

Introduction to CTIP

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Continuous Integration

- **Continuous integration, delivery, deployment**

- CI/CD is a method to frequently deliver apps to customers by introducing automation into the stages of app development. The main concepts attributed to CI/CD are **continuous integration, continuous delivery, and continuous deployment**. [redhat "what is CI/CD"]

Continuous integration is a software development practice where members of a team integrate their work frequently, usually each person integrates at least daily - leading to multiple integrations per day. Each integration is verified by an automated build (**including test**) to detect integration errors as quickly as possible.

[Continuous Integration: Improving Software Quality and Reducing Risk (book)]

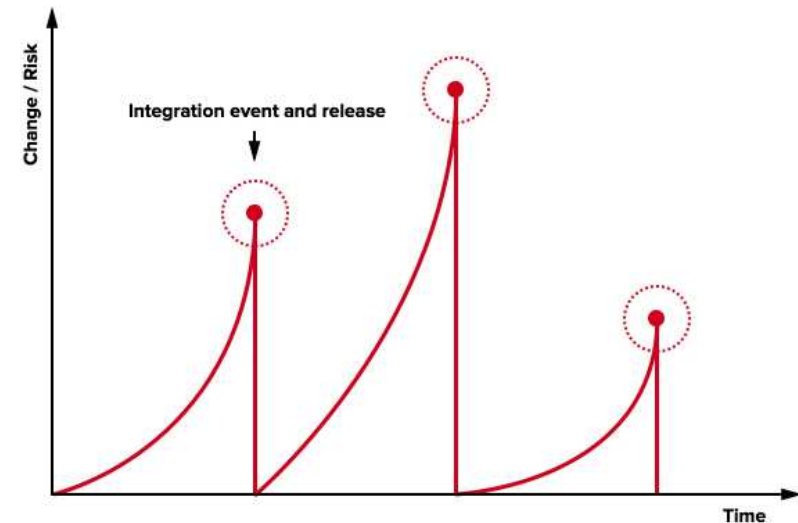
As soon as the work on a task is complete, it is integrated into the whole system. After any such integration, all the unit tests in the system must pass.

[Software engineering 10th (book)]

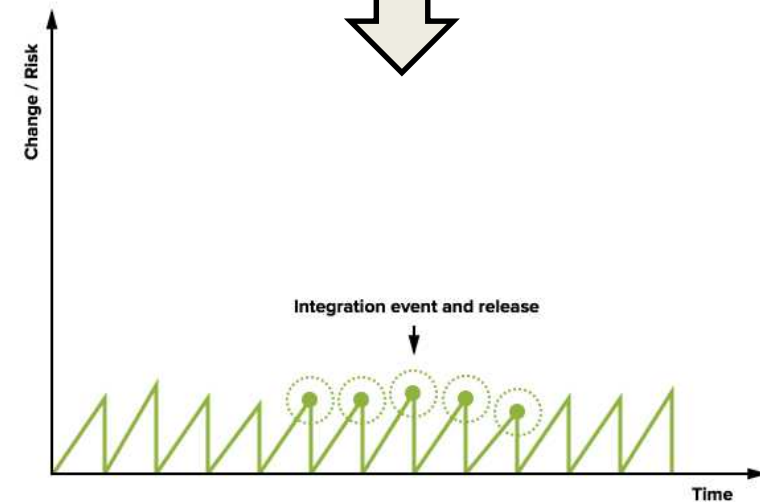
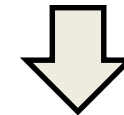


Continuous Integration

- Benefits of using CI
 - Reduced integration risk
 - Higher code quality
 - The code in version control works
 - Reduced friction between team members
 - The quality of life improvement for testers
 - Less time deploying
 - Increased confidence and morale
- Pitfalls
 - Increased project maintenance overhead
 - Hardware/Software costs



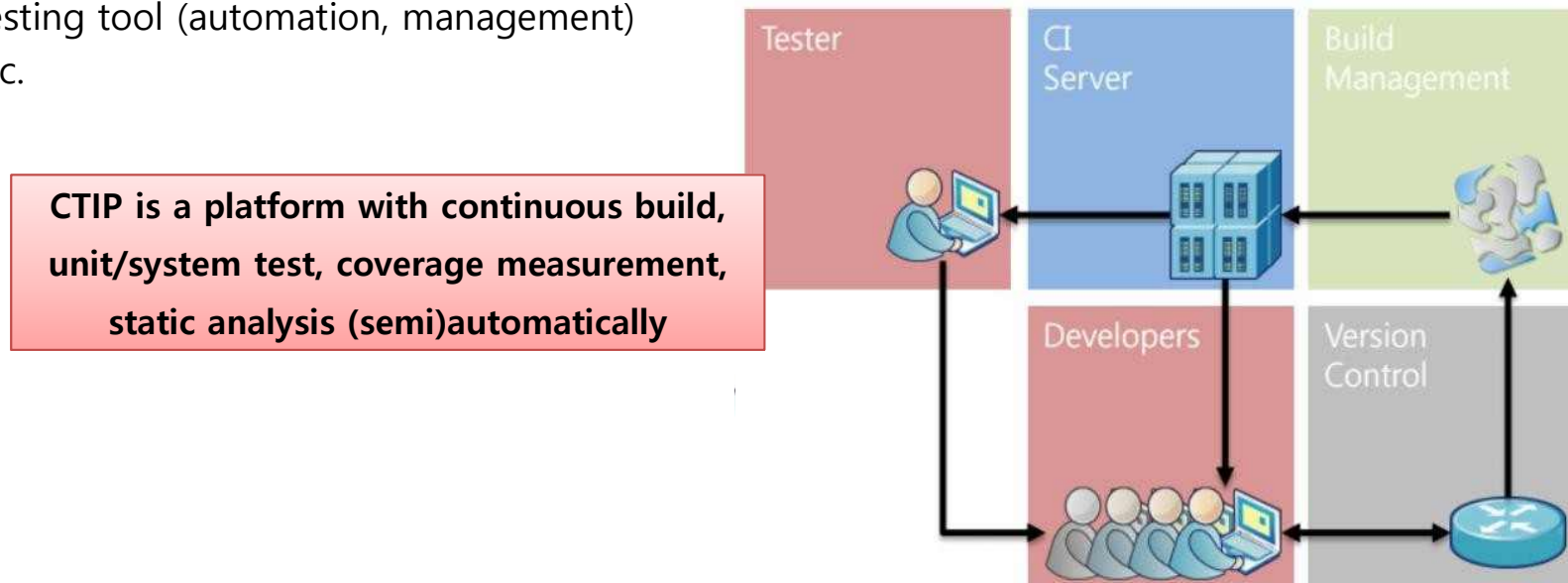
Traditional Integration



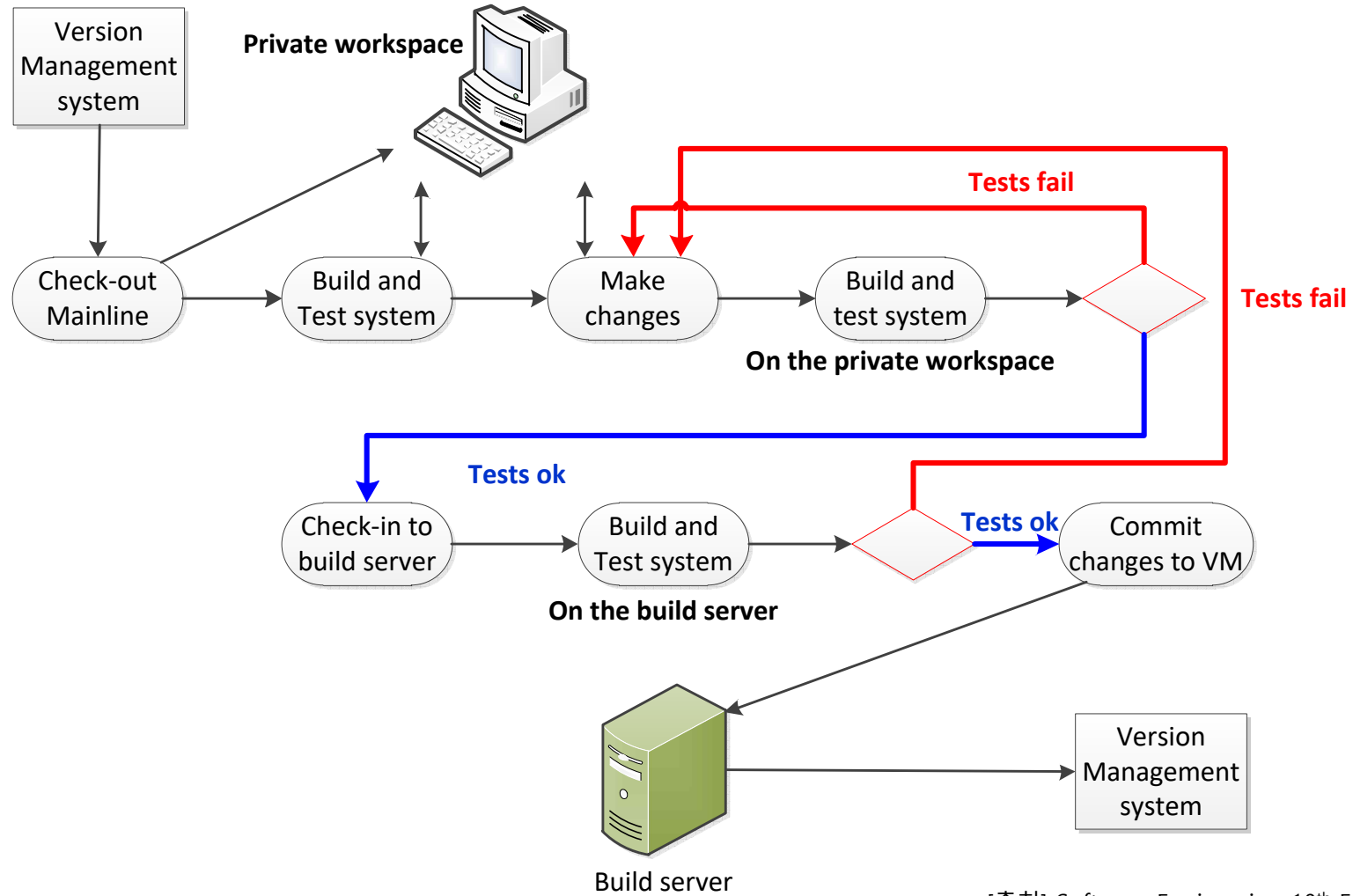
Continuous Integration

Continuous Test & Integration Platform

- Continuous test & integration platform (CTIP)
 - Continuous integration + continuous test
- CTIP consists of several (semi-)automatic tools
 - Continuous integration management
 - Version control
 - Build automation
 - Issue tracking (communication)
 - Static analysis
 - Testing tool (automation, management)
 - Etc.

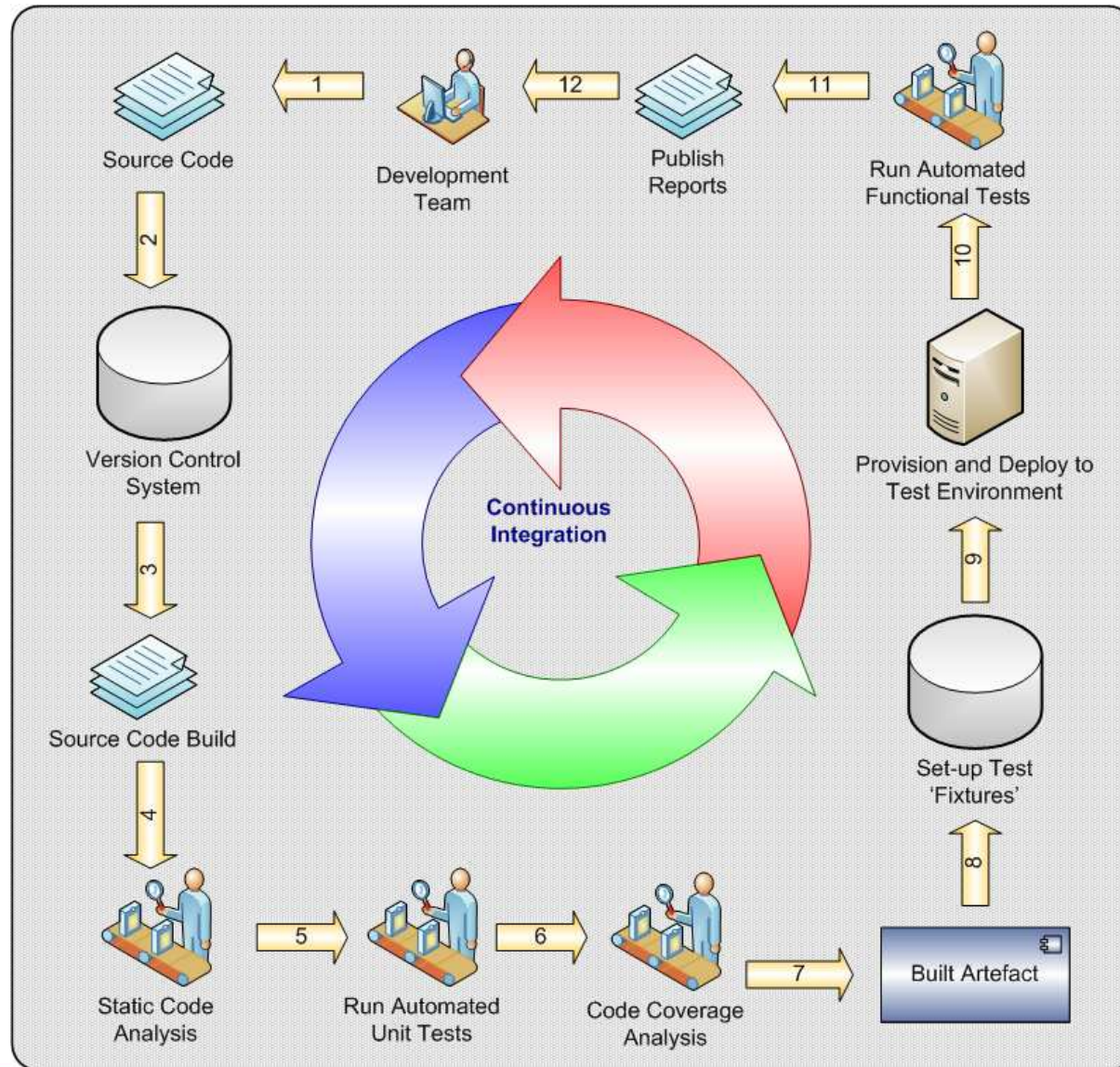


Continuous Integration Process







[출처] Software Engineering 10th Edition

Continuous Test & Integration Platform Example



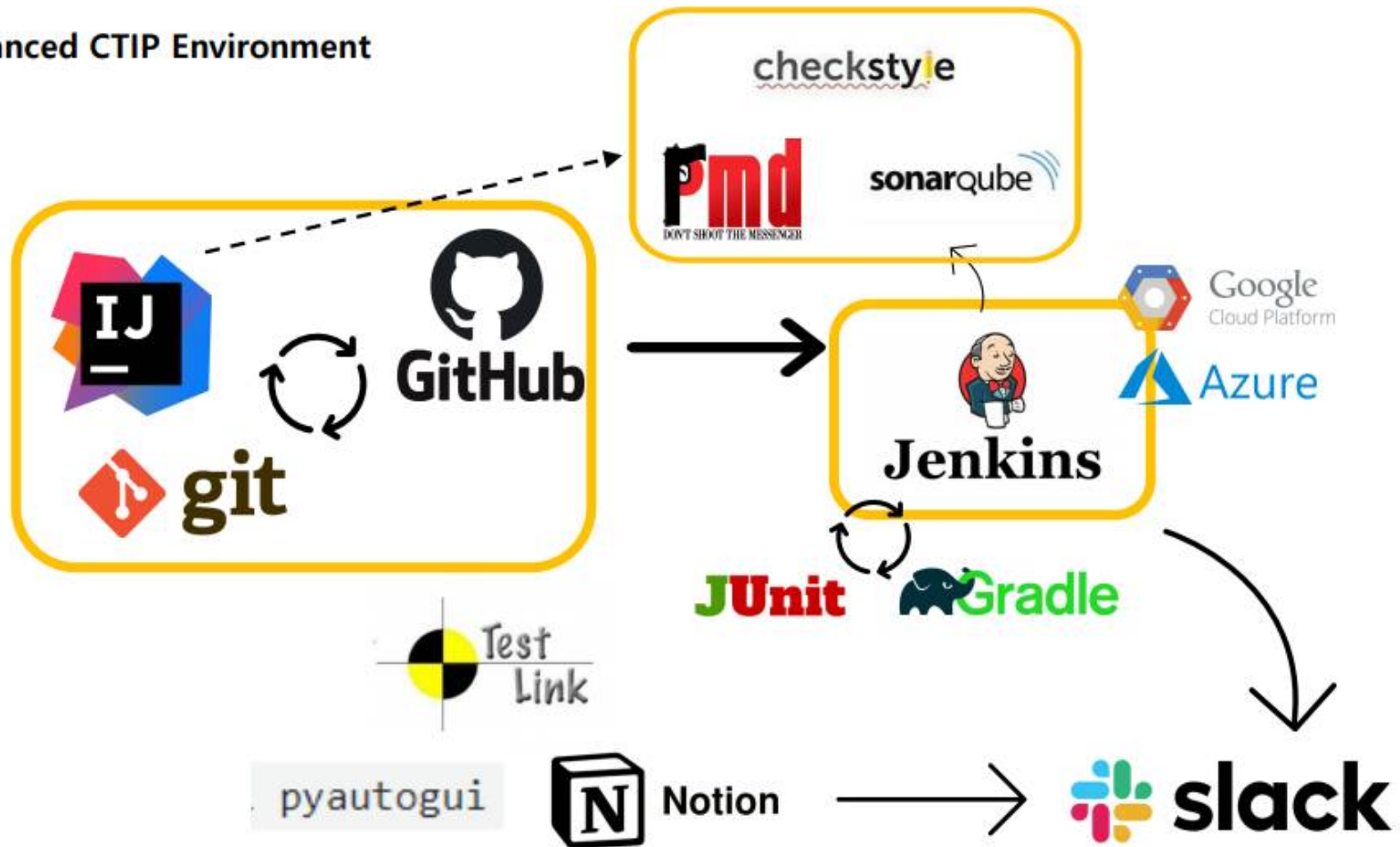
CI tool examples

	 Jenkins	 circleci	 TeamCity	 Bamboo	 GitLab
Open source	Yes	No	No	No	No
Ease of use & setup	Medium	Medium	Medium	Medium	Medium
Built-in features	3/5	4/5	4/5	4/5	4/5
Integration	★★★★★	★★★	★★★★★	★★★	★★★★★
Hosting	On premise & Cloud	On premise & Cloud	On premise	On premise & Bitbucket as Cloud	On premise & Cloud
Free version	Yes	Yes	Yes	Yes	Yes
Build Agent License Pricing	Free	From \$39 per month	From \$299 one-off payment	From \$10 one-off payment	From \$4 per month per user
Supported OSs	Windows, Linux, macOS, Unix-like OS	Linux or MacOS	Windows, Linux, macOS, Solaris, FreeBSD and more	Windows, Linux, macOS, Solaris	Linux distributions: Ubuntu, Debian, CentOS, Oracle Linux

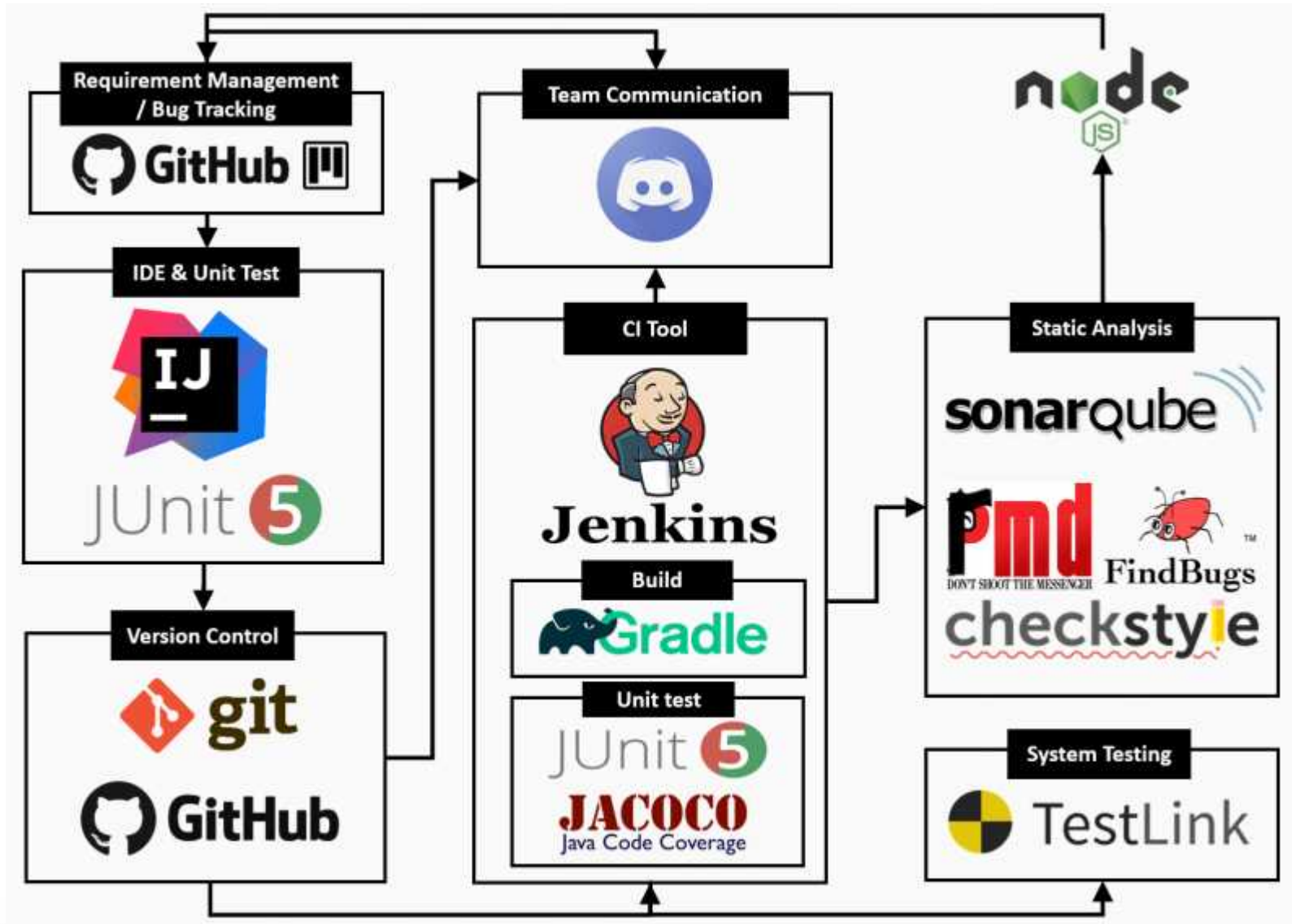
[출처] <https://www.katalon.com/resources-center/blog/ci-cd-tools/>

Continuous Test & Integration Platform Example [2020 SV]

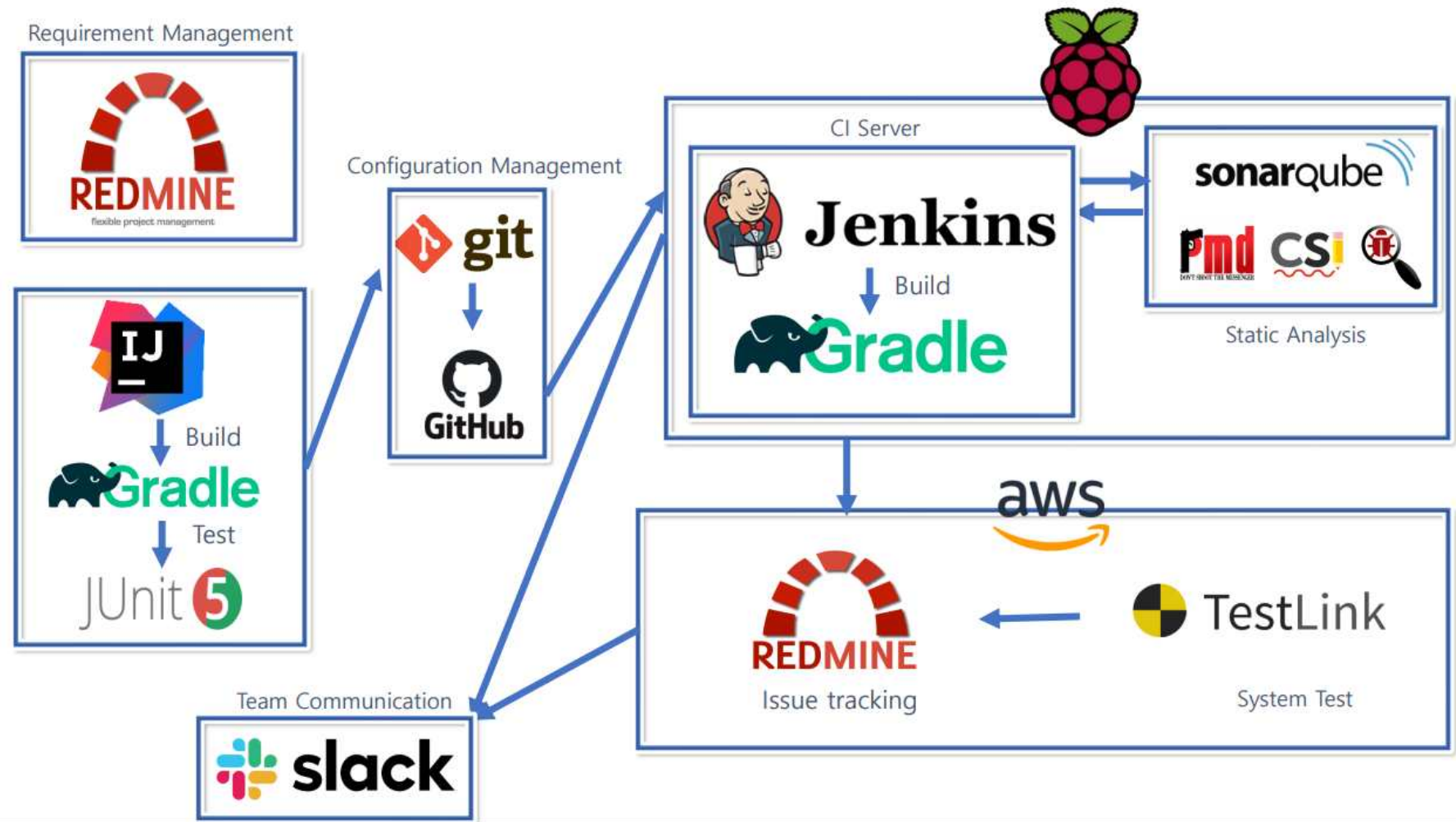
Advanced CTIP Environment



Continuous Test & Integration Platform Example [2020 SV]












Continuous Test & Integration Platform Example [2020 SV]













EXAMPLES

Automation testing tool examples

Product	 SELENIUM	 Katalon Studio	 UFT One	 TestComplete	 SoapUI
Available since	2004	2015	1998	1999	2005
Application under test	Web app	Web/API/Mobile/Desktop apps	Web/Desktop/Mobile/RPA apps	Web/Desktop/Mobile apps	API/Web service
Supported platforms	Windows Mac OS Linux Solaris	Windows Linux OS X	Windows	Windows	Windows Linux OS X
Scripting languages	Java, C#, Perl, Python, JavaScript, Ruby, PHP	Java, Groovy	VBScript	JavaScript, Python, VBScript, JScript, Delphi, C++, C#	Groovy, JavaScript
Programming skills	Advanced skills required for tools integration.	Not required. Recommended for advanced test scripts.	Not required. Recommended for advanced test scripts.	Not required. Recommended for advanced test scripts.	Not required. Recommended for advanced test scripts.
Ease of use	Requires advanced skills to install and use.	Easy to set up and use.	Complex in installation. Requires training to implement the tool.	Easy to set up. Requires training to implement the tool.	Easy to set up and use.
Ratings*	4.4 / 501 ratings 	4.4 / 651 ratings 	4.3 / 103 ratings 	4.4 / 41 ratings 	Not applicable

[출처] <https://briananderson2209.medium.com/best-automation-testing-tools-for-2018-top-10-reviews-8a4a19f664d2>

Bug tracking tool examples

Software	Overview	Free Option	Price	Site
 monday.com	Read monday.com features & functionality	14 day free trial	From \$17/2 users/month	Check out monday.com
 BugHerd	Read BugHerd features & functionality	14 day free trial	From \$39/5 users/month	Check out BugHerd
 DoneDone	Read DoneDone features & functionality	30 day free trial	From \$5/user/month, 20% discount on annual plans	Check out DoneDone
 Backlog	Read Backlog features & functionality	Freemium version 30 day free trial	From \$35/month for up to 30 users	Check out Backlog
 DebugMe	Read DebugMe features & functionality	Freemium version 30 day free trial	From \$8/month for up to 10 users	Check out DebugMe
 Zoho Bug Tracker	Read Zoho Bug Tracker features & functionality	Freemium version 10 day free trial	From \$40/month for up to 15 users	Check out Zoho Bug Tracker
 Bugyard	Read Bugyard features & functionality	14 day free trial	From \$10/month for 2 users	Check out Bugyard
 Rollbar	Read Rollbar features & functionality	Freemium version 14 day free trial	From \$41/month	Check out Rollbar
 MantisHub	Read MantisHub features & functionality	Free trial	From \$4.95/month for 5 users	Check out MantisHub
 Marker.io	Read Marker.io features & functionality	Free trial	From \$15/user/month	Check out Marker.io

Test management tool examples

1. Zephyr Scale
2. qTest
3. PractiTest
4. Zephyr
5. Test Collab
6. TestFLO for JIRA
7. XQual
8. Xray – Cutting Edge Test Management
9. TestRail
10. Kualitee
11. Requirements and Test Management for Jira (RTM)
12. SPIRATEST by Inflectra
13. Qase
14. aqua
15. ReQtest
16. Testpad
17. JunoOne
18. TestCaseLab
19. TestMonitor
20. Klaros-Testmanagement
21. QACoverage
22. JIRA

List of tools for static code analysis

Java [edit]

Tool ↕	Latest release ↕	Free software ↕	Duplicate code ↕
Checkstyle	2020-01-26	Yes; LGPL	No
Coverity	2017-01-19	No; Proprietary	
Eclipse	2017-06-28	Yes; EPL	No
FindBugs	2015-03-06	Yes; LGPL	
Infer	2017-10-19	Yes; BSD with additional patent clause ↗	
IntelliJ IDEA	2017-11-30	Yes; ASL 2	Yes
JArchitect	2017-06-11	No; Proprietary	
Jtest	2019-05-21	No; Proprietary	Yes
LDRA Testbed		No; Proprietary	
PMD	2020-10-24	Yes; BSD, ASL 2, LGPL	Yes
RIPS	2019-01-07	No; Proprietary	
Semgrep	2021-03-16 (0.43.0)	Yes; LGPL v2.1	No
SemmlerCode		No; Proprietary	
Soot	2020-10-28	Yes; LGPL	
Squale	2011-05-26	Yes; LGPL	
SourceMeter	2016-02-01	No; Proprietary	Yes
ThreadSafe	2014-03-28	No; Proprietary	

[출처] https://en.wikipedia.org/wiki/List_of_tools_for_static_code_analysis

Tool	Latest release	Free software	Duplicate code	Supported languages
Apache Yetus	2020-12-17 (0.13.0)	Yes; ASL 2		C, C++, Java, Perl, Python, Ruby, Shell, XML
Axivion Bauhaus Suite		No; Proprietary	Yes	Ada, C, C++, C#, Java
Code Dx		No; Proprietary	Yes	C, C++, C#, Java, JavaScript, JSP, PHP, Python, Rails, Ruby, Scala, VB.NET, XML ^[1]
CodeScene	2021-01-01	No; Proprietary	Yes	C, C++, C#, Java, Groovy, JavaScript, TypeScript, Objective-C, Scala, Python, Swift, Go, Visual Basic .Net, PHP, Ruby
ConQAT (retired)	2015-02-01	Yes; ASL 2		C#, C++, Java, JavaScript, ABAP, Ada
Coverity	2021-01-23 (2020.09) ^[2]	No; Proprietary		C, C++, C#, Objective-C, Java, Javascript, nodeJS, Ruby, PHP, Python
GammaTech CodeSonar	2020-06-01 (5.3)	No; Proprietary		C, C++, Objective-C, Java
HCL Security AppScan Source	2020-12-01 (10.0.3)	No; Proprietary		C, C++, .NET, Java, JSP, JavaScript, ColdFusion, ASP, PHP, Perl, Visual Basic 6, PL/SQL, Python, T-SQL, COBOL
Facebook Infer	2020-10-12 (1.0.0)	Yes; MIT		C, C++, Java, Objective-C
Imagix 4D	2020-10-01 (10.1.0)	No; Proprietary		C, C++, Java
Kiuwan	2020-07-22	No; Proprietary		C, C++, C#, Objective-C, Java, JSP, JavaScript, PHP, ABAP, COBOL, JCL, PL/SQL, T-SQL, SQL, Visual Basic, VB.NET, Android
Klocwork	2020-12-01 (2020.4)	No; Proprietary		C, C++, C#, Java
LDRA Testbed		No; Proprietary		C, C++, Ada83, Ada95, Assembler (Intel, Freescale, Texas Instruments)
MALPAS		No; Proprietary		Ada, C, Pascal, Assembler (Intel, PowerPC and Motorola)
Moose	2021-01-21 (7.0.3)	Yes; MIT		C, C++, Java, Smalltalk, .NET
PMD's Copy/Paste Detector (CPD)	2021-01-30 (6.31.0)	Yes; BSD-like	Yes	C, C++, Java, JSP, ColdFusion, PHP, JavaScript
Polyspace		No; Proprietary		C, C++, and Ada
Pretty Diff	2019-04-21 (101.0.0)	Yes; CC0	No	Markup, script and style languages (like XML, Javascript, CSS)
PVS-Studio	2020-12-17 (7.11)	No; Proprietary	No	C, C++, C++/CLI, C++/CX (Component Extensions), C#, Java
RIPS	2020-02-17 (3.4)	No; Proprietary		PHP, Java, Node.js
Semgrep	2021-03-16 (0.43.0)	Yes; LGPL v2.1	No	Go, Java, JavaScript, JSON, Python, Ruby, language-agnostic mode
Sider	2021-02-02	No; Proprietary		Ruby, Python, PHP, JavaScript, CoffeeScript, Go
SofCheck Inspector / Codepeer	2020-08-24 (21.x)	No; Proprietary	Yes	Ada, Java
SonarQube	2021-01-27 (8.6.1)	Yes; LGPL v3.0		ABAP, Apex, C, C#, C++, CSS, COBOL, Flex, Go, HTML, Java, JavaScript, Kotlin, Objective-C, PHP, PLI, PL/SQL, Python, Ruby, Scala, Swift, TSQL, TypeScript, VB.NET, Visual Basic 6, XML
SourceMeter	2016-12-16 (8.2)	No; Proprietary	Yes	Java, C, C++, RPG IV (AS/400), Python
Sotoarc-Sotograph	2018-12-03 (5.0)	No; Proprietary		C, C++, C#, Java, ABAP
Square	2020-11-27 (20.1)	No; Proprietary		Ada, C, C++, C#, Fortran, Java, Javascript, Objective-C, PHP, Python, PL/SQL, Swift, T-SQL, Typescript, VB.NET, XAML
Understand	2020-09-21 (6.0)	No; Proprietary		Ada, Cobol, Ansi C, K&R C, Ansi C++, C#, FORTRAN, Java, Jovial, Pascal, PL/M, Python, VHDL, Objective C/C++, HTML, PHP, JavaScript, XML
Yasca (retired)	2010-11-01 (2.21)	Yes		C, C++, Java, JavaScript, ASP, PHP, HTML-CSS, ColdFusion, COBOL

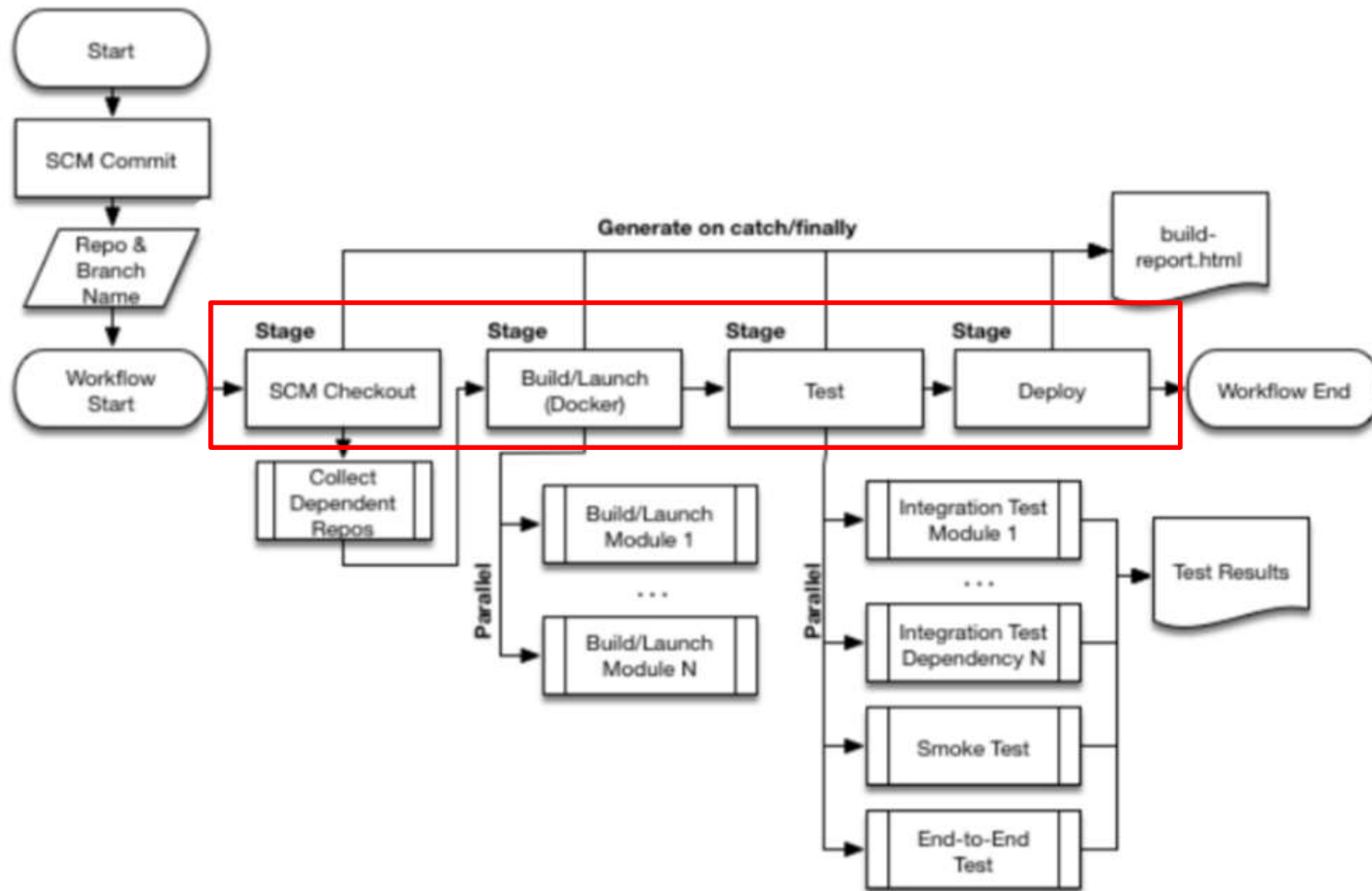
Tools for CTIP

- <https://www.swbank.kr/helper/tool/toolMain.do>

Tool	Name
Project Management	OpenProj, GanttProject, Mylyn, Hsarepoint,
Quality Management	Splint, PMD, JDepend, Checkstyle,
Requirement Analysis & Management	Jfeature, JRequisite,
Design & Modeling	StarUML, VioletUMLEditor, ArgoUML,
Configuration Management & Version Control	Trac, Jenkins (Hudson), Maven, CVS, SVN, Bugzilla, Mantis, TortoiseCVS, Mercurial, Cruise Control, Git, Ant, RedMind, Berkshelf, Perforce, Nagios, Sensu, Vagrant, Foodcritic,
Implementation	Eclipse, Valgrind, Netbeans,
Testing	TestLink, CPPUnit, OProfile, HttpUnit, EMMA, Jmeter, Nunit, SoapUI, FitNesse,
Static Analysis	Coverity, dart, sparrow, cppcheclipse, Resort, sonar, HP Fortify Static Code Analyzer, Checkmarx CxSuite, Syhunt Sandcat, Parasoft (Jtest, dotTEST, ...), VeraCode Static, Coverity Static Analysis,

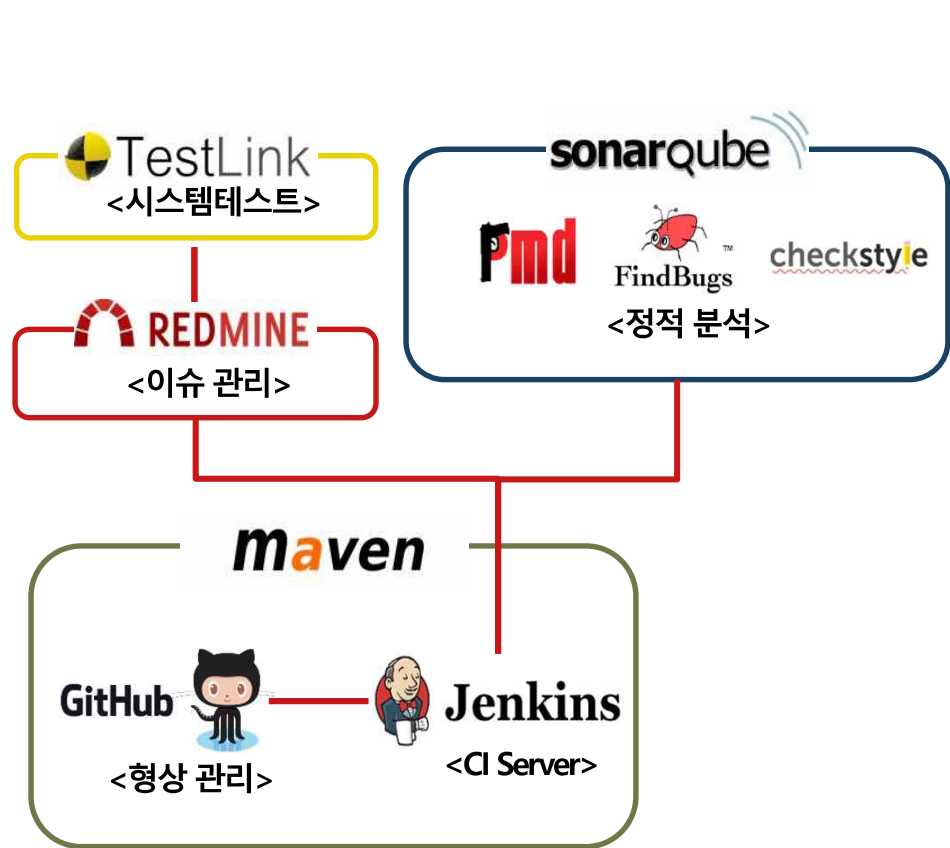
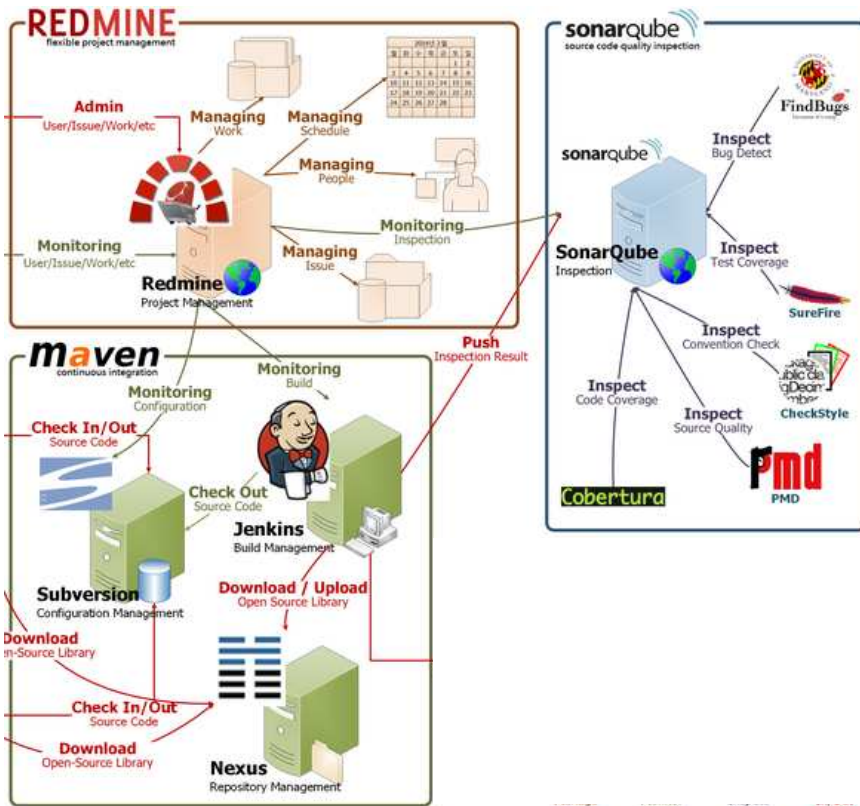
CTIP Example

Jenkins Workflow

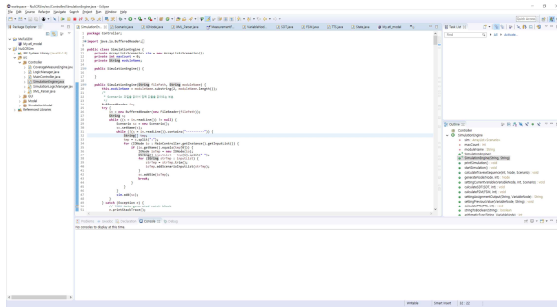


SCM: Source Code Management

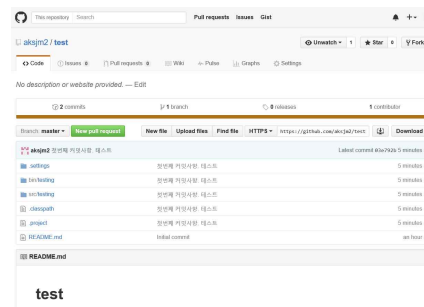
CTIP Example



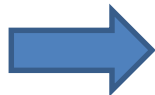
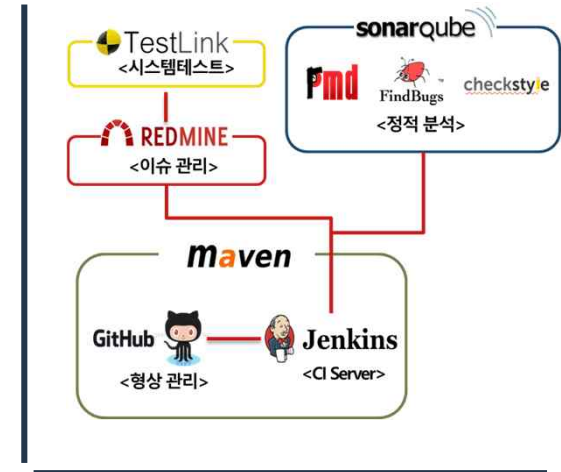
CTIP Example



코드 수정 후 푸시- Eclipse



형상 관리 - Github



자동 빌드 및 unit test 수행 - maven



빌드 및 unit test 결과 확인 - Jenkins

Continuous Test & Integration Platform Example

