CA326 Technical Specification - EfficiClean

Team Members:

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1. Introduction

1.1 Overview

Our idea in centred around the way housekeeping staff currently operate in hotels. At the moment, staff must walk up and down the halls in hotels to check what rooms have signs on them saying “Do not disturb” or “Please service my room”. Staff members are assigned a floor and if there are no rooms on their floor to be cleaned they must wait somewhere until they check the hall again.

This system is extremely inefficient.

We intend to build an application that would modernise this area of work. Instead of guests using a piece of paper on the door to notify staff when rooms are available to be cleaned they will use this application to mark the status of their room and be notified when their room is cleaned. Cleaning staff will be able to see on a web interface when rooms are ready to be cleaned, be assigned rooms and mark them as completed. This will result in this process being more efficient, safer, more accessible and better kept track of.

Rooms will have a QR code for users to download the application. They will enter their hotel ID and Room Number which will be within their room. Alongside this information, users enter their forename and surname. The application will then check the database to see if this guest is in the room. The user will then be logged into the application and be presented with home screen. Guests will also use this method of logging in on the web application.

The main features of our project are:

- A staff interface displaying the cleaning status of rooms in the hotel
- Priority queue system for cleaning team allocation to hotel rooms
- Remote notification for guests when their room is marked clean on the system
- Database interaction to automatically log out guests when their stay is over
- Staff work statistics generated for supervisor and manager
- Randomly allocated cleaning pairs daily to increase security

1.2 Glossary

Housekeeping
The department of employees who manage and perform cleaning tasks in hotels.

Integration
The act of combining or adding parts to make a unified whole

QR Code
A matrix barcode that is read by photographing it with the camera of a smartphone or other mobile device that is equipped with a bar-code reader.

Accessible
Easy to approach, reach, enter, speak with, or use.

Decrement
The act or process of decreasing; gradual reduction.

Hazardous substance
A 'hazardous substance' is any substance that has one or more of the following intrinsic 'hazardous properties': Explosiveness. Flammability. Ability to oxidise (accelerate a fire) Human toxicity (acute or chronic)

2. System Architecture

2.1 Development Environment

The Efficiclean application was developed in Intelliji Ultimate version 2017.3.4. It consists of twelve classes and 25 XML files. Our user interface was built for mobile, 600dp tablet and 720dp tablet screen sizes. The application targets Android API level 21. This reason for this being essential softwares involved in Efficiclean such as Firebase JobDispatcher, Vector Master View and Asynchronous task scheduling all require this API level or above. While we tried to build our project on a lower API level, it simply was not feasible with the features we wished to implement in our application. This API level covers approximately 70% of Android users. Google play services and firebase services were also utilised in the building of Efficiclean.

2.2 System Architecture Diagram

![](media/System Architecture.jpg)

- Efficiclean's systems architecture has two major elements, the application and the Firebase database.

- The application itself has Has three layers, the User Interface, the Client Tier and the Android Studio Mobile SDK.

- Efficiclean was developed using the Android Studio software development kit.

- The User Interface consists of 25 user pages designed for mobile and two different tablet screen sizes, 600dp and 720dp.

- The Client Tier outlined in the diagram connects the Android application to the Firebase database. Firebase is a cloud hosted environment. The Client Tier connects to the web server through HTTP. Data moves up and down a Websocket channel between the NoSQL database and Android application. These Websockets push the data to the Client so that the user does not have to refresh the application.

- The Application Tier of Firebase connects the database to the Client Tier of the Android application. This is done through a combination of HTTP and Websockets.

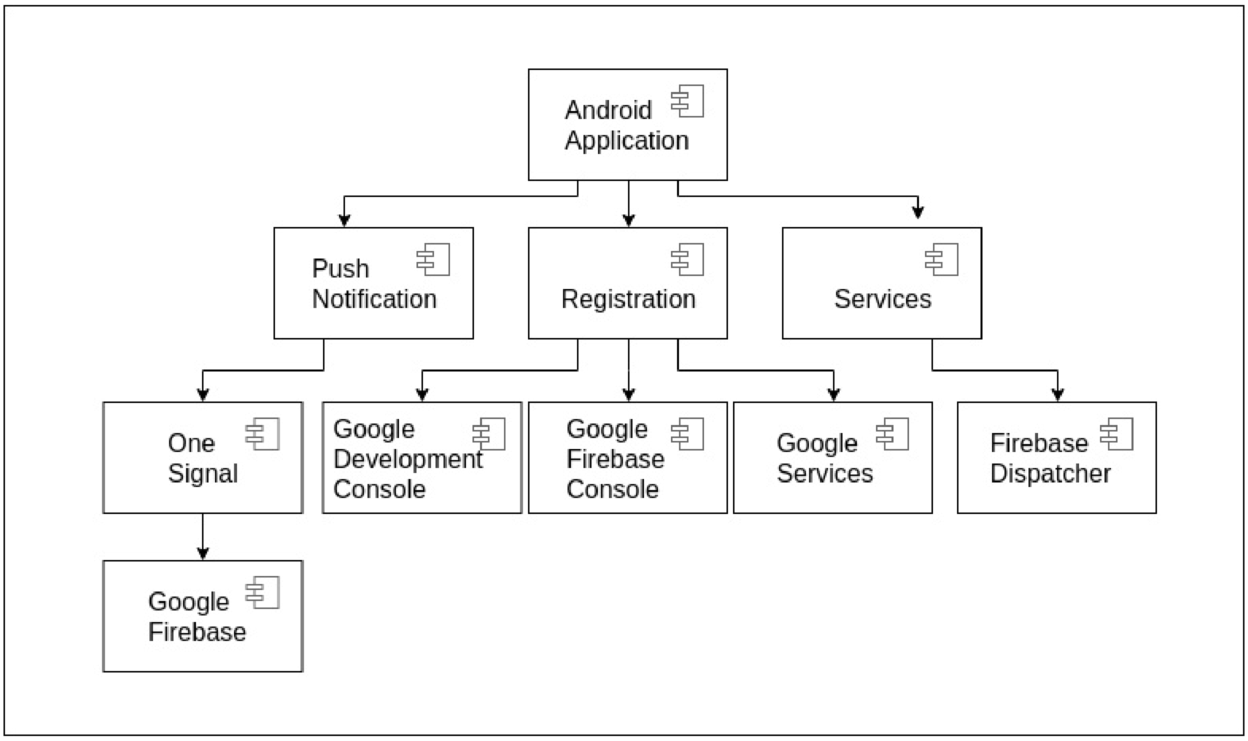
- JSON and XML are used to pass data between the application and the Application Tier.

- The applications data is in the Data Tier. This includes a vast amount of information from guest names and room numbers to staff names, approval requests and room status'. The data is stored as JSON data and is contained in a NoSQL database. We use our Google Services JSON file to create the link our application to the firebase console.

- The Application and Data Tier combined are the Firebase database which was utilised to create Efficiclean.

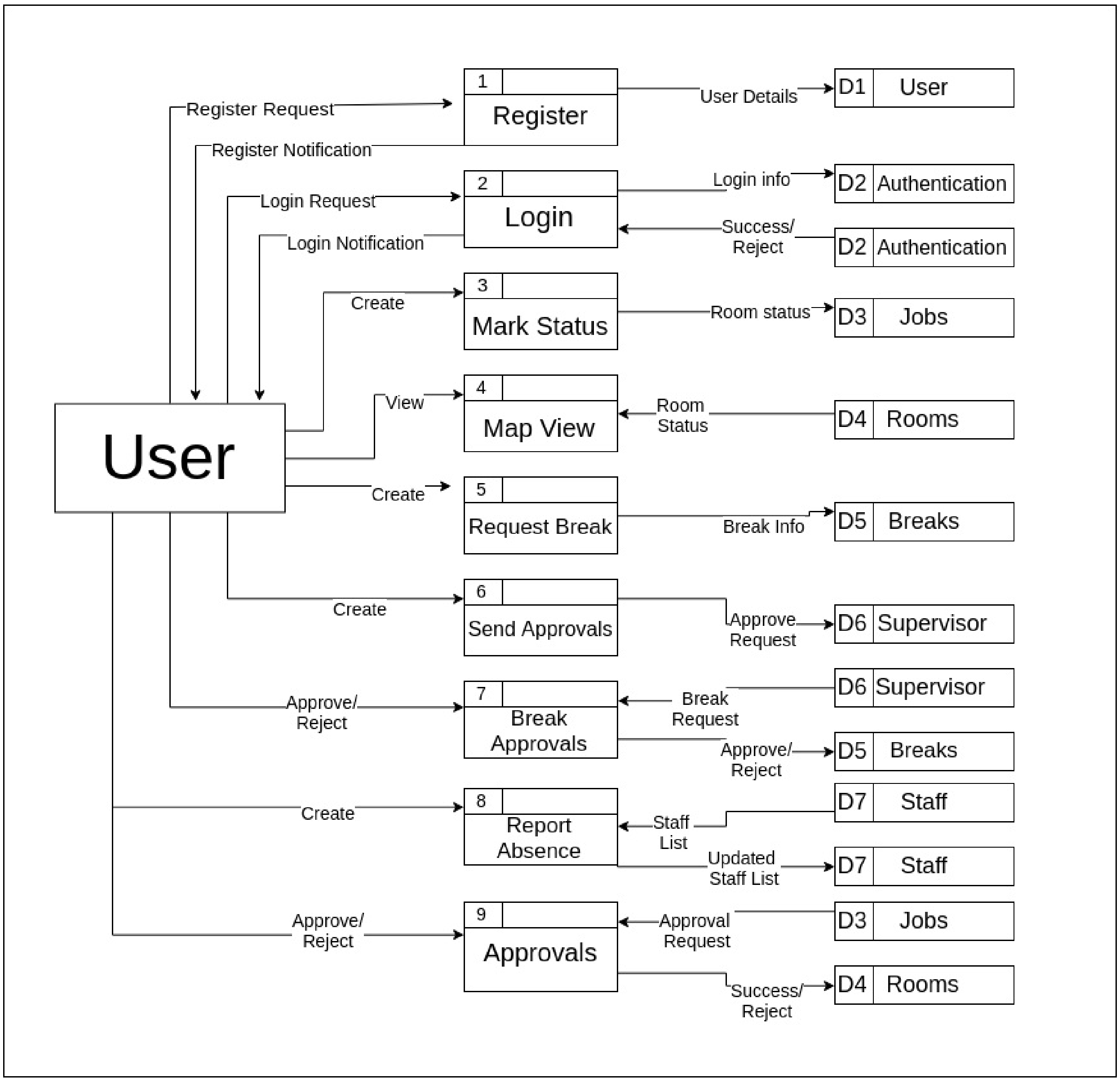
3. High Level Design

3.1 Component Model



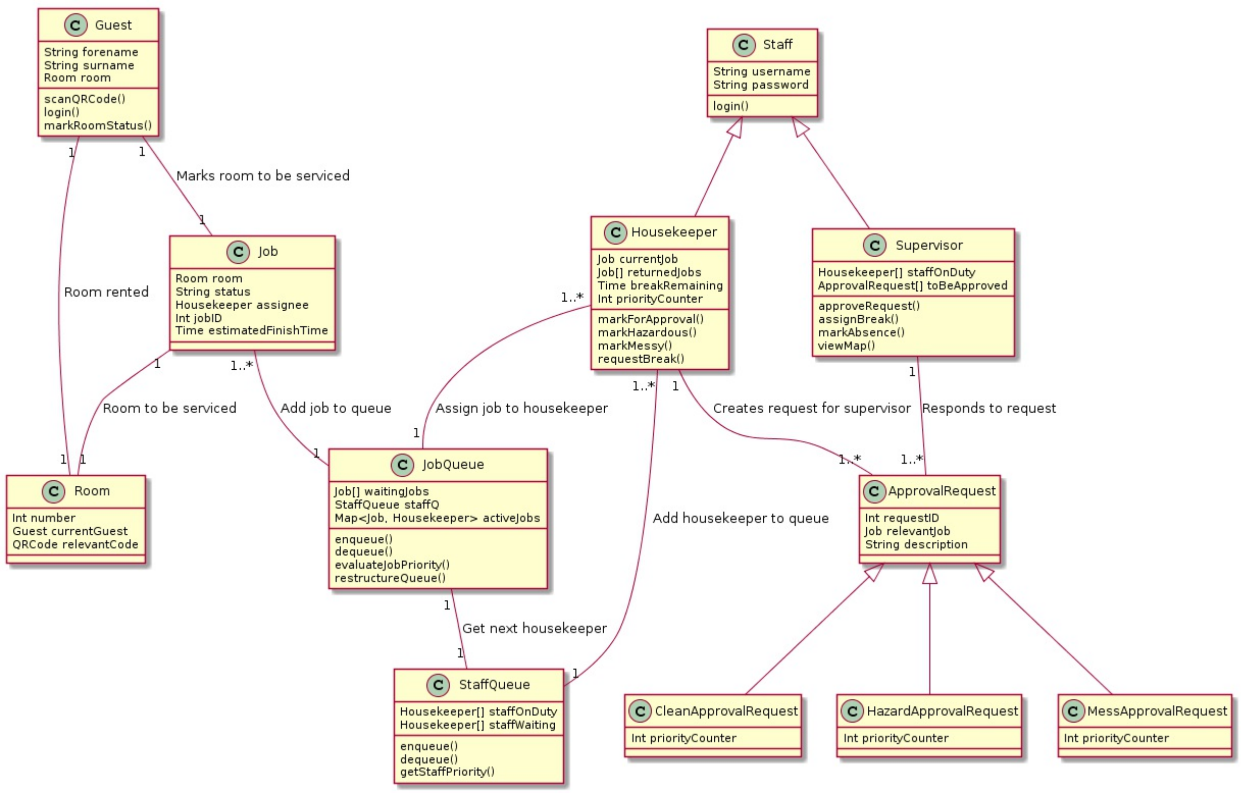
A component diagram shows the the structural relationship between components of a system. In the above diagram we see that the android application is made up of push notifications, registration and services. Registration can be broken down into Google Development Console, Google Firebase Console and Google Services. Services are made up of the Firebase Dispatcher and finally Push Notifications are generated using One Signal which itself is built on Google Firebase. Each of these components combined build the Android application Efficiclean.

3.2 Data Flow Diagram



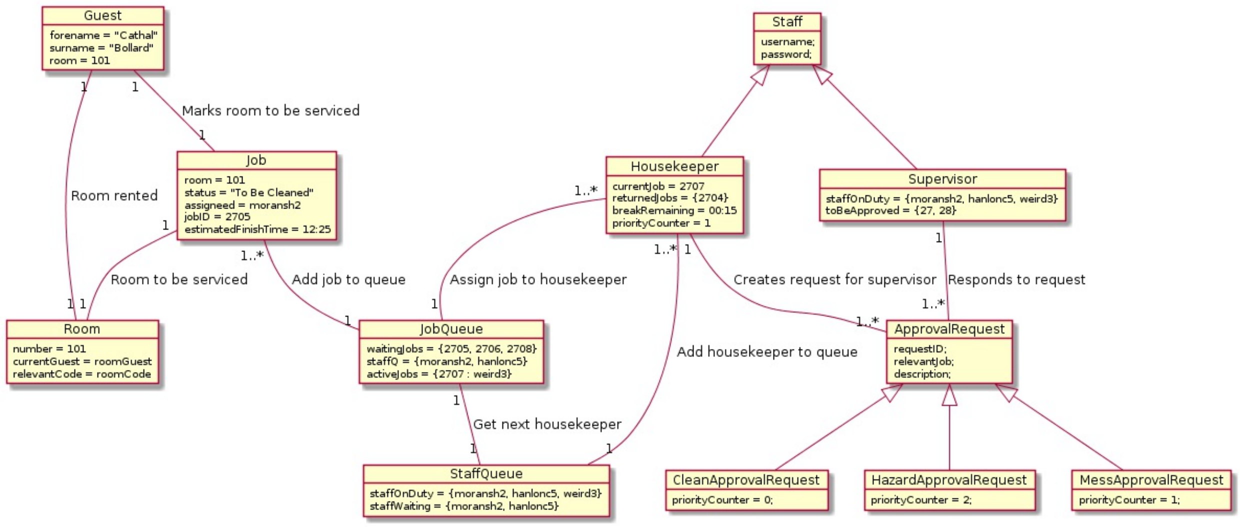
A data flow diagram is a graphical representation of the is the flow of data through a system. As we can see in the above diagram users in our system interacts with nine key processes. These processes then interact with seven data sources. For example in this diagram we can see how the user interacts with the Login process. The user sends a login request to the Login process. This process sends this login information to the authentication data source. This information is either accepted or rrejected. This is returned to the Login process and the user is notified.

3.3 Class Diagram



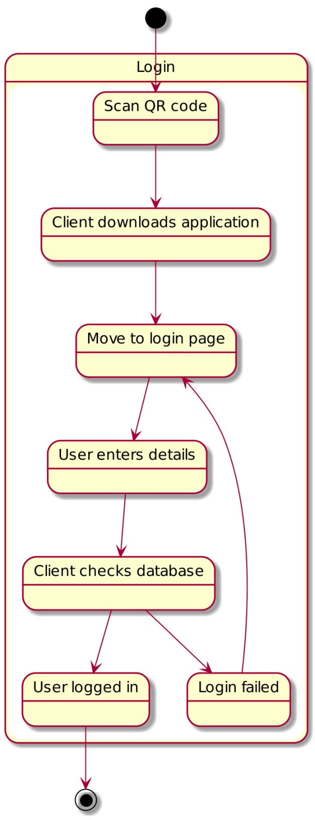
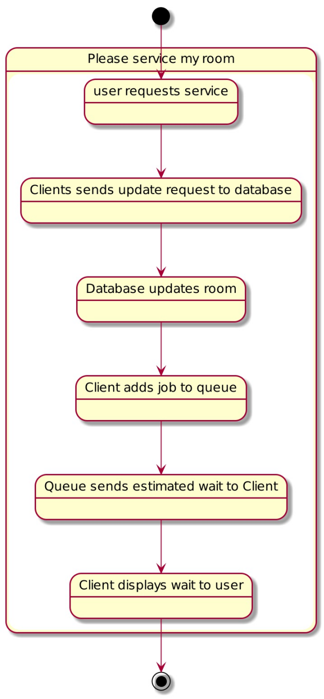
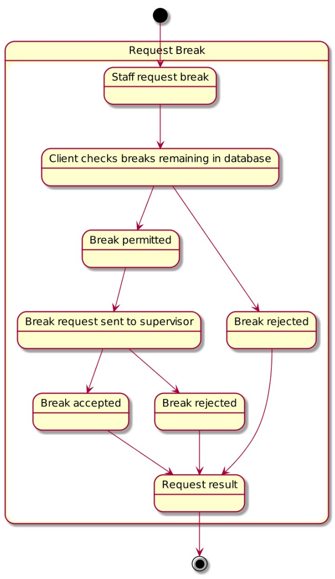
Class diagrams illustrate the relationships and dependencies among classes. Efficiclean has 12 classes detailed in the above diagram, These being Guest, Staff, Job, Housekeeper, Supervisor, Room, JobQueue, ApprovalRequest, StaffQueue, CleanApprovalRequest, HazardApprovalRequest and MessApprovalRequest. From the diagram above we can see how each of these classes interact with one another.

3.4 Object Diagram



An object diagram is an instance of a class diagram. This is a snapchat of the system at a moment in time. An example of an instance of our class within our class diagram is the Guest class. In this instance our guest's name is Cathal Bollard and he is staying in room 101.

3.5 State Machine

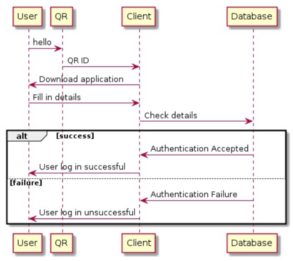
***Login ***	***Please Service***	***Request Break***
		

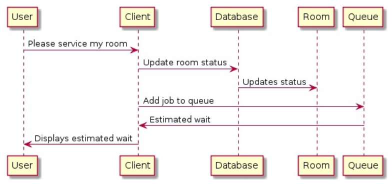
Please service my room
user requests service
Clients sends update request to database
Database updates room
Client adds job to queue
Queue sends estimated wait to Client
Client displays wait to user

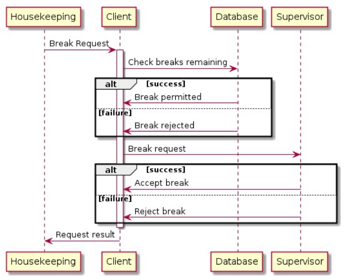
State machines show the changing state of a single object and the transitions between these states. Here we can see the changing state of the Login, Please service my room and Request break objects of Efficiclean. As we can see from the Please service my room object, we move through six stated to perform this action.

3.6 Sequence Diagram

***Login ***	***Please Service***	***Request Break***







Sequence diagrams show object interactions arranged in time sequence. Here we can see the Login, Please service my room and request break objects. We can also see the messages exchanged between objects needed to carry out these scenarios. For example in the Login sequence diagram we can see the sequence of events involved in logging in a user. We also have an alt box to represent a success or failure condition present in the sequence.

4. Problems and Resolutions

- QR codes
- Asynchronous issue preventing login
- Push Notification being sent to all Users
- JobQueue not interacting automatically with StaffQueue
- Application crashing when updating database values which are being displayed
- Black Boxes being displayed on SVG Map Overview
- Bottoms of names in tables being cut off
- Issue referencing specific path in vector drawable
- Guest Sign Out not working correctly

QR Codes

Problem

Initially, we had planned for users to download the application using a QR code which would be present in their room. This QR code would then bring them to the login screen for their specific room. Upon further investigation we discovered that this action would not be possible using a single QR code.

To combat the issue we decided to use two QR codes, one for login and one to bring the user to their room's login page. However, this only brought about more issues. We would now have to incorporate a QR scanner into the application which further complicated our user interface. If we did not incorporate this scanner and asked users to use a scanner from the app store, we would not be sure that this would bring users to the correct room page and may be unreliable.

Solution

We, after much thought, decided to allow users to download the application using a QR code but login will now not involved QR codes. As users will have to sign into a specific room in a specific hotel, we added two fields on our login page, hotel number and room number.

Asynchronous Issue Preventing Login

Problem

While attempting to log users into the application we were calling a function to validate the input values with the values in the Fireball database. We hoped that the function would execute and that we could move on in the code. However, the function wasn't validating the information quickly enough and our code would continue as normal without our result. This led to an issue where users would not be logged in with the correct credentials.

Solution

To resolve the issue we approached the issue in a way that was more suited to the asynchronous nature of Firebase. Instead of our authentication branching from the code, we created a function to continue on the process. We then called this function after the authentication process had completed ensuring we have our result. Once this fix was implemented, users could log into the application successfully.

Push Notifications being sent to all Users

Problem

All push notifications, for example service approvals or break approvals, were being sent to all users on the system including staff, guests and supervisors.

Solution

To rectify this issue, we sent a unique tag for each user to the OneSignal console. This allowed us to individually identify users. Therefore each user only received notifications specific to them.

JobQueue not interacting automatically with StaffQueue

Problem

When the JobQueue and StaffQueue were declared, the two classes were not interacting automatically when the database information was updated. This was due to the fact that we were not utilising a listener to wait on changes while the whole system was running.

Solution

This issue was fixed by creating a queue handler which would listen to any changes on the job queue and team queue. The queue handler implemented the observer interface. Both queues then inherited from the observable class. The observer method *update* allows the observer object to perform actions based on changes from the objects being observed. We also set up a queue handler creator which initialises the queue handler with the relevant hotel ID.

Application Crashing when updating database values which are being displayed

Problem

When we were displaying our table layouts containing information regarding the status of the queue, we were using *ValueEventListeners* which were constantly listening for changes in the database. We dynamically created table rows based on the relevant information being received. However, when values were updated by actions in other activities, some table rows were now acting on null values. This caused our system to crash.

Solution

When displaying this information we used listeners for *SingleValueEvents* instead of *ValueEventListeners*. This way, the data was only loaded when the activity was created rather than constantly listening throughout its lifecycle.

Black Boxes being displayed on SVG Map Overview

Problem

Unfortunately, there is a known issue when converting SVG Maps to Vector Drawables where random black boxes appear in the vector drawable and cannot be removed. A solution to this issue has not yet been developed so we had to come up with our own workaround.

Solution

To remove these black boxes from the background of our vector drawable. We implemented a large filled shape in the diagram to prevent the black squares from affecting our map view.

Bottoms of names in tables being cut off

Problem

When displaying data in table layout format, we used templates created in our xml files. Unfortunately, when dynamically creating table rows, the height of the template was not large enough to accommodate our data to be displayed.

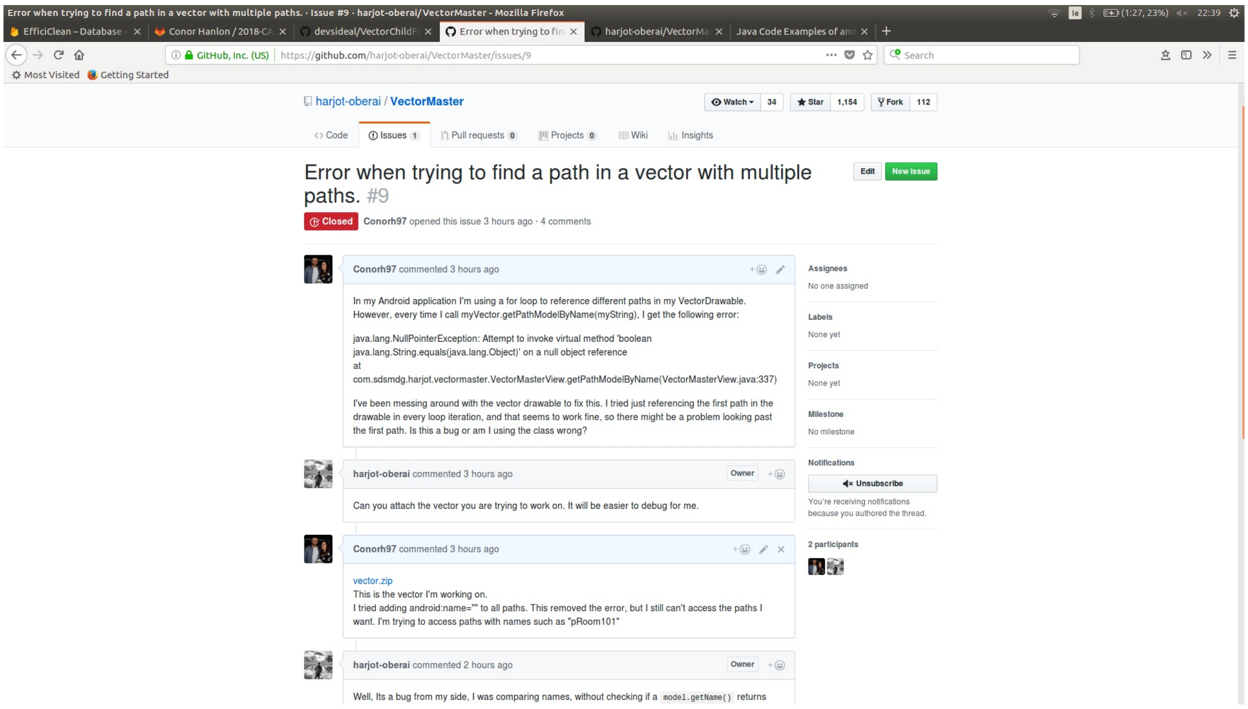
Solution

We resolved this issue by setting a minimum height rather than a specific height for our new table rows. This meant that our table row would adjust to fit information from our text view.

Issue referencing specific path in vector drawable

Problem

To reference individual paths in a vector drawable we utilised an MIT licensed project which can be found on GitHub called VectorMaster. As you can see from the screenshots below, we were getting a null pointer exception when invoking a method in the project library. We created an issue on the github repository detailing this problem and what steps we had already taken to try resolve this issue.


Error when trying to find a path in a vector with multiple paths. · Issue #9 · harjot-oberai/VectorMaster - Mozilla Firefox
https://github.com/harjot-oberai/VectorMaster/issues/9
harjot-oberai / VectorMaster
Watch 34 Star 1,154 Fork 112
Code Issues 1 Pull requests 0 Projects 0 Wiki Insights
Edit New issue

Error when trying to find a path in a vector with multiple paths. #9

Closed Conorh97 opened this issue 3 hours ago · 4 comments

Conorh97 commented 3 hours ago

In my Android application I'm using a for loop to reference different paths in my VectorDrawable. However, every time I call myVector.getPathModelByName(myString), I get the following error:

java.lang.NullPointerException: Attempt to invoke virtual method 'boolean java.lang.String.equals(java.lang.Object)' on a null object reference
at
com.sdsmdg.harjot.vectormaster.VectorMasterView.getPathModelByName(VectorMasterView.java:337)

I've been messing around with the vector drawable to fix this. I tried just referencing the first path in the drawable in every loop iteration, and that seems to work fine, so there might be a problem looking past the first path. Is this a bug or am I using the class wrong?

harjot-oberai commented 3 hours ago · Owner

Can you attach the vector you are trying to work on. It will be easier to debug for me.

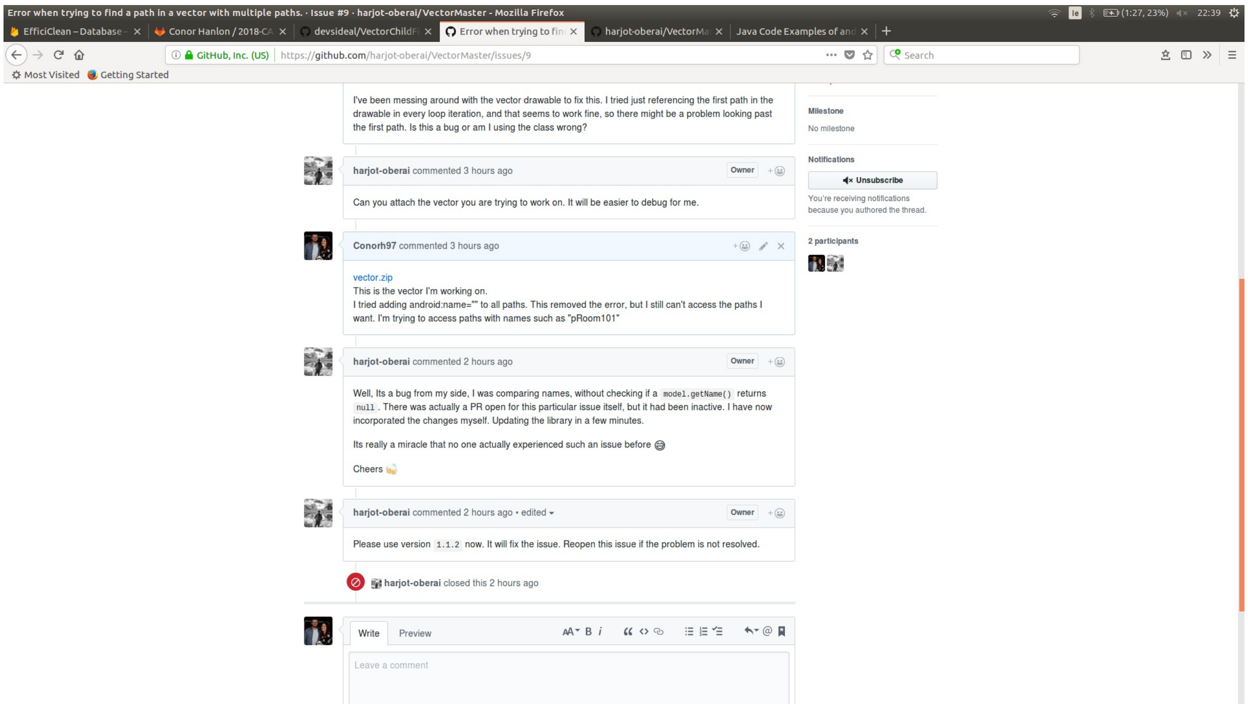
Conorh97 commented 3 hours ago

vector.zip
This is the vector I'm working on.
I tried adding android:name="" to all paths. This removed the error, but I still can't access the paths I want. I'm trying to access paths with names such as "pRoom101"

harjot-oberai commented 2 hours ago · Owner

Well, Its a bug from my side, I was comparing names, without checking if a `model.getName()` returns

Assignees: No one assigned
Labels: None yet
Projects: None yet
Milestone: No milestone
Notifications: Unsubscribe
You're receiving notifications because you authored the thread.
2 participants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This is the vector I'm working on.
I tried adding android:name="" to all paths. This removed the error, but I still can't access the paths I want. I'm trying to access paths with names such as "pRoom101"

harjot-oberai commented 2 hours ago · Owner

Well, Its a bug from my side, I was comparing names, without checking if a `model.getName()` returns `null`. There was actually a PR open for this particular issue itself, but it had been inactive. I have now incorporated the changes myself. Updating the library in a few minutes.

Its really a miracle that no one actually experienced such an issue before 😄

Cheers 🍻

harjot-oberai commented 2 hours ago • edited · Owner

Please use version `1.1.2` now. It will fix the issue. Reopen this issue if the problem is not resolved.

harjot-oberai closed this 2 hours ago

Solution

We very quickly received a response from the repository owner. He debugged the method in question and found the issue. He updated the version of the project and functionality to reference individual paths was now working.

Guest Sign Out not working correctly

Problem

When trying to sign out from the guest homepage, occasionally the user would be redirected back to the guest home page. We identified this issue was caused by Guests marking their room as "Do Not Disturb" followed by returning to the Guest homepage.

Solution

We discovered that the root of the problem was that the Guest home activity was not being completed when transitioning to different activities. This meant that multiple instances of the activity were running at the same time. To eradicate this issue, we called the *finish* method when starting new activities.

5. Installation and Configuration

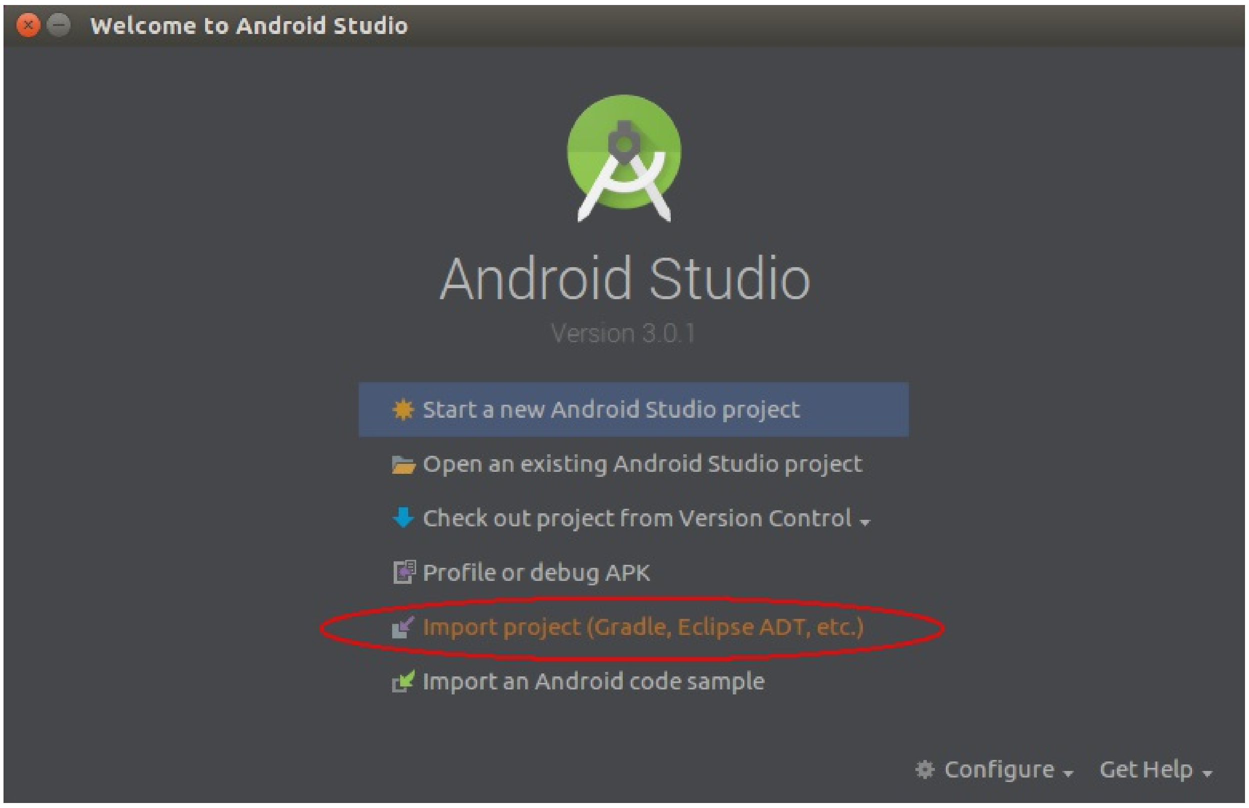
Required Software

- Android Studio Version 3.0.1
- Java 8

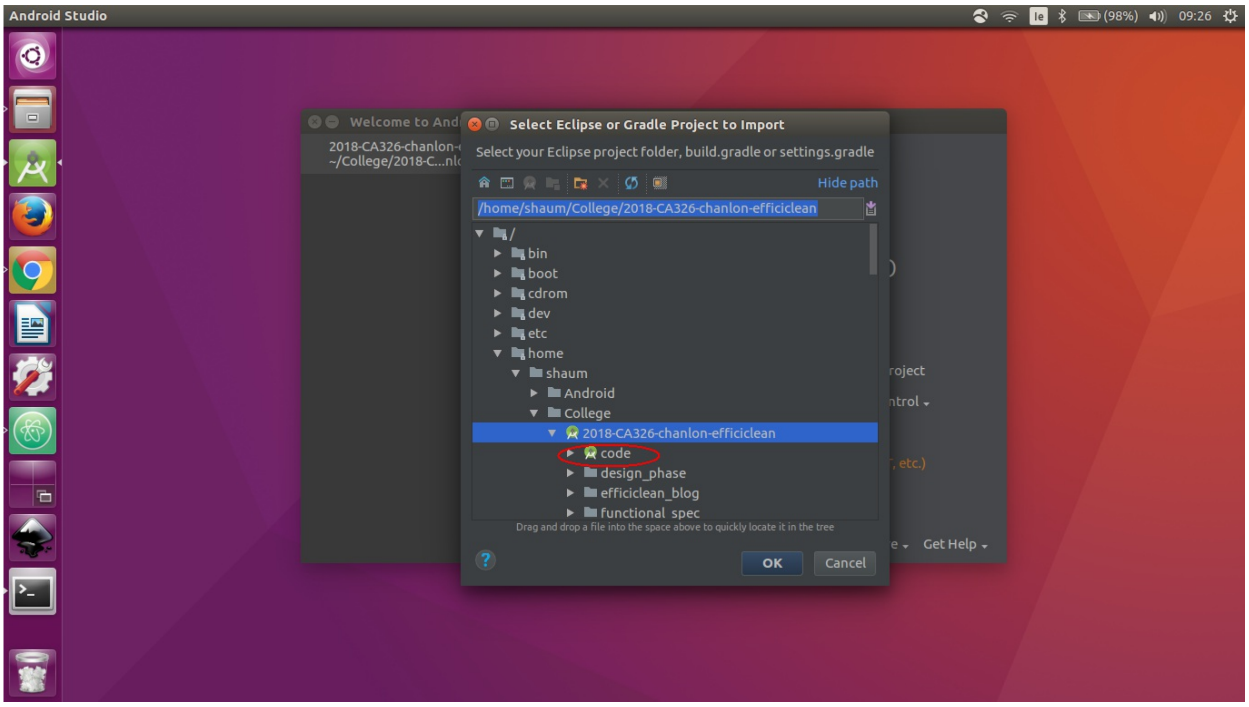
Instructions

Building the Android Project

- Choose where you would like the project to be stored.
- Create a folder here to store the project.
- Open a terminal.
- Navigate to your chosen folder.
- Execute the command: git clone https://gitlab.computing.dcu.ie/hanlonc5/2018-CA326-chanlon-efficiclean.git
- Open Android Studio


Welcome to Android Studio
Android Studio
Version 3.0.1
Start a new Android Studio project
Open an existing Android Studio project
Check out project from Version Control
Profile or debug APK
Import project (Gradle, Eclipse ADT, etc.)
Import an Android code sample
Configure
Get Help

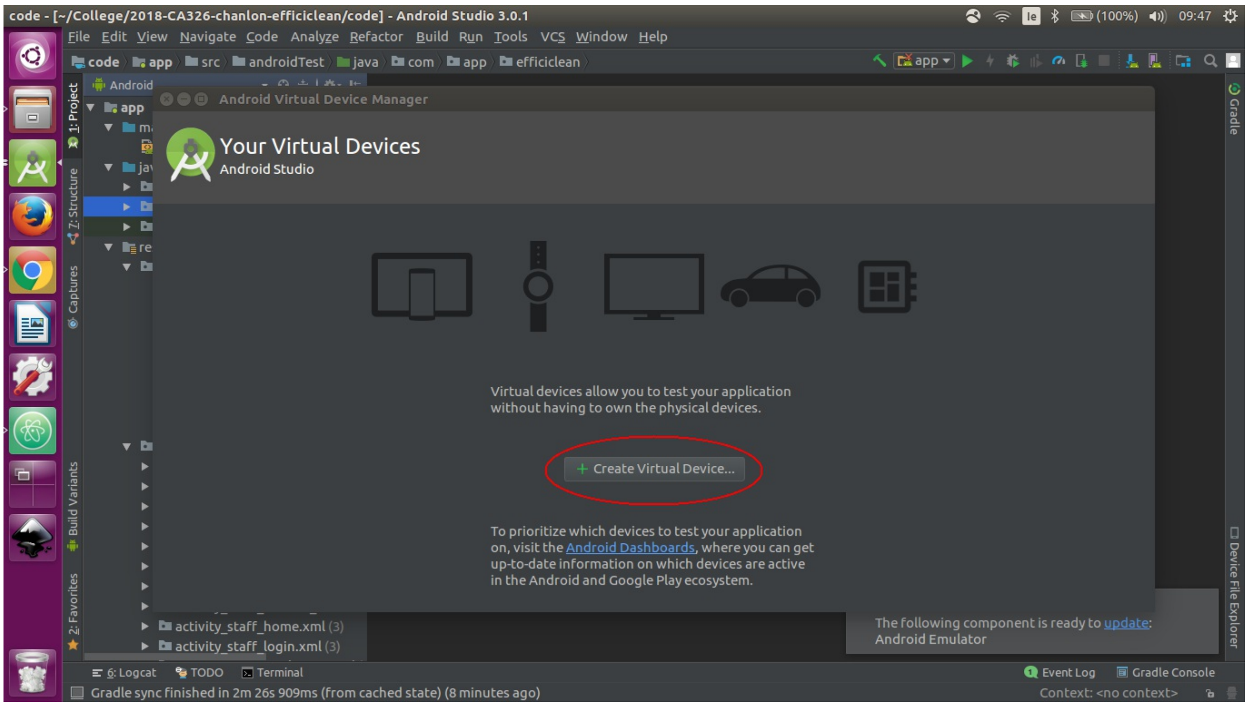
- Select Import project(Gradle, Eclipse ADT, etc) as highlighted in the screenshot above
- Navigate to “C:\Users”YOUR CREATED DIRECTORY PATH” \2018-CA326-chanlon-efficiclean”


Android Studio
(98%)
09:26
Welcome to Andr
2018-CA326-chanlon-
~/College/2018-C...nlo
Select Eclipse or Gradle Project to Import
Select your Eclipse project folder, build.gradle or settings.gradle
Hide path
/home/shaum/College/2018-CA326-chanlon-efficiclean
/
bin
boot
cdrom
dev
etc
home
shaum
Android
College
2018-CA326-chanlon-efficiclean
code
design_phase
efficiclean_blog
functional_spec
Drag and drop a file into the space above to quickly locate it in the tree
OK
Cancel
Get Help

- Click "Code"
- Click "Ok"
- The project will now build

Set up the emulator

- On the Toolbar at the top of the page click "Tools"
- Select "Android"
- Select "AVD Manager"


code - [~/College/2018-CA326-chanlon-efficiclean/code] - Android Studio 3.0.1
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
code app src androidTest java com app efficiclean
Android Virtual Device Manager
Create Virtual Device...
6: Logcat
TODO
Terminal
Event Log
Gradle Console

Your Virtual Devices
Android Studio

Virtual devices allow you to test your application without having to own the physical devices.

To prioritize which devices to test your application on, visit the Android Dashboards, where you can get up-to-date information on which devices are active in the Android and Google Play ecosystem.

The following component is ready to update: Android Emulator

activity_staff_home.xml (3)
activity_staff_login.xml (3)

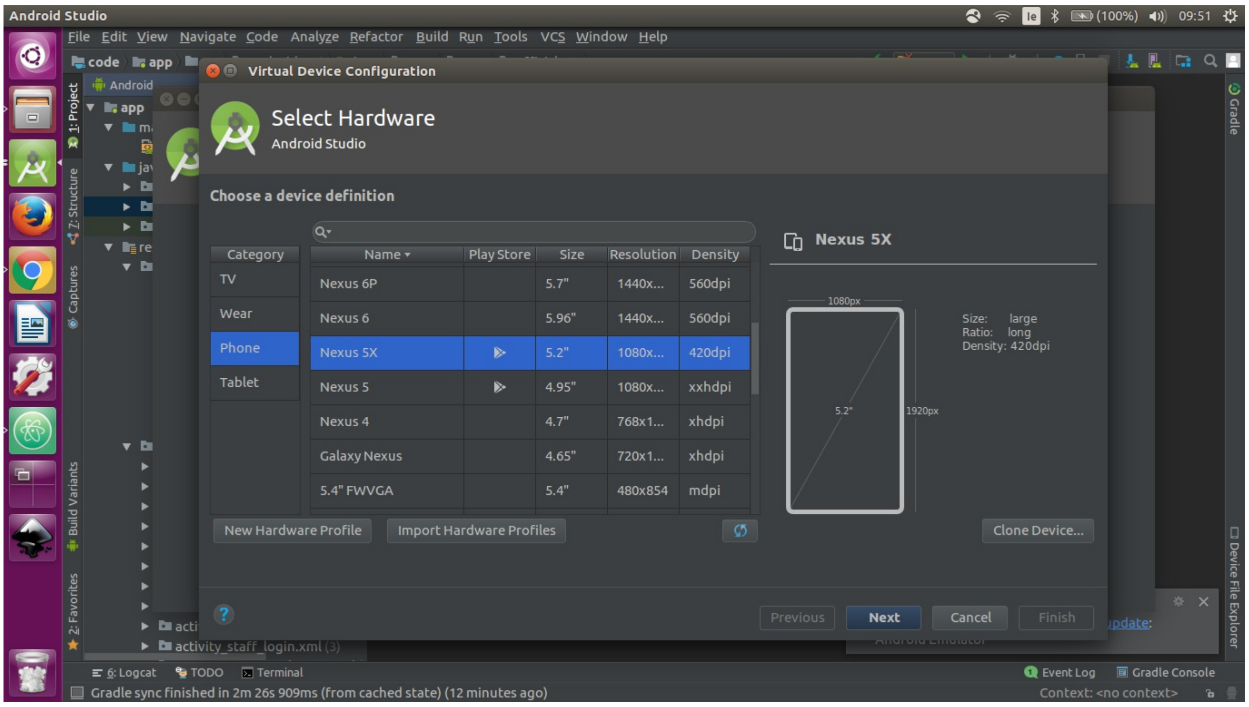
Gradle sync finished in 2m 26s 909ms (from cached state) (8 minutes ago)

Context: <no context>

- Select "Create Virtual Device"

Mobile Emulator

- Select Phone
- Select Nexus 5X as highlighted below



Virtual Device Configuration

Select Hardware
Android Studio

Choose a device definition

Category
TV
Wear
Phone
Tablet

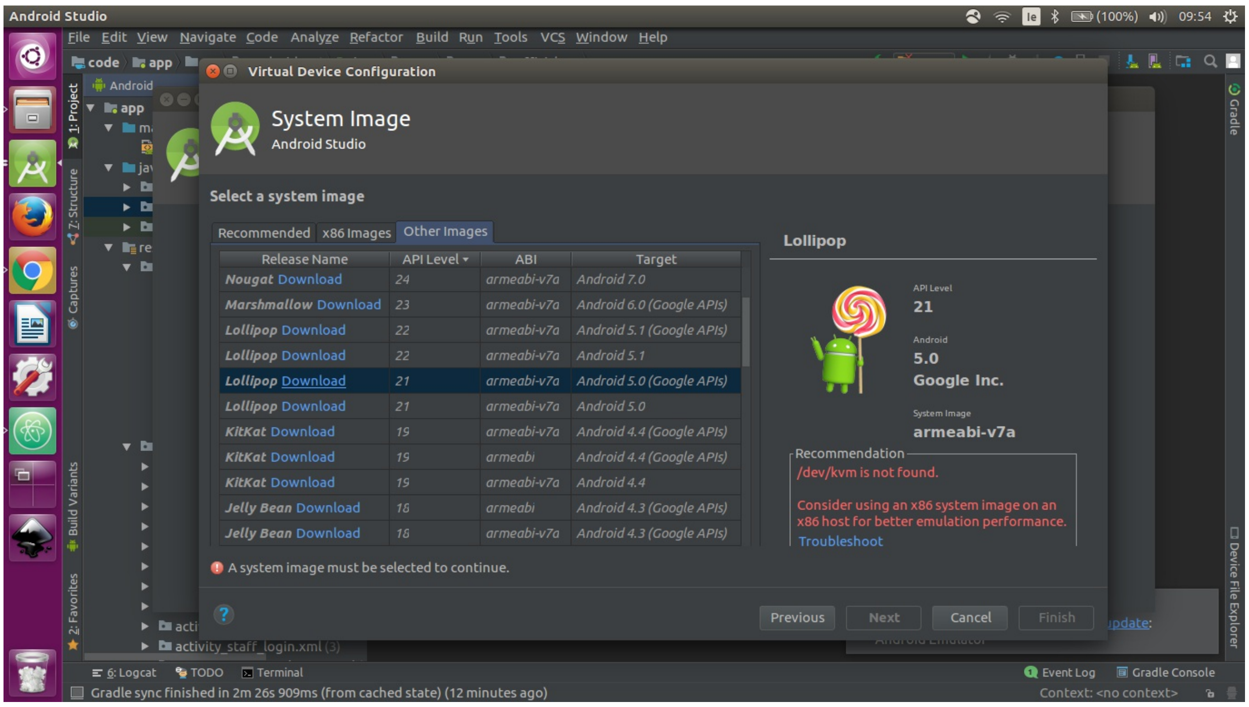
Name	Play Store	Size	Resolution	Density
Nexus 6P		5.7"	1440x...	560dpi
Nexus 6		5.96"	1440x...	560dpi
Nexus 5X	▶	5.2"	1080x...	420dpi
Nexus 5	▶	4.95"	1080x...	xxhdpi
Nexus 4		4.7"	768x1...	xhdpi
Galaxy Nexus		4.65"	720x1...	xhdpi
5.4" FWVGA		5.4"	480x854	mdpi

Nexus 5X

Size: large
Ratio: long
Density: 420dpi

Gradle sync finished in 2m 26s 909ms (from cached state) (12 minutes ago)

- Select "Other Images"
- Select "Lollipop API level 21" as highlighted below
- Click "Download"



Virtual Device Configuration

System Image
Android Studio

Select a system image

Release Name	API Level	ABI	Target
Nougat Download	24	armeabi-v7a	Android 7.0
Marshmallow Download	23	armeabi-v7a	Android 6.0 (Google APIs)
Lollipop Download	22	armeabi-v7a	Android 5.1 (Google APIs)
Lollipop Download	22	armeabi-v7a	Android 5.1
Lollipop Download	21	armeabi-v7a	Android 5.0 (Google APIs)
Lollipop Download	21	armeabi-v7a	Android 5.0
KitKat Download	19	armeabi-v7a	Android 4.4 (Google APIs)
KitKat Download	19	armeabi	Android 4.4 (Google APIs)
KitKat Download	19	armeabi-v7a	Android 4.4
Jelly Bean Download	18	armeabi	Android 4.3 (Google APIs)
Jelly Bean Download	18	armeabi-v7a	Android 4.3 (Google APIs)

Lollipop

API Level
21

Android
5.0
Google Inc.

System Image
armeabi-v7a

Recommendation
/dev/kvm is not found.

Consider using an x86 system image on an x86 host for better emulation performance.
Troubleshoot

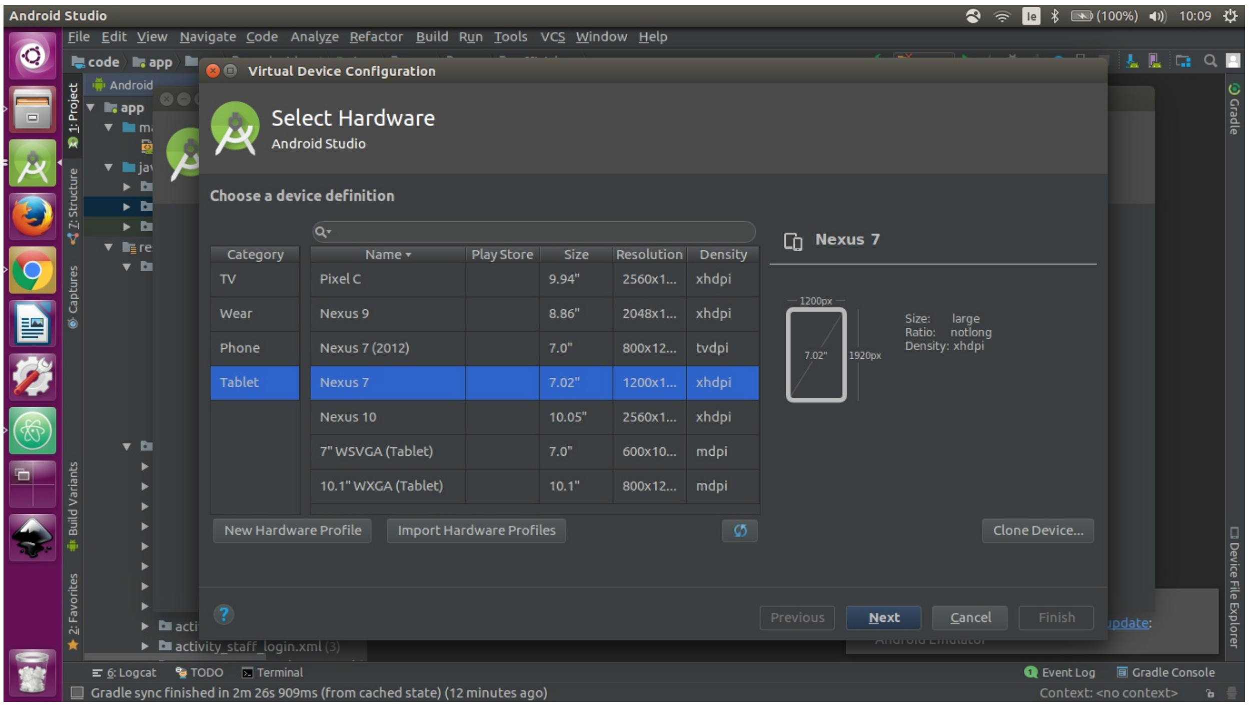
A system image must be selected to continue.

Gradle sync finished in 2m 26s 909ms (from cached state) (12 minutes ago)

- Click "Finish"
- Select "Lollipop API level 21" as highlighted above
- Click "Next"
- Click "Finish"

Tablet Emulator

- Select Phone
- Select Nexus 7 as highlighted below



Virtual Device Configuration

Select Hardware
Android Studio

Choose a device definition

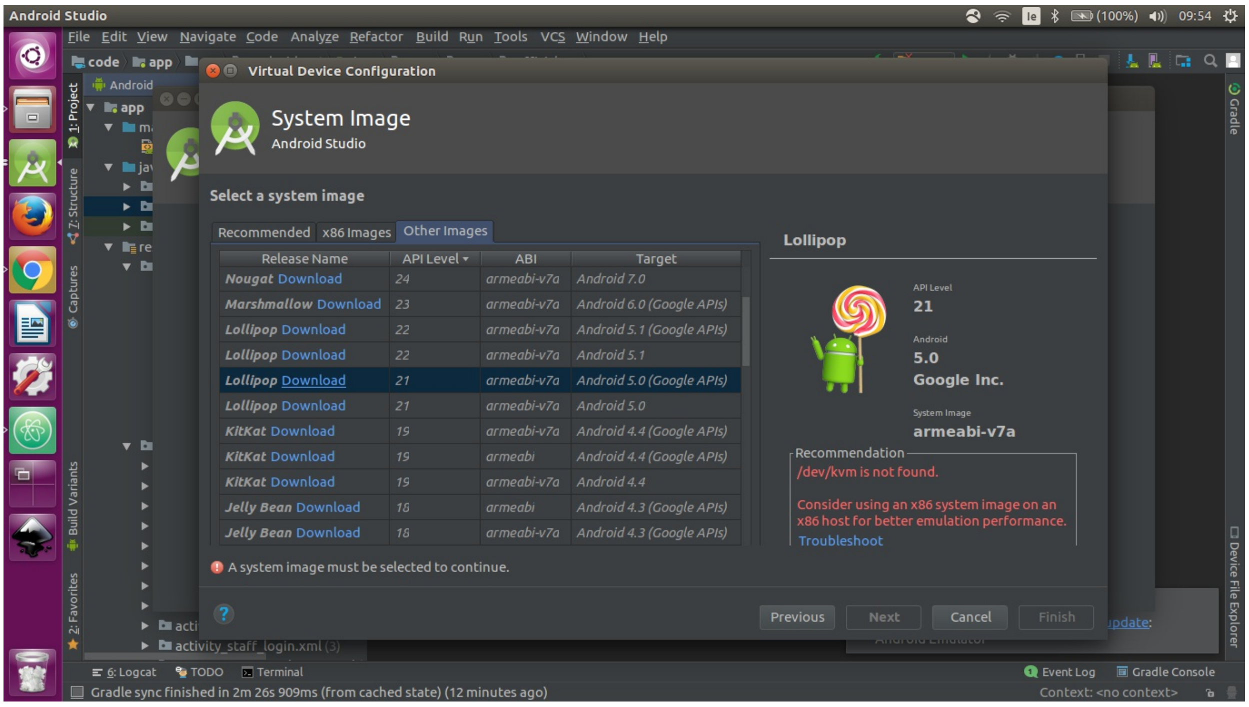
Category	Name	Play Store	Size	Resolution	Density
TV	Pixel C		9.94"	2560x1...	xhdpi
Wear	Nexus 9		8.86"	2048x1...	xhdpi
Phone	Nexus 7 (2012)		7.0"	800x12...	tvdpi
Tablet	Nexus 7		7.02"	1200x1...	xhdpi
	Nexus 10		10.05"	2560x1...	xhdpi
	7" WSVGA (Tablet)		7.0"	600x10...	mdpi
	10.1" WXGA (Tablet)		10.1"	800x12...	mdpi

Nexus 7

Size: large
Ratio: notlong
Density: xhdpi

Gradle sync finished in 2m 26s 909ms (from cached state) (12 minutes ago)

- Select "Other Images"
- Select "Lollipop API level 21" as highlighted below
- Click "Download"



Virtual Device Configuration

System Image
Android Studio

Select a system image

Recommended | x86 Images | Other Images

Release Name	API Level	ABI	Target
Nougat Download	24	armeabi-v7a	Android 7.0
Marshmallow Download	23	armeabi-v7a	Android 6.0 (Google APIs)
Lollipop Download	22	armeabi-v7a	Android 5.1 (Google APIs)
Lollipop Download	22	armeabi-v7a	Android 5.1
Lollipop Download	21	armeabi-v7a	Android 5.0 (Google APIs)
Lollipop Download	21	armeabi-v7a	Android 5.0
KitKat Download	19	armeabi-v7a	Android 4.4 (Google APIs)
KitKat Download	19	armeabi	Android 4.4 (Google APIs)
KitKat Download	19	armeabi-v7a	Android 4.4
Jelly Bean Download	18	armeabi	Android 4.3 (Google APIs)
Jelly Bean Download	18	armeabi-v7a	Android 4.3 (Google APIs)

Lollipop

API Level
21

Android
5.0
Google Inc.

System Image
armeabi-v7a

Recommendation
/dev/kvm is not found.

Consider using an x86 system image on an x86 host for better emulation performance.
Troubleshoot

A system image must be selected to continue.

Gradle sync finished in 2m 26s 909ms (from cached state) (12 minutes ago)

- Click "Finish"
- Select "Lollipop API level 21" as highlighted above
- Click "Next"
- Click "Finish"

Running the Application

- On the Toolbar at the top of the page click "Run"
- Select "Run App"
- Select your AVD "Nexus 5X API 21" (mobile) or "Nexus 7 API 21" (tablet)
- Click "Ok"
- The application will now launch