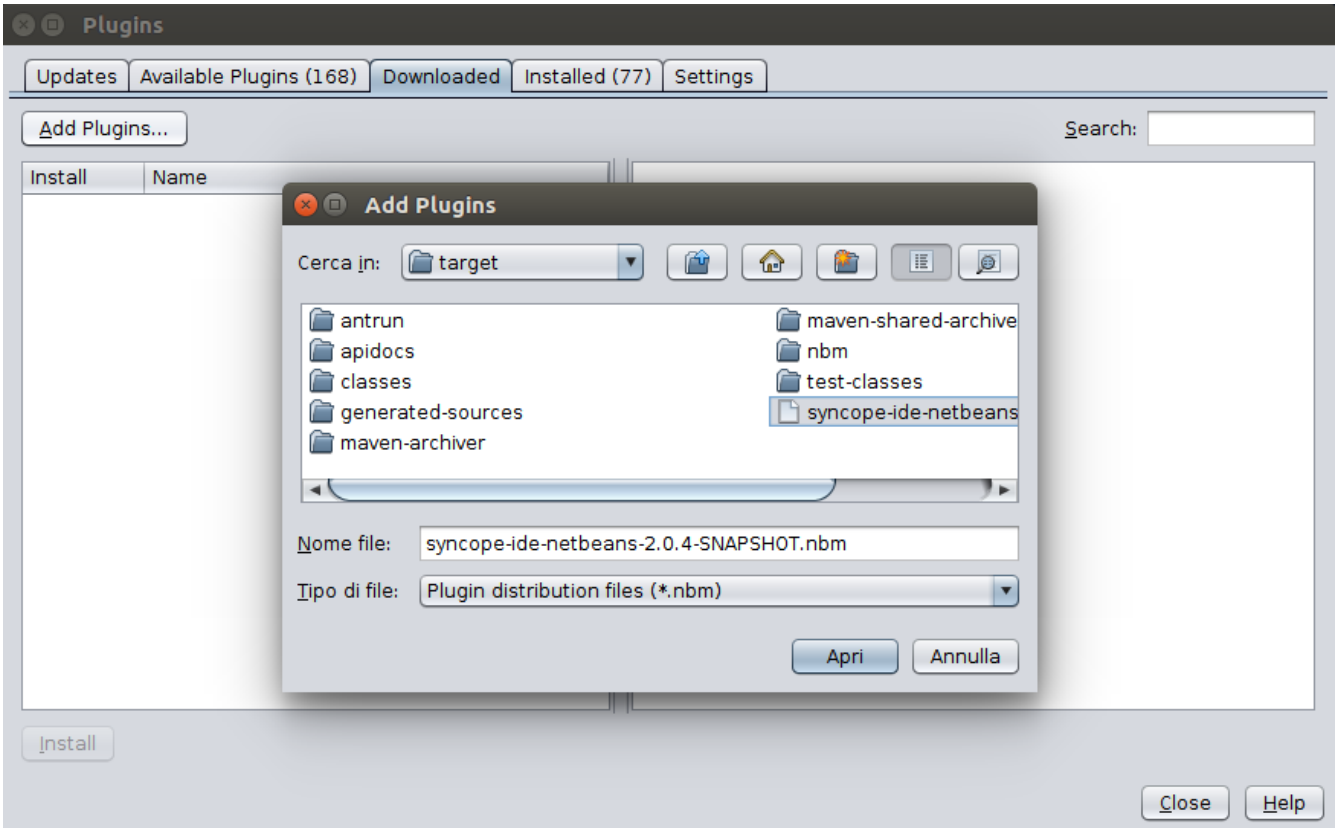
3.8.1. Installation

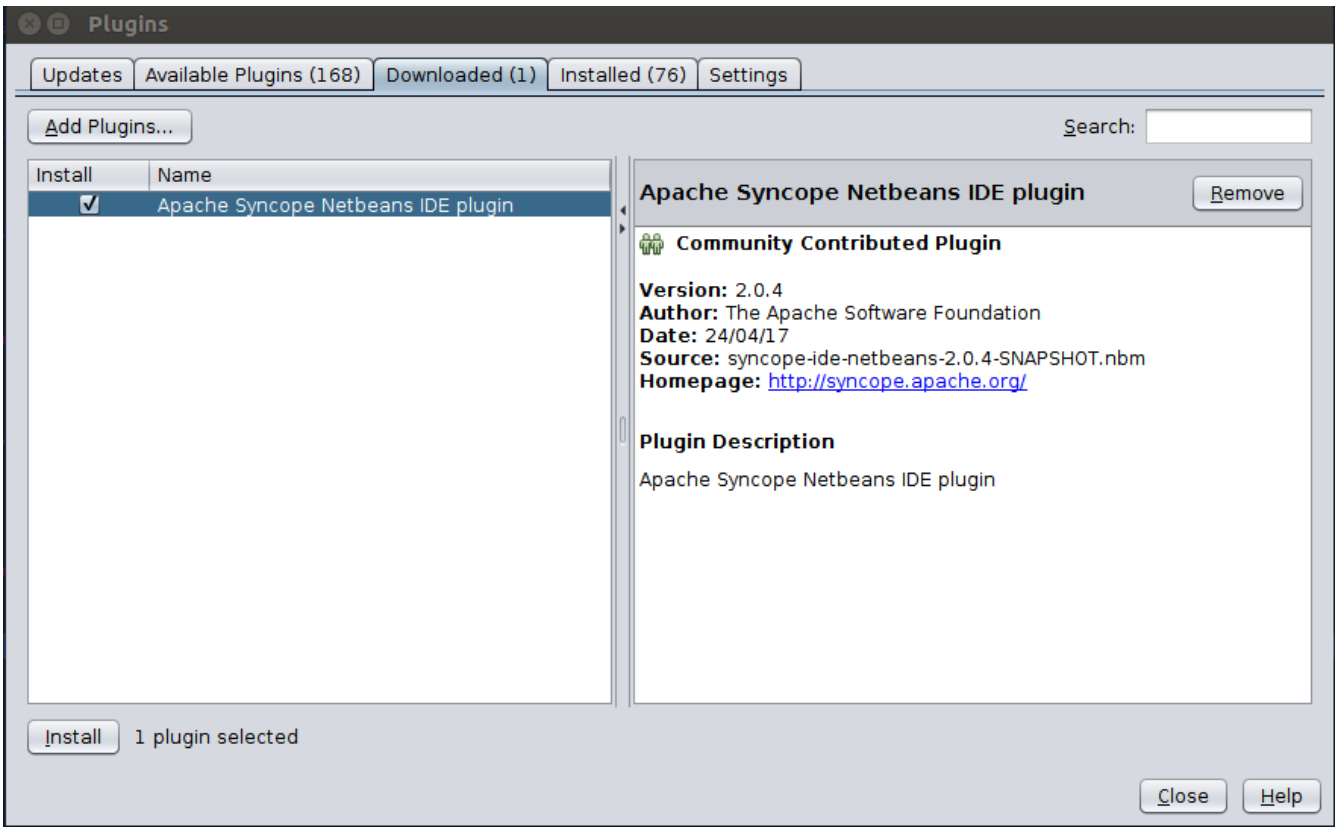
After download, start the most recent Netbeans IDE then go to `Tools > Plugins`:



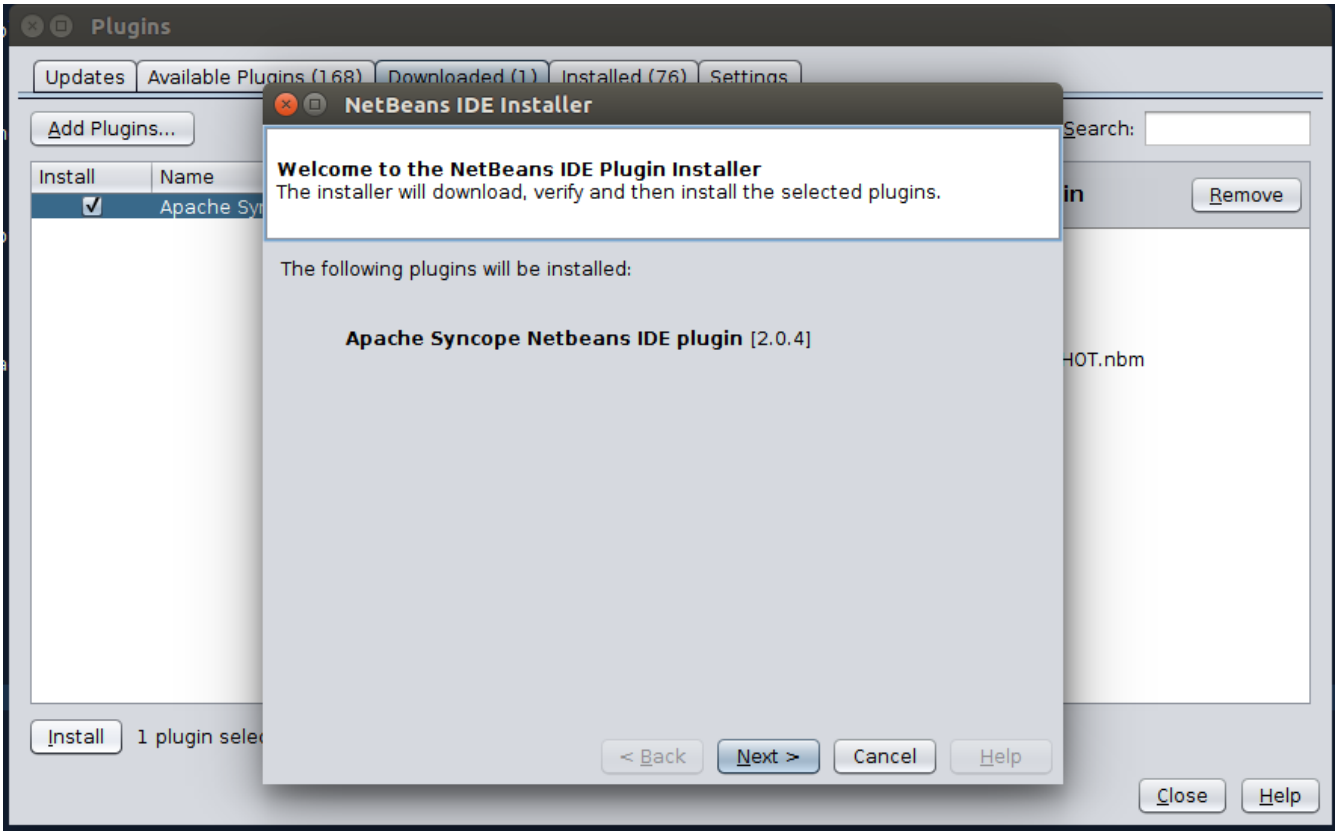
Click on `Downloaded > Add Plugins…`:

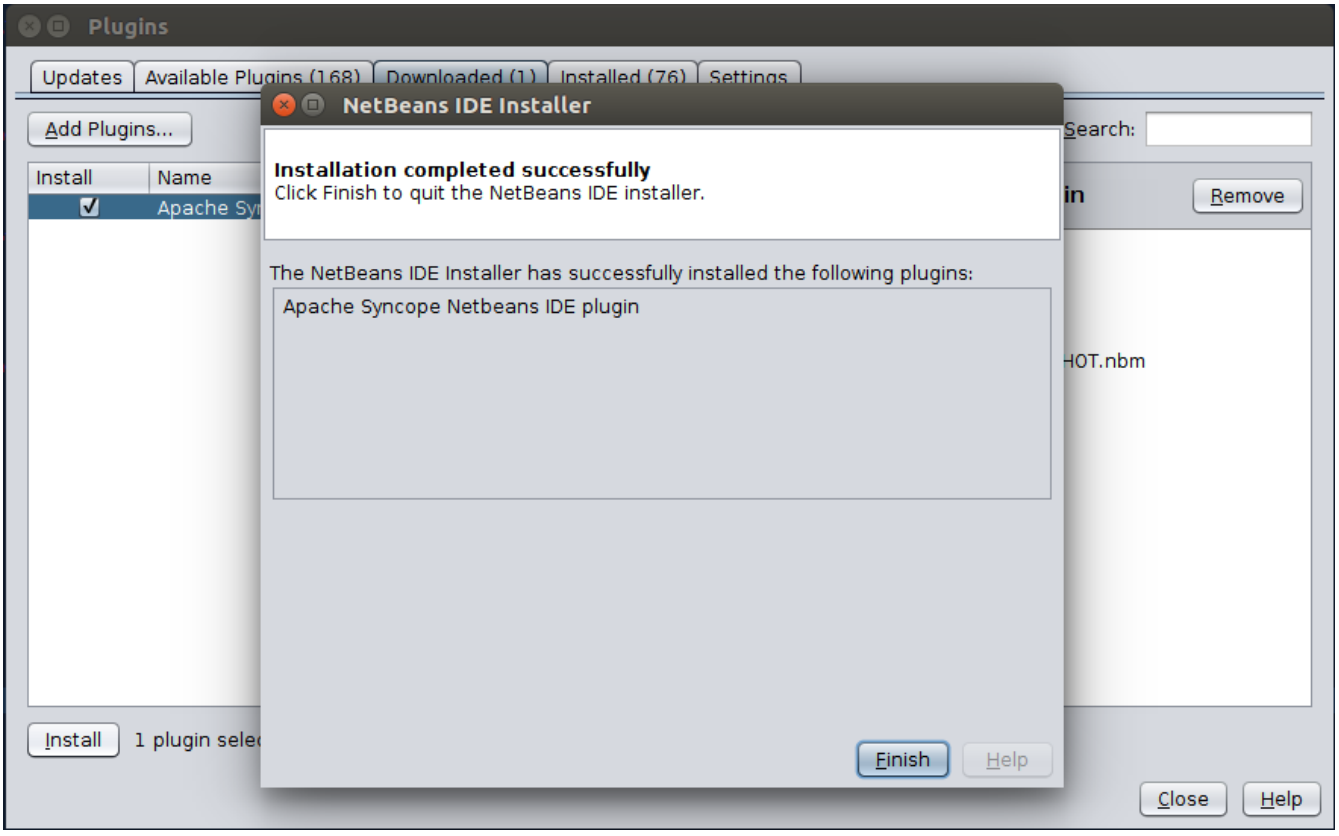






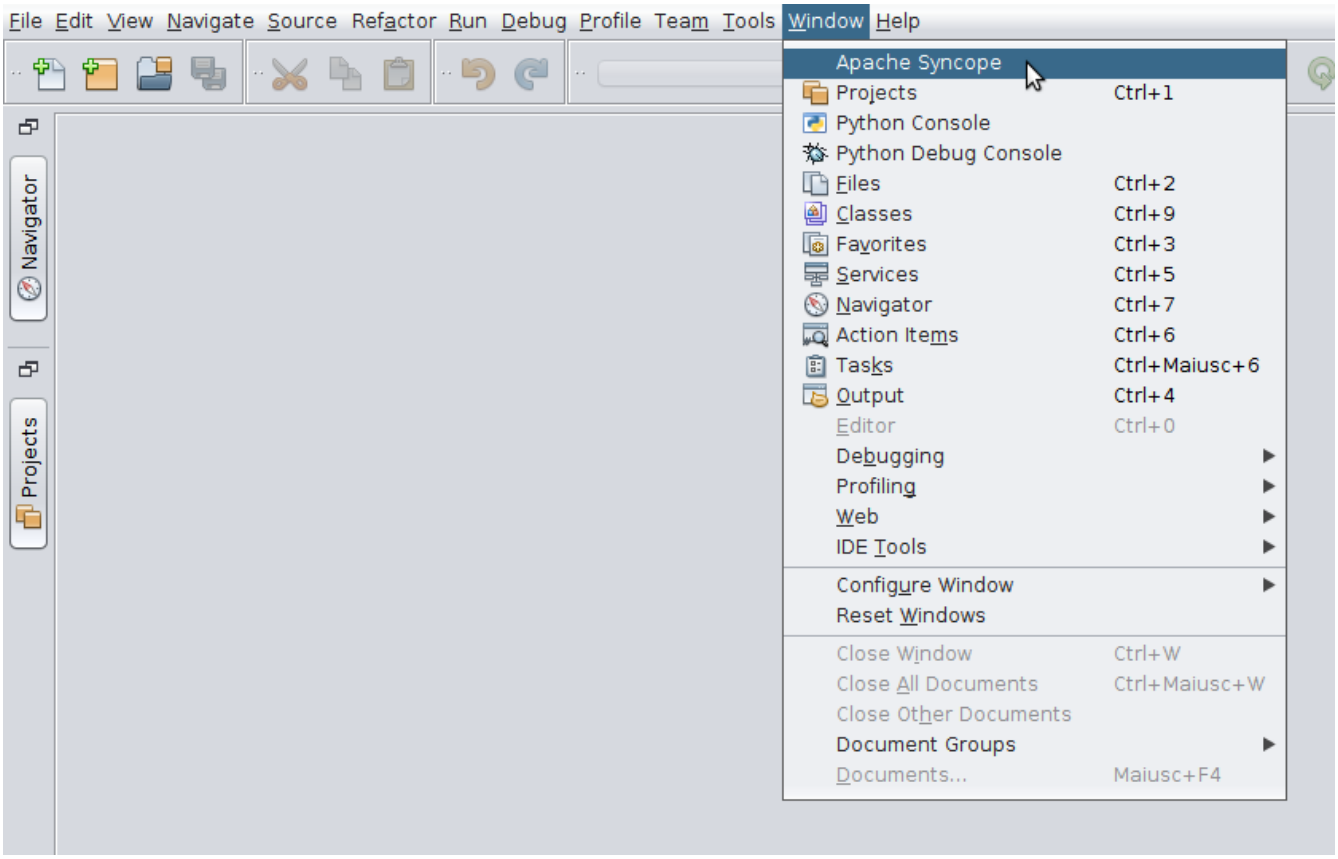
Select `Apache Syncope Netbeans IDE Plugin` and click on `Install`:



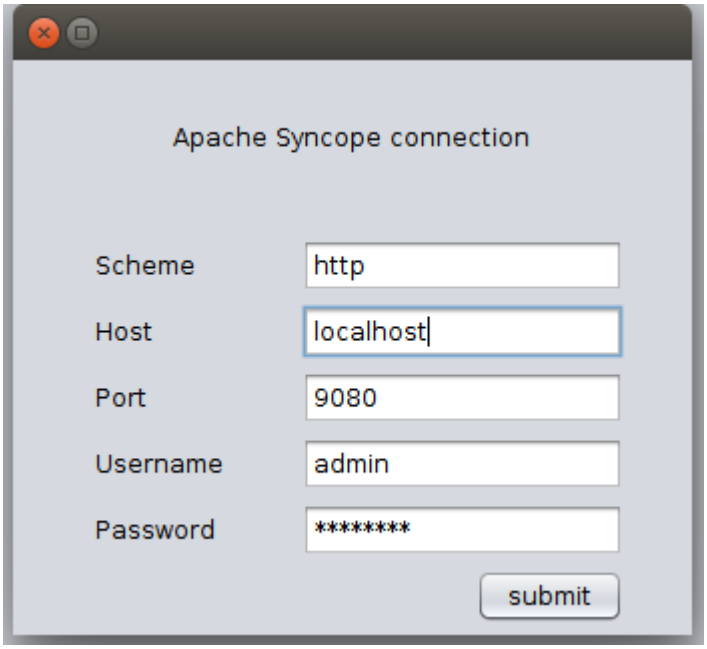


3.8.2. Setup

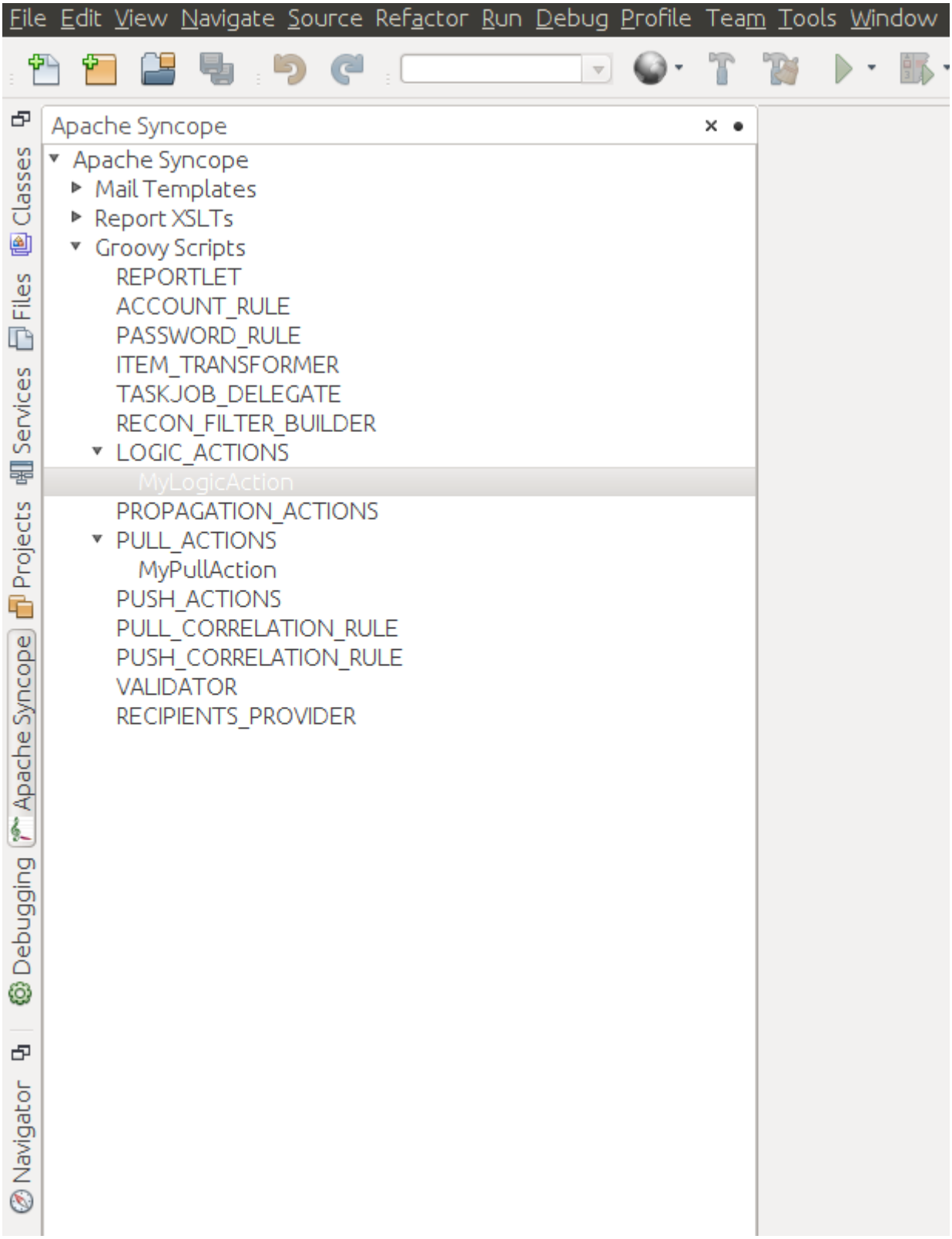
Once installed go to `Window` > `Apache Syncope`:



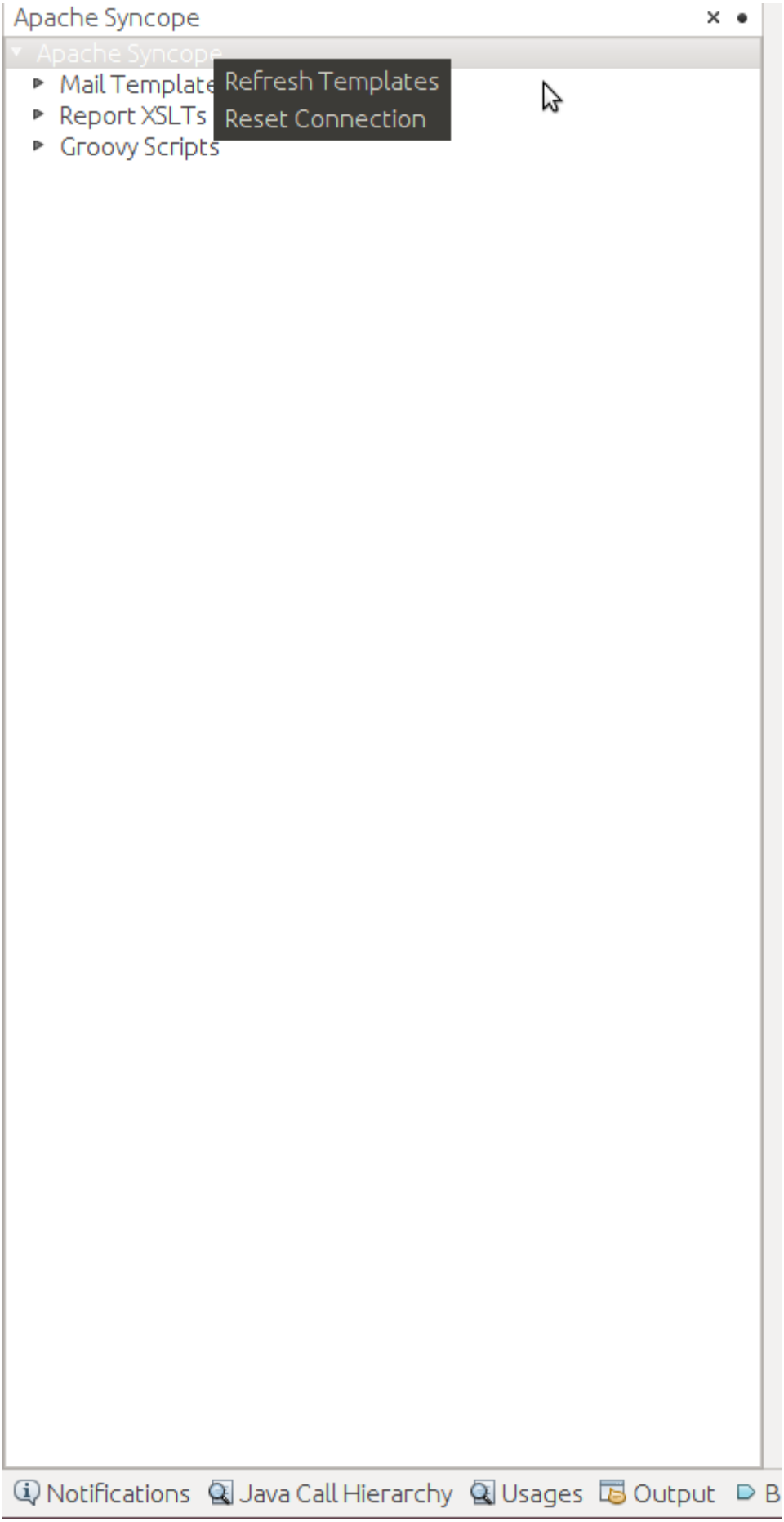
The first time the plugin is run, it will prompt for connection details:



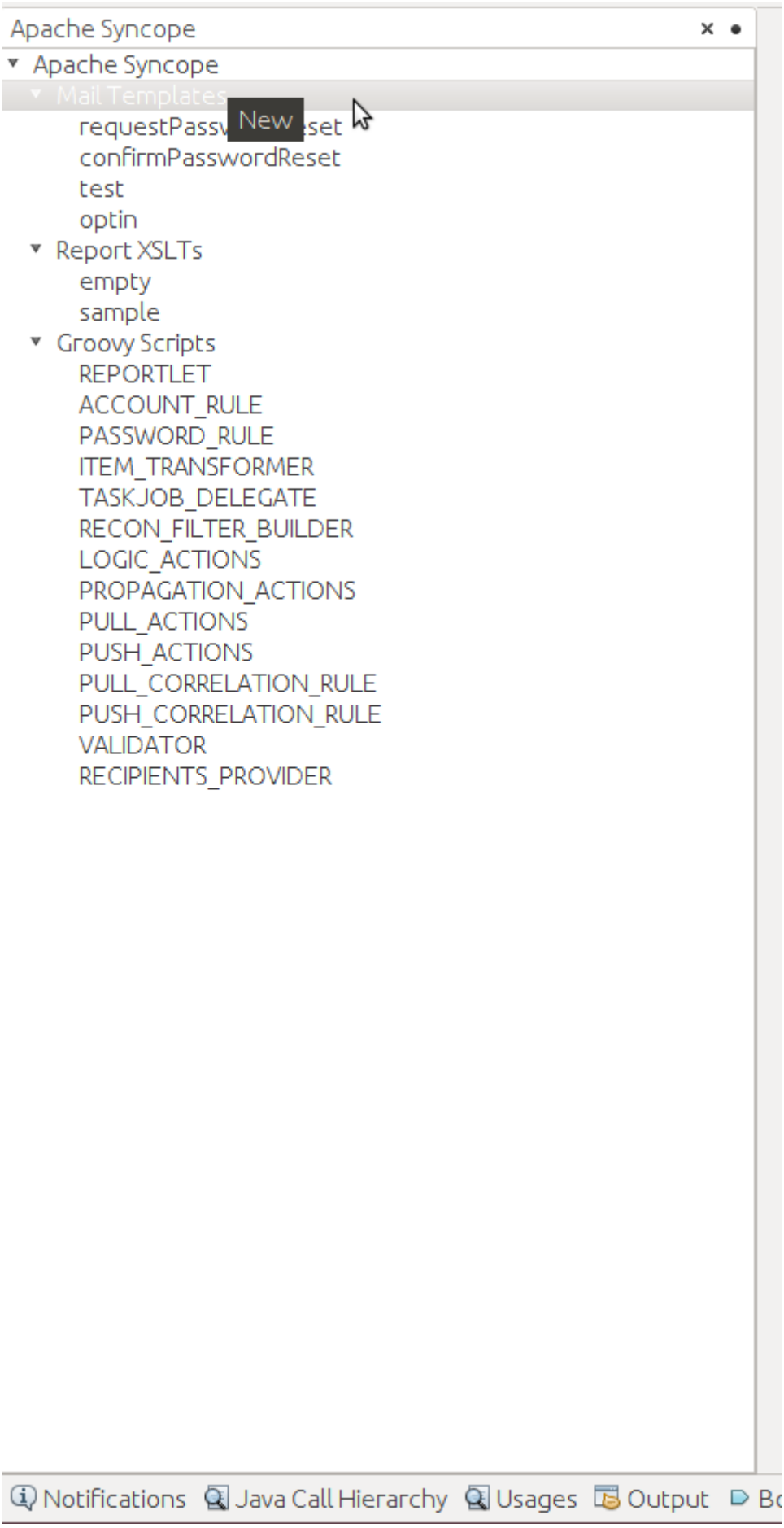
Once a connection to the given Apache Syncope deployment is established, a panel showing Mail Templates, Report XSLTs and Groovy implementations will appear on the left; by double-clicking on each folder, the list of available items is shown:



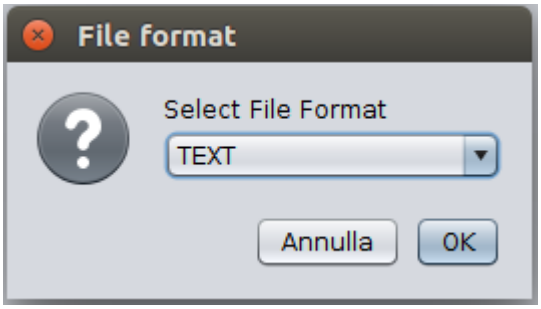
To refresh the list of available items, or to update the connection details, right-click on the Apache Syncope root node:



To create a new item, right-click on the `Mail Templates`, `Report XSLTs` or `Groovy Implementations` folder and then click on `New` label:

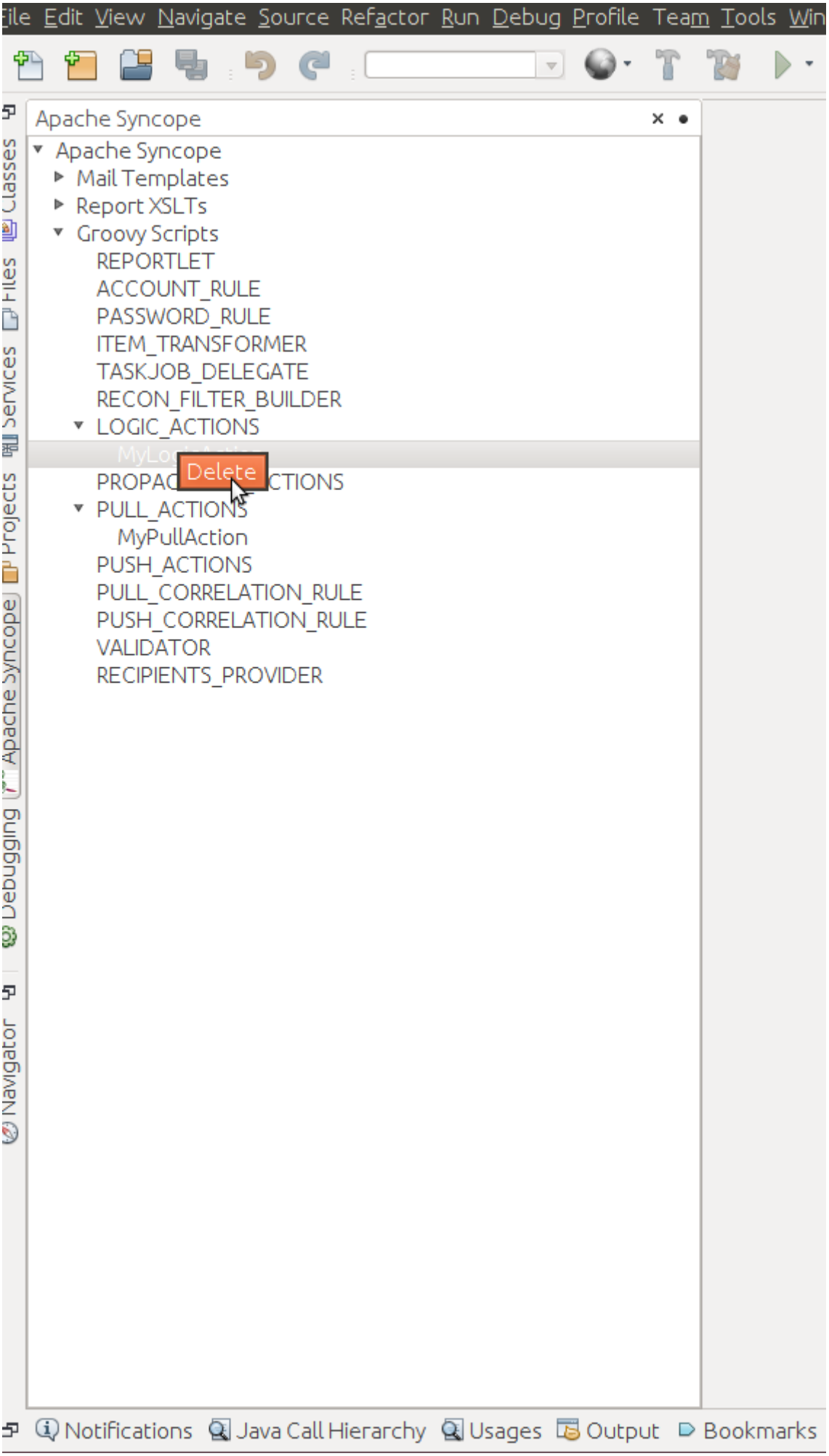


Before creating or editing a mail or report template, a modal window will be shown to select the edit format:



To edit am item, double-click on the item name and an editor will appear. On save, the item content will be uploaded to the configured Apache Syncope deployment.

To delete an existing item, right-click on the item name and then click on `Delete`:


File Edit View Navigate Source Refactor Run Debug Profile Team Tools Win
Apache Syncope
Apache Syncope
Mail Templates
Report XSLTs
Groovy Scripts
REPORTLET
ACCOUNT_RULE
PASSWORD_RULE
ITEM_TRANSFORMER
TASKJOB_DELEGATE
RECON_FILTER_BUILDER
LOGIC_ACTIONS
Delete
PROPAC CTIONS
PULL_ACTIONS
MyPullAction
PUSH_ACTIONS
PULL_CORRELATION_RULE
PUSH_CORRELATION_RULE
VALIDATOR
RECIPIENTS_PROVIDER
Classes
Files
Services
Projects
Apache Syncope
Debugging
Navigator
Notifications
Java Call Hierarchy
Usages
Output
Bookmarks

Chapter 4. Moving Forward

Once you have obtained a working installation of Apache Syncope using one of the methods reported above, you should consider reading the Apache Syncope Reference Guide. to understand how to configure, extend, customize and deploy your new Apache Syncope project.

Before deploying your Apache Syncope installation into production, it is essential to ensure that the default values for various security properties have been changed to values specific to your deployment.

The following values must be changed from the defaults in the `security.properties` file:

- **adminPassword** - The cleartext password as encoded per the `adminPasswordAlgorithm` value (`SSHA256` by default), the default value of which is "password".
- **secretKey** - The secret key value used for AES ciphering; AES is used by the use cases below:
  - if the value for `adminPasswordAlgorithm` is `AES` or the configuration parameter `password.cipher.algorithm` is changed to `AES`
  - if set for Encrypted Plain Schema instances
  - for Linked Accounts' password values
  - to securely store Access Token’s cached authorities
  - within some of the predefined rules used by Password Policies
- **anonymousKey** - The key value to use for anonymous requests.
- **jwsKey** - The symmetric signing key used to sign access tokens. See section 4.4.1 "REST Authentication and Authorization" of the Reference Guide for more information.

Note that if you installed Syncope using either the installer or the maven archetype methods, then you will have already supplied custom values for "**secretKey**" and "**anonymousKey**". Both installation methods will also query for "**jwsKey**", and the installer method will prompt for the "**adminPassword**" as well.