

# Evaluation of Android Networking Libraries

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**Abstract -** Every single person in our population has mobile and most of the work doing through mobile phone. Now expansion of internet, mobile technology becomes more popular. For this android development has really charm for us. This paper deal with networking libraries used in mobile for network communication. Therefore, there are lots of open source network libraries that mobile developers use on a daily basis for development. At this time the problem is find out which solution fits for better android app projects development necessities. Thus, android developers face the tendentiousness of selecting an appropriate network library for their specific mobile application. To reduce the challenge, this paper proposes an empirical method for benchmarking, which includes evaluation of selected libraries and a selection of representative metrics. Here we have four android networking libraries Http Client, Volley, Retrofit and Fast Android Networking are selected for evaluation. This paper examine these libraries and find which library is suitable for developers as their necessities so that they provide better experience to mobile app users.

**Keywords-** Network Library, REST API, Client-Server Communication, Services, APK

## I. INTRODUCTION

Beginning of android app development networking has played a critical role for android developers. Most of apps doesn't work on properly, rather, they connect to an online services to retrieve data or perform other networking functions. In which such functions like loading images, requesting data from an API server or downloading media files or getting a single byte from your server through internet, these can be done through networking. In open source world i.e. over internet there are a lot of good libraries out there and developers has not need to reinvented, but given libraries how complex and omnipresent networking is on Android, every android developers has one common question,

Face when they start researching about networking libraries is which libraries should I use? which supports mostly cover all features? what's the difference between them? what do I actually need? On one side developers have a bunch of openly small libraries available on internet, they only focused on solving one specific problem that you can stack on top of each other and needs combine to achieve your need of project.

Other side you have some libraries which look more like handle a lot of different scenarios related and Swiss knife and can with networking root of so many great networking libraries is that the offered options in the Android framework are not great and they were a mess to deal with in the old days. Developers had to write a lot of code each time when you request an API data, and probably you'll be

doing a sub-optimal job. This was the objective scenario to solve above discussed problem so a lot of libraries started to appear and evolve.

## II. LITERATURESURVEY

Network libraries main work is that it allow communication between Android mobile apps to other devices, online services and to calling of asynchronous network requests. For this research paper we research top500 play store available apps. Which works on networking for server communication? We get results which last updated on June 22, 2019. The result was found that Retrofit most of the application uses then other networking libraries.

Fig. 1 Android Apps percentage available on playstore uses Different Networking Libraies last updated on June 22, 2019

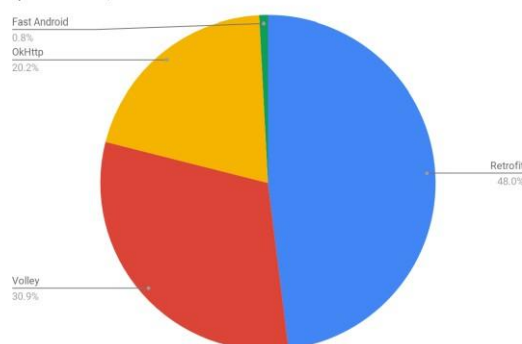


Figure1 Network Libraries on Play Store.

Current time we seeing continuous advancement changes in the mobile technology is in the market, the users of these latest libraries are also increasing. Currently available most popular android networking libraries are with no doubt Fast Android Networking Library, Retrofit, Volley and OkHttp. Recently, Fast Android Networking Library is reaching more popularity. These are the list of all networking libraries in android. Retrofit, Volley, OkHttp, Fast Android Networking, Jus, Net Request, Iris, RoboSpice, Simple Http, Thunder, android-http-client, HttpBuster, Perfecto, Web Service Connect, Smash etc.

### III. PROBLEM STATEMENT

This section covers experiment on features supported by networking libraries, android networking libraries[8][9] HTTPUrl Connection with AsyncTask, Volley, Retrofit[3] and Fast Android networking which supports request sending in background and they support post requests and multipart file uploads. Table 1 – list out the different features supported by these libraries for network communications which shows that Volley, third-party libraries have advantages like catching, prioritization, multiple requests, Image loading and many more[4][5][6]. Whereas fast android networking library supports all the features which are available in other networking libraries and that features are useful for developers. Features/Functionalities HTTP Url Connection with Async Task Volley Retrofit Post Request Multipart Uploads Multiple Request Types JSON Request etc.

Table 1 Different features supports by Android networking libraries

Features	Http Client	Volley	Retrofit	Fast Android Networking
Multipart	Yes	Yes	Yes	Yes
Different Request Types	No	Yes	Yes	Yes
JSON Request	No	Yes	Yes	Yes
Priorities	No	Yes	No	Yes
Multiple requests	No	Yes	No	Yes
Caching	No	Yes	Yes	Yes
Image Loading	No	Yes	No	Yes

Retry Mechanism	No	Yes	Manual	Yes
Manual Request Cancellation	No	Yes	No	Yes

Next we benchmarking network libraries which is Http Client, Volley, Retrofit, Fast Android Networking. After that we find different results in various test sets, in which different result that is response time we get. So different test has various results by using these result sets we create figures in graphical view which easily understands the result of the tests.

Retrofit, Volley, HttpClient and Fast Network Library

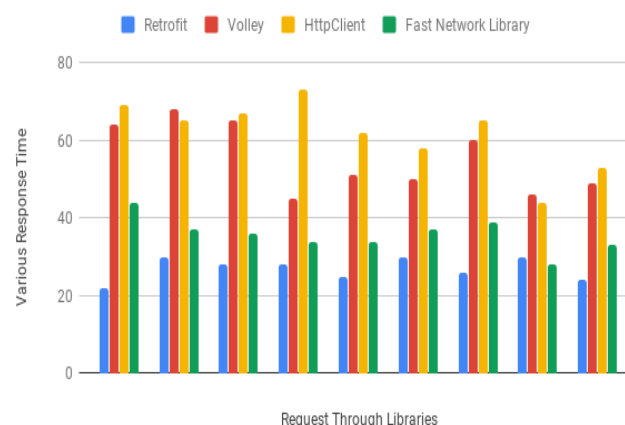


Figure2 Response Time When Single Request by libraries.

When we request a service one by one then figure 2 describes results of the networking libraries, as well as table 2 shows the response time in milliseconds. In this test retrofit wins the test.

Retrofit > Fast Android Network > Volley > HttpClient  
Table 2 Response Time with Single Request by libraries

Retrofit	Volley	Http Client	Fast Network Library
22	64	69	44
30	68	65	37
28	65	67	36
28	45	73	34
25	51	62	34

When we test these library in test sets 50 times to 100 request sets then we find the minimum response time, then figure 3 describes results of the networking libraries,

as well as table 3 shows the average response times in milliseconds of the test sets. In this test some time fast networking library wins the test and sometimes retrofit wins.

Retrofit > Fast Android Network > Volley > HttpClient  
Fast Android Network > Retrofit > Volley > HttpClient

Requests	Retrofit	Volley	Http Client	Fast Network Library
Test 1	39.4285	70.19047	997.85	30.476190
Test2	31.4285	50.1904	297.857	34.476190
Test 3	36.4285	60.1904	697.857	35.476190
Test 4	45.4285	54.19047	597.857	36.47619

Average Response Time of Network Libraries

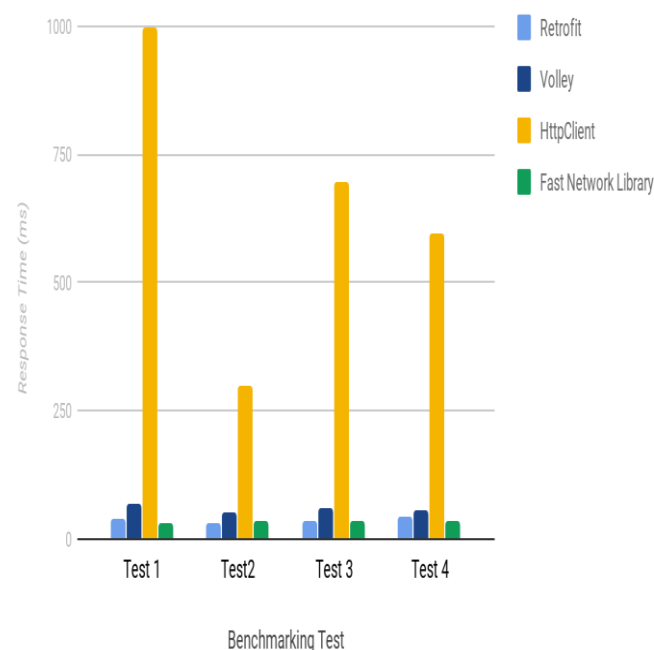
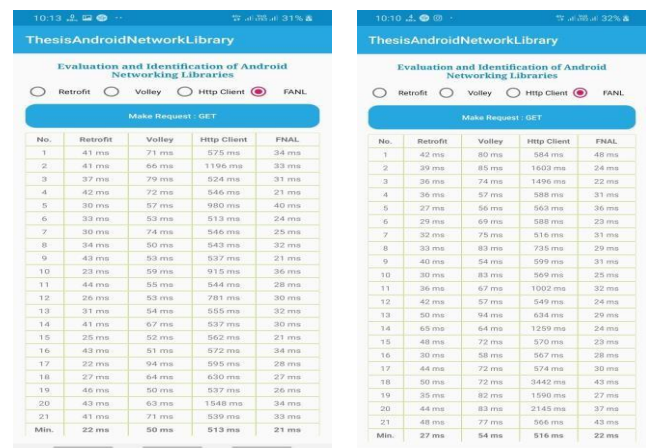


Figure 3 Average Response Time in various test.

Network[1], Volley ID3[3] and HttpClient libraries. As well as from all the response graphs under time, we can observe that the retrofit and Fast Android Network [3] is provided mostly similar response time. Volley and the Http Client as slower than retrofit and fast android network. Retrofit almost outperforms for all the libraries which is in competition with single request as well as multiple request test case. Some Screenshots of the implemented mobile application are also shown below which shows request and their response time with various scenarios:



No.	Retrofit	Volley	HttpClient	FNAL
1	41 ms	71 ms	575 ms	34 ms
2	41 ms	66 ms	1196 ms	33 ms
3	37 ms	79 ms	524 ms	31 ms
4	42 ms	72 ms	546 ms	31 ms
5	30 ms	57 ms	980 ms	40 ms
6	33 ms	53 ms	513 ms	24 ms
7	30 ms	74 ms	546 ms	25 ms
8	34 ms	50 ms	543 ms	32 ms
9	43 ms	53 ms	537 ms	21 ms
10	33 ms	59 ms	915 ms	36 ms
11	44 ms	55 ms	544 ms	28 ms
12	26 ms	53 ms	781 ms	30 ms
13	31 ms	54 ms	555 ms	32 ms
14	41 ms	50 ms	537 ms	30 ms
15	25 ms	52 ms	562 ms	21 ms
16	43 ms	51 ms	572 ms	34 ms
17	22 ms	94 ms	595 ms	28 ms
18	27 ms	64 ms	630 ms	27 ms
19	46 ms	50 ms	537 ms	26 ms
20	43 ms	63 ms	1548 ms	34 ms
21	41 ms	71 ms	539 ms	33 ms
Min.	22 ms	50 ms	513 ms	21 ms

No.	Retrofit	Volley	HttpClient	FNAL
1	42 ms	80 ms	584 ms	48 ms
2	39 ms	85 ms	1603 ms	24 ms
3	36 ms	74 ms	1496 ms	22 ms
4	36 ms	57 ms	588 ms	31 ms
5	27 ms	56 ms	563 ms	36 ms
6	29 ms	69 ms	588 ms	23 ms
7	32 ms	75 ms	516 ms	31 ms
8	33 ms	83 ms	735 ms	29 ms
9	40 ms	54 ms	599 ms	31 ms
10	30 ms	83 ms	560 ms	25 ms
11	36 ms	67 ms	1002 ms	32 ms
12	42 ms	57 ms	549 ms	24 ms
13	50 ms	54 ms	634 ms	29 ms
14	65 ms	64 ms	1259 ms	24 ms
15	48 ms	72 ms	570 ms	23 ms
16	30 ms	58 ms	567 ms	28 ms
17	44 ms	72 ms	574 ms	30 ms
18	50 ms	78 ms	3442 ms	43 ms
19	35 ms	82 ms	1590 ms	27 ms
20	44 ms	83 ms	2145 ms	37 ms
21	48 ms	77 ms	566 ms	43 ms
Min.	27 ms	54 ms	516 ms	22 ms

Retry mechanism is a main functionality for android application developers because many functions depends on re-fetching of data through service. Most of the time request fails at this time we have to recall this service at this point if we recreate whole service and add into request then we waste time and effort of processor. Example when internet slow or not available then we have to just retry that request not re-create again. We can usually 3-4 time retry request as per need of project. Libraries which uses retry mechanism is a good useful library.

Volley supports retry mechanism. Also volley support timeout the request. While we create volley request we set retry policy, request time-out, and retry attempts. By default android volley request timeout time is set to 5 seconds. But if we want to change the policy, retry attempts and timeout it supports that too. We can modify these feature according to our need of projects:

- Timeout
- Back Off Multiplier
- Number Of Retries

Retrofit has not any retry mechanism. So this is a major drawback of this library. As of now not available but may be added into future. Fast Android Networking also does not have a retry mechanism. Although they might will add a retry mechanism in upcoming version. HttpClient also have not a retry mechanism. Therefore when comparing these selected top uses libraries Android Volley, Fast Android Networking, Retrofit, and HttpClient, Volley wins this one.

Volley > Retrofit > Fast Android Network > HttpClient. So from all the experiments and comparing features of network libraries analyze the result is Retrofit and Fast Android Networking library provide the better results as compare to OkHttpClient and Volley. But Fast Android Networking Covers all the features which are available in other libraries and fulfill need of developers.

## VI. CONCLUSION

In this research we evaluated different network libraries for network communication in android. Today's time mobile app almost uses in all area for doing their work. So this is necessary to find such a libraries which provide better server communication in mobile app. This study is reduce the efforts of the android developers for making network communication in mobile app. we discuss performance evaluation matrices such as response time, different features. Form the implemented libraries experiment results, observed that Retrofit and Fast Android Networking library provide the fast result of network request. We perform different test cases in which 50-60 requests executes and analyse the response time of libraries. After test response time comes 40-50% faster than other old libraries.

Next we compare features supported by different networking libraries. Then analyse is comes that most of the features are in volley and HttpClient is supported by Fast Android Networking library and also all the features are in Retrofit is also available in Fast Android Networking library. So the result comes from this result analysis is that android developers use Fast Android Network Library or Retrofit into their mobile application. Basically Fast Android Networking is best for android developers. In future work can add more libraries to evaluate and identify network libraries, which provide better response time to user. So that it will help android app developers to overcome their efforts to identify networking library for their application.

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