Managing Modular Software

for your NuGet, C++ and Java Development

JFrog®

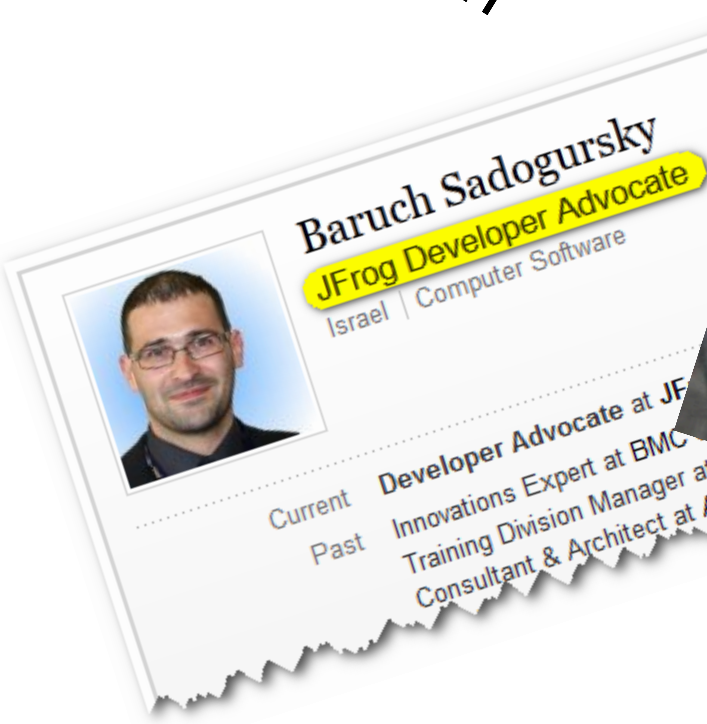
Agenda

- Modular software – why?
- Building modular software…
- … in Java
- … in C++
- … in .NET

Who’s talking?

github.com/jbaruch

@jbaruch



Baruch Sadogursky

JFrog Developer Advocate

Israel | Computer Software

Current Developer Advocate at JF

Past Innovations Expert at BMC

Training Division Manager at Alp

Consultant & Architect at AlphaCSP

WTF IS MODULE?

Module

Modular programming (also called "top-down design" and "stepwise refinement") is a software design technique that emphasizes separating the functionality of a program into independent, interchangeable modules, such that each contains everything necessary to execute only one aspect of the desired functionality.

TL;DR

Module

Module Formula

Data

+

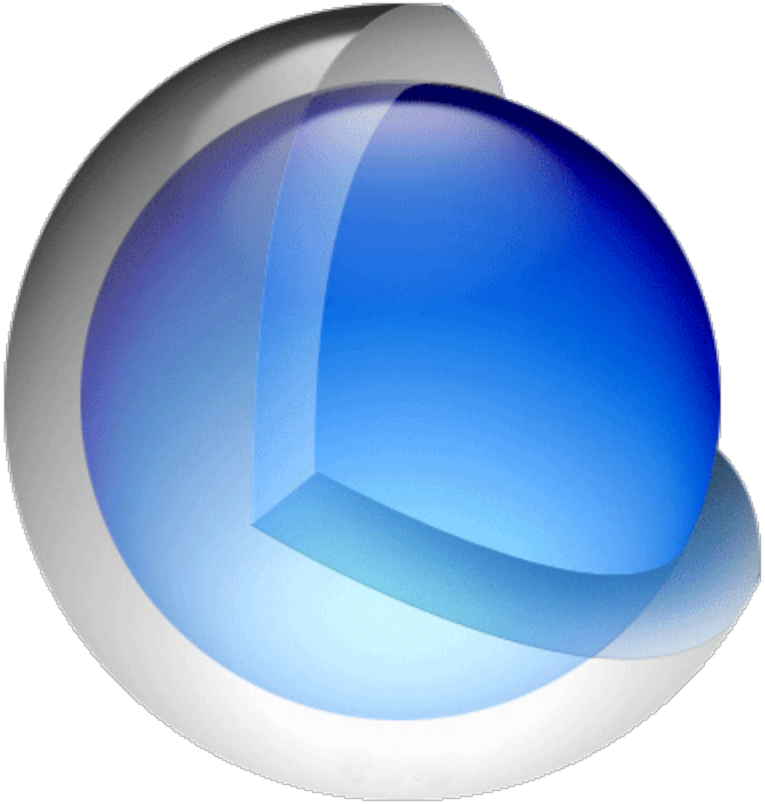
Metadata

=

Module

Unit of code

Encapsulated



Encapsulated

Smart Slide!

Discrete

Discrete

Smart Slide!

Discrete

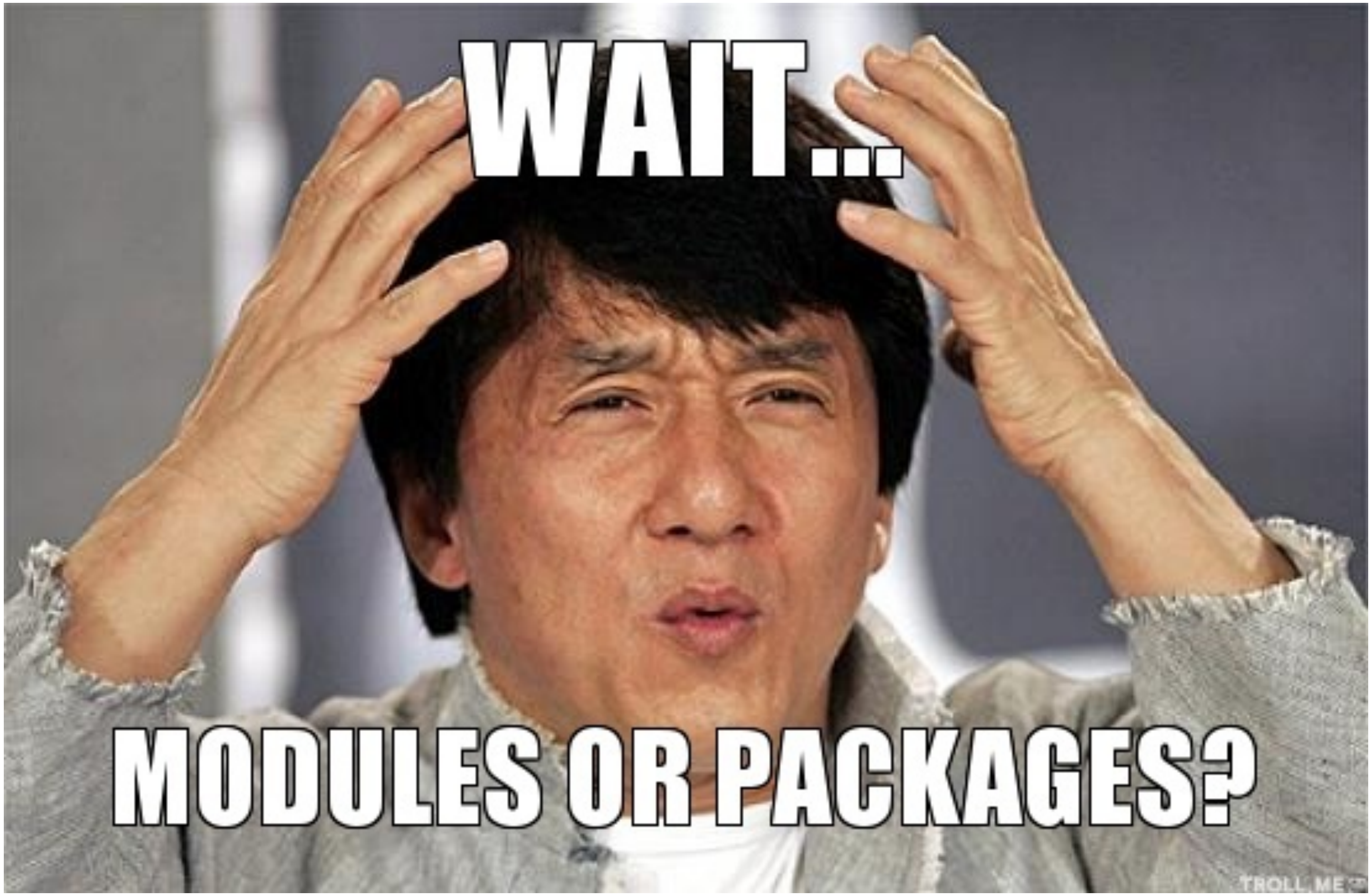
Smart Slide!

Very

Reusable

Exposed via APIs

Packages


WAIT...
MODULES OR PACKAGES?
TROLL.ME

Modules or Packages?

Technology	Package	Module

Modules or Packages?

Technology	Package	Module
Java	package keyword semantics	*.jar files, OSGi bundles

Modules or Packages?

Technology	Package	Module
Java	package keyword semantics	*.jar files, OSGi bundles
C++	namespace keyword semantics	*.dll files, *.so files

Modules or Packages?

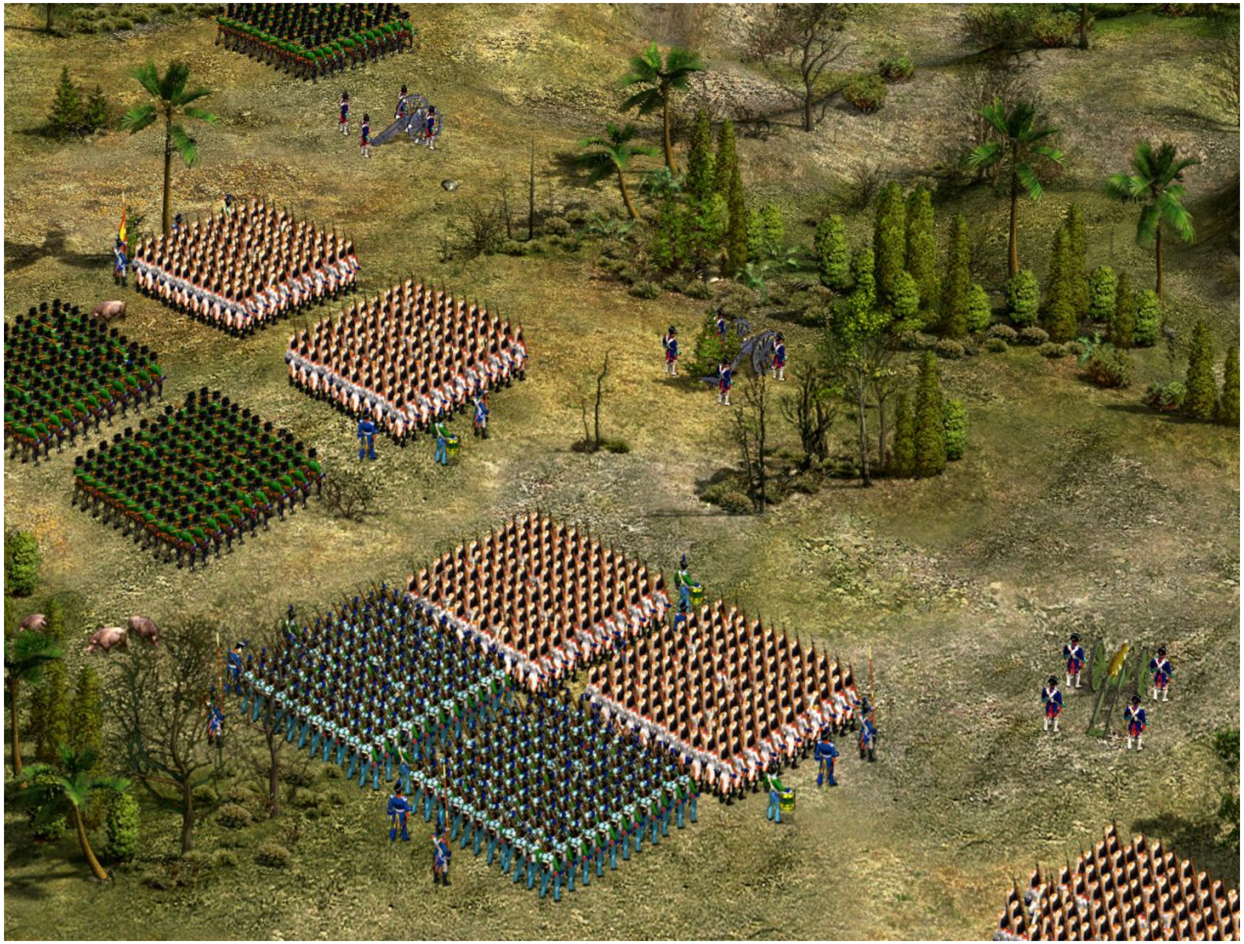
Technology	Package	Module
Java	package keyword semantics	*.jar files, OSGi bundles
C++	namespace keyword semantics	*.dll files, *.so files
C#	namespace keyword semantics	*.dll files, NuGet packages

Modular Software – why?

Discrete Units Are Smaller

Modular Security Control

Multi-Team Agility



Code Sharing

Forcing API

Module ⇨ Dependency

HOW STUFF PLAYS WITH MODULES

Build Tools and Dependencies

Recipe

1. Take sources

Recipe

1. Take sources – OK

Recipe

1. Take sources – OK
2. Bring dependencies

Recipe

1. Take sources – OK
2. Bring dependencies – where from?

Recipe

1. Take sources – OK
2. Bring dependencies – where from?
3. Build binaries

Recipe

1. Take sources – OK
2. Bring dependencies – where from?
3. Build binaries – OK

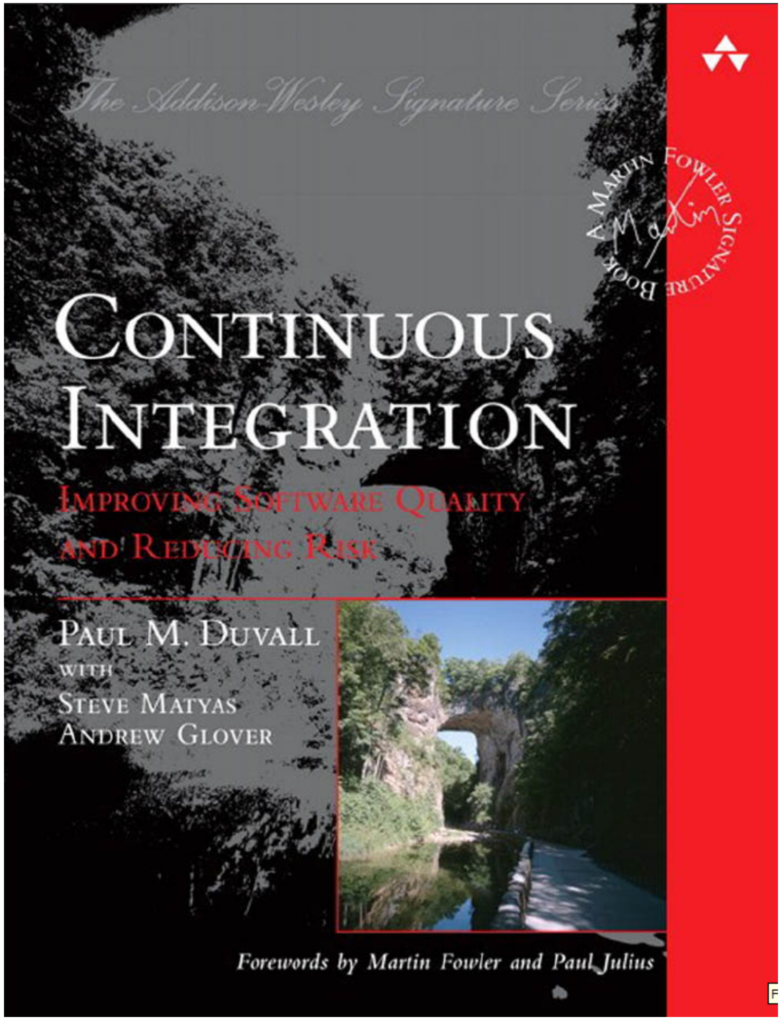
Recipe

1. Take sources – OK
2. Bring dependencies – where from?
3. Build binaries – OK
4. …

Recipe

1. Take sources – OK
2. Bring dependencies – where from?
3. Build binaries – OK
4. … - now what?

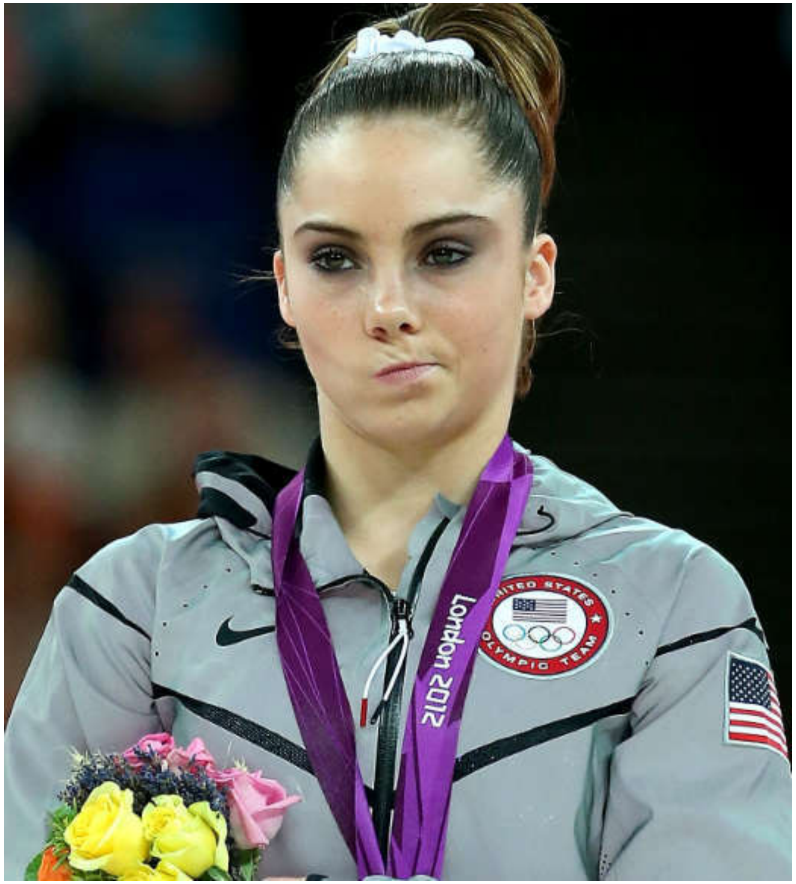
CI Servers and Modules


The Addison-Wesley Signature Series
A Martin Fowler Signature Book
Continuous Integration
Improving Software Quality and Reducing Risk
Paul M. Duvall
with
Steve Matyas
Andrew Glover
Forewords by Martin Fowler and Paul Julius

CI servers run build tools.

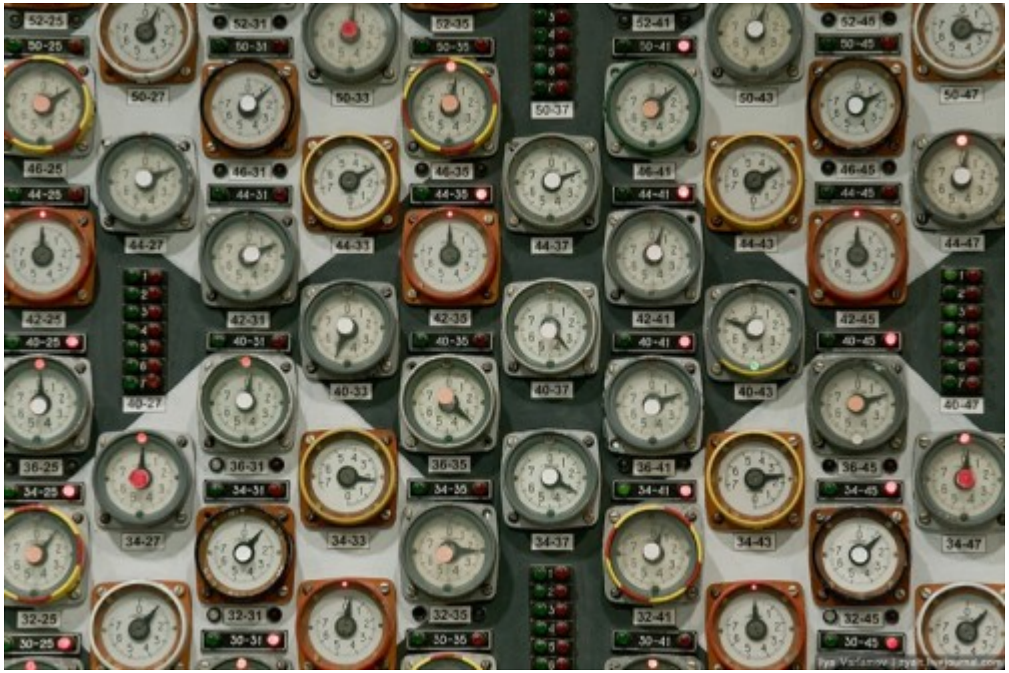
CI servers run build tools.

We can do better!

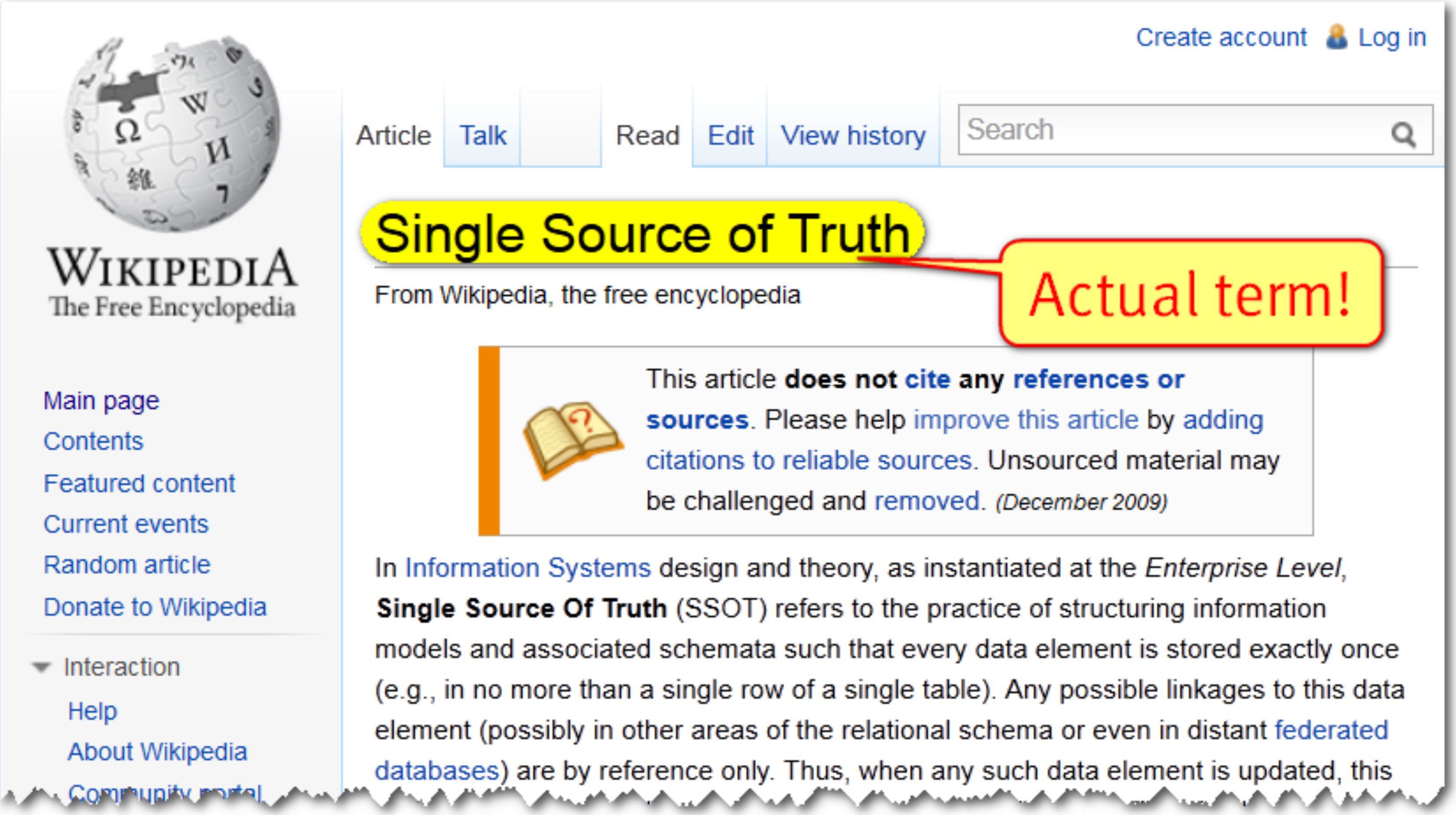


Cascading Builds

Per module results



Wait, while on the CI Servers…



Single Source of Truth

Actual term!

From Wikipedia, the free encyclopedia

This article **does not cite any references or sources**. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed. *(December 2009)*

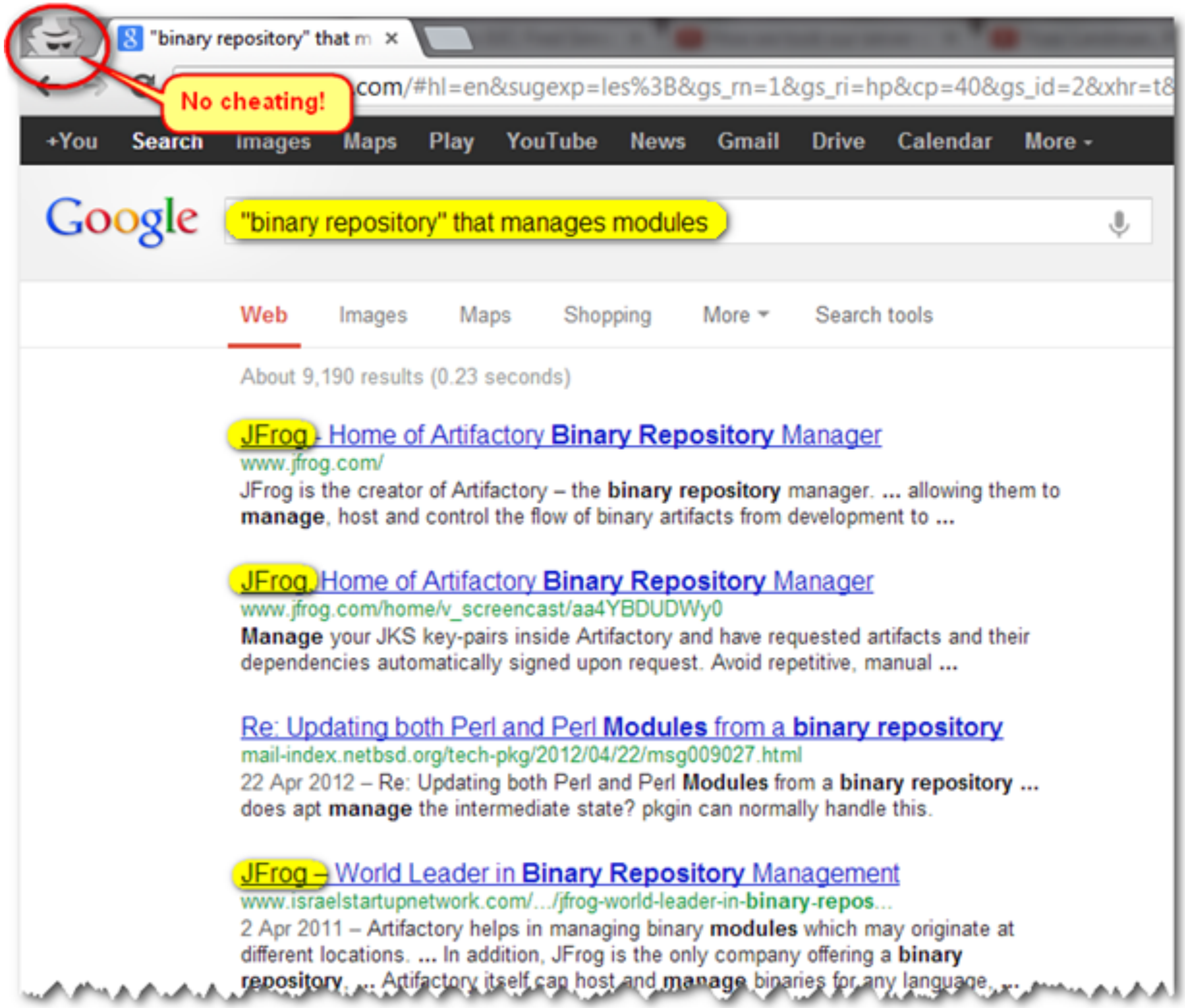
In Information Systems design and theory, as instantiated at the *Enterprise Level*, **Single Source Of Truth** (SSOT) refers to the practice of structuring information models and associated schemata such that every data element is stored exactly once (e.g., in no more than a single row of a single table). Any possible linkages to this data element (possibly in other areas of the relational schema or even in distant federated databases) are by reference only. Thus, when any such data element is updated, this

BINARY REPOSITORY AND…

What is Binary Repository

Said who?

Binary Repository Experts



No cheating!

"binary repository" that manages modules

About 9,190 results (0.23 seconds)

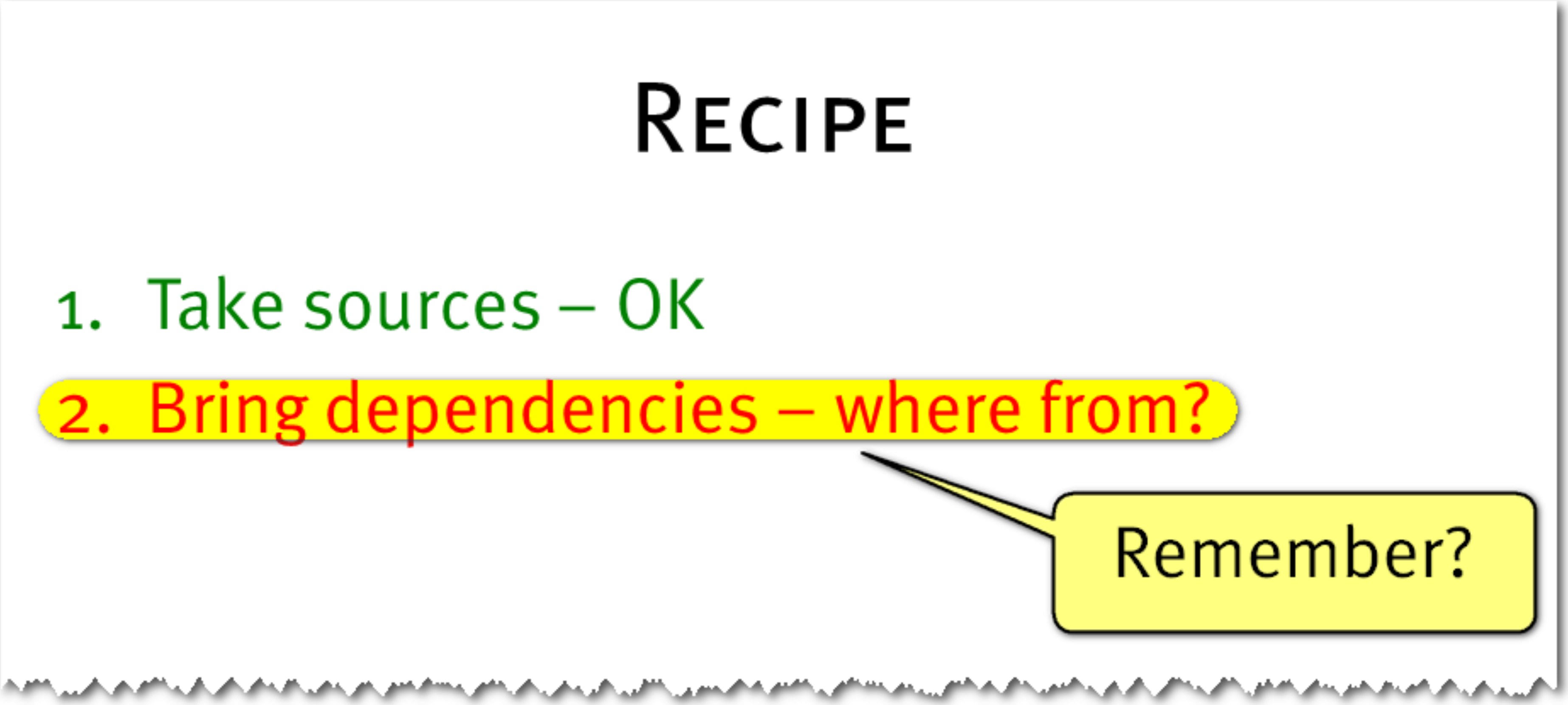
JFrog - Home of Artifactory **Binary Repository** Manager
www.jfrog.com/
JFrog is the creator of Artifactory – the **binary repository** manager. ... allowing them to **manage**, host and control the flow of binary artifacts from development to ...

JFrog Home of Artifactory **Binary Repository** Manager
www.jfrog.com/home/v_screencast/aa4YBDUDWy0
Manage your JKS key-pairs inside Artifactory and have requested artifacts and their dependencies automatically signed upon request. Avoid repetitive, manual ...

Re: Updating both Perl and Perl **Modules** from a **binary repository**
mail-index.netbsd.org/tech-pkg/2012/04/22/msg009027.html
22 Apr 2012 – Re: Updating both Perl and Perl **Modules** from a **binary repository** ... does apt **manage** the intermediate state? pkgin can normally handle this.

JFrog – World Leader in **Binary Repository** Management
www.israelstartupnetwork.com/.../jfrog-world-leader-in-**binary-repos**...
2 Apr 2011 – Artifactory helps in managing binary **modules** which may originate at different locations. ... In addition, JFrog is the only company offering a **binary repository**. ... Artifactory itself can host and **manage** binaries for any language. ...

Binary Repository as Modules Source



Recipe

1. Take sources – OK
2. Bring dependencies – where from?

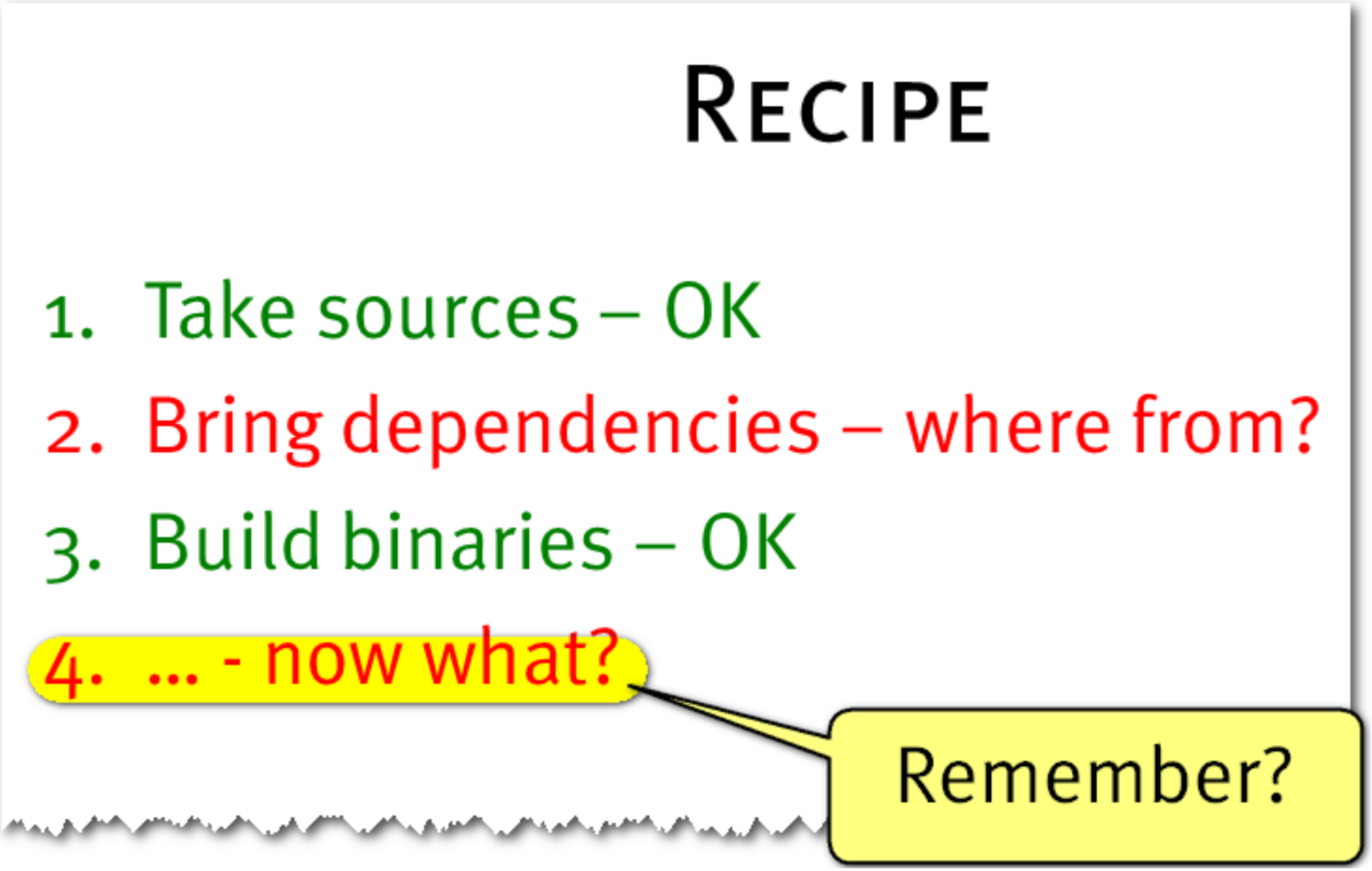
Remember?

Binary Repository as Modules Source

Hint!

Binary Repository as Modules Source

Binary Repository as Deployment Target



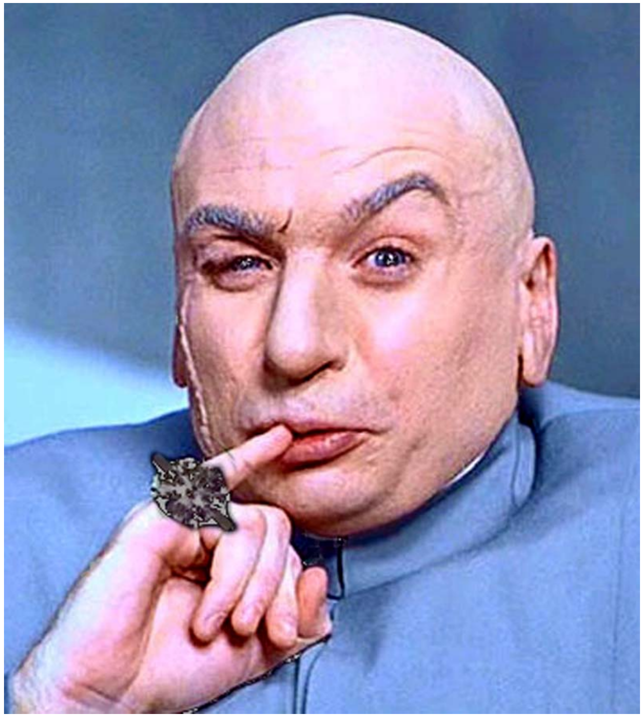
RECIPE

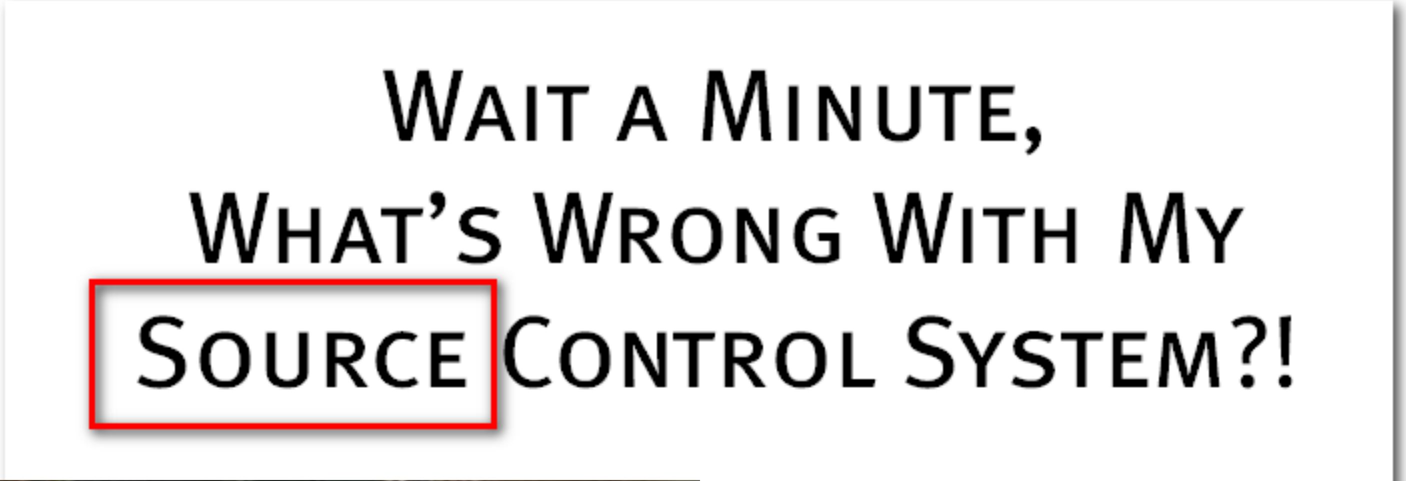
1. Take sources – OK
2. Bring dependencies – where from?
3. Build binaries – OK
4. ... - now what?

Remember?

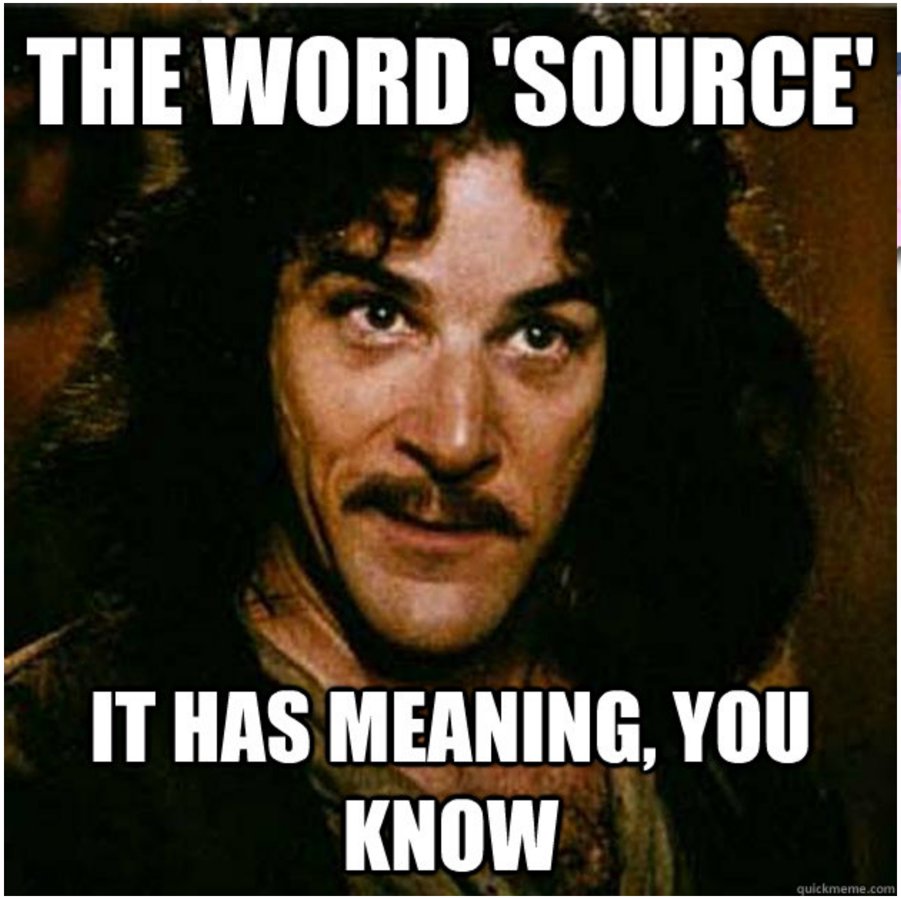
Binary Repository as Deployment Target

Wait a Minute, What's Wrong With My Source Control System?!





Wait a Minute, What's Wrong With My Source Control System?!



Sources vs. Binaries

Sources	Binaries

Sources vs. Binaries

Sources	Binaries
Text	Blob

Sources vs. Binaries

Sources	Binaries
Text	Blob
Diffable	Not diffable

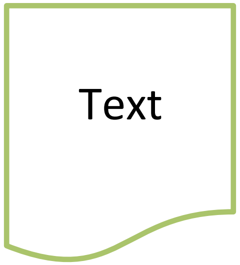
Sources vs. Binaries

Sources	Binaries
Text	Blob
Diffable	Not diffable
Versioned by content	Versioned by name

Sources vs. Binaries

Sources	Binaries
Text	Blob
Diffable	Not diffable
Versioned by content	Versioned by name
Stored by override	Should never override

Versioning By Content



Text

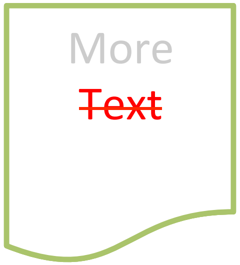
MyPoem.txt
(rev. 01)

Versioning By Content

More
Text

MyPoem.txt
(rev. 02)

Versioning By Content



More

~~Text~~

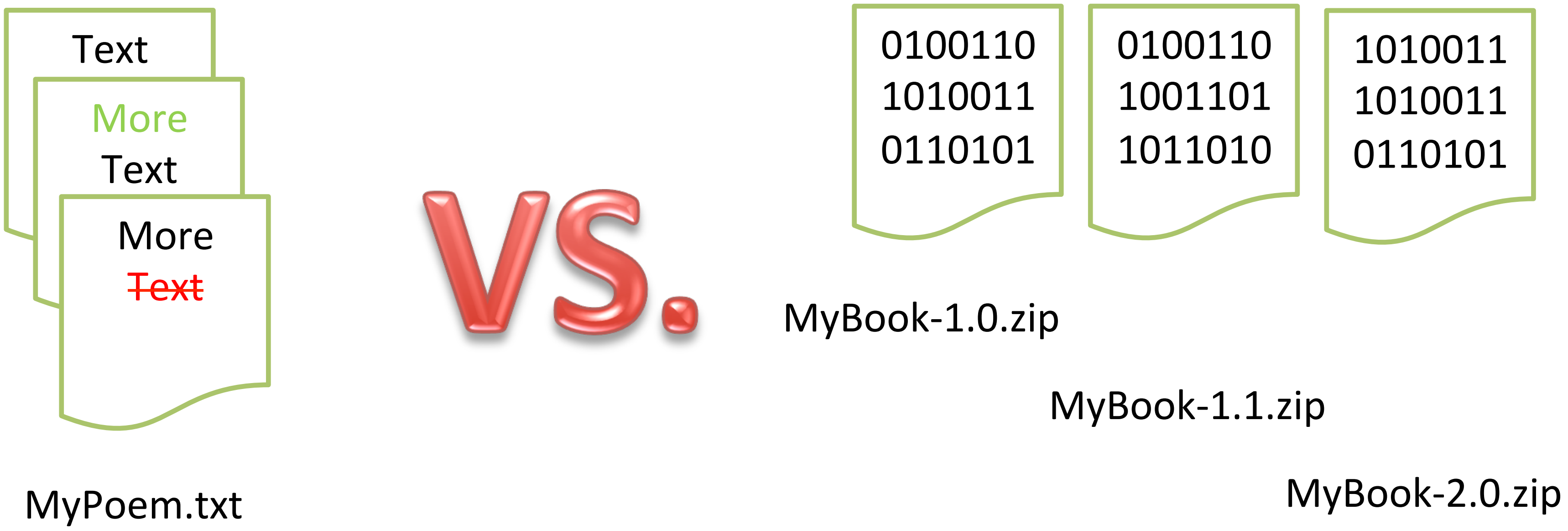
MyPoem.txt
(rev. 03)

Versioning By Content

More

MyPoem.txt
(HEAD)

Mismatch



Text

More

Text

More

~~Text~~

MyPoem.txt

VS.

0100110
1010011
0110101

0100110
1001101
1011010

1010011
1010011
0110101

MyBook-1.0.zip

MyBook-1.1.zip

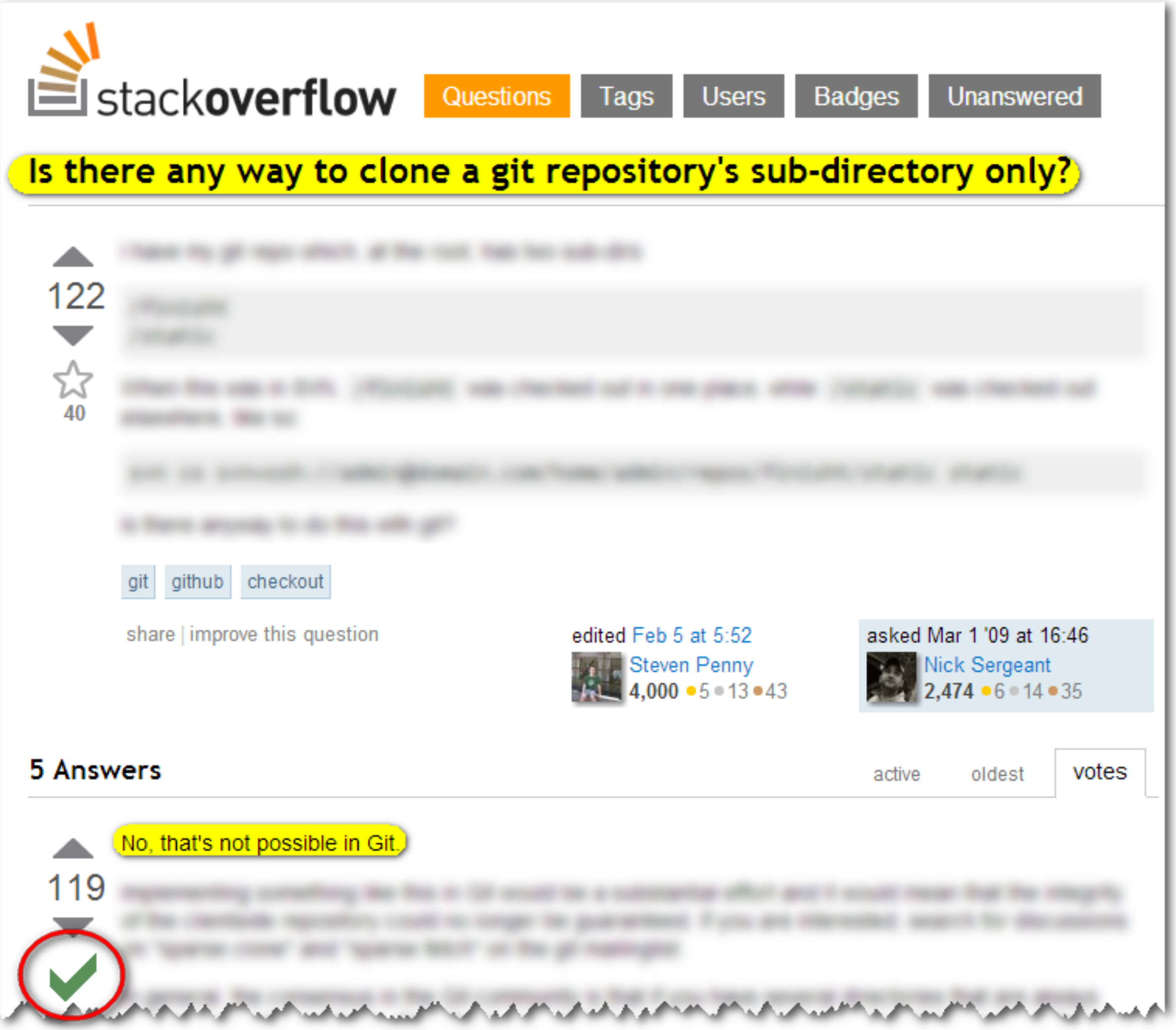
MyBook-2.0.zip

quickmeme.com

SOMEONE WILL STAND UP...
quickmeme.com

SOMEONE WILL STAND UP...
AND SAY THAT GIT
DOESN'T STORE DIFFS!
quickmeme.com

Git is a Distributed System



Is there any way to clone a git repository's sub-directory only?

122

40

git github checkout

share | improve this question

edited Feb 5 at 5:52
Steven Penny
4,000 ●5 ●13 ●43

asked Mar 1 '09 at 16:46
Nick Sergeant
2,474 ●6 ●14 ●35

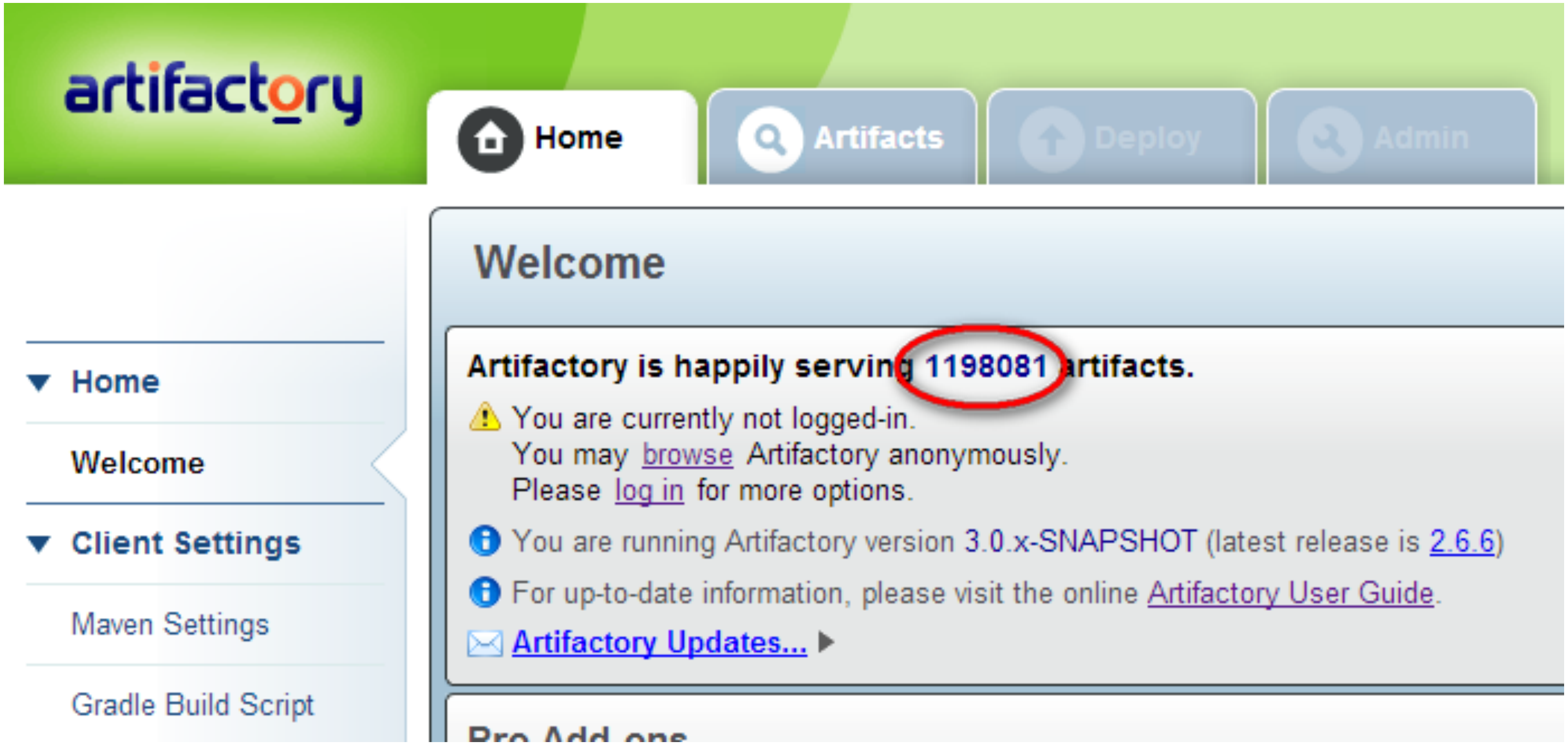
5 Answers

active oldest votes

119

No, that's not possible in Git.

R U SURE U WANT 2 CLONE IT ALL?



Welcome

Artifactory is happily serving 1198081 artifacts.

⚠ You are currently not logged-in.
You may browse Artifactory anonymously.
Please log in for more options.

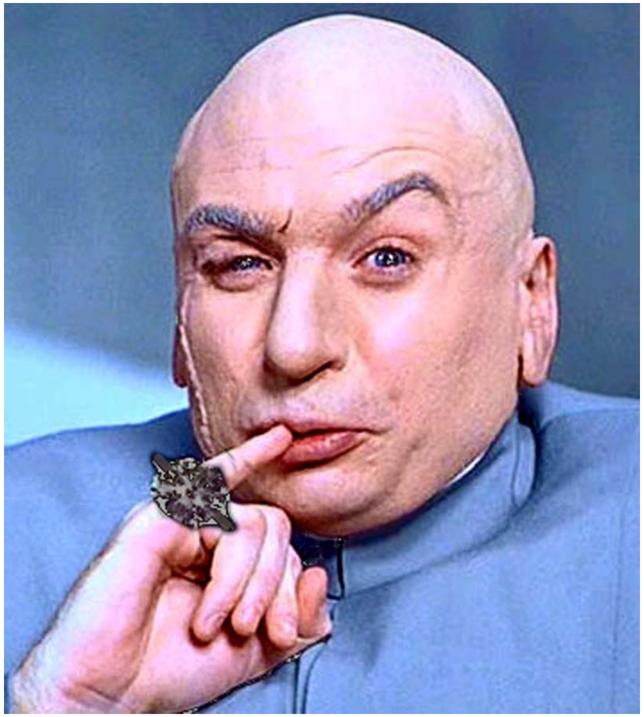
You are running Artifactory version 3.0.x-SNAPSHOT (latest release is 2.6.6)

For up-to-date information, please visit the online Artifactory User Guide.

Artifactory Updates... ▶

Pro Add-ons

OK Then, But What's Wrong With My File Server?!



It’s Fine if it knows how to:

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Optimize storage size

It’s Fine if it knows how to:

Proxy other repositories

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Expose REST API

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Optimize storage size

Enforce Module Security

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Proxy other repositories

Expose REST API

Manage artifact lifecycle

Optimize storage size

Enforce Module Security

It’s Fine if it knows how to:

Proxy other repositories

Expose REST API

Manage artifact lifecycle

Cleanup SNAPSHOTS

Optimize storage size

Enforce Module Security

It’s Fine if it knows how to:

Proxy other repositories

Expose REST API

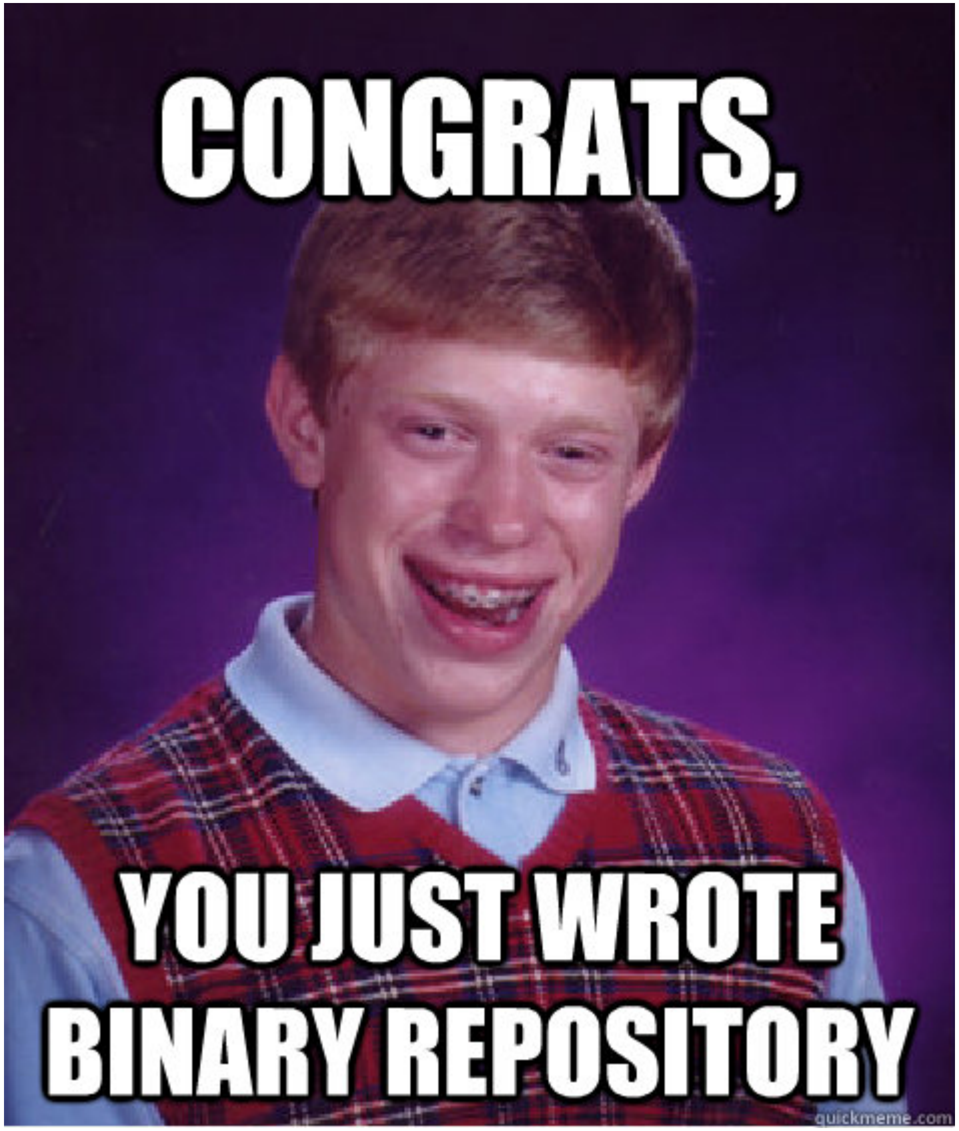
Manage artifact lifecycle

Cleanup SNAPSHOTS

Optimize storage size

Search by name, context and content

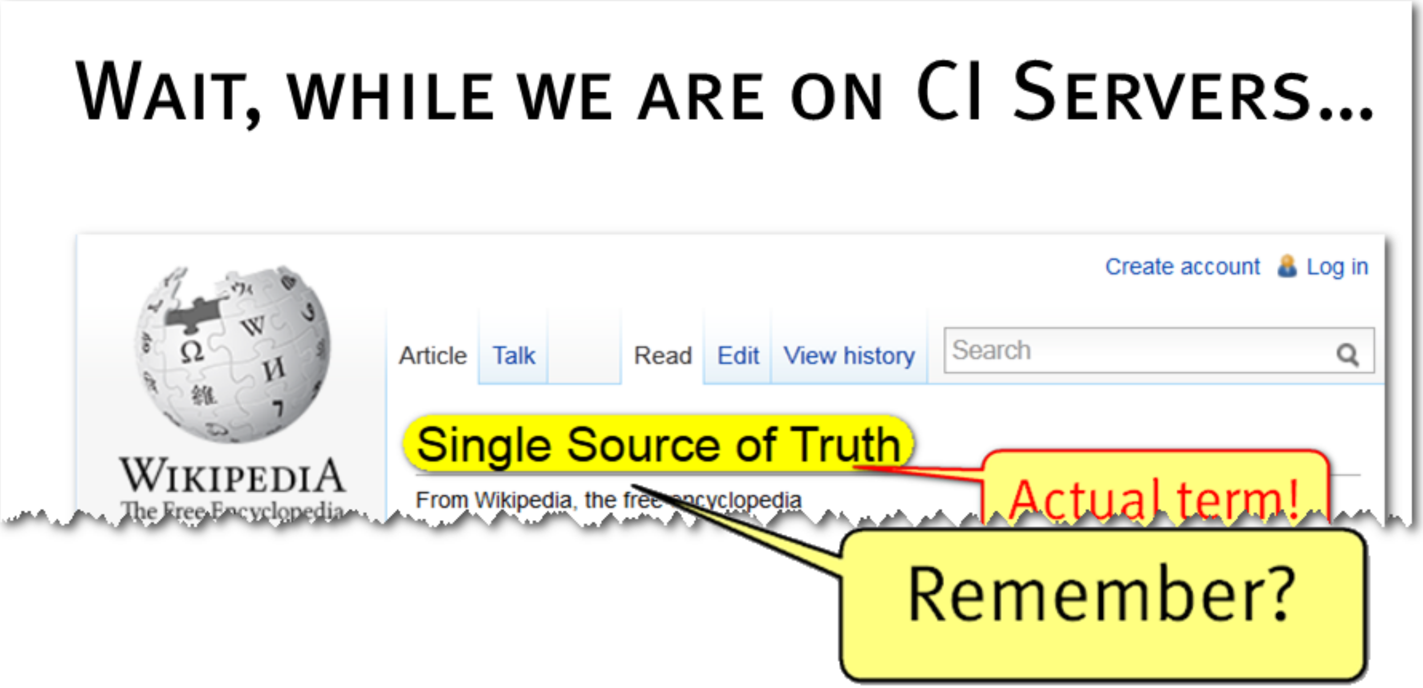
Enforce Module Security



BTW, How Many Years It Took?

Binary Repository and CI/CD

CI Server is
the Single Source of Truth



Wait, while we are on CI Servers...

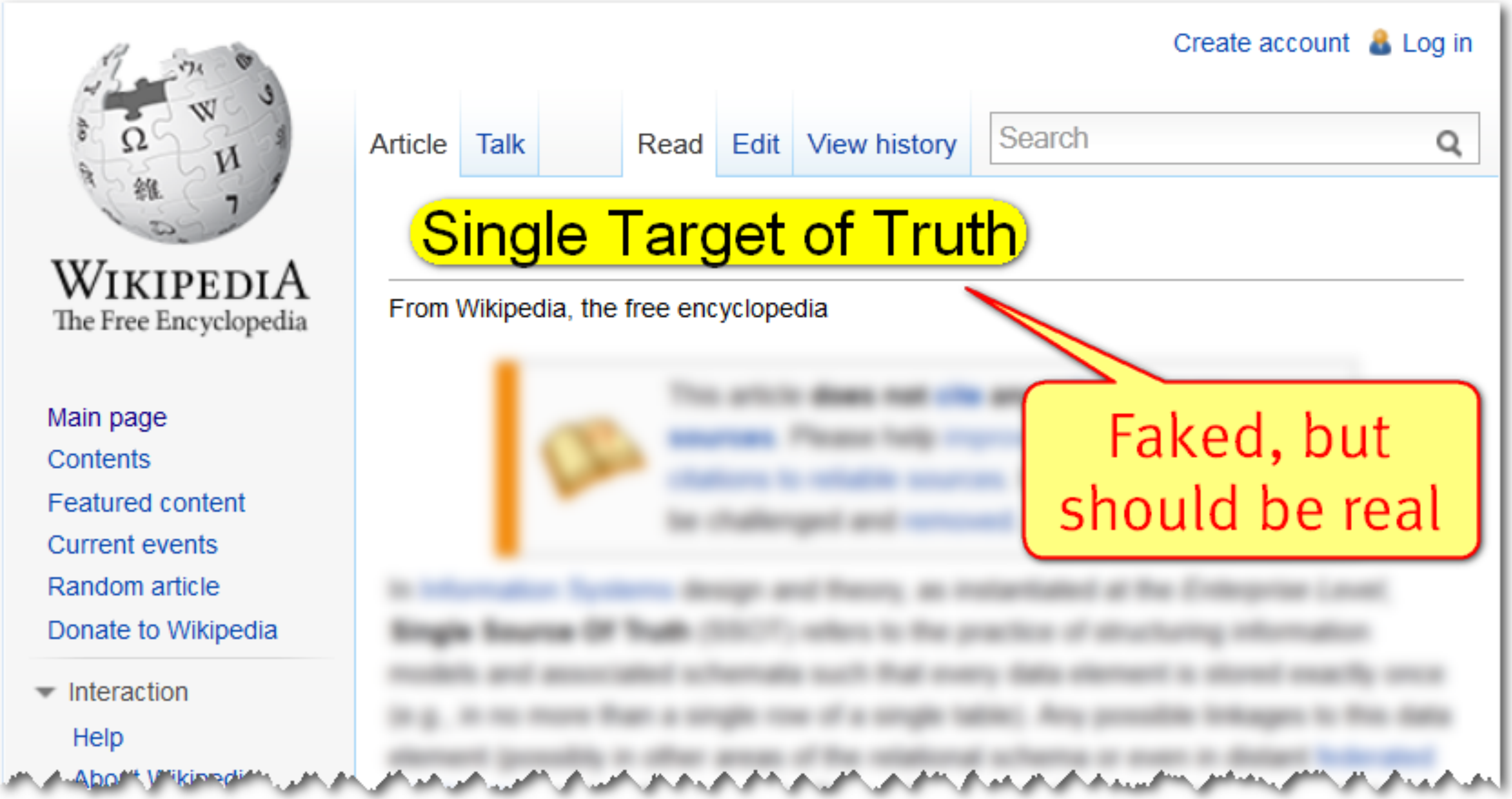
Single Source of Truth

From Wikipedia, the free encyclopedia

Actual term!

Remember?

Binary Repository is The Single Target of Truth



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Help

About Wikipedia

Single Target of Truth

From Wikipedia, the free encyclopedia

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sources. Please help improv

citations to reliable sources.

be challenged and removed.

Faked, but should be real

In Information Systems design and theory, as instantiated at the Enterprise Level, **Single Source Of Truth** (SSOT) refers to the practice of structuring information models and associated schemata such that every data element is stored exactly once (e.g., in no more than a single row of a single table). Any possible linkages to this data element (possibly in other areas of the relational schema or even in distant federated

Save the Truth!

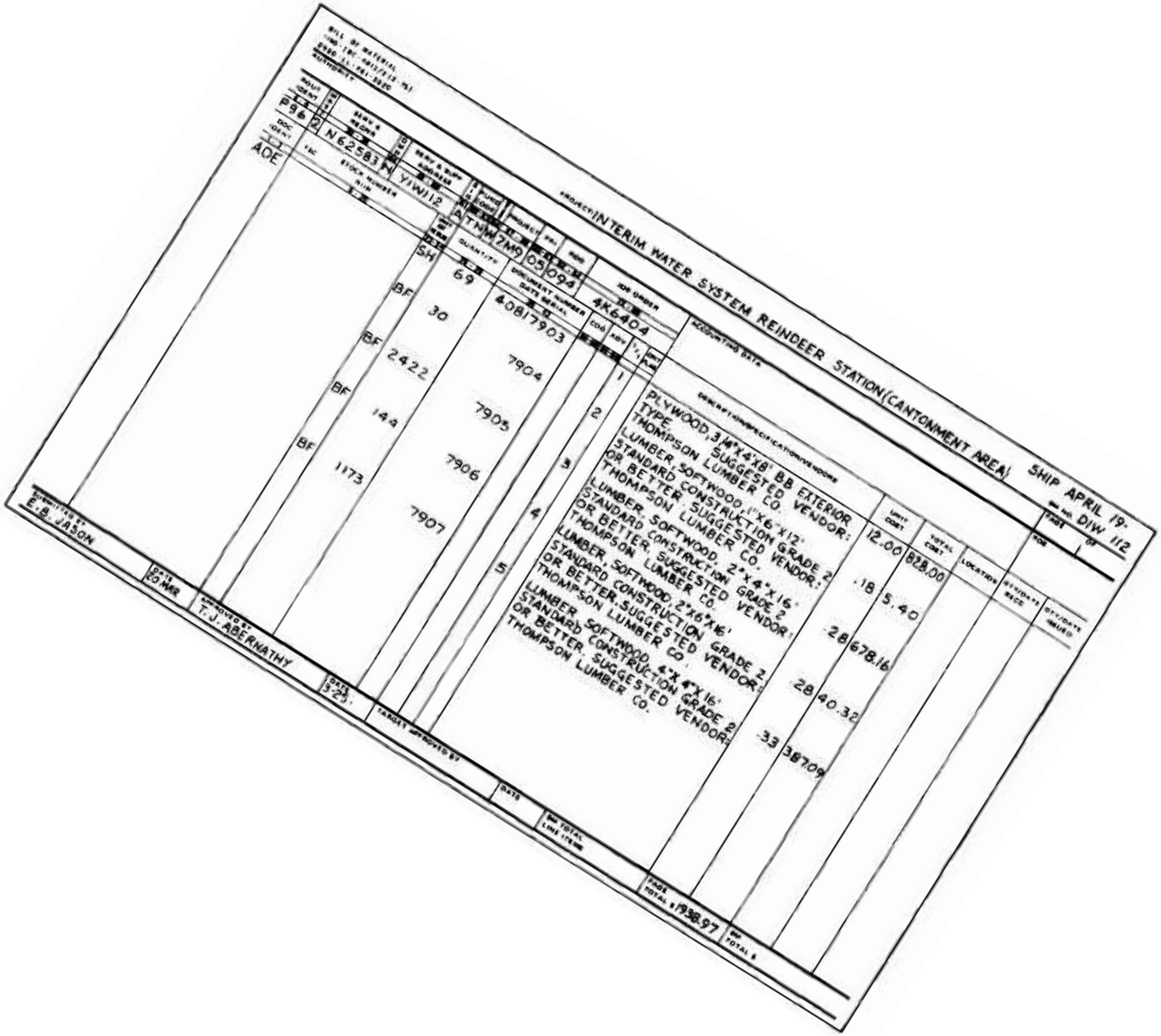
Make Strange Binary Love

Binaries + Build Info

=

2gether 4eva!!1

Standard of Truth



BILL OF MATERIAL

PROJECT INTERIM WATER SYSTEM REINDEER STATION (CANTONMENT AREA) SHIP APRIL 19-

DIW 112

P96 2 N62583 N Y1W112 A TNW 2M9 05 094 4K6404

ADE

SH	69	4081 7903	1	PLYWOOD, 3/4"X4'X8' BB EXTERIOR TYPE. SUGGESTED VENDOR: THOMPSON LUMBER CO.	12.00	828.00
BF	30	7904	2	LUMBER, SOFTWOOD, 1"X6"X12' STANDARD CONSTRUCTION GRADE 2 OR BETTER. SUGGESTED VENDOR: THOMPSON LUMBER CO.	.18	5.40
BF	2422	7905	3	LUMBER, SOFTWOOD, 2"X4"X16' STANDARD CONSTRUCTION GRADE 2 OR BETTER, SUGGESTED VENDOR: THOMPSON LUMBER CO.	.28	678.16
BF	144	7906	4	LUMBER, SOFTWOOD, 2"X6"X16' STANDARD CONSTRUCTION GRADE 2 OR BETTER. SUGGESTED VENDOR: THOMPSON LUMBER CO.	.28	40.32
BF	1173	7907	5	LUMBER, SOFTWOOD, 4"X4"X16' STANDARD CONSTRUCTION GRADE 2 OR BETTER. SUGGESTED VENDOR: THOMPSON LUMBER CO.	.33	387.09

SUBMITTED BY E.B. JASON DATE 20 MAR

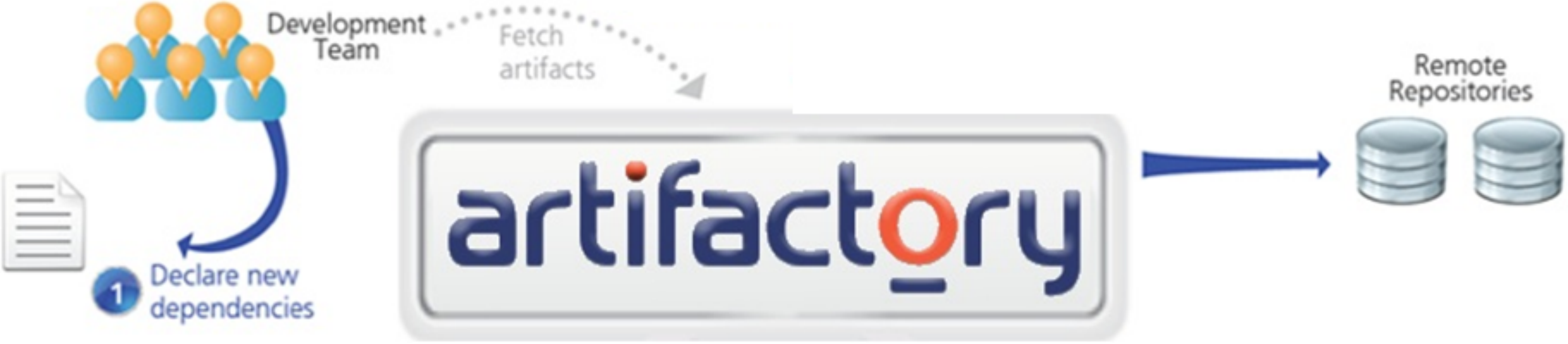
APPROVED BY T.J. ABERNATHY DATE 3-25

TARGET APPROVED BY DATE

TOTAL LINE ITEMS

PAGE TOTAL $ 1938.97 TOTAL $

How Everything Fits Together



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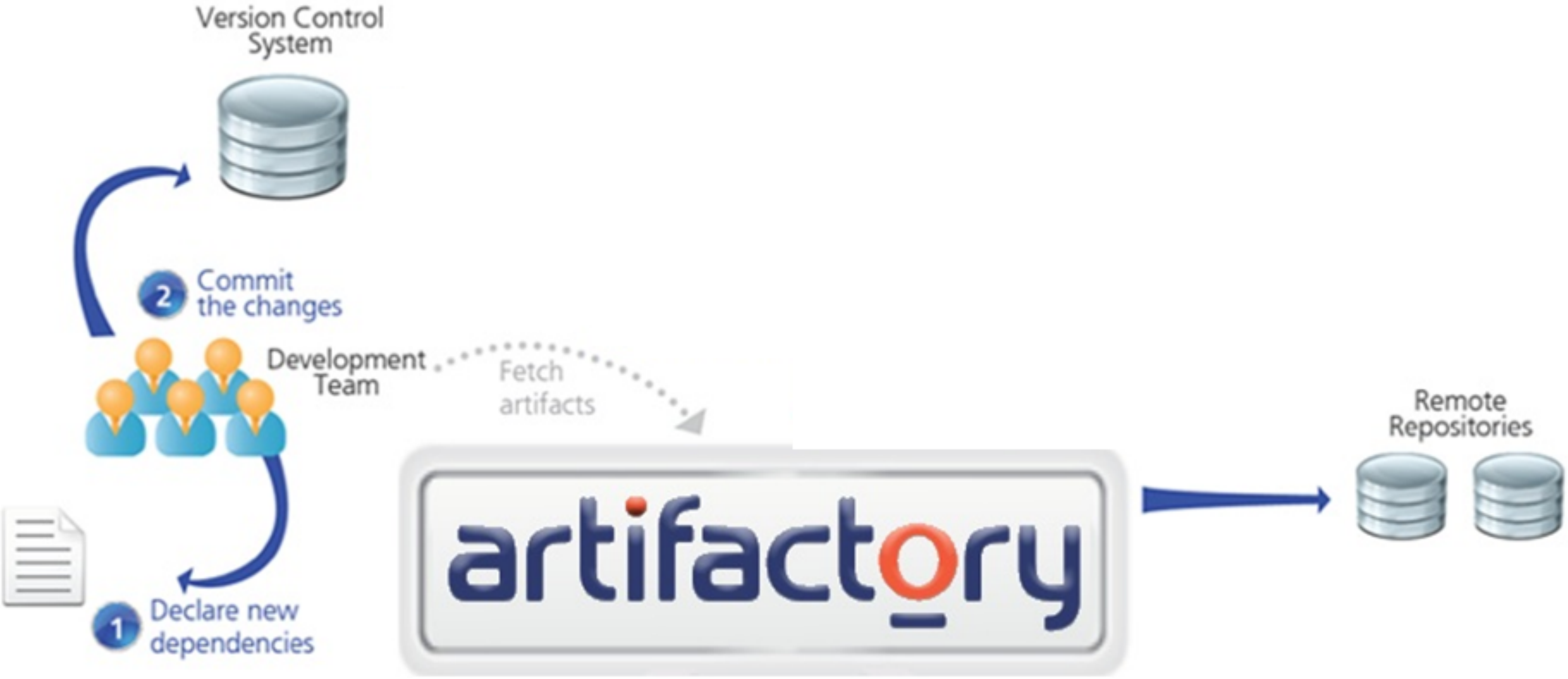
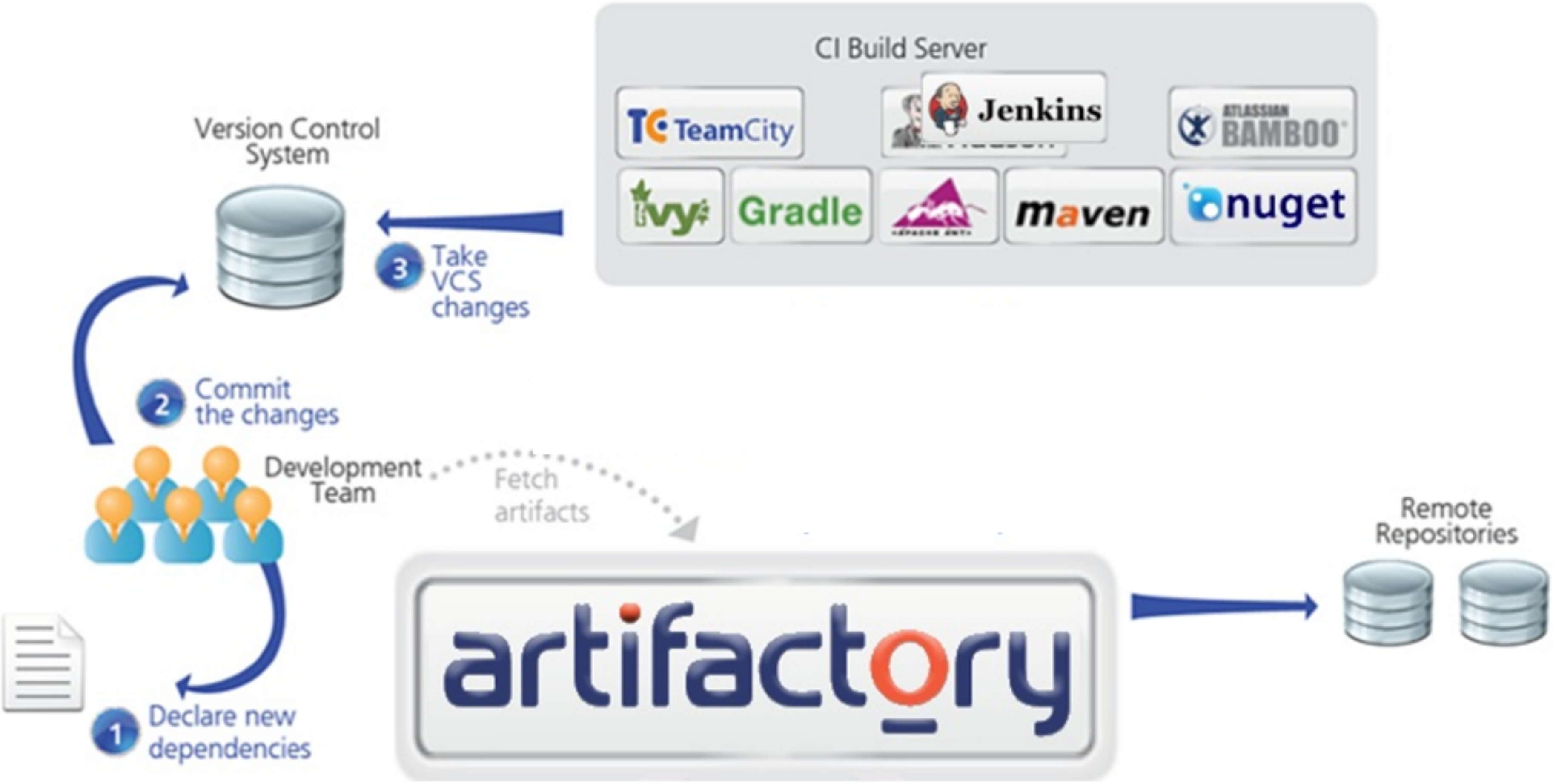
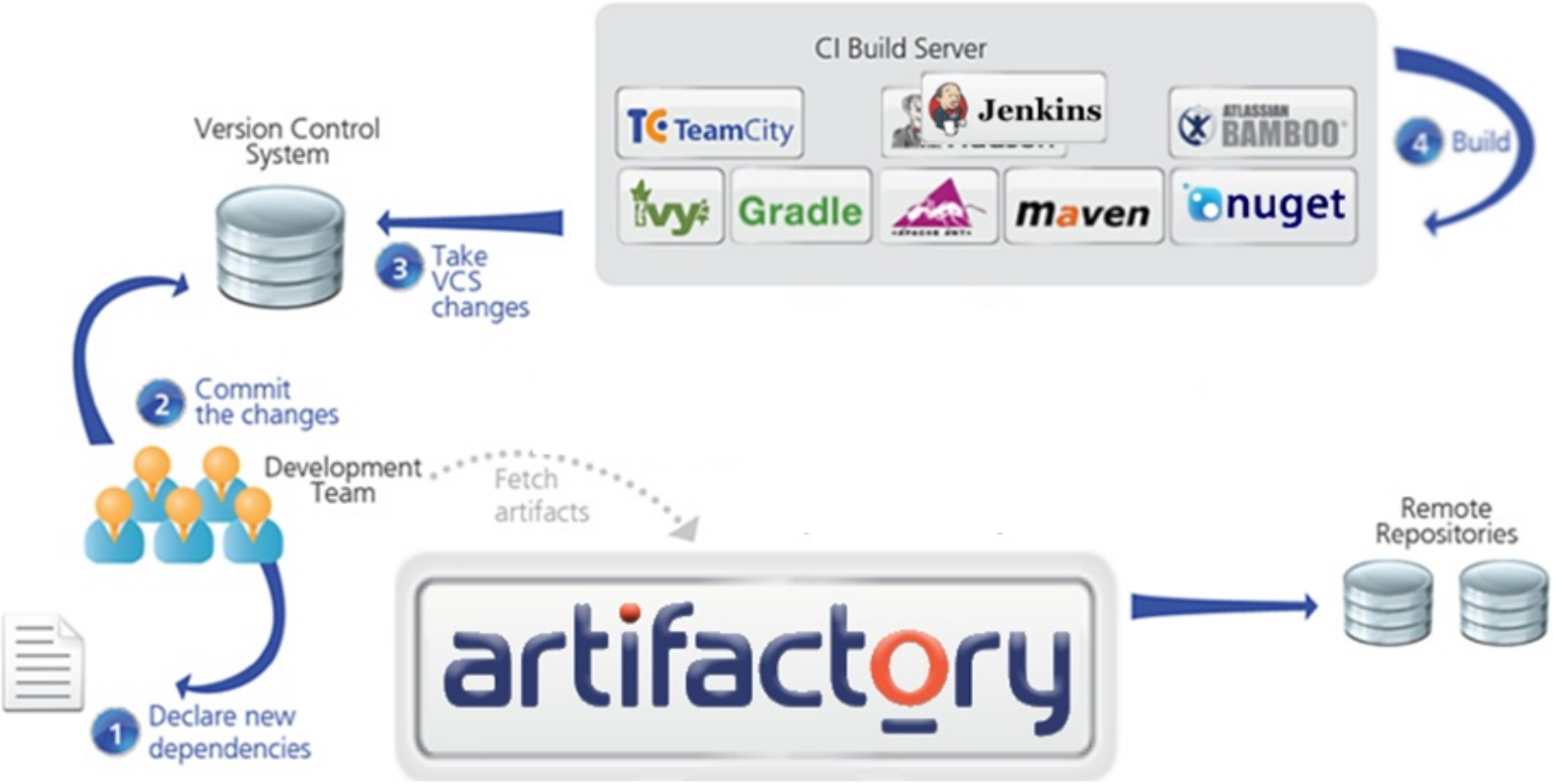


How Everything Fits Together



How Everything Fits Together



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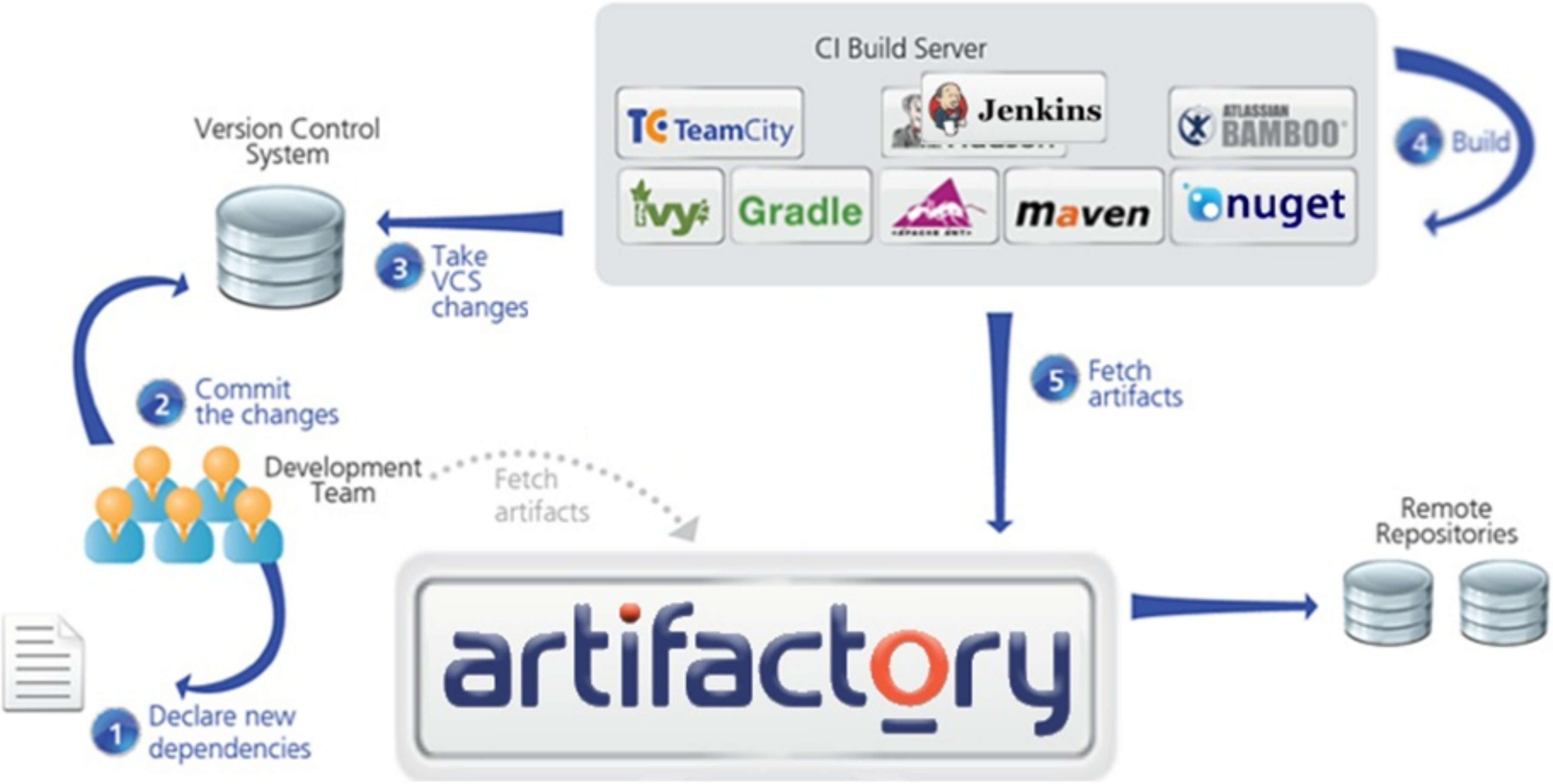

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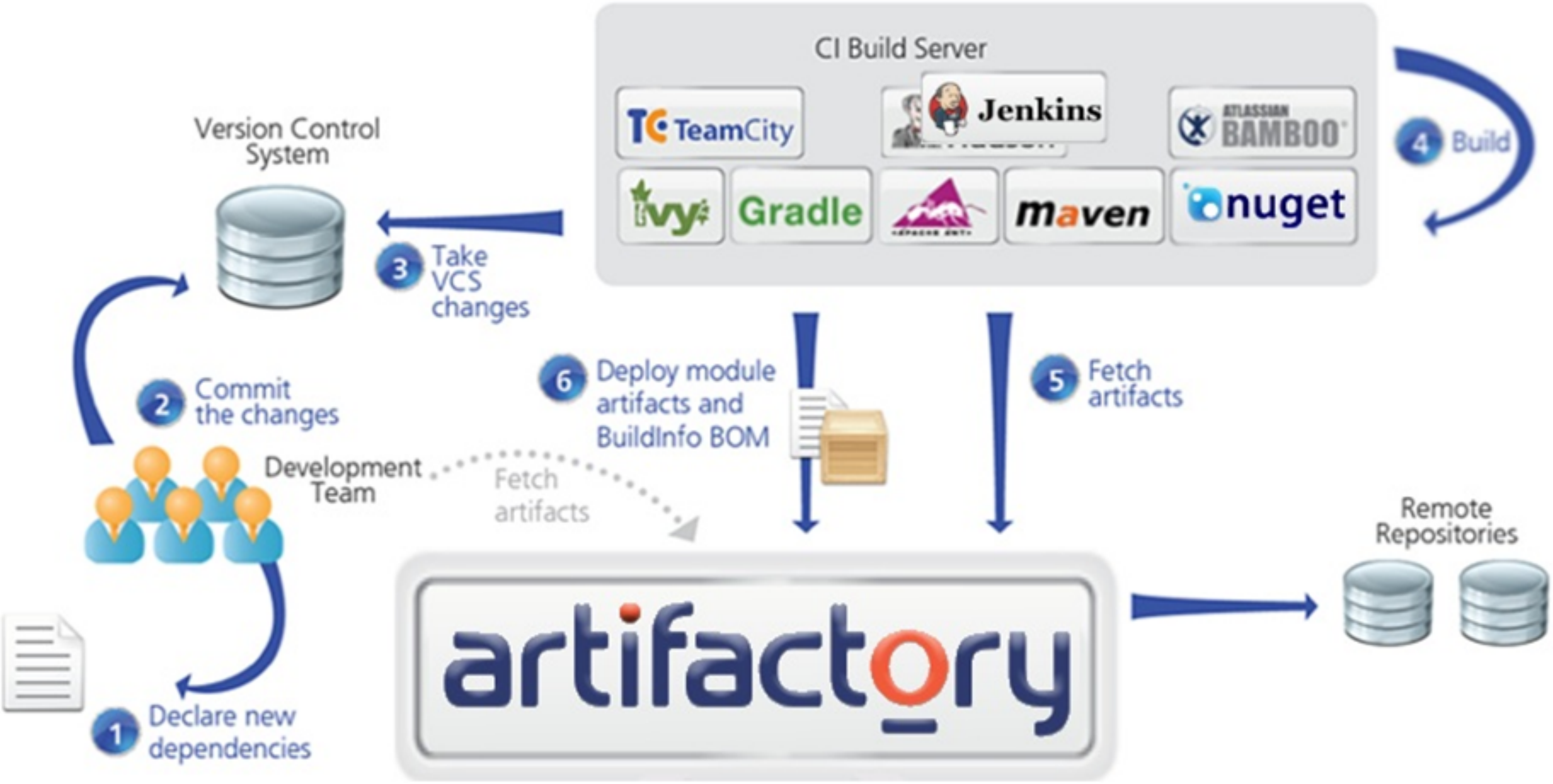
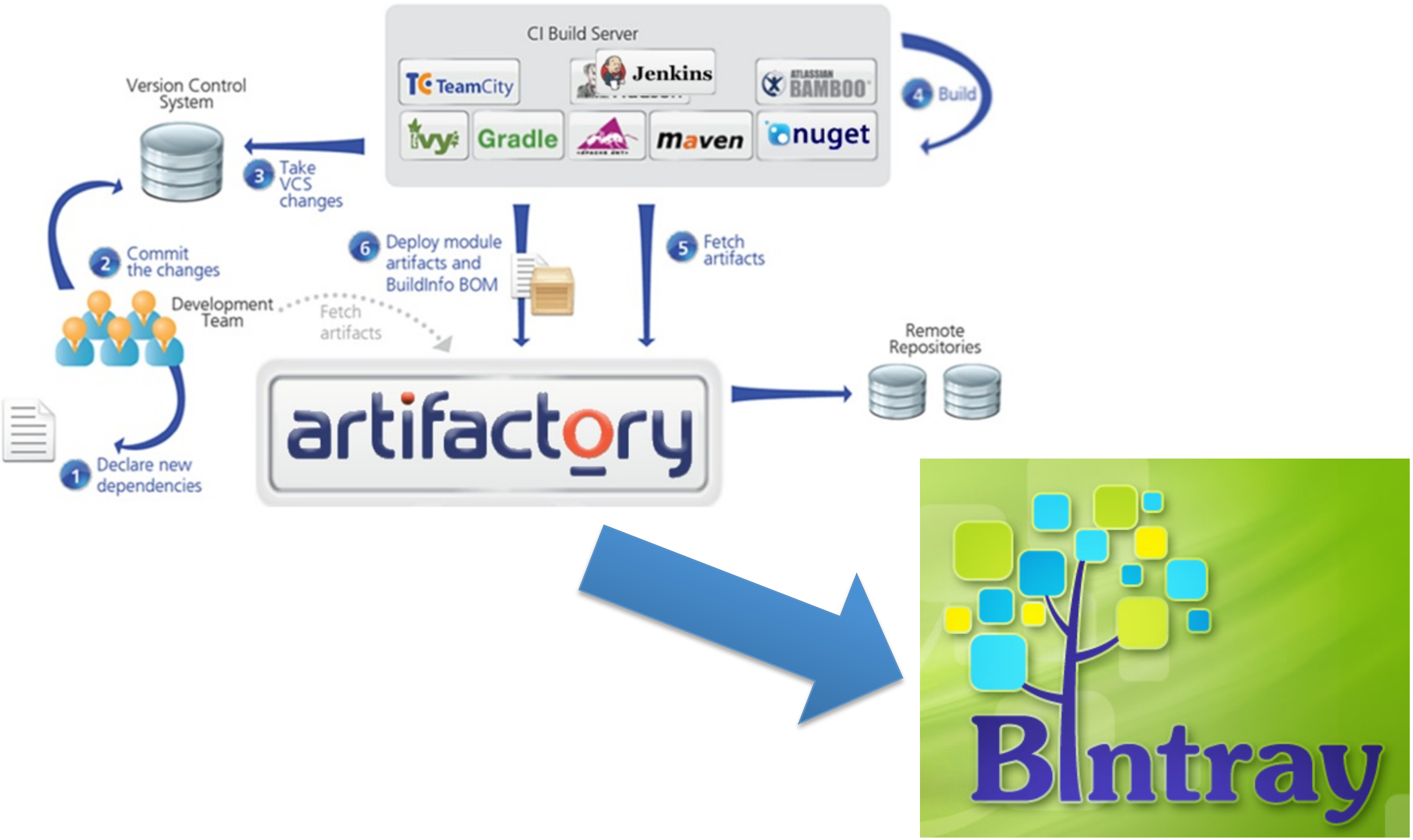


How Everything Fits Together



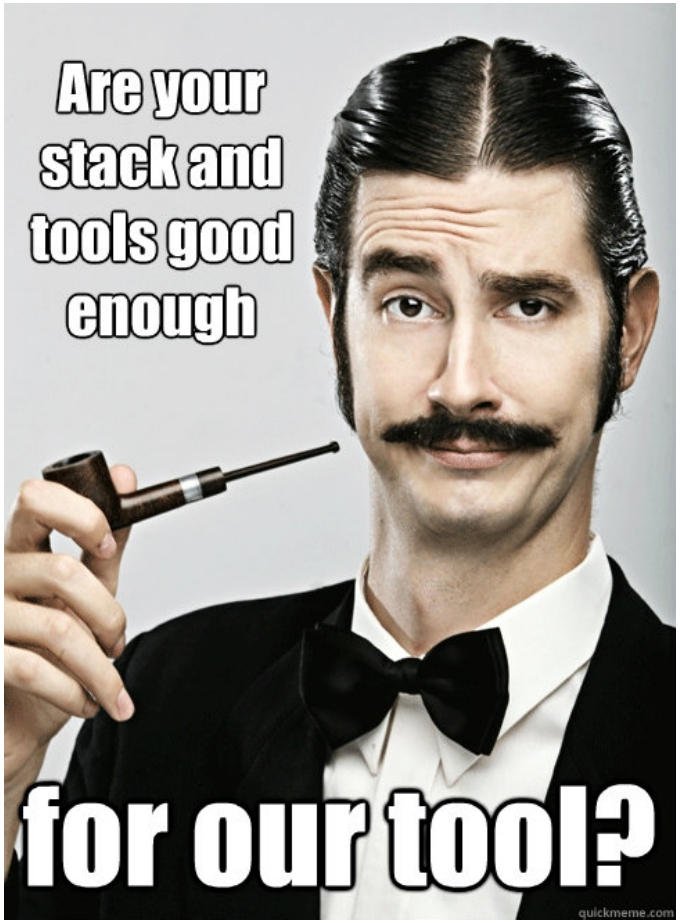
Perfect…

You Liked it, didn’t you?

Things to Consider

Lock-in?

Technology Specific?



Features to Look For

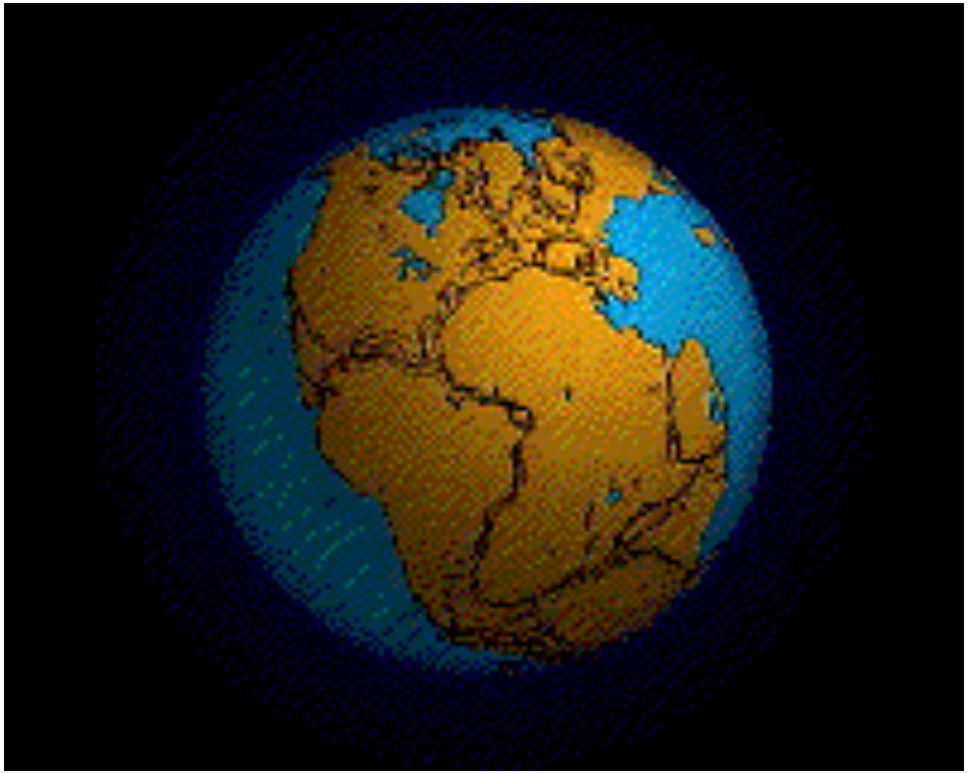
- ✓Not only Maven
- ✓Not only Java
- ✓Broad CI tools matrix
  - ✓Build tools
  - ✓CI Servers
- ✓Extensive REST support
- ✓Easy to extend

Most boring slide so far…

MODULES IN… JAVA

Java `package`

Fragmentation



The options are:

- OSGi
- Jigsaw
- Build systems managed
  - Maven, Gradle, Ivy

Bullets?
Really?

Gerd Wütherich · Nils Hartmann
Bernd Kolb · Matthias Lübken

Die OSGi Service Platform

Eine Einführung mit Eclipse Equinox

→ Mit einem Geleitwort von Peter Kriens, OSGi Technical Director

dpunkt.verlag

Gerd Wütherich · Nils Hartm
Bernd Kolb · Ma
Die OSGi
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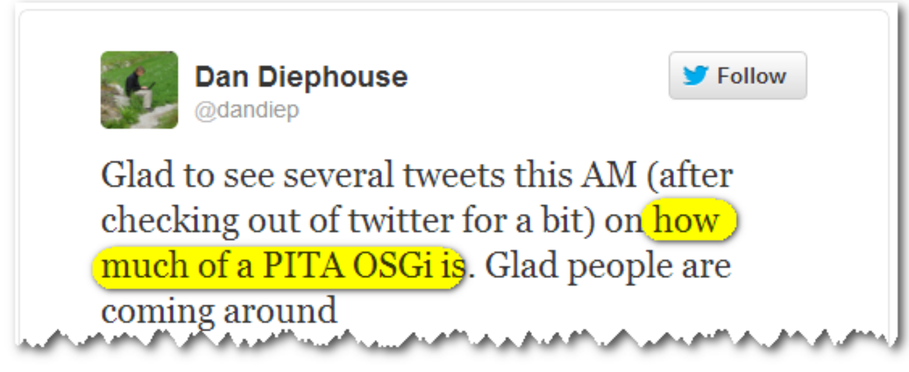
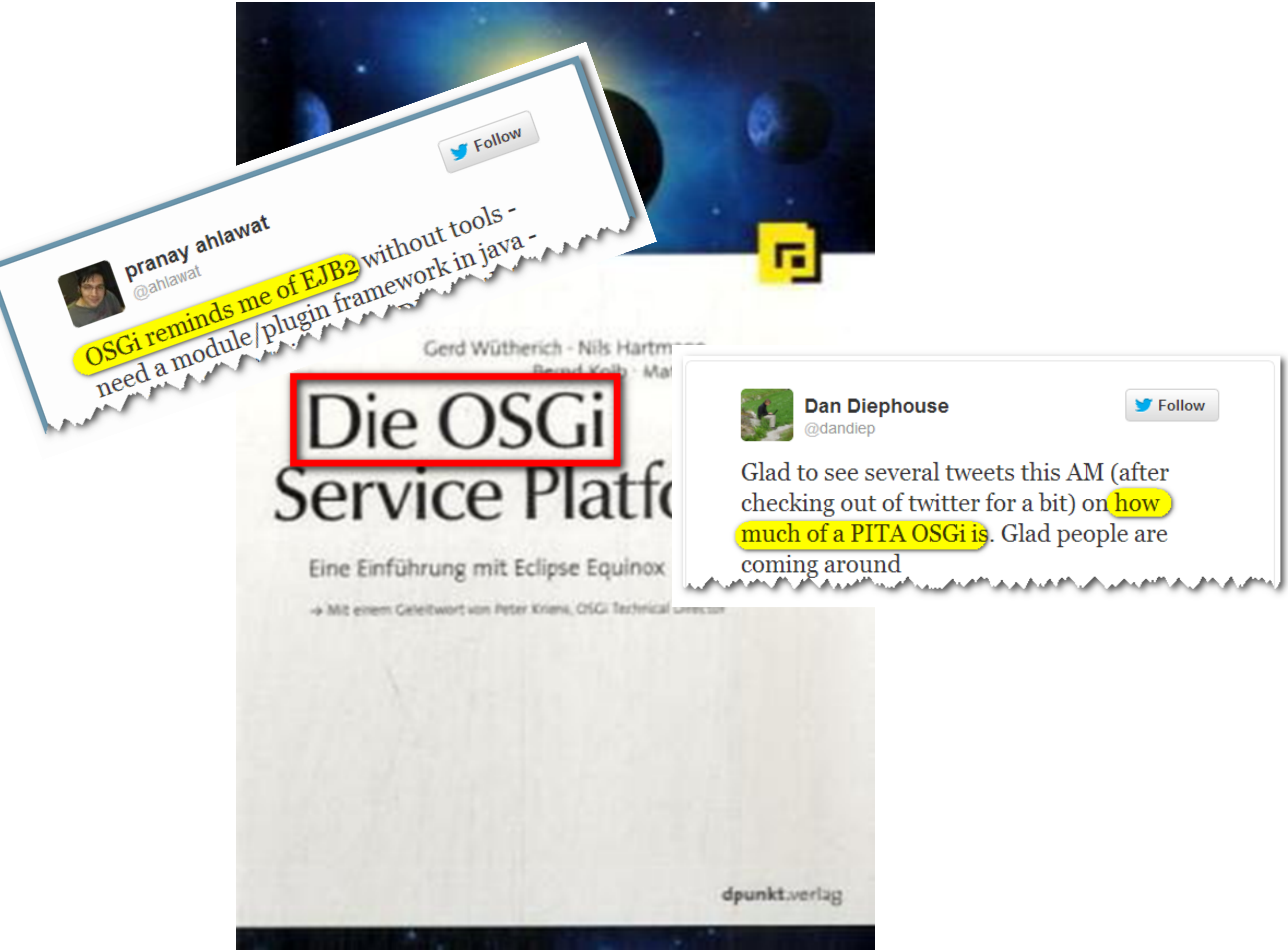


Dan Diephouse
@dandiep

Glad to see several tweets this AM (after checking out of twitter for a bit) on how much of a PITA OSGi is. Glad people are coming around



pranay ahlawat
@ahlawat

OSGi reminds me of EJB2 without tools - need a module/plugin framework in java -

Gerd Wütherich · Nils Hartm
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Die OSGi
Service Platf

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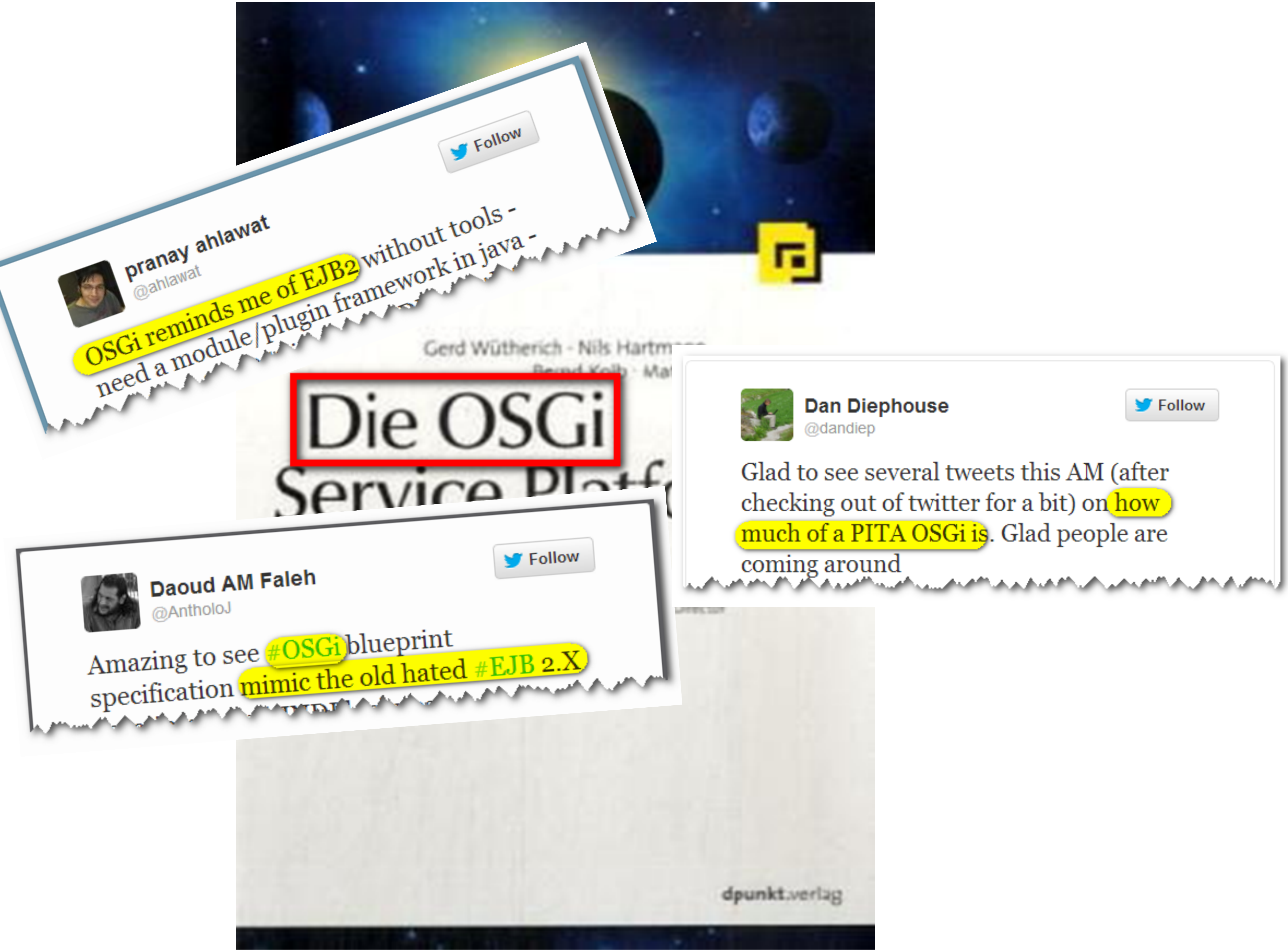

pranay ahlawat
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Follow

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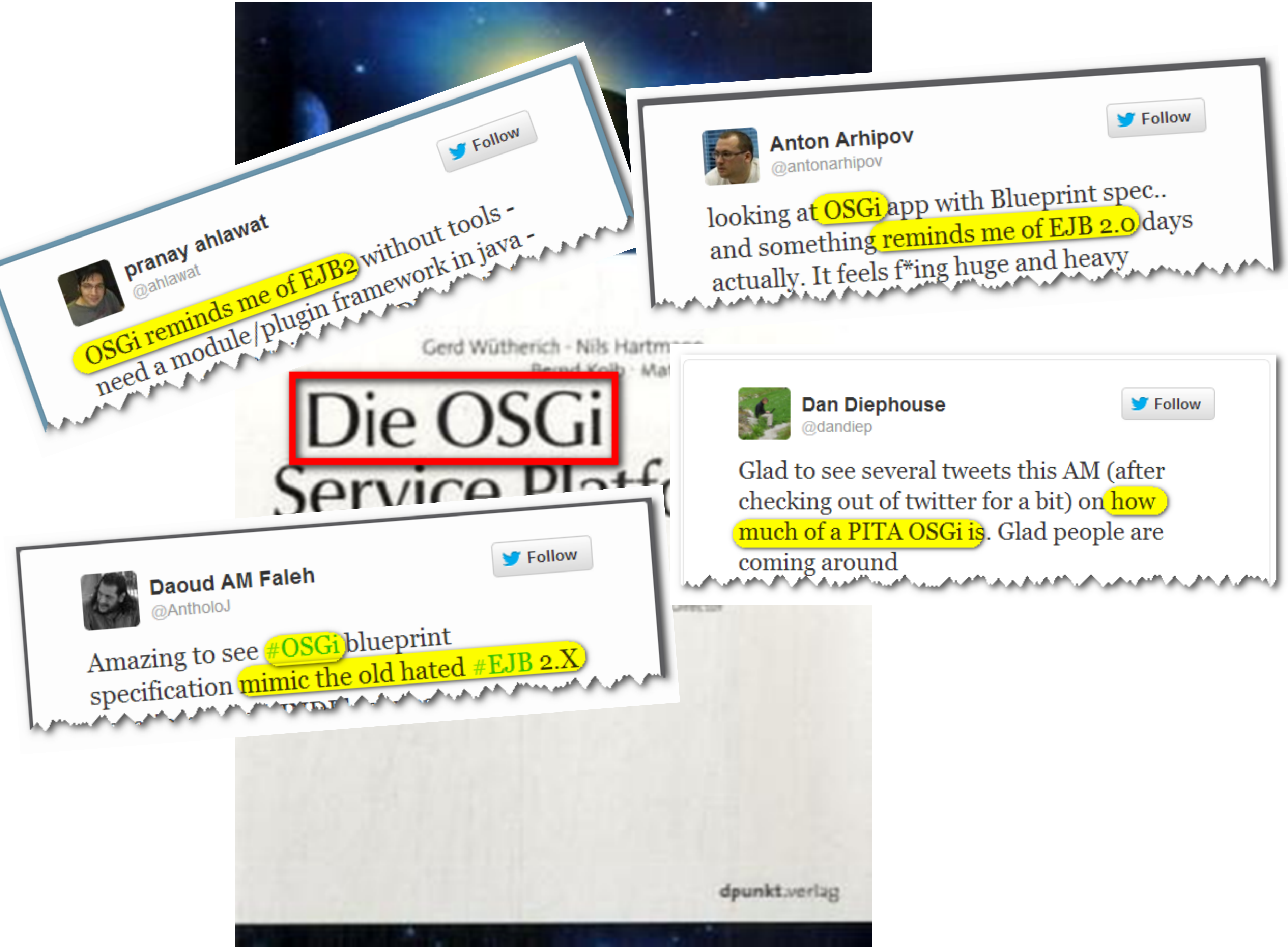
Daoud AM Faleh
@AntholoJ
Follow

Amazing to see #OSGi blueprint specification mimic the old hated #EJB 2.X



pranay ahlawat
@ahlawat

OSGi reminds me of EJB2 without tools - need a module/plugin framework in java -

Anton Arhipov
@antonarhipov

looking at OSGi app with Blueprint spec.. and something reminds me of EJB 2.0 days actually. It feels f*ing huge and heavy

Dan Diephouse
@dandiep

Glad to see several tweets this AM (after checking out of twitter for a bit) on how much of a PITA OSGi is. Glad people are coming around

Daoud AM Faleh
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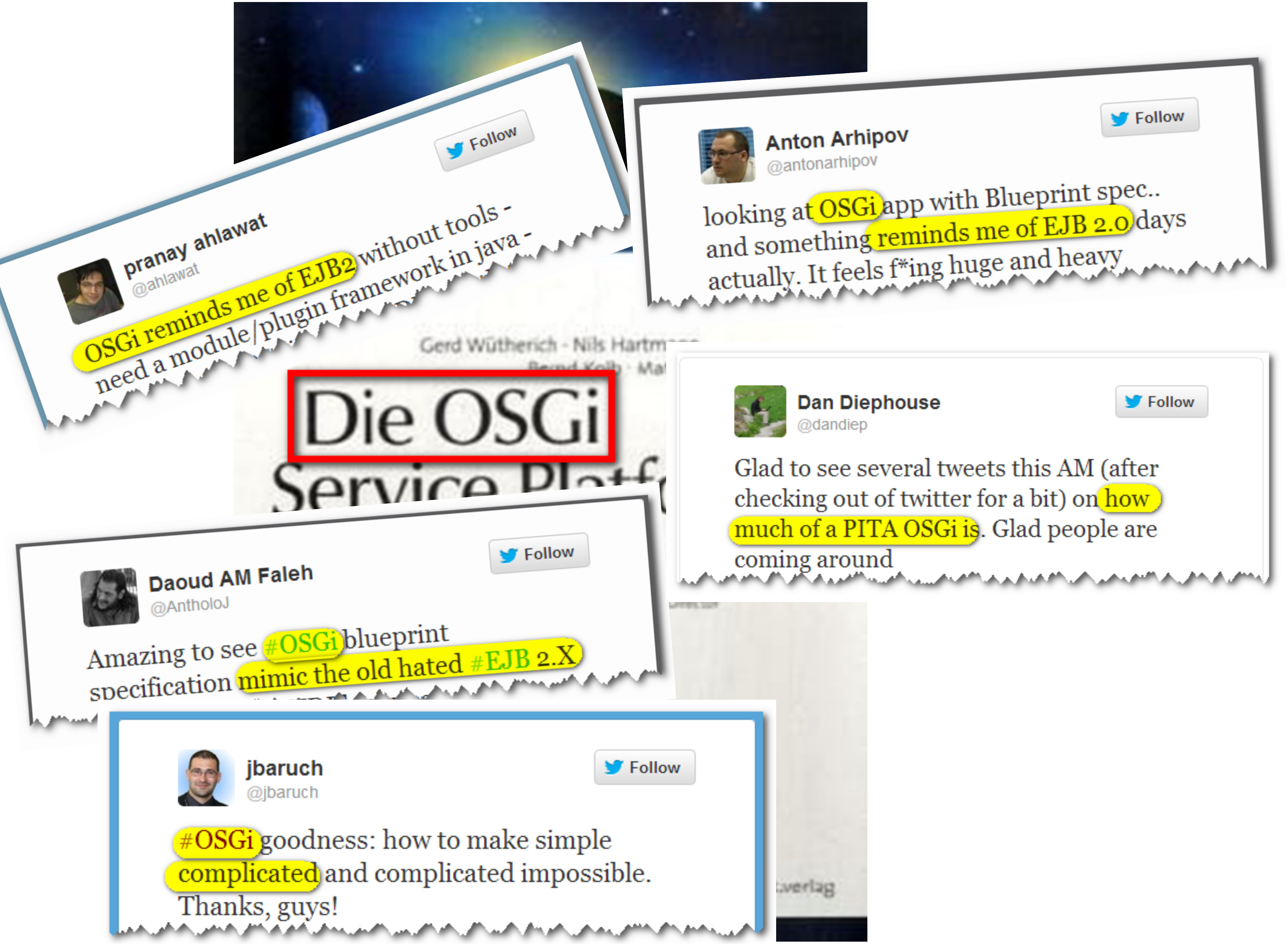

Gerd Wütherich · Nils Hartm
Bernd Kolb · Mat

Die OSGi
Service Platf

verlag

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looking at OSGi app with Blueprint spec.. and something reminds me of EJB 2.0 days actually. It feels f*ing huge and heavy

Dan Diephouse
@dandiep

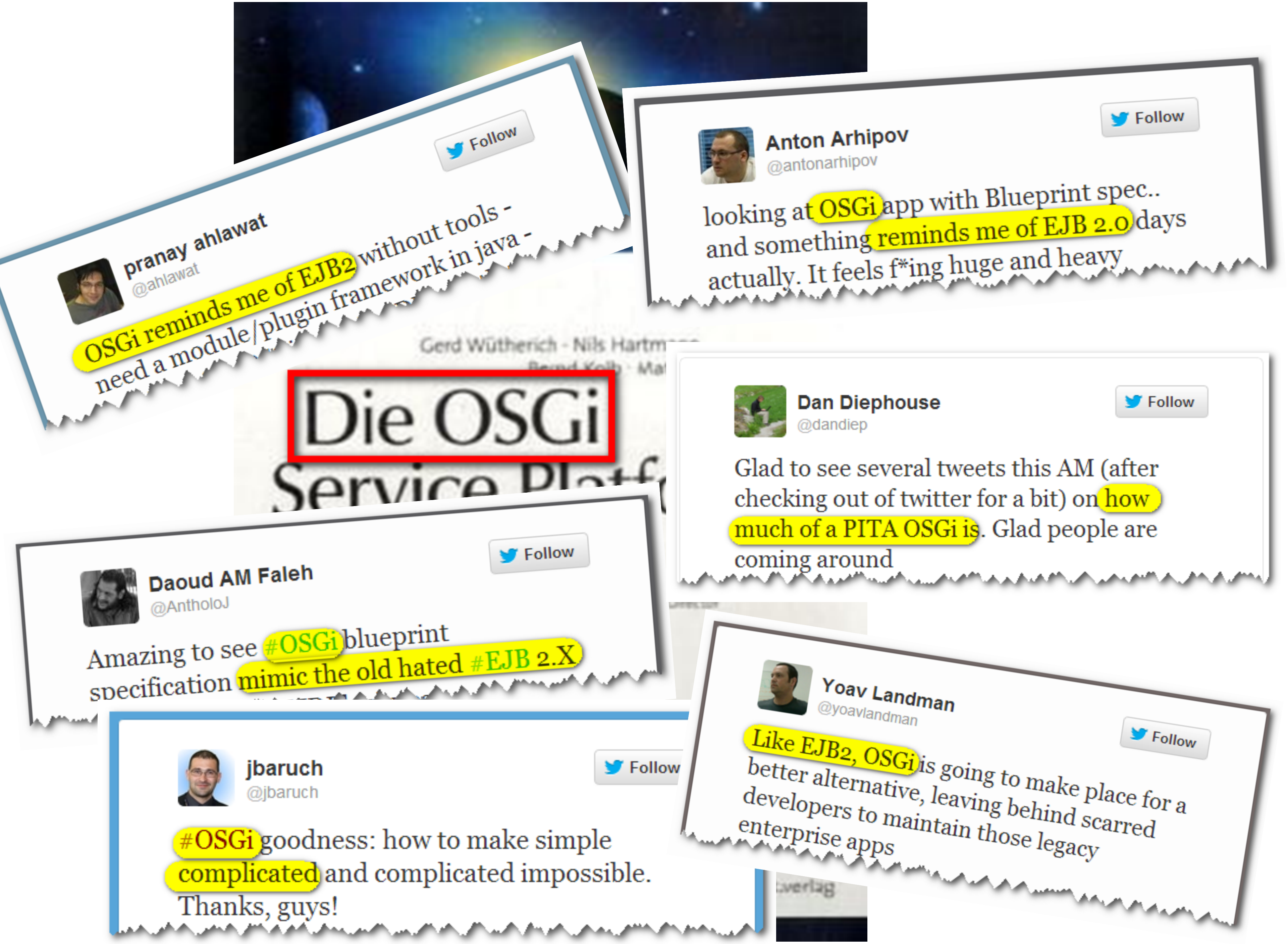
Glad to see several tweets this AM (after checking out of twitter for a bit) on how much of a PITA OSGi is. Glad people are coming around

Daoud AM Faleh
@AntholoJ

Amazing to see #OSGi blueprint specification mimic the old hated #EJB 2.X

jbaruch
@jbaruch

#OSGi goodness: how to make simple complicated and complicated impossible. Thanks, guys!



pranay ahlawat
@ahlawat

OSGi reminds me of EJB2 without tools - need a module/plugin framework in java -

Anton Arhipov
@antonarhipov

looking at OSGi app with Blueprint spec.. and something reminds me of EJB 2.0 days actually. It feels f*ing huge and heavy

Gerd Wütherich · Nils Hartm
Bernd Kolb · Mat

Die OSGi
Service Platf

verlag

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Yoav Landman
@yoavlandman

Like EJB2, OSGi is going to make place for a better alternative, leaving behind scarred developers to maintain those legacy enterprise apps

Project Jigsaw

First promise: Java 7 (2008)
Current promise: Java 9 (2015)

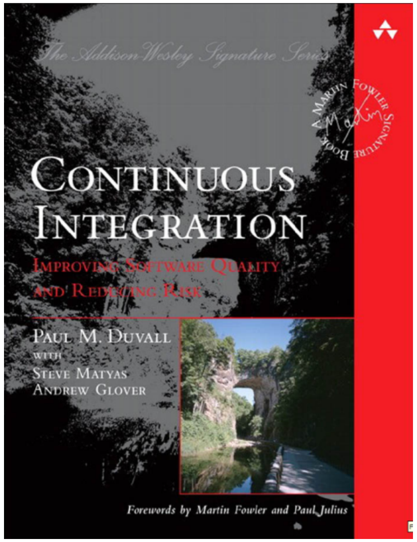
Project Jigsaw

First promise: Java 7 (2008)
Current promise: Java 9 (2015)

Nuff said.

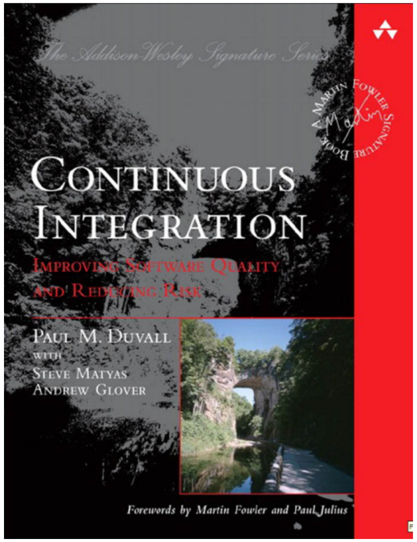
Back to plain old

Modular Build in Java

	 The Addison Wesley Signature Series A Martin Fowler Signature Book Continuous Integration Improving Software Quality and Reducing Risk Paul M. Duvall with Steve Matyas Andrew Glover Forewords by Martin Fowler and Paul Julius

Modular Build in Java

maven



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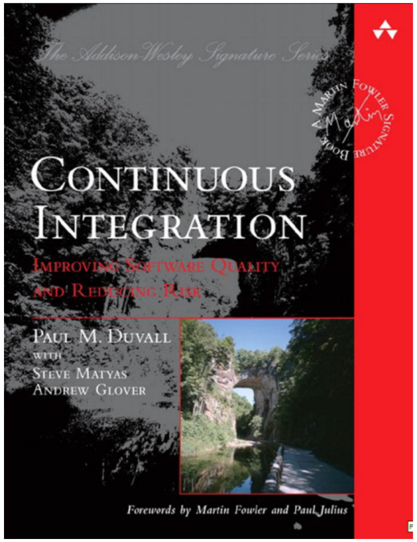
Modular Build in Java

maven

gradle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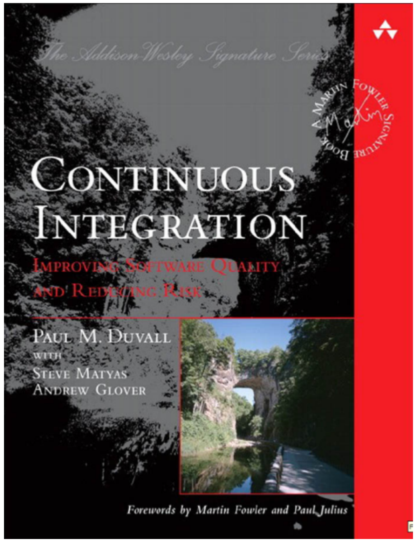
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Modular Build in Java

maven gradle ivy	Jenkins

Modular Build in Java

maven

gradle

ivy

Jenkins

TeamCity

Modular Build in Java

maven

gradle

ivy

Jenkins

TeamCity

Atlassian Bamboo

Modular Build in Java

maven gradle ivy	Jenkins TeamCity Atlassian Bamboo
artifactory	

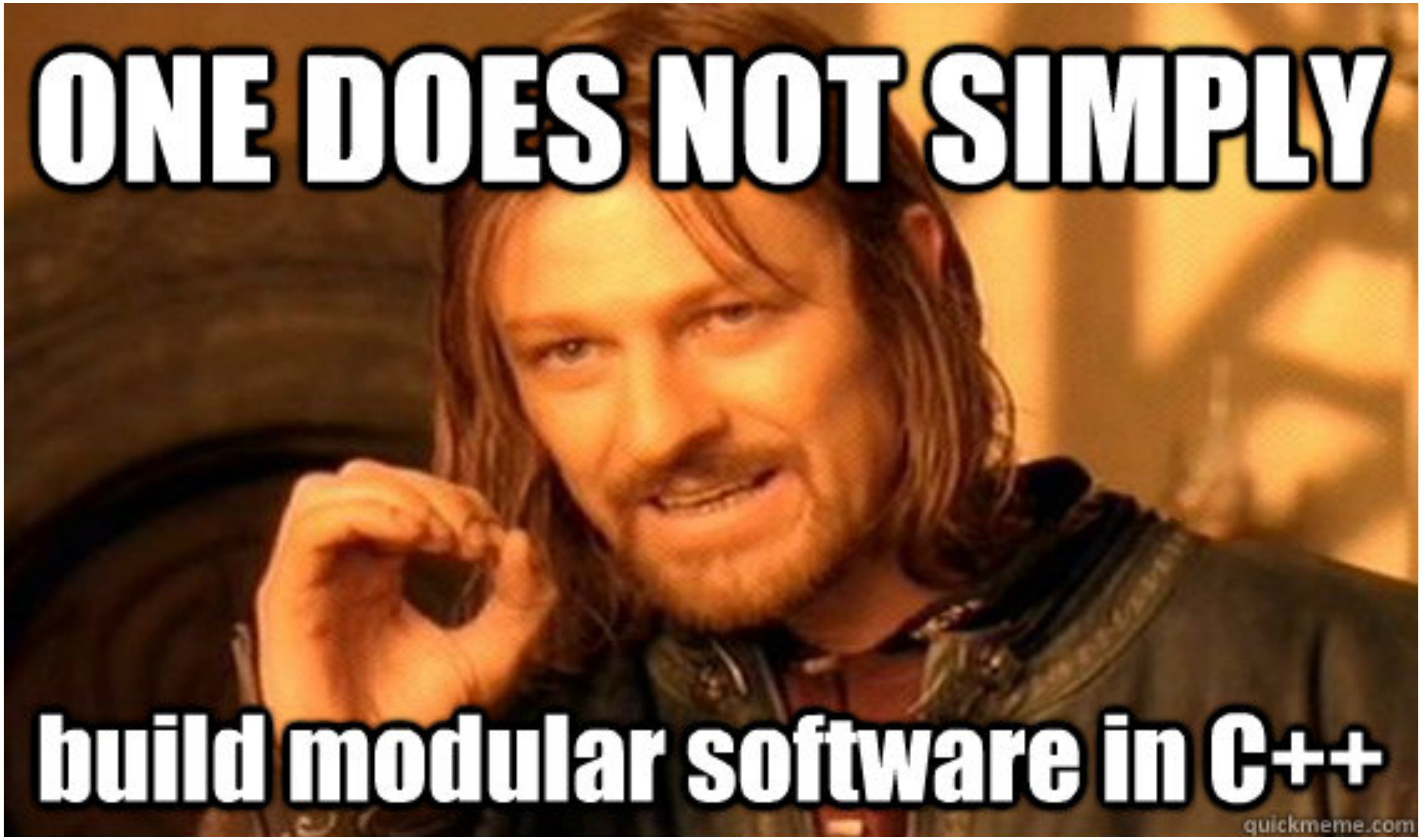
Modular Build in Java

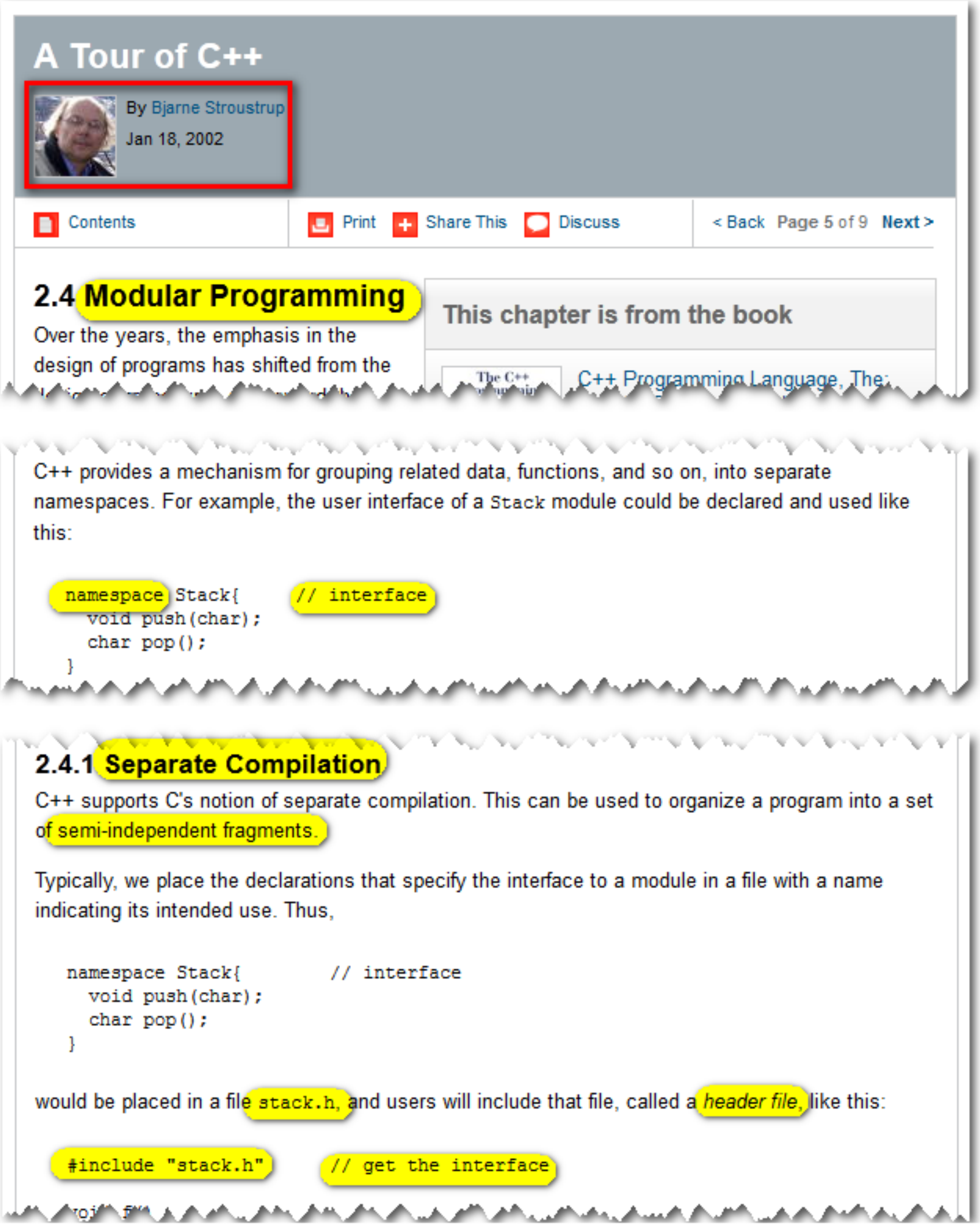
maven gradle ivy	Jenkins TC TeamCity Atlassian Bamboo
artifactory Nexus	

Modular Build in Java

maven gradle ivy	Jenkins TC TeamCity Atlassian Bamboo
artifactory Nexus archiva	

MODULES IN… C++


ONE DOES NOT SIMPLY
build modular software in C++
quickmeme.com



A Tour of C++

By Bjarne Stroustrup

Jan 18, 2002

2.4 Modular Programming

Over the years, the emphasis in the design of programs has shifted from the

This chapter is from the book

C++ Programming Language, The:

C++ provides a mechanism for grouping related data, functions, and so on, into separate namespaces. For example, the user interface of a `Stack` module could be declared and used like this:

```
namespace Stack{          // interface
  void push(char);
  char pop();
}
```

2.4.1 Separate Compilation

C++ supports C's notion of separate compilation. This can be used to organize a program into a set of semi-independent fragments.

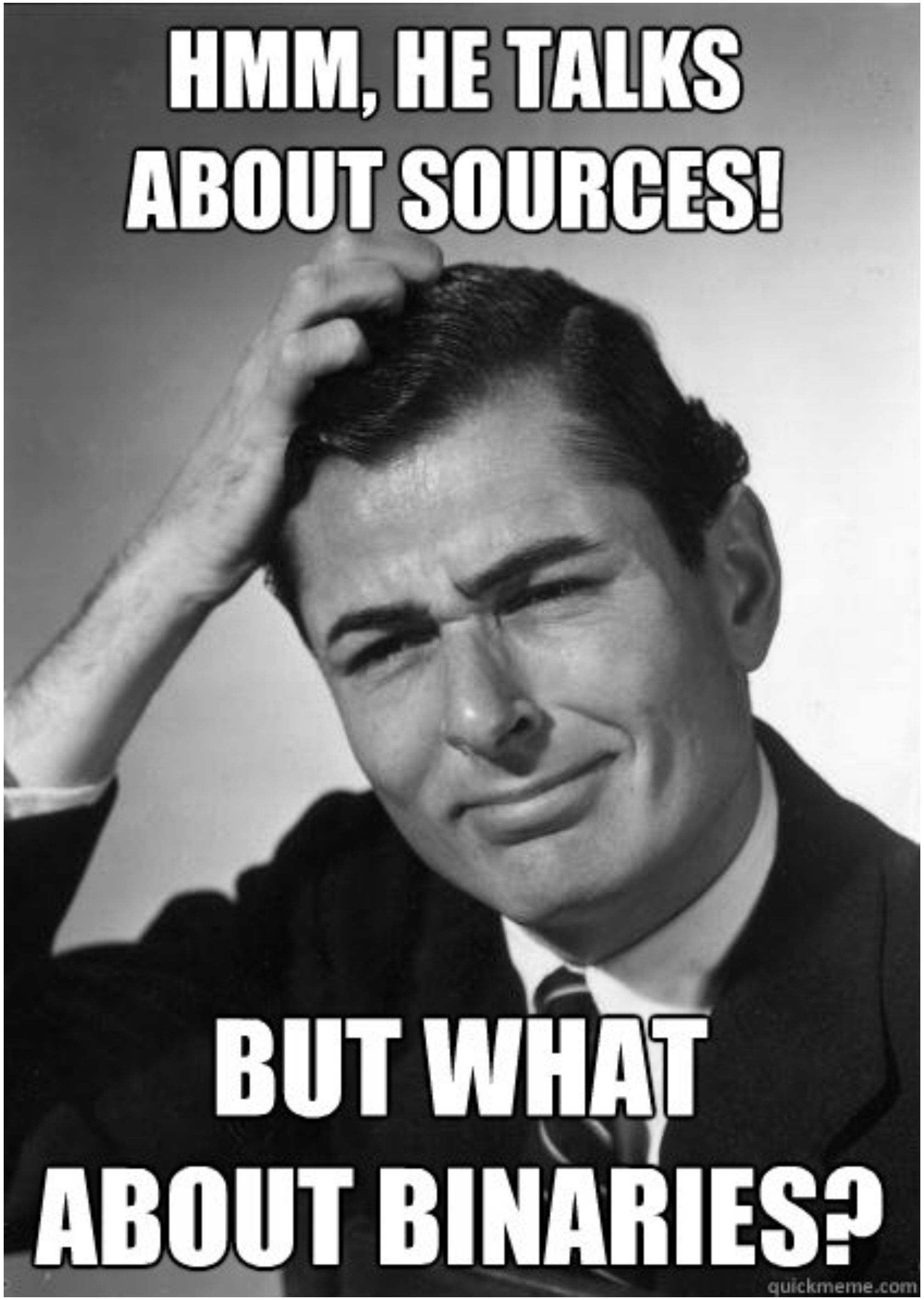
Typically, we place the declarations that specify the interface to a module in a file with a name indicating its intended use. Thus,

```
namespace Stack{          // interface
  void push(char);
  char pop();
}
```

would be placed in a file `stack.h`, and users will include that file, called a *header file*, like this:

```
#include "stack.h"      // get the interface
```

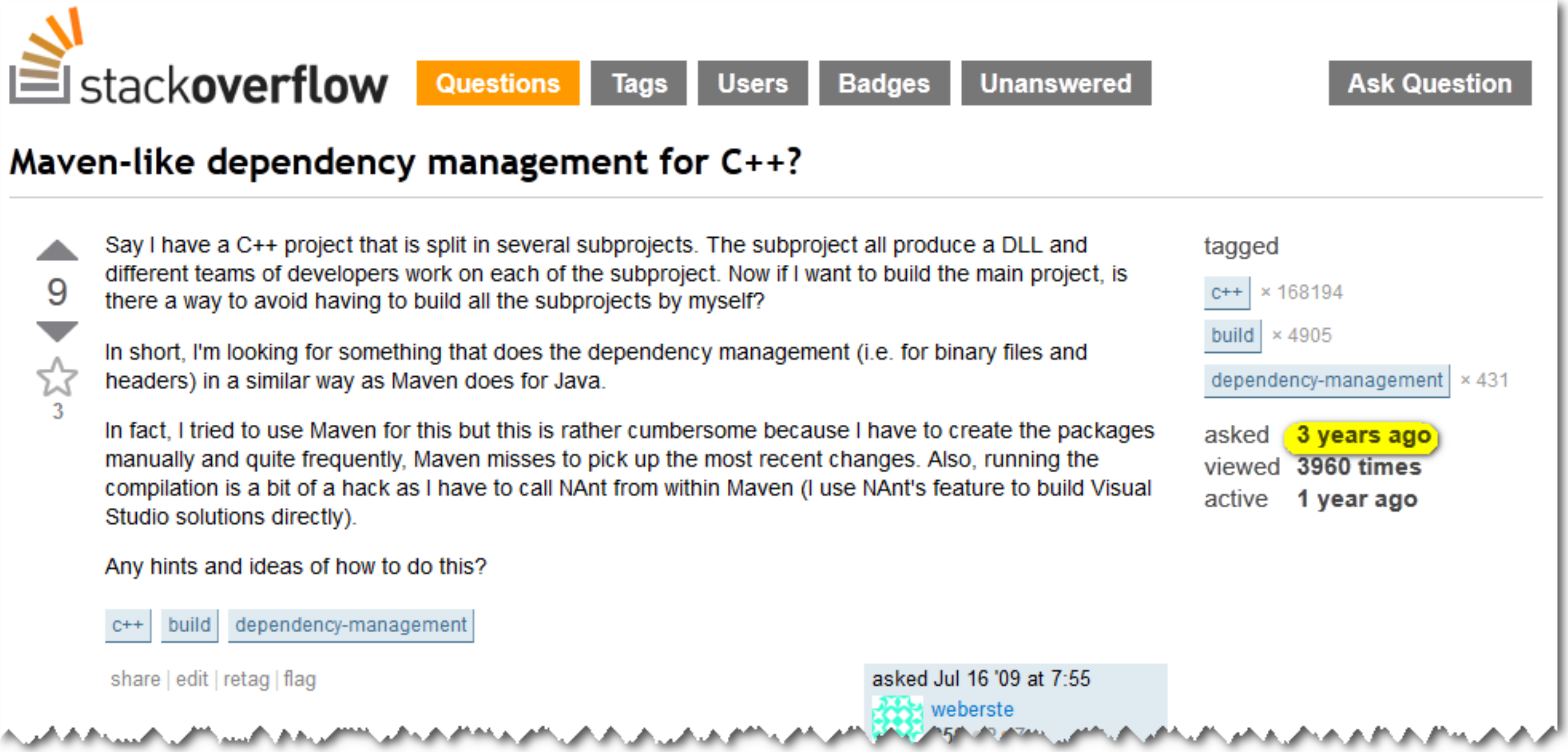
1. Extract interfaces to namespaces
2. Put them in .h files
3. Compile separately
4. Use by 'include' keyword
5. ??????
6. PROFIT


HMM, HE TALKS ABOUT SOURCES!
BUT WHAT ABOUT BINARIES?
quickmeme.com

Module Binaries

Library	OS	File type
Static	Win	*.lib
	*nix	*.a
Dynamic	Win	*.dll
	*nix	*.so

Managing Dependencies in C++



Maven-like dependency management for C++?

Say I have a C++ project that is split in several subprojects. The subproject all produce a DLL and different teams of developers work on each of the subproject. Now if I want to build the main project, is there a way to avoid having to build all the subprojects by myself?

In short, I'm looking for something that does the dependency management (i.e. for binary files and headers) in a similar way as Maven does for Java.

In fact, I tried to use Maven for this but this is rather cumbersome because I have to create the packages manually and quite frequently, Maven misses to pick up the most recent changes. Also, running the compilation is a bit of a hack as I have to call NAnt from within Maven (I use NAnt's feature to build Visual Studio solutions directly).

Any hints and ideas of how to do this?

c++ build dependency-management

share | edit | retag | flag

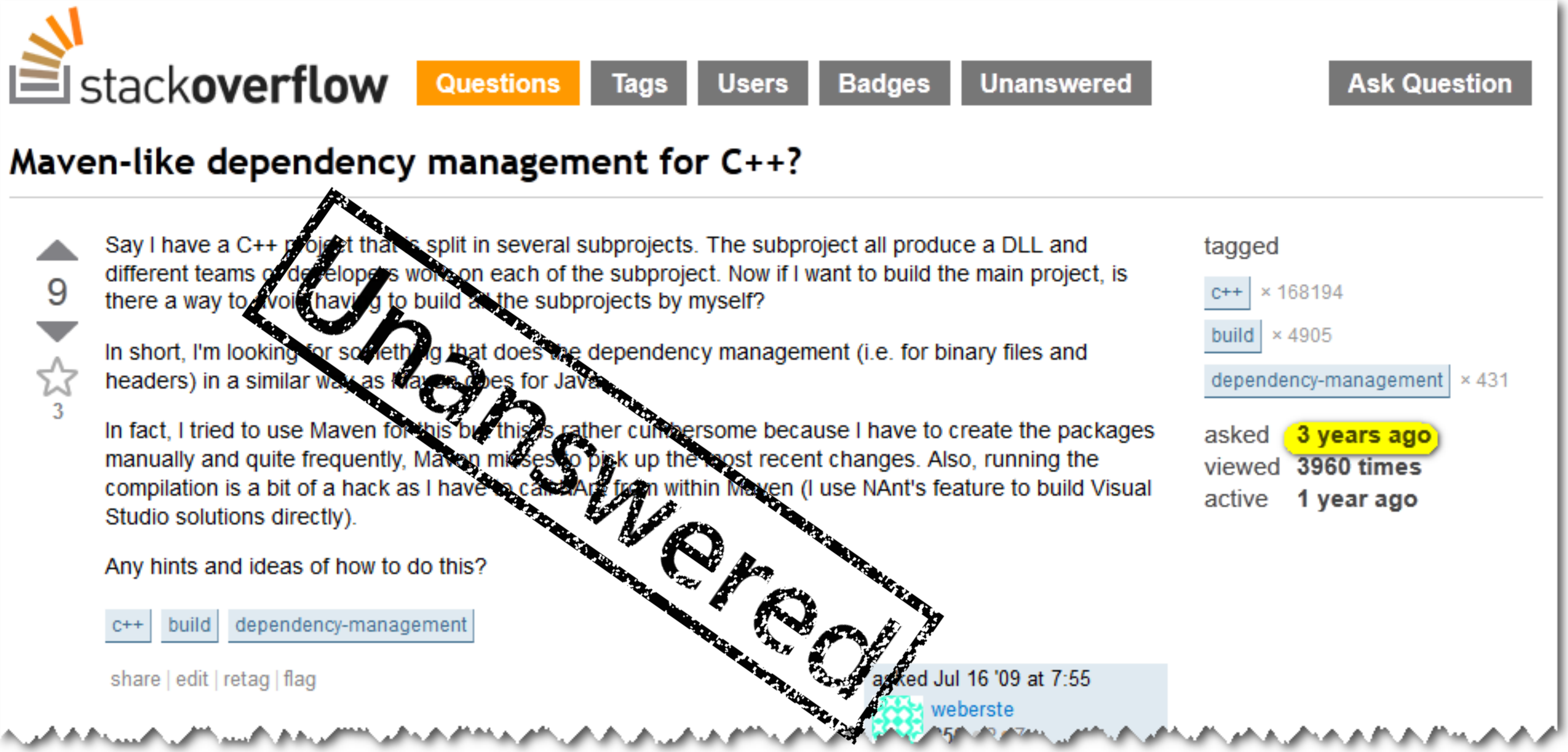
asked Jul 16 '09 at 7:55
weberste

tagged

c++ × 168194
build × 4905
dependency-management × 431

asked **3 years ago**
viewed **3960 times**
active **1 year ago**

Managing Dependencies in C++



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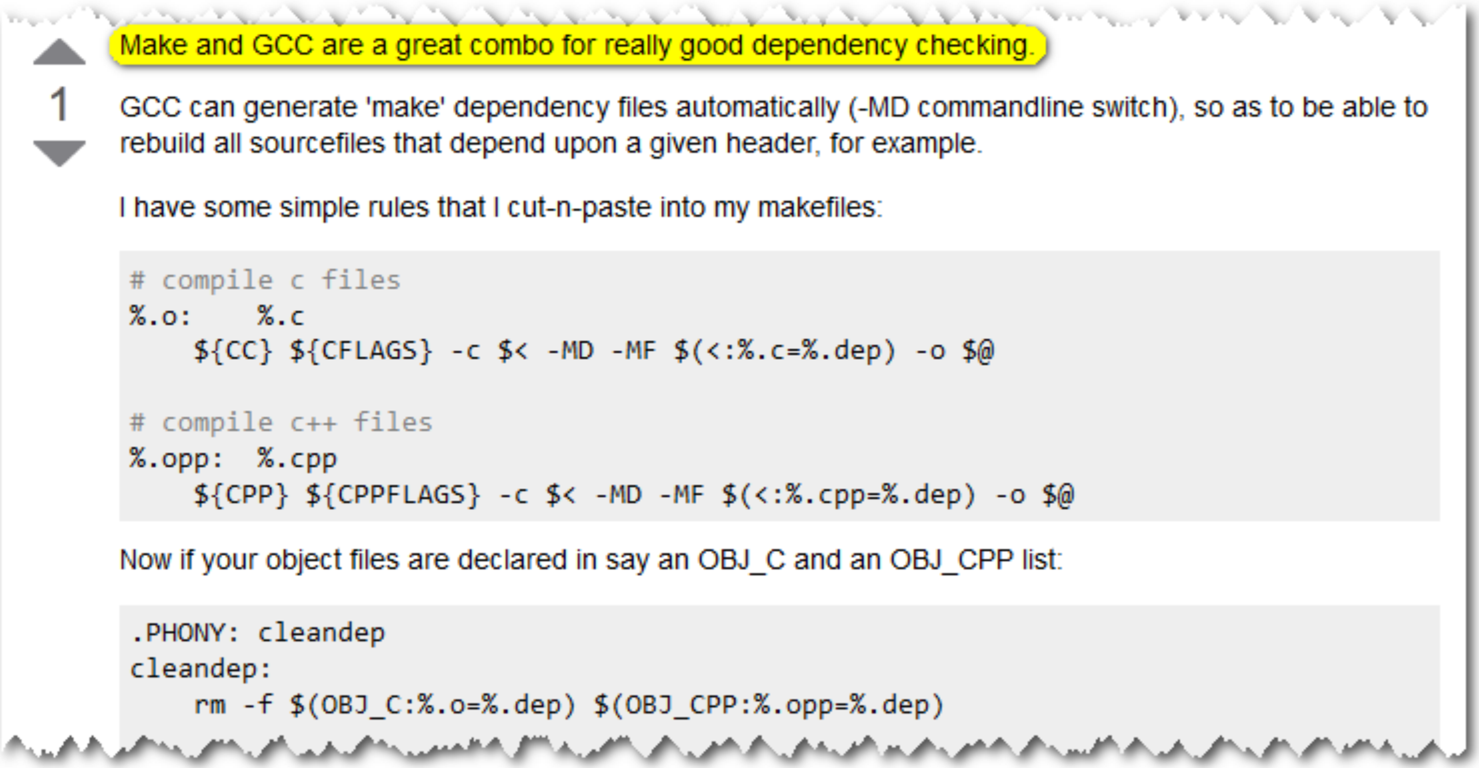
Make?



Make and GCC are a great combo for really good dependency checking.

GCC can generate 'make' dependency files automatically (-MD commandline switch), so as to be able to rebuild all sourcefiles that depend upon a given header, for example.

I have some simple rules that I cut-n-paste into my makefiles:

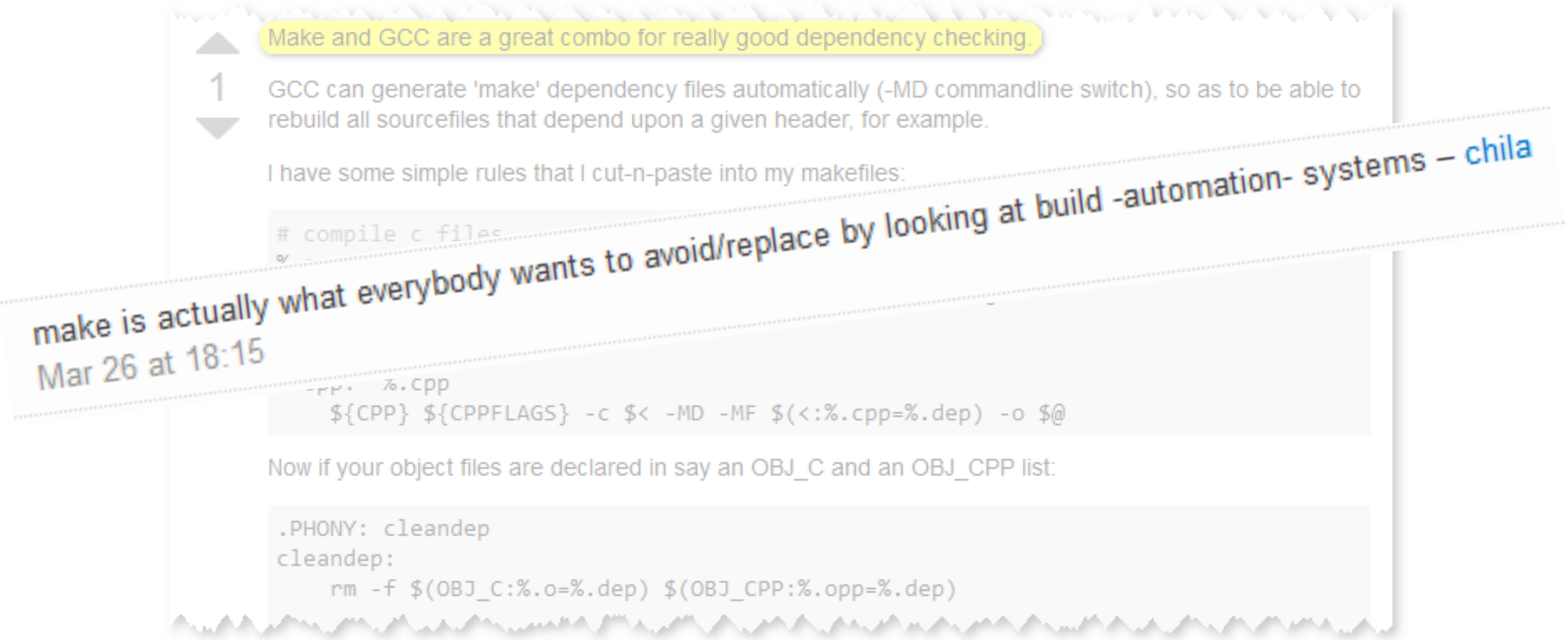
```
# compile c files
%.o:    %.c
    ${CC} ${CFLAGS} -c $< -MD -MF $(<:%.c=%.dep) -o $@

# compile c++ files
%.opp:  %.cpp
    ${CPP} ${CPPFLAGS} -c $< -MD -MF $(<:%.cpp=%.dep) -o $@
```

Now if your object files are declared in say an OBJ_C and an OBJ_CPP list:

```
.PHONY: cleandep
cleandep:
    rm -f $(OBJ_C:%.o=%.dep) $(OBJ_CPP:%.opp=%.dep)
```

Make?



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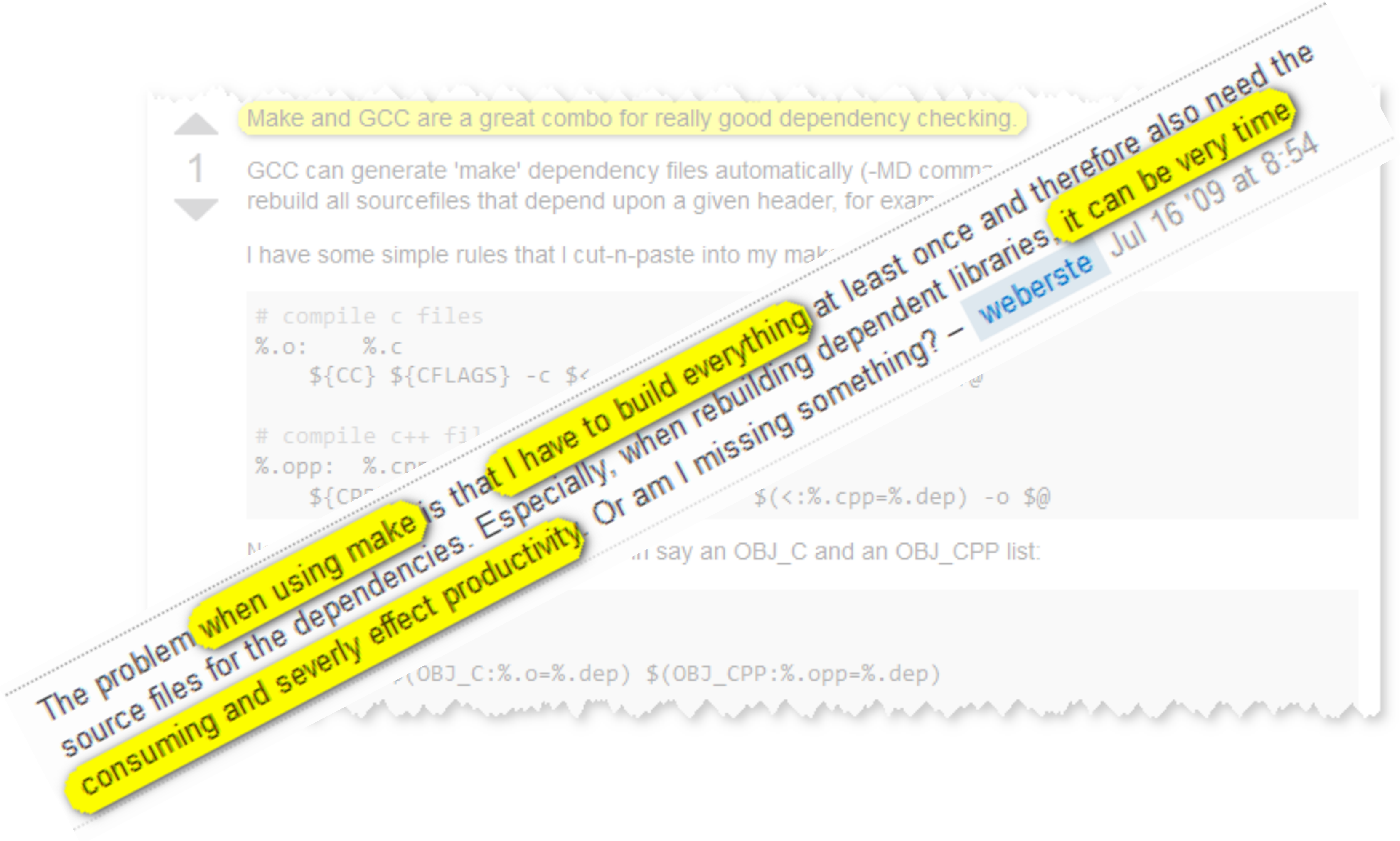
```
# compile c files
pp:  %.cpp
    ${CPP} ${CPPFLAGS} -c $< -MD -MF $(<:%.cpp=%.dep) -o $@
```

Now if your object files are declared in say an OBJ_C and an OBJ_CPP list:

```
.PHONY: cleandep
cleandep:
    rm -f $(OBJ_C:%.o=%.dep) $(OBJ_CPP:%.opp=%.dep)
```

make is actually what everybody wants to avoid/replace by looking at build -automation- systems – chila Mar 26 at 18:15

Make?



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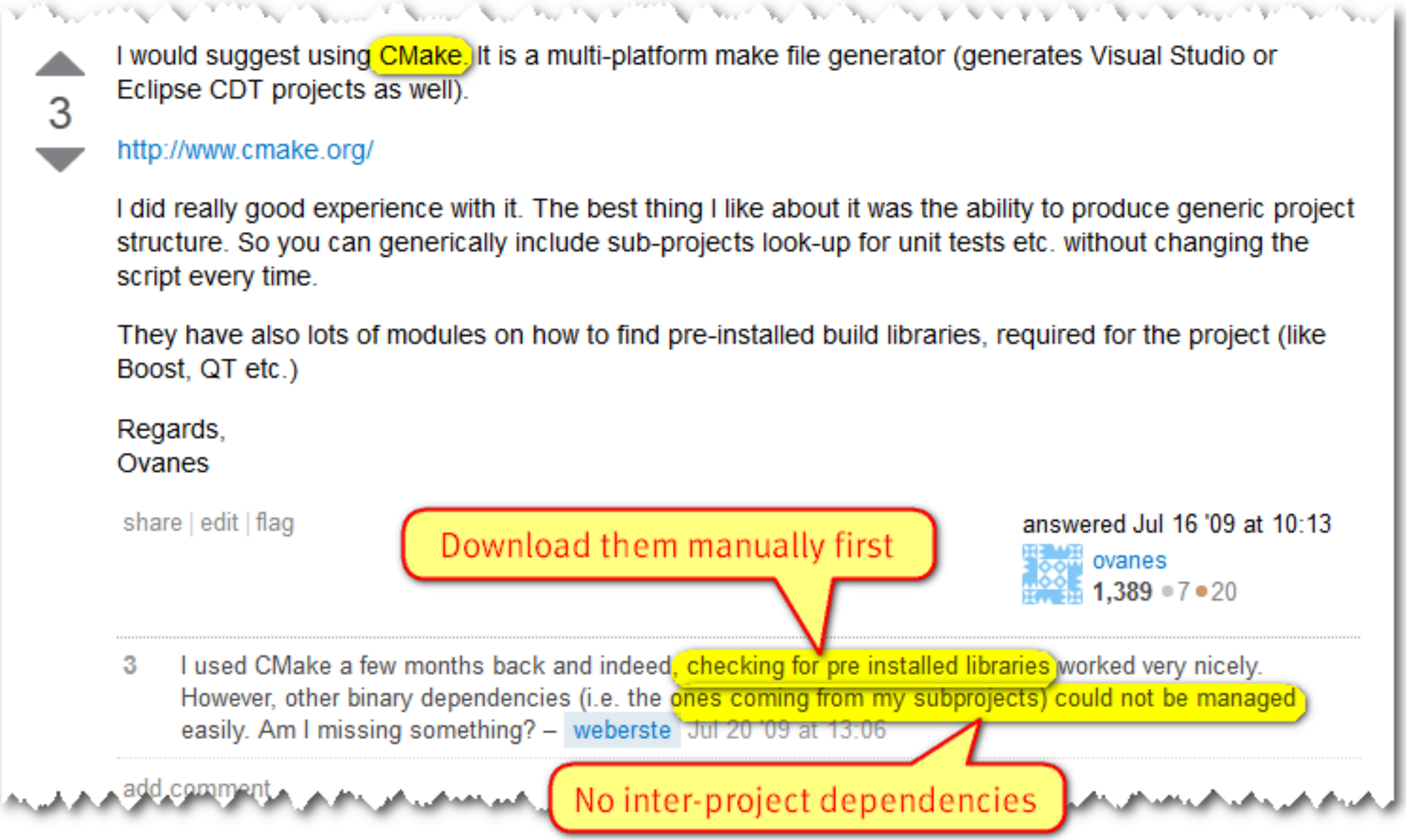
```
# compile c files
%.o:    %.c
    ${CC} ${CFLAGS} -c $<

# compile c++ fil
%.opp:  %.cp
    ${CP                          $(<:%.cpp=%.dep) -o $@
```

N   n say an OBJ_C and an OBJ_CPP list:

```
     $(OBJ_C:%.o=%.dep) $(OBJ_CPP:%.opp=%.dep)
```

The problem when using make is that I have to build everything at least once and therefore also need the source files for the dependencies. Especially, when rebuilding dependent libraries, it can be very time consuming and severly effect productivity. Or am I missing something? – weberste Jul 16 '09 at 8:54

CMake?



3

I would suggest using CMake. It is a multi-platform make file generator (generates Visual Studio or Eclipse CDT projects as well).

http://www.cmake.org/

I did really good experience with it. The best thing I like about it was the ability to produce generic project structure. So you can generically include sub-projects look-up for unit tests etc. without changing the script every time.

They have also lots of modules on how to find pre-installed build libraries, required for the project (like Boost, QT etc.)

Regards,
Ovanes

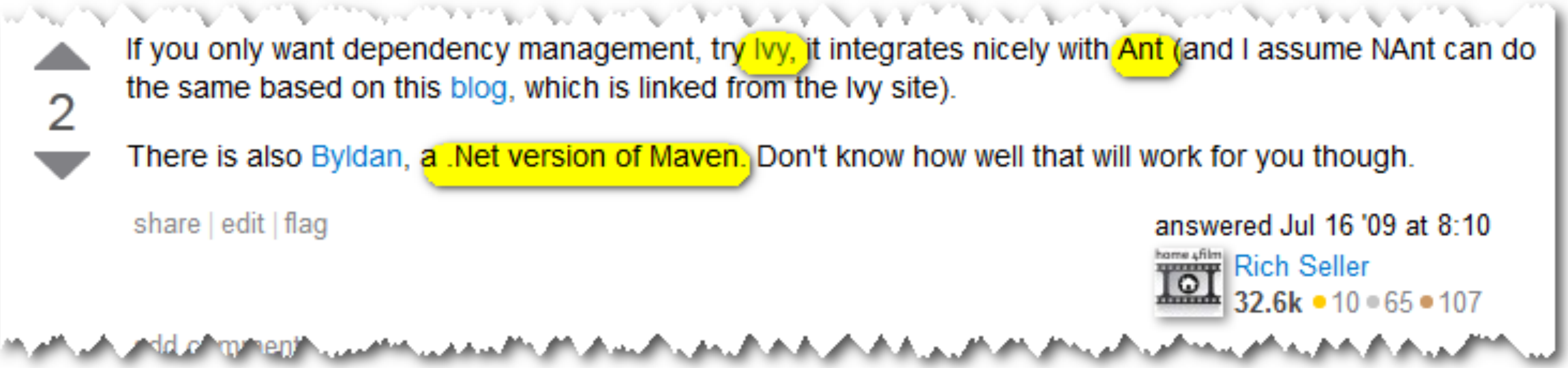
answered Jul 16 '09 at 10:13
ovanes
1,389 ●7 ●20

3 I used CMake a few months back and indeed, checking for pre installed libraries worked very nicely. However, other binary dependencies (i.e. the ones coming from my subprojects) could not be managed easily. Am I missing something? – weberste Jul 20 '09 at 13:06

Download them manually first

No inter-project dependencies

Java-Like (and Java) tools?



2

If you only want dependency management, try Ivy, it integrates nicely with Ant (and I assume NAnt can do the same based on this blog, which is linked from the Ivy site).

There is also Byldan, a .Net version of Maven. Don't know how well that will work for you though.

answered Jul 16 '09 at 8:10
Rich Seller
32.6k ● 10 ● 65 ● 107

Groovy tool!

2

If you only want dependency management, try I… Ant (and I assume NAnt can do the same based on this blog, which is linke…

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answered Jul 16 '09 at 8:10

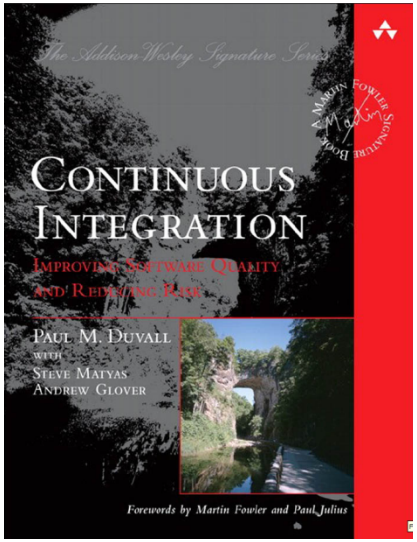
Rich Seller

32.6k ● 10 ● 65 ● 107

Chapter 48. C++ Support

gradle

Modular Build in C++



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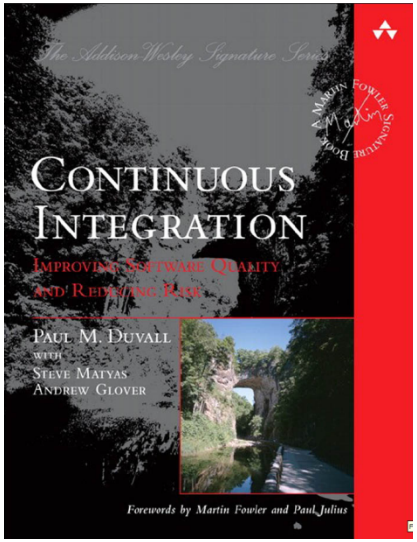
Modular Build in C++

GNU `make'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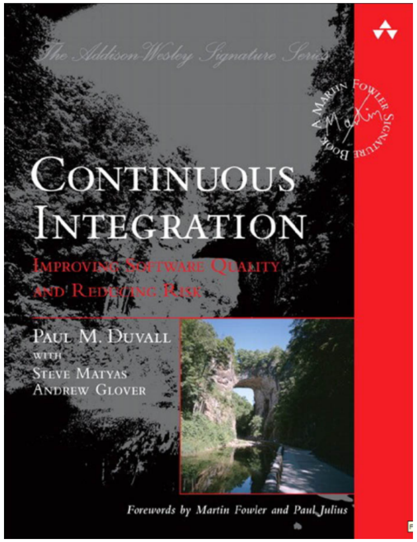
Modular Build in C++

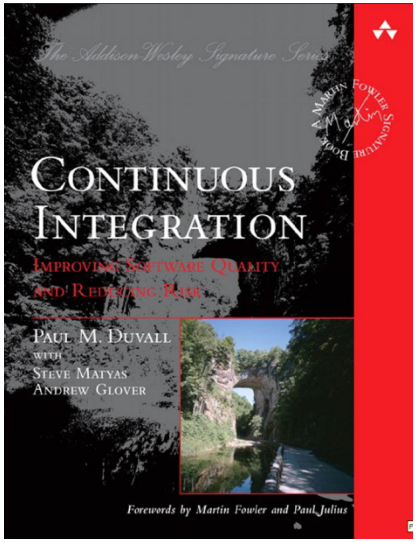
GNU `make' MSBuild	 The Addison Wesley Signature Series A Martin Fowler Signature Book Continuous Integration Improving Software Quality and Reducing Risk Paul M. Duvall with Steve Matyas Andrew Glover Forewords by Martin Fowler and Paul Julius

Modular Build in C++

GNU `make'

MSBuild

gradle



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Modular Build in C++

GNU `make' MSBuild gradle	Jenkins TeamCity Atlassian Bamboo

Modular Build in C++

GNU `make' MSBuild gradle	Jenkins TeamCity Atlassian Bamboo
artifactory	

MODULES IN… .NET

From C++ to C#

Library	OS	File type
Static	Win	*.lib
	*nix	*.a
Dynamic	Win	*.dll
	*nix	*.so

From C++ to C#

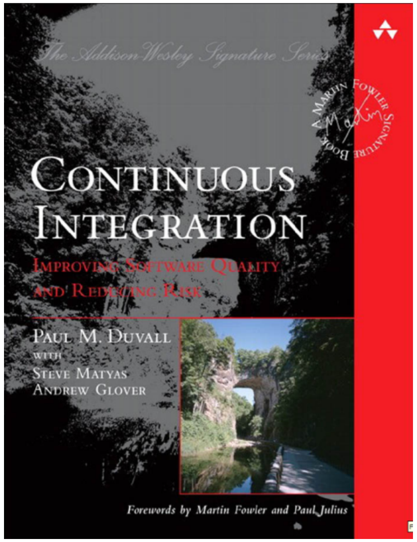
Library	Win	File type
Static	Win	*.lib
Dynamic	Win	*.dll

But is it the Only Change?

Library	Win	File type
Static	Win	*.lib
Dynamic	Win	*.dll

nuget, Baby!

Modular Build in .NET



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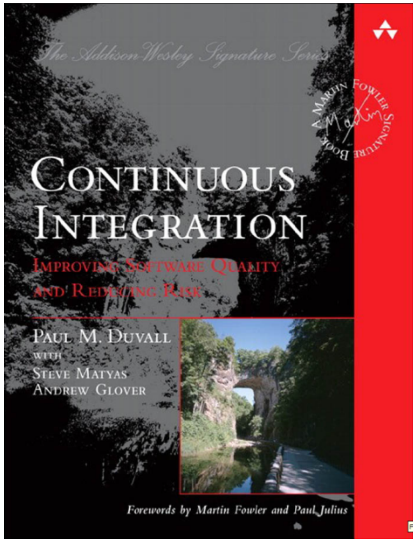
MSBuild

+

nuget



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nuget

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MSBuild + nuget	TeamCity
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DEMO TIME!

The Common Factor

MSBuild

+

nuget

gradle

TeamCity

artifactory

Microsoft®

.NET

DEVOPS REACTIONS

Bug goes unnoticed during a presentation

Submitted by Leprosy