# TBC-604
# Mobile Computing

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# Mobile Computing:

- Issues in Mobile Computing,
- Fundamentals of cellular systems,
- Cellular system infrastructure,
- Bluetooth Technology,
- Wireless Multiple Access Protocols,
- Channel Allocation in Cellular Systems.

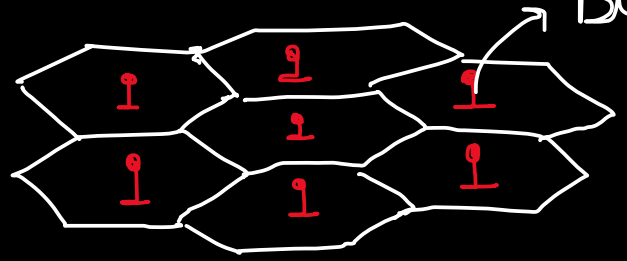
# Mobile Computing:

- Data Management Issues:
  - Mobility,
  - Wireless Communication and Portability,
  - Data Replication and Replication Schemes,
  - Basic Concept of Multihopping,
  - Multicluster Architecture.

# Mobile Computing:

## Cellular Networks → voice + DATA

adjacent cells work on different frequencies



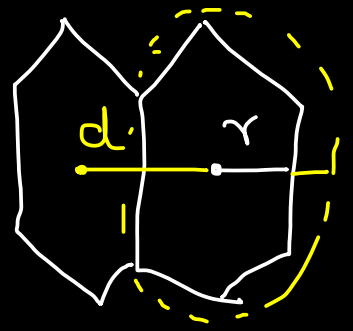

## Advantages

1. Increased capacity
2. Reduced power use
3. Larger coverage area
4. Reduced Interference from other signals.

## factors determining cell size :

1. # users
2. multiplexing and transmission technology used.

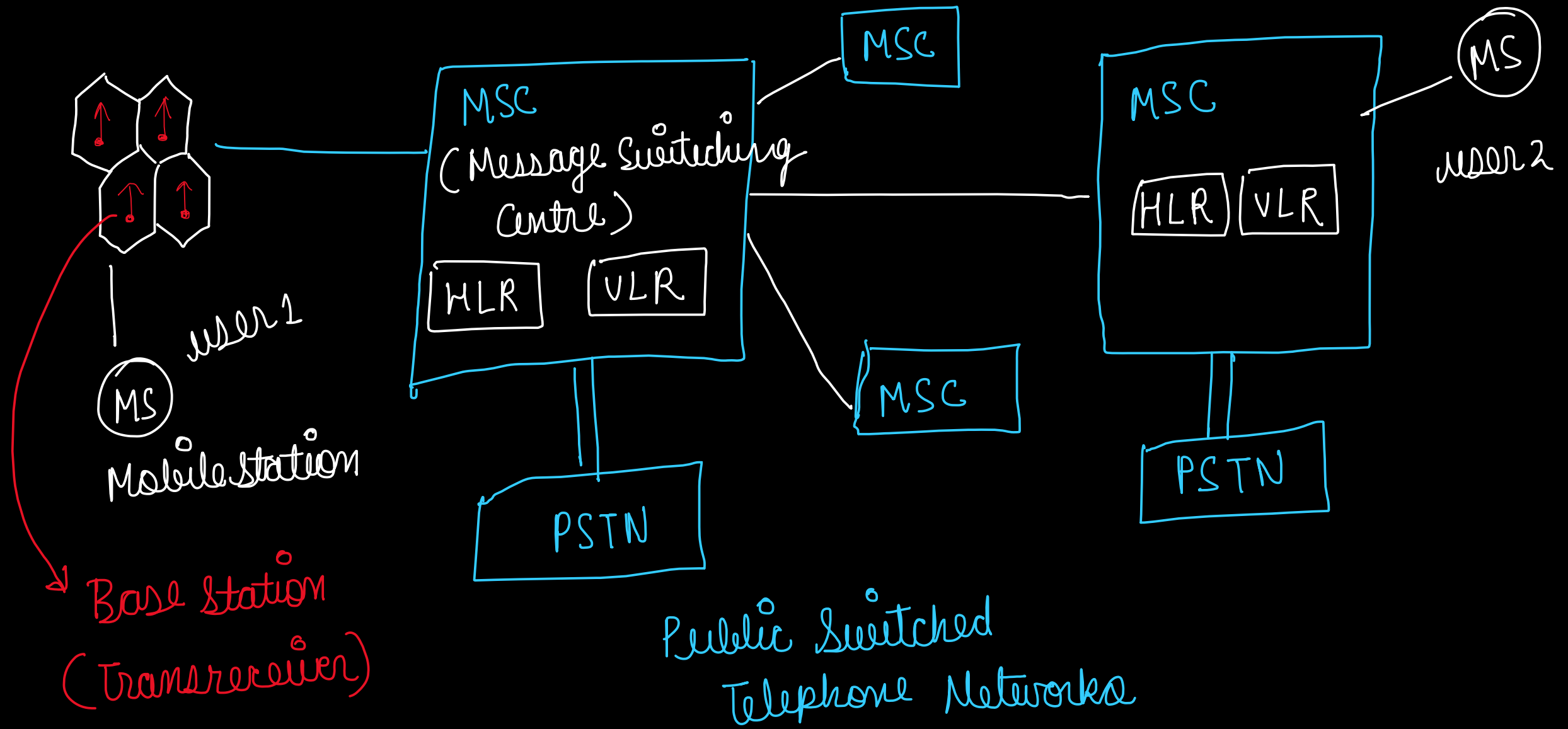
# Mobile Computing:




$d = \sqrt{3}r$

- Base Station (BS)
- Base Station Controller (BSC)
- Message Switching Centre (MSC)
- Home Location Register (HLR)
- Visitor Location Register (VLR)

# Mobile Computing: cellular network architecture



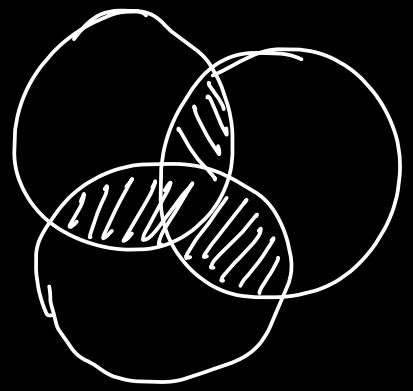
# Mobile Computing:

## Why hexagonal cell shape ?

circle have highest area

↓

but overlapping ☹



area(△) = 17.77 %

area(□) = 63.7 %

} wrt circle

area(⬡) = 83 %

# no overlapping / gap

# proper geometric shape

# Mobile Computing: Bluetooth (Personal Area Network)

PICONET → Bluetooth connectivity among a set of devices.

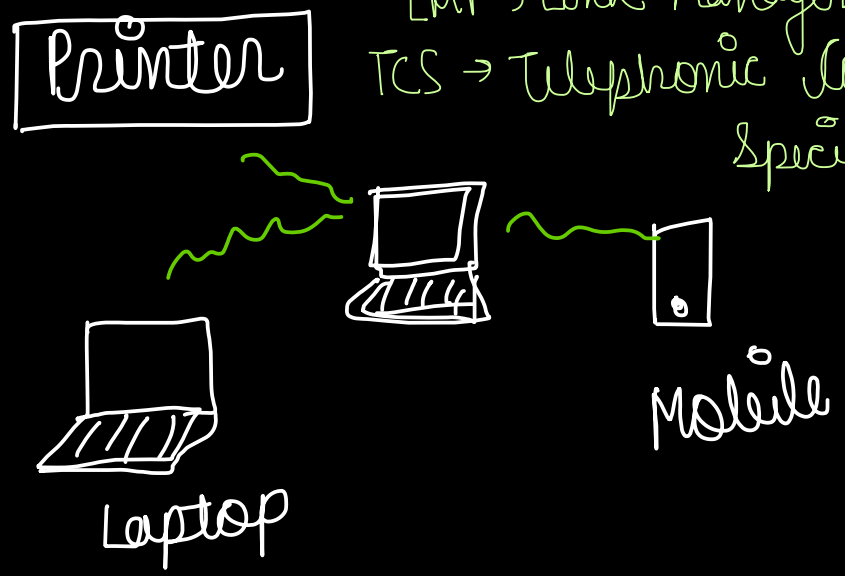
↳ very small internet

↳ Master-Slave communication architecture → 1 master / many slaves

↳ adhoc N/W is created

LMP → Link Management Protocol

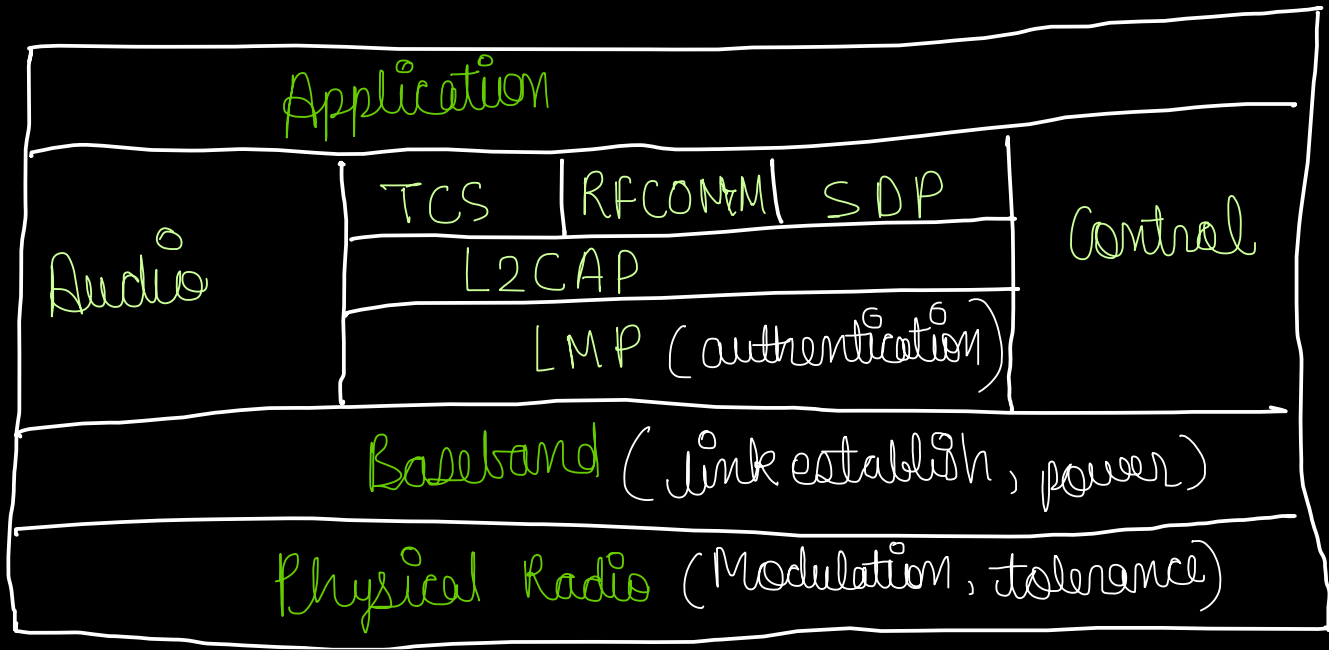
TCS → Telephonic Control Protocol Specification




SDP → Service discovery protocol

L2CAP → logical link control & adaptation protocol

## Bluetooth protocol stack



# Mobile Computing: channel Assignment

① static → fixed # channels are allocated to each cell
② dynamic → # channels are allocated dynamically from central pool

## Fixed Channel Allocation (FCA)

→ specific channels are allocated to specific cells (permanently)
→ static and can't be changed
→ frequency reuse is maximized

### disadvantages

① wastage of channel bandwidth if congestion may occur if traffic is non uniform

# Mobile Computing:

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⇓ (Mobile communication)

technology allows transmission of data, audio/video
(no need of a fixed physical link)

→ compute remotely
→ anywhere, anytime

Main concept involve :

1. Mobile communication
2. Mobile Software
3. Mobile Hardware

# Mobile Computing Functions

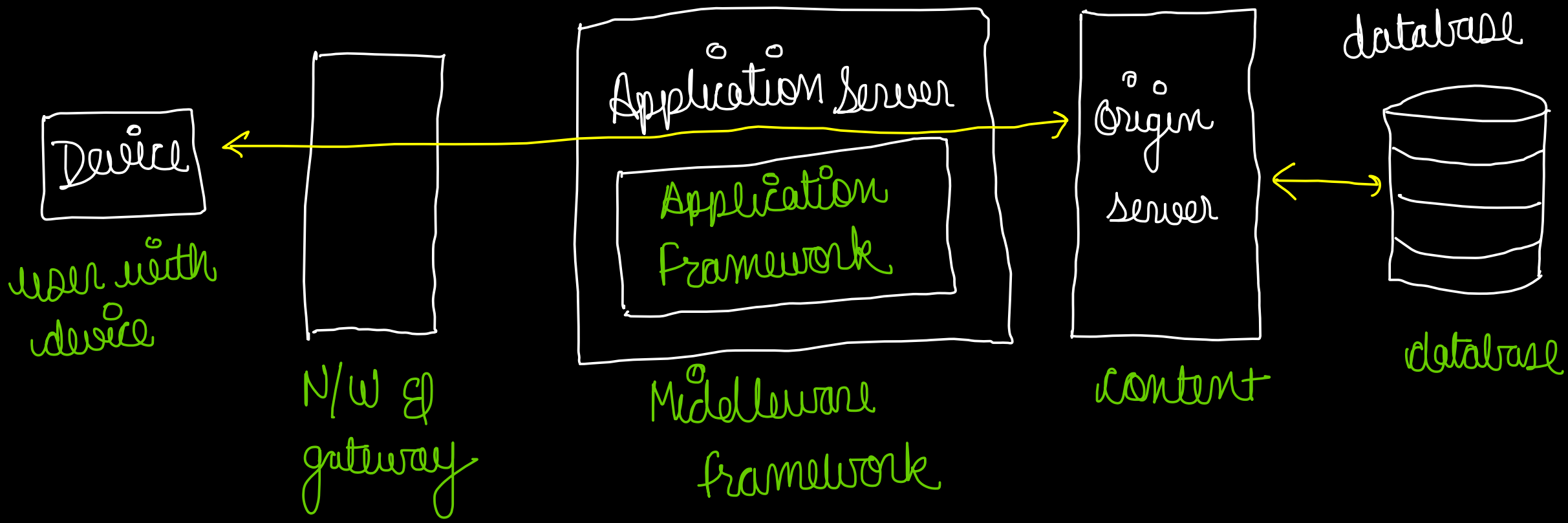
1. user mobility (user himself)
2. Network mobility (different countries)
3. Bearer mobility (service providers)
4. Device mobility (cell phone)
5. Session mobility (CDMA N/W)
   - ↳ user session → from one-user env. to other user env.
6. Agent Mobility (Different modes)
7. Host Mobility (client / server) → taking care of IP host

# Mobile Computing: logical segments

all the functions of Mobile Computing can be logically divided in 5 segments:

1. User with device → may be fixed or portable
2. Network → GSM / CDMA / Bluetooth
3. Gateway → It is required to interface different transport bearers
4. Middleware → handles presentation & rendering of content on a particular device, & security & personalization
5. Content → depicts the origin of the server & its content

# Mobile Computing: logical segments



# Mobile Computing: Networks

① Wireline Network → It consists of traditional landline system also known as PSTN (Public Switch Telephone Network).

② Wireless Network → They can be CDMA, GSM, GPRS, WLL etc.

③ Adhoc Networks → Temporary networks which are created to share data such as Bluetooth & infrared.

which support wireless communication

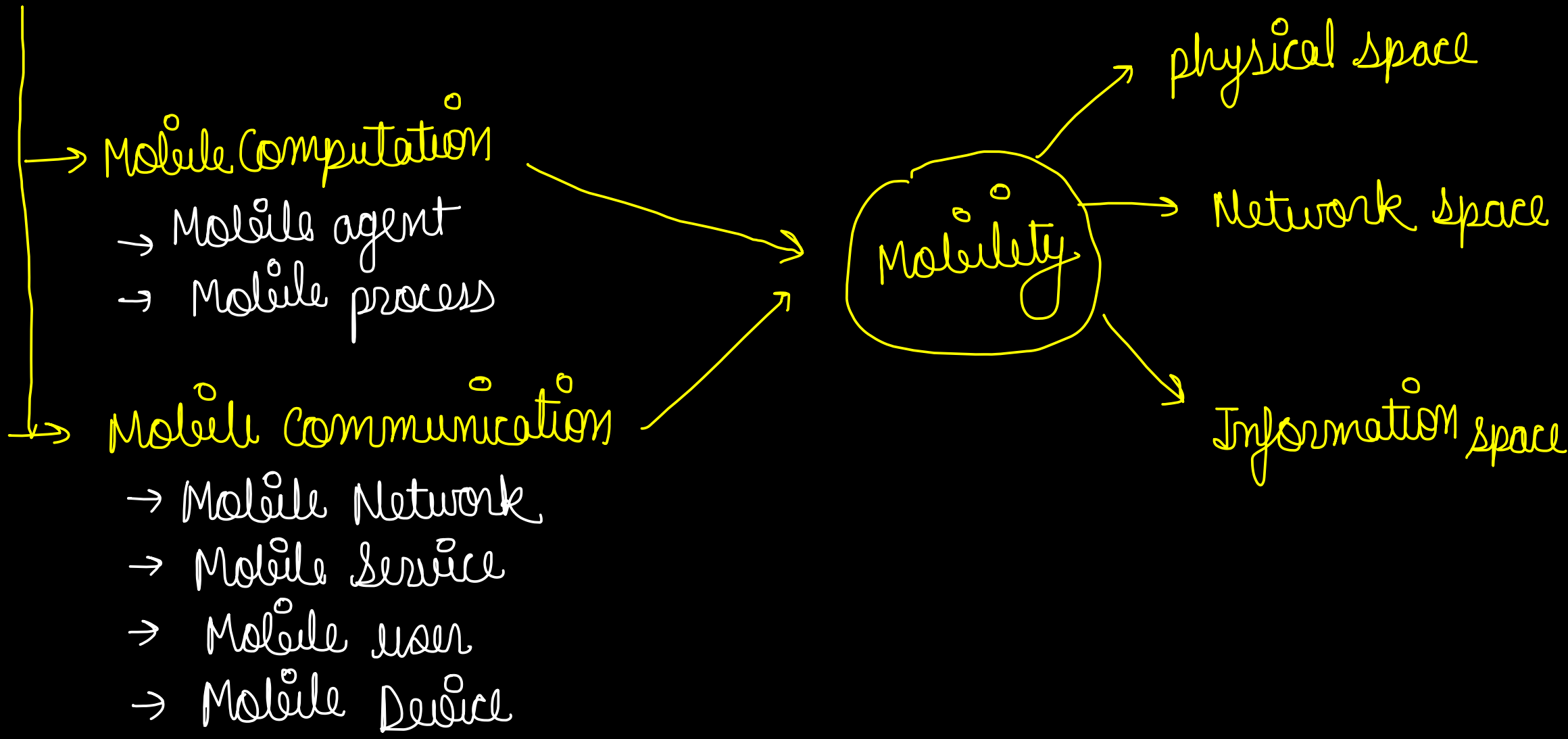
GSM

CDMA

GPRS

WLL → Wireless Local Loop

# Mobile Computing:



# Mobile Computing: Mobile computing Architecture

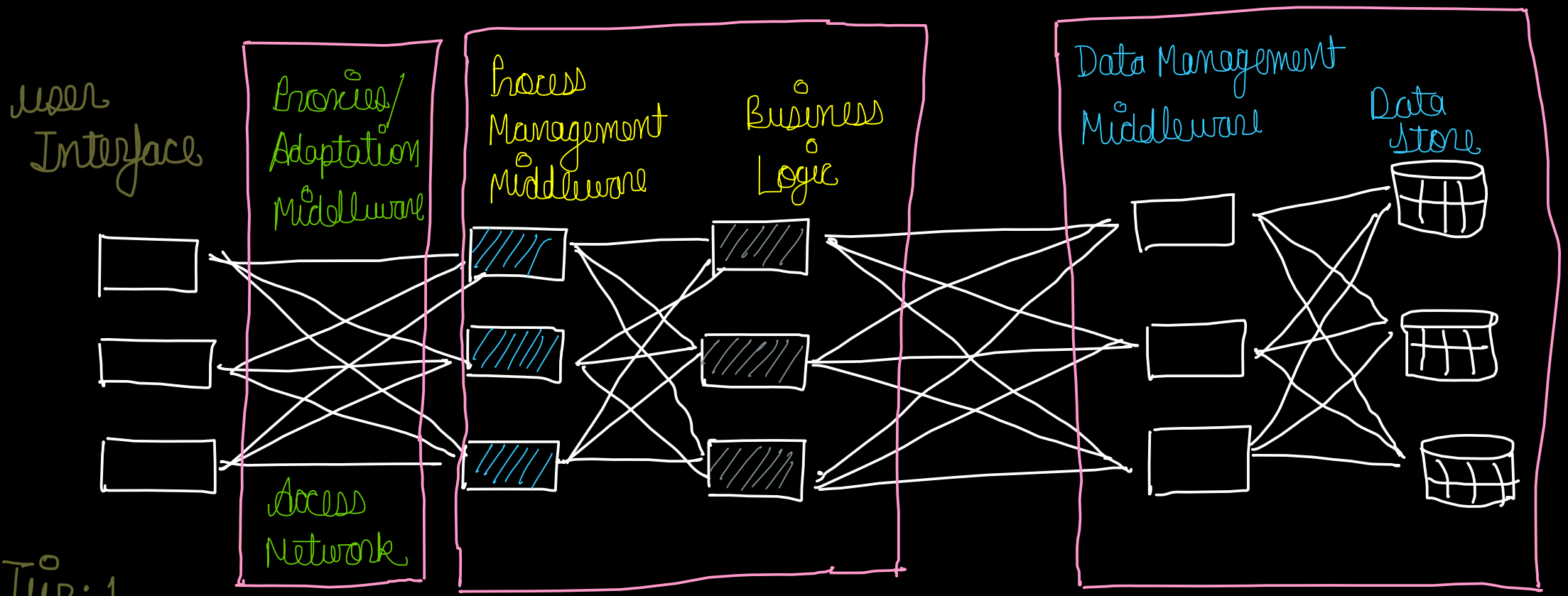
→ refers to various layers between user applications interfaces, devices and network hardware

→ required for schematic compositions, access data & software objects

3 tiers

1. User Interface or Presentation Tier (Front End)
2. Process Management or Application Tier (Middle layer)
3. Database Management or Data Tier (Back End)

# Mobile Computing: Architecture



# Mobile Computing:

1st tier / User interface → deals with user facing, device handling & rendering. → includes a user System interface where user service reside.

2nd tier / Process Management → here business logic & rules execute.
→ transaction control → accomodation of users → asynchronous queuing

3rd tier / Database Management → database access & design
→ abstraction to provide increased performance & accessibility

# Mobile Computing:

# Multicluster Architecture

Multicluster architecture is a type of architecture used in mobile computing, where many mobile devices are organized into several clusters. Each cluster has a coordinator, which is responsible for the overall management of the devices in the cluster. The coordinators are connected to each other forming a hierarchical structure.

The main advantage of this architecture is that it provides a scalable and reliable network for mobile devices. The multicluster architecture allows for efficient resource utilization, as it can dynamically allocate resources among the devices in the clusters based on their requirements.

Another advantage of this architecture is that it provides a high level of fault tolerance. If a device fails, the coordinator can detect it and assign its tasks to another device in the cluster, ensuring the smooth operation of the network.

The multicluster architecture is particularly useful in scenarios where the network topology changes frequently, as it can adapt quickly to the changing conditions. For example, in a disaster recovery scenario, where the network infrastructure is damaged, the multicluster architecture can provide a robust and flexible communication network for first responders.

Overall, the multicluster architecture is an effective solution for managing large numbers of mobile devices in a scalable and reliable way.

# Mobile Computing:

Data replication is the process of creating and maintaining multiple copies of data in different locations. The purpose of data replication is to improve data availability, increase data durability, and enhance system performance by reducing access latencies. Replication schemes are the methods used to determine how and where to replicate data.

There are several types of replication schemes:

Eager Replication: In eager replication, data is replicated immediately to all nodes that require it. This scheme provides high data availability but requires significant network bandwidth and storage space.

Lazy Replication: In lazy replication, data is replicated only when it is required. This scheme reduces network bandwidth and storage requirements but increases data access latency.

Partial Replication: In partial replication, only a subset of the data is replicated. This scheme is useful when the complete data set is too large to replicate, or when some data is accessed more frequently than others.

Full Replication: In full replication, the entire data set is replicated. This scheme provides high data availability but requires significant network bandwidth and storage space.

# Mobile Computing:

Data replication schemes can be classified based on the replication topology:

Centralized Replication: In centralized replication, all replicas are managed by a single node. This scheme provides a centralized control mechanism but can result in a single point of failure.

Decentralized Replication: In decentralized replication, each node manages its own replicas. This scheme provides better fault tolerance and scalability but can result in data inconsistencies.

Hybrid Replication: In hybrid replication, a combination of centralized and decentralized replication is used. This scheme provides a balance between control and fault tolerance.

In summary, data replication and replication schemes are critical components of mobile computing systems, which improve data availability, durability, and performance. The selection of a replication scheme depends on the requirements of the system, including data size, access patterns, fault tolerance, and scalability.

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