Why are features deprecated? An investigation into the motivation behind deprecation

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Gariel Vilen, Stefan Stojkovski and Alberto Bacchelli

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What is deprecation (in Java)?

> A program element annotated @Deprecated is one that programmers are discouraged from using, typically because it is dangerous, or because a better alternative exists. – **Java documentation on deprecation**

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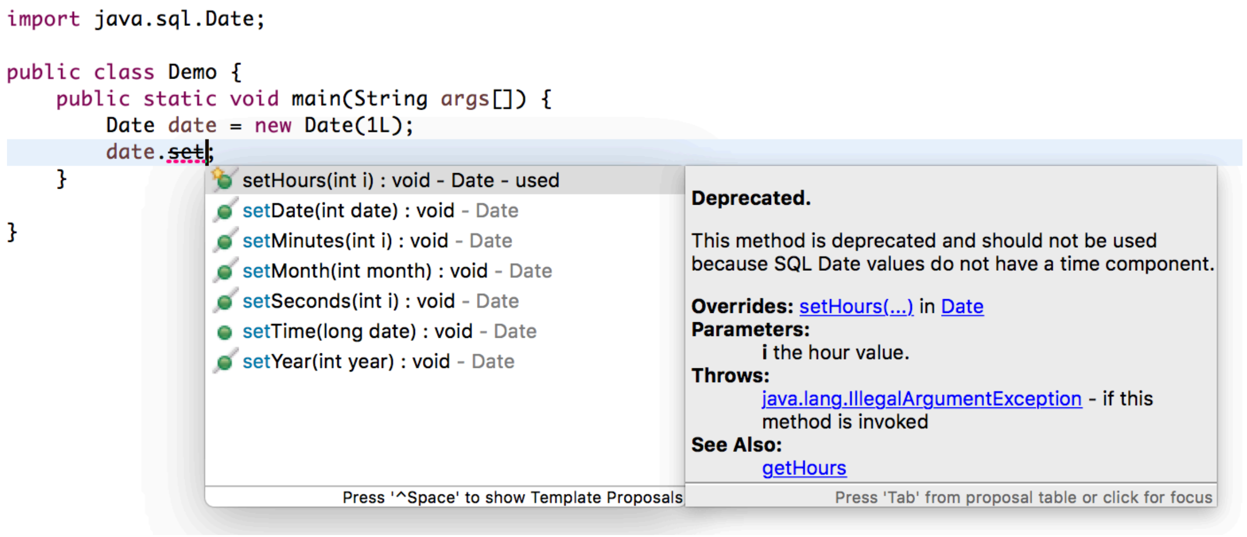
Why study deprecation?

Why study deprecation?

Communication method



```
import java.sql.Date;

public class Demo {
    public static void main(String args[]) {
        Date date = new Date(1L);
        date.set;
    }

}
```

setHours(int i) : void - Date - used
setDate(int date) : void - Date
setMinutes(int i) : void - Date
setMonth(int month) : void - Date
setSeconds(int i) : void - Date
setTime(long date) : void - Date
setYear(int year) : void - Date

Press '^Space' to show Template Proposals

Deprecated.

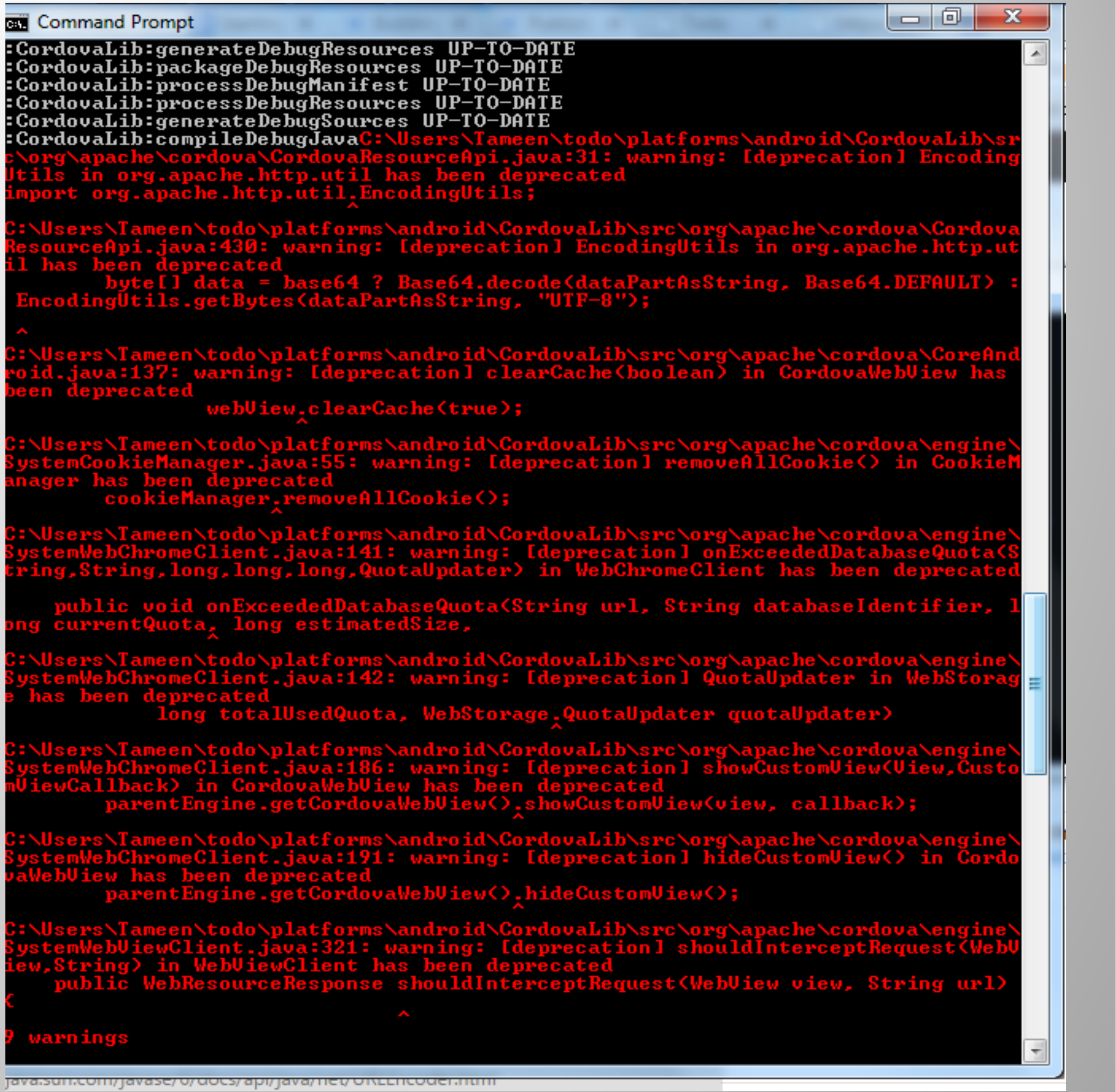
This method is deprecated and should not be used because SQL Date values do not have a time component.

Overrides: setHours(...) in Date
Parameters:
i the hour value.
Throws:
java.lang.IllegalArgumentException - if this method is invoked
See Also:
getHours

Press 'Tab' from proposal table or click for focus

Why study deprecation?

Not taken seriously



```
:CordovaLib:generateDebugResources UP-TO-DATE
:CordovaLib:packageDebugResources UP-TO-DATE
:CordovaLib:processDebugManifest UP-TO-DATE
:CordovaLib:processDebugResources UP-TO-DATE
:CordovaLib:generateDebugSources UP-TO-DATE
:CordovaLib:compileDebugJavaC:\Users\Tameen\todo\platforms\android\CordovaLib\sr
c\org\apache\cordova\CordovaResourceApi.java:31: warning: [deprecation] Encoding
Utils in org.apache.http.util has been deprecated
import org.apache.http.util.EncodingUtils;
                           ^

C:\Users\Tameen\todo\platforms\android\CordovaLib\src\org\apache\cordova\Cordova
ResourceApi.java:430: warning: [deprecation] EncodingUtils in org.apache.http.ut
il has been deprecated
        byte[] data = base64 ? Base64.decode(dataPartAsString, Base64.DEFAULT) :
 EncodingUtils.getBytes(dataPartAsString, "UTF-8");
 ^

C:\Users\Tameen\todo\platforms\android\CordovaLib\src\org\apache\cordova\CoreAnd
roid.java:137: warning: [deprecation] clearCache(boolean) in CordovaWebView has
been deprecated
                webView.clearCache(true);
                       ^

C:\Users\Tameen\todo\platforms\android\CordovaLib\src\org\apache\cordova\engine\
SystemCookieManager.java:55: warning: [deprecation] removeAllCookie() in CookieM
anager has been deprecated
        cookieManager.removeAllCookie();
                     ^

C:\Users\Tameen\todo\platforms\android\CordovaLib\src\org\apache\cordova\engine\
SystemWebChromeClient.java:141: warning: [deprecation] onExceededDatabaseQuota(S
tring,String,long,long,long,QuotaUpdater) in WebChromeClient has been deprecated

    public void onExceededDatabaseQuota(String url, String databaseIdentifier, l
ong currentQuota, long estimatedSize,
                ^

C:\Users\Tameen\todo\platforms\android\CordovaLib\src\org\apache\cordova\engine\
SystemWebChromeClient.java:142: warning: [deprecation] QuotaUpdater in WebStorag
e has been deprecated
            long totalUsedQuota, WebStorage.QuotaUpdater quotaUpdater)
                                           ^

C:\Users\Tameen\todo\platforms\android\CordovaLib\src\org\apache\cordova\engine\
SystemWebChromeClient.java:186: warning: [deprecation] showCustomView(View,Custo
mViewCallback) in CordovaWebView has been deprecated
        parentEngine.getCordovaWebView().showCustomView(view, callback);
                                        ^

C:\Users\Tameen\todo\platforms\android\CordovaLib\src\org\apache\cordova\engine\
SystemWebChromeClient.java:191: warning: [deprecation] hideCustomView() in Cordo
vaWebView has been deprecated
        parentEngine.getCordovaWebView().hideCustomView();
                                        ^

C:\Users\Tameen\todo\platforms\android\CordovaLib\src\org\apache\cordova\engine\
SystemWebViewClient.java:321: warning: [deprecation] shouldInterceptRequest(WebV
iew,String) in WebViewClient has been deprecated
    public WebResourceResponse shouldInterceptRequest(WebView view, String url)
{
                               ^

9 warnings
```

java.sun.com/javase/6/docs/api/java/net/URLEncoder.html

Our study

1

Investigate needs of API producers and consumers

Our study

1

Investigate needs of API producers and consumers

2

Enhancements to deprecation

Research questions

Investigate needs of API producers and consumers

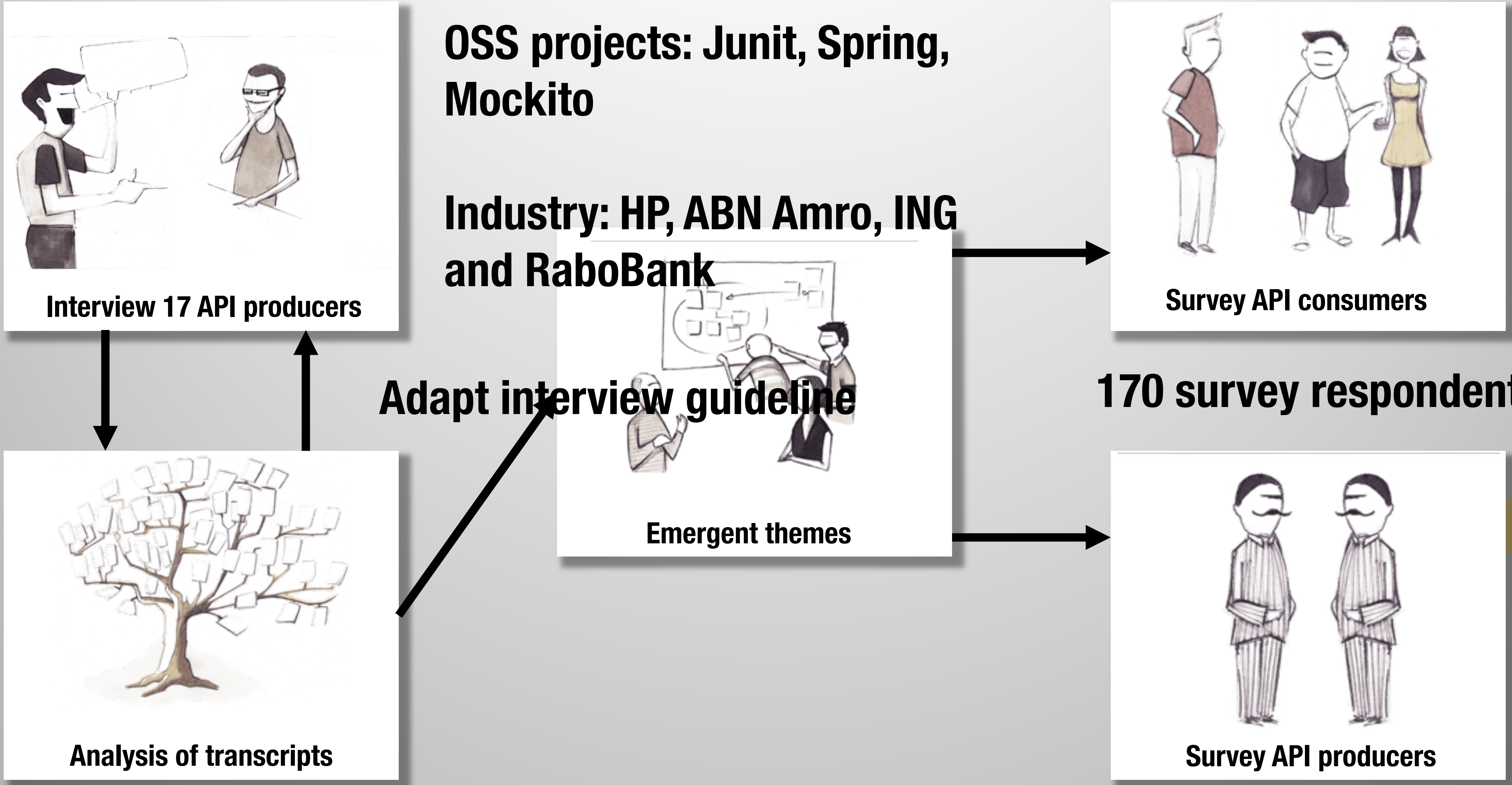
RQ1: Why do API producers deprecate features?

RQ2: When and why are deprecated features removed?

RQ3: How is an API consumer expected to react to deprecation?

RQ4: Why do API consumers react to deprecated features?

Methodology



Interview 17 API producers

Analysis of transcripts

Adapt interview guideline

Emergent themes

OSS projects: Junit, Spring, Mockito

Industry: HP, ABN Amro, ING and RaboBank

Survey API consumers

Survey API producers

170 survey respondents

Emergent themes

1

Emergent themes

Future

Prefer maintaining two versions of the same feature in the code base and only introduce breaking changes when there is a severe flaw in the feature **– P12**

Consumers do not appreciate it when functionalities are removed **– P8**

Emergent themes

Future

Future of the deprecated feature is unknown so there is no need to react **– Survey respondent**

1

Emergent themes

Future

Severity

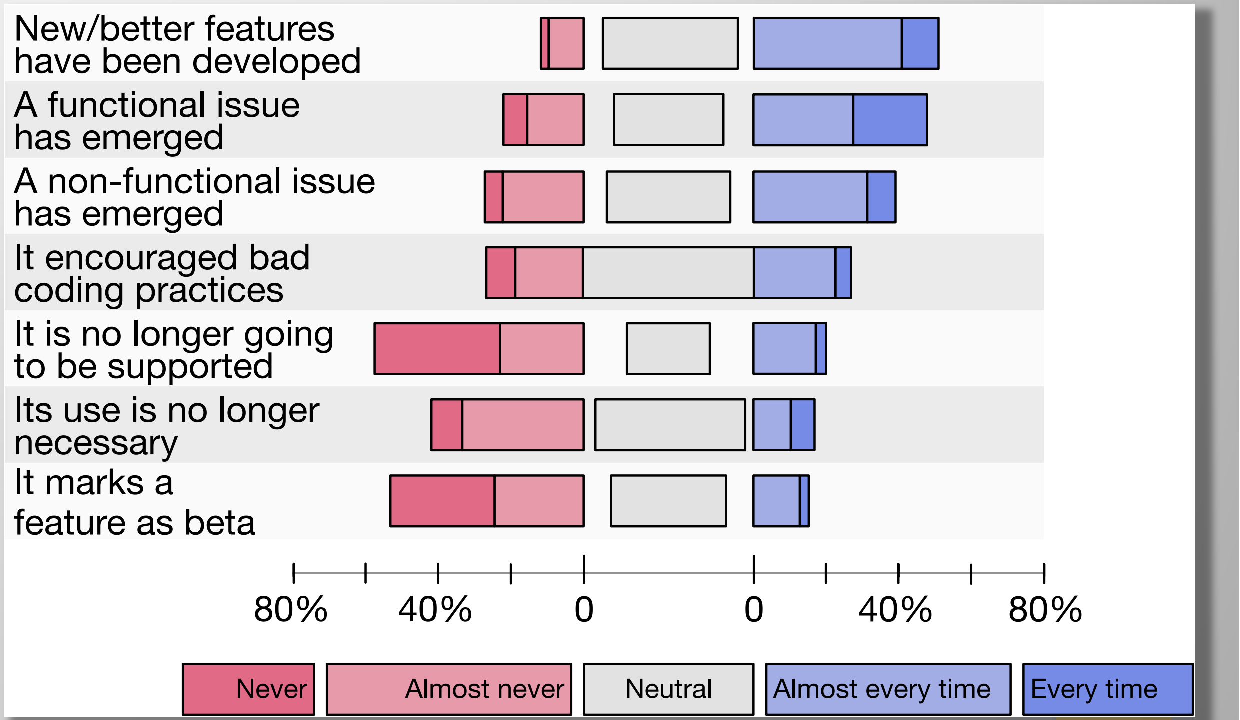
The decision to react is often based on the cost of upgrade. If the reason behind deprecation is serious, then there is an incentive to change **– P2**

1

Emergent themes

Future

Severity



Emergent themes

Future

Severity

Misuse

Deprecation is used to indicate that a feature is temporary and may change – **P16**

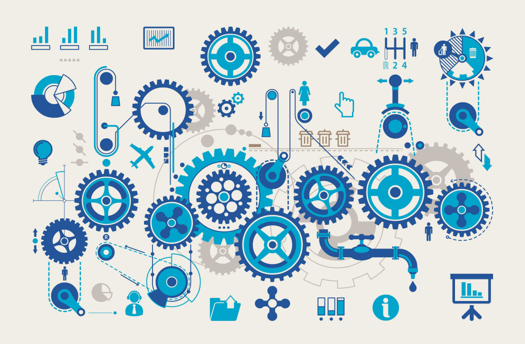
Instead of misusing deprecation a new annotation (@Unstable) was introduced to indicate beta features – **P14**

Emergent themes

Future

Severity

Misuse


Automation

An automated tool that aids consumers in transitioning from a deprecated feature to its replacements would be very helpful **– All interviewees**

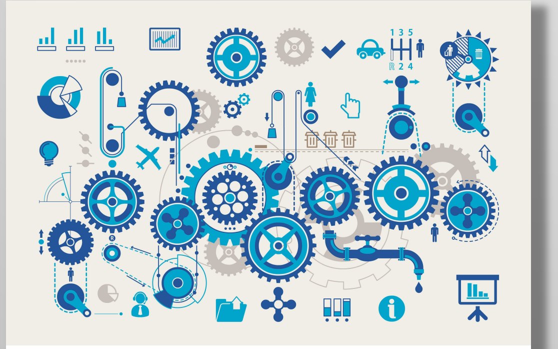
1

Emergent themes

Future

Severity

Misuse



Automation

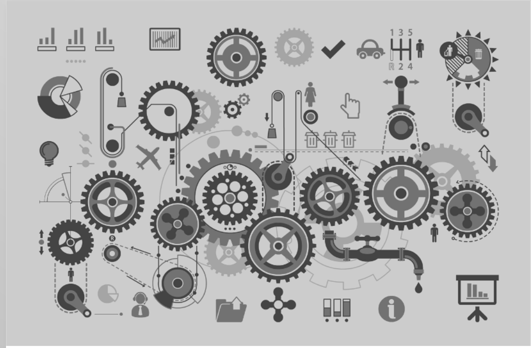
Investigate needs of API producers and consumers

RSW proposal

Future

Severity

Misuse


Automation

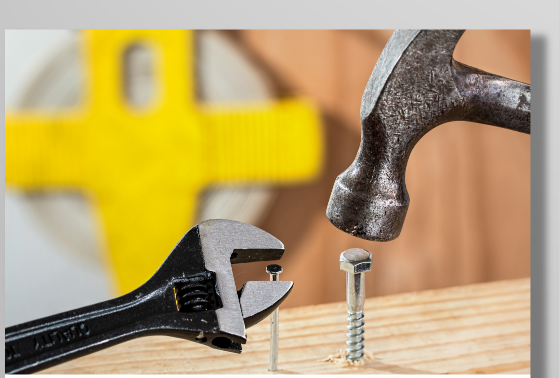
Enhancements to deprecation

2

RSW proposal

Future

Severity



Misuse

Enhancements to deprecation

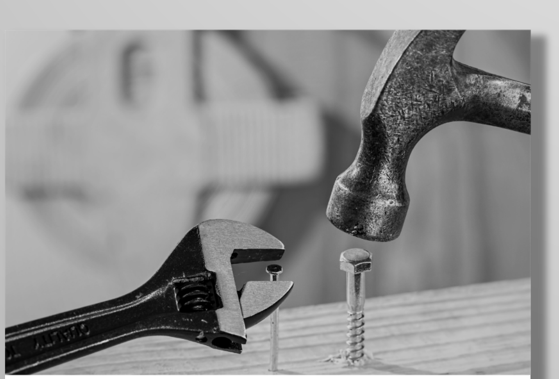
2

RSW proposal

R **Removal timeline**

Future

Severity

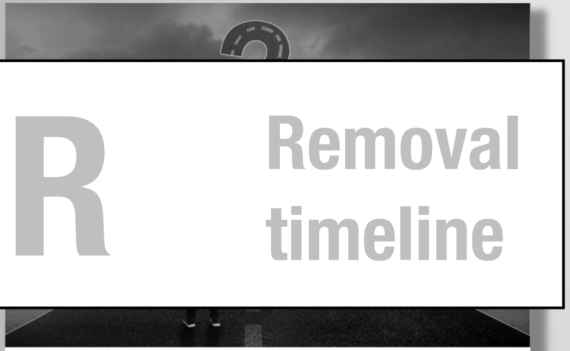


Misuse

```
@Deprecated(
removalVersion=“2.2.4”)
```

```
@Deprecated(
removalDate=“24-03-18”)
```

RSW proposal

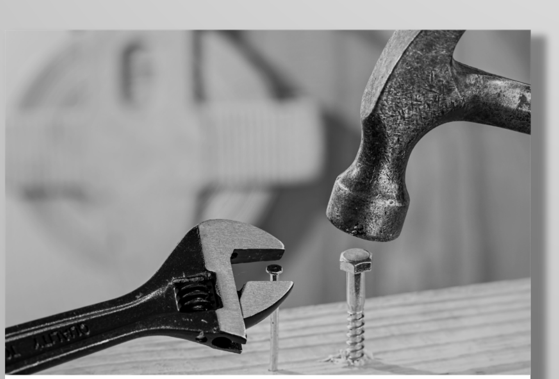


R Removal timeline

Future

S Indicate severity

Severity



Misuse

```
@Deprecated(
severity=Severity.LOW)
```

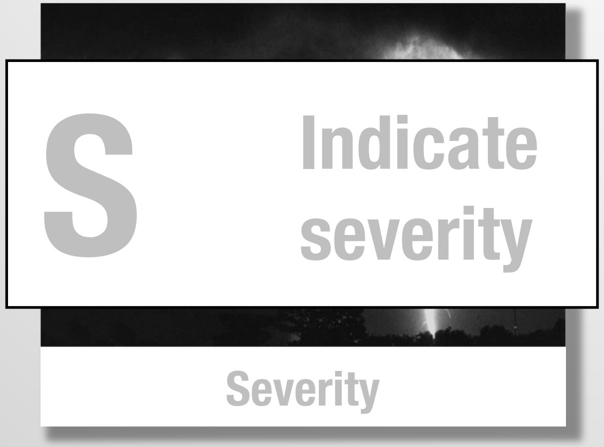
```
@Deprecated(level = 1)
@Deprecated(level = 2)
```

RSW proposal

R

Removal timeline

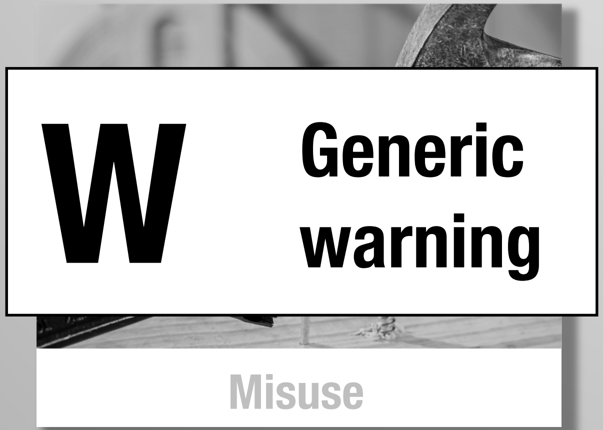
Future



S

Indicate severity

Severity



W

Generic warning

Misuse

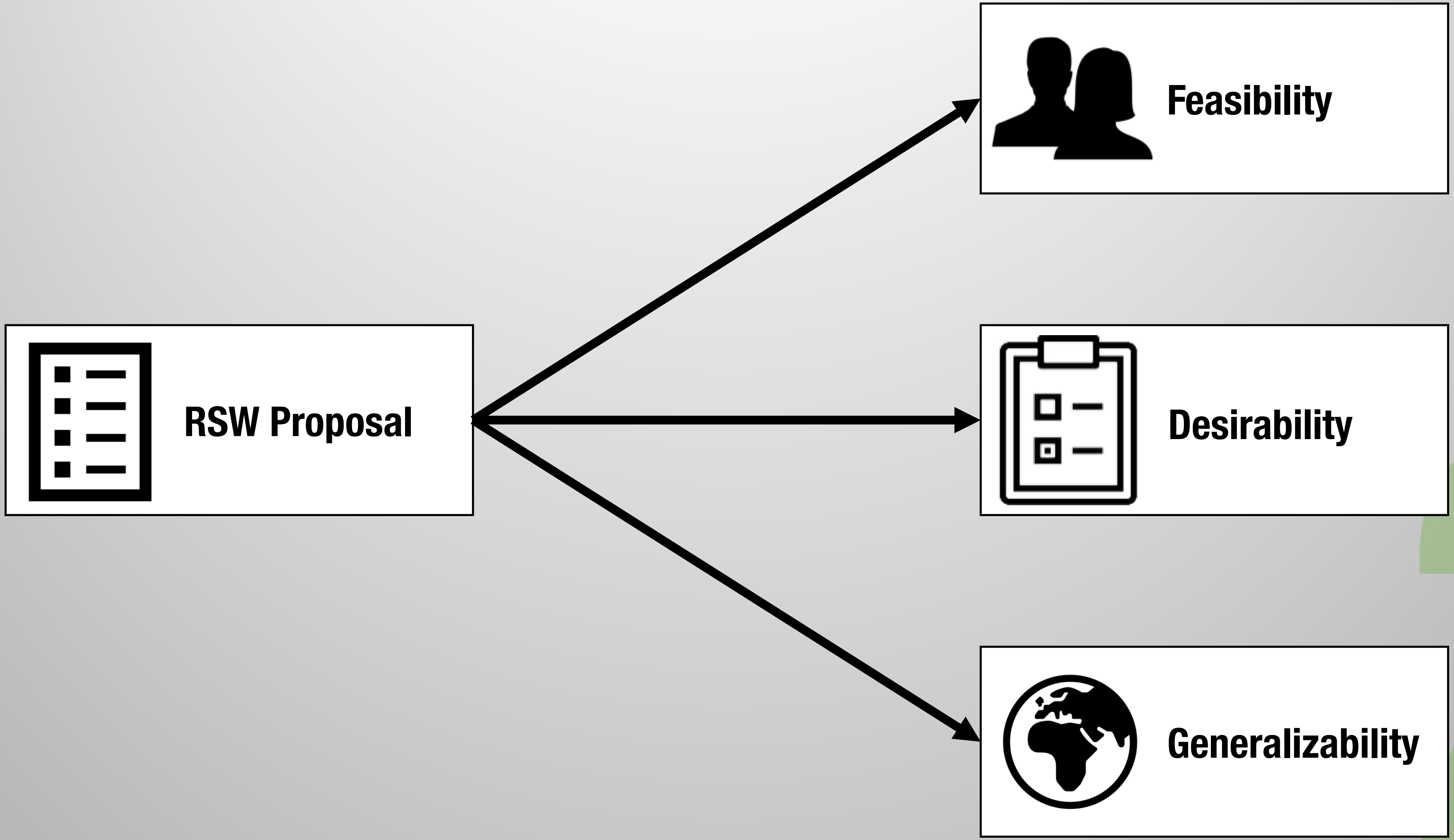
```
@Warning

   @Deprecated

   @Beta(“Beta feature”)
```

2

Evaluation methodology of the RSW proposal



2

Evaluation of the RSW proposal

Feasibility

Stuart Marks

Java Language Designer
a.k.a DrDeprecator

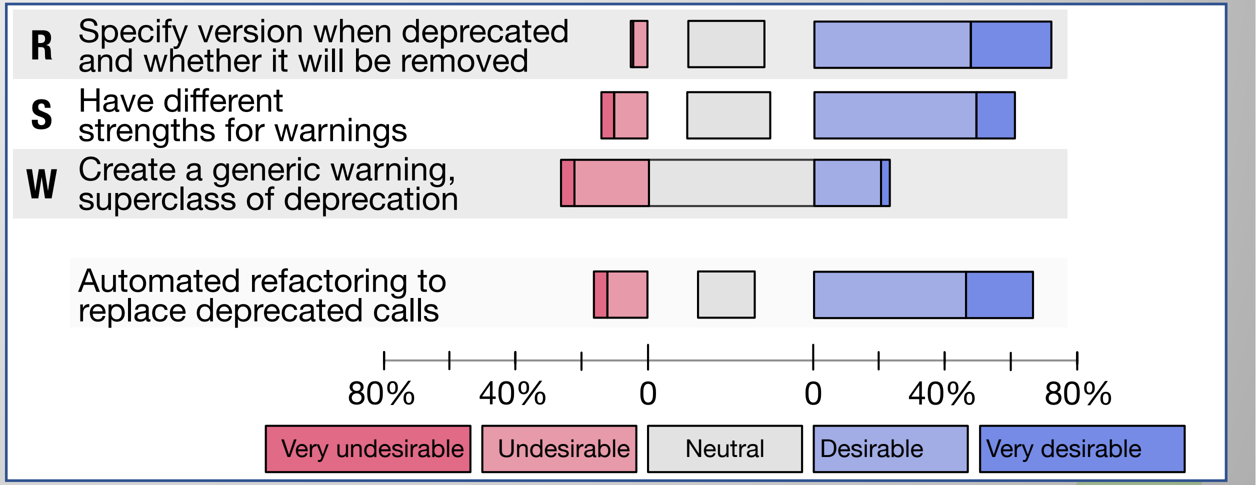
R	**Possible, not trivial** **Challenge: Version or date?**
S	**Possible, not trivial** **Challenge: defining severity**
W	**Very complex** **Extreme solution**

2

Evaluation of the RSW proposal

Feasibility

Desirability



Evaluation of the RSW proposal

Feasibility

Desirability

Generalizability

R	Ruby, Dart
S	C#, VBasic, Kotlin
W	PHP, Ruby, Delphi, R, ObjectiveC, Hack

2

Evaluation of the RSW proposal

Feasibility

Desirability

Generalizability

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Understanding Developers’ Needs on Deprecation as a Language Feature

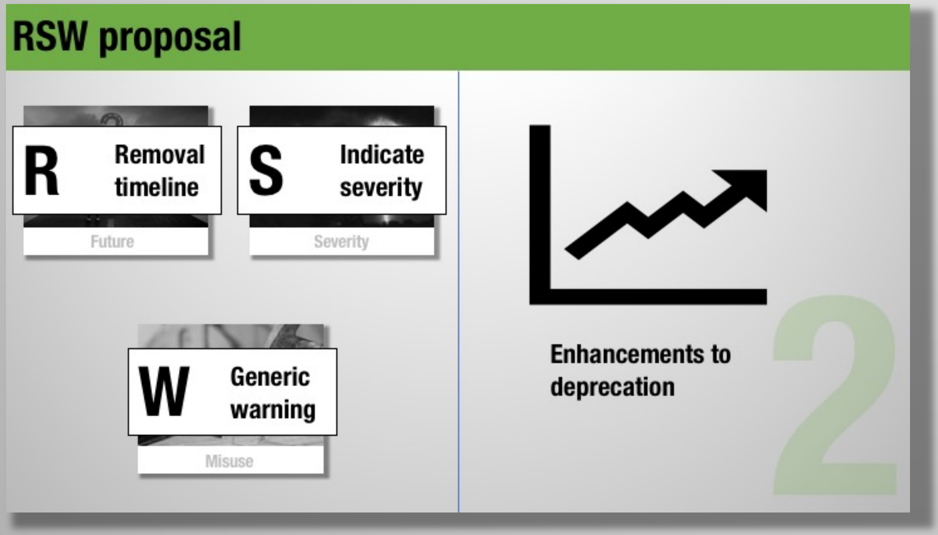
Our study

Investigate needs of API producers and consumers

Enhancements to deprecation

Emergent themes

Investigate needs of API producers and consumers



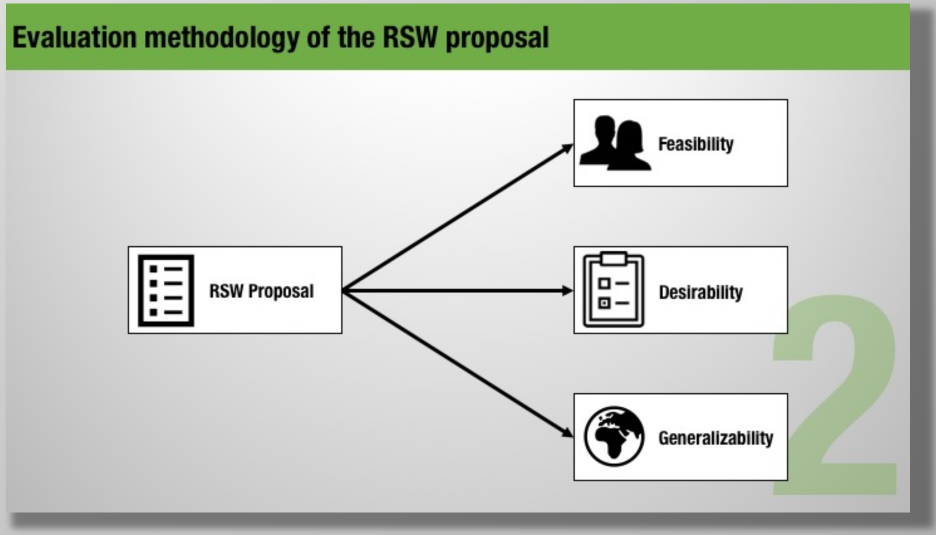
RSW proposal

R Removal timeline

S Indicate severity

W Generic warning

Enhancements to deprecation



Evaluation methodology of the RSW proposal