Multimedia Framework Overview

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Tizen Architecture

Applications
- Web Applications
- Native Applications

Web Framework
- W3C/HTML5 — Multimedia
- Device APIs
- Web UI Web Runtime

Native API

Core
- Application Framework
- Graphics & UI
- Multimedia
- Web
- Messaging
- Location
- Security
- System
- Base
- Connectivity
- Telephony
- PIM

Kernel
- Linux Kernel & Device Drivers

Infra
- SDK
- Tools
- SCM & Release Engineering

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Multimedia FW provides

- **Multimedia APIs for increasing developer productivity**
  - Player, Camera APIs etc.

- **Plug-in Architecture using GStreamer & PulseAudio**
  - Reduce the integration costs into various kind of targets

- **Multiple-Format Codec**
  - Support the various codecs, parser, demuxer & muxer as Plug-in structure
  - Support OpenMax IL architecture
    % You don't need to transcode your video/audio file

Type	List
Audio codec (Decoder)	AAC, MP3, WMA, AMR, PCM, OGG, FLAC
Video codec (Decoder)	H.263, MPEG-4, Divx, H.264, WMV, MP43, Sorenson Spark
Audio codec (Encoder)	AAC, AMR
Video codec (Encoder)	H.263, MPEG-4, H.264
Container format	MP4,3GP,AVI, WMV, ASF, MKV, MOV, TS MP3,AAC,AMR, AC3, WMA, OGG, WAV

HLS : HTTP Live Streaming

Multimedia FW : Main Features

- **High Quality Video Playback**
  - Support various kind of Multimedia Streaming
  - Support HTML5 Video and embedded playback in Web Browser
  - High Quality Playback with HW codec & Render optimization
- **High Quality & High Speed Camera/Recorder**
  - High Quality Image capture & Video Recording : Full HD(1080P)
  - Support various kind of shot mode
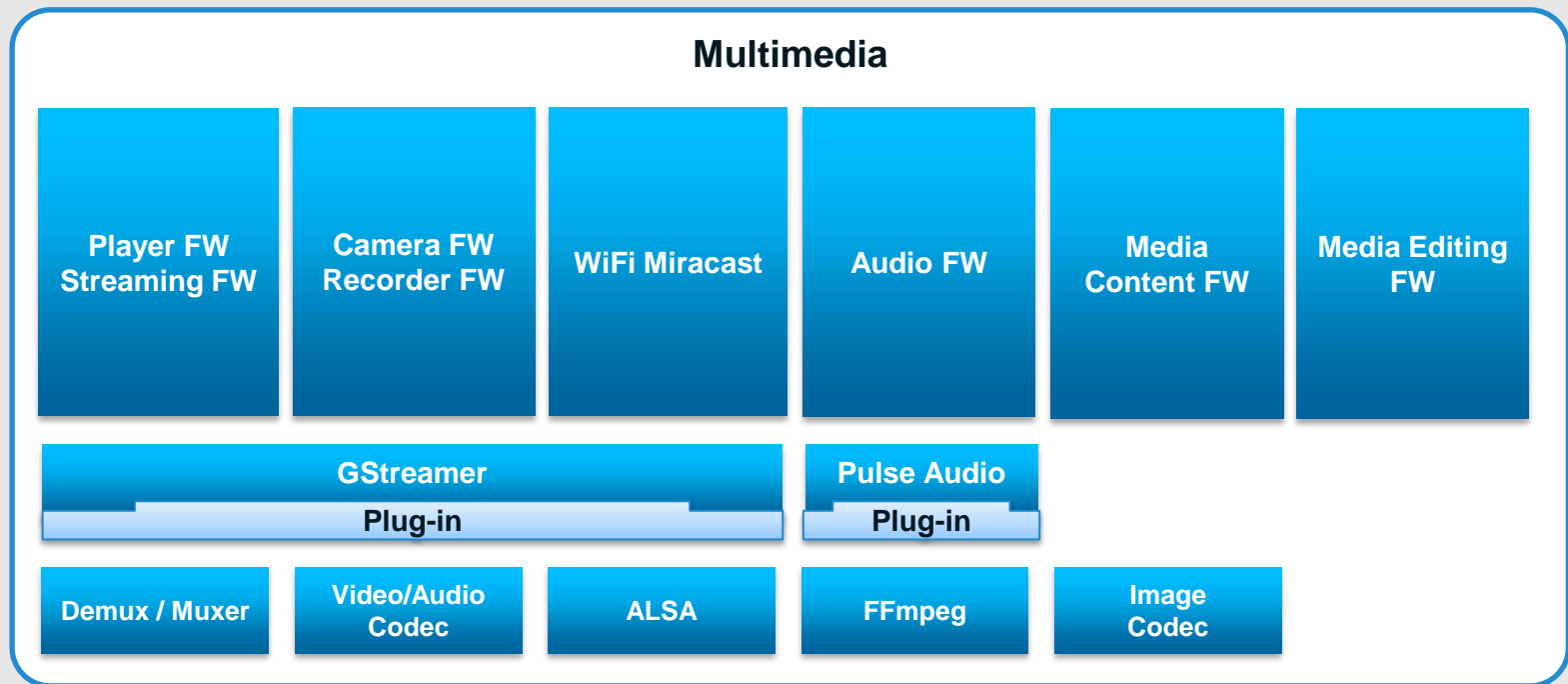 - Zero Shutter lag, Shot-to-Shot Delay Optimization
- **WiFi Miracast**
  - Screen & Audio on the Source Device is mirrored on the Sink Device
- **Media Contents Handling**
  - Manage Content list and metadata (Video/Audio/Image and Other Files)
  - Provide the thumbnail, EXIF & MP3 ID3 tag information
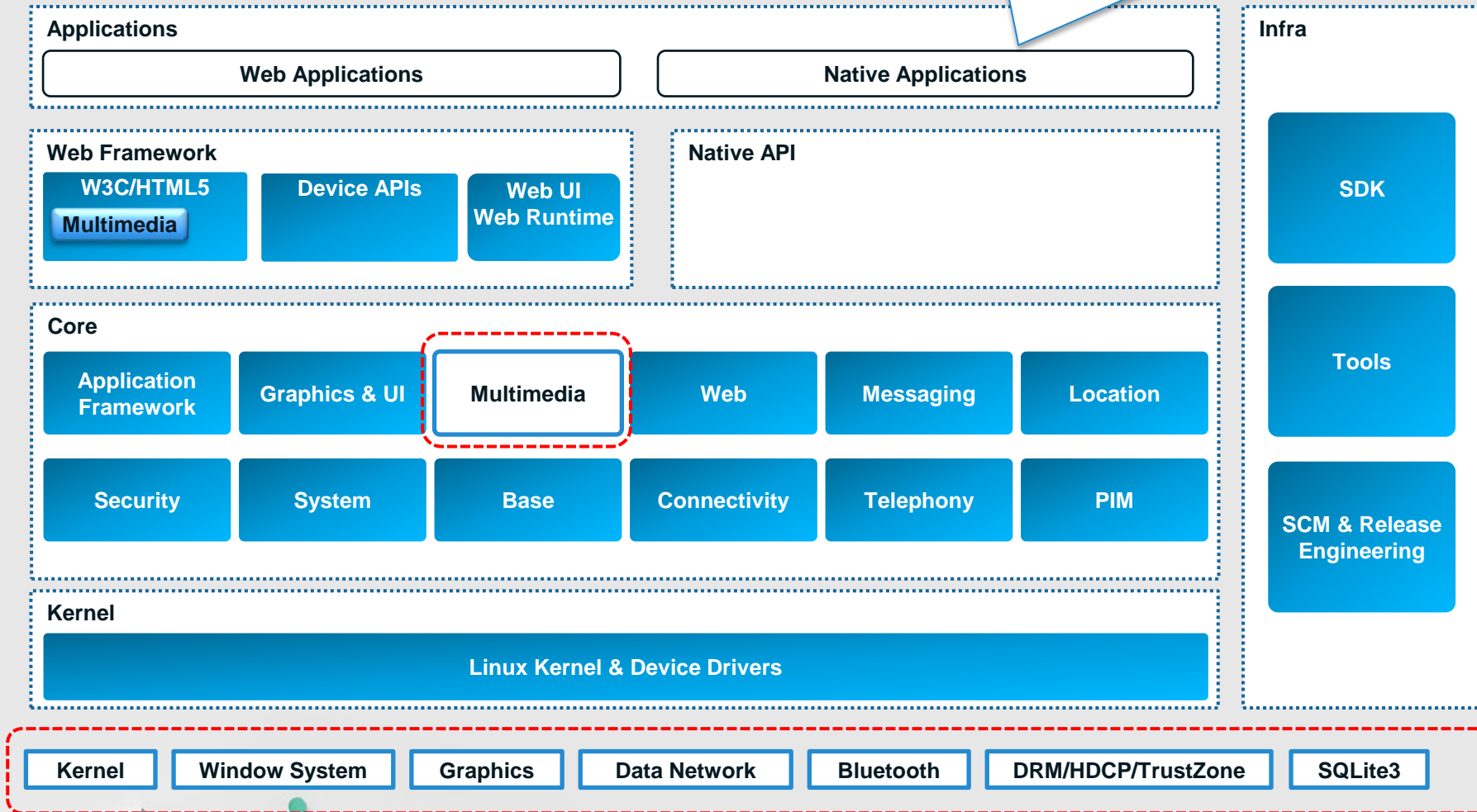 - Support Audio / Video Content Trans-coding

HLS : HTTP Live Streaming

Multimedia FW : Architecture

Multimedia

Player FW Streaming FW	Camera FW Recorder FW	WiFi Miracast	Audio FW	Media Content FW	Media Editing FW

GStreamer	Pulse Audio
Plug-in	**Plug-in**

Demux / Muxer	Video/Audio Codec	ALSA	FFmpeg	Image Codec

- **Player/Streaming FW :** Local Playback, Various kind of Streaming playback (HTTP, HLS, Smooth etc)
- **Camera/Recorder FW :** Various Shot, Full HD Recording, Audio Recording
- **Audio FW :** Audio Playback/Capture, Sound Path Control, Audio Session Manager
- **WiFi Miracast FW :** Screen Mirroring
- **Media Content FW** : Multimedia Content list and Metadata management
- **Media Editing FW** : Content Trans-code, Content Metadata Extracting and Writing
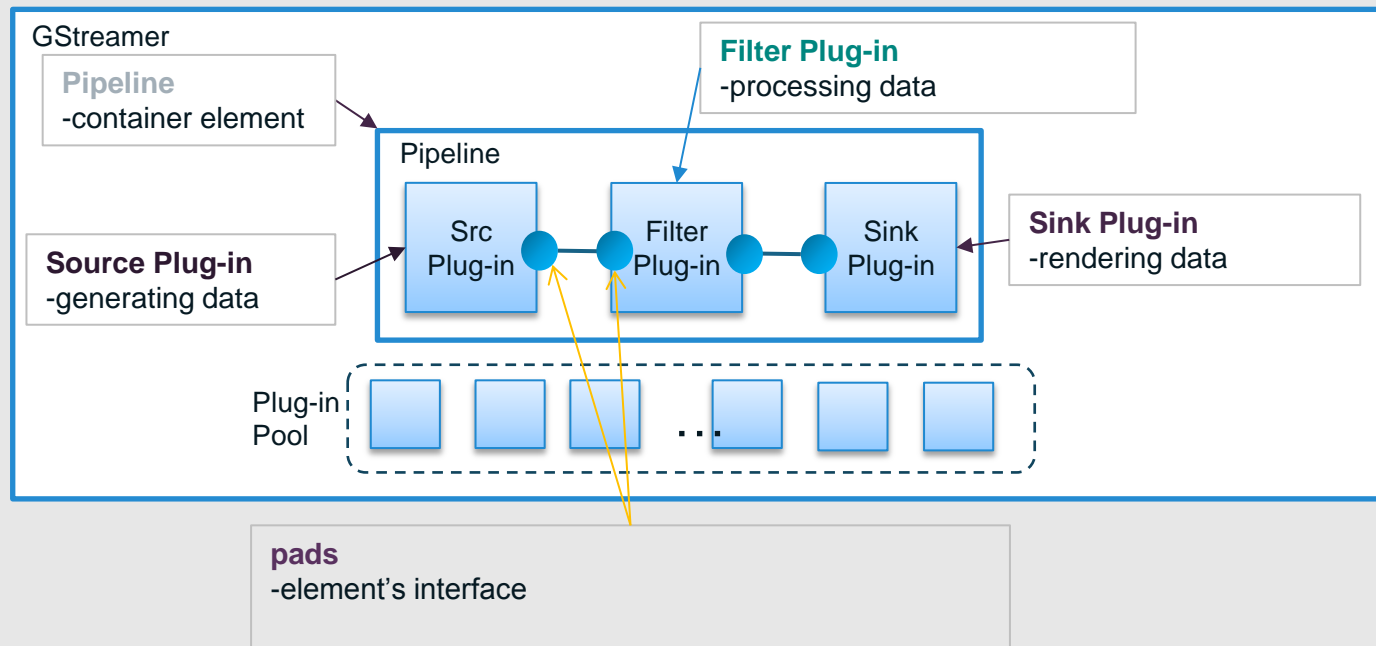
Multimedia FW : Dependency

You can make various Multimedia Applications by using Multimedia APIs
EX) Video/Streaming/Music Player, Camera
- Voice Recorder, Call / Video Call, Gallery
-etc

Applications

Web Applications	Native Applications

Web Framework

W3C/HTML5 **Multimedia**	Device APIs	Web UI Web Runtime

Native API

Infra

SDK

Tools

SCM & Release Engineering

Core

Application Framework	Graphics & UI	Multimedia	Web	Messaging	Location
Security	System	Base	Connectivity	Telephony	PIM

Kernel

Linux Kernel & Device Drivers

Kernel	Window System	Graphics	Data Network	Bluetooth	DRM/HDCP/TrustZone	SQLite3

Core Component : GStreamer

- **GStreamer**
  - Pipeline-based Multimedia Framework / Plug-in architecture

[GStreamer Pipeline Sample]

Core Component : PulseAudio

PulseAudio

- **PulseAudio**
  - Software mixing of multiple audio streams and Plug-in architecture
 - All sound will be played/captured via PulseAudio Server

Pulse Client

PulseAudio Server Core

| ALSA module SRC | ALSA module sink | BlueZ module sink |

Mic   Speaker   Bluetooth Headset
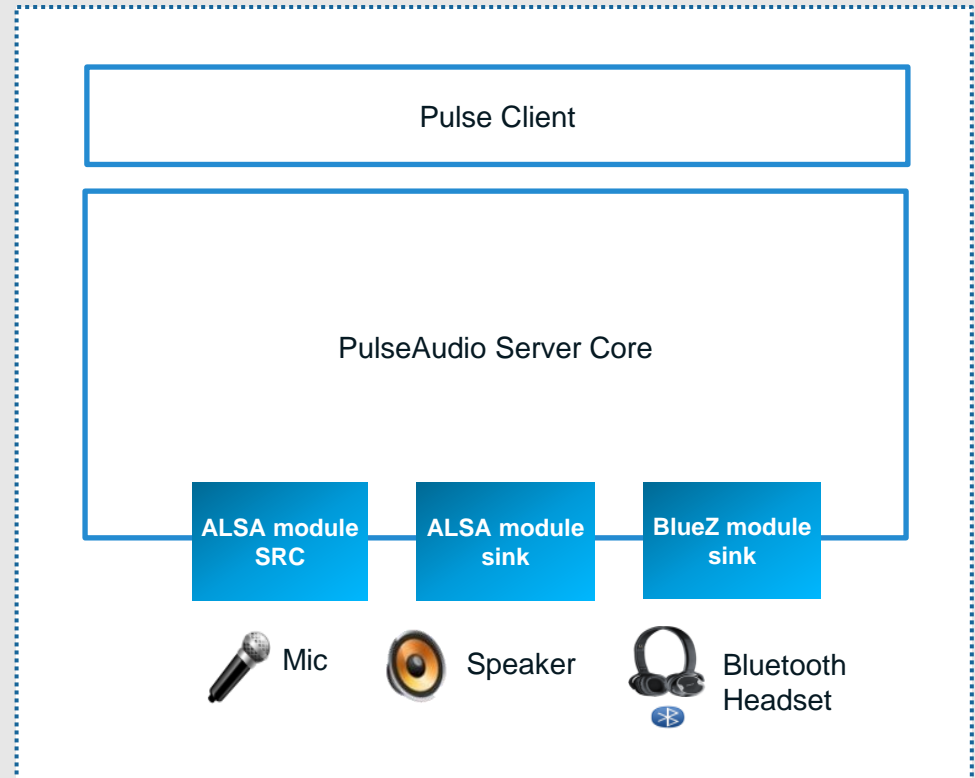
Core Component : GstOpenMax

- **OpenMax IL is supported for using HW Codec**
  - GStreamer Plug-in will communicate with OpenMAX IL Component
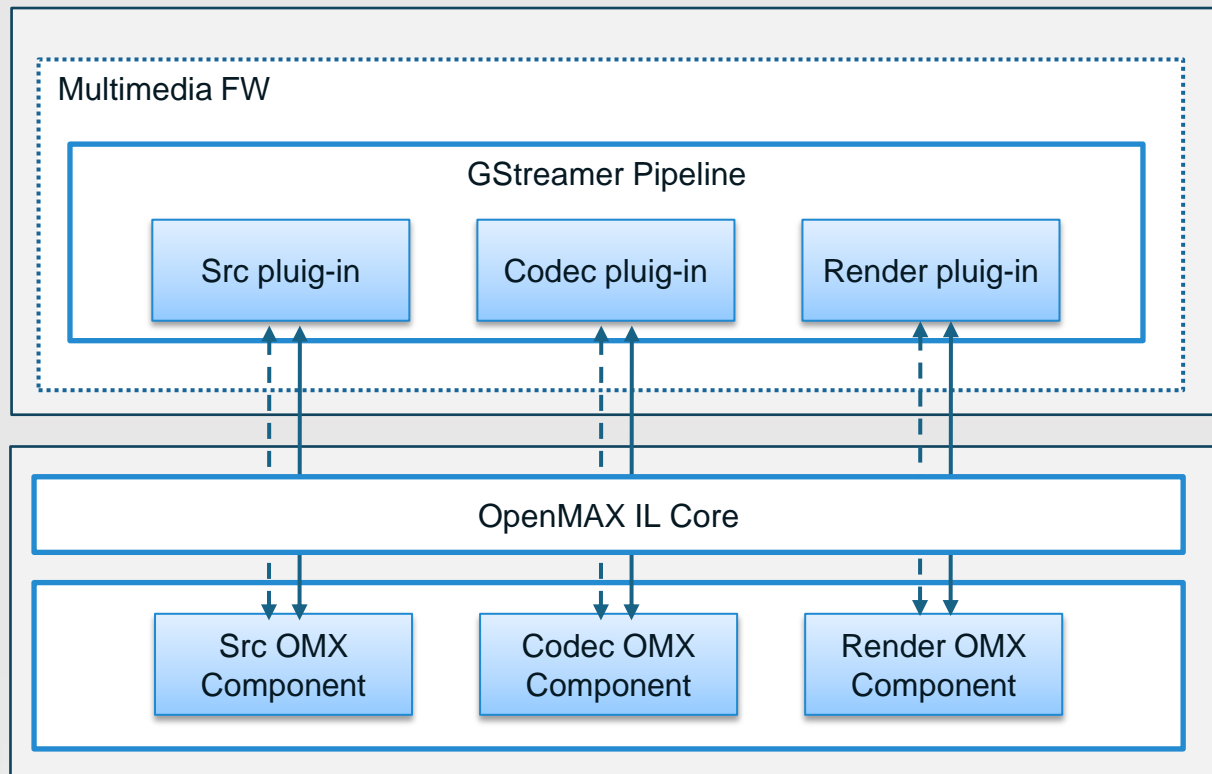
Core Component : GstOpenMax

- **Using OMX IL on GStreamer**
  - GstOpenMax is used for supporting HW Codec
  - Example) In Player pipeline
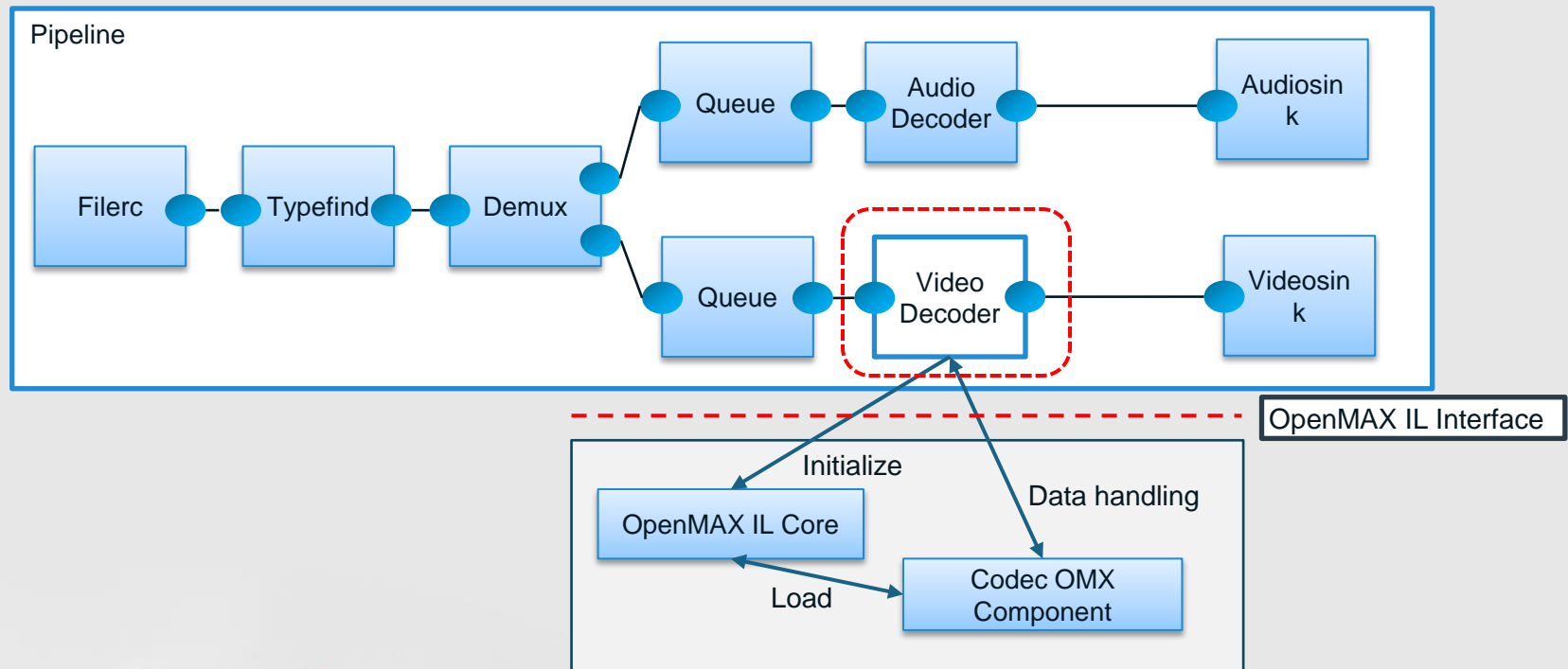
High Quality Video Playback

- **Supports High Quality Video Playback based on Plug-in Architecture**
  - Play almost every media formats without transcoding
  - Rich media support for Browser and web applications
  - Support embedded video rendering for various type of graphic surfaces
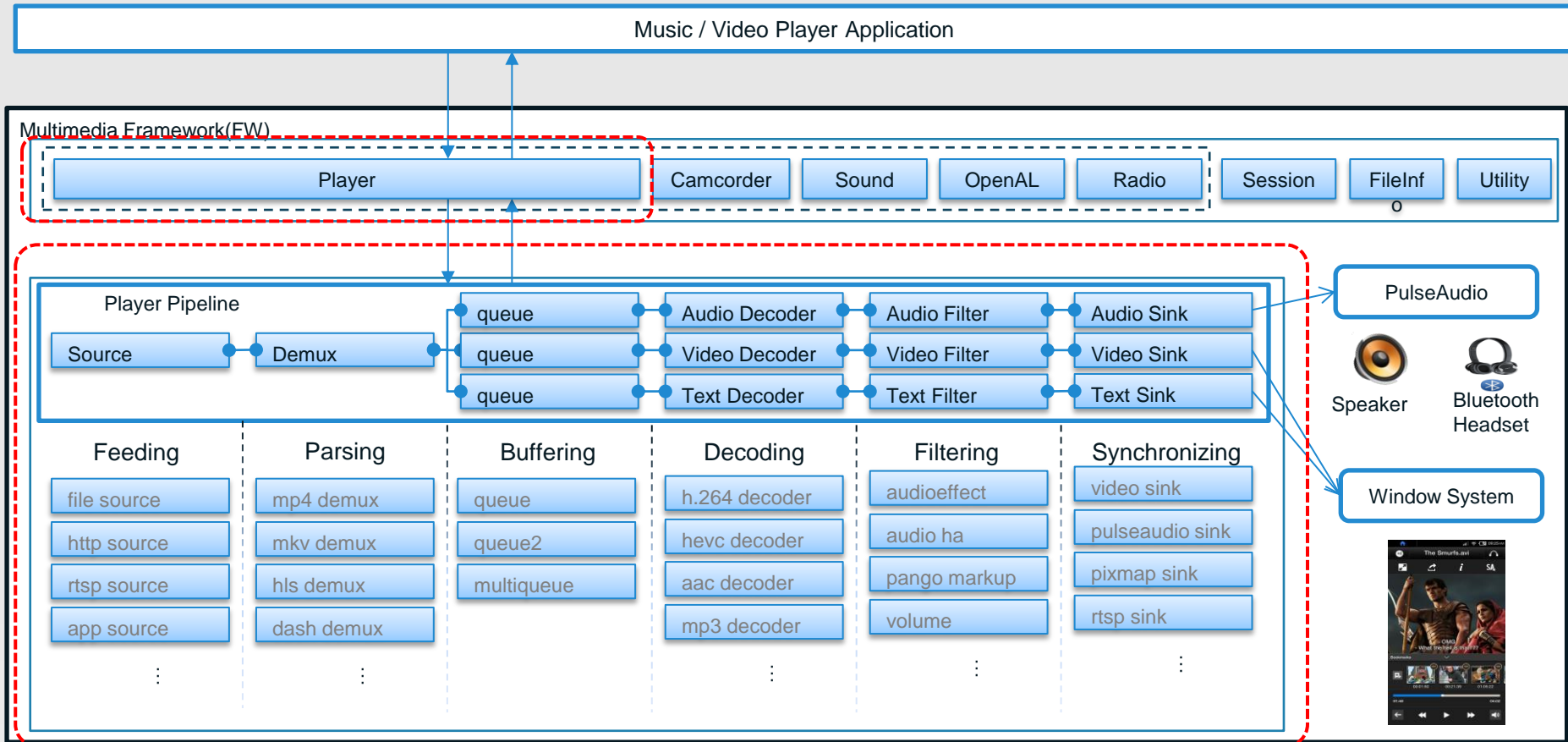
Codecs, Demuxers & DRMs

Rich Web Media Support

Video Rendering on Any Surface
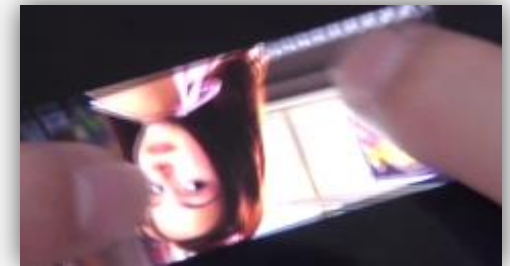
Video animation effects

Core Component : Player / Streaming FW

- **Provides functions for a multimedia application to implement playback of media contents.**
  - Support various file format/ Subtitle (SRT,SMI,SUB)
  - HTTP Streaming, HLS(HTTP Live Streaming), RTP/RTSP Streaming Progressive Download(File/URI) etc

Music / Video Player Application

Multimedia Framework(FW)

| Player | Camcorder | Sound | OpenAL | Radio | Session | FileInf o | Utility |

Player Pipeline

Source → Demux

queue	Audio Decoder	Audio Filter	Audio Sink
queue	Video Decoder	Video Filter	Video Sink
queue	Text Decoder	Text Filter	Text Sink

Feeding	Parsing	Buffering	Decoding	Filtering	Synchronizing
file source	mp4 demux	queue	h.264 decoder	audioeffect	video sink
http source	mkv demux	queue2	hevc decoder	audio ha	pulseaudio sink
rtsp source	hls demux	multiqueue	aac decoder	pango markup	pixmap sink
app source	dash demux		mp3 decoder	volume	rtsp sink
⋮	⋮	⋮	⋮	⋮	⋮

PulseAudio

Speaker

Bluetooth Headset

Window System

Rich Camera & Audio

- **High Quality & High Speed Camera**
  - High Resolution Recording & Zero Shutter Lag
  - Pluggable architecture makes easy to apply the audio and the video effect
  - Support various kind of shot modes
- **Provide Rich Experience with the Audio Accessory**
  - Audio Dock, HDMI, USB Audio 5.1ch, Bluetooth Headset, etc.
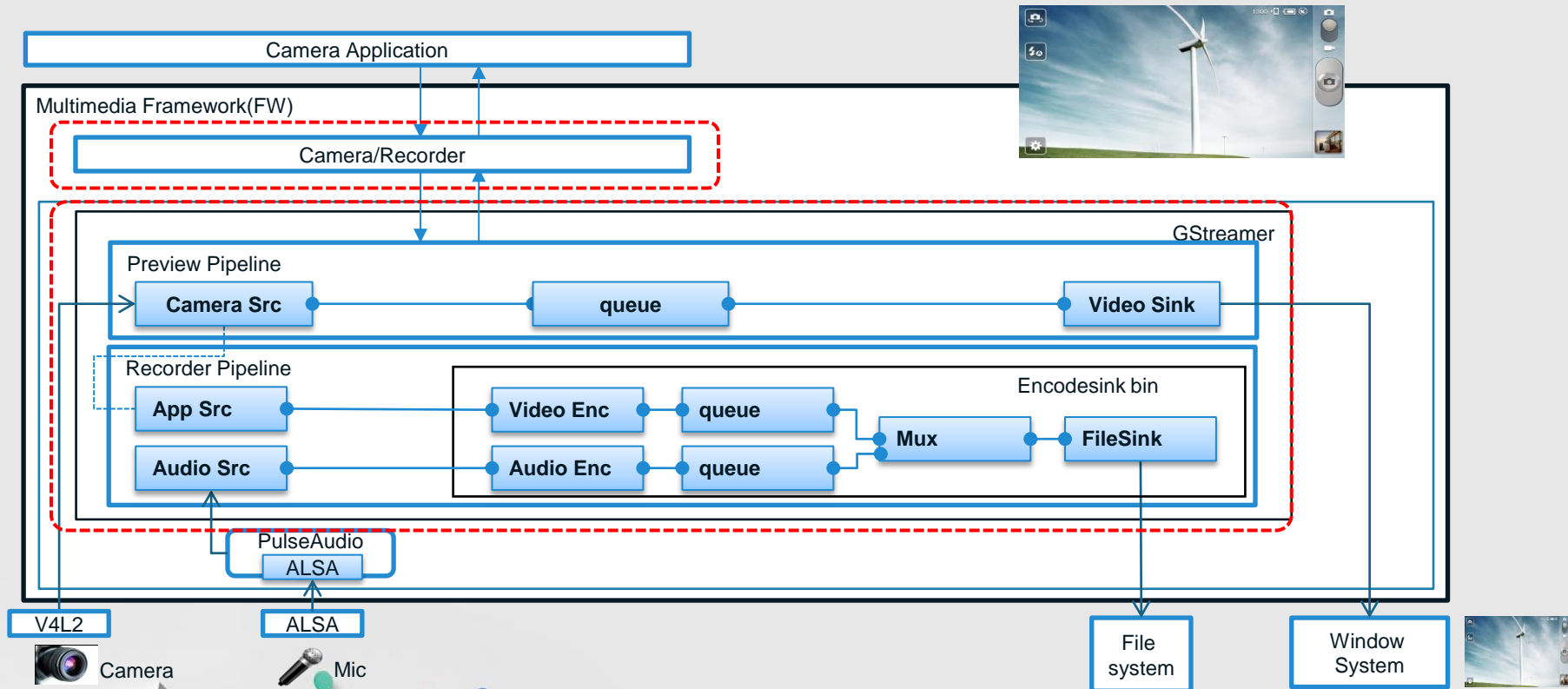
Various Camera Shot Modes

Audio Accessory Supporting

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Core Component : Camera / Recorder FW

- **Captures various media types like still image, audio/video frame from mic/camera device**
  - Capture : single/multi shot / Recorder : Video/Audio recording, Audio Recording

Camera Application

Multimedia Framework(FW)

Camera/Recorder

GStreamer

Preview Pipeline

Camera Src — **queue** — **Video Sink**

Recorder Pipeline

Encodesink bin

App Src — **Video Enc** — **queue**

Audio Src — **Audio Enc** — **queue**

Mux — **FileSink**

PulseAudio
ALSA

V4L2   ALSA

Camera   Mic

File system

Window System

Core Component : Audio FW

- **Audio IO**
  - Capture or Playback PCM
- **OpenAL**
  - Open Audio Library, Low latency audio playback especially for the game
- **PulseAudio**
  - All sound will be played via PulseAudio Server

Applications						
Media Player	System Sound	Game Sound	Camera Shutter	Ringtone	Alarm	ETC …

Multimedia FW

Player

GStreamer

Audio IO

OpenAL

PulseAudio

ALSA module sink

BlueZ module sink

Speaker

Bluetooth Headset

Bluetooth FW
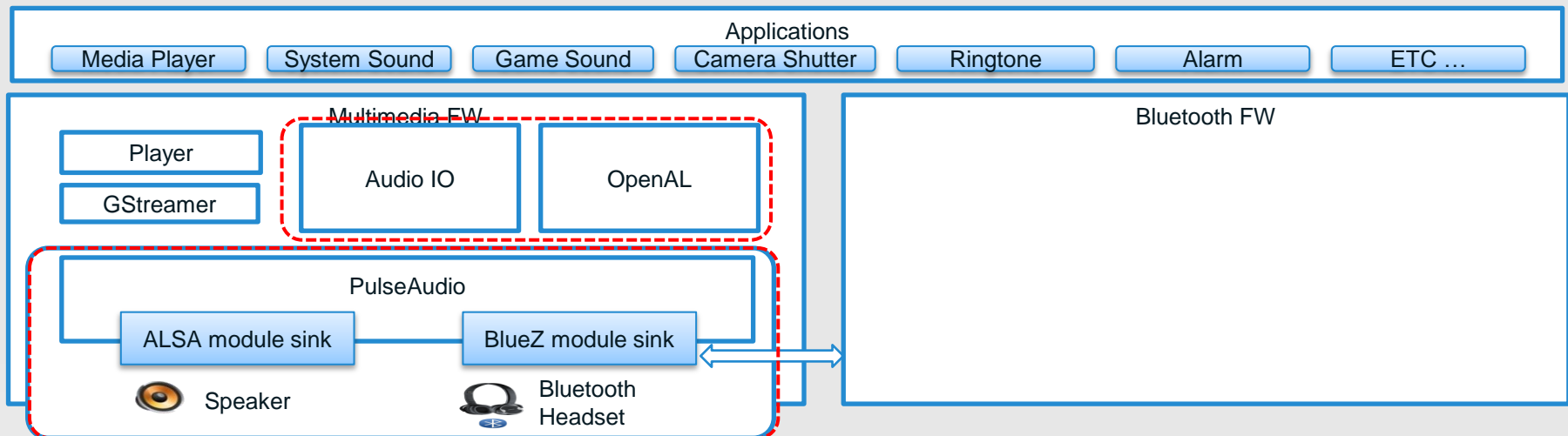
Screen Mirroring & Media Content

- **Support Standard WiFi Miracast**
  - Seamlessly displaying multimedia between devices without cables
- **Support Media Content FW & EditingFW**
  - Scanning Contents, Extracting Metadata and store metadata information by DB
  - Easy to Make User Created Contents

WiFi Miracast
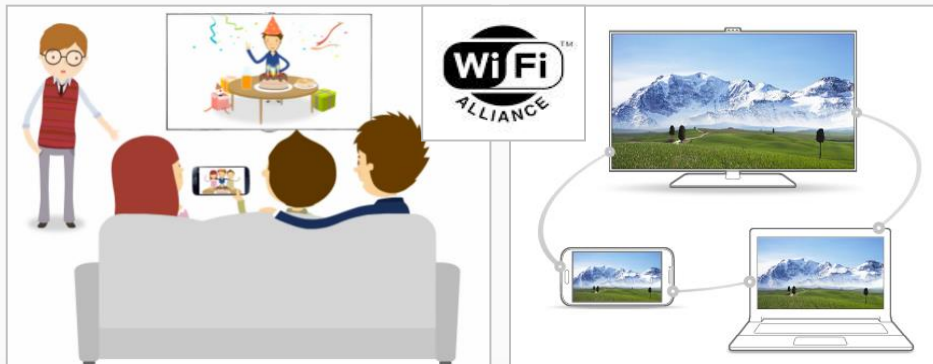
Media Content & Editing
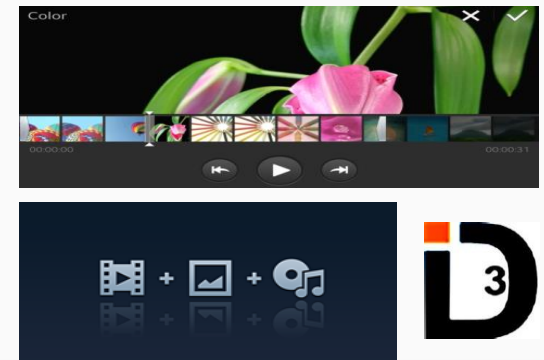
Core Component : WiFi Miracast

- **Screen on the Source Device is mirrored on the Sink Device**
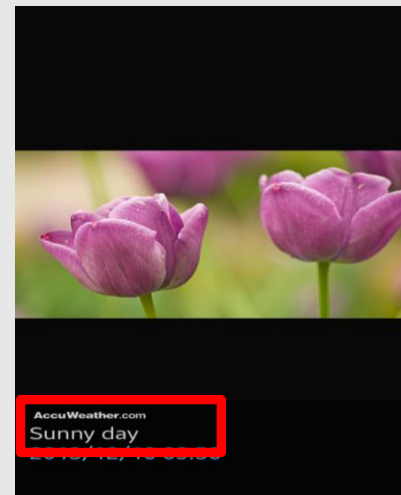 - Support Source & Sink Function
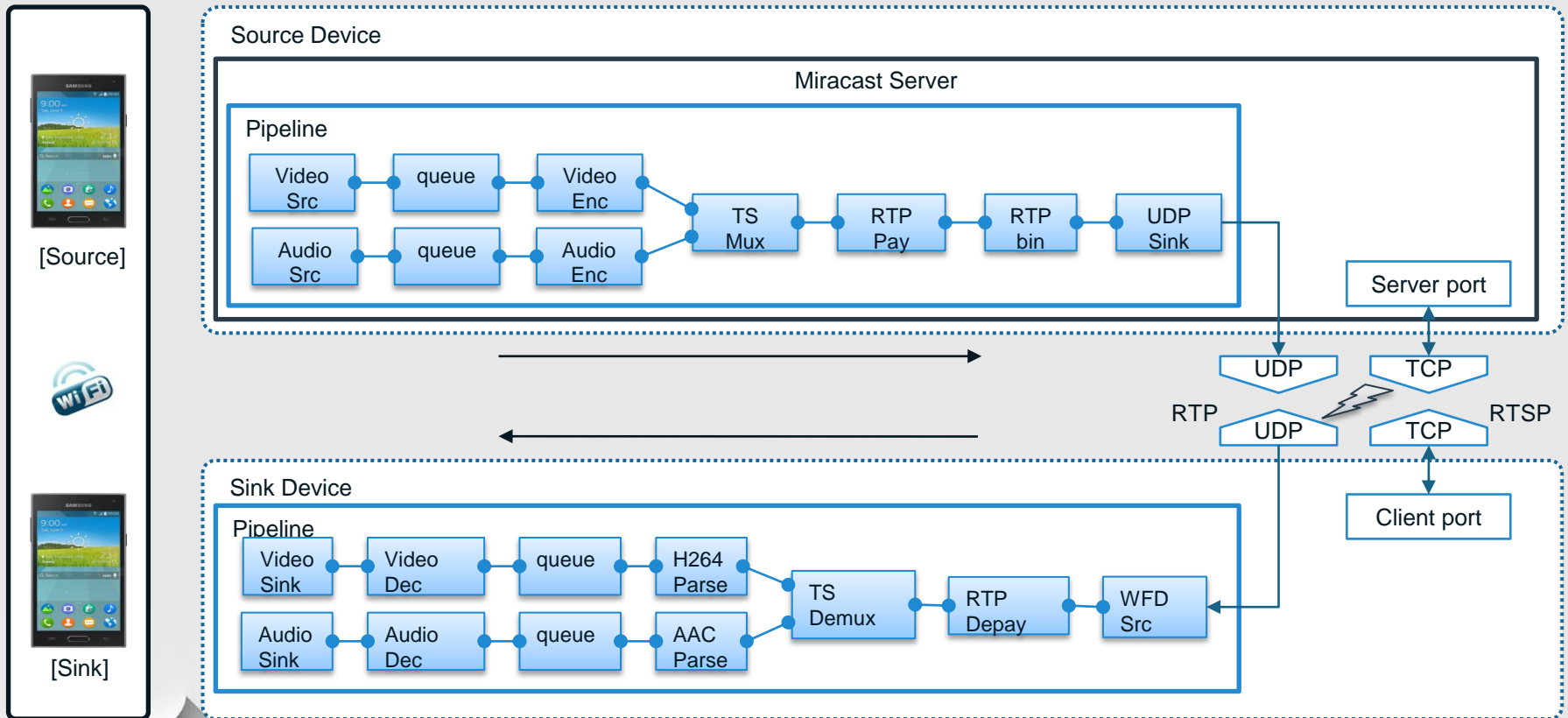
Core Component : Media Content FW

- **Manage the Content list and Metadata by DB**
  - Scanning Contents
  - Extract Content Metadata and store it in Media DB
  1. Manage ID3 Tag / Exif info, Thumbnail and User created metadata etc
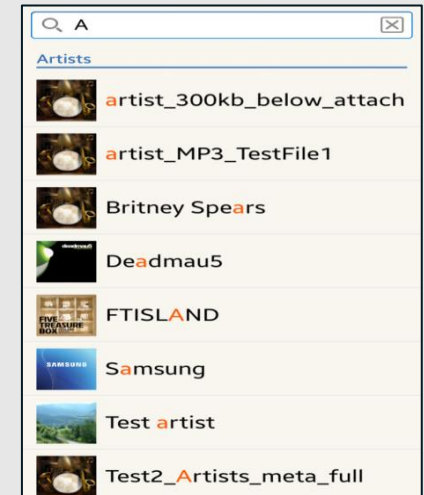 - Support Content browsing and Search
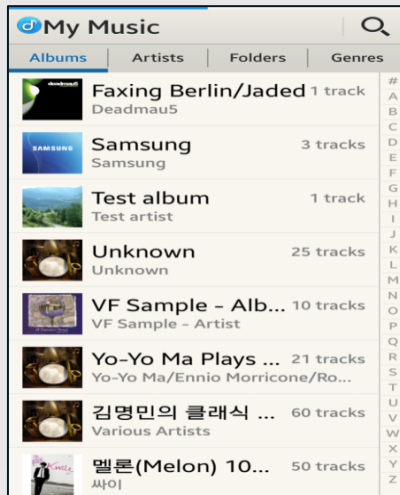
[Content Browsing]
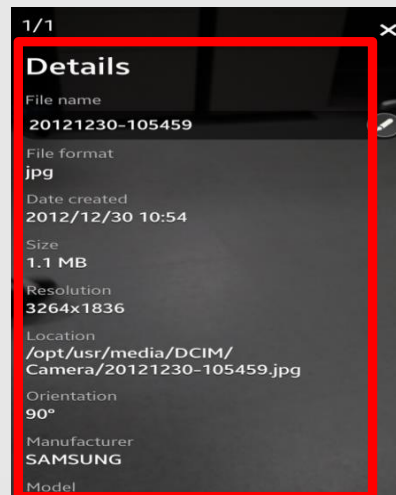
[Content Metadata]

[User created metadata]

[Content Search]

Core Component : Media Editing FW

- **Transcoder**
  - Audio Video Content Container format, Codec Format, Scaling, Framerate Converting Support, Content Trim Support
- **Metadata Editor**
  - ID3 Tag Extracting / Writing, Video Metadata and Frame Extract
- **Image Util**
  - Image Crop, Resize, Rotate, Color Space Convert Support

	Before	After
Container	AVI	MP4
Video	H.264	MPEG-4
Audio	MP3	AAC
Resolution	1080*1902	640*480

[Video Content Transcoding]

Color

01 02 03 04 05 06 07 08 09 10 11 12

[Video Content Frame Extract & Resize]

Media info

Artist Yo-Yo Ma/Ennio Morricone/Roma Sinfonietta
Title Casualities Of War Main Theme (Brian De Palma Suite: Casualities Of War)
Album Yo-Yo Ma Plays Ennio Morricone
Track length 03:53
Genre Classical
Author Ennio Morricone
Copyright Unknown
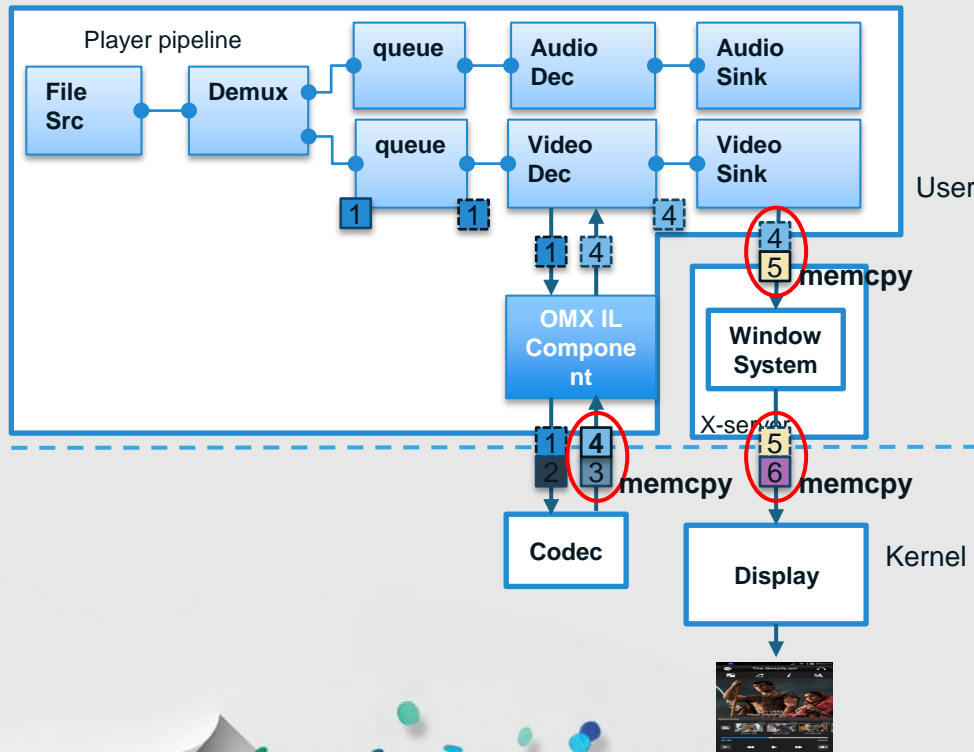Track number 13
Format 128Kbps 44.1KHz 2ch
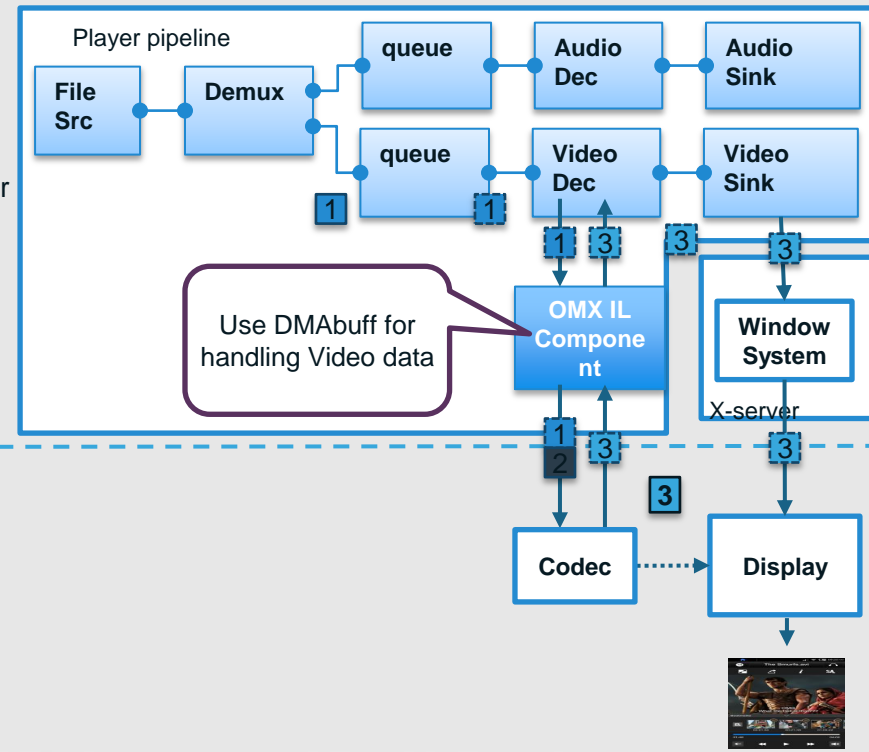
[ID3 Tag Extract]

Case Study

Hight Quality Video – Zero Copy

- **Memory handling mechanism for Zero Copy in Video playback**
  - Use DMAbuff for handling Video data

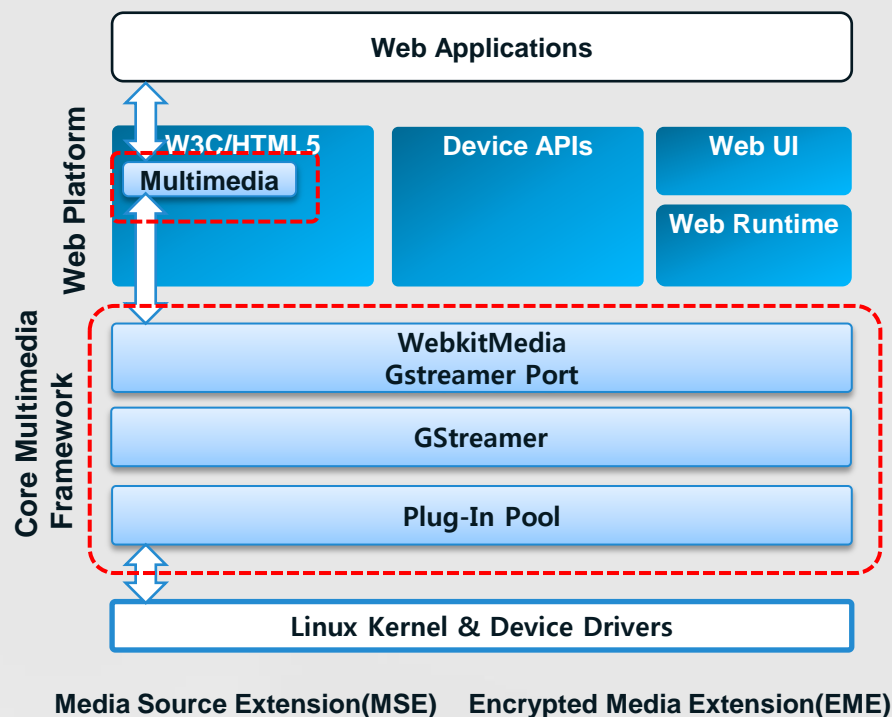
Video Decoding (normal)

Video Decoding (zero-copy)

Rich Web Media Support

- **Whole native media supports are integrated into Webkit**
  - Webkit uses GStreamer elements from Plug-In Pool

Web Applications

Web Platform

| W3C/HTML 5 | Device APIs | Web UI |
| **Multimedia** | | Web Runtime |

Core Multimedia Framework

WebkitMedia Gstreamer Port

GStreamer

Plug-In Pool

Linux Kernel & Device Drivers

Media Source Extension(MSE)   Encrypted Media Extension(EME)

| Type	List
Audio codec (Decoder)	AAC, MP3, WMA, AMR, PCM, OGG, FLAC
Video codec (Decoder)	H.263, MPEG-4, Divx, H.264, WMV, MP43, Sorenson Spark
Audio codec (Encoder)	AAC, AMR
Video codec (Encoder)	H.263, MPEG-4, H.264
Container format	MP4,3GP,AVI, WMV, ASF, MKV, MOV, TS MP3,AAC,AMR, AC3, WMA, OGG, WAV

Tizen Multimedia FW for Mirroring (1/2)

- **Support WiFi Miracast Source & Sink with various mode**

  Mirroring – Actual displayed images of WiFi Miracast source device
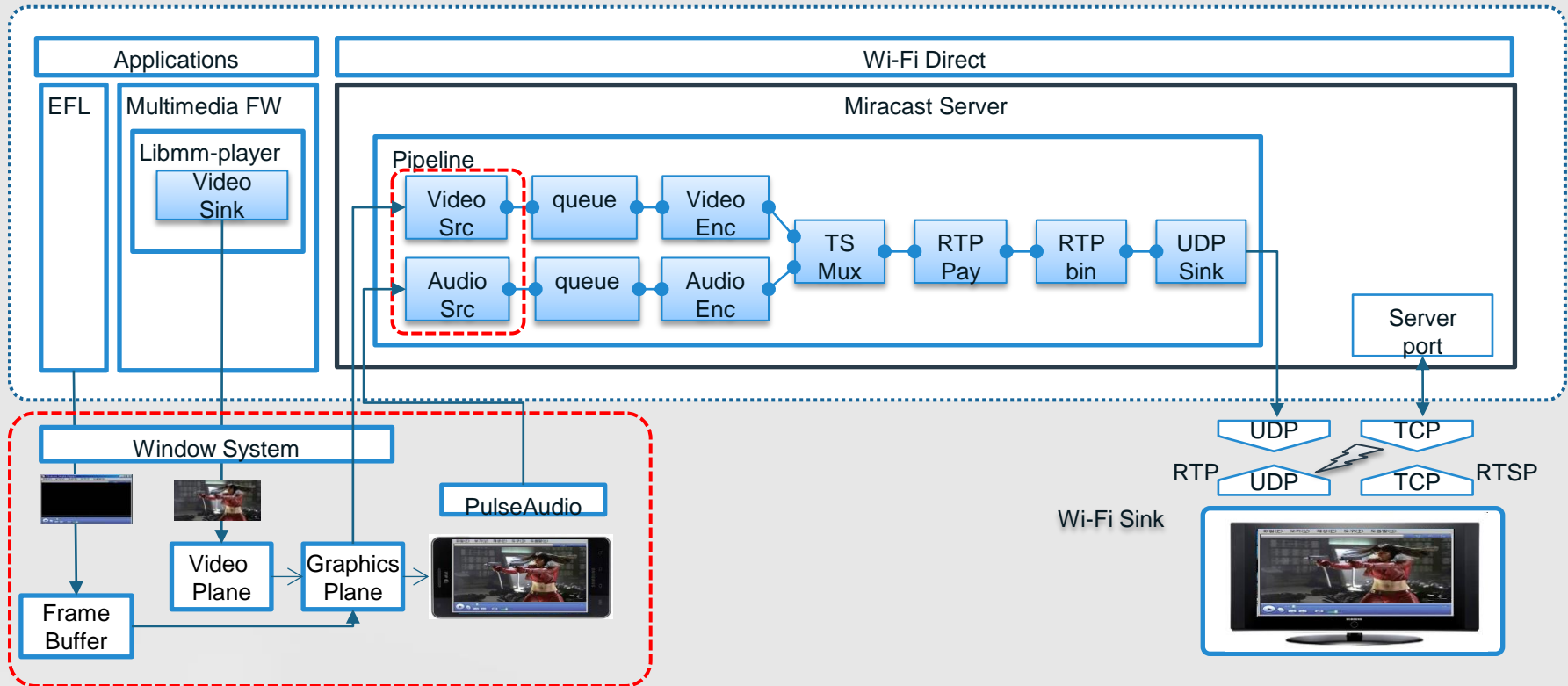

  Mirroring (Video Only mode) – Just Video images of WiFi Miracast source device
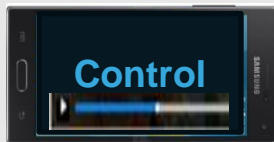
  Control by UIBC

Tizen Multimedia FW for Mirroring (2/2)
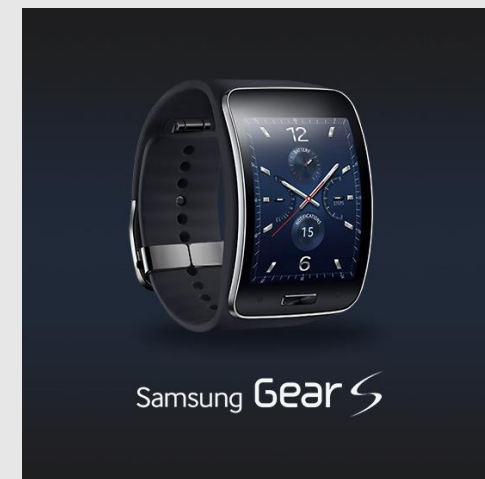
- **Pipeline of WiFi Miracast Source**

Tizen Multimedia FW on Wearable Devices

- **Standalone Music Player**
- **Standalone Camera, Video Player**
- **Audio Scenario for S Voice, Voice Control and Call**
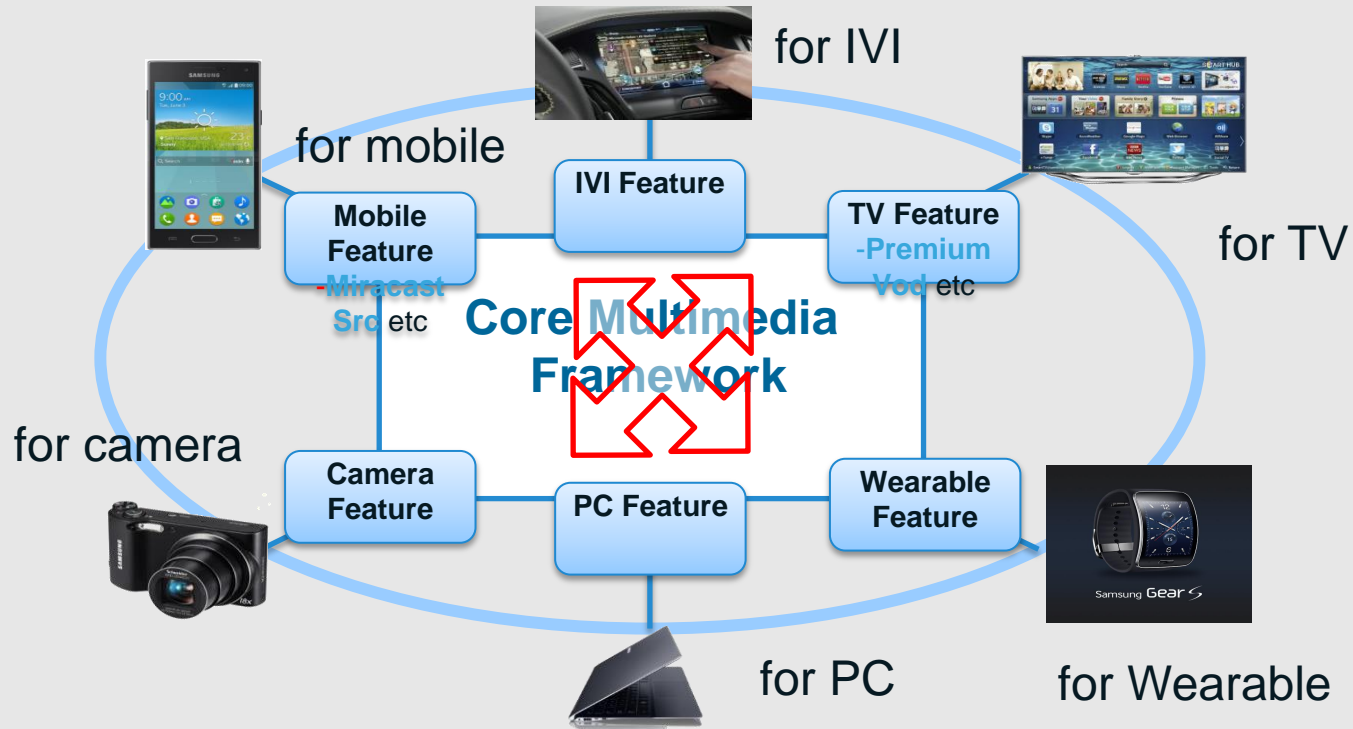- **Media Content for multi-lingual Localized Sorting**

简体字 [jiǎn tǐ zì]

繁體字 [fán tǐ zì]

Conclusion

- **Multimedia FW for Multi-Devices**

for IVI

for mobile

for TV

IVI Feature

Mobile Feature
-Miracast Src etc

TV Feature
-Premium Vod etc

Core Multimedia Framework

for camera

Camera Feature

PC Feature

Wearable Feature

for PC

for Wearable

Tizen Multimedia FW is still developing