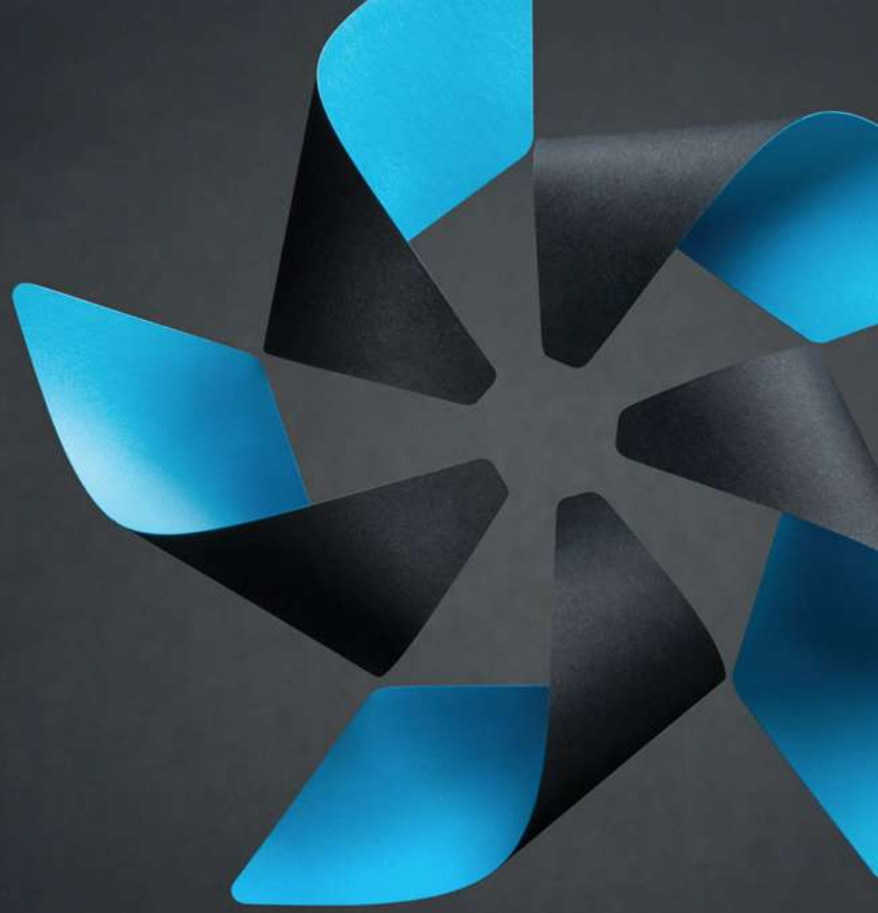


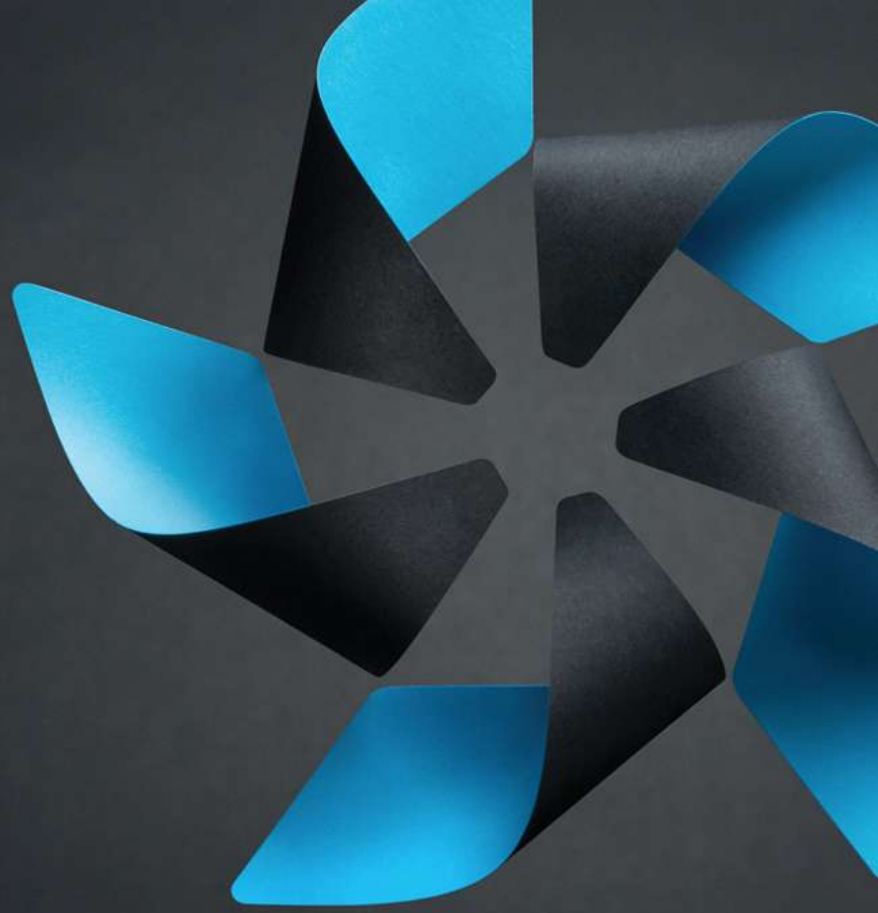
TIZEN™

Introduction & Architecture

Yoonsoo Kim
Tizen Platform Architect at Samsung

TIZEN™

TIZEN™



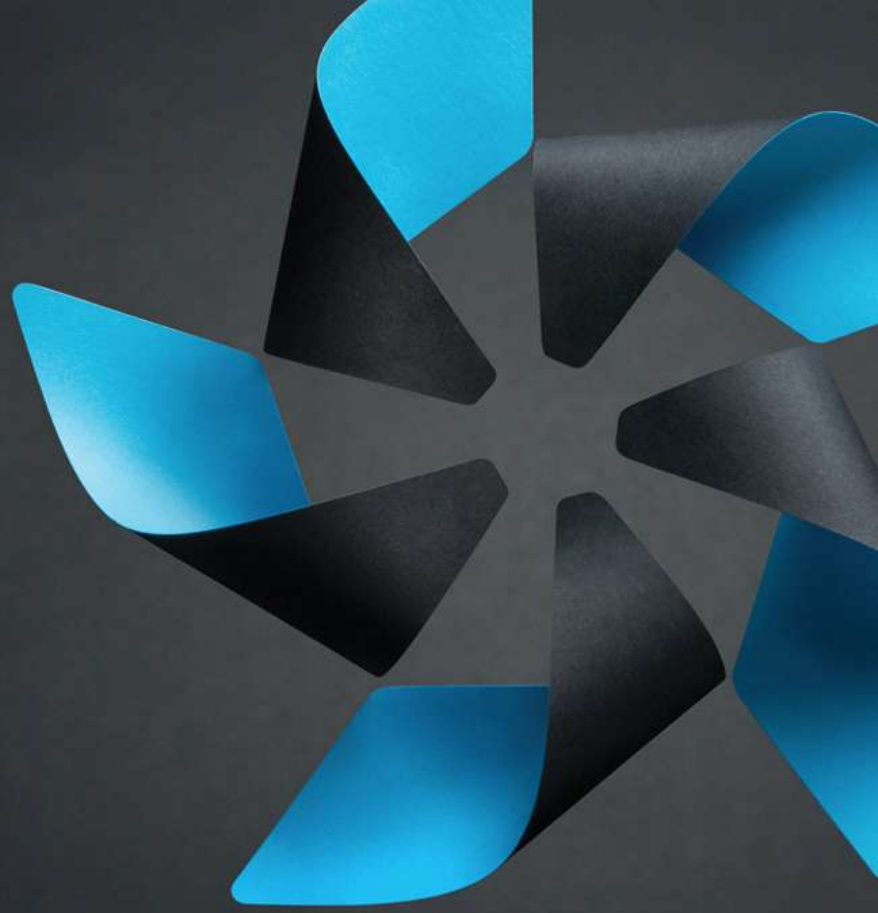
Agenda:

- Introduction
- Architecture
  - Mobile
  - IVI
- Tizen Going Forward
- Conclusions

TIZEN™

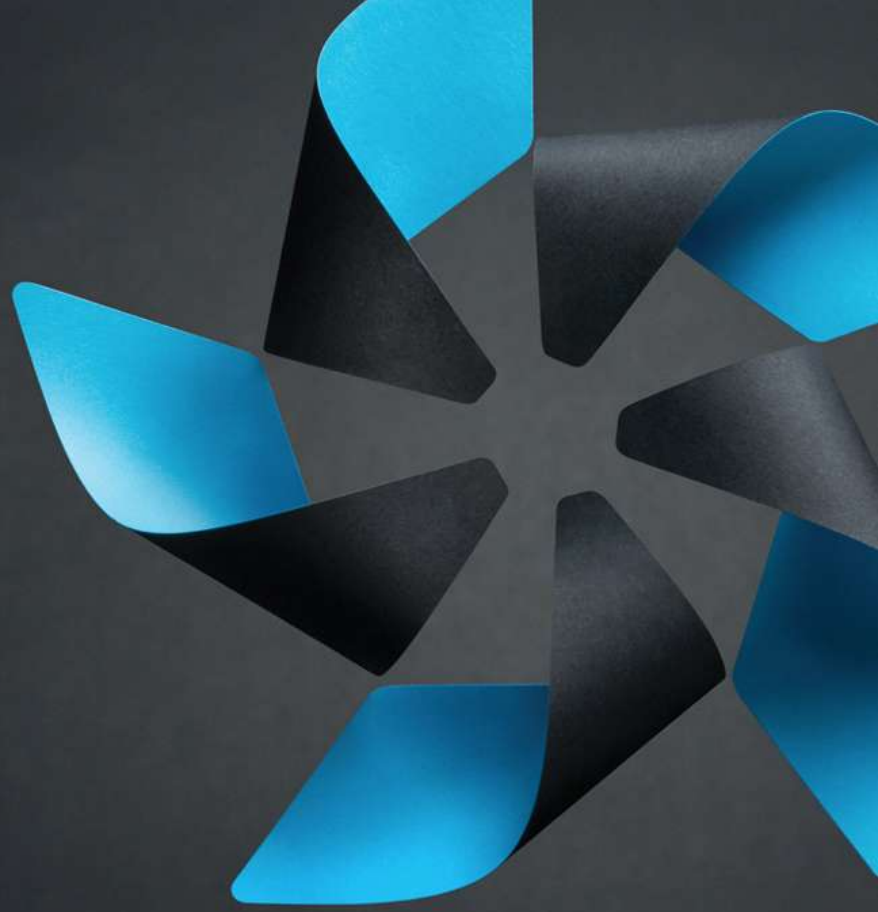
TIZEN™

Introduction



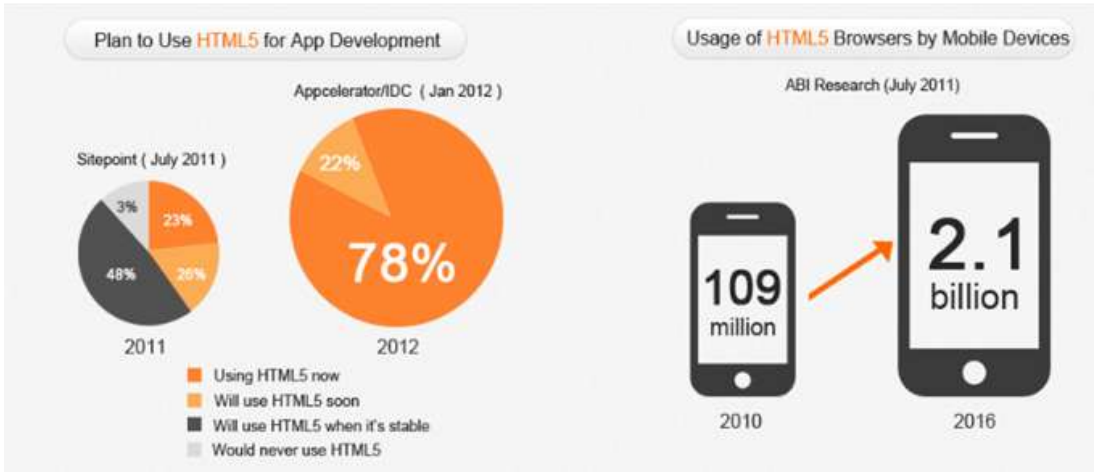
TIZEN™

Why Tizen?



Tizen is W3C Standard-Based

- HTML5 is being adopted rapidly, especially for mobile Web app development
- Tizen has the top score in html5test.com



[1] http://www.dotcominfoway.com/blog/dot-com-infoway-releases-html5-infographic

TIZEN

Tizen is a Cross-Category Platform

for PC

for mobile

for IVI

Current Profiles

for TV

for camera

for printer

for PC

for washing machine?

Future Profiles

TIZEN

Tizen Has Strong Industry Support

- The Tizen Association is formed by more than 11 companies
- Tizen Association has adopted an open governance approach to make sure that the future evolution of the platform cannot be determined by any one of its members

Tizen Association Board of Directors

TIZEN

Tizen is Open Source Project

- **Upstream projects used by Tizen:**
  - X Windows, Cairo, EFL for UI and graphics
  - Gstreamer, PulseAudio, OpenAL for multimedia
  - Connman, BlueZ, libsoup, wpa_supplicant for connectivity
  - WebKit for Web
  - Smack and OpenSSL for security
  - Dbus, glibc for base
  - Sqlite for database and PIM
  - Linux for OS Kernel
  - Eclipse for Tizen SDK
  - QEMU, U-Boot for target emulator
  - GCC, llvm, cmake, gbs for build
  - And more…

TIZEN

Tizen is Open Source Project

- **Intel and Samsung maintain or significantly contribute to:**
  - Linux, WebKit, EFL, GStreamer, U-Boot, FFMPEG, WebCL, Cairo, BlueZ, QEMU, GCC, ConnMan, NFC, PulseAudio, Smack, Wayland, oFono, X, wpa_supplicant, Dbus, glibc, OpenGL, Geoclue, and libsoup
  - With notices, attributions, full license statements, and compliance to other obligations
- **Virtually everything newly developed for Tizen has been open-sourced under Apache 2.0 License:**
  - app-core, WRT(Web Runtime), system-server, sensor-fw, app-service, slp-pkgmgr, libslp-pm, msg-service, email-service, telephony-daemon, audio-session-manager, contacts-service, slp-calendar, accounts-svc, sync-fw, cert-svc, secure-storage, nfc-manager, and more.

TIZEN

Tizen Mobile Profile Release History

Tizen 1.0 — *Apr. 2012*

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

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

Tizen 2.1 — *May 2013*

Hybrid Web/Native, Enhanced Security, and Optimized Perf.
- Hybrid Web and native app support
- Content security policy
- Trusted inter-app sharing
- Account management
- QR code and image recognition
- Systemd replacing init daemon

Tizen 2.2 — *July 2013*

Commercial Ready w/ Enhanced UX
- H/W Menu & Back key
- Better Font Legibility
- H/W LED Notification
- Integration of Apps w/ Contact
- Native API for Secure Element
- UI Customizer
- Live Web App. Editing

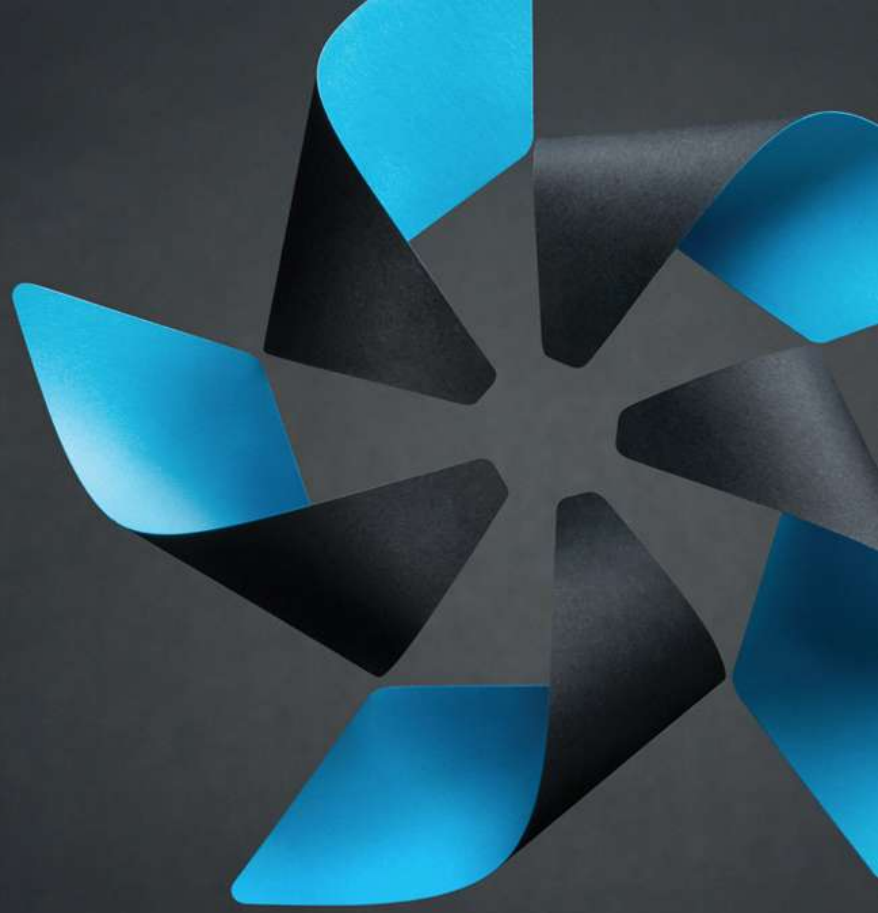
Linux kernel 2.6.36

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

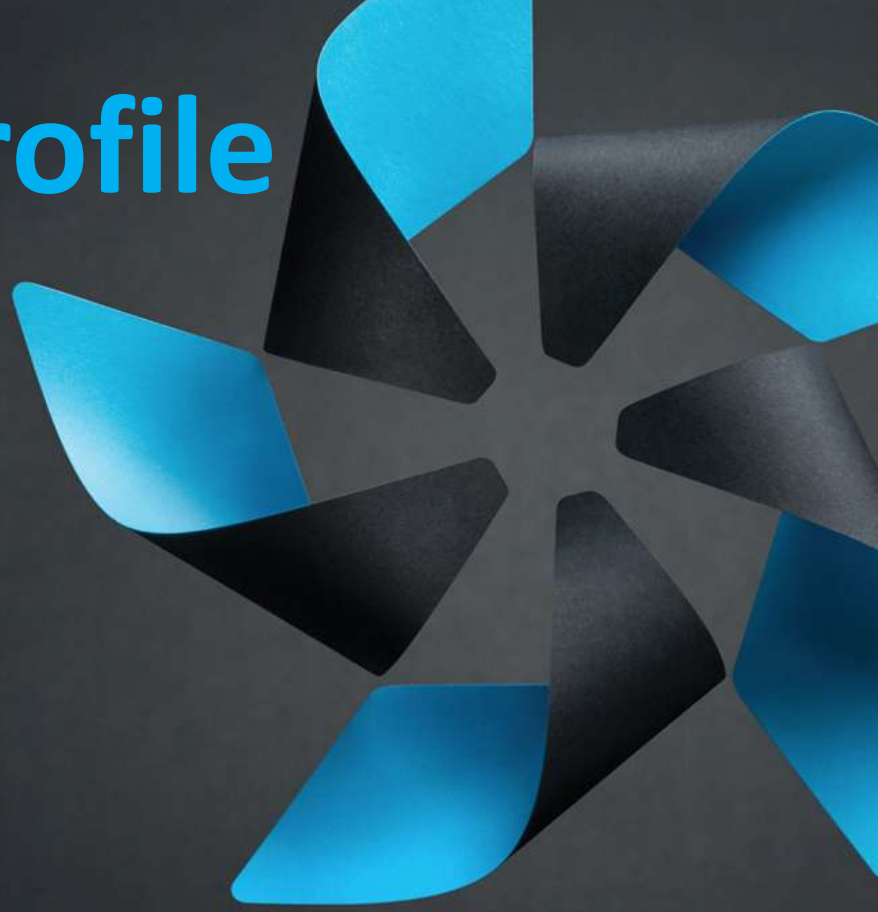
TIZEN™

Architecture

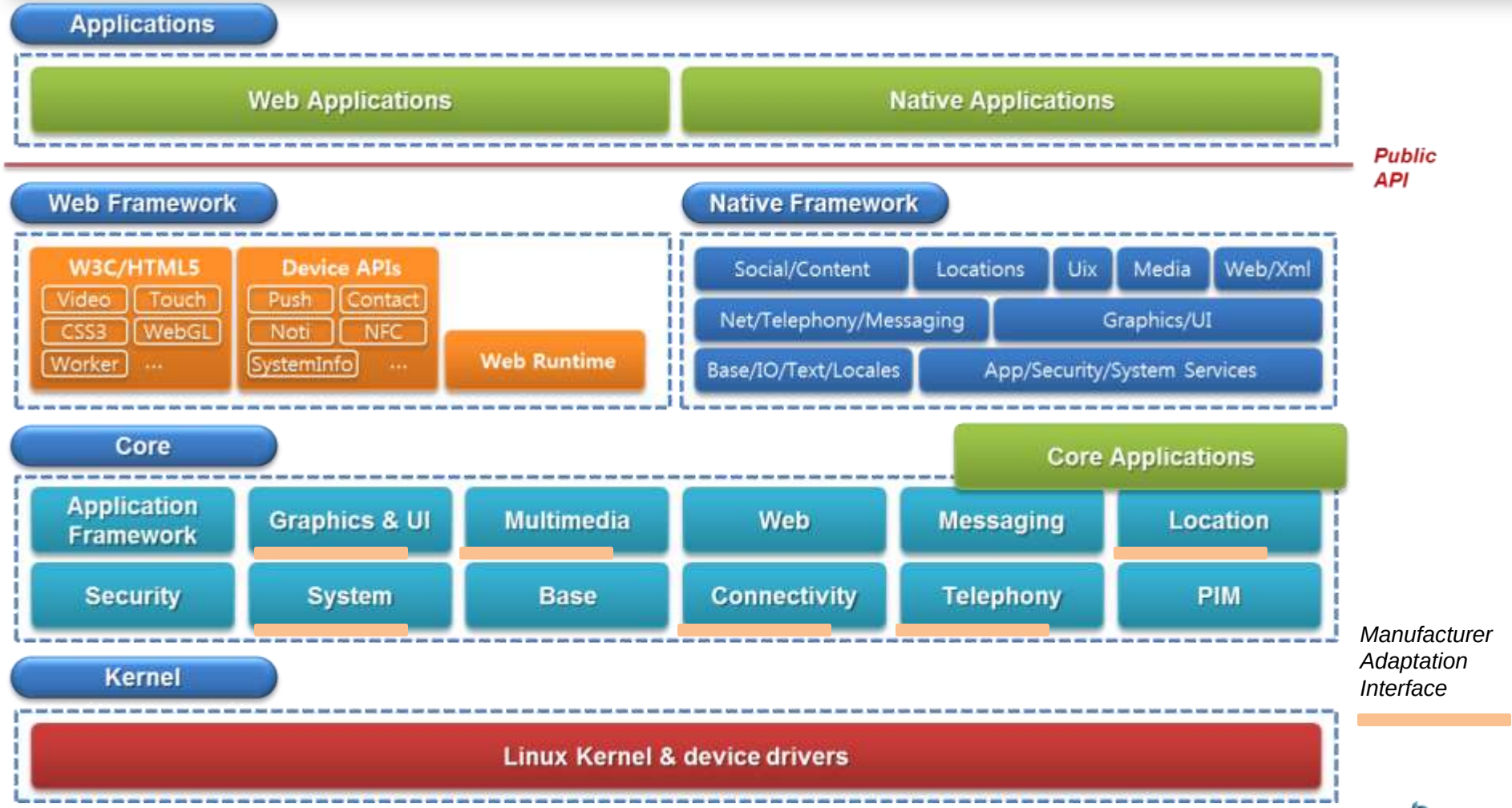


TIZEN™

Tizen Mobile Profile Architecture



Architecture Overview



TIZEN

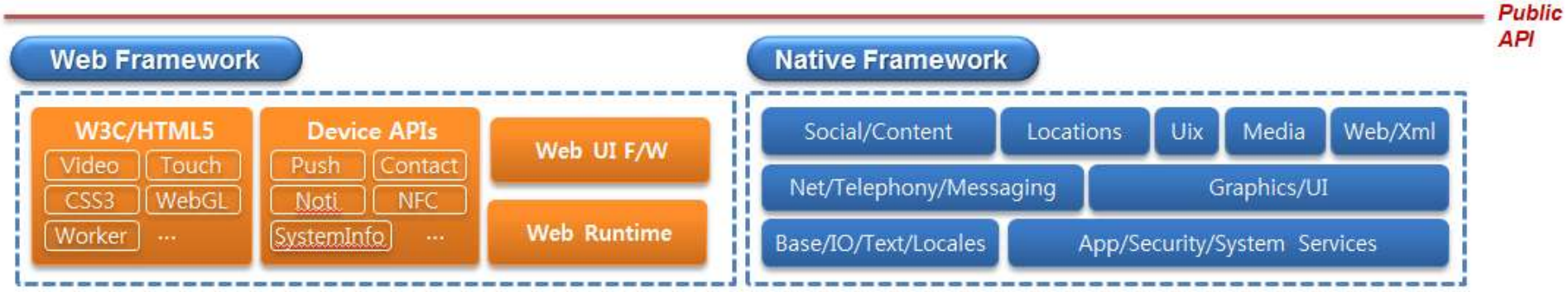
Architecture Overview

- **Web framework**
  - Provides state-of-the-art HTML5/W3C APIs, Web UI framework, supplementary APIs, and additional Tizen device APIs
- **Native framework**
  - Supports full-featured native application development and provides a variety of features like background service, image and face recognition, and TTS/STT
- **Core**
  - Underlying layer to provide common functionalities and a security mechanism
  - HW adaptation layer with plug-in architecture
  - OpenGL® ES/EGL graphics driver

TIZEN

Web vs Native Framework

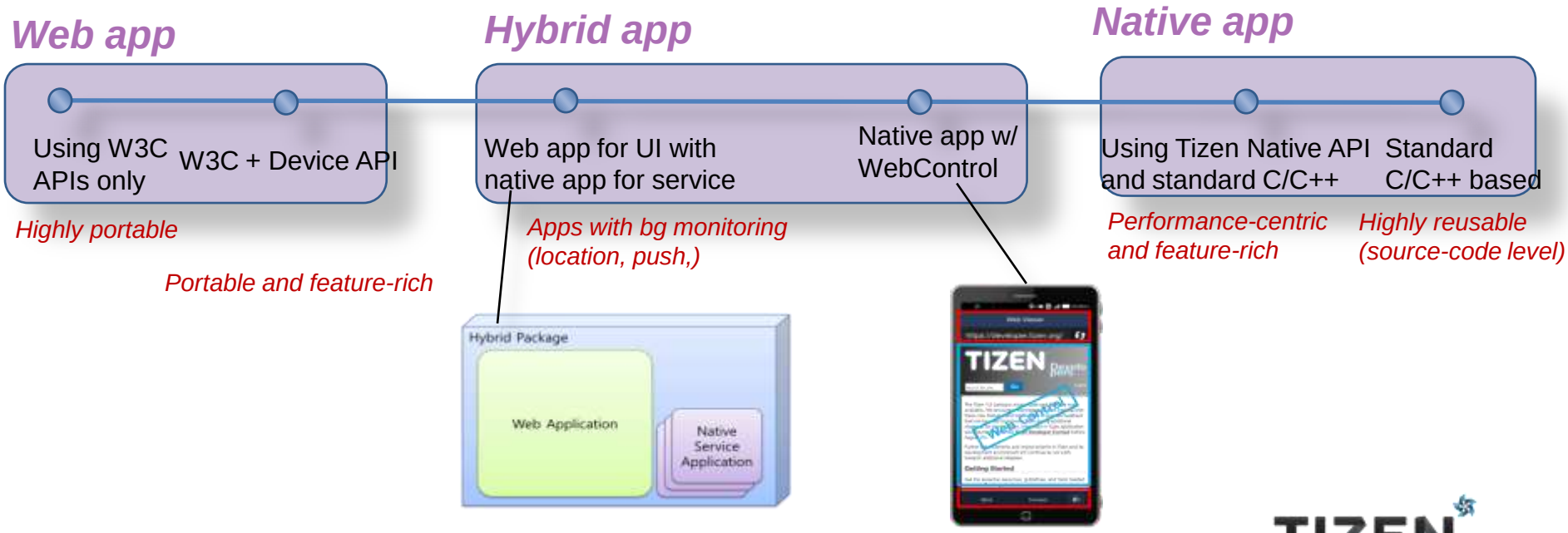
- **Native and Web frameworks are complementary to each other**
  - Web is strong in portability, ease of app development, and has a minimal learning curve
  - Native is relatively better in terms of performance and memory consumption
  - Native enables reusing the existing engine and libraries written in C & C++ in app development



TIZEN

Web and Native: Mix & Match

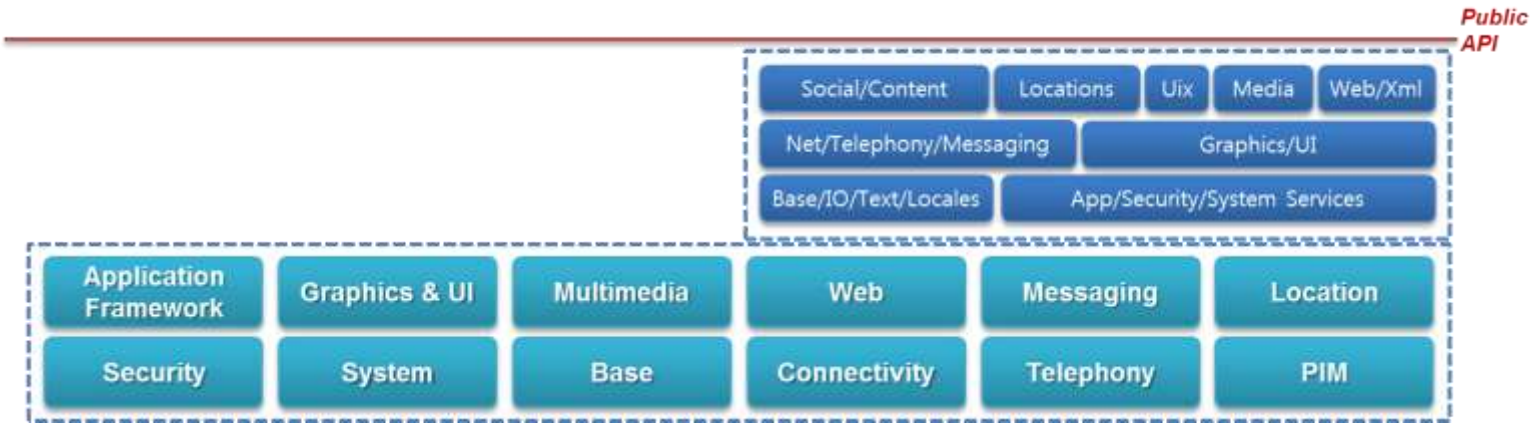
- **Different combinations for mixing Web and native, depending on the characteristics or requirements of the app to be developed**



TIZEN

Native Framework vs Core

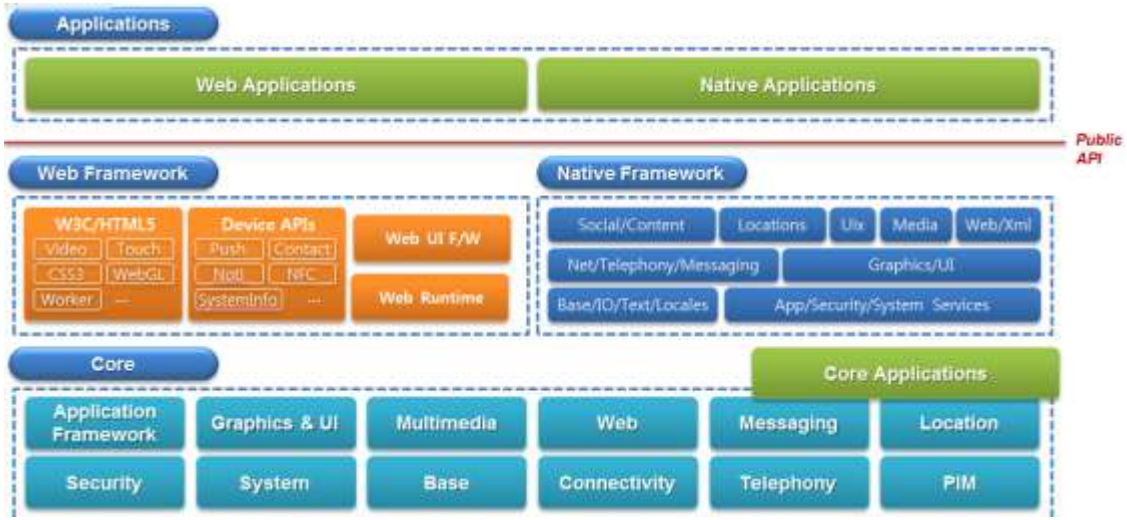
- **Both are native in nature but focusing on different aspects**
- **Core focuses on:**
  - Providing common functionalities to Web and native frameworks
  - No need to guarantee application binary compatibility (ABC)
  - Performance and power optimization
- **Native framework focuses on:**
  - Application development productivity while guaranteeing ABC
  - Well-documented API references, developer guide, sample codes, and associated tools



TIZEN

Application Types

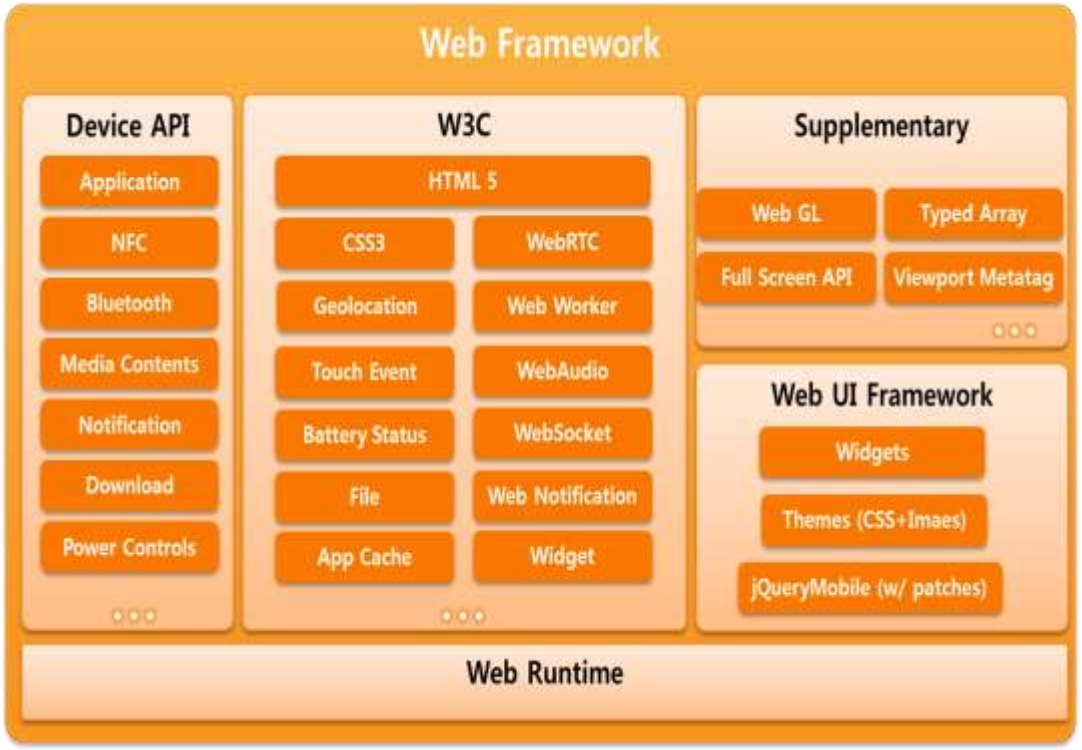
- **Web and native applications**
  - Apps using only *public* APIs to get full support for package installation and upgrade, security, backward compatibility, and so on
  - Many sample apps included in the SDK
- **Core applications**
  - Apps *using Core APIs* to fully utilize device capabilities such as telephony
  - Usually implemented and preloaded by device implementers
  - Backward binary compatibility is not guaranteed



TIZEN

Web Framework

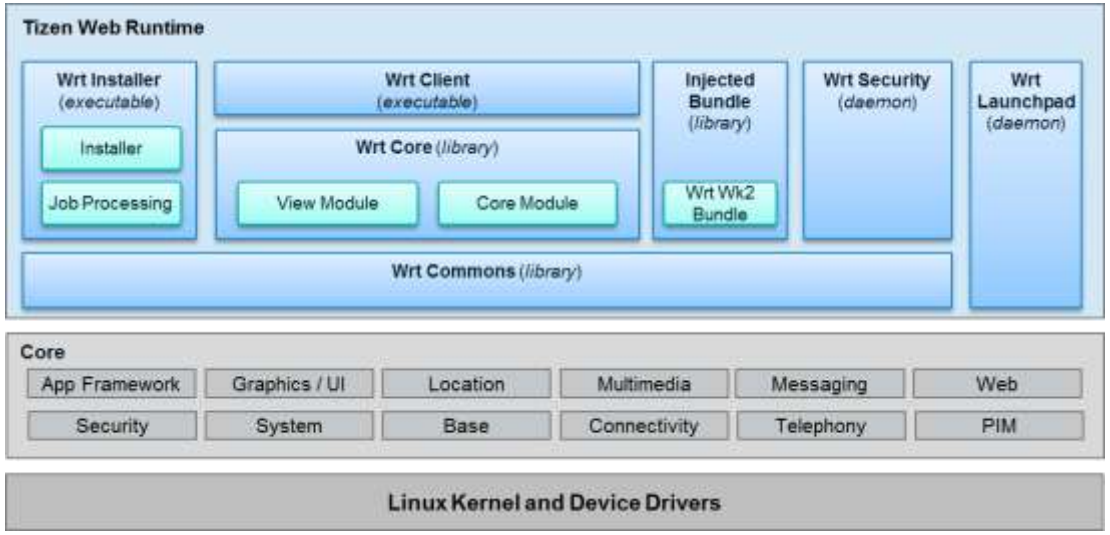
- **W3C standard Web APIs**
  - W3C/HTML5 markup, CSS, and JavaScript APIs
- **Supplementary APIs**
  - De-facto APIs (such as Khronos and Mozilla)
- **Tizen Device APIs**
  - Advanced access to the device's platform capabilities
- **UI framework**
  - jQueryMobile-based
  - Tools, such as widgets, events, effects, and animations



TIZEN

Web Runtime

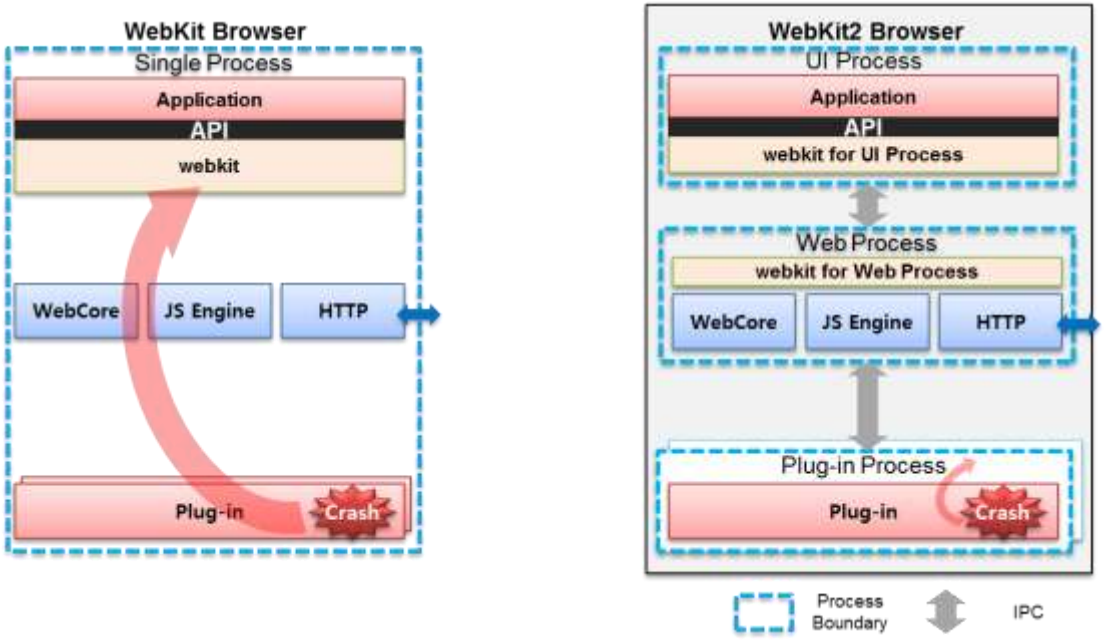
- **Package management**
  - installation and update
- **Execution and life-cycle**
  - launching, pause, and resume
- **Runtime security**
  - API/network access and sandboxing
- **Platform integration**



TIZEN

WebKit2 based Browser and Web Runtime

- **Since 2.0, Tizen is using WebKit2**
  - Split process model for web content and UI with non-blocking APIs
  - UI responsiveness, robustness, security, and better use of multicore CPUs



TIZEN

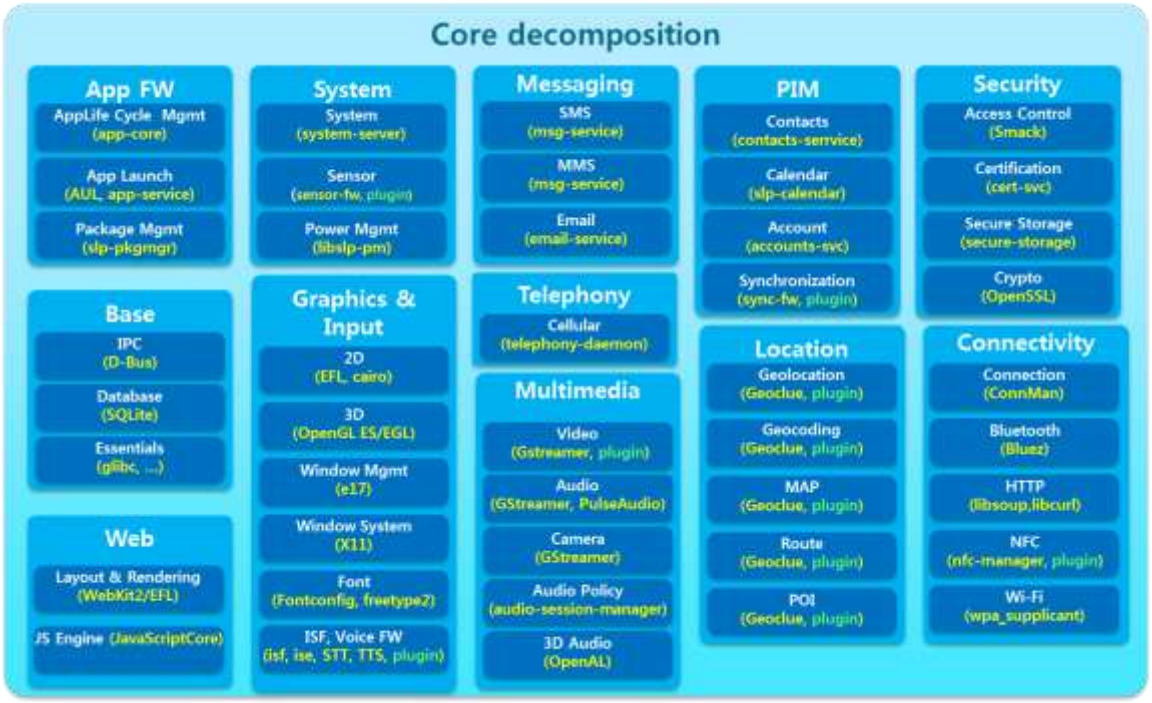
Native Framework

- **Released since Tizen 2.0**
- **Set of C++ namespaces with more than 10,000 APIs**
  - Base, IO, App, Security, Graphics and UI, Net, Messaging, Social, Locations, Web, etc
- **Support for standard C/C++, and popular open source libraries**
  - eglibc, STL, libstdc++, libxml2, OpenGL® ES, OpenAL, and OpenMP®
- **Multiprocessing support**
  - OpenMP, GCD

TIZEN

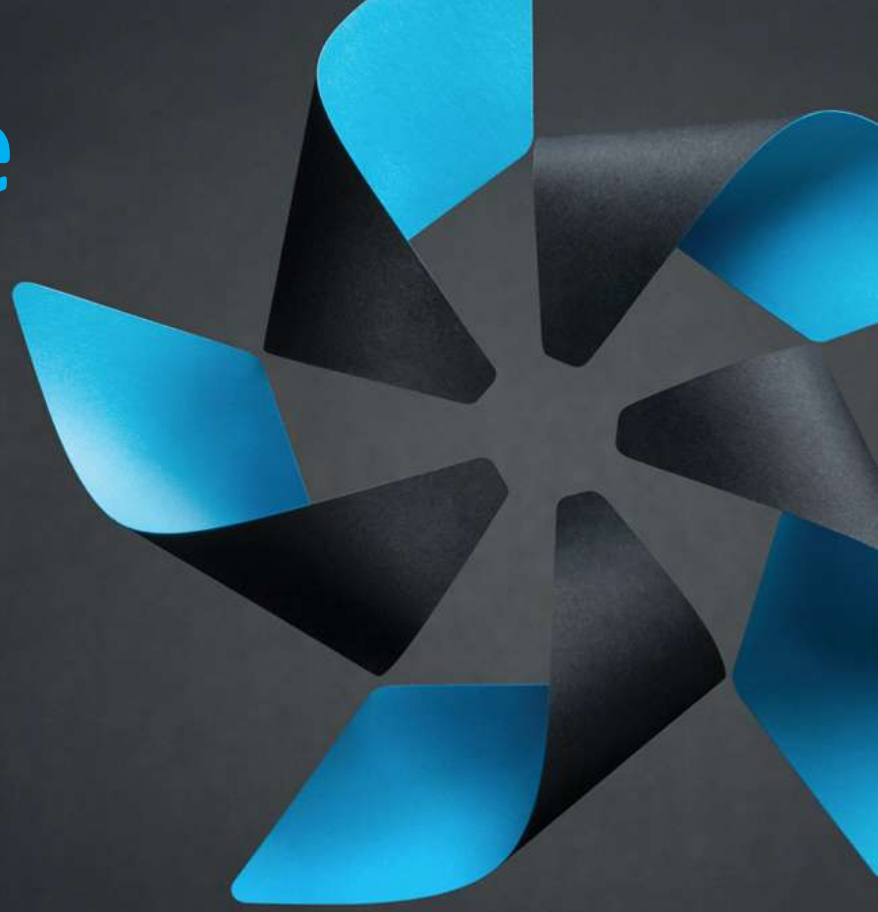
Core Framework

- **Providing common features**
  - Various native and Web APIs are implemented using the functionalities of core modules
- **Unified management for:**
  - Package (un)installation and upgrade
  - Launching applications
  - Windows for different apps with E17
  - Sensor loading and value retrieval
  - Power consumption
  - Connectivity
  - Security enforcement with Smack from the kernel
  - And more..



TIZEN

Tizen IVI Profile Architecture



IVI Demands More


Navigation GPS
Dual Display


TTS/STT

SIRIUS SATELLITE RADIO
Radio

DRIVER

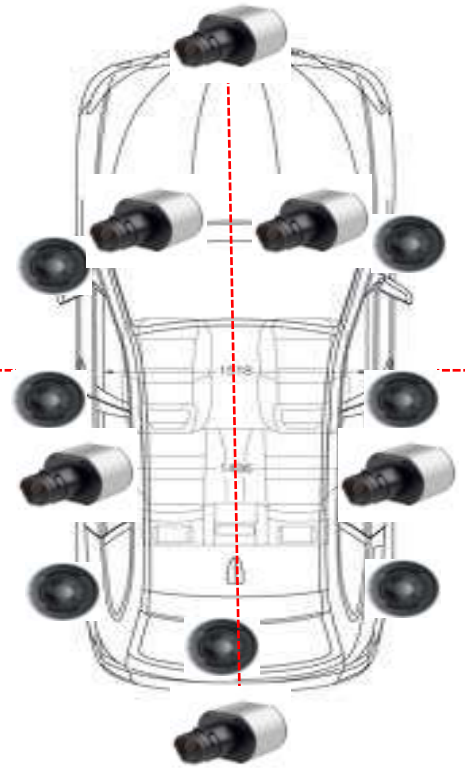
Video playback


Audio

Display

Passenger 2

Front– video analytics



BluRay playback


Audio


Display

Passenger 1


Mobile Device

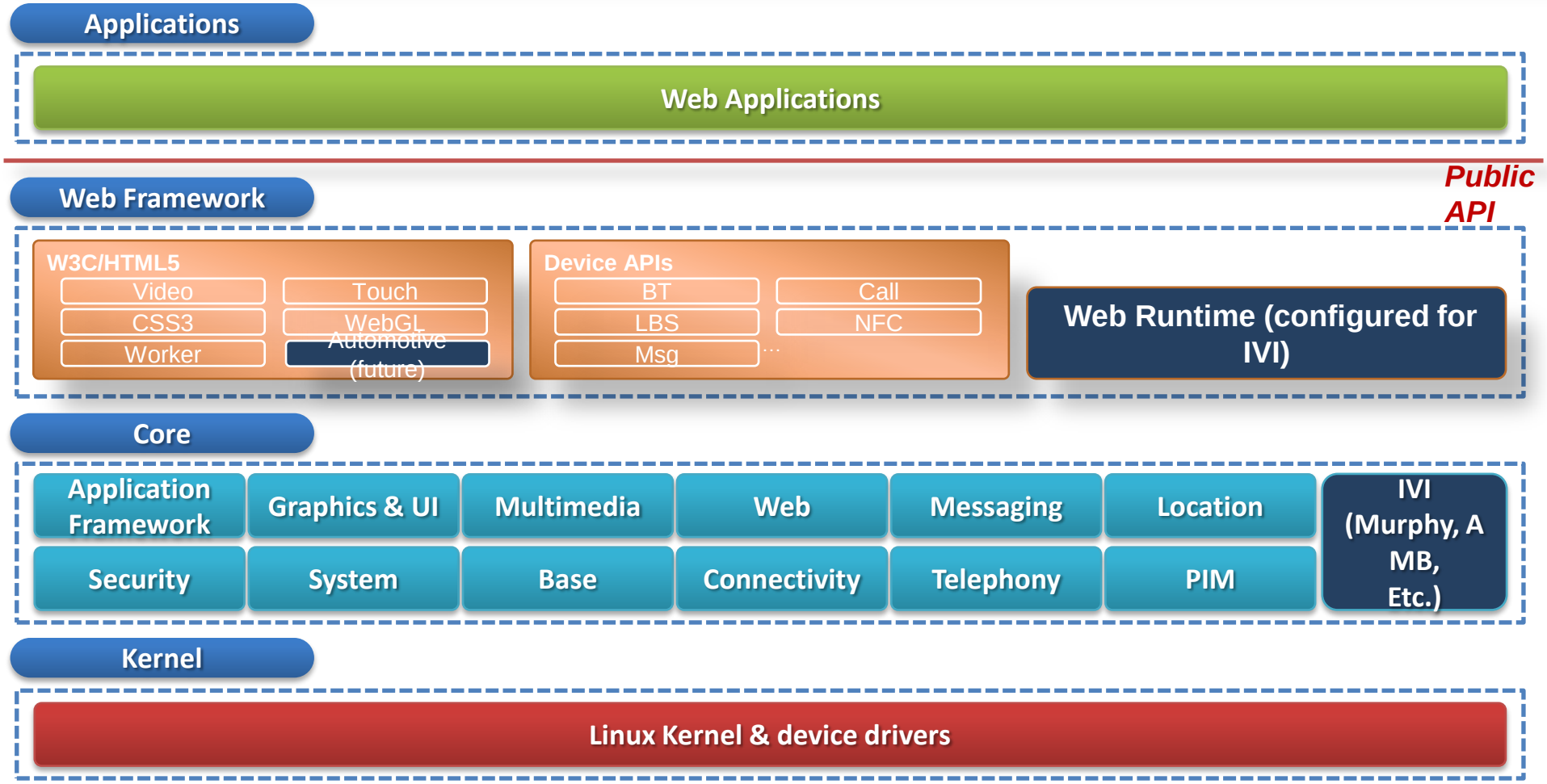

Audio


Display

Passenger 3

TIZEN

Architecture Overview



TIZEN

Tizen IVI Release History

Tizen 1.0

2012

GENIVI Compliance

- Fastboot with systemd < 5 secs
- Rootfs < 500 Mb
- Sample Navigation App
- Sample Hands free dialer App
- Media Player App
- IVI Home Screen App

Tizen 2.0

Apr. 2013

Fully functional Web framework

- Automotive Message Broker
- BT HFP dialer application
- DLNA
- Murphy Policy Manager
- WiFi Tethering
- Dual Display Support
- Sample IVI apps

Tizen Next

Focus areas

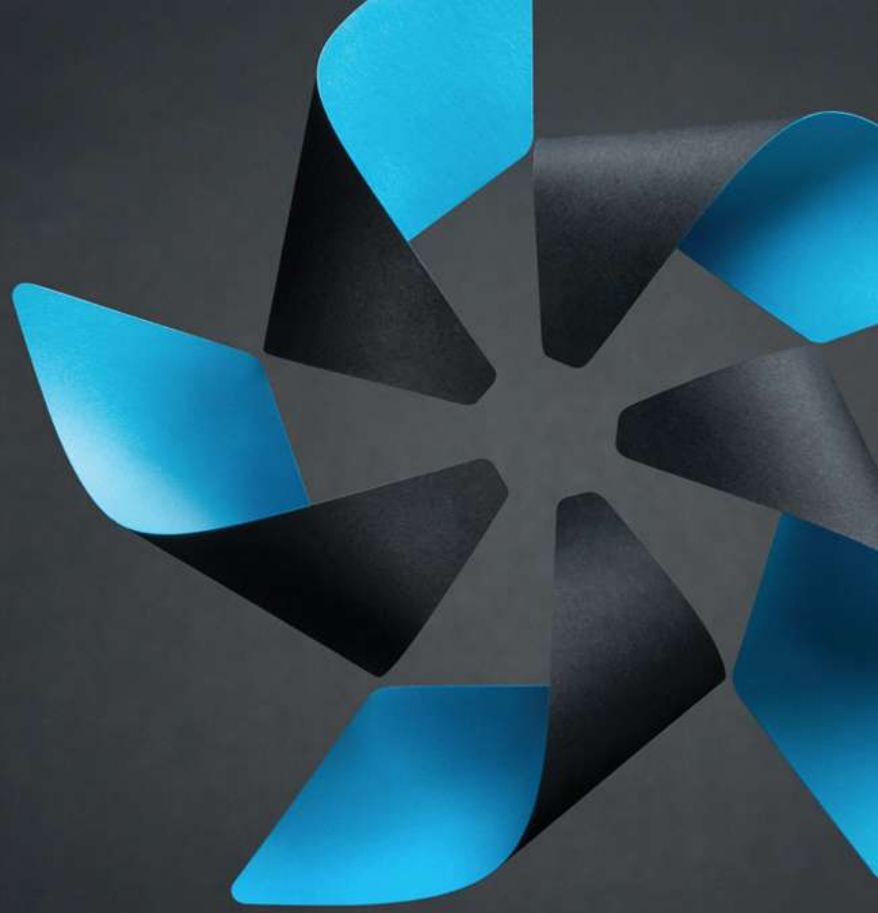
- Wayland
- Fast Boot
- Small Footprint
- Ethernet
- NFC
- HW Acceleration
- Vehicle & Additional Web APIs for Automotive
- UI Manager

Tizen IVI 3.0-M2-Aug Released 05 Sept.

TIZEN

TIZEN™

Going Forward: Development Model



TIZEN™

Tizen 3.0 @tizen.org

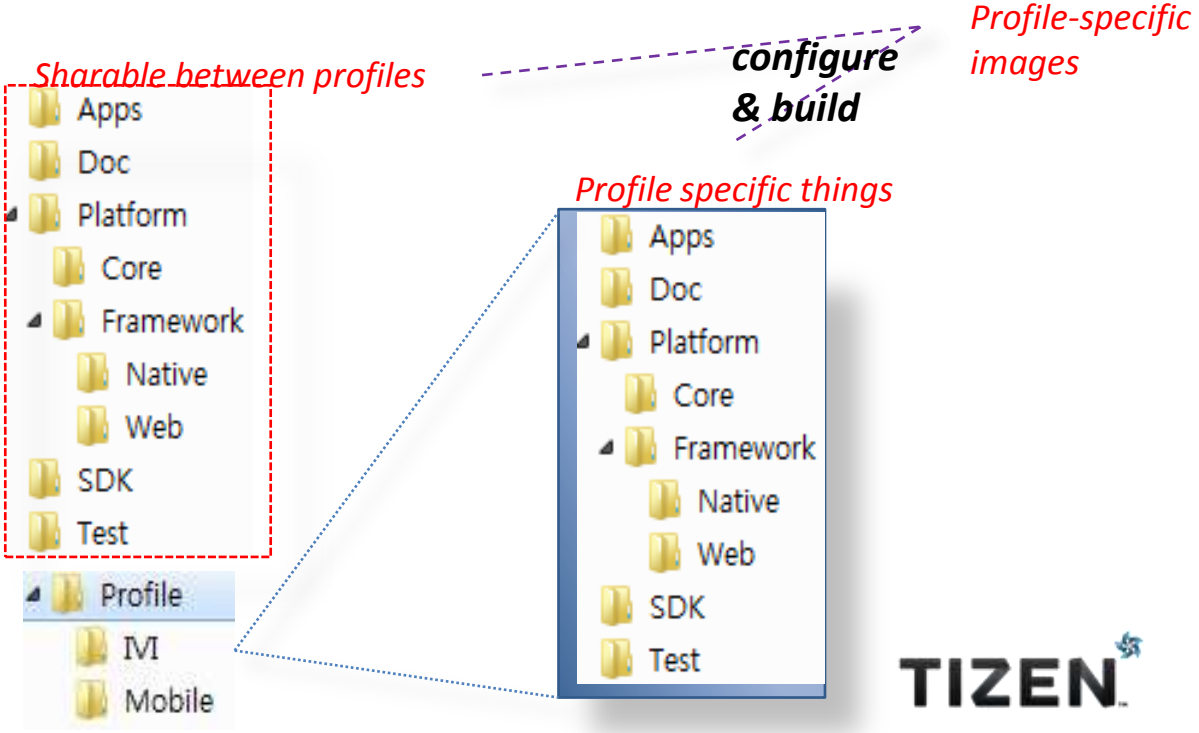
- **Until 2.2, source code uploaded to tizen.org only at milestones**
  - platform development has not been shown to public
  - No continuity and transparency
- **From 3.0, development and contribution are happening at tizen.org**
  - For productization and depending on profile policies, main code tree can be pulled out and built anywhere by anyone
- **Moved from in-out to out-in development**

TIZEN

Tizen 3.0

- **Configurable and multi-profile support with one code base**
- **3.0 is about scalability**
  - Many profiles
  - Many devices
  - Many configurations
  - Many architectures

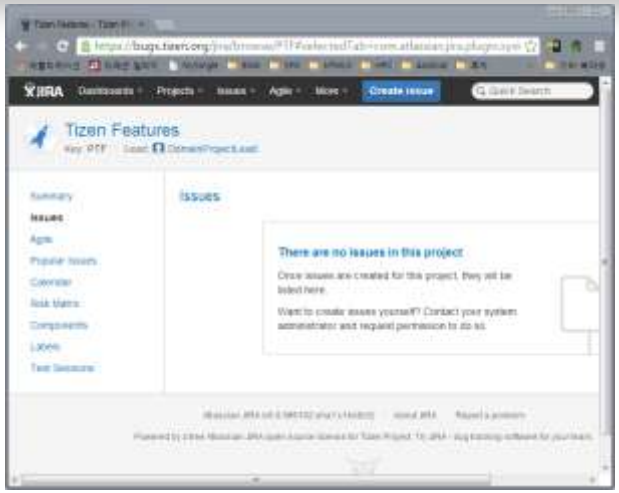
Smartphone device XYZ on ARM
produced from same platform code as an
IVI device YYY for car ABC running on IA

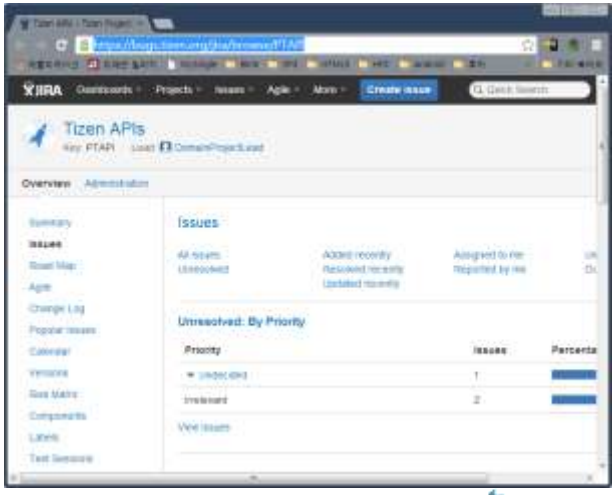


TIZEN

Development Infrastuctures

- 3.0 Features discussion
  - "Tizen Features" JIRA
- 3.0 APIs discussion
  - tsg-arch-api@lists.tizen.org
  - "Tizen APIs" JIRA
- Platform developer discussion
  - dev@lists.tizen.org
- Tizen modules
  - Git repositories
  - Development on tizen branch





TIZEN

Tizen 3.0 Git Example

- **platform/framework/native/appfw**

projects / platform / framework / native / appfw.git / summary

summary | shortlog | log | commit | commitdiff | tree

description Domain: App Framework
owner
last change Fri, 18 Oct 2013 01:23:53 +0900 (09:23 -0700)

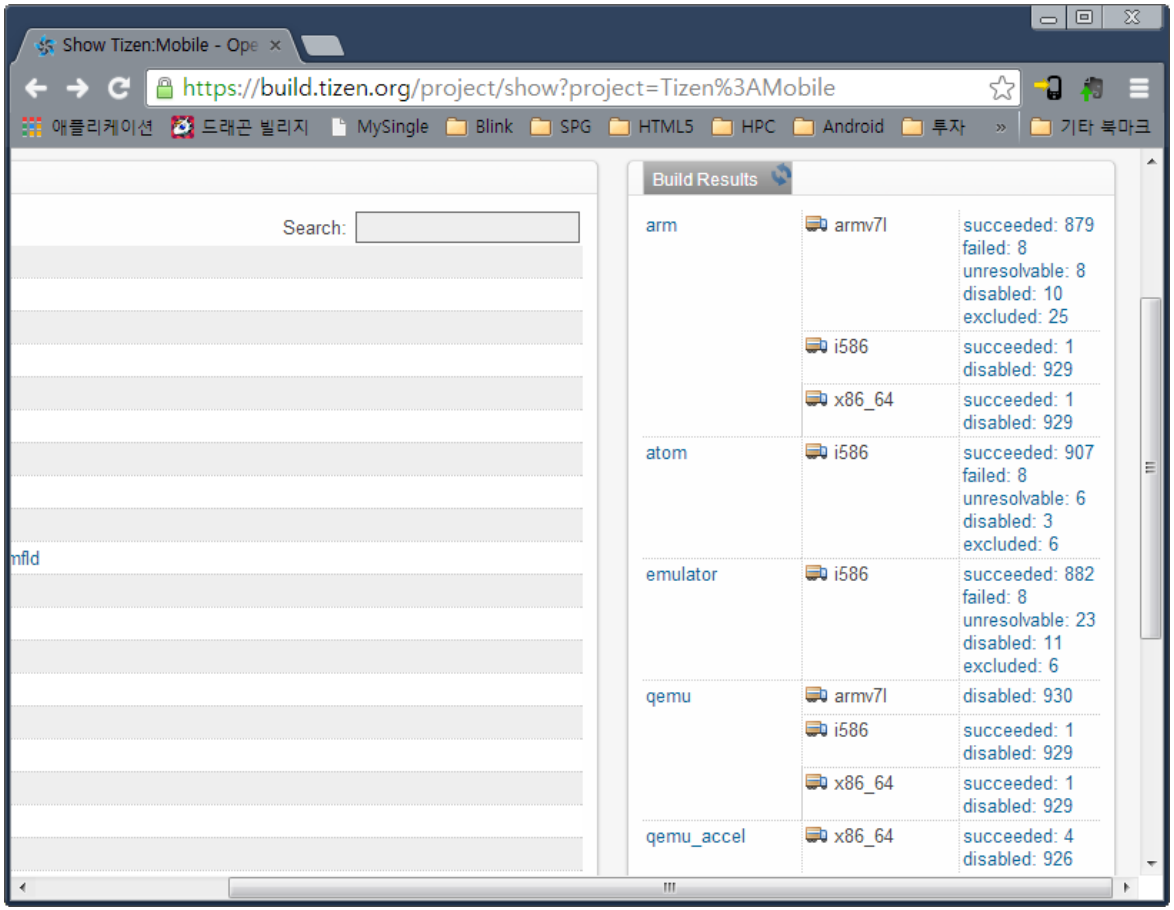
shortlog

40 hours ago	*Yoonsoo Kim*	Merge "Fix accessing freed memory in X509CertificateSto... tizen accepted/tizen/20131018.104622 submit/tizen/2
2 days ago	*Young Ik Cho*	fix AppControl result handling 99/10899/2
2 days ago	*Young Ik Cho*	use SysPropagate() log 98/10898/2
2 days ago	*Young Ik Cho*	export _AppControlImpl::FindAndStart() 97/10897/2
2 days ago	*Young Ik Cho*	move general AppControl launch logic to plugin 96/10896/2
2 days ago	*Young Ik Cho*	AppControl launch logic refactoring 95/10895/2
2 days ago	*Young Ik Cho*	Merge "Fix AppControl::Stop() without listener" into...
3 days ago	*jc815.lee*	Fix accessing freed memory in X509CertificateStore... 23/10923/3
3 days ago	*Young Ik Cho*	Fix AppControl::Stop() without listener 94/10894/2
4 days ago	*dahyeong.kim*	Correct typos in doxygen comments 02/10902/1
4 days ago	*Sunwook Bae*	Merge from 3.0 local branch 49/10849/3
8 days ago	*darpan.ka*	[ACR] [10/10/2013] [Remove] Removing API versioning to...
11 days ago	*darpan.ka*	Merge "[ACR] [01/10/2013] [Add|Deprecate] Adding ToInt8...
11 days ago	*darpan.ka*	Merge "Implementation of ToInt8() API in Number classes...
11 days ago	*dahyeong.kim*	Merge "[3.0] Fix Klocwork issue. 1.unused variables...
11 days ago	*darpan.ka*	Implementation of ToInt8() API in Number classes

TIZEN

Tizen 3.0 Build

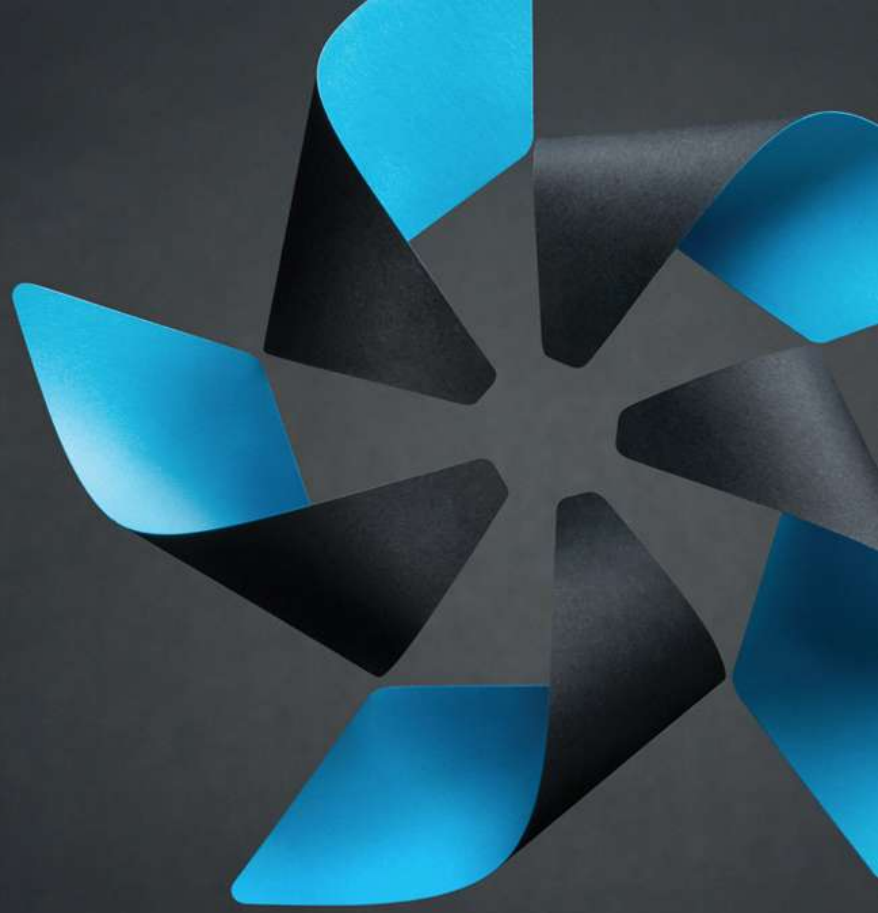
- **Build Server**



TIZEN

TIZEN™

Conclusions



TIZEN™

Conclusions

- **Tizen is W3C standard-based, cross category, strongly industry supported open source software platform under Linux Foundation**
- **Architecture:**
  - Mobile
    - **Linux Kernel 3.0**
    - **Core**
    - **Web and Native frameworks**
    - **Hybrid application types**
  - IVI
    - **Architecture for more demands**
    - **Tizen IVI 3.0-M2-Aug released**
- **Tizen 3.0 Development @ tizen.org**
  - Git hierarchy, JIRA, build

TIZEN

Thanks !
Q&A

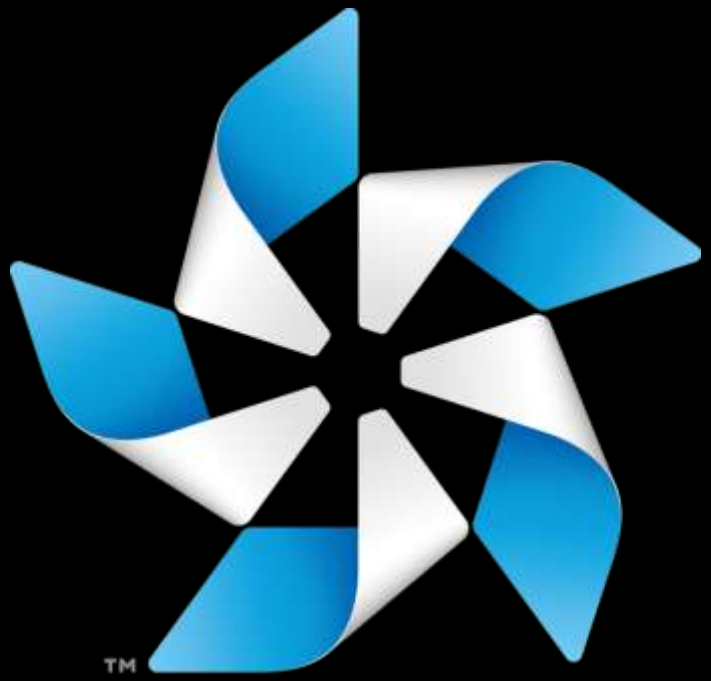
Tizen is…

- **W3C standards-based** with widest **HTML5 coverage**
- Targeting **multiple device categories** including smart phones, in-vehicle infotainment devices, smart TVs, computers, cameras, printers, and more
- Getting **strong support from industry**
- a Linux Foundation **open source project** based on Linux and various open source software

TIZEN

THE LINUX FOUNDATION

TIZEN


TM