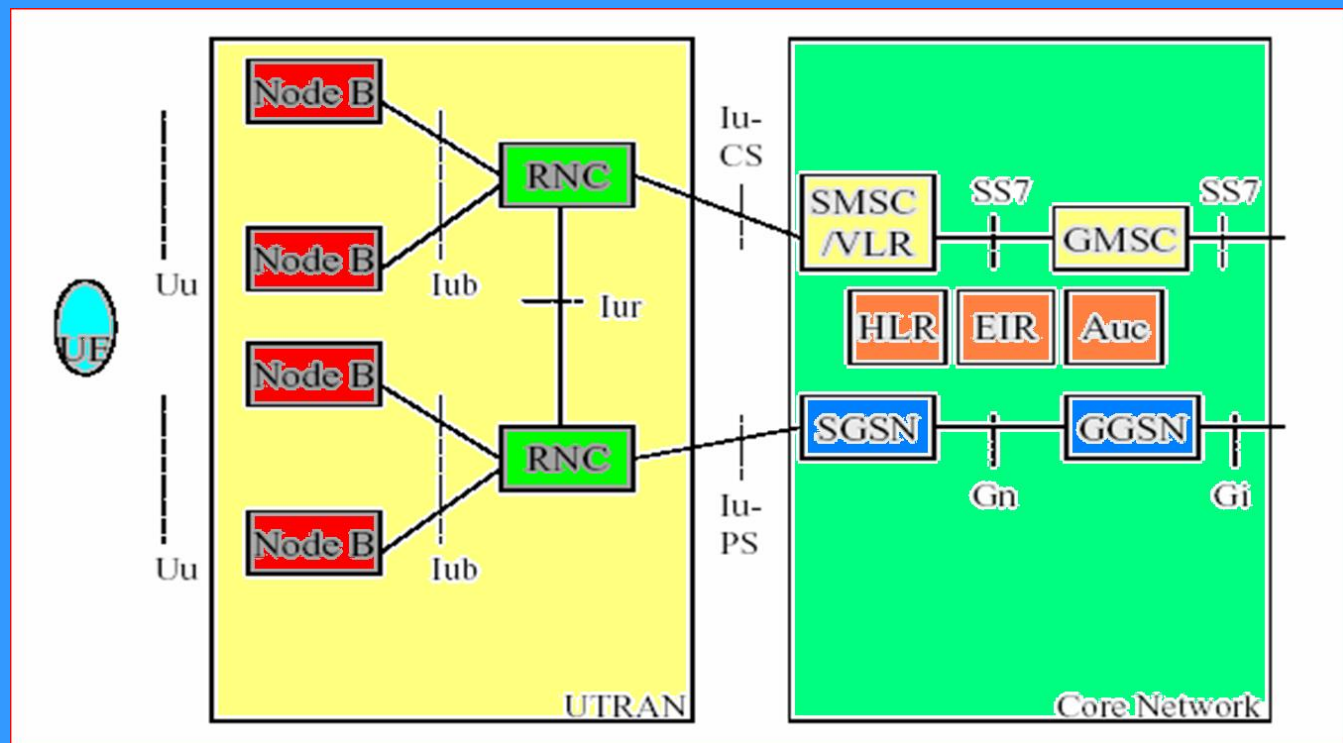


# UMTS R99 Architecture

# 3GPP Release 99 Reference Architecture

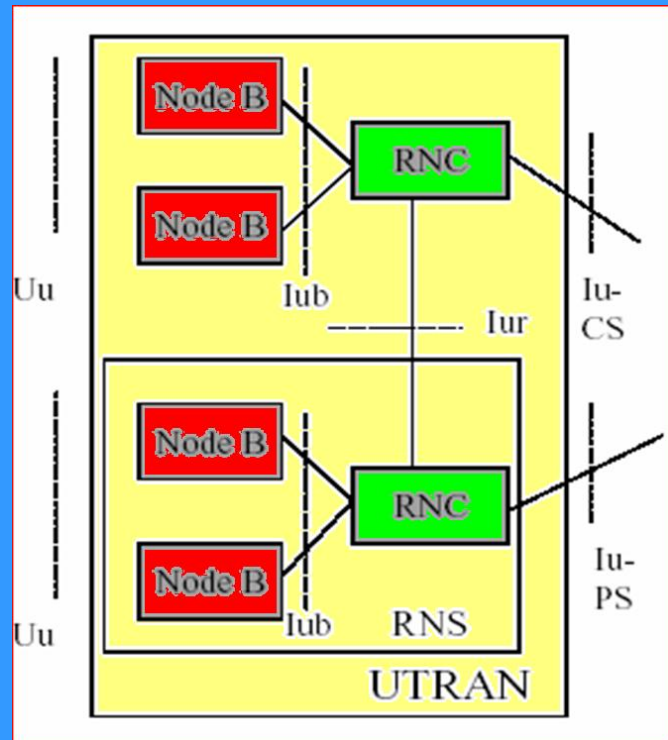


# UMTS Terrestrial Radio Access Network (UTRAN)

- **WCDMA Radio Interface Key Change from GSM**
- **UTRAN elements are comparable to GSM BSC & BTS**
- **Common Interface (Iu) for both PS and CS Core**
- **Core elements do not change dramatically**
  - **3G SMSC/VLR provides ATM based Iu-CS interface**
  - **3G SGSN supports ATM based Iu-PS interface**

# UTRAN Architecture

- Hierarchical Architecture
- Radio Network Subsystem (RNS)
- UTRAN Elements:
  - Radio Network Controller
  - Node B (Base Station)
- One RNC controls number of Node B's
- Node B is only connected to one RNC
- New interface Iur for Macrodiversity



# UTRAN Functions

**Functions related to overall system access control**

- System information broadcasting**

**Functions related to radio channel ciphering**

- Radio channel ciphering**
- Radio channel deciphering**

**Functions related to handover**

- Radio environment survey**
- Handover decision**
- Macro-diversity control**
- Handover Control**
- Handover execution**
- Handover completion**
- SRNS Relocation**
- Inter-System handover**

# UTRAN Functions

**Functions related to radio resource management and control**

- Radio bearer connection set-up and release (Radio Bearer Control)**
- Reservation and release of physical radio channels**
- Allocation and de-allocation of physical radio channels**
- Packet data transfer over radio function**
- RF power control**
- RF power setting**
- Radio channel coding**
- Radio channel decoding**
- Channel coding control**
- Initial (random) access detection and handling**

# Node B

- **Standardization term (normally called as Base Station)**
- **Comparable to Base Transceiver Station in GSM**
- **Responsible for Air Interface Layer 1**
- **Key Node B Functions:**
  - **Modulation and spreading**
  - **RF Processing**
  - **Inner-loop power control**
  - **Rate matching**
  - **Macro diversity combining/splitting inside Node B**

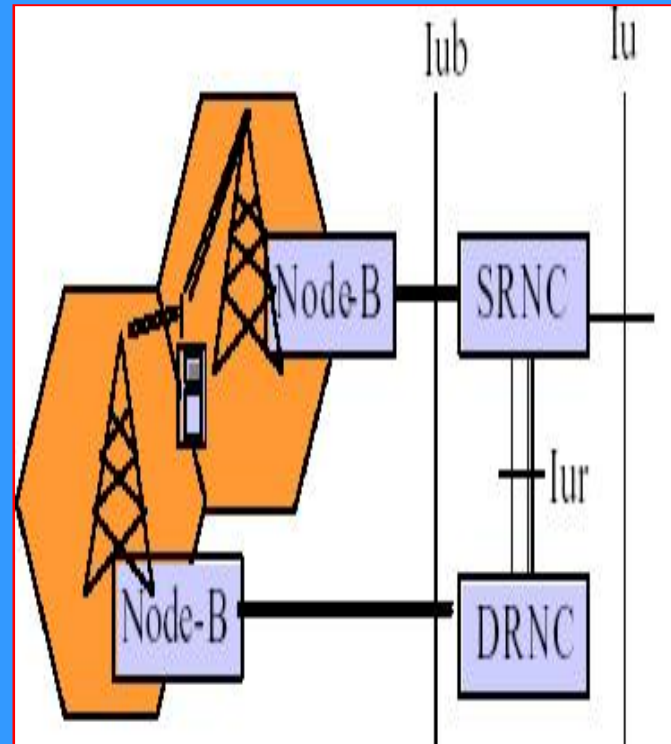
# Radio Network Controller (RNC)

- **Comparable to Base Station Controller in GSM**
- **Responsible for L2 processing of user data**
- **Responsible for Radio Resource Management**
- **Key RNC Functions:**
  - **Closed loop power control**
  - **Handover control**
  - **Admission control**
  - **Code allocation**
  - **Packet scheduling**
  - **Macro diversity combining/splitting over number of**
    - **Node Bs**



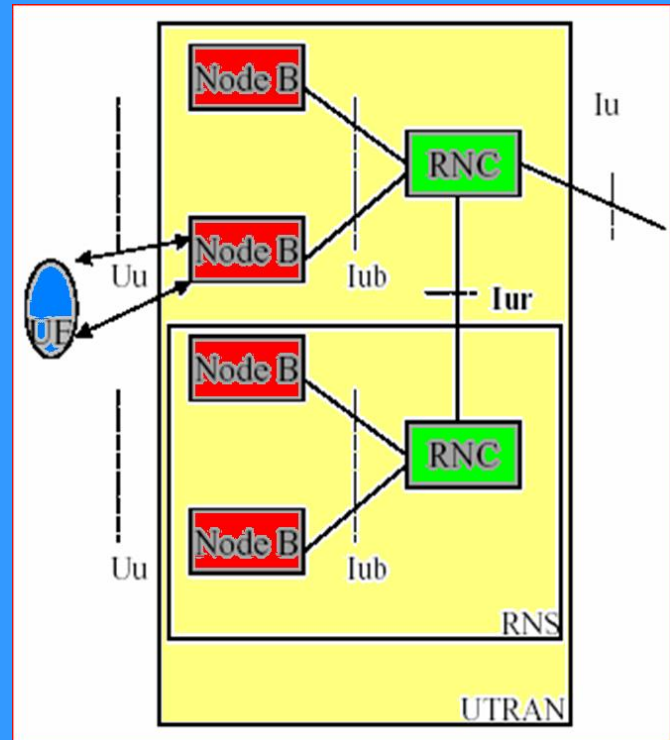
# Logical role of RNC

- RNC controlling one Node B is indicated as Controlling RNC (CRNC)
- RNC that is in charge of controlling a mobile is called serving RNC (SRNC)
- Any other RNC controlling a cell used by the mobile is called drift RNC (DRNC). It can perform macro diversity combining and splitting of the signals. It does not perform layer 1 processing of the user plane, but instead routes the data transparently via Iur and Iub.



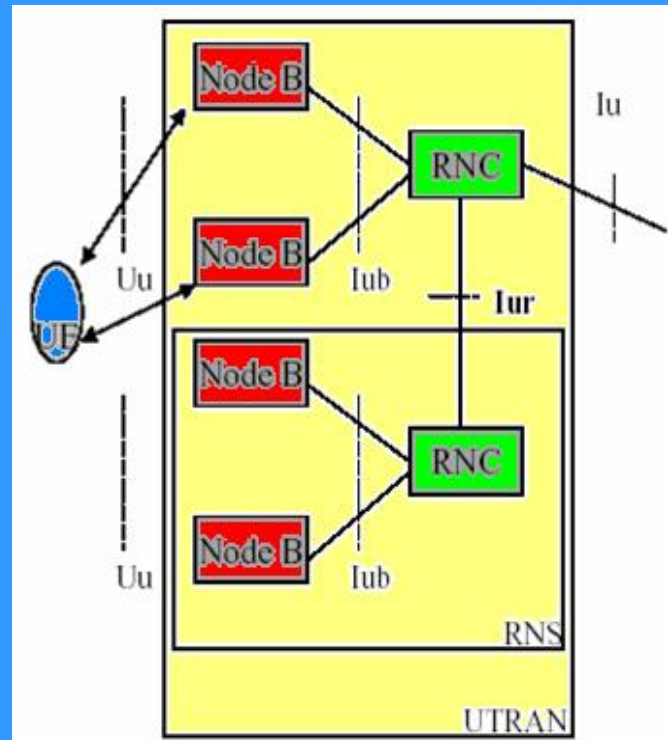
# Macro Diversity

- Softer Handover
- •1 BS
- •1 RNC



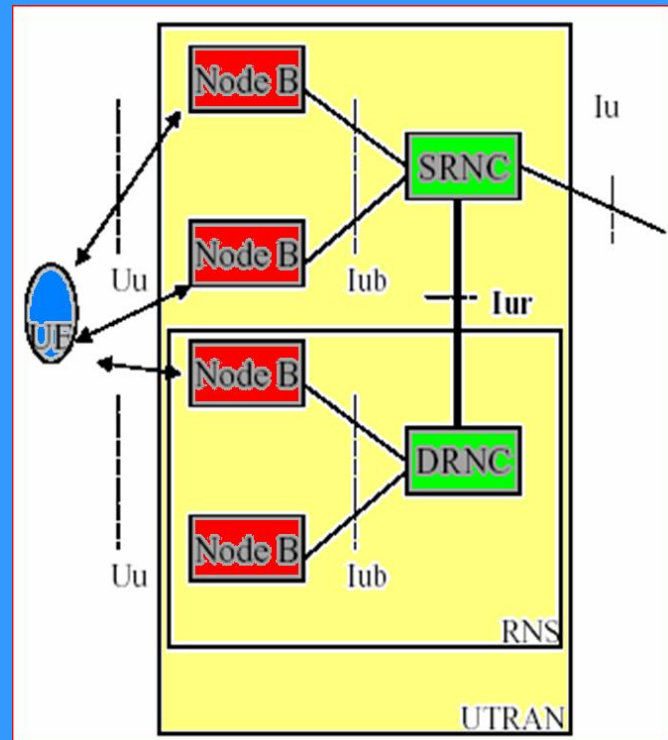
# Macro Diversity

- Soft Handover
- Number of BSs
- 1 RNC (MDC)



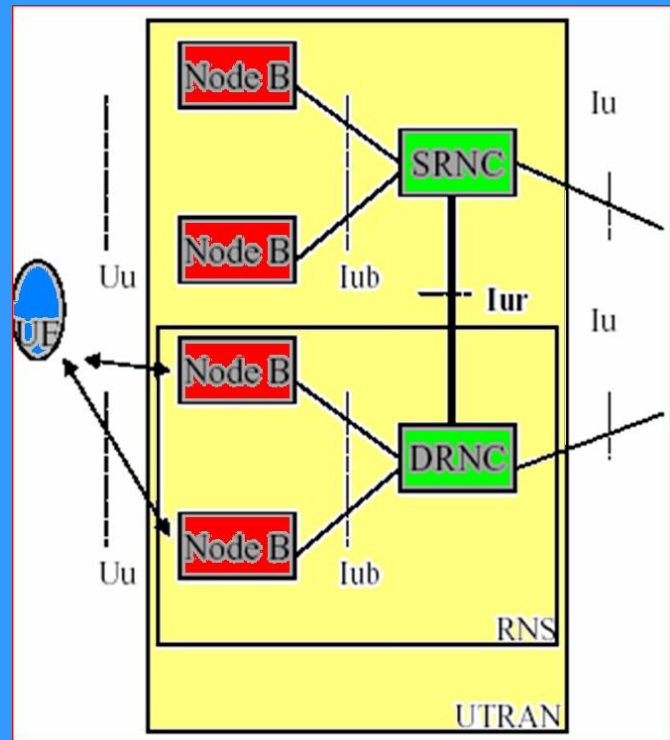
# Macro Diversity

- Soft Handover
- Number of BSs
- 1 Serving RNC (MDC)
- Number of Drift RNC



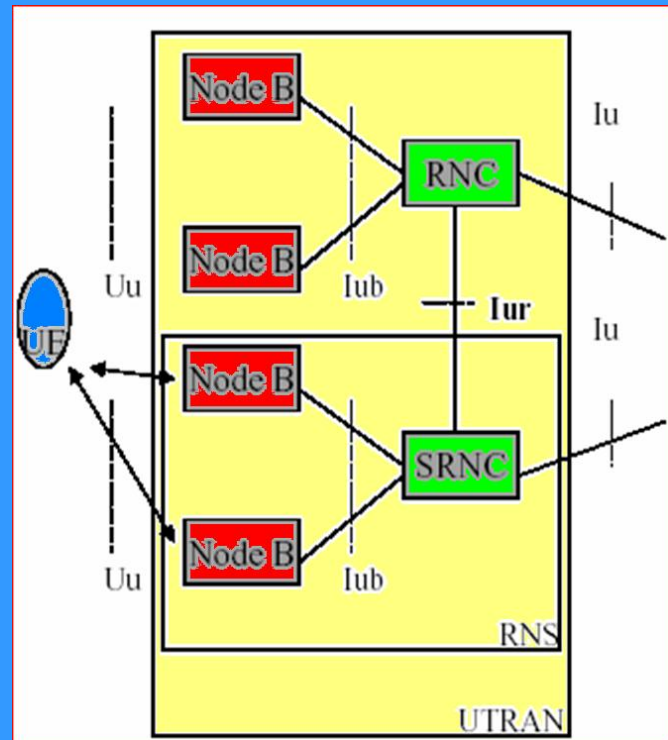
# Macro Diversity

- SRNC Anchoring



# Macro Diversity

- SRNC Relocation



# Interfaces of UTRAN

- **Iub** is the interface between Node B and RNC
  - Unlike in Abis -interface of GSM interface Iub is open interface and allows the interoperability of different vendors Node-Bs and RNCs.
- **Iur** denotes the interface between two RNCs and it is utilized to relay data and control information in case of intra-RNS handover.
- **Iu**-interface connects UTRAN to CN
- It is notable that the single interface deals with both CS and PS traffic

# UMTS protocol internetworking architecture

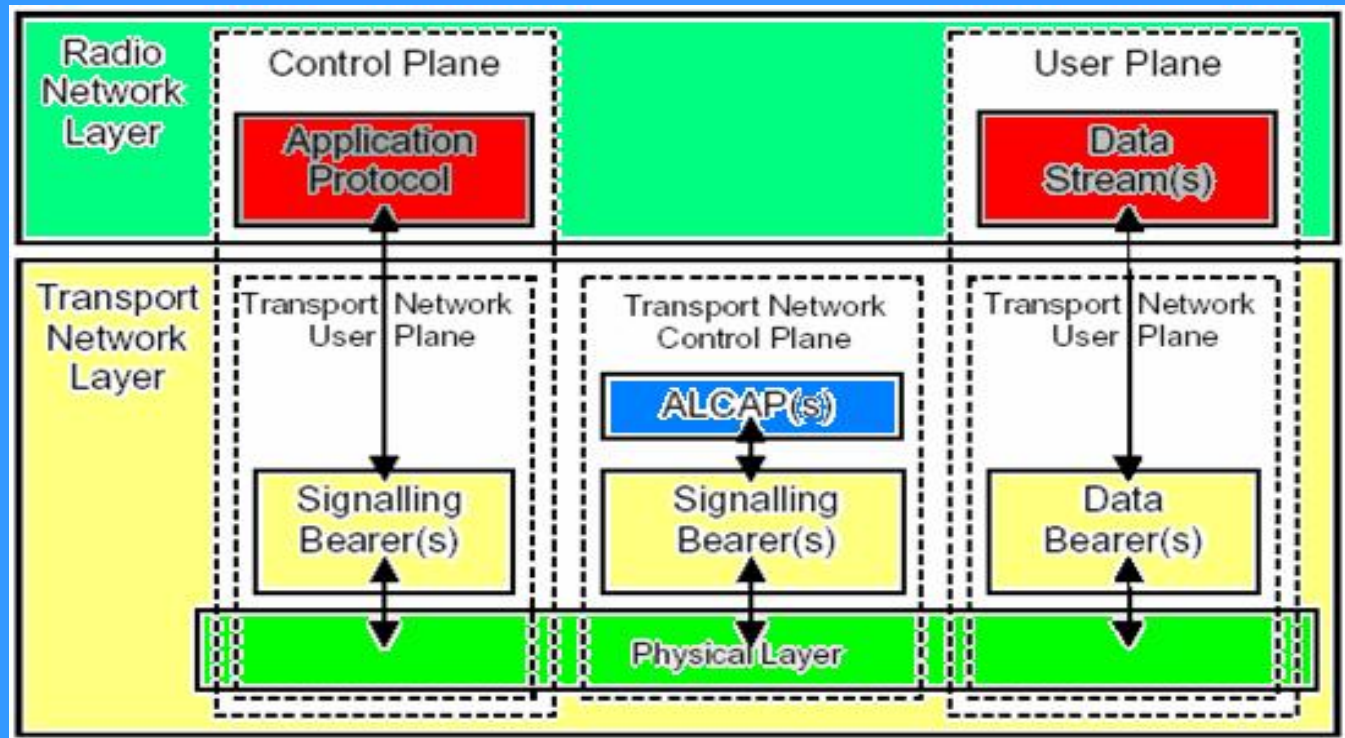
- Transport network layer is responsible for providing a general purpose transport service (user data and control data) for all UMTS network elements.
  - Physical layer in Uu interface is WCDMA
  - Physical layer fixed network side is based either on pleisochronous or synchronous digital hierarchy (PLH/SDH)
- Radio network layer protocols ensure internetworking between UE and CN on all radio access bearer related aspects.
- System network layer protocols extend from UE until the transit network edge of CN. They ensure internetworking on UMTS communication service related aspects.



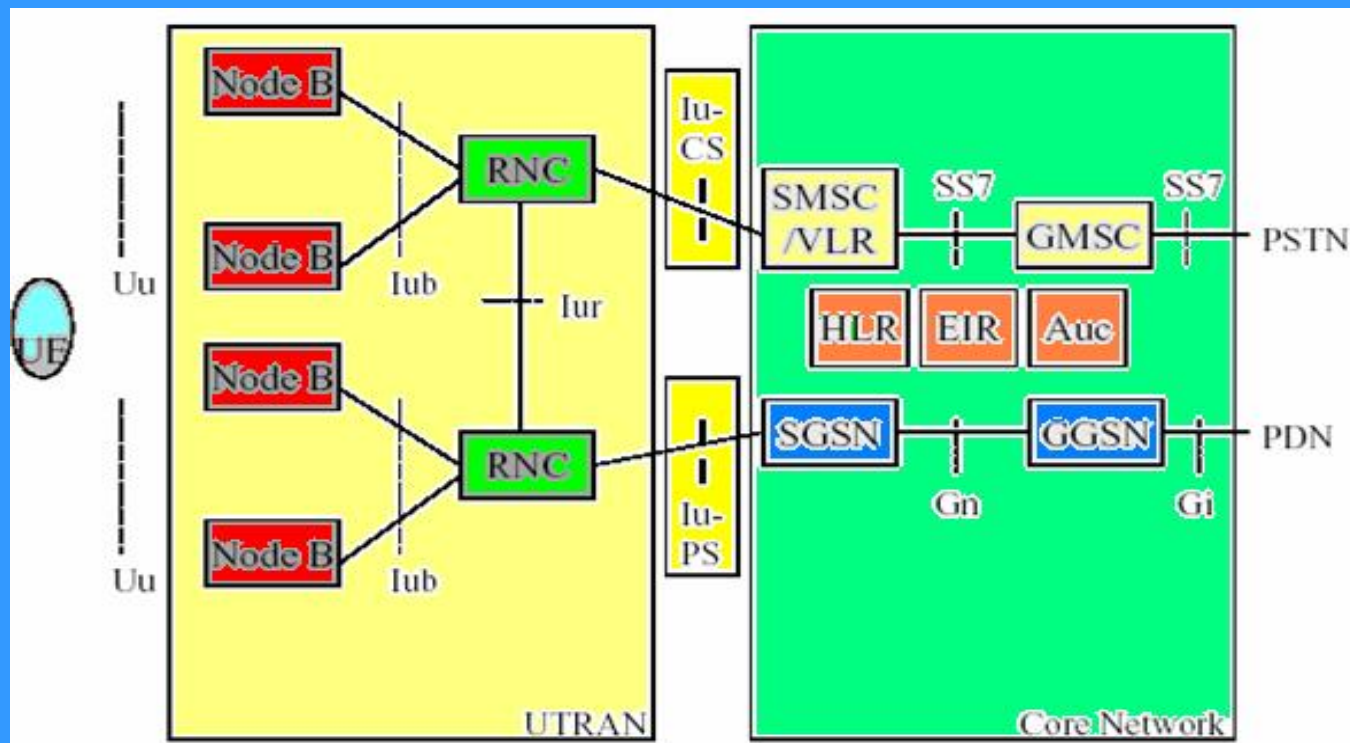
# UMTS protocol internetworking architecture

- Layers can further be divided into
  - Planes:
    - Control plane: All protocols dealing with control aspects.
    - User plane: All protocols dealing with user data transfer.
  - Domains
    - Circuit switched (CS)
    - Packet switched (PS)

# General Protocol model for UTRAN



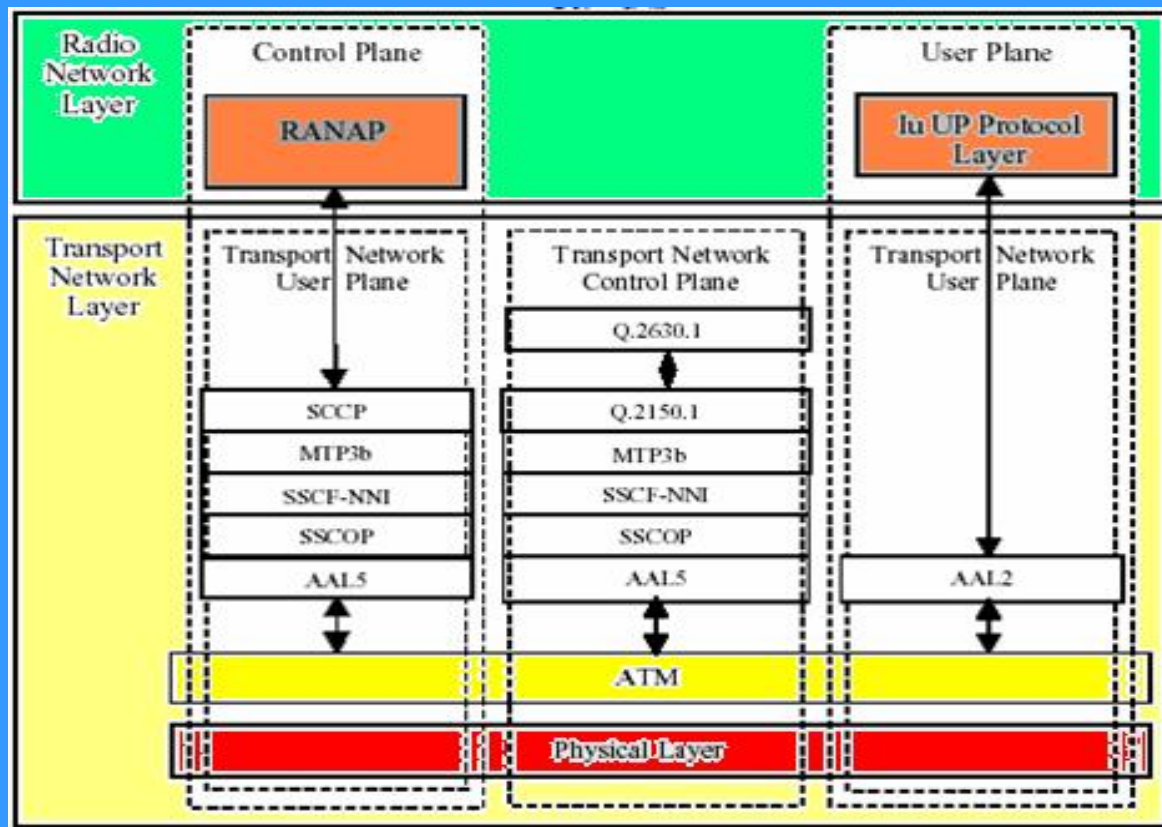
# 3GPP Release 99 Reference Architecture



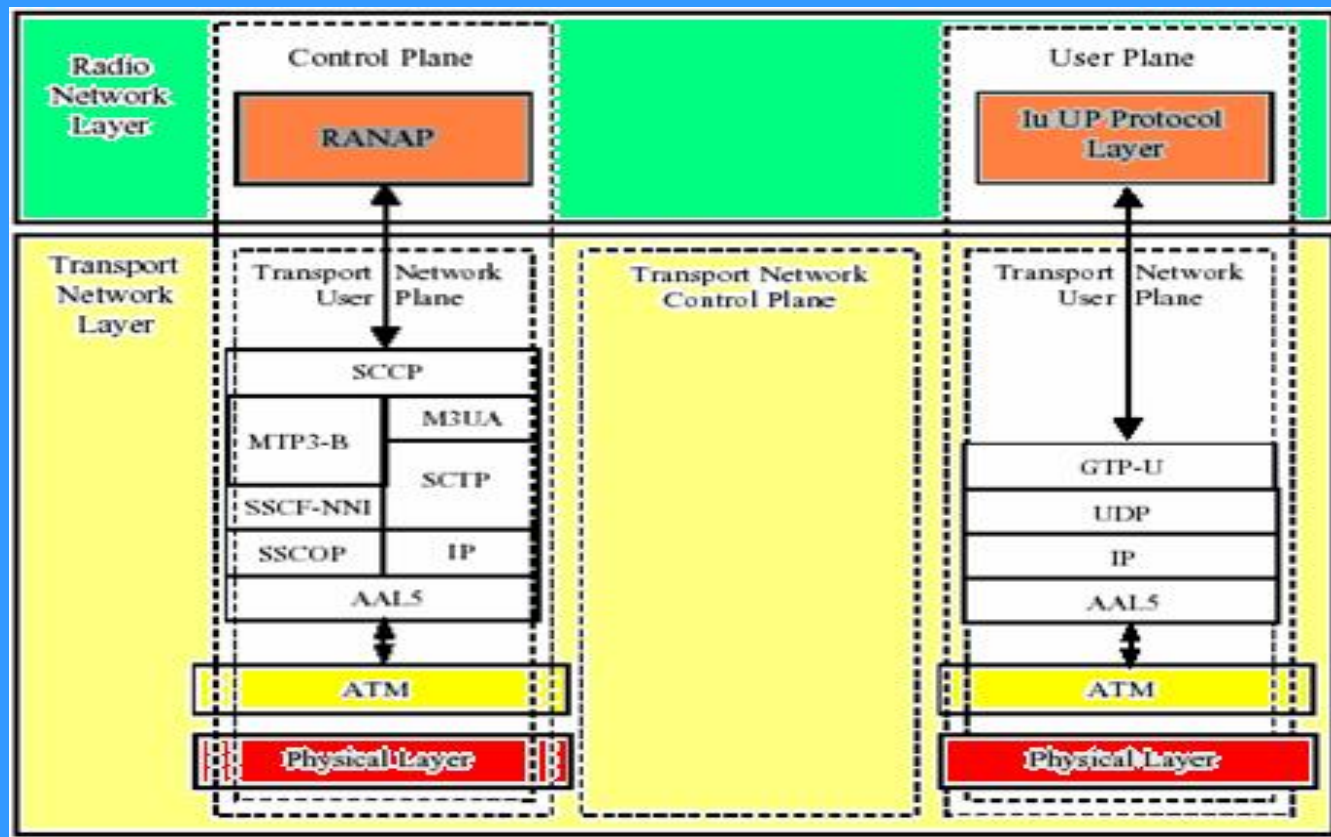
# Radio Access Network Application Part (RANAP)

- Key RANAP functions:
- Radio Access Bearer (between UE-CN)
- RAB Set-UP
- RAB Modification
- Clearing RAB
- Iu Bearer Release
- SRNC Relocation
- Paging Commands

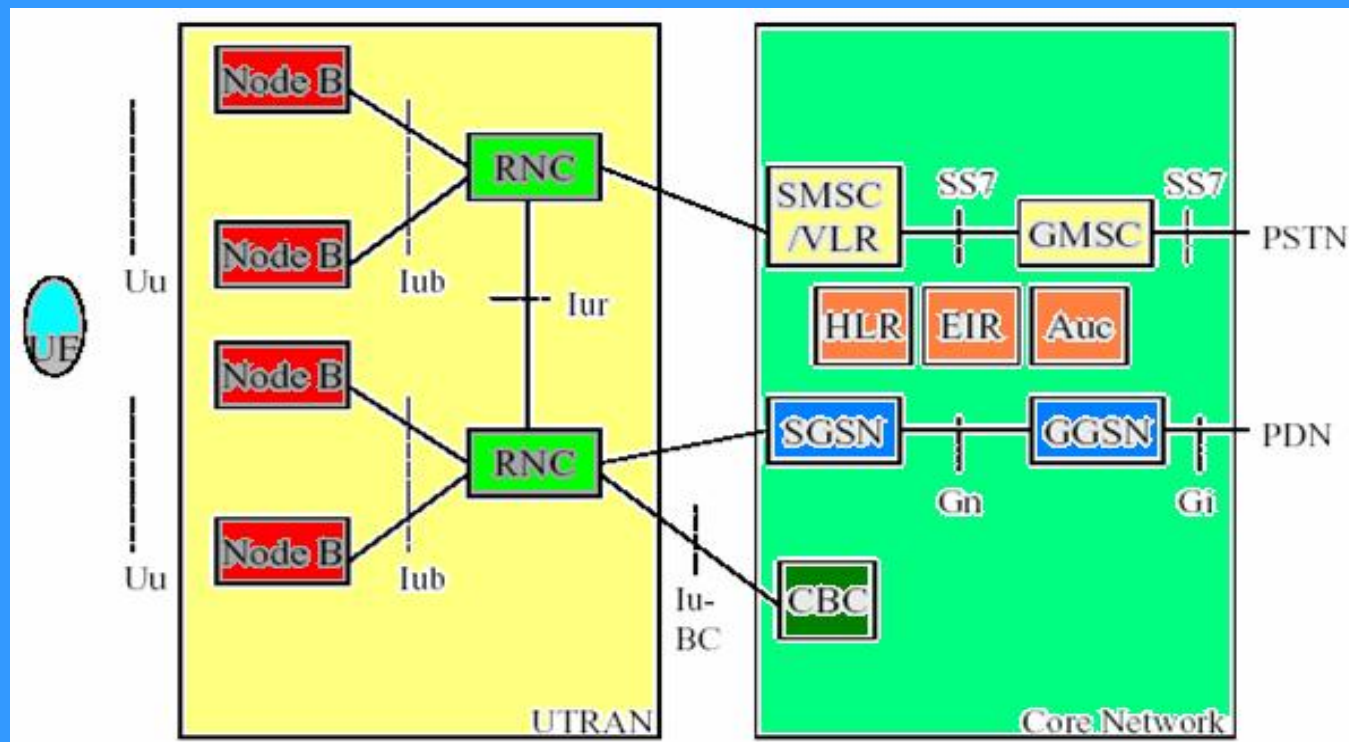
# Iu-CS



# Iu-PS

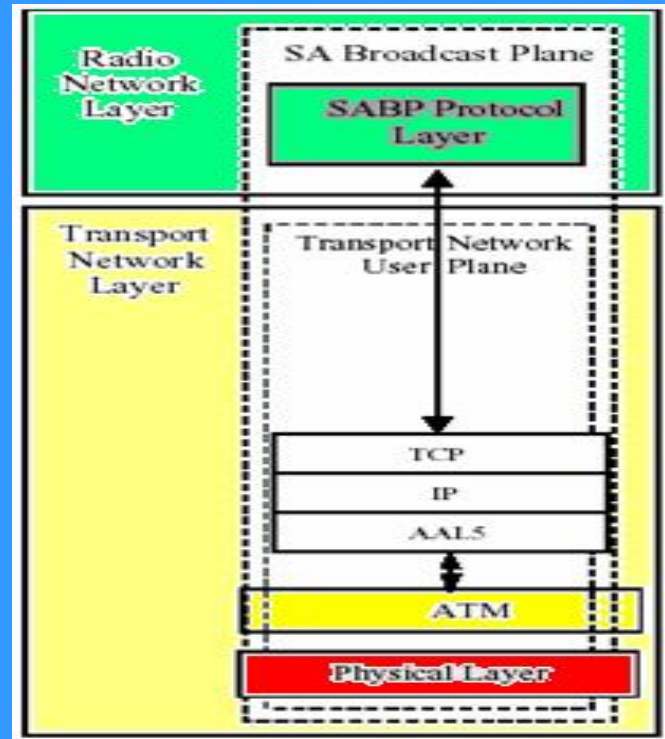


# 3GPP Release 99 Reference Architecture



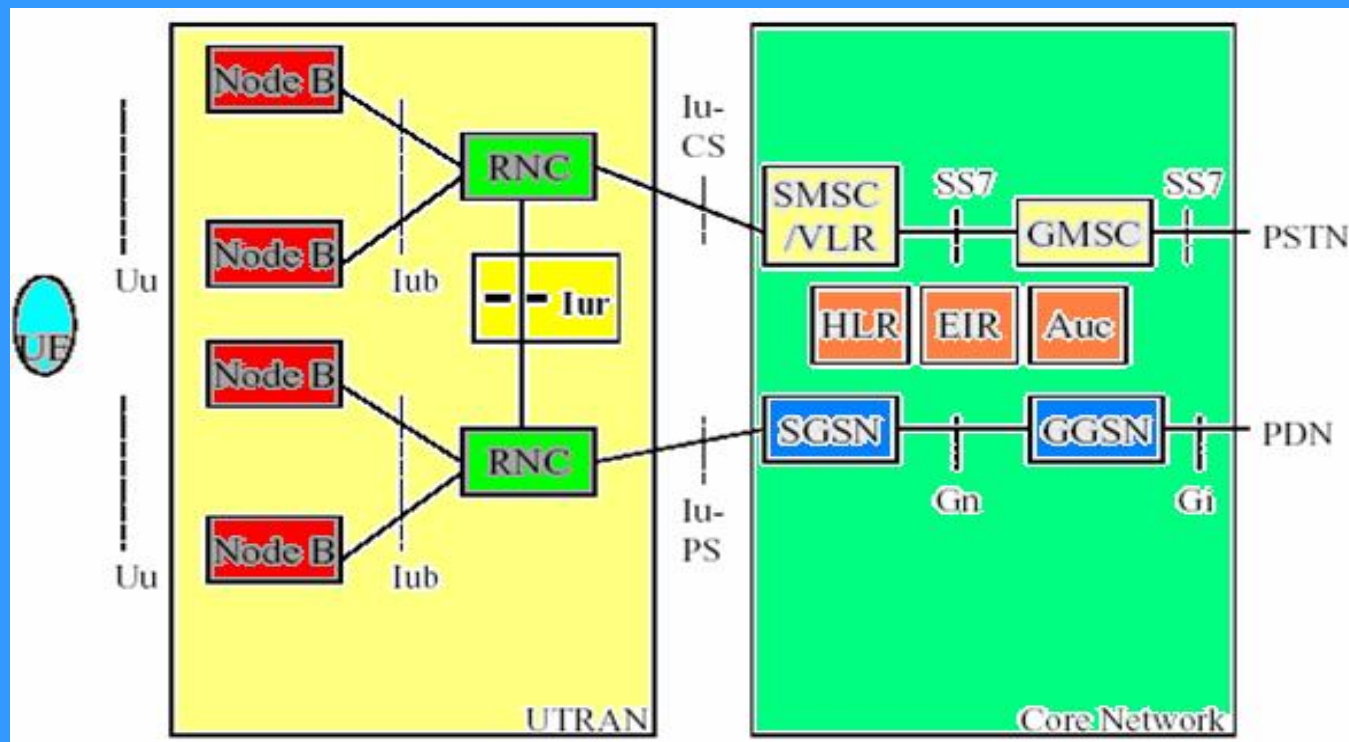
# Iu-BC

- Between RNC and Common Broadcast Center CBC
- Service Area Broadcast Protocol (SABP)





# 3GPP Release 99 Reference Architecture

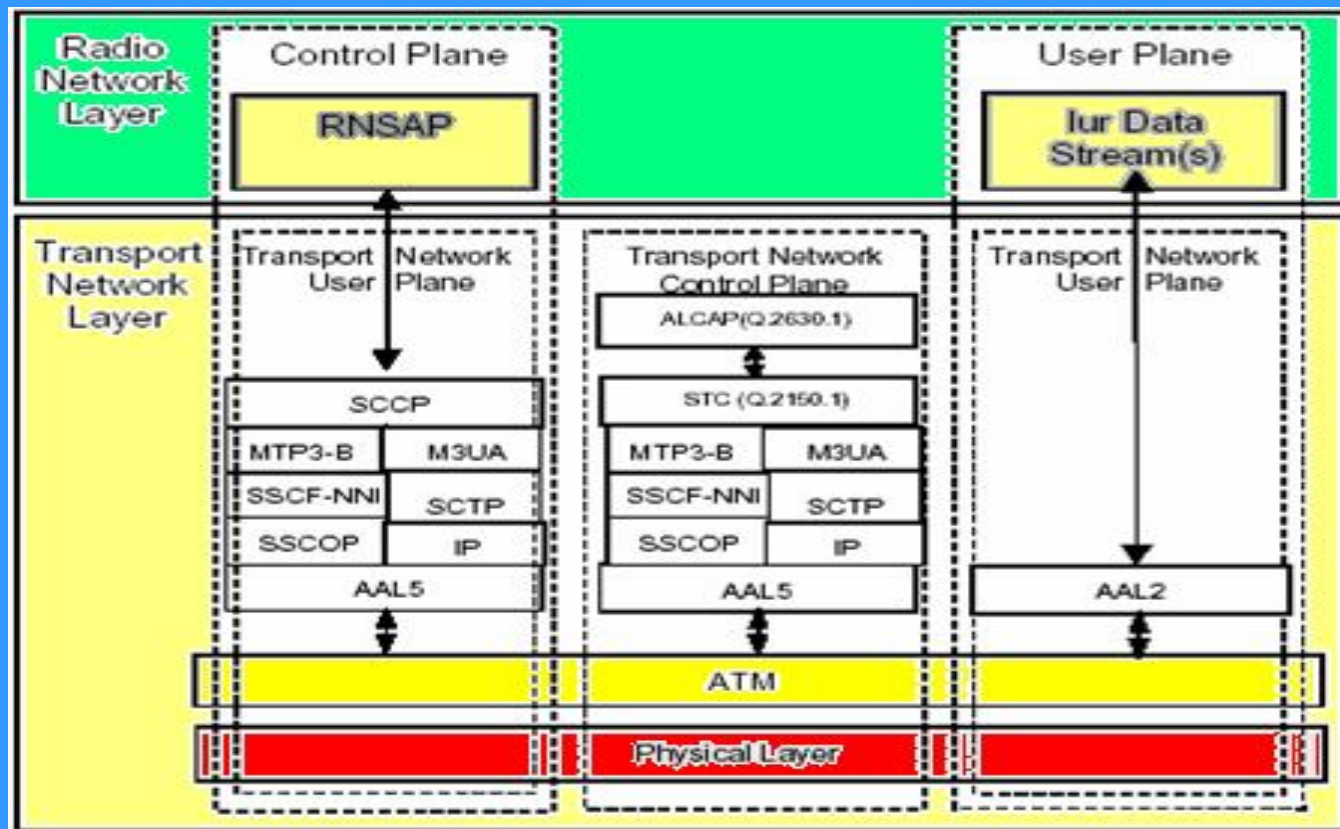


# Radio Network Subsystem Application Part (RNSAP)

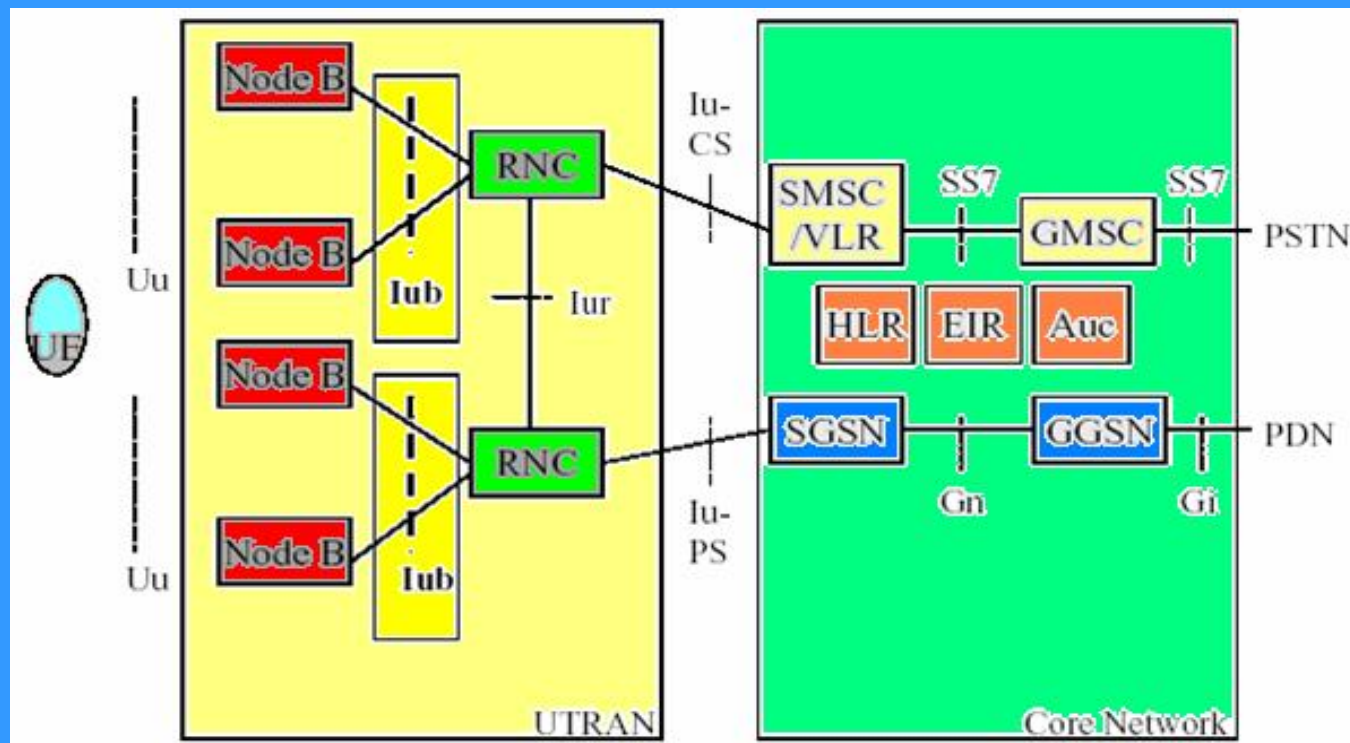
## Key RNSAP Functions:

- Radio Link
- Management (between SRNC and DRNC)
- Reconfiguration (between SRNC and DRNC)
- Supervision (reports from DRNC to SRNC)
- Common Control Channel (CCCH) Signalling Transfer
- Paging
- Relocation Execution

# Iur



# 3GPP Release 99 Reference Architecture



# Node B Application Part (NBAP)

## Key NBAP Functions:

- Cell Configuration Management
- Common Transport Channel Management
- System Information Management
- Configuration Verification/Alignment
- Measurements on Common Resources
- Radio Link Management & Supervision

# Iub

