



# Tizen Webkit For Wearable Devices

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# Tizen Webkit for Wearable



# Tizen Wearable

- **Tizen wearable**

- A set of software components for wearable product, keeping continuity with Tizen platform
- Basically major components from Tizen Mobile, but a few features are added
  - Connectivity between host device and wearable device (SAP in case of Gear 2)
  - Context manager to interpret raw sensor data and then provide meaningful context info to applications
  - Web performance/features are enhanced



Gear 2 & Gear 2 Neo



Gear 1 Upgrade

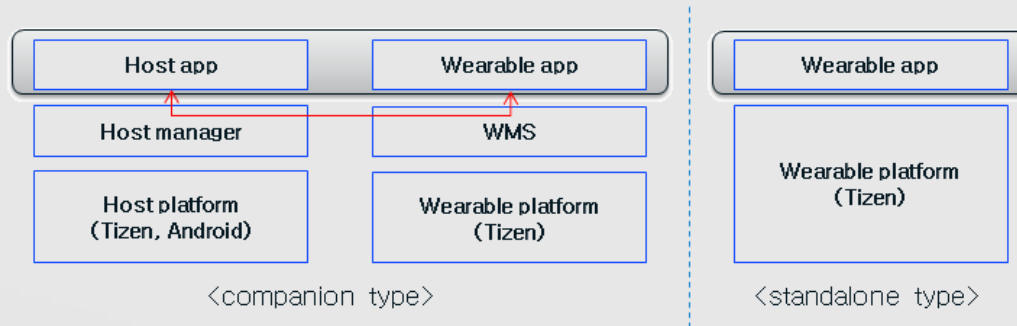
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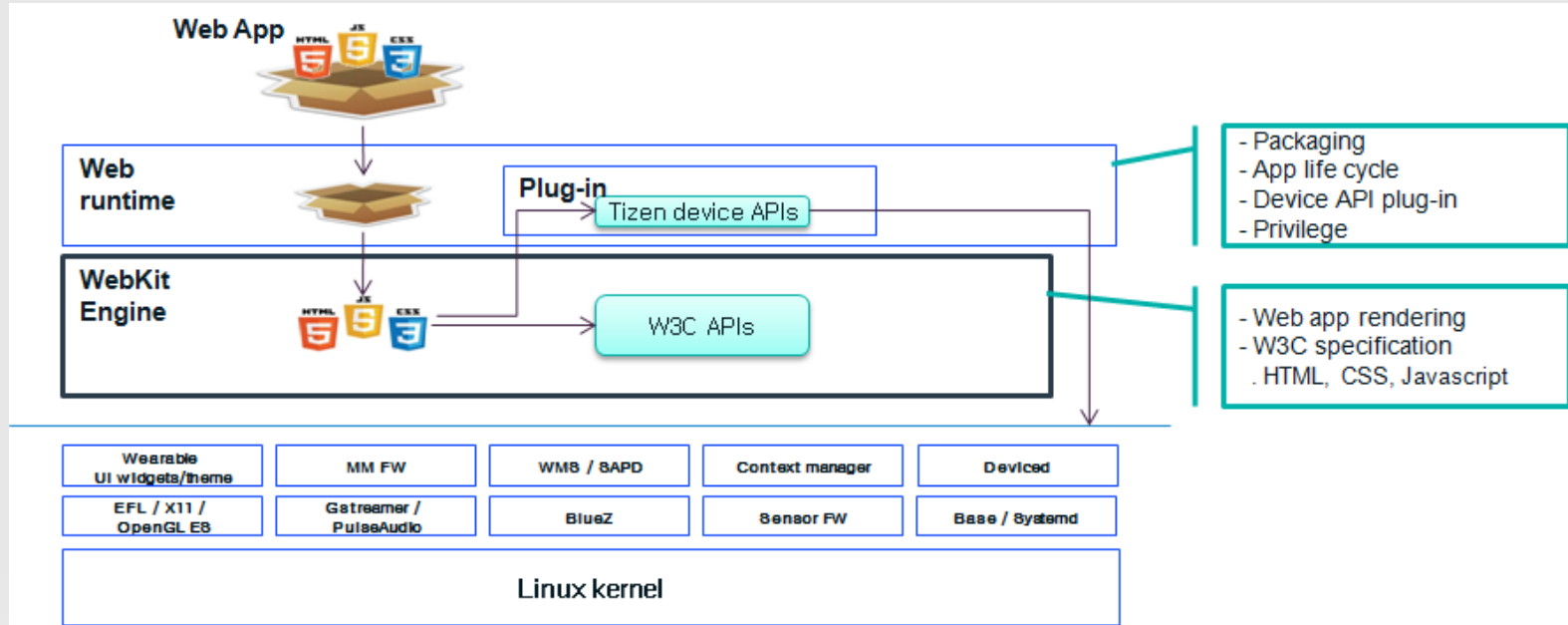
# Application Model

- **Companion type**
  - One actual application consists of host app and wearable app through connectivity
- **Standalone type**
  - Only wearable app regardless of host device

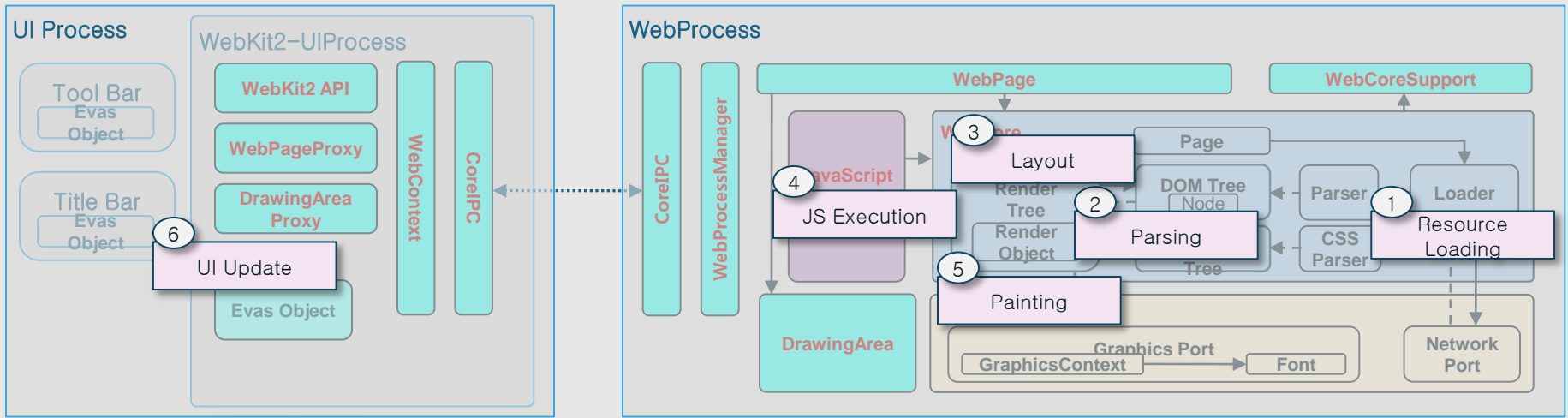
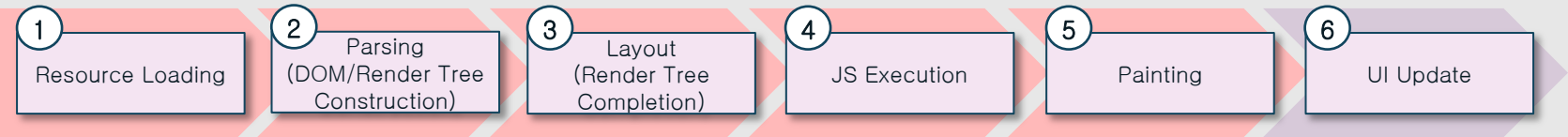


# Web App

- Only web app is allowed in wearable eco-system and wearable SDK



# WebKit2-EFL



# Tizen Wearable Profile (1/3)

- **Downsizing webkit2 features from Mobile Profile**
  - Un-used feature : SVG, WebSQL etc.
  - H/W unsupported : Network, Sensors etc
- **Add Camera, Video recording, and Audio recording features**

		Tizen Gear
DOM, Forms and Styles	HTML5 Forms (Partial)	O
	Selectors API Level 1	O
	Selectors API Level 2 (Partial)	O
	Media Queries (Partial)	O
	CSS Transforms	O
	CSS Animations Module Level 3	O
	CSS Transitions Module Level 3 (Partial)	O
	CSS Color Module Level 3	O
	CSS Backgrounds and Borders Module Level 3	O
	CSS Flexible Box Layout Module	O
	CSS Multi-column Layout Module (Partial)	X
	CSS Text Module Level 3 (Partial)	X
	CSS Basic User Interface Module Level 3 (CSS3 UI)	O
	CSS Fonts Module Level 3 (Partial)	X
	WOFF File Format 1.0	X
	DOM/JavaScript related HTML5 Enhancements	O
	HTML5 The session history of browsing contexts	O

# Tizen Wearable Profile (2/3)

Device	Touch Events version 1 (Partial)	O
	DeviceOrientation Event Specification (Partial)	O
	Battery Status API	O
	Vibration API	O
	HTML5 Browser state	X
	The Screen Orientation API	X
	The Network Information API	X
Graphics	HTML5 Thecanvaselement (Partial)	O
	HTML Canvas 2D Context (Partial)	O
	HTML5 SVG	X
Media	HTML5 Thevideo element (Partial)	O
	HTML5 Theaudio element (Partial)	O
	getUserMedia(Partial)	O
	Web Audio API (Partial)	X
	HTML Media Capture	X
Communcation	The WebSocket API	X
	XMLHttpRequest Level 2	O
	Server-Sent Events	X
	HTML5 Web Messaging	O



# Tizen Wearable Profile (3/3)

Storage	Web Storage	O
	File API	O
	File API: Directories and System	X
	File API: Writer (Partial)	X
	HTML5 Application caches	X
	Indexed Database API	O
	Web SQL Database	X
Security	Cross-Origin Resource Sharing	X
	HTML5 Theiframeelement	O
	Content Security Policy 1.0 (Partial)	O
UI	Clipboard API and events (Partial)	X
	HTML5 Drag and drop	X
	Web Notifications (Partial)	X
Performance and Optimization	Web Workers (Partial)	O
	Page Visibility	O
	Timing control for script-based animations	O
	Navigation Timing	X
Location	Geolocation API Specification	X
Widget	Widget Packaging and XML Configuration	O
	Widget Interface	O
	XML Digital Signatures for Widgets	O
	Widget Access Request Policy	X

# Camera API (1/3)

- **Provides interfaces for configuring camera options, recording video/audio, and capturing images.**
- **Accessing the Camera Device**
  - Get stream using the getUserMedia() method.

```
var stream;  
navigator.webkitGetUserMedia({video: true, audio: true}, gotStreamCallback, noStreamCallback);  
  
function gotStream(rStream) { stream = rStream; }
```

- Create camera control with the stream

```
navigator.tizCamera.createCameraControl(stream, gotCameraCallback, noCameraCallback);
```

# Camera API (2/3)

- Camera control interface

```
[NoInterfaceObject] interface CameraControl {  
    readonly attribute CameraCapabilities capabilities;  
    readonly attribute CameraMediaRecorder recorder;  
    readonly attribute CameraImageCapture image;  
    void applySettings(CameraControlSettings settings, CameraSuccessCallback onSuccess,  
CameraSettingErrorCallback onError);  
    boolean autoFocus();  
    void release();  
};
```

# Camera API (3/3)

- **Managing the camera**

- You can record videos and capture images.

```
cameraControl.recorder.start(recordingStartSuccess, recordingStartError);  
cameraControl.recorder.stop(recordingStopSuccess, recordingStopError);  
cameraControl.image.takePicture(takePictureSuccess, takePictureError);
```

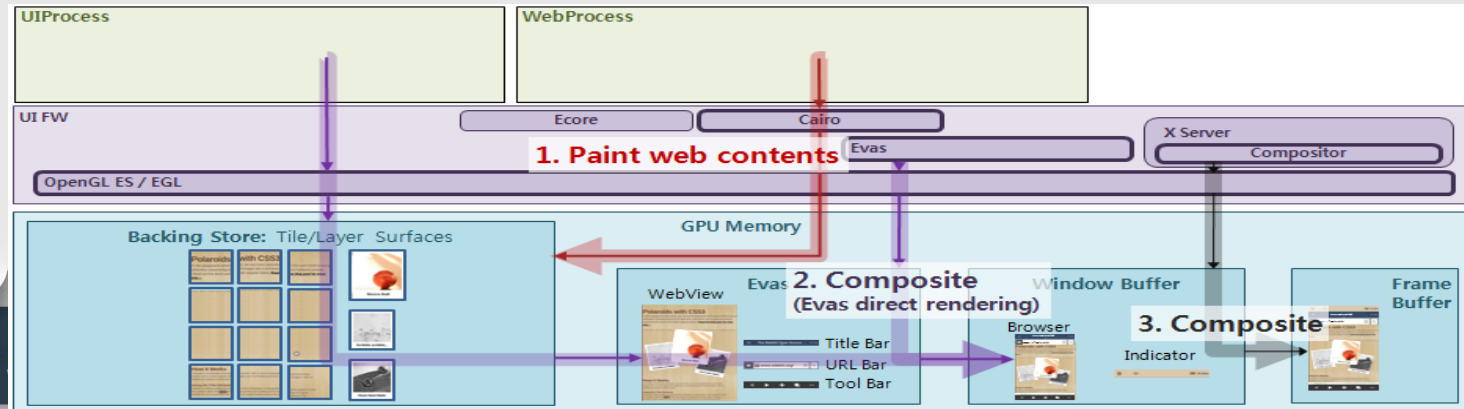
- You can access and set the camera settings, such as the file name for the recorded video or captured image.

```
var recordingSetting = { fileName : "sample.3gp"; }  
cameraControl.recorder.applySettings(recordingSetting, settingSuccessCallback, settingErrorCallback);
```

# Memory Optimization (1/2)

- **Graphics memory**

- Buffer size per screen : width \* height \* 4 Byte
  - 320 \* 320 : 400K
  - VGA : 1,200K
- Memory sharing
  - Buffer sharing between CPU & GPU, between processes
  - Evas direct rendering
- Optimizing tile pool size



# Memory Optimization (2/2)

- **Memory Clean-up for Background App**
  - Clean-up tiled-backing store
- **Useless Caches**
  - No cache for network : No network on device, All resources on device
  - No page cache : No page forward-backward usage
- **Code Size**
  - Feature Cut : SVG, WebSQL etc → Reduced 4MByte Binary Size
  - Os vs O2 vs O3
    - Os is still unstable with certain gcc versions

	Os	O2	O3
Binary Size	6,8 MBytes	8.9 MBytes	9.9 MBytes

# Performance & Power Consumption

- **Control memory, CPU & GPU frequency**
  - Maximizing Performance/Power
  - Control them to keep FPS same as LCD frequency
- **Memory optimization, Algorithm optimization**
  - Useless memory access
  - Useless/duplicated task
- **Canvas on Cairo/GL**
  - We adopted cairo/gl for canvas object
  - GL back-end is better at Performance/Power
  - Canvas Perf ([http://flashcanvas.net/examples/dl.dropbox.com/u/1865210/mindcat/canvas\\_perf.html](http://flashcanvas.net/examples/dl.dropbox.com/u/1865210/mindcat/canvas_perf.html))

	GL back-end	CPU back-end	
Score	1.37	0.36	Higher better
Power consumption (mW)	300.2	292.6	Lower better

# Tips to Tizen Web App Developers





# Tip #1 CSS vs. Canvas (1/3)

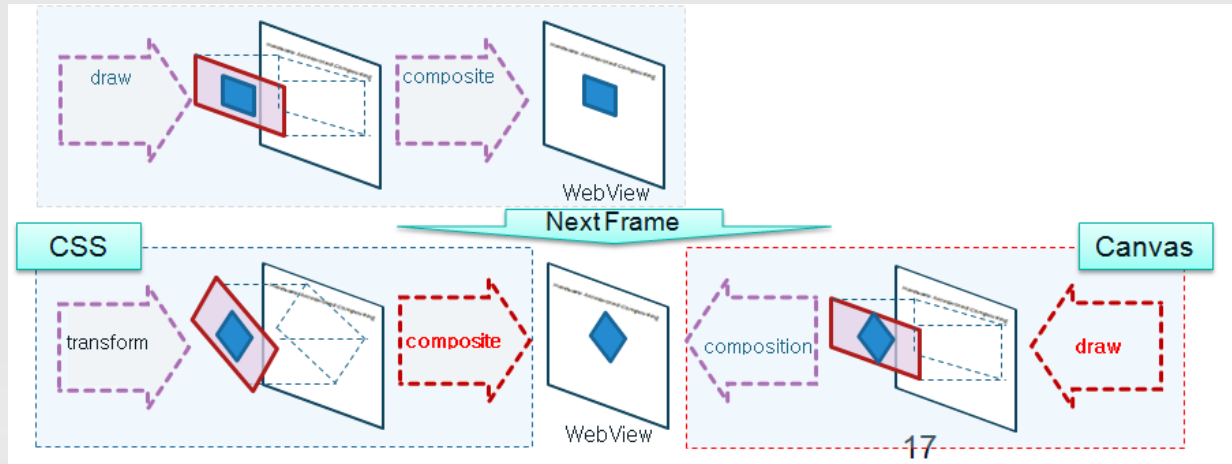
- **CSS vs. Canvas**

CSS	Canvas
More DOM Objects	Simple DOM
More Graphics Layers	One Graphics Layer per Canvas
Object based manipulation	Pixel based manipulation
Easy to (rigid body) transform objects	Easy to draw lines, curves and shapes
Lot's of options inbuilt	Need to control almost everything
Great for simple animation, effect	Great for large number of objects

# Tip #1 CSS vs. Canvas (2/3)

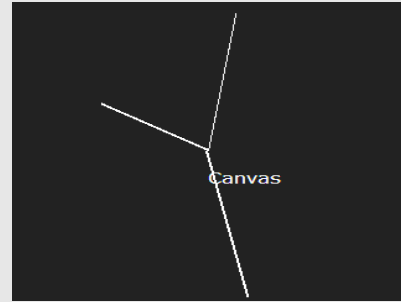
- **Accelerated Composition**

- Each graphics layer has an image buffer on which contents are drawn
- Compositing image buffers of layers to one output buffer
- CSS Transform, Canvas, Fixed position etc



# Tip #1 CSS vs. Canvas (3/3)

- **Clock App Example**
  - #1 : CSS with 3 objects – three hands
  - #2 : One canvas object
  - #3 : 3 Canvas objects – one canvas per one hand
- **Performance : All same as LCD frequency**
- **Memory Usage**



Unit : KBytes

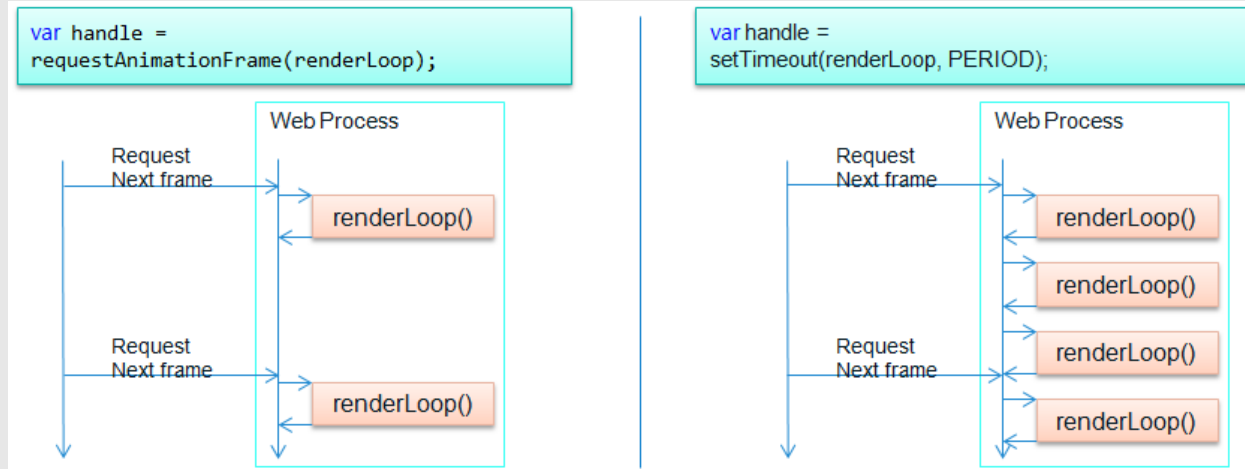
		Code	Heap	Graphics	Total
#1 CSS with 3 objects	UI Process	13,996	6,836	3,568	24,400
	Web Process	15,388	5,880	0	21,268
#2 One canvas object	UI Process	13,876	6,616	3,712	24,204
	Web Process	17,068	6,552	3,328	26,948
#3 3 Canvas object	UI Process	13,904	6,292	5,320	25,516
	Web Process	16,976	6,680	5,630	29,286

- **Power Consumption**

	Example #1	Example #2	Example #3
Power (mW)	193.8	224.2	243.2

# Tip #2 Animation

- requestAnimationFrame vs. setInterval (or setTimeout)



- Power Consumption (with a complex canvas app)

	requestAnimationFrame	setInterval
Power (mW)	285	323

# Wrap-up

- **Tizen WebKit for wearable devices is based on tizen mobile profile but some features added and cut off.**
  - Added : camera api (video recording, audio recording)
  - Cut off : Network related, sensor related features
- **Webkit is very carefully tuned considering performance, memory & power consumption**
- **For web app developer, if you understand a little bit about web engine, it would be big advantage on your app!!**