Jesus M. Gonzalez-Barahona

The balance

Releases

Collections

Dependencies (direct)

Dependencies (all)

Discussion

Summary

Technical lag for software deployments

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Seminar at IMDEA Software Madrid (Spain), October 2nd 2018

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"If I go there will be trouble And if I stay it will be double So come on and let me know"

> Should I Stay Or Should I Go? The Clash

https://www.youtube.com/watch?v=BN1WwnEDWAM

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Deployments

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Any deployment is the real world instance of an "ideal" target

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Deployments: the balance

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"If it works, don't touch it" vs.

"The quest for the ideal"

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Deployments: example

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Summary

You want the latest functionality so you deploy it but the day after it is no longer the latest

Should you update?

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Living the risky life

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\$ sudo apt-get dist-upgrade
Reading package lists... Done

Building dependency tree Reading state information... Done

Calculating upgrade... Done

1249 upgraded, 206 newly installed, 8 to remove and 3 not upgraded.

Need to get 2,856 MB of archives.

After this operation, 340 MB of additional disk space will be used.

Do you want to continue? [Y/n]

Upgrading in Debian/testing

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Dependencies

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Summary

You want the latest functionality so you deploy it but dependencies may prevent you from having the latest

Should dependencies be updated?

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Living in the past

```
install
"dependencies": {
                                    > npm i coffeescript
  "coffeescript": "~1.10.0",
  "dateformat": "~1.0.12",
                                   "eventemitter2": "~0.4.13".
                                   168,282
  "exit": "~0.1.1",
  "findup-svnc": "~0.3.0",
                                  version
                                  2.3.2
  . . .
```

Oct. 2018: Grunt master / coffescript

Releases

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Releases



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Technical lag

For a release:

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"difference between the deployed release and the ideal release"

- What is "ideal release"?
- How we measure difference between releases?

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Ideal release (examples)

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Most recent
Most recent in the stable line
Less open bugs
Less unfixed vulnerabilities

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Difference in release time

Difference in version number

Number of commits

Difference in number of open bugs

Estimated effort

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Summary

- ideal: $P \times Repos \rightarrow R$ Given $p \in P$, $repo \in Repos$, ideal(p, repo)
- diff: $R \times R \times Repos \rightarrow L$ Given $repo \in Repos$ and $r, s \in repo$, diff(r, s, repo), if package(r) = package(s)
- techlag: $R \times Repos \rightarrow L$ $\forall repo \in Repos, \forall r \in repo:$ techlag(r, repo) = diff(r, ideal(r, repo), repo)

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Example

0.23.4 Aug 4,2018 0.23.3 Jul 7,2018 0.23.2 Jul 6,2018

0.22.0 Dec 31, 2017

Package: Pandas

Deployed: 0.22.0

Ideal: 0.23.4

Lag (releases): 6 releases

Lag (reltime): 8 months, 4 days

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Dependencies (all)

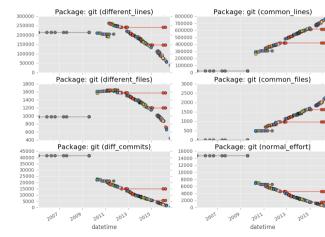
Discussion

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Example

Debian releases for git

(source code & commits diffs)



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For a collection of releases:

"aggregation of the lag for each release in the collection"

- How do we aggregate?
- Examples: maximum, summation, mean

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Sumi

• techlag: $\mathcal{P}(R) \times Repos \rightarrow L$

- Given $rcoll \in \mathcal{P}(R)$, $repo \in Repos$, $techlag_{max}(rcoll, repo) = max_{r \in rcoll}(techlag(r, repo))$
- Given $rcoll \in \mathcal{P}(R)$, $repo \in Repos$, $techlag_{add}(rcoll, repo) = \sum_{r \in rcoll} techlag(r, repo)$

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Technical lag

For direct dependencies of a release:

"technical lag for the collection formed by direct dependencies of the release"

- Having constraints into account
- Selecting as the package manager does

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Dependencies (direct)

allowed(r, p, repo) = rcol, where $rcol \subset repo$.

• selectver : $\mathcal{P}(R) \rightarrow R$ • deploy : $R \times Repos \rightarrow \mathcal{P}(R)$

Given $repo \in Repos, r \in repo$, deploy(r, repo) =

• deplag : $R \times Repos \rightarrow L$:

deplag(r, repo) = techlag(deploy(r, repo))

Technical lag

 $\{selectver(allowed(r, p_i, repo)), \forall p_i \in dep(r)\}$

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Dependencies (all)

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For all dependencies of a release:

"technical lag for the collection formed by all (transitive) dependencies of the release"

- Having constraints into account
- Selecting as the package manager does

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Summary

- $deploy^+: R \times Repos \rightarrow \mathcal{P}(R)$
- Given $repo \in Repos, r \in repo,$ $deploy^+(r, repo)$ as the minimal fix point such that: $deploy^+(r, repo) \supseteq deploy(r, repo)$ $deploy^+(r, repo) \supseteq deploy(r', repo) \forall r' \in deploy^+(r, repo)$
- $deplag^+: R \times Repos \rightarrow L:$ $deplag^+(r, repo) = techlag(deploy^+(r, repo))$

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Example





npm releases release time lag, direct dependencies

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Technical lag of:

- deployed distributions
- container images
- deployed applications
- embedded systems

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Uses

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Collections

Dependencies (direct)

Dependencies (all

Discussion

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Who can control technical lag:

- deployers: "top level" releases
- developers: direct dependencies
- ecosystems: typical dependencies

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Summar

Types

Ideal: latest, most stable, more secure, less buggy... **Difference**:

- Release metadata: versions, release time...
- Source code: diff lines, diff files
- SCM: commits, normalized effort
- ITS: bugs fixed, vulnerabilities fixed, feature requests closed

Aggregations: maximum, summation, mean, median

Summary

Technical lag

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Release

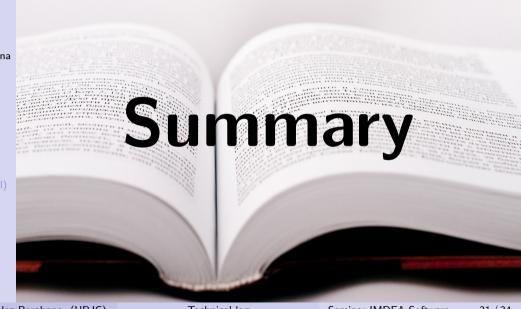
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Summary

Difference between real and ideal

What am I missing if I upgrade?

Dependencies impact on lag

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(direct)

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More info...

Ahmed Zerouali, Eleni Constantinou, Tom Mens, Gregorio Robles, Jesús M. González-Barahona: "An Empirical Analysis of Technical Lag in npm Package

ICSR 2018: 95-110

Dependencies"

Jesús M. González-Barahona, Paul Sherwood, Gregorio Robles, Daniel Izquierdo-Cortazar:

"Technical Lag in Software Compilations: Measuring How Outdated a Software Deployment Is"

OSS 2017: 182-192

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Summarv

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https://github.com/jgbarah/presentaciones

available in