

**ABI compatibility  
is not a MAJOR problem**

MANAGEABLE  
TRACTABLE

# ABI compatibility, handle the problem



- Define everything that affects your ABI:
  - Sources:
    - name
    - version: SemVer
    - user: fork
    - channel: branch

`name/version@user/channel`

(aka. Conan reference)

# ABI compatibility, handle the problem



- Define everything that affects your ABI:
  - Sources: name/version@user/channel
  - Operating system (distro, version,...), architecture,...

```
os:  
  Windows:  
    subsystem: [None, cygwin, msys, msys2, wsl]  
  WindowsStore:  
    version: ["8.1", "10.0"]  
  Linux:  
  Macos:  
    version: [None, "10.6", "10.7", "10.8", "10.9", "10.10", "10.11", "10.12", "10.13", "10.14"]  
  Android:  
    api_level: ANY  
  iOS:  
    version: ["7.0", "7.1", "8.0", "8.1", "8.2", "8.3", "9.0", "9.1", "9.2", "9.3", "10.0", "10.1", "10.2", "10.3", "11.0", "11.1"]  
  watchOS:  
    version: ["4.0", "4.1", "4.2", "4.3", "5.0", "5.1"]  
  tvOS:  
    version: ["11.0", "11.1", "11.2", "11.3", "11.4", "12.0", "12.1"]  
  FreeBSD:  
  SunOS:  
  Arduino:  
    board: ANY  
arch: [x86, x86_64, ppc32, ppc64le, ppc64, armv5el, armv5hf, armv6, armv7, armv7hf, armv7s, armv7k, armv8, armv8_32, armv8.3, sparc,
```

# ABI compatibility, handle the problem

- Define everything that affects your ABI:
  - Sources: name/version@user/channel
  - Operating system (distro, version,...), architecture,...
  - Tooling: compiler, library options,...

```
compiler:
  gcc:
    version: ["4.1", "4.4", "4.5", "4.6", "4.7", "4.8", "4.9",
              "5", "5.1", "5.2", "5.3", "5.4", "5.5",
              "6", "6.1", "6.2", "6.3", "6.4",
              "7", "7.1", "7.2", "7.3",
              "8", "8.1", "8.2"]
    libcxx: [libstdc++, libstdc++11]
  Visual Studio:
    runtime: [MD, MT, MTd, MDd]
    version: ["8", "9", "10", "11", "12", "14", "15", "16"]
    toolset: [None, v90, v100, v110, v110_xp, v120, v120_xp,
              v140, v140_xp, v140_clang_c2, LLVM-vs2012, LLVM-vs2012_xp,
              LLVM-vs2013, LLVM-vs2013_xp, LLVM-vs2014, LLVM-vs2014_xp,
              LLVM-vs2017, LLVM-vs2017_xp, v141, v141_xp, v141_clang_c2, v142]
  clang:
    version: ["3.3", "3.4", "3.5", "3.6", "3.7", "3.8", "3.9", "4.0",
```

# ABI compatibility, handle the problem



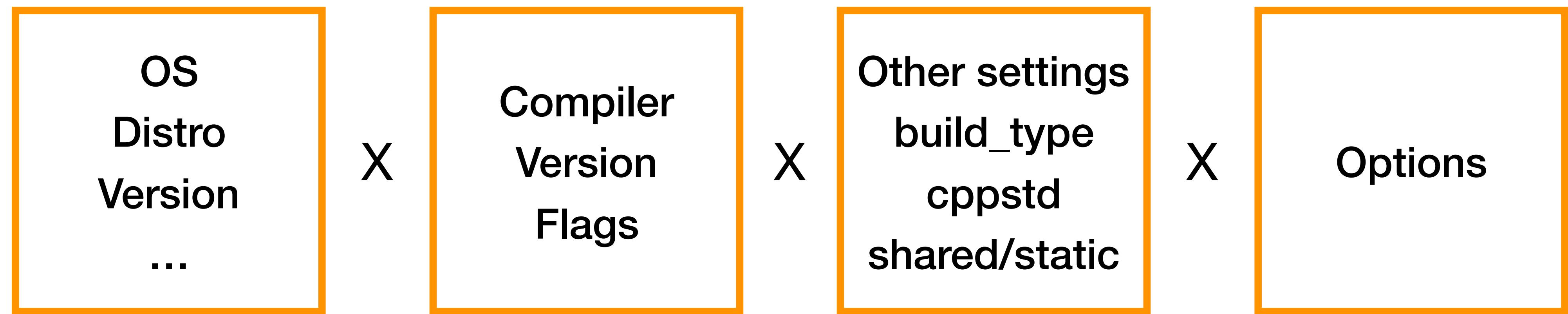
- Define everything that affects your ABI:
  - Sources: name/version@user/channel
  - Operating system (distro, version,...), architecture,...
  - Tooling: compiler, library options,...
  - Other flags/configurations

```
build_type: [None, Debug, Release, RelWithDebInfo, MinSizeRel]
cppstd: [None, 98, gnu98, 11, gnu11, 14, gnu14, 17, gnu17, 20, gnu20]
```

# ABI compatibility, handle the problem



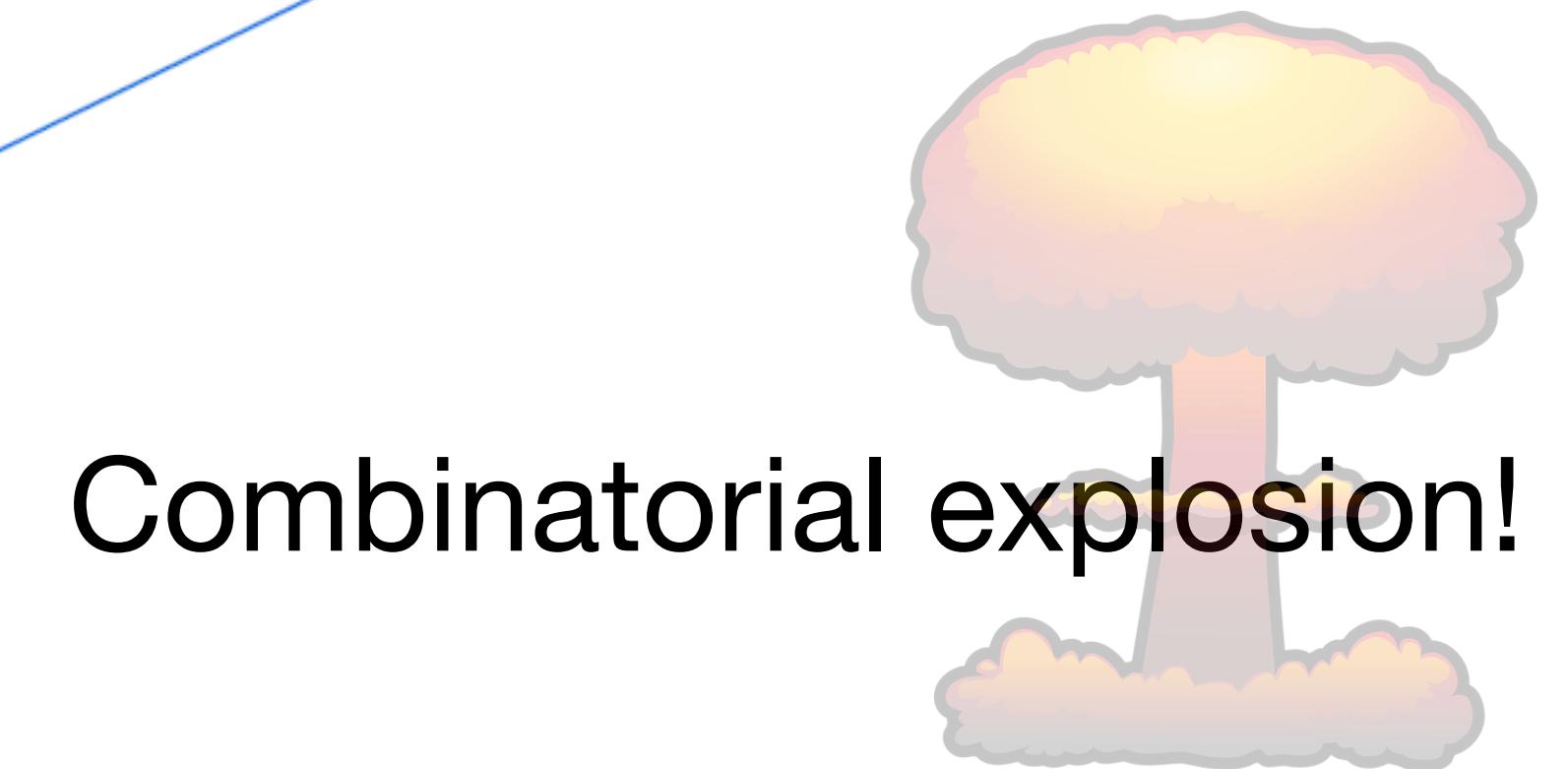
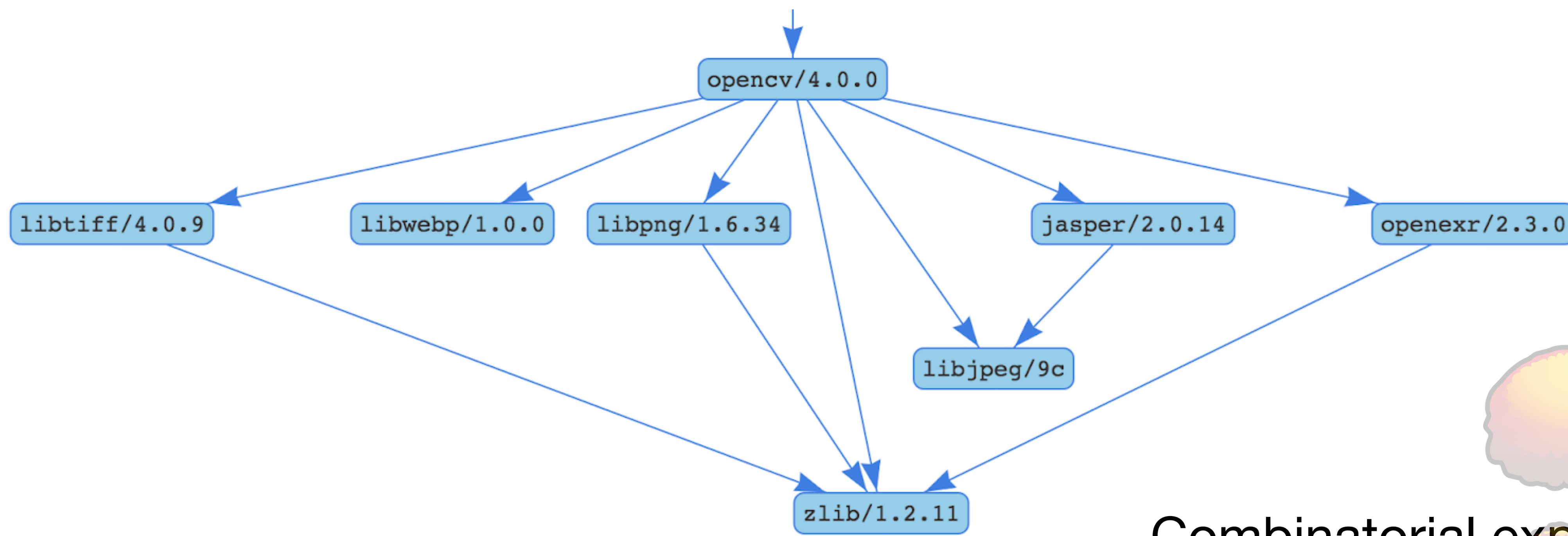
- Define everything that affects your ABI
- Assign a different ID to each combination



Combinatorial explosion!

# ABI compatibility, handle the problem

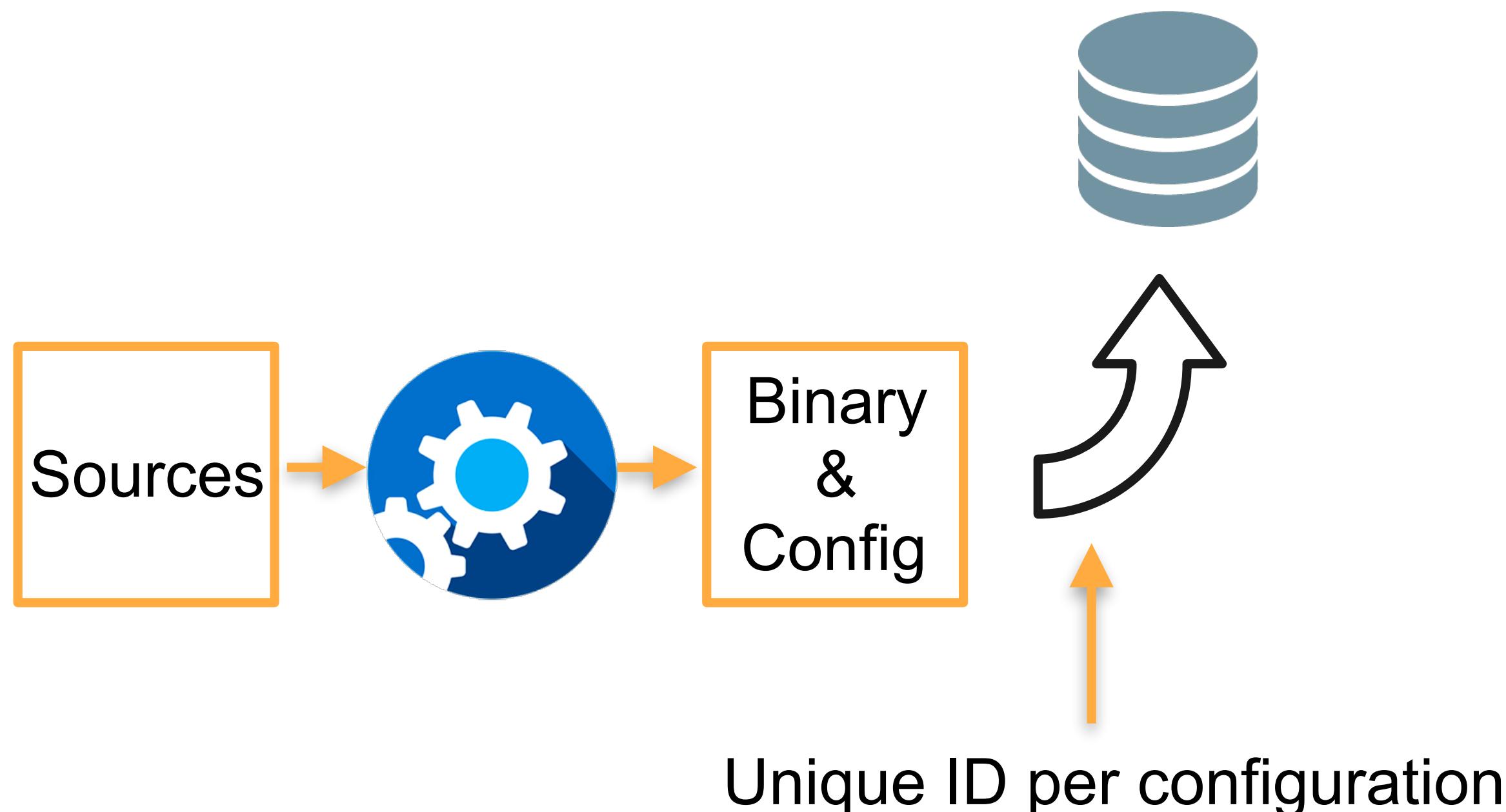
- Define everything that affects your ABI
- Assign a different ID to each combination



Combinatorial explosion!

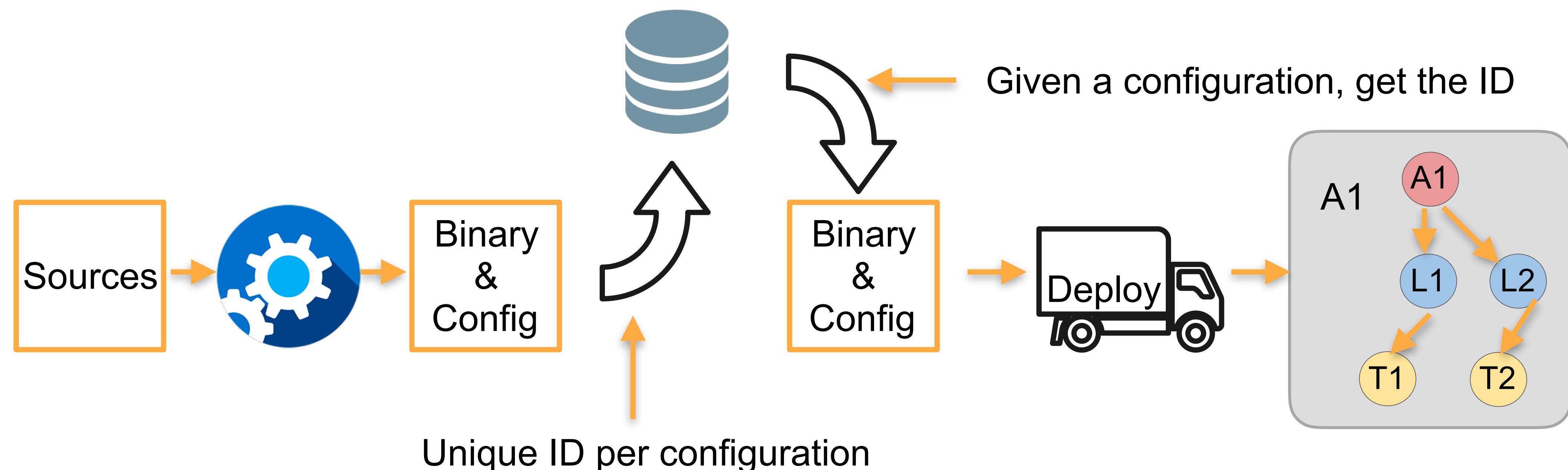
# ABI compatibility, handle the problem

- Define everything that affects your ABI
- Assign a different ID to each combination



# ABI compatibility, handle the problem

- Define everything that affects your ABI
- Assign a different ID to each combination



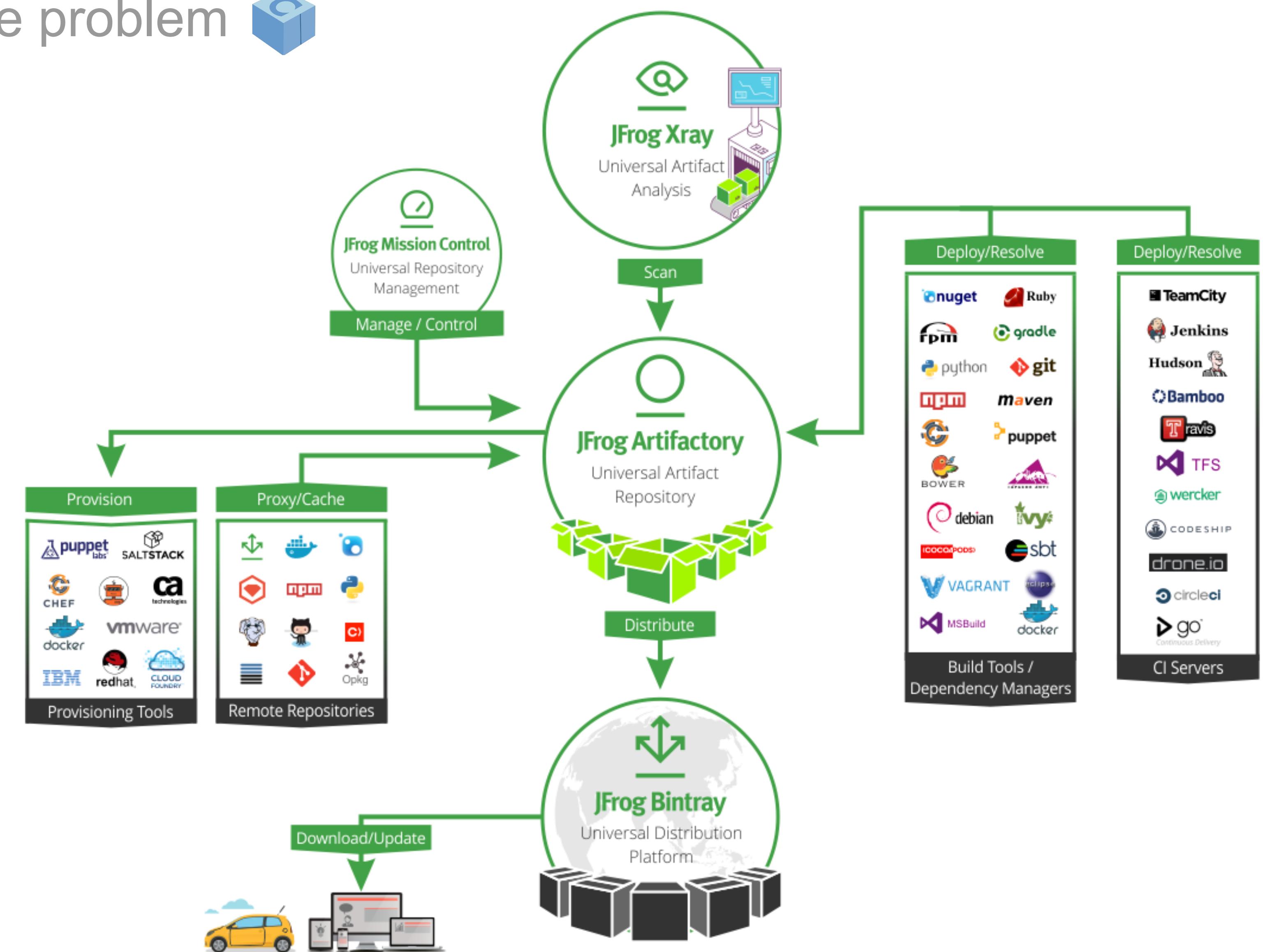


Diego Velázquez. *La fragua de Vulcano* (fragment). 1630  
Museo Nacional del Prado, Madrid (Spain)

ABI compatibility, handle the problem 

**Artifactory:**  
> Binary database

**Conan**  
~ SQL



# ABI compatibility, handle the problem



**CONAN:** reference + settings/options => ID

```
conan info . [default configuration]
ID: f8bda7f0751e4bc3beaa6c3b2eb02d455291c8a2
```

```
conan info . -s build_type=Debug
ID: f51350faf9be5480f35c35c17122e2cb6fb617f
```

```
conan info . -s build_type=Debug -s os=Windows
ID: cf18caf7722d01e5ebf09c08a264d2fa7f5e1a58
```

```
conan info . -s os=Windows
ID: 98daf1be085c523736063391741a5fde90344a04
```

```
conan info . -s os=Windows -o api=v2
ID: ffa526e575e6def1cd97cbda3f211d5f5d650870
```

```
class Library(ConanFile):
    name = "library"
    version = "1.0.0"

    settings = "os", "arch", "compiler", "build_type"
    options = {'shared': [True, False],
               'api': ['v1', 'v2', 'v3']}
    default_options = {'shared': True, 'api': 'v1'}

    def source(self):
        # Instructions to get the sources
        pass

    def build(self):
        # Instructions to build
        pass

    def package(self):
        # Collect files that belong to the package
        pass
```

# ABI compatibility, handle the problem

## CONAN: reference + ID => settings/options

```
conan search zlib/1.2.8@conan/stable [query expression]
```

Existing packages for recipe `zlib/1.2.8@conan/stable`:

**Package\_ID:** 1513b3452ef7e2a2dd5f931247c5e02edeb98cc9

[options]

**fPIC:** True

**shared:** False

[settings]

**arch:** x86\_64

**build\_type:** Debug

**compiler:** apple-clang

**compiler.version:** 10.0

**os:** Macos

**Outdated from recipe:** False

**Package\_ID:** 534dcc368c999e07e81f146b3466b8f656ef1f55

[options]

**fPIC:** True

**shared:** False



## More about CONAN?

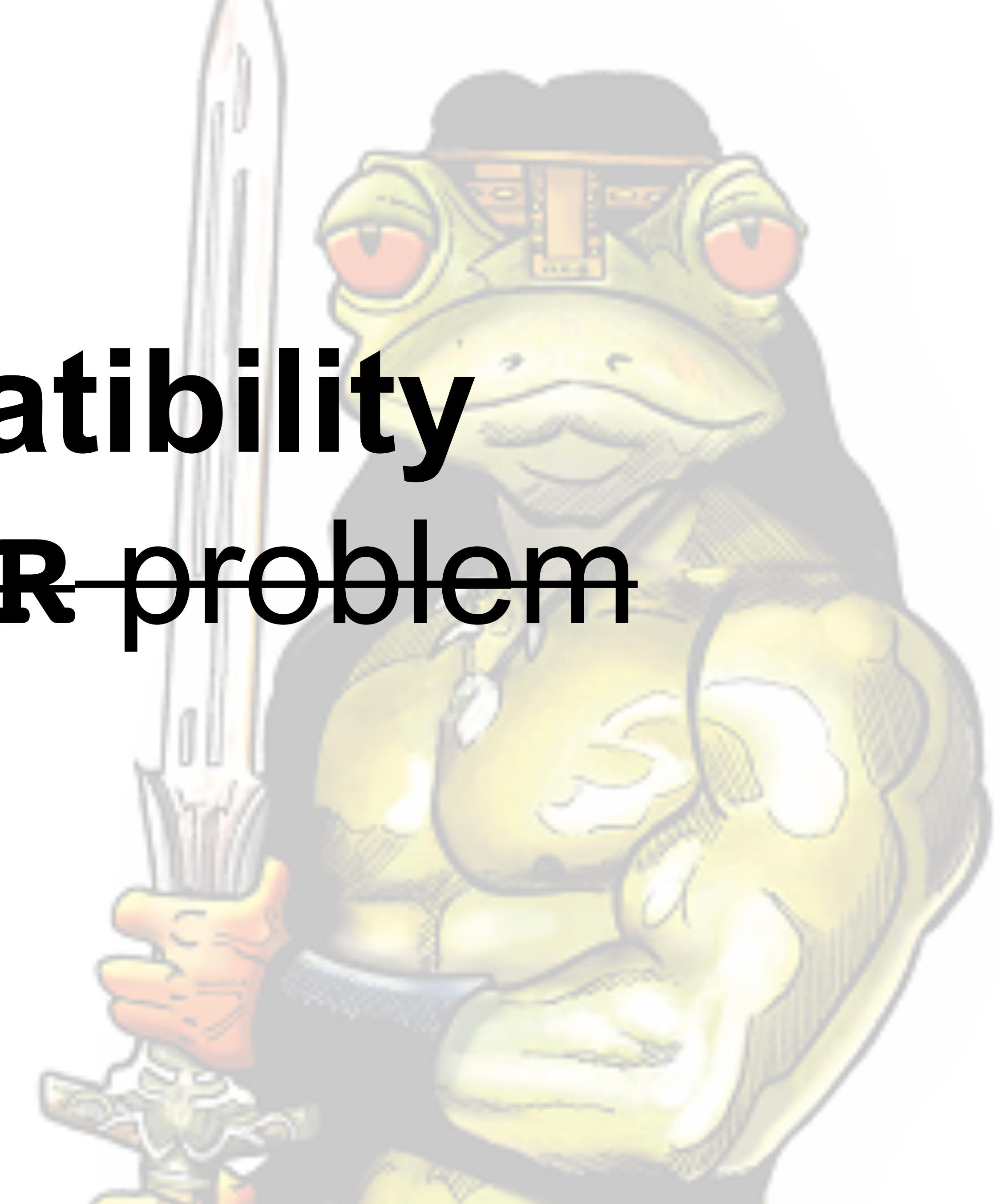
- **Italian C++ (Milan)** Jun 15
- **SwampUp (S. Francisco)** Jun 17-19
- **CppCon (Colorado)** Sept 15-20
- **Codemotion (Madrid)** Sept 24
- **Meeting Embedded (Berlin)** Nov 13
- **Meeting C++ (Berlin)** Nov 14-16

And everywhere thanks to our amazing community, you are awesome!

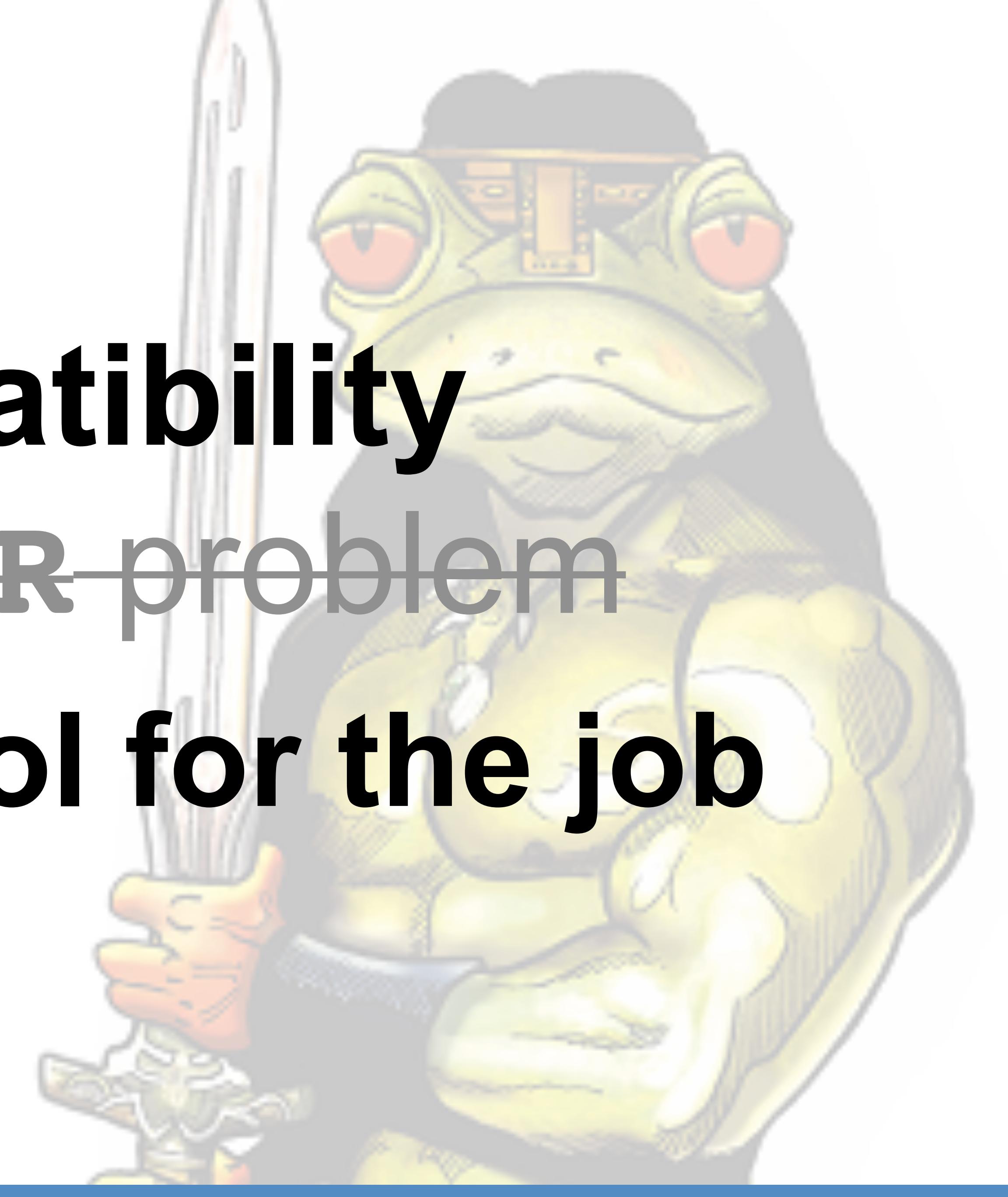


Docs: <https://conan.io>

El Greco. *Pentecostés* (fragment). 1597-1600  
Museo Nacional del Prado, Madrid (Spain)



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**ABI compatibility**  
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**Use the right tool for the job**

## References

- **GCC 5 in Fedora (What's an ABI, and what happens when we change it?)**  
Link: <https://fedoramagazine.org/gcc-5-in-fedora-whats-an-abi-and-what-happens-when-we-change-it/>
- **Mathieu Ropert. “ABI & API versioning” CppCon 2017**  
Video: <https://www.youtube.com/watch?v=la3IDPjA-d0>
- **Thiago Macieira. “Binary compatibility for library developers” C++Now 2013**  
Video: <https://www.youtube.com/watch?v=PHrXGHDd9no>
- **Conan documentation**  
Link: <http://docs.conan.io/>
- **C++ Exception handling internals (An infinite monkey, Nico Brailovsky’s blog)**  
Link: <https://monoinfinito.wordpress.com/series/exception-handling-in-c/>
- **KDE: Policies/Binary compatibility issues with C++**  
Link: [https://community.kde.org/Policies/Binary\\_Compatibility\\_Issues\\_With\\_C%2B%2B](https://community.kde.org/Policies/Binary_Compatibility_Issues_With_C%2B%2B)
- **Oracle: Stability of the C++ ABI: Evolution of a Programming Language**  
Link: <https://www.oracle.com/technetwork/systems/stablecplusplusabi-333927.html>
- **Libabigail manual**  
Link: <https://sourceware.org/libabigail/manual/index.html>
- **Examining binary files in Linux**  
Link: <http://blog.vinceliu.com/2009/06/examining-binary-files-in-linux.html>
- **What's an ABI and why is it so complicated?**  
Link: <https://accu.org/content/conf2015/JonathanWakely-What Is An ABI And Why Is It So Complicated.pdf>



Thanks!



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