

Tizen Overview & Architecture

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TIZENTM
 *Open Technet*

**There are many smart devices
in mobile market.**



And, almost as many software platforms for them



Many smart devices also appear in non-mobile market



User Expectation by it

- **Before smart device,**
 - The user knew that they were different.
 - Therefore, the user did not expect anything among them.
 - **Now,**
 - The user is expecting anything among them.
 - However, They provide different applications and user experiences
 - Disappointed about inconvenient and incomplete continuation between them.
- 1 Due to different and proprietary software platform



Why do they?

- **Why could not manufacturers provide the same platform for their devices?**
 - The platform has been designed for a specific embedded device.
 - Manufacturers do not want to share their proprietary platforms.
- **There is no software platform considering cross category devices as well as fully Open Source.**



Proprietary platforms

What if there is..

- **What if there is a standard-based, cross category platform?**
 - The same software can run on many categories of devices with few or no changes
 - Devices can be connected more easily and provide better convergence services to users
- **What if the platform is Open Source?**
 - Manufacturers can deploy the platform on their products easily
 - New features/services can be added without breaking [given the software complies to platform standards]



The platform

having these two features is



- ✓ Standard-based, **Cross Category Platform**
- ✓ **Fully Open Source** Platform

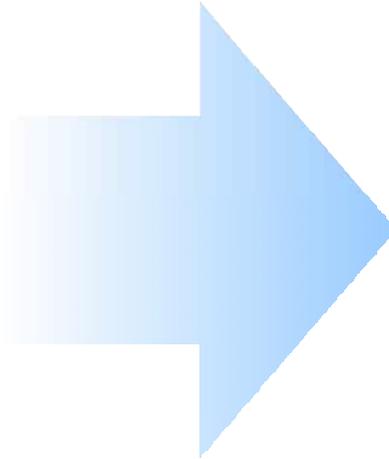
Standard-based, cross category platform



for mobile



for IVI



for TV



for camera



for printer



for PC



for washing
machine?

Tizen 2.0 Profiles

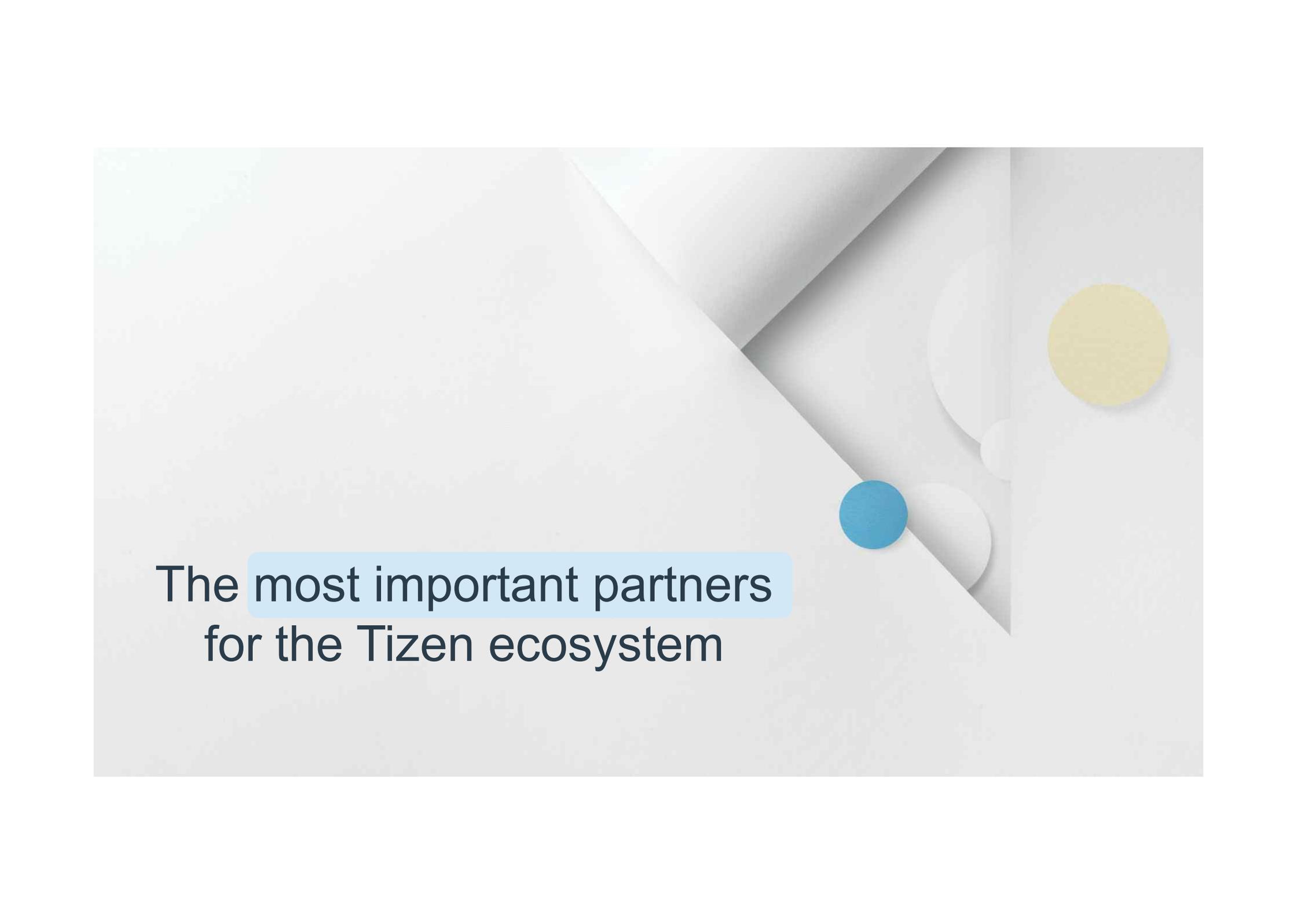
Future Profiles

Standard-based, cross category platform



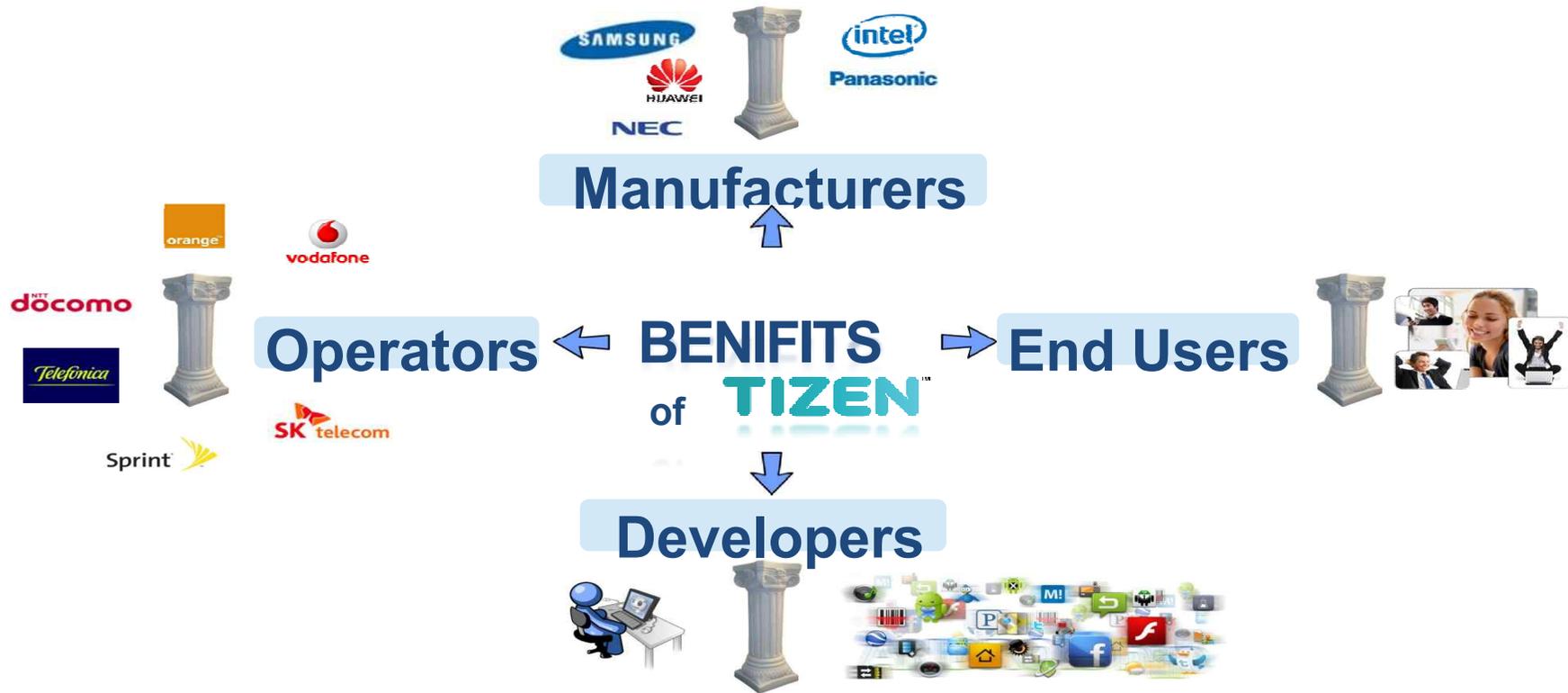
Fully Open Source platform



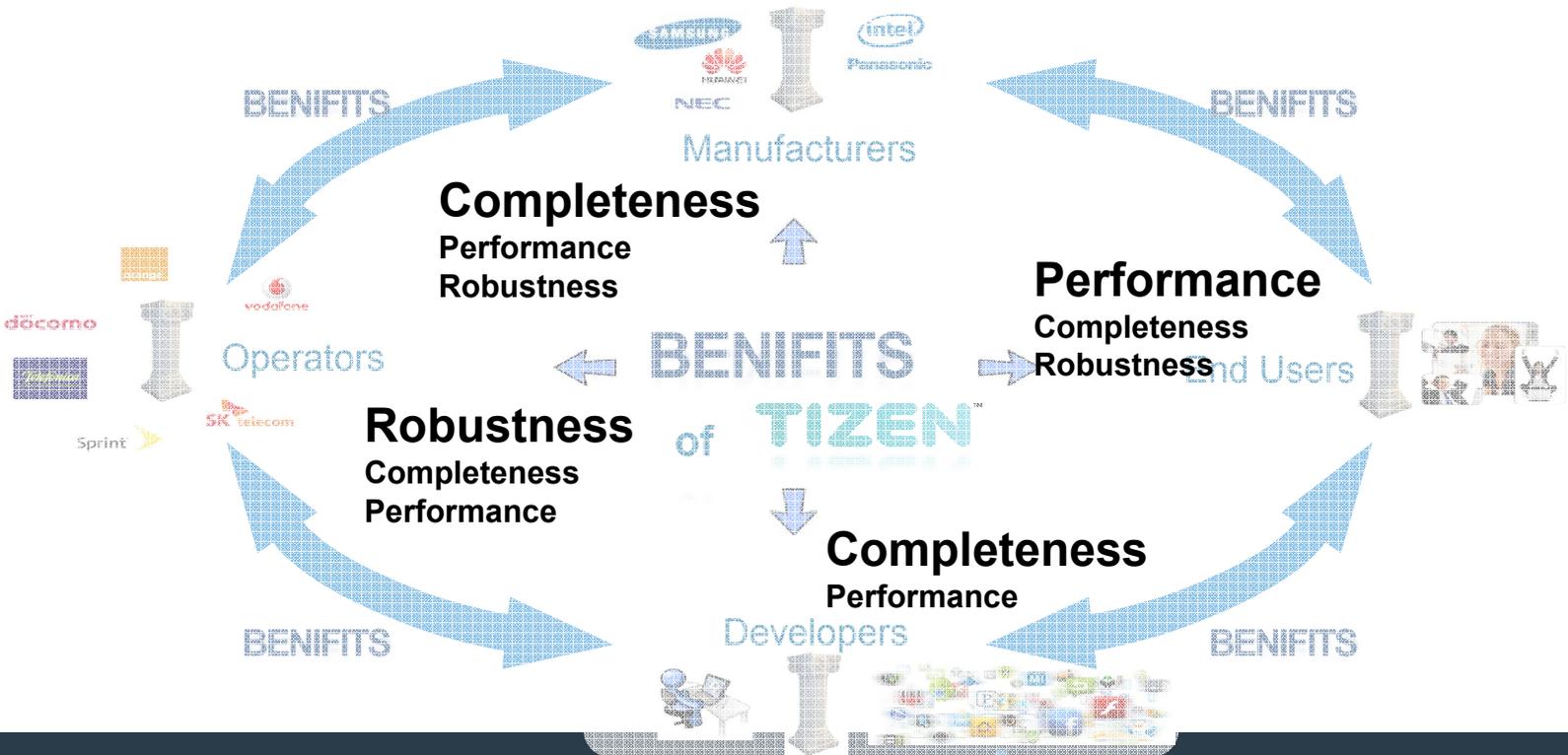
The background features a light gray gradient with several overlapping white geometric shapes, including triangles and circles, creating a layered, paper-like effect. A blue circle is positioned near the bottom right, and a yellow circle is positioned near the top right.

The most important partners
for the Tizen ecosystem

Four pillars of Tizen ecosystem



Platform pre-conditions for ecosystem

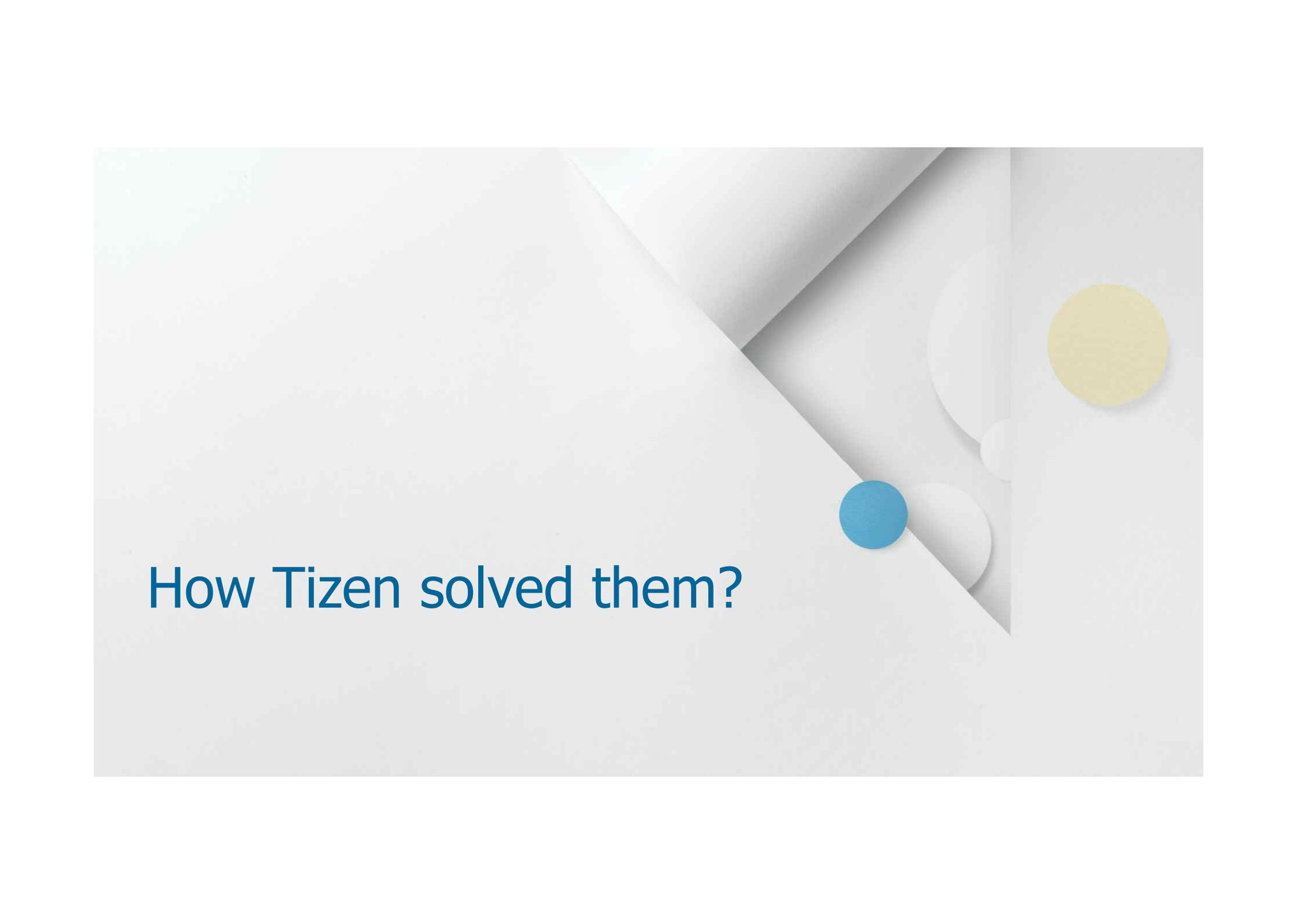


How Tizen supports them?



Key Requirements

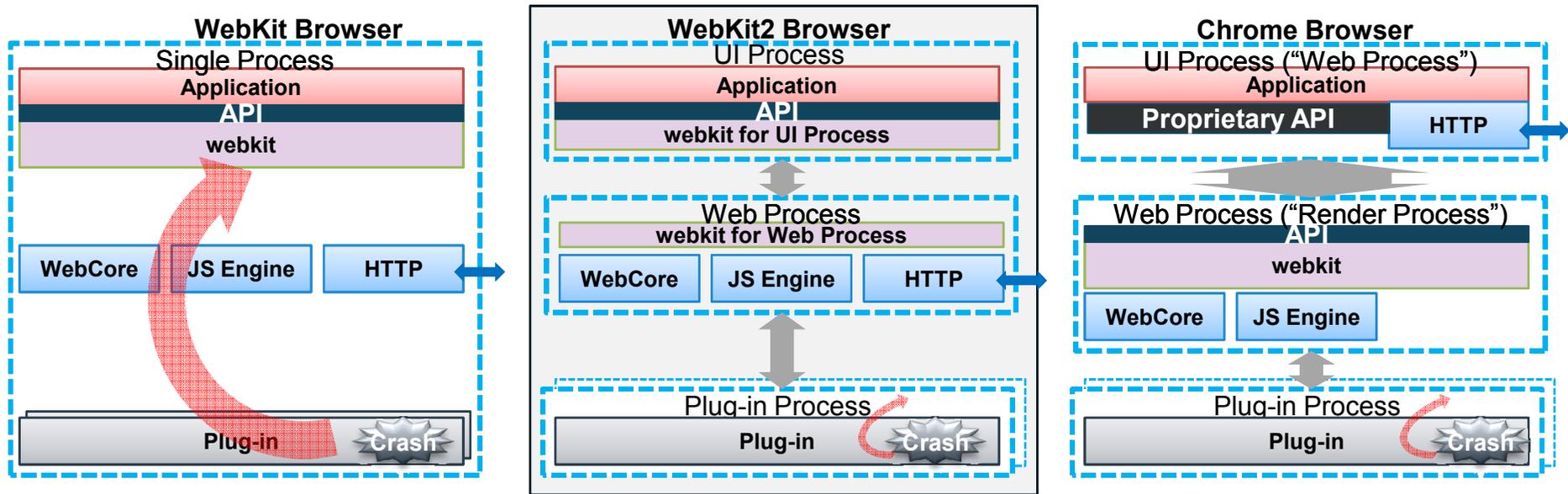
- **Robustness requires:**
 - Model for stable web application
 - More secure platform
- **Performance requires:**
 - Optimized graphics toolkit including smooth animations
 - Supporting rich effect with video
 - High performance of Web 2D & 3D Graphics
 - Minimizing power consumption and memory overhead while processing 2D/3D graphics
- **Completeness requires:**
 - Plentiful web API
 - Cellular functionalities
 - Fast and easy connectivity
 - Scalable UI



How Tizen solved them?

Robustness: Model for Stable Web App

- WebKit2 (<http://www.webkit.org>)
 - Multi-process model: protect web application from plug-in crashes
 - ※ Standardized API with small IPC overhead

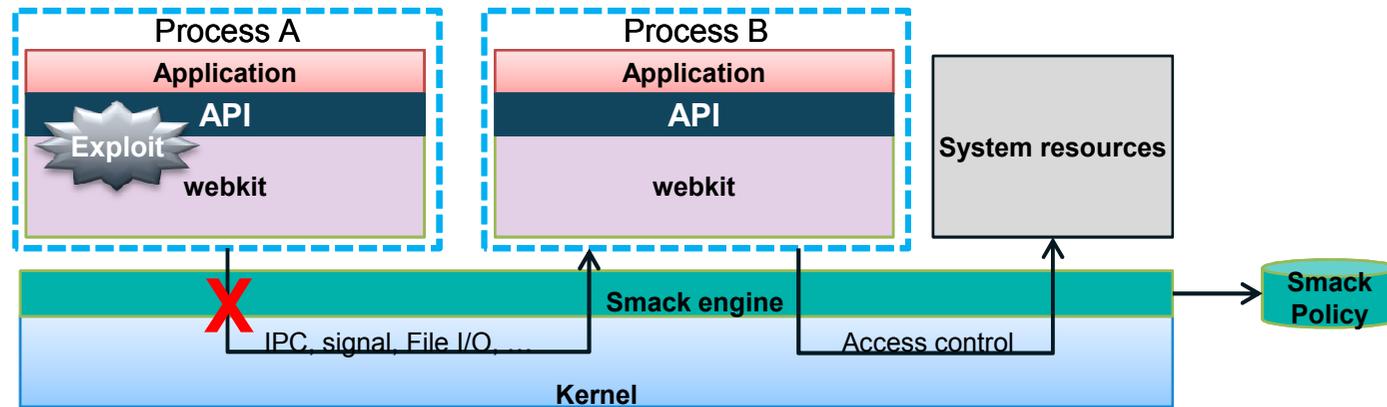


Process Boundary

IPC

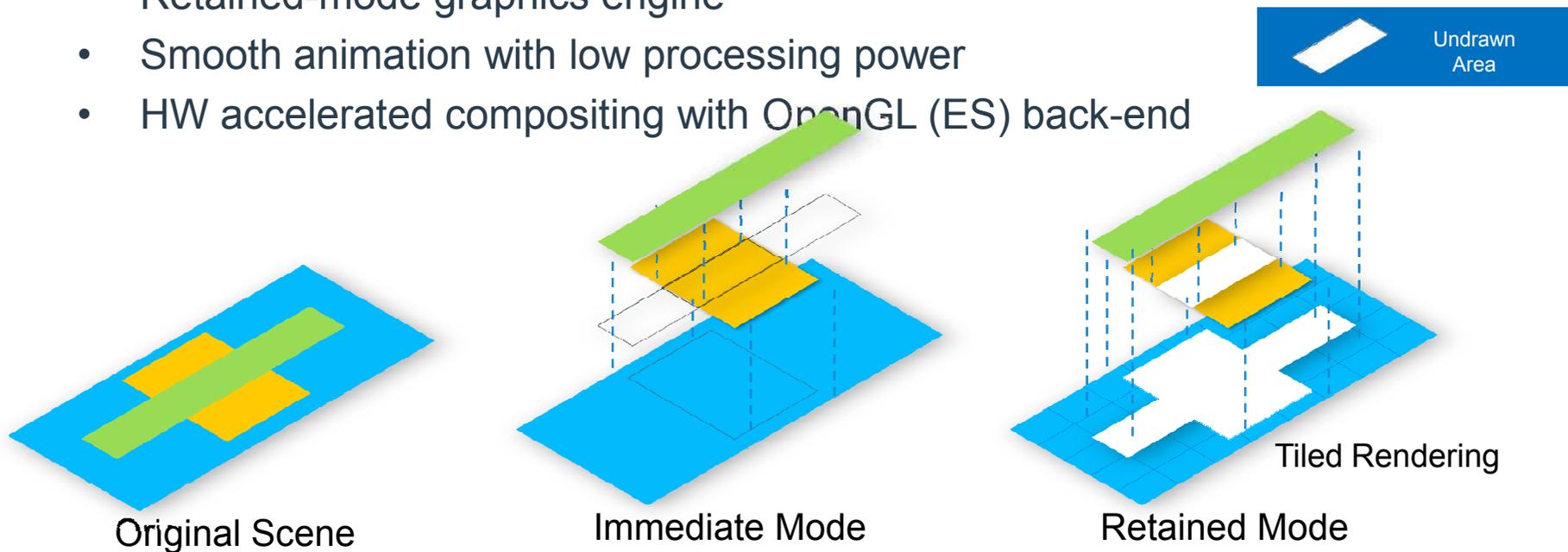
Robustness: More Secure Platform

- **Smack as the main system-level access control**
 - Simple, but fast and memory effective
 - SMACK web site: <http://schaufler-ca.com/>
- **Web Runtime enforces fine-grained access control for Web Apps**
 - Only allowed resources can be accessed
- **Smack-based process sandboxing for all widget processes**
 - Significantly reducing attack effectiveness



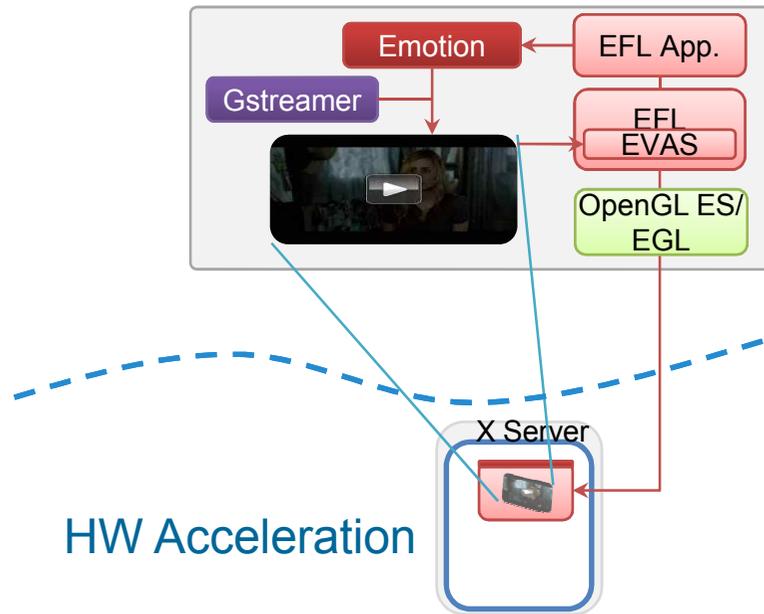
Performance: Optimized Graphics Toolkit

- Enlightenment Foundation Libraries (EFL)
 - Web site: <http://www.enlightenment.org/>
 - Retained-mode graphics engine
 - Smooth animation with low processing power
 - HW accelerated compositing with OpenGL (ES) back-end



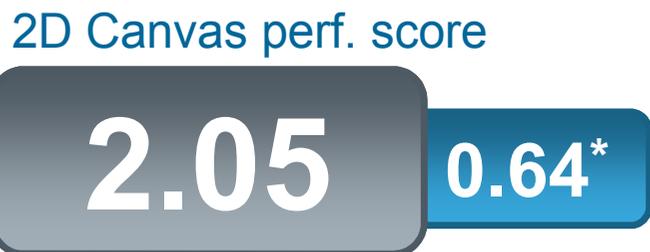
Performance: Supporting Rich Effect with Video

- Free transform of video object while playback

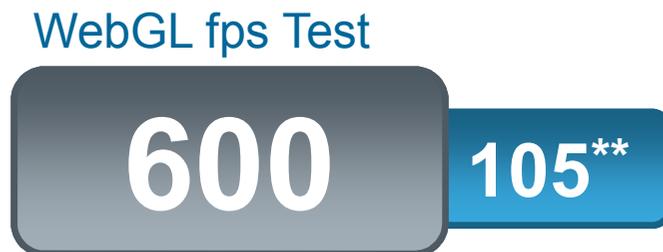


Performance: Web 2D & 3D Graphics

- 2D Graphics: Cairo OpenGL ES back-end
- 3D Graphics: WebGL support



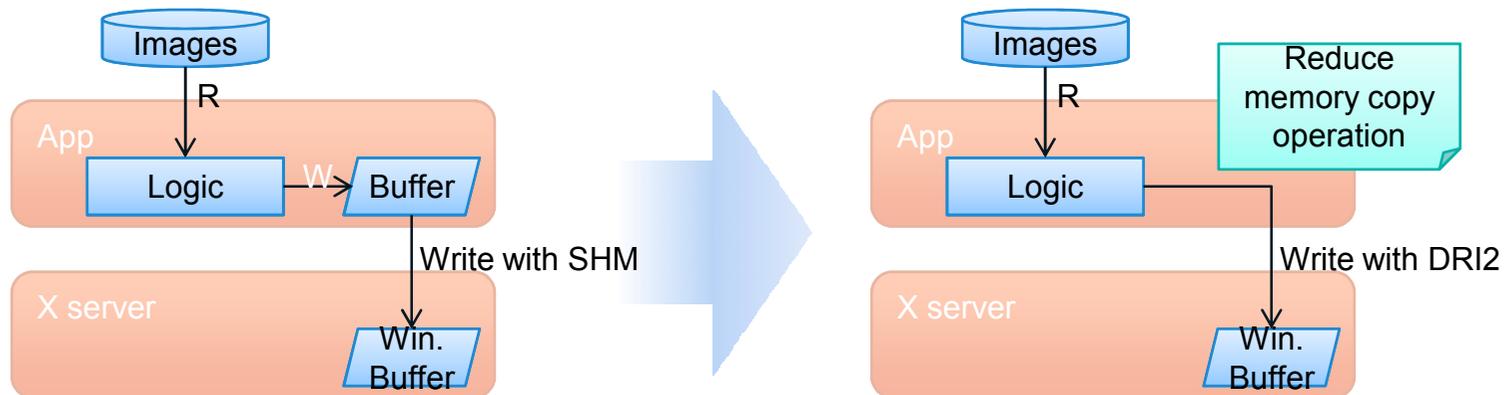
[Source: canvasperf, ie10testdrive]



[Source: Google Experiments, Tizen Demo]

Performance: Minimize Graphics overhead

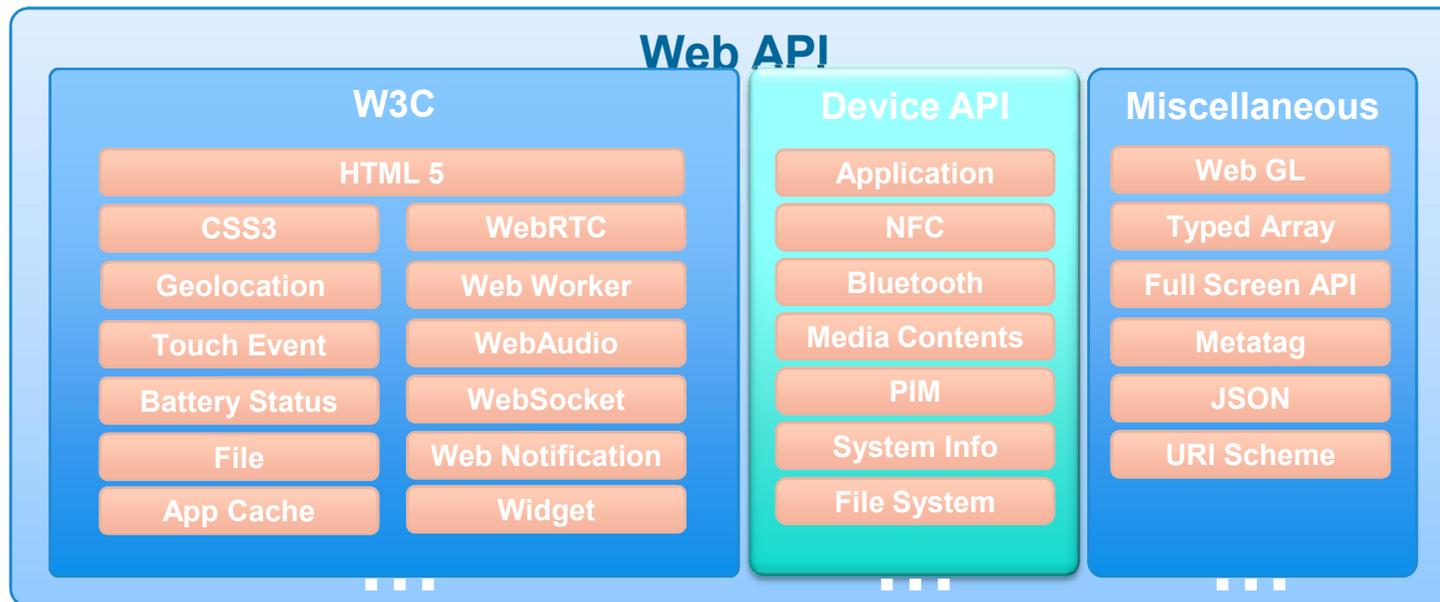
- **DRI2: Direct Rendering Infrastructure ver. 2**
 - Web site: <http://dri.freedesktop.org/>
 - Extension to support implementation of Direct Rendering in X window system
 - DRM (Direct Rendering Manager as a component of DRI) provides DMA memory management and secure hardware access



* SHM: Shared Memory

Completeness: Plentiful Web API

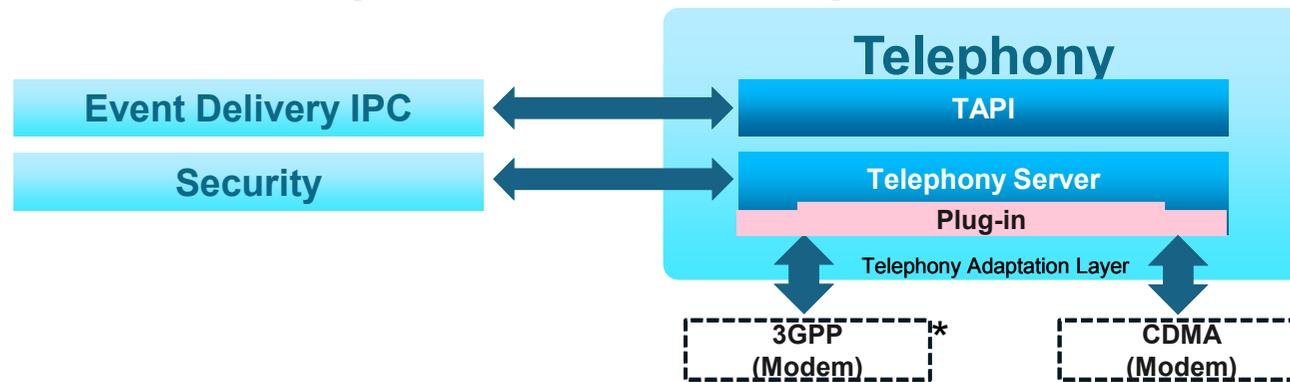
- Tizen web apps can access various device features with: W3C HTML5 device API + Tizen device API



Completeness: Cellular functionalities

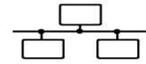
- **Cellular functionalities with modem**
 - Managing call/call-dependent services, packet-related services, network registration and configuration services, SMS services
 - Managing SIM Application Toolkit services
 - Managing SIM files, phone book, and security

*✳ Field test completed with 2 real operators**



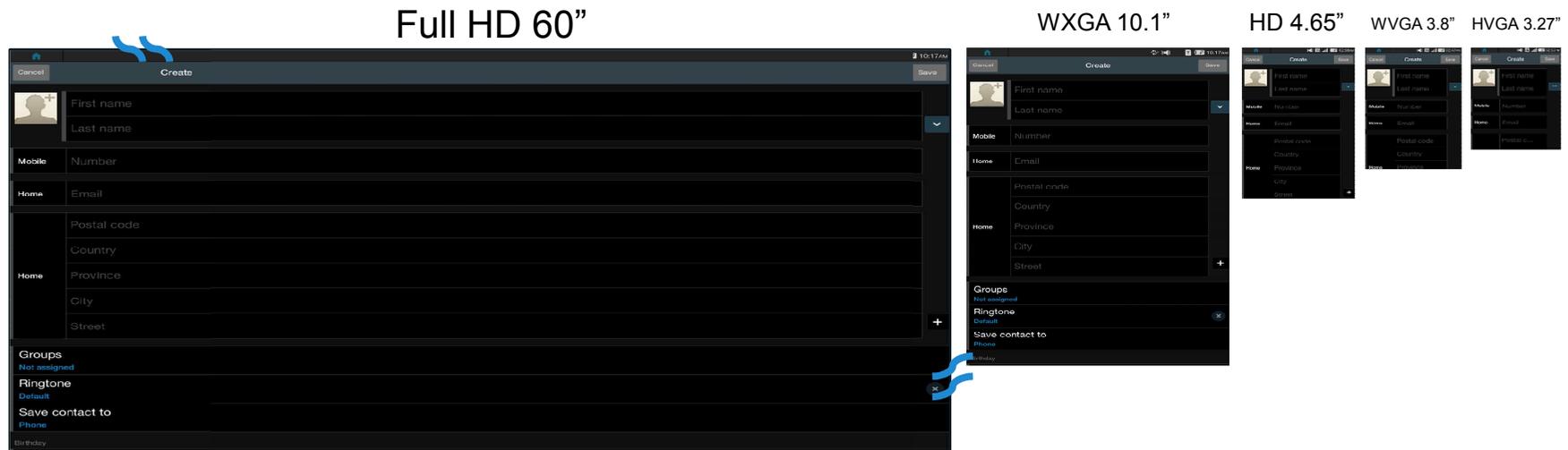
Completeness: Fast & Easy Connectivity

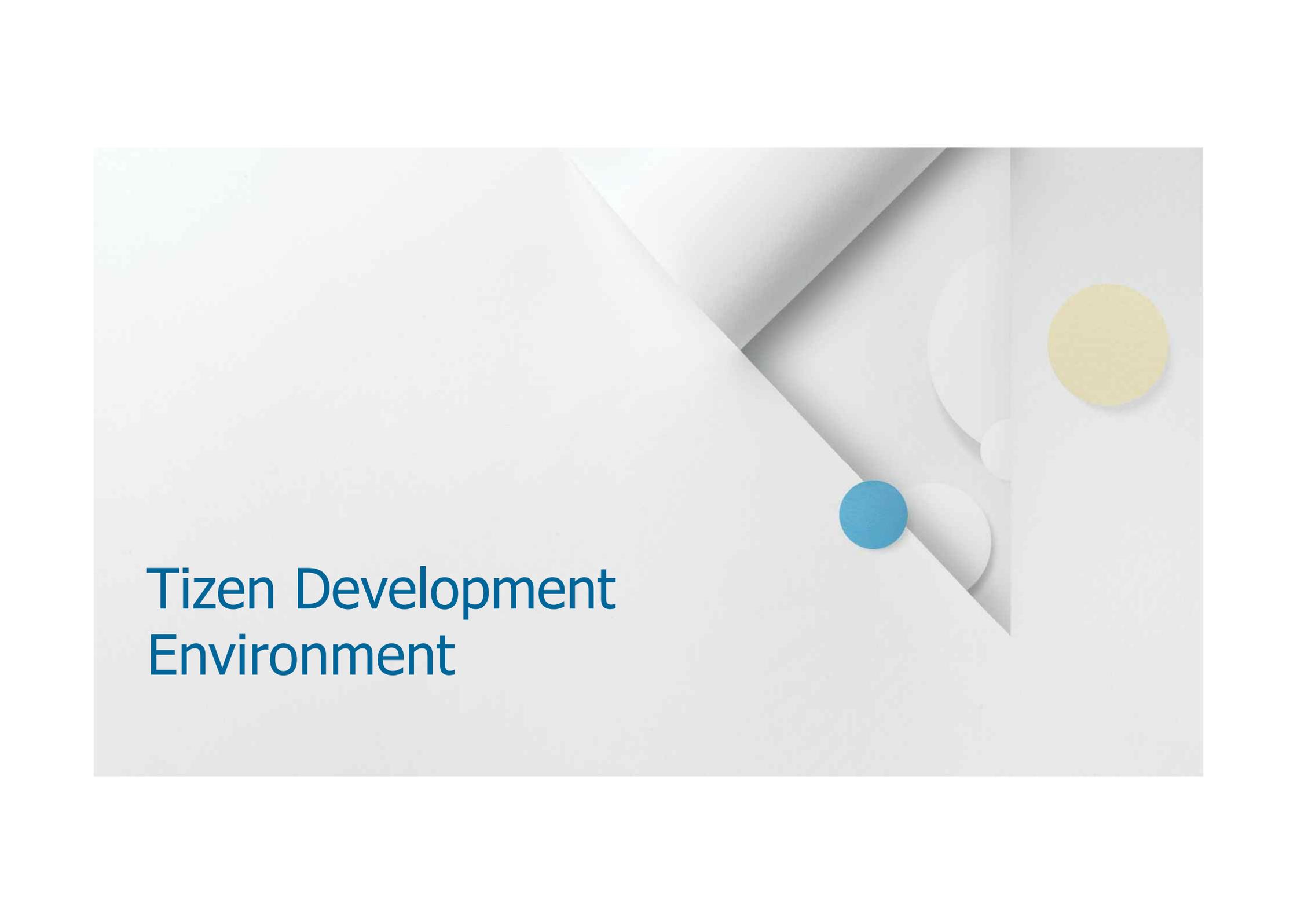
- **ConnMan (<http://connman.net/>)**
 - An light-weight design for targeting embedded devices
 - Compatible with WPA supplicant for supporting Wi-Fi network.
 - Rapidly released with upcoming features
 - High performance
 - ① Reduced DHCP time
2-5 seconds → 200 milliseconds
 - ② Wi-Fi fast connect
 - ③ Integrated DNS Cache for speed improvement
 - Smooth 3G → Wi-Fi handover/offload
 - ① Automatic login into Wi-Fi hotspots called Hotspot 2.0.



Completeness: Scalable UI

- Scalable UI objects for multi-size/resolution/aspect-ratio of screens
- Continuous scaling based on a scale value

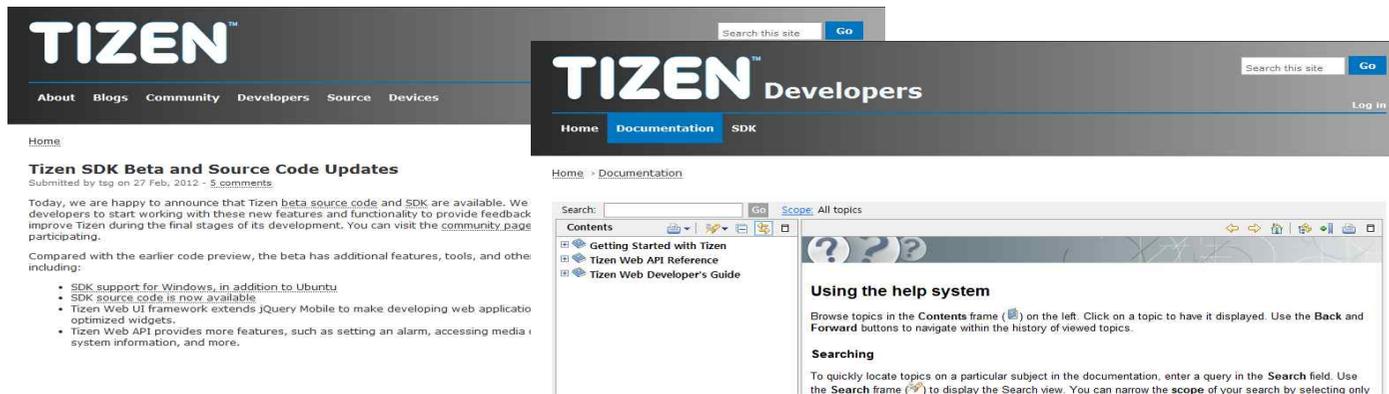




Tizen Development Environment

Visit Web Site

- Web Site: <http://www.tizen.org>
- Register & Create new account
- Online Help: <http://developer.tizen.org/documentation>
 - For beginners, web application developers and Tizen Platform Developers



Download & Install

Download SDK Installer: <https://developer.tizen.org/sdk>

The screenshot shows the 'TIZEN Developers' website. A red dashed box highlights the 'Operating System' section, which lists 'Ubuntu 32-bit'. Another red dashed box highlights the 'Download' table below.

Operating System	Download	File Size	Updated Date
Ubuntu 32-bit	tizen_sdk.tar.gz	5.9 MB	February 28, 2012
Windows 32-bit	tizen_sdk.exe	5.7 MB	February 28, 2012

Install SDK

The screenshot shows the 'Tizen SDK Install Manager' window. The 'Items' section is active, showing a list of components to be installed:

Name	Latest	Installed	Size
<input type="checkbox"/> TIZEN-IDE	0.20.10		293.774
<input checked="" type="checkbox"/> EMULATOR-TOOLS	0.20.1		23.2M
<input checked="" type="checkbox"/> EMULATOR-IMAGE	0.20.1		159.1M

The 'Description' section indicates: 'Space required : 475.8MB'. Buttons for 'Back', 'Next', and 'Cancel' are visible at the bottom.

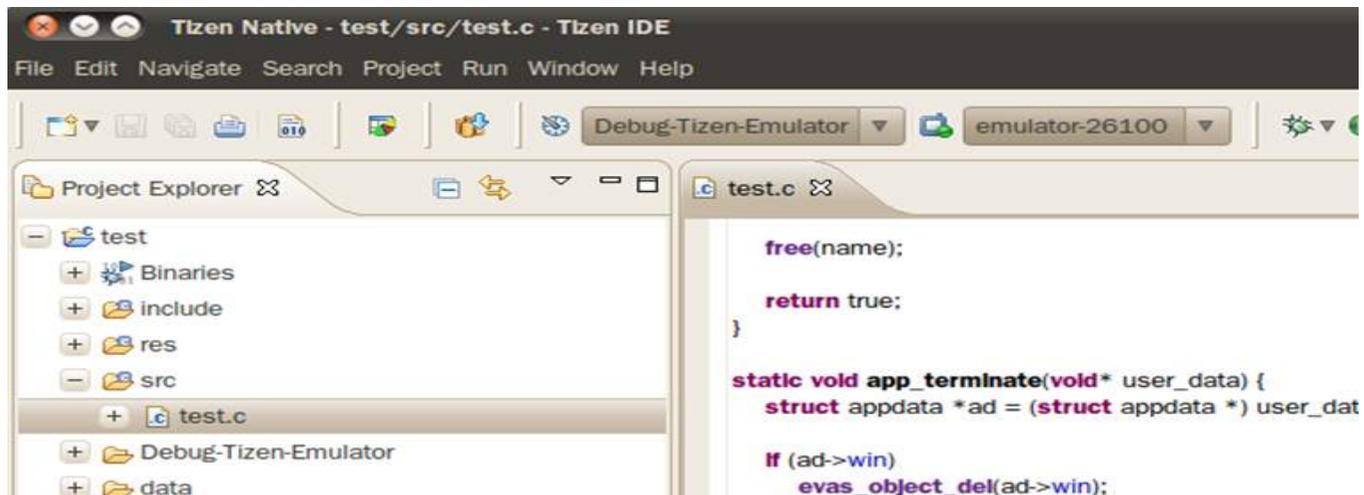
Download Source: <https://source.tizen.org/>

The screenshot shows the 'TIZEN Source' website. A red dashed box highlights the 'Getting Started' section, which includes links for 'Inside Tizen', 'Getting Started', and 'Joining the Tizen Community'.

The screenshot shows the 'Tizen SDK Install Manager' window. The 'Location' section is active, showing a text input field for the installation path: 'C:\tizen_sdk'. The 'Description' section indicates: 'Space required : 475.8MB' and 'Space available : 310.2GB'. Buttons for 'Back', 'Install', and 'Cancel' are visible at the bottom.

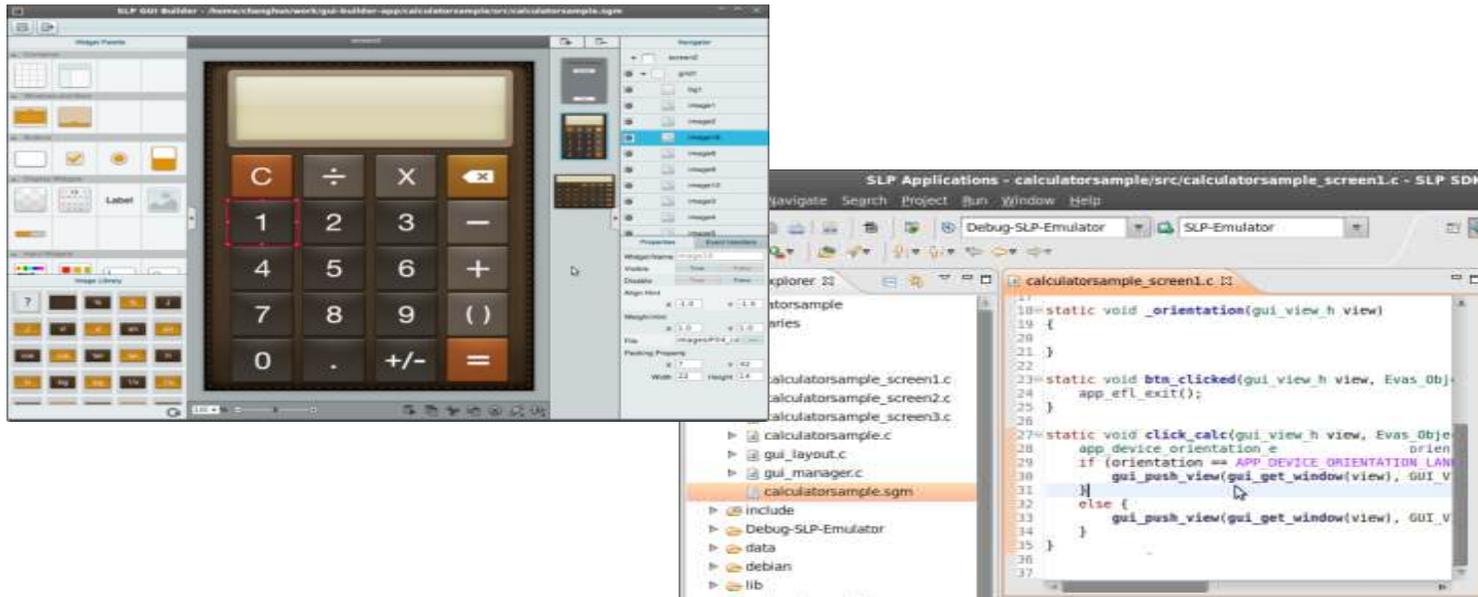
IDE

- Competitive editor for HTML, CSS, Javascript
- Project management, templates, samples, documentation
- Multiple target (Emulator/Device) management



GUI Builder

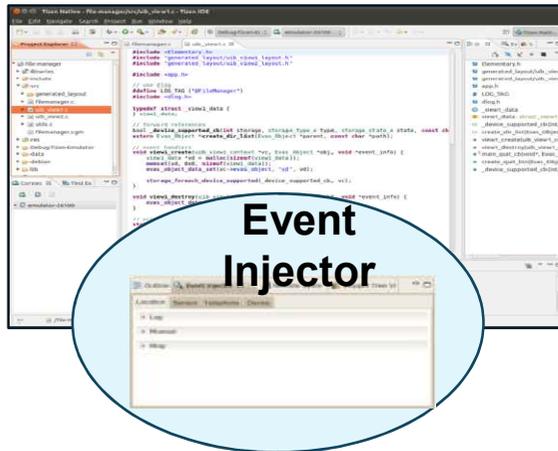
- You can visually develop application UI using GUI builder in WYSIWYG manner



Emulator

- Various Device Emulation based on open source QEMU
- Event Injector such as Call/SMS send and receive

IDE



Emulator

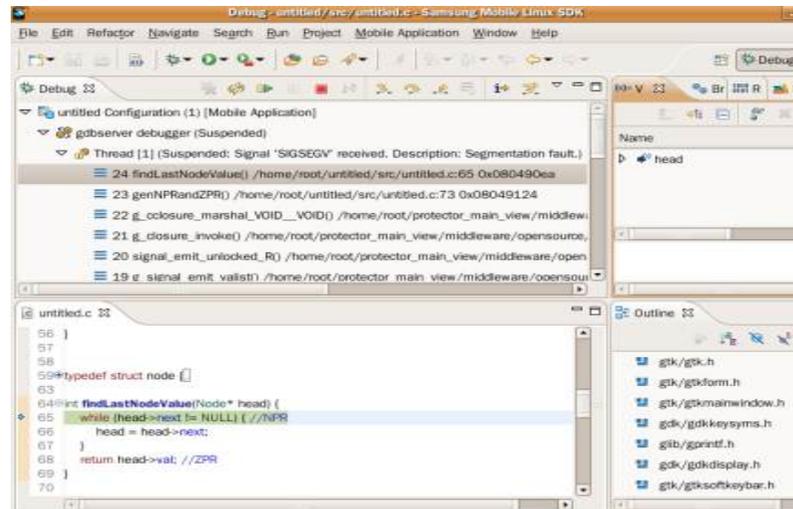


Emulator Manager



Debugging & Profiling

- Supports for various debugging with gdb and logcat
- Powerful Analysis for Memory and CPU usage



Tizen Open Source Community

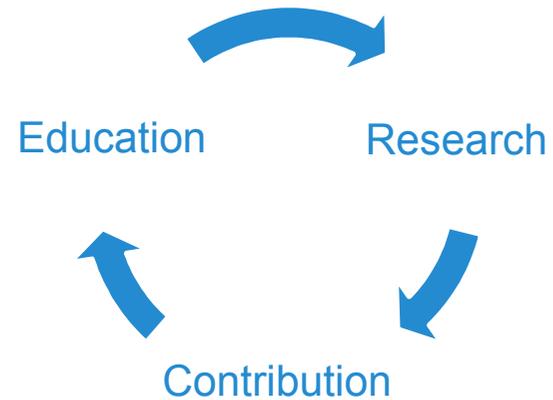
- **Contribute to Tizen Open Source Community**
 - Web Site: <https://www.tizen.org/community>
 - Anyone can contribute by:
 - ① Submitting patches
 - ② Filing bugs
 - ③ Documenting Feature requests
 - ④ Developing applications
 - ⑤ Helping with wiki documentation
 - ⑥ Participating in other community efforts and programs



Tizen for Research and Education

Research and Education

- **For research**
 - Testing and evaluating research results using Tizen
 - Reflecting research results to the real world via Tizen
- **For education**
 - Tizen itself includes various technologies such as network, sensor, graphics, multimedia, web, security, etc.



Academia Partners

- **Chaperone (UC Berkeley)**
 - Prof. Ras Bodik (ras@bodik.org)
- **MobiSocial (Stanford Univ.)**
 - Prof. Monica S. Lam (lam@cs.stanford.edu)
- **Security & Mobile Sensing (Cambridge Univ.)**
 - Ross Anderson (rja14@cam.ac.uk)
 - Cecilo Mascolo (cm542@cam.ac.uk)

STANFORD
UNIVERSITY

 UNIVERSITY OF
CAMBRIDGE
Berkeley
UNIVERSITY OF CALIFORNIA

Therefore,
Tizen will be the best choice
for Manufacturers, Operators,
Developers, and End users

Tizen Release History

Tizen 1.0

Apr. 2012

Web-centric platform

- Highest HTML5 coverage
- Tizen Device Web API
- Web UI framework (jQueryMobile based Extension)

Linux kernel 2.6.36

Tizen 2.0

Feb. 2013

Web/native dual framework

- Native API
- Unified SDK for Web and native
- Web Runtime based on WebKit2
- Web Audio, HTML Media Capture
- HTML Drag & Drop, Clipboard API

Linux kernel 3.0 (w/ many 3.4 features backported, such as CMA/IOMMU)
Memory optimization for graphics (Framebuffer → DRM/GEM, DMABUF)
eMMC 4.5 support, V4L2 (for codec and camera) support

Tizen 2.1

May. 2013

Readiness for commercialization in terms of stability & maturity

- Hybrid Web and native app support
- Content security policy
- Trusted inter-app sharing
- Account management
- QR code and image recognition
- Systemd replacing init daemon