

BECLOMA: AUGMENTING STACK TRACES WITH USER REVIEW INFORMATION

**L. PELLONI, G. GRANO, A. CIURUMELEA, S. PANICHELLA, F.
PALOMBA, H. GALL**

SANER 2018, 20-23 MARCH, CAMPOBASSO (ITALY)

149 BILLIONS OF APPS
12 MILLIONS OF DEVS
60 BILLIONS \$

TESTING TOOLS

PLETHORA OF ANDROID TESTING TOOLS:

- > **MONKEY**: STATE OF THE PRACTICE
- > **SAPIENZ**: NOW IN FACEBOOK
- > **DYNODROID**
- > ...
- > **AND A LOT OF OTHERS!**



LIMITATIONS

- › THEY ARE NOT SUITED FOR GENERATING INPUTS THAT REQUIRE HUMAN INTELLIGENCE
- › REDUNDANCY OF GENERATED INPUT SEQUENCES
- › ONLY ABLE TO DETECT BUGS THAT CAUSE UNHANDLED EXCEPTIONS. POTENTIALLY MISSING THOSE NOT RAISING



TOOLS BEHAVIOR

1. STACK TRACE

2. SEQUENCE OF INPUTS

STACK TRACE

```
// CRASH: com.danvelazco.fbwrapper (pid 4302)
// Short Msg: java.lang.NullPointerException
// Long Msg: java.lang.NullPointerException
// Build Label: samsung/espressowifixx/espressowifi:4.2.2/JDQ39/P3110XXDMH1:user/release-keys
// Build Changelist: 8291
// Build Time: 1419156873000
// java.lang.NullPointerException
// at com.danvelazco.fbwrapper.activity.BaseFacebookWebViewActivity
//          .onKeyDown(BaseFacebookWebViewActivity.java:649)
// at com.danvelazco.fbwrapper.FbWrapper.onKeyDown(FbWrapper.java:429)
// at android.view.KeyEvent.dispatch(KeyEvent.java:2640)
// at android.app.Activity.dispatchKeyEvent(Activity.java:2433)
// at com.android.internal.policy.impl.PhoneWindow$DecorView.dispatchKeyEvent(PhoneWindow.java:2021)
// at android.view.ViewRootImpl$ViewPostImeInputStage.processKeyEvent(ViewRootImpl.java:3845)
// at android.view.ViewRootImpl$ViewPostImeInputStage.onProcess(ViewRootImpl.java:3819)
// at android.view.ViewRootImpl$InputStage.deliver(ViewRootImpl.java:3392)
// at android.view.ViewRootImpl$InputStage.onDeliverToNext(ViewRootImpl.java:3442)
// at android.view.ViewRootImpl$InputStage.forward(ViewRootImpl.java:3411)
// at android.view.ViewRootImpl$AsyncInputStage.forward(ViewRootImpl.java:3518)
```

SEQUENCE OF INPUTS

```
type= raw events
count= -1
speed= 1.0
start data >>
LaunchActivity(com.ringdroid,com.ringdroid.RingdroidSelectActivity)
DispatchKey(223989,223989,0,23,0,0,-1,0)
DispatchKey(224204,224204,1,23,0,0,-1,0)
DispatchPointer(224346,224347,0,479.0,774.0,0.0,0.0,0.0,1.0,1.0,0,0)
DispatchPointer(224346,224351,2,479.60635,797.5855,0.0,0.0,0.0,1.0,1.0,0,0)
DispatchPointer(224346,224353,2,482.31937,814.9475,0.0,0.0,0.0,1.0,1.0,0,0)
DispatchPointer(224346,224357,2,483.44247,829.02045,0.0,0.0,0.0,1.0,1.0,0,0)
DispatchPointer(224346,224359,2,486.9434,848.0035,0.0,0.0,0.0,1.0,1.0,0,0)
DispatchPointer(224346,224361,2,490.1806,859.495,0.0,0.0,0.0,1.0,1.0,0,0)
DispatchPointer(224346,224364,2,497.59595,872.6837,0.0,0.0,0.0,1.0,1.0,0,0)
DispatchPointer(224346,224367,2,500.53647,894.2986,0.0,0.0,0.0,1.0,1.0,0,0)
DispatchPointer(224346,224369,1,503.94815,896.686,0.0,0.0,0.0,1.0,1.0,0,0)
DispatchPointer(224374,224374,0,166.0,4.0,0.0,0.0,0.0,1.0,1.0,0,0)
```

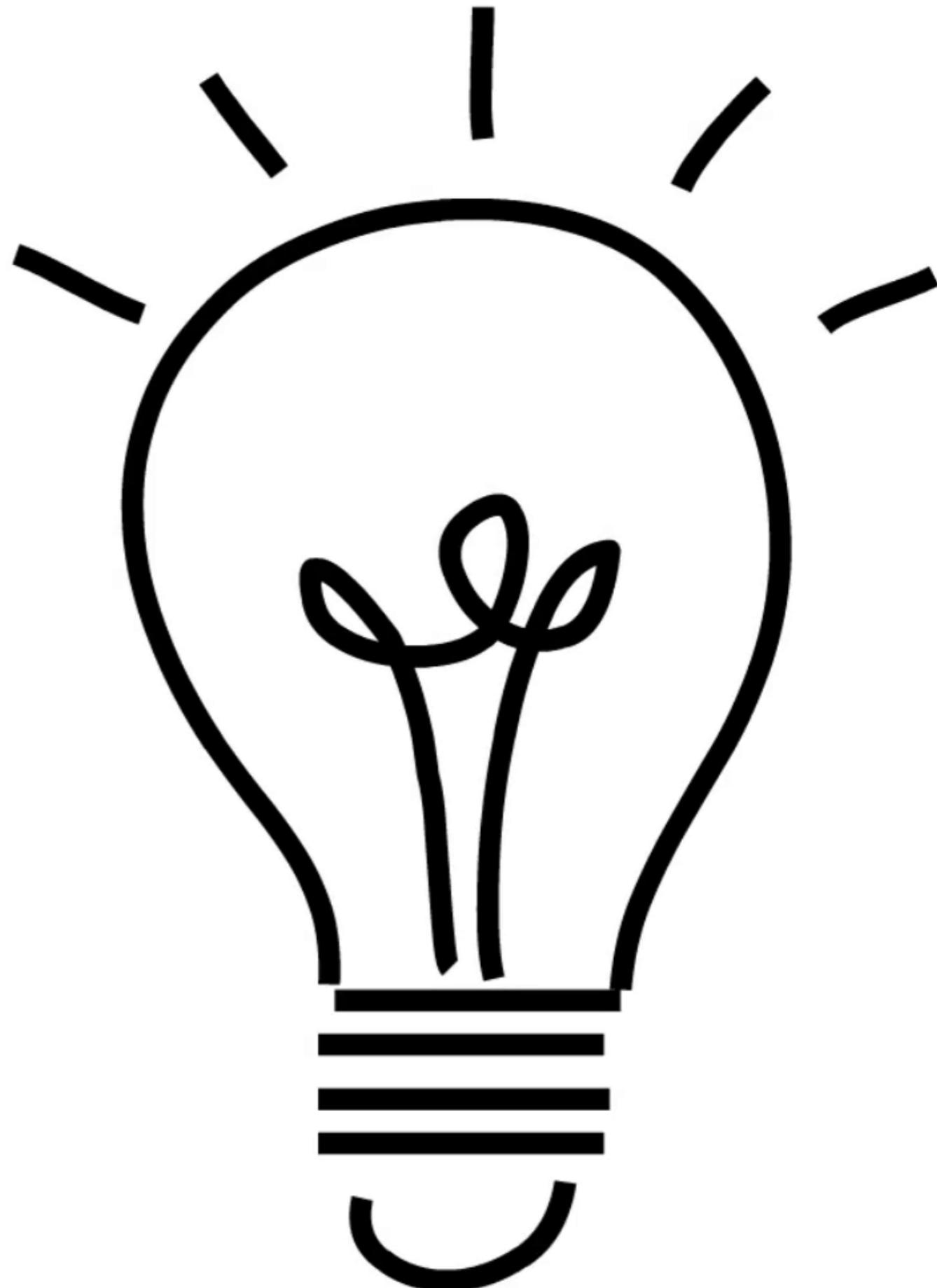
**UNDERSTAND
THE ROOT
CAUSE?**

BECLOMA'S IDEA

USER REVIEWS SUCCESSFULLY USED TO SUPPORT MAINTENANCE TASKS!

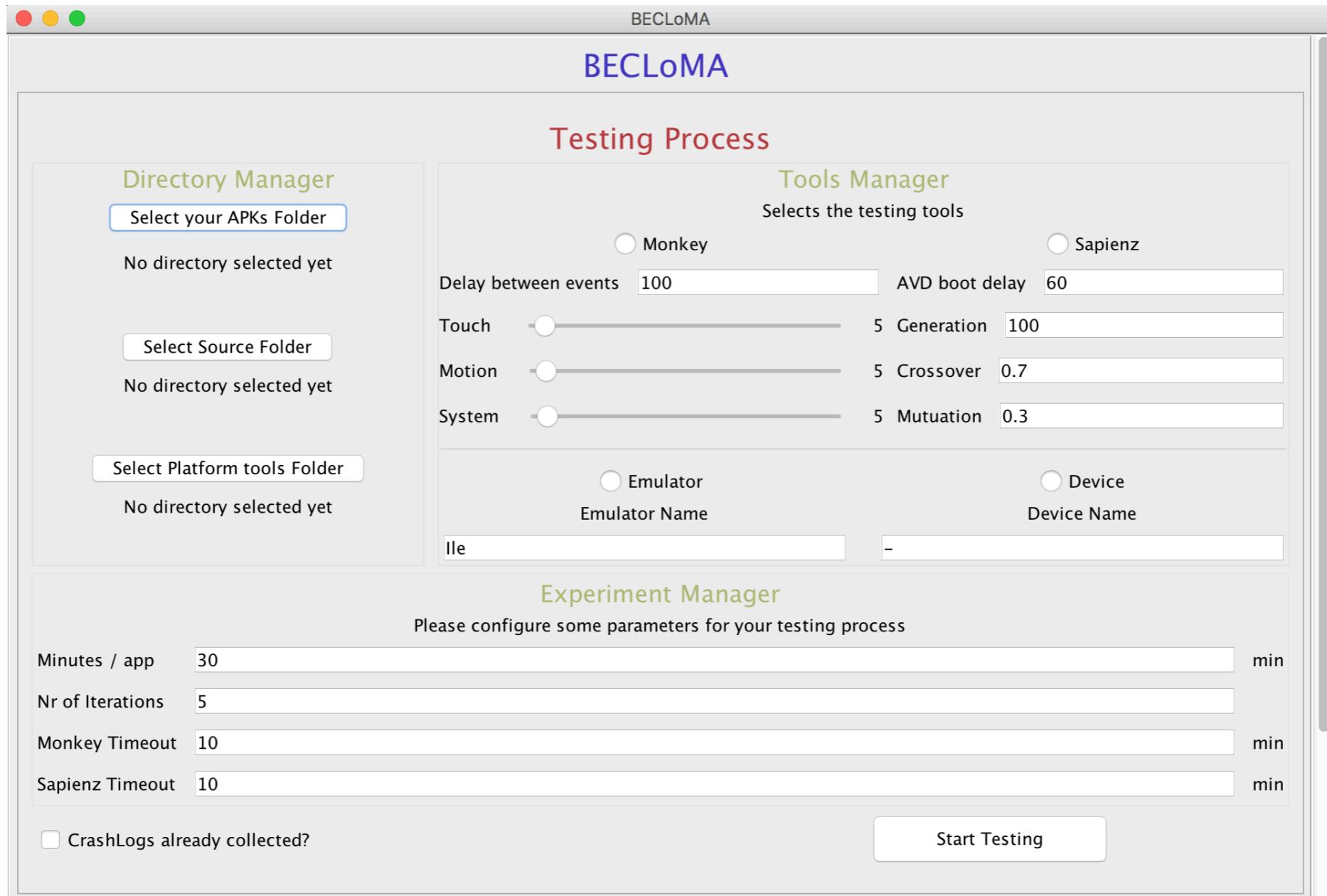
CAN WE USE THEM TO:

- > COMPREHENDING THE CAUSES BEHIND A FAILURE (BETTER AND FASTER)
- > EASING THE DEBUGGING PHASE

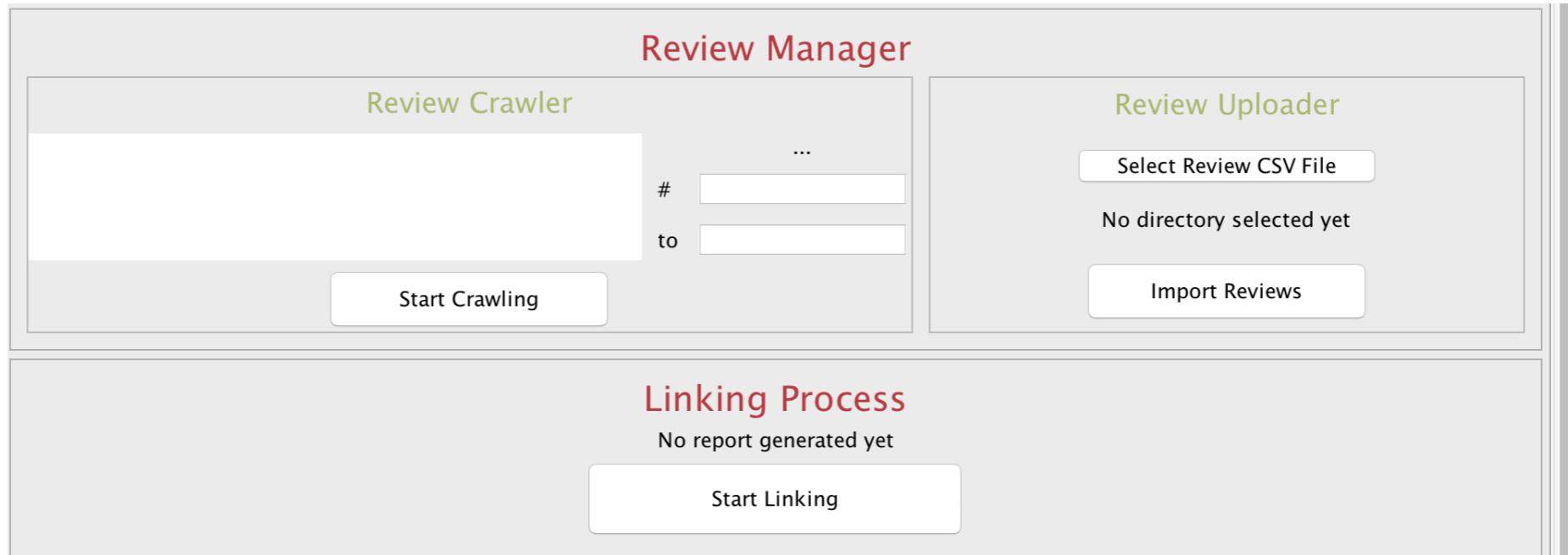


FEATURES

FACILITATING TOOLS USAGE



MINING AND CLASSIFYING



LINKING AND REPORT

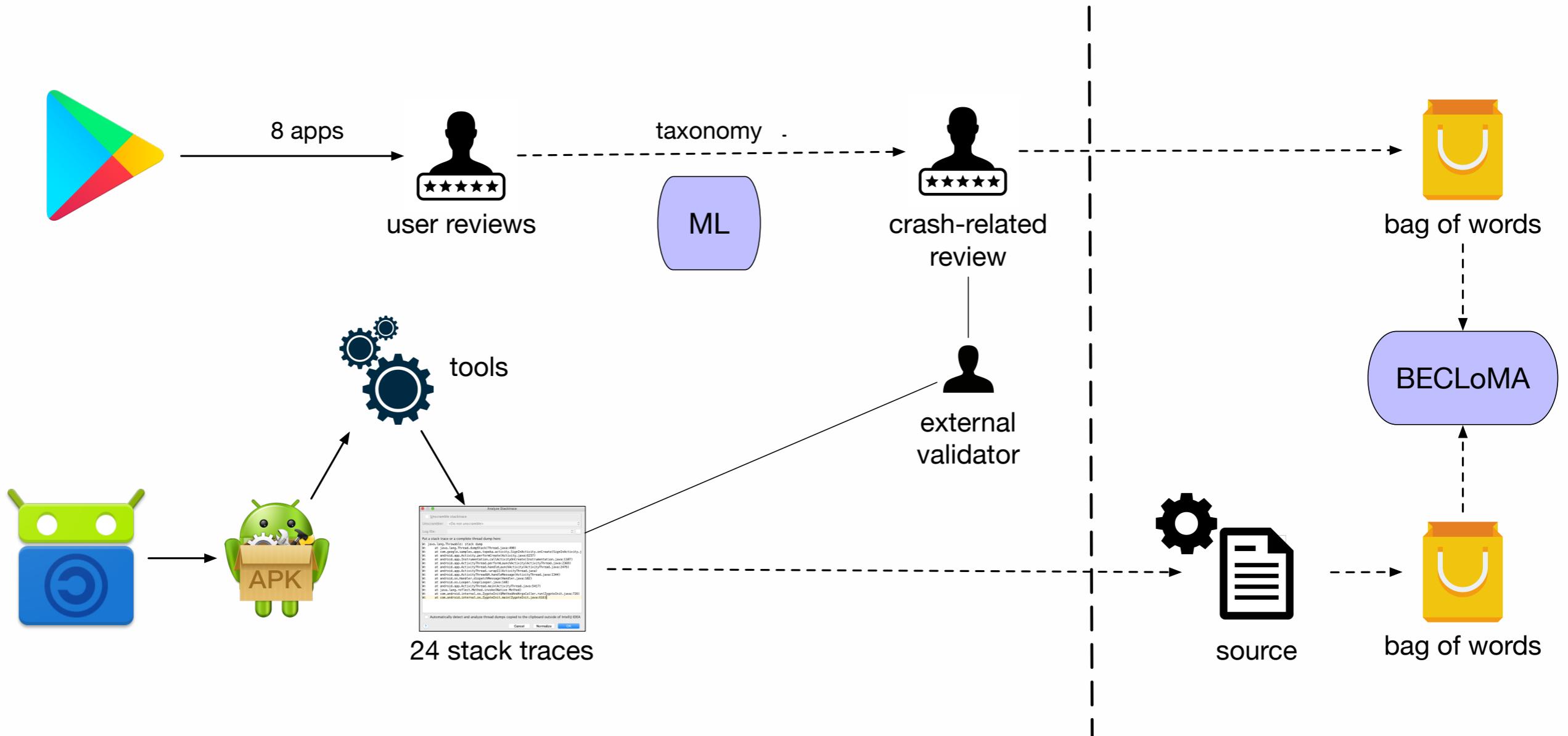
BECLoMA				General Info	Linking Summary	Useful Links
				Linking Summary		
CrashLog Location	ID	Linked Reviews	Dice Score			
crash_log_com.ringdroid.txt	1	7cdfbc8a-afc9-11e6-851d-c4b301cdf627	0.6			
		7ce01aa3-afc9-11e6-97b5-c4b301cdf627	0.5			
		7ce0754f-afc9-11e6-a7fb-c4b301cdf627	0.5			
crash_log_com.ringdroid.txt	2	7cdfbc8a-afc9-11e6-851d-c4b301cdf627	0.6			
		7ce01aa3-afc9-11e6-97b5-c4b301cdf627	0.5			
		7ce0754f-afc9-11e6-a7fb-c4b301cdf627	0.5			



HOW ACCURATE IS THE LINKING?



EVALUATION APPROACH



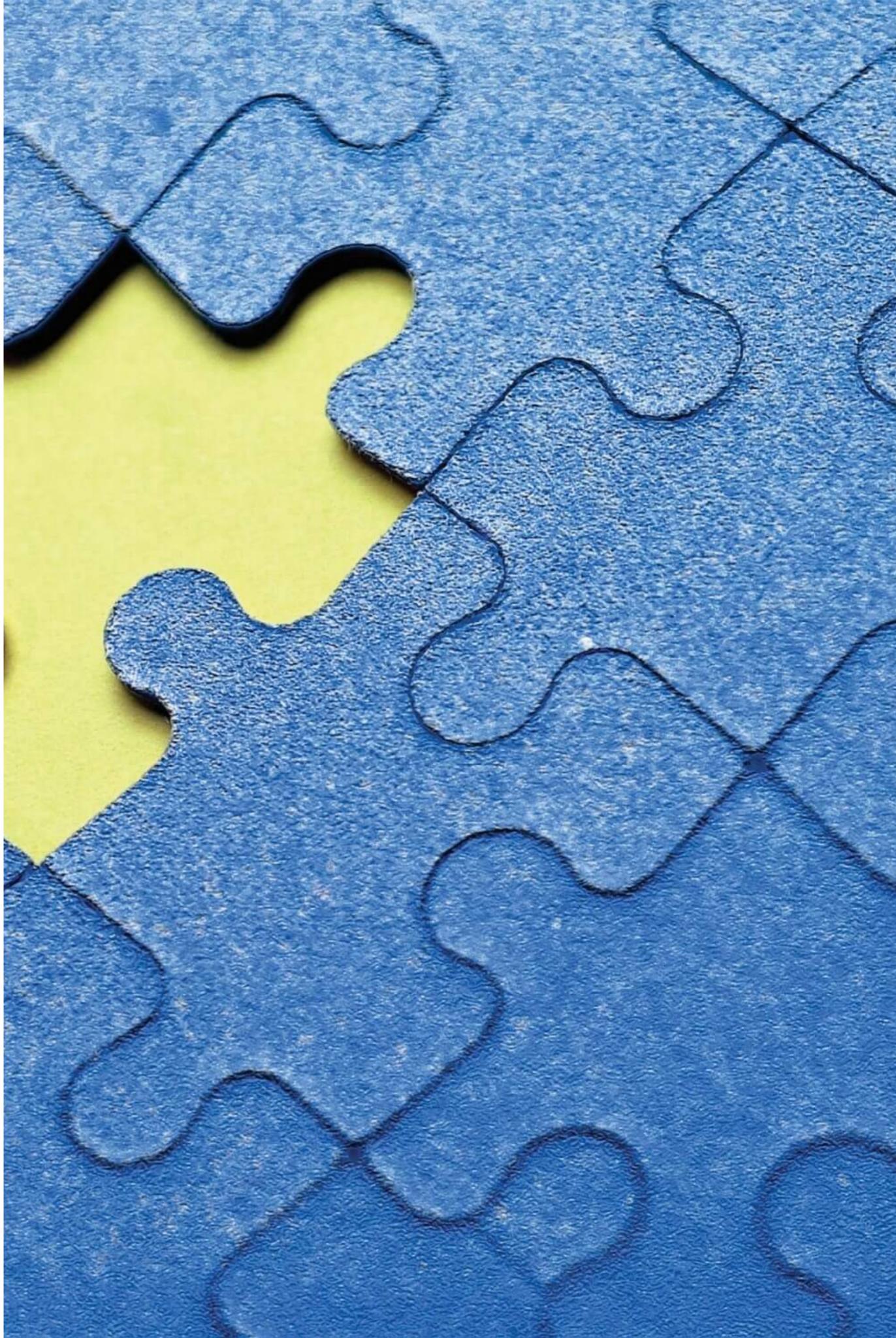
EVALUATION

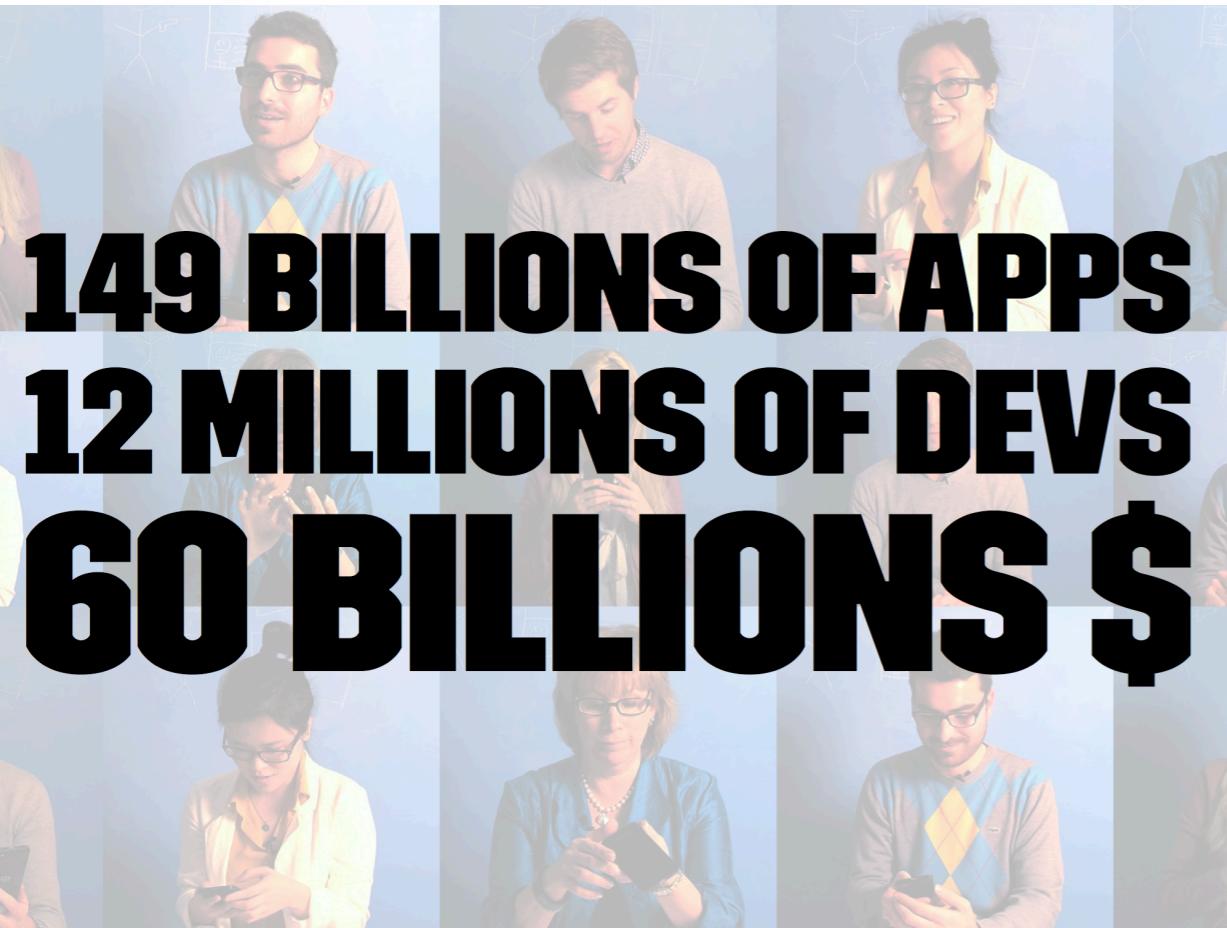
APP	PRECISION	RECALL	F1 SCORE
...
AVERAGE	82%	75%	78%

CONCLUSION

WE PRESENT BECLOMA, A TOOL THAT:

- > **FACILITATE THE USAGE OF TESTING TOOLS**
- > **MINE AND CLASSIFY REVIEWS FROM THE GOOGLE PLAY STORE**
- > **LINK STACK TRACES AND USER REVIEWS**





BECLOMA'S IDEA

USER REVIEWS SUCCESSFULLY USED TO SUPPORT MAINTENANCE TASKS!

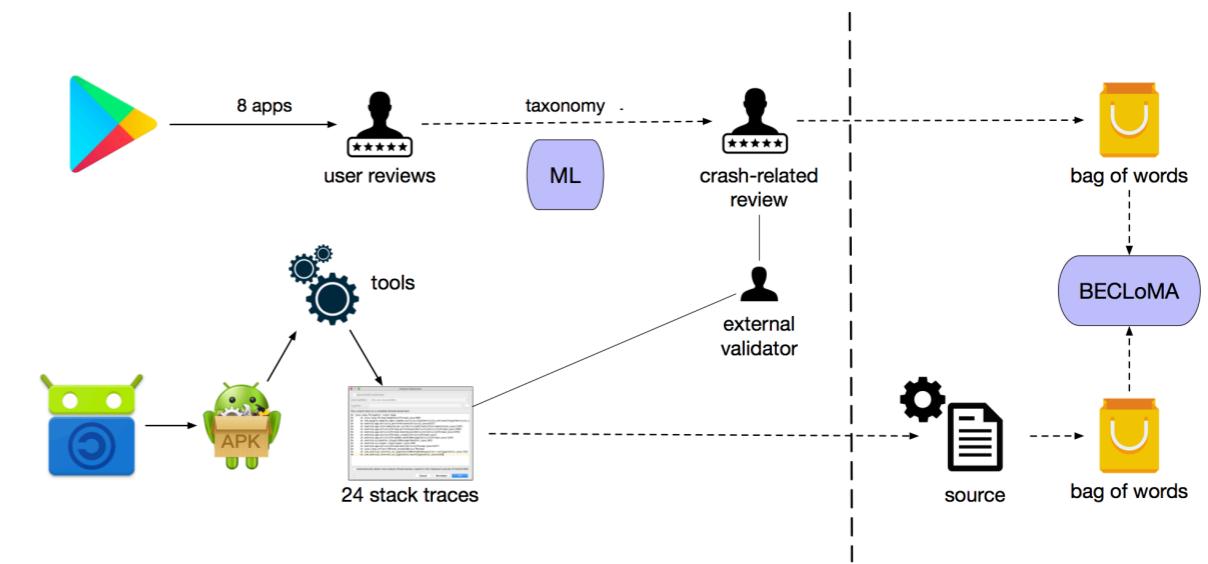
CAN WE USE THEM TO:

- COMPREHENDING THE CAUSES BEHIND A FAILURE (BETTER AND FASTER)
- EASING THE DEBUGGING PHASE



9 - GIOVANNI GRANO @ SEAL.

EVALUATION APPROACH



15 - GIOVANNI GRANO @ SEAL.

FEATURES