

Using the Second-Screen API and Intel[®] Wireless Display From Android* Applications

Xavier Hallade, Technical Marketing Engineer
Costas Stylianou, Sr. Application Engineer
Intel Corporation

SFTS002

Agenda

- What is Miracast* and Intel® Wireless Display
- Compatible Devices
- Display Modes & Use Cases
- 2-screen Demo
- Android* Second-Screen APIs with live coding example
- Summary / Q&A

Agenda

- What are Miracast* and Intel® Wireless Display
- Compatible Devices
- Display Modes & Use Cases
- 2-screen Demo
- Android* Second-Screen APIs with live coding example
- Summary / Q&A

What is Miracast*?



- Miracast* is standard for wireless peer-to-peer screen-casting, created and certified by the WiFi Alliance*
- Wireless replacement for HDMI*/MHL*
- Built upon existing standards
 - H.264 (MPEG-4 AVC) video compression & WiFi Direct
- Based on Intel® Wi-Fi Display specifications
- Open for the industry
- Support added in Android* 4.2
- *It is NOT DLNA or ChromeCast*





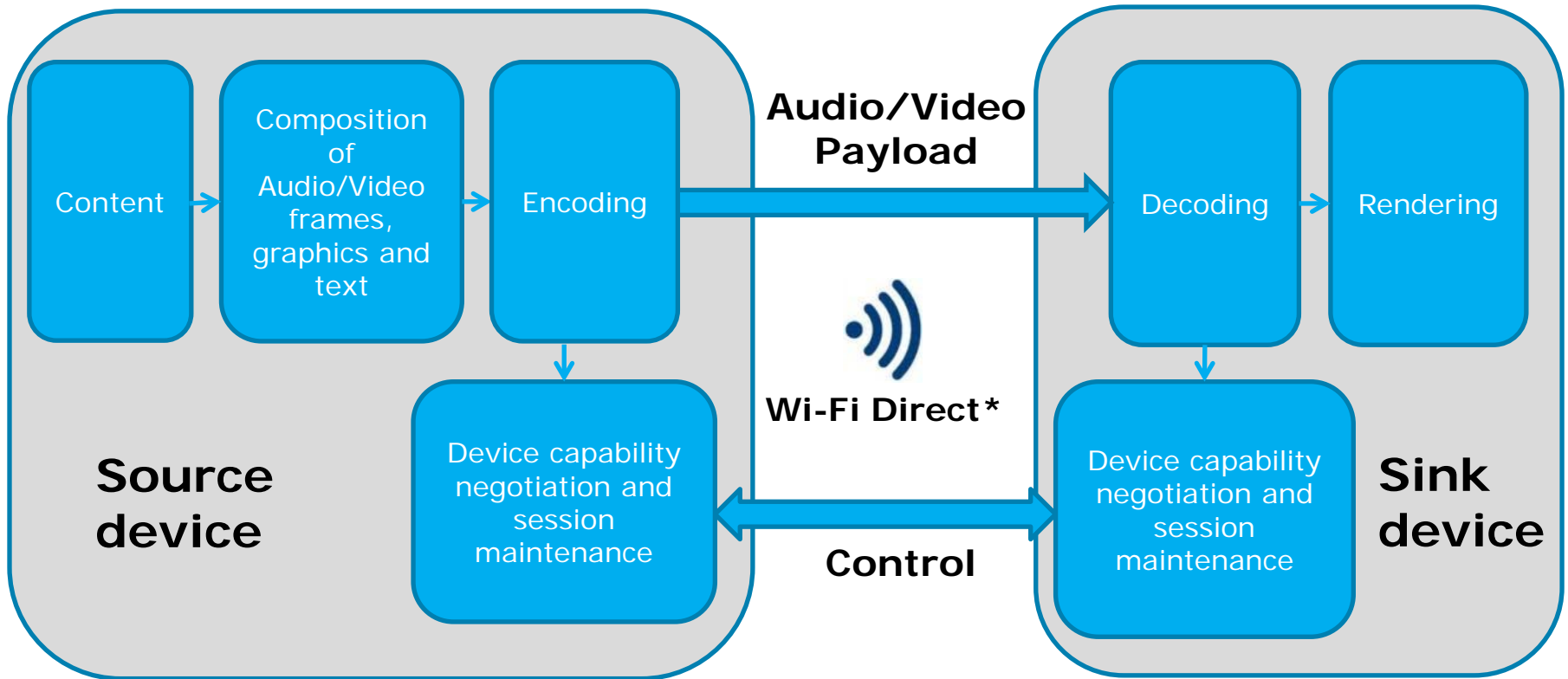
What is Intel® Wireless Display (WiDi)

- WFA Miracast* certified
 - compatible with Miracast* certified receivers.
- Supports HD video up to 1080p/30 with 2 channel stereo
- Content protection with HDCP2.1
- Supports two additional Display modes
 - Extended Video mode (with Android* media player)
 - Multi-task usage support (content on second screen, while local screen used for other task)
- Available on *most* Intel® Atom™ SOCs

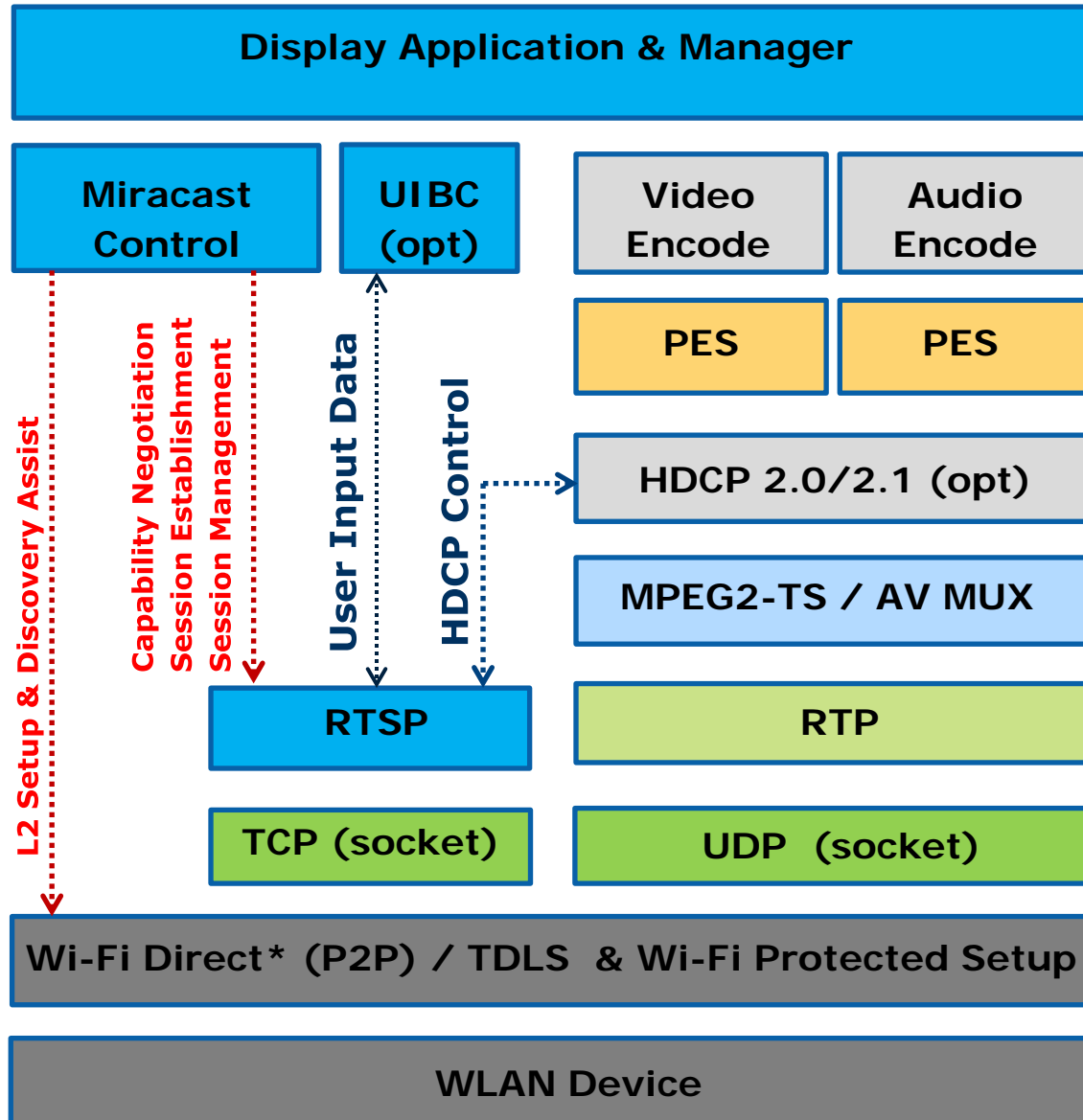


Intel® WiDi is a superset of WFA Miracast*

Miracast* Concept



Miracast* Architecture (Source side)



Agenda

- What are Miracast* and Intel® Wireless Display
- Compatible Devices
- Display Modes & Use Cases
- 2-screen Demo
- Android* Second-Screen APIs with live coding example
- Summary / Q&A

Available Miracast* Certified Sink Devices

Adapters

- Actiontec* ScreenBeam Pro
- Netgear* (ex: PTV3000)
- Acer*
- Best Buy* Rocketfish*
- Lenovo*
- ...



Actiontec®



NETGEAR®
Connect with Innovation™

Intel® WiDi Certified

Projectors

- Dell*
- Seiko Epson*
- Ricoh*
- LG*



TVs

- Samsung*
- Toshiba*
- LG*
- TCL*
- Sharp*
- Philips*



TOSHIBA
Leading Innovation >>>



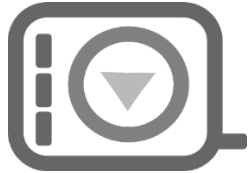
Full list of Miracast* certified devices can be found at
<http://www.wi-fi.org/wi-fi-certified-miracast>

Second-Screen Enabled Devices running Android* 4.2.x

Device	Miracast* Certified	HDMI*, MHL* or SlimPort*
Samsung* Galaxy S4	Yes	Yes
Samsung Galaxy Tab3 10.1	No	Yes
Sony* Xperia Z	Yes	Yes
LG* Optimus G	Yes	Yes
Nexus* 4	Yes	Yes
HTC* One	Yes	Yes
Lenovo* K900	Yes	No
Asus* MeMO Pad FHD10	Yes	Yes



Intel® WiDi Benefits on Intel® Atom™ SoCs



Low Latency
Gaming

WFA
Miracast*
Compliant



Easy Pairing

Full 1080p
Video



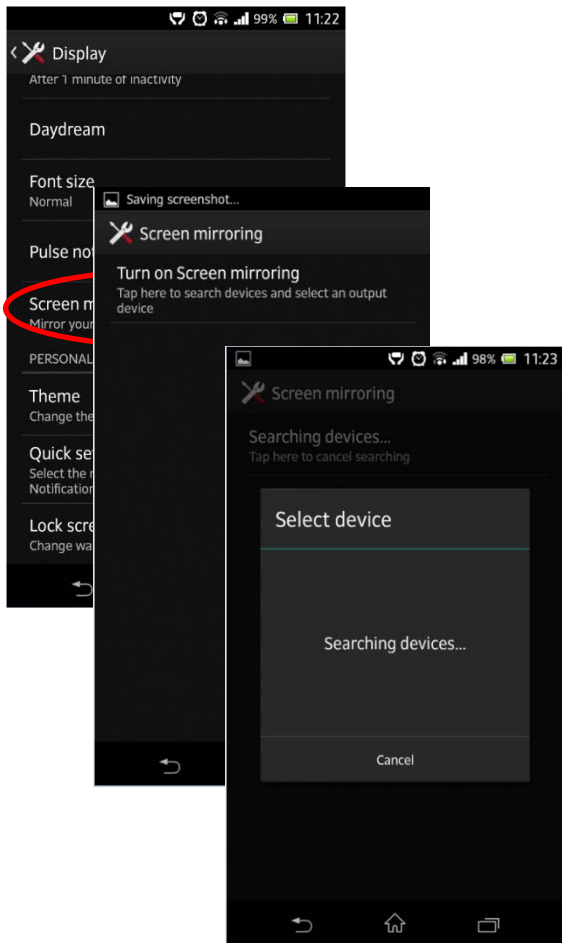
Link Health
Indicators

Best Channel
Selection

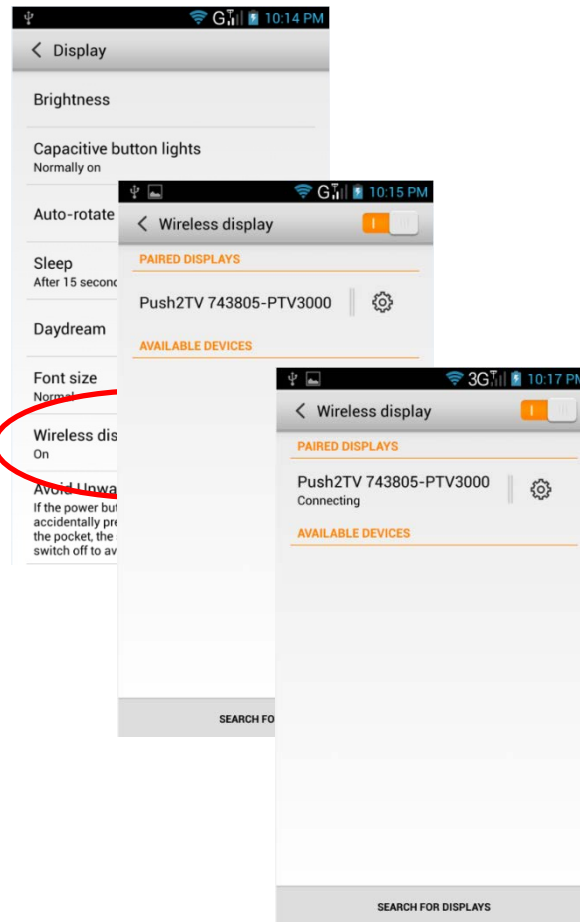


Intel® WiDi delivers 1080p HD content and low latency

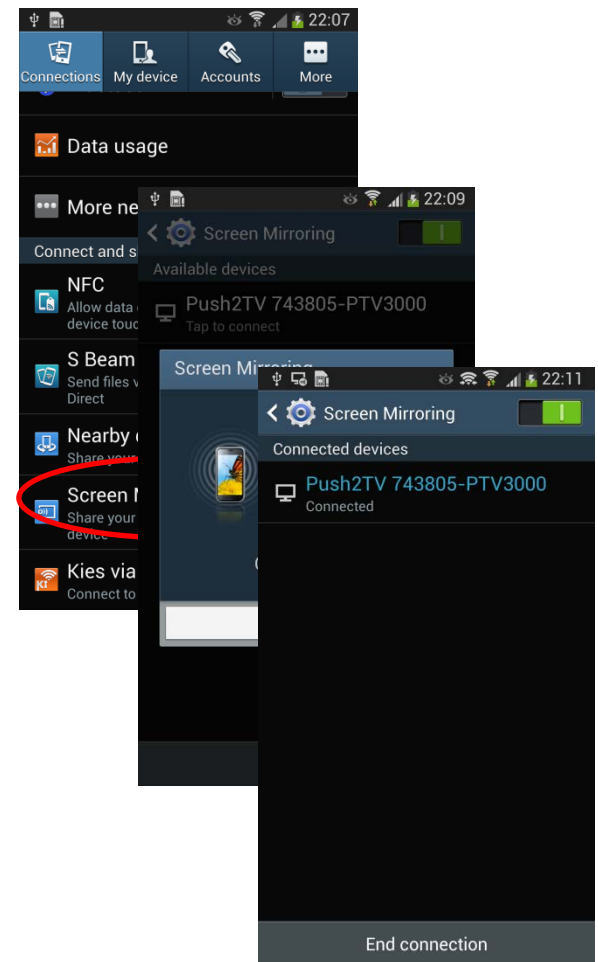
Connecting a Wireless Display on Android*



Sony* Xperia Z



Stock/Intel®



Samsung* Galaxy S4

Agenda

- What are Miracast* and Intel® Wireless Display
- Compatible Devices
- Display Modes & Use Cases
- 2-screen Demo
- Android* Second-Screen APIs with live coding example
- Summary / Q&A

Displays Modes on Android* Devices

4 modes:

- Clone
- Second-Screen applications (with Android* 4.2)
- Extended video mode (Intel[®] Platform specific)
- Background playback (Intel[®] Platform specific)

Clone Mode (Default)



- After establishing the connection, user sees local screen on the remote display
- Resolution sent to remote is the same as local display's
- No need to do anything to support this mode

Dual Screen Display With Single App



- Remote screen used for content viewing
- Local screen used for control & context info
- Application can target this mode using the Android* Presentation API

Extended Video Mode (Intel® Platform Specific)



- Video mode is activated automatically when user plays a video using Android* Media Player framework (ex: VideoView)
- User sees video content on the remote at the 1080p resolution (or whatever the native resolution of the content is)
- Local video rendering is turned off to save power, but UI stays untouched

Background Playback (Intel® Platform Specific)



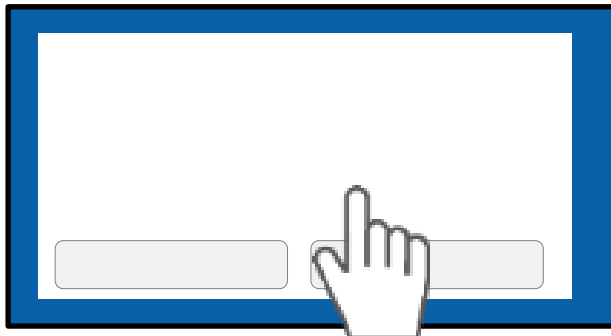
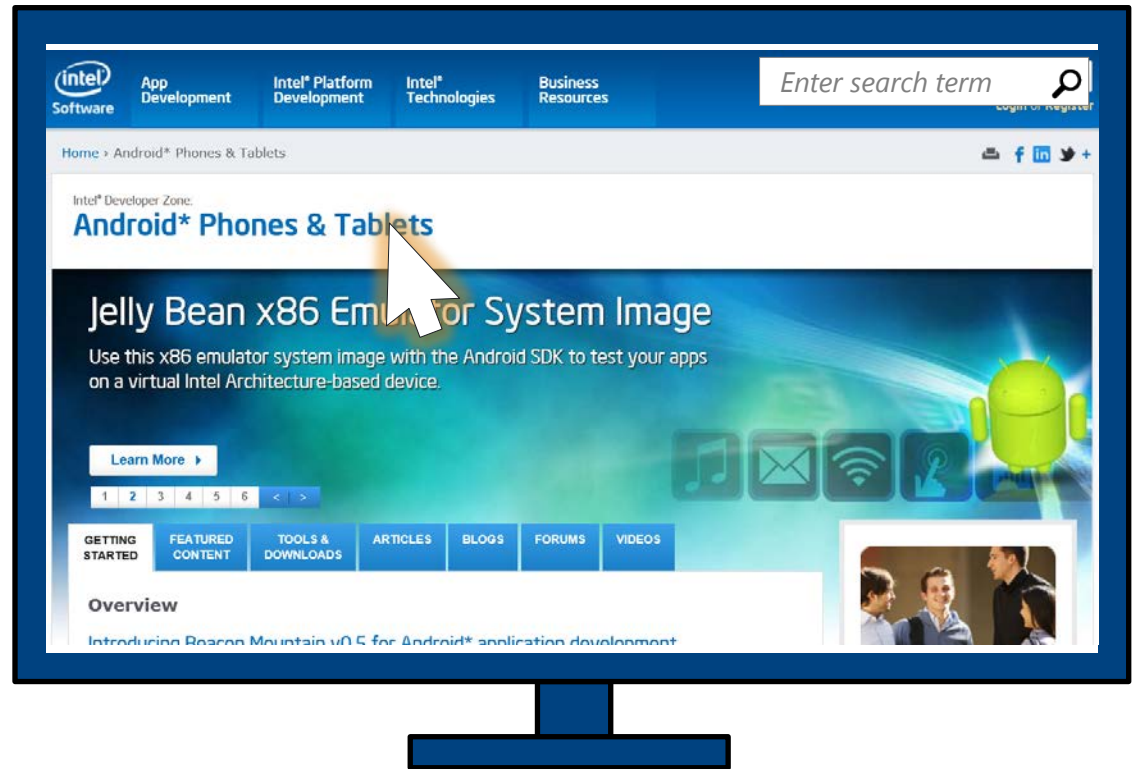
- User can send video to remote display at 1080p resolution using app that enables background streaming
- User can navigate out of the app and play 1080p video on local screen or use any other application, including receiving a phone call without any disruption to background playback

Use-Cases for Second Screen Applications

- Multi-Media Sharing
 - Share Videos and photos to a large screen and use handset to navigate
- Gaming
 - Use handset as game controller
- Productivity Apps
 - Sharing presentations to large screen or projector
- IVI
 - Transfer phones screen to car head unit (Navigation)

Ideas for Dual Screen Applications

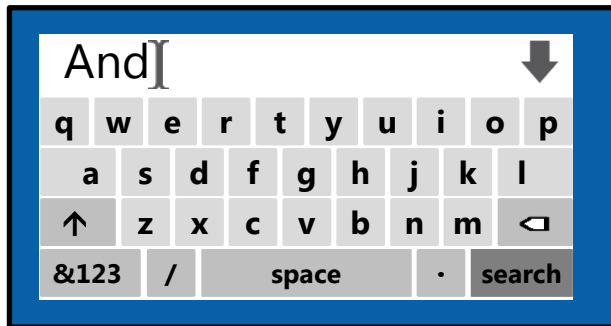
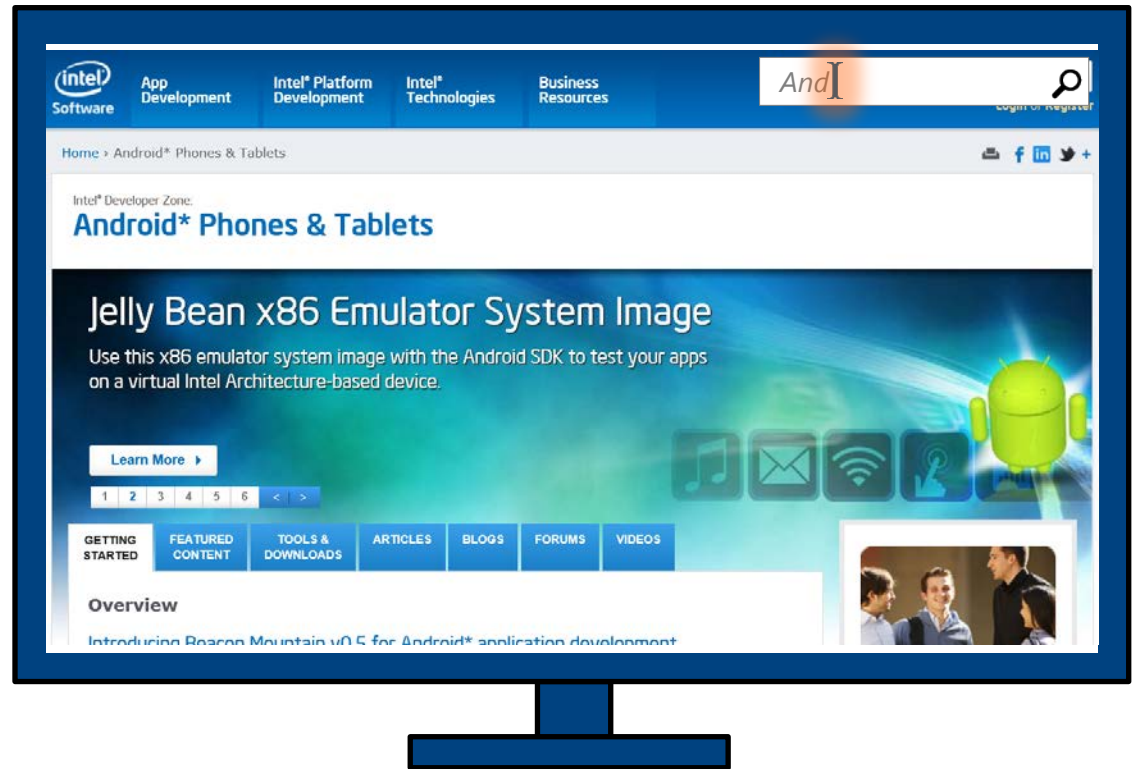
Web Browser



Touchpad Mode

Ideas for Dual Screen Applications

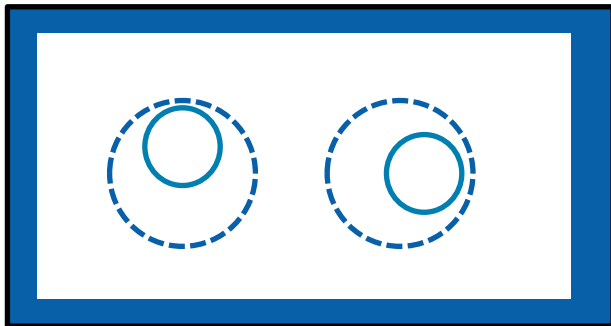
Web Browser



Keyboard Input Mode

Ideas for Dual Screen Applications

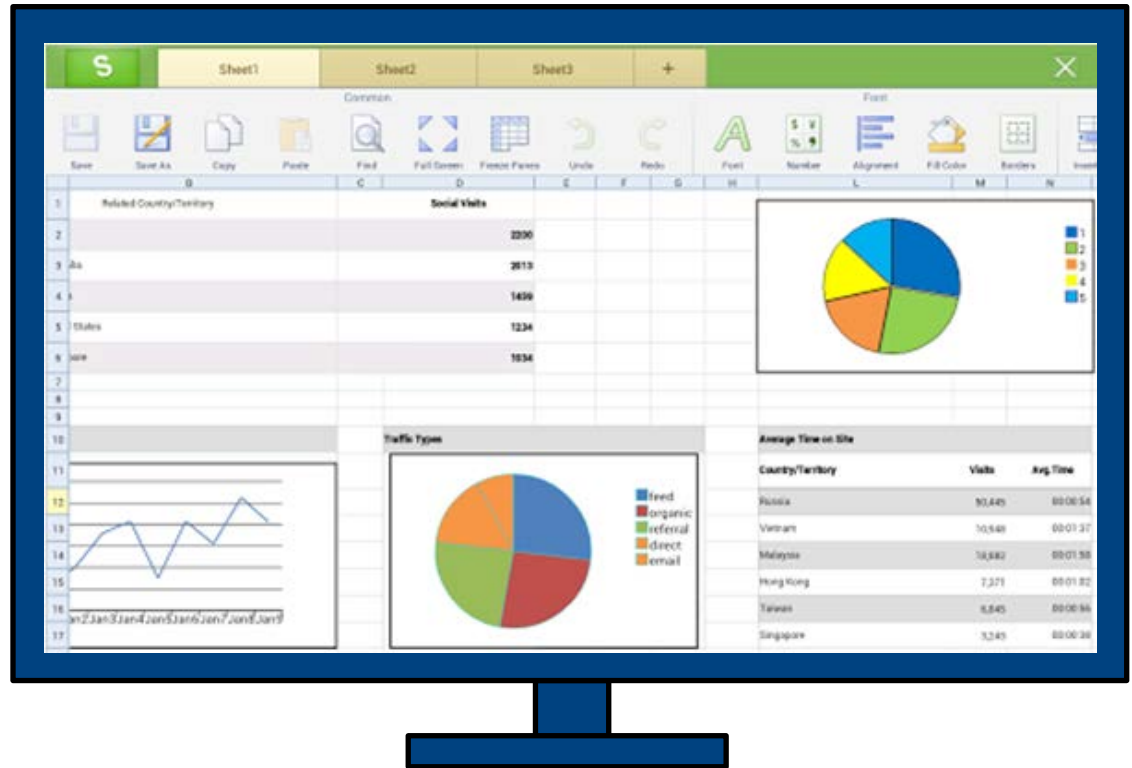
Games



Dual Joysticks Mode

Ideas for Dual Screen Applications

Productivity
App



IDF13

Second-Screen Demo

Agenda

- What are Miracast* and Intel® Wireless Display
- Compatible Devices
- Display Modes & Use Cases
- 2-screen Demo
- Android* Second-Screen APIs with live coding example
- Summary / Q&A

Android* Secondary Display API



Android added Second-Screen support via the **Presentation** class in Android* 4.2 (API Level 17), allowing you to:

- Implement support for a second screen in your applications without having to worry about the way the displays are connected (Display agnostic)
- Works with MHL*, HDMI*, SlimPort* & Miracast* compatible devices
- You can control the output on the remote (second) screen independently of the phone screen

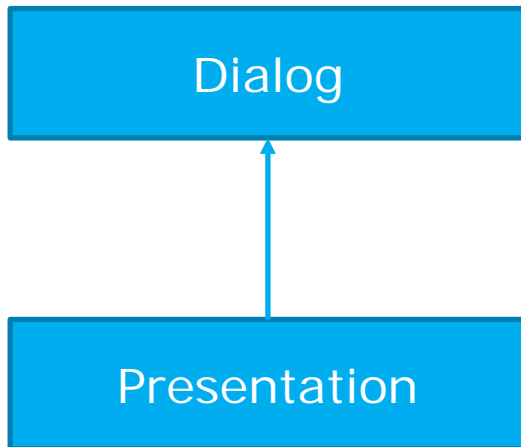


The Presentation Object

- Presentation is the based class and should be extended:

```
public class DemoPresentation extends Presentation {
```

- Needs to be associated with a Display at creation time
- Presentation inherits from Dialog, and as for a Dialog its lifecycle is bound to an Activity



You need to have a fragment based navigation if you want to keep it running while navigating in the app.

The activity should take care of pausing and resuming whatever content is playing within the presentation whenever the activity itself is paused or resumed.

Using the Presentation API

Before showing a Presentation you need to select the display, this can be done in 2 ways:

1. **MediaRouter API** (in API 16): system will decide the best display for you!

```
// Get the media router service.
MediaRouter mMediaRouter =
    (MediaRouter) getSystemService(Context.MEDIA_ROUTER_SERVICE);
// Use the MediaRouter that supports live video
MediaRouter.RouteInfo mRouteInfo =
    mMediaRouter.getSelectedRoute(MediaRouter.ROUTE_TYPE_LIVE_VIDEO);
Display presentationDisplay = mRouteInfo.getPresentationDisplay();
```

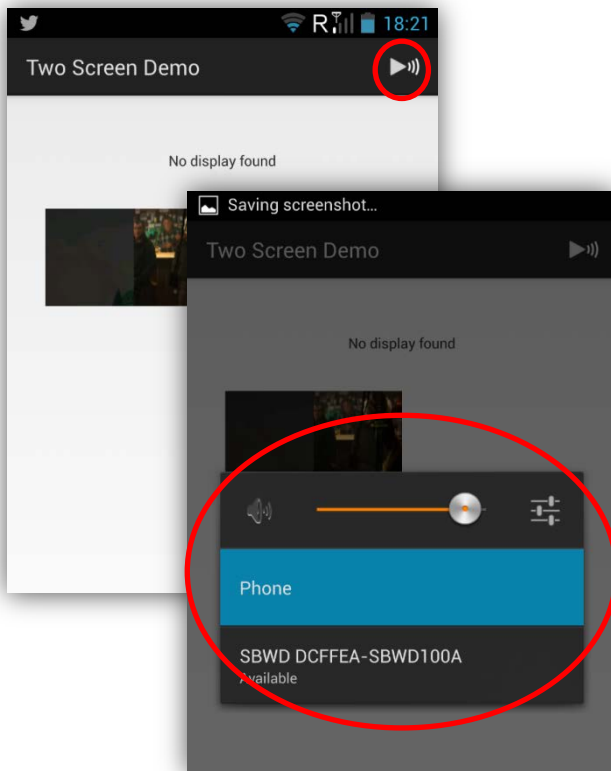
2. **Display Manager API** (in API 17): Enumeration of displays

```
// Get the display manger service.
DisplayManager mDisplayManager =
    (DisplayManger) getSystemService(Context.DISPLAY_SERVICE);
// enumerate the displays
Display[] displays =
    mDisplayManager.getDisplays(DisplayManger.DISPLAY_CATEGORY_PRESENTATION);
```

Adding a MediaRouteButton

In res/menu/default.xml:

```
<item
    android:title="Media Route Settings"
    android:actionProviderClass="android.app.MediaRouteActionProvider"
    android:showAsAction="always" />
```



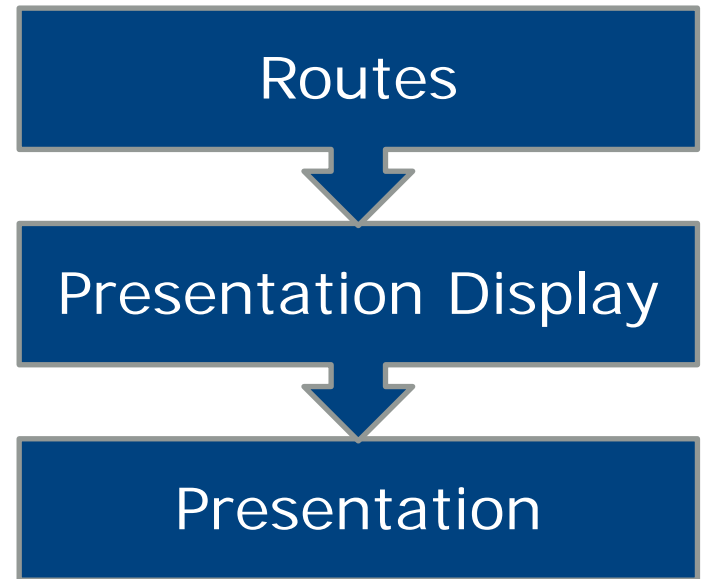
```
//Sets Media Route Button to second screen mode
mediaRouteActionProvider.setRouteTypes
    (MediaRouter.ROUTE_TYPE_LIVE_VIDEO);

//Launches the Wireless display setting intent
startActivity(new Intent
    ("android.settings.WIFI_DISPLAY_SETTINGS"));
```

Presentation API

Example of media routes

- Phone/Tablet
- Miracast* device
- ChromeCast*
- User route
- ~~HDMI Screen~~
- ~~Emulated Screen~~

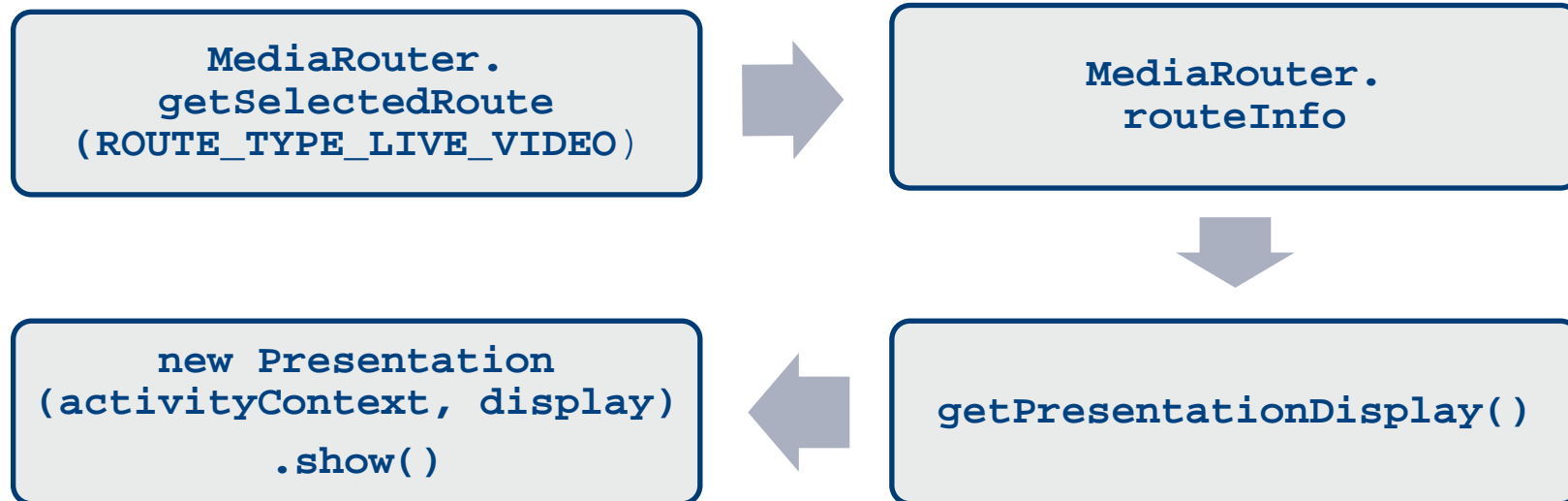


When using HDMI* or screens emulation, the Media Route will remain as the phone (or Tablet). The change is on the Presentation Display associated.

Route ≠ Display

Presentation API

How to get a Presentation displayed:



Then, using `MediaRouter.addCallback`, you have to monitor:

- `onRouteUnselected`
- `onRouteSelected`
- `onRoutePresentationDisplayChanged`

And inside the activity owning the Presentation:

- `onResume`
- `onPause`

Wireless Display APIs for Android* 4.2

- APIs for manipulating Wi-Fi Display devices are present in Android* AOSP internally, but not part of the Android framework
- Wireless Display Settings activity can be called through the Intent `android.settings.WIFI_DISPLAY_SETTINGS` but this isn't part of the framework either. Some OEMs use other intents
 - Samsung*:
`com.samsung.wfd.LAUNCH_WFD_PICKER_DLG`
 - HTC*:
`com.htc.wifidisplay.CONFIGURE_MODE_NORMAL`

Wireless Display APIs for Android* 4.2/4.3

- All of the below APIs are internal as of Android* 4.2/4.3
- They are part of AOSP and publicly exposed, but not part of the framework so are not guaranteed to work

android.provider.Settings

...

String ACTION_WIFI_DISPLAY_SETTINGS

String **getDeviceAlias()**

String **getFriendlyDisplayName()**

android.hardware.display.DisplayManager

...

String ACTION_WIFI_DISPLAY_STATUS_CHANGED

WifiDisplayStatus **getWifiDisplayStatus()**

void **scanWifiDisplays()**

void **connectWifiDisplay(String deviceAddress)**¹

void **disconnectWifiDisplay()**²

void **forgetWifiDisplay(String address)**²

void **renameWifiDisplay(String address, String alias)**²

¹android.permission.CONFIGURE_WIFI_DISPLAY required for unknown devices

²android.permission.CONFIGURE_WIFI_DISPLAY always required

android.hardware.display.WifiDisplayStatus

int **getFeatureState()**

int **getScanState()**

int **getActiveDisplayState()**

WifiDisplay **getActiveDisplay()**

WifiDisplay[] **getAvailableDisplays()**

WifiDisplay[] **getRememberedDisplays()**

android.hardware.display.WifiDisplay

String **getDeviceAddress()**

String **getDeviceName()**

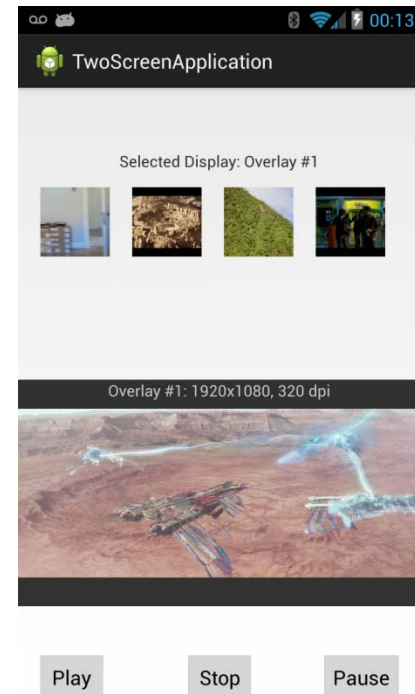
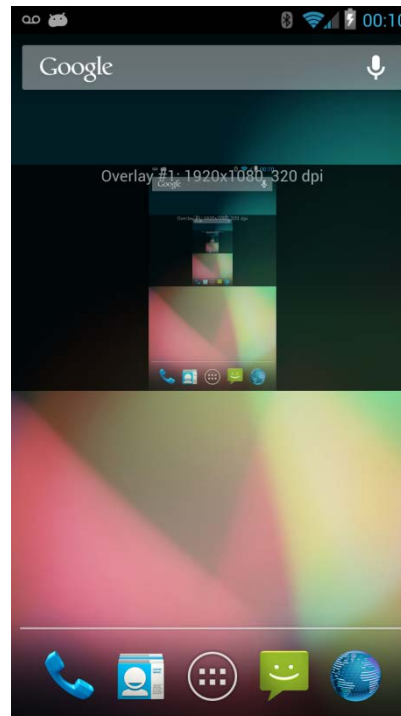
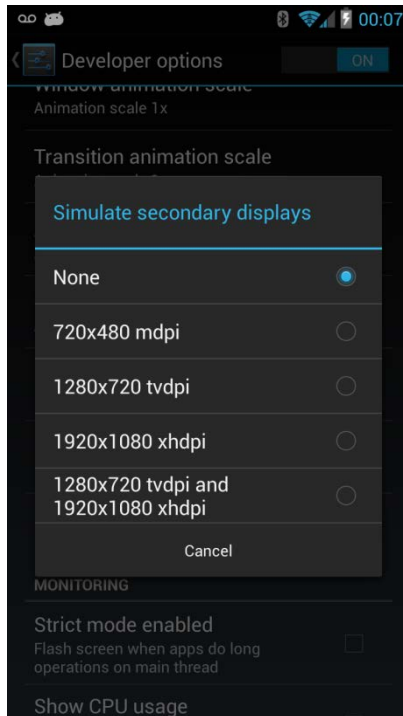
String **getDeviceAlias()**

String **getFriendlyDisplayName()**

Testing your Second-Screen Apps

Options:

- Real Hardware - supporting second screen functionality
- Simulate secondary screen - new feature in Android* 4.2 (in Developer options). You can select by resolution and DPI and once activated you get an overlay emulating the secondary screen.



Agenda

- What are Miracast* and Intel® Wireless Display
- Compatible Devices
- Display Modes & Use Cases
- 2-screen Demo
- Android* Second-Screen APIs with live coding example
- Summary / Q&A

Summary

Miracast* and Intel® WiDi are:

- Technologies that allow contents to be transmitted wirelessly to an external display
- Intel® WiDi is a superset of Miracast* meaning it offers more features such as full S3D, Dolby 5.1, premium content protection (HDCP 2.1) surround sound and low latencies for gaming

Android* Secondary Display (Presentation) API

- Introduced in Android* API Level 17, allows content to be present on a second screen in a H/W agnostic way

*Develop new use cases for applications using
Wireless Display and the Presentation API*

Additional Sources of Information

PDF of this presentation is available is available from our Technical Session Catalog: www.intel.com/idfsessionsSF. The URL is on top of Session Agenda Pages in Pocket Guide.

Web based info:

- <http://developer.android.com/reference/android/app/MediaRouteActionProvider.html>
- <http://developer.android.com/reference/android/hardware/display/DisplayManager.html>
- <http://developer.android.com/reference/android/app/Presentation.html>

Legal Disclaimer

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

A "Mission Critical Application" is any application in which failure of the Intel Product could result, directly or indirectly, in personal injury or death. SHOULD YOU PURCHASE OR USE INTEL'S PRODUCTS FOR ANY SUCH MISSION CRITICAL APPLICATION, YOU SHALL INDEMNIFY AND HOLD INTEL AND ITS SUBSIDIARIES, SUBCONTRACTORS AND AFFILIATES, AND THE DIRECTORS, OFFICERS, AND EMPLOYEES OF EACH, HARMLESS AGAINST ALL CLAIMS COSTS, DAMAGES, AND EXPENSES AND REASONABLE ATTORNEYS' FEES ARISING OUT OF, DIRECTLY OR INDIRECTLY, ANY CLAIM OF PRODUCT LIABILITY, PERSONAL INJURY, OR DEATH ARISING IN ANY WAY OUT OF SUCH MISSION CRITICAL APPLICATION, WHETHER OR NOT INTEL OR ITS SUBCONTRACTOR WAS NEGLIGENT IN THE DESIGN, MANUFACTURE, OR WARNING OF THE INTEL PRODUCT OR ANY OF ITS PARTS.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined". Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information.

The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order. Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or go to: <http://www.intel.com/design/literature.htm>

Intel® WiDi Technology requires an Intel® Wireless Display enabled system, compatible adapter and TV. 1080p and Blu-Ray* or other protected content playback only available on select Intel® Core™ processor-based systems with built-in visuals enabled, a compatible adapter and media player, and supporting Intel WiDi software and graphics driver installed. Consult your PC manufacturer. For more information, see www.intel.com/go/widi.

Intel, Look Inside and the Intel logo are trademarks of Intel Corporation in the United States and other countries.

*Other names and brands may be claimed as the property of others.
Copyright ©2013 Intel Corporation.

Legal Disclaimer

Software Source Code Disclaimer: Any software source code reprinted in this document is furnished under a software license and may only be used or copied in accordance with the terms of that license.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Risk Factors

The above statements and any others in this document that refer to plans and expectations for the third quarter, the year and the future are forward-looking statements that involve a number of risks and uncertainties. Words such as “anticipates,” “expects,” “intends,” “plans,” “believes,” “seeks,” “estimates,” “may,” “will,” “should” and their variations identify forward-looking statements. Statements that refer to or are based on projections, uncertain events or assumptions also identify forward-looking statements. Many factors could affect Intel’s actual results, and variances from Intel’s current expectations regarding such factors could cause actual results to differ materially from those expressed in these forward-looking statements. Intel presently considers the following to be the important factors that could cause actual results to differ materially from the company’s expectations. Demand could be different from Intel’s expectations due to factors including changes in business and economic conditions; customer acceptance of Intel’s and competitors’ products; supply constraints and other disruptions affecting customers; changes in customer order patterns including order cancellations; and changes in the level of inventory at customers. Uncertainty in global economic and financial conditions poses a risk that consumers and businesses may defer purchases in response to negative financial events, which could negatively affect product demand and other related matters. Intel operates in intensely competitive industries that are characterized by a high percentage of costs that are fixed or difficult to reduce in the short term and product demand that is highly variable and difficult to forecast. Revenue and the gross margin percentage are affected by the timing of Intel product introductions and the demand for and market acceptance of Intel’s products; actions taken by Intel’s competitors, including product offerings and introductions, marketing programs and pricing pressures and Intel’s response to such actions; and Intel’s ability to respond quickly to technological developments and to incorporate new features into its products. The gross margin percentage could vary significantly from expectations based on capacity utilization; variations in inventory valuation, including variations related to the timing of qualifying products for sale; changes in revenue levels; segment product mix; the timing and execution of the manufacturing ramp and associated costs; start-up costs; excess or obsolete inventory; changes in unit costs; defects or disruptions in the supply of materials or resources; product manufacturing quality/yields; and impairments of long-lived assets, including manufacturing, assembly/test and intangible assets. Intel’s results could be affected by adverse economic, social, political and physical/infrastructure conditions in countries where Intel, its customers or its suppliers operate, including military conflict and other security risks, natural disasters, infrastructure disruptions, health concerns and fluctuations in currency exchange rates. Expenses, particularly certain marketing and compensation expenses, as well as restructuring and asset impairment charges, vary depending on the level of demand for Intel’s products and the level of revenue and profits. Intel’s results could be affected by the timing of closing of acquisitions and divestitures. Intel’s results could be affected by adverse effects associated with product defects and errata (deviations from published specifications), and by litigation or regulatory matters involving intellectual property, stockholder, consumer, antitrust, disclosure and other issues, such as the litigation and regulatory matters described in Intel’s SEC reports. An unfavorable ruling could include monetary damages or an injunction prohibiting Intel from manufacturing or selling one or more products, precluding particular business practices, impacting Intel’s ability to design its products, or requiring other remedies such as compulsory licensing of intellectual property. A detailed discussion of these and other factors that could affect Intel’s results is included in Intel’s SEC filings, including the company’s most recent reports on Form 10-Q, Form 10-K and earnings release.

Rev. 7/17/13

IDF13

Backup

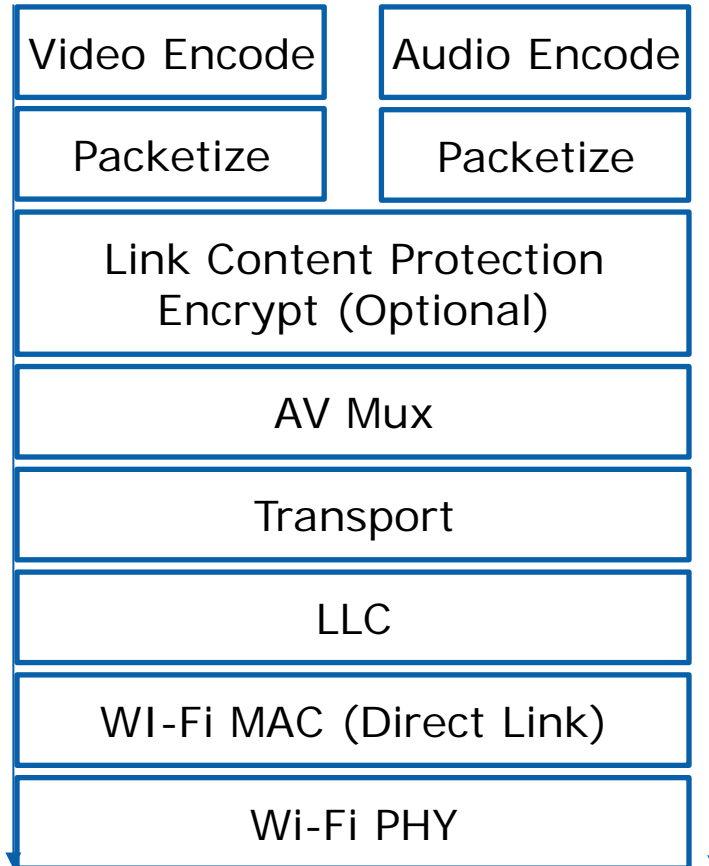
Miracast* Concept

SOURCE

Video Frames



Audio Samples

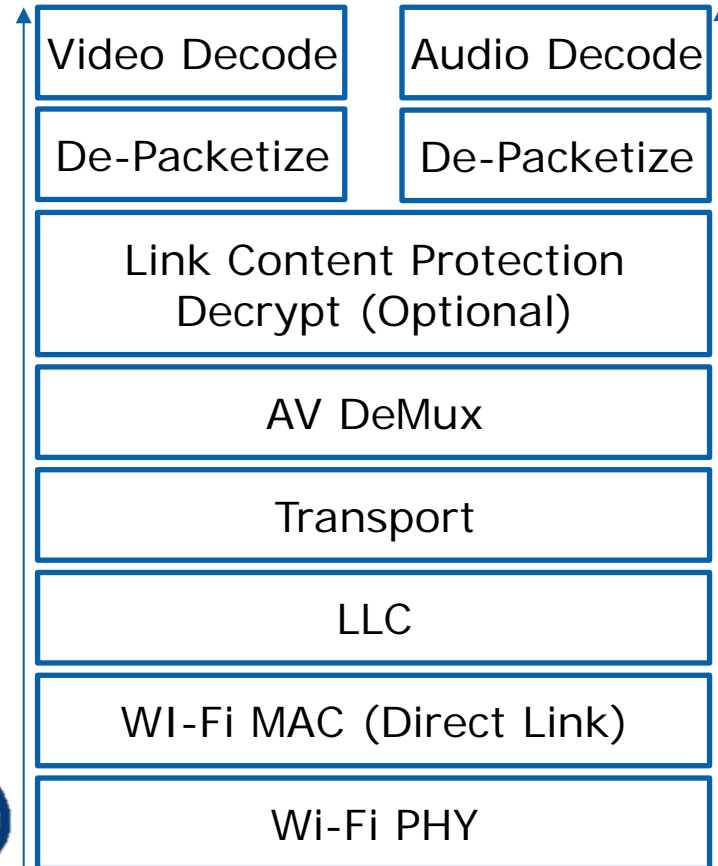


SINK

Video Render



Audio Render



Miracast vs Intel® WiDi Receiver Spec



Features	Miracast	Intel® WiDi (4 th Gen)
Resolution	480p/30fps 720p Optional	1080p/30fps 1080p/60fps Optional
HDCP	Optional	2.1
Audio	Stereo Sound	Stereo Sound & 5.1 Surround Sound
S3D	Optional	Yes
Speed Mode	Optional	Low Latency
Fast Cursor	No	Yes

Designing Layout for the Presentation

Use a layout the same way as with a Dialog.

Display properties are the same than with Google* TV:

TV setting	Addressable screen size	Density Identifier	Screen Density	Display Resolution	Screen size identifier
720p	1280 x 720 px	tvdpi	213 dp	960 x 540 dp	large
1080p	1920 x 1080 px	xhdpi	320 dp	960 x 540 dp	large

source: https://developers.google.com/tv/android/docs/gtv_android_patterns

TV display is as bigger from a phone than the user sits further from a phone: screen density is comparable.

Default theme is Holo Dark: light text on dark background is easier to read on TV.

Orientation is always... landscape!