

How to Install ONOS

Open Network Operating System (ONOS) is an open source network operating system for software-defined networks (SDN). Intended to run on white box switches, ONOS is targeted at mission critical networks, including service providers. It provides benefits including:

- Virtually unlimited control plane scalability
- High performance, suitable for large network operators
- Mission-critical level of resiliency
- Support for legacy devices
- Next-generation device support and control for devices that support OpenFlow and P4

ONOS is intended to help service providers migrate their existing networks to white box switches, thus lowering CapEx and OpEx. It was developed in conjunction with service providers including AT&T and NTT Communications.

This document describes how to install ONOS.

INSTALLING ONOS :-

1) INSTALL GIT CORE

```
$ sudo apt-get install git-core
```

2) ONOS REQUIREMENTS

System requirements

- 2GB or more RAM (I personally recommend at least 4GB)
- 2 or more processors
- Ubuntu 14.04 LTS or 16.04 LTS (Checked with both distros)

3) INSTALL MAVEN AND KARAF

Software requirements

i) Maven

Install Maven 3.3.9 on your Applications directory

```
$ cd ~
```

```
$ mkdir Applications
```

```
$ wget http://archive.apache.org/dist/maven/maven-3/3.3.9/binaries/apache-maven-3.3.9-bin.tar.gz
```

```
$ tar -zxvf apache-maven-3.3.9-bin.tar.gz -C ../Applications/
```

NOTE: Although ONOS has been migrated to Buck, maven was used in earlier releases.

ii) Karaf

Install Karaf 3.0.5 on your Applications directory

```
$ cd ~
```

```
$ cd Applications
```

```
$ wget http://archive.apache.org/dist/karaf/3.0.5/apache-karaf-3.0.5.tar.gz
```

```
$ tar -zxvf apache-karaf-3.0.5.tar.gz -C ../Applications/
```

4) INSTALL JAVA 8 and set JAVA_HOME

i) Java 8

```
$ sudo apt-get install software-properties-common -y
```

```
$ sudo add-apt-repository ppa:webupd8team/java -y
```

```
$ sudo apt-get update
```

```
$ sudo apt-get install oracle-java8-installer oracle-java8-set-default -y
```

ii) SET YOUR JAVA_HOME

```
$ export JAVA_HOME=/usr/lib/jvm/java-8-oracle
```

iii) VERIFY IT WITH FOLLOWING COMMAND

```
$ env | grep JAVA_HOME
```

```
JAVA_HOME=/usr/lib/jvm/java-8-oracle
```

5) DOWNLOAD THE LATEST ONOS

```
$ git clone https://gerrit.onosproject.org/onos
```

```
$ cd onos
```

```
$ git checkout master
```

6) ENVIRONMENTAL VARIABLES

The ONOS source comes with a sample `bash_profile` that can set these variables for you.

i) Edit `~/.bashrc`

```
$ nano ~/.bashrc
```

ii) Add the following line at the end

```
. ~/onos/tools/dev/bash_profile
```

iii) Reload `.bashrc` or log out and log in again to apply the changes

```
. ~/.bashrc
```

iv) Once you run the above command, you will see in the output of the `env` command that several new variables, such as `ONOS_ROOT`, `MAVEN`, and `KARAF_ROOT`, have been set.

```
$ env | grep ONOS_ROOT
```

```
ONOS_ROOT=/Users/nirmalkaria/onos
```

```
$ env | grep MAVEN
```

```
MAVEN=/Users/nirmalkaria/Applications/apache-maven-3.3.9
```

```
$ env | grep KARAF_ROOT
```

```
KARAF_ROOT=/Users/nirmalkaria/Applications/apache-karaf-3.0.8
```

7) BUILD AND DEPLOY ONOS

i) Edit `~/Applications/apache-karaf-3.0.5/etc/org.apache.karaf.features.cfg` file by appending the following line to `featuresRepositories`:

```
$ nano ~/Applications/apache-karaf-3.0.5/etc/org.apache.karaf.features.cfg
```

ii) Locate the `featuresRepositories` and append this line (will need a comma before appending the text to separate from the previous value)

```
mvn:org.onosproject/onos-features/1.10.0-SNAPSHOT/xml/features
```

8) BUILD ONOS WITH MAVEN

```
$ cd ~/onos
```

```
$ mvn clean install or use the alias 'mci'
```

```

[INFO] onos-network-troubleshoot ..... SUCCESS [ 0.336 s]
[INFO] onos-network-troubleshoot-api ..... SUCCESS [ 2.243 s]
[INFO] onos-network-troubleshoot-cli ..... SUCCESS [ 0.748 s]
[INFO] onos-network-troubleshoot-core ..... SUCCESS [ 3.087 s]
[INFO] onos-network-troubleshoot-app ..... SUCCESS [ 0.372 s]
[INFO] onos-incubator-core ..... SUCCESS [ 0.762 s]
[INFO] onos-incubator-grpc-dependencies ..... SUCCESS [ 0.748 s]
[INFO] onos-incubator-rpc ..... SUCCESS [ 2.589 s]
[INFO] onos-incubator-grpc ..... SUCCESS [ 0.685 s]
[INFO] onos-incubator-rpc-grpc ..... SUCCESS [ 10.901 s]
[INFO] onos-incubator-protobuf-nb ..... SUCCESS [ 1.448 s]
[INFO] onos-incubator-rpc-nb ..... SUCCESS [ 0.871 s]
[INFO] onos-features ..... SUCCESS [ 0.494 s]
[INFO] onos-archetypes ..... SUCCESS [ 0.072 s]
[INFO] onos-api-archetype ..... SUCCESS [ 1.108 s]
[INFO] onos-bundle-archetype ..... SUCCESS [ 0.059 s]
[INFO] onos-cli-archetype ..... SUCCESS [ 0.050 s]
[INFO] onos-rest-archetype ..... SUCCESS [ 0.043 s]
[INFO] onos-ui-archetype ..... SUCCESS [ 0.070 s]
[INFO] onos-uitab-archetype ..... SUCCESS [ 0.082 s]
[INFO] onos-uitopo-archetype ..... SUCCESS [ 0.091 s]
[INFO] onos-branding ..... SUCCESS [ 0.671 s]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 18:39 min
[INFO] Finished at: 2017-03-19T22:02:15-07:00
[INFO] Final Memory: 318M/994M
[INFO] -----

```

9) Selecting IP address

Export ONOS4_IP or ONOS_NIC environment variables with the IP address prefix to configure ONOS clustering component. This IP address is the ip address of the controller.

```
$ export ONOS_IP=10.1.9.255
```

```
$ export ONOS_NIC=10.1.9.*
```

10) Selecting ONOS apps to activate

To configure ONOS with a set of applications that should be automatically activated on startup, use the ONOS_APPS environment variable as follows:

```
$ export ONOS_APPS=drivers,openflow,proxyarp,mobility,fwd
```

11) Starting ONOS

```
$ ok clean
Creating local cluster configs for IP 10.1.9.247...
Setting up hazelcast.xml for subnet 10.1.9.*...
Staging builtin apps...
Customizing apps to be auto-activated: drivers,openflow,proxyarp,mobility,fwd...
Welcome to Open Network Operating System (ONOS)!
```

```
  _ _ _ _ _
 / _ V | / _ V _ /
 // _ / // _ \ \
 \ _ / | \ _ / _ /
```

```
Hit '<tab>' for a list of available commands
and '[cmd] --help' for help on a specific command.
Hit '<ctrl-d>' or type 'system:shutdown' or 'logout' to shutdown ONOS.
onos>
```

At this point, typing `help onos` at the prompt should still bring up a list of available commands. Pressing **Ctrl-D** or `logout` will exit the CLI.

METHOD 2

BUILDING ONOS USING BUCK

1) INSTALL JAVA 8 and set JAVA_HOME

i) Java 8

```
$ sudo apt-get install software-properties-common -y
$ sudo add-apt-repository ppa:webupd8team/java -y
$ sudo apt-get update
$ sudo apt-get install oracle-java8-installer oracle-java8-set-default -y
```

ii) SET YOUR JAVA_HOME

```
$ export JAVA_HOME=/usr/lib/jvm/java-8-oracle
```

iii) Verify it with the following command

```
$ env | grep JAVA_HOME
JAVA_HOME=/usr/lib/jvm/java-8-oracle
```

2) Download latest ONOS

```
$ git clone https://gerrit.onosproject.org/onos
$ cd onos
$ git checkout master
```

3) Development Environment Setup

The `ONOS_ROOT` environment variable is exported in the shell profile (`.bash_aliases`, `.profile`, etc.)

```
$ export ONOS_ROOT=~/.onos
$ source $ONOS_ROOT/tools/dev/bash_profile
```

4) Build with Buck

```
$ sudo apt-get install zip unzip
```

```
$ cd $ONOS_ROOT
```

```
$ tools/build/onos-buck build onos --show-output
```

```
Vineels-MacBook-Air:onos nirmalkaria$ tools/build/onos-buck build onos --show-output
```

```
Not using buckd because NO_BUCKD is set.
```

```
[-] PROCESSING BUCK FILES...FINISHED 5.2s [100%] 🐛 New buck daemon
```

```
[+] DOWNLOADING... (0.00 B/S, TOTAL: 0.00 B, 0 Artifacts)
```

```
[+] BUILDING...14.3s [15%] (208/209 JOBS, 1 UPDATED, 1 [0.5%] CACHE MISS)
```

```
|=> IDLE
```

```
|=> IDLE
```

```
|=> //tools/package:onos-package... 1.5s (checking local cache)
```

```
|=> IDLE
```

```
The outputs are:
```

```
//tools/package:onos-package buck-out/gen/tools/package/onos-package/onos.tar.gz
```

ii) To execute ONOS unit tests,

```
$ tools/build/onos-buck test
```

```
Vineels-MacBook-Air:onos nirmalkaria$ tools/build/onos-buck test
Not using buckd because NO_BUCKD is set.
[-] PROCESSING BUCK FILES...FINISHED 1.0s [100%] 🐛 New buck daemon
[-] PROCESSING BUCK FILES...FINISHED 1.0s [100%] 🐛 New buck daemon
[-] DOWNLOADING... (0.00 B/S AVG, TOTAL: 0.00 B, 0 Artifacts)
[-] BUILDING...FINISHED 2m15.7s [100%] (1487/1487 JOBS, 1060 UPDATED, 767 [51.6%]
[-] TESTING...FINISHED 3m40.5s (5378 PASS/0 FAIL)
RESULTS FOR ALL TESTS
PASS 0.1s 1 Passed 0 Skipped 0 Failed //apps/acl:onos-apps-acl-checkstyle-files-checkstyle
NOTESTS <100ms 0 Passed 0 Skipped 0 Failed org.onosproject.acl.AclWebResourceTest
PASS 3.4s 1 Passed 0 Skipped 0 Failed //apps/acl:onos-apps-acl-tests-checkstyle
PASS 0.1s 1 Passed 0 Skipped 0 Failed //apps/actn-mdsc/tetunnel-ctl:onos-apps-actn-mdsc-tetunnel-ctl-checkstyle-files-checkstyle
PASS 6.0s 1 Passed 0 Skipped 0 Failed //apps/actn-mdsc/tetunnel-pce:onos-apps-actn-mdsc-tetunnel-pce-checkstyle-files-checkstyle
PASS 798ms 1 Passed 0 Skipped 0 Failed //apps/bgprouter:onos-apps-bgprouter-checkstyle-files-checkstyle
PASS 1.1s 1 Passed 0 Skipped 0 Failed //apps/castor:onos-apps-castor-checkstyle-files-checkstyle
PASS 723ms 1 Passed 0 Skipped 0 Failed //apps/cip:onos-apps-cip-checkstyle-files-checkstyle
PASS 1.2s 1 Passed 0 Skipped 0 Failed //apps/config:onos-apps-config-checkstyle-files-checkstyle
PASS 769ms 1 Passed 0 Skipped 0 Failed //apps/cord-support:onos-apps-cord-support-checkstyle-files-checkstyle
PASS 1.2s 1 Passed 0 Skipped 0 Failed //apps/cpman/api:onos-apps-cpman-api-checkstyle-files-checkstyle
PASS <100ms 2 Passed 0 Skipped 0 Failed org.onosproject.cpman.message.ControlMessageEventTest
PASS <100ms 2 Passed 0 Skipped 0 Failed org.onosproject.cpman.message.DefaultControlMessageTest
PASS 869ms 1 Passed 0 Skipped 0 Failed //apps/cpman/api:onos-apps-cpman-api-tests-checkstyle
PASS 1.4s 1 Passed 0 Skipped 0 Failed //apps/cpman/api:onos-apps-cpman-api-checkstyle-files-checkstyle
```

iii) To import the project into IntelliJ

```
$ tools/build/onos-buck project
```

```
[Vineels-MacBook-Air:onos nirmalkaria$ tools/build/onos-buck project
```

```
Not using buckd because NO_BUCKD is set.
```

```
OK //lib:netty-common-4.1.5.Final.jar MATCHING_RULE_KEY buck-out/gen/lib/netty-common-4.1.5.Final.jar/netty-common-4.1.5.Final.jar
```

```
OK //lib:asm-5.0.4.jar MATCHING_RULE_KEY buck-out/gen/lib/asm-5.0.4.jar/asm-5.0.4.jar
```

```
OK //lib:commons-collections-3.2.2.jar MATCHING_RULE_KEY buck-out/gen/lib/commons-collections-3.2.2.jar/commons-collections-3.2.2.jar
```

```
OK //lib:commons-configuration-1.10.jar MATCHING_RULE_KEY buck-out/gen/lib/commons-configuration-1.10.jar/commons-configuration-1.10.jar
```

```
OK //lib:commons-io-2.4.jar MATCHING_RULE_KEY buck-out/gen/lib/commons-io-2.4.jar/commons-io-2.4.jar
```

```
OK //lib:commons-lang-2.6.jar MATCHING_RULE_KEY buck-out/gen/lib/commons-lang-2.6.jar/commons-lang-2.6.jar
```

```
OK //lib:commons-lang3-3.5.jar MATCHING_RULE_KEY buck-out/gen/lib/commons-lang
```

5) Run ONOS

```
$ cd $ONOS_ROOT
```

```
$ tools/build/onos-buck run onos-local -- clean debug
```

```
Vineels-MacBook-Air:onos nirmalkaria$ tools/build/onos-buck run onos-local -- clean debug
```

```
Not using buckd because NO_BUCKD is set.
[-] PROCESSING BUCK FILES...FINISHED 7.1s [100%] 🐛 New buck daemon
[-] DOWNLOADING... (0.00 B/S AVG, TOTAL: 0.00 B, 0 Artifacts)
[-] BUILDING...FINISHED 38.4s [100%] (210/210 JOBS, 16 UPDATED, 8 [3.8%] CACHE MISS)
Running clean installation...
# Host [localhost]:8101 found: line 30
/Users/nirmalkaria/.ssh/known_hosts updated.
Original contents retained as /Users/nirmalkaria/.ssh/known_hosts.old
Creating local cluster configs for IP 172.16.1.112...
Waiting for karaf.log
Mar 20, 2017 1:58:24 PM org.apache.karaf.main.Main launch
INFO: Installing and starting initial bundles
Mar 20, 2017 1:58:25 PM org.apache.karaf.main.Main launch
INFO: All initial bundles installed and set to start
Mar 20, 2017 1:58:25 PM org.apache.karaf.main.lock.SimpleFileLock lock
INFO: Trying to lock /private/tmp/onos-1.10.0-SNAPSHOT/apache-karaf-3.0.8/lock
Mar 20, 2017 1:58:25 PM org.apache.karaf.main.lock.SimpleFileLock lock
```

i) To attach to the ONOS CLI console, run:

```
$ tools/test/bin/onos localhost
```

```
Vineels-MacBook-Air:onos nirmalkaria$ tools/test/bin/onos localhost
Warning: Permanently added '[localhost]:8101' (RSA) to the list of known hosts.
Welcome to Open Network Operating System (ONOS)!
```



```
Documentation: wiki.onosproject.org
Tutorials:     tutorials.onosproject.org
Mailing lists: lists.onosproject.org
```

Come help out! Find out how at: contribute.onosproject.org

```
Hit '<tab>' for a list of available commands
and '[cmd] --help' for help on a specific command.
Hit '<ctrl-d>' or type 'system:shutdown' or 'logout' to shutdown ONOS.
```

```
onos> █
```

ii) To open your default browser on the ONOS GUI page, simply type:

```
$ tools/test/bin/onos-gui localhost or alternatively visit http://localhost:8181/onos/ui
```