Configuring a Hadoop cluster with Cloudera Manager is a detailed process that involves multiple steps, from setting up the hardware and software infrastructure to configuring security and adding additional services. Here's a deep dive into each step, including complex details and examples:

1. Setup Cluster Nodes

- **Choose Hardware:** Begin with at least three nodes, ensuring they meet the minimum hardware requirements for CPU, memory, disk space, and network connectivity.
- **Install Operating System:** Install a compatible Linux distribution on each node. Ensure all nodes are updated to the latest version.
- **Network Configuration:** Configure each node with a static IP address and update the `/etc/hosts` file for name resolution.

Example `/etc/hosts` Entry:

```
192.168.1.101 node1.cluster.com node1
192.168.1.102 node2.cluster.com node2
192.168.1.103 node3.cluster.com node3
```

2. Install Cloudera Manager

- **Choose a Node:** Select one node (preferably with better resources) as the Cloudera Manager Server.
- **Install Cloudera Manager Server:** On the chosen node, download and install Cloudera Manager Server.

Installation Commands:

```
wget [Cloudera Manager Server Download URL]
sudo yum install cloudera-manager-daemons cloudera-manager-server
```

- **Start Cloudera Manager Server:**

```
sudo systemctl start cloudera-scm-server
```

3. Cluster Configuration

- **Access Cloudera Manager:** Open Cloudera Manager in a web browser using the IP address or hostname of the node where Cloudera Manager Server is installed.
- **Launch Cluster Setup Wizard:** Use the wizard to start configuring the cluster.
- **Discover Nodes:** Enter the IP addresses or hostnames of the other nodes.

- **Assign Roles:** Assign roles like NameNode, SecondaryNameNode, DataNode, ResourceManager, NodeManager, etc., to each node based on your cluster design.

4. Configure HDFS, YARN, and Other Services

- **HDFS Configuration:** Set parameters such as block size, replication factor in the `hdfs-site.xml`.
- **YARN Configuration:** Configure resource allocations and scheduler settings in `yarn-site.xml`.
- **Use Cloudera Manager Interface:** Make these configurations via the Cloudera Manager's web interface for ease and convenience.

5. Security Configuration

- **Set up Kerberos:**
  - Install and configure a Kerberos KDC (Key Distribution Center) server.
  - Configure each node in the cluster to use Kerberos for authentication.
  - Use Cloudera Manager's security wizard to enable Kerberos authentication.

Example Kerberos Configuration Commands:

```
sudo yum install krb5-server krb5-libs krb5-auth-dialog
sudo kadmin.local -q "addprinc -randkey root/admin"
```

6. Add Additional Services

- **Choose Services:** Depending on your needs, add services like Apache Spark, Kafka, etc.
- **Use "Add Service" Wizard in Cloudera Manager:** Follow the wizard to assign roles and configure each service.

7. Test and Validate

- **Run Test Jobs:**
  - For HDFS, test by creating directories and files.
  - For YARN, run sample MapReduce jobs.
  - For additional services like Spark, run sample Spark jobs.

Example HDFS Test Command:

```
hdfs dfs -mkdir /test
hdfs dfs -put localfile.txt /test
```

Example Spark Test Job:

```
spark-submit --class org.apache.spark.examples.SparkPi --master yarn /path/to/examples.jar 1
```

Configuring a Hadoop cluster with Cloudera Manager involves careful planning and execution. Each step needs to be performed meticulously to ensure the stability and efficiency of the cluster. This hands-on exercise provides a practical understanding of setting up a basic Hadoop cluster using Cloudera Manager, but real-world scenarios may require additional customization and scaling based on specific use cases and demands.