

Introduction

- Android is a widely used mobile OS
- Developing applications requires modifications and changes during the process
- Ensure reliability of behaviors that are already working (regression testing)
- Gain insight into how changes within Activities and Library can impact other areas of an application
- Research conducted in two parts
 - Bug Study
 - Change Impact Analysis

Bug Study

Purpose: Search for change-related bugs

Application Search Criteria:

- Popular
- Long development time
- Large number of Bug reports

App	Downloads	Bug Reports	Time Span (yrs)	Change-related Bugs
Ankidroid*	1 - 5 million	2645	6	15
ConnectBot	1 - 5 million	688	6	2
AndroidWifiTether	380k	1965	4	5
EbookDroid*	1 - 5 million	937	4	10
Android-SMS	70k	195	5	4
Android Shuffle	50k-100k	330	5	6
Android Privacy Guard	100k-500k	166	2	3
Open GPS Tracker	100k-500k	432	4	1
Electric Sleep	100k-500k	217	2	3
DroidWall	1 - 5 million	318	3	10

Table 1. Table of Applications

Change Impact Analysis

Case Study: Code Change

- Ankidroid, Ebookdroid
- Breakpoint onCreate() to make activity trees
- Assumed change in each activity case-by-case
- Compared paths to change to total paths
- Counted number of subsequent activities after changed activity

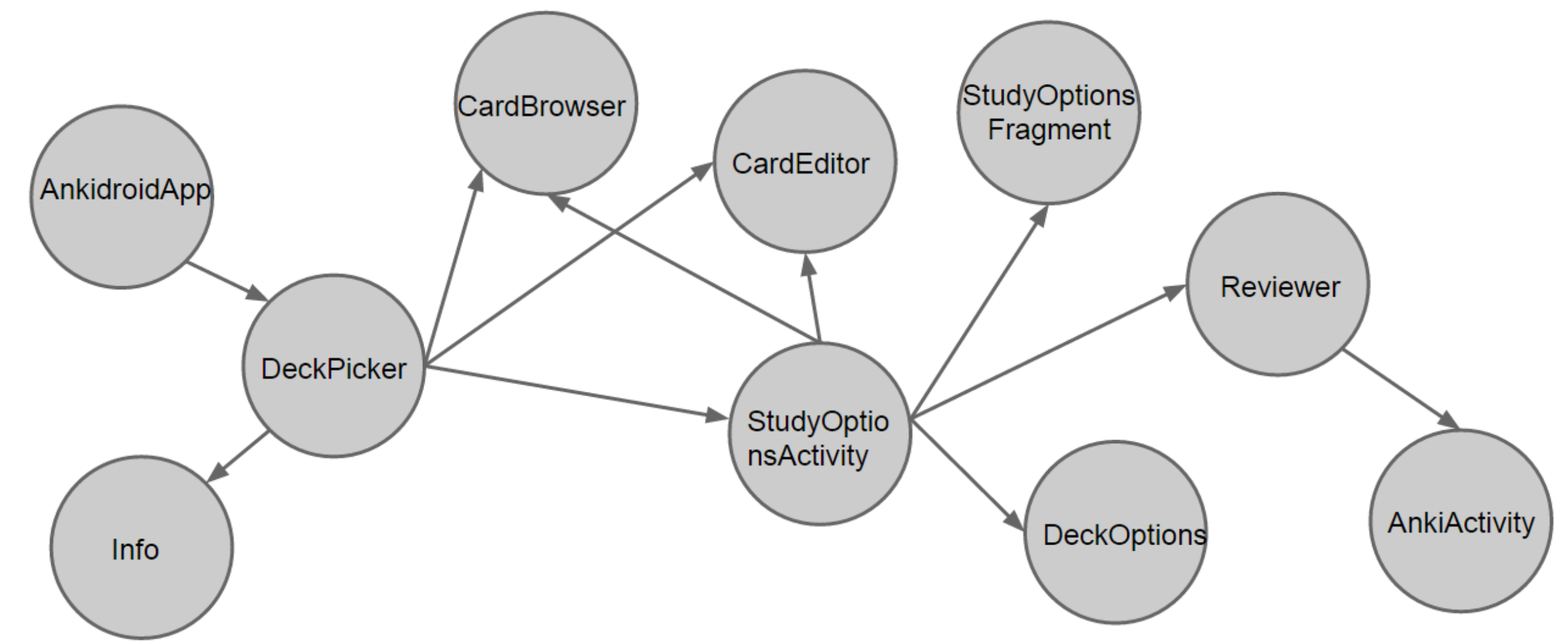


Figure 1. The activity tree of the Ankidroid application

Case Study: Library Change

- Counted all subsequent application class files within the Ankidroid(2.5alpha33) source code that had the changed library (which is highlighted)
- Counted methods within the application class files that used the application class files either by instantiated the library class via an object or a method

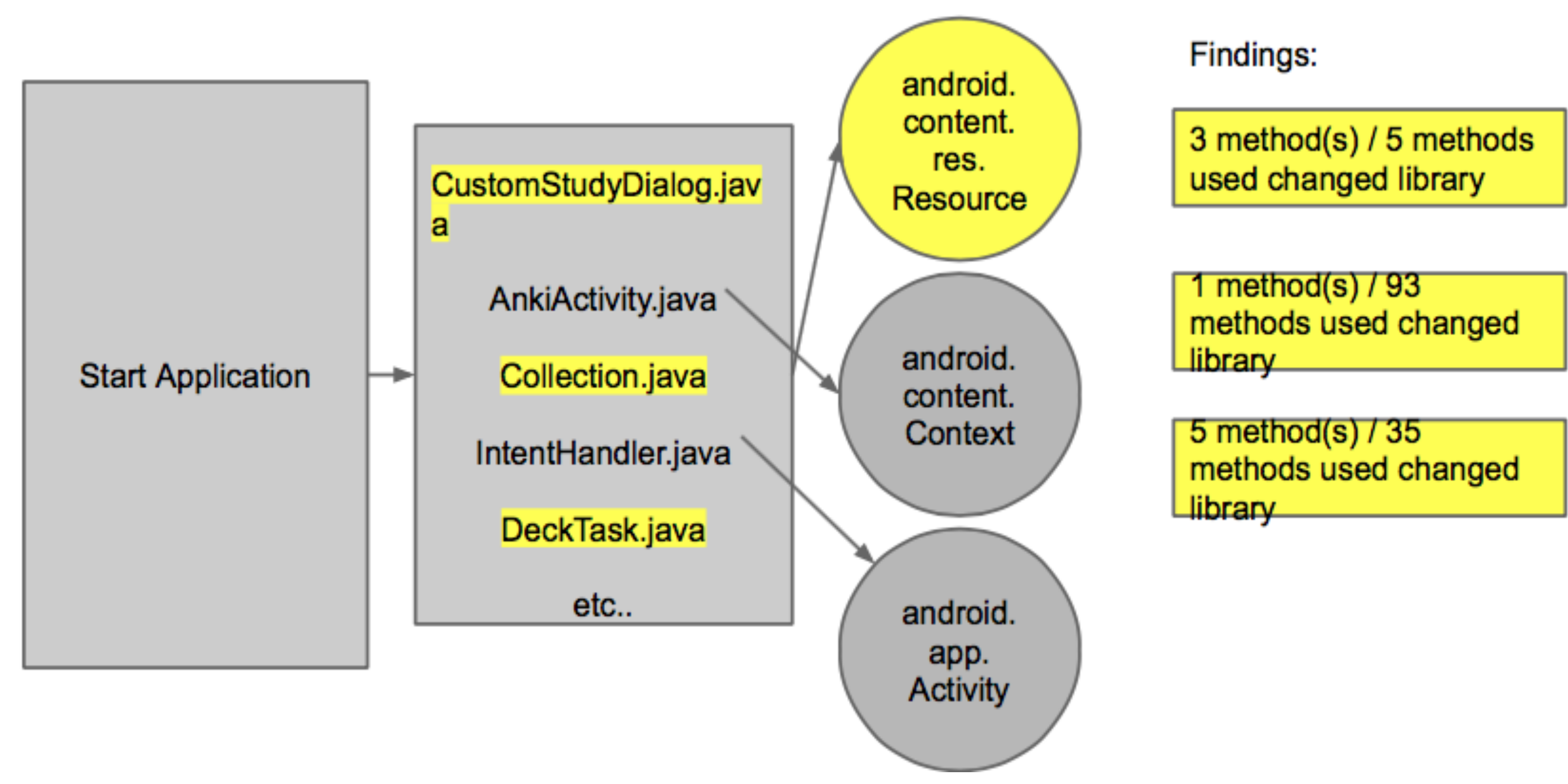


Figure 2. A Path from the Start of the application to the changed library file

Results and Analysis

Code Change:

- Reduction of paths from the total paths to paths to changed activity node
- Less subsequent activities implies less potential impact due to change
- Improve/Create regression testing methods by targeting changed areas within an application through test selection or test generation

Library Change:

- 41 out of 286 or approximately 14% of the application class files within the application actually had the changed android library *android.content.res*.
- *Resources*
- 76 out of 696 or approximately 11% of the methods in the application class files used the the changed android library class file
- These percentages show that for this particular changed android library, the impact would not be that big because the the changed library is not used that much within the application package itself.

Future Work

- Target specific areas of modified code and subsequent areas for testing
- Perform change impact analysis on the other Android components: Services, Content Providers, and Broadcast Receivers
- Regression Testing: Test Selection, Test Generation

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