

# sbt Reference Manual

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.....	51

## Preface

### sbt

```

sbt                                sbt
      sbt
      .sbt  scopes

```

sbt

### sbt

sbt

- sbt
- hello world
-

- `sbt` `sbt`
  - `.sbt`
- Jar Shell macOS Windows Linux

`sbt` terminal encoding HTTP JVM

**macOS** `sbt`

ZIP TGZ

**Homebrew**

```
$ brew install sbt
```

**SDKMAN!**

```
$ sdk install sbt
```

**Windows** `sbt`

ZIP TGZ

**Windows**

msi

## Scoop

```
$ scoop install sbt
```

## Linux sbt

### Installing from SDKMAN

To install both JDK and sbt, consider using SDKMAN.

```
$ sdk list java
$ sdk install java 11.0.4.hs-adpt
$ sdk install sbt
```

This has two advantages. 1. It will install the official packaging by AdoptOpenJDK, as opposed to the “mystery meat OpenJDK builds”. 2. It will install **tgz** packaging of sbt that contains all JAR files. (DEB and RPM packages do not to save bandwidth)

## ZIP TGZ

### Ubuntu Debian

DEB sbt

```
Ubuntu Debian DEB DEB apt-get aptitude
Synaptic sbt sudo
```

```
echo "deb https://dl.bintray.com/sbt/debian/" | sudo tee -a /etc/apt/sources.list.d/sbt.list
curl -sL "https://keyserver.ubuntu.com/pks/lookup?op=get&search=0x2EE0EA64E40A89B84B2DF73499"
sudo apt-get update
sudo apt-get install sbt
```

```
      sbt      Bintray Bintray      APT
sbt aptitude Synaptic      System      Settings      ->
Software & Updates -> Other Software
```

## Linux RPM

RPM sbt

```
Linux RPM RPM      sbt      sudo
```



Figure 1: Ubuntu Software & Updates Screenshot

```

curl https://bintray.com/sbt/rpm/rpm > bintray-sbt-rpm.repo
sudo mv bintray-sbt-rpm.repo /etc/yum.repos.d/
sudo yum install sbt

sbt      Bintray Bintray      RPM
          sbt-launcher-package

```

## Gentoo

```

sbt      ebuild      sbt ebuilds      ebuilds      sbt
emerge dev-java/sbt

```

## Hello, World

```

sbt

sbt      hello      hw.scala

object Hi {
  def main(args: Array[String]) = println("Hi!")
}

hello      sbt      run      sbt      Linux      OS X

$ mkdir hello
$ cd hello
$ echo 'object Hi { def main(args: Array[String]) = println("Hi!") }' > hw.scala
$ sbt
...
> run
...
Hi!

sbt      sbt

•
• src/main/scala src/main/java
• src/test/scala src/test/java
• src/main/resources src/test/resources
• lib jar

sbt      Scala      sbt run      sbt console      Scala REPL sbt
console      classpath      Scala

```

```

build.sbt      hello    hello/build.sbt

lazy val root = (project in file("."))
  .settings(
    name := "hello",
    version := "1.0",
    scalaVersion := "2.12.10"
  )

.sbt      build.sbt

jar      build.sbt      name version

sbt

hello/project/build.properties      sbt      1.3.4
sbt.version=1.3.4
sbt      release      99%      project/build.properties      sbt

sbt      Hello, World

sbt      "      Hello, World      hello      hello/build.sbt
hello/hw.scala hello

hello/hw.scala      sbt Maven

src/
main/
resources/
  <files to include in main jar here>
scala/
  <main Scala sources>
scala-2.12/
  <main Scala 2.12 specific sources>
java/
  <main Java sources>

```



```

test/
  resources
    <files to include in test jar here>
  scala/
    <test Scala sources>
  scala-2.12/
    <test Scala 2.12 specific sources>
  java/
    <test Java sources>
src/

sbt

      build.sbt  sbt  project  project  .scala  .sbt

build.sbt
project/
  Build.scala
  project/      .sbt      .sbt

      classes  jars  caches  target

.gitignore
target/
      /      /      target/  project/target/

      sbt      sbt      Hello, World

sbt
$ sbt

```

```

sbt                                tab
sbt    compile
> compile
compile                run        exit    Ctrl+D  Unix  Ctrl+Z  Win-
dows

```

```

sbt      sbt      sbt
$ sbt clean compile "testOnly TestA TestB"
testOnly TestA TestB clean compile testOnly

```

```

- -      sbt      ~
> ~ compile
~

```

```

sbt
clean
target
compile
src/main/scala src/main/java
test

```

```

console
classpath Scala :quit Ctrl+D Unix Ctrl+Z Windows
sbt
run < >*
sbt      main class
package
src/main/resources src/main/scala src/main/java class jar

```

help < >

reload

build.sbt project/.scala project/.sbt )

**Tab**

tab sbt tab

sbt

!

!!

!:

!n

n

!n

!n

!-n

n

!string

string

!?string

string

**.sbt**

sbt “ ” build.sbt sbt

```

1. .sbt
2. bare .sbt

.sbt                                     [bare .sbt  ][Bare-Def] .scala

.scala      project/

```

```

sbt      Project
build.sbt  Project
lazy val root = (project in file("."))
    immutable map
    name key
    sbt map
    Setting[T]  T  value  Setting  map
    value      map —— map
    Setting[String]
lazy val root = (project in file("."))
    .settings(
        name := "hello"
    )
    Setting[String]  name  "hello"  map  map  sbt  map
    map sbt          key      value  key      key  sbt
Settings            map
    Project  Setting[T]  Setting[T]  sbt  map  T
value

build.sbt

build.sbt  Project  settings scala

```

```

ThisBuild / organization := "com.example"
ThisBuild / scalaVersion := "2.12.10"
ThisBuild / version      := "0.1.0-SNAPSHOT"

lazy val root = (project in file("."))
  .settings(
    name := "hello"
  )

Setting Scala settings Scala
val lazy val def build.sbt object class project/
Scala
name version scalaVersion keys key SettingKey[T] TaskKey[T]
InputKey[T] T value key
Keys Setting[T] := Java
lazy val root = (project in file("."))
  .settings(
    name.:=("hello")
  )

Scala name := "hello" Scala
key name := Setting Setting[String] String name
SettingKey[String] Setting[String] sbt map name
"hello"
value
lazy val root = (project in file("."))
  .settings(
    name := 42 //
  )

```

## Keys

### Types

key

- SettingKey[T] key value
- TaskKey[T] key *task* value
- InputKey[T] key task Input Tasks

### Keys

```

    keys      Keys      build.sbt      import  sbt.Keys._      name
sbt.Keys.name

```

## Keys

```

    settingKey taskKey inputKey keys key value key
val task hello key
lazy val hello = taskKey[Unit](" task ")
.sbt settings vals defs settings vals
defs settings
lazy val val

```

## Task vs Setting keys

```

TaskKey[T] task Tasks compile package Unit Unit Scala
void task package TaskKey[File] task jar
task sbt compile sbt task
sbt map setting name task compile -
key task setting "taskiness" ( key property value

```

## tasks settings

```

:= setting task setting value task task

hello task
lazy val hello = taskKey[Unit]("An example task")

lazy val root = (project in file("."))
.settings(
  hello := { println("Hello!") }
)

settings

lazy val root = (project in file("."))
.settings(
  name := "hello"
)

```

## Tasks Settings

```

    task key    Setting    setting key    Setting    taskKey := 42
    Setting[Task[T]]    settingKey := 42    Setting[T]    task key
    T    value
T    Task[T]    setting    task    setting

```

## sbt Keys

```

sbt    task    name    task    compile    compile task compile
task    key

    setting key    name    task key    name setting key    value    task
key    name    task    value    show <task name>    <task name>
task    key    name    camelCase    name    Scala

    key    sbt    inspect <keyname>    inspect    setting
value    setting

```

## build.sbt

```

import    build.sbt

import sbt._
import Keys._

    .scala    Build    Plugin    .scala

```

## bare .sbt

```

bare .sbt    Setting[_]    Project

name := "hello"
version := "1.0"
scalaVersion := "2.12.10"

```

```

    jar    lib/    build.sbt

val derby = "org.apache.derby" % "derby" % "10.4.1.3"

ThisBuild / organization := "com.example"
ThisBuild / scalaVersion := "2.12.10"

```

```
ThisBuild / version      := "0.1.0-SNAPSHOT"
```

```
lazy val root = (project in file("."))
  .settings(
    name := "hello",
    libraryDependencies += derby
  )
```

### 10.4.1.3 Apache Derby

```
key libraryDependencies += := % += key
%      Ivy      ID
```

This page was translated mostly with Google Translate. Please send a pull request to improve it.

```
.sbt      build.sbt
settings      happens-before      DAG      (task graph)
```

- setting/task : .settings(...)
- key: setting SettingKey[A] TaskKey[A] InputKey[A]
- setting: SettingKey[A] setting
- task: TaskKey[A] task

```
build.sbt DSL      .value method      setting      value method      :=
+= +=
```

```
      update clean      scalacOption      key      Keys
      scalaOptions      scalaOptions
```

```
val scalacOptions = taskKey[Seq[String]]("Options for the Scala compiler.")
val update = taskKey[UpdateReport]("Resolves and optionally retrieves dependencies, producing")
val clean = taskKey[Unit]("Deletes files produced by the build, such as generated sources, o

      scalacOptions:
```



```

scalacOptions := {
  val ur = update.value // update task happens-before scalacOptions
  val x = clean.value   // clean task happens-before scalacOptions
  // ---- scalacOptions begins here ----
  ur.allConfigurations.take(3)
}

update.value clean.value      ur.allConfigurations.take(3)

.value      Scala method      build.sbt DSL      scalacOptions
{            update      clean

ThisBuild / organization := "com.example"
ThisBuild / scalaVersion := "2.12.10"
ThisBuild / version      := "0.1.0-SNAPSHOT"

lazy val root = (project in file("."))
  .settings(
    name := "Hello",
    scalacOptions := {
      val out = streams.value // streams task happens-before scalacOptions
      val log = out.log
      log.info("123")
      val ur = update.value // update task happens-before scalacOptions
      log.info("456")
      ur.allConfigurations.take(3)
    }
  )

sbt shell      scalacOptions:

> scalacOptions
[info] Updating {file:/xxx/}root...
[info] Resolving jline#jline;2.14.1 ...
[info] Done updating.
[info] 123
[info] 456
[success] Total time: 0 s, completed Jan 2, 2017 10:38:24 PM

val ur = ...      log.info("123")      log.info("456") update

ThisBuild / organization := "com.example"
ThisBuild / scalaVersion := "2.12.10"
ThisBuild / version      := "0.1.0-SNAPSHOT"

lazy val root = (project in file("."))

```

```

.settings(
  name := "Hello",
  scalacOptions := {
    val ur = update.value // update task happens-before scalacOptions
    if (false) {
      val x = clean.value // clean task happens-before scalacOptions
    }
    ur.allConfigurations.take(3)
  }
)

sbt shell    run    scalacOptions

> run
[info] Updating {file:/xxx/}root...
[info] Resolving jline#jline;2.14.1 ...
[info] Done updating.
[info] Compiling 1 Scala source to /Users/eugene/work/quick-test/task-graph/target/scala-2.12/
[info] Running example.Hello
hello
[success] Total time: 0 s, completed Jan 2, 2017 10:45:19 PM
> scalacOptions
[info] Updating {file:/xxx/}root...
[info] Resolving jline#jline;2.14.1 ...
[info] Done updating.
[success] Total time: 0 s, completed Jan 2, 2017 10:45:23 PM

target/scala-2.12/classes/      if (false)  clean
update clean                  update  clean clean  update

.value

.value    method    setting    build.sbt    .value
.value    task/setting

scalacOptions := {
  val x = clean.value
  update.value.allConfigurations.take(3)
}

.value

```

```

scalacOptions update clean          build.sbt  sbt shell
inspect scalacOptions

```

```

> inspect scalacOptions
[info] Task: scala.collection.Seq[java.lang.String]
[info] Description:
[info] Options for the Scala compiler.
....
[info] Dependencies:
[info] *:clean
[info] *:update
....
sbt

```

```

inspect tree compile          key incCompileSetup          key
dependencyClasspath

```

```

> inspect tree compile
[info] compile:compile = Task[sbt.inc.Analysis]
[info] +-compile:incCompileSetup = Task[sbt.Compiler$IncSetup]
[info] | +-*/*:skip = Task[Boolean]
[info] | +-compile:compileAnalysisFilename = Task[java.lang.String]
[info] | | +-*/*:crossPaths = true
[info] | | +-{.}/*:scalaBinaryVersion = 2.12
[info] | |
[info] | +-*/*:compilerCache = Task[xsbti.compile.GlobalsCache]
[info] | +-*/*:definesClass = Task[scala.Function1[java.io.File, scala.Function1[java.lang.S
[info] | +-compile:dependencyClasspath = Task[scala.collection.Seq[sbt.Attributed[java.io.F
[info] | | +-compile:dependencyClasspath::streams = Task[sbt.std.TaskStreams[sbt.Init$Scoped
[info] | | +-*/*:streamsManager = Task[sbt.std.Streams[sbt.Init$ScopedKey[_ <: Any]]]
[info] | | |
[info] | | +-compile:externalDependencyClasspath = Task[scala.collection.Seq[sbt.Attributed
[info] | | | +-compile:externalDependencyClasspath::streams = Task[sbt.std.TaskStreams[sbt.I
[info] | | | +-*/*:streamsManager = Task[sbt.std.Streams[sbt.Init$ScopedKey[_ <: Any]]]
[info] | | |
[info] | | | +-compile:managedClasspath = Task[scala.collection.Seq[sbt.Attributed[java.io.F
[info] | | | +-compile:classpathConfiguration = Task[sbt.Configuration]
[info] | | | | +-compile:configuration = compile
[info] | | | | +-*/*:internalConfigurationMap = <function1>
[info] | | | | +-*/*:update = Task[sbt.UpdateReport]
[info] | | | |
....

```

```

compile sbt          update          compile          sbt          update
sbt                  key          key

```

```

    setting

scalacOptions    task key                2.12    "-Xfatal-warnings"
"-deprecation"

lazy val root = (project in file("."))
  .settings(
    name := "Hello",
    organization := "com.example",
    scalaVersion := "2.12.10",
    version := "0.1.0-SNAPSHOT",
    scalacOptions := List("-encoding", "utf8", "-Xfatal-warnings", "-deprecation", "-unchecked"),
    scalacOptions := {
      val old = scalacOptions.value
      scalaBinaryVersion.value match {
        case "2.12" => old
        case _      => old filterNot (Set("-Xfatal-warnings", "-deprecation").apply)
      }
    }
  )

sbt shell

> show scalacOptions
[info] * -encoding
[info] * utf8
[info] * -Xfatal-warnings
[info] * -deprecation
[info] * -unchecked
[success] Total time: 0 s, completed Jan 2, 2017 11:44:44 PM
> ++2.11.8!
[info] Forcing Scala version to 2.11.8 on all projects.
[info] Reapplying settings...
[info] Set current project to Hello (in build file:/xxx/)
> show scalacOptions
[info] * -encoding
[info] * utf8
[info] * -unchecked
[success] Total time: 0 s, completed Jan 2, 2017 11:44:51 PM

    key ( Keys):

val scalacOptions = taskKey[Seq[String]]("Options for the Scala compiler.")
val checksums = settingKey[Seq[String]]("The list of checksums to generate and to verify for")

scalacOptions checksums

build.sbt checksums scalacOptions

```

```
// The scalacOptions task may be defined in terms of the checksums setting
scalacOptions := checksums.value
```

```
    setting key    task key    setting key    subproject
```

```
// Bad example: The checksums setting cannot be defined in terms of the scalacOptions task!
checksums := scalacOptions.value
```

```
    setting setting
```

```
    setting
```

```
    subproject
```

```
// name our organization after our project (both are SettingKey[String])
organization := name.value
```

Here's a realistic example. This rewires `scalaSource` in `Compile` key to a different directory only when `scalaBinaryVersion` is "2.11".

```
scalaSource in Compile := {
  val old = (scalaSource in Compile).value
  scalaBinaryVersion.value match {
    case "2.11" => baseDirectory.value / "src-2.11" / "main" / "scala"
    case _      => old
  }
}
```

## build.sbt DSL

```
build.sbt DSL          DAG setting  setting
```

```
    Make (1976) Ant (2000)  Rake (2003)
```

## Make

```
    Makefile
```

```
target: dependencies
```

```
[tab] system command1
```

```
[tab] system command2
```

```
    all
```

```
    1. Make
```

```
    2. Make
```

```
    Makefile
```

```

CC=g++
CFLAGS=-Wall

all: hello

hello: main.o hello.o
    $(CC) main.o hello.o -o hello

%.o: %.cpp
    $(CC) $(CFLAGS) -c $< -o $@

make      all      hello      Make      hello
Make      hello      hello      main.o      hello.o
      main.o hello.o      hello
      make      Make      flow-based      Make
      DSL

```

## Rake

```

Make      Ant Rake      sbt      Rakefile

task name: [:prereq1, :prereq2] do |t|
  # actions (may reference prereq as t.name etc)
end

Rake

```

## flow-based

flow-based                      Compile / compile

sbt

DAG      happens-before      build.sbt      DSL      flow-based  
 Makefile   Rakefile  
 flow-based

## Scope

scope .sbt

### Key

name key sbt map  
key “scope”

- key
- key compile main test
- Key packageOptions jar class packageBin packageSrc

*key name* scope

scoped key

sbt map settings map key *scope* key set-  
ting build.sbt scope key  
scope build.sbt scope

## Scope

*Scope* scope key

scope

- Projects
- Configurations
- Tasks

### Project Scope

settings keys

Project setting setting setting

### Configuration Scope

*configuration* classpath Configuration Ivy  
MavenScopes

sbt configurations

- Compile src/main/scala

- Test src/test/scala
- Runtime task run classpath

key configuration configuration task  
 key compile package run key key sourceDirectories scalacOptions  
 fullClasspath configuration

## Task Scope

Settings task task packageSrc setting packageOptions  
 task key packageSrc key packageOptions scope  
 task packageSrc packageBin packageDoc key artifactName  
 packageOptions key task

## Scope

scope task task Global  
 Global setting task Global setting task

scope key key  
 scope sbt scope key scope sbt scope Global  
 scope scope  
 scope scope  
 inspect key “ ”

## sbt scope key

sbt scope keys  
 {<build-uri><project-id>/config:intask::key  
 • {<build-uri><project-id> project project scope  
 <project-id>  
 • config configuration  
 • intask task  
 • key scope key  
 “\*” Global scope  
 scoped key



- project project
  - configuration task key configuration
- Configuration

### scoped key

- fullClasspath key scope project key configuration task scope
- test:fullClasspath configuration fullClasspath test configuration scope scope
- \*:fullClasspath configuration Global configuration
- doc::fullClasspath key fullClasspath doc task project configuration
- {file:/home/hp/checkout/hello/}default-aea33a/test:fullClasspath project {file:/home/hp/checkout/hello/}default-aea33a {file:/home/hp/checkout/hello/} project project id default-aea33a configuration test task
- {file:/home/hp/checkout/hello/}/test:fullClasspath {file:/home/hp/checkout/hello/} project
- {./}/test:fullClasspath {./} project {./} Scala ThisBuild
- {file:/home/hp/checkout/hello/}/compile:doc::fullClasspath scope

### scope

```
sbt          inspect    key    scope    inspect test:fullClasspath

$ sbt
> inspect test:fullClasspath
[info] Task: scala.collection.Seq[sbt.Attributed[java.io.File]]
[info] Description:
[info] The exported classpath, consisting of build products and unmanaged and managed, internal
[info] Provided by:
[info] {file:/home/hp/checkout/hello/}default-aea33a/test:fullClasspath
[info] Dependencies:
[info]   test:exportedProducts
[info]   test:dependencyClasspath
[info] Reverse dependencies:
[info]   test:runMain
[info]   test:run
[info]   test:testLoader
[info]   test:console
[info] Delegates:
```

```

[info] test:fullClasspath
[info] runtime:fullClasspath
[info] compile:fullClasspath
[info] *:fullClasspath
[info] {.}/test:fullClasspath
[info] {.}/runtime:fullClasspath
[info] {.}/compile:fullClasspath
[info] {.}/*:fullClasspath
[info] */test:fullClasspath
[info] */runtime:fullClasspath
[info] */compile:fullClasspath
[info] */*:fullClasspath
[info] Related:
[info] compile:fullClasspath
[info] compile:fullClasspath(for doc)
[info] test:fullClasspath(for doc)
[info] runtime:fullClasspath

task .sbt      setting task      scala.collection.Seq[sbt.Attributed[java.io.File]]
“Provided by”  scoped key      {file:/home/hp/checkout/hello/}default-aea33a/test:fullClasspath
test configuration {file:/home/hp/checkout/hello/}default-aea33a
project
“Dependencies”

sbt

• configuration runtime:fullClasspath compile:fullClasspath
  scoped key project “ project” task Global
• project “ project” task Global configuration
  Global *:fullClasspath
• project project {.} ThisBuild
• project Global */test:fullClasspath project current
  Global * “ project” project */test:fullClasspath
  test:fullClasspath
• project configuration Global */*:fullClasspath task
  Global */*:fullClasspath Global

inspect fullClasspath inspect test:fullClasspath con-
figuration sbt compile inspect compile:fullClasspath
inspect fullClasspath

inspect *:fullClasspath fullClasspath Global configuration

```

Configuration

## scope

```

build.sbt  bare key      project configuration task Global

lazy val root = (project in file("."))
  .settings(
    name := "hello"
  )

sbt inspect name {file:/home/hp/checkout/hello/}default-aea33a/*:name
project {file:/home/hp/checkout/hello/}default-aea33a configuration
task * task
Keys in scope in scope name Compile configuration

name in Compile := "hello"
name packageBin task
name in packageBin := "hello"
name scope Compile configuration packageBin task
name in (Compile, packageBin) := "hello"
Global
name in Global := "hello"
name in Global scope Global scope Global task
configuration Global project Global */*:name
{file:/home/hp/checkout/hello/}default-aea33a/*:name
Scala in := Scala Java
name.in(Compile).:=("hello")

```

## scope

```

key scope compile task Compile Test configuration scope
scope

key compile compile in Compile compile in Test compile
project scope task configuration scope compile task
" " scope scope key scope sbt
" compile:compile "

```

```

    name key      key name scope scope packageOptions
in (Compile, packageBin) key name packageOptions key
name      in key      scope project global config global task

+= +=

:=      key      SettingKey[T] T      key se-
quence

• +=
• +=

key sourceDirectories in Compile Seq[File] key
src/main/scala      source
Compile / sourceDirectories += new File("source")
sbt file()
Compile / sourceDirectories += file("source")
file() File
+=

Compile / sourceDirectories += Seq(file("sources1"), file("sources2"))
Seq(a, b, c, ...) Scala
source      :=
Compile / sourceDirectories := Seq(file("sources1"), file("sources2"))

:= += +=      key      sbt      “      ”      key
scope
sbt      sbt

key task
task setting task task Def.task := += +=
classpath source generator
Compile / sourceGenerators += Def.task {
  myGenerator(baseDirectory.value, (managedClasspath in Compile).value)
}

```

```

+= +=

    setting task key :=
cleanFiles += file("coverage-report-" + name.value + ".txt")

```

## Scope (.value )

This page was translated mostly with Google Translate. Please send a pull request to improve it.

```

scope .sbt scopes
scope .value

```

- scope : subproject configuration task
- scope scope Zero
- subproject scope ThisBuild
- Test Runtime Runtime Compile configuration
- build.sbt key scope \${current subproject} / Zero / Zero
- / key scope

:

```

lazy val foo = settingKey[Int]("")
lazy val bar = settingKey[Int]("")

```

```

lazy val projX = (project in file("x"))
.settings(
  foo := {
    (Test / bar).value + 1
  },
  Compile / bar := 1
)

```

```

foo setting scoped key Test / bar projX Test / bar sbt
Test / bar scoped key foo 2
sbt scope scope scope

```

## scope

scope

- 1 scope subproject configuration task
- 2 scope task scope task scope Zero scope
- task scope

- 3 scope configuration scope configuration  
Zero configuration
- 4 scope subproject scope subproject ThisBuild  
Zero
- 5 scoped key settings/tasks

## 1: scope

- 1 scope subproject configuration task  
subproject configuration task scope subpro-  
ject task scope configuration

## 2: task

- 2 scope task scope task scope Zero scope  
task scope  
key sbt scope (xxx / yyy).value

A:

```
lazy val projA = (project in file("a"))
  .settings(
    name := {
      "foo-" + (packageBin / scalaVersion).value
    },
    scalaVersion := "2.11.11"
  )

projA / name ?

1. "foo-2.11.11"
2. "foo-2.12.10"
3.

"foo-2.11.11" .settings(...) scalaVersion scope projA /
Zero / Zero packageBin / scalaVersion projA / Zero / packageBin
/ scalaVersion scoped key 2 sbt task Zero projA / Zero
/ Zero projA / scalaVersion scoped key "2.11.11"
```

## 3 configuration

- 3 scope configuration scope configuration  
Zero configuration

```

    projX
lazy val foo = settingKey[Int]("")
lazy val bar = settingKey[Int]("")

lazy val projX = (project in file("x"))
  .settings(
    foo := {
      (Test / bar).value + 1
    },
    Compile / bar := 1
  )

    scope projX / Test / Zero      Test      Runtime Runtime      Compile

Test / bar      3 sbt  scope projX / Test / Zero projX / Runtime
/ Zero  projX / Compile / Zero      Compile / bar

```

#### 4 subproject

- 4 scope subproject scope subproject ThisBuild  
Zero

B:

```
ThisBuild / organization := "com.example"
```

```

lazy val projB = (project in file("b"))
  .settings(
    name := "abc-" + organization.value,
    organization := "org.tempuri"
  )

```

```
projB / name
```

1. "abc-com.example"
2. "abc-org.tempuri"
- 3.

```

    abc-org.tempuri      4      projB / Zero / Zero scope
organization projB      "org.tempuri"      setting ThisBuild /
organization

```

scope

C:

```

ThisBuild / packageBin / scalaVersion := "2.12.2"

lazy val projC = (project in file("c"))
  .settings(
    name := {
      "foo-" + (packageBin / scalaVersion).value
    },
    scalaVersion := "2.11.11"
  )

projC / name
1. "foo-2.12.2"
2. "foo-2.11.11"
3.

foo-2.11.11 scope projC / Zero / packageBin scalaVersion
scalaVersion scoped to projC / Zero / packageBin is undefined. 2 projC
/ Zero / Zero 4 ThisBuild / Zero / packageBin 1 subproject
"2.11.11" projC / Zero / Zero

D:

ThisBuild / scalacOptions += "-Ywarn-unused-import"

lazy val projD = (project in file("d"))
  .settings(
    test := {
      println((Compile / console / scalacOptions).value)
    },
    console / scalacOptions -= "-Ywarn-unused-import",
    Compile / scalacOptions := scalacOptions.value // added by sbt
  )

projD/test
1. List()
2. List(-Ywarn-unused-import)
3.

List(-Ywarn-unused-import) 2 projD / Compile / Zero 3 projD
/ Zero / console 4 ThisBuild / Zero / Zero 1 projD / Compile /
Zero subproject projD configuration task

Compile / scalacOptions scalacOptions.value projD / Zero
/ Zero 4 ThisBuild / Zero / Zero List(-Ywarn-unused-import)

```



## inspect

inspect

```
sbt:projD> inspect projD / Compile / console / scalacOptions
[info] Task: scala.collection.Seq[java.lang.String]
[info] Description:
[info] Options for the Scala compiler.
[info] Provided by:
[info] ProjectRef(uri("file:/tmp/projD/"), "projD") / Compile / scalacOptions
[info] Defined at:
[info] /tmp/projD/build.sbt:9
[info] Reverse dependencies:
[info] projD / test
[info] projD / Compile / console
[info] Delegates:
[info] projD / Compile / console / scalacOptions
[info] projD / Compile / scalacOptions
[info] projD / console / scalacOptions
[info] projD / scalacOptions
[info] ThisBuild / Compile / console / scalacOptions
[info] ThisBuild / Compile / scalacOptions
[info] ThisBuild / console / scalacOptions
[info] ThisBuild / scalacOptions
[info] Zero / Compile / console / scalacOptions
[info] Zero / Compile / scalacOptions
[info] Zero / console / scalacOptions
[info] Global / scalacOptions
```

```
“Provided by”    projD / Compile / console / scalacOptions    projD
/ Compile / scalacOptions    “Delegates” ( )
```

- subproject projD scope scope ThisBuild Zero
- subproject configuration Compile scope scope Zero
- task task scope console / scope task scope console /  
scope

## .value

- 5 scoped key settings/tasks
- |        |                     |       |                       |               |             |                  |
|--------|---------------------|-------|-----------------------|---------------|-------------|------------------|
| scope  |                     |       | Scala                 | OO            | trait Shape | drawShape        |
| method | Shape trait         |       | method                | drawShape     |             |                  |
| sbt    | scope               | scope | scope                 | project-level | setting     | build-level set- |
| ting   | build-level setting |       | project-level setting |               |             |                  |

E:

```

lazy val root = (project in file("."))
  .settings(
    inThisBuild(List(
      organization := "com.example",
      scalaVersion := "2.12.2",
      version      := scalaVersion.value + "_0.1.0"
    )),
    name := "Hello"
  )

lazy val projE = (project in file("e"))
  .settings(
    scalaVersion := "2.11.11"
  )

projE / version
1. "2.12.2_0.1.0"
2. "2.11.11_0.1.0"
3.
   2.12.2_0.1.0 projE / version ThisBuild / version ThisBuild
/ scalaVersion build-level setting

F:

ThisBuild / scalacOptions += "-D0"
scalacOptions += "-D1"

lazy val projF = (project in file("f"))
  .settings(
    compile / scalacOptions += "-D2",
    Compile / scalacOptions += "-D3",
    Compile / compile / scalacOptions += "-D4",
    test := {
      println("bippy" + (Compile / compile / scalacOptions).value.mkString)
    }
  )

projF / test
1. "bippy-D4"
2. "bippy-D2-D4"
3. "bippy-D0-D3-D4"
4.
   "bippy-D0-D3-D4" Paul Phillips someKey += "x"

someKey := {
  val old = someKey.value

```

```

    old := "x"
  }

    5      scoped key      +=

ThisBuild / scalacOptions := {
  // Global / scalacOptions <- Rule 4
  val old = (ThisBuild / scalacOptions).value
  old := "-D0"
}

scalacOptions := {
  // ThisBuild / scalacOptions <- Rule 4
  val old = scalacOptions.value
  old := "-D1"
}

lazy val projF = (project in file("f"))
  .settings(
    compile / scalacOptions := {
      // ThisBuild / scalacOptions <- Rules 2 and 4
      val old = (compile / scalacOptions).value
      old := "-D2"
    },
    Compile / scalacOptions := {
      // ThisBuild / scalacOptions <- Rules 3 and 4
      val old = (Compile / scalacOptions).value
      old := "-D3"
    },
    Compile / compile / scalacOptions := {
      // projF / Compile / scalacOptions <- Rules 1 and 2
      val old = (Compile / compile / scalacOptions).value
      old := "-D4"
    },
    test := {
      println("bippy" + (Compile / compile / scalacOptions).value.mkString)
    }
  )

ThisBuild / scalacOptions := {
  Nil := "-D0"
}

scalacOptions := {
  List("-D0") := "-D1"
}

```

```

lazy val projF = (project in file("f"))
  .settings(
    compile / scalacOptions := List("-D0") :+ "-D2",
    Compile / scalacOptions := List("-D0") :+ "-D3",
    Compile / compile / scalacOptions := List("-D0", "-D3") :+ "-D4",
    test := {
      println("bippy" + (Compile / compile / scalacOptions).value.mkString)
    }
  )

```

.sbt    Scopes

- lib     jar
- repository

```

      jar    lib            classpath
      jar    lib     ScalaCheck Specs2 ScalaTest
lib        classpaths compile test run    console            classpath
      Compile / dependencyClasspath Runtime / dependencyClasspath
      build.sbt            unmanagedBase key            lib
      custom_lib   lib
unmanagedBase := baseDirectory.value / "custom_lib"
baseDirectory            baseDirectory    unmanagedBase
value
      unmanagedBase    jar    task unmanagedJars
task    unmanagedJars task    Compile configuration    lib
Compile / unmanagedJars := Seq.empty[sbt.Attributed[java.io.File]]

```

sbt    Apache Ivy            Ivy    Maven

```

libraryDependencies Key

      libraryDependencies      Maven POM      Ivy      sbt

      groupId artifactId revision

libraryDependencies += groupId % artifactID % revision

      Configuration val (Test) configuration

libraryDependencies += groupId % artifactID % revision % configuration

libraryDependencies Keys

val libraryDependencies = settingKey[Seq[ModuleID]]("Declares managed dependencies.")

%      ModuleID      ModuleID      libraryDependencies

      sbt Ivy      sbt      Apache Derby      Maven2

libraryDependencies += "org.apache.derby" % "derby" % "10.4.1.3"

      build.sbt      update sbt Derby ~/.ivy2/cache/org.apache.derby/
compile update      update

      +=

libraryDependencies += Seq(
  groupId % artifactID % revision,
  groupId % otherID % otherRevision
)

      libraryDependencies :=

%%      Scala

      groupId %% artifactID % revision      groupId % artifactID %
revision      groupId %% sbt      Scala      %%

libraryDependencies += "org.scala-tools" % "scala-stm_2.11" % "0.3"

      scalaVersion 2.11.1      "org.scala-tools"      %%

libraryDependencies += "org.scala-tools" %% "scala-stm" % "0.3"

      Scala      jar

Ivy

groupId % artifactID % revision      revision      Ivy
"latest.integration" "2.9.+" "[1.0,)"      "1.6.1" Ivy

```

```

        sbt      Maven2      resolver Ivy

resolvers += name at location
        at

resolvers += "Sonatype OSS Snapshots" at "https://oss.sonatype.org/content/repositories/snapshots"
resolvers key Keys
val resolvers = settingKey[Seq[Resolver]]("resolvers")
at      Resolver
sbt      Maven
resolvers += "Local Maven Repository" at "file://" + Path.userHome.absolutePath + "/.m2/repository"

resolvers += Resolver.mavenLocal

```

```

resolvers
sbt resolvers      externalResolvers
      externalResolvers resolvers

```

### Per-configuration dependencies

```

src/test/scala Test configuration
Test configuration classpath Compile configuration % "test"
libraryDependencies += "org.apache.derby" % "derby" % "10.4.1.3" % "test"
Test configuration
libraryDependencies += "org.apache.derby" % "derby" % "10.4.1.3" % Test
sbt      show compile:dependencyClasspath      derby jar      show
test:dependencyClasspath      derby jar
ScalaCheck Specs2 ScalaTest      % "test"

```

```
.sbt
```

```
      jar
    Project lazy val
  lazy val util = project
  lazy val core = project
  val      ID      ID      in
  lazy val util = project.in(file("util"))
  lazy val core = project in file("core")
```

To factor out common settings across multiple projects, create a sequence named `commonSettings` and call `settings` method on each project.

```
      commonSettings      settings

  lazy val commonSettings = Seq(
    organization := "com.example",
    version := "0.1.0",
    scalaVersion := "2.12.10"
  )

  lazy val core = (project in file("core"))
    .settings(
      commonSettings,
      // other settings
    )

  lazy val util = (project in file("util"))
    .settings(
      commonSettings,
      // other settings
    )

    version
```

aggregate classpath

### Aggregation

Aggregation    aggregate    task    aggregated

```
lazy val root = (project in file(".")).aggregate(util, core)
```

```
lazy val util = project
```

```
lazy val core = project
```

root    util    core    sbt

root    task    update task

```
lazy val root = (project in file(".")).  
  .aggregate(util, core)  
  .settings(  
    aggregate in update := false  
  )
```

[...]

aggregate in update    update task    scope    key    scopes  
task task

### Classpath

dependsOn    core classpath    util    core

```
lazy val core = project.dependsOn(util)
```

core    util    core    util

dependsOn(bar, baz)    dependsOn

### configuration    classpath

foo dependsOn(bar)    foo    compile configuration    bar    compile config-  
uration    dependsOn(bar % "compile->compile")

"compile->compile"    ->    "depends on"    "test->compile"    foo    test  
configuration    bar    compile configuration

->config    ->compile    dependsOn(bar % "test")    foo    test configu-  
ration    bar    Compile configuration



```

    "test->test"    test    test          bar/src/test/scala
foo/src/test/scala
    configuration    dependsOn(bar % "test->test;compile->compile")

```

**root**

```

    sbt
    hello-foo      base = file("foo")    foo      foo
foo/Foo.scala    foo/src/main/scala    sbt      foo

```

```

    sbt      projects      project <projectname>      task
compile      root
    ID      task    subProjectID/compile

```

```

.sbt      .sbt      .sbt      project/      Scala

```

## Appendix: Subproject build definition files

```

foo    .sbt    foo/build.sbt    hello-foo    scope
    hello    hello/build.sbt hello/bar/build.sbt hello/foo/build.sbt
    version := "0.6"    sbt    show version

```

```

> show version
[info] hello-foo/*:version
[info] 0.7
[info] hello-bar/*:version
[info] 0.9
[info] hello/*:version
[info] 0.5

```

```

hello-foo/*:version    hello/foo/build.sbt    hello-bar/*:version
hello/bar/build.sbt    hello/*:version    hello/build.sbt    scoped
keys    version key    scope    build.sbt    build.sbt

```

Style choices:

- Each subproject's settings can go into \*.sbt files in the base directory of that project, while the root build.sbt declares only minimum project declarations in the form of lazy val foo = (project in file("foo")) without the settings.
- We recommend putting all project declarations and settings in the root build.sbt file in order to keep all build definition under a single file. However, it up to you.

```
project/*.scala  foo/project/Build.scala
```

```
build.sbt
```

```
task          codeCoverage task
```

```
hello          sbt-site    hello/project/site.sbt    Ivy    ID
addSbtPlugin

addSbtPlugin("com.typesafe.sbt" % "sbt-site" % "0.7.0")

sbt-assembly    hello/project/assembly.sbt
addSbtPlugin("com.eed3si9n" % "sbt-assembly" % "0.11.2")

resolvers += Resolver.sonatypeRepo("public")
```

```
0.13.5  sbt
```

```
build.sbt

lazy val util = (project in file("util"))
  .enablePlugins(FooPlugin, BarPlugin)
  .settings(
    name := "hello-util"
  )
```

```

enablePlugins

      disablePlugins          util  IvyPlugin          build.sbt

lazy val util = (project in file("util"))
  .enablePlugins(FooPlugin, BarPlugin)
  .disablePlugins(plugins.IvyPlugin)
  .settings(
    name := "hello-util"
  )

                                sbt      plugins

> plugins
In file:/home/jsuereth/projects/sbt/test-ivy-issues/
  sbt.plugins.IvyPlugin: enabled in scala-sbt-org
  sbt.plugins.JvmPlugin: enabled in scala-sbt-org
  sbt.plugins.CorePlugin: enabled in scala-sbt-org
  sbt.plugins.JUnitXmlReportPlugin: enabled in scala-sbt-org

plugins      sbt      sbt      3

1. CorePlugin:  task
2. IvyPlugin:
3. JvmPlugin:      Java/Scala

JUnitXmlReportPlugin      junit-xml

      sbt-site          site.sbt

site.settings

// `util`      site
lazy val util = (project in file("util"))

// `core`      site
lazy val core = (project in file("core"))
  .settings(site.settings)

                                $HOME/.sbt/1.0/plugins/      $HOME/.sbt/1.0/plugins/
classpath      sbt      $HOME/.sbt/1.0/plugins/      .sbt      .scala
      project/

```

```
$HOME/.sbt/1.0/plugins//build.sbt      addSbtPlugin()
```

- IDE sbt IDE
- web xsbt-web-plugin

```
sbt .sbt
```

```
SettingKey TaskKey .sbt      InputKey
Keys
val scalaVersion = settingKey[String]("scala ")
val clean = taskKey[Unit]("          source ")
          "scalaVersion"      "      scala  "
.sbt      T      SettingKey[T]          T      TaskKey [T]      .sbt
          " "      batch
.sbt .scala          autoImport val      .sbt

:=

val sampleStringTask = taskKey[String]("A sample string task.")
val sampleIntTask = taskKey[Int]("A sample int task.")

ThisBuild / organization := "com.example"
ThisBuild / version      := "0.1.0-SNAPSHOT"
ThisBuild / scalaVersion := "2.12.10"
```

```

lazy val library = (project in file("library"))
  .settings(
    sampleStringTask := System.getProperty("user.home"),
    sampleIntTask := {
      val sum = 1 + 2
      println("sum: " + sum)
      sum
    }
  )

value
sbt      Scala      HTML      HTML
HTML
sbt      API  IO

```

```

value
sampeIntTask
sampleIntTask := {
  val sum = 1 + 2      // first
  println("sum: " + sum) // second
  sum                  // third
}

JVM  sum 3

startServer stopServer sampeIntTask

val startServer = taskKey[Unit]("start server")
val stopServer = taskKey[Unit]("stop server")
val sampleIntTask = taskKey[Int]("A sample int task.")
val sampleStringTask = taskKey[String]("A sample string task.")

ThisBuild / organization := "com.example"
ThisBuild / version      := "0.1.0-SNAPSHOT"
ThisBuild / scalaVersion := "2.12.10"

lazy val library = (project in file("library"))
  .settings(
    startServer := {
      println("starting...")
      Thread.sleep(500)
    },
  )

```

```

stopServer := {
  println("stopping...")
  Thread.sleep(500)
},
sampleIntTask := {
  startServer.value
  val sum = 1 + 2
  println("sum: " + sum)
  stopServer.value // THIS WON'T WORK
  sum
},
sampleStringTask := {
  startServer.value
  val s = sampleIntTask.value.toString
  println("s: " + s)
  s
}
)

sbt      sampleIntTask
> sampleIntTask
stopping...
starting...
sum: 3
[success] Total time: 1 s, completed Dec 22, 2014 5:00:00 PM
      sampleIntTask

```



Figure 2: task-dependency

Scala	value	sampleIntTask	startServer	stopServer	sampleIntTask	sbt
•	sampleIntTask					
•						
•						

```

sbt      sampleStringTask

> sampleStringTask
stopping...
starting...
sum: 3
s: 3
[success] Total time: 1 s, completed Dec 22, 2014 5:30:00 PM

sampleStringTask startServer sampleIntTask sampleIntTask startServer
Scala            value          sampeStringTask

```



Figure 3: task-dependency

```

test      Test / compile Test / test

```

```

stopServer
sampleStringTask

lazy val library = (project in file("library"))
.settings(
  startServer := {
    println("starting...")
    Thread.sleep(500)
  },
  sampleIntTask := {
    startServer.value
    val sum = 1 + 2
    println("sum: " + sum)
    sum
  },
  sampleStringTask := {
    startServer.value
    val s = sampleIntTask.value.toString
    println("s: " + s)
  }
)

```

```

    s
  },
  sampleStringTask := {
    val old = sampleStringTask.value
    println("stopping...")
    Thread.sleep(500)
    old
  }
)

sampleStringTask

> sampleStringTask
starting...
sum: 3
s: 3
stopping...
[success] Total time: 1 s, completed Dec 22, 2014 6:00:00 PM

```

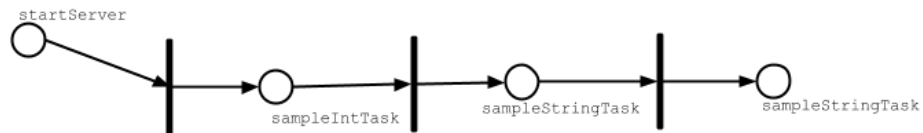


Figure 4: task-dependency

## Scala

Scala project/ServerUtil.scala

```

sampleIntTask := {
  ServerUtil.startServer
  try {
    val sum = 1 + 2
    println("sum: " + sum)
  } finally {
    ServerUtil.stopServer
  }
  sum
}

```



build.sbt

sbt

```
build.sbt      sbt      sbt      Scala      sbt
project
  sbt
  ,      project/project/
```

```
hello/      #
  Hello.scala      #      src/main/scala
  build.sbt      # build.sbt project/
  project/      #
    Build.scala      #
    build.sbt      #      --project/project
    project/      #
      Build.scala # project/project/
      project/project/
      .scala .sbt      build.sbt Build.scala
```

```
project .scala      project/Dependencies.scala
import sbt._
object Dependencies {
```

```

// Versions
lazy val akkaVersion = "2.3.8"

// Libraries
val akkaActor = "com.typesafe.akka" %% "akka-actor" % akkaVersion
val akkaCluster = "com.typesafe.akka" %% "akka-cluster" % akkaVersion
val specs2core = "org.specs2" %% "specs2-core" % "2.4.17"

// Projects
val backendDeps =
  Seq(akkaActor, specs2core % Test)
}

Dependencies build.sbt      val      Dependencies._
import Dependencies._

ThisBuild / organization := "com.example"
ThisBuild / version      := "0.1.0-SNAPSHOT"
ThisBuild / scalaVersion := "2.12.10"

lazy val backend = (project in file("backend"))
  .settings(
    name := "backend",
    libraryDependencies ++= backendDeps
  )

.scala

.scala      Scala
            build.sbt      project/*.scala      .scala      scala

            project/*.scala

sbt          sbt      sbt

```

sbt:

- Scala Scala Programming in Scala Scala
- .sbt
- Setting sbt Setting task
- Setting key := += ++=
- Setting sbt
- key
- *tasks* key value task Non-task
- Scopes
- key value scope
- scope configuration project task
- scope task configuration
- configuration Compile Test
- project “ ” scope
- scopes scope
- build.sbt .scala task
- sbt
- 
- addSbtPlugin project/plugins.sbt build.sbt
- sbt

sbt