Network Variability Impacts Mobile Application Performance

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Abstract: Internet connectivity became a mandatory on mobile device in recent days. Due to memory constrain and dynamic data management developers were going for the web application or hybrid application development approach for the morden mobile applications. Web applications completely depend on the internet and hybrid applications partially depend on internet. For both cases the network connectivity is mandatory. This paper aim to compare the different speed of the network and based on that what is the impact of the mobile application performance has been analysed.

Keywords: Mobile Network, 4G, 5G, Wi-Fi.

1. Introduction

Mobile application usage has been increased greatly in the computing environment. Starting from education to enterprise mobile applications are dominating. There are applications which works without the networks. But most of the applications running depending on the networks. In case of network independent mobile applications are makes use of local storage to store data. On the other hand the network depended mobile applications always need the networks to communicate with the server or database. The network used for this communication may vary from 2G to 5G [1]. The impact of the network speed has the direct proportion in the performance of the mobile application. This performance also has the impact on the user experiences [2] and behaviour of the application. The below figure 1 show the mobile application communication with server / database. The network connectivity testing on an ideal network is complex and challenging task. There are different bandwidth existing. The communication network for the mobile application either Mobile Network or Wi-Fi. The both network connectivity has variations on the connection speed depends on the infra structure and subscriptions. In India the basic mobile network infrastructure starts from 2G connectivity. Still many service providers having the 2G network for the communication in the remote area. The speed of the 2G network is slow when compared with 3G networks. When comparing with 4G network the 3G network not much slow.

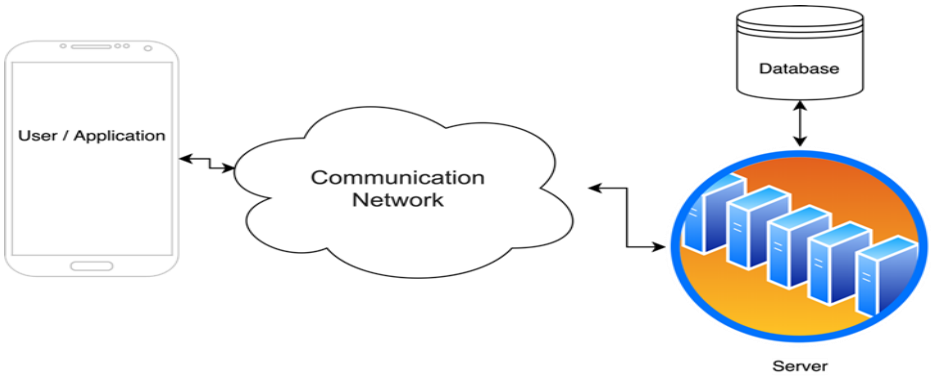

Fig 1: Mobile Application communication with Server / Database

These speed variation gives some uncomfortable user experience and performance degradation due to the delay. In case of Wi-Fi the speed depend mostly on two aspects. First aspect is the type of connectivity user has the subscribed and the next number of users connected with that wi-fi hot spot or node.

The testing environment can be arranged in the following diversity. A network with slow speed, medium speed and fast speed connectivity [3]. Also for Wi-Fi a good speed connectivity with no user and Wi-Fi with more number of users connected also open Wi-Fi networks.

2. Impact of slow network

The network has many impacts on the mobile application performance and user experience. The major impacts are communication delay or break with server / database, unexpected behaviour of application, performance issues and loss of data.

Serious effects may cause on the mobile application due to the sudden change in the network on wireless communication with the server. Mobile application may be freezes, UI collapses, data mismatch when there is no network to communicate. Network issues leads to a varying performance. Hang, slow down or crash are some issues in mobile application while it facing network issues. Data on the application might lose when there is a sudden loss of networks.

3. Testing setup environment

The performance based on network can be analysed using the following scenarios. The mobile application must be selected to fully or partially depend on networking. The network must be selected in various speed.

There are three mobile application has been selected for the testing purpose. First application MAD Lab Manuel, Second application MAD and third application is CC1SS202021. The reason for selecting these application is the first application fully independent on network, second one partially dependent on network and last application fully depend on network. The performance has been analysed on different networks. The mobile network with different speed and wi-fi with different constrains.

3.1 Mobile Application

The applications used for this testing has been one three category. First category not depending on network. Next category partially depend on network finally category fully depend on network.

- MAD Lab Application :

This application used to refer the programs and sample output for the Mobile Application Development Lab. All documents were stored locally on assert folder so these files can be accessed without the network connection.[5]

- MAD Application :

This application has 50% data in the assert folder remaining 50% data stored in web space. The WebView has been used to fetch and display the contents stored in web space. The firebase database also used for storing and retrieving the data. To get the data from web space the network connectivity is mandatory. Based on the network speed the data will be fetched faster. When the application connected with network 100% data can be accessed. [6]

- CC1SS202021:

This application 100% depend on the network. All data stored in the webspace. When user needed the pages loaded from the webspace. If network connection not available then user not able to access the data. [7]

3.2 Mobile Network Selected

The network has been selected the in two major aspect. First mobile network and second Wi-Fi network. Below table 1 list out the mobile networks and speed used for the performance analysis and the table 2 list the Wi-Fi network. The speed has been checked using google speed test tool

- Mobile Network:

Sl.No	Type of Network	Service	Speed
1	Slow Network	2G	Download: 2 Mbps Upload : 0.2 Mbps
2	Medium speed network	3G	Download: 5.20 Mbps Upload : 0.70 Mbps
	Medium speed network	4G	Download:15 Mbps Upload : 0.85 Mbps
3	Fast Network*	5G*	Download: 100 Mbps* Upload : 10 Mbps*

- Wi-Fi Network

Sl.No	Type of Network	Service	Speed
1	Single User connected Wi-Fi	Fibber Connection	Download:63 Mbps Upload : 5.01 Mbps
2	Multiuser connected Wi-Fi	Open Network	Download: 10 Mbps Upload : 1 Mbps

3.3 Important Checkpoints to Consider

While testing the network first need to understand the constraints and points to check. When connected with network, check the application working with sync with web space. List the error that may occur when the application not connected with network. Check the performance of applications under various network conditions.

4. Performance of application:

The following table 1 gives the performance of the application on different network

Table 1: Mobile Application Performance on different network

Network / Application	2G	3G	4G / 5G*	Wi-Fi -Single User	Wi-Fi - Open Network
MAD Lab	Working	Working	Working	Working	Working
MAD	50% work well. 50% data loading from the space takes longer time. Large size files Not loaded.	Working well on when good network strength	Working well, not much delay.	Working well, not much delay.	Working well, some delay.
CC1SS202021	Not working properly	Working well when good signal strength	Working well, not much delay.	Working well, not much delay.	Working well with some delay in loading the content.

From the above table it is clearly observed that the mobile applications working well when connected with fast network connection, Wi-Fi with single user, medium speed with good strength. Some delay occurring when medium speed network with poor signal strength and Wi-Fi with more users. Not working properly when the application connected with slow network.

5. Conclusion:

This paper impact of the network on mobile application performance has been analysed. The analysis results clearly showing that if any mobile application depending on network connection need good signal strength network or good speed Wi-Fi for the best performance. Mobile application suffering with some delay when connected with medium speed and open Wi-Fi network. Slow networks are not suitable for the mobile applications which has full dependence on web space. Hence when the user trying to use the application with either partial or full dependence on web space are recommended to have a good network connectivity such as 4G / 5G or Single user high speed Wi-Fi.

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