MAC-hs UE SIDE (Downlink)

High Level Design Document - MHS_PM

Document Reference No:
NESPL/UMTS_UE/HLD_MHS_PR

Version_7.3.0

NEX-G Exuberant solutions Pvt. Ltd.

C-28, 2nd Floor Sector 65
Noida UP – 201301
INDIA
http://www.exuberantsolutions.com

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NEX-G Exuberant solutions Pvt. Ltd.

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	Name	**Role**	**Signature**
Authored by	**Varun Chhangani** **Ankit Chaudhary** **Gagan Deep Sharma**	**Project Development**	
Approved by	**Mr. Amit Kumar Sinha**	**Team Leader**	
Released by	**Mr.S.S. Bhowmick**	**Manager**	

1. Introduction

1.1 Purpose

The main purpose of this document is to capture the Medium Access Control Layer requirement for -hs part mapping in downlink direction of UE as per 3GPP release 7.3.0.

1.2 Documents and Conventions

As per the company standards.

1.3 Intended Audience

NEX-G Integration team.

1.4 Project Scope

To describe and demonstrate the Medium Access Control requirement in High Speed UE based on Release 7.3.0 3GPP Specification.

1.5References

3GPP TS 25.321: “Medium Access Control Protocol Specification”.

3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

3GPP TS 33.102: "Security architecture".

3GPP TS 34.123: " Testing”.

3GPP TS 25.301: "Radio Interface Protocol Architecture"

3GPP TS 25.302: “Services provided by the physical layer”.

3GPP TS 25.123: “Services provided by the physical layer”

2. Overall Description

2.1 Productive Perceptive

NEXP 4 is a terminal which will support 3G, 4G technologies. Our software will reside in ARM 11processor. The product will be supporting UMTS, HSPA, Wi - MAX. It will be having Physical layer Interface to Wi-MAX (OFDM, FDMA and MIMO) TX/RX and UMTS (WDCMA). MAC for dedicated UE Side Procedures are being designed here. The product is scheduled to be release in 2013.

2.2 Features

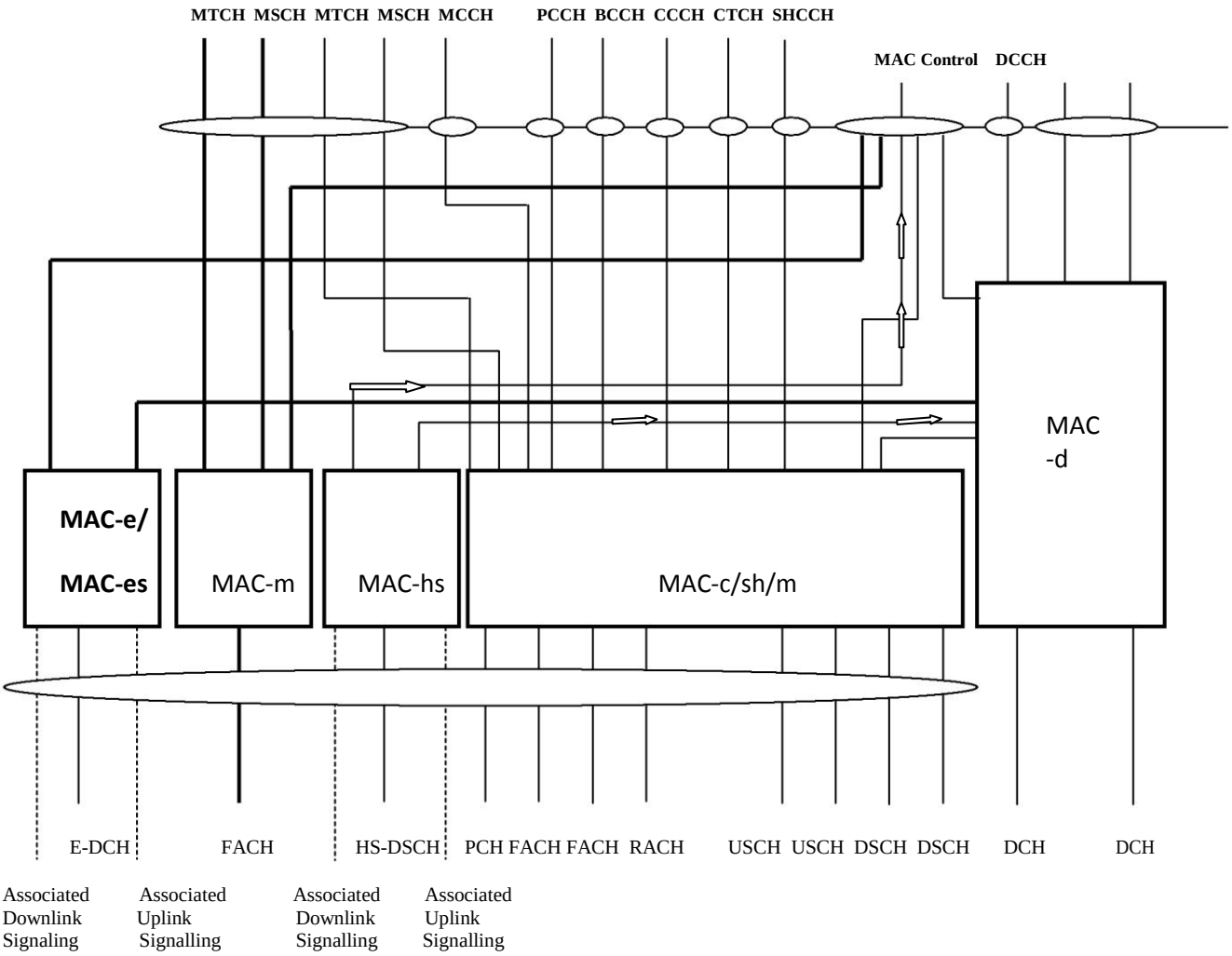
The products will Support Data Rates of the order of 2 Mbps to 50 Mbps. It will be having an interface to the peripherals likes of LCD screens, Audio/Video Interfaces.

2.3 Operating Environment

Currently simulating on Linux 12_04, final platform will be RTOS **(REX, L4, Blast, Hexagon**) ARM 11 processor, GCC Compiler, & vim editor.

3. ARCHITECTURE

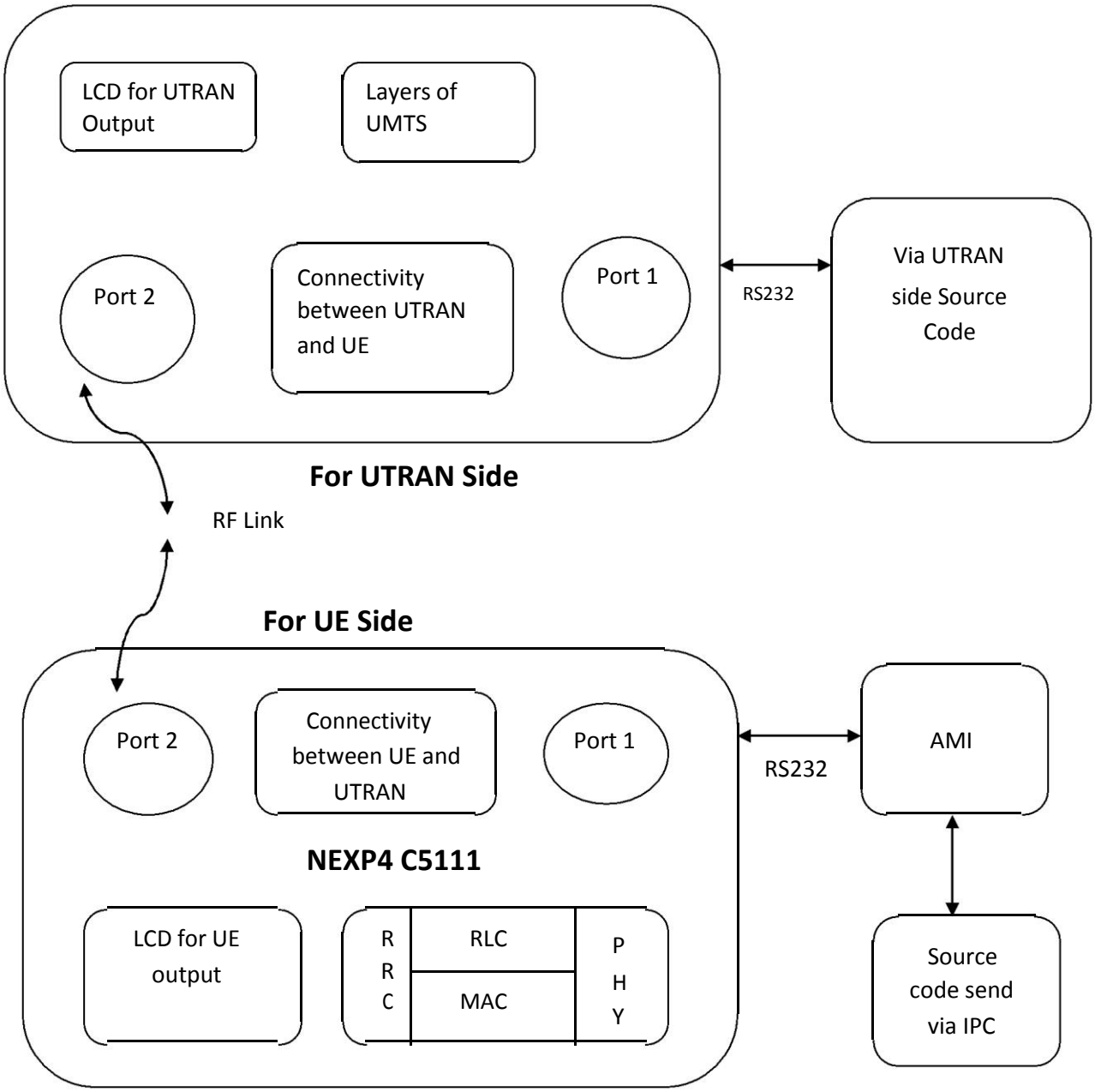
3.1 TRAFFIC RELATED ARCHTECTURE - UE SIDE



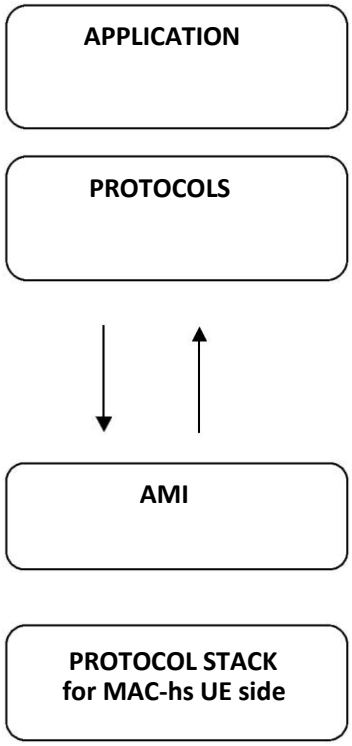
MAC architecture are constructed from MAC entities.
In our Project we only use, the **MAC-hs** is the MAC entity that handles the following transport channels:

➔ High speed downlink shared channel (HS-DSCH)

3.2 Software Architecture :



3.2.1 SOFTWARE ARCITECTURE ACTUAL N/W:

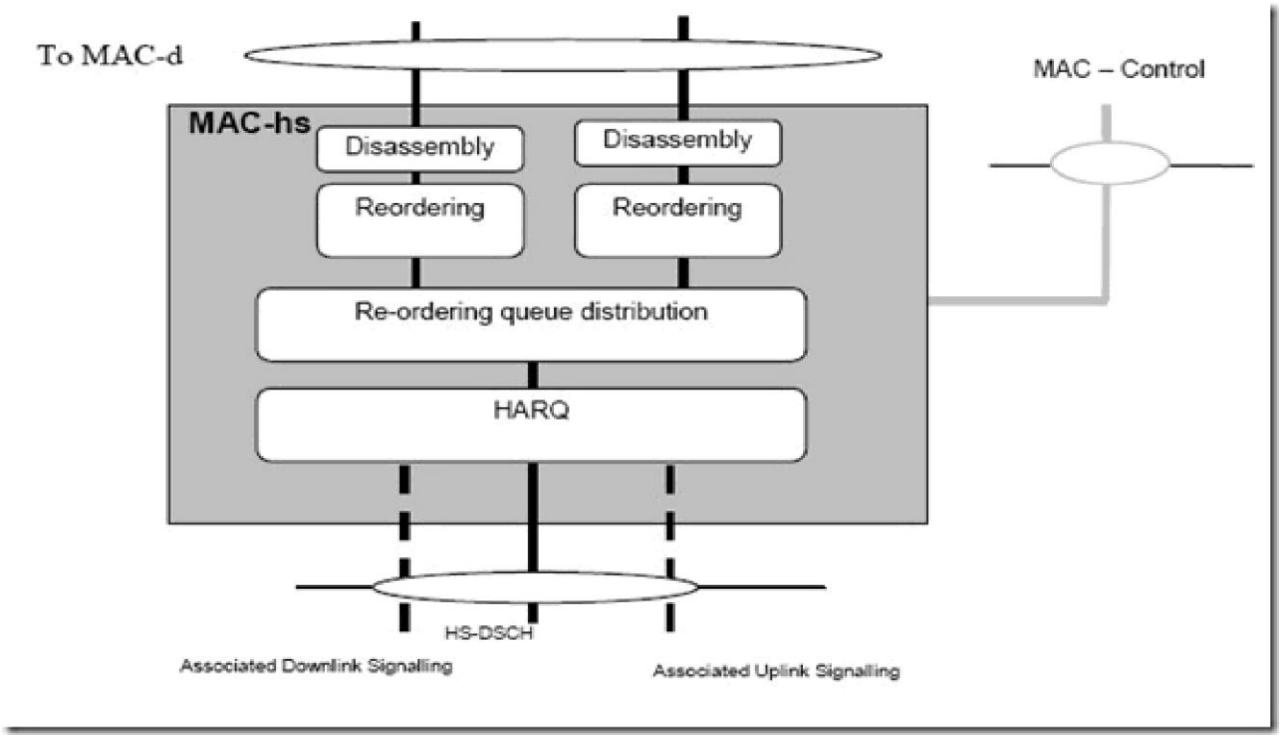


For UMTS/EGDE

AMI: This is Advanced Messaging Interface is use to overcome the problem in AT command. In AMI remove unnecessary protocols and time delay, maximizes standby time, Multi-tasking messaging interface enables multiple simultaneous requests.So that's the reason we are using AMI in UMTS or 3G.

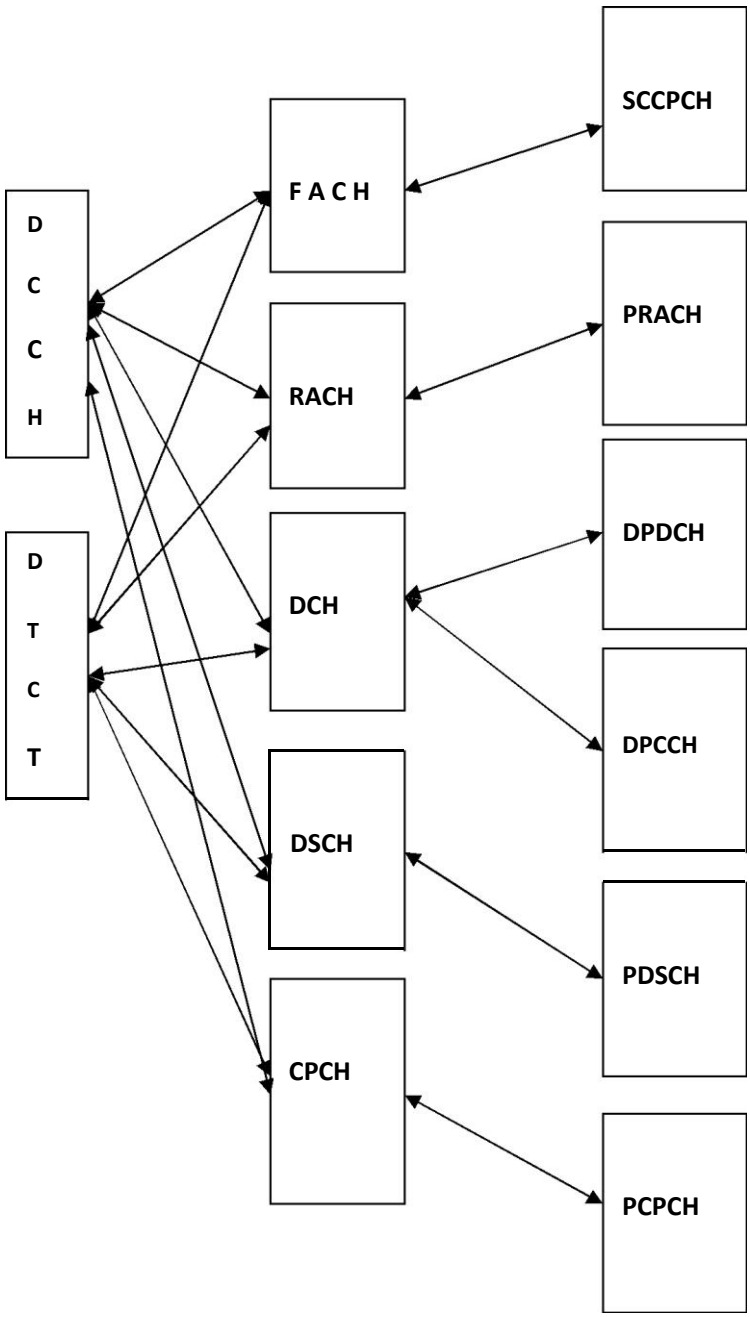
Than we add the software testing and then use of software in application.which is given below

3.3 MAC-hs ENTITY – UE SIDE



In the model above the MAC-hs comprises the following entities. In 1.28 Mcps TDD multi-frequency HS-DSCH cell, the associated downlink control channel and uplink control channel pair controlling the HS-DSCH transmission on the certain carrier shall be allocated on the same carrier. The downlink control channel carries the HS-DSCH operation related info and the uplink control channel carries the feedback info from the UE side.

3.4 CHANNEL STRUCTURE FOR MAC-hs:



4. DESIGN

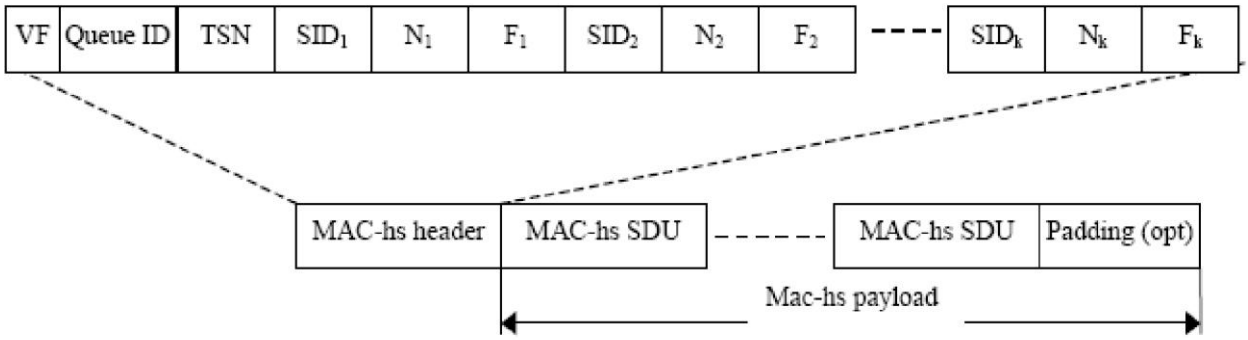
MODELING OF MAC-hs :

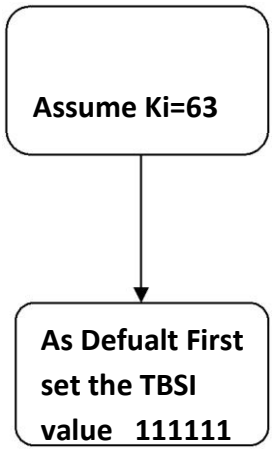
4.1 MODULE 1:

Signalling of Transport Block Size for HS-DSCH:

Set the value of MAC header by TBSI value which is given below

All value is 111111 than set VF, QID, TSN, SID, N, F is one.





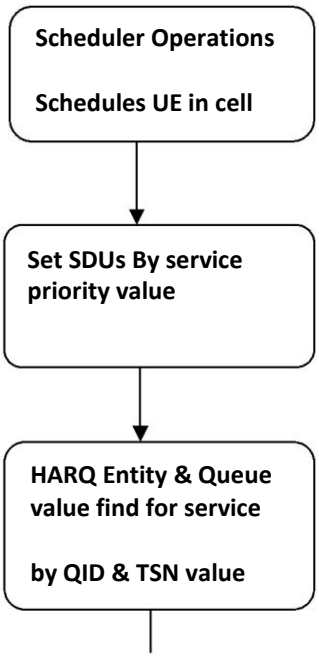
4.2 MODULE 2

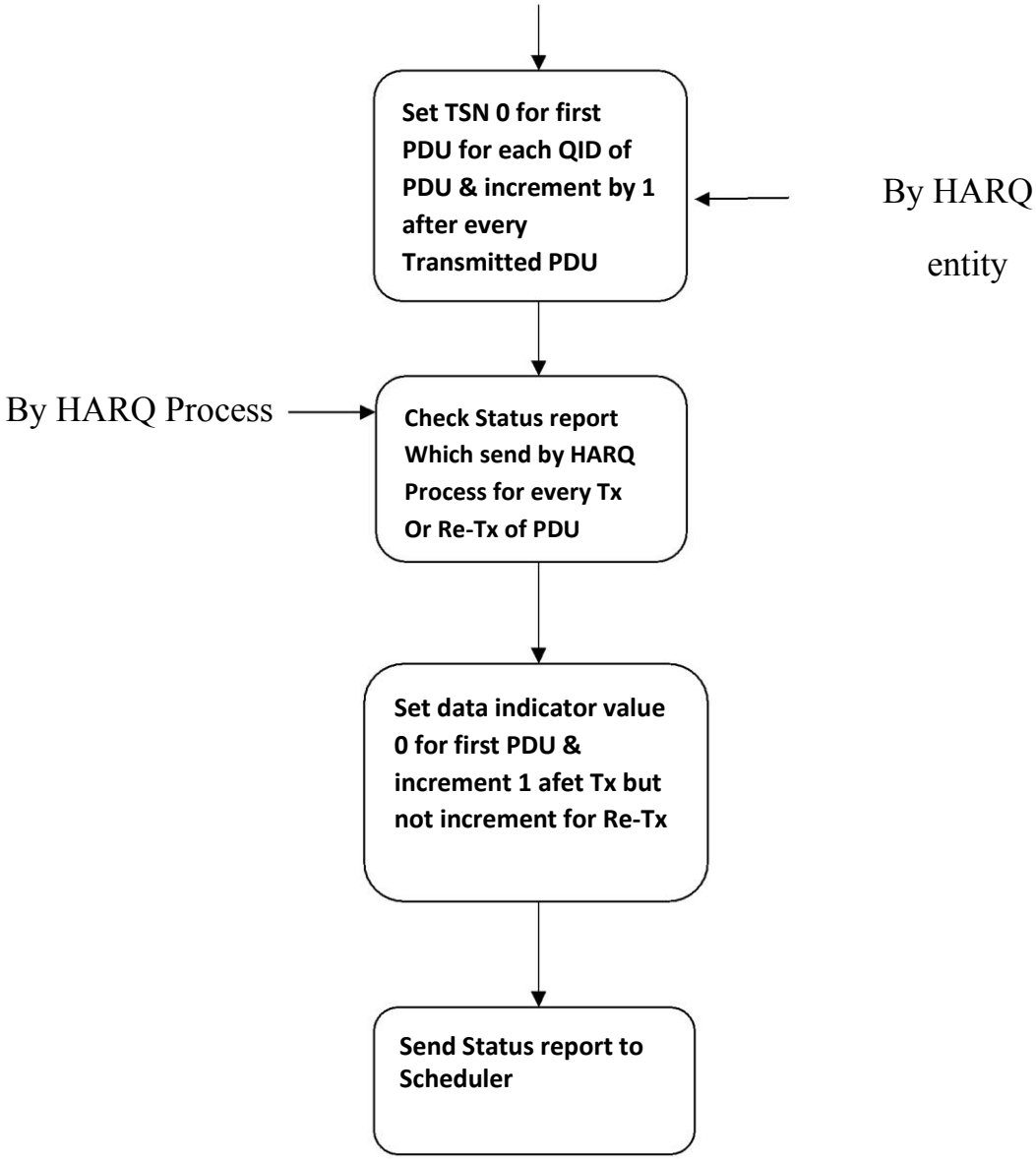
DESCRIPTION OF THE MAC-hs FUNCTION:

The functions which are performed in MAC-hs :

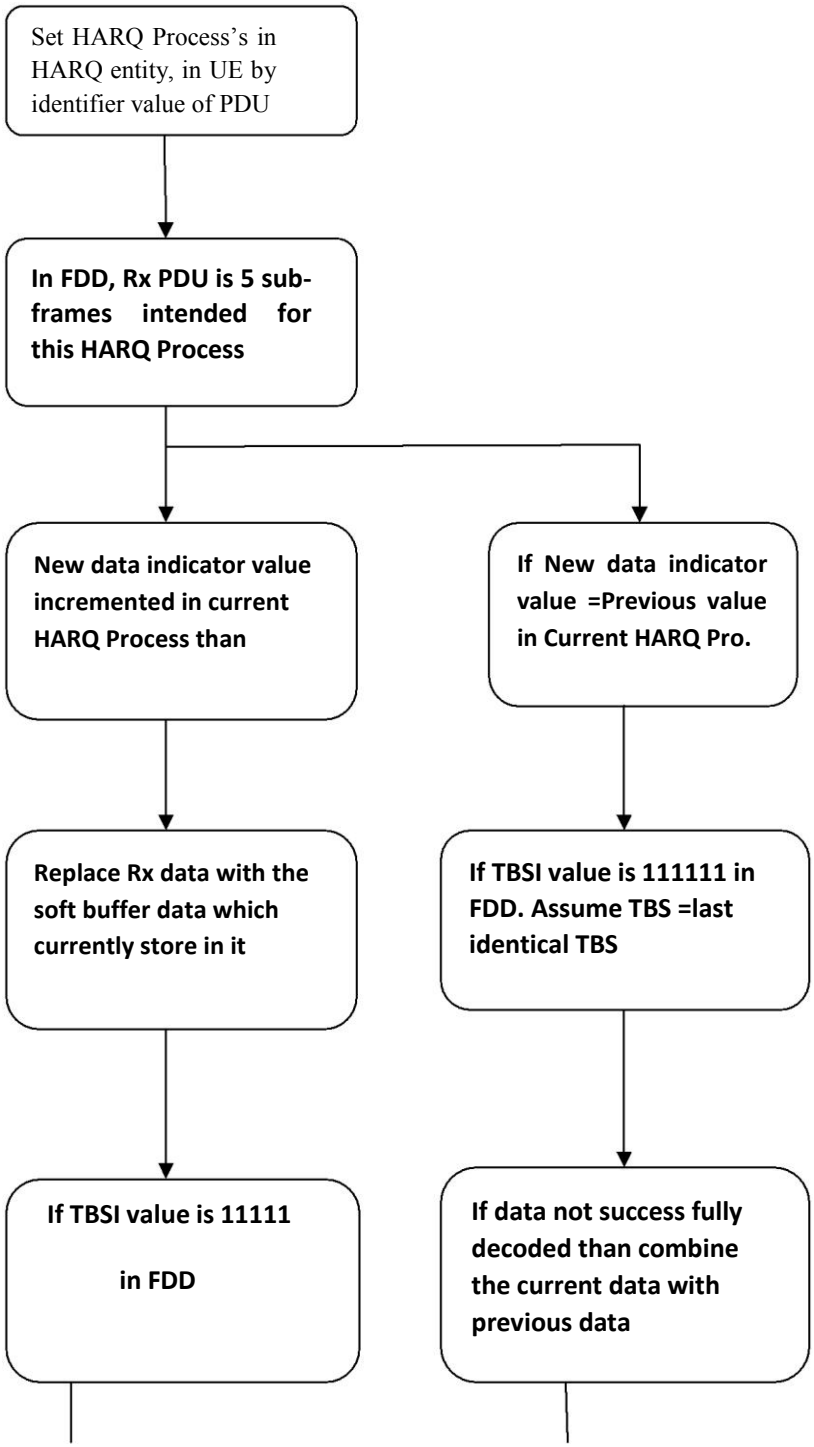
- Control of HS-DSCH transmission and reception:
  - HARQ Entity
  - HARQ Process
  - Reordering Entity
  - Disassembly Entity

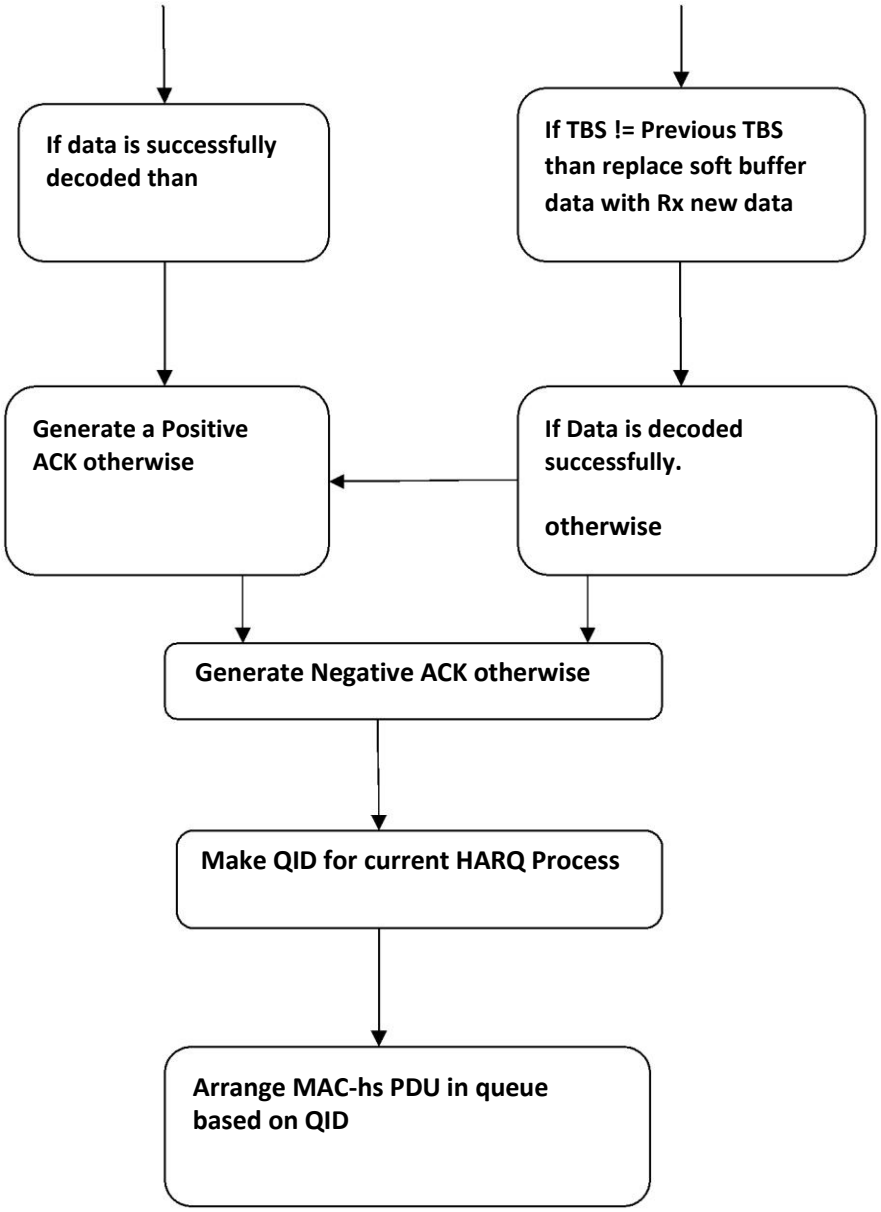
4.2.1 MODULE 4.1 Network Operation:



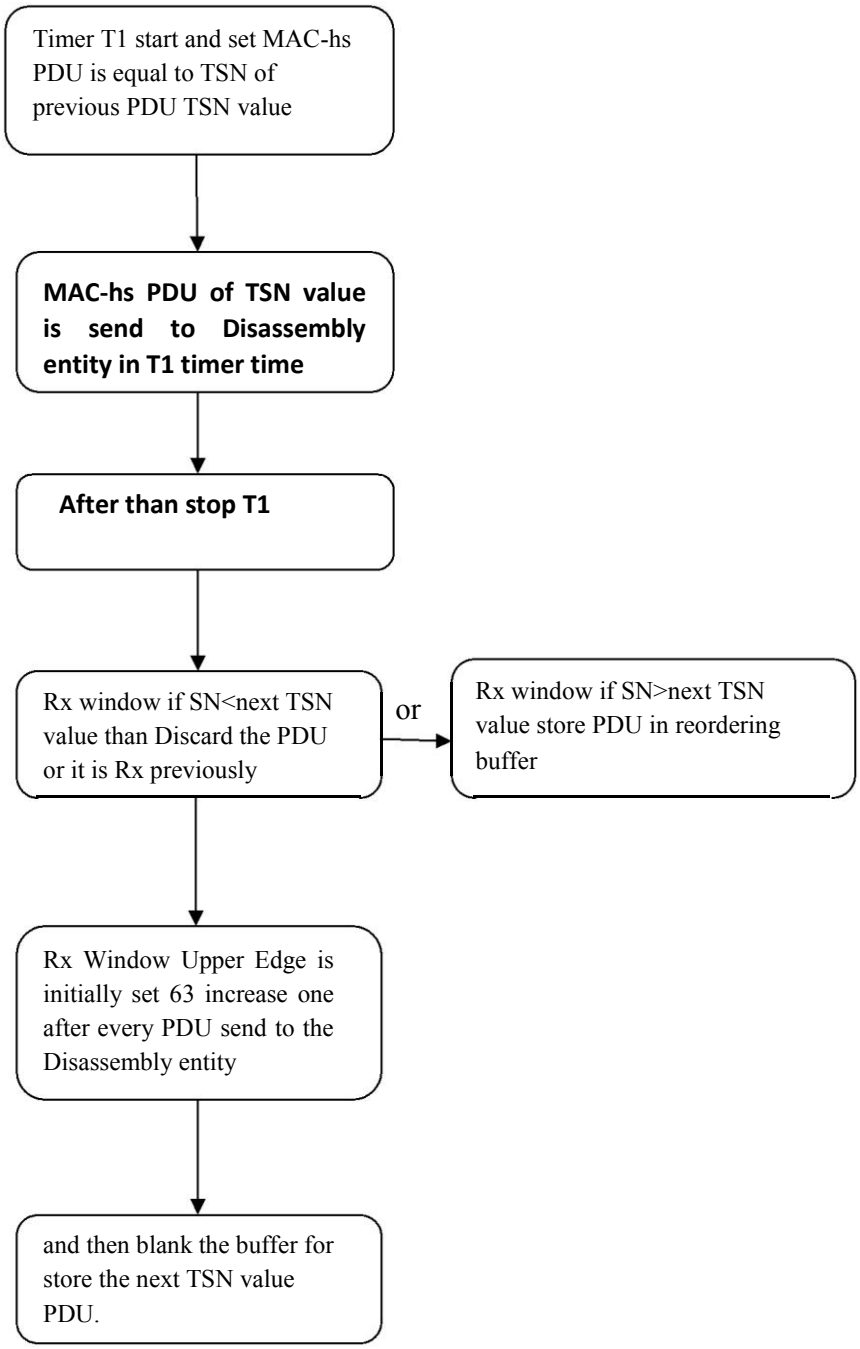

Set TSN 0 for first PDU for each QID of PDU & increment by 1 after every Transmitted PDU
By HARQ entity
By HARQ Process
Check Status report Which send by HARQ Process for every Tx Or Re-Tx of PDU
Set data indicator value 0 for first PDU & increment 1 afet Tx but not increment for Re-Tx
Send Status report to Scheduler

4.2.2 MODULE 4.2
UE Operation: For HARQ :

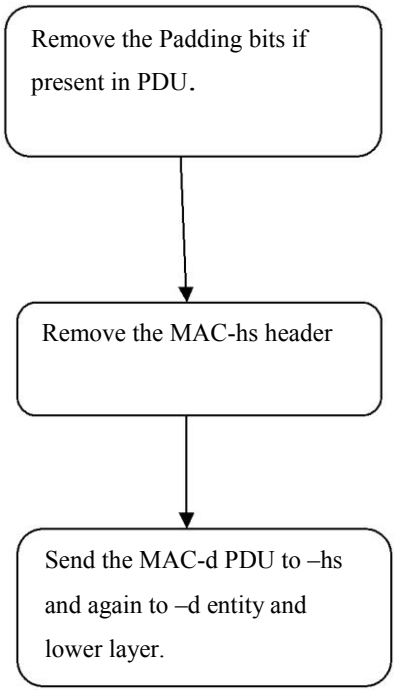



If data is successfully decoded than
If TBS != Previous TBS than replace soft buffer data with Rx new data
Generate a Positive ACK otherwise
If Data is decoded successfully.
otherwise
Generate Negative ACK otherwise
Make QID for current HARQ Process
Arrange MAC-hs PDU in queue based on QID

For Reordering Entity:



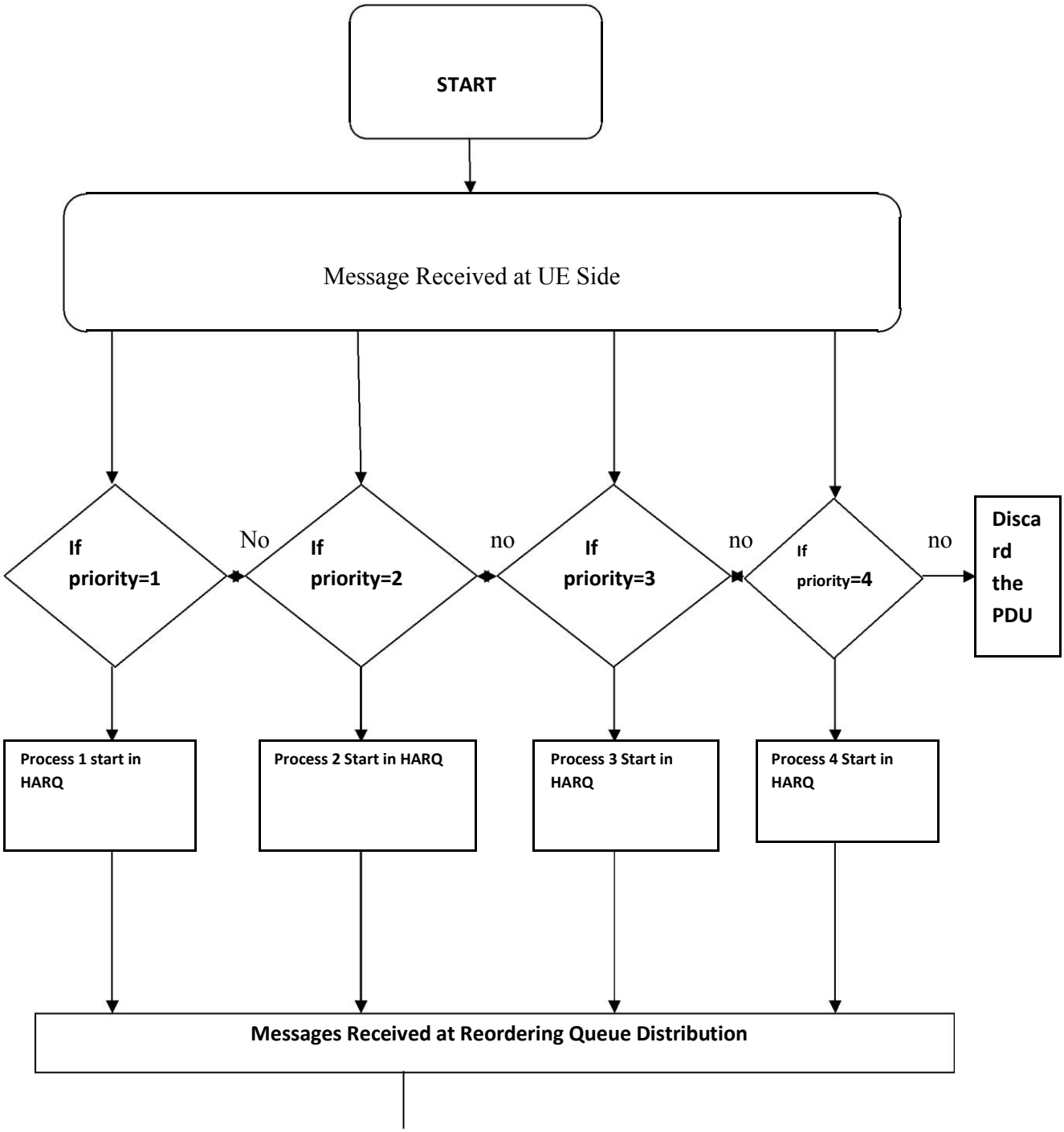
For Disassembly Entity:

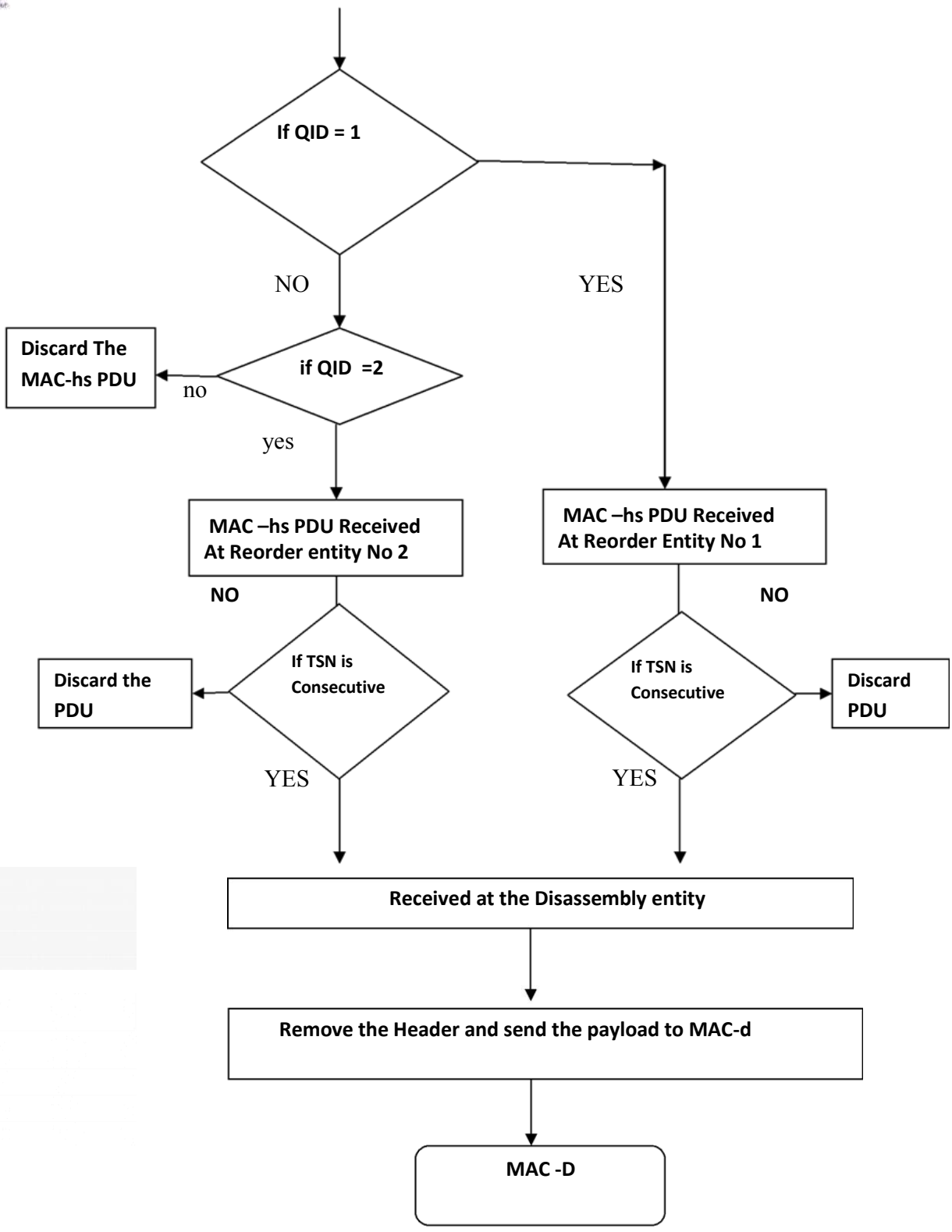


4.3 FINAL MODULE:

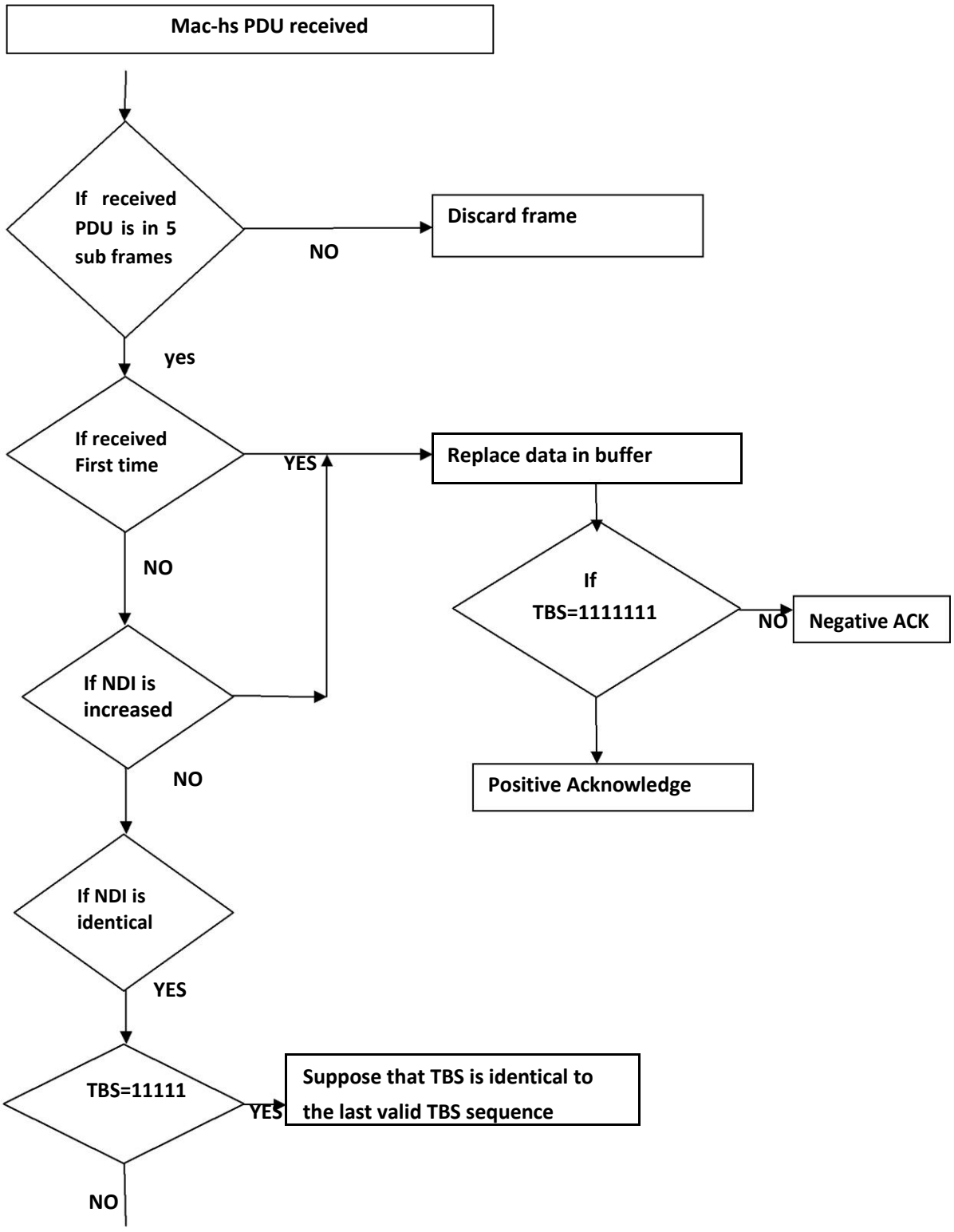
This module we done the final step of Project Designing, by Flow Chart.

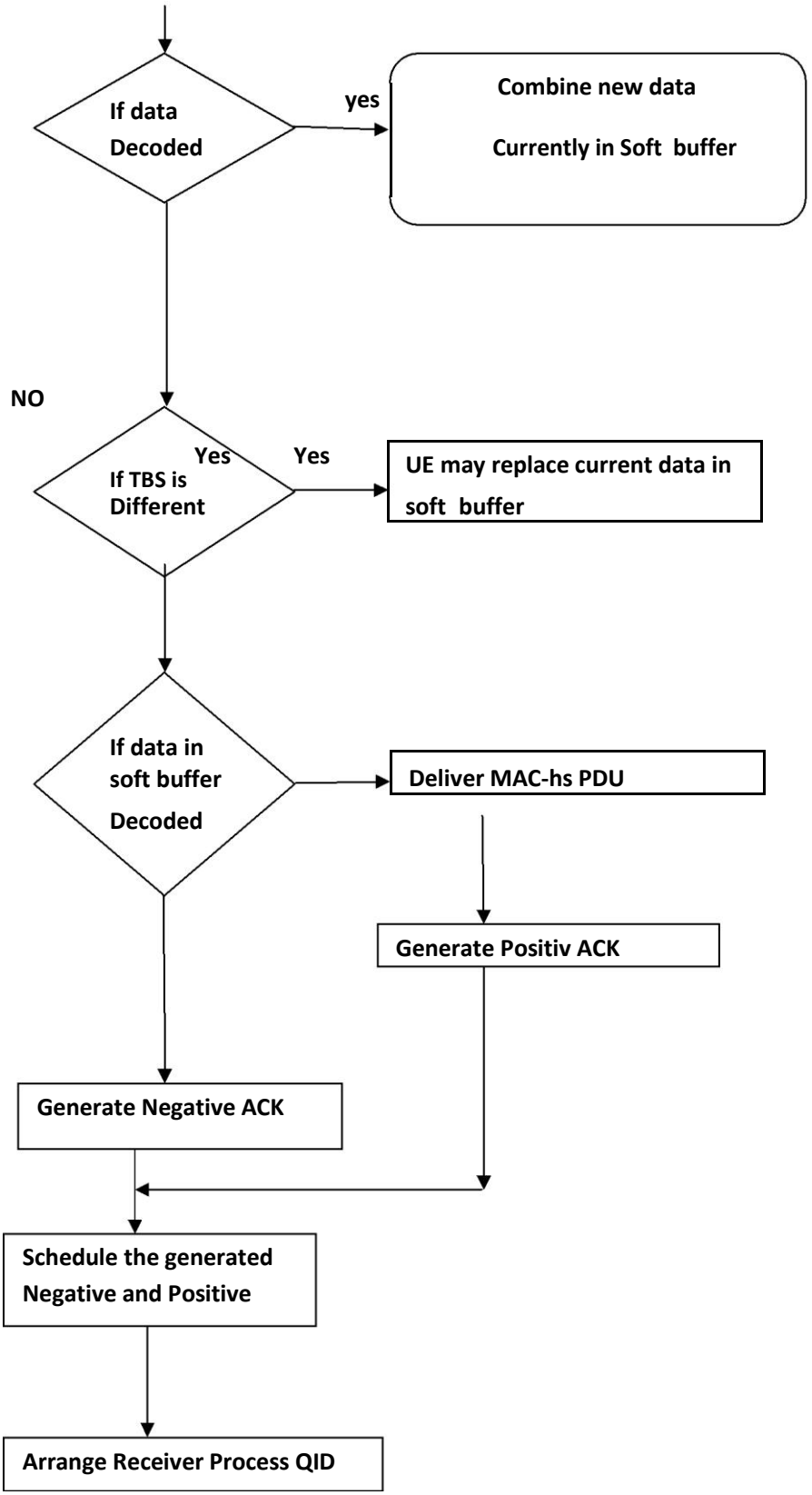
4.6.1 FLOW OF DATA FROM MAC-HS DOWNLINK UE SIDE:




If QID = 1
NO
YES
Discard The MAC-hs PDU
no
if QID =2
yes
MAC –hs PDU Received At Reorder entity No 2
MAC –hs PDU Received At Reorder Entity No 1
NO
NO
Discard the PDU
If TSN is Consecutive
If TSN is Consecutive
Discard PDU
YES
YES
Received at the Disassembly entity
Remove the Header and send the payload to MAC-d
MAC -D

4.3.2 Control of Transmission and Reception of HS-DSCH :




If data
Decoded
yes
Combine new data
Currently in Soft buffer
NO
Yes
If TBS is
Different
Yes
UE may replace current data in
soft buffer
If data in
soft buffer
Decoded
Deliver MAC-hs PDU
Generate Positiv ACK
Generate Negative ACK
Schedule the generated
Negative and Positive
Arrange Receiver Process QID

5 External Interface

5.1 Hard Ware Interface

ARM 11 Processor

5.2 Software Interface

Message Queue : Message queues provide a reasonably easy and efficient way of passing data between two unrelated processes. They have the advantage over named pipes that the message queue exists independently of both the sending and receiving processes, which removes some of the difficulties that occur in synchronizing the opening and closing of named pipes.

Message queues provide a way of sending a block of data from one process to another. Additionally, each block of data is considered to have a type, and a receiving process may receive blocks of data having different type values independently. The good news is that you can almost totally avoid the synchronization and blocking problems of named pipes by sending messages. Even better, you can “look ahead” for messages that are urgent in some way.

Linux does have two defines, MSGMAX and MSGMNB, which define the maximum size in bytes of an individual message and the maximum size of a queue, respectively. These macros may be different or, for that matter, not even present on other systems.

5.3 Communication Interface

Message Queue

6. Appendix

- **ASC -** Access Service Class
- **C-** Control
- **CCCH**- Common Control Channel
- **DCCH**- Dedicated Control Channel
- **DCH**- Dedicated Channel
- **DSCH**- Downlink Shared Channel
- **DTCH**- Dedicated Traffic Channel
- **E-DCH**- Enhanced Dedicated Channel
- **FDD**- Frequency Division Duplex
- **HARQ**- Hybrid Automatic Repeat Request
- **MAC**- Medium Access Control
- **PDU**- Packet Data Unit
- **PHY**- Physical Layer
- **RLC**- Radio Link Control
- **RNC**- Radio Link Control
- **SAP**- Service Access Point
- **SDU**- Service Data Unit
- **TDD**-Time Division Duplex
- **TFCI**- Transport Format Combination Indicator
- **TFI**- Transport Format Indicator
- **TSN**- Transmission Sequence Number
- **U**- User
- **UE**- User Equipment
- **UL**- Uplink
- **UTRAN**- Universal Terrestrials Radio Access Network