

Device Connection and Contents Delivery for Second Screen Service

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Abstract. Along with the improvements of smart devices, the ways of approaching contents are becoming more diverse. Especially in broadcasting services, Second Screen Service based hybrid network, a collaboration of original and web contents, is drawing much attention. This study proposes foundational techniques for providing second screen service by using device connection and contents transmitting techniques. Public and private devices use UPnP to find each other and WebSocket to deliver contents. Through these processes, the contents displayed and other additional contents in a public device are able to be delivered and shown in private devices.

Keywords: Second Screen Service, Second Screen Device, WebSocket, UPnP, Contents Delivery, SmartTV, Broadcasting

1 Introduction

As the types of contents and devices that can use contents are becoming more diverse, the ways of approaching contents are also becoming diverse. In broadcasting, by interlocking second devices with Smart TV's, Second Screen Service based hybrid network can be made. This allows second screen devices to also view the broadcasted contents and other web contents from the TV, along with information about these contents. Second Screen Service is similar to the concept of devices collaborating whereas the TV and other devices are connected, allowing Smart Phones, Tablet PCs, and other devices to help the TV broadcast contents. In order for various devices to smoothly provide Second Screen Service, they need to be able to identify each other regardless of hardware specifications, and send the required data to the right device. Therefore, this research proposes the techniques of using UPnP to discover devices and WebSocket to send real-time contents to provide Second Screen Service.

2 Entire System Map

The main goal of this research is to show private devices through Second Screen Service, the additional and original contents displayed in public devices. This goal is mapped out in Fig. 1.

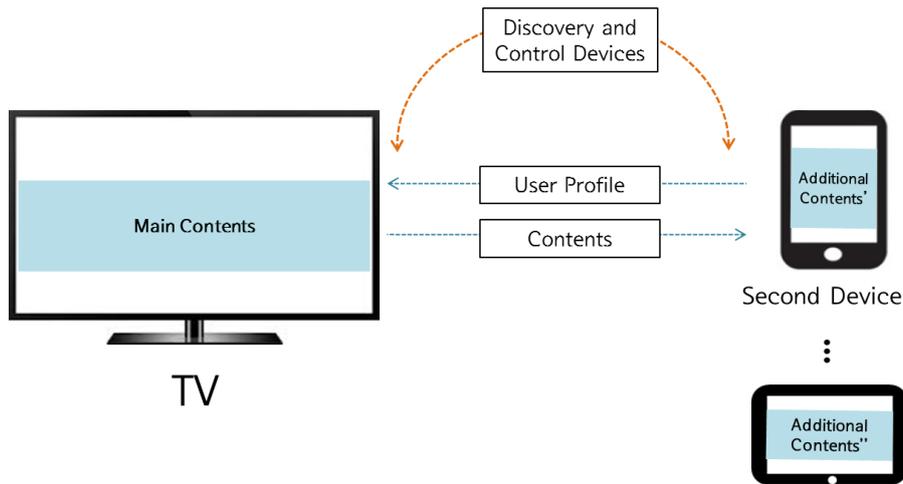


Fig. 1. Entire System Map

Second Screen Service takes place between public devices, such as the Smart TV, and private devices, such as second screen devices. While main contents are displayed in TVs, additional contents are played in second screen devices. The additional contents are related to the contents displayed in TVs, which allows the types of the contents to be changed when sent to TVs from second screen devices. In order to play any additional contents in second screen devices, the techniques to connect a TV and a private device and deliver contents are needed. By using techniques of UPnP and WebSocket, these tasks can be achieved.

3 Connecting Devices and Sending Contents

3.1 Connecting Devices by UPnP

UPnP connection requires six stages: assign addresses, discover devices, earn certain techniques, control, event, and present [1]. In the stage of assigning addresses, if TVs and second screen devices access a common network and search the DHCP (Dynamic Host Configuration Protocol), these devices each receive an IP. In the stage of discovering devices, second screen devices use the SSDP (Simple Service Discovery Protocol) Protocol to search TVs. When a TV is discovered, the second screen device requests for the TV's technical and service technique documents. Then in the

controlling stage, the information earned from the previous stage are analyzed. The second screen device then sends a command to the TV through SOAP(Simple Object Access Protocol). In the event stage, the changes in the variables that represent the TV's condition are watched over. As these are notified to second screen devices, second screen devices are operated [Fig. 2] [2].

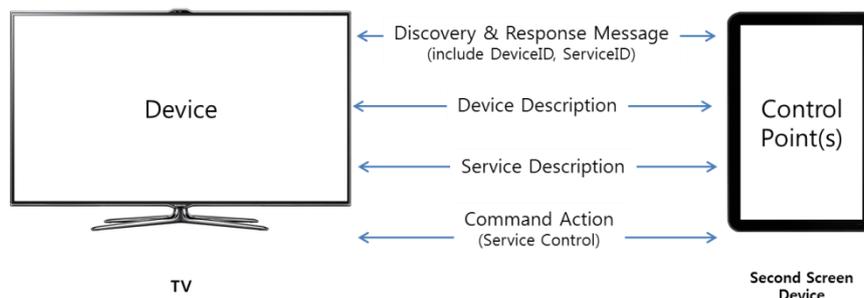


Fig. 2. UPNP Connection Process.

3.2 Sending Additional Contents Using WebSocket

TVs can send real-time additional contents to second screen devices. WebSocket use HTTP communication to allow connection among web browsers and among web servers. Therefore, applications installed on each device are produced by web apps and are able to support WebSocket. If a web app in a device is accessed, the app sends a request for connection to WebSocket through web servers. Then if the Web Servers and browsers connect, communication between these becomes possible [Fig. 3][3].

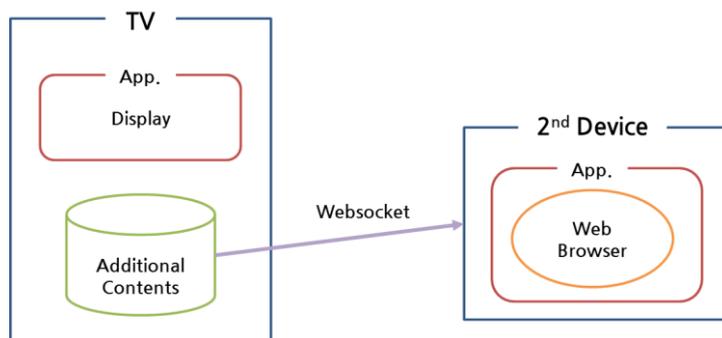


Fig. 3. WebSocket Communication between Second Screen Devices.

4 Results and Further Research

We have implemented in this study are as follows: Foremost, second screen devices access service pages, and the notebook acting as TVs access web pages and play TV programs. The buttons for connection in service pages, which are in second screen devices, help attempt to access UPnP. When the temporarily saved segment files start playing, the notebooks acting as TVs send second screen devices a message. This message, which is delivered by image buttons, says that the notebooks have each of the second screen devices' contents. If an image button is pressed in second screen devices, a request to assign additional contents to the right image is sent to a server. If the server accepts the request, the related additional contents are streamed. All of these, which includes image buttons and playing or displaying additional contents, occur real-time through WebSocket.

Recently, with smart TVs in home networks as the foundations, more and more studies of linking diverse second screen devices to provide second screen service are being made. This research examines the techniques of linking devices and sending real-time contents to ultimately provide Second Screen Service. The accomplishment of this research is that by using standard technology, the research attempted to examine in depth about the connection and deliverance of contents between public and private devices. Through the use of standard technology, this research enforced that every type of device was able to use services.

Furthermore, by applying this study to broadcasting systems, and send web contents related to broadcasted contents through transfer technology, we hope to see the use of Second Screen Service to be commercialized.

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