Android Wear OS: Features and Security
A Review of Android Wear Operating System

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Abstract : Currently the android operating system is being used by millions of users on their smart phones as portable operating system. Further Google developed Android TV for television sets, Android Auto for vehicles especially for cars and Android Wear for Smart Watches and other wearable devices based on the hugely successful Android Smartphone platform. Initially it was released by Google on March 18, 2014 while its recent version (Wear 2.9) released on Feb 26, 2018.
Android wear is based on the same Linux kernel as it's another member made for Smartphones, similarly developers needs latest version of Android Studio and the SDKs to come up with new form of apps. To use Android Wear, essentially requirement is Android Smartphone with Bluetooth facility. This also works on iOS for iPhones but not useful for Windows phone users. Android Wear is compatible with phones running Android 4.3 or above and with iOS 9 or above.
This paper is written to explore the information and features of Android Wear for Smartphone, as well as security concern to the same.

IndexTerms **– Android, Wear 2.0, Smartphone, features, version history, security.**

I. INTRODUCTION

In today's world people are more techno savvy, they are using various gadgets to simplify their work. Especially they are using gadgets like Smartphone, PDA, tablet where these devices are used for communication purpose, and at the same time to use internet applications. Wearable devices are one form of portable computer, which is exclusive and for use of personalized services. These devices can be worn by person and can move anywhere. It may pair with Smartphone or any other smart device and can use various applications for personal purpose.

II. HISTORY AND COMPATIBILITY

As soon as this platform (Wear) was announced and released with developers preview, companies like Asus, Motorola, LG, HTC and Samsung were announced as partners. At Google developers' conference (Google I/O), the Samsung Gear Live and LG G Watch were launched on June 25, 2014, along with further details about Android Wear. The LG G Watch is the first Android Wear smart watch released and shipped. Motorola's Moto 360 was released on September 5, 2014.

On December 10, 2014, an update started to roll out, adding new features including a watch face API and changed the software to be based on Android 5.0 "Lollipop".

The LG G Watch and Gear Live started shipping in July 2014, while the Moto 360 began shipping in September 2014. The next batch of Android Wear devices, which arrived at the end of 2014, included the Asus ZenWatch, the Sony SmartWatch 3, and the LG G Watch R. As of March 2015, the latest Android Wear devices are the LG Watch Urbane, and the Huawei Watch.

On August 31, 2015, Google launched pairing application for iOS version 8.2 or newer, allowing limited support for receiving iOS notifications on smart watches running Android Wear. As of September 2015, only the LG Watch Urbane and Huawei Watch are supported, but Google announced support for more smart watch models.

2.1 Version History

The version history of Wear 2.0 based on Android is given in Table 1 below. Similarly, Android wear devices are also developed simultaneously from various companies Viz. Asus, Casio, Fossil, Huawei, LG, Motorola, Samsung etc.

Currently version 2.9 is the highest version of Android Wear, and very soon its new version Android Wear 3.0 will get launched, though nothing has been confirmed by Google. Expectations from this version are better performance and better battery life. Also the ability to connect a device to Windows PC or Mac that would be interesting feature.

Version	Android Based Version	Release Date
4.4W1	4.4	June 2014
4.4W2	4.4	October 2014
1.0	5.0.1	December 2014
1.1	5.1.1	4 May 2015
1.3	5.1.1	12 August 2015
1.4	6.0.1	11 November 2015
1.5	6.0.1	29 March 2016
2.0	7.1.1	28 February 2017
2.6	7.1.1	20 November 2017
2.6	8.0.0	26 November 2017

Table 1: Version History

2.7	8.0.0	11 December 2017
2.8	8.0.0	26 January 2018
2.9	8.0.0	26 February 2018

2.2 Wearable Devices

A wearable device is an electronic device which can be worn by human being and that can be controlled by the user. These devices are having operational and interactional properties means it's always on and accessible. Also this device is having capability of computations and works like computer like mobile or smart phones and tablets computers. In some cases, however, wearable devices are more competent for tasks such as calculation, navigation, and remote picture than handheld devices due to their portability characteristics.

Currently there are two categories of these wearable devices. In first category products like head mounting devices viz. glass and helmet, hand worn devices viz. watch, bracelet, ring, finger and gloves, body-dressed devices viz. shirt, coat, underwear, trouser, pants, foot worn devices viz. socks, shoes and hooking devices viz. key tracker, belt etc.

The second category is related to functionality of devices. Wearable devices related to fitness and health of user Viz. sport wristband and smart bracelet, information consulting viz. smart glass, smart watch.

Different types of wearable devices are developed and developing by well-known brands all over the world. Some of these have shown in the Figure 1.

Figure 1: Various wearable devices.

Table 2: List of Android Wear Devices

Brand	Name	Release Date
Asus	ZenWatch	November 9, 2014
Asus	ZenWatch3	November 2016

Fossil	Q Explorist	August 28, 2017
Huawei	Watch	September 2, 2015
Huawei	Watch 2 Classic	April 18 2017
LG	G Watch	June 25, 2014
LG	Watch Sport	Feb 9, 2017
LG	Watch Style	Feb 9, 2017
Motorola	Moto 360 (2nd generation)	September 14, 2015
Sony	SmartWatch 3	November 2014
Samsung	Gear Live	June 25, 2014
Casio	Smart Outdoor Watch WSD-F20	April 21, 2017

III. Android Wear Interface and Features

Android Wear 2.0 introduces a variety of new features and capabilities, such as *complications*, curved layouts, navigation and action drawers, and expanded notifications. Also, Wear 2.0 makes it possible for you to build standalone apps that work independently of handheld apps. The new *wrist gestures* capability enables one-handed interactions with your app.

Users can find directions by voice from the phone, choose transport mode, including bike, and start a journey. While traveling, the watch shows directions, and vibrates to indicate turns by feel.

Via Google Fit and similar applications, Android Wear supports ride and run tracking. On devices sporting the needed sensor, heart activity can be sampled automatically through the day or on demand. Step-counting, calorie expenditure etc. are also monitored. These features work within the Fit ecosystem, allowing integration with companion devices and applications. The watch reinforces achievements with cards noting goal attainment, when a goal is near, summaries of heart, and body activity.

Users can use their Android Wear Watch to control their phone. Music can be requested. The screen then shows a card for play-control, volume, skip, media images, allowing music to be controlled from the wrist with the user free to move.

The vibration engine alerts users about important notifications originating from a user-selectable set of applications. Wear provides multiple options for replying, including Google Voice Typing for dictating responses to messages, and spoken or drawn emoticons.

Intelligent notifications from Google Now are supported including traffic, flights, hotel check-in, meeting alerts, location- and time-based reminders, weather and sport, stocks, flight status, boarding passes, restaurant bookings, etc.

Users can receive messages sent to them via Google Hangouts, and respond with a voice message. User can check important info like who is calling, SMS and messages, and alerts from your favorite apps. You can even speak, handwrite type, use Smart Reply, or draw a quick response right from your watch. Users can get help by using 'Okay Google' on Android Wear which is built in feature called Google Assistant.

If the phone's camera app is activated, the screen is relayed to the watch, and the user can control the shutter, and view photos on the watch. Third-party applications support using the phone camera as a streaming device, or more varied camera control.

Note taking is fully supported via Google Keep and other note-apps, as is marking-off check lists etc. Via voice commands the user can create location and time-based reminders, set alarms, timers etc. which appear on the watch at the appropriate time or place.

Many applications have been released, with developers such as Evernote etc. creating new functionality on the watch: for instance, handing off notes to the watch screen when the user turns off their phone screen. Location-based applications like Foursquare show suitable nearby venues, allow check-in etc.

In version 2.9 following features are included:

- Improved notification glanceability
- Improved layout shows more messages at a glance
- Background changed to darker side for better readability

IV. Security in Android Wear

Security is the prerequisite for both safety and privacy. And today, as with so many IoT devices, many security experts believe that wearable devices are mostly not secure.

For small wearable devices, security has to be built in from the ground up. Android wear are having protocols like transport layer security (TSL) and the secure network management protocol. Support for encryption, password protection, and a secure-boot mechanism for remote firmware upgrades are essential, too.

Privacy naturally depends on security, but it's defined by establishing clear rules for sharing information in the device.

However, an emerging set of guidelines called Privacy by Design (PbD) offers an approach to protecting privacy by embedding it into the design specifications of technologies, business practices, and physical infrastructures. That means building in privacy up front—right into the design specifications and architecture of new systems and processes. PbD has identified seven principles, including keeping it user-centric and ensuring that it's preventative and not remedial. While these have yet to be fully defined, they can still be used as general principles to guide design from the device to the application, and the use of the data all the way to the cloud.

The need for safety should go without saying, but the issue of safety can get quite subtle when it involves details of the application. Security will prevent attacks from outside, but safety must be built into the device so that it works reliably and provides timely and meaningful information.

That will require careful selection of sensors, such as accelerometers, levels, and motion sensors, combined with functions like GPS and careful software design to provide data that can be accurately analyzed—partly in real time on the device as well as on a remote site in the cloud. Each type of wearable device will have a different set of such considerations. Therefore, it's important for a line of products to be able to share common processor architecture.

V. Conclusion

Google has great experience of technology development for mobile devices viz Smartphone, tablet etc. By studying all the aspects regarding Google's new Wearable OS, it is to be said that as Android Wear OS developed by Google has full of beautiful features which are

very attractive to young generation as well as those whose always moving. People will use it by installing various apps which they like; similarly more attention is given on security issues.

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