Maven, or Make for Non-Cooks

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The Original Problem

- cc *.c takes too long
- Why not compile just what's changed?

  theOtherThing: this.o that.o; ln -o

  theOtherThing *.o

  this.o: this.c; cc -c this.c

  that.o: that.c; cc -c that.c

[Stuart Feldman in Software: Practice and Experience, V 9, Issue 4, *Make, a Program for Maintaining Computer Programs*]

Third line is the Recipe

- You can add lots of lines of recipe

```
that.o: that.c;
        lint that.c && \
        cc -c that.c
```

- And you can add targets for common recipes

```
clean:; rm *.o
```

But It's Still Hard

- You have to write all those dependency lines
- The linker knows some of the information
  - theOtherThing: this.o that.o
- The c compiler knows all the .h files
  - this.o: this.c stdio.h
- So have them write the non-recipe lines

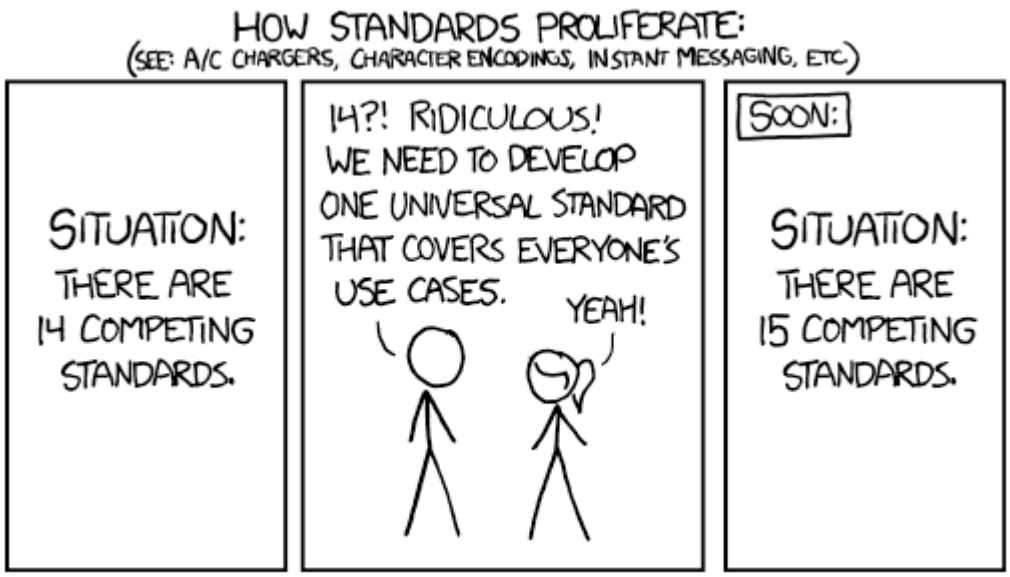
The Next Problem: Repetition

- Two pairs of near-identical recipes in this simple example
- So we added macros
  - FOO=/usr/local/obscure
  - @echo “Install in ${FOO}”
- And rules
  - %.o: %.c; cc -o $<
- And more rules
  - Etc, etc, ite ad nauseam

Any Fool can write Makefiles

- And many do.
  - No standardization
  - Lots of make dialects
- Conventional targets
  - all, clean, install,test
- Lots of standards, all different

XKCD Says...


HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC)
SITUATION: THERE ARE 14 COMPETING STANDARDS.
14?! RIDICULOUS! WE NEED TO DEVELOP ONE UNIVERSAL STANDARD THAT COVERS EVERYONE'S USE CASES.
YEAH!
SOON:
SITUATION: THERE ARE 15 COMPETING STANDARDS.

So Start Again From Scratch

- QEF, with one common notation
- And other, less-well-known approaches
  - But mostly they reinvented square wheels
- Ant, try writing everything in XML

Apache Ant

- Ant was still annoying
  - No standard build targets
  - Every antfile contained another re-invented wheel
  - It was xml, but mostly imperative
  - And it *was* xml
- Couldn't we get *simpler*?
  - Or, if it was a wheel, *rounder*?

Apache Maven

- Grew out of dissatisfaction with Ant
  - Simplify and streamline a mongo antfile, from Apache Turbine
- Ant provided primitives like “mkdir” and “copy”
- Maven provided “compile” and “install”
  - Bootstrapped with ant, jelly xml
- M2 Upgraded to clean it up some more
  - Java, and XML as a declarative language

No Recipes

- Write plugins to do common operations
  - install jar
  - install war
  - Create project

A Standard Set of Targets

- By default, anyway:
  - Clean
  - Compile
  - Test
  - Install
- “mvn clean install”
  - Does just what you expect

Common infrastructure

- If you say plugin:download -D... gnurrs, it will
  - Download the “gurrs” extension
  - Install it in your environment
- Most common steps already written
- For example, install a project into Eclipse

Plugins: gee, looks like everything else

```
<plugin>
    <groupId>
        org.apache.maven.plugins</groupId>
    <artifactId>
        maven-eclipse-plugin</artifactId>
    <version>2.9</version>
    <configuration> ...
```

Easy things should be easy

- All sorts of common operations are already written
- The almost all work
- But when they don't...

Hard things should be at least possible

- Just *try* debugging install under eclipse on Linux
- You'd better know Maven, Eclipse and Linux
- Or google a lot

The good part

- Everything is a dependency
- It's really make, recursively self-applied
- The O'Reilly book teaches you to make and debug plugins

Using MVN

- Mvn phase
- Mvn specific:command
-
- They say “convention”

Three main variables

- Group id, maven-plugins
- artifact id, maven-axis-plugin
- Version, 0.7
  - or
- Version, 0.7-SNAPSHOT
  - Means latest version of 0.7
- Maps to paths, eg
  - maven-plugins/plugins/maven-axis-plugin.0.7.jar

Three main variables, ctd

```
<project ...> ...
    <groupId>com.skilledgaming</groupId>
    <artifactId>platform</artifactId>
    <packaging>war</packaging>
    <version>1.0-SNAPSHOT</version>
```

For example

- Add an actual plugin
  - Mvn plugin:download -DgroupId=maven-plugins -DartifactId=maven-axis-plugin -Dversion=0.7
  - Will download a plugin used to in turn download NOAA data, used in a weather-map coding example (U.S. National Oceanic and Aeronautic Administration)

Repositories for all the bits

- If we had declared a dependency on axis, maven would download it itself

```
<dependency>
        <groupId>axis</groupId>
        <artifactId>axis</artifactId>
        <version>1.2.1</version> ...
```

- Covers annoying long lists of dependencies in build and test tools
- Huge time-saver

Repository declarations

- The installer created several

```
<repository>
    <id>central</id>
        <url>
http://artifactory.virgin/artifactory/repo
        </url>
        <snapshots>
            <enabled>false</enabled>
        ...
```

Multi-project builds

- Each project produces one artifact (deliverable)
  - The can have dependencies between them
  - They can depend on external binaries
- A collection of projects is a collection of dependencies, like make, but with most of the recipes taken out

Multi-project builds, ctd

- Can include continuous integration systems
- And revision control targets
- Ditto remote repositories, using snapshots
- Also used for building plugins

Multi-project builds, ctd

- Even this one has some substructure

```
<dependency>
    <groupId>
        com.skilledgaming.platform
    </groupId>
    <artifactId>jskills</artifactId>
    <version>1.0</version>
</dependency>
```

In Practice

- Build a web app
- Back end uses NOAA data
- Delivered as a jar or war
- All the components used to build and install are dependencies

Conclusions?

- Make with standards
- and compiled recipes
- Scales via recursing on dependencies

- Easy to use, hard to learn
  - A traditional tradeoff
- As the English would say, "Not half bad"