Approach for Switching Automatic Protection Using Mobile Signal

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ABSTRACT
This paper, approaches for availability and performance of a wireless system with an automatic protection switching for smart vehicle. The wireless communication networks are more subjected to the channel impairment than wire line communication networks. In modern telecommunications network, it is transferred as packet data (packet switching). The processing of these packets has been resulted the creation of Integrated Circuits that are optimized to deal with this form of data. The signal transmitted through cell-phone can open the doors of a car that have a centralized locking system.

Keywords
MTSO, RSSI Cell, GSM, USDC, APS**,** MANET, Microprocessor, Bluetooth.

1. INTRODUCTION
In older telecommunications networks, information (data) is transferred as analog signals such as in analog TV/Radio networks. In modern telecommunications network, it is transferred as packet data (termed as packet switching). The processing of these packets has been resulted the creation of Integrated Circuits (ICs) that are optimized to deal with this form of data. Network processors have specific features to optimize packet processing within these networks. This evolution has resulted in more complex and more flexible ICs being created. The newer circuits are programmable and thus allow a single monolithic IC design to undertake a number of different functions, where the appropriate program is installed. The telephone network is now widely used to carry digital information.[1] This architecture is general and can be used to describe the existing wireless systems, such as GSM (Global System for Mobile Communications) and USDC (United States

Digital Cellular). Mobile Ad hoc Networking [10] (MANET) has become a lively field within the past few

years. Since it is difficult to conduct experiments with real mobile computers and wireless networks, nearly all published MANET articles are buttressed with simulation results, and the simulations are based on common simplifying assumptions. Many such assumptions may be too simple; a recent article in *IEEE Communications* warns that "An opinion is spreading that one cannot rely on the majority of the published results on performance evaluation studies of telecommunication networks based on stochastic simulation, since they lack credibility" [PJL02]. It then proceeded to survey 2200 published network simulation results to point out systemic flaws. Microprocessor technology [4, 5] is progressing so rapidly that even experts in the field are having trouble keeping up with current advances. The microprocessor evolved over the course of many years of research, and people all over the world enjoy the benefits of this electronic miracle. It is difficult to think of anything that has affected modern life more than this invention such as cellular phones, wristwatches, calculators, automobiles, stereos, televisions, and computers [1].

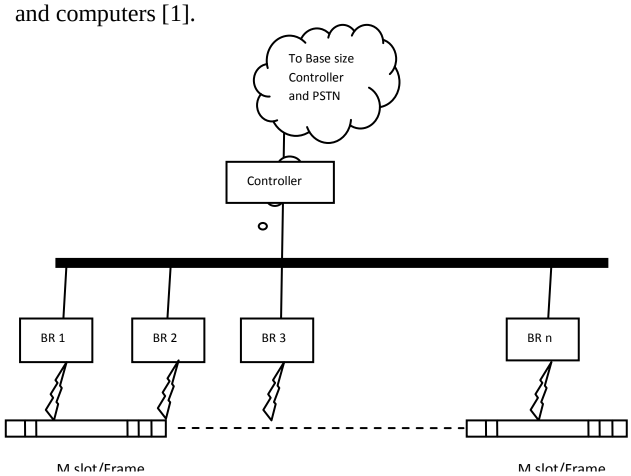

Figure 1 A Base Transceiver System

As more competition develops in this billion a year business, power and speed of the microprocessor is expanding at an almost explosive rate. The changes have been most evident over the last decade. The microprocessor has changed the way computers work by making them faster. The microprocessor is often called the brain of the CPU (Central Processing Unit) and without the microprocessor the computer is more or less useless. Network processors [5] are used in the manufacture of many different types of instruments such as: Router, firewalls, detection device, prevention device and monitoring system.

2. CELLULAR PHONES SYSTEM
Cellular telephone system is extremely popular and lucrative worldwide, these are the system that ignited the wireless revolution. Cellular system provided two way voice and data communication with regional, national and international coverage. Cellular radio telephones are usually installed in cars, trucks and are available handheld models also. The conventional telephone does not provide communication services in remote location. Telephone communication from vehicle is also desirable. Therefore, cellular radio telephones are necessary. Fig. 2 describes how the area served by cellular telephone is divided into cell.

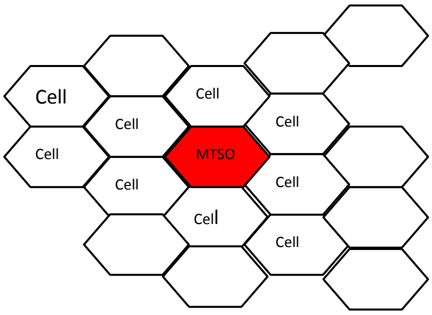

Figure 2 Cellular Telephone Is Divided Into Cell.

In old Mobile Telephone System (MTS) [6] only one large radio repeater station was used. It contains a high power transmitter. But concept of cellular radio is that, rather than serving a given geographic area with a single transmitter and receiver, the area is divided into many smaller areas known as cells. A cell covers small area and contains its own receiver and low power transmitter. The desired service area is divided into many cells. Each cell site is chosen to serve the vehicles in that cell area. Each cell is connected by telephone lines to a master control centre **Mobile Telephone Switching Office (MTSO).** As a vehicle containing the telephone passes through a cell, it is served by that cell transceiver. The telephone call is routed through the MTSO and telephone system. As the vehicle moves to the next cell, the system automatically switches from one cell to next. When the signal strength drop below a desired level, the receiver in the cell station automatically seek a cell where the signal from mobile unit is stronger. [1] A computer at MTSO switches the transmission from the vehicle to that stronger cell in a very short period of time. Cellular radio system operates at higher frequencies (800 to 900 MHz), therefore, more spectrum space is available. The signal derived from the DEM. And used to tell MTSO about received signal strength is called "Received Signals Strength Indicator (RSSI)" MTSO makes the decision from RSSI about switching to another cell. A general block diagram of cellular radio is shown in figure (3).

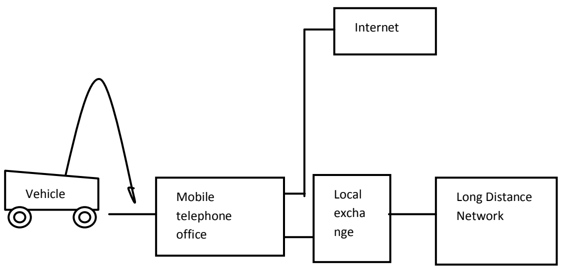

Figure 3 Cellular Network Architecture

3. WIRELESS SYSTEMS WITH AUTOMATIC PROTECTION SWITCHING (APS)

With APS occurs, [2, 9] the talking channels on the failed base repeater will be switched to other working base repeaters if excess idle channels are available. If the number of idle channels is not less than *M* _ when the base repeater failure occurs, then all the talking channels can be switched to the working base repeaters. Note that the talking channels can be switched to different base repeaters. If the number of idle channels, *j* is less than *M* _ when the base repeater failure occurs, then (1) some of the talking channels cannot be switched to the working base repeaters, (2) all the channels are busy after APS, and (3) *M* - *j* _ ongoing calls will be dropped. When the control channel will be switched to other base repeater even if there are no spare channels available, i.e., one ongoing talk will be preemptively dropped to make room for the control channel.

3.1 Markov Chain of System with APS

Figure 4 also illustrates the state diagram of the underlying continuous time Markov chain [2, 9]. State ***(k, 0)*** > represents that the system is working perfectly, with ***k*** _ busy traffic channels. State ***(k, 1)*** represents that one of the base repeaters is down while ***k*** _ traffic channels are busy.

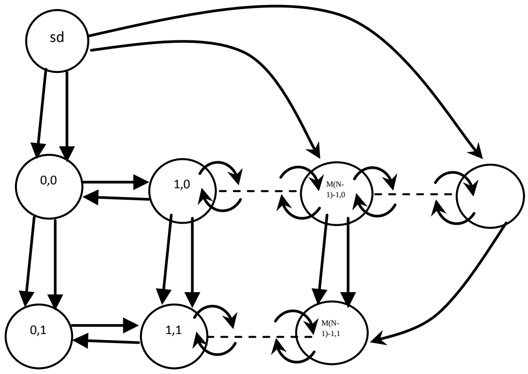

Figure 4 The State Diagram Of Markov Chain.

3.2 Hierarchical Model of System with APS

The model in Fig. 4 can be decomposed hierarchically with the higher level focusing on availability (see Figure 5), Where state ***0*** and ***1*** are the aggregation of states ***(k, 0)***; and ***(0 < k < MN-1)*** and ***(k,1)***; and ***(0 < k < MN-1)*** respectively, and the lower level focusing on performance. Solving the Markov chain in Figure 5, we have

$$\begin{cases} P_0 = 1\Big/\left(1 + \frac{\lambda_s}{\mu_s} + \frac{N\lambda_{br}}{\mu_{br}}\right), \\ P_1 = P_0 \frac{N\lambda_{br}}{\mu_{br}}, \quad P_{s\_d} = P_0 \frac{\lambda_s}{\mu_s}. \end{cases}$$

The system availability is given as,

$$A = P_0 + P_1 = \frac{1 + N\lambda_{br}/\mu_{br}}{1 + \lambda_s/\mu_s + N\lambda_{br}/\mu_{br}}.$$

Applying the same derivation as in the preceding section, the total blocking probability is given by

$$P_{b,0} = P_b(MN-1),$$

$$P_{d,0} = P_d(MN-1),$$

$$P_{b,1} = P_b(M(N-1)-1),$$

$$P_{d,1} = P_d(M(N-1)-1).$$

$$P_b = P_0 P_{b,0} + P_1 P_{b,1} + P_{s\_d}$$

$$P_d = P_0 P_{d,0} + P_1 P_{d,1} + P_{s\_d}$$

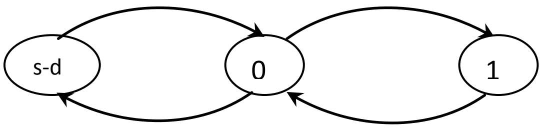

Figure 5 Availability Model for System w/APS

4. SYSTEM AVAILABILITY

Notice that system availability of models is a function of the following parameters: ***N*** as total number of BRs λs, μs, λs and μbr the improvement of availability by APS is achieved by eliminating the ctrl down outage. Mobile communication is able to superimpose another modulating signal. [1] The signals are transmitted through the transmitting media and other wireless operating appliances which are beside the connected cell phone should be active but requirement is that its transmitter should be with a person at a remote distance. Another requirement is Blue-Tooth should be on.

4.1 Transmitter: - This is a low power FM unit operating in the frequency range of 824 to 845 MHz There are 666 transmit channels spaced 30 kHz apart. The carrier provided by a frequency synthesizer's phase modulated. Pre emphasis is used to minimize noise [7]. The maximum power output of transmitter is 3W.The Automatic Power Control (APC) circuit causes the transmitter power to change or decrease based on an input control signal from MTSO.

4.2 Antenna: - The transmitter output is fed to the isolator or duplexer circuit that allows the transmitter and receiver to share the same antenna. The duplexer consists of two band pass filter, one for transmitter and one for receiver.

4.3 Frequency Synthesizer: - This section develops all signals used by transmitter and the receiver [7]. The frequency generated by transmitter and receiver is simulated by this unit. Frequency difference of transmitting frequency and receiving frequency is properly maintained to avoid the overlapping of the frequencies.

4.4 Receiver: - This operates frequency range of 870 to 890 MHz transmit and receive frequency are spaced by 45 MHz, apart. The receiver is double super heterodyne type [6]. It consist of duplexer, RF amplifier, mixer, local oscillator, IF amplifier, FM demodulator and audio oscillator. The signal derived from the DEM. And used to tell MTSO about received signal strength is called "Received Signals Strength Indicator (RSSI)" MTSO makes the decision from RSSI about switching to another cell [7].

4.5 Control Unit: - This contains the hand set with speaker and microphone. It also contains a touch-tone dialing circuit. The control unit is operated by microprocessor that drives indicators [8].

4.6 Logic Circuit: - This unit interprets the serial data from the cell site and MTSO. It contains a microprocessor with random-access-memory and read-only-memory [8].

5. CONCLUSIONS

From this paper, it is concluded that the automatic protection switching can enhance the availability of the wireless system significantly. It also improves the performance in terms of new call blocking probability and handoff call dropping probability. The effect of increasing the number of reserved channels for handoff calls is also investigated. A related optimization problem has also been raised by introducing a weighted objective function of new call blocking probability and handoff call dropping probability. Further studies include evaluating the perform ability of wireless system with multiple control channels and integrated services, and Blue-Tooth.

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