

The XXX project

----Environmental installation by skymind

(一)	OS install.....	2
(二)	Base environment install.....	6
(三)	Cmake install.....	6
(四)	Gcc install.....	7
(五)	JDK install.....	8
(六)	Maven install.....	8
(七)	Git install.....	9
(八)	NVIDIA Driver install.....	9
(九)	CUDA install.....	10
(十)	CUDNN install.....	11
(十一)	LIBND4J install.....	12
(十二)	ND4J install.....	12
(十三)	Datavec install.....	12
(十四)	DI4j install.....	13
(十五)	All install by script code(9、10、11、12)	13
(十六)	Scala install.....	13
(十七)	Hdfs install.....	13
(十八)	Spark install.....	16
(十九)	Test All.....	18

文件修订历史记录(Document revision history)			
Version	revision date	author	decription
1.0.0	July 26 th ,2017	Wang Feng	first draft
1.0.1	July 28 th ,2017	W F	Perform tasks according to document
1.0.2	August 6th,2017	W F	Improving document

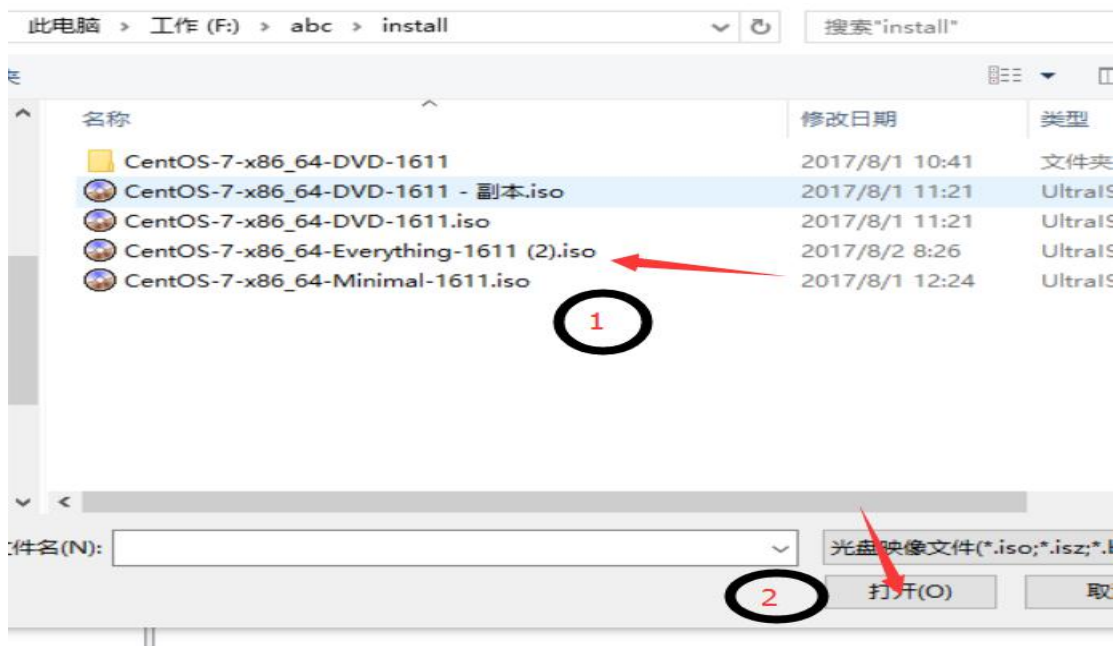
(一) OS install

- ① The operation system is cenos 7.3
- ② The os link: <https://www.centos.org/download/>

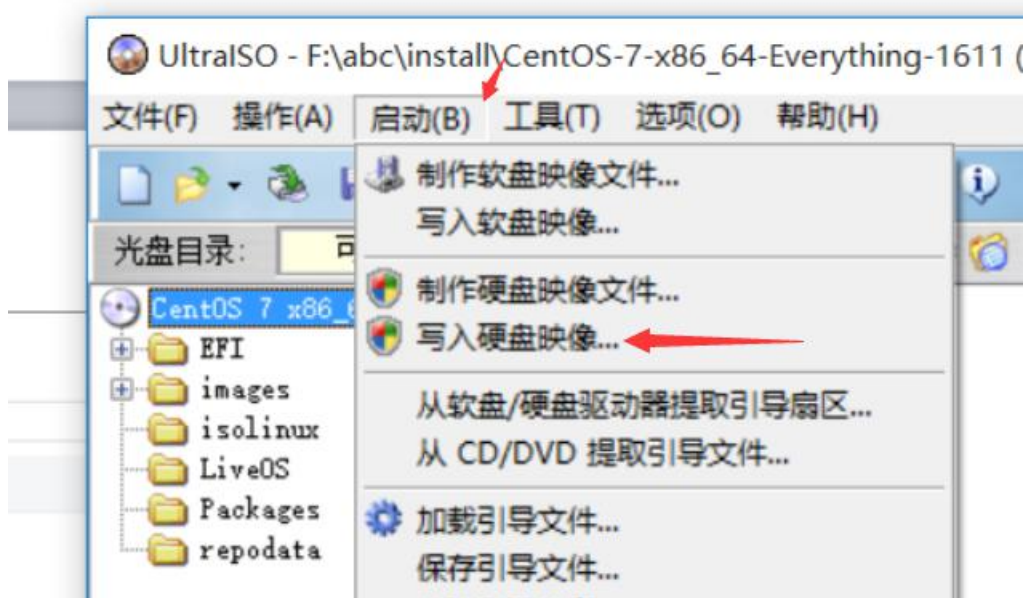


- ③ Download ultraISO, this is link: www.ezbsystems.com
poll code =====:
- ④ Making U disk

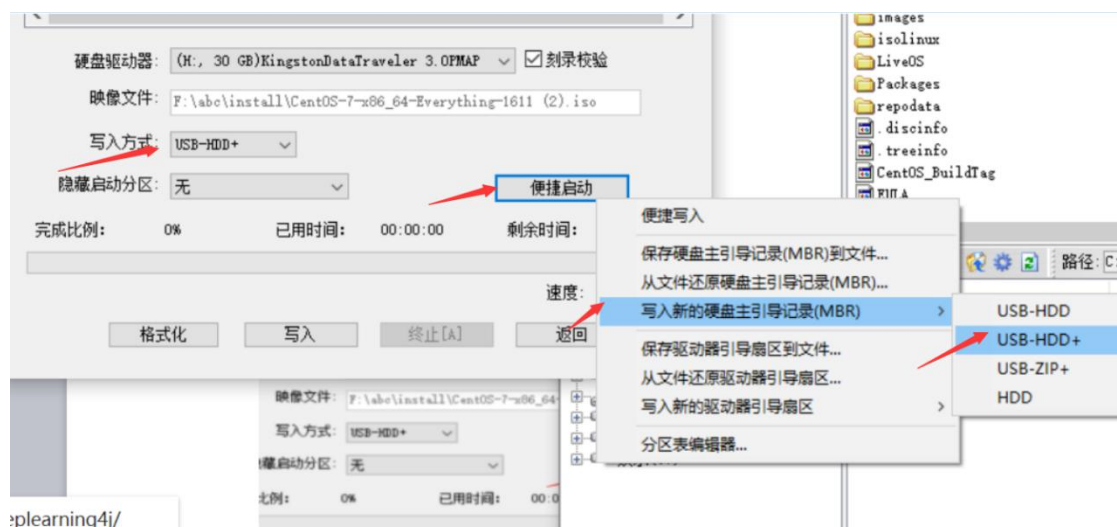
Opening ultraISO software, and then File->open->choice cenos-xxx.iso



Then click: run(启动)->write disk mirror image (写入硬盘映像), As I use the Chinese version software, so the translation into English may not match the vocabulary of the english software, please check it



And then click quickly start, choice write a new hard disk master boot record(MBR),click usb-hdd+

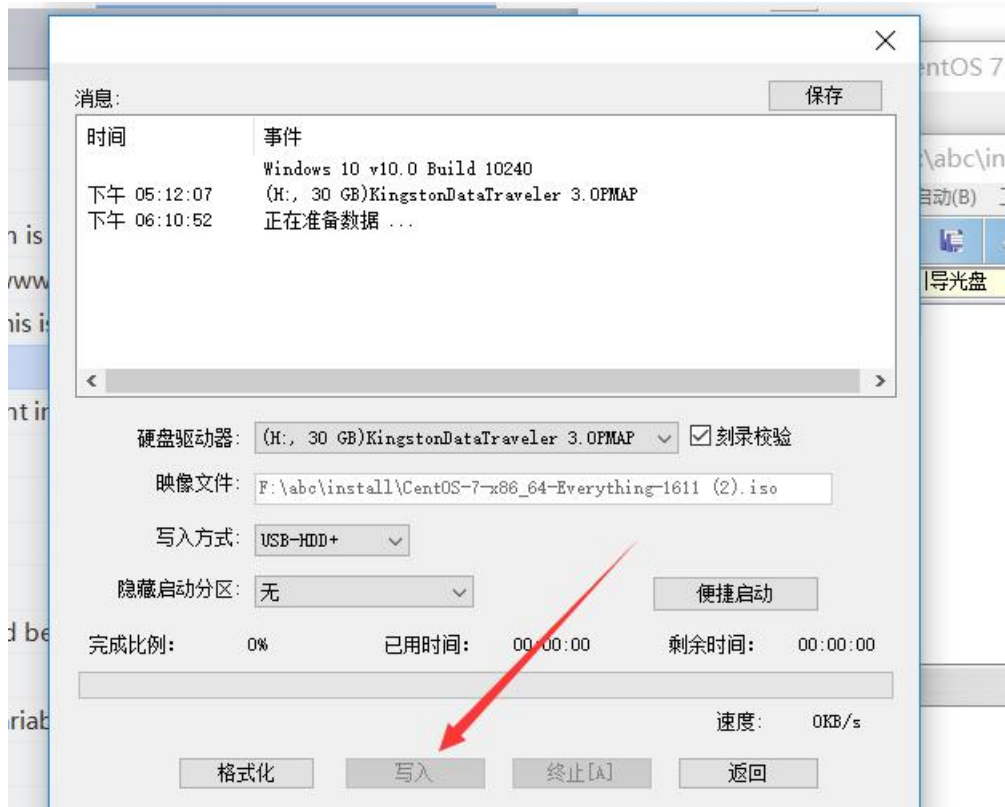


Then formatting





And then write :



Then ,Inserting the U disk to the machine that should be set USB U disk starting in the bios

(二) Base environment install

```

yum groupinstall 'Development Tools' or yum install "Development Tools"
yum install glibc-static libstdc++-static
yum install kernel-devel kernel-headers #gcc make
#yum install python-devel

```

(三) Cmake install

① Website

The office website is <https://cmake.org/>

wget https://cmake.org/files/v3.9/cmake-3.9.0-Linux-x86_64.tar.gz

② Whether the cmake had been installed

```
rpm -qa|grep cmake
```

cmake --version(if the version is less than 3.2,installed again)

If the cmake is exist, delete it :yum remove cmake

```

[root@d8 ~]# cmake -version
cmake version 2.8.12.2
[root@d8 ~]# rpm -qa|grep cmake
cmake-2.8.12.2-2.el7.x86_64
[root@d8 ~]# yum remove cmake

```

③ Install cmake

Download Source Distribution or Binary Distribution,here is binary distribution,so

```
tar -zxvf cmake-3.9.0-Linux-x86_64.tar.gz
```

```
mv cmake-3.9.0-Linux-x86_64 /usr
```

④ Setting environment variable

```
Vi /etc/profile
```

```
#cmake path
export CMAKE_HOME=/usr/cmake-3.9.0-Linux-x86_64
export PATH=$PATH:$CMAKE_HOME/bin
```

⑤ Test

```
[root@d10 usr]# cmake -version
cmake version 3.9.0

CMake suite maintained and supported by Kitware (kitware.com/cmake).
```

(四) Gcc install

Tip:the cuda 8 must compile by gcc that the version is less than 5

I had installed that is 4.9 version again(these is same installing way)

① website

The official website is <http://gcc.gnu.org/>

```
wget ftp://nl.mirror.babylon.network/gcc/releases/gcc-7.1.0/gcc-7.1.0.tar.gz
```

Other links:<https://gcc.gnu.org/mirrors.html>

② Whether the gcc had been installed

```
rpm -qa|grep gcc
```

If the gcc version is less than 4.9, and then install again, but old gcc may not be deleted

③ Install gcc

```
tar -jxvf gcc-7.1.0.tar.gz
```

```
cd gcc-7.1.0
```

```
./contrib/download_prerequisites
```

```
mkdir build
```

```
cd build
```

```
../configure --enable-checking=release --enable-languages=c,c++ --disable-multilib
```

```
make
```

```
make install
```

```
Shutdown -r now
```

④ Test

```
[root@d10 ~]# gcc -v
Using built-in specs.
COLLECT_GCC=gcc
COLLECT_LTO_WRAPPER=/usr/local/libexec/gcc/x86_64-pc-linux-gnu/7.1.0/lto-wrapper
Target: x86_64-pc-linux-gnu
Configured with: ../configure --enable-checking=release --enable-languages=c,c++ --disable-multilib
Thread model: posix
gcc version 7.1.0 (GCC)
```

⑤ deleted Residual gcc 4.8, as follow

```
[root@d10 libnd4j]# rpm -qa|grep gcc
```

```
gcc-gfortran-4.8.5-11.el7.x86_64
```

```
gcc-4.8.5-11.el7.x86_64
```

```
rpm -e xxx(gcc*),
```

⑥ Maybe do some check,as follow(but I didn't do)

⑦ Check the dynamic library

```
strings /usr/lib64/libstdc++.so.6 | grep GLIBC
```

If the GCC dynamic library is an old version of the show. These problems, because when upgrading GCC, DLL dynamic library generation does not replace the old version of GCC.

Handling problems:

Execute the following command, generates a search GCC compiled the latest library:

⑧ Find / -name "libstdc++.so*"

⑨ The latest libstdc++.so.6.0.21 library is copied to the /usr/lib64 directory:

```
/home/yl/gcc-build-4.9.2/x86_64-unknown-linux-gnu/libstdc++-v3/src/.libs/libstdc++.so.6.0.20 /usr/lib64/
```

⑩ After copying, to modify the default dynamic library system: soft connection reconstruction default library.switch to the /usr/lib64 directory:

```
cd /usr/lib64/
```

⑪ Delete the original soft connection:

```
rm -rf libstdc++.so.6
```

⑫ The default library soft connection to the latest library:

```
ln -s libstdc++.so.6.0.20 libstdc++.so.6
```

⑬ The default upgrade is complete. The dynamic re run the following command to check the dynamic library:

```
Strings /usr/lib64/libstdc++.so.6 | grep GLIBC
```

⑭ To complete the installation.

(五) JDK install

The version of the java is 1.8 and 64bit

Website:

<http://download.oracle.com/otn-pub/java/jdk/8u144-b01/090f390dda5b47b9b721c7dffa008135/jdk-8u144-linux-x64.tar.gz>

(六) Maven install

The version of the maven is 3.5.0

Website:

<http://mirrors.tuna.tsinghua.edu.cn/apache/maven/maven-3/3.5.0/binaries/apache-maven-3.5.0-bin.tar.gz>

```
tar -zxvf apache-maven-3.5.0-bin.tar.gz
```

```
mv
```


(七) Git install

① website

The office website is <https://git-scm.com/download/>

wget <https://github.com/Git/Git/archive/v2.3.0.tar.gz>

Other links: <https://www.kernel.org/pub/software/scm/git/>

② Whether the git had been installed

`rpm -qa|grep git`

If the git is exist, delete it ,yum remove git

③ Install git

`tar zxvf git-2.11.0.tar.gz`

`cd git-2.11.0`

`make prefix=/usr/local/git all`

`make prefix=/usr/local/git install`

`whereis git`

④ Setting enviroment variable

`Vi /etc/profile`

`#add export PATH=$PATH:/usr/local/git/bin`

⑤ Test

`git --version`

```
[root@d10 git]#
[root@d10 git]# git --version
git version 2.9.4
[root@d10 git]#
```

(八) NVIDIA Driver install

① Check graphics card type

`lspci | grep VGA` OR `lspci | grep 3D`

② Download driver

LINUX RHEL 7



③ Authorizing driver software

`chmod +x NVIDIA-Linux-x86_64-340.32.run`

④ systemctl stop gdm or init3

⑤ lsmod | grep nouveau

⑥ vim /etc/modprobe.d/blacklist.conf /*Nouveau joined to black list*/

blacklist nouveau

⑦ And then

```
/*bak initramfs*/
```

```
# mv /boot/initramfs-$(uname -r).img /boot/initramfs-$(uname -r).img.bak
```

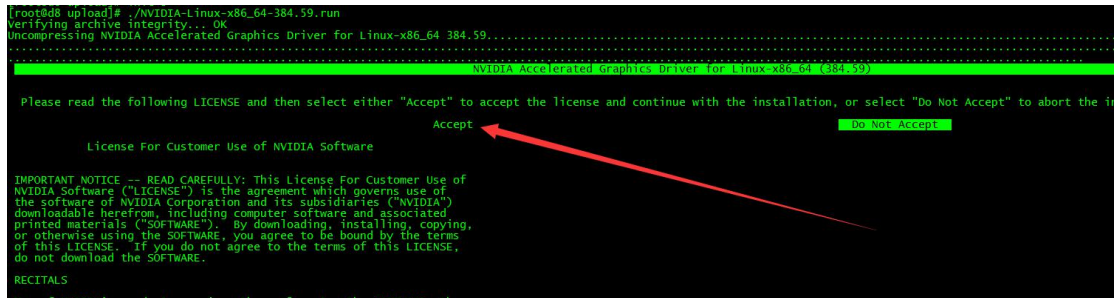
```
/*rebuild initramfs*/
```

```
# dracut -v /boot/initramfs-$(uname -r).img $(uname -r)
```

```
# systemctl isolate multi-user.target /*set (开机启动)到 3 层多用户模式*/
```

```
# reboot or shutdown -r now
```

⑧ Running driver software



```
[root@8 upload]# ./NVIDIA-Linux-x86_64-384.59.run
Verifying archive integrity... OK
Uncompressing NVIDIA Accelerated Graphics Driver for Linux-x86_64 384.59.....
NVIDIA Accelerated Graphics Driver for Linux-x86_64 (384.59)

Please read the following LICENSE and then select either "Accept" to accept the license and continue with the installation, or select "Do Not Accept" to abort the installation.

License For Customer Use of NVIDIA Software

IMPORTANT NOTICE -- READ CAREFULLY: This License For Customer Use of
NVIDIA Software ("LICENSE") is the agreement which governs use of
the software of NVIDIA Corporation and its subsidiaries ("NVIDIA")
downloadable herefrom, including computer software and associated
printed materials ("SOFTWARE"). By downloading, installing, copying,
or otherwise using the SOFTWARE, you agree to be bound by the terms
of this LICENSE. If you do not agree to the terms of this LICENSE,
do not download the SOFTWARE.

RECITALS
```

(九) CUDA install

Website :

https://developer.nvidia.com/compute/cuda/8.0/Prod2/local_installers/cuda_8.0.61_375.26_

linux-run

Install progress:referring official manual operation

Test:

```
./NVIDIA_CUDA-8.0_Samples/bin/x86_64/linux/release/deviceQuery
```

① website

The office website is <http://www.nvidia.com>

```
wget https://developer.nvidia.com/compute/cuda/8.0/Prod2/local_installers/cuda_8.0.61_3
```

75.26_linux-run

② Install cuda

Graphics card is Matrox, does not support CUDA, stop installation

③ Set enviroment

```
Vi /etc/profile
```

```
#cuda
export CUDA_HOME=/usr/local/cuda-8.0
export PATH=$PATH:$CUDA_HOME/bin
export LD_LIBRARY_PATH=$CUDA_HOME/lib64:$CUDA_HOME/extras/CUPTI/lib64:$LD_LIBRARY_PATH
```

④ Test

```
[root@d10 d14j-general-benchmark]# nvcc -V
nvcc: NVIDIA (R) Cuda compiler driver
Copyright (c) 2005-2016 NVIDIA Corporation
Built on Tue Jan 10 13:22:03 CST 2017
Cuda compilation tools, release 8.0, V8.0.61
[root@d10 d14j-general-benchmark]# nvidia-smi
```

NVIDIA-SMI 384.59		Driver Version: 384.59	
GPU	Name	Persistence-M	Bus-Id
Fan	Temp	Pwr:Usage/Cap	Memory-Usage
0	Tesla K40m	off	00000000:03:00.0
N/A	31C	64W / 235W	0MiB / 11439MiB
			83%
			Default

```

Processes:
GPU      PID Type Process name
-----
No running processes found

```

(+) CUDNN install

TIP: in fact, we should download cudnnv6.0

① Download cudnn

→ <https://developer.nvidia.com/rdp/cudnn-download>

Please check your framework documentation to determine the recommended version. If you are using cuDNN with a Pascal GPU, version 5 or later is required.

For access to cuDNN user guide, API reference and release notes, please visit the

- Download cuDNN v7.0 (August 3, 2017), for CUDA 9.0 RC
- Download cuDNN v7.0 (August 3, 2017), for CUDA 8.0
- cuDNN for IBM POWER8 will be available soon
- cuDNN User Guide
- cuDNN Install Guide
- cuDNN Release Notes
- cuDNN v7.0 Library for Linux
- cuDNN v7.0 Library for Windows 7

② Install

```
tar -xvzf cudnn-8.0-linux-x64-v6.0.tgz
$cp -P cuda/include/cudnn.h /usr/local/cuda-8.0/include
$ cp -P cuda/lib64/libcudnn* /usr/local/cuda-8.0/lib64
$ chmod a+r /usr/local/cuda-8.0/include/cudnn.h /usr/local/cuda-8.0/lib64/libcudnn*
```

```
[root@d10 upload]# tar -zxvf cudnn-8.0-linux-x64-v6.0.tgz
cuda/include/cudnn.h
cuda/lib64/libcudnn.so
cuda/lib64/libcudnn.so.6
cuda/lib64/libcudnn.so.6.0.21
cuda/lib64/libcudnn_static.a
[root@d10 upload]# cp -P cuda/include/cudnn.h /usr/local/cuda-8.0/include
[root@d10 upload]# cp -P cuda/lib64/libcudnn* /usr/local/cuda-8.0/lib64
[root@d10 upload]# chmod a+r /usr/local/cuda-8.0/include/cudnn.h /usr/local/cuda-8.0/lib64/libcudnn*
[root@d10 upload]#
```

(十一) LIBND4J install

```
git clone https://github.com/deeplearning4j/libnd4j.gitcd libnd4j

./buildnativeoperations.sh

# and/or when using GPU

# ./buildnativeoperations.sh -c cuda -cc INSERT_YOUR_DEVICE_ARCH_HERE

# i.e. if you have GTX 1070 device, use -cc 61

export LIBND4J_HOME=`pwd`

cd ..
```

(十二) ND4J install

git clone https://github.com/deeplearning4j/nd4j

```
mvn clean install -DskipTests -Dmaven.javadoc.skip=true -pl
'!:nd4j-cuda-7.5,!:nd4j-cuda-7.5-platform,!:nd4j-tests'## More recent 0.6.1 version of the above command

mvn clean install -DskipTests -Dmaven.javadoc.skip=true -pl
'!:nd4j-cuda-8.0,!:nd4j-cuda-8.0-platform,!:nd4j-tests'

# or when using GPU# mvn clean install -DskipTests -Dmaven.javadoc.skip=true -pl '!:nd4j-tests'
```

(十三) Datavec install

```
# build and install datavec

git clone https://github.com/deeplearning4j/datavec.gitcd datavecif [ "$SCALAV" == "" ]; then

    bash buildmultiplescalaversions.sh clean install -DskipTests -Dmaven.javadoc.skip=trueelse

    mvn clean install -DskipTests -Dmaven.javadoc.skip=true -Dscala.binary.version=$SCALAV
-Dscala.version=$SCALAFi
```

(十四) DL4j install

```
# 构建并安装 deeplearning4j
git clone https://github.com/deeplearning4j/deeplearning4j.git
cd deeplearning4j
mvn clean install -DskipTests -Dmaven.javadoc.skip=true
# 或者为多个 Scala 版本进行交叉编译
# ./buildmultiplescalaversions.sh clean install -DskipTests -Dmaven.javadoc.skip=true
## 如果跳过了 CUDA, 可能需要将
## -pl '!deeplearning4j-cuda-8.0'
## 添加至 mvn clean install 命令, 避免构建脚本寻找 cuda 库
```

(十五) All install by script code(9、10、11、12)

Website:

<https://github.com/deeplearning4j/deeplearning4j/blob/master/build-dl4j-stack.sh>

./build-dl4j-stack.sh //for cpu

./build-dl4j-stack.sh -c cuda //for gpu

Other documents:referring <https://deeplearning4j.org/buildinglocally>

(十六) Scala install

- ① Download spark

<https://downloads.lightbend.com/scala/2.12.2/scala-2.12.2.tgz>

- ② Install spark

Tar -zxvf scala-2.12.2.tgz

Mv scala-2.12.2 /usr

Vi /etc/profile

```
#scala
export SCALA_HOME=/usr/scala-2.12.2
export PATH=$PATH:$SCALA_HOME/bin
"/etc/profile" 108L, 2542C written
[root@d8 upload]# source /etc/profile
```

- ③ Test

```
[root@d8 upload]# scala -version
Scala code runner version 2.12.2 -- Copyright 2002-2017, LAMP/EPFL and Lightbend, Inc.
```

(十七) Hdfs install

- ① Download hadoop

www.apache.org/dyn/closer.cgi/hadoop/common/hadoop-2.8.0/hadoop-2.8.0.tar.gz

Home » Dyn About Projects People Get Inv




We suggest the following mirror site for your download:

<http://mirrors.tuna.tsinghua.edu.cn/apache/hadoop/common/hadoop-2.8.0/hadoop-2.8.0.tar.gz>

Other mirror sites are suggested below. Please use the backup mirrors only to download PGP and MD5 signatures to verify working.

Or

mirror.bit.edu.cn/apache/hadoop/common/

Index of /apache/hadoop/common

Name	Last modified	Size	Description
 Parent Directory		-	
 current/	08-Jul-2017 01:58	-	
 hadoop-1.2.1/	20-Jun-2017 18:08	-	
 hadoop-2.6.1/	20-Jun-2017 18:13	-	
 hadoop-2.6.2/	20-Jun-2017 18:16	-	
 hadoop-2.6.3/	20-Jun-2017 18:18	-	
 hadoop-2.6.4/	20-Jun-2017 18:21	-	
 hadoop-2.6.5/	20-Jun-2017 18:21	-	
 hadoop-2.7.0/	20-Jun-2017 18:13	-	
 hadoop-2.7.1/	20-Jun-2017 18:16	-	
 hadoop-2.7.2/	20-Jun-2017 18:18	-	
 hadoop-2.7.3/	20-Jun-2017 18:18	-	
 hadoop-2.7.4/	06-Aug-2017 16:16	-	
 hadoop-2.8.0/	20-Jun-2017 18:16	-	
 hadoop-2.8.1/	20-Jun-2017 02:02	-	

② Ready enviroment for hadoop

```
ssh-keygen -t rsa -P "
```



```
[root@d8 .ssh]# ssh-keygen -t rsa -P ''
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa):
/root/.ssh/id_rsa already exists.
Overwrite (y/n)? y
Your identification has been saved in /root/.ssh/id_rsa.
Your public key has been saved in /root/.ssh/id_rsa.pub.
The key fingerprint is:
45:20:03:1a:fd:0b:70:7e:46:98:a4:fc:84:74:2d:67 root@d8.cecun.com
The key's randomart image is:
+--[ RSA 2048 ]-----+
|      oo+=o ...      |
|      o.** Eo .       |
|      =+. *          |
|      oo + .         |
|      .+ .S          |
|                      |
+-----+
[root@d8 .ssh]# scp id_rsa.pub root@d10.cecun.com:/home
Warning: Permanently added 'd10.cecun.com' (ECDSA) to the list of known hosts.
Warning: the ECDSA host key for 'd10.cecun.com' differs from the key for the IP address '172.16.192.20'
Offering key for IP in /root/.ssh/known_hosts:1
root@d10.cecun.com's password:
id_rsa.pub
[root@d8 home]# cat id_rsa.pub >> ~/.ssh/authorized_keys
[root@d8 .ssh]# scp authorized_keys root@d10.cecun.com:~/.ssh
[root@d10 home]# ssh d10.cecun.com
Last login: Mon Aug 7 14:35:00 2017 from 172.16.0
[root@d8 ~]# exit
logout
Connection to d10.cecun.com closed.
[root@d10 home]#
```

- ③ Setting configure file,as follow

Core-site.xml,hdfs-site.xml,yarn-site.xml.mapred-site.xml, hadoop-env.sh

- ④ Runing commad:hadoop namenode -format

```
[root@d10 bin]# ./hadoop namenode -format
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.
17/08/07 16:08:26 INFO namenode.NameNode: STARTUP_MSG:
/*****
STARTUP_MSG: Starting NameNode
STARTUP_MSG: user = root
STARTUP_MSG: host = 172.16.192.20
STARTUP_MSG: args = [-format]
STARTUP_MSG: version = 2.8.0
STARTUP_MSG: classpath = /usr/local/hadoop-2.8.0/etc/hadoop:/usr/local/hadoop-2.8.0/sh
/lib/apacheds-i18n-2.0.0-M15.jar:/usr/local/hadoop-2.8.0/share/hadoop/common/lib/apached
sn1-api-1.0.0-M20.jar:/usr/local/hadoop-2.8.0/share/hadoop/common/lib/api-util-1.0.0-M20
.8.0/share/hadoop/common/lib/avro-1.7.4.jar:/usr/local/hadoop-2.8.0/share/hadoop/common/
ons-beanutils-core-1.8.0.jar:/usr/local/hadoop-2.8.0/share/hadoop/common/lib/commons-cli
local/hadoop-2.8.0/share/hadoop/common/lib/commons-collections-3.2.2.jar:/usr/local/hadoo
share/hadoop/common/lib/commons-configuration-1.6.jar:/usr/local/hadoop-2.8.0/share/hadoo
ib/commons-io-2.4.jar:/usr/local/hadoop-2.8.0/share/hadoop/common/lib/commons-lang-2.6.j
cal/hadoop-2.8.0/share/hadoop/common/lib/commons-math3-3.1.1.jar:/usr/local/hadoop-2.8.0
mmon/lib/curator-client-2.7.1.jar:/usr/local/hadoop-2.8.0/share/hadoop/common/lib/curator
s-2.7.1.jar:/usr/local/hadoop-2.8.0/share/hadoop/common/lib/qson-2.2.4.jar:/usr/local/ha
```

- ⑤ Set enviroment :vi /etc/profile

```
#hdfs
export HADOOP_HOME=/usr/local/hadoop-2.8.0
export PATH=$PATH:$HADOOP_HOME/bin:$HADOOP_HOME/sbin
export HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/lib/native
export HADOOP_OPTS="-Djava.library.path=$HADOOP_HOME/lib"
```

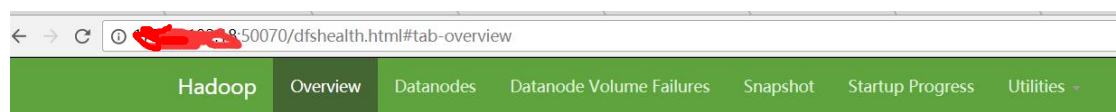
- ⑥ Start hadoop

```
[root@d8 sbin]# jps
16820 Jps
```

./sbin/start-all.sh OR .sbin/start-dfs.sh .sbin/start-yarn.sh

```
[root@d8 sbin]# ./start-dfs.sh
Starting namenodes on [d8.cecun.com]
d8.cecun.com: starting namenode, logging to /usr/local/hadoop-2.8.0/logs/hadoop-root-namenode-d8.cecun.com.out
localhost: starting datanode, logging to /usr/local/hadoop-2.8.0/logs/hadoop-root-datanode-d8.cecun.com.out
Starting secondary namenodes [d8.cecun.com]
d8.cecun.com: starting secondarynamenode, logging to /usr/local/hadoop-2.8.0/logs/hadoop-root-secondarynamenode-d8.cecun.com.out
[root@d8 sbin]# jps
17778 Jps
17480 SecondaryNameNode
17194 DataNode
17021 NameNode
[root@d8 sbin]# ./start-yarn.sh
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop-2.8.0/logs/yarn-root-resourcemanager-d8.cecun.com.out
localhost: starting nodemanager, logging to /usr/local/hadoop-2.8.0/logs/yarn-root-nodemanager-d8.cecun.com.out
[root@d8 sbin]# AC
[root@d8 sbin]# jps
17860 ResourceManager
18404 Jps
18101 NodeManager
17480 SecondaryNameNode
17194 DataNode
17021 NameNode
```

⑦ browsing web



Overview 'd8.cecun.com:9000' (active)

Started:	Mon Aug 07 16:24:47 +0800 2017
Version:	2.8.0, r91f2b7a13d1e97be65db92ddabc627cc29ac0009
Compiled:	Fri Mar 17 12:12:00 +0800 2017 by jdu from branch-2.8.0
Cluster ID:	CID-c0d2d708-69ff-4185-980f-685eae75606e
Block Pool ID:	BP-1718771471-172.16.192.18-1502094204565

Summary

Security is off.

(十八) Spark install

① Download spark

Download Apache Spark™

1. Choose a Spark release:
2. Choose a package type:
3. Choose a download type:
4. Download Spark: [spark-2.2.0-bin-hadoop2.7.tgz](#)
5. Verify this release using the [2.2.0 signatures and checksums](#) and [project release KEYS](#).

Note: Starting version 2.0, Spark is built with Scala 2.11 by default. Scala 2.10 users should download the Spark source package and build with Scala 2.10 support.

④ Install spark


```
[root@d10 upload]# tar -zxvf spark-2.2.0-bin-hadoop2.7.tgz
```

```
#spark path
export SPARK_HOME=/usr/spark-2.2.0-bin-hadoop2.7
export PATH=$PATH:$SPARK_HOME/bin
"/etc/profile" 98L, 2314C written
```

Modify spark-config.sh(adding words that's pointed by red arrow)

```
# Add the Pyspark classes to the PYTHONPATH:
if [ -z "${PYSPARK_PYTHONPATH_SET}" ]; then
  export PYTHONPATH="${SPARK_HOME}/python:${PYTHONPATH}"
  export PYTHONPATH="${SPARK_HOME}/python/lib/py4j-0.10.4
  export PYSPARK_PYTHONPATH_SET=1
fi
export JAVA_HOME=/usr/jdk1.8.0_144
```

⑤ Test

```
[root@d8 upload]# ./spark-shell
-bash: ./spark-shell: No such file or directory
[root@d8 upload]# cd /usr/spark-2.2.0-bin-hadoop2.7/bin/
[root@d8 bin]# ./spark-shell
Using Spark's default log4j profile: org/apache/spark/log4j-defaults.properties
Setting default log level to "WARN".
To adjust logging level use sc.setLogLevel(newLevel). For SparkR, use setLogLevel(newLevel).
17/08/07 13:28:49 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-j
17/08/07 13:28:55 WARN ObjectStore: Version information not found in metastore. hive.metastore.schema.verification
17/08/07 13:28:55 WARN ObjectStore: Failed to get database default, returning NoSuchObjectException
17/08/07 13:28:56 WARN ObjectStore: Failed to get database global_temp, returning NoSuchObjectException
Spark context Web UI available at http://172.16.192.18:4040
Spark context available as 'sc' (master = local[*], app id = local-1502083730737).
Spark session available as 'spark'.
Welcome to

  _ _ _ _ _
 / _ _ _ _ \   version 2.2.0
( _ _ _ _ _ )
  _ _ _ _ _

Using Scala version 2.11.8 (Java HotSpot(TM) 64-Bit Server VM, Java 1.8.0_144)
Type in expressions to have them evaluated.
Type :help for more information.

scala>
```

Spark Master at spark://**[redacted]**:7077

URL: spark://**[redacted]**:7077
 REST URL: spark://**[redacted]**:6066 (cluster mode)
 Alive Workers: 1
 Cores in use: 32 Total, 0 Used
 Memory in use: 124.6 GB Total, 0.0 B Used
 Applications: 0 Running, 0 Completed
 Drivers: 0 Running, 0 Completed
 Status: ALIVE

Workers

Worker Id	Address	State	Cores	Memory
worker-20170814000616- [redacted]	[redacted]	ALIVE	32 (0 Used)	124.6 GB (0.0 B Used)
worker-20170814000616- [redacted]	[redacted]	DEAD	32 (0 Used)	124.6 GB (0.0 B Used)

Running Applications

Application ID	Name	Cores	Memory per Executor	Submitted Time	User	State	Duration
----------------	------	-------	---------------------	----------------	------	-------	----------

Completed Applications

Application ID	Name	Cores	Memory per Executor	Submitted Time	User	State	Duration
----------------	------	-------	---------------------	----------------	------	-------	----------

(十九) Test All

```
[INFO] Finished at: 2017-08-07T12:03:03+08:00
[INFO] Final Memory: 31M/1544M
[INFO] -----
[root@d8 dl4j-examples]# mvn exec:java -Dexec:mainClass="org.deeplearning
[INFO] Scanning for projects...
[INFO]
[INFO] -----
[INFO] Building DeepLearning4j Examples 0.9.0
[INFO] -----
[INFO] --- exec-maven-plugin:1.4.0:java (default-cli) @ dl4j-examples ---
o.d.e.c.AnimalsClassification - Load data....
o.d.e.c.AnimalsClassification - Build model....
o.n.l.f.Nd4jBackend - Loaded [JCublasBackend] backend
o.n.n.NativeOpsHolder - Number of threads used for NativeOps: 32
o.n.l.a.o.e.DefaultOpExecutioner - Backend used: [CUDA]; OS: [Linux]
o.n.l.a.o.e.DefaultOpExecutioner - Cores: [32]; Memory: [26.7GB];
o.n.l.a.o.e.DefaultOpExecutioner - Blas vendor: [CUBLAS]
o.n.l.j.o.e.CudaExecutioner - Device name: [Tesla K40m]; CC: [3.5]; Total
o.d.n.m.MultiLayerNetwork - Starting MultiLayerNetwork with WorkspaceMode
o.d.e.c.AnimalsClassification - Train model....
o.n.n.Nd4jBlas - Number of threads used for BLAS: 0
o.d.d.i.MultipleEpochsIterator - Epoch 1, number of batches completed 3
o.d.o.l.ScoreIterationListener - Score at iteration 0 is 1.40197558831570
o.d.o.l.ScoreIterationListener - Score at iteration 1 is 1.56358739585684
o.d.o.l.ScoreIterationListener - Score at iteration 2 is 1.53983928861981
o.d.d.i.MultipleEpochsIterator - Epoch 2, number of batches completed 3
o.d.o.l.ScoreIterationListener - Score at iteration 3 is 1.50972248915701
o.d.o.l.ScoreIterationListener - Score at iteration 4 is 1.49426171931529
[INFO] Building DeepLearning4j Examples 0.9.0
[INFO] -----
[INFO] --- exec-maven-plugin:1.4.0:java (default-cli) @ dl4j-examples ---
o.d.e.c.AnimalsClassification - Load data....
o.d.e.c.AnimalsClassification - Build model....
o.n.l.f.Nd4jBackend - Loaded [CpuBackend] backend
o.n.n.NativeOpsHolder - Number of threads used for NativeOps: 8
o.n.n.Nd4jBlas - Number of threads used for BLAS: 8
o.n.l.a.o.e.DefaultOpExecutioner - Backend used: [CPU]; OS: [Linux]
o.n.l.a.o.e.DefaultOpExecutioner - Cores: [32]; Memory: [26.7GB];
o.n.l.a.o.e.DefaultOpExecutioner - Blas vendor: [OPENBLAS]
o.d.n.m.MultiLayerNetwork - Starting MultiLayerNetwork with WorkspaceM
o.d.e.c.AnimalsClassification - Train model....
o.d.d.i.MultipleEpochsIterator - Epoch 1, number of batches completed
```