
Finding Deep Bugs in Software

CSE Lightning Talk – October 2015



Shing-Chi Cheung

Computer Science & Engineering

HKUST

Xiaoming has a brother doing
PhD at HKUST ...



A “great prayer”??



So, he prays ...



When he becomes Laoming
working on programming
assignment at HKUST, he
does not need to pray like
his brother ...



Can someone write
tests for me?



Lead a good life at HKUST ...

**Can someone finds out
where my code is wrong?**

**Can someone fix the bugs
for me?**



My research areas

- Fault analysis and detection
- Fault diagnosis
- Fault repairing



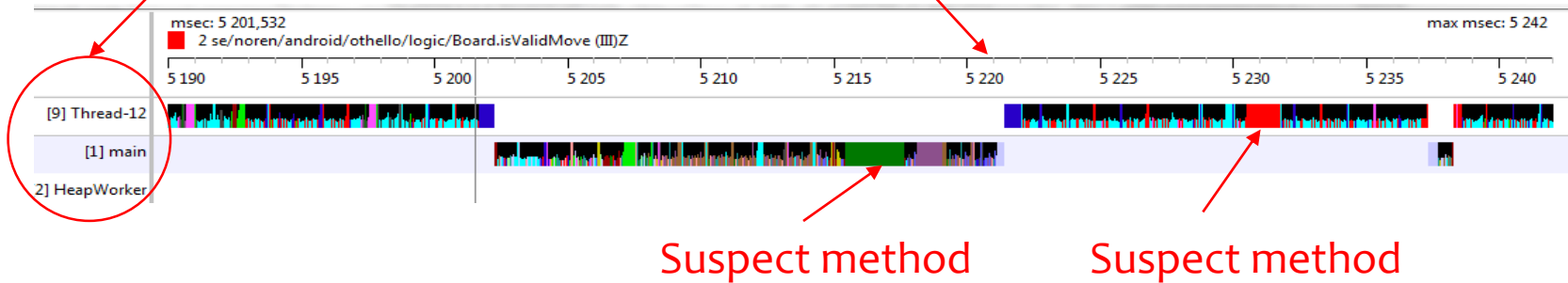
Android Performance Bug Detection

Conduct an empirical study of *popular apps* at Google Play suffering from *performance bugs*



Running threads

Timeline



Android Performance Bug Detection

Conduct an empirical study of *popular apps* at Google Play suffering from *performance bugs*



Research questions

Bug types and impacts

Bug manifestation

Debugging and fixing effort

Common bug patterns

Running threads

Timeline



Build bug detection tool - PerfChecker

- *PerfChecker detected 126 previously-unknown issues in 18 of the 29 analyzed applications*

Application name	Bug pattern instances	
	View holder pattern violation	Long running operations in main threads
Ushahidi	9	2
Firefox	1	0
FBReaderJ	6	6
OI File Manager	1	0
...

Results

- **68 issues** (54.0%) were **confirmed** as real performance bugs by original developers

Application name	Bug pattern instances	
	View holder pattern violation	Long running operations in main threads
Ushahidi	9	2
Firefox	1	0
FBReaderJ	6	6
OI File Manager	1	0
...

Feedback from developers

- *Developers are interested in performance analyzers*



Henry (Ushahidi developer)

“Thanks for reporting this ... Just curious, where is this static code checker? Anywhere I can play with it as well?”

Feedback from developers

- *Developers act quickly with concrete suggestions*

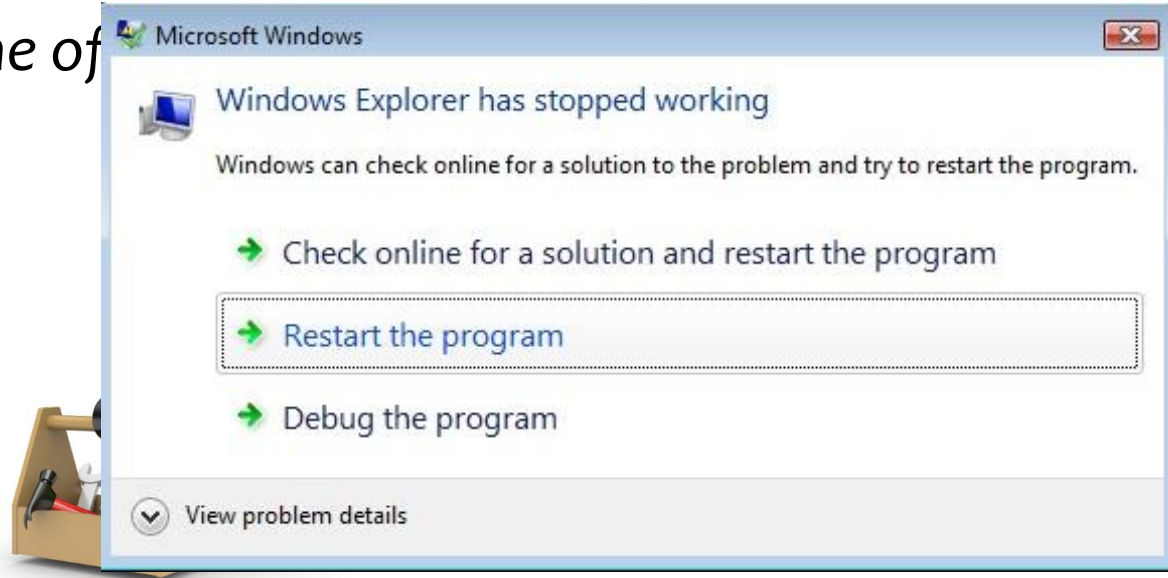


George (OI File Manager developer)

“Thanks a lot for reporting the problems. The ViewHolder pattern has just been added to the BookmarkListAdapter in [8c9c429](#).”

Follow-up

One of

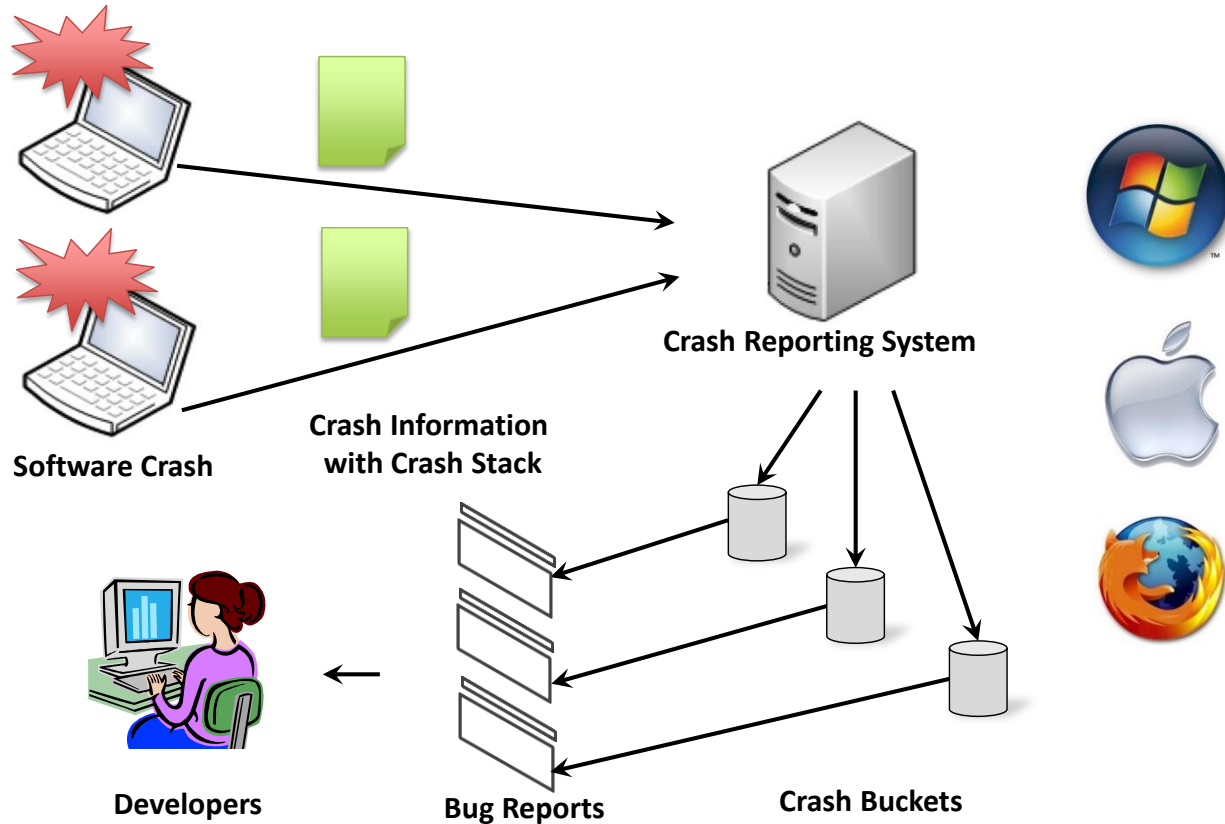


(for IntelliJ)

use
ake

ACM SIGSOFT Distinguished Paper Award 2014

Crash Analysis



Feedbacks From Mozilla Developers

- Locating crashing faults is hard

*“Sometimes it can **be very difficult.**”*

*“Some crashes are hard to fix because **it is not necessarily indicative of the place where it crashes in the crash stack ...**”*

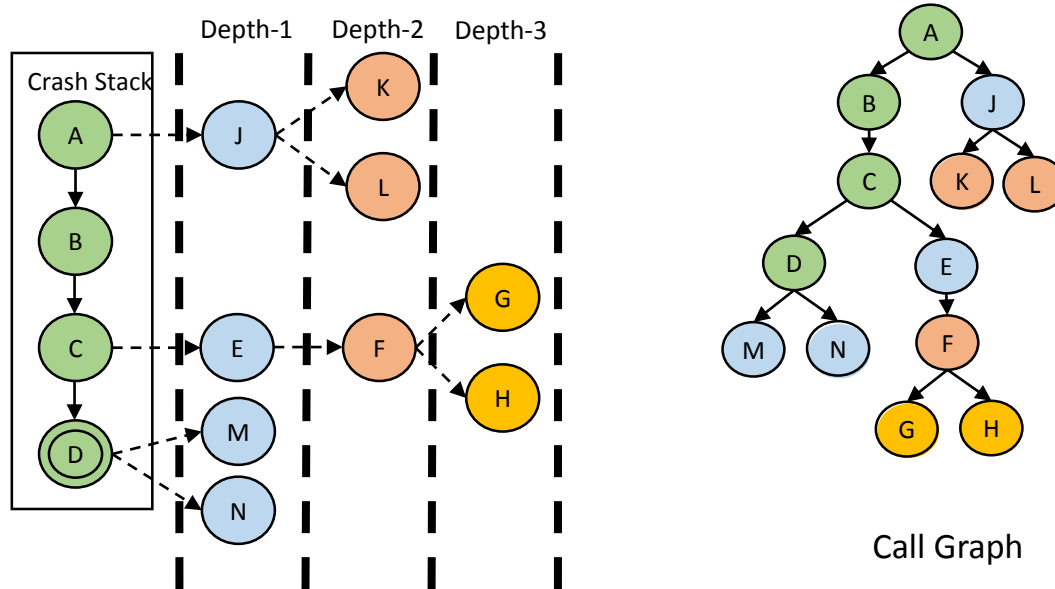
- Ad hoc approach

*“I use the **top down method of following the crash backwards.**”*

*“... and look at the crash stack listed. It shows the line number of the code, and then **I go to the code and inspect it.** If I am unsure what it does **I go to the second line of the stack and code and inspect that, and so on and so forth ...**”*

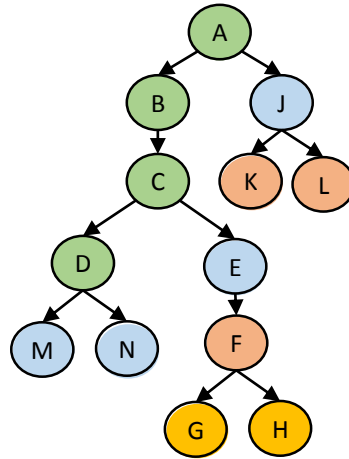
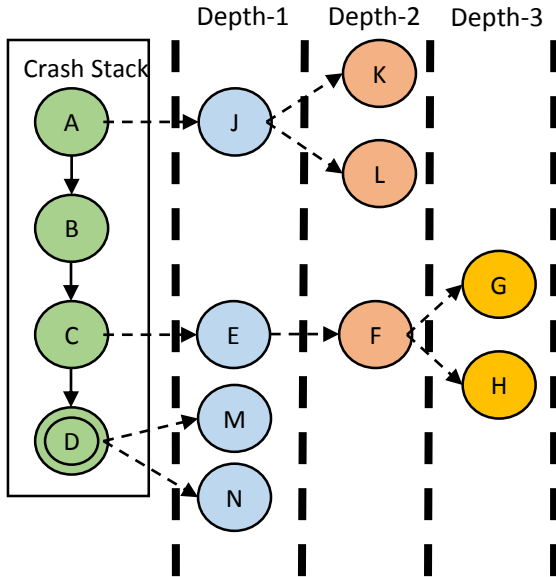
Crash Analysis

- *Propose an algorithm to locate the faulty function*
- *Based on a large volume of crash stacks*



Crash Analysis

- Propose an algorithm to locate the faulty function
- Based on a large volume of crash stacks



```
1. Obj D(){
2.   Obj s;
3.   int a = M();
4.   char b = ‘ ’;
5.   Obj[] c = N(b);
6.   s=c[1]; //crash here
7.   if(s!=‘ ’){
8.     ...
9.   }
8.   ...
9. }
```

Not in slicing

variables {s,c}

CrashLocator Performance

System	Recall@1	Recall@5	Recall@10	MRR
Firefox 4.0b4	55.6%	66.7%	77.8%	0.627
Firefox 4.0b5	47.1%	70.6%	70.6%	0.566
Firefox 4.0b6	48.0%	64.0%	64.0%	0.540
Firefox14.0.1	52.0%	52.0%	56.0%	0.528
Firefox16.0.1	53.8%	53.8%	53.8%	0.542
Thunderbird17.0	48.5%	66.7%	78.8%	0.568
Thunderbird24.0	50.0%	66.7%	66.7%	0.544
SeaMonkey2.21	55.0%	70.0%	70.0%	0.600
Summary	50.6%	63.7%	67.5%	0.559

ACM SIGSOFT Distinguished Paper Award 2014

Grand Challenge



- Questions
- Tags
- Users
- Badges
- Unanswered
- Ask Question

Stack Overflow is a question and answer site for professional and enthusiast programmers. It's 100% free.

[Sign up](#)

Here's how it works:



Anybody can ask a question



Anybody can answer



The best answers are voted up and rise to the top

Grand Challenge



8



Trying to merge some videos together and export them as a single file, everything seems to be correct from looking at tutorials/examples however my AVAssetExportSession never seems to be complete, and my video file is never exported, any help as to a blindingly obvious error I'm missing would be very appreciated.

Below is the function where i merge the videos

note 'videos' in the loop is a member variable `var videos = [AVAsset]()` which gets populated (and it does i checked) before merge is called.

```
private func merge()
{
    // Create AVMutableComposition to contain all AVMutableComposition tracks
    var mix_composition = AVMutableComposition()
    var total_time_seconds = 0.0
    var tracks = [AVCompositionTrack]()

    // Loop over videos and create tracks, keep incrementing total duration
    for video in videos
    {
        // Create the composition track for this video
        let track = mix_composition.addMutableTrackWithMediaType(AVMediaTypeVideo, preferen

        // Add video duration to total time
        total_time_seconds = total_time_seconds + video.duration.seconds
    }
}
```

Grand Challenge

• Bronze Badge

Bronze badges encourage users to try out new features on the site. They are easy to get if you try!

• Silver Badge

Silver badges are less common than bronze ones. You'll need to plan your strategy to get one of these.

• Gold Badge

Gold badges recognize important contributions from members of the community. They are rarely awarded.

- Questions
- Tags
- Users
- Badges
- Unanswered**
- Ask Question

er

Here's how it works:



Anybody can ask a question



Anybody can answer



The best answers are voted up and rise to the top

Can someone write
tests for me?



**Can someone finds out
where my code is wrong?**

**Can someone fix the bugs
for me?**

