Control Room Accelerator Physics

Day 1

Introduction to Open XAL

Overview

Open XAL is an extensible application framework for developing accelerator physics applications, scripts and services.

Collaboration

Open XAL is a collaboration among SNS, CSNS, ESS, GANIL, TRIUMF and FRIB.

Official Website

http://xaldev.sourceforge.net

Features

- Open Source collaboration with dozens of developers across several sites
- Pure Java for cross platform development and deployment
- Application Framework for rapidly developing modern applications
- Toolbox of Java packages
- Collection of applications (over four dozen) and services
- EPICS Channel Access support
- Ant based build system independent of IDE

Development Requirements

- Java J2SE 7 with JDK
- Git 1.7.5
- Ant 1.8

Runtime Requirements

- Java J2SE 7
- JRuby 1.6 (for JRuby scripts)
- Jython 2.1 (for Jython scripts)
- EPICS Channel Access client libraries (optional - native Channel Access)

Reference Release Source Code Anonymous Access

Raw / IDE Independent

git clone http://git.code.sf.net/p/xaldev/openxal

Eclipse Configured

git clone http://git.code.sf.net/p/xaldev/project.eclipse

Xcode Configured

git clone http://git.code.sf.net/p/xaldev/project.xcode

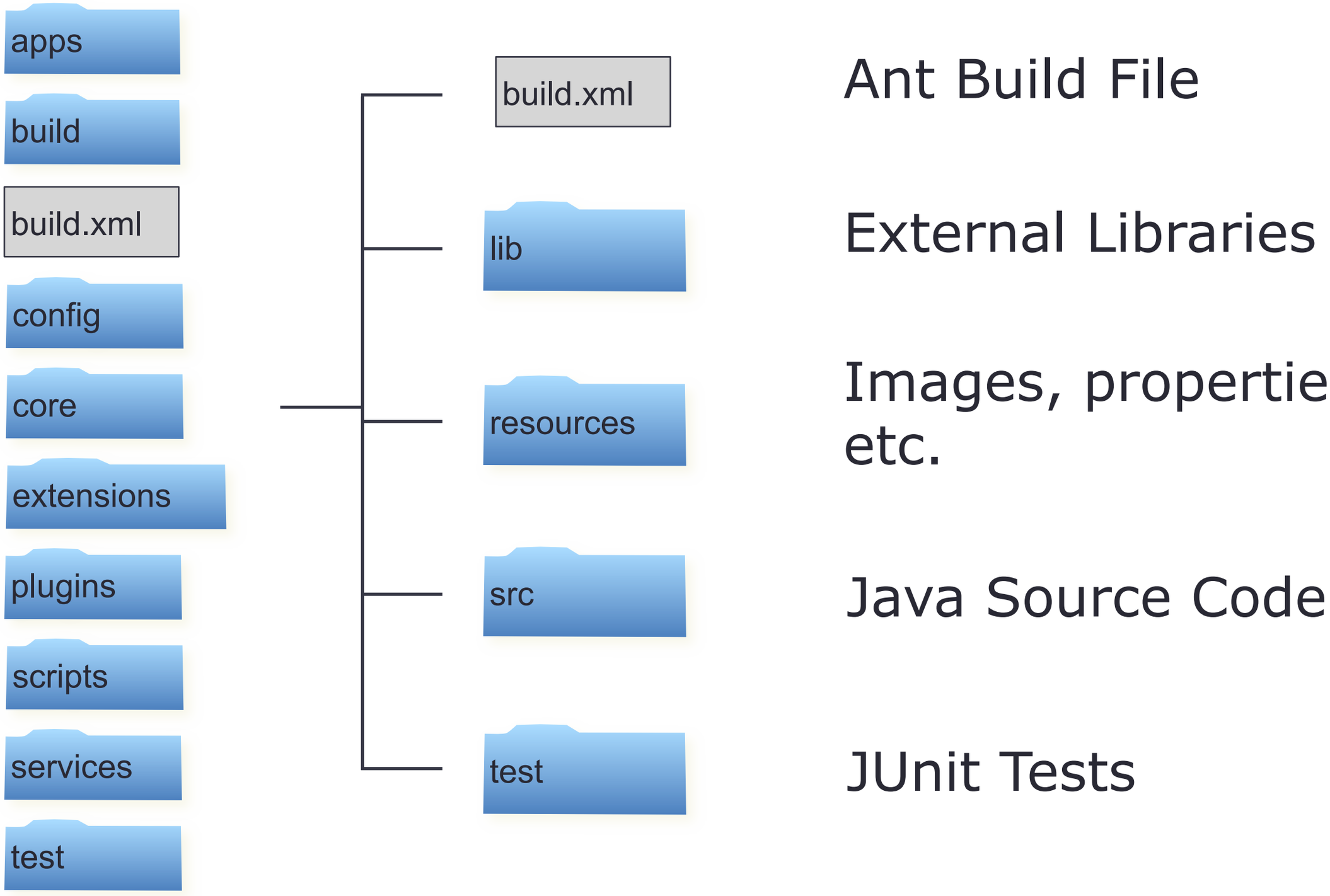
Primary Constructs

Construct	Description
Core	Common Open XAL library
Extension	Optional addition to the Core, Core has no dependency
Plugin	One of each type of plugin is required by Core at runtime
Service	Runs continuously, headless, includes extension
Application	Launched by user, Graphical Interface
Script	JRuby or Jython based script which may have an graphical interface

Core Overview

- Common packages shared across sites
  - Online Accelerator Physics Model
  - Accelerator Object Graph
  - Channel Access abstraction
  - Database abstraction
  - Messaging
  - Concurrency Dispatch
  - Math packages

Project Layout - Core



Extension Overview

- Mechanism to add capabilities to Open XAL without changing the core
- May depend on core, extensions and plugins
- Core has no dependency on extensions
- Apps and Services may depend on extensions
- May include libraries, resources and source code
  - Included libraries (e.g. jmdns) should be completely wrapped by their extension
- Two types
  - Pure
  - Service

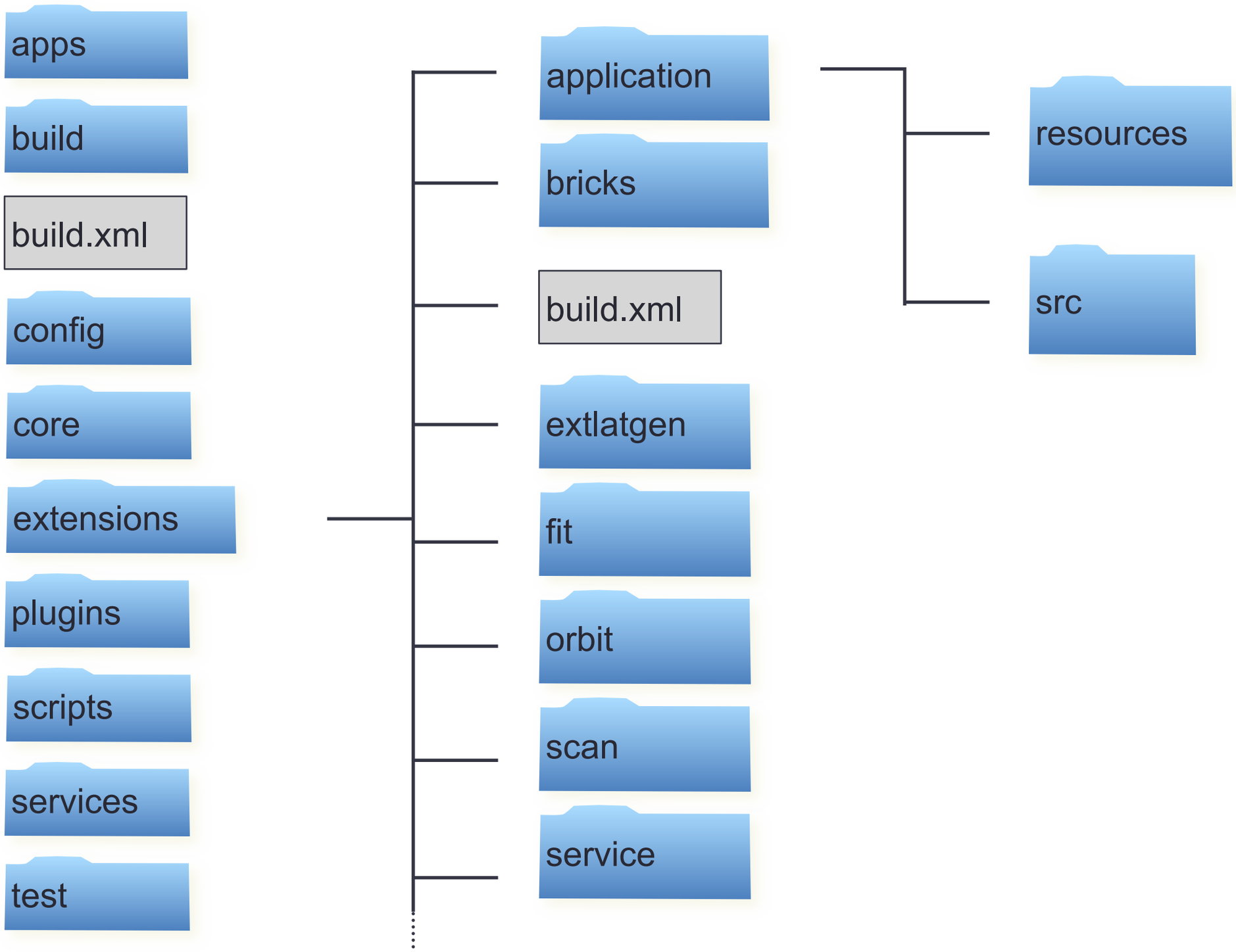
Pure Extension

- Placed under top level extensions directory
- Examples: application (framework), bricks (runtime), fit, scan, solver, service (framework), widget
- Package prefix: xal.extension.<extension-name>

Service Extension

- Associated with a service
- A service's protocol is an extension
- A service's other supporting code may be an extension
- Placed at extensions directory under its service's directory
- Package prefix: xal.service.<service-name>
- Example: pvlogger

Project Layout - Pure Extensions



Plugin Overview

- Mechanism to provide custom implementation for some abstracted core components (e.g. Channel)
- May depend on core, extensions and plugins
- Core has runtime only dependency on plugin families
- Apps and Services may depend directly on plugins
- May include libraries, resources and source code
  - Libraries should be completely wrapped (e.g. jca)
- Two types
  - Solitary
  - Family Member

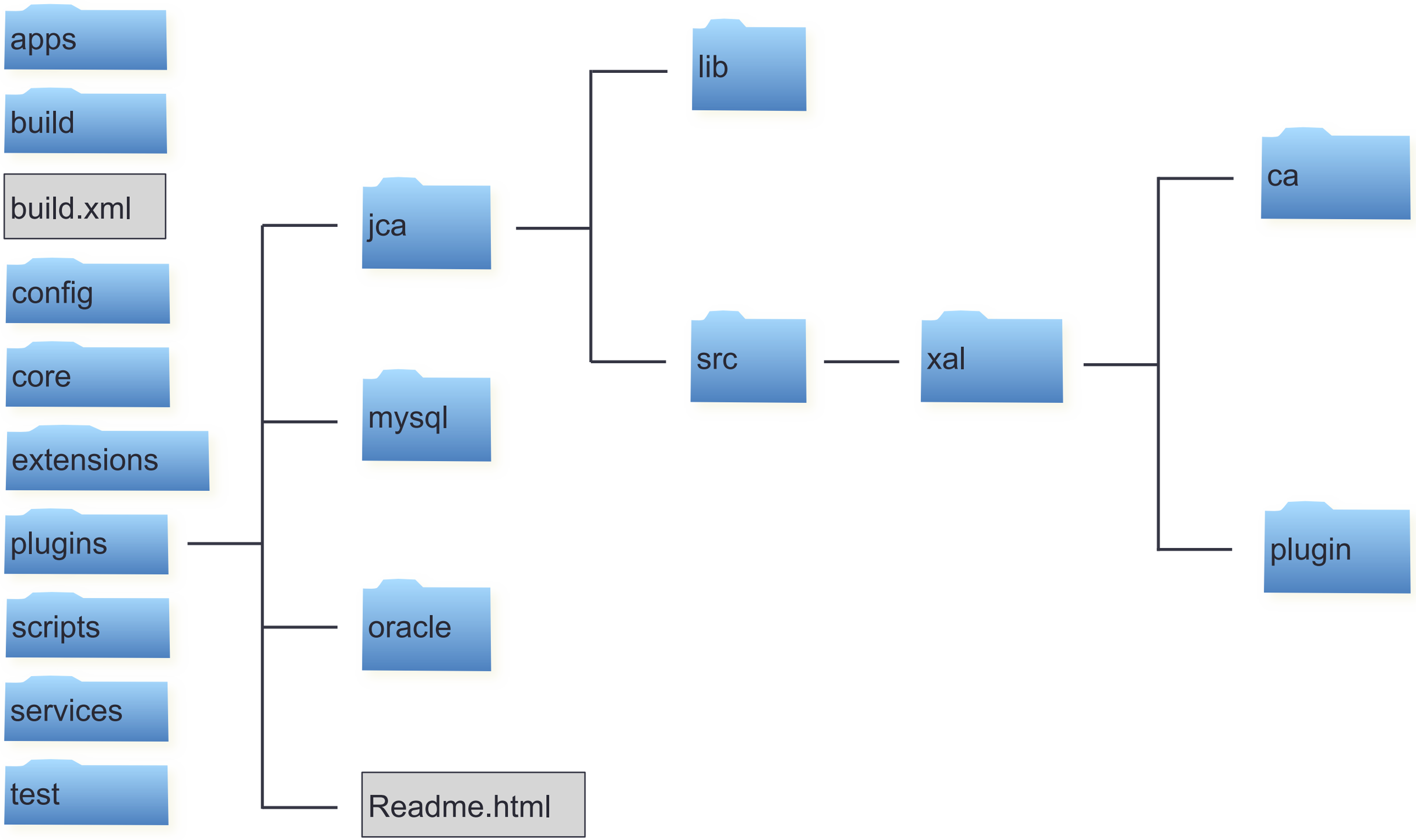
Solitary Plugin

- Only one plugin for a given family may be included
- Core references a plugin family class to be implemented by just one plugin (e.g. channel factory)
- Two source code package prefixes to supply (abstract and implementation)
  - xal.<core package tree>
  - xal.plugin.<plugin-name>
- Example JCA Plugin

Family Member Plugin

- Multiple plugins for a given family may be included
- Core references a plugin family indirectly through configuration files (e.g. database configuration)
- One source code package prefix to supply
  - xal.plugin.<plugin-name>
- Database Adaptor Plugins
  - oracle, mysql

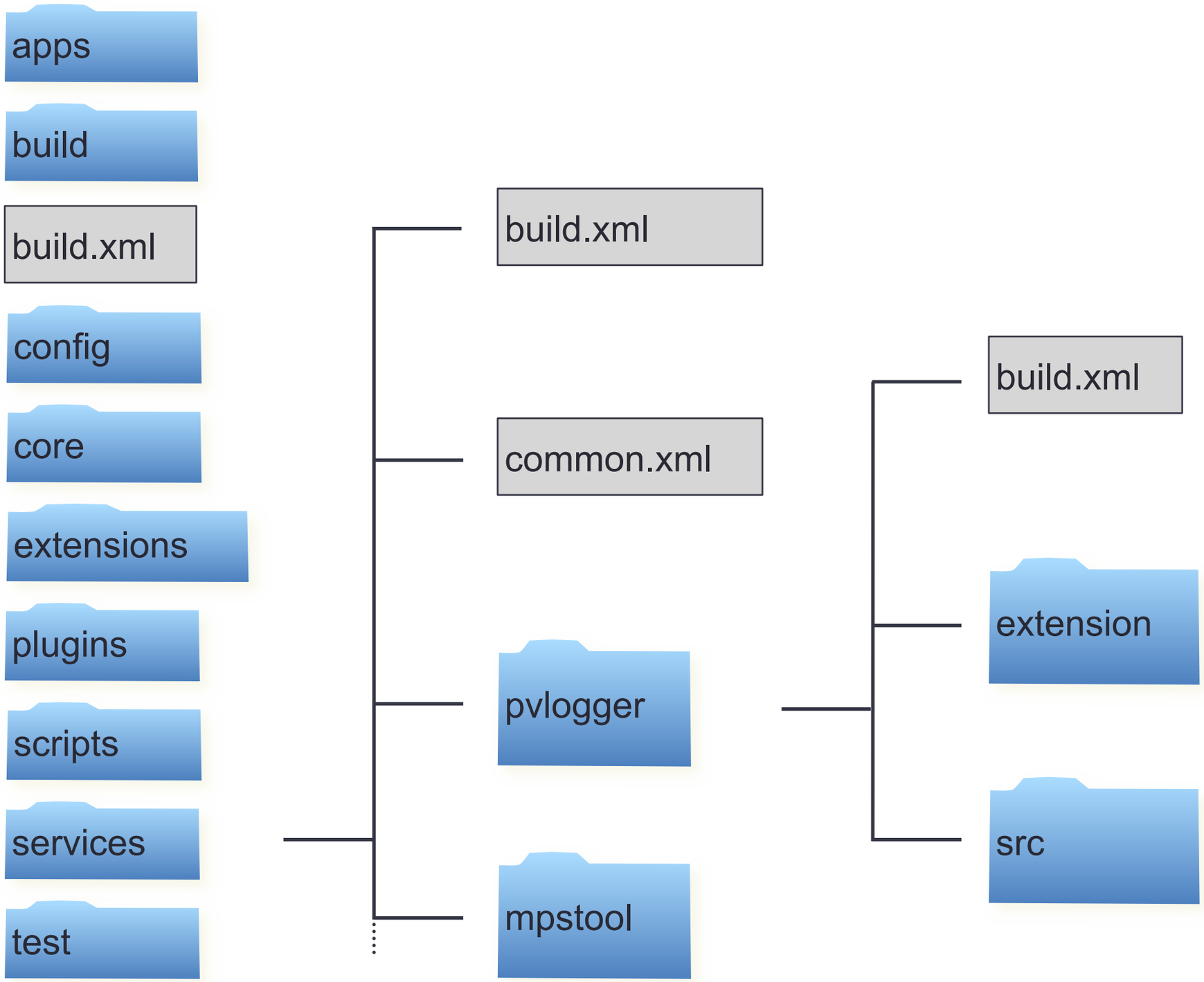
Project Layout - Plugins



Services Overview

- Headless executable
- Runs 24/7
- Supports multiple clients via remote messages using the service framework

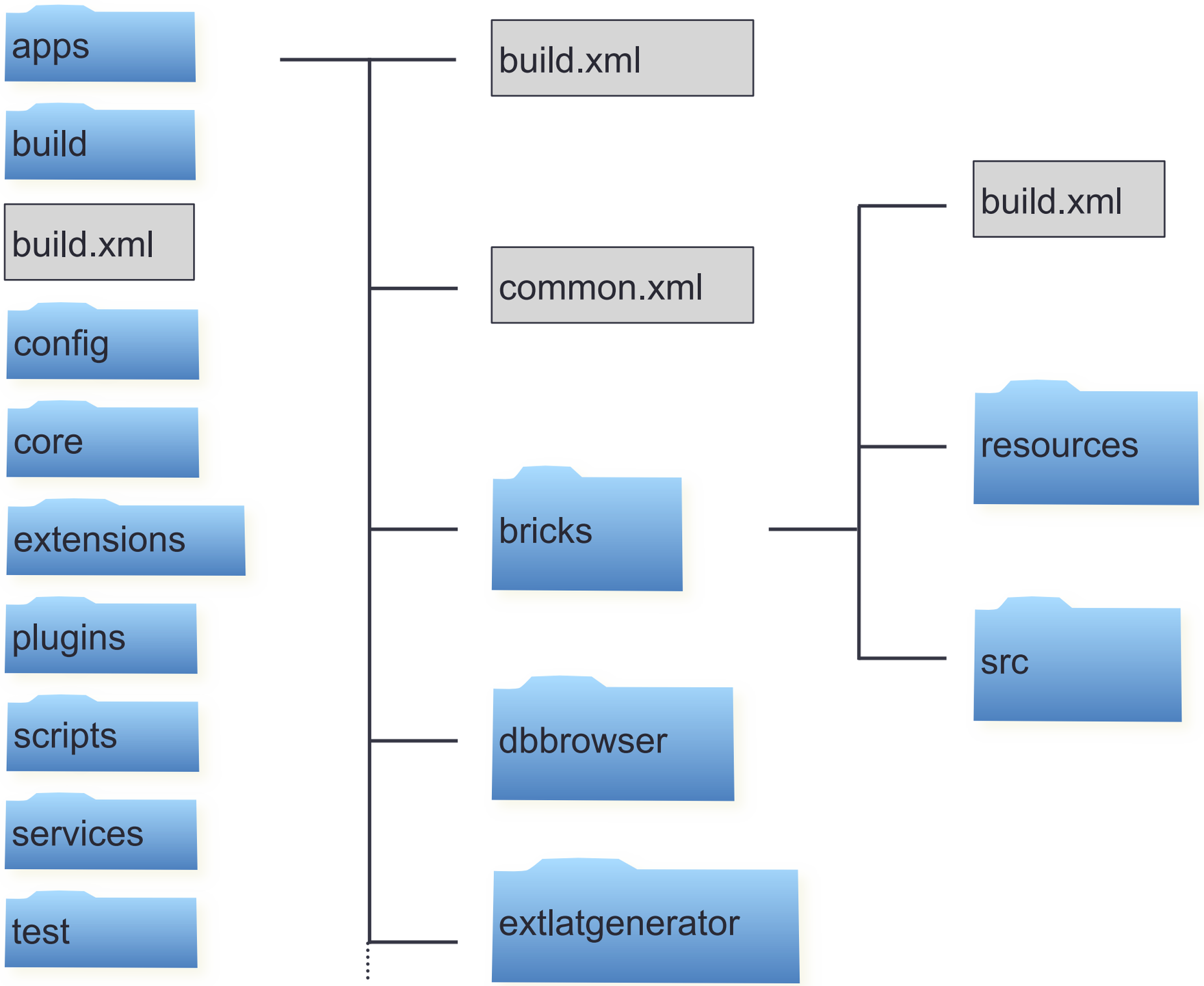
Project Layout - Services



Applications Overview

- Executable with a user interface
- Built upon the application framework
- Inherits a common extensible menubar
- Shares a common look and feel
- Model - View - Controller architecture

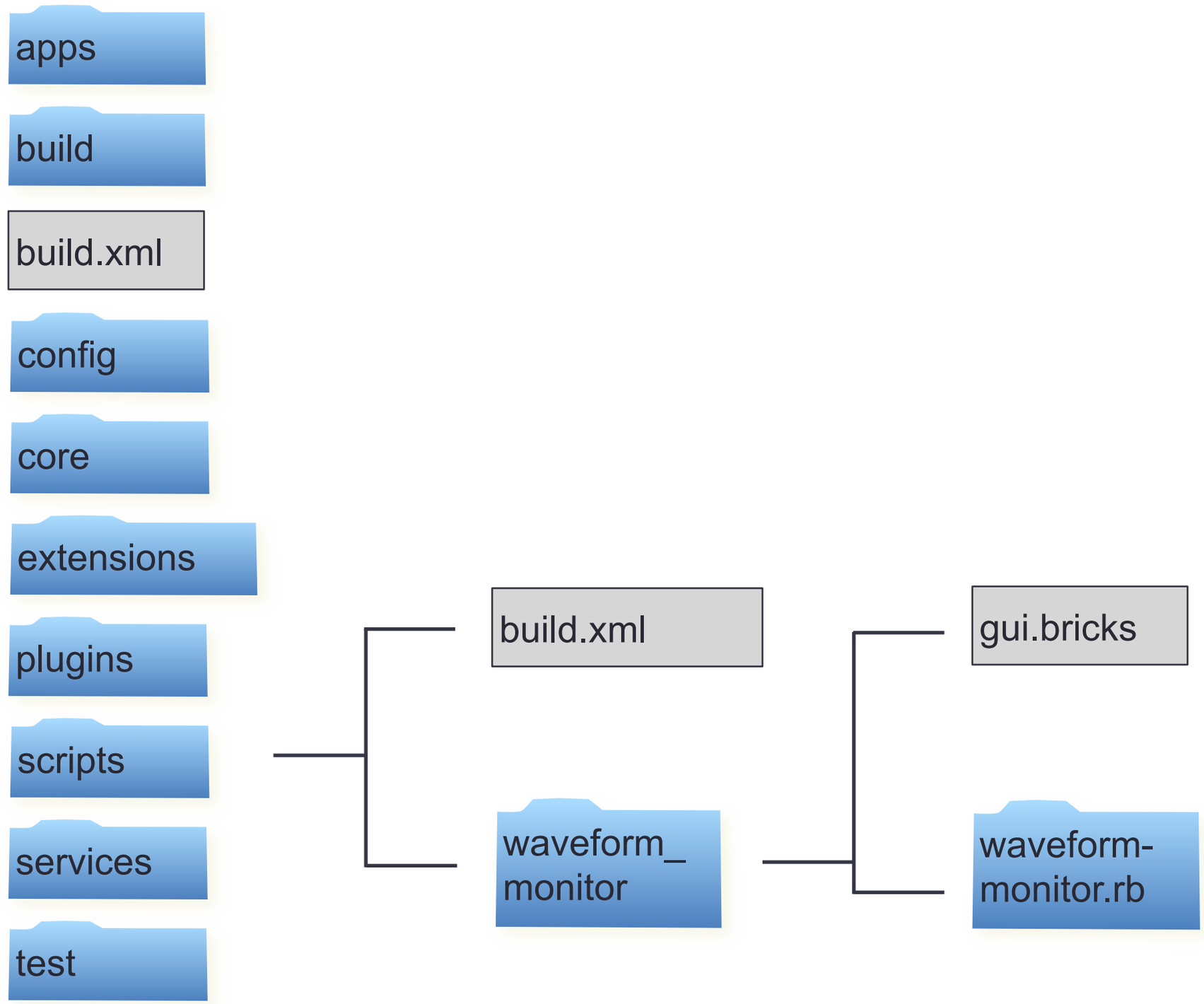
Project Layout - Applications



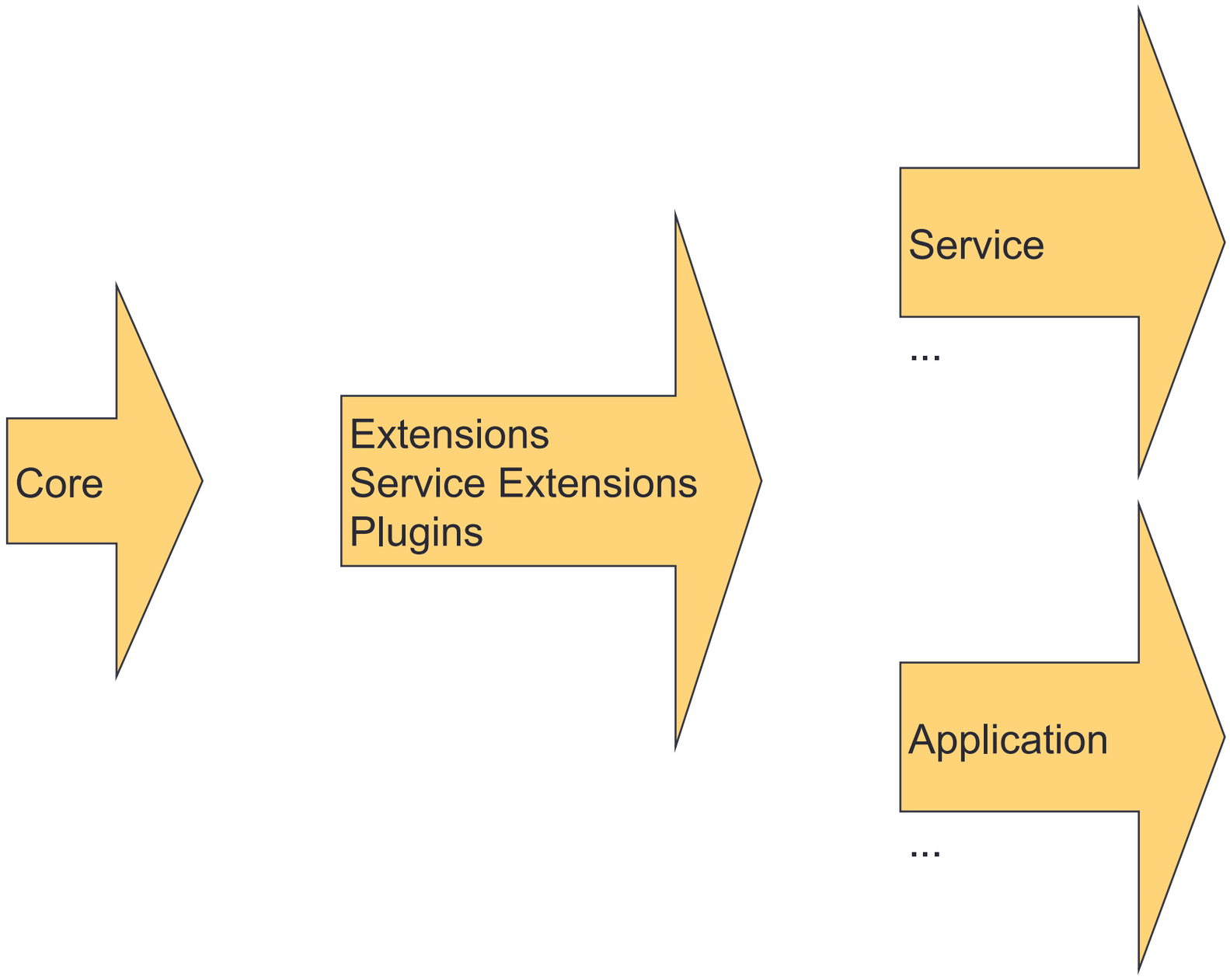
Scripts Overview

- JRuby or Jython Script
- May have a graphical user interface
- Allows for rapid development and testing

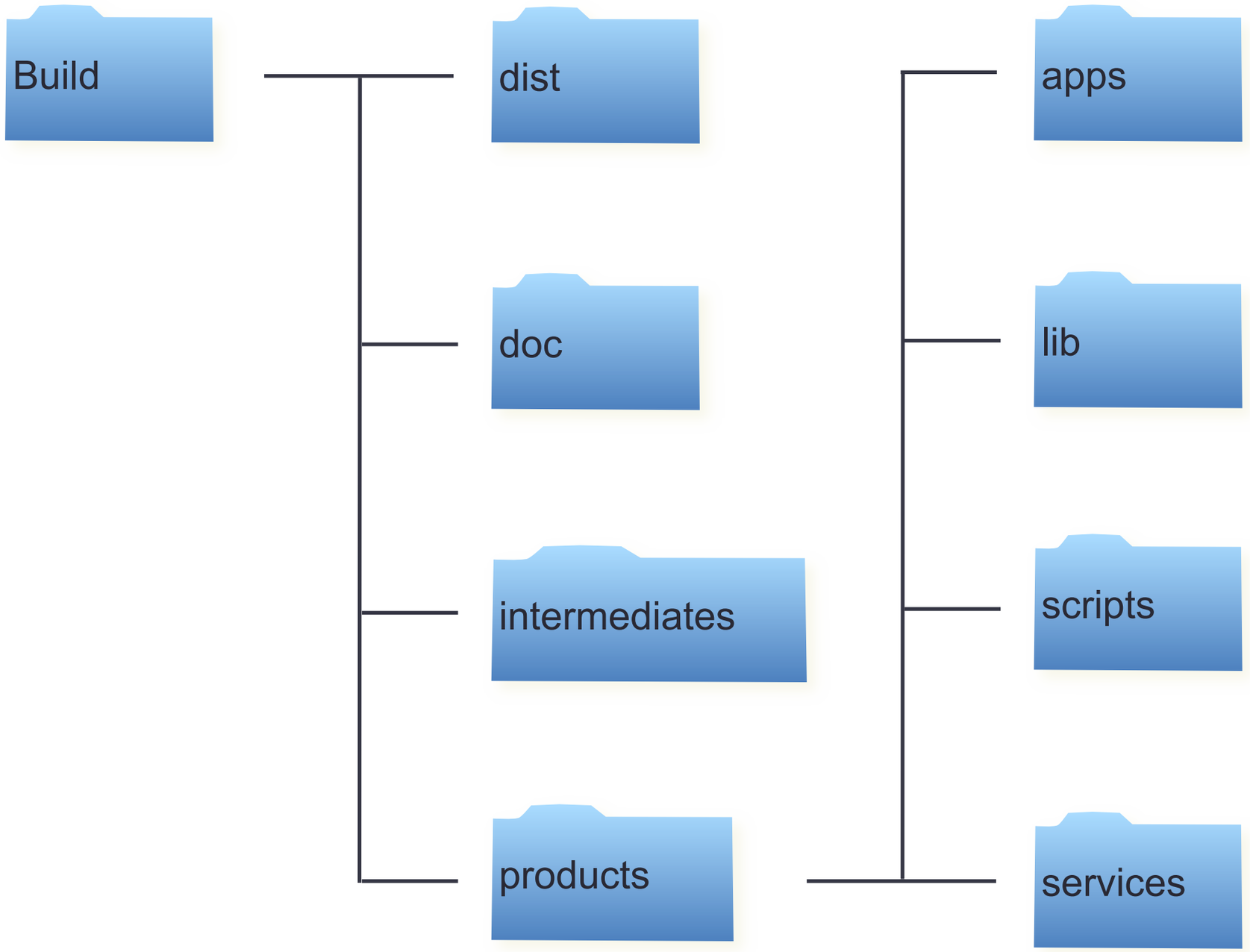
Project Layout - Scripts



Default Build Phases



Build Directory Hierarchy



Build Options

- You can build everything at the top level by simply typing: ant
- You can get the available build options by typing: ant help
- Each absolutely independent component has its own build file
  - At component root, simply type: ant
  - You can build an individual application
  - You cannot build an individual extension

Top Level Build Options

```
> ant help

Buildfile: /Users/t6p/Projects/OpenXAL/Development/Base/openxal/build.xmlhelp:     [echo] Build the XAL project     [echo] Usage: ant
[ant options] target1 [target2 | target3 | ... ]     [echo]      [echo]   where target(s) can be:     [echo]
help ..... Print this message.     [echo]     all ..... Build the XAL core, services and
applications. Copy scripts to the build directory.     [echo]     apps ..... Compile the applications and assemble
the jar products.     [echo]     clean ..... Clean compiled classes and build products     [echo]
core ..... Compile the core XAL classes and assemble the jar products.     [echo]     doc .....
Build the javadoc for the core, extensions and plugins.     [echo]     info ..... Post build information.     [echo]
install ..... Install all build products which allow batch installation.     [echo]     install-apps .....
Install all apps which allow batch installation.     [echo]     install-doc ..... Install the javadoc.     [echo]
install-scripts ..... Install all scripts.     [echo]     install-services ..... Install all services which allow batch
installation.     [echo]     install-shared ..... Install the core.     [echo]     jar-resources ..... Archive
resources for the core plus all batch enabled applications and services.     [echo]     purge-build ..... Purge all build
products.     [echo]     purge-install ..... Purge all installed products.     [echo]     purge-intermediates ..... Purge
the build intermediates.
```

Top Level Build Options Continued

```
     [echo]     purge-shared-intermediates . Purge the shared build intermediates.     [echo]     run-tests .................. Build
and run unit tests.     [echo]     scripts ..................... Copy scripts to the build directory.     [echo]
services ................... Compile the services and assemble the jar products.     [echo]     shared ..................... Build the
shared library including the core and any extensions and plugins.     [echo]     standalone-apps ............ Build the applications
which allow batch building and assemble the jar products as standalone applications.     [echo]     standalone-services ........ Build
the services which allow batch building and assemble the jar products as standalone services.
```