Udaykumar Pedduri
Tizen Platform Architect at Samsung

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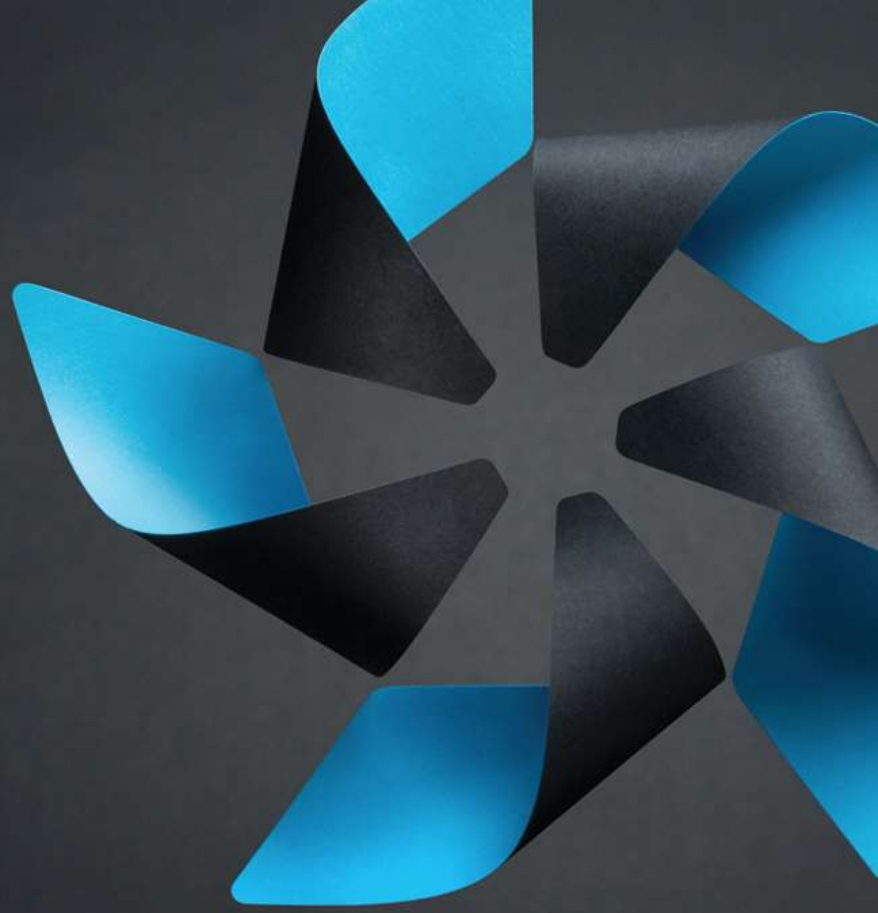

Main Agendas in this Seminar:

- Introduction
  - Naming
  - History With Developing Cycle
  - Screenshots of Operating System
- Architecture
  - Mobile
  - IVI
  - Applications
- Android Os Vs IPhone OS Vs Tizen Os
- Tizen Going Forward
- Conclusions
- References

Naming

- Tizen is a crisp, strong name that matches the scope and capabilities of this new open source operating system.
- The name was created by combining the connectivity of **“tie,”** the activity of **“rise”** and the meditative qualities of **“Zen”.**
- Tizen was stands for **Tizengram.**
- Together, the name represents an operating system that works with you and gives you the easiest access to your mobile life.

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History With Developing Cycle

- 2005: Maemo (**Nokia**)
- 2007: Moblin (**Intel**)
- 2010: MeeGo (**Nokia, Intel, other major hardware & software companies**)
- 2010: Bada (**Samsung : for less Android dependence**)
- 2011: MeeGo abandoned by Nokia (**for Windows Phone**)
- 2011: MeeGo abandoned by Intel, and then by its other supporters

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Cycle contd.

- 2011: LiMo 4 (**LiMo Foundation - Samsung collaboration**)
- 2011: Intel joins **LiMo**, which is renamed **Tizen**
- 2012: **LiMo Foundation** is renamed **Tizen Association**
- 2012: Samsung has aim to merge **Bada with Tizen**
- On September 25, 2012, Tizen released version 2.0 alpha, code-named **Magnolia**

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Year to Year Development

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Cycle contd.

- On **February 18, 2013**, Tizen released version 2.0, code-named **Magnolia.**
- On **April 2013** Samsung announced **Tizen.**
- On **May 17, 2013**, Tizen released version **2.1**, code-named **Nectarine**.
- On **July 22, 2013**, Tizen released version **2.2**.
- On **November 9, 2013**, Tizen released version **2.2.1**.
- On **November 8, 2014**, Tizen released version **2.3**.

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Screenshots of Tizengram

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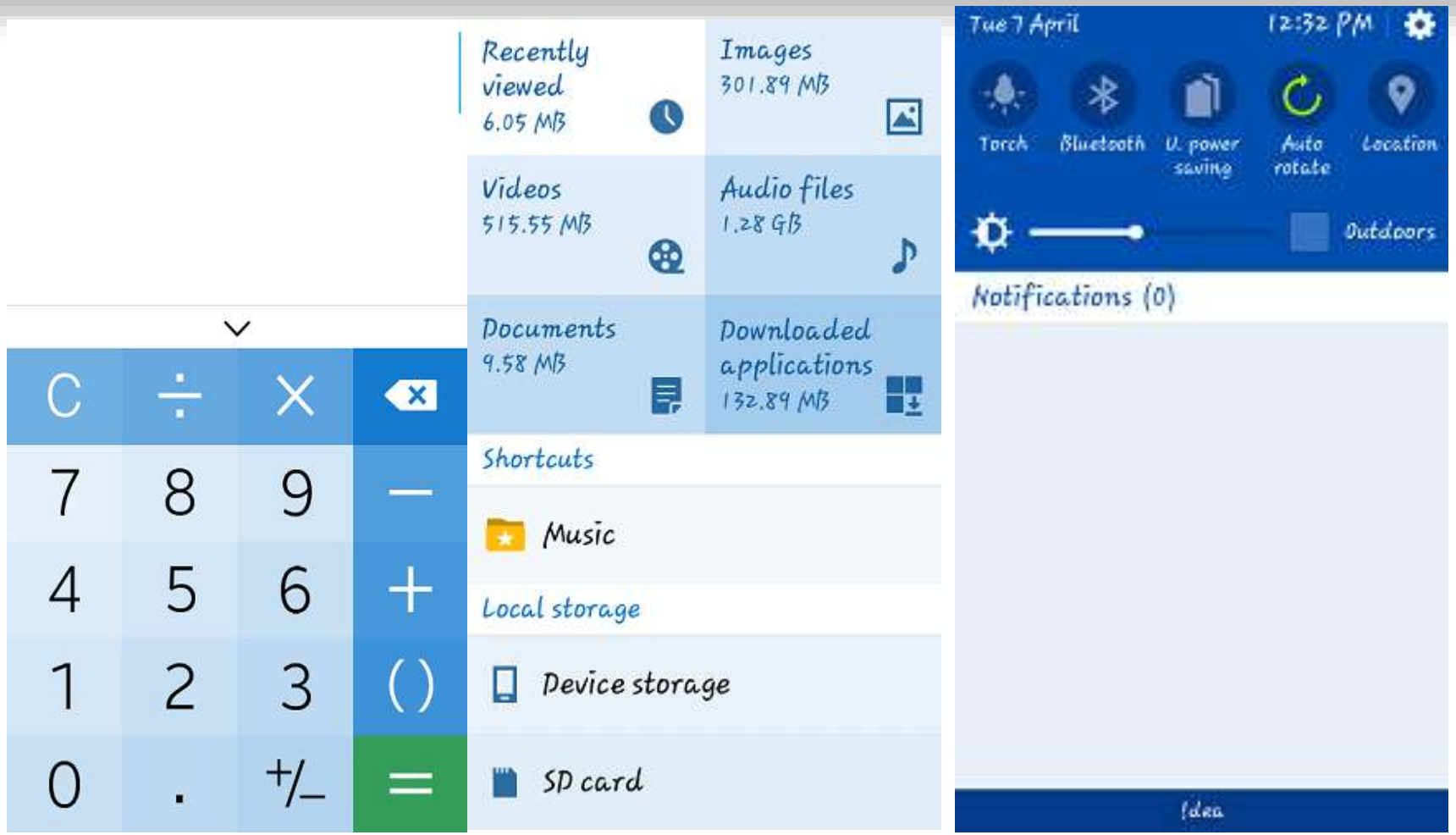
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Audio files
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Documents
9.58 MB
Downloaded applications
132.89 MB
Shortcuts
Music
Local storage
Device storage
SD card
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Torch
Bluetooth
U. power saving
Auto rotate
Location
Outdoors
Notifications (0)
Idea

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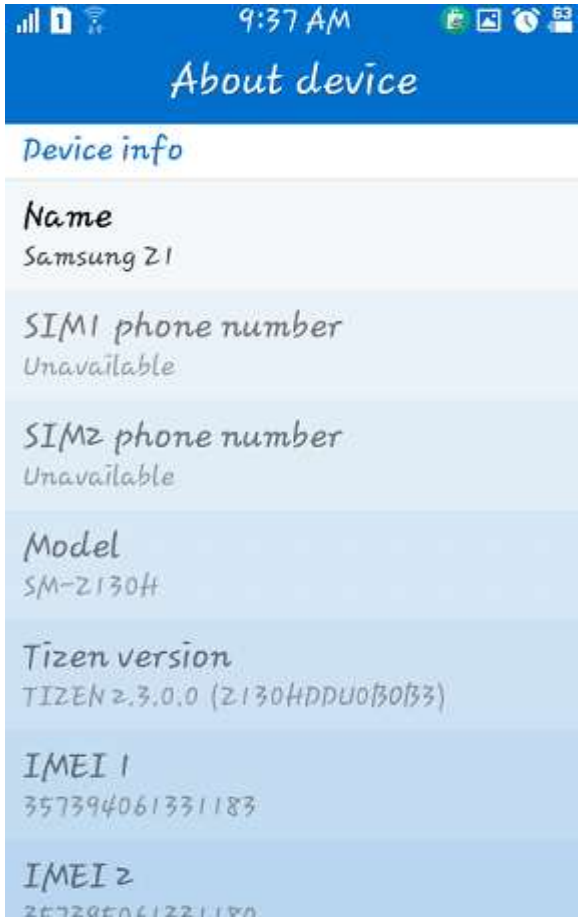
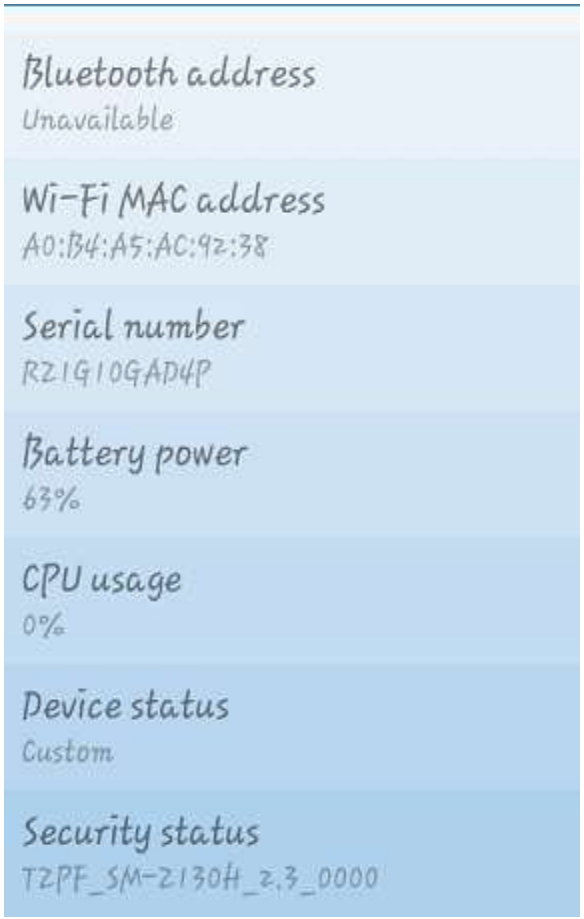

9:37 AM
About device
Device info
Name
Samsung Z1
SIM1 phone number
Unavailable
SIM2 phone number
Unavailable
Model
SM-Z130H
Tizen version
TIZEN 2.3.0.0 (Z130HDDU0B0B33)
IMEI 1
357394061331183
IMEI 2


Bluetooth address
Unavailable
Wi-Fi MAC address
A0:B4:A5:AC:92:38
Serial number
RZ1G10GAD4P
Battery power
63%
CPU usage
0%
Device status
Custom
Security status
TZPF_SM-Z130H_2.3_0000

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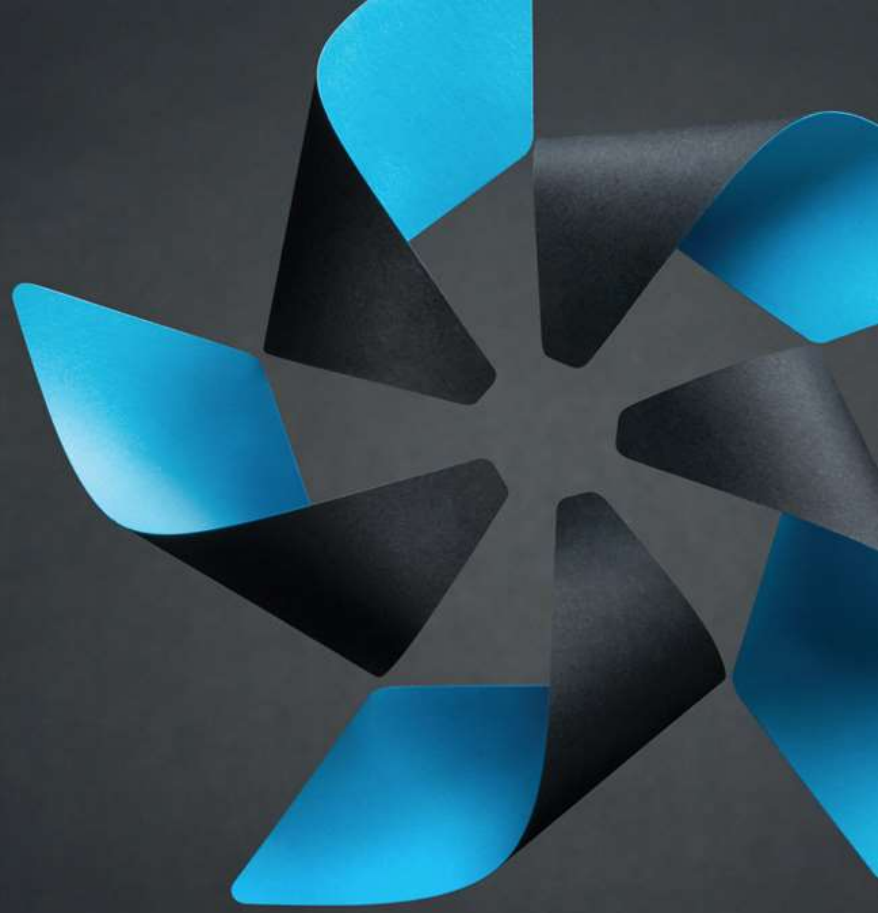
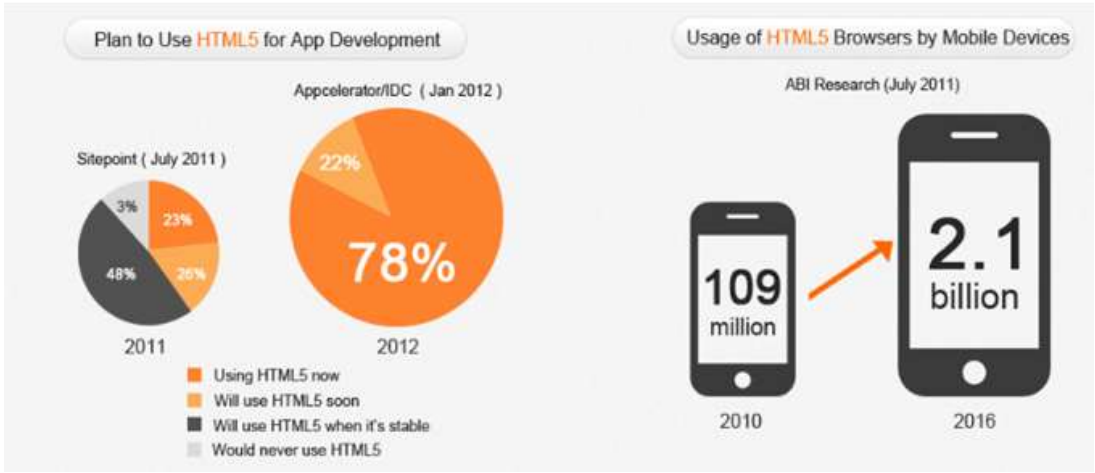
Why Tizen?



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

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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

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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

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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…

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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.

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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

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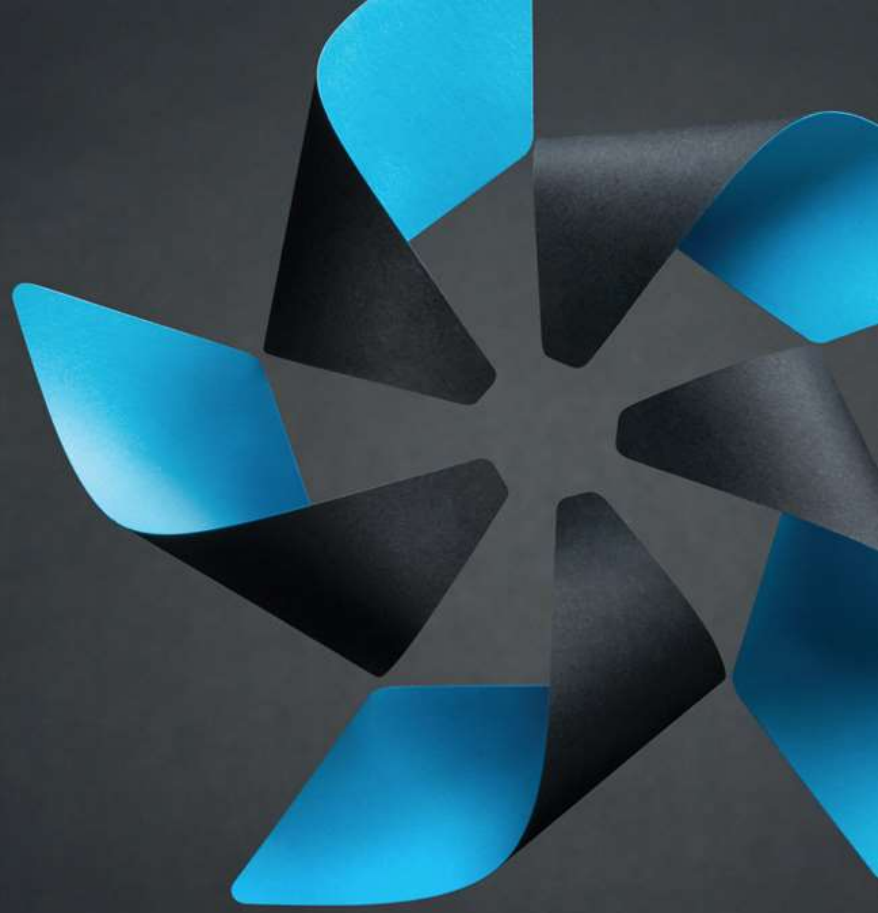
Architecture



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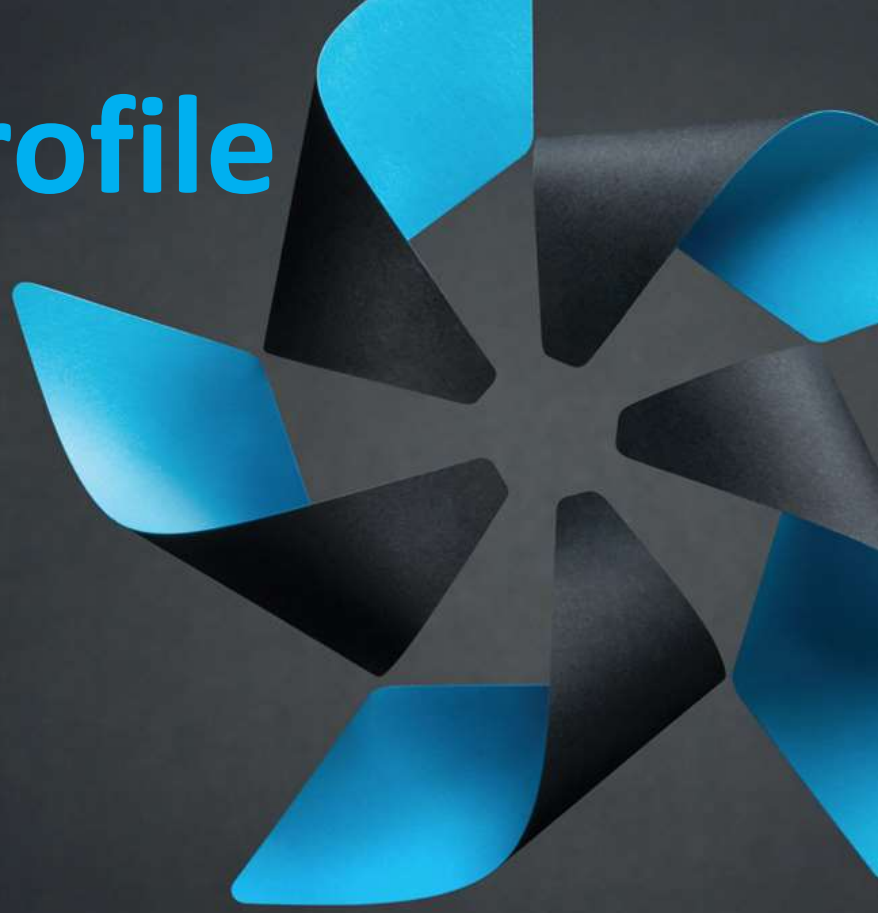
Tizen Mobile Profile Architecture



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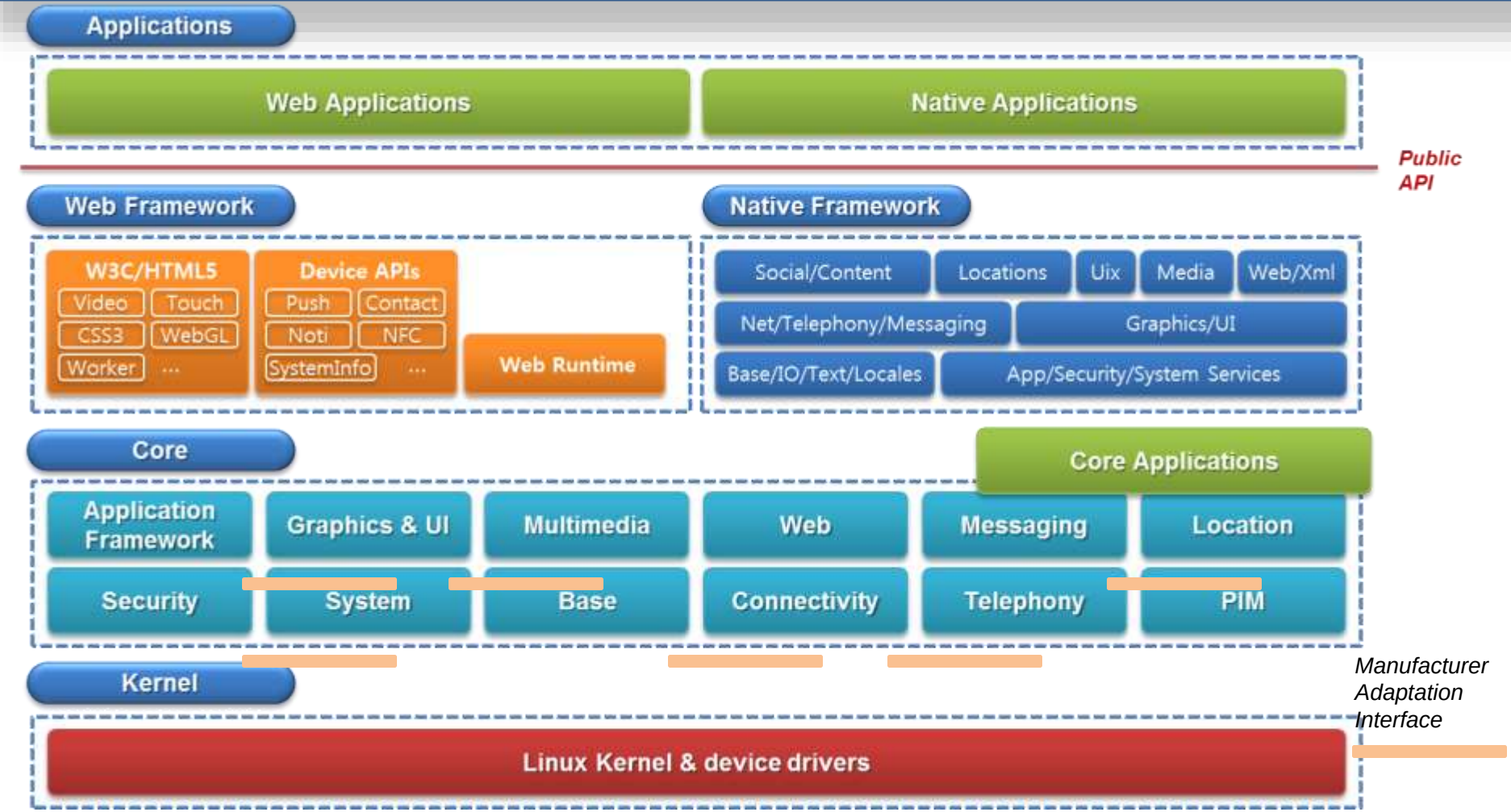
Architecture Overview



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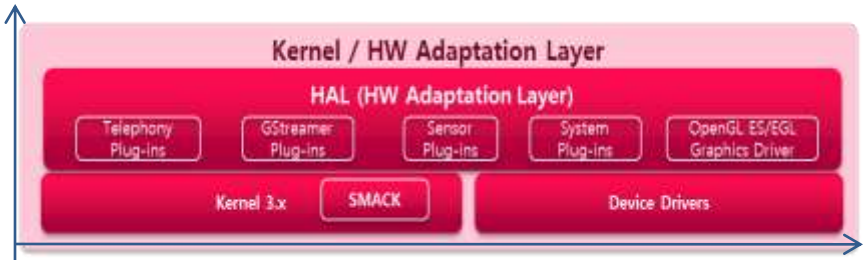
Architecture Overview

- **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



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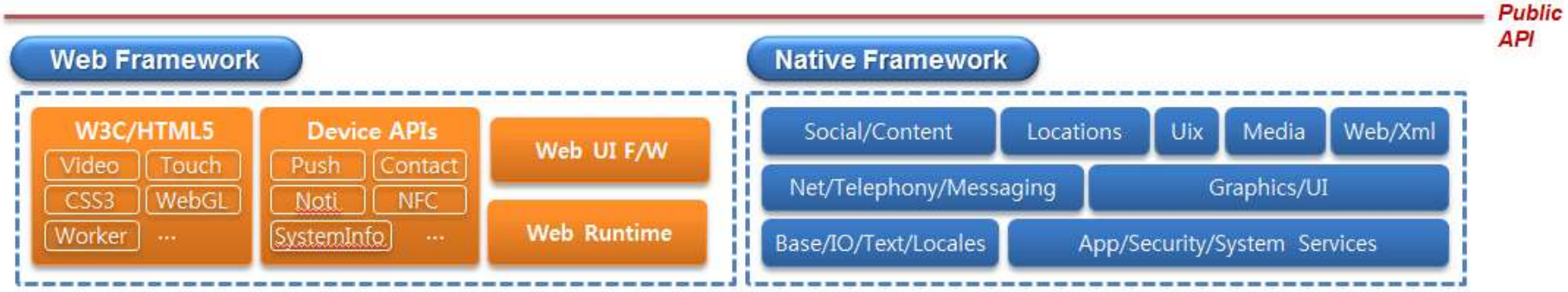
Web vs Native Framework

- **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



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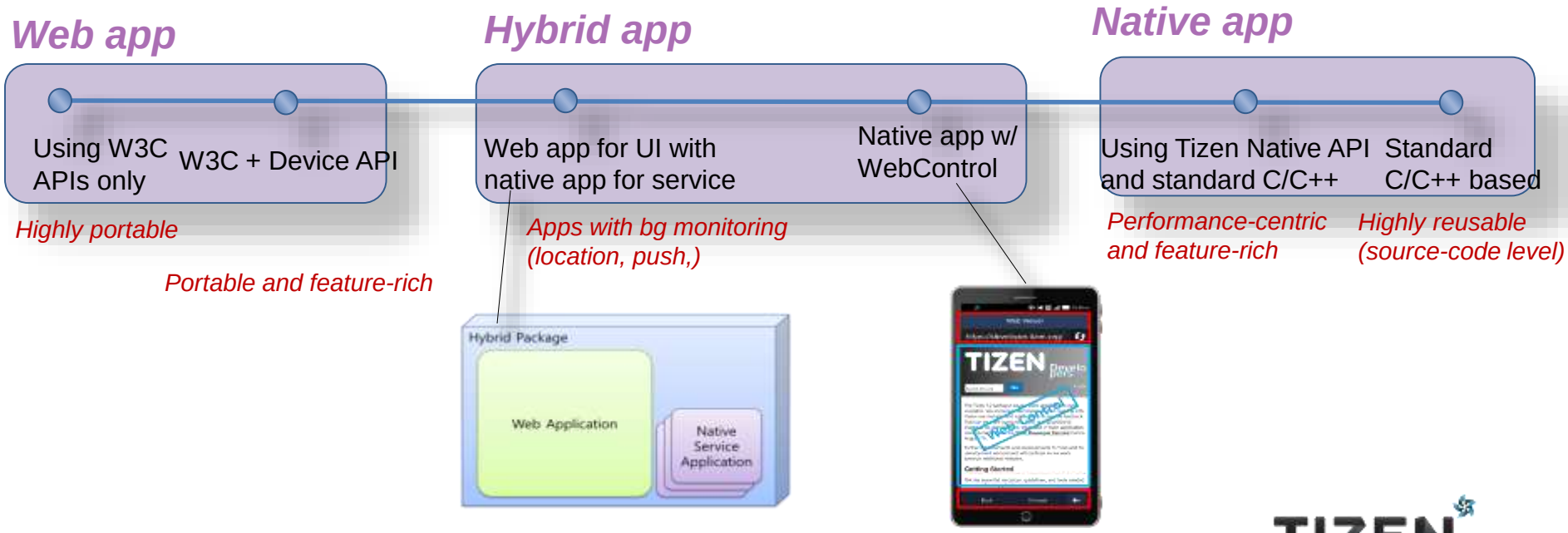
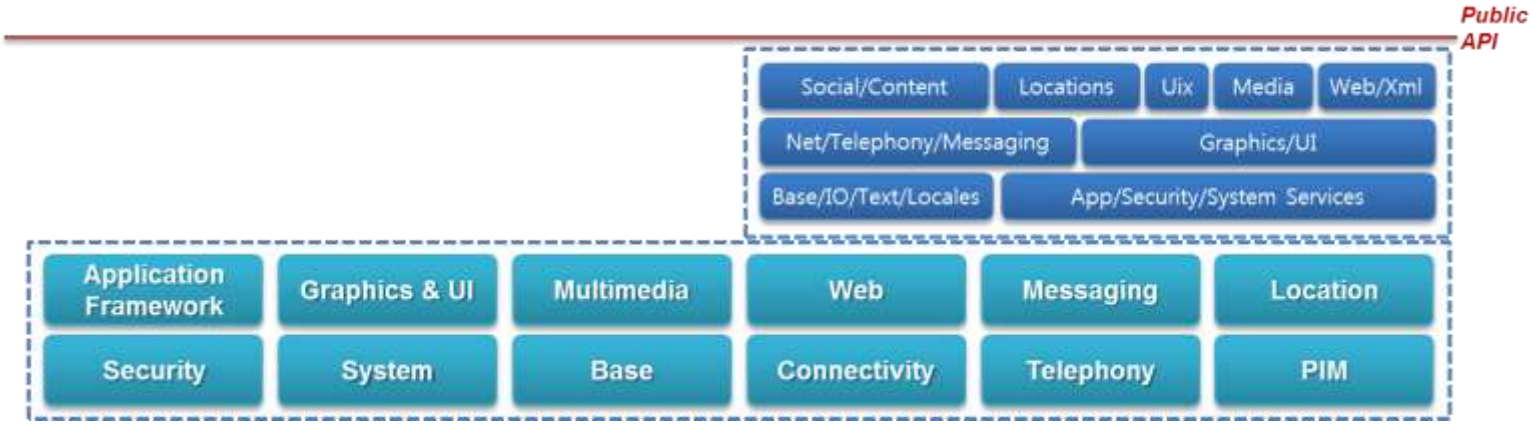
Web and Native: Mix & Match

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



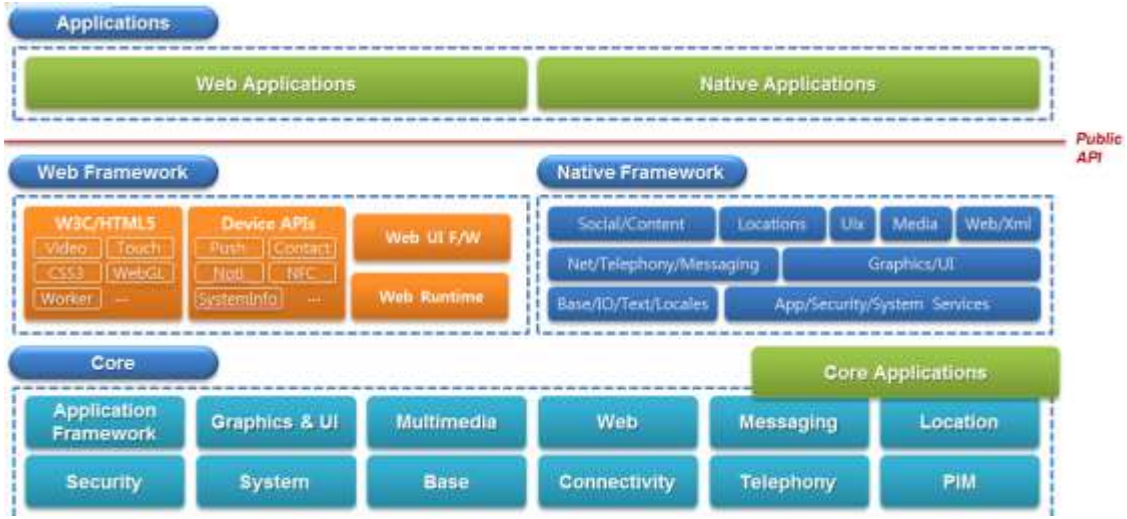
Native Framework vs Core

- **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



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



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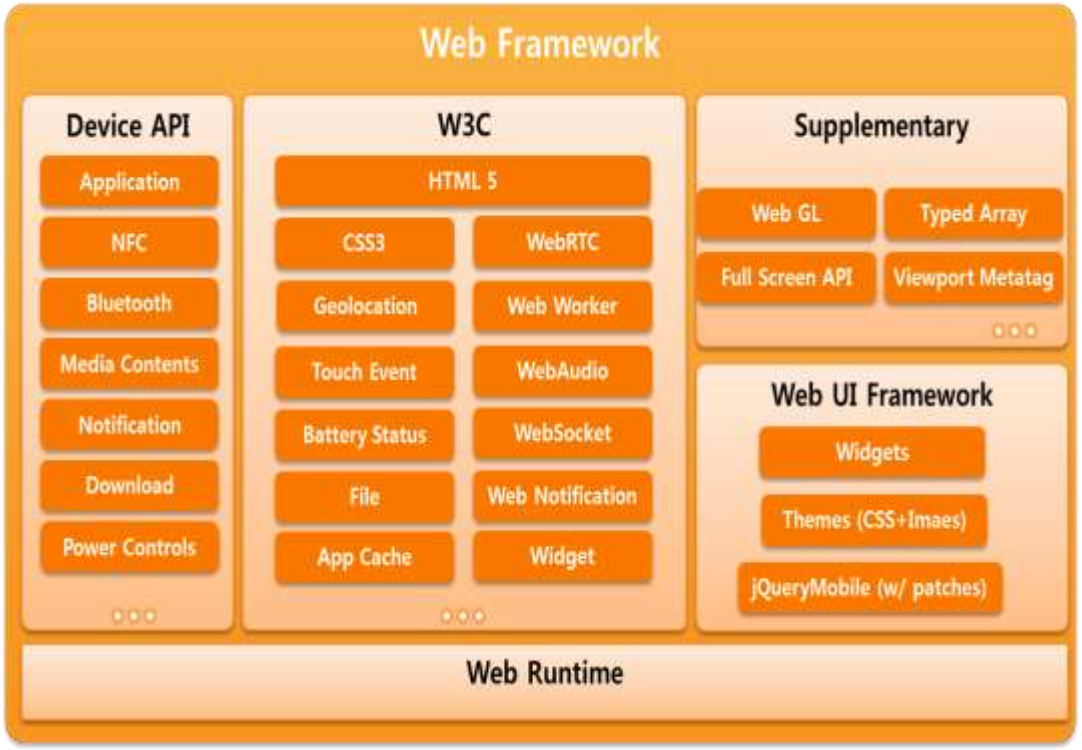
Web Framework

- **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



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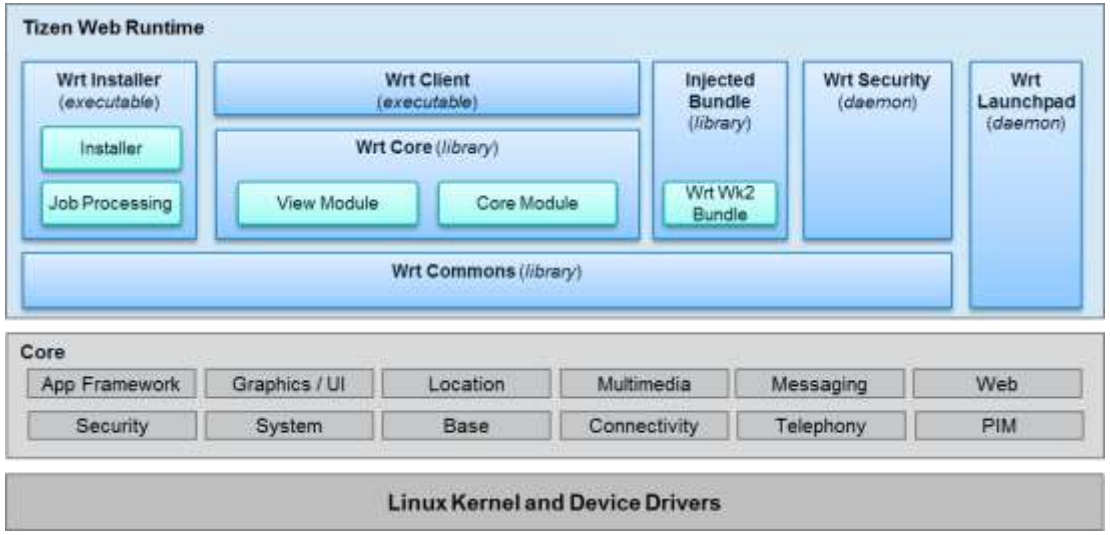
Web Runtime

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



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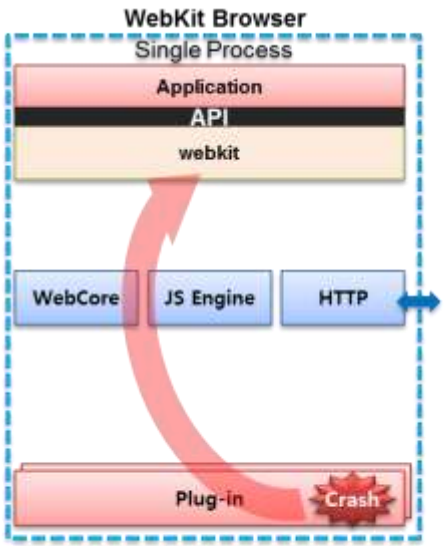
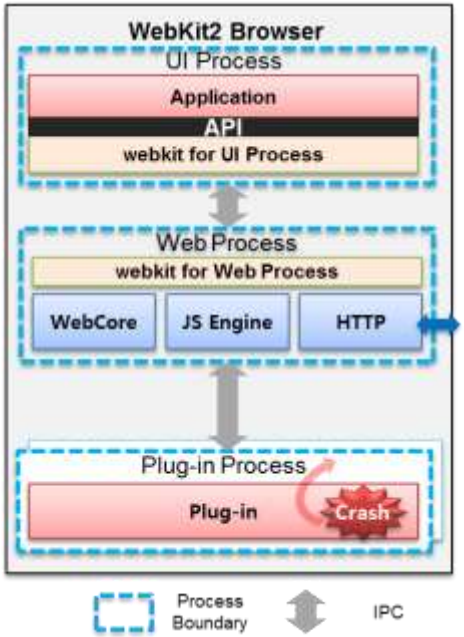
WebKit2 based Browser and Web Runtime

- **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





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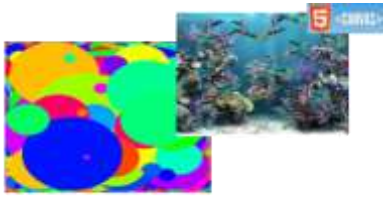
Web 2D and 3D Graphics

- **HTML5 Canvas is accelerated by**
  - Cairo OpenGL® ES backend
- **WebGL**
  - Directly uses OpenGL® ES
  - Triple buffering

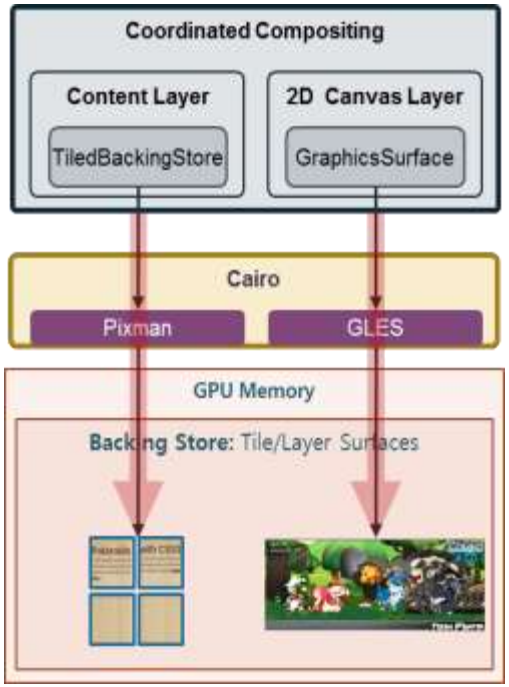
2D Canvas performance score

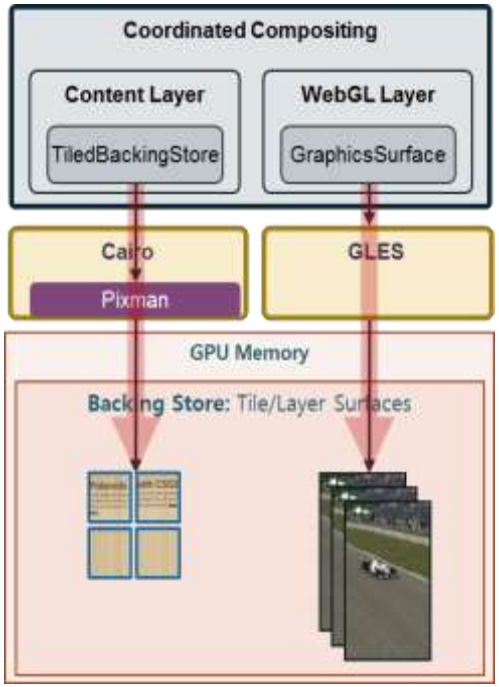


[Source: canvasperf, ie10testdrive]

WebGL fps test

[Source: Google Experiments, Tizen Demo]





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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

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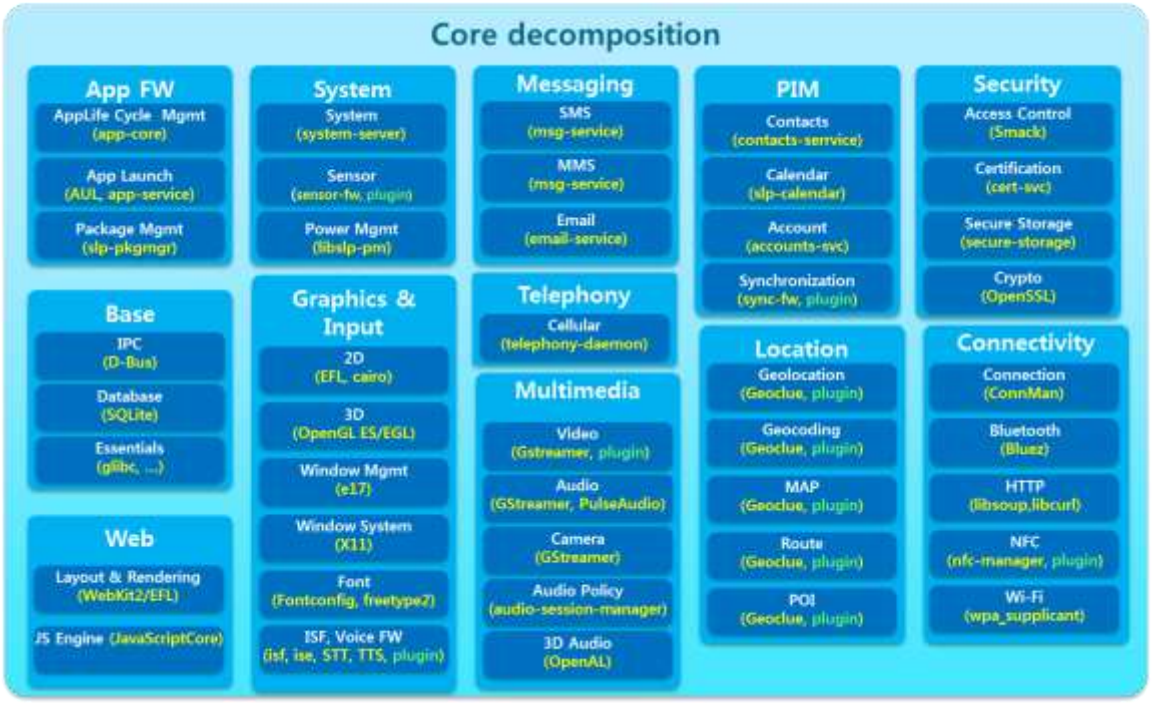
Core Framework

- **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..



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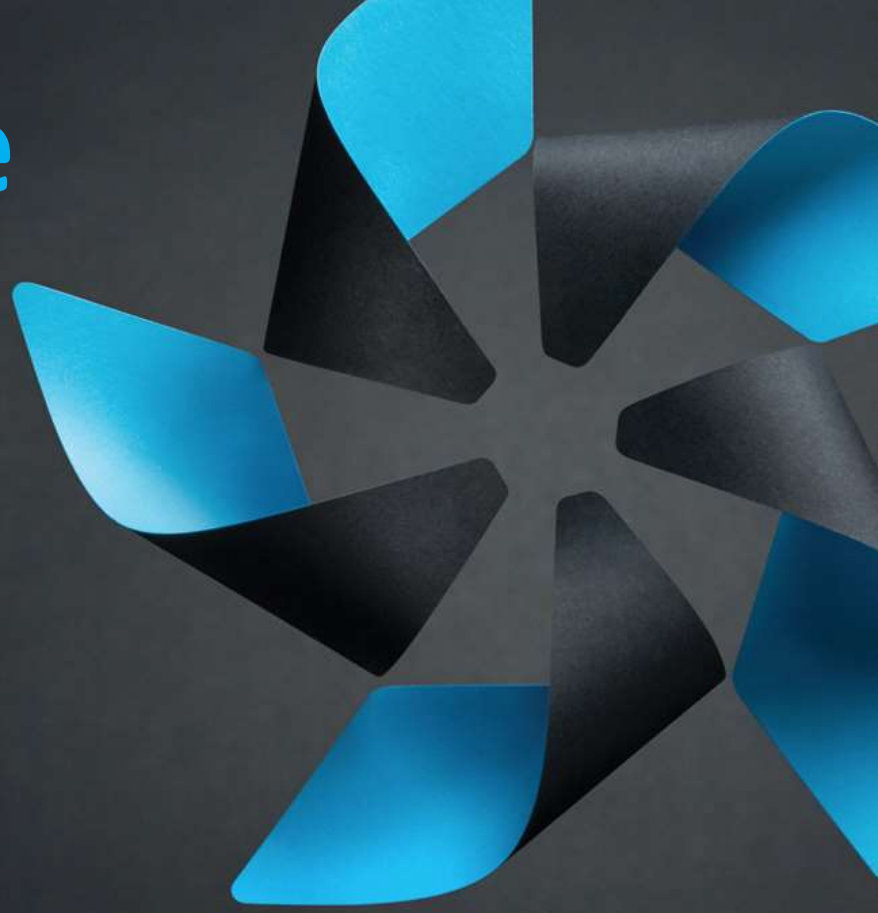
Tizen IVI Profile Architecture



THE LINUX FOUNDATION

IVI Demands More

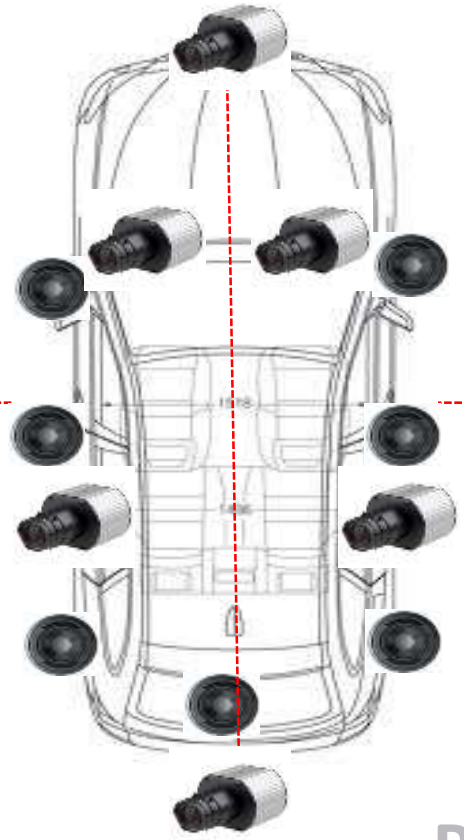

Navigation GPS
Dual Display


TTS/STT

SIRIUS SATELLITE RADIO
Radio

DRIVER

Front– video analytics




Audio


BluRay playback


Display

Passenger 1


Video playback


Audio


Display

Passenger 2


Mobile Device


Audio


Display

Passenger 3

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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.

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Tizen Provides Application

- Tizen provides application development tools based on the JavaScript libraries jQuery and jQuery Mobile.
- Since version 2.0, a native application framework is also available, based on Open Services Platform from the Bada platform.
- The software development kit (SDK) allows developers to use HTML5 and related Web technologies to write applications that run on supported devices.

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Tizen Released first Mobile

- **Samsung Z** and **Galaxy Gear** devices are the first released with Tizen as their OS.
- **In May 2013**, Samsung released the firmware for their NX2000 and cameras. The architecture source code is based on
- On **June 2014**, at the Tizen Developer Conference Samsung showed a **Tizen based smart TV's.**

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Android Os Vs Tizen Os

VS

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TIZEN OS Features and Advantages over Android OS and IOS

- Technology is something that abruptly change in such a short time, the bestselling today might be the least selling tomorrow.
- This is what Tizen OS developers expect in the future. Before, IOS was the largest selling operating system.
- Because it was used by the Apple Industry, and the popularity of Apple was very high at that time.
- Then Google launched its Android OS in the market, which snatched the spotlight from IOS.
- Android became the top grossing OS ever since.

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Contd..

- However, other developers are trying to make another OS that would be able to compete with Android and IOS.
- Firefox launched its Firefox OS which was HTML5 based.
- There was Ubuntu Touch, which allowed a split screen multi-tasking. It was also based on HTML5 code.
- Another new OS that hoped to compete with the other OS in the market is the Tizen OS, which was supported by the big companies like Intel and Samsung.
- Samsung mobiles have been purely dependent on Google's OS, the Android.
- Today, it planned to create its own OS and to minimize its dependency on Google.

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Contd..

- The first prototype phone running under Tizen OS received negative effects from those who tired it.
- Some of the comments made were that there was nothing different from the Tizen OS with that of the Android and the IOS.
- They have exactly the same features. But the developers promised to improve their new OS before they launched it by the end of this year.

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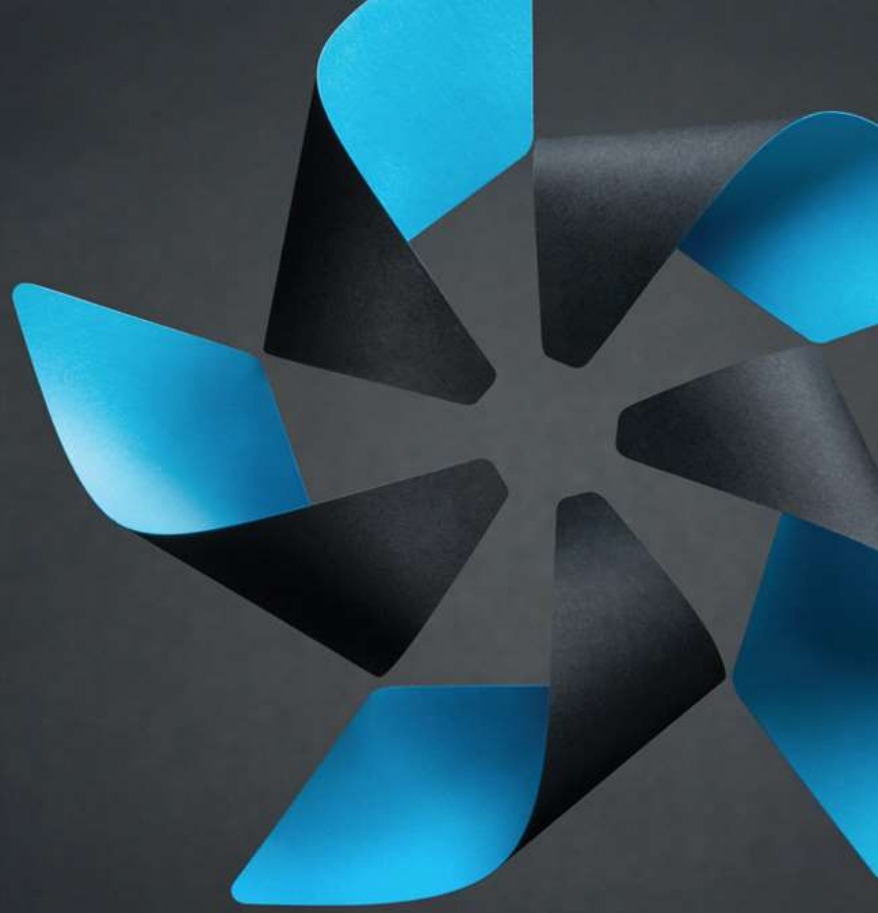
Going Forward: Development Model



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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**

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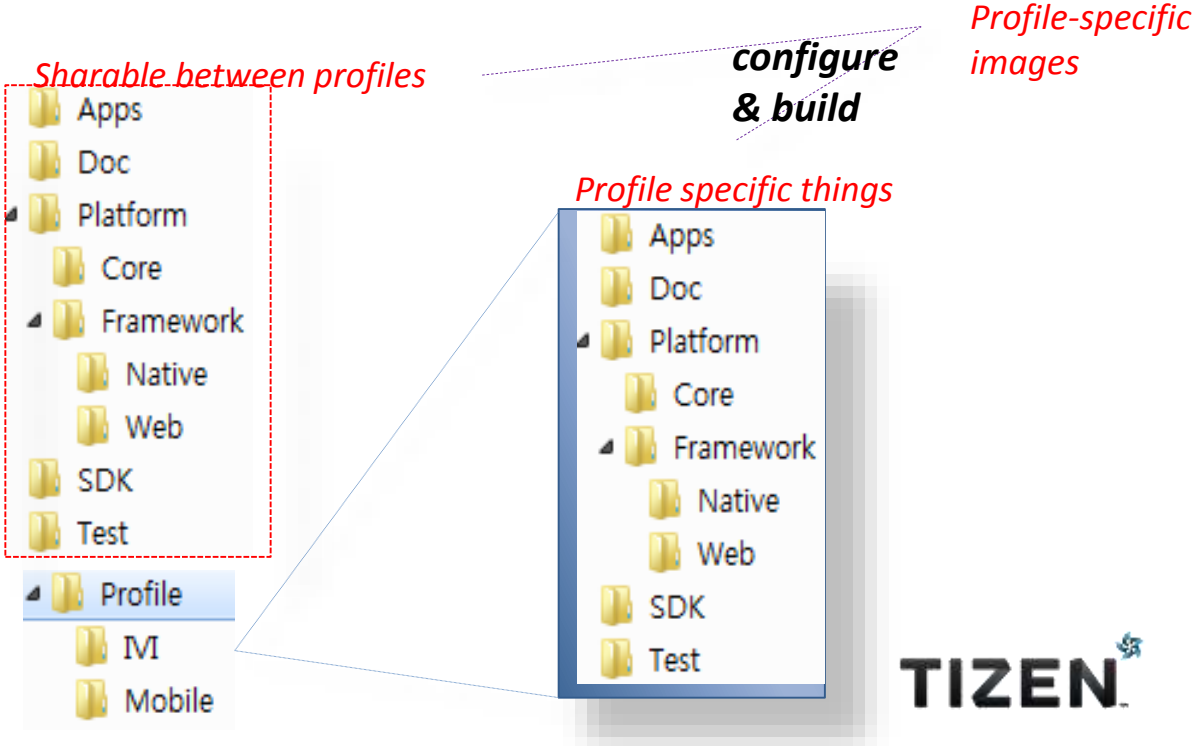
Tizen 3.0

- **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



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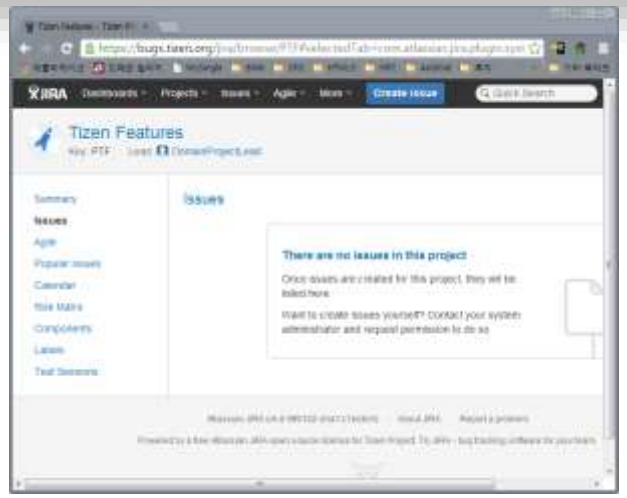
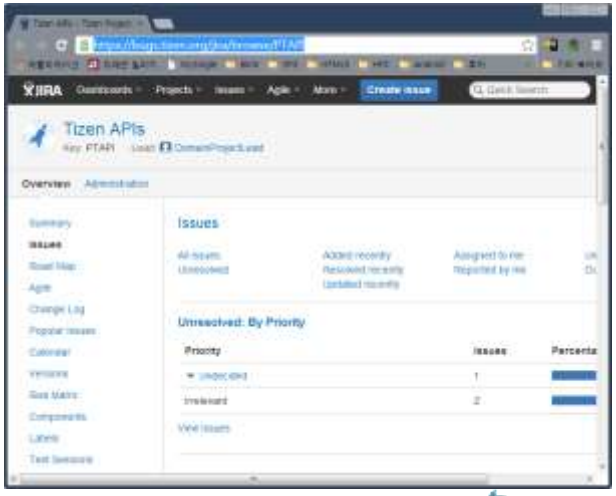
Development Infrastuctures

- 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





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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**

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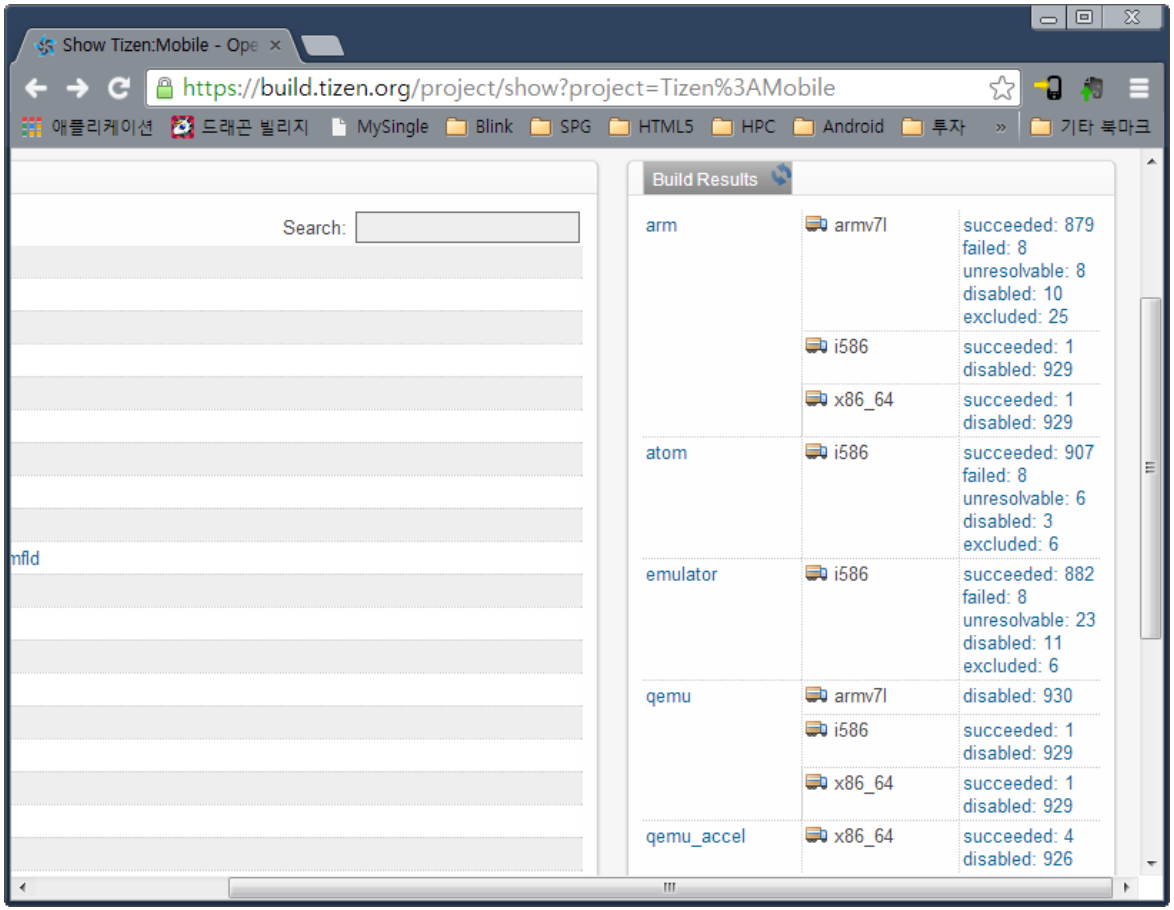
Tizen 3.0 Build

- **Build Server**



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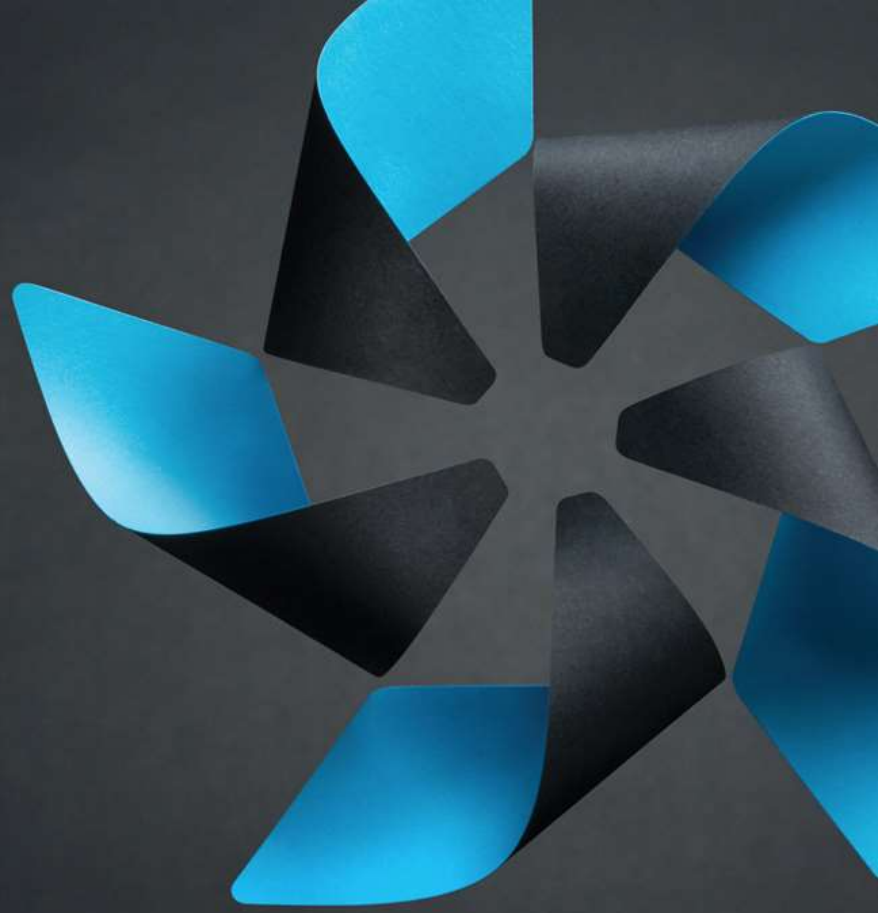
Conclusions



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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

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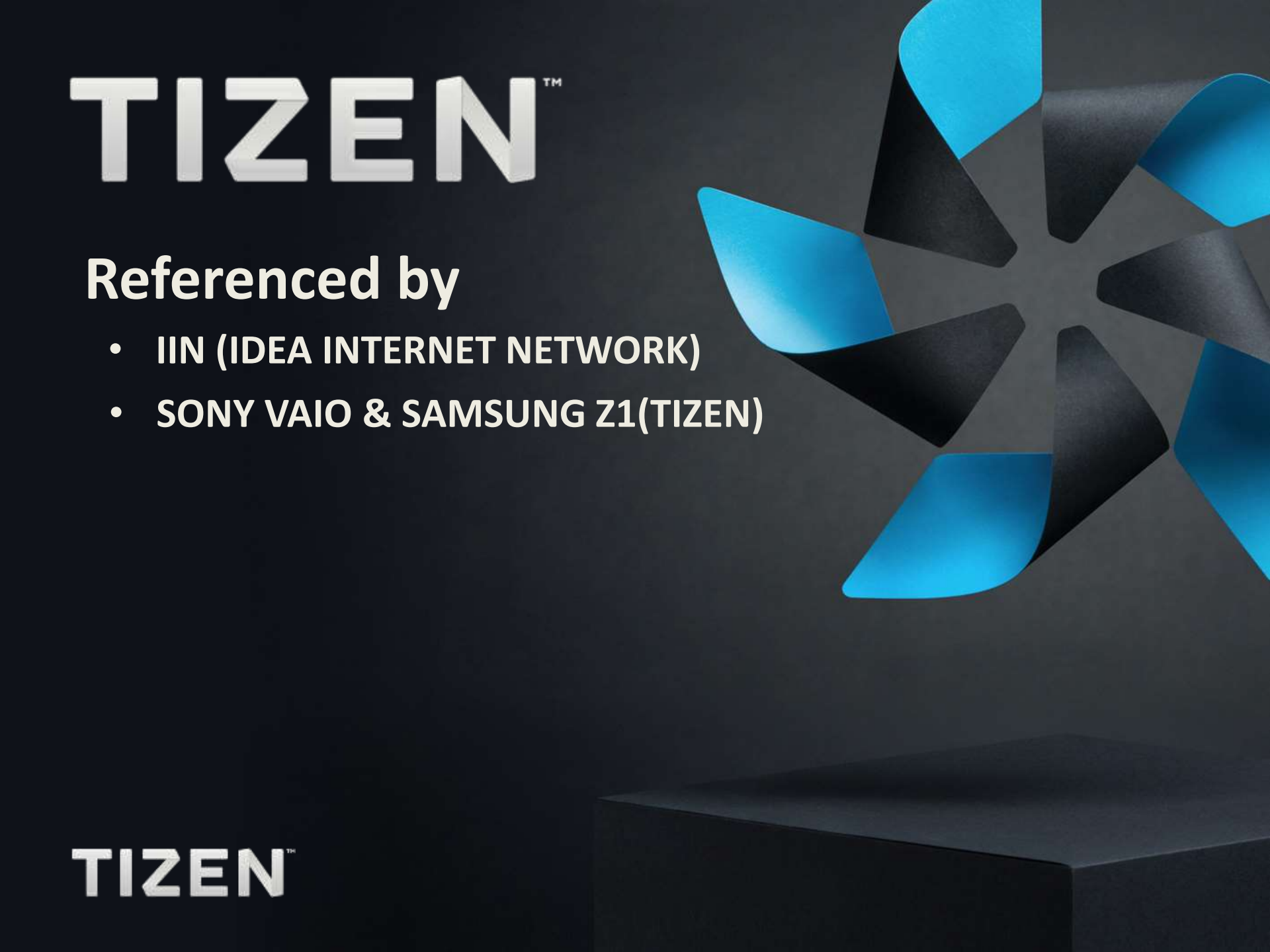
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Referenced by
• IIN (IDEA INTERNET NETWORK)
• SONY VAIO & SAMSUNG Z1(TIZEN)
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Thanks !

Any Doubts???

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

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THE LINUX FOUNDATION

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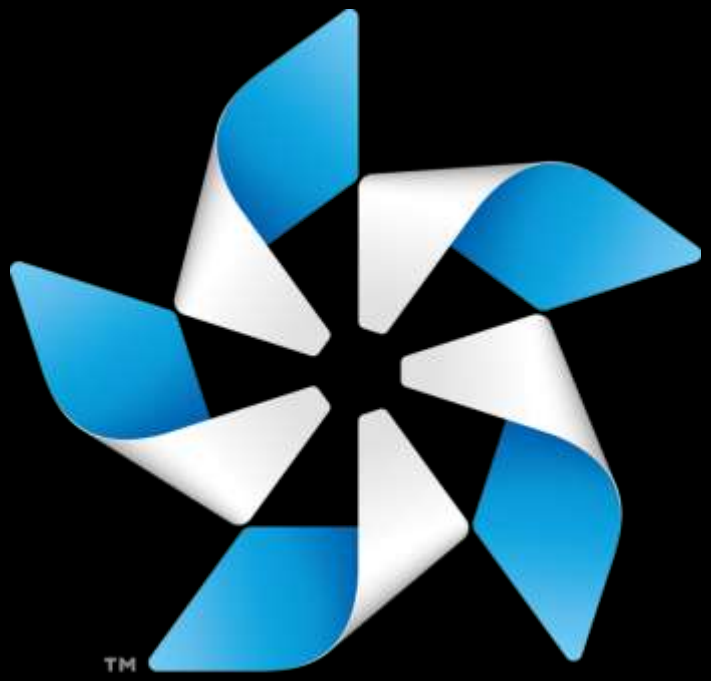
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