

A STUDY ON THE RADIO BASE STATION 2000

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Tesis Dikemukakan Kepada
Fakulti Kejuruteraan, Universiti Malaysia Sarawak
Sebagai Memenuhi Sebahagian Daripada Syarat
Penganugerahan Sarjana Muda Kejuruteraan
Dengan Kepujian (Kejuruteraan Elektronik Dan Telekomunikasi)
2002

Dedicated to my beloved Family and Friends
Thanks for everything...

ACKNOWLEDGEMENT

I would like to acknowledge the contributions of several peoples whom have enabled me to complete my thesis. First of all, million thanks to my supervisor, Dr Awangku Abdul Rahman Bin Pengiran Hj. Yusof for his help and invaluable advice. His supervision on the project is very much appreciated. And also my appreciation to Dean of Engineering Faculty, Professor Dr. Mohamad Kadim Bin Suaidi and Head of Core Group of Electronics and Telecommunications Program, Mr. Ng Liang Yew.

A special thanks to CELCOM staff, En. Ismael Bin Hamdan and En. Rosli Bin Shamsuddin for their help in giving advice and encouragement for me. Besides that, I would like to thank all the lecturers and staff who helped me in completing this project.

Last but not least, I also would like to express my gratitude to my family members, colleagues and friends for their support and encouragement in completing this thesis.

ABSTRAK

Radio Base Station 2000 merupakan kabinet-kabinet penting dalam sistem telekomunikasi. Ia berkait rapat dengan sistem telefon bergerak. *Radio Base Station 2000* juga dikategorikan kepada *RBS 2101*, *RBS 2102*, *RBS 2103*, *RBS 2202* dan *RBS 2301* mengikut jenis kabinet sama ada kabinet dalaman atau kabinet luaran. Di samping itu, ciri-ciri setiap kabinet juga dikaji secara terperinci. Oleh sebab itu, matlamat utama penulis kertas kajian ini adalah untuk memberi pengenalan serba sedikit berkenaan struktur binaan kabinet *Radio Base Station 2000*, komponen-komponen dalam kabinet, sistem-sistem yang digunakan dan masalah-masalah yang sering berlaku di tapak projek berdasarkan satu kajian yang telah dijalankan di Syarikat Telekomunikasi. Definisi untuk sebahagian istilah-istilah yang digunakan bagi menerangkan sesuatu *Radio Base Station 2000* juga dinyatakan dalam kertas kajian ini.

ABSTRACT

Radio Base Station 2000 is one of the most important components in a telecommunication system. It is closely related to mobile telephone systems. *Radio Base Station 2000* may be categorized into *RBS 2101*, *RBS 2102*, *RBS 2103*, *RBS 2202* and *RBS 2301* depending on the cabinet types; either indoor cabinets or outdoor cabinets. Furthermore, the characteristics of each cabinet are studied in details.

Therefore, the intention of this paper is to give an introduction on the structure of *Radio Base Station 2000* cabinet, the components used in the cabinets, systems used and trouble shooting that occur at site based on the research at a telecommunication company. In addition, the definition of some of the terminologies used to described *Radio Base Station 2000* are given in this paper.

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CHAPTER 1

INTRODUCTION

1. Background

The use of cellular telephones has increased steadily since their introduction in 1978. Worldwide, 500 million users of cell phones are expected by the year 2001, and 700 million users are expected by the year 2003. Similar technologies, including Specialized Mobile Radio (SMR) and Personal Communications Services (PCS) are also being introduced in many areas.

Cell phones operate by communicating with a nearby base station, which contains a low-powered radio transceiver and antenna. The antenna is usually mounted on a tower, the roof of a building, or on another structure that provides the required height for proper coverage. The base station relays calls between the user and the telephone system.

Cellular communication systems require the use of many base stations located throughout a service area. When a user places a call, his or her handset communicates with a nearby base station, which then relays the call to a central switching office and then to the conventional landline telephone network. As the user moves about, he or she is "handed off" to other base stations.

Thus, each base station is a low power radio station that serves users in a small geographic region called a cell. Scattered throughout a metropolitan coverage into small cells or small areas of coverage. Each frequency could be reused in non-adjacent cells. The

location of each base station is determined by two different needs on the part of the system. One is to provide adequate coverage that is signal strength throughout the entire service area. The second is to provide adequate capacity to provide enough free channels to accommodate any user who might wish to use the system.

As a system grows, base stations are installed closer together to increase capacity but operated at lower power levels to prevent interference among base stations. Thus, in urban areas base stations are closer together, but are operated at lower power levels, than in rural areas where the cells tend to be larger.

The antenna height is critical. It must be high enough to provide coverage throughout the cell, but low enough to preclude interference with remote cells that re-use the same frequencies. Depending on the needs of the system, the antennas may be from 10 to 100 meters above ground. Base station antennas are frequently located on tall tapered poles called monopoles, much like lamp standards, or on towers of a metal strut lattice construction.

Base station antennas may also be located on existing structures, such as water tanks, high-voltage transmission-line towers, or buildings. To reduce the aesthetic impact of their systems on communities, companies generally prefer to install their antennas on existing structures, and to co-locate where possible that locate base stations from different companies on the same structure.

1.1. Project Objectives

The objectives of this project are to get more information and study about Radio Base Station 2000 system; such as the definition of RBS 2000, hardware and software architecture of RBS 2000, types of RBS 2000, antenna system, cabinet installation,

cabinet assembly test, benefits and future evolutions of RBS 2000. Besides that, the objective is to understand the Global System for Mobile Communication (GSM) concept in a Radio Base Station system whether it is appropriate for our future telecommunication.

Furthermore, this title is related to my industrial training program at Cellular Communication (CELCOM) Malaysia Network Sdn Bhd, Bandar Sunway, Petaling Jaya, Selangor Darul Ehsan, of which details of time of attachment with CELCOM are given. Besides that, the objective is to study the functions of equipment related to a Radio Base Station and the problems associated with it at the site. Furthermore, the objective is to learn how to solve some problems using a suitable method.

1.2. Project Overview

Radio Base Station 2000 is a family of Radio Base Stations included in the digital Mobile Telephone Systems CME 20 and CMS 40. CME 20 stands for Cellular Mobile Europe using the Ericsson GSM system that is Ericsson digital land mobile telecommunication system; which is based on the GSM (Global System for Mobile Communication) standards. CME 20 Ericsson GSM system comprises the Ericsson equipment only. CMS 40 is Cellular Mobile System which is Ericsson digital land mobile telecommunication system based on the Joint Technical Committee (JTC) specification for PCS (Personal Communication Services) 1900.

The radio base stations within the RBS 2000 family are available in different versions. They cover indoor and outdoor cabinets and contain the radio equipment. Some versions are supplied with battery backup and space for transport module. There

are five types of RBS 2000 used in CME 20 and CMS 40 system; which are shown in the figure below.

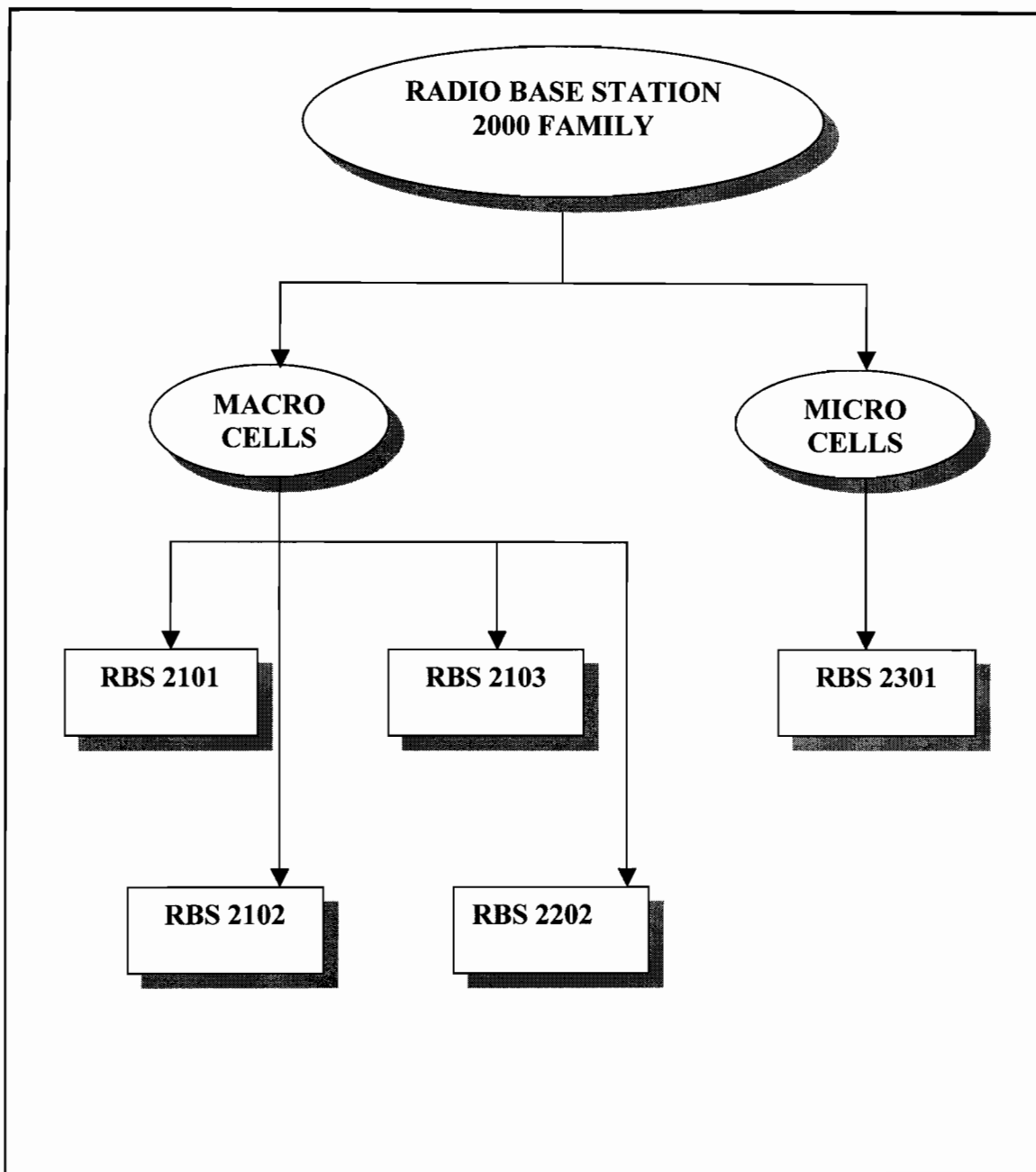


Figure 1.1: *The Radio Base Station 2000 Family*

The Radio Base Station 2000 family can be categorized into two types, which are macro cells and micro cells. The Macro cells cover a relatively large area. One macro cell might support 12 channels and only 12 simultaneous conversations. In a 7-cell reuse pattern with each cell covering a radius of about 11 miles, no improvement is due to the fact that cells must overlap; conversations on the same frequency channels in adjacent cells will interfere with each other.

While the micro cells cover a smaller area. If a macro cell were divided into micro cells, in a 7-cell reuse pattern, a reuse factor of 128 is realized. The same 12 channels could support 1,536 simultaneous conversations.

1.3. Outline of Thesis

This thesis is divided into ten chapters. The subject matter of each chapter logically builds on the information presented in the previous chapters.

Chapter 1 provides an introduction to the Radio Base Station that is important in our telecommunications scope. Besides that, the objectives of this report are also described in this chapter.

Chapter 2 provides a history, definition and concept of Radio Base Station in the telecommunication network.

Chapter 3 describes the systems that are used by the Radio Base Station. The Radio Base Station 2000 uses the GSM (Global System for Mobile Communication) system.

Chapter 4 provides a description of antenna system. The basic of antenna and the antenna terminology can be seen in this chapter.

Chapter 5 provides the types of Radio Base Station 2000. They are RBS 2101, RBS 2102, RBS 2103, RBS 2202 and RBS 2301. The cabinet and the technical data of each type of Radio Base Station 2000 are described in this chapter.

Chapter 6 provides the architecture of the Radio Base Station and the function of equipment in the Radio Base Station 2000 system. The hardware and software architecture of RBS Macro and RBS Micro are described in this chapter.

Chapter 7 provides the cabinet installation of the outdoor and indoor cabinet. The preparation and installation of the outdoor and indoor cabinet can be seen in this chapter.

Chapter 8 provides the trouble shooting that always occurs at the site and the best solution to solve the problems. Besides that, the tools for testing the Radio Base Station 2000 are described in this chapter.