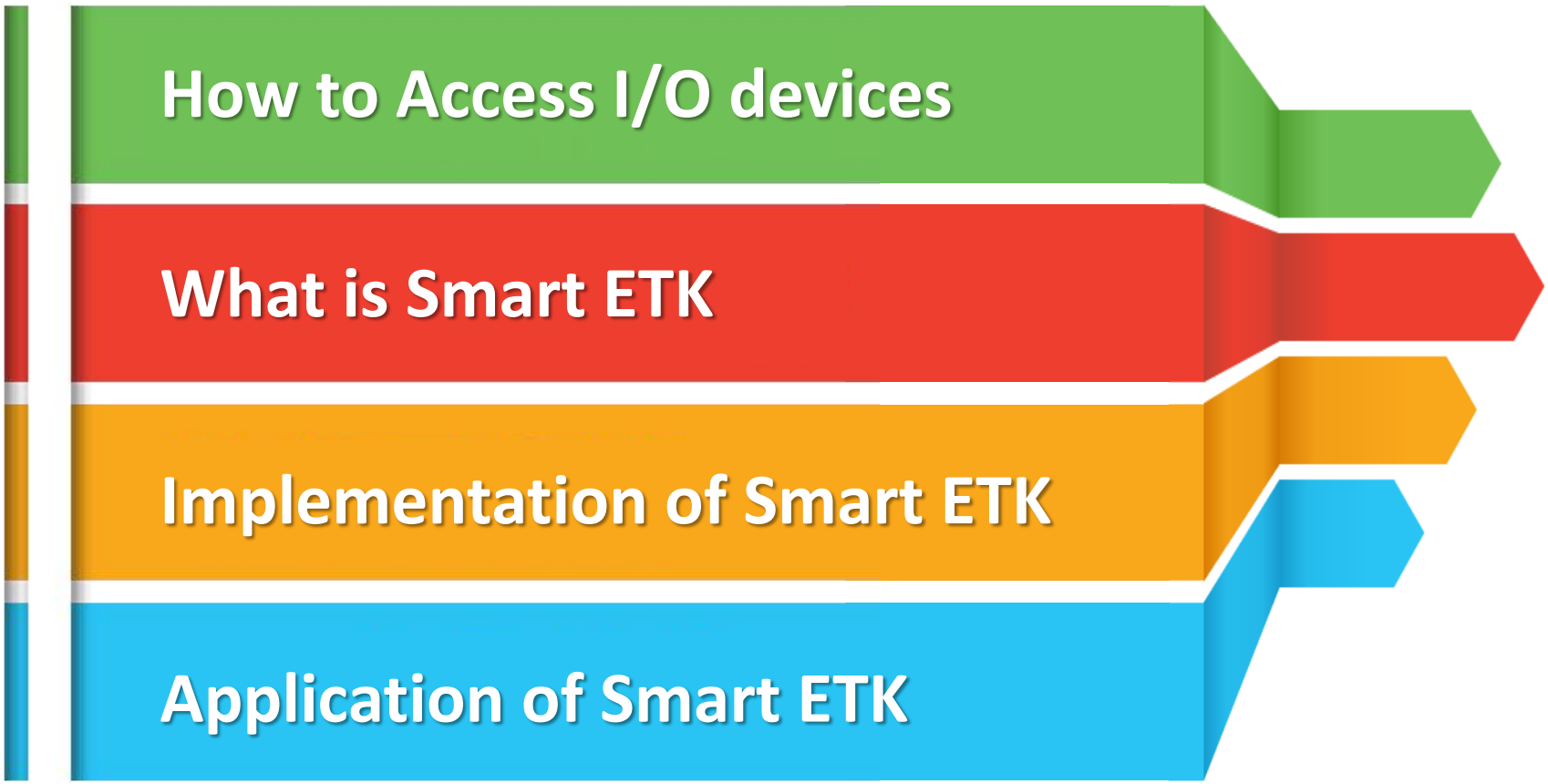
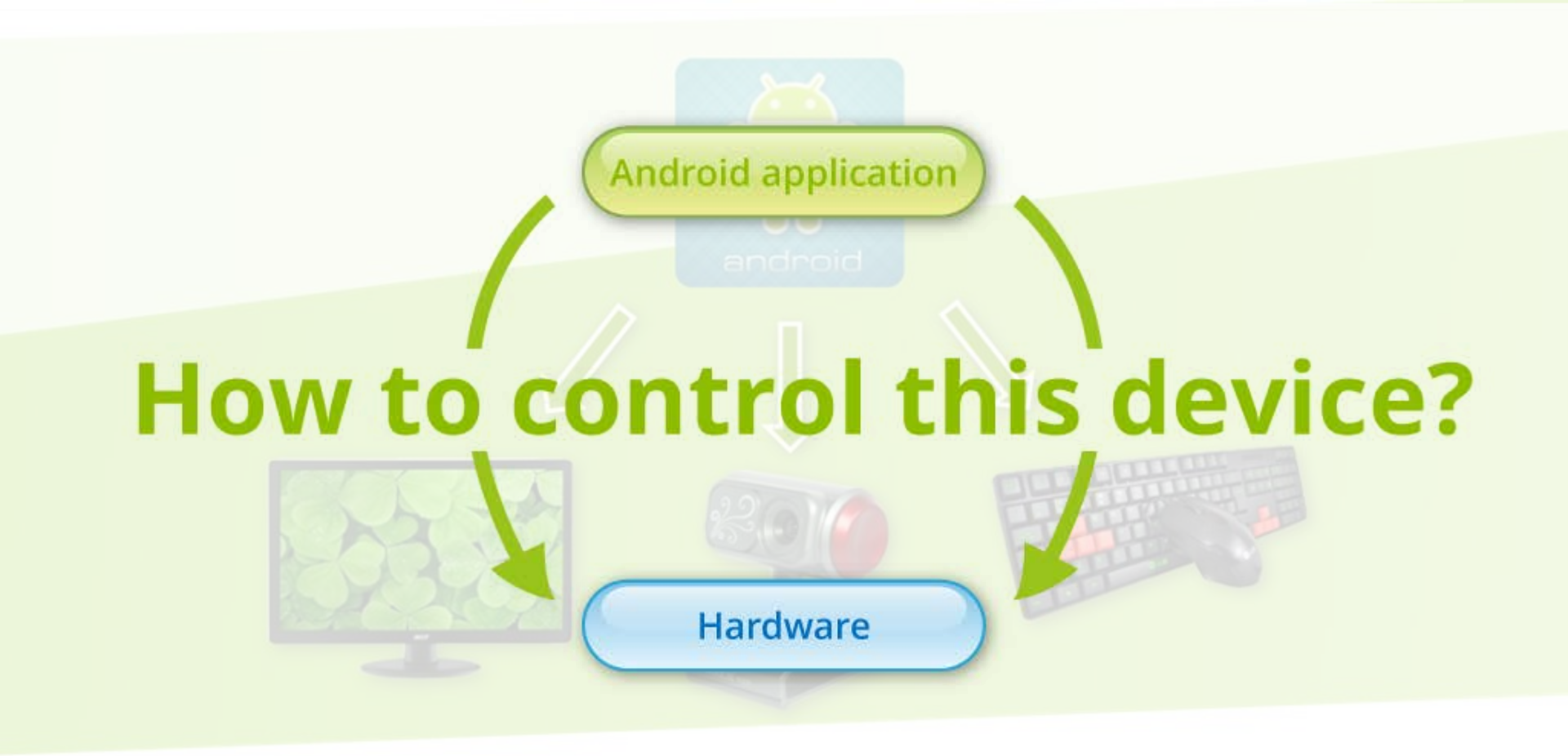
Gaining Access to Legacy I/O Devices with Android


How to Access I/O devices
What is Smart ETK
Implementation of Smart ETK
Application of Smart ETK

How to Access I/O Devices

- Android Framework and HAL
- Flow of I/O Access
- Introduction of JNI
- Sample
- Summary

How to Access I/O Devices



Android Framework

Conventional Four-Layer Framework

Application Layer

Provides Java-based user interface

Application Framework Layer

Provides interfaces, services and resource management for applications

System Runtime Layer

Provides shared libraries, Android runtime library and Dalvik virtual machine

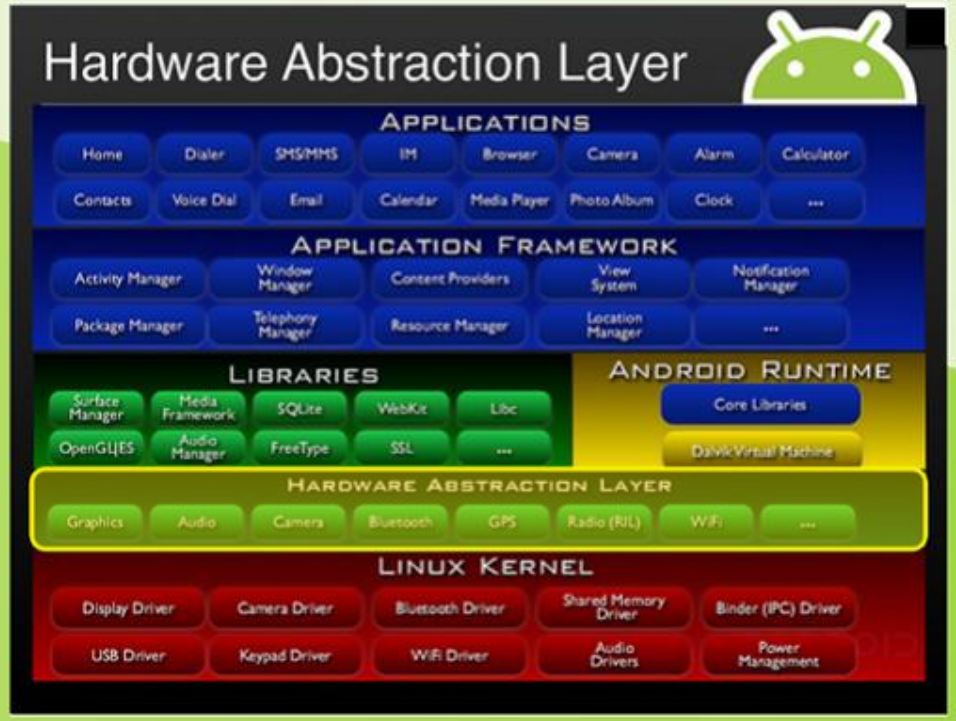
Linux Kernel

Provides kernel level system services such as security, memory & process management, network stack and drivers

HAL

Android Framework with HAL

Package of Linux Kernel Driver, Providing interface upwards and shielding lower implement details



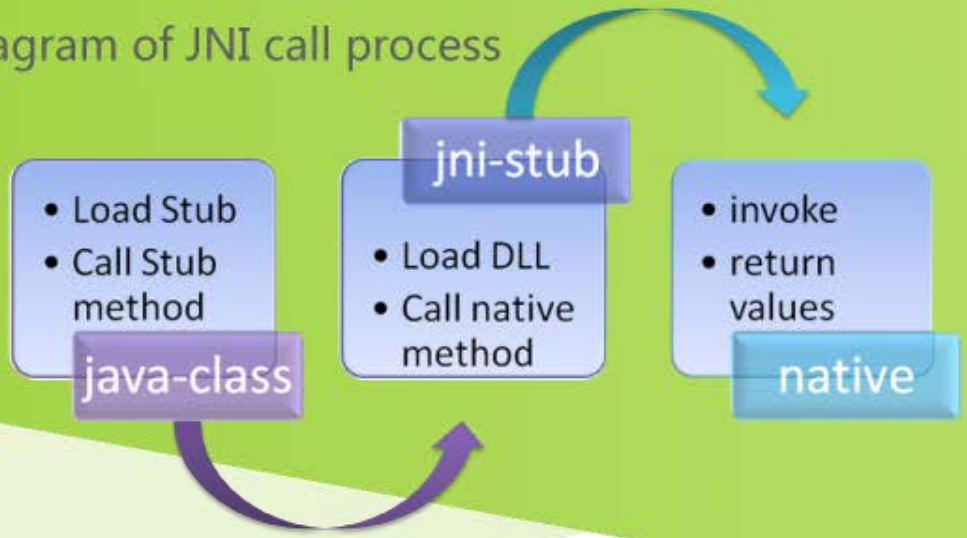
Flow of Access to I/O

Introduction of JNI

JNI: Java Native Interface

Support mutual operation between Java and C or C++ running in JVM, or local assembly code

Diagram of JNI call process



Implement JNI by c/c++ and practice objective native function by JNI. For Java, jvm indirectly calls objective native function by loading and calling JNI

Sample

Sample of reading and writing GPIO devices by JNI

Step 1: Compile .so files for GPIO driver

a. Add GPIO.java files into Android project

CPIO.java concludes the native interface running GPIO

b. Use javah command on GPIO.java to generate XXX.h file

javah -classpath bin/classes -d jni com.via.vepd.GPIO

Create com_via_vepd_GPIO.c file under Linux to implement the formerly defined interface:

For example:

```
jint JNICALL Java_com_via_vepd_ GPIO _ setEnable(JNIEnv *env, jobject c, jboolean enable)
{
 int result;
 // do GPIO operation
 return result;
}
```

Use gcc to compile com_via_vepd_GPIO.c and generate libGPIO.so file

Sample

Sample of reading and writing GPIO devices by JNI

Step 2: Use driver library files in application

a. Add libSmartETK.co provided by VIA under the directory of:
libs\armeabi\ in Android project

b. Add GPIO.java into Android project

Summary

Difficulties in accessing I/O devices in Android:

Linux Kernel background required

Hardware background required

Linux driver debugging skill required

Java and C/C++ programming skills required

In Summary : Device driver development is high cost and high risk

- How to access to I/O devices
- **What is Smart ETK**
- Implementation of Smart ETK
- Application of Smart ETK

What is Smart ETK

VIA Smart ETK

An embedded tool kit featuring a rich set of APIs, such as GPIO, audio and LAN, etc., which help to shorten development time and speed up time to market.

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- **Implementation of Smart ETK**
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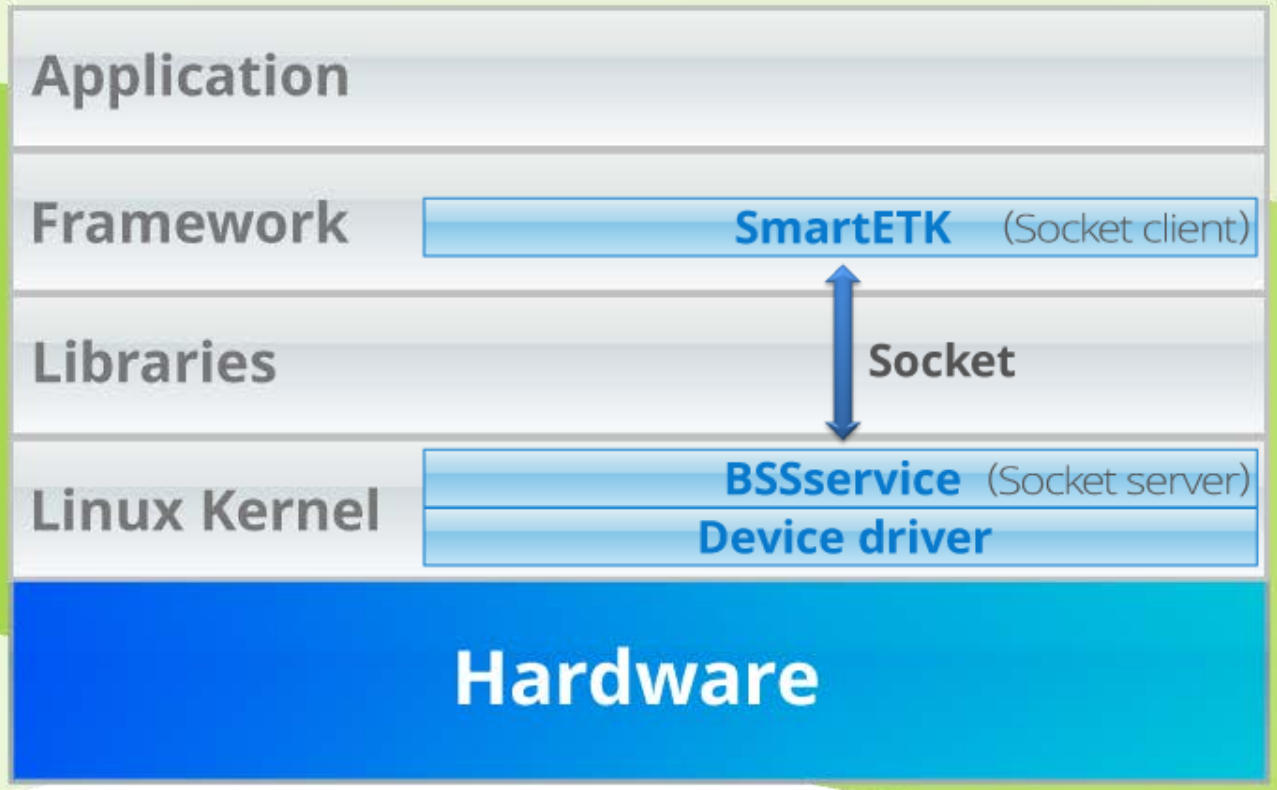
Implementation of Smart ETK



Implementation of Smart ETK

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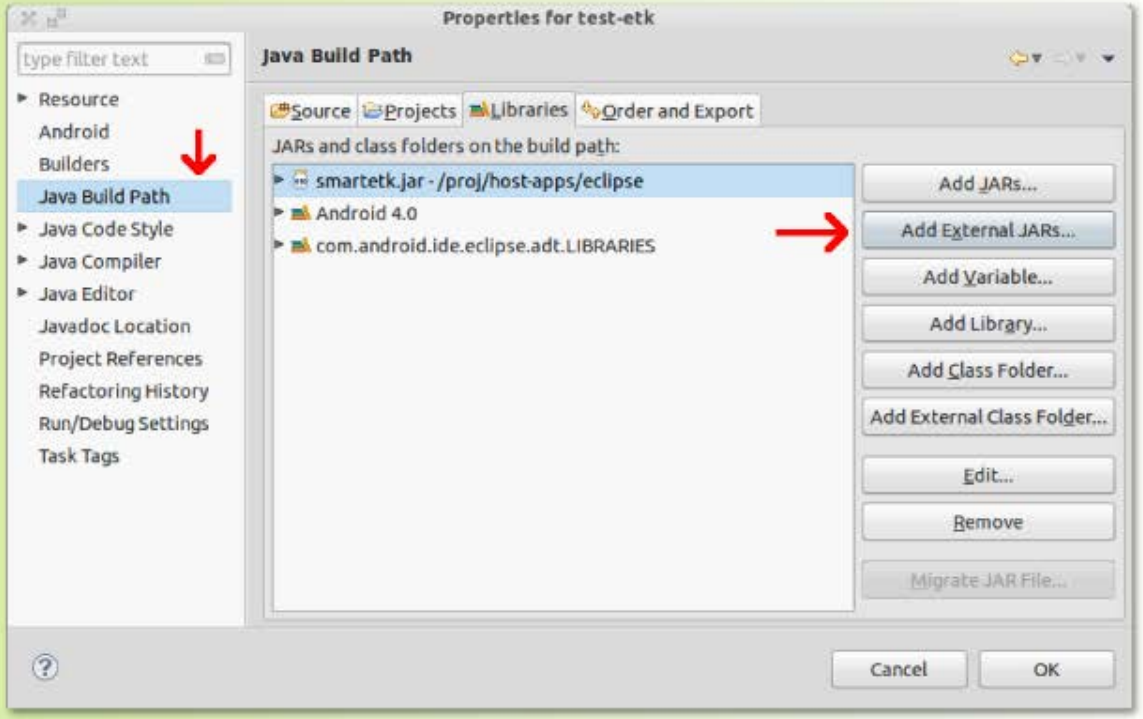
Application of Smart ETK

Sample 1. Use Smart ETK to implement reading and writing GPIO device

a. Import Smart ETK

On the properties page of Android project, visit "Add External JARs..." to import smartetk.jar into the project.

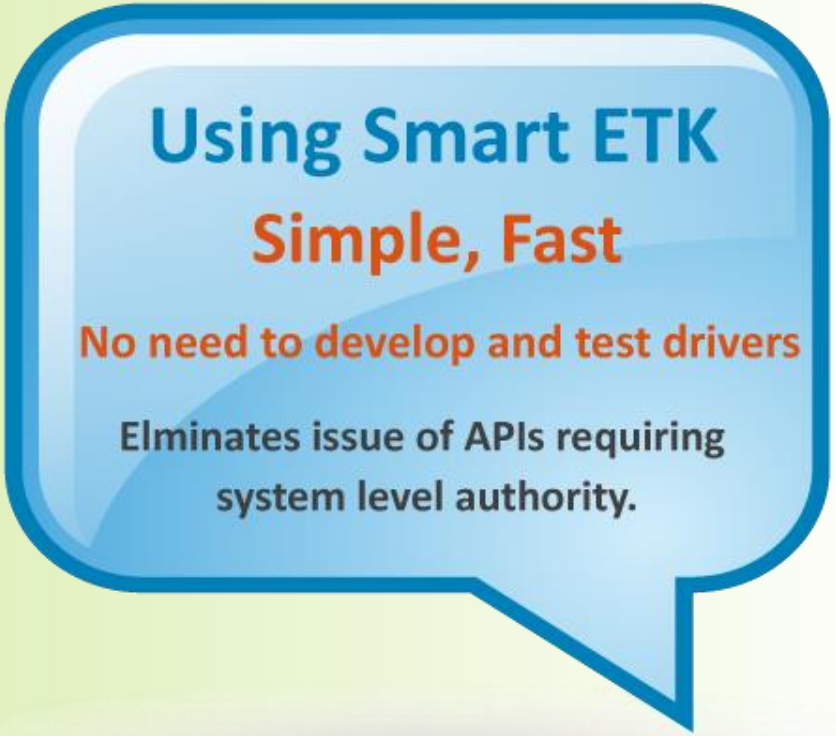


Application of Smart ETK

Sample 1. Use Smart ETK to implement reading and writing GPIO device

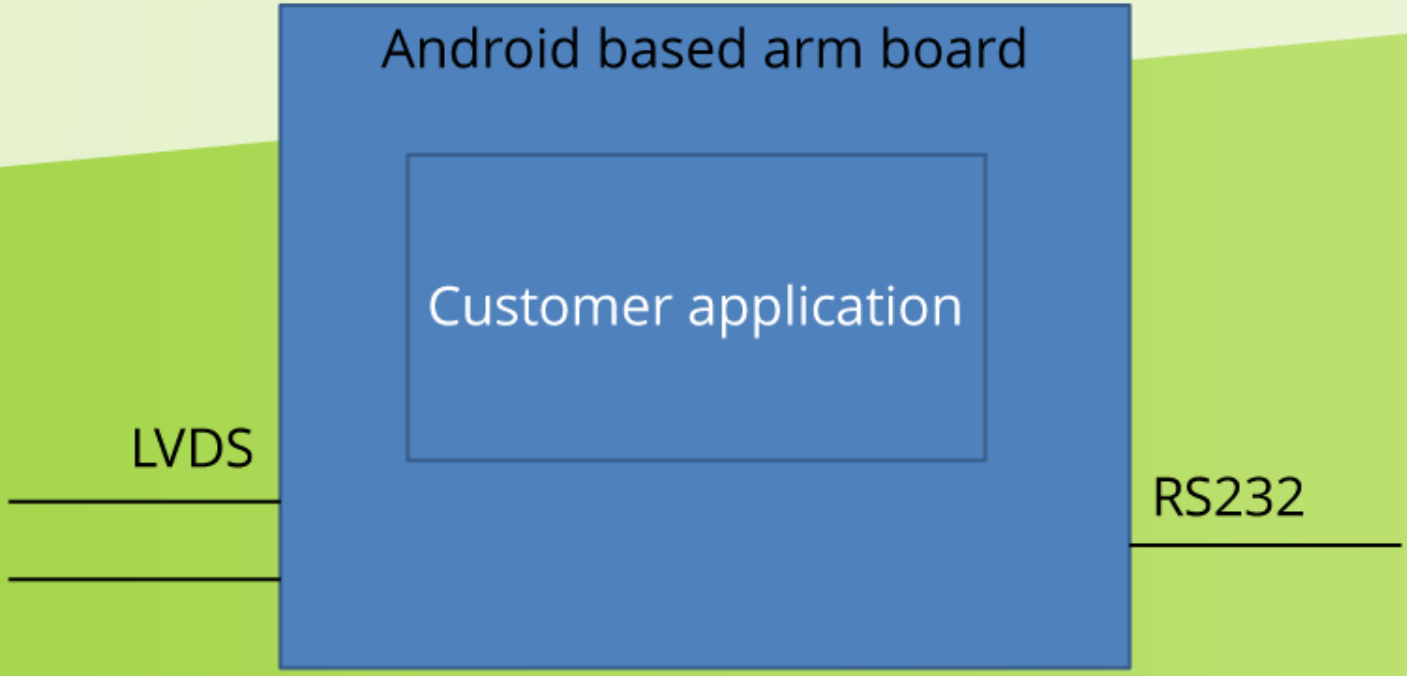
b. Call APIs provided by Smart ETK in application layer programs

```
import com.via.vepd.SmartETK;

/* Declare  variables to get GPIO6 values */
boolean[] bEnable = new boolean[1];
int[] nDirection = new int[1];
int[] nValue = new int[1];

GPIO gpio6 = new GPIO(6);

gpio6.setEnable(true);

gpio6.setDirection(GPIO.GM_GPO);
gpio6.setValue(1);

gpio6.getEnable(bEnable);

gpio6.getDirection(nDirection);
gpio6.getValue(nValue);
```



Application of Smart ETK

- **Sample 2. Industrial Automation Example:**
  Customer required to use an Android application to control a step motor as well as utilize a touch LCD panel to complete certain tasks



Application of Smart ETK

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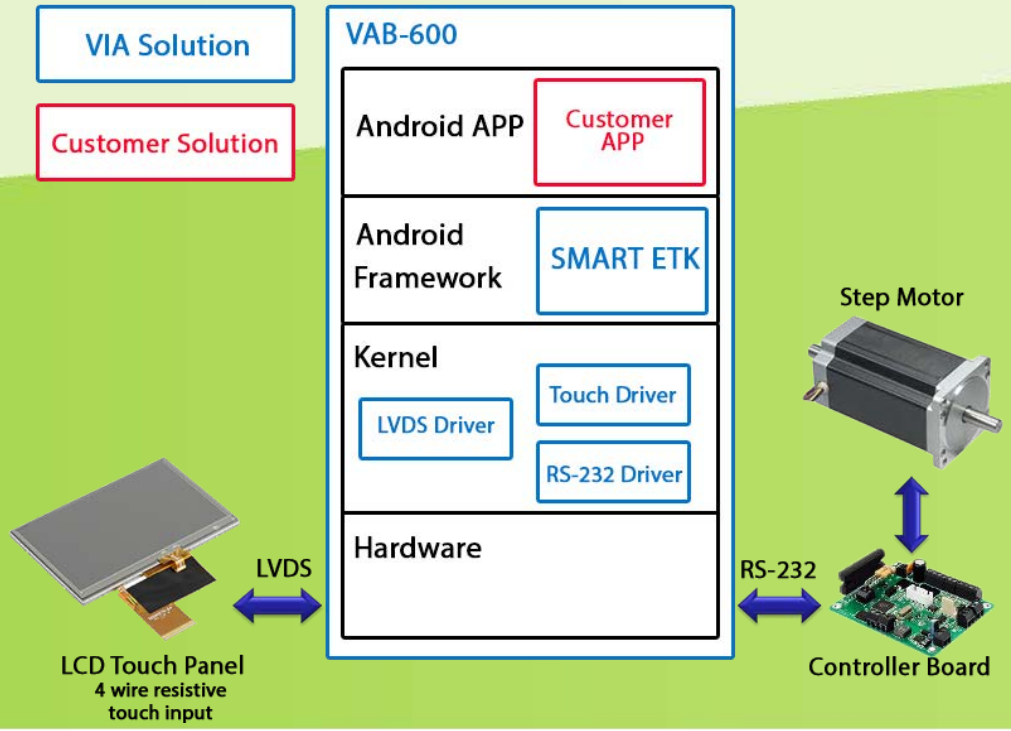


Smart ETK Advantages

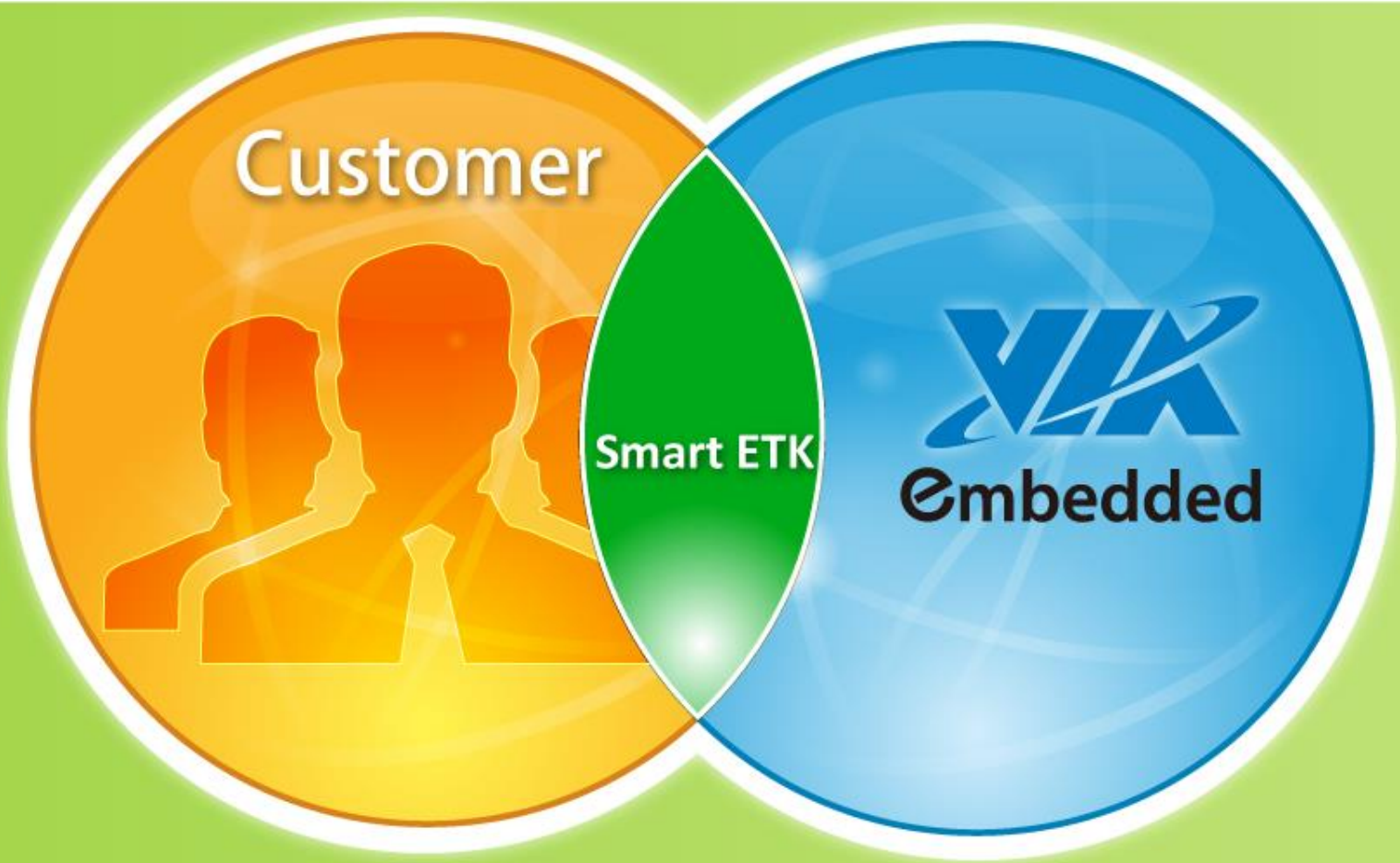
With Smart ETK

1. Application uses APIs in agreed style to control all peripheral devices, making it easy and convenient
2. VAB-600+Smart ETK
   Low investment of human resources, increased product reliability

Without Smart ETK

1. Need to develop and modify drivers for all peripheral devices
2. Android BSP needs to be modified
3. Harder to integrate software and hardware

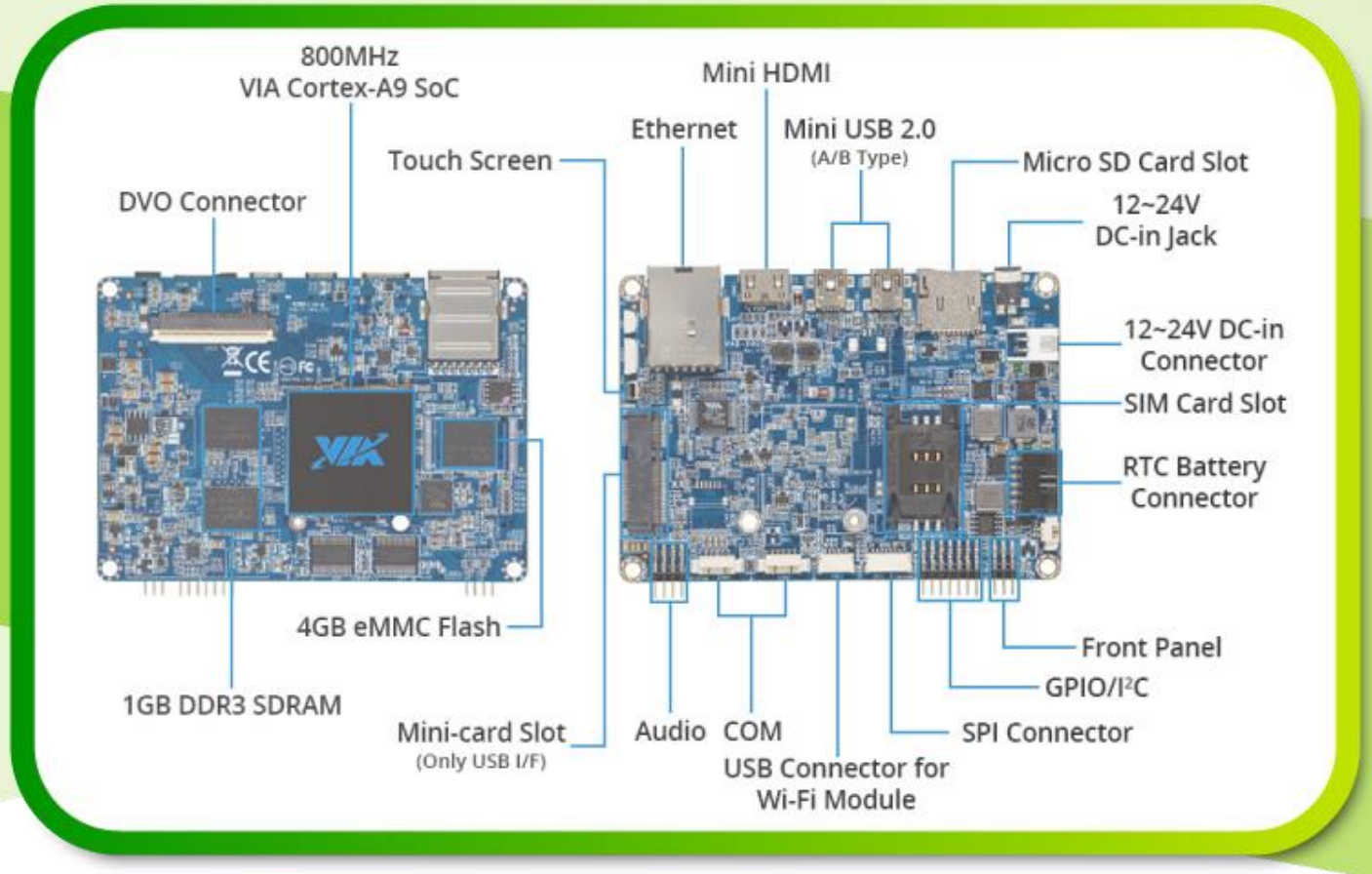
Creating Value for Both Sides



Smart ETK helps to reduce risk and cost of development

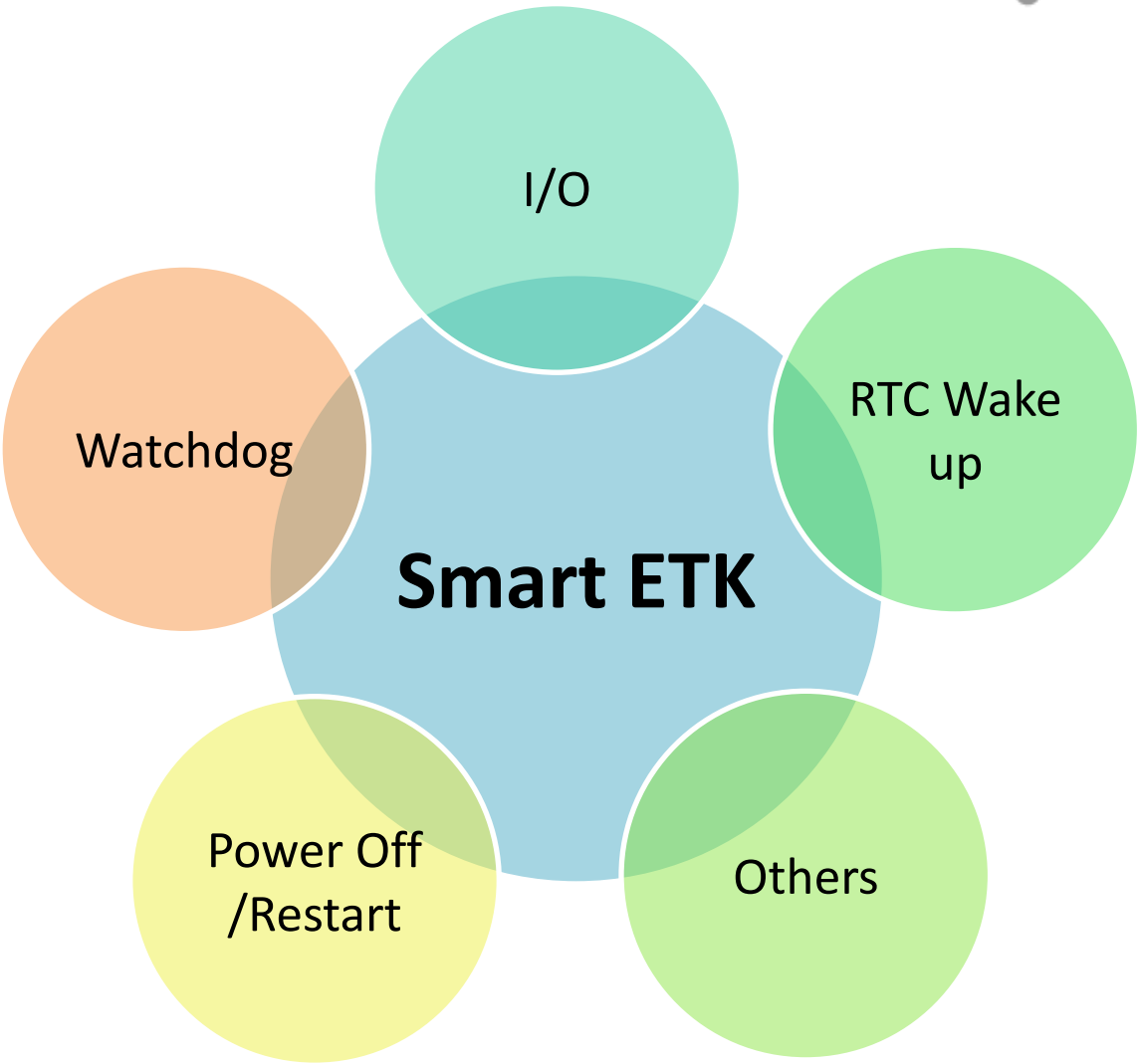
VAB-600

Ultra-compact 10cm x 7.2cm Pico-ITX form factor with rich I/O feature set



http://www.viaembedded.com/cn/boards-cn/pico-itx/vab-600/

Smart ETK Full Function Display



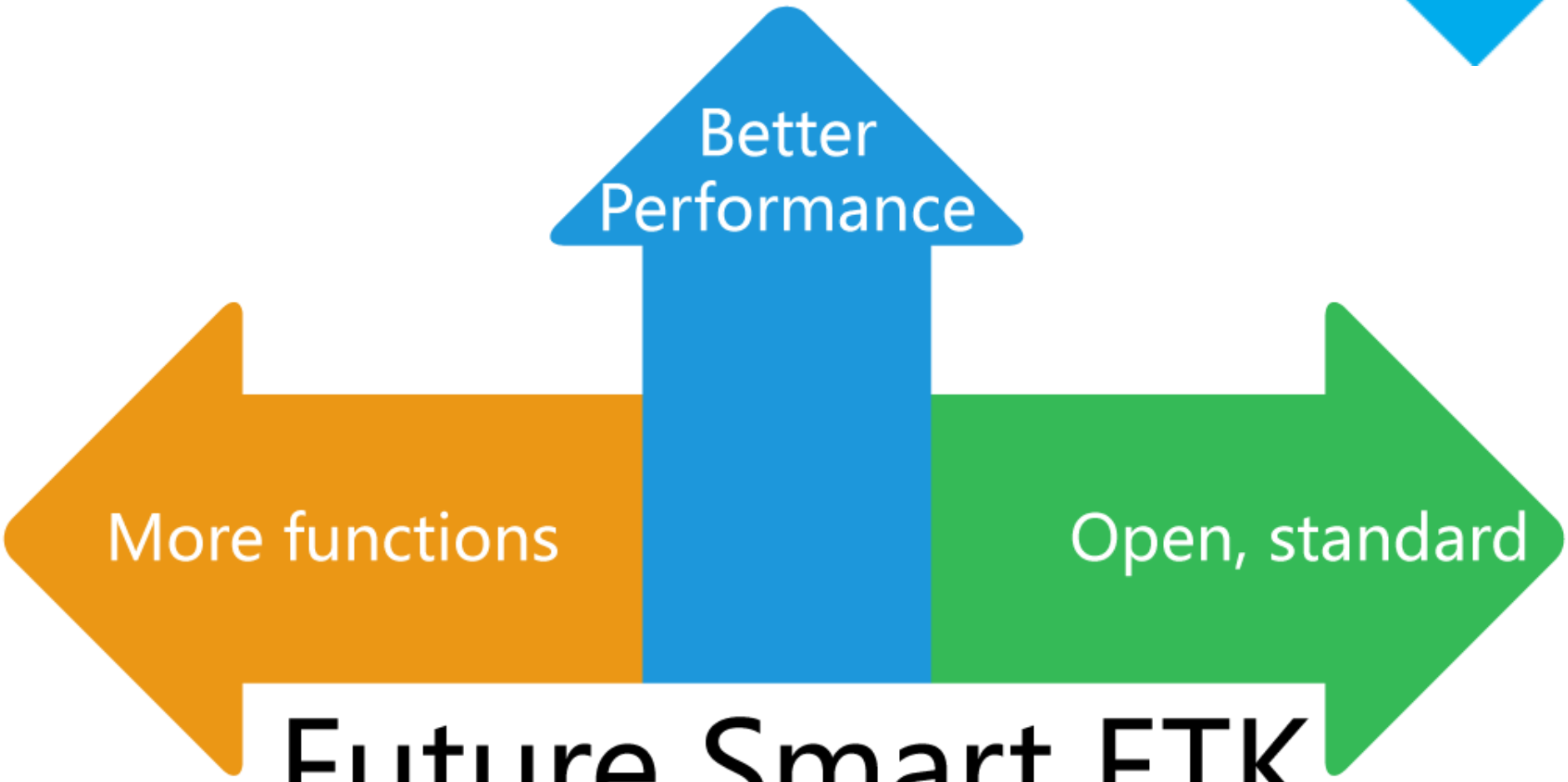
RTC Wake Up Function

Community Signage examples:

Android 4.0.3-based signage player

Automatic daily startup at 7:00

Automatic daily shutdown at 19:00



Future Smart ETK