

Analysis of DevOps Tools to Predict an Optimized Pipeline by Adding Weightage for Parameters

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ABSTRACT

Now-a-days more than ever, DevOps [Development + Operations] has gained a tremendous amount of attention in software industry. Selecting the tools for building the DevOps pipeline is not a trivial exercise as there are plethora's of tools available in market. It requires thought, planning, and preferably enough time to investigate and consult other people. Unfortunately, there isn't enough time in the day to dig for top-rated DevOps tools and its compatibility with other tools. Each tool has its own pros/cons and compatibility of integrating with other tools. The objective of this paper is to propose an approach by adding weightage to each parameter for the curated list of the DevOps tools.

Keywords

DevOps, SCM, dependencies, compatibility and pipeline

1. INTRODUCTION

DevOps, where automation and orchestration work hand in hand to streamline deployment contains numerous tools, so researching which one is right for your application is vital. The available DevOps tools can be broadly classified [1] by using Data Mining techniques or by periodic table. The periodic table, or periodic table of elements, is a tabular arrangement of the chemical elements, ordered by their atomic number, electron configuration, and recurring chemical properties, whose structure shows periodic trends [2]. Similarly, DevOps tools are arranged by different software companies. For instance, Xebialabs - An independent software company specializing in DevOps and CyberArk a publicly traded information security company [3]. Each project has a continuing pressure to adopt DevOps to increase the productivity, time to market, etc.

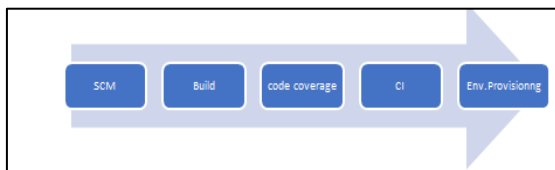


Fig1. Basic Pipeline

DevOps pipeline is classified with SCM [Source Code Management], Build, CI [Continuous Integration], Code Coverage and Environment provisioning tools to build a pipeline. Each classification has its own categories/parameters. The study described here was undertaken to contribute to the small set of DevOps tools. For each classification of tools, weightage is added to the listed parameters - License, Operating system, Platform, Hardware and configuration, Tool/Framework, Dependencies, Embedded GUI, Performance, Migration Feasibility, scalability, Compatibility to CICD pipelines, Security, Reliability, Support availability and its availability over the

cloud.

2. SCM

Source code management (SCM) is a software tool used for development, versioning and enables team working in multiple locations to work together more effectively. This plays a vital role in increasing team's productivity. Some of the SCM tools, considered for this study are GIT, SVN, CVS, ClearCase, Mercurial, TFS, Monotone, Bitkeeper, Code co-op, Darcs, Endeavor, Fossil, Perforce, Rational Synergy, Source Safe, and GNU Bazaar. Table1 consists of SCM tools with weightage.

3. BUILD

Build is a process that enables source code to be automatically compiled into binaries including code level unit testing to ensure individual pieces of code behave as expected [4]. The most famous build tools considered here are Maven, Ant, Gradle, MS build, Ubuild, phing and Nant. Table 2 consists of Build tools with weightage.

4. CI

Continuous Integration is compiling, building, packaging and integrating the software on a continuous basis. With every check-in of a source code, system triggers the compilation process and runs code coverage, Unit testing, static analysis and automated deployment. Some of the CI tools considered here are Jenkins, Buildbot, Travis, Strider CI, Bamboo, Teamcity, Solano CI, CruiseControl and Semaphore. Table 3 consists of CI tools with weightage.

5. CODE COVERAGE

Code coverage testing is to determine which blocks of source code are executed during run time in an operating system is accomplished using instrumented code and a performance analysis profiler [5]. This can also be used to cover all code snippets in the program for testing. Some of the code coverage tools are EMMA, Hansel, Cobertura, Clover, GroboUtils, Quilt, Jcoverage, Clover.NET, Ncover, DevPartner, C# Test Coverage, Squish Coco, Dot Cover, Pylid, PHP Test Coverage Tool. Table 4 consists of code coverage tool with weightage.

6. ENVIRONMENT PROVISIONING

Environment provisioning is a key part of a continuous delivery process. The idea is simple: we should not only build, test and deploy application code, but also the underlying application environment. Environment consists of three main areas Infrastructure, configuration and dependencies [6]. Some of the tools used are Ansible, Cobbler, Chef, Puppet, Salt Stack, Windows PowerShell, CFEngine, Rex, Cloudify and Pallet. Table 5 consists of tools with weightage.

7. HOW TO SELECT TOOL?

Face to Face, Telephone discussions and e-mail questionnaires method are used to understand client requirements. The design, wording, form and order of questions can affect the type of tool obtained while selecting the pipeline manually. In addition, by adding the weightages after selecting all the tools can be used to build an optimized pipeline. Unless all the pieces of software delivery lifecycle work like a well-oiled machine-efficiency of organization to optimize the delivery, lifecycle cannot be met [7]. The problem is to identify the optimized tool set considering the future directions and growth for the company for the above cluster of tools. As coined by someone “To make error is human. To propagate error to all server in automatic way is DevOps”. To identify this manually needs lot of knowledge/patience/time on all the tools and still possibilities are there to miss out the optimized set.

8. CONCLUSION

To recapitulate, optimized tool set can be identified with the least weightage calculated based on the templates for each SCM, build, CI, code coverage and Environment provisioning. The future study of this paper is to automate the addition of the weightage process. The DevOps pipeline can be expanded to repository management, plan, Testing and Deployment.

9. REFERENCES

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10. APPENDIX

Table1: SCM tools with categories and weightag

Tools Category / Names	License	wtg	OS	wtg	Platform	wtg	H/W Config	wtg	Tool/ Framework	wtg	Dependencies	wtg	EmbeddedGUI	wtg	Performance	Migration Feasibility	wtg	Stability	wtg	Compatibility to CICD pipelines	wtg	Security	wtg	Realibility	wtg	Support availability	wtg	Available over the cloud	wtg	Cumulative wtg
GIT	Freeware	1	L/W	1	Yes	1	Min	1	Tool	1	depends on repos	5	Available	1	9	Available	1	No	3	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	26
SVN	Freeware	1	L/W	1	Yes	1	Min	1	Tool	1	Third party tools	6	Available	1	9	Available	1	No	3	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	27
CVS	Freeware	1	L/W	1	Yes	1	Min	1	Tool	1	windows server 20	2	Available	1	8	Available	1	No	3	Yes	1	Yes	1	Yes	1	Yes	1	No	3	24
Clearcase	Licensed	2	L/W	1	Yes	1	Moderate	2	Tool	1	No depends	1	Available	1	8	Available	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	No	3	25
Mercurial	Freeware	1	L/W	1	Yes	1	Moderate	2	Tool	1	python	2	Available	1	9	Available	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	24
TFS	Licensed	2	W	2	No	2	Moderate	2	Tool	1	windows server 20	2	Available	1	9	Available	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	27
MoNo tone	Freeware	1	L/W	1	Yes	1	Min	1	Tool	1	No depends	1	Available	1	8	Available	1	Yes	1	Yes	1	Yes	1	No	3	Yes	1	No	3	25
Bitkeeper	Licensed/FreeTrial	2	L/W	1	Yes	1	Moderate	2	Tool	1	No depends	1	Available	1	8	Available	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	23
Code co-op	Commercial/freetrial	2	W	2	No	2	Min	1	Tool	1	Microsoft SQL Serv	1	Available	1	7	NA	3	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	No	3	27
Darcs	Freeware	1	L/W	1	Yes	1	Min	1	Tool	1	No depends	1	Available	1	8	Available	1	No	3	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	21
Endeavor	Licensed	2	W	2	No	2	Moderate	2	Tool	1	No depends	1	Available	1	7	Available	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	24
Fossil	Freeware	1	L/W	1	Yes	1	Min	1	Tool	1	SQLite Database	1	Available	1	8	Available	1	No	3	Yes	1	Yes	1	Yes	1	Yes	1	No	3	23
Perforce	Licensed/FreeTrial	2	L/W	1	Yes	1	Min	1	Tool	1	No depends	1	Available	1	9	Available	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	23
Rational Syme	Licensed	2	L/W	1	Yes	1	Moderate	2	Tool	1	No depends	1	Available	1	8	Available	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	No	3	25
Source Safe	Licensed	2	W	2	No	2	Moderate	2	Tool	1	IIS	5	Available	1	7	Available	1	No	3	Yes	1	Yes	1	No	3	Yes	1	Yes	1	30
GNU Bazaar	Licensed	2	L/W	1	Yes	1	Min	1	Tool	1	python	3	Available	1	8	Available	1	Yes	1	Yes	1	Yes	1	No	3	Yes	1	No	3	28

Table 2: Build tools with categories and weightage

Tools Category / Names	License	wtg	cost	wtg	OS	wtg	Platform	H/W Config	wtg	Tool/Frame work	wtg	Dependencies	wtg	GUI	wtg	Performance	Mig. Feasibility	wtg	Scalability	wtg	Compatibility to CICD pipelines	wtg	Security	wtg	Realibility	wtg	Support availability	wtg	Available over the cloud	wtg	Cumulative	
												runtime supporting jar																				
MAVEN	Freeware	1	No	1	L/W	1	Yes	1	Min.Rqmt	1	Tool	1	No depends	1	Not availab	2	9	NA	3	Yes	4	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	31
ANT	Freeware	1	No	1	L/W	1	Yes	1	Min.Rqmt	1	Tool	1	No depends	1	Not availab	2	8	NA	3	Yes	4	Yes	1	Moderate	2	Yes	1	Yes	1	Moderate	2	31
GRADLE	Freeware	1	No	1	L/W	1	Yes	1	Min.Rqmt	1	Tool	1	groovy Scripts	5	Not availab	2	8	NA	3	Yes	4	Yes	1	Moderate	2	Yes	1	Yes	1	Yes	1	34
MSBUILD	Freeware	1	No	1	W	2	No	2	Min.Rqmt	1	Tool	1	No depends	1	Not availab	2	7	NA	3	Yes	4	Yes	1	Moderate	2	Moderate	2	Yes	1	Moderate	2	33
Nant	Freeware	1	No	1	L/W	1	Yes	1	Min.Rqmt	1	Tool	1	No depends	1	Not availab	2	8	NA	3	Yes	4	Yes	1	Moderate	2	No	3	No	2	Moderate	2	34
Ubuild	License	2	Yes	2	L/W	1	Yes	1	Min.Rqmt	1	Tool	1	No depends	1	Not availab	2	8	NA	3	Yes	4	Yes	1	Moderate	2	Yes	1	Yes	1	Moderate	2	33
Phing	Freeware	1	No	1	L/W	1	Yes	1	Min.Rqmt	1	Tool	1	No depends	1	Not availab	2	7	NA	3	Yes	3	Yes	1	Moderate	2	Yes	1	Yes	1	Moderate	2	29

Table 3: CI tools with categories and weightage

Tools Category / Names	License	wtg	cost	wtg	OS	wtg	Platform	wtg	H/W config	wtg	Tool/Frame work	wtg	Dependencies	wtg	Embedded GUI	wtg	Performance	Mig. Feasibility	wtg	Scalability	wtg	Compatibility to OGD pipelines	wtg	Security	wtg	Reality	wtg	Support availability	wtg	Available over the cloud	wtg	Cumulative wtg
EMMA	Freeware	1	No	1	L/W	1	Yes	1	Min	1	Tool	1	Maven command	4	Available	1	7	Available	1	yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	25
Hansel	Freeware	1	No	1	L/W	1	Yes	1	Moderate	2	Tool	1	Based on the text file given	4	Available	1	6	NA	3	yes	1	No	3	Moderate	2	Yes	1	Yes	1	No	3	32
Cobertura	Freeware	1	No	1	L/W	1	Yes	1	Min	1	Tool	1	Maven POM file	4	Available	1	9	Available	1	yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	27
Clover	Licensed	2	Yes	2	L/W	1	Yes	1	Min	1	Tool	1	Maven Clover Plugin	4	Available	1	9	Available	1	yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	29
GroboUtils	Freeware	1	No	1	L/W	1	Yes	1	Min	1	Tool	1	Library files	4	Available	1	6	Available	1	yes	1	No	3	Moderate	2	No	3	No	2	Yes	1	30
Quilt	Freeware	1	No	1	L/W	1	Yes	1	Moderate	2	Tool	1	Dot graph	4	Available	1	7	Available	1	yes	1	No	3	Yes	1	Yes	1	Yes	1	Yes	1	28
Jcoverage	Freeware	1	No	1	L/W	1	Yes	1	Min	1	Tool	1	Maven Jcoverage Plugin	4	Available	1	7	Available	1	yes	1	No	3	Yes	1	Yes	1	Yes	1	Yes	1	27
Clover.NET	Licensed	2	Yes	2	L/W	1	Yes	1	Min	1	Tool	1	Maven Clover plugin	4	Available	1	9	Available	1	yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	29
Ncover	Freeware	1	No	1	L/W	1	Yes	1	Min	1	Tool	1	Ncover plugin	5	Available	1	9	Available	1	yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	28
DevPartner	Freeware	1	No	1	L/W	1	Yes	1	Moderate	2	Tool	1	No depends	1	Available	1	7	Available	1	No	3	No	3	Moderate	2	Moderate	2	Yes	1	Yes	1	29
CF Test Coverage	Freeware	1	No	1	L/W	1	Yes	1	Moderate	2	Tool	1	Structure Matrix	4	Available	1	7	NA	3	yes	1	No	3	Moderate	2	Yes	1	No	2	No	3	34
Squish Coco	Licensed	2	Yes	2	L/W	1	Yes	1	Min	1	Tool	1	External Libraries	4	Available	1	9	Available	1	yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	29
Dot Cover	Freeware	1	No	1	L/W	1	Yes	1	High	3	Tool	1	Dot net file format	2	Available	1	7	Available	1	yes	1	Yes	1	Yes	1	Yes	1	No	2	Yes	1	26
Pylid	Freeware	1	No	1	L/W	1	Yes	1	Moderate	2	Tool	1	No depends	1	Available	1	7	Available	1	yes	1	No	3	NA	3	Yes	1	Yes	1	No	3	29
PHP Test Coverage	Licensed	2	Yes	2	L/W	1	Yes	1	High	3	Tool	1	No depends	1	Available	1	7	NA	3	yes	1	No	3	Yes	1	Yes	1	Yes	1	Yes	1	30

Table 4: Code Coverage tools with categories and weightage

Tools Category / Names	License	wtg	cost	wtg	OS	wtg	Platform	wtg	H/W Config	wtg	Tool/Frame work	wtg	Dependencies	wtg	Embedded GUI	wtg	Performance	Mig. Feasibility	wtg	Scalability	wtg	Compatibility to OGD pipelines	wtg	Security	wtg	Reality	wtg	Support availability	wtg	Available over the cloud	wtg	Cumulative wtg
Jenkins	Licensed	2	No	1	Windows/Linux/Mac OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Jquery	2	Available	1	9	Available	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	26
Buildbot	Licensed	2	No	1	Windows/Linux/Mac OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Python	3	Available	1	8	Available	1	Yes	1	NA	3	Yes	1	Yes	1	Yes	1	Yes	1	28
Travis	Licensed	2	No	1	Linux/OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Ruby	3	Available	1	8	Moderate availabilit	2	Yes	1	Yes	1	Yes	1	Moderate	2	Yes	1	Yes	1	28
Strider	Licensed	2	No	1	Ubuntu 14.04	2	Yes	1	Min.Rqmt	1	Tool	1	Node.js/js/mongo DB	2	Available	1	8	Available	1	Yes	1	NA	3	Yes	1	Yes	1	Yes	1	Yes	1	28
Bamboo	Licensed	2	From \$10(starter)	2	Windows/Linux/Solaris/OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Servlet Container	2	Available	1	9	Available	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	27
Teamcity	Commerci Licensed/ 14 day fretrial	2	Yes upto \$1000	2	Windows/Linux/Mac OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Java	2	Available	1	9	Available	1	Yes	1	Yes	1	Moderate	2	Yes	1	Yes	1	Yes	1	28
Solano	Licensed/ 14 day fretrial	2	Yes/ starts at \$15/month	1	Linux	1	Yes	1	Min.Rqmt	1	Tool	1	Crossplatform, privatecloud	5	Available	1	7	Available	1	Yes	1	Moderate	2	Moderate	2	Moderate	2	Yes	1	Yes	1	30
CruiseControl	Licensed	2	No	1	Windows/Linux/Mac OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Java	2	Available	1	8	Available	1	Moderate	2	Yes	1	Yes	1	Yes	1	Yes	1	No	3	28
Semaphore	Licensed	2	No	1	Windows/Linux	1	Yes	1	Min.Rqmt	1	Tool	1	Ruby	3	Not available	2	7	Available	1	Yes	1	NA	3	Yes	1	Yes	1	Yes	1	Yes	1	28

Table 5: Environment provisioning tools with categories and weightage

Tools Category / Names	License	wtg	cost	wtg	OS	wtg	Platform	wtg	H/W Config	wtg	Tool/Frame work	wtg	Dependencies	wtg	Embedded GUI	wtg	Performance	Mig. Feasibility	wtg	Scalability	wtg	Compatibility to OGD pipelines	wtg	Security	wtg	Reality	wtg	Support availability	wtg	Available over the cloud	wtg	Cumulative wtg
Jenkins	Licensed	2	No	1	Windows/Linux/Mac OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Jquery	2	Available	1	9	Available	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	26
Buildbot	Licensed	2	No	1	Windows/Linux/Mac OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Python	3	Available	1	8	Available	1	Yes	1	NA	3	Yes	1	Yes	1	Yes	1	Yes	1	28
Travis	Licensed	2	No	1	Linux/OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Ruby	3	Available	1	8	Moderate availabilit	2	Yes	1	Yes	1	Yes	1	Moderate	2	Yes	1	Yes	1	28
Strider	Licensed	2	No	1	Ubuntu 14.04	2	Yes	1	Min.Rqmt	1	Tool	1	Node.js/js/mongo DB	2	Available	1	8	Available	1	Yes	1	NA	3	Yes	1	Yes	1	Yes	1	Yes	1	28
Bamboo	Licensed	2	From \$10(starter)	2	Windows/Linux/Solaris/OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Servlet Container	2	Available	1	9	Available	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	27
Teamcity	Commerci Licensed/ 14 day fretrial	2	Yes upto \$1000	2	Windows/Linux/Mac OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Java	2	Available	1	9	Available	1	Yes	1	Yes	1	Moderate	2	Yes	1	Yes	1	Yes	1	28
Solano	Licensed/ 14 day fretrial	2	Yes/ starts at \$15/month	1	Linux	1	Yes	1	Min.Rqmt	1	Tool	1	Crossplatform, privatecloud	5	Available	1	7	Available	1	Yes	1	Moderate	2	Moderate	2	Moderate	2	Yes	1	Yes	1	30
CruiseControl	Licensed	2	No	1	Windows/Linux/Mac OS X	1	Yes	1	Min.Rqmt	1	Tool	1	Java	2	Available	1	8	Available	1	Moderate	2	Yes	1	Yes	1	Yes	1	Yes	1	No	3	28
Semaphore	Licensed	2	No	1	Windows/Linux	1	Yes	1	Min.Rqmt	1	Tool	1	Ruby	3	Not available	2	7	Available	1	Yes	1	NA	3	Yes	1	Yes	1	Yes	1	Yes	1	28