Managing dependencies is more than running “composer update”

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What are Dependencies?

- Services
  - APIs
  - Client-side Integrations (OAuth / External JS / Analytics / …)

- Software
  - Libraries
  - Programs / Tools

- External Assets

What is Dependency Management?

- Assembly
- Dependency Change Management
- Risk Analysis & Reduction

May happen at build time or at runtime

Dependency Assembly

- Installation of Libraries, Tools, etc.
  - composer install
  - apt-get install foo
  - Application of Configuration Management (Puppet, Chef, Ansible, Salt, …)

- Configuration for Connections to Services, external APIs
  - Authentication
  - Glue Code
- Connection to Services (usually at Runtime)

Dependency Assembly

Past:

- Step-by-Step installation instructions
- Readmes, Delete and reinstall individual packages

Today:

- Description of a system state (e.g. composer.json, top.sls)
- Tools to move the system into the state (e.g. composer, salt)

Dependency Change Management

- Dependency Change
    - Adding, Removing, Updating, Replacing of Libraries
    - Replacing APIs
    - composer update
- Dependency Change Management
    - Balance Risks, Consequences, Cost & Advantages
    - Architecture Decisions which enable “Change”
        - Example: Abstraction to replace concrete service

Risk Analysis: Availability

Affects Assembly

Examples:

- Open Source Library deleted
- Payment Service unavailable
- EU VATId Service out of order
- Jenkins not accessible

Risk Reduction: Availability

- Software is available when you have a copy
  - composer cache
  - Forks
  - Private Packagist or Satis
- Services are available depending on external factors
  - Can the service be called asynchronously?
    - e.g. run VATId check after payment
    - e.g. Private Packagist inits package in worker, no GitHub access in controller
  - Are errors clearly presented to users?
    - e.g. low timeouts, error messages when external Service X not available

Risk Analysis: Compatibility

Affects Change Management

Examples:

- BC Break in Library Update
- API Semantics change:
  - Payment API no longer supports credit card tokens, only payment tokens valid for Apple Pay etc., too

Risk Reduction: (New) Dependencies

Quality Criteria for software libraries (and services)

- Number of Maintainers / Developers
- Actively Developed?
- How many users?
  - Packagist shows installation count
- Where is a library being installed from?
  - GitHub, self-hosted svn server? -> Availability
- Alternatives / how easy to replace? Complexity?
  - Could you take over maintenance?

Risk Reduction: Compatibility

Semantic Versioning (Semver) promises Compatibility

x.y.z

- Must be used consistently
- Only valuable if BC/Compatibility promise formalized
  - See http://symfony.com/doc/current/contributing/code/bc.html
- Otherwise choose narrower Version Constraints, check more frequently
  - e.g. ~1.2.3 instead of ^1.2.3

Risk Reduction: Compatibility

- Automated
  - Tests
  - Static Analysis
- Manual
  - Read Changelogs (and write them!)
  - Experience which libraries break BC

Risk Reduction: Compatibility

- “`composer update`”
  - no isolation of problems unless run very frequently
- “`composer update <package...>`”
  - explicit conscious updates
- “`composer update --dry-run [<package...>]`”
  - Understanding and preparing effects of updates

How do partial updates work?

```
{   “name”: “zebra/zebra”,
    “require”: {
        “horse/horse”: “^1.0” }}

{   “name”: “giraffe/giraffe”,
    “require”: {
        “duck/duck”: “^1.0” }}
```

How do partial updates work?

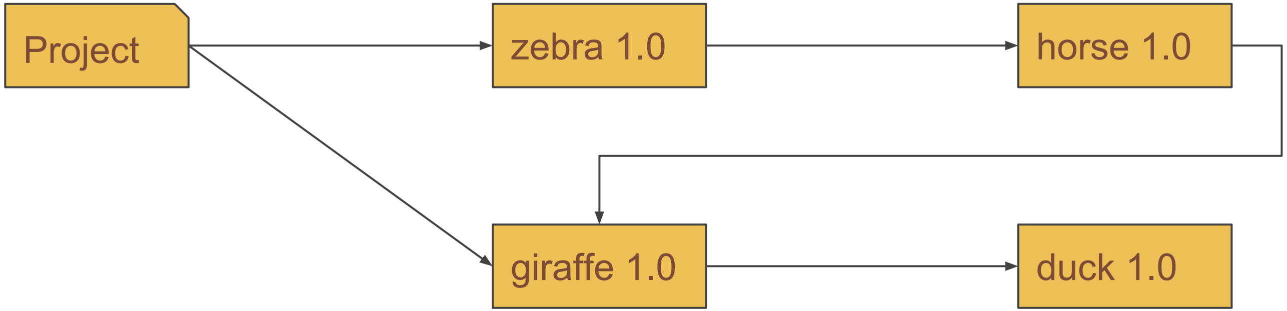
```
{   “name”: “horse/horse”,
    “require”: {
        “giraffe/giraffe”: “^1.0” }}

{   “name”: “duck/duck”,
    “require”: {}}
```

How do partial updates work?

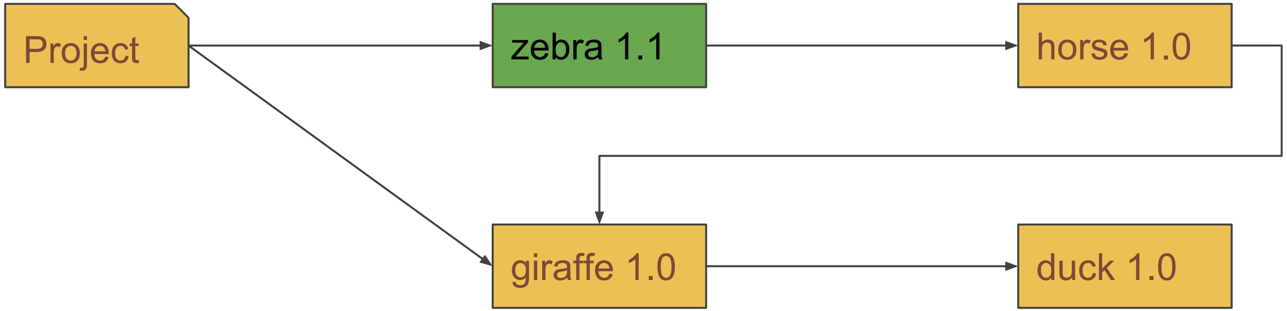
```
{
    “name”: “my-project”,
    “require”: {
        “zebra/zebra”: “^1.0”,
        “giraffe/giraffe”: “^1.0”
    }
}
```

How do partial updates work?



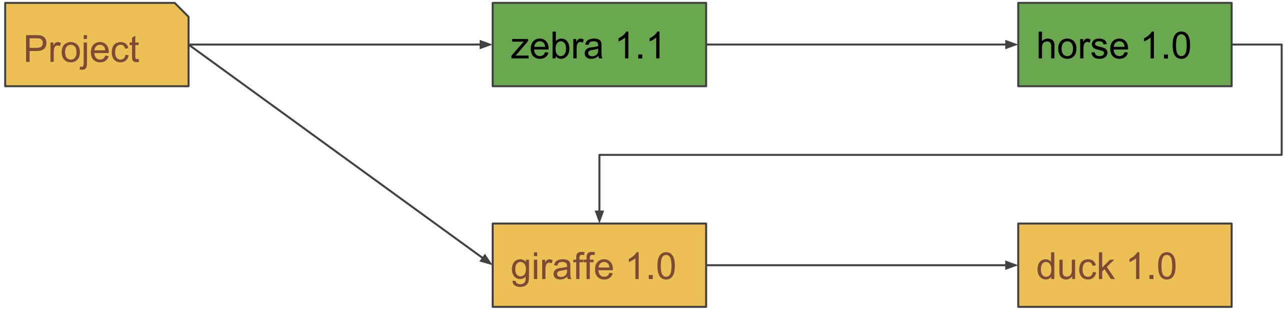
```
Now each package releases 1.1
```

How do partial updates work?



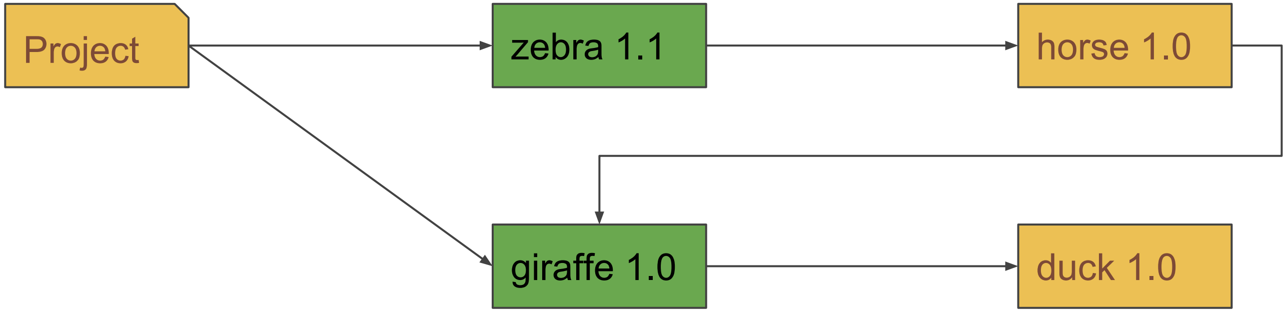
```
$ composer update --dry-run zebra/zebra
    Updating zebra/zebra (1.0 -> 1.1)
```

How do partial updates work?



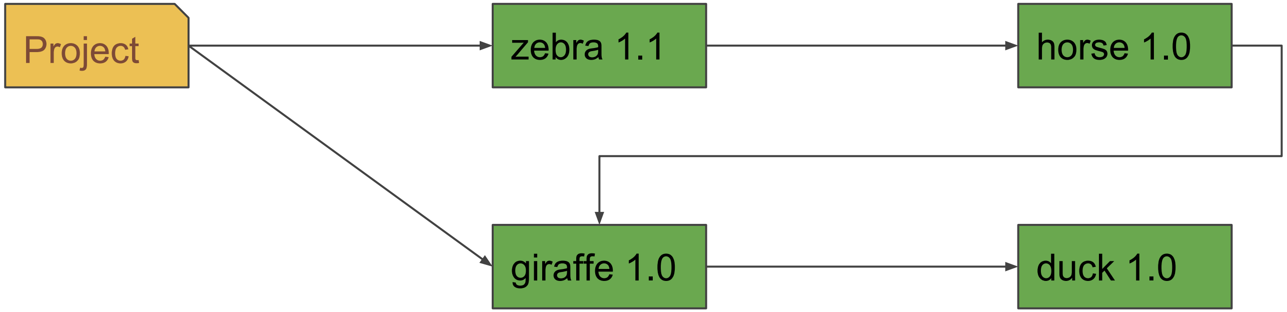
```
$ composer update --dry-run zebra/zebra --with-dependencies
    Updating horse/horse (1.0 -> 1.1)
    Updating zebra/zebra (1.0 -> 1.1)
```

How do partial updates work?



```
$ composer update --dry-run zebra/zebra giraffe/giraffe
    Updating zebra/zebra (1.0 -> 1.1)
    Updating giraffe/giraffe (1.0 -> 1.1)
```

How do partial updates work?



```
$ composer update zebra/zebra giraffe/giraffe --with-dependencies
    Updating duck/duck (1.0 -> 1.1)
    Updating giraffe/giraffe (1.0 -> 1.1)
    Updating horse/horse (1.0 -> 1.1)
    Updating zebra/zebra (1.0 -> 1.1)
```

The Lock File

- Contents
  - all dependencies including transitive dependencies
  - Exact version for every package
  - download URLs (source, dist, mirrors)
  - Hashes of files

- Purpose
  - Reproducibility across teams, users and servers
  - Isolation of bug reports to code vs. potential dependency breaks
  - Transparency through explicit updating process

Commit The Lock File

- If you don’t
    - composer install without a lock file is a composer update
    - Affects Assembly
        - Conflict can randomly occur on install
        - You may not get the same code
    - You no longer manage change
      Change is managing you!

- The lock file exists to be commited!

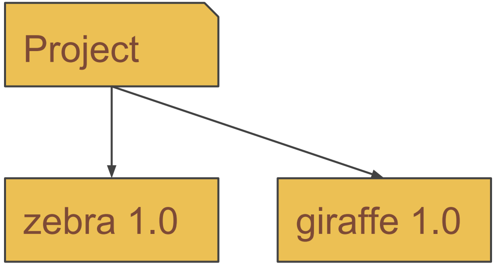
How to resolve lock merge conflicts?

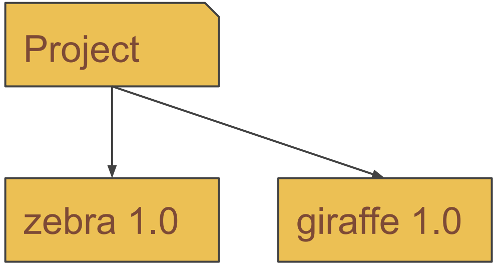
- composer.lock cannot be merged without conflicts
    - contains hash over relevant composer.json values

- `git checkout <refspec> -- composer.lock`
    - `git checkout master -- composer.lock`

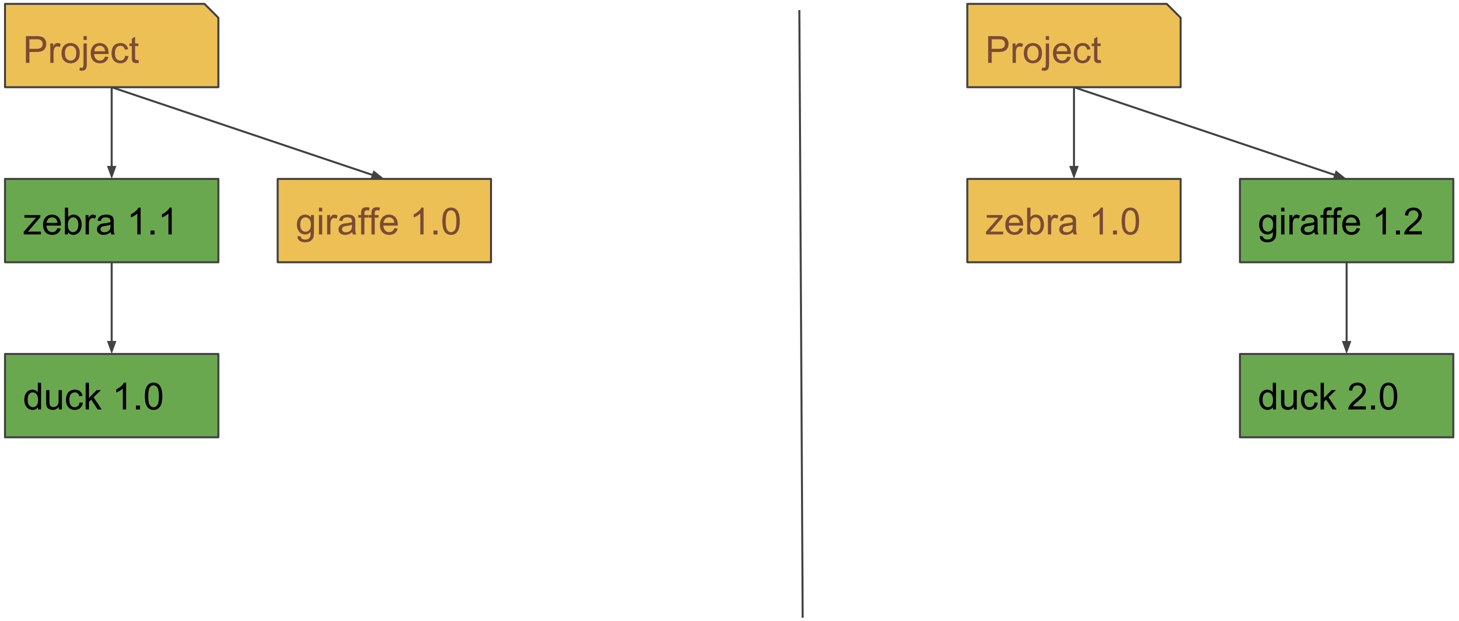
- Repeat: `composer update <list of deps>`
    - Store parameters in commit message
    - Separate commit for the lock file update

How to resolve lock merge conflicts?

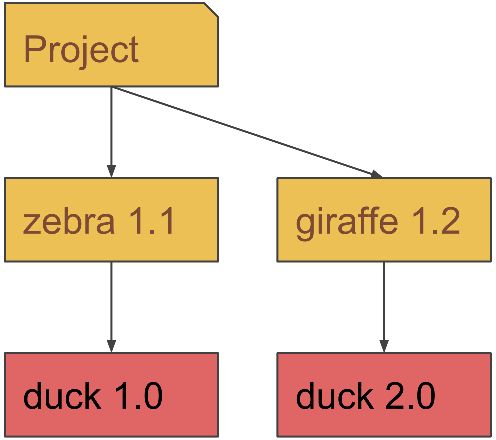




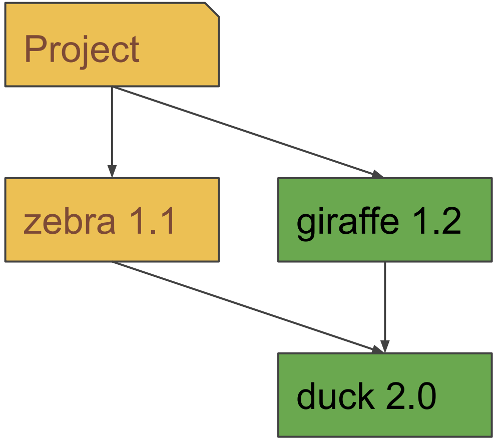
How to resolve lock merge conflicts?



How to resolve lock merge conflicts?



Merge results in invalid dependencies



Rerunning update is safe

Risk Analysis: Compliance / Legal

Affects Change Management

Examples:

- Viral Copy-Left License not compatible with proprietary product
- Terms of Service
  - May I use an API for my services?
    Cloudflare / packagist.org
  - How much time do I have when a supplier terminates the service?
  - SLA with sufficient support?

Risk Minimization: Compliance / Legal

- Software dependency license must fit product license or customer requirements
    - `composer licenses`
    - Private Packagist License Review

- Terms of Service / SLA / Contracts
    - Criteria for selection
    - Negotiable
    - Strong dependencies justify financial expenses to create security

Assessing & Managing Risk

- Formulate a Plan B
- Identify problems which are probable and which have great effects

- **Dependencies are great!** They can save tons of money and time
- Only spend resources on reducing risk until the risk is acceptable

Summary

- composer update [--dry-run] <package>
- git checkout <branch> -- composer.lock
- Formalize BC promises for users of your libraries
- SemVer: Don’t be afraid to increase the major version
- Document changes to dependencies

- Have a plan B
- Don’t waste resources on potential problems which are unlikely to occur or have insignificant effects
- **Dependencies are great!**
  Benefit usually greater than cost

Developers must consider dependency management from a business perspective
Business / Management must not ignore risk from software dependencies

Thank you!

Questions / Feedback?

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