Spring Social

The Spring Social project enables your applications to establish Connections with Software-as-a-Service (SaaS) Providers such as Facebook and Twitter to invoke APIs on behalf of Users.

1. Introduction

1.1. Socializing applications

The phrase "social networking" often refers to efforts aimed at bringing people together. In the software world, those efforts take the form of online social networks such as Facebook, Twitter, and LinkedIn. Over a billion of this world's internet users have uses these services to keep frequent contact with family, friends, and colleagues.

To illustrate, imagine that Natraz is a member of an online movie club. A function of the movie club application is to recommend movies for its members to watch and to let its members maintain a list of movies that they have seen and those that they plan to see. When Natraz sees a movie, he signs into the movie club site, checks the movie off of his viewing list, and indicates if he liked the movie or not. Based on his responses, the movie club application can tailor future recommendations for Natraz to see.

On its own, the movie club provides great value to Natraz, as it helps him choose movies to watch. But Natraz is also a Facebook user. And many of Natraz's Facebook friends also enjoy a good movie now and then. If Natraz were able to connect his movie club account with his Facebook profile, the movie club application could offer him a richer experience. Perhaps when he sees a movie, the application could post a message on his Facebook wall indicating so. Or when offering suggestions, the movie club could factor in the movies that his Facebook friends liked.

Social integration is a three-way conversation between a service provider, a service consumer, and a user who holds an account on both the provider and consumer. All interactions between the consumer and the service provider are scoped to the context of the user's profile on the service provider.

In the narrative above, **Facebook** is the service provider, the movie club application is the service consumer, and Natraz is the user of both. The movie club application may interact with Facebook on behalf of Natraz, accessing whatever Facebook data and functionality that Natraz permits, including retrieving Natraz's friends and posting messages to his wall.

From the user's perspective, both applications provide some valuable functionality. But by connecting the user's account on the consumer application with his account on the provider application, the user brings together two applications that can now offer the user more value than they could individually.

With Spring Social, your application can play the part of the service consumer, interacting with a service provider on behalf of its users. The key features of Spring Social are:

- **A "Connect Framework" that handles the core authorization and connection flow with service providers.**
- **A "Connect Controller" that handles the OAuth exchange between a service provider, consumer, and user in a web application environment.**
- **A "Signin Controller" that allows users to authenticate with your application by signing in with their Provider accounts, such as their Twitter or Facebook accounts.**

In addition, there are a handful of provider-specific modules that extend Spring Social to enable integration with popular SaaS providers, including Facebook and Twitter.

1.2. Getting Spring Social

The core Spring Social project consists of the modules described in Spring Social Modules.

Table 1. Spring Social Modules

Name	Description
spring-social-core	Spring Social's Connect Framework and OAuth client support.
spring-social-config	Java and XML configuration support for Spring Social.
spring-social-security	Spring Security integration support.
spring-social-web	Spring Social's ConnectController which uses the Connect Framework to manage connections in a web application environment.

Which of these modules your application needs will largely depend on what facets of Spring Social you intend to use.

1.2.1. Gradle

At very minimum, you'll need the core module in your application's classpath:

build.gradle

```
compile "org.springframework.social:spring-social-core:2.0.0.M4"
```

To let Spring Social handle the back-and-forth authorization handshake between your web application and a service provider, you'll need the web module:

build.gradle

```
compile "org.springframework.social:spring-social-web:2.0.0.M4"
```

You'll probably want to take advantage of Spring Social's simplified configuration support for XML and/or Java configuration. If so, you'll need the config module:

build.gradle

```
compile "org.springframework.social:spring-social-config:2.0.0.M4"
```

If you want to integrate Spring Social with Spring Security to enable users to sign into your application via Facebook, Twitter, or another provider, you'll need the security module:

build.gradle

```
compile "org.springframework.social:spring-social-security:2.0.0.M4"
```

Final GA releases of Spring Social will be available in the Maven Central repository. But if you are developing against a milestone or release candidate version, such as 1.1.0.M1 or 1.1.0.RC1, then you will need to add Spring's milestone repository to your build in order to resolve the artifacts:

build.gradle

```
repositories {
  mavenLocal()
  maven { url 'http://maven.springframework.org/milestone' }
```

```
  mavenCentral()
}
```

Similarly, if you are trying out the latest nightly build version (e.g. 1.1.0.BUILD-SNAPSHOT), you will need to add Spring's snapshot repository:

build.gradle

```
repositories {
  mavenLocal()
  maven { url 'http://maven.springframework.org/snapshot' }
  mavenCentral()
}
```

1.2.2. Maven

At very minimum, you'll need the core module in your application's classpath (as a Maven `<dependency>`):

pom.xml

```
<dependency>
    <groupId>org.springframework.social</groupId>
    <artifactId>spring-social-core</artifactId>
    <version>2.0.0.M4</version>
</dependency>
```

Or, if you're using Gradle to build your project:

build.gradle

```
compile "org.springframework.social:spring-social-core:2.0.0.M4"
```

To let Spring Social handle the back-and-forth authorization handshake between your web application and a service provider, you'll need the web module:

pom.xml

```
<dependency>
    <groupId>org.springframework.social</groupId>
    <artifactId>spring-social-web</artifactId>
    <version>2.0.0.M4</version>
```

```
</dependency>
```

You'll probably want to take advantage of Spring Social's simplified configuration support for XML and/or Java configuration. If so, you'll need the config module:

pom.xml

```
<dependency>
    <groupId>org.springframework.social</groupId>
    <artifactId>spring-social-config</artifactId>
    <version>2.0.0.M4</version>
</dependency>
```

If you want to integrate Spring Social with Spring Security to enable users to sign into your application via Facebook, Twitter, or another provider, you'll need the security module:

pom.xml

```
<dependency>
    <groupId>org.springframework.social</groupId>
    <artifactId>spring-social-security</artifactId>
    <version>2.0.0.M4</version>
</dependency>
```

Final GA releases of Spring Social will be available in the Maven Central repository. But if you are developing against a milestone or release candidate version, such as 1.1.0.M1 or 1.1.0.RC1, then you will need to add the following repository to your build in order to resolve the artifacts:

pom.xml

```
<repository>
    <id>org.springframework.maven.milestone</id>
    <name>Spring Maven Milestone Repository</name>
        <url>http://repo.spring.io/milestone</url>
</repository>
```

Similarly, if you are trying out the latest nightly build version (e.g. 1.1.0.BUILD-SNAPSHOT), you will need to add the following repository:

pom.xml

```
<repository>
```

```
    <id>org.springframework.maven.snapshot</id>
    <name>Spring Maven Snapshot Repository</name>
        <url>http://repo.spring.io/snapshot</url>
</repository>
```

1.2.3. Client modules

In addition to modules that make up the core Spring Social project, there are a number of provider-specific client modules that are released separately that provide connectivity and API bindings to popular SaaS providers. These client modules are listed in Spring Social Client Modules.

Table 2. Spring Social Client Modules

Name	Maven group ID	Maven artifact ID
Spring Social Facebook	org.springframework.social	spring-social-facebook
Spring Social Twitter	org.springframework.social	spring-social-twitter
Spring Social LinkedIn	org.springframework.social	spring-social-linkedin
Spring Social GitHub	org.springframework.social	spring-social-github
Spring Social TripIt	org.springframework.social	spring-social-tripit

All of these modules are optional, depending on the connectivity needs of your application. For instance, if your application will connect with Facebook, you'll want to add the Facebook module to your project. In Gradle:

build.gradle

```
compile "org.springframework.social:spring-social-facebook:2.0.0.M4"
```

Or in Maven:

pom.xml

```
<dependency>
    <groupId>org.springframework.social</groupId>
    <artifactId>spring-social-facebook</artifactId>
    <version>2.0.0.M4</version>
</dependency>
```

Note that each of the client modules will progress and release on a different schedule than Spring Social. Consequently, the version numbers for any given client module may not align with Spring Social or any other client module.

Refer to each client module's reference documentation for details on connectivity and the API binding.

1.2.4. Dependencies

Spring Social depends on a few things to run. Most dependencies are optional and an effort has been made to keep the required dependencies to a minimum. The project dependencies are described in this section.

Java

Spring Social requires Java 1.6 or greater.

Java Servlet API

The Spring Social web support requires Java Servlet 2.5 or greater (Tomcat 6+). We recommend, however, that you use Java Servlet 3.0 or greater.

Spring Framework

Spring Social depends on `RestTemplate` provided by the core Spring Framework in the spring-web module. It requires Spring Framework version 3.1 or above, although Spring Framework 4.0 is recommended.

Spring Security Crypto

If you're not already using Spring Security to secure your application, you'll need to add the standalone crypto module. This is required for OAuth1 request signing and encrypting credentials when persisting connection data. If you're already using Spring Security, there is nothing for you to do because the crypto library comes included.

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pom.xml

```
<dependency>
    <groupId>org.springframework.security</groupId>
    <artifactId>spring-security-crypto</artifactId>
    <version>5.0.0.M2</version>
</dependency>
```

Apache HttpComponents

Spring Social has an optional dependency on Apache HttpComponents. If the HttpComponents HttpClient library is present, it will use it as the HTTP client (which is generally recommended). Otherwise, it will fall back on standard J2SE facilities.

pom.xml

```
<dependency>
    <groupId>org.apache.httpcomponents</groupId>
    <artifactId>httpclient</artifactId>
    <version>4.5.3</version>
</dependency>
```

Even thought HttpComponents is an optional dependency, we strongly recommend it over the fallback option.

Jackson JSON Processor

Spring Social's provider API bindings rely on the Jackson JSON Processor to map JSON responses to Java objects. Each binding, such as Facebook or Twitter, transitively depends on Jackson 2.9.0.pr3, so there's nothing special to do to add Jackson to your project's Maven or Gradle build.

2. Service Provider *Connect* Framework

The `spring-social-core` module includes a *Service Provider Connect Framework* for managing connections to Software-as-a-Service (SaaS) providers such as Facebook and Twitter. This framework allows your application to establish connections between local user accounts and accounts those users have with external service providers. Once a connection is established, it can be be used to obtain a strongly-typed Java binding to the

Service Provider's API, giving your application the ability to invoke the API on behalf of a user.

To illustrate, consider Facebook as an example ServiceProvider. Suppose your application, AcmeApp, allows users to share content with their Facebook friends. To support this, a connection needs to be established between a user's AcmeApp account and her Facebook account. Once established, a Facebook instance can be obtained and used to post content to the user's wall. Spring Social's *Connect*framework provides a clean API for managing service provider connections such as this.

2.1. Core API

The `Connection<A>` interface models a connection to an external service provider such as Facebook:

```
public interface Connection<A> extends Serializable {

    ConnectionKey getKey();

    String getDisplayName();

    String getProfileUrl();

    String getImageUrl();

    void sync();

    boolean test();

    boolean hasExpired();

    void refresh();

    UserProfile fetchUserProfile();

    void updateStatus(String message);

    A getApi();

    ConnectionData createData();
```

```
}
```

Each `Connection` is uniquely identified by a composite key consisting of a `providerId` (e.g. *facebook*) and connected `providerUserId` (e.g. *738140579*, for Craig Walls' Facebook ID). This key tells you what provider user the connection is connected to.

A `Connection` has a number of meta-properties that can be used to render it on a screen, including a `displayName`, `profileUrl`, and `imageUrl`. As an example, the following HTML template snippet could be used to generate a link to the connected user's profile on the provider's site:

```
<img src="${connection.imageUrl}" /> <a
href="${connection.profileUrl}">${connection.displayName}</a>
```

The value of these properties may depend on the state of the provider user's profile. In this case, `sync()` can be called to synchronize these values if the user's profile is updated.

A `Connection` can be tested to determine if its authorization credentials are valid. If invalid, the connection may have expired or been revoked by the provider. If the connection has expired, a connection may be refreshed to renew its authorization credentials.

A `Connection` provides several operations that allow the client application to invoke the `ServiceProvider`'s API in a uniform way. This includes the ability to fetch a model of the user's profile and update the user's status in the provider's system.

A `Connection`'s parameterized type `<A>` represents the Java binding to the `ServiceProvider`'s native API. An instance of this API binding can be obtained by calling `getApi()`. As an example, a Facebook connection instance would be parameterized as `Connection<Facebook>`. `getApi()` would return a `Facebook` instance that provides a Java binding to Facebook's graph API for a specific Facebook user.

Finally, the internal state of a connection can be captured for transfer between layers of your application by calling `createData()`. This could be used to persist the connection in a database, or serialize it over the network.

To put this model into action, suppose we have a reference to a `Connection<Twitter>` instance. Suppose the connected user is the Twitter user with screen name *jbauer*.

1. `Connection#getKey()` would return (*twitter*, *14710604*) where *14710604* is @jbauer's Twitter-assigned user id that never changes.
2. `Connection#getDisplayName()` would return *@jbauer*.
3. `Connection#getProfileUrl()` would return *http://twitter.com/jbauer*.
4. `Connection#getImageUrl()` would return *http://a0.twimg.com/profile_images/105951287/IMG_5863_2_normal.jpg*.
5. `Connection#sync()` would synchronize the state of the connection with @jbauer's profile.
6. `Connection#test()` would return `true` indicating the authorization credentials associated with the Twitter connection are valid. This assumes Twitter has not revoked the AcmeApp client application, and @jbauer has not reset his authorization credentials (Twitter connections do not expire).
7. `Connection#hasExpired()` would return `false`.
8. `Connection#refresh()` would not do anything since connections to Twitter do not expire.
9. `Connection#fetchUserProfile()` would make a remote API call to Twitter to get @jbauer's profile data and normalize it into a `UserProfile` model.
10. `Connection#updateStatus(String)` would post a status update to @jbauer's timeline.
11. `Connection#getApi()` would return a Twitter giving the client application access to the full capabilities of Twitter's native API.
12. `Connection#createData()` would return `ConnectionData` that could be serialized and used to restore the connection at a later time.

2.2. Establishing connections

So far we have discussed how existing connections are modeled, but we have not yet discussed how new connections are established. The manner in which connections between local users and provider users are established varies based on the authorization protocol used by the `ServiceProvider`. Some service providers use OAuth, others use HTTP Basic Auth, others may use something else. Spring Social currently provides native support for OAuth-based service providers, including support for OAuth 1 and OAuth 2. This covers the leading social networks, such as Facebook and Twitter, all of which use

OAuth to secure their APIs. Support for other authorization protocols can be added by extending the framework.

Each authorization protocol is treated as an implementation detail where protocol-specifics are kept out of the core Connection API. A `ConnectionFactory` abstraction encapsulates the construction of connections that use a specific authorization protocol. In the following sections, we will discuss the major `ConnectionFactory` classes provided by the framework. Each section will also describe the protocol-specific flow required to establish a new connection.

2.2.1. OAuth2 service providers

OAuth 2 is rapidly becoming a preferred authorization protocol, and is used by major service providers such as Facebook, Github, Foursquare, and Google. In Spring Social, an `OAuth2ConnectionFactory` is used to establish connections with a OAuth2-based service provider:

```
public class OAuth2ConnectionFactory<A> extends ConnectionFactory<A> {

    public OAuth2Operations getOAuthOperations();

    public Connection<A> createConnection(AccessGrant accessGrant);

    public Connection<A> createConnection(ConnectionData data);

    public void setScope(String scope);

    public String getScope();

    public String generateState();

    public boolean supportsStateParameter();

}
```

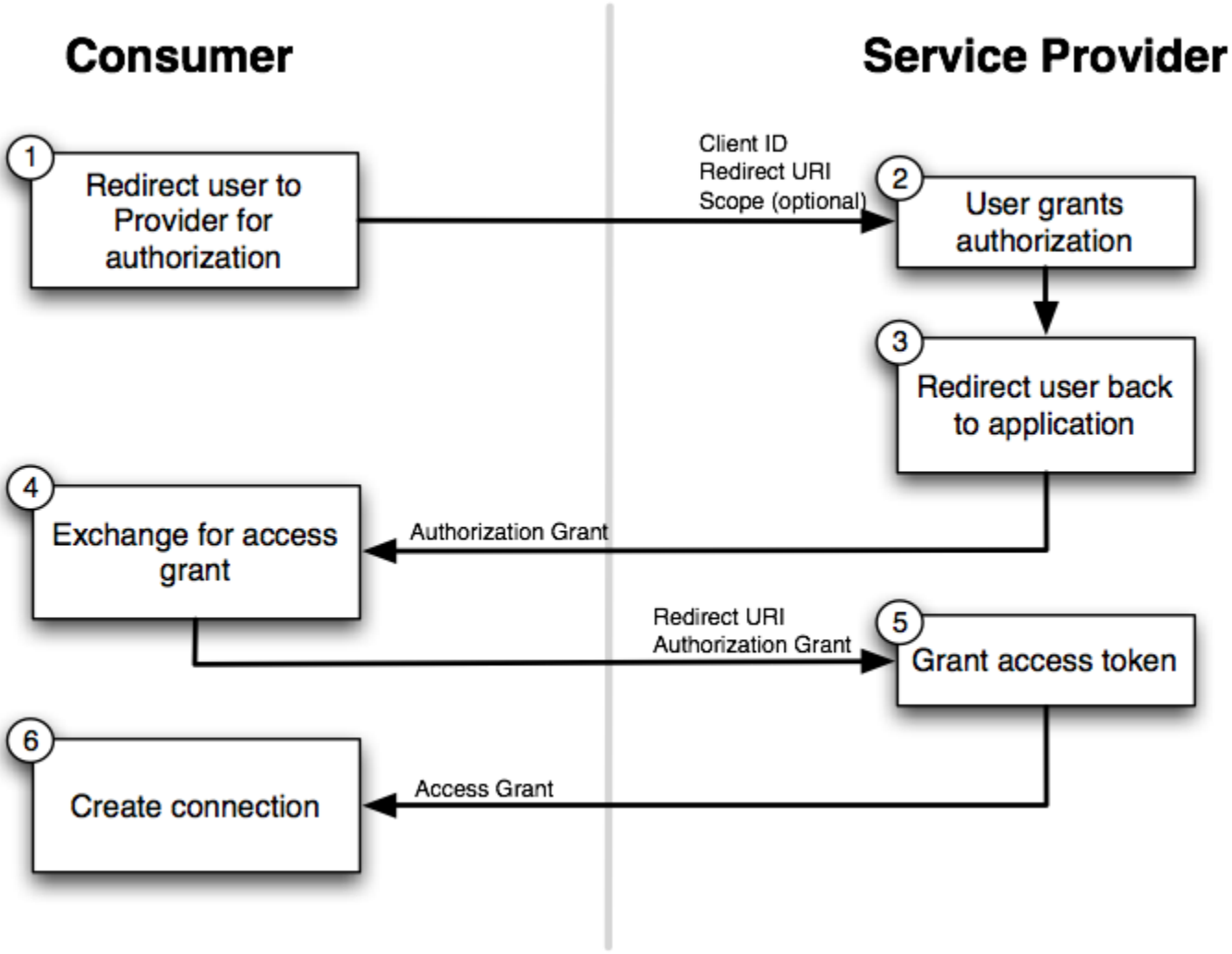
`getOAuthOperations()` returns an API to use to conduct the authorization flow, or "OAuth Dance", with a service provider. The result of this flow is an `AccessGrant` that can be used to establish a connection with a local user account by calling `createConnection()`. The `OAuth2Operations` interface is shown below:

Spring Social

```
public interface OAuth2Operations {

    String buildAuthorizeUrl(OAuth2Parameters parameters);

    String buildAuthorizeUrl(GrantType grantType, OAuth2Parameters
parameters);

    String buildAuthenticateUrl(OAuth2Parameters parameters);

    String buildAuthenticateUrl(GrantType grantType, OAuth2Parameters
parameters);

    AccessGrant exchangeForAccess(String authorizationCode, String
redirectUri,
        MultiValueMap<String, String> additionalParameters);

    AccessGrant exchangeCredentialsForAccess(String username, String
password,
        MultiValueMap<String, String> additionalParameters);

    AccessGrant refreshAccess(String refreshToken,
        MultiValueMap<String, String> additionalParameters);

    AccessGrant authenticateClient();

    AccessGrant authenticateClient(String scope);

}
```

Callers are first expected to call `buildAuthorizeUrl(GrantType, OAuth2Parameters)` to construct the URL to redirect the user to for connection authorization. Upon user authorization, the authorization code returned by the provider should be exchanged for an `AccessGrant`. The `AccessGrant` should then used to create a connection. This flow is illustrated below:

Spring Social



As you can see, there is a back-and-forth conversation that takes place between the application and the service provider to grant the application access to the provider account. This exchange, commonly known as the "OAuth Dance", follows these steps:

1. The flow starts by the application redirecting the user to the provider's authorization URL. Here the provider displays a web page asking the user if he or she wishes to grant the application access to read and update their data.
2. The user agrees to grant the application access.
3. The service provider redirects the user back to the application (via the redirect URI), passing an authorization code as a parameter.
4. The application exchanges the authorization code for an access grant.

5. The service provider issues the access grant to the application. The grant includes an access token and a refresh token. One receipt of these tokens, the "OAuth dance" is complete.
6. The application uses the `AccessGrant` to establish a connection between the local user account and the external provider account. With the connection established, the application can now obtain a reference to the Service API and invoke the provider on behalf of the user.

The example code below shows use of a `FacebookConnectionFactory` to create a connection to Facebook using the OAuth2 server-side flow illustrated above. Here, `FacebookConnectionFactory` is a subclass of `OAuth2ConnectionFactory`:

```
FacebookConnectionFactory connectionFactory =
    new FacebookConnectionFactory("clientId", "clientSecret");
OAuth2Operations oauthOperations =
connectionFactory.getOAuthOperations();
OAuth2Parameters params = new OAuth2Parameters();
params.setRedirectUri("https://my-callback-url");
String authorizeUrl = oauthOperations.buildAuthorizeUrl(params);
response.sendRedirect(authorizeUrl);

// upon receiving the callback from the provider:
AccessGrant accessGrant =
oauthOperations.exchangeForAccess(authorizationCode, "https://my-
callback-url", null);
Connection<Facebook> connection =
connectionFactory.createConnection(accessGrant);
```

The following example illustrates the client-side "implicit" authorization flow also supported by OAuth2. The difference between this flow and the server-side "authorization code" flow above is the provider callback directly contains the access grant (no additional exchange is necessary). This flow is appropriate for clients incapable of keeping the access grant credentials confidential, such as a mobile device or JavaScript-based user agent.

```
FacebookConnectionFactory connectionFactory =
    new FacebookConnectionFactory("clientId", "clientSecret");
OAuth2Operations oauthOperations =
connectionFactory.getOAuthOperations();
OAuth2Parameters params = new OAuth2Parameters();
params.setRedirectUri("https://my-callback-url");
```

```
String authorizeUrl =
oauthOperations.buildAuthorizeUrl(GrantType.IMPLICIT_GRANT, params);
response.sendRedirect(authorizeUrl);

// upon receiving the callback from the provider:
AccessGrant accessGrant = new AccessGrant(accessToken);
Connection<Facebook> connection =
connectionFactory.createConnection(accessGrant);
```

2.2.2. OAuth1 service providers

OAuth 1 is the previous version of the OAuth protocol. It is more complex OAuth 2, and sufficiently different that it is supported separately. Twitter, Linked In, and TripIt are some of the well-known ServiceProviders that use OAuth 1. In Spring Social, the `OAuth1ConnectionFactory` allows you to create connections to a OAuth1-based Service Provider:

```
public class OAuth1ConnectionFactory<A> extends ConnectionFactory<A> {

    public OAuth1Operations getOAuthOperations();

    public Connection<A> createConnection(OAuthToken accessToken);

    public Connection<A> createConnection(ConnectionData data);

}
```

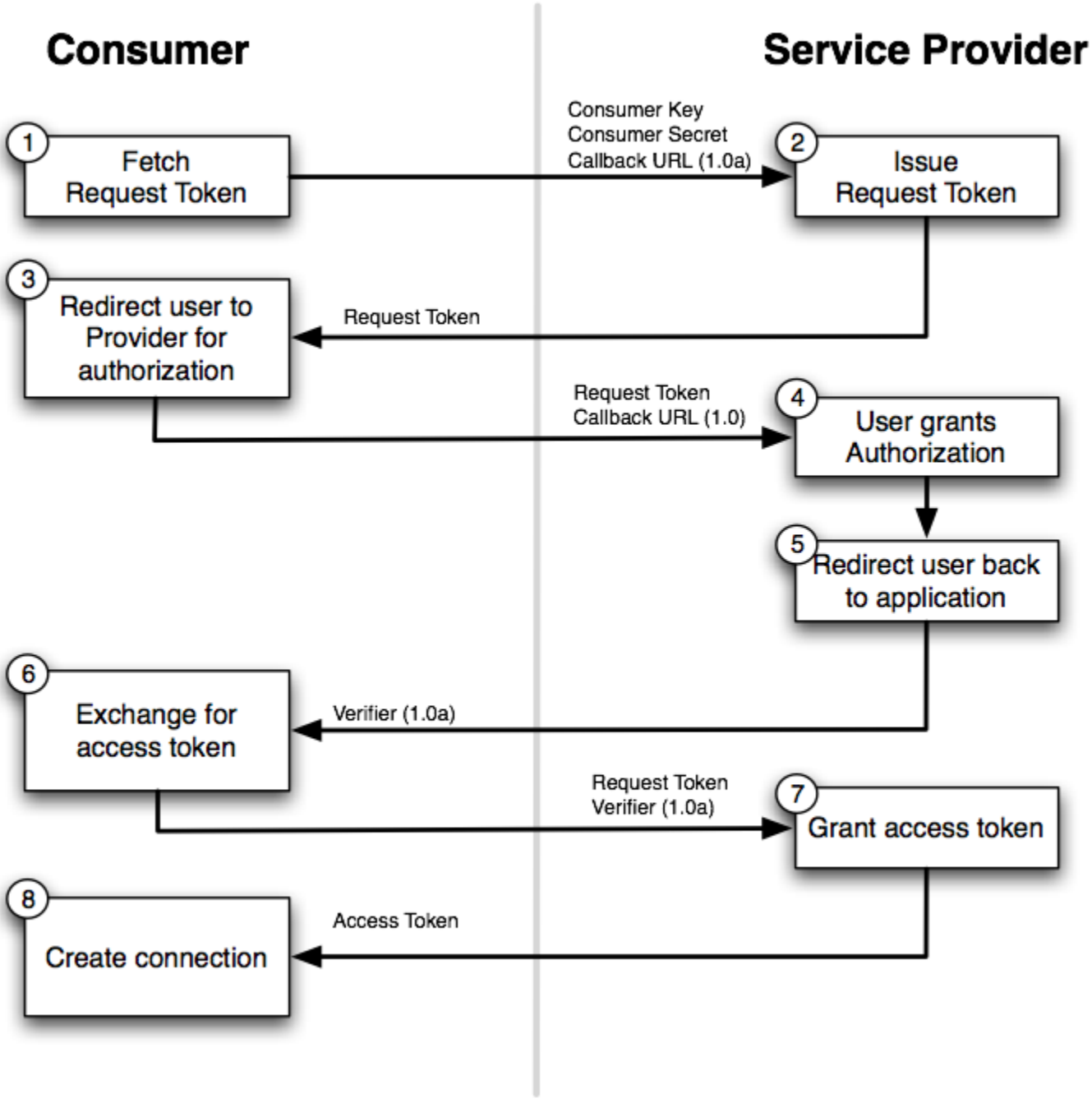
Like a OAuth2-based provider, `getOAuthOperations()` returns an API to use to conduct the authorization flow, or "OAuth Dance". The result of the OAuth 1 flow is an `OAuthToken` that can be used to establish a connection with a local user account by calling `createConnection()`. The `OAuth1Operations` interface is shown below:

```
public interface OAuth1Operations {

    OAuth1Version getVersion();

    OAuthToken fetchRequestToken(String callbackUrl,
        MultiValueMap<String, String> additionalParameters);
```

```
    String buildAuthorizeUrl(String requestToken, OAuth1Parameters
parameters);

    String buildAuthenticateUrl(String requestToken, OAuth1Parameters
parameters);

    OAuthToken exchangeForAccessToken(AuthorizedRequestToken
requestToken,
        MultiValueMap<String, String> additionalParameters);

}
```

Callers are first expected to call `fetchNewRequestToken(String)` to obtain a temporary token from the service provider to use during the authorization session. Next, callers should call `buildAuthorizeUrl(String, OAuth1Parameters)` to construct the URL to redirect the user to for connection authorization. Upon user authorization, the authorized request token returned by the provider should be exchanged for an access token. The access token should then used to create a connection. This flow is illustrated below:

Spring Social



1. The flow starts with the application asking for a request token. The purpose of the request token is to obtain user approval and it can only be used to obtain an access token. In OAuth 1.0a, the consumer callback URL is passed to the provider when asking for a request token.

2. The service provider issues a request token to the consumer.
3. The application redirects the user to the provider's authorization page, passing the request token as a parameter. In OAuth 1.0, the callback URL is also passed as a parameter in this step.
4. The service provider prompts the user to authorize the consumer application and the user agrees.
5. The service provider redirects the user's browser back to the application (via the callback URL). In OAuth 1.0a, this redirect includes a verifier code as a parameter. At this point, the request token is authorized.
6. The application exchanges the authorized request token (including the verifier in OAuth 1.0a) for an access token.
7. The service provider issues an access token to the consumer. The "dance" is now complete.
8. The application uses the access token to establish a connection between the local user account and the external provider account. With the connection established, the application can now obtain a reference to the Service API and invoke the provider on behalf of the user.

The example code below shows use of a `TwitterConnectionFactory` to create a connection to Twitter using the OAuth1 server-side flow illustrated above. Here, `TwitterConnectionFactory` is a subclass of `OAuth1ConnectionFactory`:

```
TwitterConnectionFactory connectionFactory =
    new TwitterConnectionFactory("consumerKey", "consumerSecret");
OAuth1Operations oauthOperations =
connectionFactory.getOAuthOperations();
OAuthToken requestToken =
oauthOperations.fetchRequestToken("https://my-callback-url", null);
String authorizeUrl = oauthOperations.buildAuthorizeUrl(requestToken,
OAuth1Parameters.NONE);
response.sendRedirect(authorizeUrl);

// upon receiving the callback from the provider:
OAuthToken accessToken = oauthOperations.exchangeForAccessToken(
    new AuthorizedRequestToken(requestToken, oauthVerifier), null);
Connection<Twitter> connection =
connectionFactory.createConnection(accessToken);
```

2.2.3. Registering ConnectionFactory instances

As you will see in subsequent sections of this reference guide, Spring Social provides infrastructure for establishing connections to one or more providers in a dynamic, self-service manner. For example, one client application may allow users to connect to Facebook, Twitter, and LinkedIn. Another might integrate Github and Pivotal Tracker. In Java configuration, you can configure connection factories by overriding `SocialConfigurer`'s `addConnectionFactories()` method:

```
@Override
public void addConnectionFactories(ConnectionFactoryConfigurer
cfConfig, Environment env) {
	cfConfig.addConnectionFactory(new
TwitterConnectionFactory("clientId", "clientSecret"));
	cfConfig.addConnectionFactory(new
TwitterConnectionFactory("consumerKey", "consumerSecret"));
	cfConfig.addConnectionFactory(new
LinkedInConnectionFactory("consumerKey", "consumerSecret"));
}
```

This creates a registry of connection factories that other objects can use to lookup connection factories dynamically. The connection factory registry implements the `ConnectionFactoryLocator` interface:

```
public interface ConnectionFactoryLocator {

    ConnectionFactory<?> getConnectionFactory(String providerId);

    <A> ConnectionFactory<A> getConnectionFactory(Class<A> apiType);

    Set<String> registeredProviderIds();

}
```

Example usage of a `ConnectionFactoryLocator` is shown below:

```
// generic lookup by providerId
ConnectionFactory<?> connectionFactory =
locator.getConnectionFactory("facebook");
```

```
// typed lookup by service api type
ConnectionFactory<Facebook> connectionFactory =
locator.getConnectionFactory(Facebook.class);
```

2.3. Persisting connections

After a connection has been established, you may wish to persist it for later use. This makes things convenient for the user since a connection can simply be restored from its persistent form and does not need to be established again. Spring Social provides a `ConnectionRepository` interface for managing the persistence of a user's connections:

```
public interface ConnectionRepository {

    MultiValueMap<String, Connection<?>> findAllConnections();

    List<Connection<?>> findConnections(String providerId);

    <A> List<Connection<A>> findConnections(Class<A> apiType);

    MultiValueMap<String, Connection<?>> findConnectionsToUsers(
        MultiValueMap<String, String> providerUserIds);

    Connection<?> getConnection(ConnectionKey connectionKey);

    <A> Connection<A> getConnection(Class<A> apiType, String
providerUserId);

    <A> Connection<A> getPrimaryConnection(Class<A> apiType);

    <A> Connection<A> findPrimaryConnection(Class<A> apiType);

    void addConnection(Connection<?> connection);

    void updateConnection(Connection<?> connection);

    void removeConnections(String providerId);

    void removeConnection(ConnectionKey connectionKey);

}
```

As you can see, this interface provides a number of operations for adding, updating, removing, and finding `Connection`s. Consult the JavaDoc API of this interface for a full description of these operations. Note that all operations on this repository are scoped relative to the "current user" that has authenticated with your local application. For standalone, desktop, or mobile environments that only have one user this distinction isn't important. In a multi-user web application environment, this implies `ConnectionRepository` instances will be request-scoped.

For multi-user environments, Spring Social provides a `UsersConnectionRepository` that provides access to the global store of connections across all users:

```
public interface UsersConnectionRepository {

    List<String> findUserIdsWithConnection(Connection<?> connection);

    Set<String> findUserIdsConnectedTo(String providerId, Set<String>
providerUserIds);

    ConnectionRepository createConnectionRepository(String userId);

}
```

As you can see, this repository acts as a factory for `ConnectionRepository` instances scoped to a single user, as well as exposes a couple of multi-user operations. These operations include the ability to lookup the local userIds associated with connections to support provider user sign-in and "registered friends" scenarios. Consult the JavaDoc API of this interface for a full description.

2.3.1. JDBC-based persistence

Spring Social provides a `JdbcUsersConnectionRepository` implementation capable of persisting connections to a RDBMS. The database schema designed to back this repository is defined as follows:

```
create table UserConnection (userId varchar(255) not null,
    providerId varchar(255) not null,
    providerUserId varchar(255),
    rank int not null,
```

```
    displayName varchar(255),
    profileUrl varchar(512),
    imageUrl varchar(512),
    accessToken varchar(512) not null,
    secret varchar(512),
    refreshToken varchar(512),
    expireTime bigint,
    primary key (userId, providerId, providerUserId));
create unique index UserConnectionRank on UserConnection(userId,
providerId, rank);
```

For convenience in bootstrapping the schema from a running application, this schema definition is available in the `spring-social-core` module as a resource at the path /org/springframework/social/connect/jdbc/JdbcUsersConnectionRepository.sql. Note that although this schema was designed with compatibility in mind, it may not be compatible with all databases. You may need to adapt this schema definition to accommodate any peculiarities of your chosen database.

The implementation also provides support for encrypting authorization credentials so they are not stored in plain-text.

The example code below demonstrates construction and usage of a `JdbcUsersConnectionRepository`:

```
// JDBC DataSource pointing to the DB where connection data is stored
DataSource dataSource = ...;

// locator for factories needed to construct Connections when
restoring from persistent form
ConnectionFactoryLocator connectionFactoryLocator = ...;

// encryptor of connection authorization credentials
TextEncryptor encryptor = ...;

UsersConnectionRepository usersConnectionRepository =
    new JdbcUsersConnectionRepository(dataSource,
connectionFactoryLocator, encryptor);

// create a connection repository for the single-user 'jbauer'
ConnectionRepository repository =
usersConnectionRepository.createConnectionRepository("jbauer");
```

```
// find jbauer's primary Facebook connection
Connection<Facebook> connection =
repository.findPrimaryConnection(Facebook.class);
```

2.3.2. *Persisting connections in memory*

As a convenient alternative to `JdbcUsersConnectionRepository` and `JdbcConnectionRepository`, Spring Social also provides `InMemoryUsersConnectionRepository` and `InMemoryConnectionRepository`. These in-memory repositories are useful for development-time and testing, but aren't recommended for production use.

The example code below demonstrates construction and usage of an `InMemoryUsersConnectionRepository`:

```
// locator for factories needed to construct Connections when
restoring from persistent form
ConnectionFactoryLocator connectionFactoryLocator = ...;

UsersConnectionRepository usersConnectionRepository =
    new InMemoryUsersConnectionRepository(connectionFactoryLocator);

// create a connection repository for the single-user 'jbauer'
ConnectionRepository repository =
usersConnectionRepository.createConnectionRepository("jbauer");

// find jbauer's primary Facebook connection
Connection<Facebook> connection =
repository.findPrimaryConnection(Facebook.class);
```

3. Connecting to Service Providers

In Service Provider *Connect* Framework, you learned how Spring Social's *Service Provider Connect Framework* can be used to manage user connections that link your

application's user accounts with accounts on external service providers. In this chapter, you'll learn how to control the connect flow in a web application environment.

Spring Social's `spring-social-web` module includes `ConnectController`, a Spring MVC controller that coordinates the connection flow between an application and service providers. `ConnectController` takes care of redirecting the user to the service provider for authorization and responding to the callback after authorization.

3.1. Configuring ConnectController

As `ConnectController` directs the overall connection flow, it depends on several other objects to do its job. Before getting into those, first we'll define a single Java `@Configuration` class where the various Spring Social objects, including `ConnectController`, will be configured:

```
@Configuration
@EnableSocial
public class SocialConfig implements SocialConfigurer {
  ...
}
```

`ConnectController` delegates to one or more `ConnectionFactory` instances to establish connections to providers on behalf of users. Once a connection has been established, it delegates to a `ConnectionRepository` to persist user connection data. Therefore, we'll also need to configure one or more `ConnectionFactory`s and a `ConnectionRepository`.

Each of the Spring Social provider modules includes a `ConnectionFactory` implementation:

- org.springframework.social.twitter.connect.TwitterConnectionFactory
- org.springframework.social.facebook.connect.FacebookConnectionFactory
- org.springframework.social.linkedin.connect.LinkedInConnectionFactory
- org.springframework.social.tripit.connect.TripItConnectionFactory
- org.springframework.social.github.connect.GitHubConnectionFactory

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To register one or more `ConnectionFactory` objects, override the `addConnectionFactories()` method from `SocialConfigurer` as follows:

```
@Configuration
public class SocialConfig implements SocialConfigurer {

    @Override
    public void addConnectionFactories(ConnectionFactoryConfigurer
cfConfig, Environment env) {
        cfConfig.addConnectionFactory(new TwitterConnectionFactory(
            env.getProperty("twitter.consumerKey"),
            env.getProperty("twitter.consumerSecret")));
        cfConfig.addConnectionFactory(new FacebookConnectionFactory(
            env.getProperty("facebook.clientId"),
            env.getProperty("facebook.clientSecret")));
        cfConfig.addConnectionFactory(new LinkedInConnectionFactory(
            env.getProperty("linkedin.consumerKey"),
            env.getProperty("linkedin.consumerSecret")));
    }

    ...
}
```

Here, three connection factories, one each for Facebook, Twitter, and LinkedIn, have been registered. If you would like to support other providers, simply register their connection factories here. Because client ids and secrets may be different across environments (e.g., test, production, etc), we recommend you externalize these values.

As discussed in Persisting connections, `ConnectionRepository` defines operations for persisting and restoring connections for a specific user. Therefore, when configuring a `ConnectionRepository` bean for use by `ConnectController`, it must be scoped such that it can be created on a per-user basis.

But rather than configure a `ConnectionRepository` bean directly and worry about remembering to scope it to request scope, all we must do is configure the `UsersConnectionRepository` bean by implementing `getUsersConnectionRepository()` from `SocialConfigurer`:

```
@Autowired
```

```
DataSource dataSource;

@Override
public UsersConnectionRepository
getUsersConnectionRepository(ConnectionFactoryLocator
connectionFactoryLocator) {
    return new JdbcUsersConnectionRepository(dataSource,
connectionFactoryLocator, Encryptors.noOpText());
}

@Override
public UserIdSource getUserIdSource() {
    return new AuthenticationNameUserIdSource();
}
```

The `JdbcUsersConnectionRepository` object is instantiated with a reference to a `DataSource` (which is configured elsewhere and autowired into this configuration class), the given `ConnectionFactoryLocator`, and a text encryptor. The text encryptor is any implementation of the `TextEncryptor` interface from Spring Security's crypto module. It will be used to encrypt access tokens and secrets when they are stored in the database. In this case, a no-op text encryptor is used, but we recommend that you select a stronger encryptor for production applications.

Internally, Spring Social's configuration support will use the `UsersConnectionRepository` to create a request-scoped `ConnectionRepository` bean. In doing so, it must identify the current user. Therefore, we must also override the `getUserIdSource()` to return an instance of a `UserIdSource`.

In this case, we're returning an instance of `AuthenticationNameUserIdSource`. This implementation of the `UserIdSource` interface assumes that the application is secured with Spring Security. It uses the `SecurityContextHolder` to lookup a `SecurityContext`, and from that return the `name` property of the `Authentication` object.

If your application isn't secured with Spring Security, you'll need to implement the `UserIdSource` interface as appropriate for your application's security mechanism. The `UserIdSource` interface looks like this:

```
package org.springframework.social;
```

```
public interface UserIdSource {
    String getUserId();
}
```

The `getUserId()` method simply returns a `String` that uniquely identifies the current user.

3.1.1. Configuring connection support in XML

Up to this point, the connection support configuration has been done using Spring's Java-based configuration style. But you can configure it in either Java configuration or XML. Here's the XML equivalent of the `ConnectionFactoryRegistry` configuration:

```
<facebook:config app-id="${facebook.clientId}"
                 app-secret="${facebook.clientSecret}"
                 app-namespace="socialshowcase" />
<twitter:config app-id="${twitter.consumerKey}"
                app-secret="${twitter.consumerSecret}"/>
<linkedin:config app-id="${linkedin.consumerKey}"
                 app-secret="${linkedin.consumerSecret}"/>
```

Notice that the three elements in this example come from each provider's own XML configuration namespace. You'll need Spring Social's Facebook. Twitter, and LinkedIn modules in your classpath to make use of these configuration elements.

Spring Social's own configuration namespace offers support for configuring a `JdbcConnectionRepository` like this:

```
<social:jdbc-connection-repository/>
```

The `<social:jdbc-connection-repository/>` element defaults to use a `DataSource` bean whose ID is "dataSource". If you've configured your `DataSource` bean with a different ID, you'll need to explicitly set that:

```
<social:jdbc-connection-repository data-source-ref="myDS" />
```

The `<social:jdbc-connection-repository/>` also defaults to use a `TextEncryptor` bean whose ID is "textEnryptor" and a `UserIdSource` bean whose ID is "userIdSource". If you've given those beans different IDs, then you'll need to explicitly set those as well:

```
<social:jdbc-connection-repository
    data-source-ref="myDS"
    encryptor-ref="encryptor"
    user-id-source-ref="userIdSrc" />
```

3.2. Creating connections with ConnectController

With its dependencies configured, ConnectController now has what it needs to allow users to establish connections with registered service providers. Now, simply add it to your Social @Configuration:

```
@Configuration
public class SocialConfig {

    @Bean
    public ConnectController connectController(
                ConnectionFactoryLocator connectionFactoryLocator,
                ConnectionRepository connectionRepository) {
        return new ConnectController(connectionFactoryLocator,
connectionRepository);
    }

}
```

Or, if you prefer Spring's XML-based configuration, then you can configure ConnectController like this:

```
<bean
class="org.springframework.social.connect.web.ConnectController">
    <!-- relies on by-type autowiring for the constructor-args -->
</bean>
```

`ConnectController` supports authorization flows for OAuth 1 and OAuth 2, relying on `OAuth1Operations` or `OAuth2Operations` to handle the specifics for each protocol. `ConnectController` will obtain the appropriate OAuth operations interface from one of the provider connection factories registered with `ConnectionFactoryRegistry`. It will select a specific `ConnectionFactory` to use by matching the connection factory's ID with the URL path. The path pattern that

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ConnectController handles is "/connect/{providerId}". Therefore, if `ConnectController` is handling a request for "/connect/twitter", then the `ConnectionFactory` whose `getProviderId()` returns "twitter" will be used. (As configured in the previous section, `TwitterConnectionFactory` will be chosen.)

When coordinating a connection with a service provider, `ConnectController` constructs a callback URL for the provider to redirect to after the user grants authorization. By default `ConnectController` uses information from the request to determine the protocol, host name, and port number to use when creating the callback URL. This is fine in many cases, but if your application is hosted behind a proxy those details may point to an internal server and will not be suitable for constructing a public callback URL.

If you have this problem, you can set the `applicationUrl` property to the base external URL of your application. `ConnectController` will use that URL to construct the callback URL instead of using information from the request. For example:

```
@Configuration
public class SocialConfig {

    @Bean
    public ConnectController connectController() {
        ConnectController controller = new ConnectController(
            connectionFactoryLocator(), connectionRepository());

controller.setApplicationUrl(environment.getProperty("application.url"
);
        return controller;
    }

}
```

Or if you prefer XML configuration:

```
<bean
class="org.springframework.social.connect.web.ConnectController">
    <!-- relies on by-type autowiring for the constructor-args -->
    <property name="applicationUrl" value="${application.url}" />
</bean>
```

Just as with the authorization keys and secrets, we recommend that you externalize the application URL because it will likely vary across different deployment environments.

The flow that `ConnectController` follows is slightly different, depending on which authorization protocol is supported by the service provider. For OAuth 2-based providers, the flow is as follows:

- `GET /connect` - Displays a web page showing connection status for all providers.
- `GET /connect/{providerId}` - Displays a web page showing connection status to the provider.
- `POST /connect/{providerId}` - Initiates the connection flow with the provider.
- `GET /connect/{providerId}?code={code}` - Receives the authorization callback from the provider, accepting an authorization code. Uses the code to request an access token and complete the connection.
- `DELETE /connect/{providerId}` - Severs all of the user's connection with the provider.
- `DELETE /connect/{providerId}/{providerUserId}` - Severs a specific connection with the provider, based on the user's provider user ID.

For an OAuth 1 provider, the flow is very similar, with only a subtle difference in how the callback is handled:

- `GET /connect` - Displays a web page showing connection status for all providers.
- `GET /connect/{providerId}` - Displays a web page showing connection status to the provider.
- `POST /connect/{providerId}` - Initiates the connection flow with the provider. *`GET /connect/{providerId}?oauth_token={request token}&oauth_verifier={verifier}`
    - Receives the authorization callback from the provider, accepting a verification code. Exchanges this verification code along with the request token for an access token and completes the connection. The `oauth_verifier` parameter is optional and is only used for providers implementing OAuth 1.0a.
- `DELETE /connect/{providerId}` - Severs all of the user's connection with the provider.

- `DELETE /connect/{providerId}/{providerUserId}` - Severs a specific connection with the provider, based on the user's provider user ID.

3.2.1. Displaying a connection page

Before the connection flow starts in earnest, a web application may choose to show a page that offers the user information on their connection status. This page would offer them the opportunity to create a connection between their account and their social profile. `ConnectController` can display such a page if the browser navigates to `/connect/{provider}`.

For example, to display a connection status page for Twitter, where the provider name is "twitter", your application should provide a link similar to this:

```
<a href="<c:url value="/connect/twitter" />">Connect to Twitter</a>
```

`ConnectController` will respond to this request by first checking to see if a connection already exists between the user's account and Twitter. If not, then it will with a view that should offer the user an opportunity to create the connection. Otherwise, it will respond with a view to inform the user that a connection already exists.

The view names that `ConnectController` responds with are based on the provider's name. In this case, since the provider name is "twitter", the view names are "connect/twitterConnect" and "connect/twitterConnected".

Optionally, you may choose to display a page that shows connection status for all providers. In that case, the link might look like this:

```
<a href="<c:url value="/connect" />">Your connections</a>
```

The view name that `ConnectController` responds with for this URL is "connect/status".

3.2.2. Initiating the connection flow

To kick off the connection flow, the application should `POST` to `/connect/{providerId}`. Continuing with the Twitter example, a JSP view resolved from "connect/twitterConnect" might include the following form:

```
<form action="<c:url value="/connect/twitter" />" method="POST">
```

```
    <p>You haven't created any connections with Twitter yet. Click the
button to create
       a connection between your account and your Twitter profile.
       (You'll be redirected to Twitter where you'll be asked to
authorize the connection.)</p>
    <p><button type="submit"><img src="<c:url
value="/resources/social/twitter/signin.png" />"/>
    </button></p>
</form>
```

When `ConnectController` handles the request, it will redirect the browser to the provider's authorization page. In the case of an OAuth 1 provider, it will first fetch a request token from the provider and pass it along as a parameter to the authorization page. Request tokens aren't used in OAuth 2, however, so instead it passes the application's client ID and redirect URI as parameters to the authorization page.

For example, Twitter's authorization URL has the following pattern:

```
https://twitter.com/oauth/authorize?oauth_token={token}
```

If the application's request token were "vPyVSe"[1], then the browser would be redirected to https://twitter.com/oauth/authorize?oauth_token=vPyVSe and a page similar to the following would be displayed to the user (from Twitter)[2]:

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In contrast, Facebook is an OAuth 2 provider, so its authorization URL takes a slightly different pattern:

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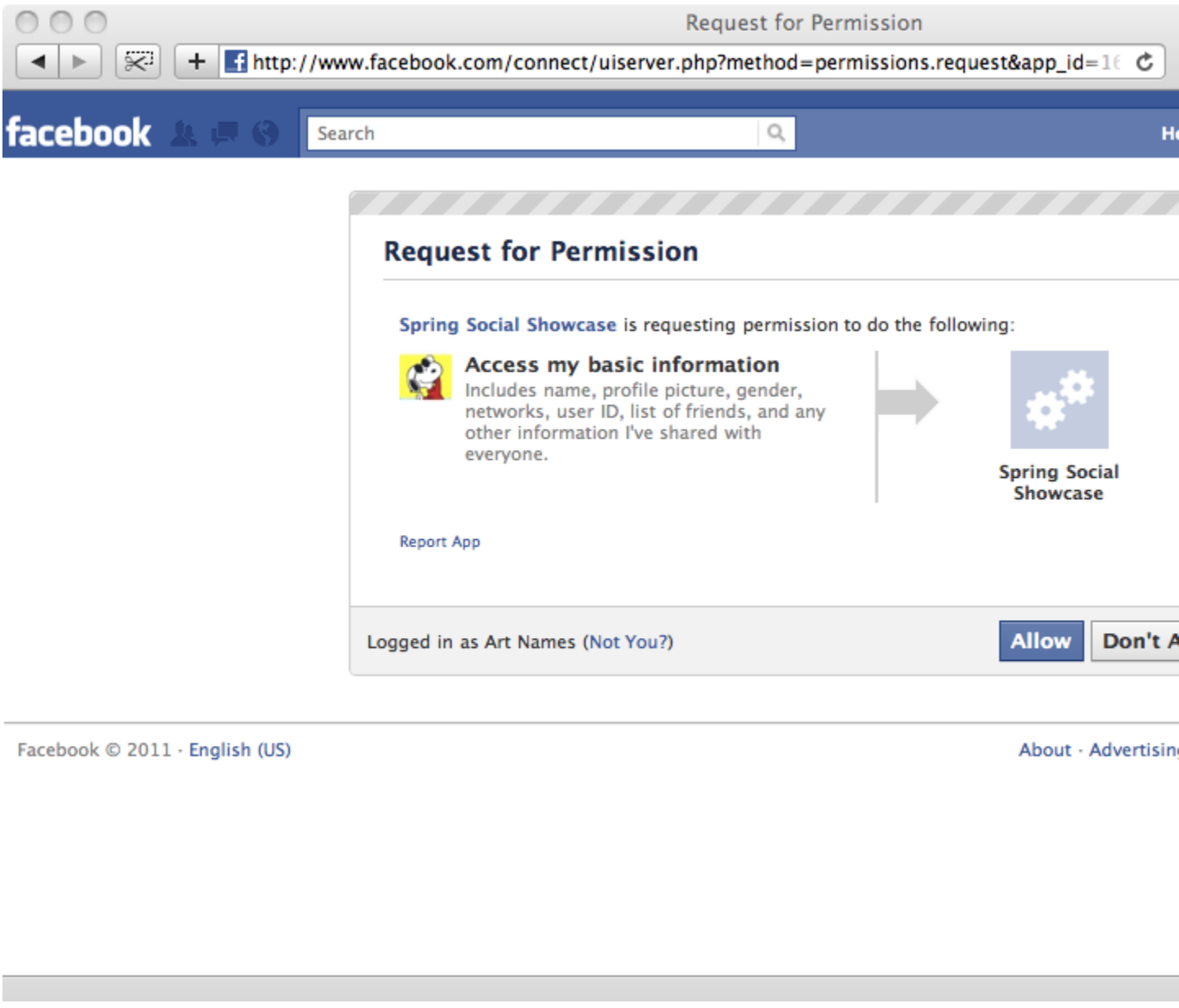
```
https://graph.facebook.com/oauth/authorize?client_id={clientId}&redire
ct_uri={redirectUri}
```

Thus, if the application's Facebook client ID is "0b754" and it's redirect URI is "http://www.mycoolapp.com/connect/facebook", then the browser would be redirected to https://graph.facebook.com/oauth/authorize?client_id=0b754&redirect_uri=http://www.mycoolapp.com/connect/facebook and Facebook would display the following authorization page to the user:



If the user clicks the "Allow" button to authorize access, the provider will redirect the browser back to the authorization callback URL where `ConnectController` will be waiting to complete the connection.

The behavior varies from provider to provider when the user denies the authorization. For instance, Twitter will simply show a page telling the user that they denied the application access and does not redirect back to the application's callback URL. Facebook, on the other hand, will redirect back to the callback URL with error information as request parameters.

3.2.3. Authorization scope

In the previous example of authorizing an application to interact with a user's Facebook profile, you notice that the application is only requesting access to the user's basic profile information. But there's much more that an application can do on behalf of a user with Facebook than simply harvest their profile data. For example, how can an application gain authorization to post to a user's Facebook wall?

OAuth 2 authorization may optionally include a scope parameter that indicates the type of authorization being requested. On the provider, the "scope" parameter should be passed along to the authorization URL. In the case of Facebook, that means that the Facebook authorization URL pattern should be as follows:

```
https://graph.facebook.com/oauth/authorize?client_id={clientId}&redire
ct_uri={redirectUri}&scope={scope}
```

`ConnectController` accepts a "scope" parameter at authorization and passes its value along to the provider's authorization URL. For example, to request permission to post to a user's Facebook wall, the connect form might look like this:

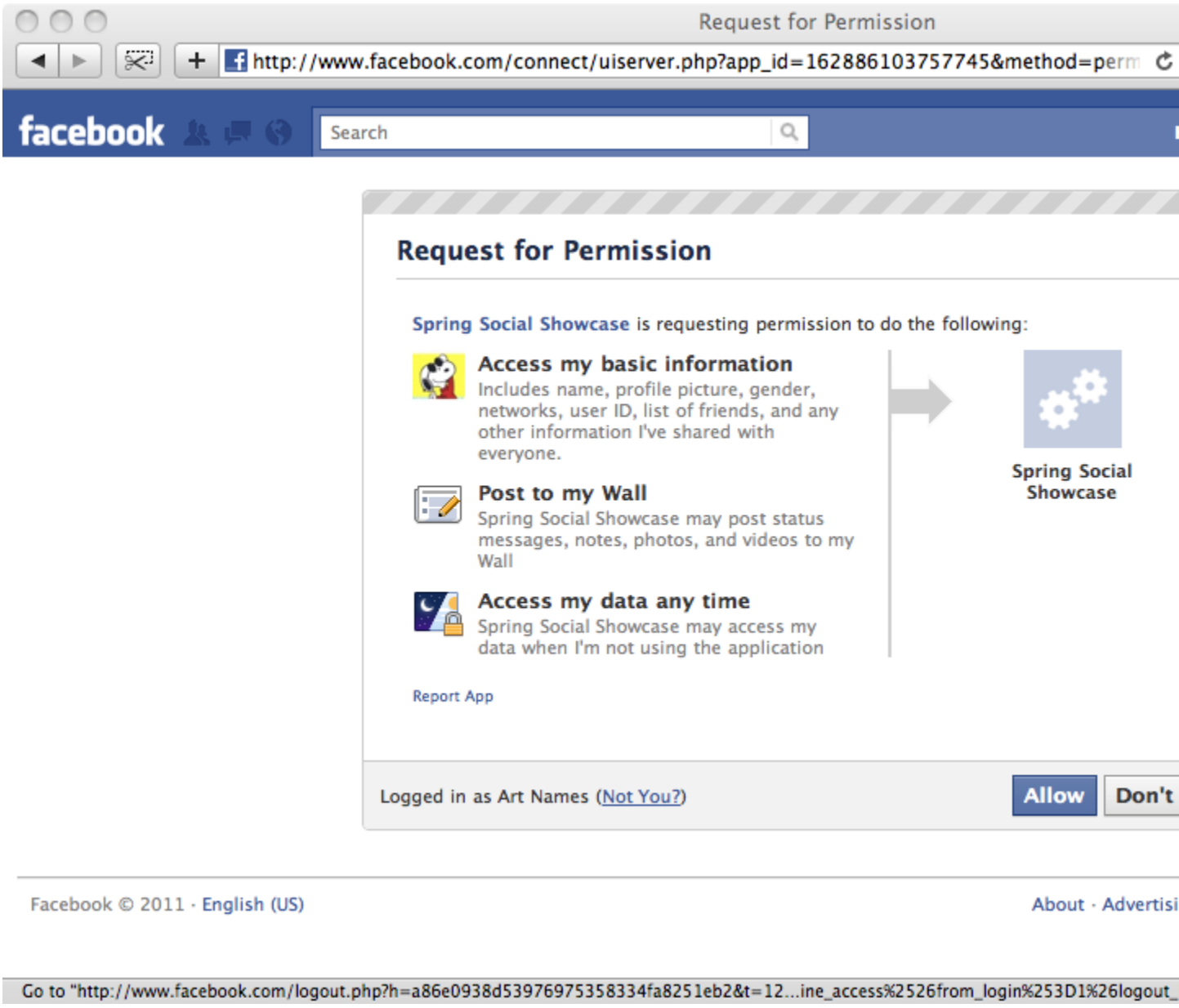
```
<form action="<c:url value="/connect/twitter" />" method="POST">
    <input type="hidden" name="scope"
value="publish_stream,offline_access" />
    <p>You haven't created any connections with Twitter yet. Click the
button to create
       a connection between your account and your Twitter profile.
       (You'll be redirected to Twitter where you'll be asked to
authorize the connection.)</p>
    <p><button type="submit"><img src="<c:url
value="/resources/social/twitter/signin.png" />"/>
    </button></p>
```

```
</form>
```

The hidden "scope" field contains the scope values to be passed along in the `scope>` parameter to Facebook's authorization URL. In this case, "publish_stream" requests permission to post to a user's wall. In addition, "offline_access" requests permission to access Facebook on behalf of a user even when the user isn't using the application.

> OAuth 2 access tokens typically expire after some period of time. Per the OAuth 2 specificati
> accessing a provider after a token expires by using a refresh token to either renew an expire
> access token (all without troubling the user to re-authorize the application).
>
> Facebook does not currently support refresh tokens. Moreover, Facebook access tokens exp
> avoid having to ask your users to re-authorize ever 2 hours, the best way to keep a long-live
> "offline_access".

When asking for "publish_stream,offline_access" authorization, the user will be prompted with the following authorization page from Facebook:



Scope values are provider-specific, so check with the service provider's documentation for the available scopes. Facebook scopes are documented at http://developers.facebook.com/docs/authentication/permissions.

3.2.4. Responding to the authorization callback

After the user agrees to allow the application have access to their profile on the provider, the provider will redirect their browser back to the application's authorization URL with a

code that can be exchanged for an access token. For OAuth 1.0a providers, the callback URL is expected to receive the code (known as a verifier in OAuth 1 terms) in an `oauth_verifier` parameter. For OAuth 2, the code will be in a `code` parameter.

`ConnectController` will handle the callback request and trade in the verifier/code for an access token. Once the access token has been received, the OAuth dance is complete and the application may use the access token to interact with the provider on behalf of the user. The last thing that `ConnectController` does is to hand off the access token to the `ConnectionRepository` implementation to be stored for future use.

3.2.5. Disconnecting

To delete a connection via `ConnectController`, submit a DELETE request to "/connect/{provider}".

In order to support this through a form in a web browser, you'll need to have Spring's HiddenHttpMethodFilter configured in your application's web.xml. Then you can provide a disconnect button via a form like this:

```
<form action="<c:url value="/connect/twitter" />" method="post">
  <div class="formInfo">
    <p>
      Spring Social Showcase is connected to your Twitter account.
      Click the button if you wish to disconnect.
    </p>
  </div>
  <button type="submit">Disconnect</button>
  <input type="hidden" name="_method" value="delete" />
</form>
```

When this form is submitted, `ConnectController` will disconnect the user's account from the provider. It does this by calling the `disconnect()` method on each of the `Connection`s returned by the provider's `getConnections()` method.

3.3. Connection interceptors

In the course of creating a connection with a service provider, you may want to inject additional functionality into the connection flow. For instance, perhaps you'd like to automatically post a tweet to a user's Twitter timeline immediately upon creating the connection.

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`ConnectController` may be configured with one or more connection interceptors that it will call at points in the connection flow. These interceptors are defined by the `ConnectInterceptor` interface:

```
public interface ConnectInterceptor<A> {

    void preConnect(ConnectionFactory<A> connectionFactory,
MultiValueMap<String, String> parameters, WebRequest request);

    void postConnect(Connection<A> connection, WebRequest request);

}
```

The `preConnect()` method will be called by `ConnectController` just before redirecting the browser to the provider's authorization page. Custom authorization parameters may be added to the provided parameter map. `postConnect()` will be called immediately after a connection has been persisted linking the user's local account with the provider profile.

For example, suppose that after connecting a user account with their Twitter profile you want to immediately post a tweet about that connection to the user's Twitter timeline. To accomplish that, you might write the following connection interceptor:

```
public class TweetAfterConnectInterceptor implements
ConnectInterceptor<Twitter> {

    public void preConnect(ConnectionFactory<Twitter> provider,
MultiValueMap<String, String> parameters, WebRequest request) {
        // nothing to do
    }

    public void postConnect(Connection<Twitter> connection, WebRequest
request) {
        connection.updateStatus("I've connected with the Spring Social
Showcase!");
    }
}
```

This interceptor can then be injected into ConnectController when it is created:

```
@Bean
```

```
public ConnectController connectController() {
    ConnectController controller = new
ConnectController(connectionFactoryLocator(),
        connectionRepository());
    controller.addInterceptor(new TweetAfterConnectInterceptor());
    return controller;
}
```

Or, as configured in XML:

```
<bean
class="org.springframework.social.connect.web.ConnectController">
    <property name="interceptors">
        <list>
            <bean
class="org.springframework.social.showcase.twitter.TweetAfterConnectIn
terceptor" />
        </list>
    </property>
</bean>
```

Note that the `interceptors` property is a list and can take as many interceptors as you'd like to wire into it. When it comes time for `ConnectController` to call into the interceptors, it will only invoke the interceptor methods for those interceptors whose service operations type matches the service provider's operations type. In the example given here, only connections made through a service provider whose operation type is `Twitter` will trigger the interceptor's methods.

4. Signing in with Service Provider Accounts

In order to ease sign in for their users, many applications allow sign in with a service provider such as Twitter or Facebook. With this authentication technique, the user signs into (or may already be signed into) his or her provider account. The application then tries to match that provider account to a local user account. If a match is found, the user is automatically signed into the application.

Spring Social supports such provider-based authentication in two different ways:

- `ProviderSignInController` is a Spring MVC controller that performs a similar flow as `ConnectController`, except that it ultimately results in an authentication instead of a new connection.
- `SocialAuthenticationFilter` is a Spring Security filter that plugs into Spring Security's filter chain for provider sign in.

Which of these options you choose will come down to whether or not you are using Spring Security to secure your application. Although both options will work with Spring Security, we recommend using `SocialAuthenticationFilter` in applications where Spring Security is in play. As an implementation of Spring Security's `AuthenticationFilter`, it offers a tighter and more natural integration with Spring Security. `ProviderSignInController`, on the other hand, is agnostic to the security mechanism your application employs and can be used in applications that aren't using Spring Security.

4.1. Enabling provider sign in with `SocialAuthenticationFilter`

`SocialAuthenticationFilter` is an implementation of Spring Security's `AuthenticationFilter`. As such, it plugs into Spring Security's filter chain just like any other authentication filter.

The easiest way to configure `SocialAuthenticationFilter` is to apply `SpringSocialConfigurer` in your Spring Security Java configuration. For example, the following `configure()` method (from the spring-social-showcase-sec sample) configures several factors of web security, including `SpringSocialConfigurer`:

```
@Override
protected void configure(HttpSecurity http) throws Exception {
    http
        .formLogin()
            .loginPage("/signin")
            .loginProcessingUrl("/signin/authenticate")
            .failureUrl("/signin?param.error=bad_credentials")
        .and()
            .logout()
                .logoutUrl("/signout")
```

```
                .deleteCookies("JSESSIONID")
        .and()
            .authorizeRequests()
                .antMatchers("/admin/**", "/favicon.ico",
...).permitAll()
                .antMatchers("/**").authenticated()
        .and()
            .rememberMe()
        .and()
            .apply(new SpringSocialConfigurer());
}
```

4.1.1. Adding a provider sign-in button

`SocialAuthenticationFilter` reacts to requests whose path fits a pattern of "/auth/{providerid}". Therefore, to initiate a provider sign-in flow via `SocialAuthenticationFilter`, you can simply provide a link to "/auth/{providerid}" on a web page. For example, consider the following excerpt from a Thymeleaf template:

```
<!-- TWITTER SIGNIN -->
<p><a th:href="@{/auth/twitter}"><img
th:src="@{/resources/social/twitter/sign-in-with-twitter-d.png}"
border="0"/></a></p>

<!-- FACEBOOK SIGNIN -->
<p><a th:href="@{/auth/facebook}"><img
th:src="@{/resources/social/facebook/sign-in-with-facebook.png}"
border="0"/></a></p>

<!-- LINKEDIN SIGNIN -->
<p><a th:href="@{/auth/linkedin}">Sign In with LinkedIn</a></p>
```

This HTML results in 3 links, one each for Twitter, Facebook, and LinkedIn. When the user clicks on the Twitter link, the browser will navigate to a URL whose path is "/auth/twitter". `SocialAuthenticationFilter` will intercept that request and initiate an authentication flow with Twitter by redirecting the browser to Twitter's authentication page:

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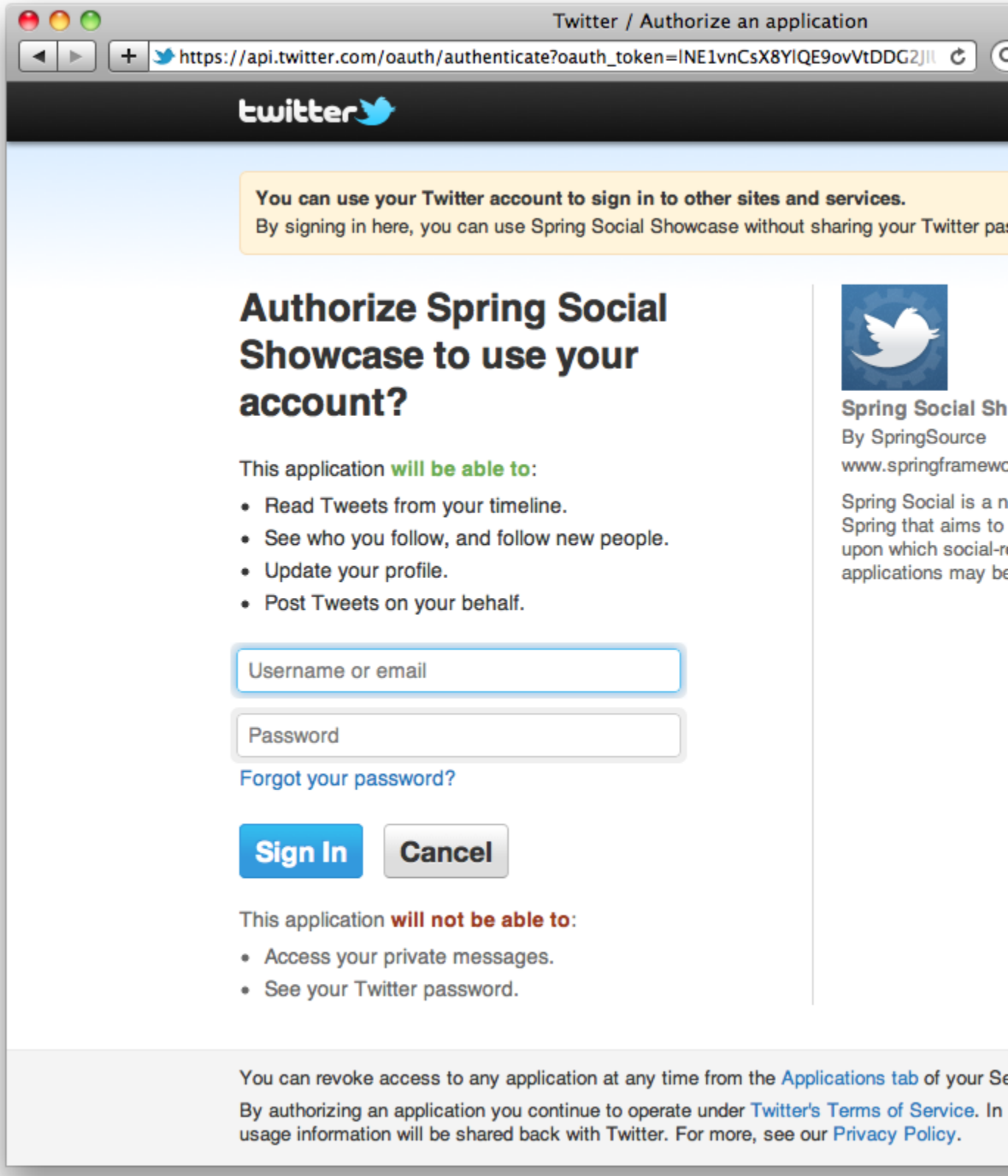

Of course, for `SocialAuthentication` to work, you must have configured a `ConnectionFactory` implementation corresponding to the provider (e.g., `TwitterConnectionFactory`).

4.2. Enabling provider sign in with `ProviderSignInController`

`ProviderSignInController` works very much like `ConnectController` in that it goes through the OAuth flow (either OAuth 1 or OAuth 2, depending on the provider). Instead of creating a connection at the end of process, however, `ProviderSignInController` attempts to find a previously established connection and uses the connected account to authenticate the user with the application. If no previous connection matches, the flow will be sent to the application's sign up page so that the user may register with the application.

To add provider sign in capability to your Spring application, configure `ProviderSignInController` as a bean in your Spring MVC application:

```
@Bean
public ProviderSignInController providerSignInController(
            ConnectionFactoryLocator connectionFactoryLocator,
            UsersConnectionRepository usersConnectionRepository) {
    return new ProviderSignInController(
        connectionFactoryLocator,
        usersConnectionRepository,
        new SimpleSignInAdapter(new HttpSessionRequestCache()));
}
```

Or in XML, if you prefer:

```
<bean
class="org.springframework.social.connect.web.ProviderSignInController
">
    <!-- relies on by-type autowiring for the constructor-args -->
</bean>
```

As with `ConnectController`, `ProviderSignInController` uses information from the request to determine the protocol, host name, and port number to use when creating a

callback URL. But you may set the `applicationUrl` property to the base external URL of your application to overcome any problems where the request refers to an internal server. For example:

```
@Bean
public ProviderSignInController providerSignInController(
            ConnectionFactoryLocator connectionFactoryLocator,
            UsersConnectionRepository usersConnectionRepository) {
    ProviderSignInController controller = new
ProviderSignInController(
        connectionFactoryLocator,
        usersConnectionRepository(),
        new SimpleSignInAdapter(new HttpSessionRequestCache()));

controller.setApplicationUrl(environment.getProperty("application.url"
));
    return controller;
}
```

Or when configured in XML:

```
<bean
class="org.springframework.social.connect.web.ProviderSignInController
">
    <!-- relies on by-type autowiring for the constructor-args -->
    <property name="applicationUrl" value="${application.url}" />
</bean>
```

Once again, we recommend that you externalize the value of the application URL since it will vary between deployment environments.

When authenticating via an OAuth 2 provider, `ProviderSignInController` supports the following flow:

- `POST /signin/{providerId}` - Initiates the sign in flow by redirecting to the provider's authentication endpoint.
- `GET /signin/{providerId}?code={verifier}` - Receives the authentication callback from the provider, accepting a code. Exchanges this code for an access token. Using this access token, it retrieves the user's provider user ID and uses that to lookup a connected account and then authenticates to the application through the sign in service.

- If the provider user ID doesn't match any existing connection, `ProviderSignInController` will redirect to a sign up URL. The default sign up URL is "/signup" (relative to the application root), but can be customized by setting the `signUpUrl` property.
- If the provider user ID matches more than one existing connection, `ProviderSignInController` will redirect to the application's sign in URL to offer the user a chance to sign in through another provider or with their username and password. The request to the sign in URL will have an "error" query parameter set to "multiple_users" to indicate the problem so that the page can communicate it to the user. The default sign in URL is "/signin" (relative to the application root), but can be customized by setting the `signInUrl` property.
- If any error occurs while fetching the access token or while fetching the user's profile data, `ProviderSignInController` will redirect to the application's sign in URL. The request to the sign in URL will have an "error" query parameter set to "provider" to indicate an error occurred while communicating with the provider. The default sign in URL is "/signin" (relative to the application root), but can be customized by setting the `signInUrl` property.

For OAuth 1 providers, the flow is only slightly different:

- `POST /signin/{providerId}` - Initiates the sign in flow. This involves fetching a request token from the provider and then redirecting to the provider's authentication endpoint.
  - If any error occurs while fetching the request token, `ProviderSignInController` will redirect to the application's sign in URL. The request to the sign in URL will have an "error" query parameter set to "provider" to indicate an error occurred while communicating with the provider. The default sign in URL is "/signin" (relative to the application root), but can be customized by setting the `signInUrl` property. * `GET /signin/{providerId}?oauth_token={request token}&oauth_verifier={verifier}`
    - Receives the authentication callback from the provider, accepting a verification code. Exchanges this verification code along with the request token for an access token. Using this access token, it retrieves the user's provider user ID and uses that to lookup a connected account and then authenticates to the application through the sign in service.

- If the provider user ID doesn't match any existing connection, `ProviderSignInController` will redirect to a sign up URL. The default sign up URL is "/signup" (relative to the application root), but can be customized by setting the `signUpUrl` property.
- If the provider user ID matches more than one existing connection, `ProviderSignInController` will redirect to the application's sign in URL to offer the user a chance to sign in through another provider or with their username and password. The request to the sign in URL will have an "error" query parameter set to "multiple_users" to indicate the problem so that the page can communicate it to the user. The default sign in URL is "/signin" (relative to the application root), but can be customized by setting the `signInUrl` property.
- If any error occurs when exchanging the request token for an access token or while fetching the user's profile data, `ProviderSignInController` will redirect to the application's sign in URL. The request to the sign in URL will have an "error" query parameter set to "provider" to indicate an error occurred while communicating with the provider. The default sign in URL is "/signin" (relative to the application root), but can be customized by setting the `signInUrl` property.

4.2.1. ProviderSignInController's dependencies

As shown in the Java-based configuration above, `ProviderSignInController` depends on a handful of other objects to do its job.

- A `ConnectionFactoryLocator` to lookup the `ConnectionFactory` used to create the `Connection` to the provider.
- A `UsersConnectionRepository` to find the user that has the connection to the provider user attempting to sign in.
- A `SignInAdapter` to sign a user into the application when a matching connection is found.

When using XML configuration, it isn't necessary to explicitly configure these constructor arguments because `ProviderSignInController`'s constructor is annotated with `@Inject`. Those dependencies will be given to `ProviderSignInController` via autowiring. You'll still need to make sure they're available as beans in the Spring application context so that they can be autowired.

You should have already configured most of these dependencies when setting up connection support (in the previous chapter). But when used

with `ProviderSignInController`, you should configure them to be created as scoped proxies:

```
@Bean
@Scope(value="singleton", proxyMode=ScopedProxyMode.INTERFACES)
public ConnectionFactoryLocator connectionFactoryLocator() {
    ConnectionFactoryRegistry registry = new
ConnectionFactoryRegistry();

    registry.addConnectionFactory(new FacebookConnectionFactory(
        environment.getProperty("facebook.clientId"),
        environment.getProperty("facebook.clientSecret")));

    registry.addConnectionFactory(new TwitterConnectionFactory(
        environment.getProperty("twitter.consumerKey"),
        environment.getProperty("twitter.consumerSecret")));

    return registry;
}

@Bean
@Scope(value="singleton", proxyMode=ScopedProxyMode.INTERFACES)
public UsersConnectionRepository usersConnectionRepository() {
    return new JdbcUsersConnectionRepository(dataSource,
connectionFactoryLocator(), textEncryptor);
}
```

In the event that the sign in attempt fails, the sign in attempt will be stored in the session to be used to present a sign-up page to the user (see Signing up with a sign up form).

The `SignInAdapter` is exclusively used for provider sign in and so a `SignInAdapter` bean will need to be added to the configuration. But first, you'll need to write an implementation of the `SignInAdapter` interface.

The `SignInAdapter` interface is defined as follows:

```
public interface SignInAdapter {
    String signIn(String userId, Connection<?> connection,
NativeWebRequest request);
```

```
}
```

The `signIn()` method takes the local application user's user ID normalized as a String. No other credentials are necessary here because by the time this method is called the user will have signed into the provider and their connection with that provider has been used to prove the user's identity. Implementations of this interface should use this user ID to authenticate the user to the application.

Different applications will implement security differently, so each application must implement `SignInAdapter` in a way that fits its unique security scheme. For example, suppose that an application's security is based on Spring Security and simply uses a user's account ID as their principal. In that case, a simple implementation of `SignInAdapter` might look like this:

```
@Service
public class SpringSecuritySignInAdapter implements SignInAdapter {
    public String signIn(String localUserId, Connection<?> connection,
NativeWebRequest request) {
        SecurityContextHolder.getContext().setAuthentication(
            new UsernamePasswordAuthenticationToken(localUserId, null,
null));
        return null;
    }
}
```

4.2.2. Adding a provider sign in button

With `ProviderSignInController` and a `SignInAdapter` configured, the backend support for provider sign in is in place. The last thing to do is to add a sign in button to your application that will kick off the authentication flow with `ProviderSignInController`.

For example, the following HTML snippet adds a "Signin with Twitter" button to a page:

```
<form id="tw_signin" action="<c:url value="/signin/twitter"/>"
method="POST">
  <button type="submit">
    <img src="<c:url value="/resources/social/twitter/sign-in-with-
twitter-d.png"/>" />
  </button>
```

```
</form>
```

Notice that the path used in the form's `action` attribute maps to the first step in ProviderSignInController's flow. In this case, the provider is identified as "twitter".

Clicking this button will trigger a POST request to "/signin/twitter", kicking off the Twitter sign in flow. If the user has not yet signed into Twitter, the user will be presented with the following page from Twitter:

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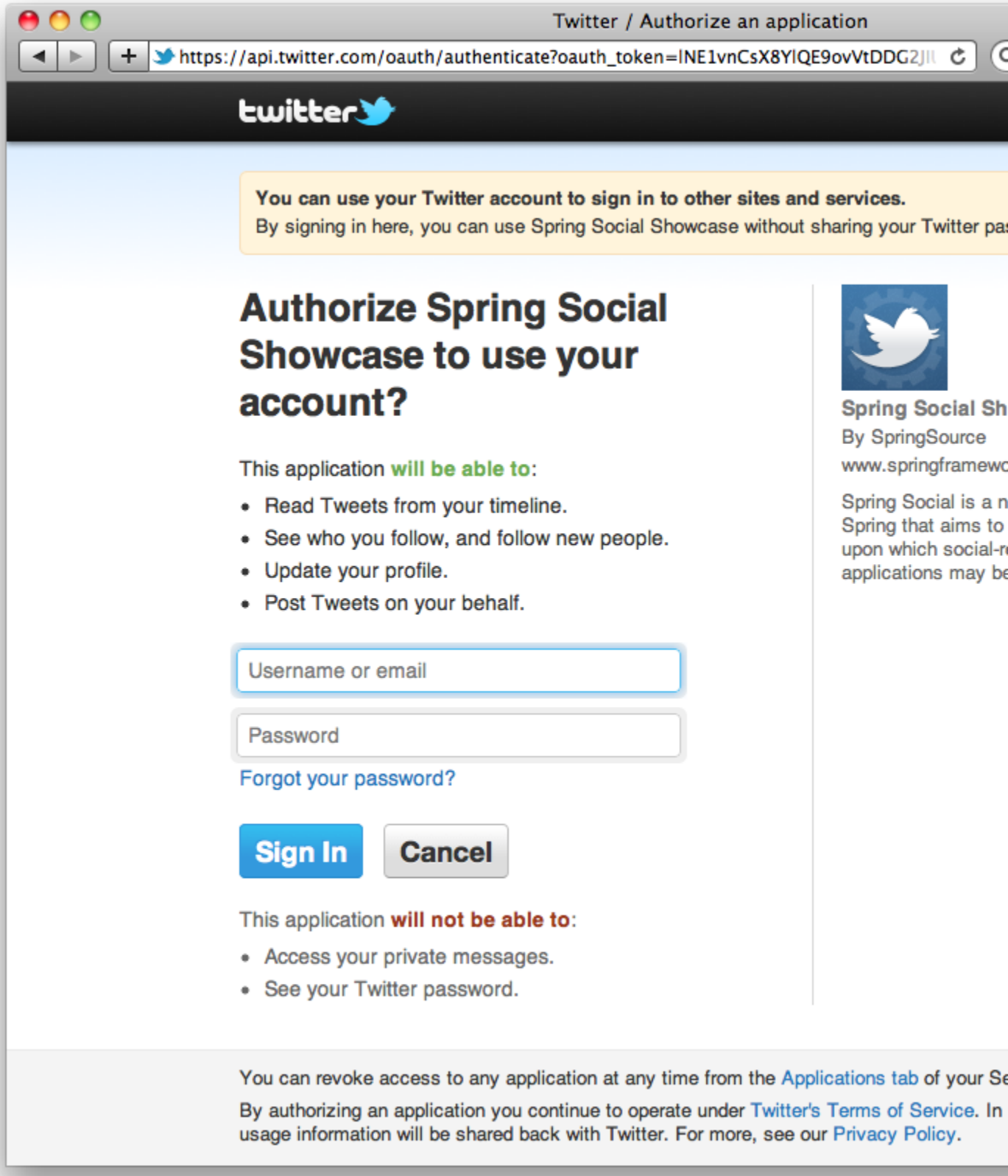

After signing in, the flow will redirect back to the application to complete the sign in process.

4.3. Signing up after a failed sign in

If `ProviderSignInController` can't find a local user associated with a provider user attempting to sign in, there may be an opportunity to have the user sign up with the application. Leveraging the information about the user received from the provider, the user may be presented with a pre-filled sign up form to explicitly sign up with the application. It's also possible to use the user's provider data to implicitly create a new local application user without presenting a sign up form.

4.3.1. Signing up with a sign up form

By default, the sign up URL is "/signup", relative to the application root. You can override that default by setting the `signUpUrl` property on the controller. For example, the following configuration of `ProviderSignInController` sets the sign up URL to "/register":

```
@Bean
public ProviderSignInController providerSignInController(
            ConnectionFactoryLocator connectionFactoryLocator,
            UsersConnectionRepository usersConnectionRepository) {
    ProviderSignInController controller = new
ProviderSignInController(
        connectionFactoryLocator,
        usersConnectionRepository(),
        new SimpleSignInAdapter(new HttpSessionRequestCache()));
    controller.setSignUpUrl("/register");
    return controller;
}
```

Or to set the sign up URL using XML configuration:

```
<bean
class="org.springframework.social.connect.web.ProviderSignInController
">
    <property name="signUpUrl" value="/register" />
</bean>
```

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Before redirecting to the sign up page, `ProviderSignInController` collects some information about the authentication attempt. This information can be used to prepopulate the sign up form and then, after successful sign up, to establish a connection between the new account and the provider account.

To prepopulate the sign up form, you can fetch the user profile data from a connection retrieved from `ProviderSignInUtils#getConnection()`. For example, consider this Spring MVC controller method that setups up the sign up form with a `SignupForm` to bind to the sign up form:

```
@Autowired
ProviderSignInUtils providerSignInUtils;

@RequestMapping(value="/signup", method=RequestMethod.GET)
public SignupForm signupForm(WebRequest request) {
    Connection<?> connection =
providerSignInUtils.getConnection(request);
    if (connection != null) {
        return
SignupForm.fromProviderUser(connection.fetchUserProfile());
    } else {
        return new SignupForm();
    }
}
```

If `ProviderSignInUtils#getConnection()` returns a connection, that means there was a failed provider sign in attempt that can be completed if the user registers to the application. In that case, a `SignupForm` object is created from the user profile data obtained from the connection's `fetchUserProfile()` method. Within `fromProviderUser()`, the `SignupForm` properties may be set like this:

```
public static SignupForm fromProviderUser(UserProfile providerUser) {
    SignupForm form = new SignupForm();
    form.setFirstName(providerUser.getFirstName());
    form.setLastName(providerUser.getLastName());
    form.setUsername(providerUser.getUsername());
    form.setEmail(providerUser.getEmail());
    return form;
}
```

Here, the `SignupForm` is created with the user's first name, last name, username, and email from the `UserProfile`. In addition, `UserProfile` also has a `getName()` method which will return the user's full name as given by the provider.

The availability of `UserProfile`'s properties will depend on the provider. Twitter, for example, does not provide a user's email address, so the `getEmail()` method will always return null after a sign in attempt with Twitter.

After the user has successfully signed up in your application a connection can be created between the new local user account and their provider account. To complete the connection call `ProviderSignInUtils#doPostSignUp()`. For example, the following method handles the sign up form submission, creates an account and then calls `ProviderSignInUtils#doPostSignUp()` to complete the connection:

```
@RequestMapping(value="/signup", method=RequestMethod.POST)
public String signup(@Valid SignupForm form, BindingResult
formBinding, WebRequest request) {
    if (formBinding.hasErrors()) {
        return null;
    }
    Account account = createAccount(form, formBinding);
    if (account != null) {
        SignInUtils.signin(account.getUsername());
        ProviderSignInUtils.doPostSignUp(account.getUsername(),
request);
        return "redirect:/";
    }
    return null;
}
```

4.3.2. Implicit sign up

To enable implicit sign up, you must create an implementation of the `ConnectionSignUp` interface and inject an instance of that `ConnectionSignUp` to the connection repository. The `ConnectionSignUp` interface is simple, with only a single method to implement:

```
public interface ConnectionSignUp {
```

```
    String execute(Connection<?> connection);
}
```

The `execute()` method is given a `Connection` that it can use to retrieve information about the user. It can then use that information to create a new local application user and return the new local user ID. For example, the following implementation fetches the user's provider profile and uses it to create a new account:

```
public class AccountConnectionSignUp implements ConnectionSignUp {

    private final AccountRepository accountRepository;

    public AccountConnectionSignUp(AccountRepository
accountRepository) {
        this.accountRepository = accountRepository;
    }

    public String execute(Connection<?> connection) {
        UserProfile profile = connection.fetchUserProfile();
        Account account = new Account(profile.getUsername(),
profile.getFirstName(), profile.getLastName());
        accountRepository.createAccount(account);
        return account.getUsername();
    }

}
```

If there is any problem in creating the new user implicitly (for example, if the implicitly chosen username is already taken) `execute()` may return null to indicate that the user could not be created implicitly. This will ultimately result in `ProviderSignInController` redirecting the user to the signup page.

Once you've written a `ConnectionSignUp` for your application, you'll need to inject it into the `UsersConnectionRepository`. In Java-based configuration:

```
@Bean
@Scope(value="singleton", proxyMode=ScopedProxyMode.INTERFACES)
public UsersConnectionRepository
usersConnectionRepository(AccountRepository accountRepository) {
```

```
    JdbcUsersConnectionRepository repository = new
JdbcUsersConnectionRepository(
        dataSource, connectionFactoryLocator(),
Encryptors.noOpText());
    repository.setConnectionSignUp(new
AccountConnectionSignUp(accountRepository));
    return repository;
}
```

5. Adding Support for a New Service Provider

Spring Social makes it easy to add support for service providers that are not already supported by the framework. If you review the existing client modules, such as spring-social-twitter and spring-social-facebook, you will discover they are implemented in a consistent manner and they apply a set of well-defined extension points. In this chapter, you will learn how to add support for new service providers you wish to integrate into your applications.

The process of adding support for a new service provider consists of several steps:

1. Create a source project for the client code e.g. `spring-social-twitter`.
2. Develop or integrate a Java binding to the provider's API e.g. `Twitter`.
3. Create a `ServiceProvider` model that allows users to authorize with the remote provider and obtain authorized API instances e.g. `TwitterServiceProvider`.
4. Create an ApiAdapter that maps the provider's native API onto the uniform Connection model e.g. `TwitterAdapter`.
5. Finally, create a ConnectionFactory that wraps the other artifacts up and provides a simple interface for establishing connections e.g. `TwitterConnectionFactory`.

The following sections of this chapter walk you through each of the steps with examples.

5.1. Creating a source project for the provider client code

A Spring Social client module is a standard Java project that builds a single jar artifact e.g. spring-social-twitter.jar. We recommend the code structure of a client module follow the guidelines described below.

5.1.1. Code structure guidelines

We recommend the code for a new Spring Social client module reside within the `org.springframework.social.{providerId}` base package, where {providerId} is a unique identifier you assign to the service provider you are adding support for. Consider some of the providers already supported by the framework as examples:

Table 3. Spring Social Client Modules

Provider ID	Artifact Name	Base Package
facebook	spring-social-facebook	org.springframework.social.faceb
twitter	spring-social-twitter	org.springframework.social.twitte
linkedin	spring-social-linkedin	org.springframework.social.linked

Within the base package, we recommend the following subpackage structure:

Table 4. Module Structure

Subpackage	Description
api	The public interface that defines the API binding.
api.impl	The implementation of the API binding.
connect	The types necessary to establish connections to the service provider.

You can see this recommended structure in action by reviewing one of the other client modules such as spring-social-twitter:

Here, the central service API type, Twitter, is located in the api package along with its supporting operations types and data transfer object types. The primary implementation of that interface, TwitterTemplate, is located in the api.impl package (along with other package-private impl types have that been excluded from this view). Finally, the connect package contains the implementations of various connect SPIs that enable connections to Twitter to be established and persisted.

5.2. Developing a Java binding to the provider's API

Spring Social favors the development of strongly-typed Java bindings to external service provider APIs. This provides a simple, domain-oriented interface for Java applications to use to consume the API. When adding support for a new service provider, if no suitable Java binding already exists you'll need to develop one. If one already exists, such as Twitter4j for example, it is possible to integrate it into the framework.

5.2.1. Designing a new Java API binding

API developers retain full control over the design and implementation of their Java bindings. That said, we offer several design guidelines in an effort to improve overall consistency and quality:

- *Favor separating the API binding interface from the implementation.* This is illustrated in the spring-social-twitter example in the previous section. There, "Twitter" is the central API binding type and it is declared in the org.springframework.social.twitter.api package with other public types. "TwitterTemplate" is the primary implementation of this interface and is located in the org.springframework.social.twitter.api.impl subpackage along with other package-private implementation types.
- *Favor organizing the API binding hierarchically by RESTful resource.* REST-based APIs typically expose access to a number of resources in an hierarchical manner. For example, Twitter's API provides access to "status timelines", "searches", "lists", "direct messages", "friends", "geo location", and "users". Rather than add all operations across these resources to a single flat "Twitter" interface, the Twitter interface is organized hierarchically:

```
public interface Twitter extends ApiBinding {
```

```
    BlockOperations blockOperations();

    DirectMessageOperations directMessageOperations();

    FriendOperations friendOperations();

    GeoOperations geoOperations();

    ListOperations listOperations();

    SearchOperations searchOperations();

    StreamingOperations streamingOperations();

    TimelineOperations timelineOperations();

    UserOperations userOperations();

    RestOperations restOperations();

}
```

DirectMessageOperations, for example, contains API bindings to Twitter's "direct_messages" resource:

```
public interface DirectMessageOperations {

    List<DirectMessage> getDirectMessagesReceived();

    List<DirectMessage> getDirectMessagesReceived(int page, int
pageSize);

    List<DirectMessage> getDirectMessagesReceived(int page, int
pageSize, long sinceId, long maxId);

    List<DirectMessage> getDirectMessagesSent();

    List<DirectMessage> getDirectMessagesSent(int page, int pageSize);

    List<DirectMessage> getDirectMessagesSent(int page, int pageSize,
long sinceId, long maxId);
```

```
    DirectMessage getDirectMessage(long id);

    void sendDirectMessage(String toScreenName, String text);

    void sendDirectMessage(long toUserId, String text);

    void deleteDirectMessage(long messageId);
}
```

5.2.2. Implementing a new Java API binding

API developers are free to implement their Java API binding with whatever REST/HTTP client they see fit. That said, Spring Social's existing API bindings such as spring-social-twitter all use Spring Framework's RestTemplate in conjunction with the Jackson JSON ObjectMapper and Apache HttpComponents HTTP client. RestTemplate is a popular REST client that provides a uniform object mapping interface across a variety of data exchange formats (JSON, XML, etc). Jackson is the leading Java-based JSON marshalling technology. Apache HttpComponents has proven to be the most robust HTTP client (if it is not available on the classpath Spring Social will fallback to standard J2SE facilities, however). To help promote consistency across Spring Social's supported bindings, we do recommend you consider these implementation technologies (and please let us know if they do not meet your needs).

Spring Social has adopted a convention where each API implementation class is named "{ProviderId}Template" e.g. TwitterTemplate. We favor this convention unless there is a good reason to deviate from it. As discussed in the previous section, we recommend keeping implementation types separate from the public API types. We also recommend keeping internal implementation details package-private.

The way in which an API binding implementation is constructed will vary based on the API's authorization protocol. For APIs secured with OAuth1, the consumerKey, consumerSecret, accessToken, and accessTokenSecret will be required for construction:

```
public TwitterTemplate(String consumerKey, String consumerSecret,
String accessToken,
    String accessTokenSecret) { ... }
```

For OAuth2, only the access token should be required:

```
public FacebookTemplate(String accessToken) { ... }
```

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Each request made to the API server needs to be signed with the authorization credentials provided during construction of the binding. This signing process consists of adding an "Authorization" header to each client request before it is executed. For OAuth1, the process is quite complicated, and is used to support an elaborate request signature verification algorithm between the client and server. For OAuth2, it is a lot simpler, but does still vary across the various drafts of the OAuth2 specification.

To encapsulate this complexity, for each authorization protocol Spring Social provides a `ApiTemplate` base class you may extend from to construct a pre-configured RestTemplate instance that performs the request signing for you. For OAuth1:

```
public class TwitterTemplate extends AbstractOAuth1ApiBinding {
    public TwitterTemplate(String consumerKey, String consumerSecret,
String accessToken,
            String accessTokenSecret) {
        super(consumerKey, consumerSecret, accessToken,
accessTokenSecret);
    }
}
```

An OAuth2 example:

```
public class FacebookTemplate extends AbstractOAuth2ApiBinding {
    public FacebookTemplate(String accessToken) {
        super(accessToken);
    }
}
```

Once configured as shown above, you simply call `getRestTemplate()` and implement the various API operations. The existing Spring Social client modules all invoke their RestTemplate instances in a standard manner:

```
public TwitterProfile getUserProfile() {
    return
getRestTemplate().getForObject(buildUri("account/verify_credentials.js
on"),
        TwitterProfile.class);
}
```

A note on `RestTemplate` usage: we do favor the `RestTemplate` methods that accept a URI object instead of a uri `String`. This ensures we always properly encode client data submitted in URI query parameters, such as screen_name below:

```
public TwitterProfile getUserProfile(String screenName) {
    return getRestTemplate().getForObject(buildUri("users/show.json",
        Collections.singletonMap("screen_name", screenName)),
TwitterProfile.class);
}
```

For complete implementation examples, consult the source of the existing API bindings included in Spring Social. The `spring-social-twitter` and `spring-social-facebook` modules provide particularly good references.

5.2.3. Testing a new Java API binding

We recommend that you use Spring's REST client testing support, including `MockRestServiceServer` to test your API bindings.

First create an instance of `MockRestServiceServer` against the `RestTemplate` instance used by your API implementation:

```
TwitterTemplate twitter = new TwitterTemplate("consumerKey",
"consumerSecret", "accessToken",
    "accessTokenSecret");
MockRestServer mockServer =
MockRestServiceServer.createServer(twitter.getRestTemplate());
```

Then, for each test case, record expectations about how the server should be invoked and answer what it should respond with:

```
@Test
public void getUserProfile() {
    HttpHeaders responseHeaders = new HttpHeaders();
    responseHeaders.setContentType(MediaType.APPLICATION_JSON);


mockServer.expect(requestTo("https://api.twitter.com/1.1/account/verif
y_credentials.json"))
```

```
                .andExpect(method(GET))
                .andRespond(withSuccess(jsonResource("twitter-profile"),
APPLICATION_JSON));

    TwitterProfile profile =
twitter.userOperations().getUserProfile();
    assertEquals(161064614, profile.getId());
    assertEquals("jbauer", profile.getScreenName());
}
```

In the example above the response body is written from a twitter-profile.json file located in the same package as the test class:

```
private Resource jsonResource(String filename) {
    return new ClassPathResource(filename + ".json", getClass());
}
```

The content of the file should mirror the content the remote service provider would return, allowing the client JSON deserialization behavior to be fully tested:

```
{
    "id":161064614,
    "screen_name":"jbauer"
}
```

For complete test examples, consult the source of the existing API bindings included in Spring Social. The `spring-social-twitter` and `spring-social-facebook` modules provide particularly good references.

5.2.4. Integrating an existing Java API binding

If you are adding support for a popular service provider, chances are a Java binding to the provider's API may already exist. For example, the Twitter4j library has been around for awhile and provides a complete binding to Twitter's API. Instead of developing your own binding, you may simply wish to integrate what already exists. Spring Social's connect framework has been carefully designed to support this scenario.

To integrate an existing API binding, simply note the binding's primary API interface and implementation. For example, in Twitter4j the main API interface is named "Twitter" and instances are constructed by a TwitterFactory. You can always construct such an API instance directly, and you'll see in the following sections how to expose an instance as part of a Connection.

5.3. Creating a `ServiceProvider` model

As described in the previous section, a client binding to a secure API such as Facebook or Twitter requires valid user authorization credentials to work. Such credentials are generally obtained by having your application conduct an authorization "dance" or handshake with the service provider. Spring Social provides the ServiceProvider<A> abstraction to handle this "authorization dance". The abstraction also acts as a factory for native API (A) instances.

Since the authorization dance is protocol-specific, a ServiceProvider specialization exists for each authorization protocol. For example, if you are connecting to a OAuth2-based provider, you would implement OAuth2ServiceProvider. After you've done this, your implementation can be used to conduct the OAuth2 dance and obtain an authorized API instance. This is typically done in the context of a ConnectionFactory as part of establishing a new connection to the provider. The following sections describe the implementation steps for each ServiceProvider type.

5.3.1. OAuth2

To implement an OAuth2-based ServiceProvider, first create a subclass of AbstractOAuth2ServiceProvider named {ProviderId}ServiceProvider. Parameterize <A> to be the Java binding to the ServiceProvider's's API. Define a single constructor that accepts an clientId and clientSecret. Finally, implement getApi(String) to return a new API instance.

See `org.springframework.social.facebook.connect.FacebookServiceProvider` as an example OAuth2ServiceProvider:

```
public final class FacebookServiceProvider extends
AbstractOAuth2ServiceProvider<Facebook> {

    public FacebookServiceProvider(String clientId, String
clientSecret) {
        super(new OAuth2Template(clientId, clientSecret,
            "https://graph.facebook.com/oauth/authorize",
            "https://graph.facebook.com/oauth/access_token"));
    }

    public Facebook getApi(String accessToken) {
        return new FacebookTemplate(accessToken);
    }
```

```
}
```

In the constructor, you should call super, passing up the configured OAuth2Template that implements OAuth2Operations. The OAuth2Template will handle the "OAuth dance" with the provider, and should be configured with the provided clientId and clientSecret, along with the provider-specific authorizeUrl and accessTokenUrl.

Some providers support provider sign-in (see Signing in with Service Provider Accounts) through an authentication URL that is distinct from the authorization URL. Using the OAuth2Template constructor as shown above will assume that the authentication URL is the same as the authorization URL. But you may specify a different authentication URL by using OAuth2Template's other constructor. Facebook does not have a separate authentication URL, but for the sake of the example, suppose that Facebook's authentication URL is "https://graph.facebook.com/oauth/authenticate". The following implementation of the FacebookServiceProvider constructor configures the OAuth2Template for that case:

```
public FacebookServiceProvider(String clientId, String clientSecret) {
    super(new OAuth2Template(clientId, clientSecret,
        "https://graph.facebook.com/oauth/authorize",
        "https://graph.facebook.com/oauth/authenticate",
        "https://graph.facebook.com/oauth/access_token"));
}
```

In getApi(String), you should construct your API implementation, passing it the access token needed to make authorized requests for protected resources.

5.3.2. OAuth1

To implement an OAuth1-based ServiceProvider, first create a subclass of AbstractOAuth1ServiceProvider named {ProviderId}ServiceProvider. Parameterize <A> to be the Java binding to the ServiceProvider's API. Define a single constructor that accepts a consumerKey and consumerSecret. Finally, implement getApi(String, String) to return a new API instance.

See `org.springframework.social.twitter.connect.TwitterServiceProvider` as an example OAuth1ServiceProvider:

```
public final class TwitterServiceProvider extends
AbstractOAuth1ServiceProvider<Twitter> {
```

```
    public TwitterServiceProvider(String consumerKey, String
consumerSecret) {
        super(consumerKey, consumerSecret, new
OAuth1Template(consumerKey, consumerSecret,
            "https://twitter.com/oauth/request_token",
            "https://twitter.com/oauth/authorize",
            "https://twitter.com/oauth/authenticate",
            "https://twitter.com/oauth/access_token"));
    }

    public Twitter getApi(String accessToken, String secret) {
        return new TwitterTemplate(getConsumerKey(),
getConsumerSecret(), accessToken, secret);
    }

}
```

In the constructor, you should call super, passing up the the consumerKey, secret, and configured OAuth1Template. The OAuth1Template will handle the "OAuth dance" with the provider. It should be configured with the provided consumerKey and consumerSecret, along with the provider-specific requestTokenUrl, authorizeUrl, authenticateUrl, and accessTokenUrl. The authenticateUrl parameter is optional and may be left out if the provider doesn't have an authentication URL that is different than the authorization URL.

As you can see here, OAuth1Template is constructed with Twitter's authentication URL (used for provider sign-in; see Signing in with Service Provider Accounts), which is distinct from their authorization URL. Some providers don't have separate URLs for authentication and authorization. In those cases, you can use OAuth1Template's other constructor which doesn't take the authentication URL as a parameter. For example, here's how the TwitterServiceProvider constructor would look without configuring the authentication URL:

```
public TwitterServiceProvider(String consumerKey, String
consumerSecret) {
    super(consumerKey, consumerSecret, new OAuth1Template(consumerKey,
consumerSecret,
        "https://twitter.com/oauth/request_token",
        "https://twitter.com/oauth/authorize",
        "https://twitter.com/oauth/access_token"));
}
```

In getApi(String, String), you should construct your API implementation, passing it the four tokens needed to make authorized requests for protected resources.

Consult the JavaDoc API of the various service provider types for more information and subclassing options.

5.4. Creating an ApiAdapter

As discussed in the previous chapter, one of the roles of a Connection is to provide a common abstraction for a linked user account that is applied across all service providers. The role of the ApiAdapter is to map a provider's native API interface onto this uniform Connection model. A connection delegates to its adapter to perform operations such as testing the validity of its API credentials, setting metadata values, fetching a user profile, and updating user status:

```
public interface ApiAdapter<A> {

    boolean test(A api);

    void setConnectionValues(A api, ConnectionValues values);

    UserProfile fetchUserProfile(A api);

    void updateStatus(A api, String message);

}
```

Consider `org.springframework.social.twitter.connect.TwitterAdapter` as an example implementation:

```
public class TwitterAdapter implements ApiAdapter<Twitter> {

    public boolean test(Twitter twitter) {
        try {
            twitter.userOperations().getUserProfile();
            return true;
        } catch (ApiException e) {
            return false;
        }
    }
```

```
    public void setConnectionValues(Twitter twitter, ConnectionValues
values) {
        TwitterProfile profile =
twitter.userOperations().getUserProfile();
        values.setProviderUserId(Long.toString(profile.getId()));
        values.setDisplayName("@" + profile.getScreenName());
        values.setProfileUrl(profile.getProfileUrl());
        values.setImageUrl(profile.getProfileImageUrl());
    }

    public UserProfile fetchUserProfile(Twitter twitter) {
        TwitterProfile profile =
twitter.userOperations().getUserProfile();
        return new
UserProfileBuilder().setName(profile.getName()).setUsername(
            profile.getScreenName()).build();
    }

    public void updateStatus(Twitter twitter, String message) {
        twitter.timelineOperations().updateStatus(message);
    }

}
```

As you can see, test(...) returns true if the API instance is functional and false if it is not. setConnectionValues(...) sets the connection's providerUserId, displayName, profileUrl, and imageUrl properties from TwitterProfile data. fetchUserProfile(...) maps a TwitterProfile onto the normalized UserProfile model. updateStatus(...) update's the user's Twitter status. Consult the JavaDoc for ApiAdapter and Connection for more information and implementation guidance. We also recommend reviewing the other ApiAdapter implementations for additional examples.

5.5. Creating a ConnectionFactory

By now, you should have an API binding to the provider's API, a ServiceProvider<A> implementation for conducting the "authorization dance", and an ApiAdapter<A> implementation for mapping onto the uniform Connection model. The last step in adding support for a new service provider is to create a ConnectionFactory that wraps up these artifacts and provides a simple interface for establishing Connections. After this is done, you may use your connection factory directly, or you may add it to a registry where it can be used by the framework to establish connections in a dynamic, self-service manner.

Like a ServiceProvider<A>, a ConnectionFactory specialization exists for each authorization protocol. For example, if you are adding support for a OAuth2-based provider, you would extend from OAuth2ConnectionFactory. Implementation guidelines for each type are provided below.

5.5.1. OAuth2

Create a subclass of OAuth2ConnectionFactory<A> named {ProviderId}ConnectionFactory and parameterize A to be the Java binding to the service provider's API. Define a single constructor that accepts a clientId and clientSecret. Within the constructor call super, passing up the assigned providerId, a new {ProviderId}ServiceProvider instance configured with the clientId/clientSecret, and a new {Provider}Adapter instance.

See `org.springframework.social.facebook.connect.FacebookConnectionFactory` as an example OAuth2ConnectionFactory:

```
public class FacebookConnectionFactory extends
OAuth2ConnectionFactory<Facebook> {
    public FacebookConnectionFactory(String clientId, String
clientSecret) {
        super("facebook", new FacebookServiceProvider(clientId,
clientSecret), new FacebookAdapter());
    }
}
```

5.5.2. OAuth1

Create a subclass of OAuth1ConnectionFactory<A> named {ProviderId}ConnectionFactory and parameterize A to be the Java binding to the service provider's API. Define a single constructor that accepts a consumerKey and consumerSecret. Within the constructor call super, passing up the assigned providerId, a new {ProviderId}ServiceProvider instance configured with the consumerKey/consumerSecret, and a new {Provider}Adapter instance.

See `org.springframework.social.twitter.connect.TwitterConnectionFactory` as an example OAuth1ConnectionFactory:

```
public class TwitterConnectionFactory extends
OAuth1ConnectionFactory<Facebook> {
    public TwitterConnectionFactory(String consumerKey, String
consumerSecret) {
```

```
        super("twitter", new TwitterServiceProvider(consumerKey,
consumerSecret), new TwitterAdapter());
    }
}
```

Consult the source and JavaDoc API for ConnectionFactory and its subclasses more information, examples, and advanced customization options.

5.6. Extending an existing Service Provider

Are you already using an existing provider like Spring Social GitHub? You may run into the situation where the Spring Social API doesn't cover every operation you need. Or you may wish to apply extra behavior like caching certain operations. This section explores extension points Spring Social's core includes.

5.6.1. Adding extra operations

If you look at the implementation you are using, it probably has a core template, like GitHubTemplate. But what if it doesn't have the operation you are looking for? You can either wait for the team to develop it, or write it yourself.

To write your own extension, simply extend the core class and add your own implementation:

```
public class ExtendedGitHubTemplate extends GitHubTemplate {

    public static final String API_URL_BASE =
"https://api.github.com";

    public ExtendedGitHubTemplate(String githubToken) {
        super(githubToken);
    }

    public List<GitHubRepo> findAllRepositories(String type, String
name) {
        return asList(this.getRestTemplate().getForObject(
                API_URL_BASE + "/{type}/{name}/repos?per_page=100",
                GitHubRepo[].class, type, name));
    }
```

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This fragment extends Spring Social GitHub's `GitHubTemplate`. It adds a new method, `findAllRepositories`. By extending the core template, you are granted access to an already-connected `RestTemplate` via `getRestTemplate()`. You have to assemble the URI yourself, but online documentation from the provider puts the power in your hands.

5.6.2. Augmenting Spring Social's RestTemplate

By design, Spring Social uses an embedded `RestTemplate` to do the legwork of interacting with the provider. That way, if you are using more than one Spring Social project, each one's individual instance won't collide with other. As a side effect, it may seem hard to apply something like caching. It's not.

Spring Social's `AbstractOAuth2ApiBinding`, the root of all OAuth2-based provider templates, provides a hook ot post process the `RestTemplate` when it gets created.

```
public class ExtendedGitHubTemplate extends GitHubTemplate {

    ...

    @Override
    protected RestTemplate postProcess(RestTemplate restTemplate) {
        AspectJProxyFactory factory = new
AspectJProxyFactory(restTemplate);
        factory.addAspect(RestTemplateAspect.class);
        factory.setProxyTargetClass(true);
        return factory.getProxy()
    }
```

In this example, the code extends `GitHubTemplate` and then overrides sthe `postProcess()` method. In Spring Social core, the **restTemplate** is simply passed through during creation and nothing is changed. In this example, the code creates an AspectJ proxy, adds some `RestTemplateAspect` advice, sets the factory to proxy the class and not its interface, and then returns back a proxy.

You can already do things like wrap `GitHubTemplate` operations with caching. This hook enables you to apply any type of advice directly to the `RestTemplate`.

---

1. This is just an example. Actual request tokens are typically much longer.

2. If the user has not yet signed into Twitter, the authorization page will also include a username and password field for authentication into Twitter.