

**Parental Controller for Android
Software Architecture Document**

Version 3.0

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Software Architecture Document	Date: 07/01/2012

Revision History

Date	Version	Description	Author
07/01/2012	1.1	Initialize the document	H.M.G.C.Karunarithne
14/01/2012	1.2	Develop the Architecture of the system	H.M.G.C.Karunarithne
15/01/2012	1.3	Develop the Dynamic interaction between functionalities	H.M.G.C.Karunarithne
22/01/2012	1.5	Generate and send a message, Design GUI for Child app	H.M.G.C.Karunarithne
31/01/2012	1.7	Generated MMS and send, Forward pictures/Capture snapshot of screen	H.M.G.C.Karunarithne
14/02/2012	1.8	Modify for mid evaluation	H.M.G.C.Karunarithne
28/02/2012	2.0	Generate Call Notification Report	H.M.G.C.Karunarithne
13/03/2012	2.5	Get the Phone Location	H.M.G.C.Karunarithne
28/03/2012	3.0	Finalize Documents	H.M.G.C.Karunarithne

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1. Introduction

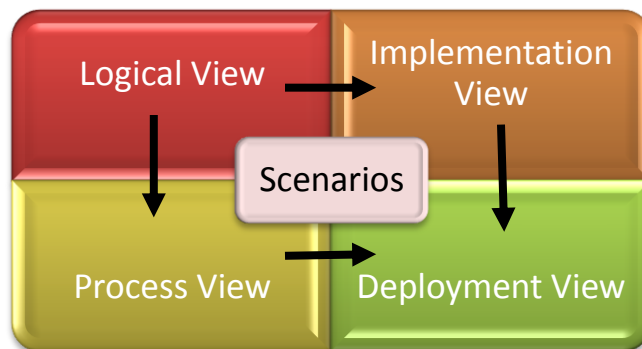
The Software Architecture document describes overview of Parental Controller with the perspective of its outline technologies; assemble of components of the app and high-light architecture review for developing the project in sequential manner. Parental Controller is application software running on Android OS which has the feathers of controlling one Android device (child droid) by another Android device (parent droid) and transmitting information between two devices.

The document of Parental Controller for Android provides a high-level description of the goals of the architecture, the use cases support by the system and architectural styles and components that have been selected to best achieve the use cases.

1.1 Purpose

The Software Architecture Document (SAD) provides a comprehensive architectural overview of the Parental Controller for Android. It presents a number of different architectural views to depict different aspects of the system. It is intended to capture and convey the significant architectural decisions which have been made on the system.

In order to depict the software as accurately as possible, the structure of this document is based on the “4+1” model view of architecture [3].



The “4+1” View Model allows various stakeholders to find what they need in the software architecture.

The Architecture of the project (myself) should get involve with change management of the system and modify the document according to solve problems arise. The developer (myself) of the project should be using this documentation to implement the project top of the Android OS. Also project evaluator should be inspect and analysis the documentation and give feedback on current position assessment and future enhancements.

1.2 Scope

This Software Architecture Document provides an architectural overview of the Parental Controller for Android. The Android software app is being developed by H.M.G.C.Karunaratne, undergraduate of University of Moratuwa for Android platform users according to their need for out of charge.

This documentation will be use as a software architectural guidance for developers and to software architecture to keep track on overall structure of the app. Also, this document will be use

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to evaluate the project at the end of project as an evaluation for course module and users of this application will be affect by this documentation according to the final product of the app.

1.3 Definitions, Acronyms, and Abbreviations

- **RUP:** Rational Unified Process
- **UML:** Unified Modeling Language
- **SAD:** Software Architecture Document
- **Parentdroid** – Parent Android (The application which is control by an adult person. Administrator of the system)
- **Childroid** – Childe Android (person who is under control)
- **MSP** – Mobile Service Provider

1.4 References

- [1]. Software Architecture usability discussion
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- [2]. RUP example template
<http://www.ts.mah.se/RUP/wyliecollegeexample/courseregistrationproject/artifacts/analysisdesign/sadoc.htm>
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- [4]. RUP Software Architecture Document Template
http://www.ts.mah.se/RUP/RationalUnifiedProcess/webtmpl/templates/a_and_d/rup_sad.htm
- [5]. RUP Software Architecture Documentation Example, November 30, 1999
http://www.ts.mah.se/RUP/RationalUnifiedProcess/examples/csports/ex_sad.htm
 - Parental Controller for Android – Feasibility Report
 - Parental Controller for Android – Project Vision Report
 - Parental Controller for Android – Project Schedule
 - Parental Controller for Android – Software Development Case
 - Parental Controller for Android - Software Requirement Specification for Parentdroid
 - Parental Controller for Android – Software Requirement Specification for Childroid
 - Parental; Controller for Android – Quality Assurance Plan

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1.5 Overview

The organization of the rest of the Software Architecture Documentation can be describes as following;

- 1.5.1.1 **Architectural Representation** of this document will give the architecture in 4 different perspectives. They are Logical view, Implementation View, Deployment View and Process view. At last we will give a brief idea of each of these though some use cases with scenarios.
- 1.5.1.2 **Architectural Goals and Constraints** will describe the goals and constrains of the system which related to the design of the architecture.
- 1.5.1.3 **Use-Case View** of this document will describe the use cases which are incorporate with the Parental Controller for Android apps.
- 1.5.1.4 **Logical view** of this document describes the architecturally significant parts of the design model, such as its decomposition into subsystems and packages.
- 1.5.1.5 **Process view** of the architecture document will describe the structure of the process which is parts of the development process of the Parental Controller for Android apps.
- 1.5.1.6 **Deployment view** will describe how the Parental Controller for Android apps will be deployed in the environment.
- 1.5.1.7 **Implementation view** of the architecture will describe how the system will be implemented in architectural manner. Also this section describes the overall structure of the implementation model, the decomposition of the software into layers and subsystems in the implementation model, and any architecturally significant components.
- 1.5.1.8 **Data View** is a description of the persistent data storage perspective of the system. This section is optional if there is little or no persistent data or the translation between the Design Model and the Data Model is trivial.
- 1.5.1.9 **Size and Performance** is a description of the major dimensioning characteristics of the software that impact the architecture, as well as the target performance constraints.
- 1.5.1.10 **Quality** will be a description of how the software architecture contributes to all capabilities of the system: extensibility, reliability, portability, and so on. If these characteristics have special significance, such as safety, security or privacy implications, they must be clearly delineated.

2. Architectural Representation

The architecture of the Parental Controller for Android is represented by “4+1” model representation. The UML specification of the system according to RUP process has been divided into the following views:

2.1.1.1 Use-Case View:

Use-case view describes the set of scenarios and/or use cases that represent some significant, central functionality of the system. It uses the actors and use cases for describes the system, this view presents the needs of the user and is elaborated further at the design level to describe discrete flows and constraints in more detail. This domain vocabulary is independent of any processing model or representational syntax.

This view focus on all stakeholders of the system and Use-Case models will be output as artifacts.

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2.1.1.2 Logical View:

Logical view will focus on functional requirements of the app. It describes the design's object model and most important use-case realizations. Design of the system is mostly focused on this and will output UML diagrams as artifacts.

2.1.1.3 Process View:

Process view will describe non-functional requirements of the Android app. Also it describes the design's concurrency and synchronization aspects. It will be affected on integration of the system.

2.1.1.4 Deployment View:

Deployment view describes the mapping of the software onto the hardware and shows the system's distributed aspects. Also it describes potential deployment structures, by including known and anticipated deployment scenarios in the architecture we allow the implementers to make certain assumptions on network performance, system interaction and so forth.

2.1.1.5 Implementation View

Implementation view decompose app into Software components and show their interaction by including the layers and subsystems of the application. This will give an implementation model of components to the programmers.

2.1.1.6 Data View

Data View describes persistence of data. It will describe the architecturally significant persistent elements in the data model. This will give data model about database system and file structure that will be use.

3. Architectural Goals and Constraints

There are some key requirements and system constraints that have a significant impact on the system architecture of Parental Controller for Android. They are:

3.1.1.1 Technical Platform

- Parental Controller will be deployed on the top of Android platform with the version of 4.0.
- Have to use communication protocols which are supported by Android 4.0 version.
- Have to concern about platform security features about accessing the hardware level and lower level privileges monitoring constrains

3.1.1.2 Security

The system must be secured to enough to communicate between two applications. System should achieve more security with respect to performance to avoiding conflict of trade-off.

To ensure the security with respect to local/physical access to the system, it must have;

- Authentication for Parentdroid: There is no feature to login to Parentdroid application by assuming that parent will take necessary action to keep the Smartphone safe.(changed)

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- Authentication for Childroid: To login to Childroid app, it must use a user name and a password which are used in Parentdroid and authentication verification must be done to access to the setting of Childroid application. Childroid application access notification sends to the Parentdroid device.(changed)

For internet access, the following requirements are mandatory

- Confidentiality: sensitive data must be encrypted (user name and password).
- Data integrity: Requirements changed. So not necessary to care about this aspect. (Future enhancement: Data sent across the network cannot be modified by Childroid. It must be generated by Childroid app and don't get involved by Childroid user.)

3.1.1.3 Safety

- Two applications must be safety enough to run up individually and keep running.
- Safety of the Childroid should not affect by hardware components such as SIM and Data chips.

3.1.1.4 Availability

- Targeted availability is 12/7: 12 hours a day, 7 days a week
- Whenever the Childroid may not response, instruct to Parentdroid user to check for the current situation.

3.1.1.5 Persistence

- Requirement changed. Android allow storing the data in XML format. Also reminder feature was removed from the application and no need to use database (Data should be stored and ensure persistence by using relational database)
- Data which would be stored as XML in Childroid must be not accessible by Childroid user

3.1.1.6 Privacy

- Privacy of the Childroid is not mandatory according to the functionalities.
- But privacy of the Parentdroid side must be assured by Parent himself

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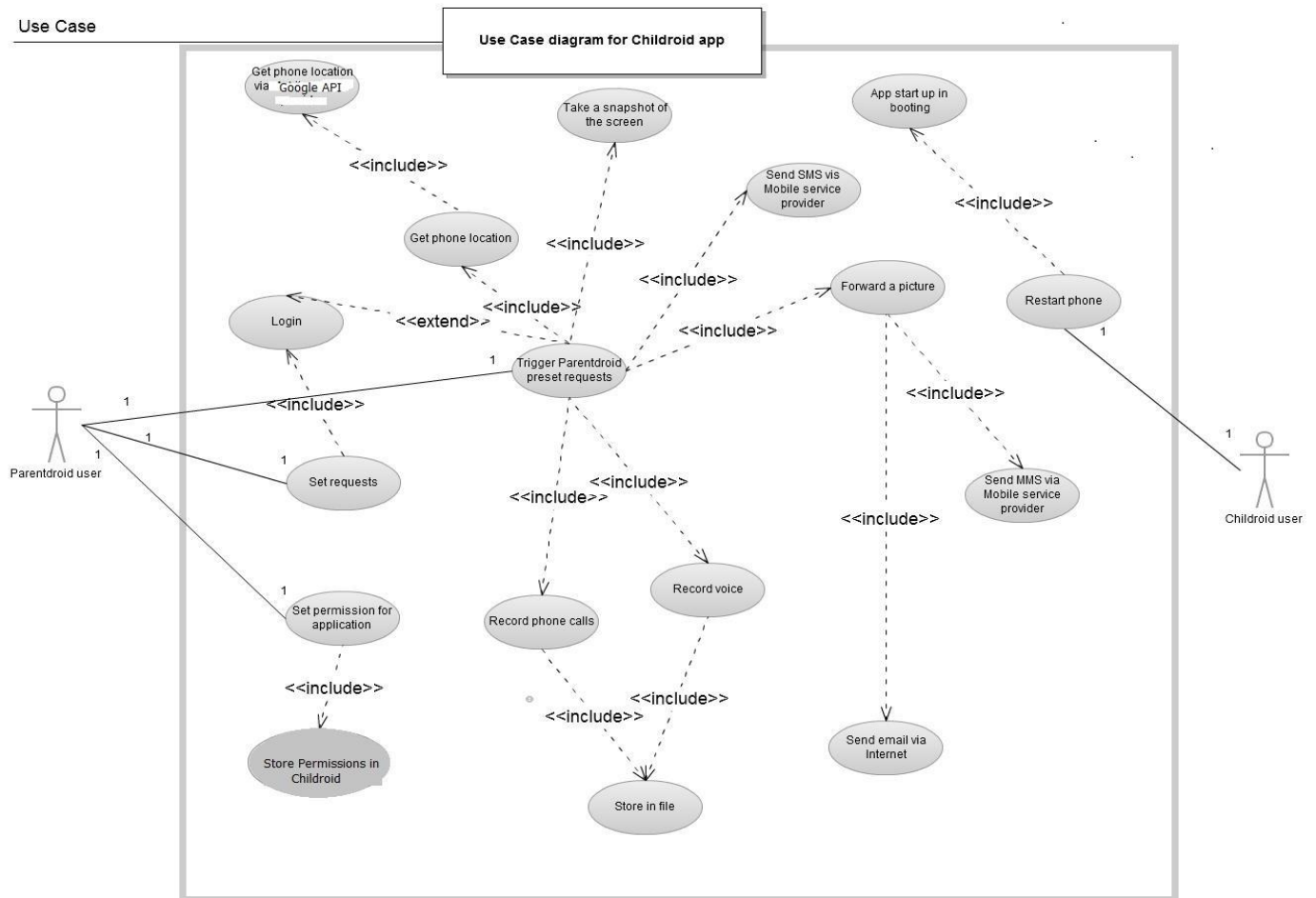
4. Use-Case View

A description of the use-case view of the software architecture. The Use Case View is important input to the selection of the set of scenarios and/or use cases that are the focus of iteration. It describes the set of scenarios and/or use cases that represent some significant, central functionality. It also describes the set of scenarios and/or use cases that have a substantial architectural coverage (that exercise many architectural elements) or that stress or illustrate a specific, delicate point of the architecture.

- Get phone location via Google API
- Login
- Set Requests
- Take a snapshot
- Send SMS/MMS via MSP
- Forward a picture
- Record voice
- Record Phone calls
- Store in file
- Send email via internet
- Show Child Location
- View Notifications
- View Photos
- View Child's SMS

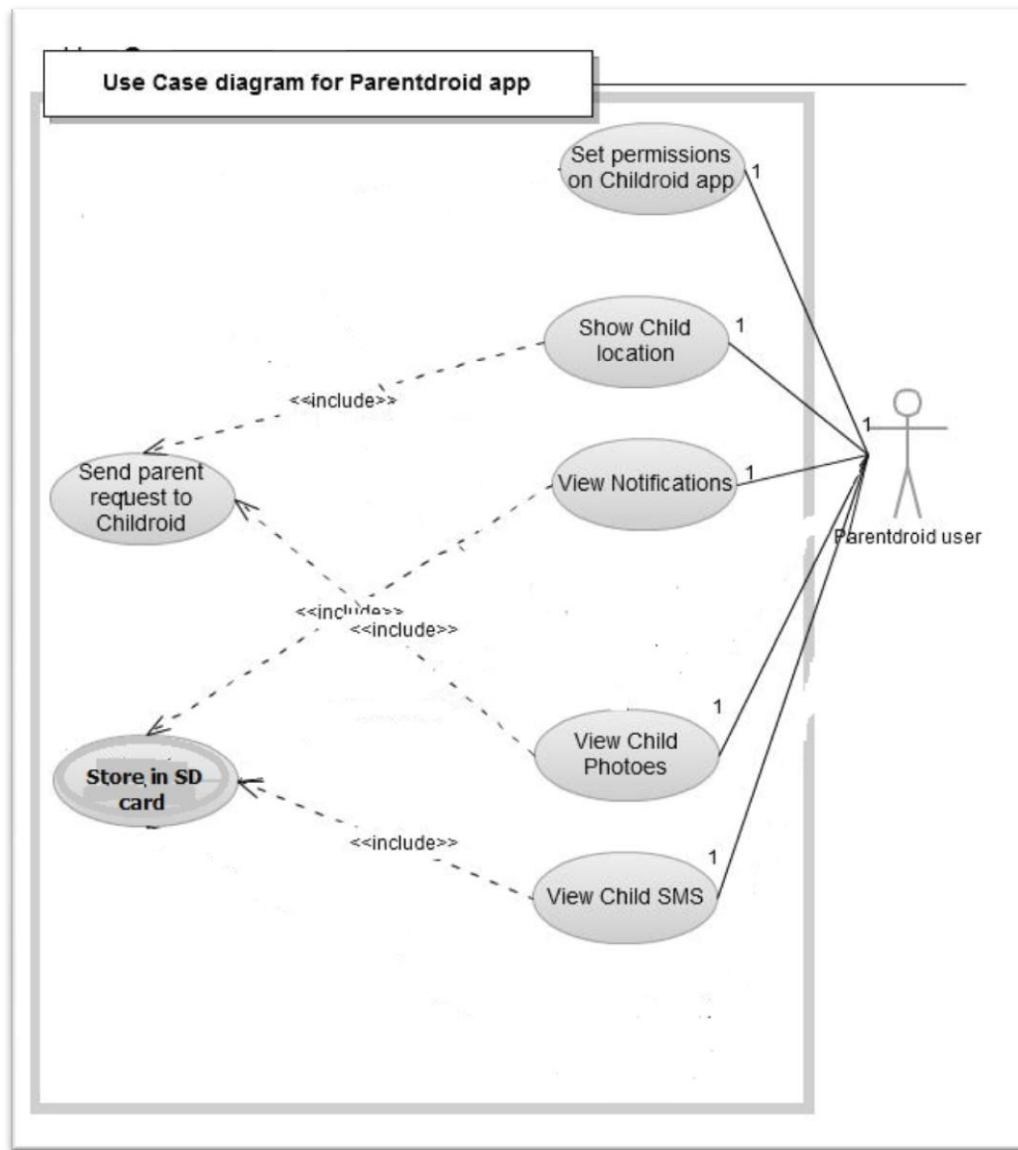
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4.1.1 User case for Parent user in Childroid Application



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4.1.2 Use Case diagram for Parent user in Parentdroid Application



4.2 Use-Case Realizations

- **Get phone location via MSP**
Get the Childroid device location via Google API method. Then parent can get the info about where his/her child is.
- **Login**
Only Parent has a user account in Childroid Application and password is saved in Childroid Application as an encrypted XML format. In order to set any changes in Childroid, user authentication is required.
- **Set Requests**
Parentdroid can send a SMS request for specify information about Childroid. Then Childroid will immediately reply to the parent.
- **Set permission for Application**

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See Risk report.

- **Take a snapshot**
Random time intervals, Childroid get instantaneous snapshot of device. Difficult to implement with using an Emulator.
- **Send SMS/MMS via MSP**
Create SMS/MMS and send to Parentdroid
- **Forward a picture**
Forward pictures which are stored in Childroid to parent's email account
- **Record voice**
Record and temporary store voice within instantaneous time and sent to parent's email account
- **Record Phone calls**
Record phone calls and temporary store in file and sent to parent's email account.
- **Show Child Location**
Show the child location by using a map
- **View Notifications**
Show notifications which are sent by Childroid
- **View Photos**
View photos which are taken by child
- **View Child's SMS**
View the SMS which are sent and received by child

5. Logical View

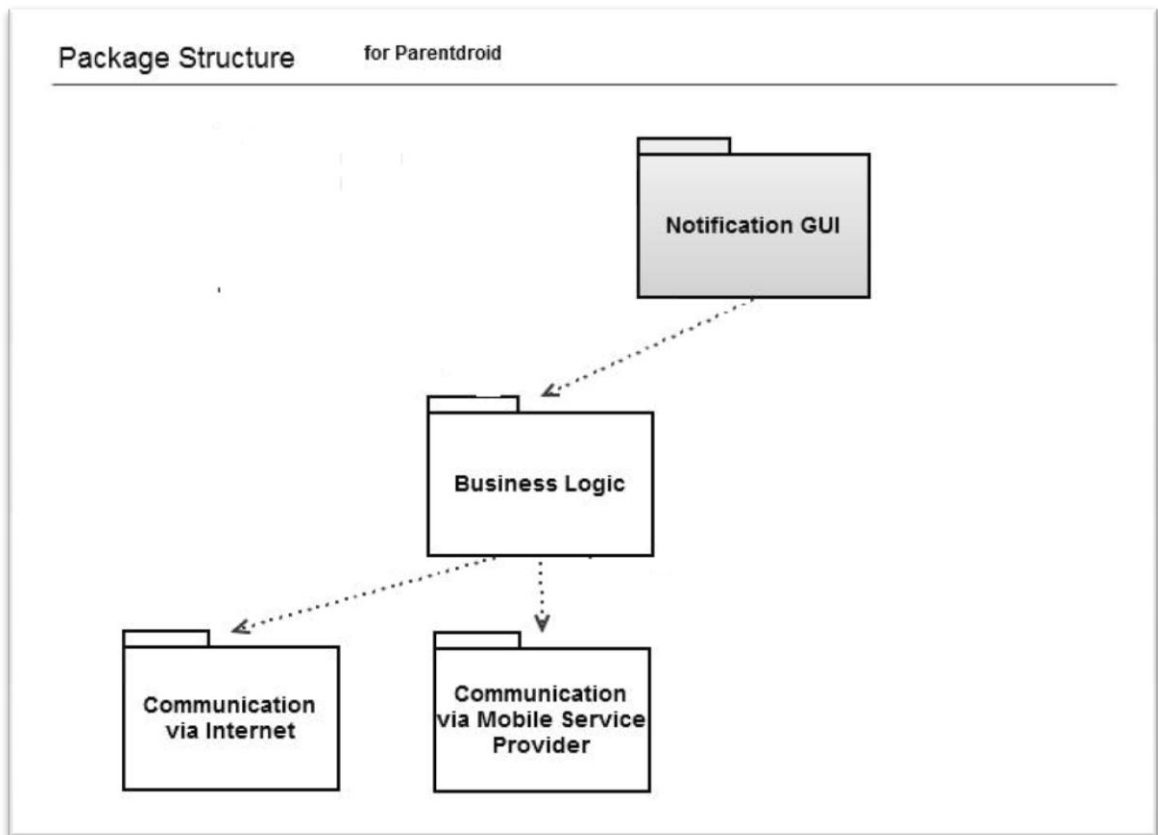
This section describes about the logical view of the architecture. It will describe the most important classes, their organization in service packages and subsystems, and the organization of these subsystems into layers. Further modification will be done by myself and update into software architecture during development process.

The logical view of the Parental Controller system is comprised of the 6 main packages under each app which can be including into three layers.

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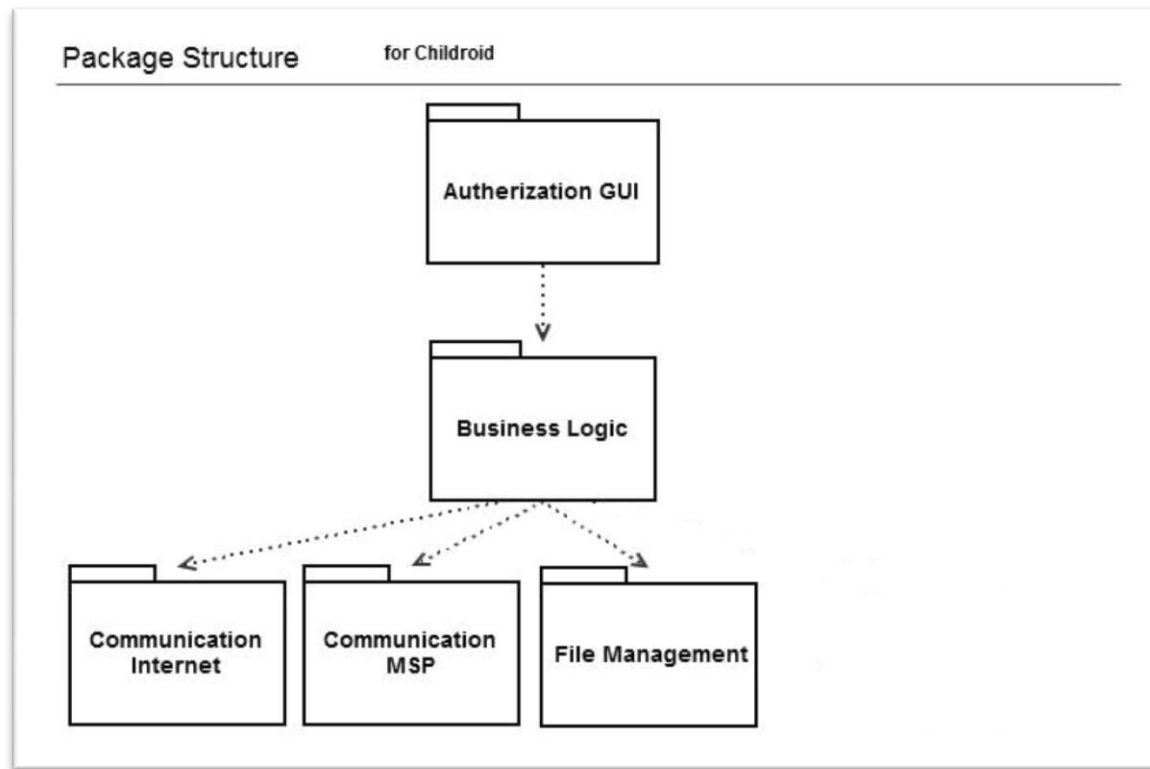
5.1 Overview

5.1.1 Package Structure for Parentdroid



5.1.2 Package Structure for Childdroid

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5.2 Architecturally Significant Design Packages

This is a system which is operating with the interaction between two applications which are running on Android platform. Those have following functionalities and description about there responsibilities, operations and attributes.

- **Authentication GUI**

Authentication GUI contains classes for get access to the system.

- **Notification GUI**

Notification GUI contains classes for each of the forms that the parent uses to communicate with the System. Boundary classes exist to support maintaining of child activities, maintaining of reminders, get info by instantaneous accessing and get preset notifications about child etc.

- **Business Logic**

The Business Logic Package contains control classes for interfacing with the triggering events, maintain accessibility and AI control.

- **Communication via Internet**

This is Middleware for communication. It contains classes for create emails, get access to internet so on.

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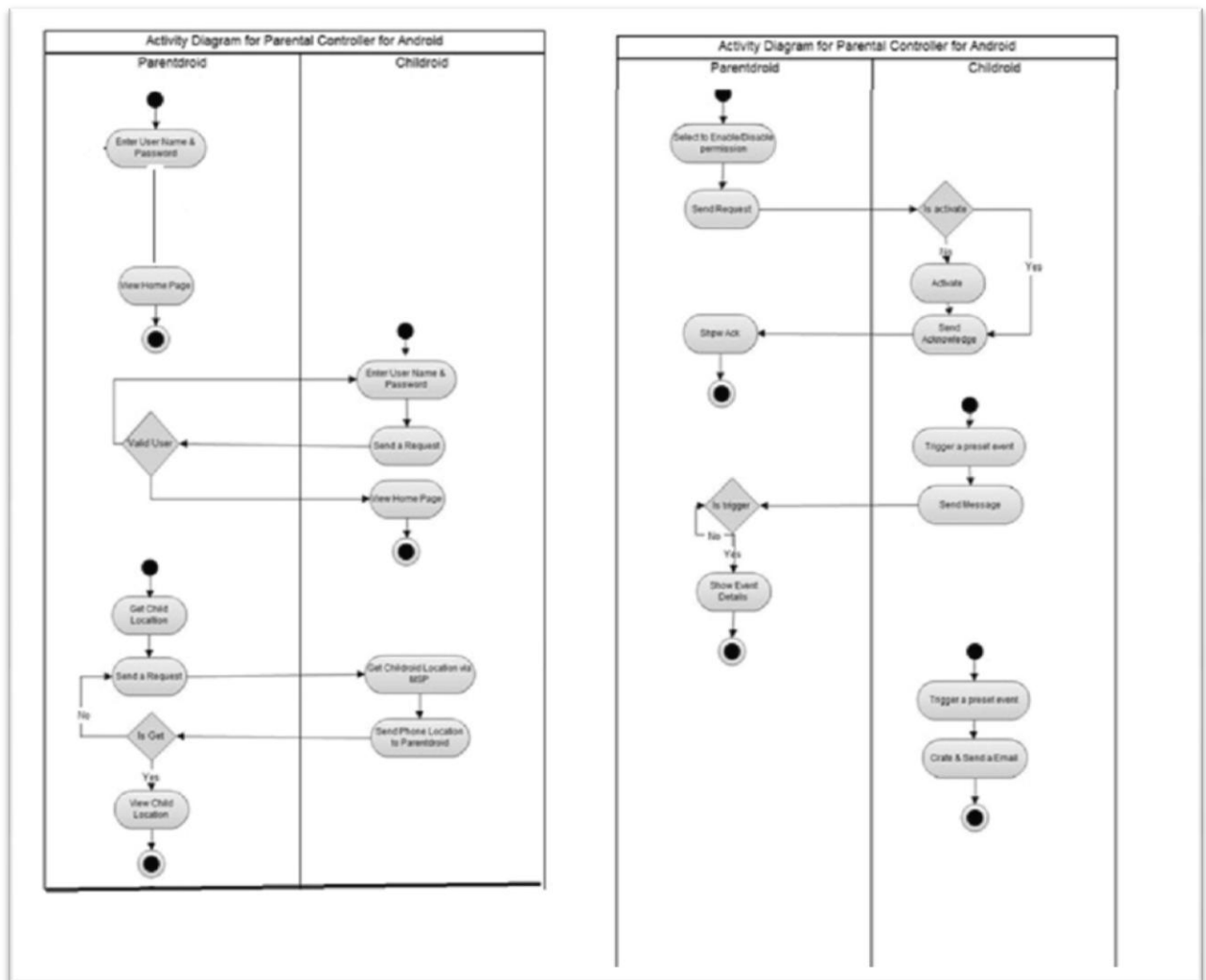
▪ Communication via MSP

This is Middleware for communication. It contains classes for create SMS/MMS, get phone location so on.

▪ File Management

This package contains classes for access to file system on Android platform and retrieve those data when ever want.

6. Process View



Process view describes the system's decomposition into lightweight processes (single threads of control) and heavyweight processes (groupings of lightweight processes). Organize the section by groups of processes that communicate or interact. Describe the main modes of communication between processes, such as message passing, interrupts, and rendezvous.

At this point in the design, a single process is envisioned to provide server-level functions for the Parental Controller System for each app. Thread for application functions will be part of this

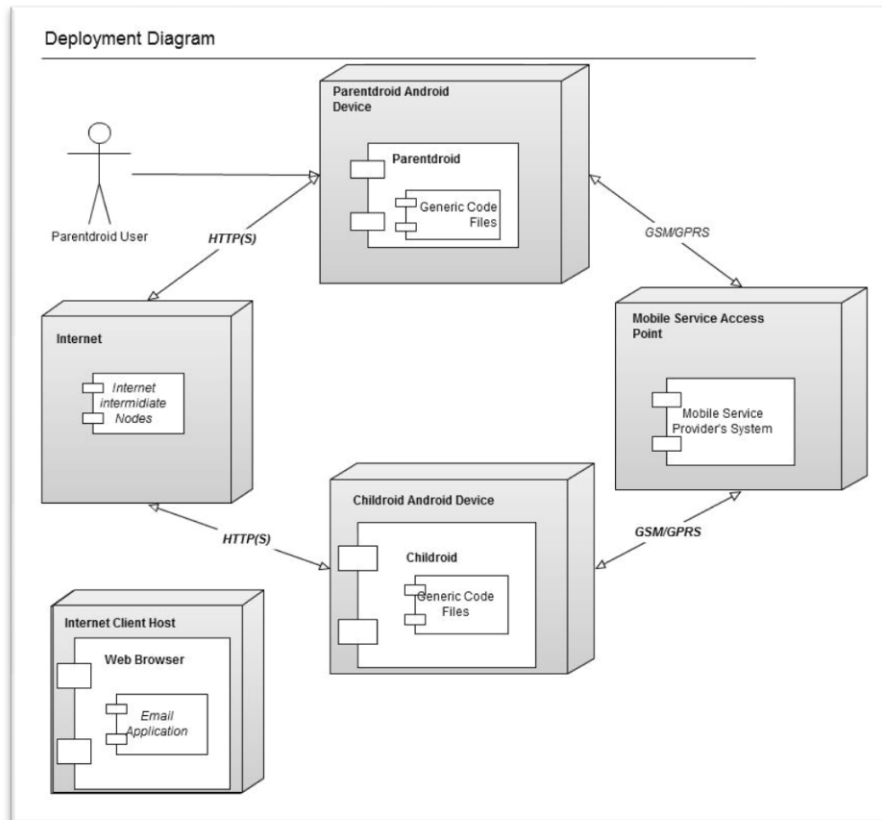
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process.

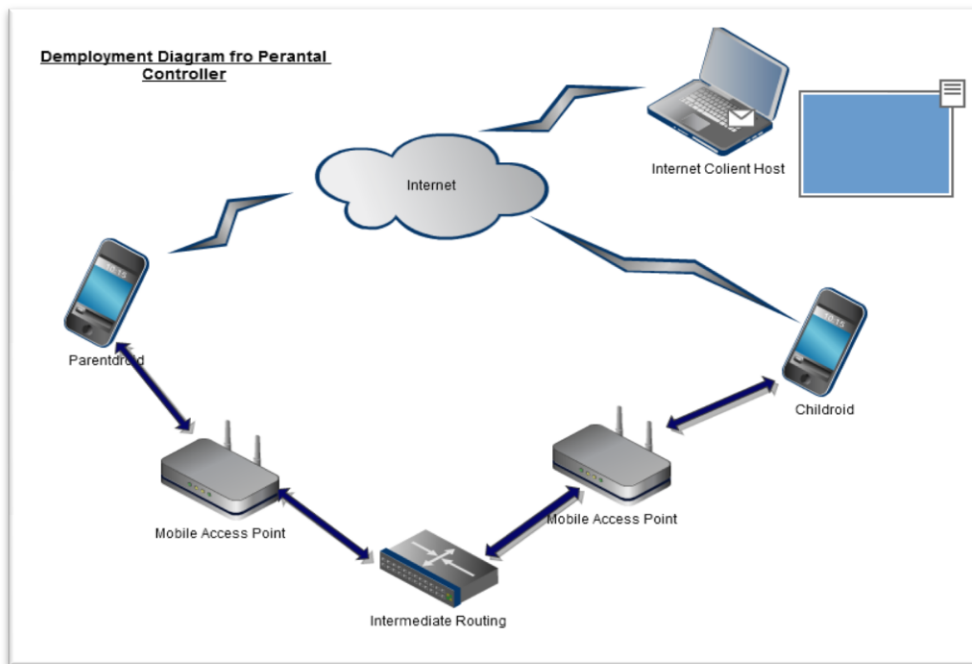
7. Deployment View

A description of the deployment view of the architecture describes the various physical nodes for the most typical platform configurations. Also describes the allocation of tasks (from the Process View) to the physical nodes.

This section is organized by physical network configuration; each such configuration is illustrated by a deployment diagram, followed by a mapping of processes to each processor.



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8. Implementation View

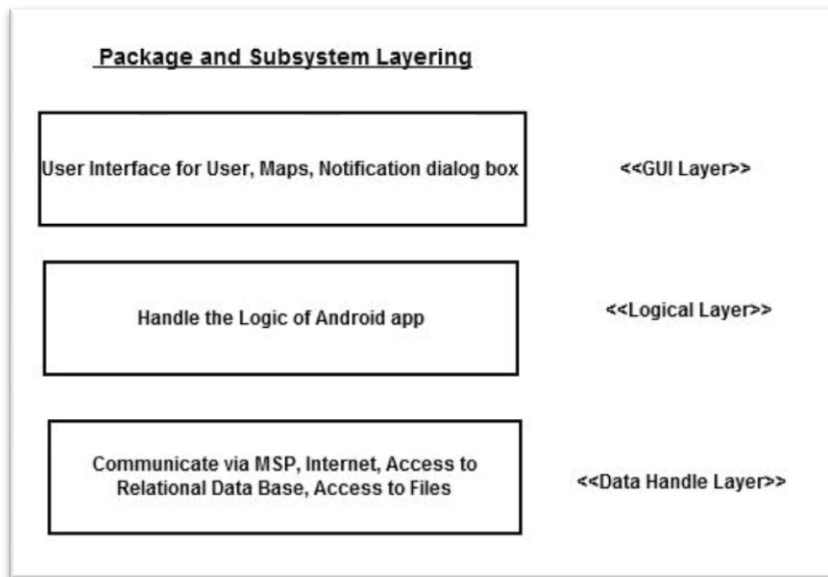
The Implementation view depicts the physical composition of the implementation in terms of Implementation Subsystems, and Implementation Elements (directories and files, including data, and files).

Usually, the layers of the Implementation view do fit the layering defined in the Logical view. It is unnecessary to document the Implementation view in great details in this document.

- GUI Layer
- Logical Layer
- Data Handle Layer

8.1 Overview

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8.2 Layers

8.2.1 GUI Layer

GUI layer contains all the components needed to allow interactions with an end-user. It encompasses the user interface

8.2.2 Logical Layer

Logical layer contains all the components used to access the domain layer or directly the resource layer when this is appropriate.

8.2.3 Data Handle Layer

Data Handle layer contains the components needed to enable communication between apps and the data storage on system (Database, external services, ERP, etc...)

9. Data View (optional)

Data view is omit in this documentation due to data persistence isn't a significant aspect of the system.

10. Size and Performance

The software architecture supports the key sizing and Performance requirements, as described in the Supplementary documents:

- Childroid shall require less than 50MB disk space to store temporary data and Parentdroid shall be capable of have and maintaining database supportability
- The selected architecture supports the sizing and timing requirements through the implementation of Individual Repository model architecture

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- The Parentdroid and Childdroid are implemented on Android platform based smart phone. The components have been designed to ensure that minimal disk and memory requirements are needed for both two apps.
- Parentdroid and Childdroid should be up and running all the time.
- Both of apps should be using a working Mobile service
- Childdroid should be able to complete all task which are request by Parentdroid

11. Quality

The software architecture supports the quality requirements, as stipulated in the Supplementary documents:

- The operating system shall be Android version 4.0 or higher
- The user interface of the Parental Controller shall be designed for ease-of-use and shall be appropriate for a usual Android Mobile user interfaces with help of local guide for the System.
- Each feature of the Parental Controller shall have built-in online help for the user. Online Help shall include step by step instructions on using the System. Online Help shall include forum to user to ask questions from developers.
- Upgrades to the Parental Controller for Android apps shall be downloadable from the Android developers' site over the internet. This feature enables users to have easy access to system upgrades.
- Should be easy to use and more interactive to user in order to compete in Market
- To achieve good Security Authentication and authorization mechanisms will be added to the Parentdroid app login.