Mason

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Mason: Motivation

- **Previously, modules had to be checked into repository**
  - Developers had to sign a CLA
  - Code had to be under a compatible license
  - Code needed to be reviewed by core team
- **Modules were gated for release alongside the compiler**
- **This hinders the ability for users to contribute/share code**

Mason: Overview

- **Mason is a package manager and build tool for Chapel**
  - "a skilled worker who builds by laying units of substantial material"
  - Influenced by Rust’s Cargo
  - Basic functionality (version 0.1.0) introduced in Chapel 1.16

- **Written entirely in Chapel**
  - An instance of eating our own dog food.

Mason: Overview

- **Command line tool: ‘mason’**
  - Builds, runs, and documents packages
- **Centralized registry, decentralized packages,**
  - Packages exist as TOML files in a single repository
  - Source code exists somewhere else, like a GitHub repository
- **Dependencies are managed on a per project basis**
  - Dependency resolution uses semantic versioning

Mason: Outline

- **Basic Usage**
  - Building Mason
  - Creating, Building, and Running a Project
  - Building Documentation
  - Searching for Packages
  - Adding Dependencies
  - Dependency Resolution
- **Mason Registry**
- **Publishing Packages**
- **Planned Features**

Mason: Building Mason

- **Mason comes with Chapel release and git repository**

- **Build mason with ‘make mason’ from $CHPL_HOME**
  - Will build Chapel compiler if not already built
  - Symbolically links executable to same directory as ‘chpl’
  - Also supports the ‘make install’ target

```
> git clone git@github.com:chapel-lang/chapel.git
> cd chapel
> make mason
```

Mason: Creating a Project

- **Create a project with ‘mason new <project name>’**

```
> mason new MyPackage
Created new library project: MyPackage
```

  - Initializes an empty git repository

```
MyPackage/
  Mason.toml
  src/
    MyPackage.chpl
 .git/
```

Mason: Creating a Project

- A default manifest, "Mason.toml", is created

```
[brick]
name = "MyPackage"
version = "0.1.0"
chplVersion = "1.16.0"

[dependencies]
```

Packages start as v0.1.0

Compatible with 1.16 or later

Zero dependencies

- A default source file is also generated

```
/* Documentation for MyPackage */
module MyPackage {
  writeln("New library: MyPackage");
}
```

Mason: Building a Project

Compile your project with ‘mason build’:

1. Refreshes the registry

2. Creates a lock file, "Mason.lock", also in TOML format

- Ensures repeatable builds by locking in versions and configurations

```
> cat MyPackage/Mason.lock
[root]
name = "MyPackage"
version = "0.1.0"
chplVersion = "1.16.0..1.16.0”
```

3. Downloads dependencies to $MASON_HOME

- Defaults to $HOME/.mason/

4. Compiles the program into MyPackage/target/debug/

Mason: Running a Project

- **Use 'mason run' to execute your project**

```
> mason run
New library: MyPackage
```

- **Final directory hierarchy:**

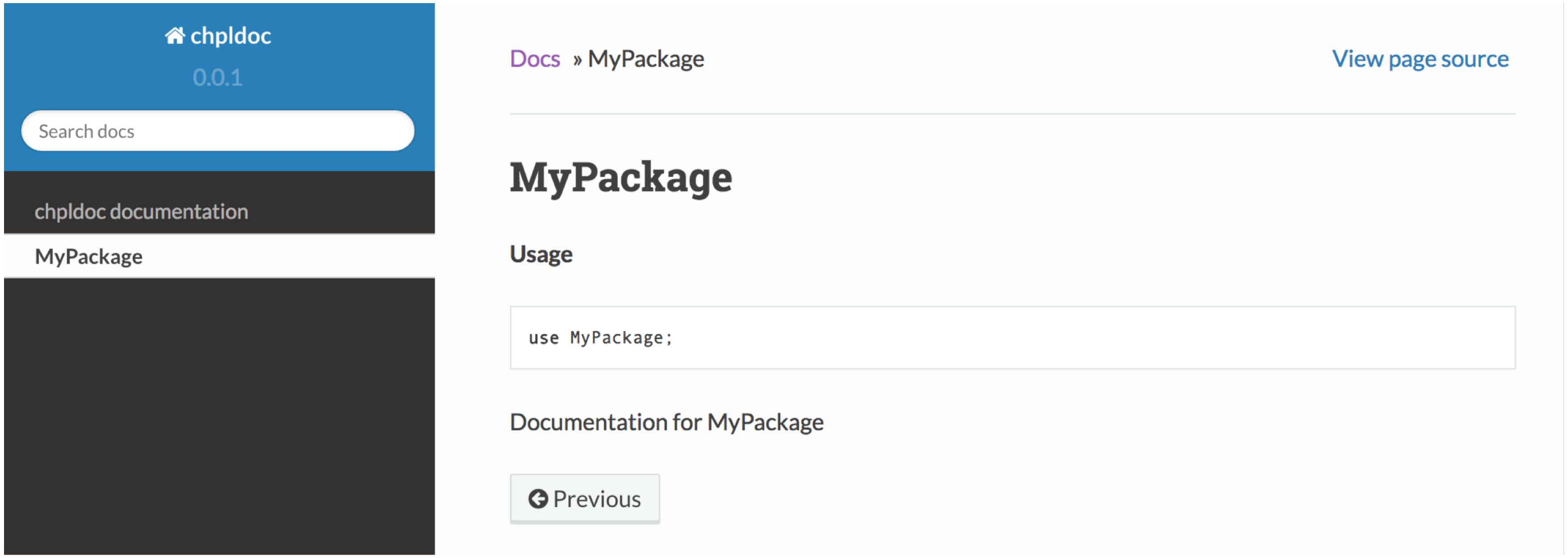
```
MyPackage/
  Mason.toml
  Mason.lock
  src/
    MyPackage.chpl
  target/
    debug/
      myPackage
  .git/
```

Mason: Building Documentation

- **Use 'mason doc' to build documentation with chpldoc**

```
> mason doc
chpldoc src/MyPackage.chpl
```

- **HTML documentation built in MyPackage/docs/**



MyPackage

Usage

```
use MyPackage;
```

Documentation for MyPackage

Mason: Searching for packages

- **Search with ‘mason search <query>’**
  - Case-insensitive substring matching
  - Lists latest version of packages
  - Empty query will list all packages

```
> mason search E
Alice (0.3.0)
Eve (1.3.0)
MyPackage (0.1.0)

> mason search bo
Bob (1.1.0)
```

Mason: Adding Dependencies

- **Add dependencies by modifying Mason.toml**
  - List module dependencies and versions

```
...
[dependencies]
Bob = "1.1.0"
Alice = "0.3.0"
```

- **The next ‘mason build’ will:**
  - Resolve versions and download dependencies to $MASON_HOME
  - Build the program with the modules in the compiler's module path

```
> mason build
Updating mason-registry
Downloading dependency: Bob-1.1.0
Downloading dependency: Alice-0.3.0
```

Mason: Lock File

- **Lock file stores versions and source locations**

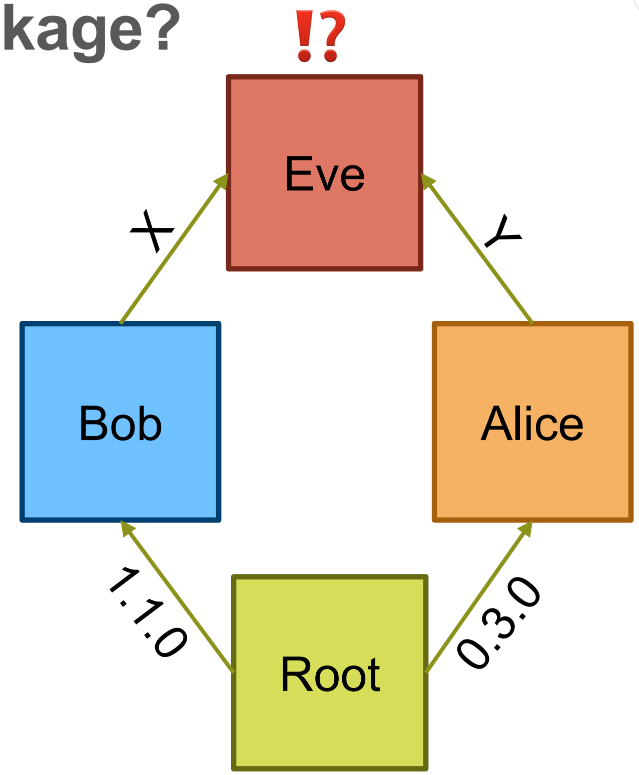
```
[root]
name = "MyPackage"
version = "0.1.0"
chplVersion = "1.16.0 .. 1.16.0"
dependencies = [“Bob 1.1.0 https://github.com/BobDev/Bob”, ..]

[Bob]
name = "Bob"
version = "1.1.0"
chplVersion = "1.16.0 .. 1.16.0"
source = "https://github.com/BobDev/Bob"
dependencies = [...]

[Alice]
...
```

Mason: Dependency Resolution

- **What if there are two versions of a package?**
- **IVRS relies on semantic versioning**
  - "Incompatible Version Resolution Strategy"
  - Semantic versioning:
    - Distinct major versions are incompatible
    - Use the latest minor version
    - Use the latest bug fix



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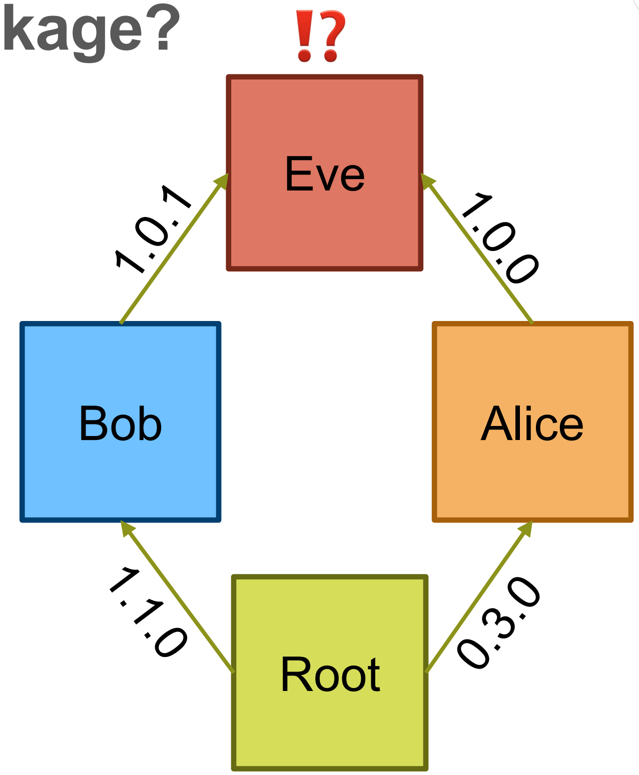

Bob	Alice	Result (Eve)
1.0.1	1.0.0	1.0.1

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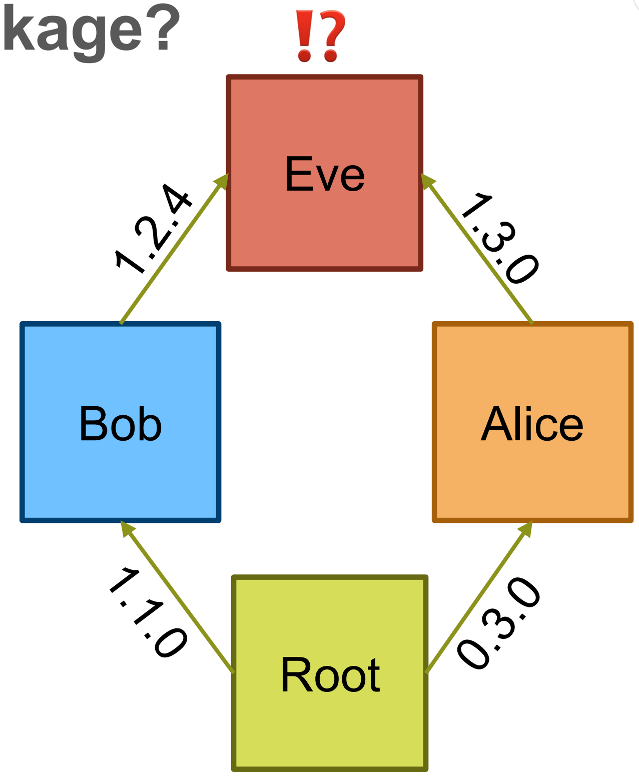

Bob	Alice	Result (Eve)
1.0.1	1.0.0	1.0.1
1.2.4	1.3.0	1.3.0

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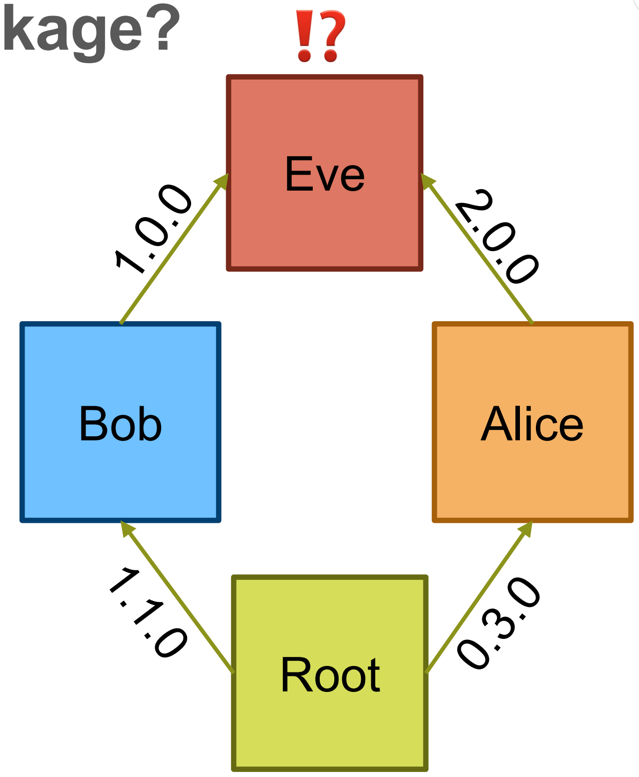

Bob	Alice	Result (Eve)
1.0.1	1.0.0	1.0.1
1.2.4	1.3.0	1.3.0
1.0.0	2.0.0	Error

Mason: The Registry

- **Mason uses a centralized registry**
  - https://github.com/chapel-lang/mason-registry
- **Packages are defined by manifest files:**

```
mason-registry/
  Bricks/
    Bob/
      1.1.0.toml
    Alice/
      0.3.0.toml
    Eve/
      1.2.4.toml
      1.3.0.toml
```

- **Registry manifest include an additional ‘source’ field**

```
source = "https://github.com/chapel-lang/MyPackage"
```

Mason: The Registry

- **Mason can be configured to look elsewhere for registry**
  - MASON_REGISTRY – a registry in the form of a git URL
  - Registries can be local git repositories
  - Registries can include local or private git repositories as packages

```
MASON_REGISTRY = https://github.com/someUser/custom-registry
```

- **Mason can support multiple registries**
  - MASON_REGISTRY can contain comma-separated registries
  - Packages are searched in left-to-right order of MASON_REGISTRY

```
MASON_REGISTRY = \
  ”my/local/private/registry, \
   https://github.com/someUser/custom-registry, \
   https://github.com/chapel-lang/mason-registry”
```

Mason: The Registry

- ‘mason env’ lists relevant environment variables
  - Similar to ‘printchplenv’

```
> export MASON_REGISTRY=/path/to/shared/registry
> mason env
MASON_HOME: /users/eve/.mason
MASON_REGISTRY: /path/to/shared/registry *
```

Mason: Publishing a Package to Registry

- **Add git tag to package repository in format of ‘vX.Y.Z’**

```
git tag -a v0.1.0 -m ”MyPackage 0.1.0"
```

- **Fork the mason-registry**
- **Add manifest file to <package>/<version>.toml**
  - Include additional ‘source’ field

```
[brick]
name = "MyPackage"
version = "0.1.0”
chplVersion = "1.16"
author = "Chapel Lang"
source = "https://github.com/chapel-lang/MyPackage"

[dependencies]
```

- **Open a Pull Request against chapel-lang/mason-registry**

Mason: Planned Features

- Add support for testing

```
> mason test
```

- Simplify publishing of new packages

```
> mason publish
```

- Add support for non-Chapel dependencies
- Add CI testing for the package ecosystem
- And much much more…
  - See issue #7106 for mason wish list

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