Designing of Simulation Model for Performance Testing on 3G Radio Link Control Protocol

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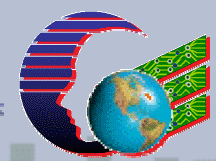
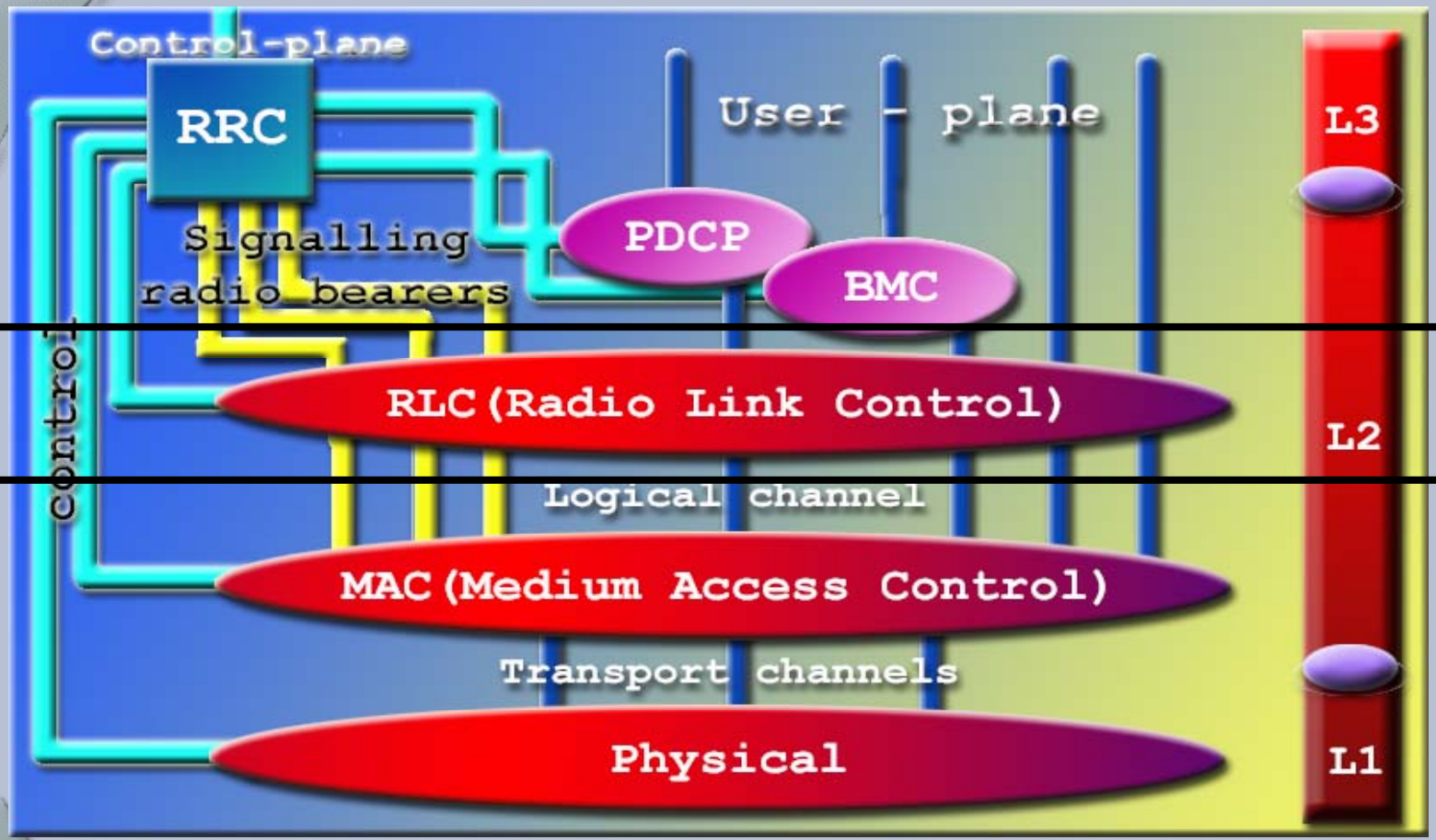


Outline

- Radio Link Control (RLC) Protocol in 3G Systems
- Design of RLC Simulation Model
- Simulation Description
- Simulation Processes
- Conclusion and Future work

Radio Link Control Protocol



Radio Link Control Protocol

- **Functions in RLC**
  - **Segmentation and reassembly**
  - **Transfer of user data (RLC Service Data Units (SDUs)**
  - **Service Data Unit (SDU) discard**
  - **Protocol error detection and recovery**
  - **Padding**

Radio Link Control Protocol

- **Functions in RLC**
  - **Error correction**
  - **In-sequence delivery of upper layer PDUs**
  - **Duplicate detection**
  - **Ciphering**

Radio Link Control Protocol

Operations in Transmitting side

- Polling Mechanism
- SDU Discard Mechanism

Operation in Receiving side

- Status Report Transmission Mechanism

Polling Mechanism

Polling Mechanism triggers

- **Poll_Timer:** started when a polling is submitted to the lower layer
- **Poll_Periodic_Timer:** started when a RLC session is created
- **Poll_Prohibit_Timer:** prohibit transmission of polls within a certain periodic
- **Last_PDU_In_Buffer:** when the last AMD PDU is scheduled, poll is set

Polling Mechanism

Polling Mechanism triggers

- Last_PDU_In_Retransmission_Buffer
- Window_Based_Polling
- Every_Poll_PDU_PDU
- Every_Poll_SDU_SDU

SDU Discard Mechanism

- Avoid buffer overflow in RLC layer
- Reduce the maximum transmission delay

- **Triggers:**
  1. Timer-based discard with explicit signaling
  2. SDU discard after MAX_DAT number of retransmissions

Design of RLC Simulation Model

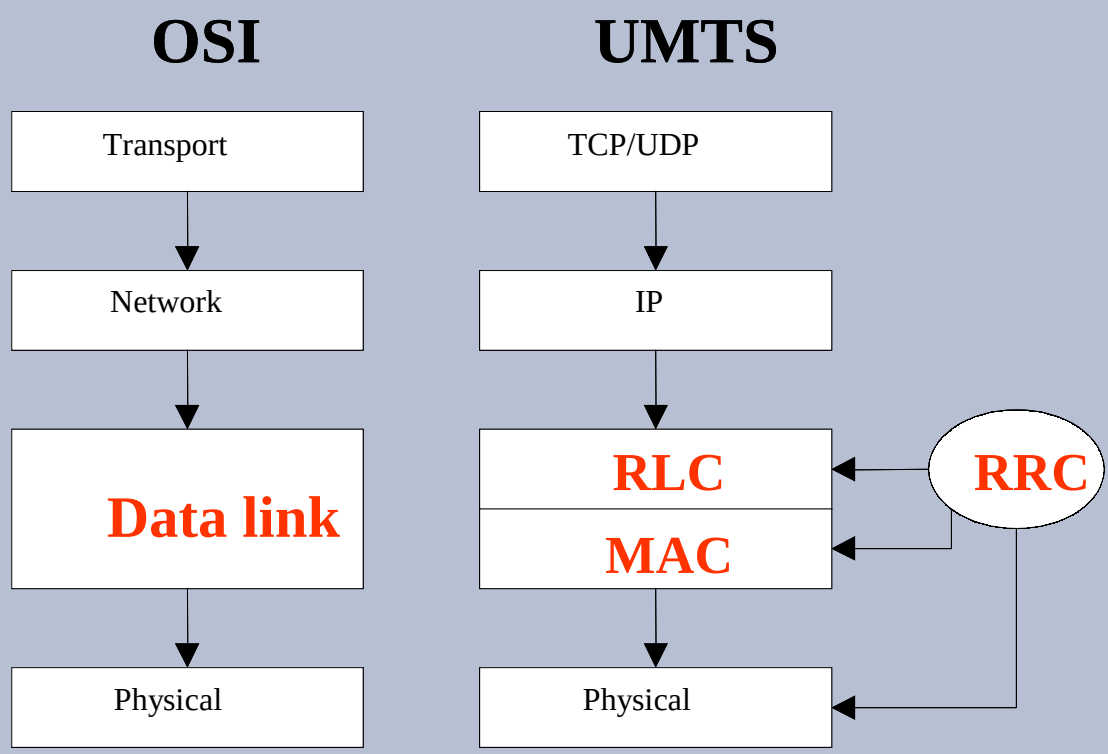


Fig 1: UMTS Simulation model compares with OSI model

Design of RLC Simulation Model

- **Transparent Mode (TM)**

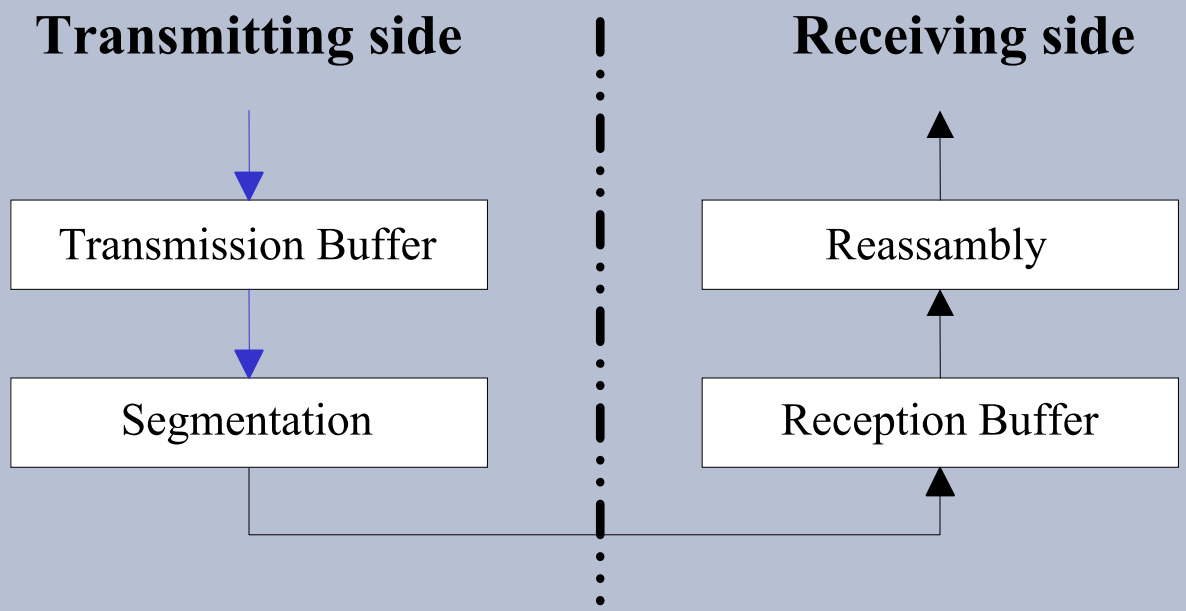


Fig 3: Model of two transparent mode peer entities

Design of RLC Simulation Model

- **Unacknowledged Mode (UM)**

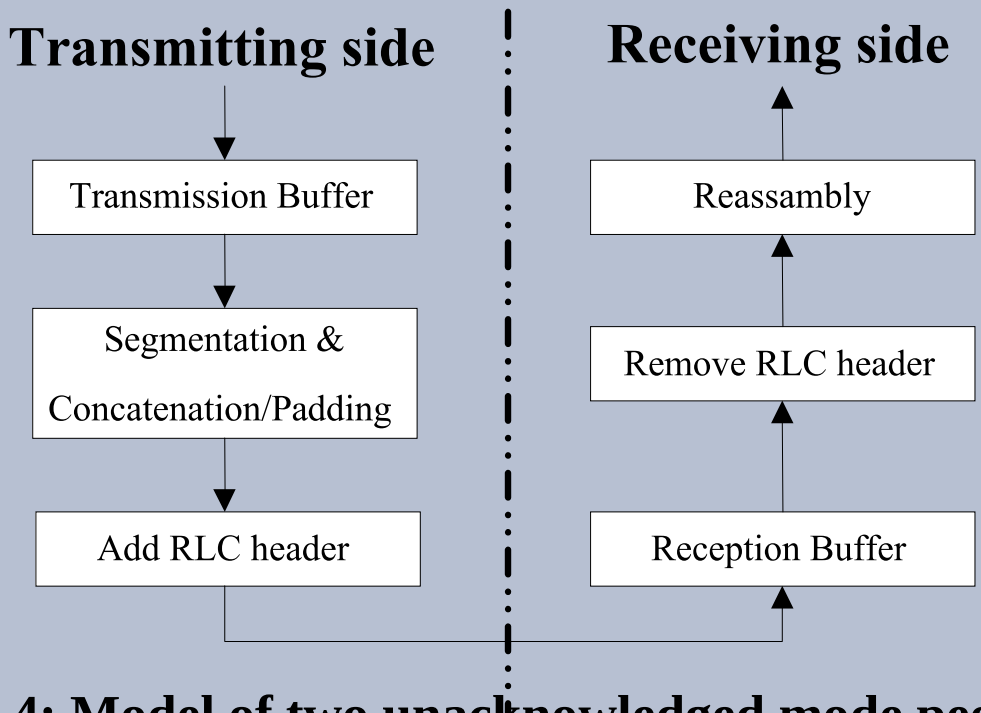


Fig 4: Model of two unacknowledged mode peer entities

Design of RLC Simulation Model

- **Acknowledged Mode (AM)**

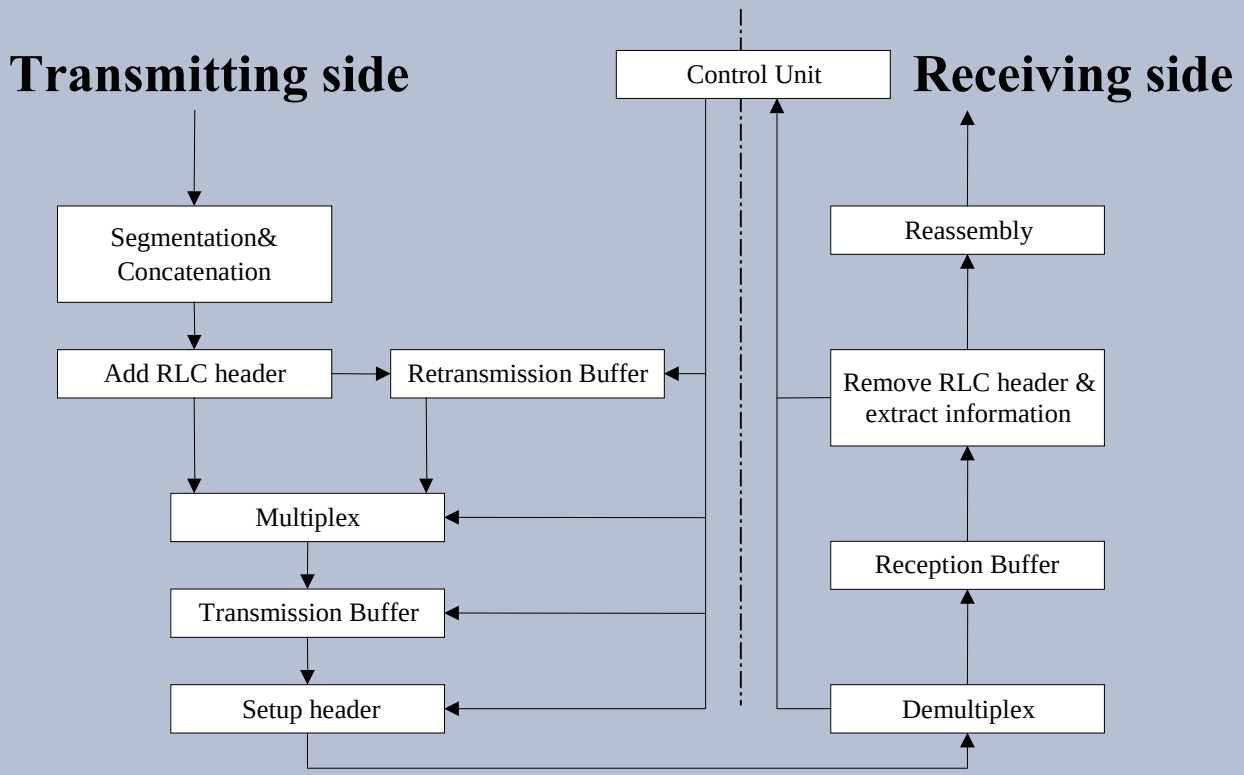


Fig 5: Model of two acknowledged mode peer entities

Design of RLC Simulation Model

- **UML models for RLC of all operation modes**

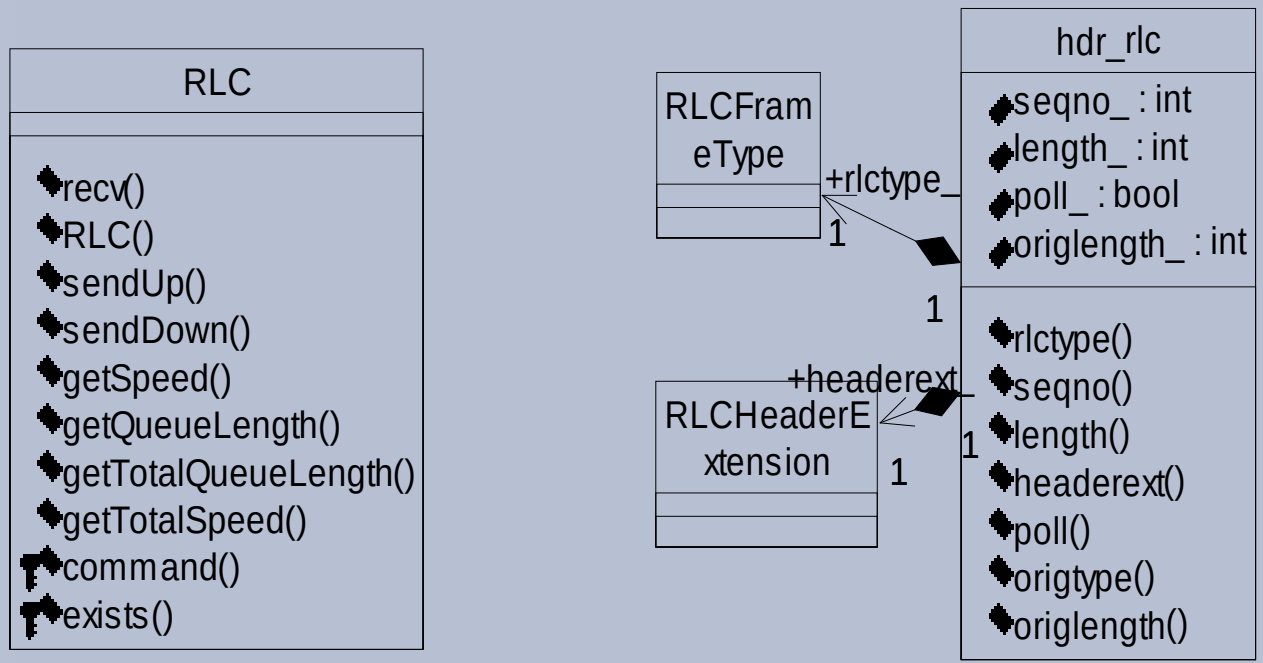


Fig 6: UML diagram of *RLC* class

Design of RLC Simulation Model

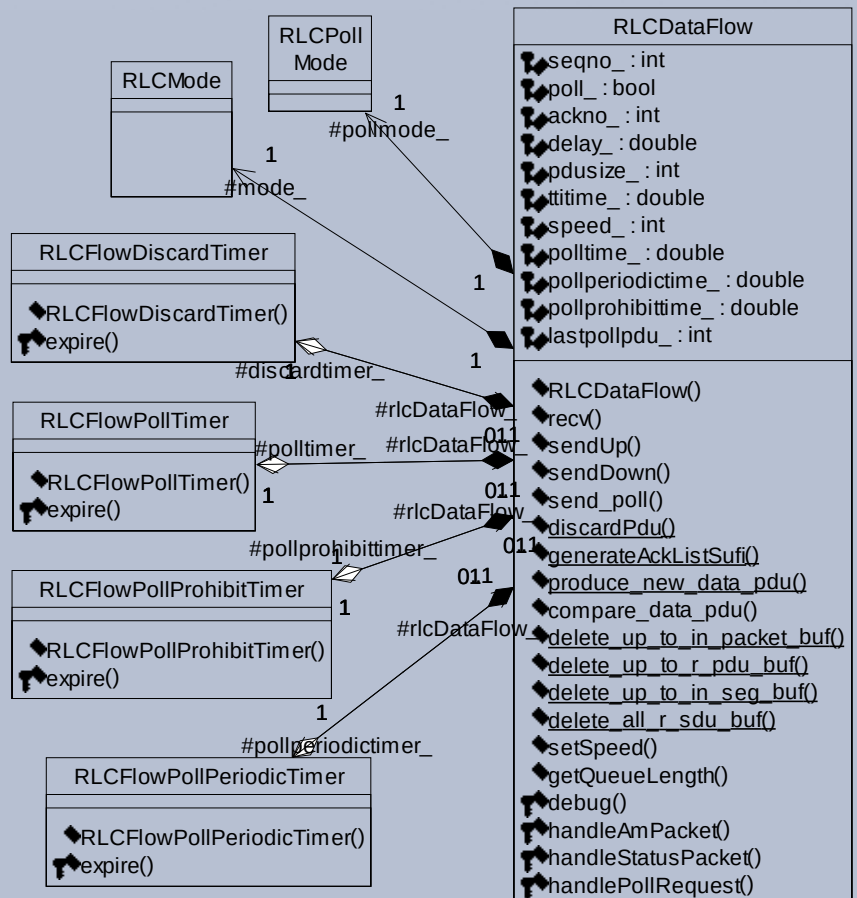


Fig 7: UML diagram of *RLCDataFlow* class

Simulation Description

- **The simulation will be implemented with Network Simulation version 2.**
- **The upper layers in the transmitting side of RLC generate ftp and voice data traffic and send to RLC layer.**
- **In case of ftp traffic, RLC operates in AM mode, the data flow and functions would be done as shown in Fig 5.**
- **Voice traffic has higher priority than ftp data traffic.**

Simulation Description

Parameters	Value
SDU traffic model	Voice and FTP
PDU size	40 bytes
TTI	20 ms
Service rate	384 kbps (or 24 PDUs per TTI)
SDU Discard function	Timer based discard
Round Trip Delay	200 ms
RLC window size	4096 PDUs

Simulation Processes

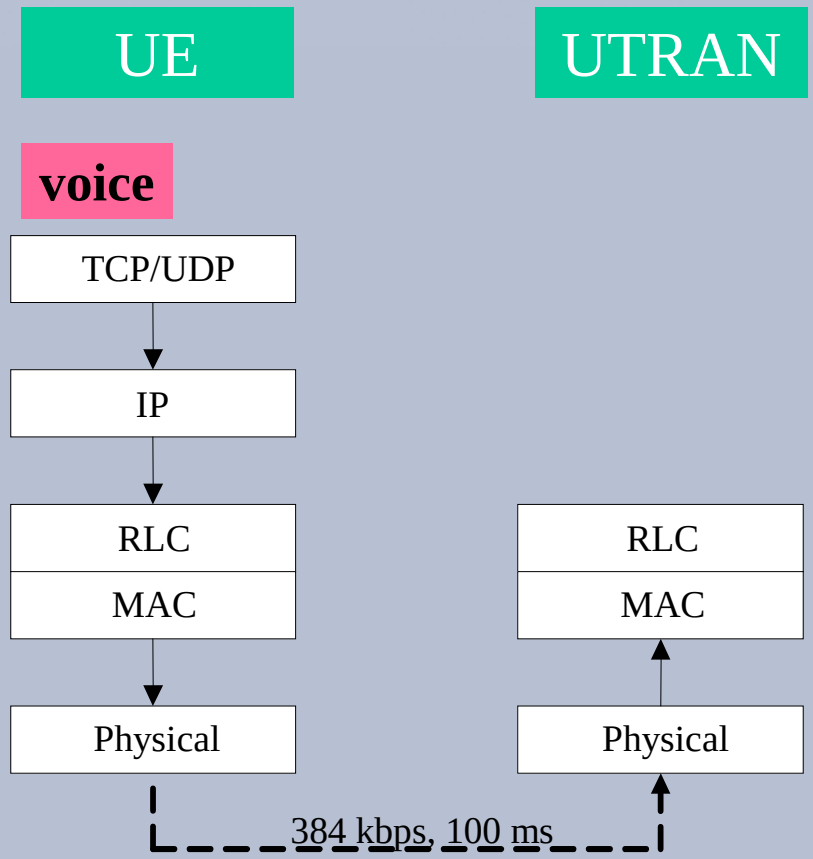


Fig 8: Simulation Protocol Stack

Simulation Processes

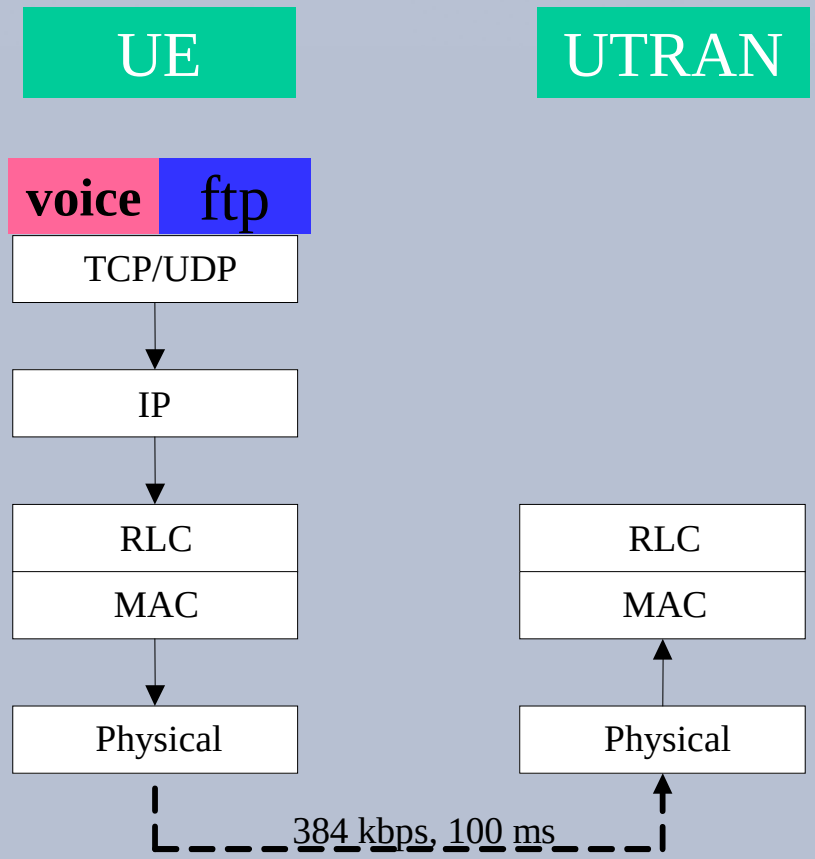


Fig 8: Simulation Protocol Stack

Simulation Processes

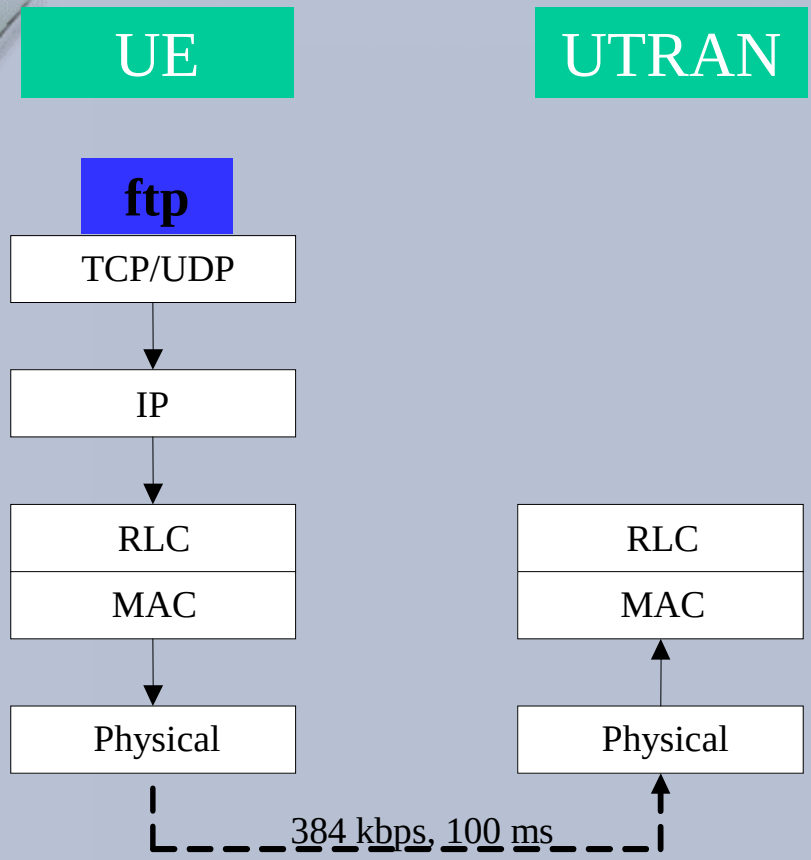


Fig 8: Simulation Protocol Stack

- delay time, throughput and error checking are considered.
- changing some parameters and restarting all simulation process again

Conclusion and Future works

- **We present the overview and designed of RLC simulation model for performance testing and show in UML diagrams.**

- **The simulation model will be completely implemented in NS2 and used to analyze the RLC performance.**

Thank you

Comment and Questions