

# Survey paper on Google's new Fuchsia OS

Vishal Lagoo, Priyanka Sorte

**Abstract**— Fuchsia is a new operating system currently being developed by Google. It became known to the public when a form appeared on git in August 2016, but no official announcement was done. Considering Chrome OS and Android OS are based on Linux kernel, Fuchsia OS is based on a new microkernel called Zircon, named after the mineral. Fuchsia OS will target devices like smartphones, tablets, smart and IoT based devices.

**Keywords:** Fuchsia, Google, Android, Kernel, Monolithic, Microkernel, Linux, Zircon, Operating System

## 1 INTRODUCTION

Fuchsia is an open source capability based operating system currently being developed by Google, LLC. It was made publically available on git in August 2016. No official announcement was done on this. As we know, Android is currently most popular and free of cost mobile operating system. Android is also product of Google. Android is based on Linux kernel and is open source operating system. Android is now also used in smart devices like watch, cars, televisions, etc. But there is a drawback. According to Google, Android will not be able to handle ever-upgrading hardwares. So they have implemented plans to develop Fuchsia OS. Fuchsia is new card based user interface system which is based on new microkernel 'Zircon'. According to GitHub, Fuchsia can run on many platforms like Mobiles, tablets, computers & laptops, embedded smart systems and smart home appliances. On July 1, 2019, Google first time announced Fuchsia officially and homepage was made live which provided source code and usage documentation for developers.

## 2 FEATURES

Though, Fuchsia is not released yet, but still there are some 'rumoured' features are:

### 2.1 Card based simple user interface

According to first developer impressions Fuchsia will use material designing using cards. So there

will be much smoother UI actions as compared to Android.

### 2.2 Updates to 3rd party Hardware

It reportedly can be used upon nearly all types of device hardwares and can be improvised accordingly.

### 2.3 Flexibility

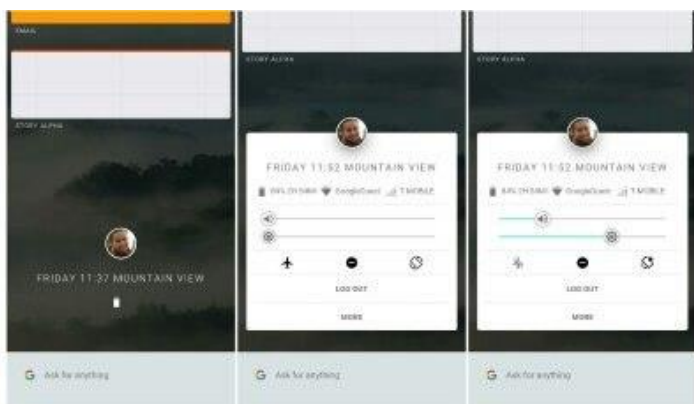
Currently android runs on mobile, watches and televisions, but Fuchsia os can be used on smaller devices like CCTV Cameras, IoT devices, fitness bands, etc. Also, Fuchsia has ability to scale up to larger devices like Laptops, Televisions and processors like ARM, MIPS, x64 and x86. Recently Fuchsia made support available for Kirin 970 chipset using which now, Huawei Honor mobile devices can install and use Fuchsia OS.

### 2.4 Support for Android Apps

Recently, Google has announced that Fuchsia will support all the android apps. That means all .apk files can now be installed on Fuchsia os and can be used. Though it supports android apps, but there will be another platform to develop applications and widgets for Fuchsia running devices. Google's Flutter SDK will be used to develop applications for Fuchsia.

### 2.5 Assistant Friendly

One thing is certain. But new Google Fuchsia OS is more Google Assistant Friendly than Android or same



• Author Vishal Lagoo is currently pursuing MSc. IT, Mumbai University, India, PH-+91 9225495455. E-mail:vishallagoo@gmail.com

• Co-Author Priyanka Sorte is currently professor in Mumbai University, Country, PH-+91 9689157442. E-mail:psorte@mes.ac.in

as for iOS. The mobile app development company can utilize its features like app drawer, camera use, and on-screen activity to enhance Google Assistant based features.

### 3 DEVELOPMENT

Fuchsia operating system is still privately being developed by Google, LLC. It is licenced under revised form of BSD, NIT, Apache2.

#### 3.1 Magenta Kernel

This kernel is not based on Linux, also it is not traditional monolithic kernel. It's based upon microkernel which provides better performance, responsiveness, optimized resource management. It is all in one package containing large binary of base kernels and drivers. In case of Android, it is built on the top of Unix-specific unit and requires lot of modifications to run android on other kernels.

Monolithic kernels run in single core process which makes them less secure. Magenta is also small in size which avails more storage for external usage.

#### 3.2 Zircon Kernel

Zircon is the core platform which is responsible for power behind Fuchsia OS. It is composed of microkernel as well as small set of userspace services, drivers and libraries, boot images, etc. Zircon provides syscalls which manages processes, threads, v-memory, inter-process communications as well a locking. Reports are Google did modified Magenta and renamed as Zircon Kernel.

#### 3.3 Environment Preperation

##### In Debian

```
sudo apt-get install build-essential curl git python unzip
```

##### In macOS

```
xcode-select --install
```

#### 3.4 Fuchsia Framework

Fuchsia OS framework consists of following components:

- Core Libraries
- Application Models
  - Interface Definition Language
  - Services

- Environments
- Boot Sequences
- Components
- Sessions
- Namespaces
- Sandboxing

## 4 TECHNOLOGY

### 4.1 Escher

It is a rendering feature which is used often to soften shadows, color blending, light diffusions and lens effect, etc. Using Escher is being used in Fuchsia to improve graphics quality and overall visual performance.

### 4.2 Flutter SDK

Flutter is an cross-platform open source software development kit developed by Google, LLC. It is used for developing applications for android, iOS, windows, mac, linux, websites and even for Fuchsia OS. Flutter SDK uses Google's Dart programming language to develop applications.

### 4.3 Google's Dart

It is a powerful tool to build full-featured native applications in Flutter SDK. Dart mainly supports five types of paradigms which are as follows:

- a. Scripting
- b. Object Oriented Programming
- c. Imperative
- d. Reflective
- e. Functional

## 5 COMPARATIVE STUDY BETWEEN FUCHSIA OS AND ANDROID

Comparison Type	Fuchsia OS	Android
Kernel	Zircon	Linux
Kernel Type	Microkernel	Monolithic
Development	Flutter SDK using Dart	Native (Android Studio) Hybrid (Cordova)
Performance *	Flutter 58fps & 220ms	Native 57fps & 229ms
Ram & CPU Management	60% of total resources	40% of total resources

\*All above results of performance and resource management tests are conducted by various developers on developer's community on internet and results may vary across multiple devices.

## 6 CONCLUSION

Fuchsia is currently under development and released for testing purpose only. Fuchsia offers cross-platform support and hence can overtake Android in market of smart devices.

It may come out as universal operating system running on mobiles, desktops, smart devices as well as IoT devices. Even windows can face a tough competition. Fuchsia will be open source, cross platform, fast, reliable and smart operating system which first time implemented on microkernel which is unlike traditional linux kernels.

Linux recently completed 25 years in market and hence faced many challenges, problems and grew up solving most of them. As Fuchsia is open source, developers can contribute to make operating system better.

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