

sbt Reference Manual

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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 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 configu-
ration * 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

```

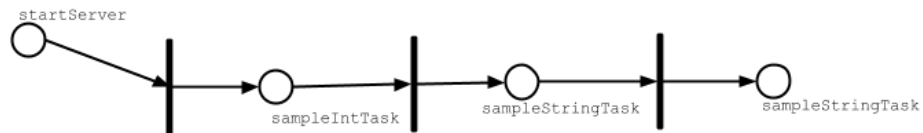


Figure 4: task-dependency

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