Ad hoc Collaboration Space for Distributed Cross Device Mobile Application Development Using WiFi Direct (ACS)

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I would like to dedicate this thesis to my loving family ...

Declaration

I hereby declare that except where specific reference is made to the work of others, the contents of this dissertation are original and have not been submitted in whole or in part for consideration for any other degree or qualification in this, or any other university. This dissertation is my own work and contains nothing which is the outcome of work done in collaboration with others, except as specified in the text and Acknowledgements.

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Abstract

Over the last few years, we have seen an enormous increase in the usage of electronic devices smart phones, tablets, laptops, TVs and wearables, which are developed by different manufacturer for different platforms. People surrounded by these devices need to interact with them during the meeting, presentation, class room and lots of other collaborative activities to share and receive information across the devices. However, the interaction among these devices is still device centric and dependent on the expensive fixed software and hardware infrastructure. In a situation, where fixed infrastructure service does not exist, suspended or disrupted due to some reasons, the interaction across these devices is not possible. In this study we have presented the framework that provides the highly performing reliable ad hoc network as well as facilitate the development of cross device distributed mobile applications without using any fixed expensive infrastructure. The novelty of our approach is that it has reduced the application development time by hiding the complexities and providing the easy to use API's for application developer to build distributed mobile applications. Otherwise, the development takes extra time and distract the developer to build cross device applications due to high complexity level. This framework supports diverse types of android based devices of different manufacturer and all interactions are done using the WiFi Direct that enables the nearby devices to communicate with each other without the need of any common access point.

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Chapter 1

Introduction

We have seen a flourishing increase in the demand of electronic devices during the last few years. Many different types of devices such as tablets, mobiles and smart watches are easily available in the market on an affordable price offered by different manufacturer for different platforms. A large [48] number of users are connected/engaged with one or more devices as per their convenience and services provided by these devices. This growing trend leads towards the requirements of distributed cross device collaborative spaces that facilitate the seamless collaboration across these devices. The distributed cross device spaces [52,53] is an emerging research area, where UI components are distributed across multiple devices and facing number of challenges such as interoperability, data synchronization, data transfer efficiency, fault tolerance and resource management.

The ubiquitous computing vision of Weiser's [2] to seamlessly integrate the multiple devices of different sizes and capabilities in order to share the program and data has clearly defined the concept and need of collaborative cross device interaction. In such type of systems, functionality and interactions are distributed across more than one devices and these devices actively participate in the collaboration activity. Recent researches [46,47] have highlighted the benefits of devices coordination and proved that the true implementation of ubiquitous computing vision is near to arrive.

Sørensen [4] has categorized the cross device interaction into four categories communality, collaboration, continuity, and complementary on the basis of device usage as sequential and simultaneous. The first theme communality refers to situation where many users are interacting with the device sequentially for example Koday's facebook photo-printing machine. The second theme collaboration covers situation of simultaneous interaction by many users, where interface components are distributed among the users, for example division in a multi-player game. Related to this type of interaction, researches [24,25] have been conducted in the past to investigate the collaboration between the users in multi device