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DUAL SIM DUAL ACTIVE FEATURE IN A 3G MODEM: A COMPREHENSIVE SURVEY

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Abstract:

Now a day's wirelessly connected mobile devices are present almost everywhere. During the last decade mobile communications substantially became a crucial part of individuals' daily routine worldwide. Dual-SIM mobile phones utilize technology that permits the use of two SIMs at a time. The technology permits simultaneous access to the mobile network services. The Dual SIM Dual Active (DSDA) phones keep both SIMs active at all time. When you are taking calls on one SIM, you will still receive calls and messages on the other. You will get the option to put the first call on Hold and attend the call on the other SIM. This paper focuses on improving the technique used for handling Multisim in a 3G mobile modem. It also focuses on synchronization mechanism used for interaction among all the subsystems (viz. 2G, 3G, and LTE etc.) on occurrence of a dual sim scenario. The improvisation can be done by adding an extra core and an extra firmware for dual core communication.

Index Terms: Modem, 3G, Multisim, Dual Core & Firmware

1. Introduction:

As the accelerating pace for the rapid change in the mobile market, substantial consumer demand for smart phones, tablets and other mobile devices is fueling the worlds market. From consumer markets perspective a product is smart, cost efficient and successful if it can be operated smoothly while talking, moving or in idle mode.

"Dual-SIM mobile phones utilize technology that permits the use of two SIMs at a time." The technology permits simultaneous access to the mobile network services. "The Dual SIM Dual Active (DSDA) phones keep both SIMs active at all time." When you are taking calls on one SIM, you will still receive calls and messages on the other. You will get the option to put the first call on Hold and attend the call on the other SIM. Dual Active phones have two separate Transceivers and in some cases different processor cores for both SIM [4].

"The first phone to include dual SIM functionality was the Benefon Twin, released by Benefon in 2000." "The two major types of dual-SIM phones are active and standby." Dual-SIM Standby (DSS) requires the user to specify which of the two SIMs is able to transmit or receive voice calls and data while Dual-SIM Active (DSA) enables both cards to receive voice calls and data at the same time. This latter feature usually requires an additional transceiver for the secondary SIM.

A standby phone allows both SIMs to be accessed through time multiplexing. When making or receiving calls, the modem locks to the active channel; the other channel would be ignored and thus unavailable during the duration of the call. Two examples of Dual-SIM Standby smart phones are the Samsung Galaxy S Duos and the Sony Xperia M2 Dual. Dual SIM Active phones, however, come with two transceivers, and are capable of receiving calls on both SIM [2]. "DSDA ("Dual SIM Dual Active") supports two parallel and independent 3G connections for two SIM cards." Note that the

term 3G is used for W-CDMA/HSPA+. It can be realized by a single baseband. This paper eliminates the bottlenecks that are presented in the operation of control unit of mobile phone to meet the optimal performance.

2. 3G Physical Layer:

First and foremost requirement is to understand 3G physical layer architecture. UMTS is a 3rd generation telecommunication network based on the existing GSM (2nd generation) core network employing a totally new radio access technology WCDMA. 3G was developed mainly to provide high data rate (up to 2 Mbps).

WCDMA is a wideband Direct-Sequence Code Division Multiple Access (DS-CDMA) system, i.e. user information bits are spread over a wide bandwidth by multiplying the user data with quasi-random bits (called chips) derived from CDMA spreading codes. In order to support very high bit rates (up to 2 Mbps), the use of a variable spreading factor and multicode connections is supported.

The chip rate of 3.84 Mcps leads to a carrier bandwidth of approximately 5 MHz. DSCDMA systems with a bandwidth of about 1 MHz, such as IS-95, are commonly referred to as narrowband CDMA systems. The inherently wide carrier bandwidth of WCDMA supports high user data rates and also has certain performance benefits, such as increased multipath diversity [3].

The physical layer of the radio interface has been typically the main discussion topic when different cellular systems have been compared against each other. The physical layer structures naturally relate directly to the achievable performance issues when observing a single link between a terminal station and a base station.

3. Literature Survey:

The literature related to the research topic has been reviewed for last few years in order to find out work carried out by various researchers. It is noticed that most of the research carried out belongs to the following categories: [5] The paper "Research and Design of Dual-Network Dual-Standby in Radio Interface Layer Based on Android" focuses on the improvement and the implementation of Dual-Network Dual-Standby (DNDS) based on Android. In this paper the research was carried out on the call processing system. The new design scheme improves the Radio Interface Layer (RIL) and transplants a new set of RIL Daemon (RILD) processing mechanism. The result shows that this method has the advantages of simple, easy transplant, and effectively reduces the complexity and workload.

[6] "A Power-saving Standby Method to Extend Battery Life in Dual-mode Cellular Phones" presents Dual-mode cellular phones, including smart phones, are recently attracting much attention from both users and telecom operators throughout many countries. To avoid traffic concentration generated by these devices on 3G networks, it is important to lead users to connect with fixed networks via WLAN. However, keeping both 3G and WLAN interfaces on consumes a great deal of power, which considerably shortens the standby time. To achieve longer battery life, they have proposed a power-saving standby method (PSSM) whose features are: (1) constant deactivation of the WLAN interfaces except for when required; (2) no additional functions in a mobile operator's network; and (3) avoidance of a WLAN AP search distant from a cellular phone.

[7] The Paper "Performance improvements of Universal Mobile Telecommunications System enhanced uplink using mitigation scheme in single Tx and dual Rx dual-SIM dual-active devices" presents a Single Tx and dual Rx dual-SIM dual-active features can connect two separate networks at the same time using a single transmit chain through a timesharing schedule. The timesharing schedule sets the

priority of the two simultaneous connections and assigns the user equipment uplink time slots to transmit data based on preference of the two simultaneous connections. Global System for Mobile Communications (GSM) and Universal Mobile Telecommunications System (UMTS), two concurrent radio access technologies, are considered for performance evaluations.

These papers can depict the conclusion of literature survey that in the first paper the work carried out was on DNDS call processing system, the second paper is on power saving concept in Dual-mode cellular phones and the last one is on connecting two separate networks at the same time using a single transmit chain through a timesharing schedule. In our work, we are going to work on DSDA system and we are using single baseband modem for both the sim.

4. Implementation:

The boot procedure is initiated each time when one of the following resets occurs in the 3G Layer 1 Control Firmware x instance:

External Reset: The external reset is initiated by setting the reset signal RST3G of the 3G Layer 1 Control Firmware x instance. Typically the Host does this after power up.

Watchdog Reset: A watchdog reset happens if the Watchdog hasn't been reloaded in time due to Firmware problems.

Wake-Up Reset: This happens when the 3G Core was in power saving mode and becomes active again.

The above mentioned reset types are clearly described in the following sections. After a reset occurred the 3G Layer 1 Firmware x Bootloader x will be started. This Bootloader is placed in ROM. For communication between the Host software and the 3G Layer 1 Control Firmware Bootloader x the corresponding Module's COM-RAM x of the 3G Layer 1 Control Firmware x instance is used [2].

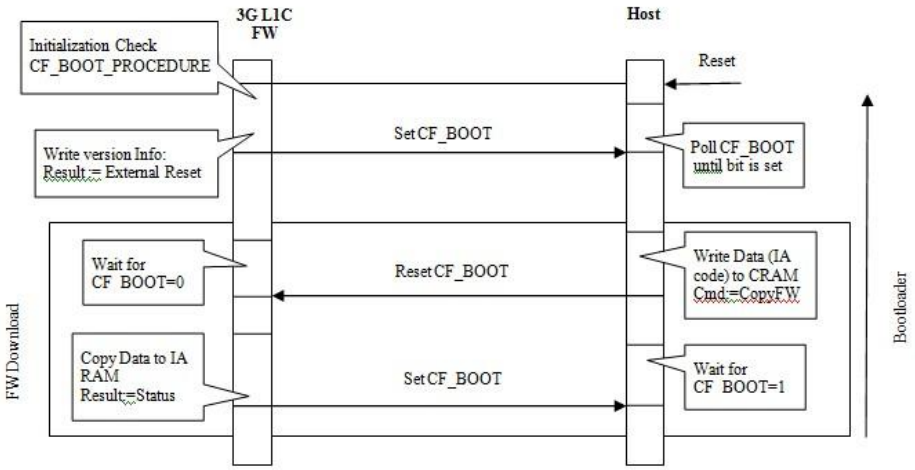

Figure 1: External Reset Boot Procedure

In external reset, If the Host invokes a reset on the RST3G_n line a download of the 3G Layer 1 Control Firmware x instance has to be done as shown in figure 1, because all memories are also reset. There are two different way to boot the 3G core. These are:

- ✓ Boot via COMRAM
- ✓ Boot via DMA

The different boot procedure will be described in more details in the following sections. The Communication Flag will indicate if the "Boot via COMRAM" or the "Boot via DMA" shall be applied by the 3G Layer 1 Control Bootloader. If this Communication Flag is set the "Boot via DMA" procedure shall be performed and if it is reset the "Boot via COMRAM" procedure shall be performed.

In Boot via COMRAM, the boot procedure shall be applied by the Host if the first 3G Layer 1 Control firmware instance is booted after an external reset occurs. If an external reset occurred all interrupt sources except the Watchdog interrupt are disabled. This is done automatically by the 3G Layer 1 Control firmware x instance. After an External reset occurred the Bootloader will first check the Communication Flag and if this flag is set to 0 continues. Otherwise, if the flag is set it will continue with the "Boot via DMA" procedure. Afterwards the Bootloader perform some necessary initialization. After the initialization have been done, the Bootloader will write the Hardware version and the Bootloader version to the corresponding core's COM-RAM x addresses. After booting the Host, it is allowed to send any request message to the 3G L1C FW x instance that can be executed by the 3G PHY.

In Boot via DMA, If booting via DMA is used the code of the 3G L1C FW instance x is loaded via the CPU DMA to the IRAM/DRAM of the corresponding 3G core instance. The 3G L1C FW Bootloader is not needed for this. The DSP and MASIP firmware image will not be downloaded in this case. The booting of the HSDPA carrier modules and Rake carrier modules will be triggered by the corresponding 3G CPU on demand. Pre-requisite for the "Boot via DMA" is that the 3G L1C FW image, the HSDPA DSP firmware image of the 3 HSDPA carrier modules, the MASIP firmware image of the 3 HSDPA carrier modules and the Rake DSP firmware image of the 2 Rake carrier modules are loaded into the external memory by the Host. Therefore there is a memory area reserved in the external memory for this purpose.

5. Conclusion and Future Scope:

All mobile companies are trying their best to develop and sell products competitively still with the DSDA feature as one of the main concerns. In this survey paper, we arrived at a potential solution for the Dual Sim Dual Active feature during 3G Dual core booting service with sim swap scenarios.

Dual-Sim Dual-Active is the best feature to support the operation of two SIM's on 3G at the same time without doubling up the 3G baseband hardware resources. So the modem can enable two fully independent voice/data sessions concurrently. It is advancement in mobile technology and going to be implemented in Intel based mobiles & tablets.

Future scope involves developing an efficient 3G modem using the advancement in Multisim feature. So that it can be used to keep both the SIM active simultaneously. It is possible to make the solution even more end user friendly by introducing following features:

- ✓ Transmitter & Receiver Blanking
- ✓ Diversity Blanking
- ✓ Transmitter & Receiver Toggling

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