Framework Enhancement for Received Signal Strength Monitoring in SBTS

Ambica[1], Dhanalaxmi.L[2]

[1]Student, [2]Assistant Professor
Department of Electronics and Communication Engineering
Bangalore Institute of Technology, Bangalore

Abstract— In the on-going electronic world, many applications are working on networking and communication. The most common limitation among all of them is time consumption. Base transceiver station is used inmanywireless communicationstandards. A BTS forms allied part of the base station subsystem developments for system management. Base transceiver station consists of several transceivers which helps in serving many different frequencies and so many different sectors of the cell. SBTS is a product by Nokia which can support 3 RATS (LTE, WCDMA and GSM) in one System Module (FSMr3).SBTS uses K3 tool to do end-to-end Automation testing, which is used to reduce the complexity of usage of number of hardware components in setting up communication environment. K3 is a wrapper on top of TTCN-3 script. RSSI can be used as a tool to give an indication of line quality. It does not always give sharp results. In addition to normal fluctuation in received signal levels, the signal level can also be infected by in_band interference sources. When it happens, a intense signal level can be reported. But data can be corrupted. Communication systems should be implemented with some link margin to ensure reliable communications in changing conditions. In such cases where it is wished to test signal quality, a loopback test should be performed to give the best indication of line quality by measuring actual data transfer success. The amount of best packets received during a loopback test is the best way to get an idea of the quality of communication in a data radio system.

***Index Terms*— RSSI, BTS, BSS, TTCN-3, GSM,**

I. INTRODUCTION

Since from few days, there has been a rapid development of digital mobile networks. The broadness of mobile radio has changed the way of communication that is using in information services. Single RAN (radio access network) BTS (Base Transceiver Station) architecture offers a useful approach to the efficient modernization of the networks while simultaneously ensuring that systems are flexible and prepared for the future.Single RAN BTS strategy is straightforward, it runs diverse radio technologies(RATs) on a solitary multi-reason equipment stage.

Single RAN BTS will involve one radio establishment with normal transport and operational and administration framework with being coordinated bound together security crosswise over radio get to advancements (RATs). It empowers the co-appointment and operation of various RATs, and in addition helps in utilizing existed RATs to bring the best execution by planning their favorable circumstances.

MaxStream radio modules has receivers those are able to receive and amplify very weak signals from a very far transmitter. The receiver can successfully pick up the weakest signal and demodulate at an acceptable bit_error rate is called receiver sensitivity.

Far away transmitter is moved closer to a receiver, then the strength of the transmitted signal at the receiving antenna will be increased. Measuring the strength of the signal at the receiving antenna is one best method of calculating the quality of the communication link.The primary functionality of this module is to monitor the signals received from the main and diversity paths.

It provides continuous antenna supervision for all TRX objects in supervisory mode, which are not locked and also contain a diversity pathRSSI data currently can be observed from BTS Manager/Element Manager, but the data can be get for one BTS at one time. The deep optimization service need monitoring the Rx Difference for a large mount of BTS, And the analysis purpose need long time data storage for statistic calculation. the Element Manager does not contented for these requirement. Enhancements on RSSI helps in Collecting RSSI average values from BTS and store them into NetAct database.

II. RELATED WORK

Received signal strength indicator is a record of how well your device can here a signal from an access point or router. This value that is helpful in determining the enough signal to get a good wireless connection. RSSI value is stored from the client's device, it is not the same as transmited power from a router. RSSI is used to measure the relative quality of a received signal to a client device, but has no accurate value.
RSSI functional module will have all the required functionality for monitoring of main and Diversity RSSI (Rx signal) balance. The purpose of this feature is to monitor the Rx antennas condition. Rx antennas can be monitored to detect major problems by taking a long-term average of the difference between Main and Diversity Rx RSSI (Received Signal Strength Indication). This

feature can provide continuous antenna supervision for all TRX objects in Supervisory mode, which are not locked and also contain a diversity path.

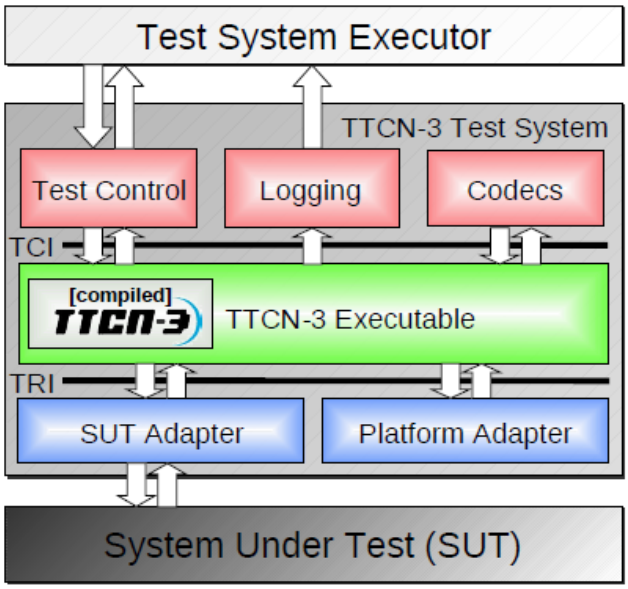
III. FRAME WORK

A framework is a set of guidelines, protocols, rules and standards for creating and designing test cases. It is a layered functions and structure which indicates what kind of programs can be developed. It may be a set of functions and how they interrelate. The test automation framework is a combination of concepts and tools that uses internal libraries and reusable code modules to provide a backbone for test automation. Testing automation frameworks can orient test cases by providing the test case syntax, including directions for methodology, and setting up a scope for iterative testing to make the whole process more efficient and easy.

The advantages of test automation is scalability, ease of scripting, increase in modularity, reusability, less cost and maintenance. Minimum manual intervention is one of the main advantage.

TTCN-3 is an adaptable dialect which is pertinent to every responsive framework over an assortment of correspondence interfaces. Different conventions, modules and administrations can be tried. The dialect has capacity to determine dynamic simultaneous testing configurations.it has operations for system and message based correspondence. It has all around characterized sentence structure and the capacity to indicate encoding data and different characteristics.

The main unit of TTCN-3 framework is a module. A module can't be arranged into sub-modules. A module can call definitions from different modules. Modules can have parameters to permit test suite parameterization. A module comprises of a definition part and a control part. The definition part of a module characterizes test segments, correspondence ports, information sorts, constants, test information formats, capacities, marks for strategy calls at ports, test cases, and so on.



TCI = TTCN-3 Control Interface
TRI = TTCN-3 Runtime Interface

Figure 1 The TTCN-3 Test System Architecture

IV. INTERFACES WITH BTS

BTS comprises of a Transceiver (TRX) which handles transmission and gathering of signals, a combiner which consolidates sustains from a few TRXs with the goal that they could be conveyed through a solitary receiving wire in this manner lessening the quantity of reception apparatuses that need be to introduced, a power intensifier which will do flag enhancement from all TRX for transmission through the radio wire, a duplexer which is utilized for withdrawing, sending and accepting signs to or from the radio wire and a radio wire which is an outside piece of the BTS.

BTS can be used in any of the wireless communication standards. It is generally associated with mobile communication technologies like GSM and CDMA. A BTS is a part of the base station subsystem (BSS). Base transceiver station will have many number of transceivers (TRXs) which allow it to serve several different frequencies and many different sectors of the cell.

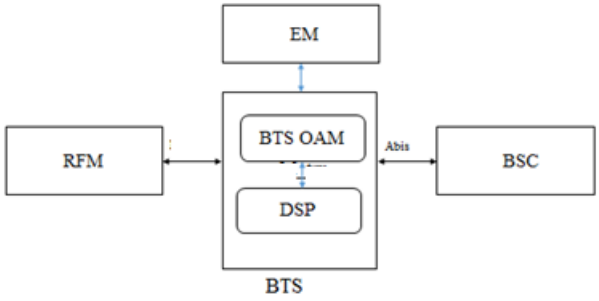


Figure 2 BTS interfaces

System module O&M software controls the operation of whole BTS. It acts as BTS Master to all the units in BTS. SOM interacts with the BSC and terminate the OMUSIG. It communicates with slave O&M tasks running on each unit to control, configure and supervise that particular unit.TRX O&M software is responsible for configuring and supervising the TRX. It is controlled by SOM.

A. Inteface between BTS and DSP

This interface is management interface between System On Module (SOM) and TRX On Module (TOM), which is used for exchange of configuration messages between SOM and TOM software. SOM is BTS O&M. The BTS configuration information is with SOM. SOM pass on the information required for TRX configuration to TOM. SOM-TOM also exchanges messages to perform different tests. The interface is also used to exchange the alarms, status, and test and response messages.

B. Interface between EM and BTS

Thisinterface is management interface between SOM-EM, which is used for exchange of configuration and management messages between System module and EM module. The BTS configuration information lie with SOM and SOM is provided with this information either by BSC or by a site engineer. Site engineer uses EM to pass this information to SOM. This interface is also used to display the various configuration parameters/properties of the BTS to the site engineer. The interface is also used to exchange the alarms, status, and trace and response messages.

C. Interface between RFM and BTS

This interface is management interface between HWMGT-RMGW, which is used by SOM Tasks to access the UNIT OAM interface. All Unit OAM messages have their counter parts in M_rm interface. Only difference is that M_rm messages are c-structure based and Unit OAM messages are XML stream based.

D. Interface between BSC and BTS

It is the interface between BTS and BSC. It transmits traffic and signalling information between GSM BTS and GSM BSC. It is the first physical connection that happens for call to take place. Protocol used is Stream Control Transmission Protocol, SCTP is a protocol which helps in transporting (PSTN) signalling messages over IP network area. SCTP is used in wide applications, including transport of broadcast and streaming data, without the need for TCP. SCTP is a connection_oriented protocol.Itprovides many of the simple features of TCP such as acknowledgments, fragmentation, and sequencing. SCTP helps in eliminating many of the overhead inherent in TCP that can creates delays. It also provides extra features that optimize it for signal transport.

E. Managed object

Managed object presents the current status of the BTS. The reason for this is, M-plane needs to observe the current status and configuration as well as all changes that occurred inside BTS, both hardware related and software related. All required parameters shall be visibe up to date.
Every managed object is uniquely described by distinguished name that is called distname. Dist name consists of MO class, instance identifier and MO distname of his parent.

Let’s consider following MO distname(DN): /MRBTS-1/RAT-1/EQM_L-1/RMOD_L-1/RU_L-1

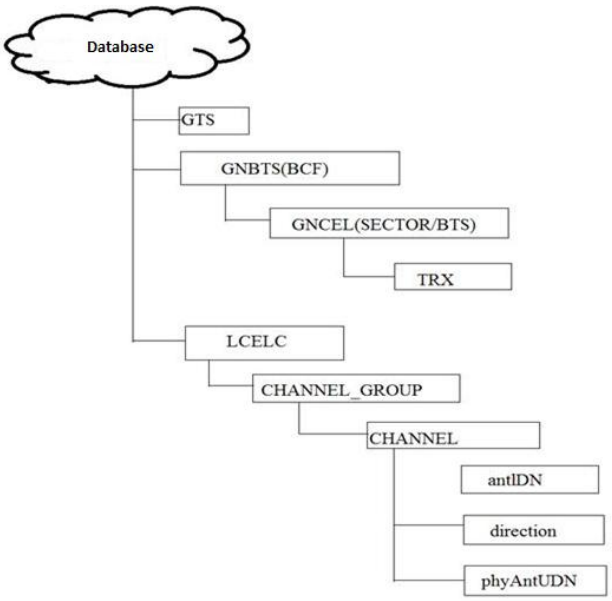


Figure 3 Managed object tree

V. PROPOSED WORK

A. Design flow of Testcase

The GSM BTS software is downloaded in linux container. To test the software downloaded, Digital Signal Processing Unit, Base Station Control Unit and Database are simulated. Abis, Mtrx and Database interfaces are also simulated.

1. GSM base transceiver station software is downloaded and it sends Database Signin request to IM. Once signinis successful GSM data base is created.
2. Digital Signal Processing Unit is brought up.
3. SCTP connection is established.
4. Omusig is established between BSC and BTS.
5. BTS configuration data is sent successful.
6. Baseband flow is initiated.
7. Once baseband flow is completed the trx comes to on air state.
8. BSC sends RSSI COUNTER REQUEST to GTS.
9. GTS send this to DSP (which handles calls).
10. DSP response back by sending RSSI COUNTER RESPONSE.
11. If reported power is grater than threshold level then GTS raise alarm.

VI. SIMULATION FLOW

The Base Station Controller, Digital Signal Processing Unit is simulated using K3 framework. The interfaces are also simulated. Results are captured using logs file. Verification of parameters are done by analyzing logs.

The interface between BSC and BTS is Abis O&M interface. When BTS ID is sent in interface the value may not be the same as used in BSC user interface to identify the BTS object. Instead of the BTS ID of BSC [range 1…4400] the SECTOR_ID [range 1…248] value is used. The SECTOR_ID is unique under the BCF. Sector_id is defined in the BTS object creation by BSC. The first free value under the BCF is used.
when the 10 min duration timer expires, RSSI module sends M_trx__RSSI_COUNT_REQ message to TRX_OM's of all those BB modules for which at least one carrier is in Supervisory mode and unlocked, the TRX shall also have diversity configured.
RSSI module starts a three second timer to receive responses from all the valid TRXs. TRX_OM's responds to RSSI module with M_trx_RSSI_COUNT_RSP message which has the average of RSSI values for main branch and diversity branch and the total number of samples collected for all carriers separately.
If some TRXs have not responded within three seconds then zeroes are used as values for main, diversity and number of samples in the current table corresponding to those BB modules. RSSI module combines all RSSI reports from all BB modules for all carriers. This procedure is repeated 6 times.
After every such iteration, RSSI module appends the RSSI sample size and RSSI values for main and div antennas for every carrier to its previous values. The decision for starting/cancelling the raw alarm is taken only after the 1 hr supervision period, after which the procedure is restarted.

The parameters depend on the configuration file used. For example, 4+4+4 configuration file indicates that there are three sectors and each sector has 4 transceivers. The following parameters are verified from the logs.

TABLE 1: VALIDATED PARAMETERS

PARAMETERS	VALUES
Bsc_Id	1
Bts_Id	1
Hopping-state	0(non-hopping)
Transmitter Power(W)	10
Number of DSP	2
Band(MHz)	900
Number of sectors	3
Rxdiversity	ENABLE

VII. CONCLUSION

Generally all calls are handled by DSP. RSSI request and response messages will exchanged between GTS-BSC and BSC-DSP. If received signal strength is greater than threshold which is calculated by BSC, then GTS will raise alarm to indicate more traffic. Received signal strength indicator is a record of how well your device can here a signal from an access point or router. It is value that is helpful for calculating the enough signal to get a good wireless connection. RSSI value is stored from the client's equipment, it is not the same as transmitted power from a router. RSSI is a used to note down the relative quality of a received signal to a client device, but has no absolute value.

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