Avaya Breeze® platform External Database Access

The following document provides sample code and guidelines for how an Avaya Breeze Service can use Java Persistence API (JPA) to access data from an external database. The document is only meant as a "getting started" guide and only provides very high-level concepts.

The document will use the WhiteList sample application to illustrate the points. For a design overview of the WhiteList sample application, please refer to the *Whitelist Sample Service Guide*. The source code, without the concepts discussed in this document, is in the *Avaya Breeze SDK, Developer Preview Release*.

Both the Whitelist Sample Service Guide and the SDK are available on Avaya DevConnect.

This document will provide sample code to enhance the WhiteList service with the concepts described here.

There are six areas covered:

1. Standard JPA configuration file: persistence.xml
2. Stateless beans with local interfaces
3. Connection pooling
4. Entity
5. Entity Manager
6. Cache Specific Attributes

Standard JPA configuration file: persistence.xml

The persistence.xml configuration file, located at `META-INF/persistence.xml`, defines one or more persistence units. At a high level, a persistence unit contains information about how to contact a database, and entities associated with that unit. An entity represents a table in a relational database; an entity instance represents a row in that database.

The WhiteList sample service connects to a PostgreSQL database on the server itself. It uses an entity, `WhiteListEntry`, to read a row from the whitelist database. The WhiteList `persistence.xml` has one persistence unit. It is named `whiteListDataSource`, and contains one entity, `com.avaya.services.whitelist.db.WhiteListEntry`. It also contains properties about how to connect to a local PostgreSQL database, such as the database driver, `org.postgresql.Driver`, Url, `jdbc:postgresql://localhost/whitelist` and credentials.

Stateless beans with local interfaces

The main class for the WhiteList service is `WhiteList.class`. It makes use of a helper class, `DestinationFinderImpl`, which retrieves the ultimate destination for the call. The `DestinationFinderImpl` is a POJO and is created in the `WhiteList` constructor. We want to turn the `DestinationFinderImpl` into a stateless bean. That way, it can use dependency injection for its resources and enjoy all other benefits of being a container managed bean.

To turn the class into a stateless local bean, add the bolded, **`@Local`**, text to the `DestinationFinder`:

```
@Local
public interface DestinationFinder {…}
```

Add the bolded text, **`@Stateless`**, to the `DestinationFinderImpl`:

```
@Stateless
public class DestinationFinderImpl implements DestinationFinder {…}
```

The `WhiteList.class` is not managed by the container. Therefore it must use JNDI to lookup the `DestinationFinderImpl` bean. It cannot use injection.

There is only one implementation of the local `DestinationFinder` interface. The JNDI name for the bean
becomes: `ejblocal:com.avaya.services.whitelist.DestinationFinder`.

The `DestinationFinderImpl` stateless bean also makes use of another stateless bean, `PermissionAgentImpl`. Since the `DestinationFinderImpl` is a bean managed by the container, it is not necessary to use JNDI to lookup that bean, it can use injection. The injection becomes:

```
@Stateless
public class DestinationFinderImpl implements DestinationFinder
{
      @EJB
      private PermissionAgent permissionAgent;
      ...
}
```

The above describes the procedure of how to either lookup or inject a stateless bean.

Connection pooling

The WhiteList service makes a request to the database every time it is invoked. This is to determine whether the caller can directly call the called party.

Without connection pooling, each request requires a connection to be opened to the PostgreSQL database. That is a time intensive operation.

To avoid that time intensive operation, the application makes use of a connection pool. This, very simply, means that the database connections are maintained so future requests can reuse an existing connection.

One way to enable connection pooling for the application is to make use of the DBCP component of the Apache project (http://commons.apache.org/dbcp). Add the bolded line to the persistence unit in the persistence.xml:

```
<persistence-unit name="whiteListDataSource"
transaction-type="JTA">
 <class>com.avaya.services.whitelist.db.WhiteListEntry</class>
    <properties>
           <property name="openjpa.ConnectionProperties"
                value="DriverClassName=org.postgresql.Driver,
          Url=jdbc:postgresql://135.9.182.116:5432/whitelist,
              MaxActive=100,
              MaxWait=10000,
              TestOnBorrow=true,
                Username=postgres,
              Password=postgres" />
           <property name="openjpa.ConnectionDriverName"
         value="org.apache.commons.dbcp.BasicDataSource"/>
      </properties>
 </persistence-unit>
</persistence>
```

Entity

The WhiteList service uses one entity, the `WhiteListEntry`. It contains two attributes: calling and called handles.

The class is annotated as an entity, using the `@Entity` annotation. It is also annotated with name of the database, `@Table(name = "WHITELIST")`.

Entity Manager

An Entity Manager is associated with a Persistence Context. A Persistence Context is essentially a cache.

The `WhiteList` service uses the `WhiteListDaoImpl` to interact with the PostgrSQL database. The `WhiteListDaoImpl` is created for every request along with an Entity Manager. This means that any cached data is flushed for each request.

Using the same technique described in the “Stateless beans with local interfaces” section above we can turn the `WhiteListDaoImpl` into a stateless bean. This allows us to inject an Entity Manager into the bean, thus removing the need to get an Entity Manager for each request.

The code for the `WhiteListDaoImpl` with the Entity Manager injected looks like this:

```
@Stateless
public class WhiteListDaoImpl implements WhiteListDao
{
      private static final String PERSISTENCE_UNIT_NAME =
"whiteListDataSource";

      @PersistenceContext(unitName = PERSISTENCE_UNIT_NAME) private
EntityManager entityManager;
      ...
}
```

To inject a `@PersistenceContext`, the Persistence Unit must use a transaction-type of JTA. The persistence.xml changes the name

From: `<persistence-unit name="whitelist" transaction-type="RESOURCE_LOCAL">`

To: **`<persistence-unit name="whiteListDataSource" transaction-type="JTA">`**

Although not necessary, the name change better represents that we’re going to use a data source.

Cache Specific Attributes

The above information describes a very simple configuration and java code to read information from a PostgreSQL database.

The following information will explain what additional attributes are needed to enable basic JPA caching and a time-based eviction scheme for queries.

One way to turn on caching is to add the following line to the persistence unit in persistence.xml:

```
<property name="openjpa.DataCache" value="true"/>
```

That will cache a default number of queries. The default number of queries can be changed by adding the following attribute:

```
<property name="openjpa.QueryCache" value="true(CacheSize=10000,
SoftReferenceSize=0)"/>
```

The above line will make the cache size 10,000. The `SoftReferenceSize` parameter indicates how many evicted queries will still have soft references to them.

With the two above lines added, the persistence.xml becomes:

```
<persistence-unit name="whiteListDataSource"
transaction-type="JTA">
<class>com.avaya.services.whitelist.db.WhiteListEntry</class>
        <properties>

                <property name="openjpa.ConnectionProperties"
                        value="DriverClassName=org.postgresql.Driver,
                                Url=jdbc:postgresql://135.9.182.116:5432/whitelist,
                                MaxActive=100,
                                MaxWait=10000,
                                TestOnBorrow=true,
                                Username=postgres,
                                Password=postgres" />

                <property name="openjpa.ConnectionDriverName"
value="org.apache.commons.dbcp.BasicDataSource" />
                <property name="openjpa.DataCache" value="true" />
                <property name="openjpa.QueryCache" value="true(CacheSize=10000,
SoftReferenceSize=0)" />

        </properties>
</persistence-unit>
```

The WhiteList service only reads from the external database. It does not use JPA to write data. Updates to the database are performed by logging into PostgresSQL and affecting the data directly. Because updates are not reflected in the persistence context, such data is stale from the service's perspective.

For instance, say Alice can call Bob directly. The element manager caches this query. Then the database is modified such that Alice is not allowed to call Bob directly. The persistence context still has the old query cached and until the cache changes the service will allow calls directly between Alice and

Bob. That's not good.
One simple way around the above issue is to evict queries from the cache periodically. This can be achieved by simply adding the following line to the entity:

```
@DataCache(timeout = 600000) // This would evict the cached entry
after 600 seconds (10 minutes)
```

The above strategy would guarantee that a query is at most 10 minutes out of synch with the data source.

With the above annotation added in bold, the entity becomes:

```
@Entity(name = "WHITELIST")
@DataCache(timeout = CacheValues.DEFAULT_EVICTION_TIMEOUT_IN_MILLISECONDS)
@Table(name = "WHITELIST")
@NamedQueries(
{
        @NamedQuery(
                name = NamedQueriesList.FIND_WHITELIST_ENTRY,
                query = "SELECT c FROM WHITELIST c " +
                        "WHERE c.calledHandle= :calledNumber and
c.callingHandle= :callingNumber"),

        @NamedQuery(name = NamedQueriesList.FIND_WHITELIST_ENTRIES,
                query = "SELECT c FROM WHITELIST c")
})
```

Configuring JNDI using a persistence unit properties

We are using a file **PersitanceUnitProperties.java** to configure JNDI which is based on the openjpa persistence.
In this file we have a method called **Map<String, String> getPersistanceUnitMap(),** we are configuring the JNDI name into the map.
persistenceProperties.put("javax.persistence.jtaDataSource", getJNDIName());
The above line is where the JNDI is configured where the value is got from the Attribute page.

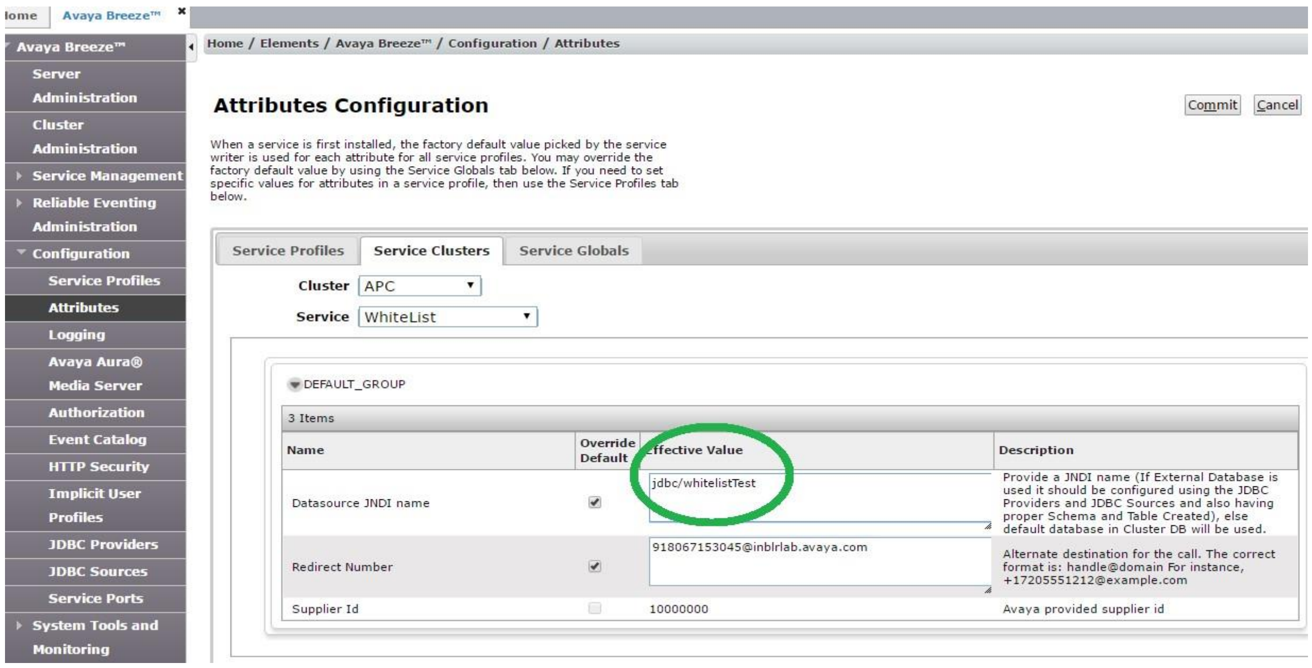
The External Database should be having the schema for whitelist and a table created in the following format:

```
CREATE TABLE whitelist (

 id BIGSERIAL PRIMARY KEY NOT NULL,
 updateDateTime timestamp NOT NULL
 DEFAULT now(), called_handle
 VARCHAR(255) NOT NULL, calling_handle
 VARCHAR(255) NOT NULL,
 unique(called_handle,calling_handle)

 );
```

Testing using an External Database



Attributes Configuration

When a service is first installed, the factory default value picked by the service writer is used for each attribute for all service profiles. You may override the factory default value by using the Service Globals tab below. If you need to set specific values for attributes in a service profile, then use the Service Profiles tab below.

Cluster: APC
Service: WhiteList

DEFAULT_GROUP

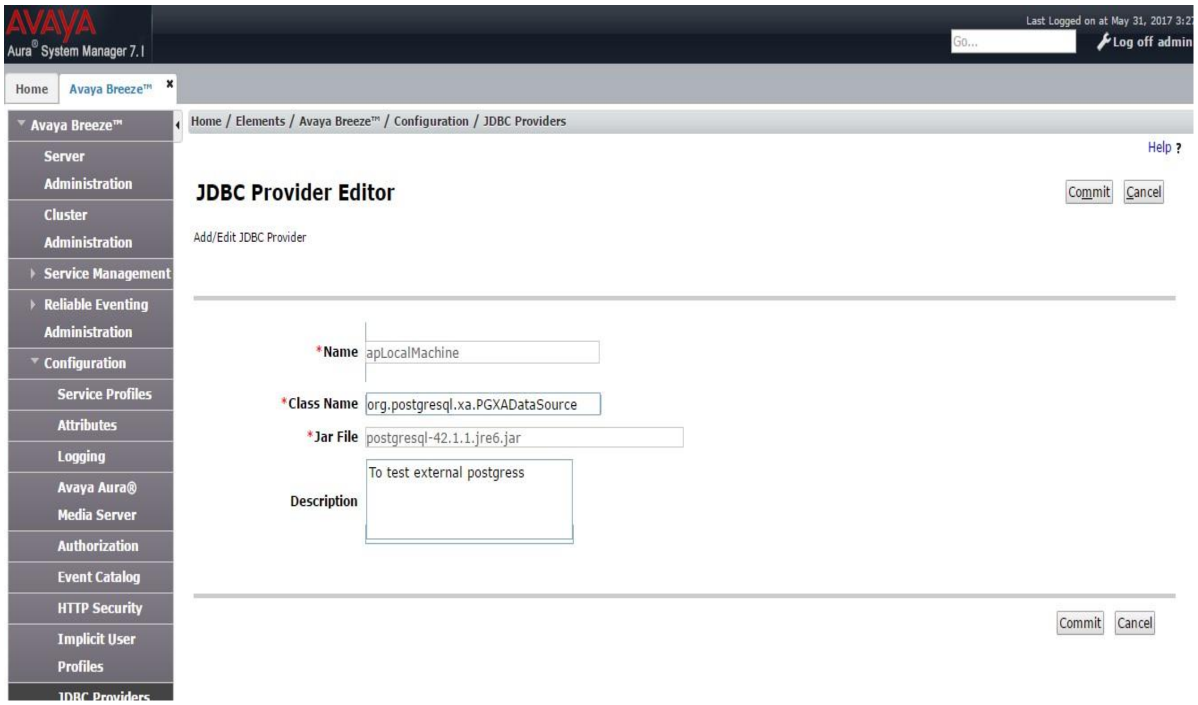
3 Items

Name	Override Default	Effective Value	Description
Datasource JNDI name	✓	jdbc/whitelistTest	Provide a JNDI name (If External Database is used it should be configured using the JDBC Providers and JDBC Sources and also having proper Schema and Table Created), else default database in Cluster DB will be used.
Redirect Number	✓	918067153045@inblrlab.avaya.com	Alternate destination for the call. The correct format is: handle@domain For instance, +17205551212@example.com
Supplier Id		10000000	Avaya provided supplier id

We can use an external Postgres Database.

We must configure the attributes page in the SMGR as shown in the above Screenshot.

The **Data source JNDI name** should be configured using the **JDBC Providers and JDBC Sources.**
Refer to Avaya Breeze Admin Guide on how to configure Providers and Sources.
A screenshot of basic configuration of **JDBC Providers** is as below.



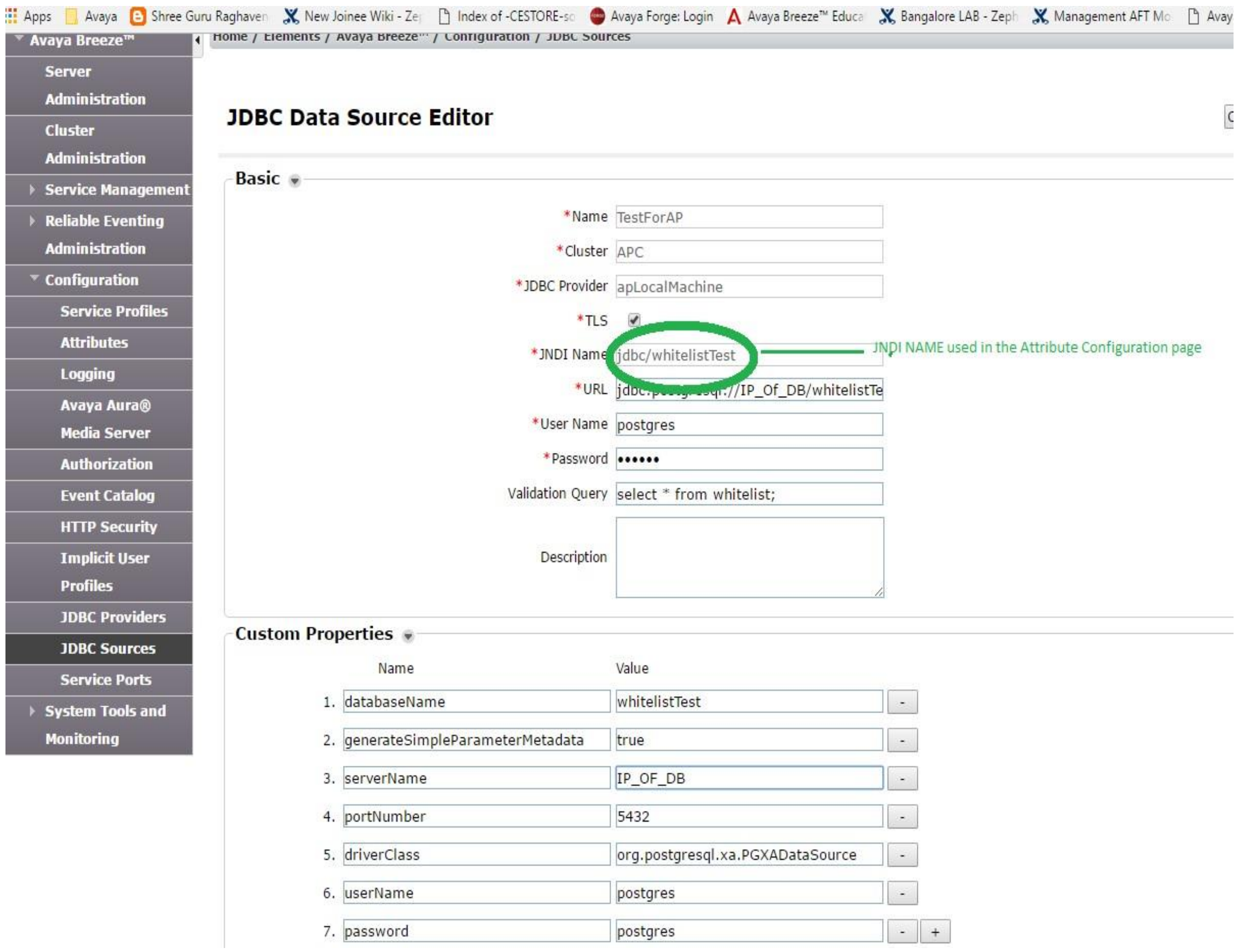
JDBC Provider Editor

Add/Edit JDBC Provider

*Name	apLocalMachine
*Class Name	org.postgresql.xa.PGXADataSource
*Jar File	postgresql-42.1.1.jre6.jar
Description	To test external postgress

This **JDBC Provider** should be installed as the Service into the Cluster.

Next, we have to configure the **JDBC Sources** and a screenshot is as below.



JDBC Data Source Editor

Basic

*Name	TestForAP
*Cluster	APC
*JDBC Provider	apLocalMachine
*TLS	✓
*JNDI Name	jdbc/whitelistTest
*URL	jdbc:postgresql://IP_Of_DB/whitelistTe
*User Name	postgres
*Password	••••••
Validation Query	select * from whitelist;
Description	

Custom Properties

	Name	Value
1.	databaseName	whitelistTest
2.	generateSimpleParameterMetadata	true
3.	serverName	IP_OF_DB
4.	portNumber	5432
5.	driverClass	org.postgresql.xa.PGXADataSource
6.	userName	postgres
7.	password	postgres

Once the above JDBC Providers and JDBC Sources are configured we must use the same name of JNDI from here to the attribute page.

Now by using the User- Interface/Script/Rest web service we can insert data into the database and we can start using the Whitelist snap-in.