

# Companion Devices and Sharing the Content Between

## Companion Devices and Set Top Box

Santosh Kumar K S<sup>1</sup>, Manjunath A E<sup>2</sup>, PardhaSarathy CH.<sup>3</sup>, ShivakumarB.M<sup>4</sup>

Student, M.Tech (CSE), RVCE, Bangalore, India<sup>1</sup>

Assistant Professor, CSE, RVCE, Bangalore, India<sup>2</sup>

Student, M.Tech (CSE), RVCE, Bangalore, India<sup>3</sup>

Student, M.Tech (CSE), RVCE, Bangalore, India<sup>4</sup>

**ABSTRACT:** Companion devices have become common in households. The Set Top Box is being geared up to interact with them. This document tries to describe the interactions between the various devices in the home network. The focus shall be on the activity of the consumers.

**Keywords:** Companion Devices, Set Top Box, Streaming, Secondary storage.

### I. INTRODUCTION

#### UPnP (Universal Plug and Play)

“Universal Plug and Play (UPnP) is a set of networking protocols for primarily residential networks without expert administrators that permits networked devices, such as personal computers, printers, Internet gateways, Wi-Fi access points and mobile devices to seamlessly discover each other's presence on the network and establish functional network services for data sharing, communications, and entertainment.”

In the context of the Set Top box and Companion Devices functionality, two features of UPnP are used: UPnP basic architecture and UPnP AV architecture.

#### UPnP Basic Architecture:

UPnP basic architecture defines how two home network devices automatically detect each other and share basic information about the capabilities and the services supported by each device. UPnP describes two entities – devices that supply services and control points that utilize those services. Those entities are logical; the same physical entity may contain one or more devices and one or more control points.

The architecture is described in [UPnP Basic Device] and contains the following parts:

- Addressing – can be done either by using DHCP or by using hard-coded IP addresses in an “Auto IP” mechanism.
- Discovery – based on SSDP protocol, each device advertises its presence. Control points and devices use this protocol to search for other devices in the home network

- Description – the device provides information about the device itself and about the services that the device support, using XML documents provided via HTTP request
- Control – the control point may invoke actions on the services supplied by the device. Those actions are SOAP commands.
- Eventing – the control point may monitor changes to evented state variables of a service. Notifications about changes are broadcast or sent via unicast to registered clients. Registration for unicast notifications and sending the notifications are using the GENA protocol on top of HTTP. Multicast notifications are sent using UDP multicast
- Presentation – UPnP enables support for remote UI functionality where the control points renders HTTP pages it receives from the service. Using remote UI replaces the need for actions and state variables.

#### UPnP AV architecture:

The UPnP AV architecture describes how two home network devices – a media server and a media renderer can interact in order to display media content over the home network.

The UPnP AV architecture describes in [UPnP AV Architecture] several models for accessing media content across the home network.

The Media Server device can provide the following services:

- Content Directory Service (CDS) for browsing listings of available content



- Scheduled Recording Service (SRS) for making bookings for record and managing conflicts related to those bookings
- Connection Manager (CM) for creating a session for presenting media
- AV Transport (AVT) for controlling a media session

Note: AVT services for Media server device “streams” the content to the client device

The Media Renderer device can provide the following services:

- AV Transport (AVT) for controlling a media session

Note AVT service for Media renderer device “plays” the content locally on the STB

- Connection Manager (CM) for creating a session for presenting media
- Rendering Control Service (RCS) for controlling the settings (Volume etc) of the STB.

The Control point device can discover devices and services in the home network. The control point device can control the media server and media renderer devices.

#### DLNA (Digital Living Network Alliance)

The DLNA organization specifies a set of restrictions over several standards used in the home network domain in order to enable better inter-operability between media devices in the home network.

The DLNA specification contains:

- Guidelines for the usage of UPnP Basic Architecture and UPnP AV architecture to enable better inter-operability. For example, restricting the size of the messages used across the home network
- A large set of supported media formats profiles
- How information about media format profiles is communicated between server and renderer
- Guidelines for link protection mechanism

#### I. USE CASES - STB USER INTERFACE

##### MediaShare Use Case:

##### Use Case – I want to watch my personal content in Laptop on the Big screen TV



Figure 1: PC and STB communication

The Viewer is browsing the content from the Laptop using the STB User interface. The STB is acting as a control point in the UPnP network. The STB does not expose a media renderer device. STB plays back the content through HTTP from the Laptop. Currently STB is integrated with the Tversity Media server in the Laptop. Planning is underway to make the STB work with any standard UPnP Media server device.

Note The Media server in the STB is not used in this use case.

#### Multi-room DVR Use cases:

##### Use Case - I want to watch my personal content in Other STB's on the Big screen TV



Figure 2: communication between multiple STB's

The Viewer is browsing the content from the Server STB using the Client STB User interface. The client STB is acting as a control point in the UPnP network. The server STB exposes a CDS service that is used by the companion device for browsing the server STB. The server STB does not expose a media renderer device.



Client STB uses Option 2) as mentioned in the “Browse Planner” section to display the server STB planner.

Client STB displays the catalog of the chosen server in MR DVR.

Client STB shall display the Unified catalog of all servers (STB’s) in the home network in MR DVR Phase 2.

Client STB plays back (streams) the content through a proprietary ARA protocol from the server STB.

### Use cases - Companion Device User Interface

#### Use case - I want to browse the recordings on my STB from my iPad and Play them on the STB:



Figure 3: planner browsing from STB on CD.

The Viewer is browsing the content from the Server STB using the Companion device application. The companion device is acting as a control point in the UPnP network. The STB is acting as a media server device in the home network. The server STB exposes a CDS service that is used by the companion device for browsing the server STB. The server STB also exposes a Media renderer device.

Companion device browses the planner as mentioned in the “Browse Planner” section to display the server STB planner.

Companion device controls the STB by requesting to playback the content in the STB. Companion device uses the AVT service of the media renderer device for starting playback in the STB.

Note The playback happens on the STB and is not streamed from STB.

#### Use Case – I want to browse the Service list and EPG Guide on my iPad and Play them on the STB:



Figure 4: List and Guide browsing from STB on CD.

The Viewer is browsing the content from the Server STB using the Companion device application. The companion device is acting as a control point in the UPnP network. The STB is acting as a media server device in the home network. The server STB exposes a CDS service that is used by the companion device for browsing the server STB. The server STB also exposes a Media renderer device.

Companion device browses the service list and the guide information as mentioned in the “Browse Planner” section to display the Guide.

The service list information can be used to “Search” for events of that service in the EPG container of the server STB.

Companion device controls the STB by requesting to playback the content in the STB. Companion device uses the AVT service of the media renderer device for starting playback in the STB.

Note The playback happens on the STB and is not streamed from STB.

The companion device application can also use the SDP API and interact with the head end for displaying the Guide and Planner. This is discussed in detail in another section below.

#### Use Case – I want to make bookings on the STB from my iPad:



Figure 5: recording initiation from CD to STB.

The Viewer is browsing the Guide from the Server STB using the Companion device application. The companion device is acting as a control point in the UPnP network. The STB is acting as a media server device in the home network. The server STB exposes an SRS service that is used by the companion device application to make bookings.

Companion device browses the service list and the guide information as mentioned in the “Browse Planner” section to display the Guide.

The service list information can be used to “Search” for events of that service in the EPG container of the server STB.

Companion device can choose to create a booking for the displayed guide event using the SRS service of the media server device. The SRS request is processed by the STB and a booking is made in the planner.

The booking also triggers an event update from the STB. This event can be used by the STB to update the Planner display in the companion device.

#### Use Case – I want to watch my personal content in Companion device on the Big screen TV (STB):



Figure 6: play personal content from CD to TV.

The Viewer is browsing the content that is locally stored in the companion device using the companion device application. The companion device is acting as a control point in the UPnP network. The companion device is also acting as a media server device. The STB is acting as a media renderer device in the home network.

The companion device has to use the Connection Manager service of the media renderer device to initiate playback of the content on the STB.

STB does not implement the PrepareForConnection() action of CMS currently.

There are 2 options to realize this use case:

1. Support PrepareForConnection() action in STB and link the connection id provided by STB to the HTTP request from the STB for the content. This option requires implementation in CORE.
2. Use the AVT action SetTransportURI() with the URI pointing to the content in the companion device. Normal media share playback use case is applicable here. This is implemented already. Has to be tested though ☺.

#### Use Case – I want to watch my personal content in Laptop on the Big screen TV (STB):

The Viewer is browsing the content that is stored on the Laptop in the companion device using the companion device application. The companion device is acting as a control point in the UPnP network. The Laptop is acting as a media server device. The STB is acting as a media renderer device in the home network.

The companion device has to use the Connection Manager service of the media renderer device to initiate playback of the content on the STB. The Laptop also has to support CMS for the media server device.

STB does not implement the PrepareForConnection() action of CMS currently.

There are 2 options to realize this use case:

1. Support PrepareForConnection() action in STB and link the connection id provided by STB to the HTTP request from the STB for the content. This option requires implementation in CORE.
2. Use the AVT action SetTransportURI() with the URI pointing to the content in the companion device. Normal media share playback use case is



applicable here. This is implemented already. Has to be tested though ☺.

## II. CONCLUSION

Companion devices have become part of regular life, Set Top Box has lot of content being broadcasted from operators and since Set Top Box cannot be roamed elsewhere like companion devices, sharing the content from Set Top box to Companion devices provides the great flexibility to users to get the content on own companion devices and use it later.

## FURTHER ENHANCEMENTS

The whiteboard can be enhanced in a number of ways as mentioned below:

- To stream the content with security (content protection) without avoiding content rights.

## REFERENCES:

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## BIOGRAPHY



Santosh Kolar working as student at RVCE Bangalore and his areas of interest are Middleware and applications for Set Top Boxes.



Manjunath A E is working as Assistant Professor in R V College of Engineering Bangalore. His areas of interest are Device Drivers, Context Aware computing, Adhoc Networks, Mobile Computing, Java / J2EE and Java native interface (JNI).



Shivakumar B.M working as student at RVCE Bangalore. His areas of interest are Device Drivers, Embedded Systems, RTOS, Networks, Telecom, C, C++, Java and Java native interface (JNI).



PARDHA SARATHY working as student at RVCE Bangalore, His areas of interest are Linux SystemSoftware, Microprocessors.