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**TOPIC: Case Study of Tizen Operating System**

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**Case Study of Tizen Operating System**

**ABSTRACT**

This paper presents a study of Tizen, an open source operating system and platform targeting devices from smart phones, wearable’s, smart TV, including auto (Infotainment), for the partial fulfilment of the requirements in Masters in information Systems, Information System 215 (IS 215), University of the Philippines, Open University (UPOU).

Considering the present situation where the trends are heading towards mobile and wearable’s, Tizen has its own advantages and disadvantages compared with other platform like Android and iOS. This study also covers on what frameworks and APIs are available in application development for devices powered by Tizen operating system.

**TIZEN BRIEF HISTORY**

In 2005, Nokia developed a Debian GNU-Linux based platform that includes Maemo operating system and Software Development Kit (SDK). Later in February 15, 2010 Nokia and Intel Corporation announced the merging of Maemo software platform and Moblin “mobile Linux” of Intel and was named MeeGo. In February 11, 2011, almost one year after, Nokia partnered with Microsoft to create a global mobile ecosystem and chose Windows Operating System (OS) to run on Nokia devices. Since Nokia partnered with Microsoft, Intel has been without a major mobile hardware partner the reason Intel abandoned MeeGo in favour of Tizen. On the other hand, in February 25, 2013 Samsung officially announced that they are retiring their Bada operating system (bada means “ocean in Korean”) and merged it into Tizen. Today, Linux Foundation is hosting Tizen while its development will be completely open and lead by technical team composed of Intel and Samsung.

**THE OPERATING SYSTEM OF EVERYTHING**

Tizen is an open and flexible operating system. The name Tizen combines the connectivity of “Tie”, the activity of “Rise”, and the meditative qualities of “Zen” “retrieved from https://developer.tizen.org/faq“.Tizen is an open source operating system that encourages community innovation and enables full UX design. This OS is created for more than just Smart phones. It has a cross-architecture for multiple categories initially on smart phones, tablets and automotive infotainment with other electronic device.

Tizen have multiple profiles to cater almost every industry. From smart phones, tablets, wearable’s, up to vehicles, bio and banks. According to J.K. Shin - CEO, Samsung Electronics "There are many convergences not only among IT gadgets, including smartphones, tablets, PCs, and cameras, but also among different industries like cars, bio, or banks". Tizen’s current profiles are Tizen IVI (In vehicle Infotainment), Tizen mobile, Tizen TV, and Tizen Wearable’s. These profiles are built on top of Tizen Common, which is a shared infrastructure.

Manufacturers are free to modify one of these profiles to satisfy their business requirements, or they can develop their own profile utilizing Tizen common shared infrastructure for memory processing and power consumption to fit in their needs. For application developers, it offers HTML5 and native APIs written in C/C++.

Tizen will not only be the operating system of everything. It is also the chosen platform of Samsung Electronics to support their vision of Internet of Things (IOT). It is an idea that every device you have and even products that you don’t normally expect to see technology will be connected and communicating with each other.

**DEVICES AND CONSUMER ELECTRONICS USING TIZEN**

Samsung electronics is the most vocal promoter of Tizen. In fact Samsung successfully launched Z1 in January 14, 2015. It is the first smart phone running in Tizen. On January 7, 2014 in International Consumer Electronic Show (CES), the same company announced that in 2015 all of its Smart TV would come equipped with its platform built in Tizen. After a year, in CES 2015 Samsung exhibits “Samsung and BMW IoT Collaboration”, Samsung Gear S powered by Tizen connected to BMWi Car. In the same event Samsung also showcased its Smart TV equipped with Tizen.

**FRAMEWORKS USED IN DEVELOPING TIZEN APPLICATIONS**

A mobile ecosystem cannot survive without a robust selection of mobile applications available for users. In order to address this, Tizen enable application developers to choose between two frameworks: native and web development. In development using web development framework, Tizen is supporting standard base HTML5, CSS, and JavaScript. HTML5 promised to remove barriers for mobile app developers using a common framework that is accessible and recognized as a standard. Tizen’s JavaScript-based device APIs also enable advanced device access but not limited to Bluetooth and NFC from your web application. Tizen have also native APIs that include classes and methods that application developers can use in designing and in implementation of business requirements. In native development framework, Tizen developers may take advantage of device functionalities like sensors; call operations, managing of media files, network and social services, messaging and web browsing functionality. Previous investment of projects written in C/C++ can also be ported in Tizen using its native APIs. No matter what framework is chosen by Tizen’s developers, its platform ensures that all applications will have consistent look and feel across all devices.

**TIZEN VS. ANDROID**

Android is a mobile operating system and platform for smart phones, tablets, wearables, Smart TVs, cameras, and Cars (Auto). Google acquired it in 2005, then worked with Open Handset Alliance to release the Android Open Source

Project (AOSP) in 2008. Since 2008 up to now, Android powers hundreds of Millions of mobile devices in more than 190 countries around the world. Android is not just an operating system but also a platform for creating mobile

enterprise application and games that can be uploaded to Android Market (Google Play) for instant distribution. Android has its own powerful development framework. It provides everything an application developer needs in building in class application experience. Once the application is built using Android Development Kit, it can be deployed to a wide range of devices, from phones to tablets and beyond via Google Play.

|  |  |  |
| --- | --- | --- |
| Features | Tizen | Android |
| Supported  Device |  |  |
| Smart Phones | Z1 | Android 1.6 Donut,  Android 2.0 Éclair,  Android 2.2 Froyo,  Android 2.3  Gingerbread,  Android 3.0  Honeycomb,  Android 4.0 Ice  Cream Sandwich,  Android 4.1 Jelly  Bean, Android 4.4  Kitkat, Android 5.0  Lollipop |
| Tablets |  | Same as in smart  phone OS  releases |
| Wearables | Samsung Gear S | Android Wear |
| TV | Samsung Smart TV | Android TV |
| Auto | In Vehicle Infotainment | Android Auto |
| Others | On-going: gaming  console, DVR and  appliance | Camera, Washing  Machine, Fridge |
| No. of  Powered  Devices in %  World wide | Less than 8.9 % | 70.1% |

**TABLE. TIZEN – ANDROID COMPARISON**

Tizen like Android is also an operating system and a platform for mobile devices, wearables to auto (infotainment). They are almost similar but differ in terms of platform maturity and market reach. A mobile platform can be considered mature if it has a very good support in terms of hardware and application development APIs that are available for developers. The support of manufacturers is also an advantage. The more manufacturers are supporting the said operating system the more it will become mature because manufacturers can easily raise issues (like compatibility) they encountered during their testing. OS engineers in their next releases can address that issues. Another trait of a mature operating system is based on its market reach and availability of applications to the consumers, may it be public or private sector.

**HELLO TIZEN: BUILDING A SIMPLE TIZEN APPLICATION**

Developing Tizen application is almost the same as developing application for Android. Tizen IDE must be installed first. Here are the steps followed by the author for his first Tizen Application:

Tizen SDK Installation (method used is network installation)

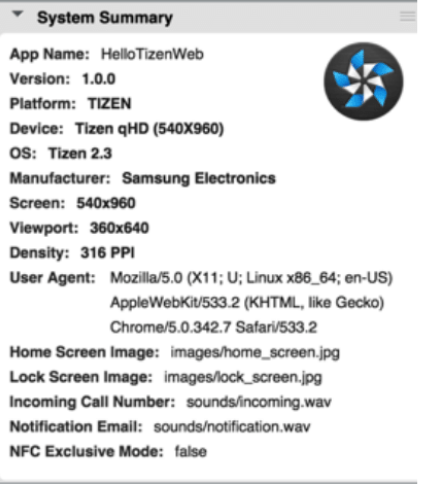
1. Downloaded SDK Install Manager (tizen-sdk\_2.3.63\_macos-64.bin)

2. Network Installation was chosen

3. Run SDK Install Manager in terminal using “java -XstartOnFirstThread -

Dorg.eclipse.swt.internal.carbon.smallFonts -jar InstallManager.jar” (it is inside <dir\_loc>/inst-manager/inst-manager.app/Contents/Resources/Java)

4. Select Components to install and “click install” Launch Tizen IDE found in (<dir>/tizen-sdk/ide)



In “Project Explorer” right click and create new project Choose between Tizen Web or Native Project (the author chose Tizen Web Project)

In Template select “Basic” under MOBILE-2.3

Fill up project Name “HelloTizenWeb”.

Finally it will create a Tizen Web Project name “HelloTizenWeb”.

Under “HelloTizenWeb” project you update the index.html with your desired text and layout to be displayed.

Run application by “Run as” – Tizen Web Application

It is easy to develop your first Tizen applications if you are familiar with C/C++ or Java and web technologies like HTML and JavaScript. It is a plus for developers familiar with Eclipse based IDE since Tizen IDE is also based on Eclipse.

**TIZEN’S STRENGTH AND WEAKNESSES**

Tizen is built on top of Linux kernel that drives the Tizen platform. Linux is well known for memory management and robust performance.

Since Linux is one of the most stable Unix based kernel, inherited by Tizen that automatically become its strength. Tizen file system adopts the ext4 file system as a default root. Unlike Android, it is not using ramdisk and initramfs.

Memory management in Tizen, process and resources is maintained using cgroup. If a process moves to the foreground from background, the process group also moves into the “foreground” cgroup. The advantage of using cgroup is that the priority of the process is promoted to reduce the possibility that the process is killed in a low memory circumstances. If the system memory reaches the low memory threshold, the kernel notifies the resource. Then resource reclaims the background group to get sufficient free memory.

Another advantage of Tizen is it can be run inside Android in two ways: by full system wipe and installation or the easy way, that is using “kexec” to multiboot Android device. “kexec” is Linux booting itself. It is a syscall that allows

Linux kernel to boot another Linux kernel without restarting the device. Its edge is it boots faster because it doesn’t require restarting the device. At the same time it skips boot loader. However, booting over previous kernel get the RAM in an intermediate state. Other than the core concept of operating system, Tizen is very similar to Android.

**CONCLUSION**

The mobile OS ecosystem is already saturated with big companies like Google, Apple, and Microsoft and to include Blackberry. It is already a red ocean market.

As Tizen is almost similar to Android, it will be difficult for Tizen to have a business deal because the dominant (Android and iOS) platforms that is considered a “System Lock In”, like in LG, HTC, smart phones that are locked with android.

Data gathered during this study support these findings. According to International Data Corporation (IDC) “Worldwide all those companies making Android phones sell a lot more units than Apple sell”.

iOS and Android platform are still the majority in app download from Google

Play and App Store that is 51% and 40% respectively. On which platform is more widely used in business, a report by Citrix covering the fourth quarter of 2012 as shown below, iOS and Android are still dominating.

It will be very hard for Tizen to penetrate the market, as it is a new platform compared to Android and iOS. Also each company’s market proportions are almost equal, leaving a small share for new entrants like Tizen.