Dell | Cloudera Solution Crowbar Administration User's Guide v.2.3

A Dell User's Guide for Apache ™ Hadoop ® Deployment

Crowbar v1.6

June 11, 2013

Dell Next Generation Compute Solutions

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May 2013

Notes, Cautions, and Warnings

A **NOTE** indicates important information that helps you make better use of your computer.

A **CAUTION** indicates potential damage to hardware or loss of data if instructions are not followed.

A **WARNING** indicates a potential for property damage, personal injury, or death.

Abbreviations

Abbreviation	Definition
BMC	Baseboard Management Controller.
DBMS	Database management system.
EDW	Enterprise data warehouse.
EoR	End-of-row switch/router.
HDFS	Hadoop Distributed File System.
IPMI	Intelligent Platform Management Interface.
LAG	Link aggregation group.
LOM	Local Area Network on Motherboard.
NIC	Network interface card.
ToR	Top-of-rack switch/router.

Introduction

This document provides instructions you to use when deploying Cloudera Manager and Apache Hadoop Ecosystem components with Crowbar. This guide is for use with the Crowbar Users Guide, and is *not* a stand-alone document. It specifically covers Cloudera Manager, Apache Hadoop and the deployment steps from a Crowbar prospective. Please refer to the *Crowbar User Guide* for assistance with installing common Crowbar components and configuring the target systems.


Concepts beyond the scope of this guide are introduced as needed in notes and references to other documentation.

Overview

Hadoop is an Apache project being built and used by a global community of contributors, written in the Java programming language. Yahoo! has been the largest contributor to the project, and uses Hadoop extensively across its businesses. Other contributors and users include Facebook, LinkedIn, eHarmony, and eBay. Cloudera has created a quality controlled distribution of Hadoop and offers commercial management software, support, and consulting services.

Dell developed a solution for Hadoop that includes optimized hardware, software, and services to streamline deployment and improve the customer experience.

The Dell | Cloudera Solution is based on the Cloudera CDH Enterprise distribution of Hadoop. Dell's solution includes:

- Dell Reference architecture (RA) and best practices documentation.
- Optimized hardware and network infrastructure.
- Cloudera CDH software (CDH Community-provided for customer-deployed solutions).
- Cloudera Manager free edition with the ability to upgrade to enterprise level via Cloudera issued license key.
- Cloudera Manager provided Hadoop infrastructure management tools.
- Dell Crowbar software framework.

This solution provides Dell a foundation to offer additional solutions as the Hadoop environment evolves and expands.

Document Scope

The focus of this guide is the use of Crowbar, *not* Apache Hadoop or Cloudera Manager. While Crowbar includes substantial components to assist in the deployment of Apache Hadoop and Cloudera Manager, its operational aspects are completely independent. For more detailed information, please refer to the following links:

Cloudera Manager 4.6 Documentation

- http://www.cloudera.com/content/support/en/documentation/manager/cloudera-manager-v4-latest.html

CDH4 Documentation

- http://www.cloudera.com/content/support/en/documentation/cdh4-documentation/cdh4-documentation-v4-latest.html

Apache Hadoop Documentation

- http://hadoop.apache.org/

This guide provides this additional information about Cloudera as notes flagged with the Cloudera logo. For detailed operational support for Hadoop, we suggest visiting the Cloudera documentation web site at http://www.cloudera.com.

Opscode Chef Server

Crowbar makes extensive use of Opscode Chef Server, http://opscode.com. To explain Crowbar actions, you should understand the underlying Chef implementation. This guide provides this additional Chef information as notes flagged with the Opscode logo.

To use Crowbar, it is not necessary to log into the Chef Server; consequently, use of the Chef UI is not covered in this guide. Supplemental information about Chef is included.

Crowbar is not limited to managing Dell servers and components. Due to driver requirements, some barclamps, for example: BIOS and RAID must be targeted to specific hardware; however, those barclamps are not required for system configuration.

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This section provides detailed information about the basics of Hadoop, and Hadoop components deployment.

Hadoop Basics

The Hadoop software library is a framework that allows for the distributed processing of large data sets across clusters of computers using a simple programmatic driven processing model. Hadoop is designed to scale up from a minimum of three servers to thousands of machines, each offering local computation and storage.

Rather than rely on hardware to deliver high-availability, the Hadoop library itself is designed to detect and handle failures at the application layer, so delivering a highly-available service on a cluster of computers, each of which may be prone to failures.

Hadoop is ideal for organizations with a growing need to store and process massive application datasets. It enables applications to work with thousands of nodes and petabytes of data.

- **Hadoop Core**: The common libraries and utilities that provide the basic Hadoop runtime environment. A set of components and interfaces which implement a distributed filesystem and provide general I/O access for the Hadoop framework (serialization, Java RPC and persistent data storage).
- **Hadoop Distributed File System (HDFS)**: A distributed file system that provides redundant, high-throughput access to application data.
- **MapReduce**: A software framework for distributed processing of large data sets on compute clusters.

Apache Hadoop Component Deployment

Cloudera Manager and Pig employ Crowbar tools to construct a starting proposal, and then edit any parameters to fit the specific needs of your environment. Once the proposal is ready, apply the proposal to deploy each system components.

The Base Hadoop system (HDFS and Map Reduce), YARN, Zookeeper, HBase, Oozie, Hive, Hue, Flume, Impala, Sqoop, and Solr are deployed using the Cloudera Manager administration console. Crowbar also provides a supplemental Hadoop Ecosystem Barclamp (Pig). You must install the base Hadoop system (HDFS and Map Reduce) using Cloudera Manager before deploying any of these add-ons.

Table 1: Supported Apache Hadoop Components

Component	Deployment Method	Description
HDFS	Cloudera Manager	Apache Hadoop Distributed File System (HDFS) is the primary storage system used by Hadoop applications. HDFS creates multiple replicas of data blocks and distributes them on compute hosts throughout a cluster to enable reliable, extremely rapid computations.
MapReduce	Cloudera Manager	Apache Hadoop MapReduce supports distributed computing on large data sets across your cluster (requires HDFS).
YARN	Cloudera Manager	Apache Hadoop MapReduce 2.0 (MRv2), or YARN, is a data computation framework that supports MapReduce applications (requires HDFS). The current upstream MRv2 release is not yet considered stable and should not be considered production-ready at this time.
ZooKeeper	Cloudera Manager	Apache ZooKeeper is a centralized service for maintaining and synchronizing configuration data.

Component	Deployment Method	Description
HBase	Cloudera Manager	HBase is an open-source, non-relational, distributed database modeled after Google's BigTable and is written in Java. It is developed as part of Apache Software Foundation's Apache Hadoop project and runs on top of HDFS (Hadoop Distributed Filesystem), providing BigTable-like capabilities for Hadoop. That is, it provides a fault-tolerant way of storing large quantities of sparse data. HBase features compression, in-memory operation, and Bloom filters on a per-column basis as outlined in the original BigTable paper. Tables in HBase can serve as the input and output for MapReduce jobs run in Hadoop, and may be accessed through the Java API but also through REST, Avro or Thrift gateway APIs. HBase is not a direct replacement for a classic SQL Database, although recently its performance has improved, and it is now serving several data-driven websites, including Facebook's Messaging Platform.
Hive	Cloudera Manager	Hive is a data warehouse system that offers a SQL-like language called HiveQL.
Oozie	Cloudera Manager	Oozie is a workflow coordination service to manage data processing jobs on your cluster.
Hue	Cloudera Manager	Hue is a graphical user interface to work with Cloudera's Distribution Including Apache Hadoop (requires HDFS, MapReduce, and Hive).
Flume	Cloudera Manager	Flume collects and aggregates data from almost any source into a persistent store such as HDFS.
Impala	Cloudera Manager	Impala provides a real-time SQL query interface for data stored in HDFS and HBase. Impala requires Hive service and shares Hive Metastore with Hue.
Sqoop	Cloudera Manager	Sqoop is a tool designed for efficiently transferring bulk data between Apache Hadoop and structured datastores such as relational databases. The version supported by Cloudera Manager is Sqoop 2.
Solr	Cloudera Manager	Solr is a distributed service for indexing and searching data stored in HDFS. The current Solr release is beta software and not recommended for use in production.
Pig	Crowbar Barclamp	Pig is a platform for analyzing large data sets that consists of a high-level language for expressing data algorithms.

For more information about Hadoop, please visit http://hadoop.apache.org/.

Crowbar User Interface

Crowbar is delivered as a Web application available on the admin node using HTTP on port 3000. By default, you can access it using http://192.168.124.10:3000. Additionally, the default installation contains an implementation of Hadoop specific components (see table below).

Dell supports running Crowbar on the following browsers: Firefox 3.6, Firefox 11, Google Chrome, Internet Explorer 8, and Internet Explorer 9. HTML5 compatibility and a minimum screen resolution of 1024x768 are recommended.

Table 2: User Interface Service URLs

User Interface Service	Default Location	Port	Example URL
Crowbar	Crowbar Admin Node	3000	http://<crowbar_admin_node>:3000
Cloudera Manager	Hadoop Edge Node	7180	http://<cloudera_manager_server_node>:7180
Hadoop Name Node	Hadoop Name Node	50070	http://<master_name_node>:50070
Hadoop Secondary Name Node	Hadoop Secondary Name Node	50090	http://<secondary_name_node>:50090
Hadoop Data Node	Hadoop Data Node	50075	http://<data_node>: 50075
Hadoop Job Tracker Web	Hadoop Job Tracker Node	50030	http://<job_tracker_node>: 50030
Hadoop Task Tracker Web	Task Tracker Node	50060	http://<task_tracker_node>:50060

The crowbar admin node IP address (192.168.124.10) is the default address. Replace it with the address assigned to the Crowbar Admin node. Nagios, Ganglia and Chef can be accessed directly from a web browser or via selecting one of the links on the Crowbar Dashboard.

Cloudera Manager Overview

Cloudera Manager deploys and centrally operates a complete Hadoop stack. The application automates the installation process, reducing deployment time from weeks to minutes, gives you a cluster-wide, real time view of the services running and the status of their hosts, provides a single, central place to enact configuration changes across your cluster; and incorporates a full range of reporting and diagnostic tools to help you optimize cluster performance and utilization. Cloudera Manager provides full lifecycle management for Hadoop deployments.

Functionality Outline

- Installs the complete Hadoop stack in minutes via a wizard-based interface
- Gives you complete, end-to-end visibility and control over your Hadoop cluster from a single interface
- Enables you to set server roles and configure services across the cluster
- Enables you to gracefully start, stop and restart of services as needed
- Shows information pertaining to hosts in your cluster including status, resident memory, virtual memory and roles

Table 3: Cloudera Manager Free Edition and Cloudera Manager Differences

Feature	Cloudera Standard (Free Edition)	Cloudera Enterprise (60-Day Trial)	Cloudera Enterprise (Licensed Edition)
CDH FEATURES			
Hadoop	✅	✅	✅
Flume	✅	✅	✅
Hive	✅	✅	✅
Mahout	✅	✅	✅
Oozie	✅	✅	✅
Pig	✅	✅	✅
Sqoop	✅	✅	✅
Whirr	✅	✅	✅
Zookeeper	✅	✅	✅
Hue	✅	✅	✅
HBase	✅	✅	✅
Impala	✅	✅	✅
Search (beta)	✅	✅	✅
CLOUDERA MANAGER FEATURES			
Deployment & Configuration	✅	✅	✅
Service Management	✅	✅	✅
Service & Host Monitoring	✅	✅	✅
Diagnostics	✅	✅	✅
API	✅	✅	✅
Rolling Updates/Restarts	⚠	✅	✅
SNMP Support	⚠	✅	✅
LDAP Integration	⚠	✅	✅

Feature	Cloudera Standard (Free Edition)	Cloudera Enterprise (60-Day Trial)	Cloudera Enterprise (Licensed Edition)
Configuration History & Rollbacks	⚠	✓	✓
Operational Reports	⚠	✓	✓
Automated Disaster Recovery	⚠	✓	(BDR Add-on)
CLOUDERA NAVIGATOR FEATURES			
Data Audit – HDFS, Hbase & Hive	⚠	✓	Navigator Add-on
Access Management	⚠	✓	Navigator Add-on
TECHNICAL SUPPORT AND INDEMNITY			
Core Projects	⚠	⚠	✓
Apache HBase	⚠	⚠	RTD Add-on
Cloudera Impala	⚠	⚠	RTQ Add-on
Cloudera Manager	⚠	⚠	✓
Cloudera Navigator	⚠	⚠	Navigator Add-on

Barclamps

Best practice is to reboot a node whenever a barclamp proposal is applied or updated.

Table 4: Barclamp Descriptions

Barclamp	Description
Cloudera Manager	Provides end-to-end management for apache Hadoop with the ability to deploy and centrally operate a complete Hadoop stack gives you a cluster wide, real time view of nodes and services running and provides a single central place to enact configuration changes across your cluster. Cloudera Manager incorporates a full range of reporting and diagnostic tools to help you optimize cluster performance and utilization.
Pig	Platform for analyzing large data sets that consists of a high-level language for expressing data algorithms.

Cloudera Manager Barclamp

The Cloudera Manager Barclamp performs all the low level operating system configuration setup for the Hadoop cluster and installs the Cloudera Manager server setup in order to prepare for Hadoop cluster deployment.

Although Crowbar makes intelligent guesses to preconfigure the node assignments, they may not be optimal for your environment. You can click on the **Remove Node** icon to remove any node from a role.

Installing the Cloudera Manager Barclamp

1. Navigate to the Crowbar interface using a Web browser. Typically, the IP address is http://192.168.124.10:3000.
2. Click on the **Barclamps** tab, and then select **Apache Hadoop**.
3. Select the **Clouderamanager** barclamp, and then click on the **Create** button.
4. In the *Edit Proposal* screen, select **true** from the *Barclamp* > *Log Debug Messages* drop-down.
5. Ensure that the Deployment Type dropdown selection is set to **auto** (the default).

The Cloudera Manager API parameters in the *Edit Proposal* screen are relevant only if you select **manual** as the Deployment Type. If you select the default **auto** they are ignored, and no further action is required for them.

6. Scroll down to the *Node Deployment* section.
7. Drag and drop nodes from the *Available Nodes* column to their proper roles:
   a. **Clouderamanager-cb-adminnode** - Preconfigured with the Crowbar Admin Node
   b. **Clouderamanager-server** - Dell recommends that you use the Edge Node
   c. **Clouderamanager-namenode** - The primary and secondary Name Nodes
   d. **Clouderamanager-datanode** - The Data Nodes
   e. **Clouderamanager-edgenode** - The Edge Node
   f. **Clouderamanager-ha-journaling node** - The Quorum-based Journaling Node

g. **Clouderamanager-ha-filernode** - The High-availability Filer Node

You can select only one type of high availability – Quorum-based Journaling or Filer. They are mutually exclusive. Dell recommends that you use Quorum-based Journaling.

8. Click the **Apply** button to commit the barclamp proposal to your nodes.

9. Return to the *Nodes* > *Dashboard* screen.

   a. Once all icons are green, the barclamp proposal has been applied.

   b. You can view the process of the proposal for each node by viewing their consoles via SSH sessions.

10. Reboot the nodes.

It may take some time for all node icons to return to a green "Ready" status.

Table 5: Barclamp Parameters

Name	Description	Required	Default
Log Debug Messages	Enable log debug messages (/var/log/chef/client.log).	true	false

Table 6: Operating System Parameters

Name	Description	Required	Default
File System Type	File system type (ext3/ext4).	true	ext4
Map/Reduce File Handles	Maximum number of Map/Reduce open file handles.	true	32768
HDFS File Handles	Maximum number of HDFS open file handles.	true	32768
HBASE File Handles	Maximum number of HBASE open file handles.	true	32768

Table 7: Cloudera Manager API Parameters

Name	Description	Required	Default
Deployment Type	Specifies the deployment options.	true	auto
Server Port	Indicates the port upon which the Cloudera Manager server communicates.	true	7180
User Name	Indicates the Cloudera Manager administrative username.	true	admin
Password	Indicates the Cloudera Manager administrative user's password	true	admin
Use TLS (https)	Specifies whether or not the Cloudera Manager server uses TLS cryptography over HTTPS.	true	false
API Version	Indicates the Cloudera Manager API version.	true	2

Table 8: Cluster Parameters

Name	Description	Required	Default

Name	Description	Required	Default
Cluster Name	Indicates the name of the cluster.	true	cluster01
CDH Version	Indicates the CDH version in use.	true	CDH4
Cloudera Manager License Key (optional)	Indicates the Cloudera Manager administrative user's license key.	false	N/A
Rack ID	Indicates the cluster rack ID.	true	/default

Table 9: Hadoop High Availability Parameters (Shared Storage using NFS)

Name	Description	Required	Default
Shared Edits Directory	Specifies the HA shared edits directory.	true	/dfs/ha
Shared Edits Export Options	Specifies the HA shared edits export options.	true	rw,async,no_root_squash,no_subtree_check
Shared Edits Mount Options	Specifies the HA shared edits mount options.	true	rsize=65536,wsize=65536,intr,soft,bg

Cloudera Manager Installation Overview

1. After the Clouderamanager barclamp has been deployed from Crowbar, you must run the Cloudera Manager configuration wizard in order to fully deploy the Hadoop cluster. This operation will perform the following tasks:
   - Using SSH, discovers the cluster hosts you specify via IP address ranges or hostnames.
   - Installs the Cloudera Manager Agent and CDH4 (including Hue) on the cluster data nodes.
   - Configures the package repositories for Cloudera Manager, CDH4 and the Oracle JDK.
   - Enables you to select and configure optional Hadoop eco-system components.
   - Determines mapping of services to host.
   - Suggests a Hadoop configuration and automatically starts the Hadoop services.
2. You can choose to abort the Cloudera Manager Agent and CDH installation process; the Cloudera Manager wizard will automatically revert and completely rollback the installation process for any uninstalled components. Installed components are not uninstalled during an abort.

Cloudera Manager Node Inventory Page

Once the Cloudera barclamp has been deployed, from the Edit Proposal page, there is a link below the Proposal Attributes section called "Cloudera Manager Nodes." Clicking on this link will display a page titled "Cloudera Node Inventory." This screen is pictured in the figure below. You can print this page as it will be very useful during the Cloudera Manager installation to ensure the correct nodes are selected for their intended Cloudera Manager roles.

Figure 1: Node Inventory Screen

You can also export this data to a comma separated value file by selecting the "Export to CSV" button at the top of the page.

Cloudera Manager Administration Console

Dell has tested running the Cloudera Manager Administration console on the following browsers: Firefox 3.6, Firefox 11, Google Chrome, Internet Explorer 8, and Internet Explorer 9.

To start the Cloudera Manager Administration Console:

1. In a web browser, type the following URL: http(s):// IP_ADDRESS: PORT_NUMBER.
    a. IP_ADDRESS is the name or IP address of the host machine where the Cloudera Manager Web Server is installed.
    b. PORT_NUMBER is the default port number (7180).
    c. Crowbar Installation defaults are Crowbar Admin Node on port 7180 (http://192.168.124.10:7180).

2. Log into the Cloudera Manager Admin Console. The default login credentials are:

    a. Username: admin

    b. Password: admin

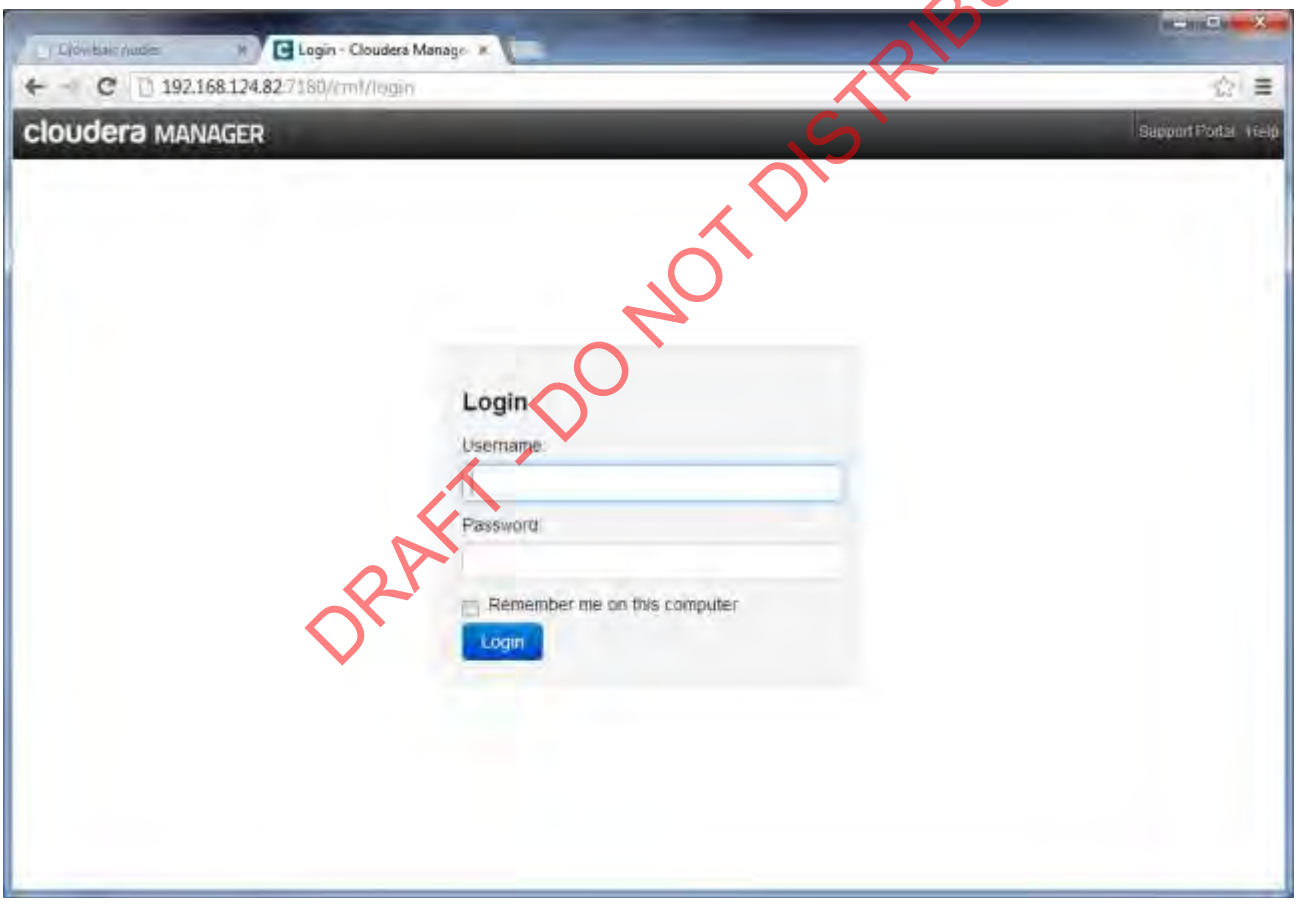
- You can also access the Cloudera Manager Administration Console from the Crowbar User Interface using the link located on the crowbar admin node view page (Cloudera Manager).

For security, you should change the password for the default admin user account as soon as possible. This option is available from the Cloudera Manager application, under the ***Administration***->***Password*** tab.

Login Screen

1. Enter the user login name and password (default=admin, admin).
2. If you want to save the password, enable the **Remember me on this computer** checkbox.
3. Click the **Login** button to proceed.

Figure 2: Login Screen



Select Edition Screen

This screen enables you to select one of the following Clouder Manager editions:

- **Cloudera Standard** - A free edition with limited features.
- **Cloudera Enterprise Trial** - A free, 60-day trial of the full-featured Cloudera Enterprise edition. After 60 days the trial expires, and the product will continue to function as Cloudera Standard.

- **Cloudera Enterprise** - The full Cloudera Enterprise product. This edition requires a paid, annual license.

1. Click on the column for the product you wish to install. That column becomes highlighted.

    a. If you wish to use the Cloudera Manager Free Edition or Cloudera Enterprise Trial Edition, click the **Continue** button to proceed.

2. If you have obtained a Cloudera Manager License key and you wish to upgrade to the Cloudera Manager Enterprise Edition, you can enter the license key.

    a. Click the **Upload License** button.

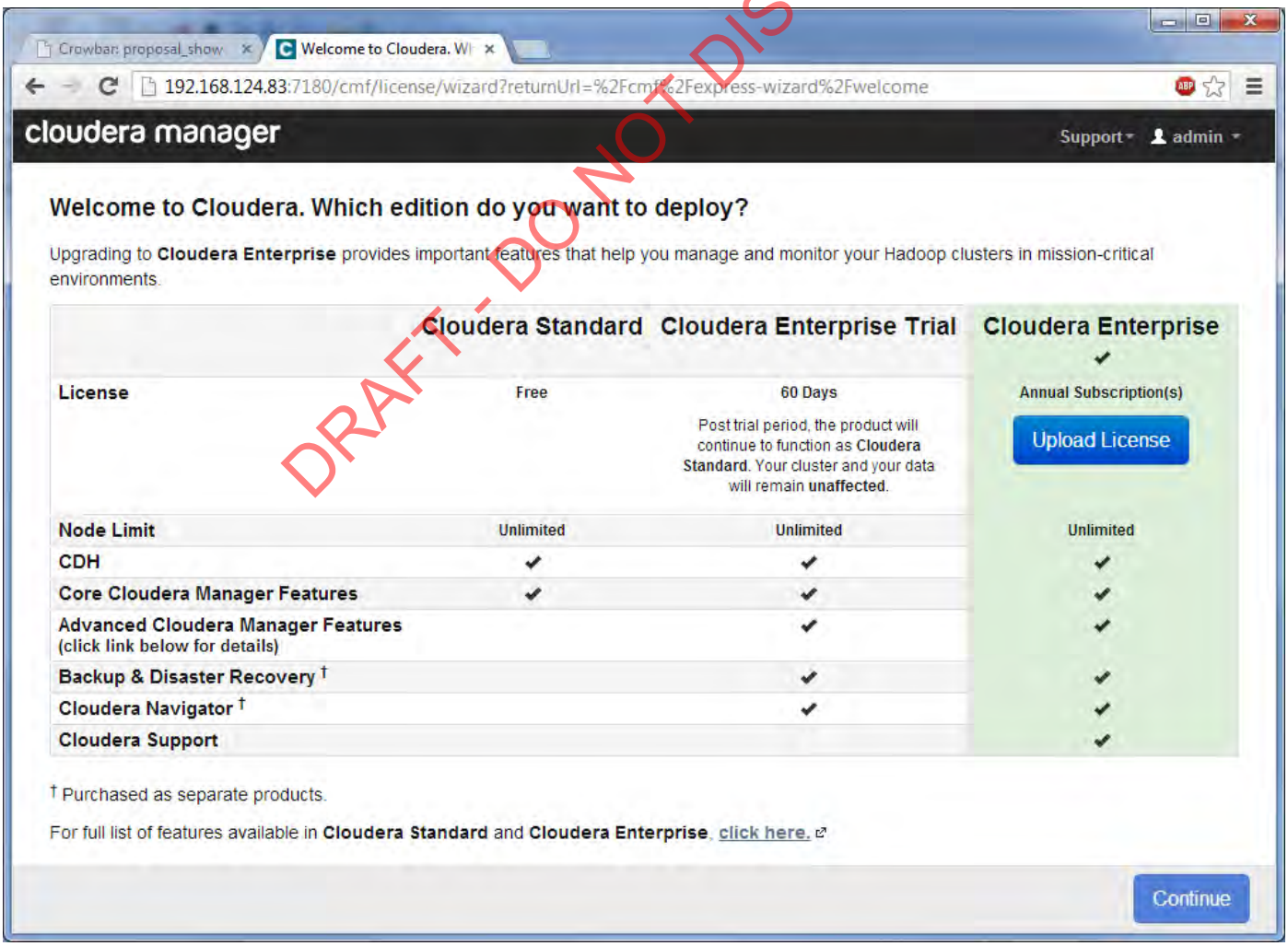
    b. A file browser window appears, enabling you to select a license key file.

    c. Click the **Upload** button to apply the license key.

    d. Click the **Continue** Button to proceed after the license key has been applied.

Applying the license key is an optional step and you can always enter the license key later on in the process by clicking on the ***welcome->admin*** link in the Cloudera Manager user interface. This menu option is located at the top right side of the display.

Figure 3: Select Edition Screen



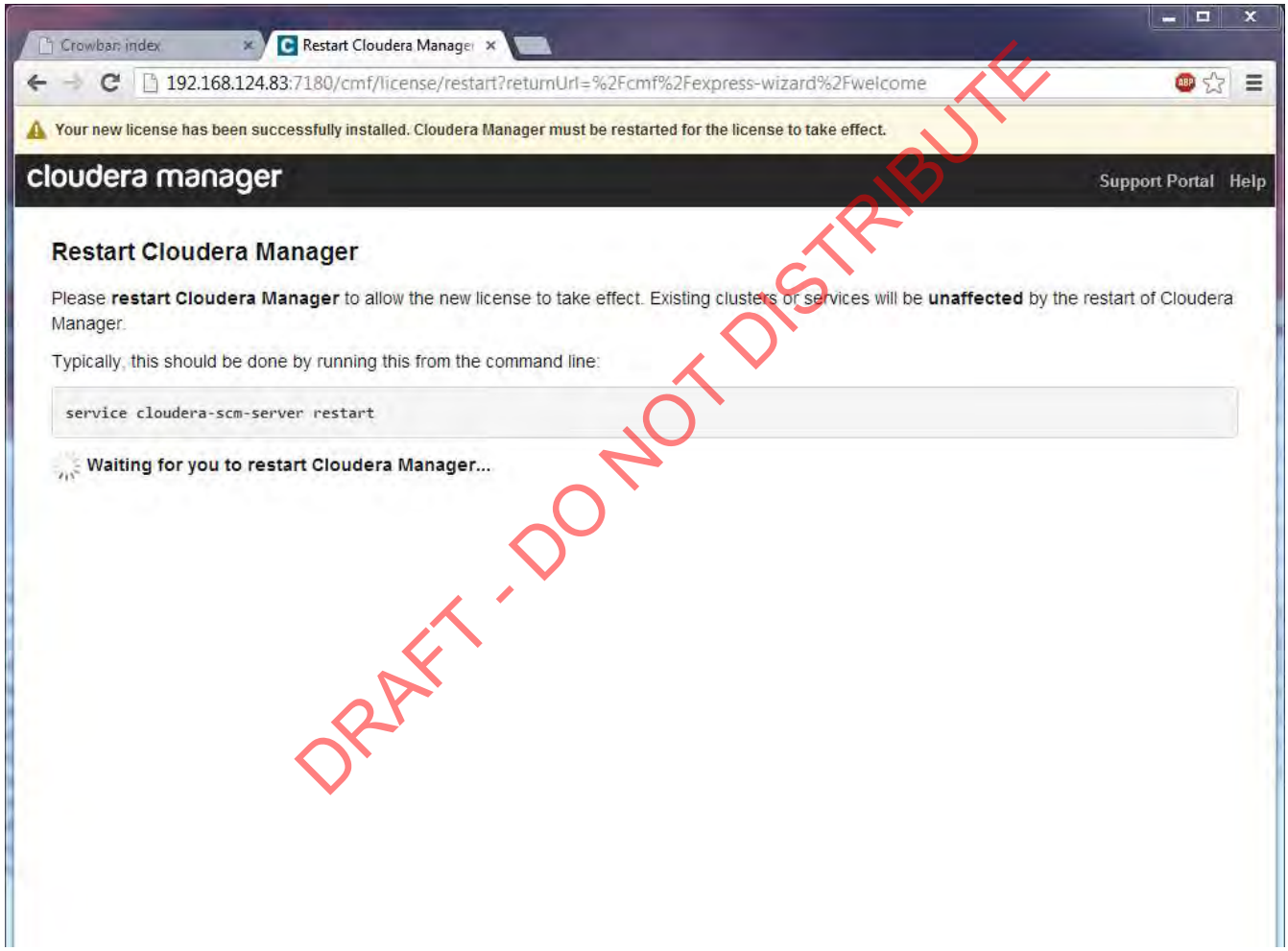
License Key Restart Screen

1. Once the license key has been uploaded, the Cloudera Manager application will ask you to restart the Cloudera Manager server in order for it to take effect. You need to open an SSH console on the node which has the Cloudera Manager (*clouderamanager-server*) role applied to it (login=root/crowbar) and execute the following commands:

```
cd /etc/init.d
sudo service cloudera-scm-server restart
```

2. Once the Cloudera manager server has been restarted, you need to log back into the Cloudera Manager user Interface to proceed.

Figure 4: License Key Restart Screen



- Upon restarting the service, the screen message transitions from "*Waiting for you to restart Cloudera Manager …*" to "*Restarting …*" See .

The User interface refreshes to the Login screen.

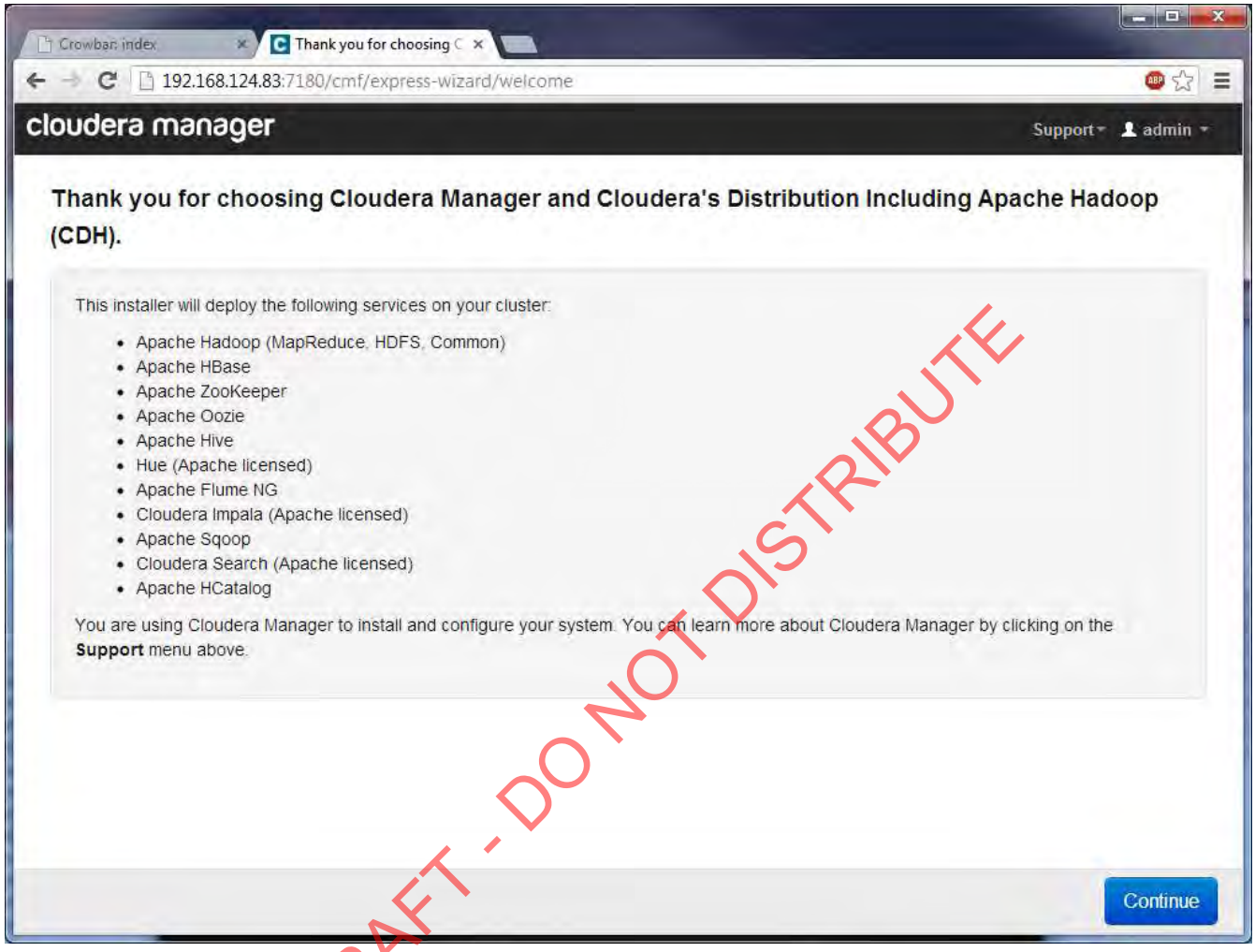
- Login with username **admin** and password **admin**.

License Key Confirmation Screen

If you have entered the Cloudera Manager License key, you will see this additional screen.

- Click the **Continue** Button to proceed.

Figure 5: License Key Confirmation Screen



Node Search Screen

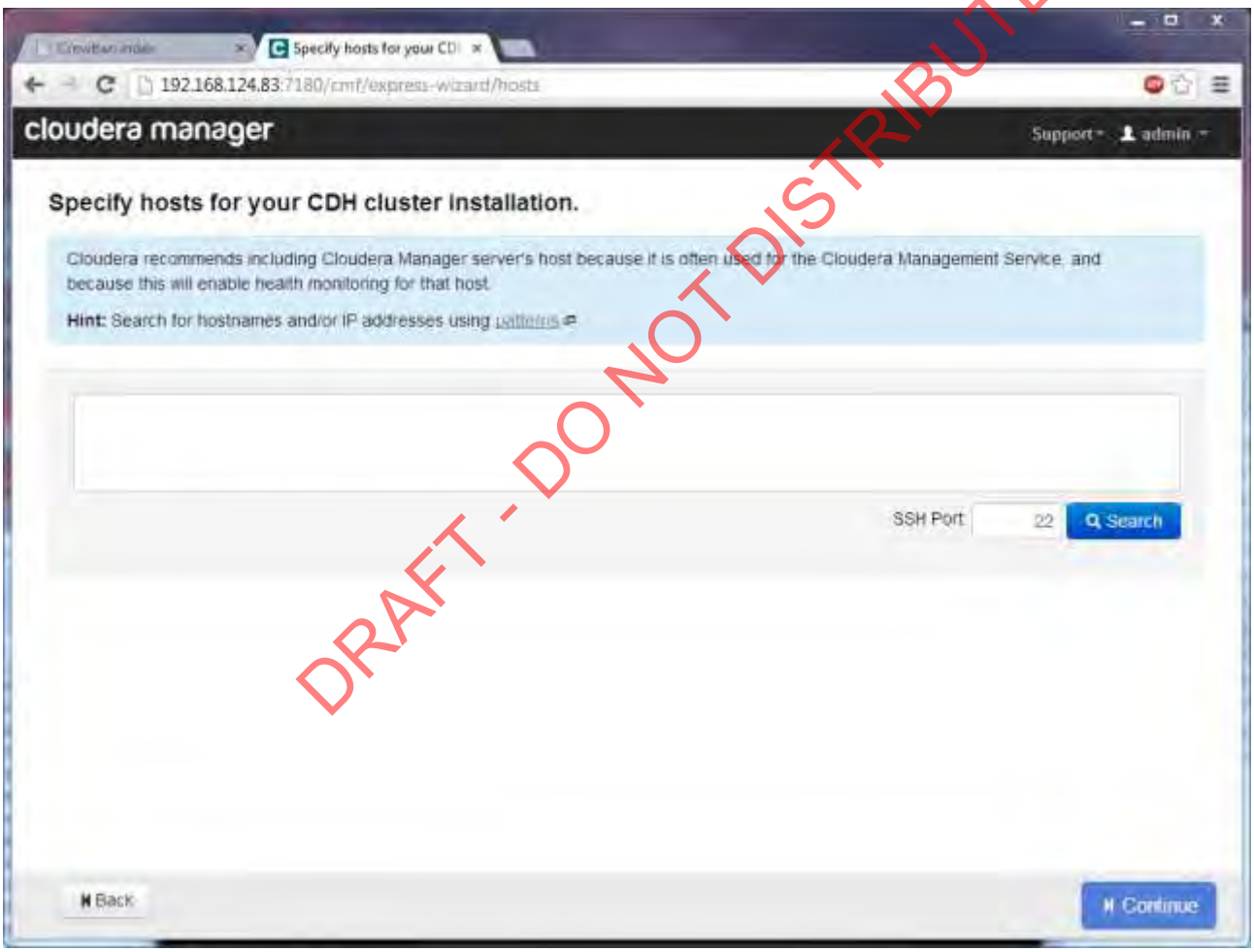
1. Enter the IP range or hostname search pattern for all Hadoop cluster nodes. Cloudera Manager will search the cluster using this pattern and will consider any node with a Cloudera Manager agent process running on it as a valid Hadoop node candidate. For example;

   - 192.168.124.[80-90] will attempt to discover all the nodes between 192.168.124.80 and 192.168.124.90
   - 192.168.124.8[1-3] will attempt to discover 192.168.124.81, 192.168.124.82, and 192.168.124.83
   - For additional information on Cloudera Manager search patterns, see the search for hostnames and/or IP addresses using patterns link on the Cloudera Manager user Interface.

2. Optionally, enter the host's **SSH Port**. The default port is 22.

3. Click the **Search** button to proceed.

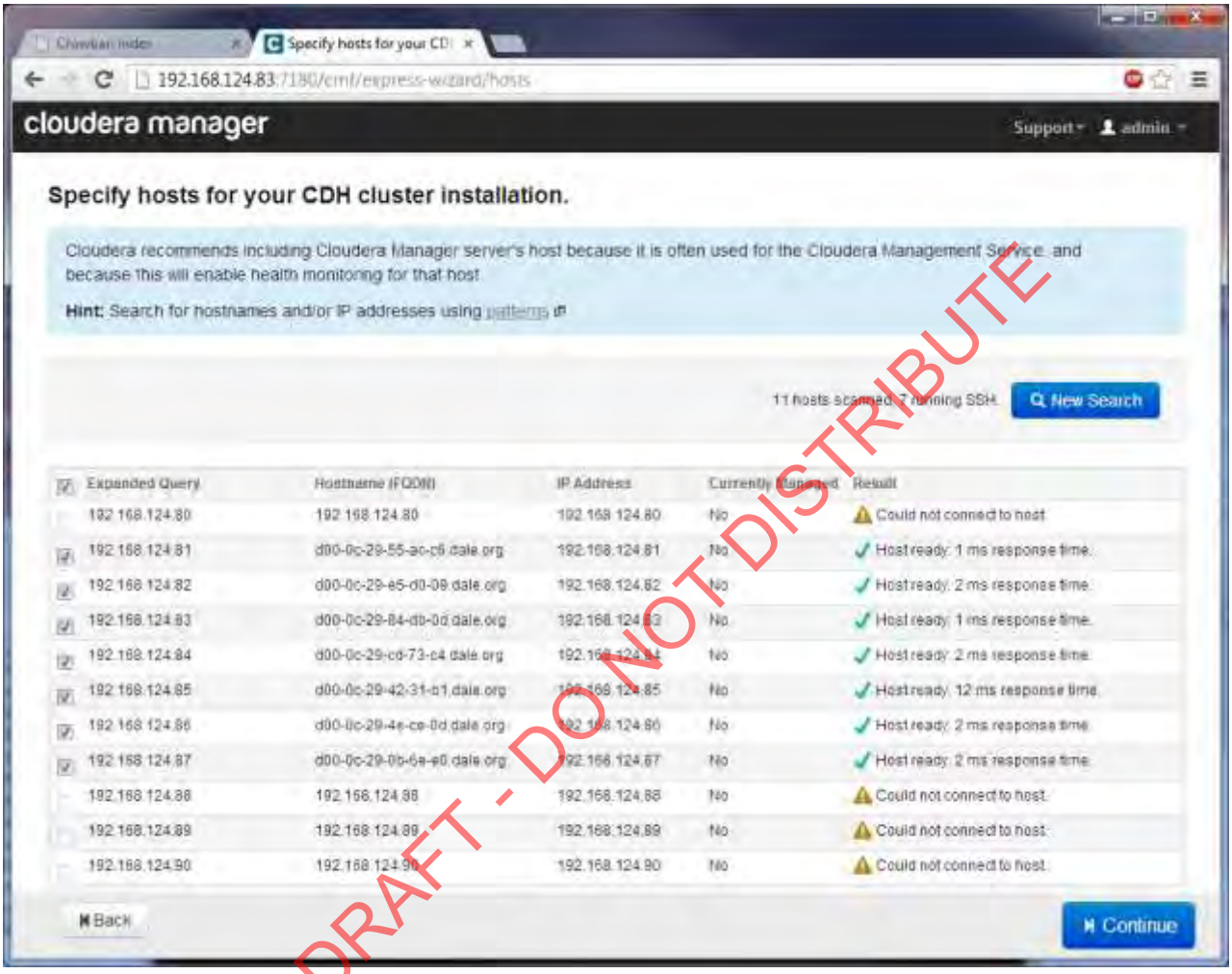
Figure 6: Cloudera Cluster Node Search Screen



Node Search Results Screen

1. Verify that all your Hadoop nodes have been discovered.
2. Make any cluster configuration adjustments by selecting or deselecting any checkboxes.
3. Click the **Continue** button to proceed.

Figure 7: Node Search Results Screen

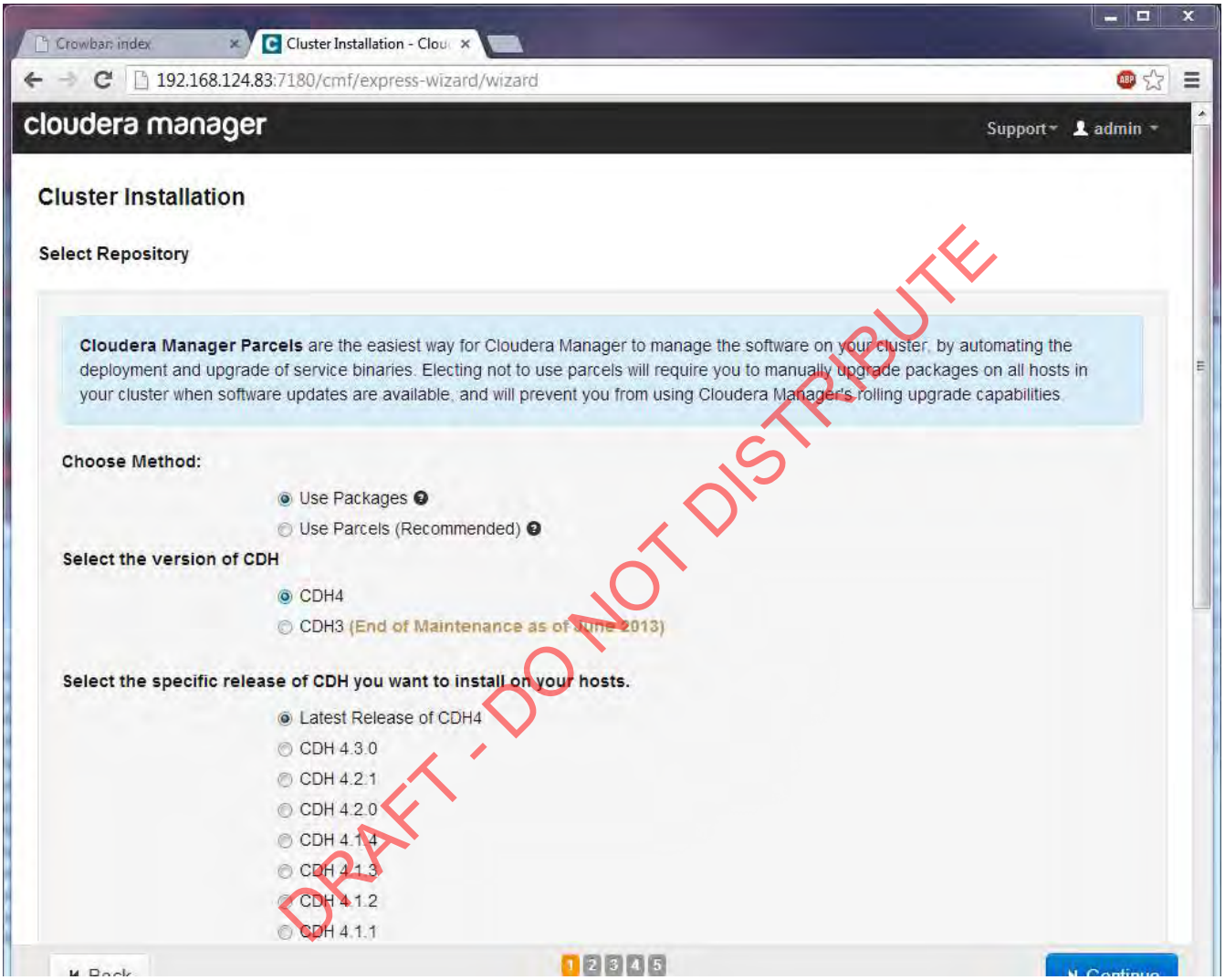


Select Repository Screen

- Select **Use Packages** as the installation method.

The Dell | Cloudera Solution includes built-in software repositories, accessible via Packages instead of the default Cloudera "parcels". This enables you to install the software without Internet access.

Figure 8: Select Repository Screen



The Select Repository screen expands to display configuration choices.

Repository Configuration Screen

RPM based packages are served from the crowbar admin node. By default, the IP address is 192.168.124.10 on port 8091 (http://192.168.124.10:8091). If you configure the crowbar admin node to be on another IP address, you will have to make the appropriate adjustments to the URLs listed above.

1. Select **CDH4** for installation.
2. Select **Custom Repository** for CDH.
    a. Enter this URL - http://192.168.124.10:8091/redhat-6.4/crowbar-extra/clouderamanager
3. Select **None** for Impala™ installation.
    a. Or, to install Impala, select **Custom Repository** for Impala.
    b. Enter this URL - http://192.168.124.10:8091/redhat-6.4/crowbar-extra/clouderamanager
4. Select **None** for Solr installation.
    a. Or, to install Solr, select **Custom Repository** for Solr.
    b. Enter this URL - http://192.168.124.10:8091/redhat-6.4/crowbar-extra/clouderamanager
5. Select **Custom Repository** for Cloudera Manager Agent.
    a. Enter this URL - http://192.168.124.10:8091/redhat-6.4/crowbar-extra/clouderamanager
6. Leave the GPG Key URL field empty.
7. Click the **Continue** button to proceed.

About Cloudera Impala

Cloudera Impala enables you to perform fast SQL queries upon HDFS or HBase-stored Apache Hadoop data. It uses the same ODBC driver, SQL (Hive SQL) syntax, storage infrastructure, and user interface as Apache Hive. Impala is not a replacement for MapReduce-based batch processing frameworks.

You must point the *Custom Repository for Impala* to Cloudera's corresponding repository in order to download Impala. See Repository Configuration Screen above. Cloudera Manager must be installed and operational upon a node with Internet access in order for Impala to function. Cloudera currently supports Impala running on Red Hat Enterprise Linux (RHEL)/CentOS 6.4 (64-bit) platforms only.

You can find Cloudera's Impala documentation at http://www.cloudera.com/content/support/en/documentation/cloudera-impala/cloudera-impala-documentation-v1-latest.html.

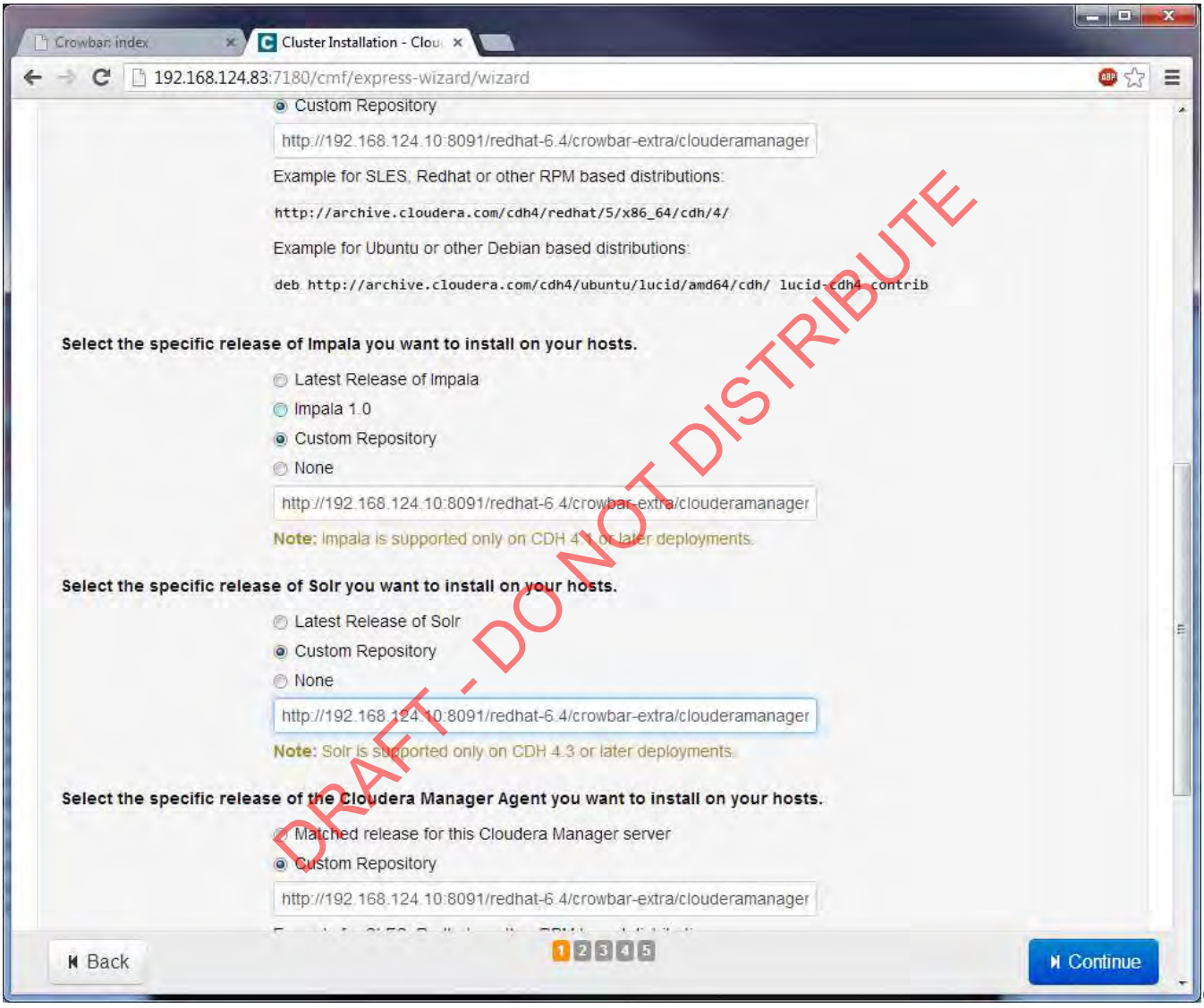
About Solr

Cloudera Search, powered by Apache Solr™, enables fast, easy searches within a Hadoop cluster. Users are not required to have deep technical skills in order to use Cloudera Search effectively. Cloudera Search is a replacement for MapReduce-based batch processing frameworks.

Cloudera Search is a Cloudera beta product; as such, Dell does not provide support for Cloudera Search. You can find Cloudera Search documentation at http://www.cloudera.com/content/support/en/documentation/cloudera-search/cloudera-search-documentation-v1-latest.html.

You must point the Custom Repository for Cloudera Search to Cloudera's corresponding repository in order to download Cloudera Search. See Repository Configuration Screen above. Cloudera Manager must be installed and operational upon a node with Internet access in order for Cloudera Search to function. Cloudera currently supports Cloudera Search running on Red Hat Enterprise Linux (RHEL)/CentOS 6.2 (64-bit) platforms only.

Figure 9: Repository Configuration Screen

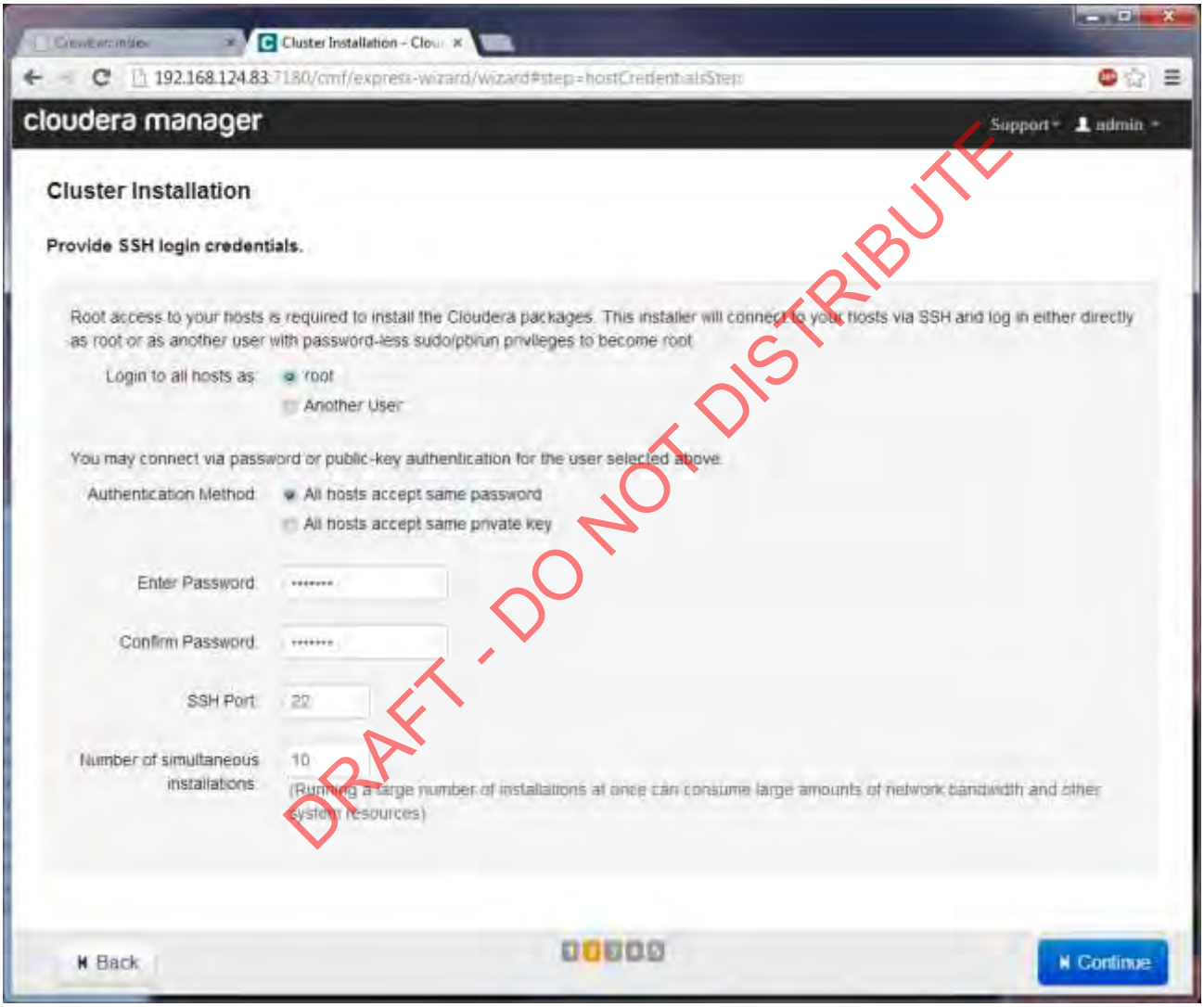


C

SSH Credentials Screen

1. Select **Login to all hosts as root**.
2. Select **All hosts accept same password**.
3. Enter the **SSH login password** for the cluster (default=crowbar).
4. Accept the default settings for the **SSH port** and **number of simultaneous installations**.
5. Click the **Continue** button to proceed.

Figure 10: SSH Credentials Screen

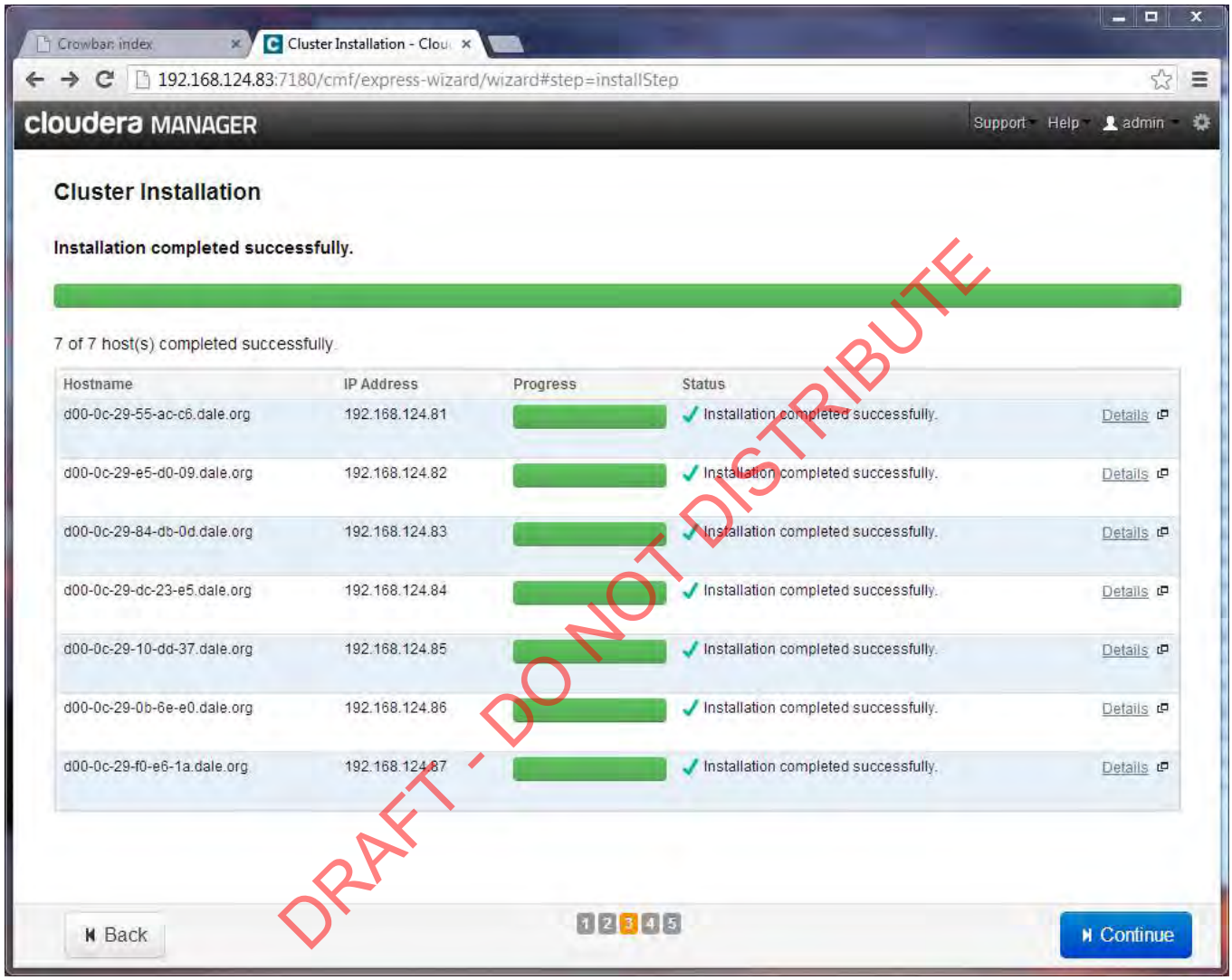


Package Install Screen

You will see bar graphs next to each node and the name of the package it is installing.

1. Wait for the installation process to complete.
2. Click the **Continue** button to proceed.

Figure 11: Package Install Screen

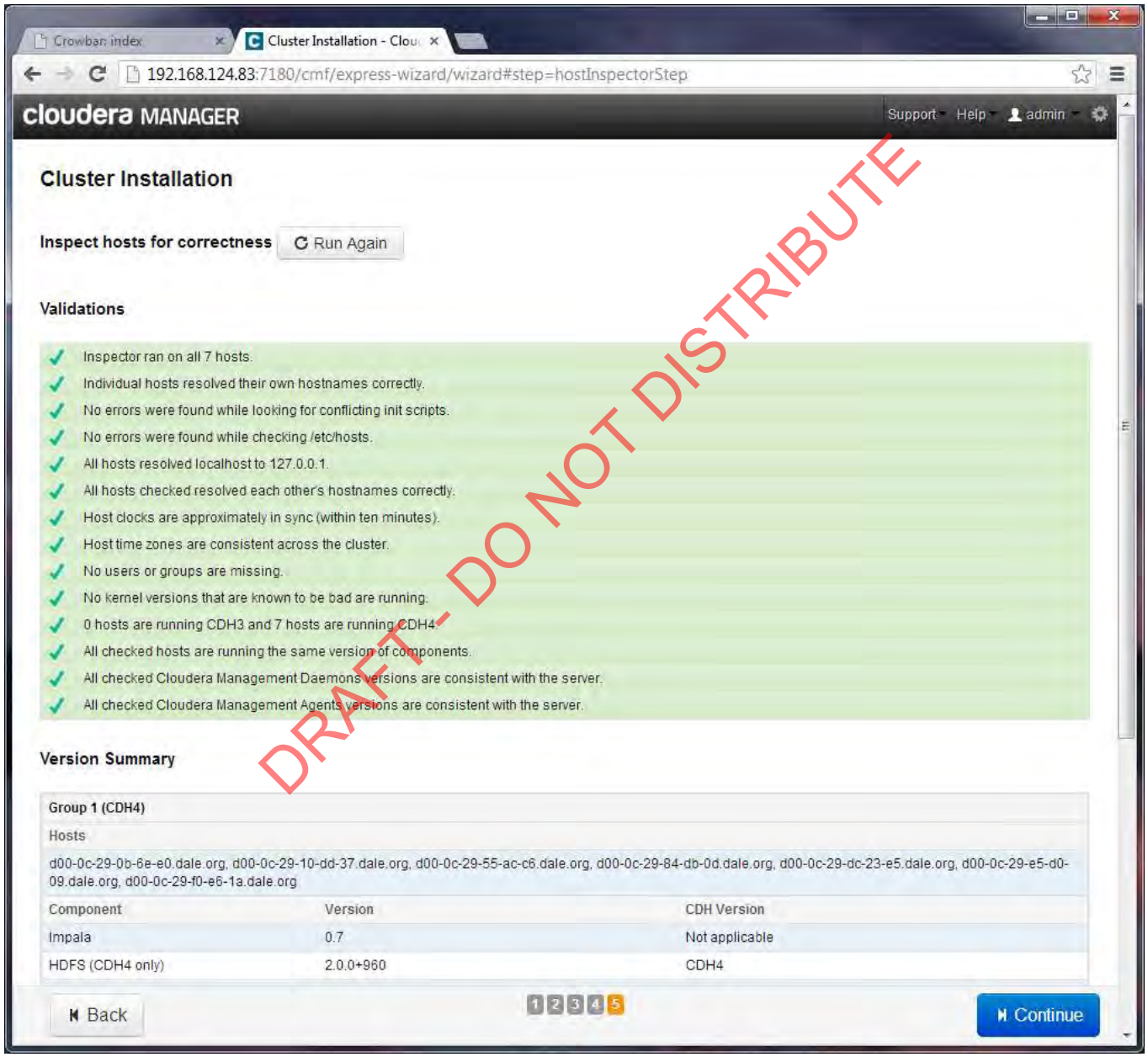


Host Inspector Screen

The Cloudera Manager Host Inspector runs during this part of the installation process in order to validate the proper cluster configuration for the Hadoop installation.

1. Wait for this process to complete.
2. Click the **Run Again** button if you want to run the Host Inspector again.
3. Click the **Continue** button to proceed.

Figure 12: Host Inspector Screen



Service Selection Screen

1. Select the services that you want to install.

    - **Core Hadoop** – includes HDFS, MapReduce, Oozie, Hive, and Hue
    - **Core with Real-Time Delivery** – Includes HDFS, MapReduce, ZooKeeper, HBase, Oozie, Hive, and Hue
    - **Core with Real-Time Query (Beta)** – Includes HDFS, MapReduce, Impala, Oozie, Hive, and Hue
    - **All Services** – Includes HDFS, MapReduce, ZooKeeper, HBase, Impala, Oozie, Hive, and Hue
    - **Custom Services** – Select only the services that you want
    - **Cloudera Navigator** – A separately-licensed suite of management services

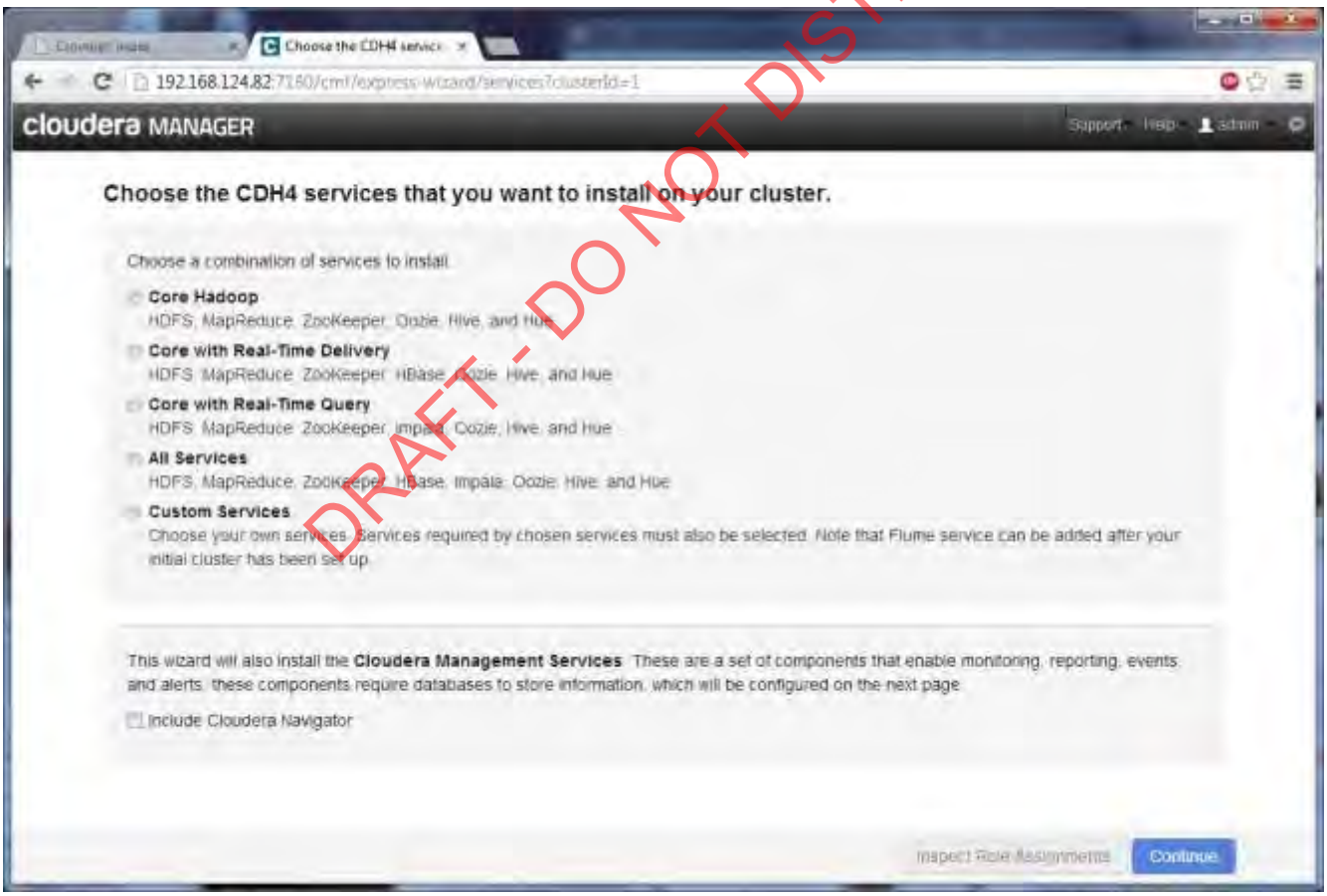
If you select anything other than *All Services*, you can optionally add additional services in the future.

2. If you select ***Cloudera Navigator***, first ensure that you have purchased the required licenses. Cloudera Navigator is a separately-licensed feature. Please contact your Dell representative for more information.

3. Click the **Inspect Role Assignments** button to configure the Hadoop cluster services.

Important: **Do not** select *Continue*, as this will give you the default role assignments, which may not be acceptable to you.

Figure 13: Service Selection Screen



Inspect Role Assignments Screen # 1

1. Select the Cloudera Manager role assignments for Hadoop cluster deployment. Recommended settings for the Dell Reference Architecture:

    a. **CM DataNode** – Crowbar nodes which contains the *clouderamanager-datanode* role.

    b. **CM NameNode** – 1st Crowbar node which contains the *clouderamanager-namenode* role.

    c. **CM SecondaryNameNode** – 2nd Crowbar node which contains the *clouderamanager-namenode* role.

    d. **CM TaskTracker roles** – Crowbar nodes which contains the *clouderamanager-datanode* role.

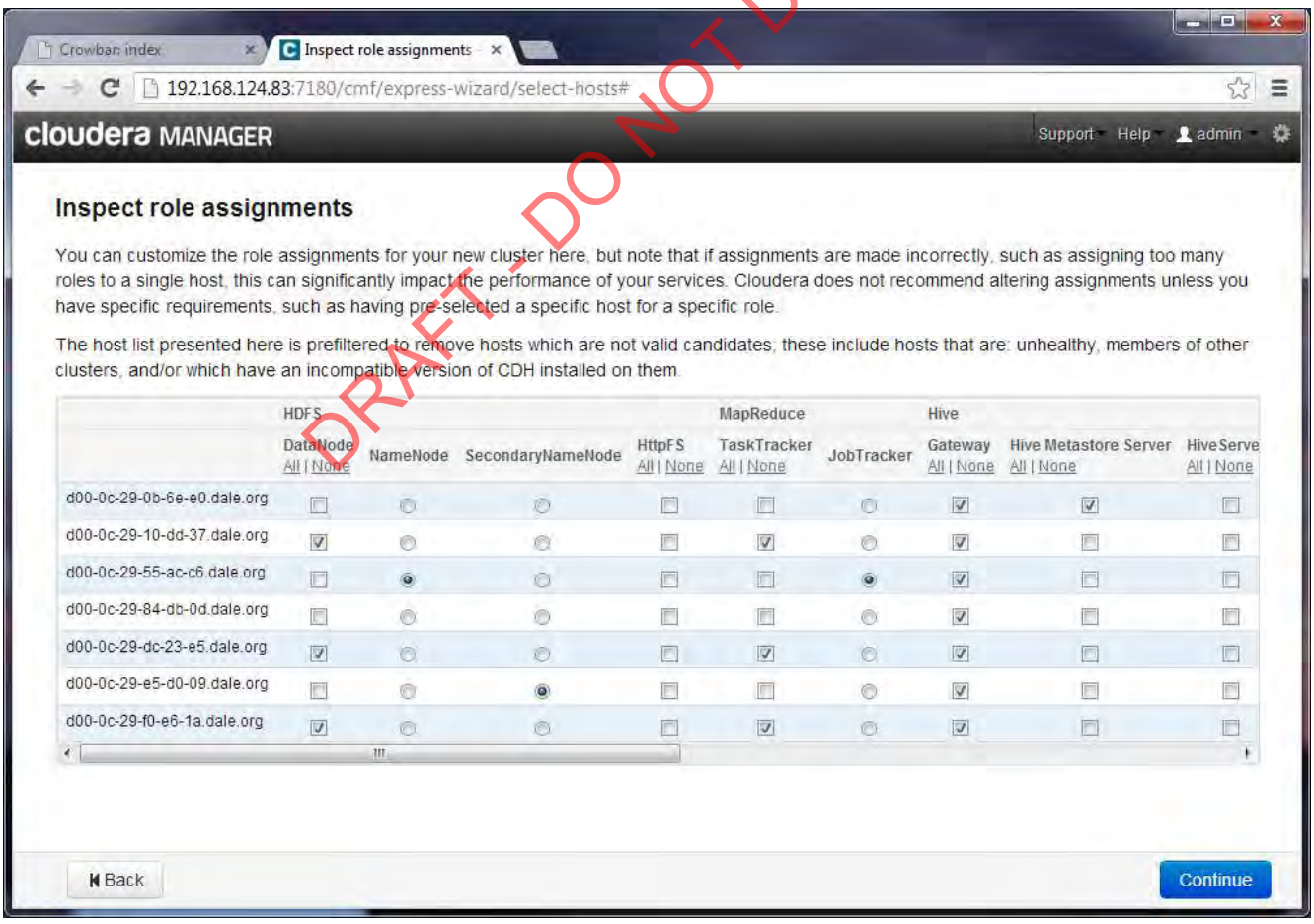
    e. **CM JobTracker role** – Crowbar node which contains the *clouderamanager-namenode* role.

    f. **Cloudera Management Service roles** – Crowbar node which contains the *clouderamanager-server* role.

2. Please refer to Figure 15: Inspect Role Assignments Screen #2, before clicking the **Continue** button.

The Cloudera Node Inventory page you printed from within the Cloudera Manager barclamp page in Crowbar is very useful for this step to ensure the roles selected in Cloudera Manager are assigned to nodes which have been provisioned (RAID, BIOS, etc.) specifically for that purpose.

Figure 14: Inspect Role Assignments Screen # 1



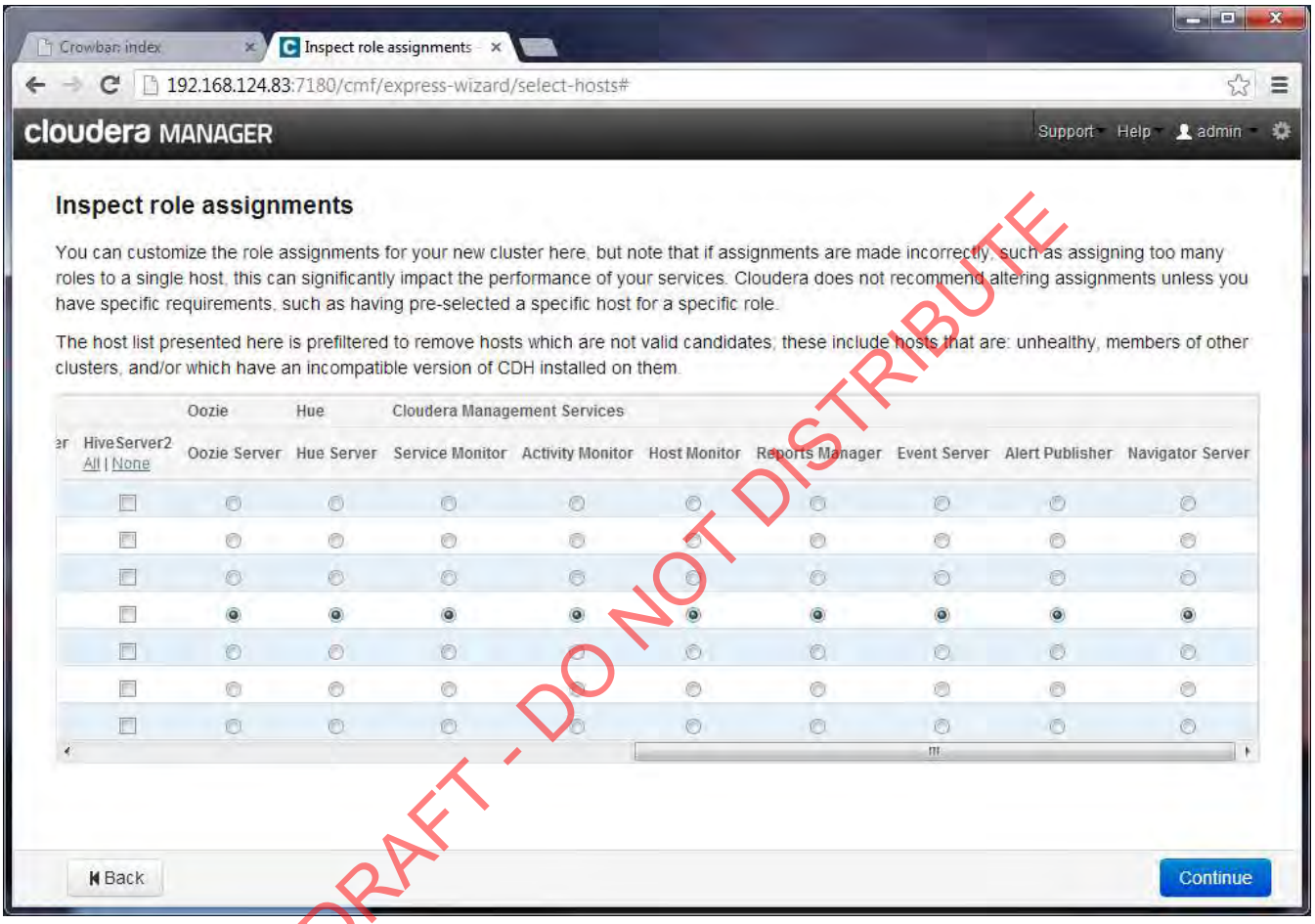
Inspect Role Assignments Screen # 2

If you entered the Cloudera Manager License key, you will see this additional screen.

1. Select the role assignments for Hadoop add-ons services and monitoring services (Activity Monitor, Service Monitor, Reports Manager, etc.). Dell suggests that you assign these roles to the Cloudera Manager Server Node.

2. Click the **Continue** button to proceed.

Figure 15: Inspect Role Assignments Screen #2

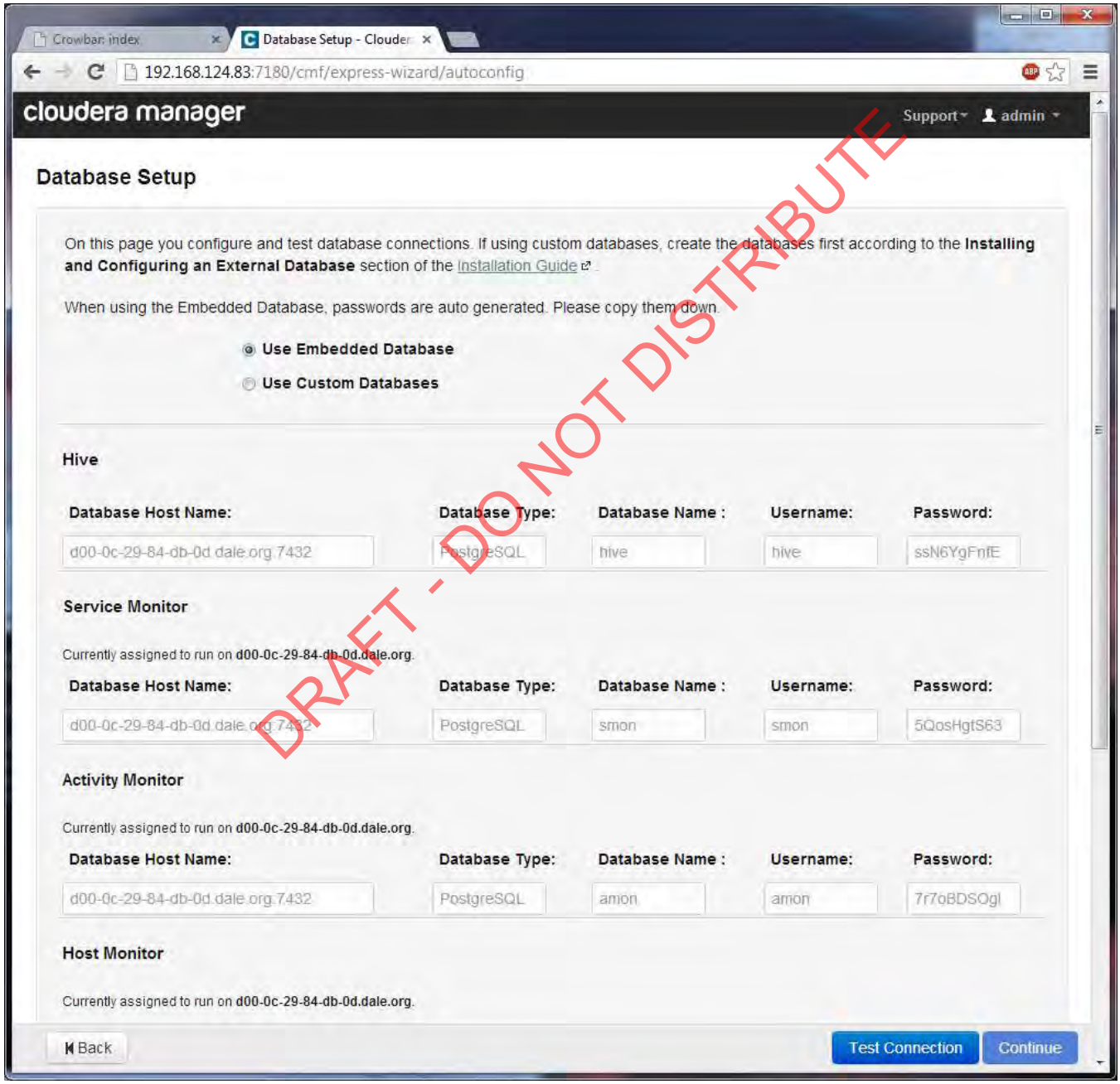


Monitoring Database Setup Screen

If you entered the Cloudera Manager License key, you will see this additional screen.

1. Select **Use Embedded Database**.
2. You can leave the rest of the settings at default values unless you want to change them.
3. Click the **Test Connection** button to make sure you can connect to all the databases (required).
4. Click the **Continue** button to proceed.

Figure 16: Monitoring Database Setup Screen

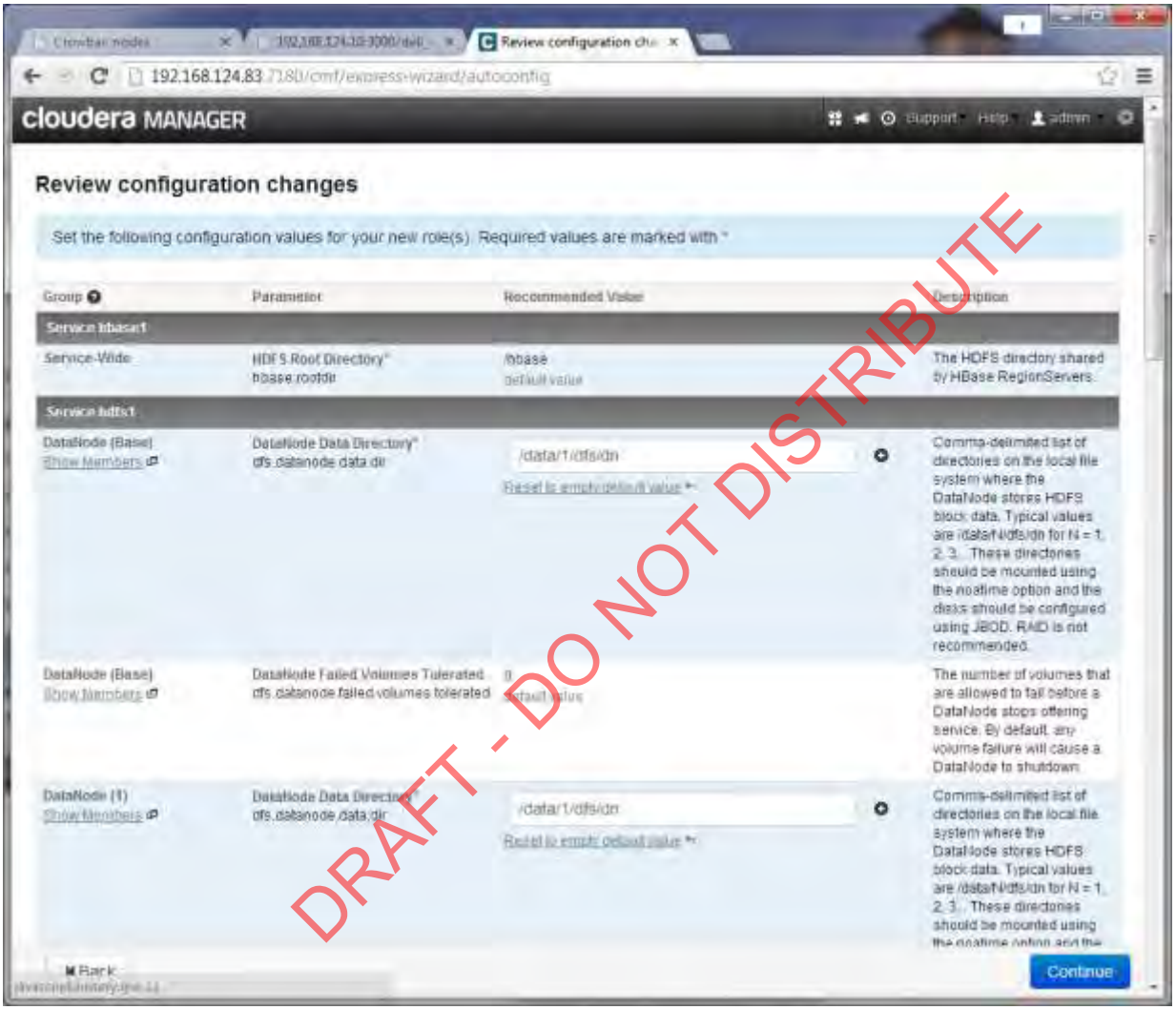


Review Configuration Changes Screen

If you entered the Cloudera Manager License key, you will see this additional screen.

1. If not set by default, set the Alert Publisher mail server hostname for alerts (*localhost*).
2. If not set by default, set the Alert Publisher mail server message recipients for alerts (*root@localhost*).
3. Click the ***Continue*** button to proceed.

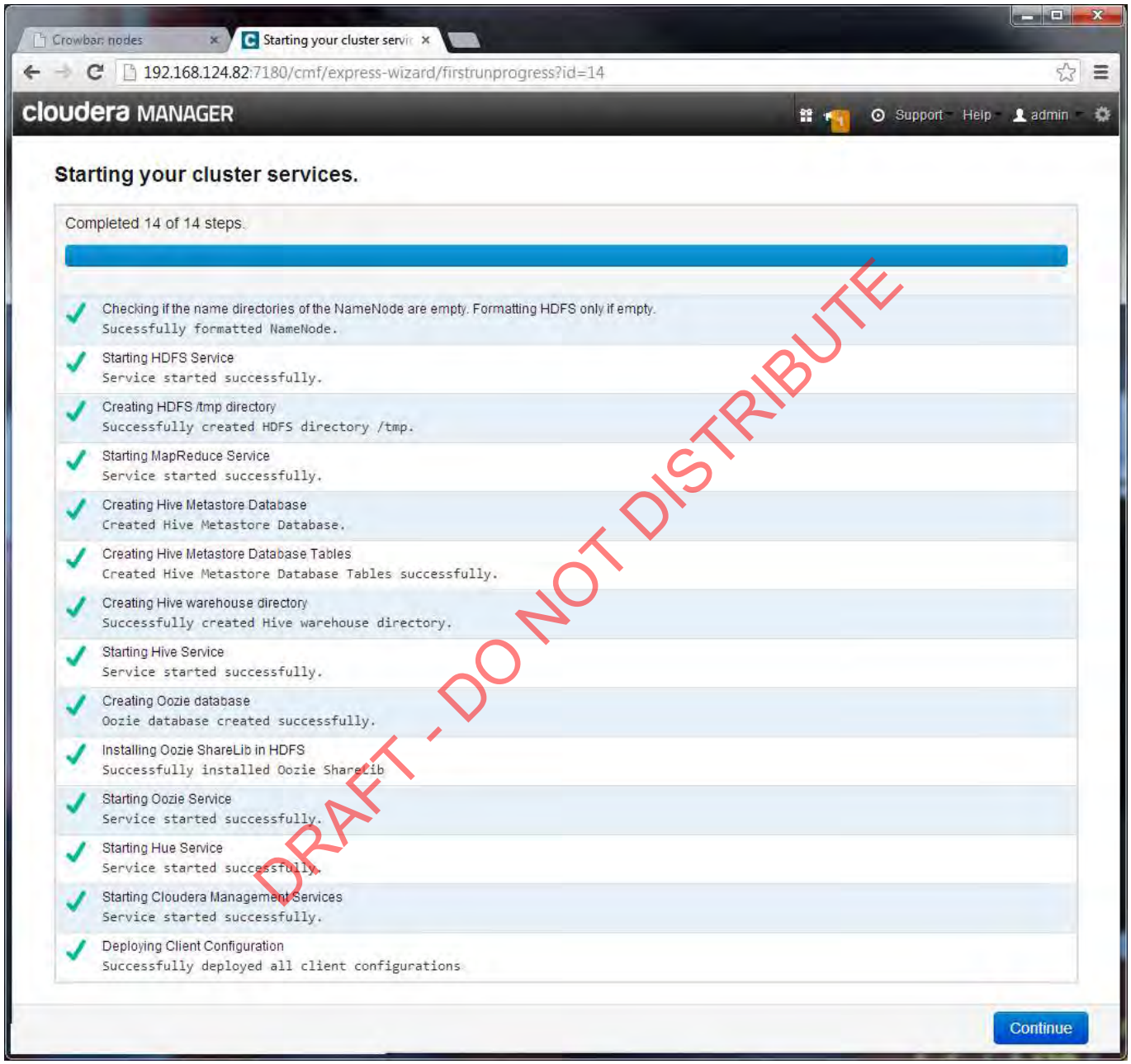
Figure 17: Review Configuration Changes Screen



Cluster Services Initialization Screen

1. Wait for the Hadoop cluster installation process to complete.
2. Click the ***Continue*** button to proceed.

Figure 18: Cluster Services Initialization Screen

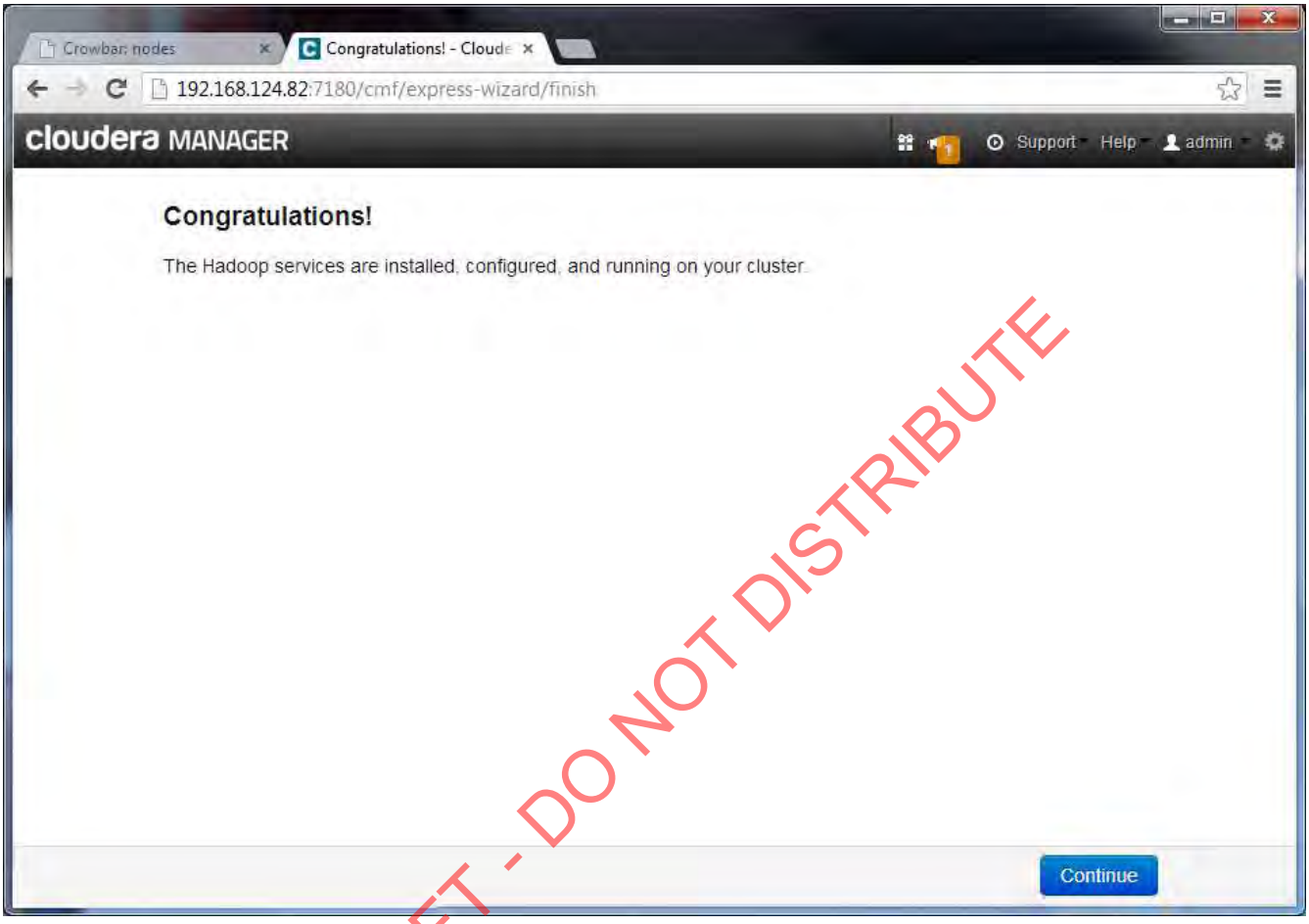


Configuration Completion Screen

If the Hadoop configuration steps complete successfully, you will see the final Cloudera Manager confirmation screen.

- Click the **Continue** button to start using Cloudera Manager.

Figure 19: Configuration Completion Screen

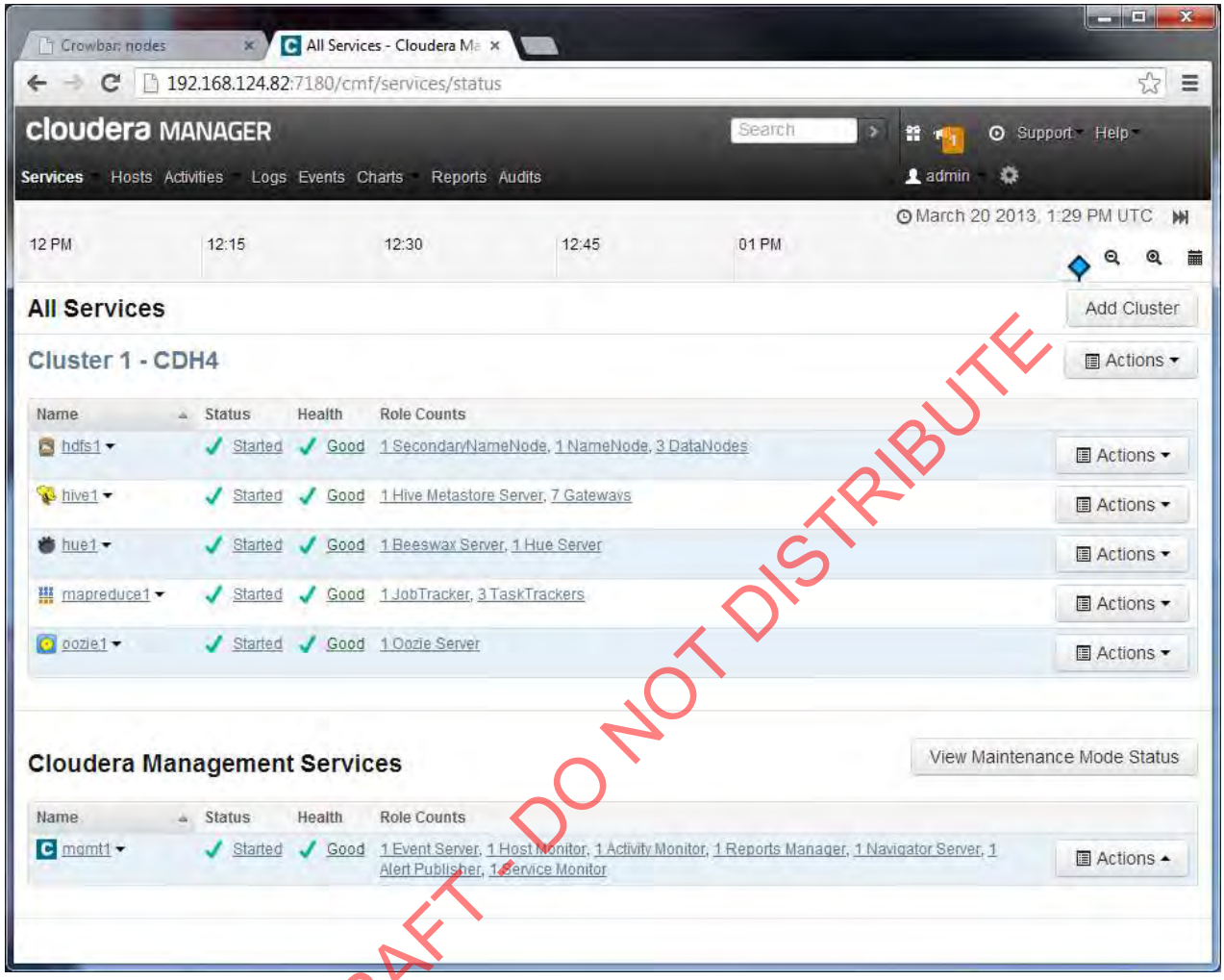


Service Display Screen

This is the normal startup screen after Cloudera Manager has completed the installation steps.

- Please refer to the *Cloudera Manager Users Guide* for additional information on operating Cloudera Manager.

Figure 20: Service Display Screen



Pig Barclamp

Apache Pig is a platform for analyzing large data sets that consists of a high-level language for expressing data analysis programs, coupled with infrastructure for **evaluating** these programs. The salient property of Pig programs is that their structure is amenable to substantial parallelization, which in turns enables them to handle very large data sets.

Pig's infrastructure layer consists of a compiler that produces sequences of MapReduce programs, for which large-scale parallel implementations already exist (e.g., the Hadoop subproject). Pig's language layer currently consists of a textual language called Pig Latin, which has the following key properties:

- **Ease of programming:** It is trivial to achieve parallel execution of simple, "embarrassingly parallel" data analysis tasks. Complex tasks comprised of multiple interrelated data transformations are explicitly encoded as data flow sequences, making them easy to write, understand, and maintain.
- **Optimization opportunities:** The way in which tasks are encoded permits the system to optimize their execution automatically, allowing the user to focus on semantics rather than efficiency.
- **Extensibility:** Users can create their own functions to do special-purpose processing.

Table 10: Pig Barclamp Parameters

Name	Description	Required	Default
java_home	JAVA_HOME environment variable.	true	/usr/java/jdk1.6.0_31/jre
log4jconf	log4jconf log4j configuration file.	true	./conf/log4j.properties
brief	brief logging - no timestamps.	true	false
cluster	Clustername, name of the hadoop jobtracker. If no port is defined port 50020 will be used.	false	
debug_level	Debug level, INFO is default.	true	INFO
file	A file that contains pig script.	false	
jar	Load jarfile, colon separated.	false	
verbose	Verbose print all log messages to screen (default to print only INFO and above to screen).	true	false
exectype	Exectype local or mapreduce - mapreduce is default.	true	mapreduce
ssh_gateway	HOD gateway property.	false	
hod_expect_root	HOD expect root property.	false	
hod_expect_uselatest	HOD use latest root property.	false	
hod_command	HOD command root property.	false	
hod_config_dir	HOD config directory property.	false	
hod_param	HOD param property.	false	
pig_spill_size_threshold	Do not spill temp files smaller than this size (bytes).	true	5000000
pig_spill_gc_activation_size	EXPERIMENT: Activate garbage collection when spilling a file bigger than this size (bytes). This should help reduce the number of files being spilled.	true	40000000
log_file	Log file location.	false	

Sqoop Barclamp

Sqoop is an SQL-based command-line tool to assist with HDFS data import/export (SQL-to-Hadoop). Sqoop is a tool designed to transfer data between Hadoop and relational databases. You can use Sqoop to import data from a relational database management system (RDBMS) such as MySQL or Oracle into the Hadoop Distributed File System (HDFS), transform the data in Hadoop MapReduce, and then export the data back into an RDBMS.

Sqoop automates most of this process by relying on the database to describe the schema for the data to be imported. Sqoop uses MapReduce to import and export the data, which provides parallel operation as well as fault tolerance.

Table 11: Sqoop Barclamp Parameters

Name	Description	Required	Default
sqoop_connection_factories	A comma-delimited list of ManagerFactory implementations which are consulted, in order, to instantiate ConnManager instances used to drive connections to databases.	false	
sqoop_tool_plugins	A comma-delimited list of ToolPlugin implementations which are consulted, in order, to register SqoopTool instances which allow third-party tools to be used.	false	
sqoop_metastore_client_enable_autoconnect	If true, Sqoop will connect to a local metastore for job management when no other metastore arguments are provided.	true	false
sqoop_metastore_client_autoconnect_url	The connect string to use when connecting to a job-management metastore. If unspecified, uses ~/.sqoop/. You can specify a different path here.	false	
sqoop_metastore_client_autoconnect_username	The username to bind to the metastore.	false	
sqoop_metastore_client_autoconnect_password	The password to bind to the metastore.	false	
sqoop_metastore_client_record_password	If true, allow saved passwords in the metastore.	false	
sqoop_metastore_server_location	Path to the shared metastore database files. If this is not set, it will be placed in ~/.sqoop/.	false	
sqoop_metastore_server_port	Port that this metastore should listen on.	false	

Support

Dell Support

To obtain Dell hardware and software support:

- Open a request at Dell's support portal: http://support.dell.com
- See a list of Dell Technical Support call centers near you

Cloudera Support

To obtain support for Hadoop:

- Open a request at Cloudera's support portal: http://www.cloudera.com/hadoop-support/

Appendix A: Dell | Hadoop Solution Components

- **Hadoop:** http://en.wikipedia.org/wiki/Hadoop.
- **Hadoop Distributed File System (HDFS):** A distributed file system that provides high-throughput access to application data (http://en.wikipedia.org/wiki/Hadoop_Distributed_Filesystem#Hadoop_Distributed_File_System).
- **MapReduce:** A software framework for distributed processing of large data sets on compute clusters (http://en.wikipedia.org/wiki/MapReduce).
- **HBase:** A scalable, distributed database that supports structured data storage for large tables.
- **Hive:** A data warehouse infrastructure that provides data summarization and ad-hoc querying.
- **ZooKeeper:** A high-performance coordination service for distributed applications.
- **Pig:** A platform for analyzing large data sets that consists of high-level language for expressing data analysis programs, coupled with infrastructure for evaluating these programs.
- **Sqoop:** A tool designed to import data from relational databases into Hadoop. Sqoop uses JDBC to connect to a database.
- **Oozie:** An open-source workflow engine and coordination service to manage data processing jobs within Hadoop.
- **Hue:** A browser based interface for interacting with Hadoop clusters.
- **Crowbar:** A Dell-provided, supported, and maintained toolset for system deployment and configuration automation. Crowbar supports the bare-metal bring-up of new hardware and configuration management of existing hardware.

Appendix B: References

- Cloudera: http://www.cloudera.com
- Nagios: http://www.nagios.org
- Ganglia: http://ganglia.sourceforge.net

To Learn More

For more information on the Dell | Cloudera Solution, visit:
www.Dell.com/Hadoop

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