

Your partner in development
René Janssen (Accountmanager)
r.janssen@logic.nl



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- **Introduction Logic /suppliers**
- **HMI as example**
- **Architecture of Android vs Linux**
- **Process visualization, real time**
- **Accessing process variables, GPIO**
 - In Android
 - In Linux
- **Customizing Android vs Linux**
- **Certification**
- **Summary**

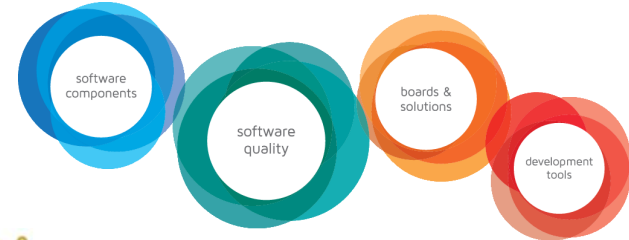


Logic Technology is the logical choice!

As Europe's market leader, we provide companies developing high-tech electronics with tools and software that increases the productivity of the developers as well as the quality of their output.

We are here to allow you to focus on what is really important:

The creation of great products!



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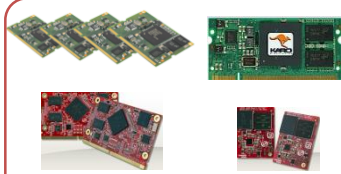
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Our solutions

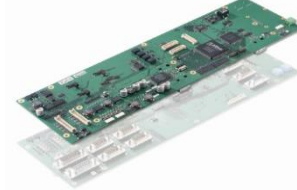
Developer Kits



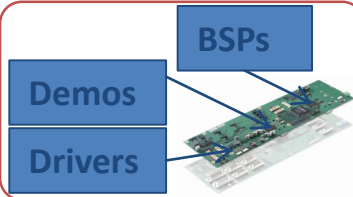
Computer Modules



Custom Designs



SW products



SW Engineering

Consulting
Complete concepts
Feasibility studies
Customer Specific HW/SW

Support



Android

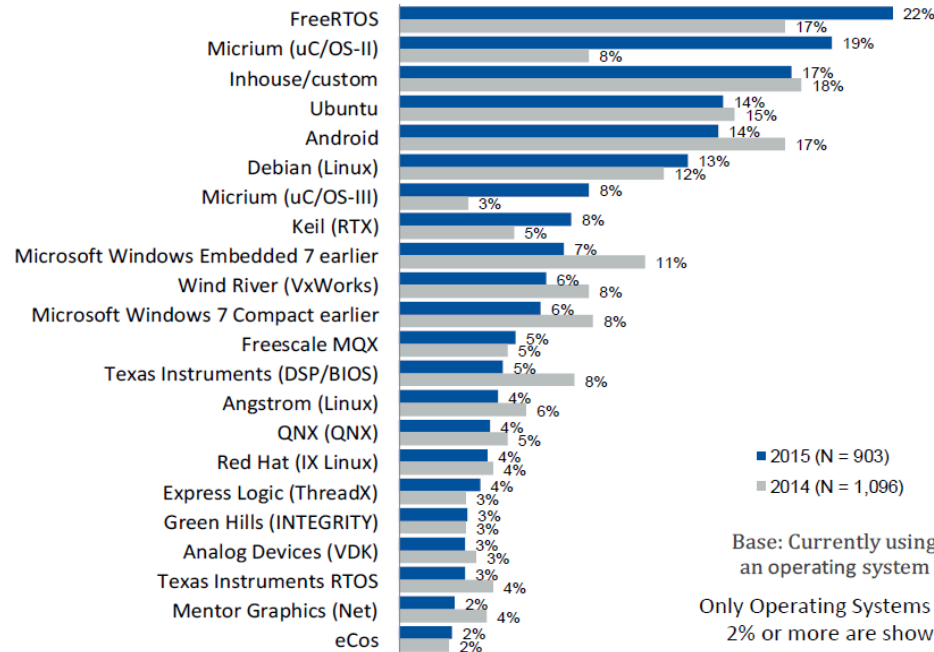


<http://developer.android.com/about/index.html>



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Used Operating systems



■ 2015 (N = 903)

■ 2014 (N = 1,096)

Base: Currently using
an operating system

Only Operating Systems with
2% or more are shown.



Android not only for Smart Phones anymore

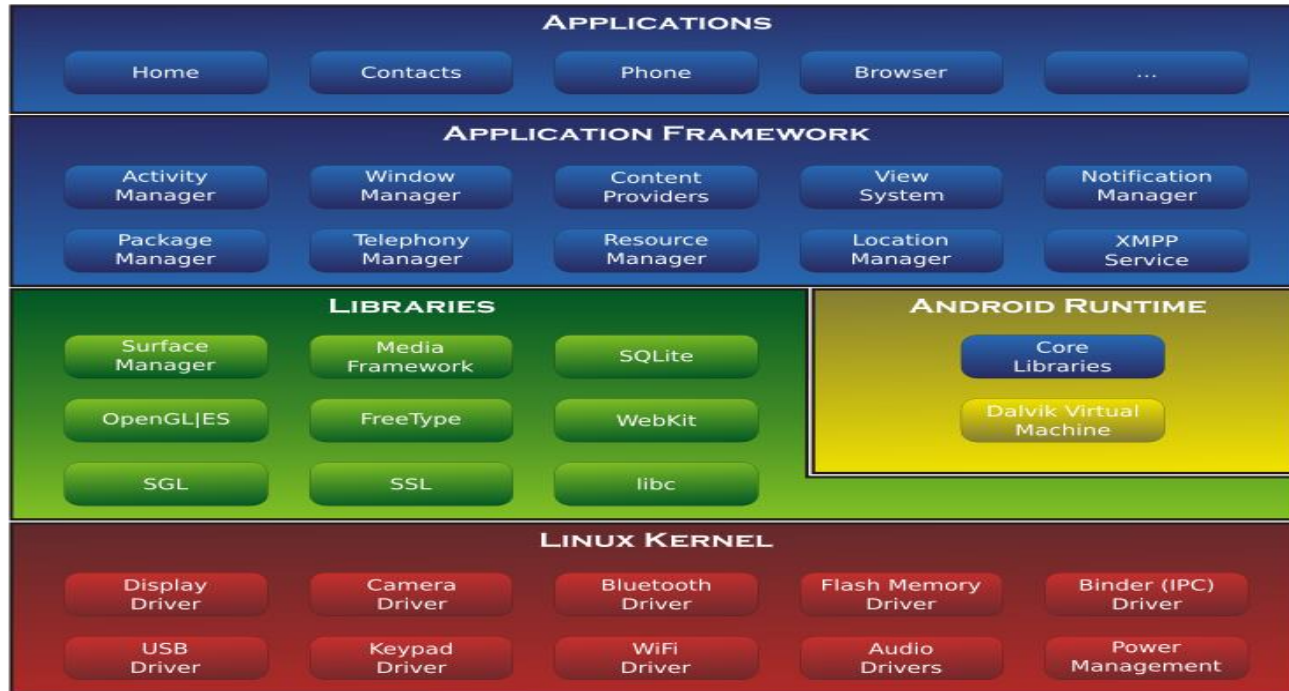
- Android TV
- Android Tablet
- Home Phone System
- Home Command Center
- Washing machines
- Cars
- Camera



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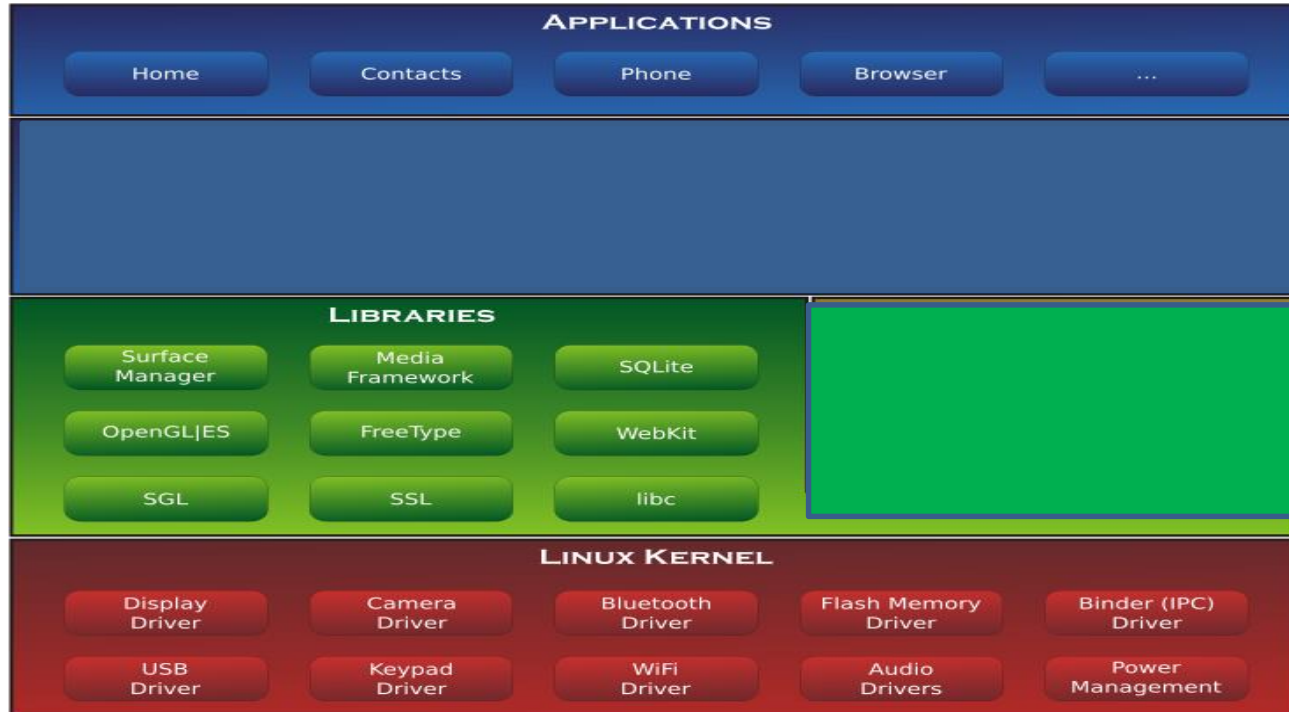
Architecture of Android



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Architecture of Linux



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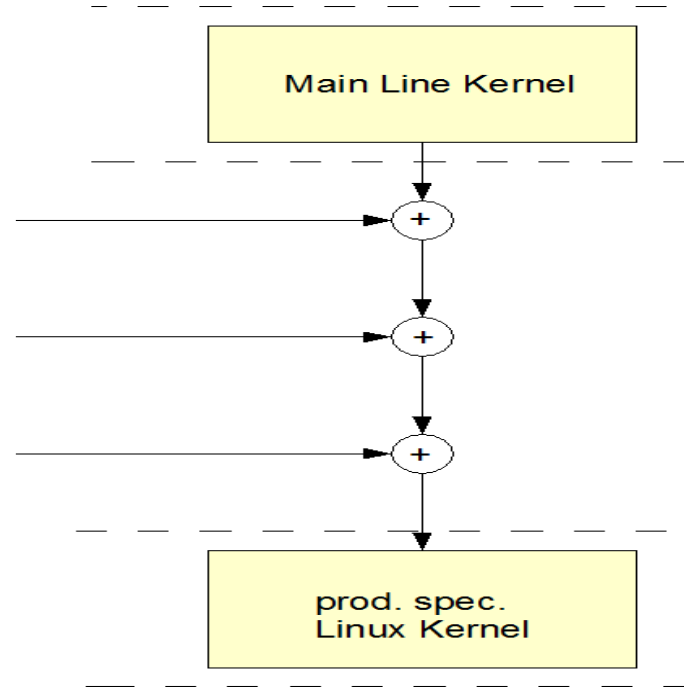
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Building BSP

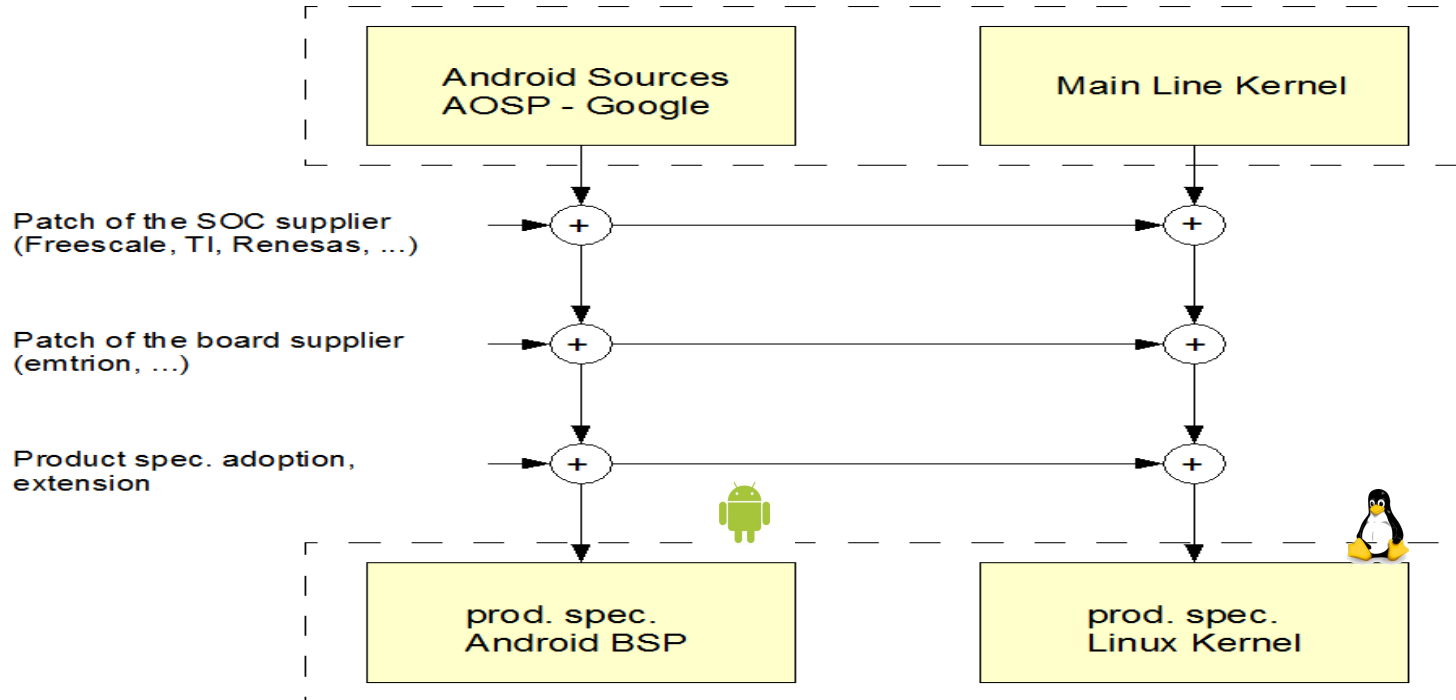
Patch of the SOC supplier
(Freescale, TI, Renesas, ...)

Patch of the board supplier
(emtrion, ...)

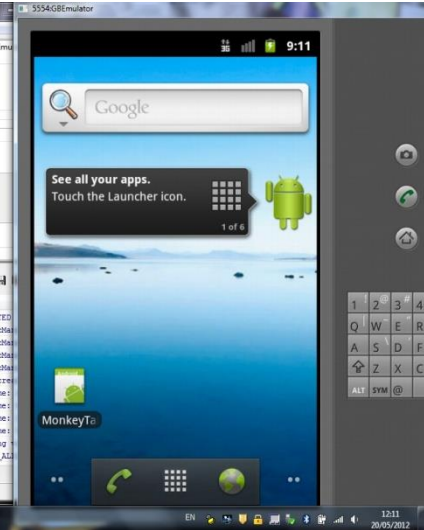
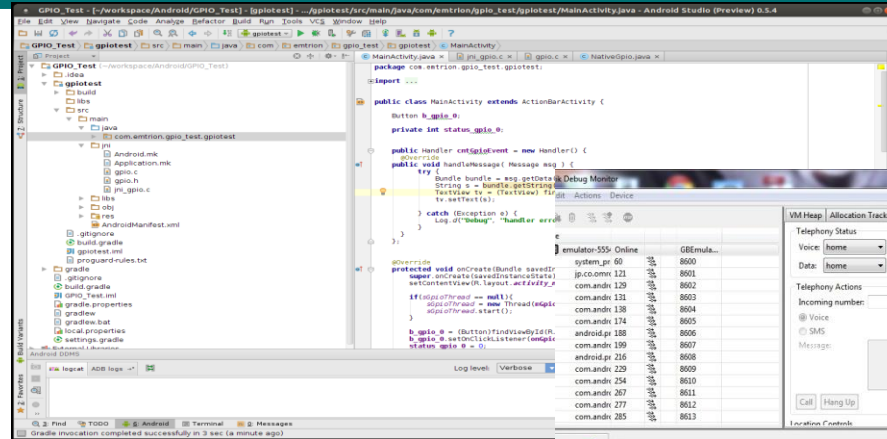
Product spec. adoption,
extension



Building BSP



Android – writing apps



NDK

- Supports (Java ,C/C++)
- Closer to HW / Native Interface
- BSP development

SDK

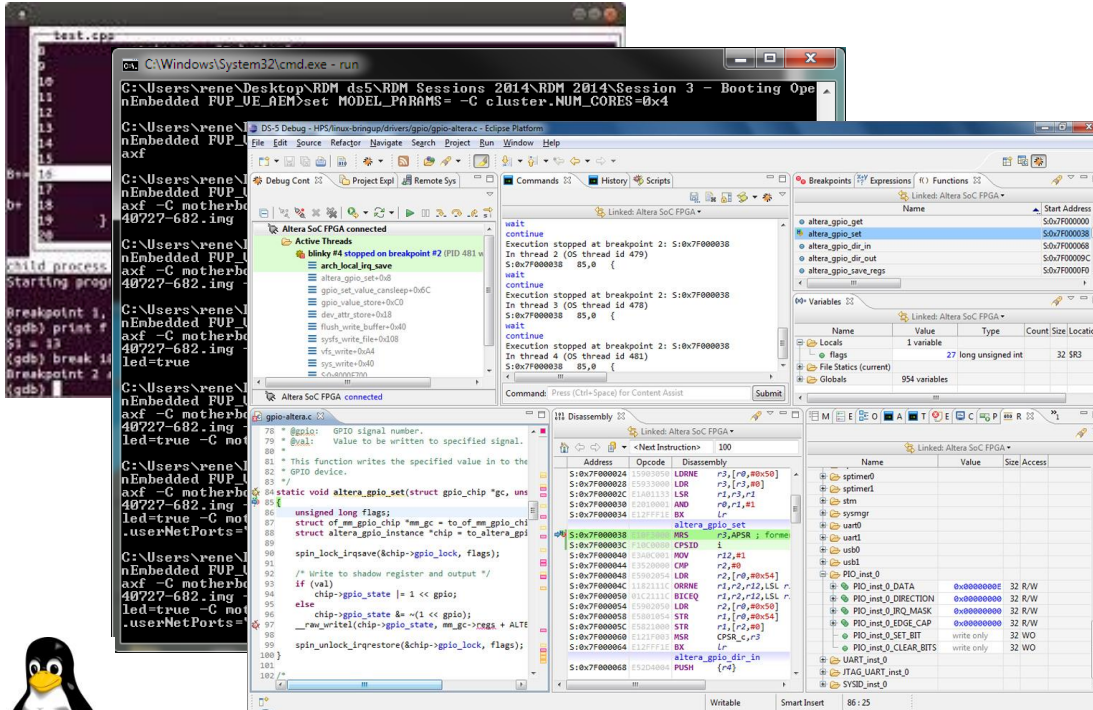
- Only Supports Java
- App development



Linux development tools

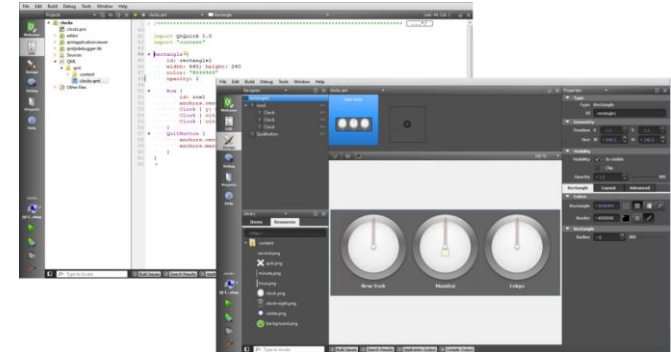
LOGIC
TECHNOLOGY

There's always a Logic Solution!



Kernel

- GCC / Commandline
 - Yocto, buildroot ,LTIB,.....
 - Device tree
- ## Drivers / Application
- Eclipse / commandline/...
- ## HMI
- QT (creator)/gtk/html5...



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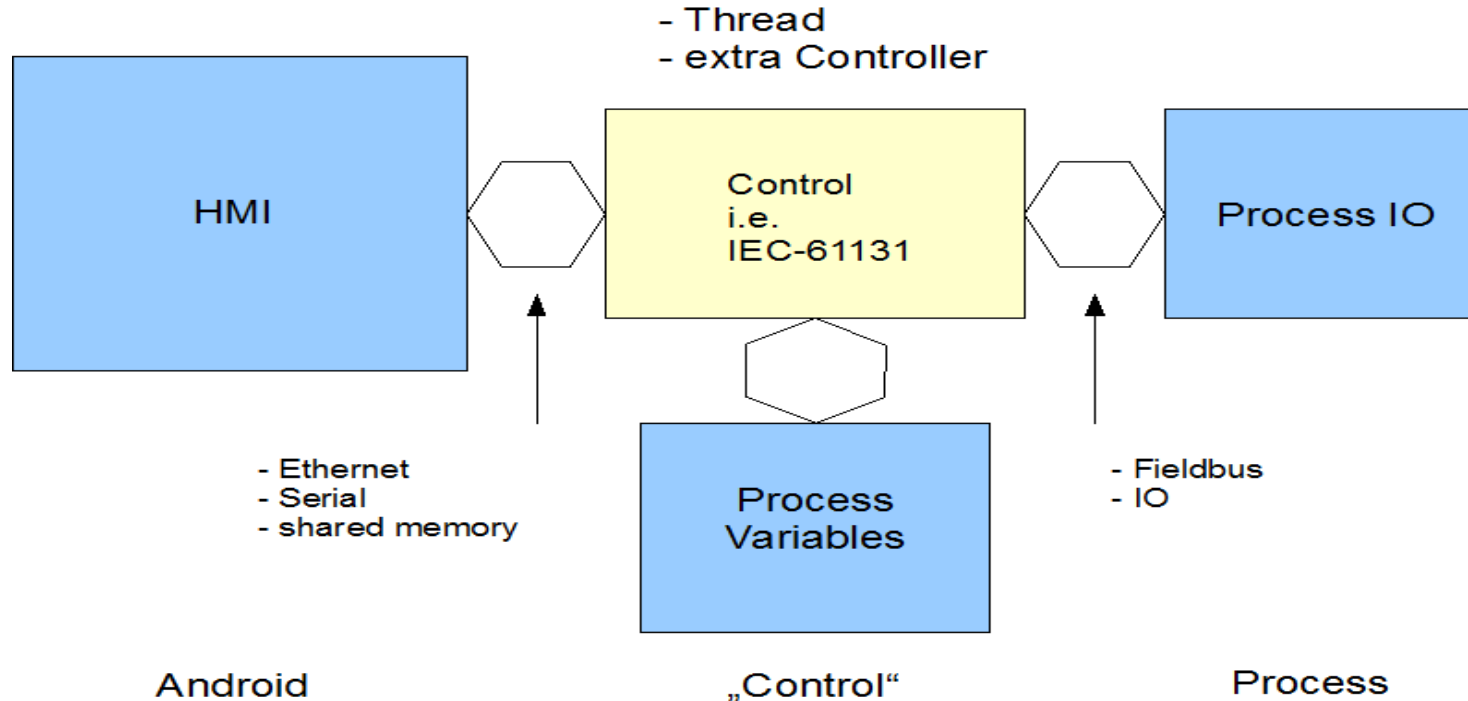
- **Interface between man and technical process**
 - Visualization of process information
 - Controlling a technical process
- **industry – HMI**
- **household – white goods, brown goods**
- **neither PC nor Smart-Phone**
 - Only one application
 - no „app-store“
 - Rich multimedia functionality, well known api



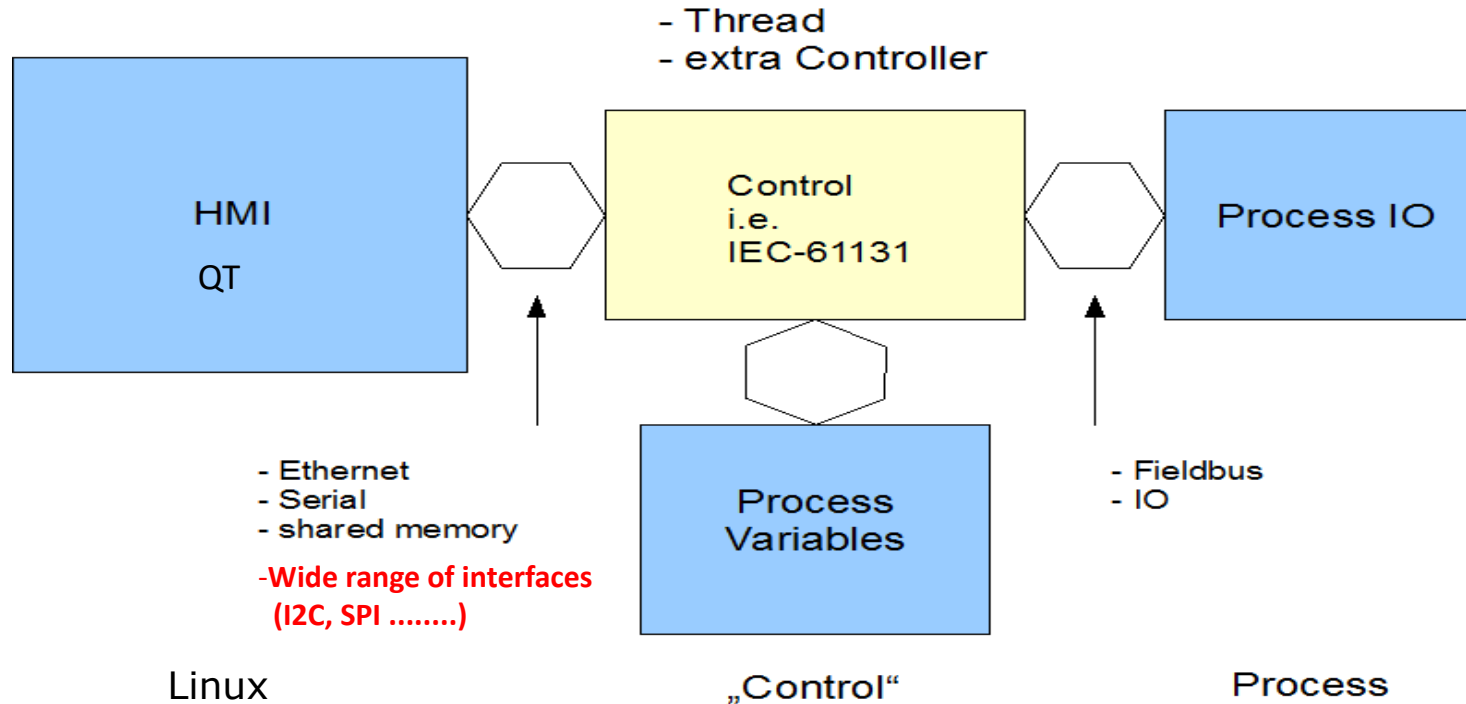
- Abstract description of a process, input and output variables, marker, implemented as a data structure in a programm. Shared memory.
- Process control language i.e. IEC-61131
- Cyclic and deterministic update of the process variables
- non deterministic visualization of the process data
- Deterministic processing of commands initiated via the HMI – special situation for alarms



Accessing and computing process variables (Android)



Accessing and computing process variables (linux)



Android – Realtime ?

- Java based applications run in a virtual machine (Dalvik, ART)
- Garbage collector not optimized for real time
- Powermanagement \leftrightarrow wakelock
- Android not suitable for running realtime applications
→ Coprocessor for realtime tasks needed



Linux :

- No virtual machine
- RT Patches available
- Better Powermanagement features



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- Services running with „system“ permission, Linux kernel components usually have „root“ permission
- Apps running with own UID and GID
- Application Lifecycle management
- Direct access to sysfs not out of the box possible

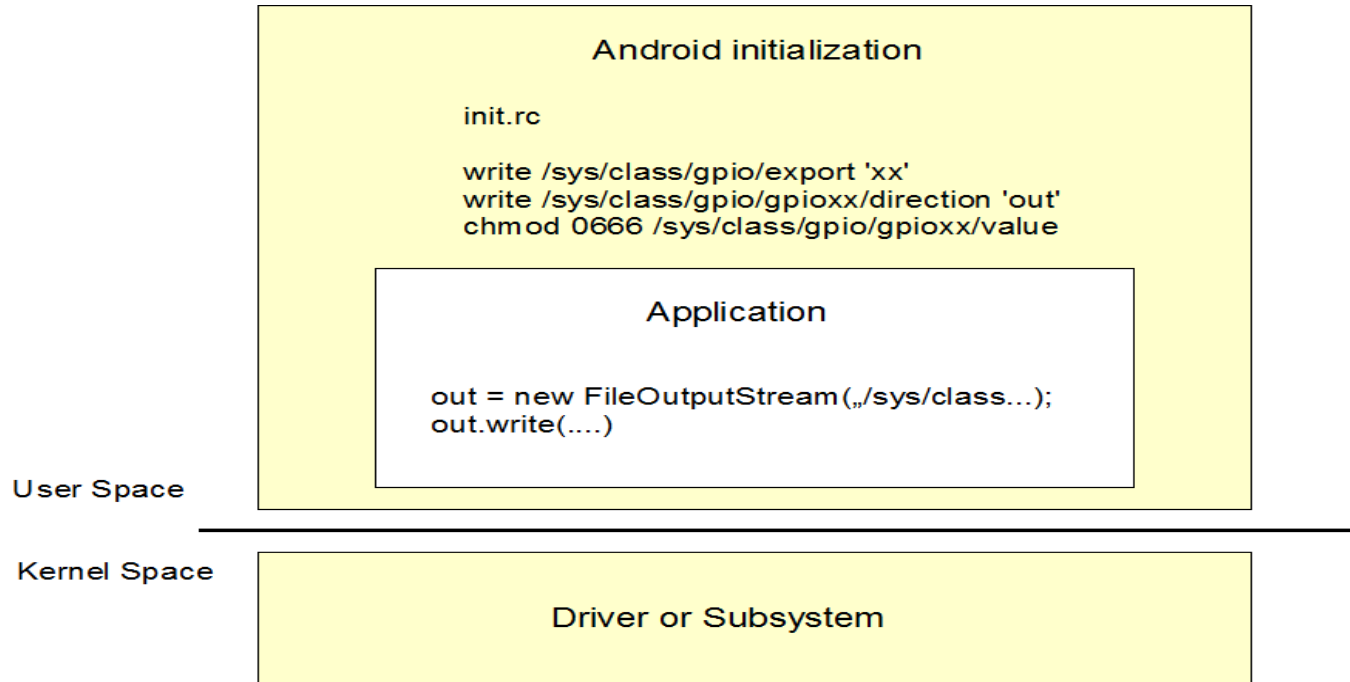


Linux:

- Through device drivers access to sysfs



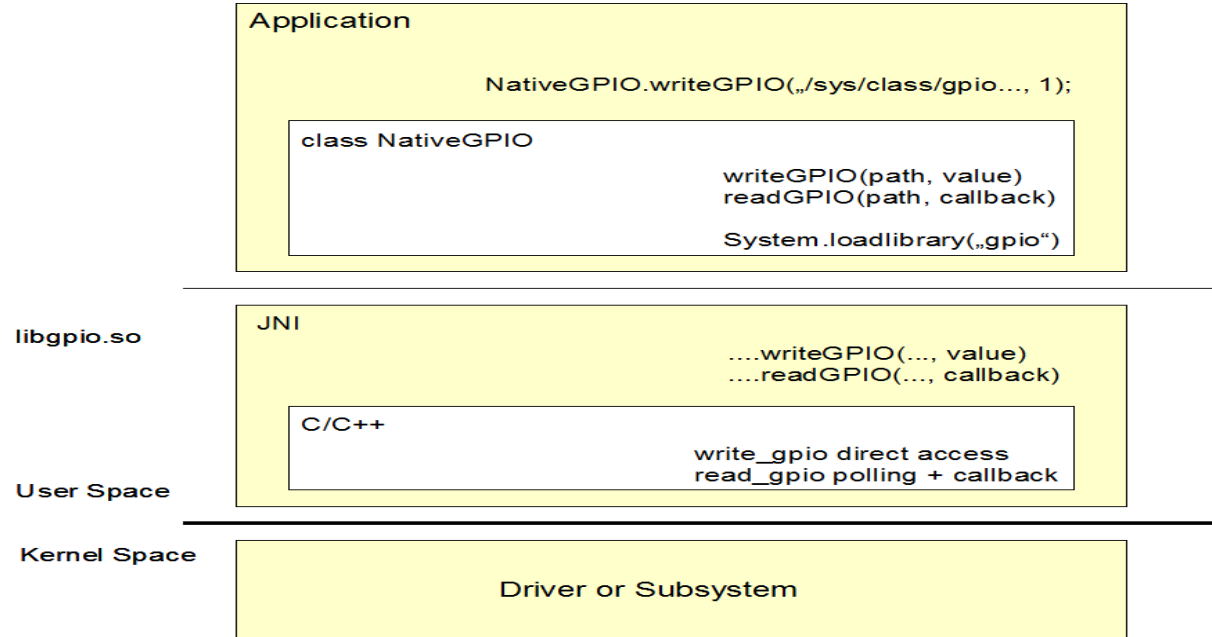
Android – accessing hardware (GPIO)



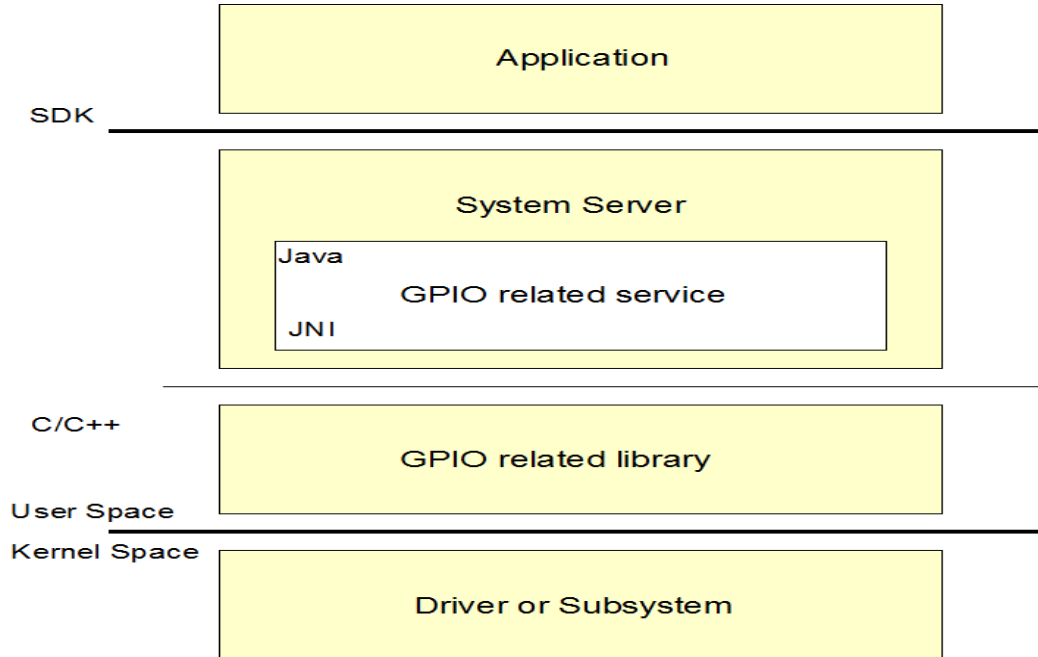
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GPIO access using NDK



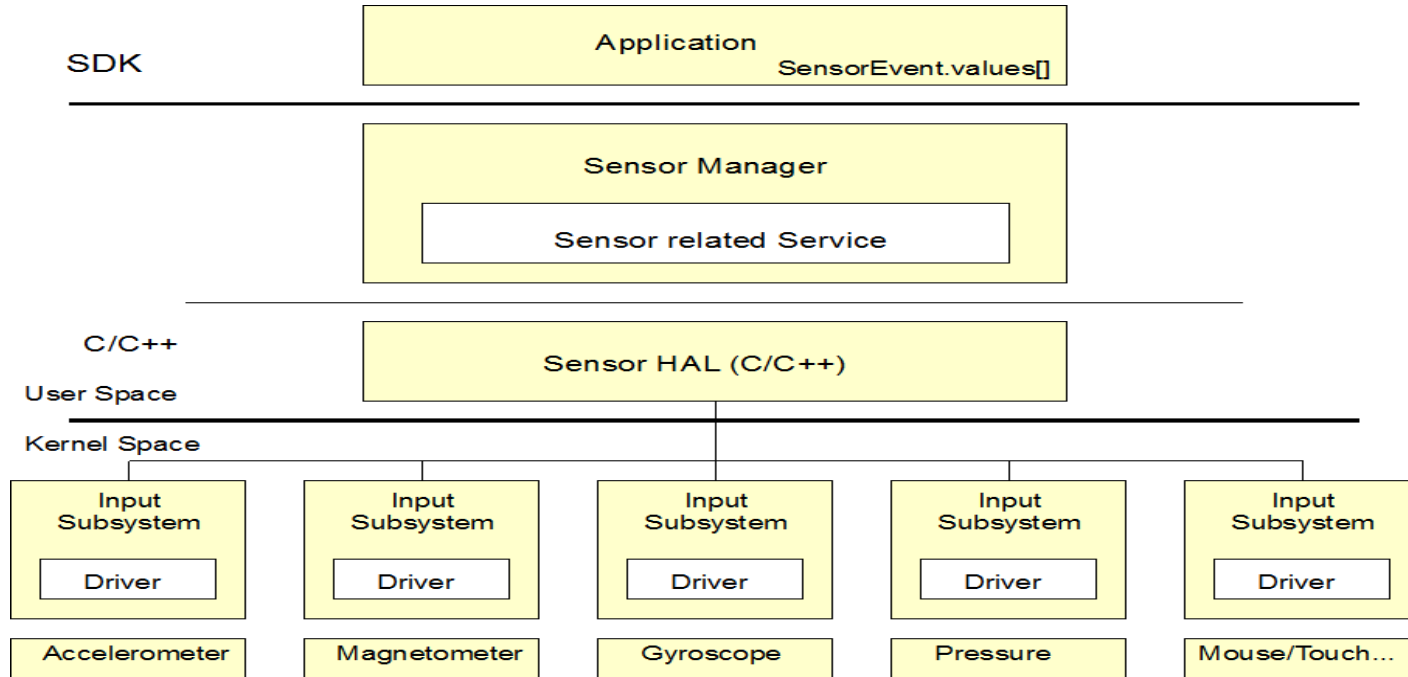
GPIO access using SDK



- Extending HAL using C/C++
- Implementing Linux Driver
- Implementing System Service using Java
- Implementing Wrapper using JNI
- Calling System Service in App
- Automatic start of Service by System Server



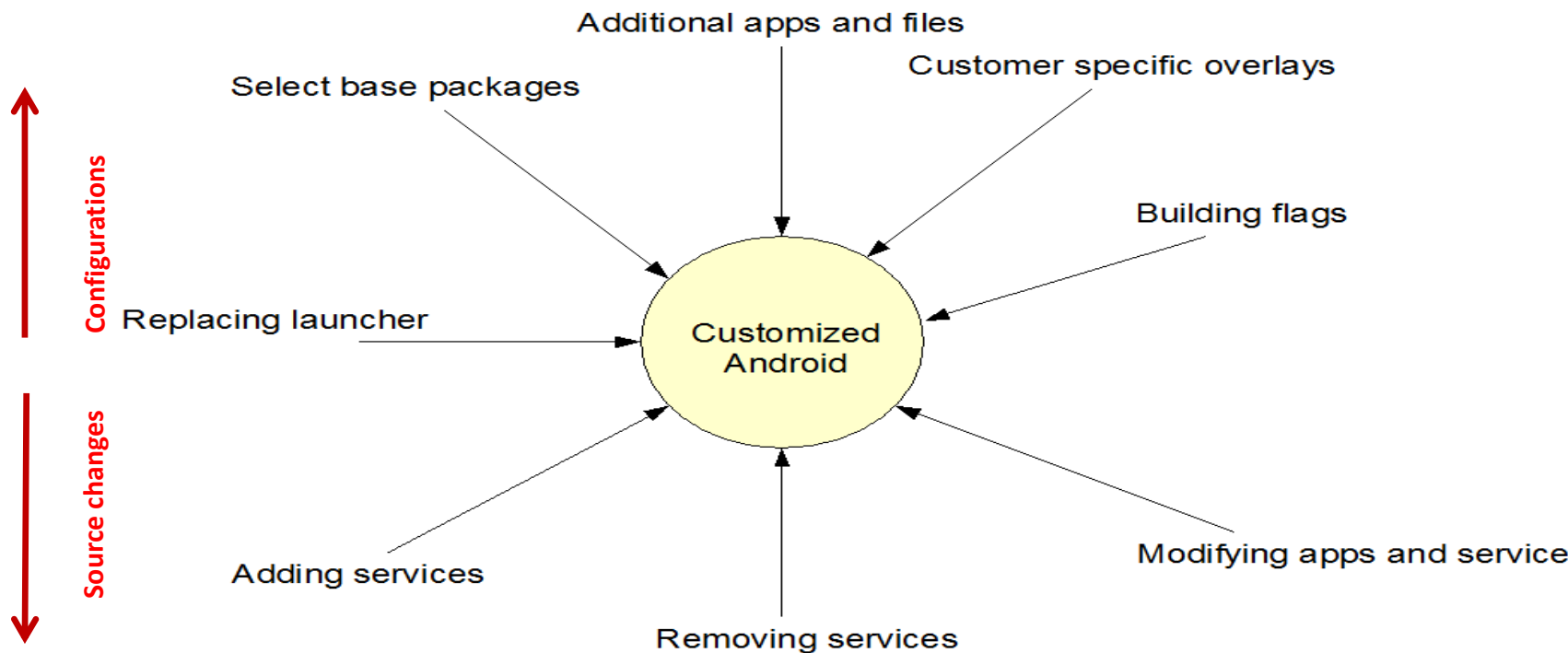
Sensor framework



Tailoring Android look and feel



There's always a Logic Solution!



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My Android



- No longer Smart Phone, it's HMI now
- Reducing original flexibility of Android to key functions for HMI
- Individual look and feel
- Rich multimedia functionality



Needing Play-store :

- Requirements for the hardware
 - Requirement for software and services
 - Test-Suite for checking completeness, correctness and stability of the system (CTS)
- For gaining access to the App-Store or App-Play



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Summary

- Well known usability
- Easy to use framework (Android Studio)
- Rich and well known API (Java)
- Good documentation (application development)



But:

- No realtime
- Missing support for industrial fieldbus interfaces
- Has to be tailored for HMI applications
- When tailored then no certification by Google



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Where can we help you ?

- **We have available :**

- Com's with Linux , Android , CE
- Complete ready to start development kits
- IP of our modules (BSP, Schematics, with direct integration support)
- Engineering / support teams
- Development tools /Kits.....

- **We can help you to convert Android -> My android**

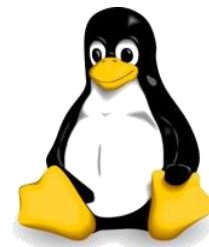
- **For more info Please visit our Booth (7C042)**



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