

CUSTOMISED POWER EFFICIENT ANDROID ROM

Software Design & Verification Document

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1. Introduction

A software design is a meaningful engineering representation of some software product that is to be built. During the design process the software specifications are transformed into design models that describe the details of the data structures, system architecture, interface, and components. Each design product is reviewed for quality before moving to the next phase of software development. At the end of the design process a design specification document is produced. This document, called the Software Design Document is composed of the design models that describe the data, architecture, interfaces and components.

A software design document (SDD) is a written description of a software product, that a software designer writes in order to give a software development team an overall guidance of the architecture of the software project. Practically, a design document is required to coordinate a large team under a single vision.

The proposed system aims to improve the power efficiency of the android device by building a customized Android ROM(similar to an operating system) which would make the installation of the stock applications optional. Power efficiency will also be improved by making changes to the kernel to bring about controlling the processor speeds to obtain maximum power efficiency.

In building the ROM from the source code additional features like support for native languages like Malayalam can be brought about.

2. Design

After the problem identification, definition, requirement analysis and documentation, the next major phase in software development is design. A design specification provides explicit information about the requirements for a product and how the product is to be put together. This document provides a comprehensive architectural overview of the system, using a number of different architectural views to depict different aspects of the system. To identify the specific audiences for the document with an indication of how they are expected to use the document and to focus on specifying a high-level view of the architecture of our system, and on the interaction between the user and the system also to identify the low-level view of each component of the software and how the components interact with each other.

The major design concepts implemented are:

- **Architectural Design:** It gives a high-level architecture of the system

which deals with the working and inter-relationship of different modules. Architectural design also provides the functionalities of the important modules of the system.

- **Abstraction :** Abstraction helps to hide the implementation details and complexities of the system from users. The technical aspects of customizing the ROM is irrelevant to the users.
- **Modularity:** The main problem is broken into a number of submodules to help the implementation. At last the submodules are combined into a single module. Modularity feature helps the process of maintenance, release of new versions, debugging, re-usability etc. modular development is used in this project, where in each module is developed separately and then combining the modules to form a solution for the entire problem.
- **Refinement :** Process of elaboration where the designer provides successively more detail for each design component .
- **Information Hiding:** Modules should be specified and designed so that information contained within a module is inaccessible to other modules that have no need for such information.
- **Control Hierarchy:** A program structure that represents the organization of a program component and implies a hierarchy of control. It describes the control flow between various modules.

There are many aspects that is to be considered in software design. The major aspects considered for design of this project are:

- **Compatibility-** The ROM should be compatible with other Android devices with slight modifications, taking into account the differences in hardware. Besides, the new releases should also be compatible with its older releases.
- **Reliability-** The ROM should work without crashing function under stated conditions for a specified period of time.
- **Security -** One of the key aspects in application design. Security cannot be compromised for it will eventually destroys the core function of the ROM. Unauthorized personnel/applications must not be allowed to modify the ROM's settings.

- **Fault-tolerance-** The ROM should be able to resistant to and able to recover from component failure.
- **Extensibility-** New capabilities can be added to the application without major changes to the underlying architecture.
- **Maintainability-** Any system is susceptible to errors, hence this system should be maintainable.
- **Re-usability-** The ROM should be able to add further features and modification with slight or no modification.
- **Usability-** The application user interface must be practical for its target user. Default values for the parameters must be chosen so that they are a good choice for the majority of the users.

By considering the above concepts and the requirements of various stakeholders this project is mainly divided into four modules,

1. **Voltage control**
2. **Brightness control**
3. **Bloatware removal**
4. **Kernel optimising**

2.1 Voltage control

Mobile CPUs are designed to run at a certain range of clock frequencies. This preset voltages can be varied for better performance or long lasting battery. Overclocking is the process to raise the phone's power over the limits imposed by the manufacturer. Whereas undervolting can considerably decrease the voltage at which the device works for better battery drain.

2.2 Brightness control

The Automatic Brightness control and Light Sensor on smart phones has a major impact on displayed image quality, screen viewability and readability, as well as preventing eye strain and headaches when the screen is too bright or too dim for the current level of ambient lighting, which varies considerably. But for many consumers, it is their impact on power consumption that generates the greatest concerns and emotions. Most smart phones run with the screen considerably brighter than it should be, which wastes a lot of power in addition to causing eyestrain.

2.3 Bloatware removal

All most all the stock ROMs available today comes with a range of stock applications like maps,newsreader and other bloatwares which may not be useful to the user. These applications run persistently in the background and cannot be removed most of the time. These bloatwares takes up valuable resources in the form of memory and battery charge. In the customized ROM these are rectified by giving the user the ability to remove the unnecessary applications .

2.4 Kernel optimizing

Part of the kernel codes can be optimized to get better battery life as well as faster performance. Some of the components in the stock kernel are not necessary for the performance of the device. Removing or optimizing these components provide a boost in battery life.

3. Design Verification

Design verification is an essential step in the development of any product. Also referred to as qualification testing, design verification ensures that the product as designed is the same as the product as intended.

Verification helps to check whether the actual design meets the expected requirements.

- **Development tests** : There are different types of tests possible during the development phase. Development tests are useful for determining the feasibility of the design and gaining insights that further direct the design. The application would be tested in a emulator during development stages.
- **Proof testing** : Proof testing is a type of design verification testing that includes prototypes. Proof tests are designed to test the product failure. These tests are often used to identify where eventual failures may occur. This information is useful for identifying potential warranty issues and costs.
- **Acceptance testing** : Depending on the criticality of failures, testing costs and efficiency, we can calculate the acceptance of the information management system. Testing costs are negligible since the emulator can be functioned as different devices with different OS versions.

Methods that can be used in verification testing are as follows :

- **Demonstration** Demonstration can be conducted in actual or simulated environment. For the proposed system it is relatively inexpensive.
- **Inspection** This method is used to verify the requirements related to the physical characteristics are met or not. In our system the physical characteristics related to the user interface.
- **Analysis** This method used for verifying whether testing of the proposed system is feasible and the system is risk minimal.
- **Testing** Testing can be one of the most expensive verification methods, depending on complexity as well as equipment and facility requirements. Our system does not require expensive testing methods.
- **Similarity** Since our system includes the features similar to other products. This method verifies whether those features are met or exceeded the current specification.

Conclusion

This project aims to implement an Android ROM .Detailed knowledge of the building environment and the Android system is a prerequisite for building the ROM. Intricate working of the Android system can be learnt by doing the project. The ROM can be ported to other Android devices with minor modifications depending on the hardware differences.