Oracle® Big Data SQL
Installation Guide

Release 3.2.1.1

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Contents

4   Expanding or Shrinking an Installation

5   Reconfiguring an Installation

6   Uninstalling Oracle Big Data SQL

7   Securing Big Data SQL

8   Additional Tools Installed

A　Installation Quick Reference

B　bds-config.json Configuration Example

C　Oracle Big Data SQL Installation Examples

D　Determining the Correct Software Version and Composing the Download Paths for Hadoop Clients

E　Oracle Big Data SQL Licensing

F　Change History for Previous Releases

Index

Preface

The *Oracle Big Data SQL User's Guide* describes how to use and manage the Oracle Big Data SQL product.

Audience

This guide is intended for administrators and users of Oracle Big Data SQL, including:

- Application developers
- Data analysts
- Data scientists
- Database administrators
- System administrators

The guide assumes that the reader has basic knowledge of Oracle Database single-node and multinode systems, the Hadoop framework, the Linux operating system, and networking concepts.

Related Documents

See the *Oracle Big Data SQL User's Guide* for instructions on using the product.

The following publications provide information about the use of Oracle Big Data SQL with the Oracle Big Data Appliance and Oracle Big Data Connectors:

- *Oracle Big Data Appliance Owner's Guide*
- *Oracle Big Data Appliance Software User's Guide*
- *Oracle Big Data Connectors User's Guide*

You can find more information about Oracle's Big Data solutions and Oracle Database at the Oracle Help Center

For more information on Hortonworks HDP and Ambari, refer to the Hortonworks documentation site at http://docs.hortonworks.com/index.html.

For more information on Cloudera CDH and Configuration Manager, see http://www.cloudera.com/documentation.html

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.
# prompt	The pound (#) prompt indicates a command that is run as the Linux `root` user.

Backus-Naur Form Syntax

The syntax in this reference is presented in a simple variation of Backus-Naur Form (BNF) that uses the following symbols and conventions:

Symbol or Convention	Description
[ ]	Brackets enclose optional items.
{ }	Braces enclose a choice of items, only one of which is required.
|	A vertical bar separates alternatives within brackets or braces.
...	Ellipses indicate that the preceding syntactic element can be repeated.
delimiters	Delimiters other than brackets, braces, and vertical bars must be entered as shown.
boldface	Words appearing in boldface are keywords. They must be typed as shown. (Keywords are case-sensitive in some, but not all, operating systems.) Words that are not in boldface are placeholders for which you must substitute a name or value.

Who Should Install Release 3.2.1.1?

If you need to support connections from Oracle Database 12.2.0.1, or, you are running Grid 12.2.0.1, then install Oracle Big Data SQL 3.2.1.1.

Support for connections from Oracle Database 12.1.0.2 to Hadoop does not require an upgrade from Big Data SQL 3.2 to 3.2.1.1, unless:

- The 12.1.0.2 database is managed by Oracle Grid Infrastructure 12.2, or,
- The 12.1 database is connecting to a Hadoop cluster with Big Data SQL 3.2.1 installed.

> **Note:**
>
> If you do install Release 3.2.1.1 on the Hadoop cluster, remember to apply the new database deployment bundle from the Hadoop cluster installation to the database tier.

Please check the Oracle Big Data SQL Master Compatibility Matrix (Doc ID 2119369.1 in My Oracle Support) for further details.

Changes in Oracle Big Data SQL 3.2.1.1

Oracle Big Data SQL Release 3.2.1.1 includes the following changes.

New Database Compatibility Parameter for the Jaguar Installer

The configuration file that is passed to the Jaguar installer now accepts an optional `database_compatibility` parameter:

This parameter gives you a way to save on system resources (particularly memory) if all databases connected to a cluster are of the same version of Oracle Database. Oracle Big Data SQL provides a different offloader process for each supported version of Oracle Database. In this release, there are offloader process for Oracle Database 12.1 and 12.2. By default, both are running. If you only need Oracle 12.1 connections or 12.2 connections, but not both, then you can use `database_compatibility` to prevent start up of the offloader process that you do not need.

This parameter is within the `cluster` section of the configuration file. We set compatibility to 12.1 in this example:

```
"cluster" : {
    "database_compatibility" : [ "12.1" ]
}
```

Like any other configuration parameter, you can change this later by running a `jaguar reconfigure` operation.

Installation Differences on Exadata Database Machine RAC Systems and non-Exadata Database Machine RAC Systems

> **Note:**
>
> The following apply *only* to Oracle Big Data SQL 3.2.1.1 and only for installations on RAC Systems running on commodity hardware (RAC systems that are not Exadata Database Machines).

- Only Ethernet is supported for connections between Oracle Database 12.2 and the Hadoop cluster.
- There are special steps specific to Oracle Big Data SQL 3.2.1.1 that you must follow the first time that you install the database side of the software on the database nodes. The details are provided in Steps for Installing on Oracle Database Nodes in the installation guide.

Known Limitations Reported in Release 3.2.1 That are Resolved in 3.2.1.1

- JSON CLOB predicate pushdown is working in Release 3.2.1.1

- In Release 3.2.1, storage indexes for an Oracle Big Data SQL table may not be utilized where the following DDL operation is performed:

```
ALTER TABLE table_name PROJECT COLUMN REFERENCED;
```

This is also fixed in Release 3.2.1.1.

1
Introduction

This guide describes how to install Oracle Big Data SQL, how to reconfigure or extend the installation to accommodate changes in the environment, and, if necessary, how to uninstall the software.

This installation is done in phases. The first two phases are:

- Installation on the node of the Hadoop cluster where the cluster management server is running.

- Installation on each node of the Oracle Database system.

If you choose to enable optional security features available, then there is an additional third phase in which you activate the security features.

The two systems must be networked together via Ethernet or InfiniBand. (Connectivity to Oracle SuperCluster is InfiniBand only).

> ✎ **Note:**
>
> For Ethernet connections between Oracle Database and the Hadoop cluster, Oracle recommends 10 Gb/s Ethernet.

The installation process starts on the Hadoop system, where you install the software manually on one node only (the node running the cluster management software). Oracle Big Data SQL leverages the adminstration facilities of the cluster management software to automatically propagate the installation to all DataNodes in the cluster.

The package that you install on the Hadoop side also generates an Oracle Big Data SQL installation package for your Oracle Database system. After the Hadoop-side installation is complete, copy this package to all nodes of the Oracle Database system, unpack it, and install it using the instructions in this guide. If you have enabled Database Authentication or Hadoop Secure Impersonation, you then perform the third installation step.

1.1 Supported System Combinations

Oracle Big Data SQL supports connectivity between a number of Oracle Engineered Systems and commodity servers.

The current release supports Oracle Big Data SQL connectivity for the following Oracle Database platforms/Hadoop system combinations:

- Oracle Database on commodity servers with Oracle Big Data Appliance.

- Oracle Database on commodity servers with commodity Hadoop systems.

- Oracle Exadata Database Machine with Oracle Big Data Appliance.

- Oracle Exadata Database Machine with commodity Hadoop systems.

Oracle SPARC SuperCluster support is not available for Oracle Big Data SQL 3.2 .1 at this time.

> **✎ Note:**
>
> The phrase "Oracle Database on commodity systems" refers to Oracle Database hosts that are not the Oracle Exadata Database Machine. Commodity database systems may be either Oracle Linux or RHEL-based. "Commodity Hadoop systems" refers to Hortonworks HDP systems and to Cloudera CDH-based systems other than Oracle Big Data Appliance.

1.2 Oracle Big Data SQL Master Compatibility Matrix

See the Oracle Big Data SQL Master Compatibility Matrix (Doc ID 2119369.1 in My Oracle Support) for up-to-date information on Big Data SQL compatibility with the following:

- Oracle Engineered Systems.

- Other systems.

- Linux OS distributions and versions.

- Hadoop distributions.

- Oracle Database releases, including required patches.

1.3 Prerequisites for Installation on the Hadoop Cluster

The following active services, installed packages, and available system tools are prerequisites to the Oracle Big Data SQL installation. These prerequisites apply to all DataNodes of the cluster.

The Oracle Big Data SQL installer checks all prerequisites before beginning the installation and reports any missing requirements on each node.

Platform requirements, such as supported Linux distributions and versions, as well as supported Oracle Database releases and required patches and are not listed here. See the Oracle Big Data SQL Master Compatibility Matrix (Doc ID 2119369.1 in My Oracle Support) for this information.

> **⊘ Important:**
>
> - Oracle Big Data SQL 3.2.1.1 does not support single user mode for Cloudera clusters.
>
> - On CDH, if you install the Hadoop services required by Oracle Big Data SQL as packages, be sure that they are installed from within CM. Otherwise, CM will not be able to manage them. This is not an issue with parcel-based installation.

Services Running

These Apache Hadoop services must be running on the cluster.

- HDFS

- YARN

- Hive

You do not need to take any extra steps to ensure that the correct HDFS and Hive clients URLs are specified in the database-side installation bundle.

The Apache Hadoop services listed above may be installed as parcels or packages on Cloudera CDH and as stacks on Hortonworks HDP.

Packages

The following packages must be pre-installed on all Hadoop cluster nodes before installing Oracle Big Data SQL. These packages are already installed on versions of Oracle Big Data Appliance supported by Oracle Big Data SQL.

- Oracle JDK version 1.7 or later is required on Oracle Big Data Appliance. Non-Oracle commodity Hadoop servers must also use the Oracle JDK.

- dmidecode

- net-snmp, net-snmp-utils

- perl

  PERL LibXML – 1.7.0 or higher, e.g. perl-XML-LibXML-1.70-5.el6.x86_64.rpm

  perl-libwww-perl, perl-libxml-perl, perl-Time-HiRes, perl-libs, perl-XML-SAX

The `yum` utility is the recommended method for installing these packages:

```
# yum -y install dmidecode net-snmp net-snmp-utils perl perl-libs perl-
Time-HiRes perl-libwww-perl perl-libxml-perl perl-XML-LibXML perl-XML-
SAX
```

Conditional Requirements

- perl-Env is required for systems running Oracle Linux 7 or RHEL 7 only.

  ```
  # yum -y install perl-Env
  ```

System Tools

- curl

- libaio

- rpm

- scp

- tar

- unzip

- wget

- yum

- zip

The libaio libraries must be installed on each Hadoop cluster node:

```
# yum install -y libaio
```

Environment Settings

The following environment settings are required prior to the installation.

- NTP enabled

- The path to the Java binaries must exist in `/usr/java/latest`.

- The path `/usr/java/default` must exist and must point to `/usr/java/latest` .

- Check that these system settings meet the requirements indicated. All of these settings can be temporarily set using the `sysctl` command. To set them permanently, add or update them in `/etc/sysctl.conf`.

  - `kernel.shmmax` and `kernel.shmall` must each be greater than physical memory size.

  - `kernel.shmmax` and `kernel.shmall` values should fit this formula:

    ```
    kernel.shmmax = kernel.shmall * PAGE_SIZE
    ```

    (You can determine `PAGE_SIZE` with `# getconf PAGE_SIZE`.)

  - `vm.swappiness=10`

    If cell startup fails with an error indicating that the `SHMALL` limit has been exceeded, then increase the memory allocation and restart Oracle Big Data SQL.

  - socket buffer size:

    ```
    net.core.rmem_default >= 4194304
    net.core.rmem_max >= 4194304
    net.core.wmem_default >= 4194304
    net.core.wmem_max >= 4194304
    ```

Proxy-Related Requirements:

- The installation process requires Internet access in order to download some packages from Cloudera or Hortonworks sites. If a proxy is needed for this access, then either ensure that the following are set as Linux environment variables, or, enable the equivalent parameters in the installer configuration file, `bds-config.json`)

  - `http_proxy` and `https_proxy`

  - `no_proxy`

    Set `no_proxy` to include the following: "`localhost,127.0.0.1,<Comma-separated list of the hostnames in the cluster (in FQDN format).>`".

- On Cloudera CDH, clear any proxy settings in Cloudera Manager administration before running the installation. You can restore them after running the script

that creates the database-side installation bundle (`bds-database-create-bundle.sh`).

> **✎ See Also:**
>
> Configuration Parameters for bds-config.json describes the use of `http_proxy` , `https_proxy`, and other parameters in the installer configuration file.

Hardware Requirements

- Physical memory >= 12GB
- Number of cores >= 8

Networking

If Hadoop traffic is over VLANs, all DataNodes must be on the same VLAN.

Python 2.7 < 3.0 (for the Oracle Big Data SQL Installer)

The Oracle Big Data SQL installer requires Python (version 2.7 or greater, but less than 3.0) locally on the node where you run the installer. This should be the same node where the cluster management service (CM or Ambari) is running.

If any installation of Python in the version ranged described above is already present, you can use it to run the Oracle Big Data installer.

If an earlier version than Python 2.7.0 is already installed on the cluster management server and you need to avoid overwriting this existing installation, you can add Python 2.7.x as a secondary installation.

> **✎ Restriction:**
>
> On Oracle Big Data Appliance do not overwrite or update the pre-installed Python release. This restriction may also apply other supported Hadoop platforms. Consult the documentation for the CDH or HDP platform you are using.

On Oracle Linux 5, add Python 2.7 as a secondary installation. On Oracle Linux 6, both Python 2.6 and 2.7 are pre-installed and you should use the provided version of Python 2.7 for the installer. Check whether the default interpreter is Python 2.6 or 2.7. To run the Oracle Big Data SQL installer, you may need to invoke Python 2.7 explicitly. On Oracle Big Data Appliance, SCL is installed so you can use to enable version 2.7 for the shell as in this example:

```
[root@myclusteradminserver:BDSjaguar] # scl enable python27 "./jaguar
install bds-config.json"
```

Below is a procedure for adding the Python 2.7.5 as a secondary installation.

> **Tip:**
>
> If you manually install Python, first ensure that the `openssl-devel` package is installed:
>
> ```
> # yum install -y openssl-devel
> ```
>
> If you create a secondary installation of Python, it is strongly recommended that you apply Python update regularly to include new security fixes. On Oracle Big Data Appliance, do not update the mammoth-installed Python unless directed to do so by Oracle.

```
# pyversion=2.7.5
# cd /tmp/
# mkdir py_install
# cd py_install
# wget https://www.python.org/static/files/pubkeys.txt
# gpg --import pubkeys.txt
# wget https://www.python.org/ftp/python/$pyversion/
Python-$pyversion.tgz.asc
# wget https://www.python.org/ftp/python/$pyversion/
Python-$pyversion.tgz
# gpg --verify Python-$pyversion.tgz.asc Python-$pyversion.tgz
# tar xfzv Python-$pyversion.tgz
# cd Python-$pyversion
# ./configure --prefix=/usr/local/python/2.7
# make
# mkdir -p /usr/local/python/2.7
# make install
# export PATH=/usr/local/python/2.7/bin:$PATH
```

1.4 Prerequisites for Installation on Oracle Database Nodes

Installation prerequisites vary, depending on type of Hadoop system and Oracle Database system where Oracle Big Data SQL will be installed.

See the *Oracle Big Data SQL Master Compatibility Matrix* (Doc ID 2119369.1) in My Oracle Support.

Patch Level

Patches must be applied on Oracle Database 12.x and Oracle Grid Infrastructure (when used). The applicable patches depend on the database version in use. Please refer to the Oracle Support Document 2119369.1 (Oracle Big Data SQL Master Compatibility Matrix) for details.
Also check the compatibility matrix for supported Linux distributions and Oracle Database release levels.

Packages Required for Kerberos

If you are installing on a Kerberos-enabled Oracle Database System, these package must be pre-installed:

- krb5-workstation
- krb5-libs

Packages for the "Oracle Tablespaces in HDFS" Feature

Oracle Big Data SQL provides a method to store Oracle Database tablespaces in the Hadoop HDFS file system. The following RPMs must be installed:

- `fuse`
- `fuse-libs`

```
# yum -y install fuse fuse-libs
```

Required Environment Variables

The following are always required. Be sure that these environment variables are set correctly.

- ORACLE_SID
- ORACLE_HOME

> **Note:**
>
> GI_HOME (which was required in Oracle Big Data SQL 3.1 and earlier) is no longer required.

Required Credentials

- Oracle Database owner credentials (The owner is usually the `oracle` Linux account.)

  Big Data SQL 3.2.1.1 is installed as an add-on to Oracle Database. Tasks related directly to database instance are performed through database owner account (`oracle` or other).

- Grid user credentials

  In some cases where Grid infrastructure is present, it must be restarted. If the system uses Grid then you should have the Grid user credentials on hand in case a restart is required.

The Linux users `grid` and `oracle` (or other database owner) must both in the same group (usually `oinstall`). This user requires permission to read all files owned by the `grid` user and vice versa.

All Oracle Big Data SQL files and directories are owned by the `oracle:oinstall` user and group.

1.5 Downloading Oracle Big Data SQL

You can download Oracle Big Data SQL from either of two locations:

*   Oracle Software Delivery Cloud(also known as "eDelivery").
*   My Oracle Support My Oracle Support

Downloading from Oracle Software Delivery Cloud

1. Log in as `root` to the Hadoop node that hosts the cluster management server (CDH or Ambari). Create a new directory or choose an existing one to be Big Data SQL installation directory.

2. Log on to the Oracle Software Delivery Cloud.

3. Search for "Oracle Big Data SQL".

4. Select `Oracle Big Data SQL 3.2.1.1 for Linux x86-64`.

    The same bundle is compatible with all supported systems.

5. Read and agree to the Oracle Standard Terms and Restrictions.

6. Download the bundle.

7. On the Hadoop cluster management server (where CM or Ambari is running) create a new directory that will be your base for installing and maintain Oracle Big Data SQL. Copy the installation bundle zip file into this directory and unzip it there.

Downloading from My Oracle Support

> **✎ Note:**
>
> On My Oracle Support, the installation bundle is delivered inside of a patch zip file.

1. Log on to My Oracle Support.

2. Click on the **Patches & Updates** tab and then search for bug number: 28890233.

3. Download the file **p28890233_3211_Linux-x86-64.zip** file and unzip it.

    The extracted contents are :

    ```
    readme.txt
    BigDataSQL-3.2.1.1.zip
    BigDataSQL-3.2.1.1-installguide.pdf
    BigDataSQL-3.2.1.1-usersguide.pdf
    ```

> **Note:**
>
> This version of the installation guide is newer that the version included in the zip file. Use this installation guide and disregard the one included in the zip file (F11991-01). The part number is in the lower-left corner of the cover page.

4. On the Hadoop cluster management server (where CM or Ambari is running) create a new directory that will be your base for installing and maintain Oracle Big Data SQL. Copy the installation bundle zip file into this directory and unzip it there.

Contents of the Oracle Big Data SQL Installation Bundle

When you unzip the bundle, the `<Big Data SQL Install Directory>`/BDSjaguar directory will include the content listed the table below, with the exception of the `db-bundles` and `dbkeys` directories. These do no appear until after you have run an installation that produces the output for these directories.

> **Note:**
>
> Throughout the instructions, this guide uses the placeholder `<Big Data SQL Install Directory>` to refer to the location where you unzip the bundle. This is the working directory from which you configure and install Oracle Big Data SQL. You should secure this directory against accidental or unauthorized modification or deletion. The primary file to protect is your installation configuration file (by default, `bds-config.json`). As you customize the configuration to your needs, this file becomes the record of the state of the installation. It is useful for recovery purposes and as a basis for further changes.

Table 1-1   Oracle Big Data SQL Product Extracted Bundle Inventory

Directory or File	Description
`jaguar`	Hadoop cluster-side installation and configuration utility.

Table 1-1   (Cont.) Oracle Big Data SQL Product Extracted Bundle Inventory

Directory or File	Description
`example-bda-config.json` `example-cdh-config.json` `example-ethernet-config.json` `example-infiniband-config.json` `example-kerberos-config.json` `example-localrepos-config.json` `example-named-config.json` `example-subnetwork-config.json` `example-unsecure-config.json`	These configuration file examples show how to apply the various parameter options. The file `example-bda-config.json` includes all available configuration parameters.
`deployment_manager/*`	Python webserver for deployment utilities).
`deployment_server/*`	Deployment server Python package utility.
`bdsrepo/*`	Resources to build Cloudera parcels or Ambari stacks for the installation.
`db-bundles/`	When you run `jaguar` to install Oracle Big Data SQL on the Hadoop cluster, the installation bundle (or bundles) that you must copy over to the database side are generated and stored here.
`dbkeys/`	If you choose to use the Database Authentication security feature, then as part of the process, the Jaguar install operation generates a `.reqkey` file (a "request key) for setup of authentication with a specific database. All such request keys are stored in this directory. Database Authentication is enabled in the configuration by default, but there are further actions you need to take to in order to complete the Database Authentication setup process. These are described later in this document.

1.6 Upgrading From a Prior Release of Oracle Big Data SQL

On the Oracle Database side, Oracle Big Data SQL can now be installed over a previous release with no need to remove the older software. The install script automatically detects and upgrades an older version of the software.

Upgrading the Oracle Database Side of the Installation

On the database side, you need to perform the installation only once to upgrade the database side for any clusters connected to that particular database. This is because the installations on the database side are not entirely separate. They share the same

set of Oracle Big Data SQL binaries. This results in a convenience for you – if you upgrade one installation on a database instance then you have effectively upgraded the database side of all installations on that database instance.

Upgrading the Hadoop Cluster Side of the Installation

If existing Oracle Big Data SQL installations on the Hadoop side are not upgraded, these installations will continue to work with the new Oracle Big Data SQL binaries on the database side, but will not have access to the new features in this release.

1.7 Important Terms and Concepts

These are special terms and concepts in the Oracle Big Data SQL installation.

Oracle Big Data SQL Installation Directory

On both the Hadoop side and database side of the installation, the directory where you unpack the installation bundle is not a temporary directory which you can delete after running the installer. These directories are staging areas for any future changes to the configuration. You should not delete them and may want to secure them against accidental deletion.

Database Authentication Keys

Database Authentication uses a key that must be identical on both sides of the installation (the Hadoop cluster and Oracle Database). The first part of the key is created on the cluster side and stored in the `.reqkey` file. This file is consumed only once on the database side, to connect the first Hadoop cluster to the database. Subsequent cluster installations use the configured key and the `.reqkey` file is no longer required. The full key (which is completed on the database side) is stored in an `.ackkey` file. This key is included in the part of the ZIP file created by the database-side installation and must be copied back to the Hadoop cluster by the user.

Request Key

By default, the Database Authentication feature is enabled in the configuration. (You can disable it by setting the parameter `database_auth_enabled` to "false" in the configuration file.) When this setting is true, then the Jaguar `install`, `reconfigure` and `updatenodes` operations can all generate a `request key` (stored in a file with the extension `.reqkey`). This key is part of a unique GUID-key pair used for Database Authorization. This GUID-key pair is generated during the database side of the installation. The Jaguar operation creates a request key if the command line includes the `--requestdb` command line parameter along with a single database name (or a comma separated list of names). In this example, the install operation creates three keys, one for each of three different databases:

```
# ./jaguar --requestdb orcl,testdb,proddb install
```

The operation creates the request keys files in the directory *<Oracle Big Data SQL install directory>*/BDSJaguar/dbkeys. In this example, Jaguar `install` would generate these request key files:

```
orcl.reqkey
testdb.reqkey
proddb.reqkey
```

Prior to the database side of the installation, you copy request key to the database node and into the path of the database-side installer, which at runtime generates the GUID-key pair.

Acknowledge Key

After you copy a request key into the database-side installation directory, then when you run the database-side Oracle Big Data SQL installer it generates a corresponding *acknowledge key* . The acknowledge key is the original request key, paired with a GUID. This key is stored in a file that is included in a ZIP archive along with other information that must be returned to the Hadoop cluster by the user. .

Database Request Operation (databasereq)

The Jaguar `databasereq` operation is "standalone" way to generate a request key. It lets you create one or more request keys without performing an `install` , `reconfigure` , or `updatenodes` operation:

```
# ./jaguar --requestdb <database name list> databasereq {configuration
file | null}
```

Database Acknowledge ZIP File

If Database Authentication, or Hadoop Secure Impersonation is enabled for the configuration, then the database-side installer creates a ZIP bundle configuration information . If Database Authentication is enabled, this bundle includes the acknowledge key file. Information required for Hadoop Secure Impersonation is also included if that option was enabled. Copy this ZIP file back to `/opt/oracle/DM/databases/conf` on the Hadoop cluster management server for processing.

Database Acknowledge is a third phase of the installation and is performed only when any of the three security features cited above are enabled.

Database Acknowledge Operation (databaseack)

If you have opted to enable any or all of three new security features (Database Authentication, or Hadoop Secure Impersonation), then after copying the Database Acknowledge ZIP file back to the Hadoop cluster, run the Jaguar *Database Acknowledge* operation.

The setup process for these features is a "round trip" that starts on the Hadoop cluster management server, where you set the security directives in the configuration file and run Jaguar, to the Oracle Database system where you run the database-side installation, and back to the Hadoop cluster management server where you return a copy of the ZIP file generated by the database-side installation. The last step is when you run `databaseack`, the Database Acknowledge operation described in the outline below. Database Acknowledge completes the setup of these security features.

Default Cluster

The *default cluster* is the first Oracle Big Data SQL connection installed on an Oracle Database. In this context, the term *default cluster* refers to the installation directory on the database node where the connection to the Hadoop cluster is established. It does not literally refer to the Hadoop cluster itself. Each connection between a Hadoop cluster and a database has its own installation directory on the database node.

An important aspect of the default cluster is that the setting for Hadoop Secure Impersonation in the default cluster determines that setting for all other cluster

connections to a given database. If you run a Jaguar `reconfigure` operation some time after installation and use it to turn Hadoop Secure Impersonation in the default cluster on or off, this change is effective for *all* clusters associated with the database.

If you perform installations to add additional clusters, the first cluster remains the default. If the default cluster is uninstalled, then next one (in chronological order of installation) becomes the default.

1.8 Installation Overview

The Oracle Big Data SQL software must be installed on all Hadoop cluster DataNodes and all Oracle Database compute nodes.

Important: About Service Restarts

On the Hadoop-side installation, the following restarts may occur.

- Cloudera Configuration Manager (or Ambari) may be restarted. This in itself does not interrupt any services.
- Hive, YARN , and any other services that have a dependency on Hive or YARN (such as Impala) are restarted.

  The Hive libraries parameter is updated in order to include Oracle Big Data SQL JARs. On Cloudera installations, if the YARN Resource Manager is enabled, then it is restarted in order to set cgroup memory limit for Oracle Big Data SQL and the other Hadoop services. On Oracle Big Data Appliance, the YARN Resource Manager is always enabled and therefore always restarted.

On the Oracle Database server(s), the installation may require a database and/or Oracle Grid infrastructure restart in environments where updates are required to Oracle Big Data SQL cell settings on the Grid nodes. See Potential Requirement to Restart Grid Infrastructure for details.

If A Previous Version of Oracle Big Data SQL is Already Installed

On commodity Hadoop systems (those other than Oracle Big Data Appliance) the installer automatically uninstalls any previous release from the Hadoop cluster.

You can install Oracle Big Data SQL on all supported Oracle Database systems without uninstalling a previous version.

Before installing this Oracle Big Data SQL release on Oracle Big Data Appliance, you must use bdacli to manually uninstall the older version if it had been enabled via bdacli or Mammoth. If you are not sure, try `bdacli bds disable`. If the disable comment fails, then the installation was likely done with the setup-bds installer. In that case, you can install the new version Oracle Big Data SQL without disabling the old version.

How Long Does It Take?

The table below estimates the time required for each phase of the installation. Actual times will vary.

Table 1-2   Installation Time Estimates

Installation on the Hadoop Cluster	Installation on Oracle Database Nodes
Eight minutes to 28 minutes The Hadoop side installation may take eight minute if all resources are locally available. An additional 20 minutes or more may be required if resources must be downloaded from the Internet.	The average installation time for the database side can be estimated as follows: • 15 minutes for a single node database if a restart is not required. If a restart is required, the time will vary, depending on the size of the database. • On a RAC database, multiply the factors above by the number of nodes. • If an Oracle Grid restart is required, factor that in as well.

The installation process on Hadoop side includes installation on the Hadoop cluster as well as generation of the bundle for the second phase of the installation on the Oracle Database side. The database bundle includes Hadoop and Hive clients and other software. The Hadoop and Hive client software enable Oracle Database to communicate with HDFS and the Hive Metastore. The client software is specific to the version of the Hadoop distribution (i.e. Cloudera or Hortonworks). As explained later in this guide, you can download these packages prior to the installation, set up an URL or repository within your network, and make that target available to the installation script. If instead you let the installer download them from the Internet, the extra time for the installation depends upon your Internet download speed.

Pre-installation Steps

• Check to be sure that the Hadoop cluster and the Oracle Database system both meet all of the prerequisites for installation. On the database side, this includes confirming that all of the required patches are in installed. Check against these sources:

– Oracle Big Data SQL Master Compatibility Matrix (Doc ID 2119369.1 in My Oracle Support)

– Sections 2.1 in this guide, which identifies the prerequisites for installing on the Hadoop cluster. Also see Section 3.1, which describes the prerequisites for installing the Oracle Database system component of Oracle Big Data SQL.

Oracle Big Data Appliance already meets all prerequisites.

• Have these login credentials available:

– `root` credentials for both the Hadoop cluster and all Oracle Grid nodes.

On the grid nodes you have the option of using passwordless SSH with the root user instead.

– `oracle` Linux user (or other, if the database owner is not `oracle`)

– The Oracle Grid user (if this is not the same as the database owner).

– The Hadoop configuration management service (CM or Amabari) admin password.

• On the cluster management server (where CM or Ambari is running), download the Oracle Big Data SQL installation bundle and unzip it into a permanent location of your choice. (See Downloading Oracle Big Data SQL.)

- On the cluster management server, check to see if Python (at least 2.7, but less Python 3.0) is installed, as described in Prerequisites for Installation on the Hadoop Cluster.

Outline of the Installation Steps

This is an overview to familiarize you with the process. Complete installation instructions are provided in Chapters 2 and 3.

The installation always has two phases – the installation on the Hadoop cluster and the subsequent installation on the Oracle Database system. It may also include the third, "Database Acknowledge," phase, depending on your configuration choices.

1. **Start the Hadoop-Side Installation**

   Review the installation parameter options described in Chapter 2. The installation on the Hadoop side is where you make all of the decisions about how to configure Oracle Big Data SQL, including those that affect the Oracle Database side of the installation.

2. Edit the `bds-config.json file` provided with the bundle in order to configure the Jaguar installer as appropriate for your environment. You could also create your own configuration file using the same parameters.

3. Run the installer to perform the Hadoop-side installation as described in Installing or Upgrading the Hadoop Side of Oracle Big Data SQL.

   If the Database Authentication feature is enabled, then Jaguar must also output a "request key" (`.reqkey`) file for each database that will connect to the Hadoop cluster. You generate this file by including the `--requestdb` parameter in the Jaguar `install` command (the recommended way). You can also generate the file later with other Jaguar operations that support the `--requestdb`.

   This file contains one half of a GUID-key pair that is used in Database Authentication. The steps to create and install the key are explained in more detail in the installation steps.

4. Copy the database-side installation bundle to any temporary directory on each Oracle Database compute node.

5. If a request key file was generated, copy over that file to the same directory.

6. **Start the Database-Side Installation**

   Log on to the database server as the database owner Unzip bundle and execute the run file it contained. The run file does not install the software. It sets up an installation directory under `$ORACLE_HOME`.

7. As the database owner, perform the Oracle Database server-side installation. (See Installing or Upgrading the Oracle Database Side of Oracle Big Data SQL.)

   In this phase of the installation, you copy the database-side installation bundle to a temporary location on each compute node. If a `.reqkey` file was generated for the database, then copy the file into the installation directory before proceeding. Then run the `bds-database-install.sh` installation program.

   The database-side installer does the following:

   - Copies the Oracle Big Data SQL binaries to the database node.

   - Creates all database metadata and MTA extprocs (external processes) required for access to the Hadoop cluster, and configures the communication settings.

> **❗ Important:**
>
> Be sure to install the bundle on each database compute node. The Hadoop-side installation automatically propagates the software to each node of the Hadoop cluster. However, the database-side installation does not work this way. You must copy the software to each database compute node and install it directly.
>
> In Oracle Grid environments, if cell settings need to be updated, then a Grid restart may be needed. Be sure that you know the Grid password. If a Grid restart is required, then you will need the Grid credentials to complete the installation.

8. **If Applicable, Perform the "Database Acknowledge" Step**

If Database Authentication or Hadoop Secure Impersonation were enabled, the database-side installation generates a ZIP file that you must copy back to Hadoop cluster management server. The file is generated in the installation directory under `$ORACLE_HOME` and has the following filename format.

```
<Hadoop cluster name>-<Number nodes in the cluster>-<FQDN of the
cluster management server node>-<FQDN of this database node>.zip
```

Copy this file back to `/opt/oracle/DM/databases/conf` on the Hadoop cluster management server and then as `root` run the Database Acknowledge command from the BDSJaguar–3.2.1.1 directory:

```
# cd <Big Data SQL install directory>/BDSJaguar
# ./jaguar databaseack <bds-config.json>
```

Workflow Diagrams

Complete Installation Workflow

The figure below illustrates the complete set of installation steps as described in this overview.

> **✎ Note:**
>
> Before you start the steps shown in the workflow, be sure that both systems meet the installation prerequisites.
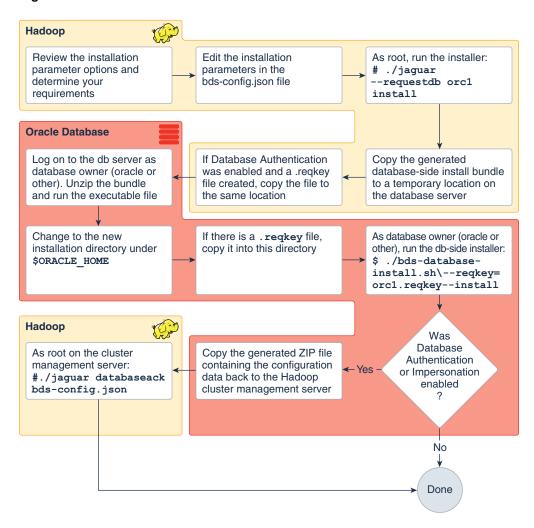
Figure 1-1   Installation Workflow

Key Generation and Installation

The figure below focuses on the three steps required to create and installing the
GUID-key pair used in Database Authentication. The braces around parameters of the
Jaguar command indicate that one of the operations in the list is required. Each of
these operations supports use of the `--requestdb` parameter.

Figure 1-2   Generating and Installing the GUID-Key Pair for Database Authentication

1.9 Post-Installation Checks

Validating the Installation With bdschecksw and Other Tests

- The script bdschecksw now runs automatically as part of the installation. This script gathers and analyzes diagnostic information about the Oracle Big Data SQL installation from both the Oracle Database and the Hadoop cluster sides of the installation. You can also run this script as a troubleshooting check at any time after the installation. The script is in $ORACLE_HOME/bin on the Oracle Database server.

```
$ bdschecksw --help
```

  See Running Diagnostics With bdachecksw in the *Oracle Big Data SQL User's Guide* for a complete description.

- Also see How to do a Quick Test in the user's guide for some additional functionality tests.

Checking the Installation Log Files

You can examine these log files after the installation.

On the Hadoop cluster side:

```
/var/log/bigdatasql
/var/log/oracle
```

On the Oracle Database side:

```
$ORACLE_HOME/install/bds* (This is a set of files, not a directory)
$ORACLE_HOME/bigdatasql/logs
/var/log/bigdatasql
```

> **Tip:**
>
> If you make a support request, create a zip archive that includes all of these logs and include it in your email to Oracle Support.

Other Post-Installation Steps to Consider

- Read about measures you can take to secure the installation. (See Securing Big Data SQL.)
- Learn how to modify the Oracle Big Data SQL configuration when changes occur on the Hadoop cluster and in the Oracle Database installation. (See Expanding or Shrinking an Installation.)
- If you have used Copy to Hadoop in earlier Oracle Big Data SQL releases, learn how Oracle Shell for Hadoop Loaders can simplify Copy to Hadoop tasks. (See Additional Tools Installed.)

1.10 Using the Installation Quick Reference

Once you are familiar with the functionality of the Jaguar utility on the Hadoop side and bds-database-install.sh on the Oracle Database side, you may find it useful to work from the Installation Quick Reference for subsequent installations. This reference provides an abbreviated description of the installation steps. It does not fully explain each step, so users should already have a working knowledge of the process. Links to relevant details in this and other documents are included.

2
Installing or Upgrading the Hadoop Side of Oracle Big Data SQL

After downloading the Oracle Big Data SQL deployment bundle and extracting the files, the next step is to configure the installer and then run the installation.

The installation of Oracle Big Data SQL on the Hadoop cluster is deployed using the services provides by the cluster management server (Cloudera Manager or Ambari). The Jaguar `install` command uses the management server API to register the BDS service and start the deployment task. From there, the management server controls the process and deploys the software to the nodes of the cluster and installs it.

The installation also generates the deployment bundle for the database side of the installation.

If a previous version of Oracle Big Data SQL is already installed, Oracle Big Data SQL upgrades the installation to Release 3.2.1.1. Users of previous Oracle Big Data SQL releases, please note that `setup-bds`, the previous Hadoop-side installer, had been replaced by the Jaguar installer and that the configuration parameters for the installation have changed significantly in this release.

2.1 Before You Start

Check to Ensure that all DataNodes of the Cluster Meet the Prerequisites

Prerequisites for both the Hadoop and Oracle Database sides of the installation are described in Chapter 1.

If you miss a prerequisite, the installer will alert you. You can see this in the output examples in Oracle Big Data SQL Installation Examples.

Plan the Configuration and Edit the Jaguar Configuration File

Review the Jaguar Configuration Parameter and Command Reference in this chapter. You should know the answers to these questions before editing the configuration file:

- Does your Hadoop environment need to connect to both Oracle Database 12.1 and 12.2 or just one of these releases?
  By default, Big Data SQL allows connections from both 12.1 and 12.2 databases. However, the offloaders that support each of these connections are resource-intensive, particularly for memory consumption on the nodes of the cluster. If you do not need dual support, you can save resource, by restricting connections to databases of one version. You set this in the configuration passed to the Jaguar installer. For example, you can enter this string to allow connections from 12.2 databases only:

  ```
  "database_compatibility" : [ "12.2" ]
  ```

- *Do you want to enable Database Authentication in order to validate connection requests from Oracle Database to Big Data SQL server processes on the Hadoop DataNodes?*

  Database Authentication in the network connection between the Oracle Database and Hadoop is set to "true" in the configuration by default. You have the option to disable it by setting the database_auth_enabled to "false":

  ```
  "database_auth_enabled" : "false",
  ```

- *Do you want to use the Multi-User Authorization feature?*

  Multi-User Authorization enables you to grant users other than oracle permissions to run SQL queries against the Hadoop cluster.

  The first step in setting up Multi-User Authorization is to set these parameters in the security section of the configuration file:

  ```
  "impersonation_enabled" : "true",
  "impersonation_usehosts" : "true",
  "impersonation_blacklist" : "hdfs,hive"
  ```

  Note that you can add any account to the blacklist.

- *Are the Hadoop cluster and the Oracle Database system going to communicate over Ethernet or over InfiniBand? Also, do the Hadoop nodes have more than one network interface?*

  See the use_infiniband and selection_subnet parameters. (The selection_subnet does not apply to Oracle Big Data Appliance.)

  ```
  "use_infiniband" : "false",
  "selection_subnet" : "5.32.128.10/21"
  ```

  By default use_infiniband is set to false. Ethernet is the default protocol.

- *Are you going pre-download the Hadoop and Hive client tarballs and set up a local repository or directory where the installer can acquire them, or, do you want the installer to download them directly from the Cloudera or Hortonworks repository on the Internet?*

  On Oracle Big Data Appliance the tarballs are stored on and automatically retrieved from a repository within the cluster. Therefore, the related configuration parameters do not apply. However, for other CDH systems or Hortonworks, you can choose to specify an URL or directory path or both for the tarballs. If instead you choose to accept the default and let the installer download the files from the Internet, then ensure that there is Internet access from the node where you are running the installation.

  ```
  "url" : [
  "http://repo1.domain.com/loc/hadoop",
  "http://repo2.domain.com/loc",
  "http://alternate.domain.com/backup/repo"
  ],
  "dir" : [ "/root/hadooprepo" ]
  ```

If you choose to let the installer download the tarballs from the Internet, you can configure the installer to work with HTTP/HTTPS proxies within your environment:

```
"http_proxy" : "http://my.proxy.server.com:80",
"https_proxy" : "http://mysecure.proxy.server.com:80"
```

You can either set the proxy values in the configuration file or use preexisting proxy environment variables.

- *If the network is Kerberos-secured, do you want the installer to set up automatic Kerberos ticket renewal for the* `oracle` *account used by Oracle Big Data SQL?*

  See the parameters in the `kerberos` section:

```
"principal" : "oracle/mycluster@MY.DOMAIN.COM",
"keytab" : "/home/oracle/security/oracle.keytab",
"hdfs-principal" : "hdfs/mycluster@MY.DOMAIN.COM",
"hdfs-keytab" : "/home/hdfs/security/hdfs.keytab"
```

- *Do you want the Oracle Big Data SQL install process to automatically restart services that are in a stale state?*

  By default, stale services are restarted automatically. If you want to suppress this, you can set the `restart_stale` parameter in the configuration file to "`false`".

- *Is the Hadoop cluster using the default REST API port for CDH or Ambari?*

  If not, set the `ports` parameter.

> **Note:**
>
> Setting these parameters in the configuration file does not complete the set up for some features. For example, to enable Database Authentication, you must also pass a special `--requestdb` parameter to the Jaguar utility in order to identify the target database or databases. There are also steps required to generate and install the security key used by this feature. To enable Multi-User Authorization, you start by setting the Hadoop Impersonation parameters in the configuration file, but also need to set up the authorization rules. The steps to complete these setups are provided where needed as you work through the instructions in this guide.

2.2 About the Jaguar Utility

Jaguar is a multifunction command line utility that you use to perform all Oracle Big Data SQL operations on the Hadoop cluster.

Jaguar currently supports these operations:

- `install`
  - Deploys Oracle Big Data SQL binaries to each cluster node that is provisioned with the DataNode service.

    – Configures Linux and network settings for `bd_cell` (the Oracle Big Data SQL service) on each of these nodes.

    – Generates the bundle that installs Oracle Big Data SQL on the Oracle Database side. It uses the parameter values that you set in the configuration file in order to configure the Oracle Database connection to the cluster.

- `updatenodes`

  Checks and updates the installation on the DataNodes of the Hadoop cluster.

- `reconfigure`

  Modifies the current configuration of the installation (according to the settings in the configuration file provided).

- `databasereq`

  Generates a request key file that contains one segment of the GUID-key pair used in Database Authentication. (The `databasereq` operation performs this function only. For `install`, `updatenodes`, and `reconfigure`, request key generation is an option that can be included as part of the larger operation.)

- `databaseack`

  Perform the last step in Database Authentication setup – install the GUID-key pair on all Hadoop DataNodes in a cluster in order to allow queries from the Oracle Database that provided it.

- `uninstall`

  Uninstalls Oracle Big Data SQL from all DataNodes of the Hadoop cluster.

> **✎ See Also:**
>
> Jaguar Operations in the next section provides details and examples.

2.2.1 Jaguar Configuration Parameter and Command Reference

Configuration Parameters

The table below describes all parameters available for use in `bds-config.json` or your own configuration file. Only the cluster `name` parameter is always required. Others are required under certain conditions stated in the description.

> **✎ Note:**
>
> When editing the configuration file, be sure to maintain the JSON format. Square brackets are required around lists, even in the case of a list with a single item.

Table 2-1   Configuration Parameters in bds-config.json (or in Customer-Created Configuration Files)

Parameter	Type	Description
`name`	`String`	The name of the cluster.
		For CDH clusters (Oracle Big Data Appliance or other), this name can be either the physical cluster name or the display name. The installer searches first by physical name and then by display name.
		Required.
database_compatibility	List	Supported database versions: "12.1" or "12.2". All incoming requests from databases of the same version are attended by a single offloader process. By default, there is an offloader running for 12.1 and another for 12.2. To conserve system resources (primarily memory), it is highly recommended that you use this configuration parameter to specify which offloaders are required. If you exclude one or the other offloader from the list, that offloader process is not started.
		Optional.
`port`	`Integer`	Cloudera Manager or Ambari REST API port.
		By default, on CDH clusters this port is 7183 for secured and 7180 for unsecured access. For Ambari, is 8443 for secured and 8080 for unsecured.
		Optional.
`restart_stale`	`Boolean`	If `"true"`, then services with stale configurations are restarted at the end of install process. These services are HDFS NodeName, YARN NodeManager and/or Hive (depending upon the settings selected).
		If `"false"`, the installation will finish but those services will remain on stale state. This is useful for avoid service interruption in order to restart when it will be more convenient.
		Optional. The default is `"true"`.
`dir`	`List`	List of directories where the Hadoop clients for deployment on the database side are located. These directories can be on the local file system or on NFS. Directories are searched in the order listed. By default, the list is empty. If the `dir` list has any entries, these are searched before the URL list is searched, since this option should provide the fastest access to the clients. To give the installer the quickest access to the tarballs, you could set up a local repository, download the tarballs separately though a direct Internet connection, copy them into a directory on the same node where the Oracle Big Data SQL installer will run, and list that directory in the `dir` parameter.
		Optional.
		Not applicable to Oracle Big Data Appliance.

Table 2-1   (Cont.) Configuration Parameters in bds-config.json (or in Customer-Created Configuration Files)

Parameter	Type	Description
url	List	This is the list of URLs where the Hadoop client tarballs for deployment on the database side are located. If you data center already has repositories set up for access via HTTP, then you may prefer to maintain the Hadoop tarballs in that repository and use URL parameter for Oracle Big Data SQL installations. The URLs can be to the localhost, an internal network, or a site on the Internet (if the node has Internet access). The URLs are tried in the order listed. If Hadoop clients cannot be successfully located via the directory list or url list or if both lists are empty, then the Cloudera or Hortonworks public repo is used by default. In that case, the node must have Internet access at install time. Note that internal proxy values and/or OS environment proxy settings must be set to allow this access if needed.
		If access to all listed repositories fails and/or Internet access is blocked, the database installation bundle is not created and a warning message is displayed. After correcting any problems and providing access to a repository, you can re-run the installer using the reconfigure and the installer should successfully generated the database-side installation bundle. Note that reconfigure detects and implements changes according the current directives in the configuration file. It does not uninstall and reinstall Oracle Big Data SQL on the cluster.
		Not applicable to Oracle Big Data Appliance. The tarballs are stored in a local repository in the cluster and the location is automatically added to the configuration file.
use_infinib and	Boolean	If "true", the communication will be set through private network interface, if "false" by client network interface.
		Used for Oracle Big Data Appliance clusters only.
		Default value: "false".

Table 2-1   (Cont.) Configuration Parameters in bds-config.json (or in Customer-Created Configuration Files)

Parameter	Type	Description
selection_s ubnet	String	If Hadoop cluster nodes have several network interfaces, you can use `selection_subnet` to select one. The selected IP address will be the nearest to the selection subnetwork. If the Hadoop cluster nodes have only one network interface, this parameter is ignored. The default value depends upon these conditions: • On non-Oracle commodity Hadoop clusters (CDH or HDP) the default selection is 0.0.0.0/0. (If a cluster node has several IP addresses, the lowest address is selected.) • On Oracle Big Data Appliance, the default is either the private or client IP address, depending upon the setting of the `use_infiniband` parameter. ✎ **Note for Oracle Big Data Appliance Users:** It's possible to configure several networks on an Oracle Big Data Appliance. If multiple networks exist, then this parameter must be set in order to select a specific network.
http_prox y https_pro xy	String	Specify the proxy settings to enable download the Hadoop client tarballs and cluster settings. If both of these strings are empty, the OS environment proxy settings are used. By default, both strings are empty. Using these two parameters in the configuration file is optional. If they are needed, you could instead set them externally as in `export http_proxy=<proxy value>` Not applicable to Oracle Big Data Appliance
database_au th_enabled	Boolean	If `"true"`, the database authentication through the GUID-key mechanism is enabled. This requires an extra step in the installation process in order to set up the database GUID-key pair on the cluster side. If `"false"`, the feature will not be enabled. Default value: `"true"`.
impersonati on_enabled	Boolean	If `"true"`, Hadoop impersonation for Multi-user Authorization support is enabled. This sets up the `oracle` OS user as the Hadoop proxy user and propagates the proxy user's black list to the database nodes. If `"false"`, this feature is not enabled. Default value: `"false"` .

Table 2-1   (Cont.) Configuration Parameters in bds-config.json (or in Customer-Created Configuration Files)

Parameter	Type	Description
impersonation_blacklist	String	The Hadoop proxy users blacklisted for impersonation. This parameter is used only used if Hadoop impersonation is enabled. Since this is a required setting on the Oracle Database side, it is provided with a default value of `"dummy"` in order to avoid extproc errors that can occur if Hadoop Impersonation is not enabled.
impersonation_usehosts	Boolean	If "true", the proxy hosts variable is set to the IP address of the database node. If "false", the proxy hosts variable is set to the wildcard: "*". Default value: `"true"`.
principal	String	The fully-qualified Kerberos principal name for the `oracle` user. The principal has three parts: • The User Name: (must always be `oracle`) • Qualifier: "/*<qualifier>*." This is optional information to help you organize and identify principals. • Domain: "`@MY.DOMAIN.COM`." This is required information managed by the KDC. The Oracle Big Data SQL installation uses the Kerberos `principal` field (and `keytab` field below) to set up automated Kerberos ticket renewal for the user represented by the principal. It does this on both the Hadoop and Oracle Database sides of the installation. The installer does not create the principal or the keytab. These must already exist. Required for secured clusters.
keytab	String	Fully-qualified location for the principal's keytab file name. Copy the keytab file to a location accessible to the Jaguar installer and set the path as the value of this parameter.
hdfs-principal	String	Fully-qualified Kerberos principal name for the "`hdfs`" user. It has three parts: `User name`, `Qualifier`, and `Domain`. The `User name` is the fully-qualified principal name for the `hdfs` user. `Qualifier` is the cluster name prefixed by a forward slash, as in `/mycluster`. `Domain` is specified in the form `@MY.DOMAIN.COM`. All three are required. The principal name is defined on the KDC. Required for secured clusters.
hdfs-keytab	String	Fully-qualified path to the principal keytab file. A keytab file is created for each principal on the KDC server. It must exist in a location accessible to the Jaguar installer. Required for secured clusters.
min_hard_limit	Integer	The minimum amount of memory reserved for Big Data SQL, in megabytes. This parameter is used on CDH clusters (Oracle Big Data Appliance and others). It is not used on HDP clusters. By default, the value is 8192 (8 GB).

Table 2-1   (Cont.) Configuration Parameters in bds-config.json (or in Customer-Created Configuration Files)

Parameter	Type	Description
max_percent age	Integer	On CDH clusters (Oracle Big Data Appliance and others) this parameter specifies the percentage of memory on each node to reserve for Big Data SQL. This percentage is considered from a total amount of: NodeManager if YARN ResourceManager is enabled for that node. Physical memory if not. .
		If the YARN Resource Manager is enabled for the node, then percentage should be based on the total amount of memory used by the NodeManager. Otherwise it should be a percentage of physical memory.
		This parameter is ignored on HDP clusters.
excluded_no des	Array	If the installer does not correctly identify a node as an edge node, then it will install the BDS agent on the node. The BDS agent checks for installation readiness. If the edge node does not meet the prerequisites, then the Oracle Big Data SQL installation fails. The excluded_nodes parameter was provided as a workaround for this problem. You could use to explicitly list edge nodes that the installer did not detect, and then rerun the installer.
		This parameter is in the network section of the configuration file.
		<pre> excluded_nodes : ["<fqdn_for_edge_node_1>","<fqdn_for_edge_node_ 2>","<fqdn_for_edge_node_3>"]</pre>
		Note that the value of excluded_nodes must be enclosed in square brackets, with each element quoted and comma-separated.
		The installer is now almost always successful at detecting edge nodes, so you should rarely need to use this parameter.

> **Note:**
>
> After Oracle Big Data SQL is installed on the Hadoop cluster management server, you can find configuration file examples that demonstrate various parameter combinations in the *<Big Data SQL Install directory>*/ BDSjaguar-3.2.1.1 directory:
>
> ```
> example-bda-config.json
> example-cdh-config.json
> example-kerberos-config.json
> example-localrepos-config.json
> example-subnetwork-config.json
> example-unsecure-config.json
> ```
>
> You can see all possible parameter options in use in example-cdh-config.json .

> ✎ **See Also:**
>
> See the Appendix Determining the Correct Software Version and Composing the Download Paths for Hadoop Clients for suggestions that can help with the setup of client tarball downloads.

Jaguar Operations

The table below lists the full set of operations performed by the Jaguar utility on the Hadoop side of the Oracle Big Data SQL installation.

The general syntax for Jaguar commands is as follows. The `--requestdb` parameter does not apply to all Jaguar commands.

```
# ./jaguar {--requestdb <comma-separated database names> | NULL }
<action> { bds-config.json | <myfilename>.json | NULL }
```

Examples:

```
# ./jaguar install
# ./jaguar install bds-config.json
# ./jaguar install mycustomconfig.json
# ./jaguar --requestdb orcl,testdb,proddb install
# ./jaguar --requestdb orcl install
```

You can use the default `bds-config.json` or your own configuration file, or omit the configuration file argument (which defaults to `bds-config.json`).

✎ About --requestdb:

The `--requestdb` parameter is required for the `databasereq` command, optional for `install`, `updatenodes`, and `reconfigure`, and non-applicable for other Jaguar commands. The parameter must be passed in to one of these operations in order to enable Database Authentication in the connection between a Hadoop cluster and a database. Unless you prefer to disable Database Authentication, it is recommended that you include `--requestdb` with the initial `install` operation. Otherwise, you will need perform an additional step later in order to generate the request key.

This parameter is functional only when Database Authentication (`database_auth_enabled`) is set to "`true`" in the configuration. (This setting is a configuration default and does not need to be explicitly set in the configuration file.)

Jaguar needs the database names in order to generate a unique `.reqkey` (request key) file for each database. When `database_auth_enabled` is set "`true`" at installation time, the `--requestdb` parameter is still optional. Post-installation you have the same option to send the request key in the `updatenodes`, `reconfigure`, and `databasereq` commands. Database Authentication is not implemented until you do all of the following:

1. Ensure that `database_auth_enabled` is either absent from the configuration file or is set to ""`true`". (It is "`true`" by default.)

2. Include `--requestdb` in a Jaguar command:

   a. Run the Jaguar `install`, `updatenodes`, or `reconfigure` and install the updated database-side installation bundle, or

   b. Run Jaguar `databasereq` to generate an acknowledge key from the existing database side installation.

3. Copy the generated ZIP file that contains the .ackkey file from the database-side installation directory to `/opt/oracle/DM/databases/conf` on the Hadoop cluster management server.

4. Run the Jaguar `databaseack` command as described in the table below.

The table below shows the available Jaguar commands.

Table 2-2　Jaguar Operations

Jaguar Operation	Supports --requestdb?	Usage and Examples

`install`
The `--requestdb` parameter is not strictly required by the install operation, but you cannot enable Database Authentication if you do not generate a request key for each database.
`--requestdb <comma-separated database list>`
	Y	Installs Oracle Big Data SQL on the Hadoop cluster identified in the configuration file and creates an installation bundle for the database side based on the parameters included in the configuration file (or default values for parameters not explicitly assigned value in the configuration file). Examples:
		
		`# ./jaguar --requestdb orcl,testdb,proddb install`
		
		No configuration file parameter is included in the above example. `bds-config.json` is the implicit default. You can specify a different configuration file as in `./jaguar --requestdb mydb install myconfig.json`
		
		✎ **Note:**
		　You may need to use the `scl` utility to ensure that the correct Python version is invoked:
		
		　`scl enable python27 "./ jaguar install"`

`updatenodes`	Y	Expand or shrink the cluster. Oracle Big Data SQL to any new DataNodes and update the cells inventory if the cluster has grown since the last Oracle Big data SQL installation.

Table 2-2   (Cont.) Jaguar Operations

Jaguar Operation	Supports --requestdb?	Usage and Examples

reconfigure	Y	Modify the current installation by applying changes you have made to the configuration file (`bds-config.json` or other).
		
		`# ./jaguar reconfigure myconfigfile.json`
		
		Note that if you run `./jaguar reconfigure <config file>` to reconfigure Oracle Big Data SQL on the Hadoop cluster, a corresponding reconfiguration is required on the Oracle Database side. The two sides cannot communicate if the configurations do not match. The Jaguar utility regenerates the database-side bundle files to incorporate the changes, You must redeploy the bundle on all database servers where it was previously installed.
		
		The `--requestdb` argument is required if `database_auth_enabled` is set to "`true`" in the updated configuration file. This is so that Jaguar will generate `.reqkey` files that are included in the database-side installation bundle. Note that we let the configuration file parameter default to `bds-config.json`.
		
		`# ./jaguar --requestdb demodb,testdb,proddb1 reconfigure`

databasereq	Y	Use this command to create the `.reqkey` file without repeating the Hadoop-side installation, or doing an `updatenodes` or `reconfigure` operation. (For example, if you forgot to include the `--requestdb` argument with the Jaguar `install` command), you can create a request key later with `databasereq`. This operation requires that `database_auth_enabled` is set to "true" (the default value) in the configuration. `  `# ./jaguar --requestdb demodb,testdb,proddb1 databasereq`

Table 2-2 (Cont.) Jaguar Operations

Jaguar Operation	Supports --reque stdb?	Usage and Examples

databaseack	N	The "Database Acknowledge" process provides confirmation to the Oracle Big Data SQL installation on the Hadoop cluster that security features you enabled in the configuration file have been successfully implemented in the database-side installation. It then completes implementation of the selected security features on the Hadoop cluster side.
		
		`./jaguar databaseack bds-config.json`
		
		Only run `databaseack` if you chose to enable security features by setting either of these parameters in the configuration file to "true":
		• `"impersonation_enabled" : "true"`
		• `"database_auth_enabled" : "true"`
		If a database-side installation bundle is built with any of these features set to "true", then the database-side installation from that bundle generates a ZIP file in the installation directory under `$ORACLE_HOME` on the database server. The format of the ZIP file name is *\<Hadoop cluster name\>-\<Number nodes in the cluster\>-\<FQDN of the cluster management server node\>-\<FQDN of this database node\>*`.zip`. For example:
		
		`$ ls $ORACLE_HOME/BDSJaguar-3.2.1.1/cdh510-6-node1.my.domain.com/*.zip`
		`$ cdh510-6-node1.my.domain.com-myoradb1.mydomain.com.zip`
		
		Copy this ZIP archive back to `/opt/oracle/DM/databases/conf` on the Hadoop cluster management server after the database-side installation is complete. Then, to fully enable the security features, run `databaseack`.

uninstall		Uninstall Oracle Big Data SQL from the Hadoop cluster. The uninstall process stops the `bd_cell` process (the Oracle Big Data SQL process) on all Hadoop cluster nodes, removes all instances from Hadoop cluster, and release all related resources.

Note:

When Oracle Big Data SQL is uninstalled on the Hadoop side, any queries against Hadoop data that are in process on the database side will fail. It is strongly recommended that you uninstall Oracle Big Data SQL from all databases systems shortly after uninstalling the Hadoop component of the software.

> ✎ **See Also:**
>
> Uninstalling Oracle Big Data SQL.

2.3 Steps for Installing on the Hadoop Cluster

After you have set up the Jaguar configuration file according to your requirements, follow these steps to run the Jaguar installer, which will install Oracle Big Data SQL on the Hadoop cluster and will also generate a database-side installation bundle that you deploy to the Oracle Database system. In these steps, `bds-config.json` is the configuration filename passed to Jaguar. This is the default. Any file name is accepted, therefore you can create separate configuration files for installation on different clusters and save them in different files.

> ✎ **Note:**
>
> Jaguar requires Python 2.7 to 3.0. If necessary, you can add a Jaguar-compatible version of Python as a secondary installation. Revisit the prerequisites section in the Introduction for details. If you are using Oracle Big Data Appliance (and possibly other Hadoop platforms), do not overwrite the installed Python release.

1. Log on to the cluster management server node as `root` and cd to the directory where you extracted the downloaded Oracle Big Data SQL installation bundle.

2. Cd to the `BDSjaguar` subdirectory under the path where you unzipped the bundle.

   ```
   # cd <Big Data SQL Install Directory>/BDSjaguar
   ```

3. Edit the file `bds-config.json`. Provide the required cluster name for the cluster where you want to install Oracle Big Data SQL:

   ```
   {
   "cluster": {
               "name": "<Your cluster name>"
               }
   }
   ```

   Add the parameters that you want to use in this installation. For example:

   - Start the Orace Database 12.1 offloader only:

     ```
     "cluster" : {
         "database_compatibility" : [ "12.1" ]
     }
     ```

   - Start both offloaders:

     ```
     "cluster" : {    "database_compatibility" : [
               "12.1", "12.2" ]}
     ```

The default is to start both offloaders so you can accomplish the same thing by leaving out the `database_compatibility` parameter.

> **✎ See Also:**
>
> The cluster name is the only required parameter in this version of Oracle Big Data SQL. See the Jaguar Configuration Parameter and Command Reference for a description of all available parameters. You can see an example of a `bds-config.json` file populated with all available parameters in bds-config.json Configuration Example.

In the BDSjaguar directory, run the Jaguar`install` operation. Pass the `install` parameter and the configuration file name. (`bds-config.json` is the implicit default) as arguments to the Jaguar command. You may or may not need to include the `--requestdb` option.

```
[root@myclusteradminserver:BDSjaguar] #  ./jaguar install <config
file name>
```

> **✎ Note:**
>
> By default, Database Authentication is set to true unless you set `database_auth_enabled` to "false" in the configuration file. If you enable Database Authentication, then either as part of the install operation or later, generate a "request key." This is half of a GUID/key pair used in the authentication process. To generate this key, include the `--requestdb` parameter in the Jaguar `install` command line:
>
> ```
> [root@myclusteradminserver:BDSjaguar] # ./jaguar --
> requestdb mydb install
> ```
>
> If the install was run with `database_auth_enabled` is "true", you can use the Jaguar `databasereq` command to generate the key after the database-side installation. Several other Jaguar commands can also generate the request key if you pass them the `--requestdb` parameter.

Jaguar prompts for the cluster management service administrator credentials and then installs Oracle Big Data SQL throughout the Hadoop cluster. It also generates the database-side installation bundle in the `db-bundles` subdirectory. The following message is returned if the installation completed without error.

```
BigDataSQL: INSTALL workflow completed.
```

4. Check for the existence of the database side installation bundle:

```
# ls <Big Data SQL Install Directory>/BDSjaguar/db-bundles
 bds-3.2.1.1-db-<cluster>-<yymmdd.hhmi>.zip
```

This bundle is for setting up Oracle Big Data SQL connectivity Oracle database and the specific cluster defined in the `bds-config.json` (or other) configuration file. It contains all packages and settings files required except for an optional database request key file.

If you included `--requestdb` in the install command, then the installation also generates one or more database request key files under the `dbkeys` subdirectory. You should check to see that this key exists.

```
# ls <Big Data SQL Install Directory>/BDSjaguar/dbkeys
 cluster1db.reqkey
```

This completes the Oracle Big Data SQL installation on the Hadoop cluster.

What Next?

After Jaguar has successfully installed Oracle Big Data SQL on the Hadoop cluster, you are done with the first half of the installation. The next step is to install Oracle Big Data SQL on the Oracle Database system that will run queries against the data on the Hadoop cluster.

To do this, copy the database-side installation bundle to any location on the Oracle Database system. Unless you set `database_auth_enabled` to "false" in the configuration file, then also copy over the `.reqkey` file generated by Jaguar.

> **Tip:**
>
> You only need to send a request key to a database once. A single request key is valid for all Hadoop cluster connections to the same database. If you have already complete the installation to connect one Hadoop cluster to a specific database, then the database has the key permanently and you do not need to generate it again or copy it over to the database again in subsequent cluster installations.

Go to Installing or Upgrading the Oracle Database Side of Oracle Big Data SQL for instructions on unpacking the bundle and installing the database-side components of the software.

> **See Also:**
>
> An example of the complete standard output from a successful installation is provided in Oracle Big Data SQL Installation Examples.

3

Installing or Upgrading the Oracle Database Side of Oracle Big Data SQL

Oracle Big Data SQL must be installed on both the Hadoop cluster management server and the Oracle Database server. This section describes the installation of Oracle Big Data SQL 3.2.1.1 on Oracle Database systems, including single-node and RAC systems.

3.1 Before You Start the Database-Side Installation

Review the points in this section before starting the installation.

If the current version of Oracle Big Data SQL is already installed on the Oracle Database system and you are making changes to the existing configuration , you do not need repeat the entire installation process. See Reconfiguring an Existing Oracle Big Data SQL Installation .

> **⚠ Important:**
>
> - For multi-node databases (such as Oracle RAC systems), **you must repeat this installation on every compute node of the database**. If this is not done, you will see RPC connection errors when the Oracle Big Data SQL service is started.
>
>   You can reuse the same installation bundle on each database node by including the optional `--ip-cell` command line parameter to pass in the correct network interface address for the node when you run the installer. If this parameter is not used, the installer searches for and selects one.
>
> - It is recommended that you set up passwordless SSH for root on the database nodes where Grid is running. Otherwise, you will need to supply the credentials during the installation on each node.
>
> - If the `diskmon` process is not already running prior to the installation, a Grid infrastructure restart will be required in order to complete the installation.
>
> - If you set up Oracle Big Data SQL connections from more than one Hadoop cluster to the same database, be sure that the configurations for each connection are the same. Do not set up one connection to use Infiniband and another to use Ethernet. Likewise, if you enable database authentication in one configuration, then this feature must be enabled in all Oracle Big Data SQL connections between different Hadoop clusters and the same database.
>
> - If the database system is Kerberos-secured, then it is important to note that authentication for the database owner principal can be performed by only one KDC. Oracle Big Data SQL currently does not support multiple Kerberos tickets. If two or more Hadoop cluster connections are installed by the same database owner, all must use the same KDC.
>
>   The `KRB5_CONF` environment variable must point to only one configuration file. The configuration file must exist, and the variable itself must be set for the database owner account at system startup.
>
> - For database running under Oracle Grid Infrastructure, if the system has more than one network interfaces of the same type (two or more Ethernet, two or more InfiniBand, or two or more Ethernet-over-InfiniBand interfaces), then the installation always selects the one whose name is first in alphabetical order.
>
> > **✎ See Also:**
> >
> > Details are provide in Special Considerations When a System Under Grid Infrastructure has Multiple Network Interfaces of the Same Type.

3.1.1 Potential Requirement to Restart Grid Infrastructure

In certain database environments `bds-database-install.sh` needs to create `cellinit.ora` and/or `celliniteth.ora`. In these cases, the script will attempt to propagate similar changes across all nodes in the Grid Infrastructure. To do this, the script expects that passwordless SSH is set up between `oracle` and `root` or it will prompt for the root password for each node during execution. If the nature of the changes requires a restart of the Grid Infrastructure, the script will also display messages indicating that grid infrastructure needs to be restarted manually. Because the installlation cannnot complete without Grid credentials if a restart is necessary, be sure that you have the Grid password at hand.

3.1.1.1 Understanding When Grid or Database Restart is Required

On the database side of Oracle Big Data SQL, the diskmon process is the agent in charge of communications with the Hadoop cluster. This is similar to its function on the Oracle Exadata Database Machine, where it manages communications between compute nodes and storage nodes.

In Grid environments, diskmon is owned by the Grid user. In a non-Grid environment, it is owned by the Oracle Database owner.

In Oracle Big Data SQL, diskmon settings are stored on `cellinit.ora` and `celliniteth.ora` files in the `/etc/oracle/cell/network-config/` directory. The installer updates these files in accordance with the cluster connection requirements.

This is how the installer determines when Grid or Oracle Database needs to be restarted:

- If the installer detects that no previous `cellinit.ora` or `celliniteth.ora` file exists, this means that no diskmon process is running. In this case, if the environment includes Oracle Grid then you must restart the Grid. If the environment does not include Grid, then you must restart Oracle Database.

- If previous `cellinit.ora` and/or `celliniteth.ora` file exist, this indicates that diskmon process is running. In this case, if the installer needs to make a change to these files, then only the database needs to be restarted.

- In multi-node Grid environments, diskmon works on all nodes as a single component and `cellinit.ora` and `celliniteth.ora` must be synchronized on all nodes. This task is done through SSH. If passwordless SSH is setup on the cluster, no user interaction is required. If not passwordless SSH is not set up, then the script will pause for you to input the root credentials for all nodes. When the cellinit.ora and celliniteth.ora files across all nodes are synchronized, then the script will continue. Then the script finishes and in this case, you must restart the Grid infrastructure.

3.1.2 Special Considerations When a System Under Grid Infrastructure has Multiple Network Interfaces of the Same Type

The Oracle Big Data SQL installation or SmartScan operation may sometimes fail in these environments because the wrong IP address is selected for communication with the cells.

When installing Oracle Big Data SQL within Oracle Grid Infrastructure, you cannot provide the installer with a specific IP address to select for communication with the Oracle Big Data SQL cells on the nodes. Network interface selection is automatically

determined in this environment. This determination is not always correct and there are instances where the database-side installation may fail, or, you may later discover that SmartScan is not working.

You can manually correct this problem, but first it is helpful to understand how the installation decides which network interfaces to select.

How the Installation Selects From Among Multiple Interfaces of the Same Type on a System Under Grid Infrastructure

- The `diskmon` process is controlled by Oracle Grid Infrastructure and not by the database. Grid manages communications with the Oracle Big Data SQL cells.

- The Oracle Big Data SQL installer in these cases does not create `cellinit.ora` and `celliniteth.ora`, nor does it update the cell settings stored in these files. In these environments, the task is handled by Grid, because it is a cluster-wide task that must be synchronized across all nodes.

- If there are multiple network interfaces, the Grid-managed update to the cells automatically selects the first network interface of the appropriate type on each node. It selects the interface whose name is first in alphabetical order. In other environments (with the exception of Exadata Database Machine systems) you can use the `--ip-cell` command line parameter with the installer to select a specific network interface. In a Grid environment, this parameter is ignored.

For example, here is a system that is under Grid Infrastructure. It has multiple InfiniBand, Ethernet, and Ethernet over InfiniBand (bondeth*) network interfaces. This is the list of interfaces:

```
[root@mynode ~]# ip -o -f inet addr show
1: lo     inet 127.0.0.1/8
2: eth0     inet 12.17.207.156/21
3: eth1     inet 16.10.145.12/21
19: bondeth0    inet 12.17.128.15/20
20: bondeth2    inet 16.10.230.160/20
21: bondeth4    inet 192.168.1.45/20
30: bondib0    inet 192.168.31.178/21
31: bondib1    inet 192.168.129.2/21
32: bondib2    inet 192.168.199.205/21
33: bondib3    inet 192.168.216.31/21
34: bondib4    inet 192.168.249.129/21
```

When the Oracle Big Data SQL installer runs on this system, the following interfaces would be selected.

- 192.168.31.178/21 is selected for the InfiniBand connection configured in `cellinit.ora`.

  Among the InfiniBand interfaces on this system, the interface name `bondib0` is first in an ascending alphabetical sort.

- 12.17.128.15/20 is selected for an Ethernet-over-InfiniBand connection configured in `celliniteth.ora`.

> **Note:**
>
> This example demonstrates an additional selection factor – Ethernet over InfiniBand takes precedence over standard Ethernet. The `bondeth0` interface name is first in this case.

How the Installation (or SmartScan) may Fail Under These Conditions

It is possible that `diskmon` cannot connect to the Oracle Big Data SQL cells via the network interface selected according to the logic described above. The correct subnet (one that `diskmon` can reach) may not appear first in an alphabetical sort.

How to Fix the Problem

You can manually change the IP addresses in the `cellinit.ora` and `celliniteth.ora` files. These files are at `/etc/oracle/cell/network-config` on each node.

1. Stop the CRS process. (Be sure to do this before the cell edit. If you do not, `diskmon` may hang.)

2. Edit `cellinit.ora` and/or `celliniteth.ora` . Change the IP addresses as needed.

3. Restart CRS.

3.2 About the Database-Side Installation Directory

You start the database side of the installation by unpacking the database-side installation bundle and executing the run file it contains. The run file creates an installation directory under `$ORACLE_HOME/BDSJaguar-3.2.1.1`. For example:

```
$ORACLE_HOME/BDSJaguar-3.2.1.1/cdh510-6-node1.mycluster.mydomain.com
```

The installation of Oracle Big Data SQL is not finished when this directory is created. The directory is a staging area that contains all of the files needed to complete the installation on the database node.

There can be Oracle Big Data SQL connections between the database and multiple Hadoop clusters. Each connection is established though a separate database-side installation and therefore creates a separate installation directory. The segments in the name of the installation directory enable you to identify the Hadoop cluster in this specific connection:

```
<Hadoop cluster name>-<Number nodes in the cluster>-<FQDN of the
cluster management server node>
```

You should keep this directory. It captures the latest state of the installation and you can use it to regenerate the installation if necessary. Furthermore, if in the future you need to adjust the database-side of the installation to Hadoop cluster changes, then the updates generated by the Jaguar `reconfigure` and/or `updatenodes` commands are applied to this directory.

Consider applying permissions that would prevent the installation directory from being modified or deleted by any user other than `oracle` (or other database owner).

3.3 Steps for Installing on Oracle Database Nodes

To install the database side of Oracle Big Data SQL, copy over the zip file containing the database-side installation bundle that was created on the Hadoop cluster management server, unzip it, execute the run file it contains, then run the installer.

Perform the procedure in this section as the database owner (`oracle` or other). You stage the bundle in a temporary directory, but after you unpack the bundle and execute the run file it contains, then the installation package is installed in a subdirectory under `$ORACLE_HOME`. For example: `$ORACLE_HOME/BDSJaguar-3.2.1.1/cdh510-6-node1.mycluster.mydomain.com`.

Before starting, check that `ORACLE_HOME` and `ORACLE_SID` are set correctly.

Copy Over the Components and Prepare for the Installation

1. If you have not already done so, use your preferred method to copy over the database-side installation bundle from the Hadoop cluster management server to the Oracle Database server. If there are multiple bundles, be sure to select the correct bundle for cluster that you want to connect to Oracle Database. Copy it to any location that you would like to use as a temporary staging area. To perform the copy operation, it may be easiest for you to log on to the Hadoop cluster management server as `root`, navigate down to the bundle location within the Oracle Big Data SQL installation directory, and push the bundle over to the database server. Use the database owner account (usually `oracle`) for the remote logon on the database side.

    In this example the bundle is copied over to `/opt/tmp`. You can copy the bundle to any secure directory, but first confirm that the directory exists.

    ```
    # cd <Big Data SQL Install Directory>/BDSjaguar-3.2.1.1/db-bundles
    # scp bds-3.2.1.1-db-<cluster>-<yymmdd.hhmi>.zip
    oracle@<database_node>:/opt/tmp
    ```

2. If you generated a database request key, then also copy that key over to the Oracle Database server.

    ```
    # cd <Big Data SQL Install Directory>/BDSjaguar-3.2.1.1/dbkeys
    # scp <database name or other name>.reqkey
    oracle@<database_node>:/opt/tmp
    ```

3. Log on to the database server host as `oracle` (or whichever user is the database owner) and `cd` to the directory where you copied the file (or files).

4. Unzip the bundle. You will see that it contains a single, compressed run file.

5. Check to ensure that the prerequisite environment variables are set — `$ORACLE_HOME` and `$ORACLE_SID`.

6. Run the file in order to unpack the bundle into `$ORACLE_HOME`. For example:

    ```
    $ ./bds-3.2.1.1-db-cdh510-170309.1918.run
    ```

Because you can set up independent Oracle Big Data SQL connections between an Oracle Database instance and multiple Hadoop clusters, the `run` command unpacks the bundle to a cluster-specific directory under `$ORACLE_HOME/BDSJaguar-3.2.1.1`. For example:

```
$ ls $ORACLE_HOME/BDSJaguar-3.2.1.1
  cdh510-6-node1.mycluster.mydomain.com
  test1-3-node1.myothercluster.mydomain.com
```

If the `BDSJaguar-3.2.1.1` directory does not already exist, it is created as well.

7. If you generated a database request key, then copy it into the newly created installation directory. For example:

```
$ cp /opt/tmp/mydb.reqkey $ORACLE_HOME/BDSJaguar-3.2.1.1/cdh510-6-
node1.mycluster.mydomain.com
```

> **Tip:**
>
> You also have the option to leave the key file in the temporary location and use the `--reqkey` parameter in the installation command in order to tell the script where the key file is located. This parameter lets you specify a non-default request key filename and/or path.
>
> However, the install script only detects the key in the installation directory when the key filename is the same as the database name. Otherwise, even if the key is local, if you gave it a different name then you must still use `--reqkey` to identify to the install script.

8. Log on to the Oracle Database node as `oracle` and change directories to the cluster-specific installation directory under `$ORACLE_HOME/BDSJaguar-3.2.1.1`. For example:

```
$ cd $ORACLE_HOME/BDSJaguar-3.2.1.1/cdh510-6-node1.my.domain.com
```

Note that the installation directory for the cluster is in place, you are ready to install the database side of Oracle Big Data SQL.

Pre-Install Steps if You are Installing on a Non-Exadata RAC System

> **Note:**
>
> These Release 3.2.1.1 pre-install steps are necessary only on RAC systems that are not running on the Oracle Exadata Database Machine.

1. Start the database if it is not running.

2. In the installation directory, start `bds-database-install.sh`, the database-side Oracle Big Data SQL installer. Do not include any parameters. You will encounter

some prompts that will allow you to perform a needed workaround and then exit the script without proceeding with the installation.

```
$ ./bds-database-install.sh
```

3. At `Enter <yes> for continue to set cell configuration, or <no> to quit`, respond with a yes.

4. At `Press <enter> to continue`, press `Enter`. This will terminate the installation. (You will start it again and run it to completion after this workaround.)

5. `$ cd /etc/oracle/cell/network-config`

6. Now delete `cellinit.ora` and temporarily rename `celliniteth.ora`.

```
$ rm cellinit.ora
$ mv celliniteth.ora celliniteth.ora.bak
```

7. Stop the Grid Infrastructure.

```
$crsctl stop crs
```

8. When control returns to the shell, restore `celliniteth.ora`.

```
$ mv celliniteth.ora.bak celliniteth.ora
```

9. Restart Grid Infrastructure.

```
$ crsctl start crs
```

Now resume the installation as described in the next section.

Install Oracle Big Data SQL on the Oracle Database Node

> **Important:**
>
> The last part of the installation may require a single restart of Oracle Database under either or both of these conditions:
>
> • If Oracle Database does not include the Oracle Grid Infrastructure. In this case, the installation script makes a change to the `pfile` or `spfile` configuration file in order to support standalone operation of `diskmon`.
>
> • If there are changes to the IP address and the communication protocol recorded in `cellinit.ora`.
> These parameters define the connection to the cells on the Hadoop cluster. For example, if this is a re-installation and the IP address for the Hadoop/Oracle Database connection changes from an Ethernet address to an InfiniBand address and/or the protocol changes (between TCP and UDP), then a database restart is required.

You should still be logged on to the node as `oracle` and in the cluster installation directory under `$ORACLE_HOME/BDSJaguar-3.2.1.1`.

1. Check `/etc/oracle/cell/network-config` to make sure that `cellinit.ora` has not been recreated. Delete it before restarting the database instance.

2. Start the database instance if it is not running.

3. Run `bds-database-install.sh`. You may need to include some optional parameters.

   ```
   $ ./bds-database-install.sh [options]
   ```

4. Restart the database (optional).

> ✎ **See Also :**
>
> The `bda-database-install.sh` installer command supports parameters that are ordinarily optional, but may be required for some configurations. See the Command Line Parameter Reference for bds-database-install.sh

Extra Step If You Enabled Database Authentication or Hadoop Secure Impersonation

- If `database_auth_enabled` or `impersonation_enabled` was set to "true" in the configuration file used to create this installation bundle, copy the zip file generated by the database-side installer back to the Hadoop cluster management server and run the Jaguar "Database Acknowledge" operation. This completes the set up of login authentication between Hadoop cluster and Oracle Database.

  Find the zip file that contains the GUID-key pair in the installation directory. The file is named according to the format below.

  ```
  <name of the Hadoop cluster>-<number nodes in the cluster>-<FQDN of
  the node where the cluster management server is running>-<FQDN of
  this database node>.zip
  ```

  For example:

  ```
  $ ls $ORACLE_HOME/BDSJaguar-3.2.1.1/cdh510-6-node1.my.domain.com/
  *.zip
  $ mycluster1-18-mycluster1node03.mydomain.com-
  myoradb1.mydomain.com.zip
  ```

  1. Copy the zip file back to `/opt/oracle/DM/databases/conf` on the Hadoop cluster management server.

  2. Log on to the cluster management server as `root`, cd to `/BDSjaguar-3.2.1.1` under the directory where Oracle Big Data SQL was installed, , and run `databaseack` (the Jaguar "database acknowledge" routine).

Pass in the configuration file that was used to generate the installation bundle (`bds-config.json` or other).

```
# cd <Big Data SQL Install Directory>/BDSjaguar-3.2.1.1
# ./jaguar databaseack bds-config.json
```

3.3.1 Command Line Parameter Reference for bds-database-install.sh

The bds-database-install.sh script accepts a number of command line parameters. Each parameter is optional, but the script requires at least one.

Table 3-1   Parameters for bds-database-install.sh

Parameter	Function
`--install`	Install the Oracle Big Data SQL connection to this cluster. **Note:** In releases prior to Oracle Big Data SQL 3.2, the install command is implicit if no other parameters are supplied. In Release 3.2 you must explicitly supply this parameter in order to do an installation.
`--version`	Show the `bds-database-install.sh` script version.
`--info`	Show information about the cluster, such as the cluster name, cluster management server host, and the web server.
`--grid-home`	Specifies the Oracle Grid home directory.
`--crs`	Use `crsctl` to set up Oracle Big Data SQL MTA extprocs. Ignored in non-Grid environments. `--crs={true|false}` The installer always checks to verify that Grid is running. If Grid is not running, then the installer assumes that Grid is not installed and that the database is single-instance. It then automatically sets the `crs` flag to `false`. If `--crs=true` is explicitly set and Grid cannot be found, the installer terminates with an error message stating that `GI_HOME` must be set.
`--cdb`	Create database objects on all PDBs for CDB databases. `--cdb={true|false}`

Table 3-1   (Cont.) Parameters for bds-database-install.sh

Parameter	Function
`--ip-cell`	IP address used by the diskmon process in single-instance database environments where there are several network interfaces. Ignored on the Oracle Exadata Database Machine. `--ip-cell=<IP address>`
`--db-resource`	Deprecated. Oracle Big Data SQL scripts will run on the database specified by `ORACLE_SID` or `ORACLE_HOME` environment variables. `--db-resource=$ORACLE_SID`
`--db-name`	Deprecated. Oracle Big Data SQL scripts will run on the database specified by `ORACLE_SID` or `ORACLE_HOME` environment variables. `--db-name=$ORACLE_HOME`

`--reqkey`	This parameter tells the installer the name and location of the request key file. Database Authentication is enabled by default in the configuration. Unless you do not intend to enable this feature, then as one of the steps to complete the configuration, you must use `--reqkey`.
	
	• To provide the key file name and the path if the key file is not in the local directory:
	
	`$ ./bds-database-install.sh --reqkey=/opt/tmp/some_name.reqkey --install`
	
	• To provide the key file name if the file is local, but the filename is not the same as the database name:
	
	`$ ./bds-database-install.sh --reqkey=some_name.reqkey --install`
	
	If the request key filename is provided without a path, then the key file is presumed to be in the installation directory. The installer will find the key if the filename is the same as the database name.
	
	For example, in this case the request key file is in the install directory and the name is the same as the database name.
	
	`$ ./bds-database-install.sh --install`
	
	This file is consumed only once on the database side in order to connect the first Hadoop cluster to the database. Subsequent cluster installations to connect to the same database use the configured key. You do not need to resubmit the `.reqkey` file.

`--uninstall`	Uninstall the Oracle Big Data SQL connection to this cluster.

Table 3-1   (Cont.) Parameters for bds-database-install.sh

Parameter	Function
`--reconfigure`	Reconfigures bd_cell network parameters, Hadoop configuration files, and Big Data SQL parameters. The Oracle Big Data SQL installation to connect to this cluster must already exist.
	Run reconfigure when a change as occurred on the Hadoop cluster side, such as a change in the DataNode inventory.
`--databaseack-only`	Create the Database Acknowledge zip file. (You must then copy the zip file back to `/opt/oracle/DM/databases/conf` on the Hadoop cluster management server and run `./jaguar databaseack <configuration file>`.)
`--mta-restart`	MTA extproc restart. (Oracle Big Data SQL must already be installed on the database server.)
`--mta-setup`	Set up MTA extproc with no other changes. (Oracle Big Data SQL must already be installed on the database server.)
`--mta-destroy`	Destroy MTA extproc and make no other changes. (Oracle Big Data SQL must already be installed on the database server.)
`--aux-run-mode`	Because Oracle Big Data SQL is installed on the database side as a regular user (not a superuser), tasks that must be done as `root` and/or the Grid user require the installer to spawn shells to run other scripts under those accounts while `bds-database-install.sh` is paused.
	The `--aux-run-mode` parameter specifies a mode for running these auxiliary scripts.
	`--aux-run-mode=<mode>`
	Mode options are:
	• `session` – through a spawned session.
	• `su` — as a substitute user.
	• `sudo` — through sudo.
	• `ssh` — through secure shell.
`--root-script`	Enables or disables the startup root script execution.
	`--root-script={true|false}`
`--no-root-script`	Disables startup root script execution.

The `--root-script-only` parameter from previous releases is obsolete.

3.4 Granting User Access

In Oracle Big Data SQL releases prior to 3.1, access is granted to the `PUBLIC` user group. In the current release, you must do the following for each user who needs access to Oracle Big Data SQL:

• Grant the `BDSQL_USER` role.

• Grant read privileges on the BigDataSQL configuration directory object.

For example, to grant access to `user1`:

```
SQL> grant BDSQL_USER to user1;
SQL> grant read on directory ORACLE_BIGDATA_CONFIG to user1;
```

> **See Also:**
>
> Use the DBMS_BDSQL PL/SQL Package to indirectly provide users access
> to Hadoop data. The Multi-User Authorization feature that this package
> implements uses Hadoop Secure Impersonation to enable the `oracle`
> account to execute tasks on behalf of other designated users.

4

Expanding or Shrinking an Installation

Changes that occur to the Hadoop cluster over time, such as network reconfiguration or DataNode services added, moved, or removed, as well as changes on the Oracle Database server, can require corresponding changes to the Oracle Big Data SQL installation.

4.1 Adding or Removing Oracle Big Data SQL on Hadoop Cluster Nodes

On the Hadoop side, Oracle Big Data SQL must be installed on every cluster node where the DataNode role is running and should not be installed on other nodes. Note that when you run `jaguar updatenodes` as described below, you must also reconfigure the Oracle Database side of the installation.

The Jaguar `updatenodes` procedure uses the cluster management server to determine where the DataNode service is running and then installs or uninstalls Oracle Big Data SQL on each cluster node as needed.

Run `updatenodes` when the distribution of DataNode services has changed in the Hadoop cluster.

```
# cd <Big Data SQL install directory>/BDSJaguar
# ./jaguar updatenodes <bds-config.json>
```

When the update is done, this message is returned to the console:

```
BigDataSQL: UPDATENODES workflow completed.
```

The following are situations where you should run `updatenodes`:

- New nodes are added to the Hadoop cluster and some or all of them are provisioned with the DataNode role.

- Services and roles are redistributed in the cluster and some DataNode instances are moved.

- One or more nodes provisioned with the DataNode role, are removed from the cluster or deprovisioned.

> **⊘ Important:**
>
> Be sure to run `updatenodes` after a cluster expansion. This will enable local processing for data stored on the updated nodes. Also, the new DataNode instances in the cluster provide additional resource for query processing that is not utilized until Oracle Big Data SQL is installed on those nodes.
> You must also run `bds-database-install.sh --reconfigure` on the database side after you run `updatenodes` on the Hadoop side.

> **✎ See Also:**
>
> The Jaguar Configuration Parameter and Command Reference provides a full description of the Jaguar `updatenodes` and `reconfigure` commands.

Communicating DataNode Changes to Oracle Database

The Oracle Database side of the installation maintains an inventory of the DataNodes where Oracle Big Data SQL is installed in the Hadoop cluster. This is a map that tells it which nodes to query. If you run `updatenodes`, this updated DataNode inventory must be provided to the database compute nodes. The `updatenodes` procedure generates a new database installation bundle that includes the new inventory. Install this updated bundle on the database compute nodes using the same method that you use in a full installation, with one difference – on the Oracle Database side, install the update using `bds-database-install.sh --reconfigure`

1. As the database owner, copy the bundle to temporary location on the database node.

2. Extract the contents of the ZIP file.

3. Execute the run file extracted from the ZIP file.

4. Go to the installation directory under `$ORACLE_HOME/BDSJaguar-3.2.1.1.`

5. Run the installer with the `--reconfigure` command line parameter. For example:

```
$ cd $ORACLE_HOME/BDSJaguar-3.2.1.1/cdh510-6-node1.mydomain.com
$ ./bds-database-install.sh --reconfigure
```

4.2 Adding or Removing Oracle Big Data SQL on Oracle Database Nodes

Add or remove Oracle Big Data SQL from Oracle Database nodes by manually running the install or uninstall program on individual database nodes as needed.

On the Oracle Database side, there is at this time no equivalent to the Hadoop-side Jaguar `updatenodes` command, which detects changes in the Hadoop cluster and installs or uninstalls Oracle Big Data SQL on cluster nodes as required.

**To Install Oracle Big Data SQL on Additional Nodes of Oracle Database RAC
System**

If you want to extend Oracle Big Data SQL from a Hadoop cluster to additional Oracle
Database nodes at any time after the initial installation of Oracle Big Data SQL, then
install the database-side installation bundle for that cluster on these database nodes
using the same configuration applied to other nodes of the database.

> **Note:**
>
> The configuration for the connection between a Hadoop cluster and Oracle
> Database must be the same for all nodes of the database.

- You may find the bundle at `<Big Data SQL Install Directory>/`
  `BDSjaguar-3.2.1.1/db-bundles` or at the temporary location on other database
  nodes where you copied the bundle in order to stage the installation. The bundle
  ZIP file should include the Hadoop cluster name and a time stamp: `bds-3.2.1.1-`
  `db-<cluster>-<yymmdd.hhmi>.zip`

- If you can no longer locate the original database-side installation bundle, but do
  have the configuration file that was used for other nodes of the database, then you
  can recreate the same bundle by running the Jaguar `reconfigure` command.

  ```
  [root@myclusteradminserver:BDSjaguar-3.2.1.1]# ./jaguar reconfigure
  my_original_configfile.json
  ```

Deploy and install the bundle on the new database nodes as described in Steps for
Installing on Oracle Database Nodes.

To Uninstall Oracle Big Data SQL from Oracle Database Nodes

See Uninstalling From an Oracle Database Server.

5
Reconfiguring an Installation

After the initial Oracle Big Data SQL installation, there may be changes on the Hadoop cluster or the Oracle Database system that require corresponding updates to the Oracle Big Data SQL configuration, including:

- A change in the status of Kerberos — if it was previously disabled and is now enabled, or vice versa.

- Implementation of TLS (Transport Layer Security) or other security measures, such as Database Authentication option now supported by Oracle Big Data SQL.

- Changes to the location of Hive service instances within the Hadoop cluster.

- A switch from Ethernet to InfiniBand (or InfiniBand to Ethernet) for networking between the Hadoop cluster and the Oracle Database system.

- A change to the version of Oracle Big Data SQL running on the Hadoop cluster.

> **ⓘ Important:**
>
> If you are storing Oracle tablespaces in HDFS, then after you run `reconfigure`, take the tablespaces offline (or stop the database) and then restart the FUSE-DFS service running on all database compute nodes that are connected to the Hadoop cluster. See *Restarting FUSE-DFS After a Reconfigure Operation* at the end of this section for details.

The basic procedure for reconfiguring an installation is:

- Edit the `bds-config.json` file as needed.

- Run the Jaguar `reconfigure` command to push the configuration changes to the Hadoop cluster nodes and to generate an updated database-side installation bundle.

- Reinstall Oracle Big Data Data SQL on Oracle Database compute nodes using the new installation bundle. You can just overwrite the current installation. There is no prerequisite to uninstall the current Oracle Big Data SQL installation on either side.

Details are provided below.

> **✎ See Also:**
>
> The addition or removal of Oracle Big Data SQL from Hadoop cluster nodes or nodes in a multinode Oracle Database system is not a considered configuration change. See Expanding or Shrinking an Installation.

Run "jaguar reconfigure" to Reconfigure the Hadoop Side of the Installation and to Generate an Updated Database Installation Bundle

1. Log on to the cluster management server node as `root` and cd to the directory where you extracted the downloaded Oracle Big Data SQL installation bundle.

2. Go to the `BDSJaguar-3.2.1.1` subdirectory under the path where you unzipped the Oracle Big Data SQL bundle .

   ```
   # cd <Big Data SQL Install Directory>/BDSJaguar-3.2.1.1
   ```

3. In the `BDSJaguar-3.2.1.1` directory, run the Jaguar utility. Pass it the `reconfigure` parameter and the configuration file name (`bds-config.json` or other) as arguments. You may or may not need to include the `--requestdb` option.

   ```
   [root@myclusteradminserver:BDSjaguar-3.2.1.1] #  ./jaguar
   reconfigure bds-config.json
   ```

   If `bds-config.json` sets `database_auth_enabled` to "`true`", then include the `--requestdb` option in the install command:

   ```
   [root@myclusteradminserver:BDSjaguar-3.2.1.1] # ./jaguar --
   requestdb testdb reconfigure
   ```

   The script prompts for the cluster management service administrator credentials and then reconfigures Oracle Big Data SQL on the management server and the cluster nodes according to the new settings in the configuration file. The script output terminates with the following message if the installation completed without error.

   ```
   BigDataSQL: RECONFIGURE workflow completed.
   ```

Copy the Updated Database Installation Bundle to Each Oracle Database Node and Install It

1. Log on as either `root` or `oracle` on the cluster management server and cd to the directory where the new database bundle was generated.

   ```
   # cd <Big Data SQL Install Directory>/BDSJaguar-3.2.1.1/db-bundles
   ```

   Check that the new bundle is there.

   ```
   [oracle@myclusteradminserver:db-bundles] # ls
   [oracle@myclusteradminserver:db-bundles] # bds-3.2.1.1-db-<cluster>-
   <yymmdd.hhmi>.zip
   ```

2. Copy the database installation bundle over to any directory on the Oracle Database node, using the `oracle` account on the Oracle system. If there are

multiple bundles, be sure to select the correct bundle for cluster that you want to connect to Oracle Database.

```
[oracle@myclusteradminserver:db-bundles] # scp bds-3.2.1.1-db-
<cluster>-<yymmdd.hhmi>.zip oracle@<database_node>:/opt/tmp
```

3. Log on to the Oracle Database node as the database owner (`oracle` or other) in order perform the installation.

4. Cd to the directory where you copied the bundle, unzip the bundle, and then run the compressed executable that was extracted from the zip file. For example:

```
$ unzip bds-3.2.1.1-db-cdh510-170309.1918.zip
$ ./bds-3.2.1.1-db-cdh510-170309.1918.run
```

5. Change directories to the new directory under ORACLE_HOME and run `bds-database-install.sh`, the database-side installer.

```
$ cd $ORACLE_HOME/BDSJaguar-3.2.1.1/cdh510-6-node1.my.domain.com
$ ./bds-database-install.sh
```

Restarting FUSE_DFS After a Reconfigure Operation

The Oracle Tablespaces in HDFS feature uses a FUSE-DFS connection for file transfers between Oracle Database and the Hadoop cluster. There is a FUSE-DFS service instance for each connection to cluster. The service is named as follows:

```
 fuse_<cluster name>_hdfs
```

If this service exists, then after a reconfiguration of an Oracle Big Data SQL installation, then do the following:

1. Either set the tablespaces in HDFS to offline or stop the database.

   The datafiles for these tablespaces are open and locked by database processes.

2. Restart FUSE-DFS. Do this on each compute node.

```
# service fuse_mycluster_hdfs restart
```

3. After FUSE-DFS has restarted, you can set the tablespaces to online (or you if you stopped the database, you can restart it).

The `status`, `stop`, and `start` operations are also available for the FUSE-DFS service, as in:

```
# service fuse_mycluster_hdfs status
```

5.1 Reconfiguring an Existing Oracle Big Data SQL Installation

When Oracle Big Data SQL is installed on the cluster management server, the database-side installation bundle that is generated contains configuration information

that is based on the current state of the cluster. When you install the bundle on the Oracle Database side, this configuration information is used to set up the connnection between the Hadoop cluster and the database server. After the installation, changes in the Hadoop cluster may require an update to the Oracle Big Data SQL configuration both sides (Hadoop cluster and database server) in order to maintain connectivity.

Here are some Hadoop-side changes which require you to reconfigure the installation:

- Network security changes, such as a switch from HTTP to HTTPS or vice versa.
- Port reassignments in the cluster management service (CM or Ambari).
- Hive changes, such as migration of the service to different node or nodes or a change to the authentication method.
- Changes to other related Hadoop services, such as HDFS, MapReduce2, and YARN, may also affect connectivity.

> **Note:**
>
> The `reconfigure` procedure cannot be used to update the installation of an older version of Oracle Big Data SQL. You should instead overwrite the old installation with the current Oracle Big Data SQL version.
>
> Do not use this procedure if the only changes are to the DataNode inventory in the cluster (if DataNodes, are moved, added, or removed). In that case, use the `updatenodes` procedures instead.

1. As root on the Hadoop cluster management server, make any necessary updates to the configuration file for the connection between the Hadoop cluster and Oracle Database (`bds-config.json` or other).

2. Go to the `BDSJaguar-3.2.1.1` directory and run Jaguar to invoke the `reconfigure` operation. Pass in the configuration filename.

   ```
   # cd <Big Data SQL install directory>/BDSJaguar-3.2.1.1
   # ./jaguar reconfigure bds-config.json
   ```

   This updates the Oracle Big Data SQL installation on the Hadoop cluster and generates a new database-side installation bundle, which you can find at *<Oracle Big Data SQL Install Directory>*/BDSJaguar-3.2.1.1/dbbundles.

   > **Note:**
   >
   > If you are using Database Authentication and already provided a request key to the database-side installer when you did the original installation, then you do not need to do again. That is, you do not need to include `--requestdb` in a `reconfigure` operation unless you want to set up a connection to another database.

3. As in the original installation, copy the new bundle file to a temporary directory each database node. Connect using the `oracle` account on the database node. For example:

```
# scp bds-3.2.1.1-db-<cluster>-<yymmdd.hhmi>.zip
oracle@dbnode:/opt/tmp
```

4. Log on to the database node as the `oracle` user.

5. Locate the bundle and unzip it.

6. Run the executable file extracted from the bundle.

```
[oracle@mydbserver: $ bds-3.2.1.1-db-<cluster>-<yymmdd.hhmi>.run
```

This extracts the installation files into a new directory under ORACLE_HOME.

7. Change directories to ORACLE_HOME and list the subdirectories. You should see the old installation directory along with the new one. The directory names will include the same cluster name, but will have different timestamps. Delete the old directory.

```
$ cd $ORACLE_HOME
$ ls
  bds-3.2.1.1-db-<cluster>-<new timestamp>
  bds-3.2.1.1-db-<cluster>-<old timestamp>
$ rm -rf bds-3.2.1.1-db-<cluster>-<old timestamp>
```

8. Change directories to the new directory.

Run `bds-database-install.sh` with the `--reconfigure` parameter.

```
$ ./bds-database-install.sh --reconfigure
```

6
Uninstalling Oracle Big Data SQL

If you want to completely uninstall Oracle Big Data SQL, the software must be removed from the Hadoop cluster management server and the Oracle Database nodes where it is currently installed.

If the Hadoop DataNode service is removed from a subset of the nodes, then Oracle Big Data SQL must be removed from those nodes only.

6.1 General Guidelines for Removing the Software

Oracle Big Data SQL can be uninstalled from the Hadoop cluster management server or from any Oracle Database servers connected to the cluster management server. The procedure is the same for all Hadoop platforms.

Guidelines for uninstalling Oracle Big Data SQL are as follows:

- To perform a complete uninstall of Oracle Big Data SQL, remove the software from the cluster management server and from each Oracle Database server connected to the BDS service.

  This is a single script execution on each server. Not other manual steps are needed.

- You can uninstall from the cluster management server first or from the database servers first.

  > **Tip:**
  >
  > If you are removing the software from both sides of the installation, uninstall it from the database side first. If you uninstall from the cluster management server first, queries in process will fail.

- On the database side, the first Oracle Big Data SQL connection installed is known as the "default cluster."

  > **Note:**
  >
  > In a Oracle RAC database, be sure to run the uninstall script on all nodes of the database.

6.2 Uninstalling From an Oracle Database Server

On any database server where you want to uninstall the current version of Oracle Big Data SQL, run the commands below as the database owner (usually the `oracle` user).

In the case of a RAC database, be sure to perform the uninstall on each instance of the RAC.

Note that the `--crs` command line parameter may or may not be required, depending upon conditions related to Grid support. See the *Command Line Parameter Reference for bds-database-install.sh* in this guide.

If FUSE is enabled for TablesSpaces in HDFS, Uninstall it First

If you had previously set up FUSE to store Oracle tablespaces in HDFS, then you must first run the following command before uninstalling Oracle Big Data SQL:

```
$ ./bds-copy-tbs-to-hdfs.sh --uninstall
```

This command removes the FUSE mount point. You can then proceed with the Oracle Big Data SQL uninstall.

Uninstalling Oracle Big Data SQL

Run `bds-database-install.sh` with the `uninstall` command.

```
$ /bds-database-install.sh --uninstall --crs=false
```

> **Note:**
>
> If Grid is not running on this database node, or, if the database does not use Grid (CRS/ASM), then include the optional `--crs` parameter and set it to `false`.
>
> Also note that the `--uninstall-as-primary` and `--uninstall-as-secondary` parameters from previous releases are deprecated in this release. It is no longer necessary to differentiate between primary and secondary clusters in the uninstall process. In addition, `--db-resource` has been deprecated and is therefore not used in the example provided here.

6.3 Uninstalling From a Hadoop Cluster

Oracle Big Data SQL works with the Hadoop DataNode service. When you run the Oracle Big Data SQL installer on the configuration management server, it automatically propagates the Oracle Big Data SQL components to all Hadoop cluster nodes where the DataNode service is running. If the DataNode service is removed

from one or more nodes, then you must also remove the Oracle Big Data SQL components from those same nodes.

> ✎ **Note to Oracle Big Data Appliance Users:**
>
> This procedure may not apply if you are uninstalling the software from Oracle Big Data Appliance, since the appliance supports two alternate install/ uninstall methods (Jaguar and native Oracle Big Data Appliance installation via Mammoth or bdacli). You must use the same method to install and uninstall. On Oracle Big Data Appliance, if Jaguar (`./jaguar`) was used to deploy Oracle Big Data SQL, then Jaguar must also be used to remove the software.
>
> If you configured the Mammoth installation to install Oracle Big Data SQL or installed it later using `bdacli enable big_data_sql`, then you must use `bdacli disable big_data_sql` to remove Oracle Big Data SQL. The `bdacli` command for uninstalling Oracle Big Data SQL uninstalls the software across the entire cluster.
>
> If you are not sure which method was used to install Oracle Big Data SQL, then you can test with `bdacli getinfo cluster_big_data_sql_enabled`. If this command returns `FALSE`, then the installation was not done via `bdacli`.

1. On the cluster management server (where CM or Ambari is running), log on as `root`.

2. Change directories to the `BDSjaguar-3.2.1.1` directory under the location where the Oracle Big Data SQL Installation bundle `BigDataSQL-<Hadoop distribution><version>.zip` was extracted.

3. Run Jaguar with the `uninstall` command and provide the configuration file previously used to install on the cluster (`bds-config.json` or other):

   ```
   [root@myclusteradminserver:BDSjaguar-3.2.1.1] # ./jaguar uninstall
   bds-config.json
   ```

   When the uninstall is complete, the following message is returned:

   ```
   BigDataSQL: UNINSTALL workflow completed.
   ```

7

Securing Big Data SQL

This section describes security features provided by Oracle Big Data SQL, measures you can take to secure Big Data SQL, and to pointers to the information you need in order to configure Oracle Big Data SQL within secured environments.

7.1 Security Overview

Network Security

In Oracle Big Data SQL, network traffic between the database and the Hadoop cluster, is no longer guaranteed to be over a private InfiniBand network, but can occur over a client network. This network traffic is not currently secured. Therefore when operating a secured Hadoop cluster (e.g., Kerberos-enabled, RPC encryption), Oracle Big Data SQL requires either that all members of the client network be trusted, or that private network connectivity is used exclusively for communication between the Hadoop nodes and Oracle database instances. This private network is commonly referred to as the *Big Data SQL interconnect network*. The interconnect network must be a private network with only trusted users, use at least one switch, and 10 Gigabit Ethernet adapters. Ensure that only the nodes in the Hadoop cluster and Oracle RAC cluster can access the interconnect network. Do not use the interconnect network for other user communication.

Installer File Security

The new Jaguar installer incorporates the following best practices for secure Linux installers and applications:

- No persistent or temporary world-writable files are created.

- No setuid or setgid files are used.

In addition, the installer works with hardened Oracle Database environments as well as hardened CDH and HDP clusters as described in the Cloudera CDH and Hortonworks HDP security documentation

Password Safety

The Jaguar installer provides these password security measures:

- Passwords for the Ambari and Cloudera Manager servers (management servers) are not be passed in on the command line and are not be saved on any persistent file during and/or after the installation is complete.

- Passwords are not be logged to any log or trace files.

Security of Related Software

Oracle Big Data SQL relies on other installed software, including third party projects. It is the customer's responsibility to ensure that such software is kept up-to-date with the latest security patches. This software includes is (but not limited to):

- Java JDK
- Python
- Perl

7.2 Big Data SQL Communications and Secure Hadoop Clusters

It is generally a good security practice to ensure that HDFS file access permissions are minimized in order to prevent unauthorized write/read access. This is true regardless of whether or not the Hadoop cluster is secured by Kerberos.

Please refer to MOS Document 2123125.1 at My Oracle Support for detailed guidelines on securing Hadoop clusters for use with Oracle Big Data SQL.

7.3 Configuring Oracle Big Data SQL in a Kerberos-Secured Environment

If Kerberos is enabled on the Hadoop system, you must configure Oracle Big Data SQL on the database server to work with Kerberos. This requires a Kerberos client on each database node where Oracle Big Data SQL is installed. Also, the OS account that owns the database (`oracle` or another account) must be provisioned as a user principal.

When operating a secured Hadoop cluster (e.g., Kerberos enabled, RPC encryption), Oracle Big Data SQL requires either that all members of the client network be trusted, or that private network connectivity is used exclusively for communication between the Hadoop nodes and Oracle database instances. This private network is commonly referred to as the Big Data SQL interconnect network. The interconnect network must be a private network with only trusted users, use at least one switch, and 10 Gigabit Ethernet adapters. Ensure that only the nodes in the Hadoop cluster and Oracle RAC cluster can access the interconnect network. Do not use the interconnect network for other user communication.

7.3.1 Enabling Oracle Big Data SQL Access to a Kerberized Cluster

You must configure Oracle Big Data SQL to use Kerberos in environments where user access is Kerberos-controlled.

There are two situations when this is required:

- When enabling Oracle Big Data SQL on a Kerberos-enabled cluster.
- When enabling Kerberos on a cluster where Oracle Big Data SQL is already installed.

Oracle Big Data SQL processes run on the nodes of the Hadoop cluster as the `oracle` Linux user. On the Oracle Database server, the owner of the Oracle Database process is also (usually) the `oracle` Linux user. When Kerberos is enabled on the Hadoop system, the following is required in order to give the user access to HDFS.

- The `oracle` Linux user needs to be able to authenticate as a principal in the Kerberos database on the Kerberos Key Distribution Center (KDC) server. The

principal name in Kerberos does not have to be 'oracle'. However, the principal must have access to the underlying Hadoop data being requested by Oracle Big Data SQL.

- The following are required on all Oracle Database nodes and all Hadoop cluster nodes running Oracle Big Data SQL:
  - Kerberos client software installed.
  - A copy of the Kerberos configuration file from the KDC.
  - A copy of the Kerberos keytab file generated on the KDC for the `oracle` user.
  - A valid Kerberos ticket for the `oracle` Linux user.

Installing the Kerberos Client

If the Kerberos client is not installed, see Installing a Kerberos Client on the Oracle Database Nodes for instructions on installing the Kerberos client.

Creating a Kerberos Principal for the oracle User

On the Kerberos Key Distribution Center (KDC) server, become `root` and use `kadmin.local` to add a principal for the `oracle` user.

1. `# kadmin.local`

2. Within kadmin.local, type:

   ```
   add_principal <user>@<realm>
   quit
   ```

   You have the option to include the password, as in:

   ```
   add_principal <user>@<realm> -pw <password>
   quit
   ```

Creating a Kerberos Keytab for the oracle User

1. On the KDC, become `root` and run the following:

   ```
   # kadmin.local
   ```

2. Within `kadmin.local`, type:

   ```
   xst –norandkey -k /home/oracle/oracle.keytab oracle
   quit
   ```

   This creates the `oracle.keytab` file for the Kerberos `oracle` user in the `/home/oracle` directory.

   > **Note:**
   >
   > If you run the xst(ktadd) command without the `–norandkey` option , this will invalidate other keytabs previously created for this user.

3. Ensure that `oracle.keytab` is owned by the `oracle` Linux user and is readable by that user only.

```
$ chown oracle oracle.keytab
$ chmod 400 oracle.keytab
```

Kerberos Tasks Automated by Oracle Big Data SQL

The following Kerberos tasks are now automated:

- Distributing Keytab and Kerberos configuration file distrbution files.

  The Oracle Big Data SQL installation can now be configured to automatically distribute the keytab and Kerberos configuration files for the `oracle` user or other database owner to the Hadoop DataNodes (and Oracle Database compute nodes). This is done if the principal name and keytab file location parameters are set in the Jaguar configuration file. This is automation is performed on both the Hadoop and Oracle Database side.

  On Oracle Big Data Appliance, the keytab file distribution is done default for the `oracle` account and you do not need to add the principal and keytab file path for this account to the configuration file.

- Acquiring a Kerberos Ticket for designated principals.

  For `oracle` and other principals that were listed in the Jaguar configuration file, the installation acquires a Kerberos ticket on each Hadoop DataNode and Oracle DB compute node

- Ticket renewal

  The installation automatically sets up cron jobs in the Hadoop cluster and on Oracle Database to kinit for new ticket for each principal in the configuration four times daily.

Cleaning up After Ticket Expirations

When the bd_cell process is running on the nodes of a secured Hadoop cluster but the Kerberos ticket is not valid, then the cell goes to quarantine status. You should drop all such quarantines.

1. Check that the `oracle` user has a valid Kerberos ticket on all Hadoop cluster nodes.

2. On each cluster node, become `oracle` and run the following:

```
$ /opt/oracle/bd_cell/cellsrv/bin/bdscli
```

3. In the bdscli shell, type:

```
list quarantine
```

4. While still in bdscli, drop each quarantine on the list:

```
drop quarantine <id>
```

5. Type `exit` to exit bdscli.

7.3.2 Installing a Kerberos Client on the Oracle Database Nodes

If the Oracle Database system is Kerberos secured, then Oracle Big Data SQL requires a Kerberos client. The client must be installed on each compute node of the database.

For commodity servers, download the Kerberos client software from a repository of your choice. If the database server is an Oracle Exadata Database Machine, download and install the software from the Oracle repository as shown below. The process should be similar for downloads from non-Oracle repositories.

Log on to the database server as root and use yum to install the `krb5-libs` and `krb5-workstation` packages. Download from the Oracle Linux 6 or Oracle Linux 5 repository as appropriate.

1. Check that the Oracle `public-yum-ol6` or `public-yum-ol5` repository ID is installed.

    ```
    # yum repolist
    ```

2. Temporarily disable all repository IDs and then enable the Oracle repository only (Oracle Linux 6 in this example).

    ```
    # yum --disablerepo="*" --enablerepo="public-yum-ol6" list
    available
    ```

3. Install the Kerberos packages.

    ```
    # yum install krb5-libs krb5-workstation
    ```

4. Copy the `/etc/krb5.conf` file from the Key Distribution Center (KDC) to the same path on the database server.

These steps must be performed for each Oracle Database node.

You must also register the `oracle` Linux user (or other Linux user) and password in the KDC for the cluster as described in Enabling Oracle Big Data SQL Access to a Kerberized Cluster

7.4 Using Oracle Secure External Password Store to Manage Database access for Oracle Big Data SQL

On the Oracle Database server, you can use the Oracle Secure External Password Store (SEPS) to manage database access credentials for Oracle Big Data SQL.

This is done by creating an Oracle wallet for the `oracle` Linux user (or other database owner). An Oracle wallet is a password-protected container used to store authentication and signing credentials, including private keys, certificates, and trusted certificates needed by SSL.

See MOS Document 2126903.1 at My Oracle Support for information on using SEPS with Oracle Big Data SQL.

7.5 About Data Security on Oracle Big Data Appliance

If your Hadoop system is an Oracle Big Data Appliance, the following tools to strengthen security are already available.

- **Kerberos authentication**: Requires users and client software to provide credentials before accessing the cluster.
- **Apache Sentry authorization**: Provides fine-grained, role-based authorization to data and metadata.
- **HDFS Transparent Encryption**: Protects the data on disk and at rest. Data encryption and decryption is transparent to applications using the data.
- **HTTPS/ Network Encryption**: Provides HTTPS for Cloudera Manager, Hue, Oozie, and Hadoop Web UIs. Also Enables network encryption for other internal Hadoop data transfers, such as those made through YARN shuffle and RPC.

> **See Also:**
>
> The Oracle Big Data Appliance Software User's Guide provides details on available security features. You can find this guide and other documentation for your release of the Oracle Big Data Appliance software in the "Big Data" section of the Oracle Help Center.

7.6 Authentication Between Oracle Database and Oracle Big Data SQL Offload Cell Server Processes

The Database Authentication feature described in this guide prevents unauthorized and potentially malicious processes (which can originate from anywhere) from connecting to Oracle Big Data SQL cell server processes in the DataNodes of the Hadoop cluster.

When Ethernet is selected for the connection between Oracle Databases and Oracle Big Data SQL, then by default this secured authentication framework is set up automatically during the installation. Database Authentication is also available as a configuration option for InfiniBand connections.

> **See Also:**
>
> Jaguar Configuration Parameter and Command Reference

7.7 The Multi-User Authorization Model

Multi-User Authorization gives you the ability to use Hadoop Secure Impersonation to direct the `oracle` account to execute tasks on behalf of other designated users. This

enables HDFS data access based on the user that is currently executing the query, rather than the singular `oracle` user.

Administrators set up the rules for identifying the query user (the currently connected user) and for mapping this user to the user that is impersonated. Because there are numerous ways in which users can connect to Oracle Database, this user may be a database user, a user sourced from LDAP, from Kerberos, or other sources. Authorization rules on the files apply to the query user and audits will identify the user as the query user.

> **See Also:**
>
> The DBMS_BDSQL PL/SQL Packagein the *Oracle Big Data SQL User's Guide* describes the Multi-User Authorization security table and the procedures for adding user maps to the table and removing them from the table.

8

Additional Tools Installed

8.1 Copy to Hadoop and OHSH

Copy to Hadoop

Copy to Hadoop makes it easy to identify and copy data from an Oracle Database table to the Apache Hadoop Distributed File System (HDFS) and create an Apache Hive external table over that data. In HDFS, the data can be saved in Oracle Data Pump files (which store data as Oracle data types). This provides an exact copy of the data in the database, without the potential for data type conversion errors. You can then query the data via Hive (and Hadoop technologies that access data through Hive) and by Oracle Big Data SQL. Oracle Data Pump data can be converted to Parquet or ORC using Hive

Oracle Shell for Hadoop Loaders (OHSH)

OHSH is an intuitive command line tool to move data between Hadoop and Oracle Database. It provides a set of declarative commands you can use to copy contents from an Oracle Database table to a Hive table.

OHSH is bundled with both Oracle Big Data SQL and Oracle Big Data Connectors. With Oracle Big Data SQL, OHSH works with Copy to Hadoop. With Oracle Big Data Connectors, OHSH provides an interface to copy contents from Hadoop and Hive to Oracle tables using Oracle Loader for Hadoop (OLH) and Oracle SQL Connector for Hadoop Distributed File System (OSCH).

Although OHSH can serve as a front end for OLH and OSCH as well as for Copy to Hadoop, OLH and OSCH are part of the Oracle Big Data Connectors product and are not installed by Oracle Big Data SQL.

Installation and Configuration of Copy to Hadoop and OHSH

You can use Copy to Hadoop and OHSH from any of these environments:

- A Hadoop cluster node
- An Oracle Database node
- An edge node.

Oracle Big Data SQL installs the kits for Copy to Hadoop and Oracle Shell for Hadoop Loaders on the Hadoop cluster management server and on any Oracle Database server node where you install Oracle Big Data SQL.

You can also manually copy the kits for both tools from the Hadoop cluster management server to an edge node and configure them for use from the edge node. The kits are stored at `/opt/oracle/orahivedp-<version>`.. See `/opt/oracle/ohsh-<version>/doc/OHSH_EDGE_NODE_README.txt` on the Hadoop cluster management server for instructions.

> **Note:**
>
> In the Oracle Big Data SQL installation, the Copy to Hadoop is fully
> automated except for the setting of the `CP2HADOOP_HOME` listed in the table
> below. You must set this manually.
> You must complete configuration of Oracle Shell for Hadoop Loaders
> manually, as described in this section.

Environment Variables for OHSH

On the Hadoop cluster management server, the OHSH configuration file is `/opt/`
`oracle/ohsh-<version>/bin/ohsh_config.sh`. On an Oracle Database node, it
is `$ORACLE_HOME/ohsh/bin/ohsh_config.sh`. This file contains environment
required by OHSH. The set of variables needed the installation on a Hadoop cluster,
Oracle Database Node or an edge node differ. The table below shows which variables
you need to set for each environment. Some of the required variables are set for you
automatically by the Oracle Big Data SQL installer.

8.1.1 Completing the OHSH Configuration on Oracle Database Nodes

The Oracle Big Data SQL installation automatically copies the OHSH installation kit to
each node where Oracle Big Data SQL is installed. There are some manual steps you
must perform to complete the installation.

> **Note:**
>
> The README file at `$ORACLE_HOME/ohsh/doc/`
> `OHSH_DB_NODE_README.txt` on the Hadoop cluster management server
> where you installed Oracle Big Data SQL describes the full set of steps
> ordinarily needed to enable OHSH on an Oracle Database node. However,
> when OHSH is installed by Oracle Big Data SQL, some of the setup is done
> for you by the installer. To complete the configuration in this context, use
> this shortened procedure instead of the full procedure documented in the
> README.
> Also notice below that patch 23237037 is required for 12.1.0.2 (or earlier
> Oracle Database releases) only. Do not install this patch if you are running a
> later release of Oracle Database.

1. Log on to the Oracle Database server as the `oracle` user.

2. Set up OHSH to work with Copy to Hadoop.

   a. Create a staging directory in the file system on the Oracle Database node:

      ```
      $ mkdir <OS_STAGE_DIR>
      ```

   b. Create an Oracle directory on this staging directory and grant read/write
      privileges to the Oracle Database user (`oracle` or other). In this example,

ORACLE_STAGE_DIR refers to the name of the directory object in Oracle Database. *OS_STAGE_DIR* refers to the path on the server.

```
SQL> CREATE DIRECTORY <ORACLE_STAGE_DIR> AS '<OS_STAGE_DIR>';
SQL> GRANT READ,WRITE ON DIRECTORY <ORACLE_STAGE_DIR> TO
<ORACLE_USER>;
```

> **✏ Note:**
>
> Later, if you employ the "stage" method to copy Oracle tables, use the OHSH `set locationdirectory` command to point to the Oracle directory object name (the name of the directory you created above in this step).

c. If you are connecting to a CDH-based Hadoop system (Oracle Big Data Appliance or other), perform the substeps below to enable the OHSH "FUSE" method, in which you copy files to Hive tables over an HDFS Mountable FUSE directory. Note that HDP does not support Fuse, therefore you cannot create a mount point to HDFS on HDP using these steps.

    i. If you are using **Oracle Database 12.1.0.2 or earlier**, install patch 23237037 (available on My Oracle Support) on all database nodes.

    ii. On the Oracle Database host, create a FUSE mount to the root of the HDFS system on the Hadoop cluster. Refer to Cloudera's documentation on installing FUSE. You may find current instructions at Configuring Mountable HDFS on Cloudera's website.

    iii. Create the Oracle directory on the FUSE mount and grant privileges. In this example, *ORACLE_FUSE_DIR* refers to the name of the directory object in Oracle Database. *OS_FUSE_MOUNT* refers to the path to the mount point on the server.

```
    SQL> CREATE DIRECTORY <ORACLE_FUSE_DIR> AS
'<OS_FUSE_MOUNT>';
    SQL> GRANT READ,WRITE ON DIRECTORY <ORACLE_FUSE_DIR>
TO <ORACLE_USER>;
```

Note that when you use OHSH later to copy Oracle tables to Hive using the "FUSE" method, use the OHSH `set locationdirectory` command to point to the same `<ORACLE_FUSE_DIR>`

3. Edit `$ORACLE_HOME/ohsh/bin/ohsh_config.sh` in order to configure the home directories of dependencies. When OHSH is installed by Oracle Big Data SQL, most of the required variables are already set for you. Set `HS2_HOST_PORT` and (if needed) `HIVE_SESS_VAR_LIST` as follows.

```
export HS2_HOST_PORT=<HS2_HOST>:<HS2_PORT>
```

Also set `HIVE_SESS_VAR_LIST` to any required Hive session variables. For example:

- To connect to HiveServer2 with Kerberos authentication:

  ```
  export HIVE_SESS_VAR_LIST="principal=<The server principal of
  HiveServer2>"
  ```

  The Hive principal is specified by the configuration
  property `hive.server2.authentication.kerberos.principal` in
  `hive-site.xml`.

- To connect to HiveServer2 running in HTTP mode:

  ```
  export HIVE_SESS_VAR_LIST="transportMode=http;httpPath=<The HTTP
  endpoint>"
  ```

- To connect to HiveServer2 when SSL is enabled:

  ```
  export HIVE_SESS_VAR_LIST="ssl=true;sslTrustStore=<Trust Store
  path>;trustStorePassword=<Trust Store password>"
  ```

4. If you want to configure OHSH to use Oracle Wallet, set environment the variables `TNS_ADMIN` and `WALLET_LOCATION` to the directory path where TNS and Oracle Wallet are stored.

   ```
   export WALLET_LOCATION="<wallet_location>"
   export TNS_ADMIN="<tns_admin_location>"
   ```

   > **Note:**
   >
   > Later, when you start an OHSH session, if the `TNS_ADMIN` and `WALLET_LOCATION` are different on the Hadoop cluster then set `hadooptnsadmin` and `hadoopwalletlocation`:
   >
   > ```
   > set hadooptnsadmin <tns_admin_hadoop_node>
   > set hadoopwalletlocation <wallet_location_hadoop_node>
   > ```

5. Start an OHSH session and check for resources. This check indicates whether or not the configuration is correct.

   ```
   $ ohsh
   ohsh> show resources
   ```

   You should see the resources `hadoop0`, `hive0`, and `bash0`.

8.1.2 Completing the OHSH Configuration on the Hadoop Cluster

On the Hadoop cluster management server, Oracle Big Data SQL installs OHSH from an RPM to `/opt/oracle/ohsh`. Perform the steps below as `root` in order to complete the Hadoop side of the configuration.

> **Note:**
>
> The installation instructions at `$ORACLE_HOME/ohsh/doc/OHSH_HADOOP_NODE_README.txt` on the Hadoop cluster management server contain extra information that is not applicable to the installation of Copy to Hadoop and OHSH in the context of the Oracle Big Data SQL installation. Use the instructions below instead.

1. If the Hadoop system is not an Oracle Big Data Appliance, then download the SQL*Plus Instant Client and Oracle Instant Client for Linux from the Oracle Technology Network. Select the client versions that matches the version of the Oracle Database.

   For example, you can find the client downloads for Oracle Database 12.2.0.1.0 at this address:http://www.oracle.com/technetwork/topics/linuxx86-64soft-092277.html

   Extract both packages into the same directory.

   Add the directory to `PATH` and `LD_LIBRARY_PATH`.

2. Create a local directory for TNS and from `TNS_ADMIN` on the Oracle Database host, copy the `tnsnames.ora` and `sqlnet.ora` file into this directory.

   If you create an Oracle Wallet for the Oracle Database host, then also copy over the Oracle Wallet file from the database server. Also check that `sqlnet.ora` points to the correct Oracle Wallet location.

   ```
   WALLET_LOCATION=
          (SOURCE=(METHOD=FILE)(METHOD_DATA=
             (DIRECTORY=<your wallet directory>)))
       sqlnet.wallet_override=true
   ```

3. As root, edit `/opt/oracle/ohsh/bin/ohsh_config.sh`. Set the following environment variables.

   ```
   export CP2HADOOP_HOME=/opt/oracle/orahivedp-<version
   export HS2_HOST_PORT=<HiveServer2 hostname>:<Port number>
   ```

   Also set `HIVE_SESS_VAR_LIST` to any required Hive session variables. For example:

   • To connect to HiveServer2 with Kerberos authentication:
   ```
   export HIVE_SESS_VAR_LIST="principal=<The server principal of
   HiveServer2>"
   ```

   • To connect to HiveServer2 running in HTTP mode:
   ```
   export HIVE_SESS_VAR_LIST="transportMode=http;httpPath=<The HTTP
   endpoint>"
   ```

   • To connect to HiveServer2 when SSL is enabled:
   ```
   export HIVE_SESS_VAR_LIST="ssl=true;sslTrustStore=<Trust Store
   path>;trustStorePassword=<Trust Store password>"
   ```

ORACLE

4. If TNS and Oracle Wallet are enabled, also add the following variables to the file and export them:

```
export WALLET_LOCATION="<your wallet directory>"
export TNS_ADMIN="<your TNS directory>"
```

5. Add `/opt/oracle/ohsh` and `$HADOOP_HOME/bin` to the PATH variable

```
PATH=/opt/oracle/ohsh-<version>/bin:$PATH
PATH=$HADOOP_HOME/bin:$PATH
```

6. Start an OHSH session and check for resources. This check indicates whether or not the configuration is correct.

```
$ ohsh
ohsh> show resources
```

You should see the resources `hadoop0`, `hive0`, and `bash0`.

8.1.3 Getting Started Using Copy to Hadoop and OHSH

See `$ORACLE_HOME/ohsh/doc` and `$ORACLE_HOME/ohsh/examples` for examples that show how to run the OHSH load methods.

See the Oracle Big Data SQL User's Guide more information on Copy to Hadoop and Oracle Shell for Hadoop Loaders.

A

Installation Quick Reference

This condensed description of the installation steps may be useful if you have installed the release before, or, feel that you do not need a detailed explanation of the steps. You can refer back to the full instructions in the main body of the guide for more information.

About Restarts

Hadoop Side:

- Cloudera Configuration Manager (or Ambari) may be restarted by the installation. This in itself does not interrupt any services.

- Hive, YARN , and any other services that have a dependency on Hive or YARN (such as Impala) are restarted.

  The Hive libraries parameter is updated in order to include Oracle Big Data SQL JARs. On Cloudera installations, if the YARN Resource Manager is enabled, then it is restarted in order to set cgroup memory limit for Oracle Big Data SQL and the other Hadoop services. On Oracle Big Data Appliance, the YARN Resource Manager is always enabled and therefore always restarted.

Database Side:

- In some cases where Grid infrastructure is present, it must be restarted. If the system uses Grid then you should have the Grid user credentials on hand in case a restart is required

- The Linux users grid and oracle (or other database owner) must both in the same group (usually `oinstall`).

Table A-1   Checking Prerequisites and Patches

Step	For More Information
1. Check for the prerequisites on both the Hadoop or Oracle Database systems. (The installation will alert you if any are missing.)	• Prerequisites for Installation on the Hadoop Cluster • Prerequisites for Installation on Oracle Database Nodes
2. Ensure that the latest Database Proactive Bundle Patch is installed on database as well as any one-off patches required for this product. **NOTE:** The Database Proactive Bundle Patch is different than the Patch Set Update. Refer to the Master Compatibility Matrix for complete details on required patches.	Oracle Big Data SQL Master Compatibility Matrix (Doc ID 2119369.1 in My Oracle Support
3. On the database server, check that `opatch` is included in `PATH` . Then run `opatch` to see what patches are installed on the database: `$ ./opatch lspatches`	
4. Copy patch 26170659 to the database server if not already installed.	

Table A-1   (Cont.) Checking Prerequisites and Patches

Step	For More Information
5. Make sure database and listener are down.	Managing Oracle Software and Applying Patches (*Database 2 Day + Real Application Clusters Guide*)
6. Unzip the patch archive on the database server. Navigate to the patch and apply it: `$ ./opatch apply` If the database server has both a database and Grid home, then you must apply the one-off patch to BOTH the grid home and database home.	
7. Navigate to `$ORACLE_HOME/Opatch` and run the `datapatch` command: `$ ./datapatch`	

Table A-2   Installing the Hadoop Side of Oracle Big Data SQL

Step	For More Information
8. Download the Oracle Big Data SQL installation bundle from OTN or eDelivery (Oracle Software Delivery Cloud).	• OTN • Oracle Software Delivery Cloud
9. Copy this file on to master node of the Hadoop cluster (where Ambari or CM is running). Unzip it and navigate to extracted directory.	

10. Create a configuration file:
 	
`{`
`"cluster": {`
`  "name": <Your cluster name>`
`  }`
`}`
 	
Some important implicit default settings you may want to modify are `database_compatibility` and `database_auth_enabled`. See the description of these parameters in the Jaguar Configuration Parameter and Command Reference in this guide.
 	
`{`
`"cluster": {`
`  "name": <Your cluster name>`
`  "database_compatibility" : [ "12.2" ]`
`  },`
`"security": {`
`  "database_auth_enabled": "false"`
`  }`
`}`
 	
Other configuration options are available.
	• Jaguar Configuration Parameter and Command Reference
	• Steps for Installing on the Hadoop Cluster

Table A-2   (Cont.) Installing the Hadoop Side of Oracle Big Data SQL

Step	For More Information
11. As `root`, run : `./jaguar install <config file>` If you want to generate a key for Database Authentication, then include the `--requestdb` parameter and list the databases that should accept the key: `./jaguar --requestdb orcl,testdb,proddb install <config file>`	
12. Copy the database-side installation bundle generated in `<Big Data SQL Install directory>/BDSjaguar-3.2.1.1/dbundles` to the database server. If you used `--requestdb` to generate a request key, find the `.reqkey` file under `/BDSjaguar-3.2.1.1/dbkeys` and copy it to the database server as well.	

Table A-3   Installing the Database Side of Oracle Big Data SQL

Step	For More Information
13. Log on as the database owner, locate the database-side installation bundle, and unzip it.	Steps for Installing on Oracle Database Nodes
14. Execute the `.run` file extracted from the ZIP file.	

15. Navigate to `$ORACLE_HOME/BDSJaguar-3.2.1.1` and find the installation directory created by the `.run` file . The directory name will indicate the cluster, node, and domain where the installation bundle originated. Cd into the directory and run the installer:
 	
`$ cd cdh510-6-node1.my.domain.com`
`$ ./bds-database-install.sh`
 	
You may need to include some parameters with this command.
	Command Line Parameter Reference for bds-database-install.sh

Perform the steps in the table below if `database_auth_enabled` and/or `impersonation_enabled` was set to `"true"` in the configuration.

Table A-4   Extra Steps to Complete the Configuration for Database Authentication and/or Multi-User Authorization

Step	For More Information

16. If Database Authentication and/or Multi-User Authorization are enabled, the database-side installation generates a ZIP file. Find this file in the installation directory and copy it back to the path indicated below on the Hadoop cluster management server:
 	
`$ ls $ORACLE_HOME/BDSJaguar-3.2.1.1/`
`cdh510-6-node1.my.domain.com/*.zip`
`  mycluster1-18-`
`mycluster1node03.mydomain.com-`
`myoradb1.mydomain.com.zip`
`$ scp mycluster1-18-`
`mycluster1node03.mydomain.com-`
`myoradb1.mydomain.com.zip root@node1:/opt/`
`oracle/DM/databases/conf`
	Steps for Installing on Oracle Database Nodes

17. Log on to the Hadoop cluster management server as `root` and run the Database Acknowledge operation:
 	
`# cd <Big Data SQL Install Directory>/`
`BDSJaguar-3.2.1.1`
`# ./jaguar databaseack <config file>`	

Table A-5   Creating Users and Setting Up Mappings for Multi-User Authorization

Action	For More Information

18. To grant a user access:
• Grant the `BDSQL_USER` role.
• Grant read privileges on the `BigDataSQL` configuration directory object.
 	
`SQL> grant BDSQL_USER to user1;`
`SQL> grant read on directory`
`ORACLE_BIGDATA_CONFIG to user1;`	

Table A-5   (Cont.) Creating Users and Setting Up Mappings for Multi-User Authorization

Action	For More Information
19. To grant users Hadoop access through the Multi-User Authorization feature, use the procedures of the DBMS_BDSQL PL/SQL Package:	DBMS_BDSQL PL/SQL Package
• Grant the `BDSQL_ADMIN` role to designated administrators in order to allow them to invoke these procedures.	
• Use the `ADD_USER_MAP` procedure to define the rules for a user. This creates a row in the `BDSQL_USER_MAP` table.	
• Use `REMOVE_USER_MAP` to remove a row from the `BDSQL_USER_MAP` table.	

See Also

These workflow diagrams provide a visual overview of the installation process as a whole and a close-up view of the steps needed to complete the setup of Database Authentication:

• Installation Workflow

• Generating and Installing the GUID-Key Pair for Database Authentication

The next two sections of this guide provide useful code examples:

• bds-config.json Configuration Example

• Oracle Big Data SQL Installation Examples

B

bds-config.json Configuration Example

The following is an example of a fully-populated bds-config.json file, which includes all available configuration parameters.

```
{
    "cluster": {
        "name": "cluster"
    },
    "api" : {
        "port" : 5050,
        "restart_stale" : "false"
    },
    "repositories" : {
        "url" : [
            "http://repo1.domain.com/loc/hadoop",
            "http://repo2.domain.com/loc",
            "http://alternate.domain.com/backup/repo"
        ],
        "dir" : [ "/root/hadooprepo" ]
    },
    "network" : {
        "use_infiniband" : "false",
        "selection_subnet" : "5.32.128.10/21",
        "http_proxy" : "http://my.proxy.server.com:80",
        "https_proxy" : "http://mysecure.proxy.server.com:80"
            "excluded_nodes" : [ "edge.node1.domain.com",
"edge.node2.domain.com" ]
        },
    "security" : {
        "database_auth_enabled" : "true",
        "impersonation_enabled" : "true",
        "impersonation_usehosts" : "true",
        "impersonation_blacklist" : "hdfs,hive"
    },
    "kerberos" : {
        "principal" : "oracle/mycluster@MY.DOMAIN.COM",
        "keytab" : "/home/oracle/security/oracle.keytab",
        "hdfs-principal" : "hdfs/mycluster@MY.DOMAIN.COM",
        "hdfs-keytab" : "/home/hdfs/security/hdfs.keytab"
    },
    "memory" : {
        "min_hard_limit" : 16384,
        "max_percentage" : 30
    }
}
```

C

Oracle Big Data SQL Installation Examples

The following are samples of the console output for the Oracle Big Data SQL installation.

- Example 1 shows the output of an installation on Oracle Big Data Appliance.

- Example 2 shows the parallel installation on Hortonworks HDP.

The database side of the installation is the same for Exadata Database Machine and all commodity Oracle Database platforms.

The database side of these scripts shows the installation on a system running Oracle Database 12.1. The output is the same for an installation on an Oracle Database 12.2 system, except for minor path changes.

Example 1: Installation on Oracle Big Data Appliance

This example shows the Hadoop-side installation where the Hadoop system is Oracle Big Data Appliance. These are the factors to note in this scenario:

> **⊘ Important:**
>
> Notice that we are using `scl` to ensure that the correct version of Python is invoked.

```
[root@clust0601bda14vm03 BDSjaguar-3.2.1.1]# scl enable python27 "./
jaguar install"
BigDataSQL:
=====================================================================.
BigDataSQL: Oracle Big Data SQL 3.2.1.1.
BigDataSQL: Starting execution on: Mon Nov 13 13:47:13 2017.
BigDataSQL:          in directory: /root/BDSjaguar-3.2.1.1.
BigDataSQL:          and hostname: clust0601bda14vm03.vm.oracle.com.
BigDataSQL: Verifying configuration parameters...
BigDataSQL: Starting server...
BigDataSQL: API protocol: http.
BigDataSQL: API port: 7180.
BigDataSQL: Waiting for management server to respond...
BigDataSQL: WARNING: If there are services in the stale state, they
will be restarted !!!.

Cloudera Manager user: admin
Password:

BigDataSQL: Authentication succeeded.
BigDataSQL: API version: 17.
BigDataSQL: Cluster type: BDA.
BigDataSQL: Cluster name: clust0601bda14vm.
```

```
BigDataSQL: Cluster version: CDH5.
BigDataSQL: Service: BIGDATASQL.
BigDataSQL: Verifying service configuration..
BigDataSQL: Connection type: Ethernet.
BigDataSQL: Initialization completed..
BigDataSQL: Copying CSD to Cloudera Manager..
BigDataSQL: Restarting management server...
BigDataSQL: Waiting for management server to respond...
BigDataSQL: Restarting Cloudera Management service..
BigDataSQL: Starting deployment server..
BigDataSQL: Deployment server listening
BigDataSQL: Analyzing cluster ....
BigDataSQL: Checking for Big Data SQL requirements..
BigDataSQL: Preparing installation..
BigDataSQL: Installing Big Data SQL agents..
BigDataSQL: No http_proxy variable defined.
BigDataSQL: No https_proxy variable defined.
BigDataSQL: Installing Big Data SQL servers..
BigDataSQL: Starting bigdatasql service..
BigDataSQL: Restarting stale services..
BigDataSQL: Restarting Cloudera Management service..
BigDataSQL: Big Data SQL task completed..
BigDataSQL: Creating database side bundle..
BigDataSQL: Creating bundle file.
BigDataSQL: Bundle file created: /root/BDSjaguar-3.2.1.1/db-bundles/
bds-3.2.1.1-db-clust0601bda14vm-171113.1347.zip.
BigDataSQL: WARNING: Database authentication is enabled, you will need
a reqkey file for set it up..
BigDataSQL:          Ignore this warning if you already have one or if
your database already has its key,
BigDataSQL:          otherwise, use './jaguar --requestdb <db name>
databasereq' to create one.
BigDataSQL: INSTALL workflow completed.
```

Requesting a .reqkey file for database "mashadb." Database Authentication is enabled but the key was not requested in the install operation.

```
[root@clust0601bda14vm03 BDSjaguar-3.2.1.1]# scl enable python27 "./
jaguar --requestdb mashadb databasereq"
BigDataSQL:
=====================================================================.
BigDataSQL: Oracle Big Data SQL 3.2.1.1.
BigDataSQL: Starting execution on: Mon Nov 13 14:07:21 2017.
BigDataSQL:          in directory: /root/BDSjaguar-3.2.1.1.
BigDataSQL:          and hostname: clust0601bda14vm03.vm.oracle.com.
BigDataSQL: Verifying configuration parameters...
BigDataSQL: Starting server...
BigDataSQL: API protocol: http.
BigDataSQL: API port: 7180.
BigDataSQL: Waiting for management server to respond...
BigDataSQL: WARNING: If there are services in the stale state, they
will be restarted !!!.

Cloudera Manager user: admin
```

```
Password:

BigDataSQL: Authentication succeeded.
BigDataSQL: API version: 17.
BigDataSQL: Cluster type: BDA.
BigDataSQL: Cluster name: clust0601bda14vm.
BigDataSQL: Cluster version: CDH5.
BigDataSQL: Service: BIGDATASQL.
BigDataSQL: Verifying service configuration..
BigDataSQL: Connection type: Ethernet.
BigDataSQL: Initialization completed..
BigDataSQL: Starting deployment server..
BigDataSQL: Deployment server listening
BigDataSQL: Requiring database keys only..
BigDataSQL: reqkey file created: /root/BDSjaguar-3.2.1.1/dbkeys/
mashadb.reqkey.
BigDataSQL: DATABASEREQ workflow completed.
```

Copy the database-side installation bundle and the request key file to the database node.

```
[root@clust0601bda14vm03 BDSjaguar-3.2.1.1]# scp /root/
BDSjaguar-3.2.1.1/dbkeys/mashadb.reqkey masha@clust0601bda14vm04:/home/
masha
masha@clust0601bda14vm04's password:
mashadb.reqkey
                         100%  252     0.3KB/s   00:00
[root@clust0601bda14vm03 BDSjaguar-3.2.1.1]# scp /root/
BDSjaguar-3.2.1.1/db-bundles/bds-3.2.1.1-db-
clust0601bda14vm-171113.1347.zip masha@clust0601bda14vm04:/home/masha
masha@clust0601bda14vm04's password:
bds-3.2.1.1-db-
clust0601bda14vm-171113.1347.zip
            100% 1020MB  51.0MB/s   00:20
```

Unzip the bundle, execute the run file, and copy the request key file into the install directory created by the run file.

```
[masha@clust0601bda14vm04 ~]$ unzip bds-3.2.1.1-db-
clust0601bda14vm-171113.1347.zip
Archive:  bds-3.2.1.1-db-clust0601bda14vm-171113.1347.zip
  inflating: bds-3.2.1.1-db-clust0601bda14vm-171113.1347.run
[masha@clust0601bda14vm04 ~]$ ./bds-3.2.1.1-db-
clust0601bda14vm-171113.1347.run
bds-3.2.1.1-db-clust0601bda14vm-171113.1347.run: platform
is                : Linux
bds-3.2.1.1-db-clust0601bda14vm-171113.1347.run: script started
at         : Mon Nov 13 14:19:56 CST 2017
bds-3.2.1.1-db-clust0601bda14vm-171113.1347.run: running
location          : /home/masha
bds-3.2.1.1-db-clust0601bda14vm-171113.1347.run:
ORACLE_SID              : mashadb
bds-3.2.1.1-db-clust0601bda14vm-171113.1347.run:
ORACLE_HOME              : /u03/app/masha/12.1.0/dbhome_mashadb
```

```
bds-3.2.1.1-db-clust0601bda14vm-171113.1347.run:
install directory          : /u03/app/masha/12.1.0/dbhome_mashadb/
BDSJaguar-3.2.1.1/clust0601bda14vm-3-clust0601bda14vm03.vm.oracle.com
bds-3.2.1.1-db-clust0601bda14vm-171113.1347.run: extracting...
bds-3.2.1.1-db-clust0601bda14vm-171113.1347.run: installer extracted
successfully

cd $ORACLE_HOME/BDSJaguar-3.2.1.1/clust0601bda14vm-3-
clust0601bda14vm03.vm.oracle.com

bds-3.2.1.1-db-clust0601bda14vm-171113.1347.run: for setup Big Data SQL
on this database instance
[masha@clust0601bda14vm04 ~]$ mv mashadb.reqkey $ORACLE_HOME/
BDSJaguar-3.2.1.1/clust0601bda14vm-3-clust0601bda14vm03.vm.oracle.com
```

Change to the install directory and run the install operation of bds-database-install.sh.

```
[masha@clust0601bda14vm04 ~]$ cd $ORACLE_HOME/BDSJaguar-3.2.1.1/
clust0601bda14vm-3-clust0601bda14vm03.vm.oracle.com
[masha@clust0601bda14vm04 clust0601bda14vm-3-
clust0601bda14vm03.vm.oracle.com]$ ./bds-database-install.sh --install
bds-database-install: platform is            : Linux
bds-database-install: script started at       : Mon Nov 13 14:20:59
CST 2017
bds-database-install:
running location          : /u03/app/masha/12.1.0/dbhome_mashadb/
BDSJaguar-3.2.1.1/clust0601bda14vm-3-clust0601bda14vm03.vm.oracle.com
bds-database-install: ORACLE_SID              : mashadb
bds-database-install: ORACLE_HOME             : /u03/app/masha/12.1.0/
dbhome_mashadb
bds-database-install: configuration spfile    : spfilemashadb.ora
bds-database-install: Grid home               : not detected
bds-database-install: db resource             : mashadb
bds-database-install: mta extproc sid         :
bds_mashadb_clust0601bda14vm
bds-database-install: use of crsctl           : false
bds-database-install: root
shell script /u03/app/masha/12.1.0/dbhome_mashadb/install/bds-database-
install-10657-root-script-clust0601bda14vm.sh
please run as root:

<enter> to continue checking..
q<enter> to quit


bds-database-install: root script seem to have succeeded, continuing...
bds-database-install: cluster type            : bda
bds-database-install: connection type         : Ethernet
bds-database-install: cluster name            : clust0601bda14vm
bds-database-install: dictionary cluster name : clust0601bda14vm
bds-database-install: Hadoop version          : hadoop-2.6.0-cdh5.12.1
bds-database-install: Hive version            : hive-1.1.0-cdh5.12.1
bds-database-install: HBase version           : hbase-1.2.0-cdh5.12.1
```

```
bds-database-install: BDSQL version             : 3.2.1.1
bds-database-install: BDSQL install date         : Mon Nov 13 13:59:09
2017
bds-database-install: bd_cell version            :
bd_cell-12.1.2.0.100_LINUX.X64_171109.1-1.x86_64
bds-database-install: cp2hadoop kit version      : orahivedp-3.2.1.1
bds-database-install: ohsh kit version           : ohsh-1.3.1
bds-database-install: cell config dir            : /etc/oracle/cell/
network-config
bds-database-install: hybrid cell model          : false
bds-database-install: cell network(s)            : 192.168.254.5/27
bds-database-install: allow multiple subnets     : _skgxp_ant_options=1
bds-database-install: use UDP protocol           :
_skgxp_dynamic_protocol=2
bds-database-install: cellaffinity.ora file      : missing
bds-database-install: listener end point         : EXTPROC1521
bds-database-install: installing JDK             : jdk1.8.0_151
bds-database-install: action                     : setup
bds-database-setup: validating 192.168.254.4/27 against network
interfaces
bds-database-setup: trying to ping cluster nodes from 10.0.2.15
bds-database-setup: response fail from 192.168.254.4
bds-database-setup: response fail from 192.168.254.2
bds-database-setup: response fail from 192.168.254.3
bds-database-setup: trying to ping cluster nodes from 192.168.254.5
bds-database-setup: response ok from 192.168.254.4
bds-database-setup: response ok from 192.168.254.2
bds-database-setup: response ok from 192.168.254.3
bds-database-setup: ping succeeded on all nodes, using 192.168.254.5/27
at eth1 instead
bds-database-setup: installing cluster configuration files
bds-database-setup: unpacking hadoop-2.6.0-cdh5.12.1.tar.gz
bds-database-setup: unpacking hadoop-2.6.0-nativelib-ol6.tar.gz
bds-database-setup: unpacking hive-1.1.0-cdh5.12.1.tar.gz
bds-database-setup: unpacking hbase-1.2.0-cdh5.12.1.tar.gz
bds-database-setup: creating database objects
bds-database-setup: mta will be setup
bds-database-setup: creating /u03/app/masha/12.1.0/dbhome_mashadb/hs/
admin/initbds_mashadb_clust0601bda14vm.ora
bds-database-setup: mta shutdown bds_mashadb_clust0601bda14vm
bds-database-setup: removing existing mta parameter settings
bds-database-setup: setting performance parameters for mta
bds-database-setup: setting listener_address to EXTPROC1521
bds-database-setup: starting extproc bds_mashadb_clust0601bda14vm
bds-database-setup: waiting upto 100 seconds for extproc to register
with listener
...................ok
bds-database-setup: patching view LOADER_DIR_OBJS
bds-database-setup: creating mta dblinks
bds-database-setup: installing cp2hadoop
bds-database-setup: installing ohsh
bds-database-setup: reconfiguring database instance mashadb
bds-database-setup: adding parameter _bigdata_external_table=true
bds-database-setup: setup cell contiguration
bds-database-setup: cellinit.ora already has the configured ip address
```

```
bds-database-setup: cellinit.ora already enabled with UDP protocol
bds-database-setup: celliniteth.ora already has the configured ip
address
bds-database-setup: celliniteth.ora already enabled with UDP protocol
bds-database-setup: cellaffinity.ora already disabled
bds-database-setup: no database restart needed

bds-database-setup: activation zip file created: clust0601bda14vm-3-
clust0601bda14vm03.vm.oracle.com-clust0601bda14vm04.vm.oracle.com.zip

# /u03/app/masha/12.1.0/dbhome_mashadb/BDSJaguar-3.2.1.1/
clust0601bda14vm-3-clust0601bda14vm03.vm.oracle.com/clust0601bda14vm-3-
clust0601bda14vm03.vm.oracle.com-clust0601bda14vm04.vm.oracle.com.zip

bds-database-setup: copy this file to
root@clust0601bda14vm03.vm.oracle.com:/opt/oracle/DM/databases/conf
bds-database-setup: and run:

./jaguar databaseack

bds-database-setup: configuration successful for
cluster clust0601bda14vm

bds-database-setup: log files in /u03/app/masha/12.1.0/
dbhome_mashadb/install
bds-database-setup: bds-database-install-10657-* files
for more detailed info
bds-database-setup: full log in bds-database-
install-10657-main-script.log
```

This is the output from the root script execution:

```
[root@clust0601bda14vm04 ~]# /u03/app/masha/12.1.0/dbhome_mashadb/
install/bds-database-install-10657-root-script-clust0601bda14vm.sh
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: removing existing entries for 192.168.254.4 from /etc/
hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: removing existing entries for 192.168.254.2 from /etc/
hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: removing existing entries for 192.168.254.3 from /etc/
hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: removing existing entries for
clust0601bda14vm03.vm.oracle.com from /etc/hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: removing existing entries for
clust0601bda14vm01.vm.oracle.com from /etc/hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: removing existing entries for
clust0601bda14vm02.vm.oracle.com from /etc/hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: removing existing entries for clust0601bda14vm03
```

```
from /etc/hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: removing existing entries for clust0601bda14vm01
from /etc/hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: removing existing entries for clust0601bda14vm02
from /etc/hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: added entry 192.168.254.4
clust0601bda14vm03.vm.oracle.com  clust0601bda14vm03 to /etc/hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: added entry 192.168.254.2
clust0601bda14vm01.vm.oracle.com  clust0601bda14vm01 to /etc/hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: added entry 192.168.254.3
clust0601bda14vm02.vm.oracle.com  clust0601bda14vm02 to /etc/hosts
bds-database-install-10657-root-script-clust0601bda14vm.sh:
clust0601bda14vm: root script finished successfully
```

Copy the zip file generated by bds-database-install.sh back to the Hadoop cluster management server. This zip file contains the .ackkey file needed to complete the Database Authentication setup.

```
[masha@clust0601bda14vm04 clust0601bda14vm-3-
clust0601bda14vm03.vm.oracle.com]$ scp clust0601bda14vm-3-
clust0601bda14vm03.vm.oracle.com-clust0601bda14vm04.vm.oracle.com.zip
root@clust0601bda14vm03.vm.oracle.com:/opt/oracle/DM/databases/conf
root@clust0601bda14vm03.vm.oracle.com's password:
clust0601bda14vm-3-clust0601bda14vm03.vm.oracle.com-
clust0601bda14vm04.vm.oracle.com.zip           100%
789     0.8KB/s   00:00
```

As root on the Hadoop cluster management server, run Jaguar's Database Acknowledge operation. This completes the installation.

```
BigDataSQL: Oracle Big Data SQL 3.2.1.1.
BigDataSQL: Starting execution on: Mon Nov 13 14:26:37 2017.
BigDataSQL:           in directory: /root/BDSJaguar.
BigDataSQL:           and hostname: clust0601bda14vm03.vm.oracle.com.
BigDataSQL: Verifying configuration parameters...
BigDataSQL: Starting server...
BigDataSQL: API protocol: http.
BigDataSQL: API port: 7180.
BigDataSQL: Waiting for management server to respond...
BigDataSQL: WARNING: If there are services in the stale state, they
will be restarted !!!.

Cloudera Manager user: admin
Password:

BigDataSQL: Authentication succeeded.
BigDataSQL: API version: 17.
BigDataSQL: Cluster type: BDA.
BigDataSQL: Cluster name: clust0601bda14vm.
```

```
BigDataSQL: Cluster version: CDH5.
BigDataSQL: Service: BIGDATASQL.
BigDataSQL: Verifying service configuration..
BigDataSQL: Connection type: Ethernet.
BigDataSQL: Initialization completed..
BigDataSQL: Starting deployment server..
BigDataSQL: Database acknowledge..
BigDataSQL: Deployment server listening
BigDataSQL: Refreshing Big Data SQL database connections..
BigDataSQL: Starting bigdatasql service..
BigDataSQL: Setting database key for Big Data SQL..
BigDataSQL: Restarting stale services..
BigDataSQL: Restarting Cloudera Management service..

Big Data SQL setup finished !!!
run bdschecksw tool on database node for sanity verification

BigDataSQL: DATABASEACK workflow completed.
```

Example 2: Installation on an HDP Cluster

In this example, the Hadoop-side installation is on an HDP system. To show what happens when Database Authentication is enabled but no request key is generated, we deliberately leave the `--requestdb` parameter out of the install operation. This is corrected later in the example.

```
[root@clust42bda07-adm BDSJaguar]# ./jaguar install
BigDataSQL:
====================================================================.
BigDataSQL: Oracle Big Data SQL 3.2.1.1.
BigDataSQL: Starting execution on: Mon Nov 13 12:41:05 2017.
BigDataSQL:         in directory: /root/BDSJaguar.
BigDataSQL:         and hostname: clust42bda07-adm.us.oracle.com.
BigDataSQL: Verifying configuration parameters...
BigDataSQL: Starting server...
BigDataSQL: API protocol: http.
BigDataSQL: API port: 8080.
BigDataSQL: Waiting for management server to respond...
BigDataSQL: WARNING: If there are services in the stale state, they
will be restarted !!!.

Ambari user: admin
Password:

BigDataSQL: Authentication succeeded.
BigDataSQL: API version: 1.
BigDataSQL: Cluster type: HDP.
BigDataSQL: Cluster name: afghhdp.
BigDataSQL: Cluster version: HDP-2.6.
BigDataSQL: Service: BIGDATASQL.
BigDataSQL: Verifying service configuration...
BigDataSQL: Connection type: Ethernet.
BigDataSQL: Initialization completed..
BigDataSQL: Copying Stack to Ambari..
```

```
BigDataSQL: Restarting management server...
BigDataSQL: Waiting for management server to respond...
BigDataSQL: Starting deployment server..
BigDataSQL: Deployment server listening
BigDataSQL: Analyzing cluster ....
BigDataSQL: Checking for Big Data SQL requirements..
BigDataSQL: Preparing installation..
BigDataSQL: Installing Big Data SQL agents..
BigDataSQL: Installing Big Data SQL servers..
BigDataSQL: Starting bigdatasql service.
BigDataSQL: Restarting stale services..
BigDataSQL: Starting hdfs service.
BigDataSQL: Starting yarn service.
BigDataSQL: Starting mapreduce2 service.
BigDataSQL: Starting hbase service.
BigDataSQL: Big Data SQL task completed..
BigDataSQL: Creating database side bundle..
BigDataSQL: Creating bundle file.
BigDataSQL: Bundle file created: /root/BDSJaguar/db-bundles/bds-3.2.1.1-
db-afghhdp-171113.1241.zip.
BigDataSQL: WARNING: Database authentication is enabled, you will need
a reqkey file for set it up..
BigDataSQL:         Ignore this warning if you already have one or if
your database already has its key,.
BigDataSQL:         otherwise, use './jaguar --requestdb <db name>
databasereq' for create one..
BigDataSQL: INSTALL workflow completed.
```

Database Authentication was enabled but a key was not requested in the install operation and has not been request previously for the"laicadb" database where we want to perform the installation. To correct this, we invoke the Jaguar databasereq operation to create a request key for "laicadb":

```
[root@clust42bda07-adm BDSJaguar]# ./jaguar --requestdb laicadb
databasereq
BigDataSQL:
======================================================================.
BigDataSQL: Oracle Big Data SQL 3.2.1.1.
BigDataSQL: Starting execution on: Mon Nov 13 12:56:39 2017.
BigDataSQL:         in directory: /root/BDSJaguar.
BigDataSQL:         and hostname: clust42bda07-adm.us.oracle.com.
BigDataSQL: Verifying configuration parameters...
BigDataSQL: Starting server...
BigDataSQL: API protocol: http.
BigDataSQL: API port: 8080.
BigDataSQL: Waiting for management server to respond...
BigDataSQL: WARNING: If there are services in the stale state, they
will be restarted !!!.

Ambari user: admin
Password:

BigDataSQL: Authentication succeeded.
BigDataSQL: API version: 1.
```

```
BigDataSQL: Cluster type: HDP.
BigDataSQL: Cluster name: afghhdp.
BigDataSQL: Cluster version: HDP-2.6.
BigDataSQL: Service: BIGDATASQL.
BigDataSQL: Verifying service configuration...
BigDataSQL: Connection type: Ethernet.
BigDataSQL: Initialization completed..
BigDataSQL: Starting deployment server..
BigDataSQL: Deployment server listening
BigDataSQL: Requiring database keys only..
BigDataSQL: reqkey file created: /root/BDSJaguar/dbkeys/laicadb.reqkey.
BigDataSQL: DATABASEREQ workflow completed.
```

Now that we have a database-side installation bundle and a .reqkey file, we copy both to the database node.

```
[root@clust42bda07-adm BDSJaguar]# scp /root/BDSJaguar/db-bundles/
bds-3.2.1.1-db-afghhdp-171113.1241.zip laica@clust42bda05-adm:/home/
laica
laica@clust42bda05-adm's password:
bds-3.2.1.1-db-
afghhdp-171113.1241.zip
          100%  604MB 112.0MB/s   00:05
[root@clust42bda07-adm BDSJaguar]# scp /root/BDSJaguar/dbkeys/
laicadb.reqkey laica@clust42bda05-adm:/home/laica
laica@clust42bda05-adm's password:
laicadb.reqkey
                      100%  253   453.7KB/s   00:00
```

Next, unzip the bundle, execute run file, and copy the request key to the install directory created by the run file.

```
[laica@clust42bda05-adm ~]$ unzip bds-3.2.1.1-db-afghhdp-171113.1241.zip
Archive:  bds-3.2.1.1-db-afghhdp-171113.1241.zip
  inflating: bds-3.2.1.1-db-afghhdp-171113.1241.run
[laica@clust42bda05-adm ~]$ ./bds-3.2.1.1-db-afghhdp-171113.1241.run
bds-3.2.1.1-db-afghhdp-171113.1241.run: platform is              :
Linux
bds-3.2.1.1-db-afghhdp-171113.1241.run: script started at        : Mon
Nov 13 15:03:19 CST 2017
bds-3.2.1.1-db-afghhdp-171113.1241.run: running location         : /
home/laica
bds-3.2.1.1-db-afghhdp-171113.1241.run: ORACLE_SID               :
laicadb
bds-3.2.1.1-db-afghhdp-171113.1241.run:
ORACLE_HOME                  : /u03/app/laica/12.1.0/dbhome_laicadb
bds-3.2.1.1-db-afghhdp-171113.1241.run:
install directory            : /u03/app/laica/12.1.0/dbhome_laicadb/
BDSJaguar-3.2.1.1/afghhdp-2-clust42bda07-adm.us.oracle.com
bds-3.2.1.1-db-afghhdp-171113.1241.run: extracting...
bds-3.2.1.1-db-afghhdp-171113.1241.run: installer extracted successfully

cd $ORACLE_HOME/BDSJaguar-3.2.1.1/afghhdp-2-clust42bda07-
adm.us.oracle.com
```

```
bds-3.2.1.1-db-afghhdp-171113.1241.run: for setup Big Data SQL on this
database instance
[laica@clust42bda05-adm ~]$ mv laicadb.reqkey $ORACLE_HOME/
BDSJaguar-3.2.1.1/afghhdp-2-clust42bda07-adm.us.oracle.com
```

Change to the install directory and run the database-side install utility (bds-database-install.sh).

```
[laica@clust42bda05-adm ~]$ cd $ORACLE_HOME/BDSJaguar-3.2.1.1/afghhdp-2-
clust42bda07-adm.us.oracle.com
[laica@clust42bda05-adm afghhdp-2-clust42bda07-adm.us.oracle.com]$ ./
bds-database-install.sh --install
bds-database-install: platform is                : Linux
bds-database-install: script started at          : Mon Nov 13 15:04:54
CST 2017
bds-database-install:
running location             : /u03/app/laica/12.1.0/dbhome_laicadb/
BDSJaguar-3.2.1.1/afghhdp-2-clust42bda07-adm.us.oracle.com
bds-database-install: ORACLE_SID                 : laicadb
bds-database-install: ORACLE_HOME                : /u03/app/laica/12.1.0/
dbhome_laicadb
bds-database-install: configuration spfile       : spfilelaicadb.ora
bds-database-install: Grid home                  : /u03/app/12.1.0/grid
bds-database-install: db resource                : laicadb
bds-database-install: crs resource               : ora.laicadb.db
bds-database-install: database type              : SINGLE
bds-database-install: cardinality                : 1
bds-database-install: mta extproc sid            : bds_laicadb_afghhdp
bds-database-install: use of crsctl              : true
bds-database-install: cluster type               : hdp
bds-database-install: connection type            : Ethernet
bds-database-install: cluster name               : afghhdp
bds-database-install: dictionary cluster name    : afghhdp
bds-database-install: Hadoop version             :
hadoop-2.7.3.2.6.3.0-235
bds-database-install: Hive version               : apache-
hive-1.2.1000.2.6.3.0-235-bin
bds-database-install: HBase version              :
hbase-1.1.2.2.6.3.0-235
bds-database-install: BDSQL version              : 3.2.1.1
bds-database-install: BDSQL install date         : Mon Nov 13 12:53:29
2017
bds-database-install: bd_cell version            :
bd_cell-12.1.2.0.100_LINUX.X64_171109.1-1.x86_64
bds-database-install: cp2hadoop kit version      : orahivedp-3.2.1.1
bds-database-install: ohsh kit version           : ohsh-1.3.1
bds-database-install: cell config dir            : /etc/oracle/cell/
network-config
bds-database-install: hybrid cell model          : false
bds-database-install: cell network(s)            : 10.128.18.35/21
bds-database-install: allow multiple subnets     : _skgxp_ant_options=1
bds-database-install: use UDP protocol           :
_skgxp_dynamic_protocol=2
```

```
bds-database-install: cellaffinity.ora file    : missing
bds-database-install: listener end point       : EXTPROC1521
bds-database-install: installing JDK           : jdk1.8.0_151
bds-database-install: action                   : setup
bds-database-setup: only one network interface detected,
10.128.18.35/21 at eth0
bds-database-setup: ping to cluster nodes
bds-database-setup: response ok from 10.128.18.36
bds-database-setup: response ok from 10.128.20.189
bds-database-setup: installing cluster configuration files
bds-database-setup: unpacking hadoop-2.7.3.2.6.3.0-235.tar.gz
bds-database-setup: unpacking hadoop-2.7.0-nativelib-ol6.tar.gz
bds-database-setup: unpacking apache-hive-1.2.1000.2.6.3.0-235-
bin.tar.gz
bds-database-setup: unpacking hbase-1.1.2.2.6.3.0-235.tar.gz
bds-database-setup: creating database objects
bds-database-setup: mta will be setup
bds-database-setup: creating /u03/app/laica/12.1.0/dbhome_laicadb/hs/
admin/initbds_laicadb_afghhdp.ora
bds-database-setup: mta shutdown bds_laicadb_afghhdp
bds-database-setup: removing existing mta parameter settings
bds-database-setup: stopping crs resource bds_laicadb_afghhdp
bds-database-setup: deleting crs resource bds_laicadb_afghhdp
bds-database-setup: registering crs resource bds_laicadb_afghhdp
bds-database-setup: using dependency db resource of laicadb
bds-database-setup: starting crs resource bds_laicadb_afghhdp
bds-database-setup: patching view LOADER_DIR_OBJS
bds-database-setup: creating mta dblinks
bds-database-setup: installing cp2hadoop
bds-database-setup: installing ohsh
bds-database-setup: setup cell contiguration
bds-database-setup: cellinit.ora already has the configured ip address
bds-database-setup: cellinit.ora already enabled with UDP protocol
bds-database-setup: celliniteth.ora already has the configured ip
address
bds-database-setup: celliniteth.ora already enabled with UDP protocol
bds-database-setup: cellaffinity.ora already disabled
bds-database-setup: no database restart needed

bds-database-setup: activation zip file created: afghhdp-2-clust42bda07-
adm.us.oracle.com-clust42bda05-adm.us.oracle.com.zip

# /u03/app/laica/12.1.0/dbhome_laicadb/BDSJaguar-3.2.1.1/afghhdp-2-
clust42bda07-adm.us.oracle.com/afghhdp-2-clust42bda07-adm.us.oracle.com-
clust42bda05-adm.us.oracle.com.zip

bds-database-setup: copy this file to root@clust42bda07-
adm.us.oracle.com:/opt/oracle/DM/databases/conf
bds-database-setup: and run:

./jaguar databaseack

bds-database-setup: configuration successful for cluster afghhdp

bds-database-setup: log files in /u03/app/laica/12.1.0/dbhome_laicadb/
```

```
install
bds-database-setup: bds-database-install-29088-* files for more
detailed info
bds-database-setup: full log in bds-database-install-29088-main-
script.log
```

The zip file created by the install operation contains the .ackkey file needed to complete Database Authentication setup. Copy this zip file back to the Hadoop cluster management server.

```
[laica@clust42bda05-adm afghhdp-2-clust42bda07-adm.us.oracle.com]$
scp afghhdp-2-clust42bda07-adm.us.oracle.com-clust42bda05-
adm.us.oracle.com.zip root@clust42bda07-adm.us.oracle.com:/opt/
oracle/DM/databases/conf
root@clust42bda07-adm.us.oracle.com's password:
afghhdp-2-clust42bda07-adm.us.oracle.com-clust42bda05-
adm.us.oracle.com.zip                             100%  739
0.7KB/s   00:00
```

As root on the Hadoop side run Jaguar's Database Acknowledge operation.

```
[root@clust42bda07-adm BDSJaguar]# ./jaguar databaseack
BigDataSQL:
====================================================================.
BigDataSQL: Oracle Big Data SQL 3.2.1.1.
BigDataSQL: Starting execution on: Mon Nov 13 13:08:43 2017.
BigDataSQL:          in directory: /root/BDSJaguar.
BigDataSQL:          and hostname: clust42bda07-adm.us.oracle.com.
BigDataSQL: Verifying configuration parameters...
BigDataSQL: Starting server...
BigDataSQL: API protocol: http.
BigDataSQL: API port: 8080.
BigDataSQL: Waiting for management server to respond...
BigDataSQL: WARNING: If there are services in the stale state, they
will be restarted !!!.

Ambari user: admin
Password:

BigDataSQL: Authentication succeeded.
BigDataSQL: API version: 1.
BigDataSQL: Cluster type: HDP.
BigDataSQL: Cluster name: afghhdp.
BigDataSQL: Cluster version: HDP-2.6.
BigDataSQL: Service: BIGDATASQL.
BigDataSQL: Verifying service configuration...
BigDataSQL: Connection type: Ethernet.
BigDataSQL: Initialization completed..
BigDataSQL: Starting deployment server..
BigDataSQL: Database acknowledge..
BigDataSQL: Deployment server listening
BigDataSQL: Refreshing Big Data SQL database connections..
BigDataSQL: Starting bigdatasql service.
BigDataSQL: Setting database key for Big Data SQL..
```

ORACLE

```
BigDataSQL: Restarting stale services..
BigDataSQL: Starting hdfs service.
BigDataSQL: Starting yarn service.
BigDataSQL: Starting mapreduce2 service.
BigDataSQL: Starting hbase service.

Big Data SQL setup finished !!!
run bdschecksw tool on database node for sanity verification

BigDataSQL: DATABASEACK workflow completed.
```

D

Determining the Correct Software Version and Composing the Download Paths for Hadoop Clients

To configure `bds-database-create-bundle.sh` to download the Hadoop, Hive, and HBase tarballs, you must supply an URL to each these parameters:

```
--hive-client-ws
--hadoop-client-ws
--hbase-client-ws
```

To get the information needed to provide the correct URL, first check the content management service (CM or Ambari) and find the version of the Hadoop, Hive, and HBase services running on the Hadoop cluster. The compatible clients are of the same versions. In each case, the client tarball filename includes a version string segment that matches the version of the service installed on the cluster. In the case of CDH, you can then browse the public repository and find the URL to the client that matches the service version. For the HDP repository this would require a tool that can browse Amazon S3 storage. However you can also compose the correct URL using the known URL pattern along with information that you can acquire from Ambari, as described in this section.

For CDH (Both Oracle Big Data Appliance and Commodity CDH Systems):

1. Log on to Cloudera Manager and go to the **Hosts** menu. Select **All Hosts** , then **Inspect All Hosts**.

2. When the inspection is finished, select either **Show Inspector Results** (on the screen) or **Download Result Data** (to a JSON file).

3. In either case, scan the result set and find the service versions.

   In JSON version of the inspector results, there is a `componentInfo` section for each cluster that shows the versions of software installed on that cluster. For example:

   ```
       "componentInfo": [
             ...
     {
        "cdhVersion": "CDH5",
        "componentRelease": "1.cdh5.11.1.p0.6",
     "componentVersion": "2.6.0+cdh5.11.1+2400",
     "name": "hadoop"
     },
     ...
   ```

4. Go to http://archive.cloudera.com/cdh5/cdh/5.

Look in the "hadoop," hive," and "hbase" subdirectories of the CDH5 section of the archive. In the listings, you should find the client packages for the versions of the services installed on the cluster.

5. Copy the URLs and use them as the parameter values supplied to `bds-database-create-bundle.sh`. For example:

```
http://archive.cloudera.com/cdh5/cdh/5/hadoop-2.6.0-cdh5.11.1.tar.gz
http://archive.cloudera.com/cdh5/cdh/5/hive-1.1.0-cdh5.11.1.tar.gz
http://archive.cloudera.com/cdh5/cdh/5/hbase-1.2.0-cdh5.11.1.tar.gz
```

> **See Also:**
>
> Search for "Host Inspector" on Cloudera website if you need more help using this tool to determine installed software versions.

For HDP:

1. Log on to Ambari. Go to **Admin**, then **Stack and Versions**. On the **Stack** tab, locate the entries for the HDFS, Hive, and HBase services and note down the version number of each as the "`service version`."

2. Click the **Versions** tab. Note down the version of HDP that is running on the cluster as the "`HDP version base`."

3. Click **Show Details** to display a pop-up window that shows the full version string for the installed HDP release. Note this down as the "`HDP full version`"

4. The last piece of information needed is the Linux version ("centos5," "centos6," or "centos7"). Note this down as "`OS version`."

To search though the HDP repository in Amazon S3 storage to find the correct client URLs using this information acquired in this steps, you would need an S3 browser, browser extension, or command line tool. As alternative, you can piece together the correct URLs, using these strings.

For HDP 2.5 and earlier, the URLs pattern is as follows.

```
http://public-repo-1.hortonworks.com/HDP/<OS version>/2.x/updates/<HDP
version base>/tars/{hadoop|apache-hive|hbase}-<service version>.<HDP
full version>.tar.gz
```

Here are some examples. Note that the pattern of the gzip filename is slightly different for Hive. There is an extra "`-bin`" segment in the name.

```
http://public-repo-1.hortonworks.com/HDP/centos6/2.x/updates/2.3.2.0/
tars/hadoop-2.7.1.2.3.2.0-2950.tar.gz
http://public-repo-1.hortonworks.com/HDP/centos6/2.x/updates/2.3.2.0/
tars/apache-hive-1.2.1.2.3.2.0-2950-bin.tar.gz
http://public-repo-1.hortonworks.com/HDP/centos6/2.x/updates/2.3.2.0/
tars/hbase-1.1.2.2.3.2.0-2950.tar.gz
```

For HDP 2.5 and later releases, the pattern is almost the same except that there is an additional `hadoop`, `hive`, or `hbase` directory under the `tar` directory:

```
http://public-repo-1.hortonworks.com/HDP/centos6/2.x/updates/2.5.6.0/
tars/hadoop/hadoop-2.7.3.2.5.6.0-40.tar.gz
http://public-repo-1.hortonworks.com/HDP/centos6/2.x/updates/2.5.6.0/
tars/hive/apache-hive-1.2.1000.2.5.6.0-40-bin.tar.gz
http://public-repo-1.hortonworks.com/HDP/centos6/2.x/updates/2.5.6.0/
tars/hbase/hbase-1.1.2.2.5.6.0-40.tar.gz
```

Alternative Method for HDP:

You can get the required software versions from the command line instead of using Ambari.

- `# hdp-select versions`

  Copy and save the numbers to the left of the dash as the "`HDP version base`".

- `# hadoop version`
  `# beeline --version`
  `# hbase version`

  Use the output from these commands to formulate the <*service version*>.<*HDP full version*> segment for each URL.

E

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The licensing for Oracle Big Data SQL is separate from the licensing for other Oracle products.

When you purchase licensing for Oracle Big Data SQL, note the following:

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- All data nodes within the Hadoop cluster must be licensed. Partial licensing within a node is not available.
- All disks accessed by Oracle Big Data SQL (either within or outside of the Hadoop cluster) must be licensed. This includes disks used by Kafka or NoSQL stores when Oracle Big Data SQL accesses those sources.
- There is no additional license required for the Oracle Database server side.
- Oracle Copy to Hadoop licensing is included.

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Oracle Shell for Hadoop Loaders is included in the Oracle Big Data SQL installation bundle. The following are third-party projects contained in Oracle Shell for Hadoop Loaders.

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F

Change History for Previous Releases

The following are changes in previous versions of the product.

F.1 Changes in Oracle Big Data SQL 3.2.1

Oracle Big Data SQL Release 3.2.1 includes several features that are not available in Release 3.2. There are no other enhancements or defect fixes in Release 3.2.1. Release 3.2 features are also included in this summary.

Support for Oracle Database 12.2.0.1

Release 3.2.1 can be installed on both Oracle Database 12.2.0.1 and 12.1.0.2. The same Oracle Big Data SQL 3.2.1 installation on a Hadoop cluster can connect to both Oracle Database 12.2.0.1 and 12.1.0.2.

Customers using Oracle Big Data SQL 3.2 do not need to upgrade to Release 3.2.1 if they connect to Oracle Database 12.1.0.2 only.

> **Note:**
>
> Patches must be applied on Oracle Database 12.x and Oracle Grid Infrastructure (when used). The applicable patches depend on the database version in use. Please refer to the Oracle Support Document 2119369.1 (Oracle Big Data SQL Master Compatibility Matrix) for details.

Exclusion of Edge Nodes

The installation now automatically excludes Hadoop edge nodes. In earlier releases, the BDS agent was installed on edge nodes in order to enable Copy to Hadoop. The BDS agent checks for installation prerequisites and these checks would sometimes fail on edge nodes. The BDS agent is no longer installed by default on edge nodes.

In addition, the Oracle Big Data SQL configuration file now has an optional `excluded_nodes` parameter where you can manually exclude nodes. It is possible, though not likely, that the installer may not identify a node as an edge node. You can use this parameter to manually identify missed edge nodes and then re-run the installer, but should rarely need to do so.

This parameter is in the network section of the configuration file.

```
    excluded_nodes :  [ "<fqdn_for_edge_node
1>","<fqdn_for_edge_node_2>","<fqdn_for_edge_node_3>" ]
```

Related Topics

- [bds-config.json Configuration Example](#)
  The following is an example of a fully-populated bds-config.json file, which includes all available configuration parameters.

- [Oracle Big Data SQL Installation Examples](#)
  The following are samples of the console output for the Oracle Big Data SQL installation.

> ✎ **See Also:**
>
> - The Jaguar Configuration Parameter and Command Reference in the *Big Data SQL Installation Guide* describes the complete set of configurable installation parameters.

F.1.1 Changes Inherited From Oracle Big Data SQL 3.2

Oracle Big Data SQL Release 3.2 includes major improvements in performance, secure network connectivity, authentication, and user administration, as well as installation and configuration.

Support for Querying Kafka Topics

Release 3.2 provides Hive and Oracle Big Data SQL the ability to query Kafka topics via a new Hive storage handler. You can use this storage handler to create external Hive tables backed by data residing in Kafka. Oracle Big Data SQL or Hive can then query the Kafka data through the external tables. The Kafka key, value, offset, topic name, and partition id are mapped to Hive columns.   You can explicitly designate the offset for each topic/partition pair, otherwise the offset will start from the earliest offset in the topic and end with the latest offset in the topic for each partition.

Improved Processing of Parquet Files

Oracle has introduced its own Parquet reader for processing data in Parquet format. This new reader provides significant performance and resource utilization improvements over the existing Hive Parquet driver. These include:

- More intelligent column processing retrieval. The reader uses "lazy materialization" to process only columns with rows that satisfy the filter, thereby improving I/O.

- Leveraging of dictionaries during filter predicate processing to improve CPU usage.

- Streamlined data conversion, which also contributes to more efficient CPU usage.

The Big Data SQL installation enables the Oracle's Parquet reader by default. You have the option to disable it and revert to the generic Parquet reader.

Multi-User Authorization

In previous releases of Oracle Big Data SQL, all queries against Hadoop and Hive data are executed as the `oracle` user and there is no option to change users. Although `oracle` is still the underlying user in all cases, Oracle Big Data SQL 3.2 now uses Hadoop Secure Impersonation to direct the `oracle` account to execute tasks on behalf

of other designated users. This enables HDFS data access based on the user that is currently executing the query, rather than the singular `oracle` user.

Administrators set up the rules for identifying the query user. They can provide rules for identifying the currently connected user and mapping the connected user to the user that is impersonated. Because there are numerous ways in which users can connect to Oracle Database, this user may be a database user, a user sourced from LDAP, from Kerberos, or a user from other sources. Authorization rules on the files apply for that user and HDFS auditing identifies the actual user running the query.

> ✎ **See Also:**
>
> Administration for Multi-User Authorization is done through the DBMS_BDSQL PL/SQL Package, which is documented in the *Oracle Big Data SQL User's Guide*.

Authentication Between Oracle Database and Oracle Big Data SQL Cells

This authentication is between Oracle Database and the Big Data SQL cells on the Hadoop cluster, facilitating secure communication. The Database Authentication enhancement provides a safeguard against impersonation attacks, in which a rogue service attempts to connect to the Oracle Big Data offload server process running on a cluster node.

Kerberos Ticket Renewal Automation

On a Kerberos-secured network you can configure the installation to set up automated Kerberos ticket renewal for the `oracle` account used by Oracle Big Data SQL. This is done for both the Hadoop cluster and Oracle Database sides of the installation. You must provide the principal name and the path to the keytab file.in the `bds-config.json` configuration file. A template is provided in the configuration file:

```
"kerberos" : {
"principal" : "oracle/mycluster@MY.DOMAIN.COM",
"keytab" : "/home/oracle/security/oracle.keytab"
}
```

If you provide the Kerberos parameters in the configuration file, then Oracle Big Data SQL installation sets up cron jobs on both the Hadoop cluster and Oracle Database servers. These jobs renew the Kerberos tickets for the principal once per day.

The principal and keytab file must already exist.

Automatic Upgrade

The current release can now be installed over an earlier release with no need to remove the older software on either the Hadoop or Oracle Database side. The previous installation is upgraded to the current release level.

Common Installation Bundle for all Platforms

In previous releases, customers needed to unpack the Oracle Big Data SQL installation bundle and choose the correct package for their Hadoop system (CDH

or HDP). Now the bundle contains a single installation package that works for all supported Hadoop systems.

Simpler and Faster Installation with the new "Jaguar" Installer

The Jaguar installer replaces `setup-bds.sh`, the installer in previous releases. Jaguar includes these changes:

- **Automatic Check for Installation Prerequisites on Hadoop Nodes**

  Jaguar checks for installation readiness on each Hadoop DataNode and reports any missing prerequisites.

- **No Need to Manually Generate the Database-Side Installation Bundle**

  The database-side installation bundle that previously was manually generated by the customer can now be generated automatically. You still need to copy the bundle to the Oracle Database nodes and install it.

- **Faster Overall Installation Time on the Hadoop Side**

  Installation time will vary, but on the Hadoop Side the installation may take approximately eight minutes if all resources are local, possibly 20 minutes if Hadoop clients must be downloaded from the Internet, depending on download speed.

- **Prerequisite Apache Services on CDH can now be Installed as Either Packages or Parcels**

  Previously on CDH systems, the Oracle Big Data SQL installation required that the HDFS, YARN, and HIVE components had been installed as parcels. These components can now be installed on CDH as either packages or parcels. There is no change for HDP, where they must be installed as stacks.

  > **⬦ Note:**
  >
  > On CDH systems, if the Hadooop services required by Oracle Big Data SQL are installed as packages, be sure that they are installed from within Cloudera Manager. Otherwise, Cloudera Manager will not be able to manage these services. This is not an issue with parcels.

- **In the CLI, the Jaguar utility Replaces *./setup-bds***

  The Jaguar utility is now the primary tool for Hadoop-side installation, de-installation, and configuration changes, as in these examples:

  ```
  # ./jaguar install bds-config.json
  # ./jaguar reconfigure bds-config.json
  # ./jaguar uninstall bds-config.json
  ```

- **The Default Configuration File Name is *bds-config.json*, but Alternate File Names are Also Accepted**

  You can now drop the explicit `bds-config.json` argument and allow the installer default to `bds-config.json`, as in the first example below. You can also specify

an alternate configuration file of any name, though it must adhere to the same
internal format as `bds-config.json` and should be given the `.json` file type.

```
# ./jaguar install
# ./jaguar install cluster2-config.json
```

You can create configurations files with settings that are tailored to the
requirements of each cluster. For example, you may want to apply different
security parameters to Oracle Big Data SQL installations on test and production
clusters.

- **Configuration Parameters Have Changed Significantly**

  Users of previous releases will see that the Jaguar configuration file includes a
  number of new parameters. Most of them are "optional" in the sense that they
  are not uniformly required, although your particular installation may require some
  of them. See the Related Links section below for links to the table of installer
  parameters as well as an example of a configuration file that uses all available
  parameters.

- **New updatenodes Command for Easier Maintenance**

  Oracle Big Data SQL must be installed on each Hadoop cluster node that is
  provisioned with the DataNode role. It has no function on nodes where DataNode
  is not present. The new Jaguar utility includes the `updatenodes` command which
  scans the cluster for instances of the DataNode within the cluster. If the DataNode
  role has been removed or relocated, or if nodes provisioned with the DataNode
  have been added or removed, then the script installs or uninstalls Oracle Big Data
  SQL components from nodes as needed.

- **An Extra Installation Step is Required to Enable Some Security Features**

  If you choose to enable Database Authentication between Oracle Database
  and Oracle Big Data SQL cells in the Hadoop cluster, or, Hadoop Secure
  Impersonation, then an additional "Database Acknowledge" step is required.
  In this process, the installation on the database server generates a ZIP file
  of configuration information that you must copy back to the Hadoop cluster
  management server for processing.

- **On the Database Side, Connections to Clusters are no Longer Classified as
  Primary and Secondary**.

  An Oracle Database system can have Oracle Big Data SQL connections to
  multiple Hadoop clusters. In previous releases, the first these connections was
  considered the primary (and had to be uninstalled last) and the others were
  secondary. In the current release, management of multiple installation is simpler
  and `--uninstall-as-primary` and `--uninstall-as-secondary` parameters of the
  database-side installer are obsolete. However there is now a default cluster. The
  Important Terms and Concepts section of this guide explains the significance of
  the default cluster.

**Support for Oracle Tablespaces in HDFS Extended to Include All Non-System
Permanent Tablespaces**

Previous releases supported the move of permanent online tablespaces only to
HDFS. This functionality now supports online, read-only, as well as offline permanent
tablespaces.

Important Change in Behavior of the "mtactl start" Command

Oracle Big Data SQL 3.1 introduced the option to install Oracle Big Data SQL on servers where Oracle Grid Infrastructure is not present. In these environments, you can use the start subcommand of the mtactl utility (`mtactl start`) to start the MTA (Multi-Threaded Agent) extproc.

Note that in the current release, the `mtactl start` command works differently from the original Release 3.1 implementation.

• Current behavior: `mtactl start` starts an MTA extproc using the init parameter values that are stored in the repository. It uses the default values only if the repository does not exist.

• Previous behavior (Oracle Big Data SQL 3.1): `mtactl start` always uses the default init parameters regardless of whether or not init parameter values are stored in the repository.

> ✎ **See Also:**

Resource Requirements

8 CPU cores and 12 GB of RAM are now recommended for each node of the Hadoop cluster.

There are some sysctl settings related to kernel, swap, core memory, and socket buffer size that are strongly recommended for optimal performance. These are part of the installation prerequisites explained in Chapter 2 of the installation guide.

Index

Symbols

--aux-run-mode, *3-12*
--crs, *3-12*, *6-2*
--db-name, *3-12*
--db-resource, *6-2*
--grid-home, *3-12*
--ip-cell, *3-1*, *3-12*
--no-root-script, *3-12*
--reconfigure, *3-12*, *4-2*
--reqkey, *3-6*, *3-12*
--root-script, *3-12*
.reqkey file, *2-15*, *3-6*

A

Acknowledge key, *1-11*

B

bdacli, *2-1*, *6-3*
bds-config.json, *2-4*, *2-15*, *3-6*, *4-2*, *5-1*, *5-4*, *6-3*
bds-database-install.sh, *6-2*
bdschecksw, *1-13*
BDSQL_USER, *3-6*, *3-13*
BigDataSQL configuration directory object, *3-13*

C

cellint_ora, *3-6*
Commodity systems, *1-1*
configuration file, *2-4*, *2-15*, *4-2*, *5-1*
Copy to Hadoop, *8-1*
CRS, *3-12*, *6-2*

D

Database Acknowledge, *1-13*, *3-12*
Database Authentication, *1-11*, *2-1*, *2-4*, *5-1*
database_auth_enabled, *2-1*, *2-4*
databaseack, *1-11*, *2-3*, *3-6*
databasereq, *1-11*, *2-3*
DataNode, *4-2*, *5-4*
DataNodes, *2-1*

dbkeys directory, *2-15*, *3-6*
Default cluster, *1-11*, *6-1*
dir, *2-4*
diskmon process, *3-3*

E

Ethernet, *1-1*, *2-1*, *5-1*

F

FUSE-DFS, *5-1*, *6-2*, *8-2*

G

Grid, *1-13*, *3-1*, *3-3*, *3-12*
GUID-key pair, *2-3*

H

Hadoop Secure Impersonation, *2-4*
HDFS Transparent Encryption, *7-6*
HIVE_SESS_VAR_LIST, *8-2*, *8-5*
HTTPS/ Network Encryption, *7-6*

I

impersonation_blacklist, *2-1*
impersonation_enabled, *2-1*, *2-4*
InfinBand, *2-4*
InfiniBand, *1-1*, *2-1*, *5-1*
install, *2-3*
Installation directory, *2-15*, *3-5*, *3-6*, *4-2*

J

Jaguar, *1-13*, *2-1*, *2-3*, *2-15*, *3-5*, *3-6*, *4-2*, *5-1*, *5-4*, *6-3*

K

KDC, *3-1*
Kerberos, *1-6*, *2-1*, *5-1*, *8-2*, *8-5*
KRB5_CONF, *3-1*

L

licenses, third-party, *E-1*
locationdirectory, *8-2*

M

MTA
    --mta-destroy, *3-12*
    --mta-restart, *3-12*
    --mta-setup, *3-12*

N

name, *2-4*

O

OHSH, *8-1*, *8-2*, *8-5*
Oracle Data Pump, *8-1*
Oracle Instant Client, *8-5*
Oracle Loader for Hadoop, *8-1*
Oracle Shell for Hadoop Loaders, *8-1*
Oracle Tablespaces in HDFS, *1-7*, *5-1*
Oracle Wallet, *8-5*
ORACLE_HOME, *3-6*, *5-4*
ORACLE_SID, *3-6*
ORC, *8-1*

P

Parquet, *8-1*
port, *2-4*

ports, *2-1*
Python, *1-2*

R

RAC database, *6-1*
RAC systems, *3-1*
reconfigure, *2-3*, *3-5*, *4-2*, *5-1*, *5-4*
Request key, *1-11*, *2-15*, *3-6*, *3-12*
restart_stale, *2-4*
Restarts, *3-3*

S

selection_subnet, *2-1*
selection_subset, *2-4*
SQL*Plus Instant Client, *8-5*
SSH, *3-1*
SSL, *8-5*

T

third-party licenses, *E-1*
TNS, *8-5*

U

uninstall, *2-3*, *6-1–6-3*
updatenodes, *2-3*, *3-5*, *4-2*, *5-4*
url, *2-4*
use_infinband, *2-1*
use_infiniBand, *2-4*
User access, *3-13*