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KNIME

KNIME® Spark Executor

Installation Guide
Version 2.0.1

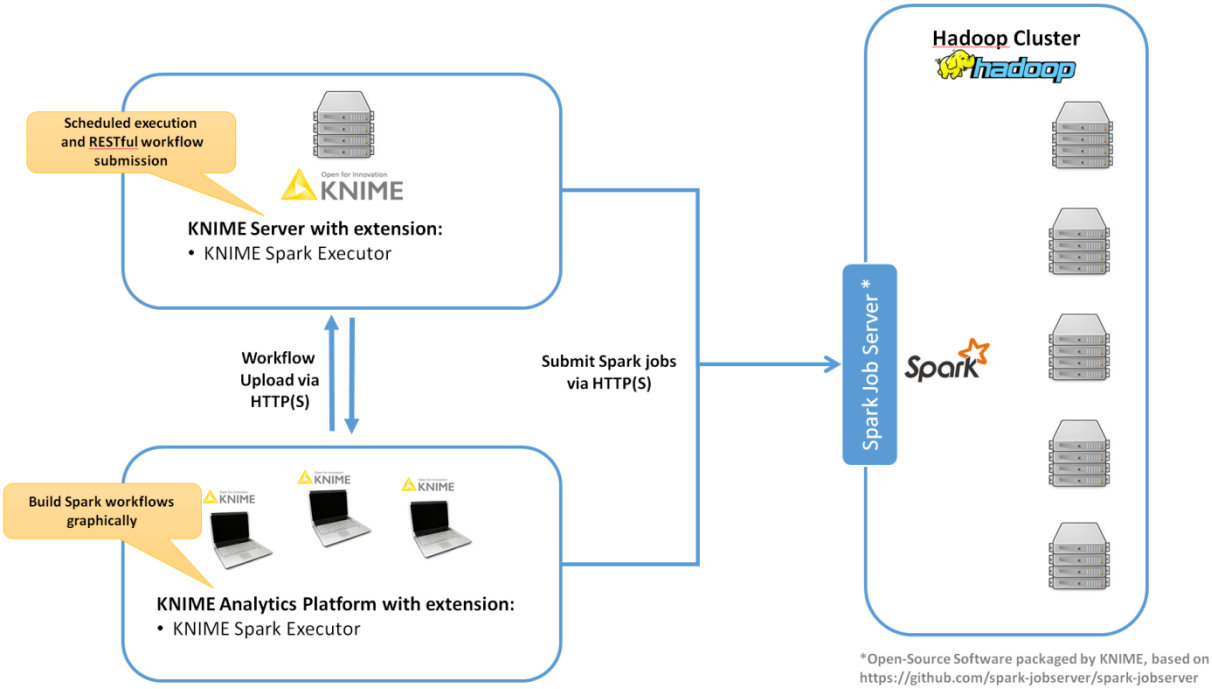
TABLE OF CONTENTS

INTRODUCTION

This document describes the installation procedure of the KNIME® Spark Executor to be used with KNIME® Analytics Platform 3.4 and KNIME® Server 4.5.

As depicted below, KNIME Spark Executor consists of:

- an *extension* for KNIME Analytics Platform/KNIME Server
- a service called *Spark Job Server*, that needs to be installed on an edge node of your Hadoop cluster or a node that can execute the *spark-submit* command.



SUPPORTED HADOOP DISTRIBUTIONS

- **Supported <u>without</u> Kerberos security:**
  - Hortonworks HDP 2.2 with Spark 1.2
  - Hortonworks HDP 2.3.0 with Spark 1.3
  - Hortonworks HDP 2.3.4 with Spark 1.5
  - Hortonworks HDP 2.4.x with Spark 1.6
  - Hortonworks HDP 2.5.x with Spark 1.6 and Spark 2.0
  - Cloudera CDH 5.3 with Spark 1.2
  - Cloudera CDH 5.4 with Spark 1.3
  - Cloudera CDH 5.5 with Spark 1.5
  - Cloudera CDH 5.6 with Spark 1.5
  - Cloudera CDH 5.7 with Spark 1.6 and Spark 2.0
  - Cloudera CDH 5.8 with Spark 1.6 and Spark 2.0
  - Cloudera CDH 5.9 with Spark 1.6 and Spark 2.0
  - Cloudera CDH 5.10 with Spark 1.6 and Spark 2.0
  - Cloudera CDH 5.11 with Spark 1.6 and Spark 2.0
  - Cloudera CDH 5.12 with Spark 1.6 and Spark 2.0
- **Supported <u>with</u> Kerberos security:**
  - Hortonworks HDP 2.4.2, 2.4.3 and HDP 2.5.x with Spark 1.6 and Spark 2.0

- Cloudera CDH 5.7, CDH 5.8 and CDH 5.9, CDH 5.10, CDH 5.11, CDH 5.12 with Spark 1.6 and Spark 2.0

SUPPORTED KNIME SOFTWARE VERSIONS

KNIME Spark Executor is compatible with the following versions of KNIME software:

KNIME Analytics Platform 3.4

KNIME Server 4.5

SPARK JOB SERVER SETUP

This section describes how to install the Spark Job Server on a Linux machine. KNIME Spark Executor requires the Spark Job Server to execute and manage Spark jobs.

BACKGROUND

The Spark Job Server provides a RESTful interface for submitting and managing Apache Spark jobs, jars, and job contexts.

MORE INFORMATION

The Spark Job Server was originally developed at Ooyala, but the main development repository is now on GitHub. For more information please consult the GitHub repository at https://github.com/spark-jobserver/spark-jobserver/, including licensing conditions, contributors, mailing lists and additional documentation.

In particular, the readme of the Job Server contains dedicated sections about *HTTPS / SSL Configuration* and *Authentication*. The GitHub repository also contains a general Troubleshooting and Tips as well as YARN Tips section. All Spark Job Server documentation is available in the doc folder of the GitHub repository.

KNIME packages the official Spark Job Server and - if necessary – adapts it for the Hadoop distributions supported by KNIME Spark Executor. These packages can be downloaded on the KNIME Spark Executor product website. We strongly recommend using these packages as they contain additional bugfixes and improvements and have been tested and verified by KNIME.

VERSION

The current versions of Spark Job Server provided by KNIME are `0.6.2.2-KNIME` (for Spark 1.x) and `0.7.0.1-KNIME` (for Spark 2.0). Their setup is described in this document.

UPDATING SPARK JOB SERVER

If you are updating an existing Spark Job Server installation to `0.6.2.2-KNIME` (for Spark 1.x), there may be changes required to some of its configuration files. The README of the Spark Job Server packaged by KNIME highlights any necessary changes to those files.

If you are updating an existing Spark Job Server installation to `0.7.0.1-KNIME` (for Spark 2.0), it is strongly recommended to make a fresh installation based on this guide. Due to the number of changes to the server's default configuration and directory layout, copying an old configuration will not work.

Due to different default installation locations between `0.6.2.2-KNIME` (for Spark 1.x) and `0.7.0.1-KNIME` (for Spark 2.0), it is possible to install both versions of Spark Job Server at the same time on the same machine.

REQUIREMENTS

The Spark Job Server runs the so-called Spark driver program and executes Spark jobs submitted via REST. Therefore, it must be installed on a machine that

- runs on Linux (RHEL 6.x/7.x recommended, Ubuntu 14 .x is also supported)
- has full network connectivity to all your Hadoop cluster nodes,
- can be connected to via HTTP (default port TCP/8090) from KNIME Analytics Platform and/or KNIME Server,
- has all libraries and cluster-specific configuration Spark, Hadoop and Hive libraries set up.

This can for example be the Hadoop master node or a cluster edge node.

HOW TO INSTALL

1. Locate the Spark Job Server package that matches your Hadoop distribution on the KNIME Spark Executor product website under **Installation Steps > KNIME Analytics Platform X.Y > Supplementary download links for the Spark Job Server.**

   Due to different default installation locations between Spark Job Server versions `0.6.2.x-KNIME` (for Spark 1.x) and `0.7.0.1-KNIME` (for Spark 2.0), it is possible to install both versions of Spark Job Server at the same time on the same machine. If you choose to do this, walk through steps 2. – 7. once for each version.

2. Download the file on the machine where you want to install Spark Job Server.

3. The recommend installation procedure is to log in as root on that machine and install the Job Server as follows (replace xxx with the version of your download).

   First, define a shell variable which we will be using in the remainder of the installation:

   ```
   Only for Job Server versions 0.6.2.x-KNIME_xxx (Spark 1.x):
   root@host$ LINKNAME=spark-job-server


   Only for Job Server versions 0.7.0.x-KNIME_xxx (Spark 2.x):
   root@host$ LINKNAME=spark2-job-server
   ```

   For all versions of Spark Job Server proceed with:

```
root@host$ useradd -d /opt/${LINKNAME}/ -M -r -s /bin/false spark-
job-server
root@host$ su -l -c "hdfs dfs -mkdir -p /user/spark-job-server ; hdfs
dfs -chown -R spark-job-server /user/spark-job-server" hdfs
root@host$ cp /path/to/spark-job-server-xxx.tar.gz /opt
root@host$ cd /opt
root@host$ tar xzf spark-job-server-xxx.tar.gz
root@host$ ln -s spark-job-server-xxx ${LINKNAME}
root@host$ chown -R spark-job-server:spark-job-server ${LINKNAME}
spark-job-server-xxx/
```

4. If you are installing on RedHat Enterprise Linux (RHEL), CentOS or Ubuntu 14.x then use the boot script which is provided and can be installed as follows:

   Only for RHEL 6.x/CentOS 6.x:

   Execute the following command to make Spark Job Server start during system boot:

   ```
   root@host$ ln -s /opt/${LINKNAME}/spark-job-server-init.d \
   /etc/init.d/${LINKNAME}
   root@host$ chkconfig --levels 2345 ${LINKNAME} on
   ```

   Only for RHEL 7.x/CentOS 7.x:

   Execute the following commands to make Spark Job Server start during system boot:

   ```
   root@host$ ln -s /opt/${LINKNAME}/spark-job-server-init.d \
   /etc/init.d/${LINKNAME}
   root@host$ systemctl daemon-reload
   root@host$ systemctl enable ${LINKNAME}
   ```

   Only for Ubuntu 14.x:

   Execute the following commands to make Spark Job Server start during system boot:

   ```
   root@host$ ln -s /opt/${LINKNAME}/spark-job-server-init.d-sysv
    /etc/init.d/${LINKNAME}
   root@host$ update-rc.d ${LINKNAME} start 20 2 3 4 5 .\
    stop 20 0 1 6 .
   ```

   The boot script will run the Job Server as the `spark-job-server` system user. If you have installed the Job Server to a different location, or wish to run the server with a different user, you will have to change the JSDIR and USER variables in the boot script.

5. Edit `environment.conf` in the server's installation directory as appropriate. The most important settings are:
   - **master**: Set…
     - `master = yarn-client` for running Spark in YARN-client mode
     - `master = spark://localhost:7077` for stand-alone mode
     - `master = local[4]` for local debugging.

     Note: yarn-cluster mode is currently not supported by Spark Job Server.
   - **Settings for predefined contexts.** Under `context-settings`, you can predefine Spark settings for the default Spark context. Please note that these settings can be

overwritten by the configuration of the KNIME extension. Under `contexts` you can predefine Spark settings for non-default Spark contexts.

6. Edit *settings.sh* as appropriate:
   - **SPARK_HOME**, please change if Spark is not installed under the given location.
   - **LOG_DIR,** please change if you want to log to a non-default location.

7. Edit *log4j-server.properties* as appropriate (not necessary unless you wish to change the defaults).

STARTING THE SPARK JOB SERVER

On RHEL 6 and Ubuntu 14.x start the server via the boot-script:

```
root@host$ /etc/init.d/${LINKNAME} start
```

On RHEL 7 and higher start the server via systemd:

```
root@host$ systemctl start ${LINKNAME}
```

Notes:

- Replace `${LINKNAME}` with either `spark-job-server` or `spark2-job-server` depending on which value you have been using in the previous section.
- **It is not recommended to start spark Job Server with the `server_start.sh` in its installation directory**.
- You can verify that Spark Job Server has correctly started via the WebUI (see Spark Job Server Web UI).

STOPPING THE SPARK JOB SERVER

On RHEL 6 and Ubuntu 14.x stop the server via the boot-script:

```
root@host$ /etc/init.d/${LINKNAME} stop
```

On RHEL 7 and higher stop the server via systemd:

```
root@host$ systemctl stop ${LINKNAME}
```

Notes:

- Replace `${LINKNAME}` with either `spark-job-server` or `spark2-job-server` depending on which value you have been using in the previous section.
- It is not recommended to stop the server with the `server_stop.sh` script.

HOW TO INSTALL ON A KERBEROS-SECURED CLUSTER

In a Kerberos secured cluster, Job Server requires a Ticket Granting Ticket (TGT) to access Hadoop services and provide user impersonation. To set this up, please first follow the installation steps in the previous section. Then proceed with the following steps:

1. Via kadmin, create a service principal and a keytab file for the `spark-job-server` Linux user. By default this is assumed to be `spark-job-server/host@REALM`, where
   - `host` is the fully qualified hostname (FQDN) of the machine where you are installing Job Server,
   - `REALM` is the Kerberos realm of your cluster.

2. Upload the keytab file to the machine where Job Server is installed and limit its accessibility to only the `spark-job-server` system user:

   ```
   root@host$ chown spark-job-server:spark-job-server /path/to/keytab
   root@host$ chmod go= /path/to/keytab
   ```

3. Now you have to tell Job Server about the keytab file and, optionally, about the service principal you have created. In `/opt/ spark-job-server-xxx/settings.sh` uncomment and edit the following lines:

   ```
   export JOBSERVER_KEYTAB=/path/to/keytab
   export JOBSERVER_PRINCIPAL=user/host@REALM
   ```

   Note: You only need to set the principal, if it is different from the assumed default principal `spark-job-server/$(hostname -f)/<default realm from /etc/krb5.conf>`

4. In `environment.conf` set the following properties:

   ```
   spark {
     jobserver {
       context-per-jvm = true
     }
   }
   shiro {
     authentication = on
     config.path = "shiro.ini"
     use-as-proxy-user = on
   }
   ```

   The effect of these settings is that Job Server will authenticate all of its users, and each user will have its own Spark context, that can access Hadoop resources in the name of this user.

5. C onfigure the authentication mechanism of Job Server in the `shiro.ini` file. Instructions for authenticating against LDAP or ActiveDirectory are covered in the *HOW TO SET UP LDAP AUTHENTICATION* section of this installation guide. Some example templates can also be found in the Spark Job Server installation folder.

6. Add the following properties to the `core-site.xml` of your Hadoop cluster:

   ```
   hadoop.proxyuser.spark-job-server.hosts = *
   hadoop.proxyuser.spark-job-server.groups = *
   ```

   This must be done either via Ambari (on HDP) or Cloudera Manager (on CDH). A restart of the affected Hadoop services is required.

HOW TO SET UP LDAP AUTHENTICATION

Spark Job Server uses the the Apache shiro framework to authenticate its users, which is can delegate authentication to an LDAP server, e.g. OpenLDAP or Microsoft ActiveDirectory.

Set up LDAP authentication as follows:

1. Activate shiro authentication in the server's `environment.conf`:

   ```
   shiro {
     authentication = on
     config.path = "shiro.ini"
     [...other settings may be here...]
   }
   ```

2. Create an empty `shiro.ini`.

3. Configure `shiro.ini` using one of the templates from the following sections, depending on whether you want to authenticate against OpenLDAP or ActiveDirectory and with or without group membership checking.

   Important notes:
   - Do not change the order of the lines in the templates.
   - Do not use single or double quotes unless you want them to be part of the configuration values. The ini file format does not support quoting.

4. Activate the shiro authentication cache by appending the following lines to `shiro.ini`:

   ```
   cacheManager = org.apache.shiro.cache.MemoryConstrainedCacheManager
   securityManager.cacheManager = $cacheManager
   ```

SHIRO.INI TEMPLATE: OPENLDAP WITHOUT GROUP MEMBERSHIP CHECKING

```
myRealm = org.apache.shiro.realm.ldap.JndiLdapRealm
myRealm.contextFactory.url = ldap://ldapserver.company.com
myRealm.userDnTemplate = uid={0},ou=people,dc=company,dc=com
```

Notes:

- In `myRealm.userDnTemplate` the placeholder `{0}` is replaced with the login name the user enters.

SHIRO.INI TEMPLATE: ACTIVEDIRECTORY WITHOUT GROUP MEMBERSHIP CHECKING

```
myRealm = org.apache.shiro.realm.ldap.JndiLdapRealm
myRealm.contextFactory.url = ldap://ldapserver.company.com
myRealm.userDnTemplate = {0}@COMPANY.COM
```

Notes:

- In `myRealm.userDnTemplate` the placeholder `{0}` is replaced with the login name the user enters. ActiveDirectory then authenticates against the user record with a matching `sAMAccountName`.

SHIRO.INI TEMPLATE: OPENLDAP WITH GROUP MEMBERSHIP CHECKING

```
myRealm = spark.jobserver.auth.LdapGroupRealm
myRealm.contextFactory.url = ldap://ldapserver.company.com
myRealm.userDnTemplate = uid={0},ou=people,dc=company,dc=com
myRealm.contextFactory.systemUsername = uid=systemuser,dc=company,dc=com
myRealm.contextFactory.systemPassword = theSystemUserPassword
myRealm.userSearchFilter = (&(objectClass=inetOrgPerson)(uid={0}))
myRealm.contextFactory.environment[ldap.searchBase] = dc=company.com,dc=com
myRealm.contextFactory.environment[ldap.allowedGroups] = group1,group2
myRealm.groupSearchFilter = (&(member={2})(objectClass=posixGroup)(cn={0}))
```

Notes:

- In `myRealm.userDnTemplate` the placeholder `{0}` is replaced with the login name the user enters.
- `myRealm.contextFactory.systemUsername` is a technical user account that must be allowed to list all user DNs and determine their group membership.
- `myRealm.userSearchFilter` and `myRealm.groupSearchFilter` are only used to determine group membership, which takes place after successful user/password authentication.
- In `myRealm.contextFactory.environment[ldap.allowedGroups]` you list all group names separated by commas, without spaces. These group names will be put into the `{0}` placeholder of the `myRealm.groupSearchFilter` when trying to find the LDAP record of a group. The DN of the user, which is determined with `myRealm.userSearchFilter`, is put into the `{2}` placeholder.

SHIRO.INI TEMPLATE: ACTIVEDIRECTORY WITH GROUP MEMBERSHIP CHECKING

```
myRealm = spark.jobserver.auth.LdapGroupRealm
myRealm.contextFactory.url = ldap://ldapserver.company.com
myRealm.userDnTemplate = {0}@COMPANY.COM
myRealm.contextFactory.systemUsername = systemuser@COMPANY.COM
myRealm.contextFactory.systemPassword = theSystemUserPassword
myRealm.userSearchFilter = (&(objectClass=person)(sAMAccountName={0}))
myRealm.contextFactory.environment[ldap.searchBase] = dc=company.com,dc=com
myRealm.contextFactory.environment[ldap.allowedGroups] = group1,group2
myRealm.groupSearchFilter = (&(member={2})(objectClass=group)(cn={0}))
```

Notes:

- In `myRealm.userDnTemplate` the placeholder `{0}` is replaced with the login name the user enters. ActiveDirectory then authenticates against the user record with a matching `sAMAccountName`.
- `myRealm.contextFactory.systemUsername` is a technical user account that must be allowed to list all user DNs and determine their group membership.

- `myRealm.userSearchFilter` and `myRealm.groupSearchFilter` are only used to determine group membership, which takes place after successful user/password authentication.
- In `myRealm.contextFactory.environment[ldap.allowedGroups]` you list all group names separated by commas, without spaces. These group names will be put into the `{0}` placeholder of the `myRealm.groupSearchFilter` when trying to find the LDAP record of a group. The DN of the user, which is determined with `myRealm.userSearchFilter`, is put into the `{2}` placeholder.

MAINTENANCE

CLEANUP JOB HISTORY

It is advisable to re-start the Spark Job Server occasionally, and clean-up its rootdir. Remove either the entire directory or only the jar files under `/tmp/spark-job-server`, or whichever file system locations you have set in `environment.conf`.

SPARK JOB SERVER WEB UI

Point your browser to *http://<server>:<port>* to check out the status of the Spark Job Server. The default port is 8090. Three different tabs provide information about active and completed jobs, contexts and jars.

TROUBLESHOOTING

JOB SERVER FAILS TO RESTART

At times, the Spark Job Server cannot be restarted when large tables were serialized from KNIME to Spark. It fails with a message similar to *java.io.UTFDataFormatException: encoded string too long: 6653559 bytes*. In that case, it is advisable to delete `/tmp/spark-job-server`, or whichever file system locations you have set in `environment.conf`.

SPARK COLLABORATIVE FILTERING NODE FAILS

If your Spark Collaborative Filtering node fails with *a "Job canceled because SparkContext was shutdown"* exception the cause might be missing native libraries on the cluster. If you find the error message *JAVA.LANG.UNSATISFIEDLINKERROR: ORG.JBLAS.NATIVEBLAS.DPOSV* in your Job Server log the native JBlas library is missing on your cluster. To install the missing lib execute the following command as root on all cluster nodes:

RedHat-based systems: `yum install libgfortran`

Debian-based systems: `apt-get install libgfortran3`

For detailed instructions on how to install the missing libraries go to the JBlas Github page. For information about the MLlib dependencies see the Dependencies section of the MLlib Guide.

The issue is described in https://spark-project.atlassian.net/browse/SPARK-797

REQUEST TO SPARK JOB SERVER FAILED, BECAUSE THE AMOUNT OF UPLOADED DATA WAS TOO LARGE

Spark Job Server limits how much data can be submitted in a single REST request. For Spark nodes that submit large amounts of data to Spark Job Server, e.g. a large MLlib model, this can result in a request failure with an error that says Request to "Spark Job Server failed, because the amount of uploaded data was too large". This problem can be addressed by increasing the maximum content length in Job Server's webserver. Add and adjust the following section in `environment.conf`:

```
spray.can.server {
      request-chunk-aggregation-limit = 200m
}

spray.can.server.parsing {
      max-content-length = 200m
}
```

SPARK JOB EXECUTION FAILED BECAUSE NO FREE JOB SLOTS WERE AVAILABLE ON SPARK JOB SERVER

Spark Job Server limits how much jobs can run at the same time within the same context. This limit can be changed by adjusting the following setting in `environment.conf`:

```
spark {
  jobserver {
    max-jobs-per-context = 100
  }
}
```

KNIME SPARK EXECUTOR EXTENSION SETUP

This section describes how to install the client-side extension of KNIME Spark Executor in KNIME Analytics Platform or KNIME Server. The extension provides all the necessary KNIME nodes to create workflows that execute on Apache Spark.

REQUIREMENTS

Required Software:
A compatible version of KNIME Analytics Platform or KNIME Server (see beginning of this document).

Network Connectivity Requirements:
KNIME Spark Executor extension (the client) needs to be able to make a network connection to the Spark Job Server service. There are two options to make this connection:

- **Direct connection (recommended):** Client → Spark Job Server (default port 8090)
- **Proxied connection:** Client → HTTP/HTTPS/SOCKS Proxy → Spark Job Server (default port 8090). Currently, only proxies that do not require any authentication are supported. Note that KNIME does not provide the proxy software itself.

INSTALLATION

The extension can be installed via the KNIME Update Manager:

1. Go to **File > Install KNIME Extensions ...**
2. Open the category **KNIME.com Big Data Extensions (licenses required)**.
3. Select the **KNIME Spark Executor** extension.
4. Click on Next and follow the subsequent dialog steps to install the extension.

If you don't have direct internet access you can also install the extension from a zipped update site:

1. Download the zipped update site from the KNIME Spark Executor product website under **Installation Steps → KNIME Analytics Platform X.Y > Extension for KNIME Analytics Platform/KNIME Server.**
2. Then register the update site in the KNIME Analytics Platform via **File > Preferences > Install/Update > Available Software Sites**. Then follow the installation steps for the KNIME Update Manager (see above).

Note that using the client-side extension requires a license, which you can purchase via the KNIME Store.

MANAGING SPARK CONTEXTS

CREATE SPARK CONTEXT

After installing the client-side extension, you should configure it to work with your environment e.g. your Spark Job Server configuration.

To setup a connection to the Spark Job Server and to create a new Spark Context to work with you should use the *Create Spark Context* node.

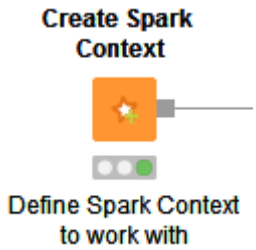


FIGURE 1 CREATE SPARK CONTEXT NODE

The node dialog has two main tabs. The first tab is the Context Settings tab which allows you to specify the following Spark Context settings:

1. **Spark version:** Please choose the Spark version of the Hadoop cluster you are connecting to.
2. **Context name:** The name of the Spark context. This should be the same for all users of the same Spark Job Server. If you want to use multiple contexts you should install a Spark Job Server for each context.

3. **Delete objects on dispose:** KNIME workflows with Spark nodes create objects such as RDDs during execution. This setting specifies whether those objects shall be deleted when closing a workflow.
4. **Spark job log level:** The Spark jobs triggered by KNIME nodes often create some log messages on the Spark Job Server. Log messages with a log level equal or above the one specified here will also be display inside KNIME Analytics Platform, which can be useful when debugging workflows.
5. **Override Spark settings:** Custom settings for the remote Spark context, e.g. the amount of memory to allocate per Spark executor. These settings override those from Job Server's *environment.conf.*
6. **Hide context exists warning:** If not enabled the node will show a warning if a Spark Context with the defined name already exists.

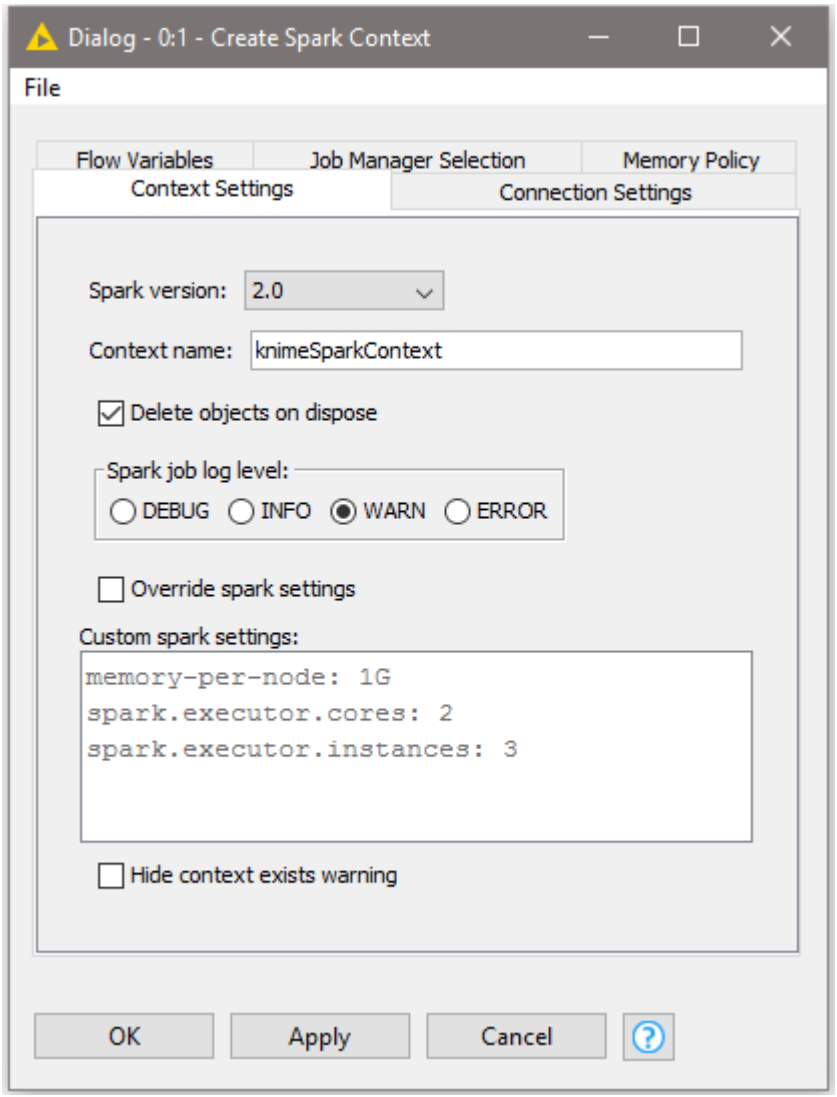


FIGURE 2 CREATE SPARK CONTEXT: CONTEXT SETTINGS

The second tab is the Connection Settings tab which allows you to specify the following connection settings:

1. **Job server URL:** This is the HTTP/HTTPS URL under which the Spark Job Server WebUI can be reached. The default URL is http//localhost:8090/.
2. **Credentials:** If you have activated user authentication, you need to enter a username and password here.
3. **Job timeout in seconds/Job check frequency:** These settings specify how long a single Spark job can run before being considered failed, and, respectively, in which intervals the status of a job shall be polled.

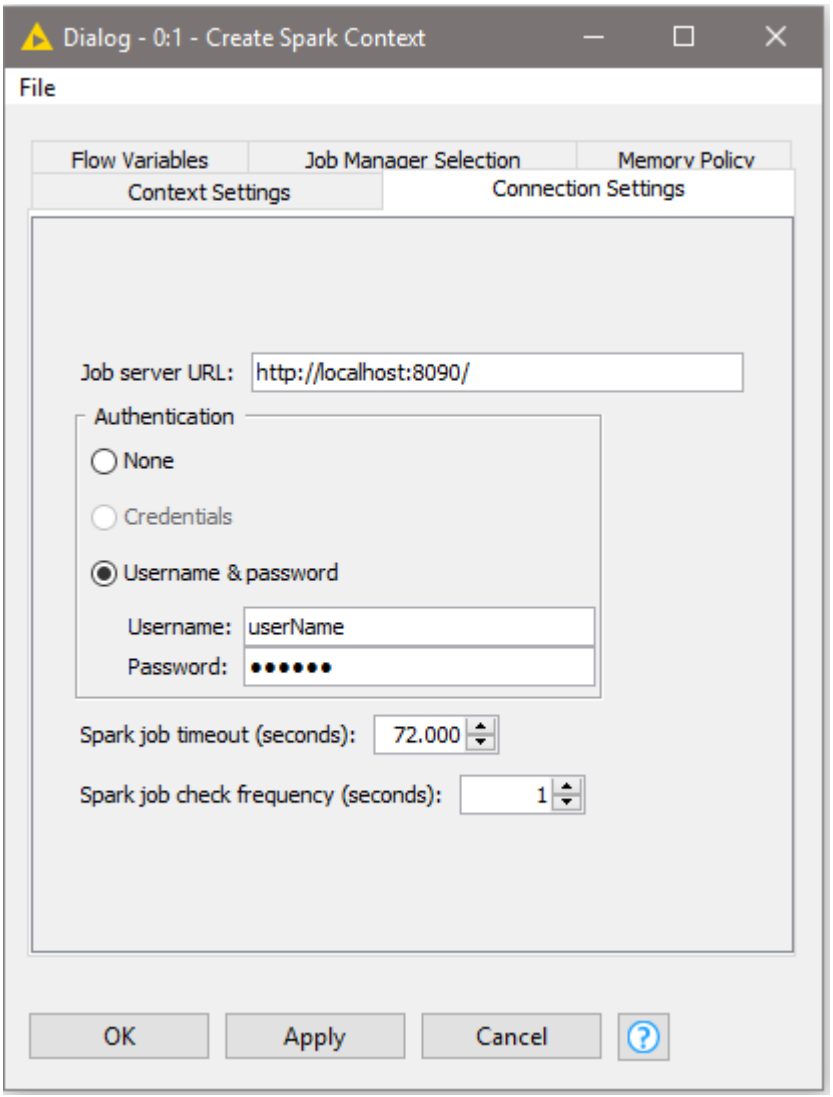


FIGURE 3 CREATE SPARK CONTEXT: CONNECTION SETTINGS

DESTROY THE SPARK CONTEXT

Once you have finished your Spark job you should destroy the created context to free up the resources your Spark Context has allocated on the cluster. To do so you can use the *Destroy Spark Context* node.

FIGURE 4 DESTROY SPARK CONTEXT NODE

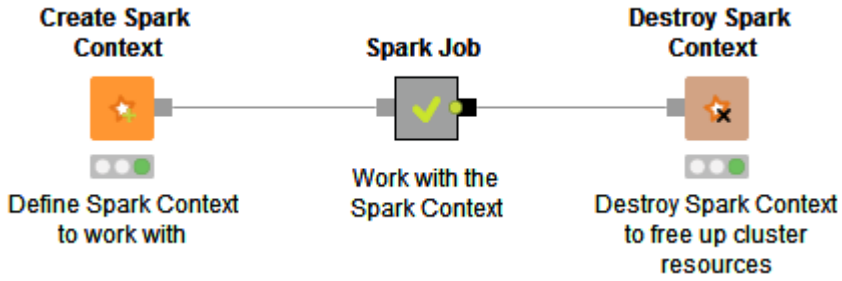


FIGURE 5 SIMPLISTIC EXAMPLE WORKFLOW OF A SPARK WORKFLOW

ADAPT DEFAULT SETTINGS

The default settings in the *Create Spark Context* node can be specified via a preference page. To change the default settings within KNIME Analytics Platform, open **File > Preferences > KNIME > KNIME Big Data Extensions > Spark** and adapt the following settings to your environment:

4. **Job server URL:** This is the HTTP/HTTPS URL under which the Spark Job Server WebUI can be reached. The default URL is http//localhost:8090/.
5. **Credentials:** If you have activated user authentication, you need to enter a username and password here.
6. **Job timeout in seconds/Job check frequency:** These settings specify how long a single Spark job is allowed to run before being considered failed, and, respectively, in which intervals the status of a job shall be polled.
7. **Spark version:** Please choose the Spark version of the Hadoop cluster you are connecting to.
8. **Context name:** The name of the Spark context. This should be the same for all users of the same Spark Job Server. If you want to use multiple contexts you should install a Spark Job Server for each context.
9. **Delete Spark objects on dispose:** KNIME workflows with Spark nodes create objects such as RDDs during execution. This setting specifies whether those objects shall be deleted when closing a workflow.
10. **Spark job log level:** The Spark jobs triggered by KNIME nodes often create some log messages on the Spark Job Server. Log messages with a log level equal or above the one specified here will also be display inside KNIME Analytics Platform, which can be useful when debugging workflows.

11. **Override Spark settings:** Custom settings for the remote Spark context, e.g. the amount of memory to allocate per Spark executor. These settings override those from Job Server's *environment.conf.*

PROXY SETTINGS

If your network requires you to connect to Spark Job Server via a proxy, please open **File > Preferences > Network Connections**. Here you can configure the details of your HTTP/HTTPS/SOCKS proxies. Please consult the official Eclipse documentation on how to configure proxies.

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