

**Marwadi**  
University

**01CE0701 – Mobile Computing**

# **Unit - 1**

## **Detailed Introduction of Mobile Computing**

Computer Engineering Department



- Introduction of Mobile Computing
- Security issues
- Different Propagation Modes
- Architecture of mobile computing
- Needs of mobile user

**MOBILITY?.....**

**Computing?.....**

## What is Mobile Computing?

- Mobile Computing is a **technology** that allows transmission of **data, voice** and **video** via a **computer** or any other **wireless enabled device** without having to be connected to a fixed physical link.

- Mobile computing can be defined as a computing environment of physical mobility.
- The user of a mobile computing environment will be able to access data, information, or other logical objects from any device in any network while on the move.
- A mobile computing system allows a user to perform a task from anywhere using a computing device in the public (the Web), corporate (business information) and personal information spaces (medical record, address book).

## Understanding the Term “Mobile computing” More ...

### **Mobile computing is used in different contexts with different names.**

- **Mobile Computing:** This computing environment moves along with the user. This is similar to the telephone number of a GSM (Global System for Mobile communication) phone, which moves with the phone. The offline (local) and real-time (remote) computing environment will move with the user. In real-time mode the user will be able to use all his remote data and services online.
- **Anywhere, Anytime Information:** This is the generic definition of ubiquity, where the information is available anywhere, all the time.
- **Virtual Home Environment:** Virtual Home Environment (VHE) is defined as an environment in a foreign network such that the mobile users can experience the same computing experience as they have in their home or corporate computing environment.



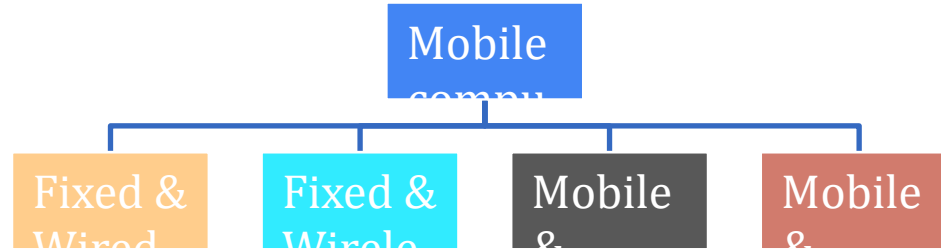
# Understanding the Term “Mobile computing”

More ...

**Mobile computing is used in different contexts with different names.**

- **Nomadic Computing:** The computing environment is nomadic and moves along with the mobile user. This is true for both local and remote services.
- **Pervasive Computing:** A computing environment, which is pervasive in nature and can be made available in any environment
- **Ubiquitous Computing:** A (nobody will notice its presence) everyplace computing environment. The user will be able to use both local and remote services
- **Global Service Portability:** Making a service portable and available in every environment. Any service of any environment will be available globally.
- **Wearable Computers:** Wearable computers can be worn by humans like a hat, shoe or clothes (these are wearable accessories).

## Types of Mobile computing



**Fixed & Wired:** Devices are **fixed** at a position, and they are connected through a **physical link** to communicate with other devices. **Ex.,** Desktop

**Fixed & Wireless:** Devices are **fixed** at a position, and they are connected through a **wireless** link to make communication with other devices. **Ex.,** Wi-Fi Router, communication tower

**Mobile & Wired:** Some devices are **wired**, and some are **mobile**. They altogether make communication with other devices.. **Ex.,** Laptops

**Mobile & Wireless:** Devices can communicate with each other irrespective of their position. They can also connect to any network without the use of any wired device.. **Ex.,** Mobile

## Benefits of Mobile Computing

- Easy to carry and work from anywhere
- Saves Time
- Voice and data transmission
- Enhanced Productivity
- Ease of Research
- Wireless LAN to access Internet from anywhere
- Attractive user interface

## Application of Mobile Computing

- Web or Internet access
- Email
- Global Position System (GPS)
- Emergency services
- Entertainment services
- Educational services
- Online Transactions

## Introduction

### ❑ Limitations of Mobile Computing

- Network Fluctuation
- Battery consumption
- Bandwidth
- Small screen sizes
- Issues of interoperability
- Security

## Application of Mobile Computing

- Web or Internet access
- Email
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# Security Concern regarding Mobile Computing



## ❑ Security Issues in mobile computing

- General Security Issues
- Wireless Security Issues
- Device Security Issues



## ❑ General Security Issues

- ★ **Confidentiality:**

- This is used to prevent unauthorized users from gaining access to any particular user's critical and confidential information.

- ★ **Integrity:**

- This is used to ensure that any type of unauthorized modification, destruction or creation of information cannot be done.

- ★ **Availability:**

- The availability is used to ensure that authorized users get the required access whenever they need it.

- ★ **Legitimate:**

- This is used to ensure that only authorized, and legitimate users have access to the services.

## ❑ Wireless Security Issues

### \* Denial of Services:

- attacker sends a large amount of unnecessary data or connection requests to the communication server. It causes a slow network, and therefore the users cannot get benefitted from using its service.

### \* Traffic Analysis:

- Monitor communication between users. In this process, the service provider listens the traffic flowing in the wireless channel to access the private information of users affected by the attacker.

### \* Eavesdropping:

- Attacker can log on to the wireless network and access sensitive data if the wireless network was not secure enough. This can also be done if the information is not encrypted.

### \* Session Interception and Modification of Message:

- It specifies that the attacker can intercept the session and modify the transmitted data in this session. This scenario is called "man in the middle." It inserts the attacker's host between the sender and receiver host.

### \* Spoofing:

- Attacker impersonates him as an authorized account of another user and tries to access the sensitive data and unauthorized services.

## ❑ Device Security Issues

### \* **Push Attacks:**

- In the push attack, the attacker creates a malicious code at the user's mobile device by hacking it and then he/she may spread it to affect other elements of the network.

### \* **Pull Attacks:**

- The pull attack is a type of attack where the attacker controls the device and handles it in his/her way. He can decide which emails they want to receive. In this attack, the user can decide about the obtained data by the device itself.

### \* **Forced De-authentication:**

- In this security issue, the attackers convince the mobile end-point or the mobile user to drop its connection and re-connection to get a new signal. Within this process, they insert their device between the mobile device and the network and steal the information or do the fraud.

## ❑ How to handle security issues?

- Hire qualified personnel.
- Install security hardware and software.
- Data should be in encrypted form.
- Educate the users on proper mobile computing ethics and security issues.
- Use antivirus software in mobile devices.
- Firewall client should be installed on mobile devices.
- Make your mobile devices encrypted with a strong password.
- Encrypt your data stored in the secondary storage devices such as Memory Sticks, Data card, removable USB etc. (Back up your mobile device)
- Ensure that the Bluetooth, Wi-Fi, etc. enabled mobile devices are turned off when you are not using them.
- Make periodic backups of your mobile devices on a data server.

# **How Wireless Communication Occurs?**

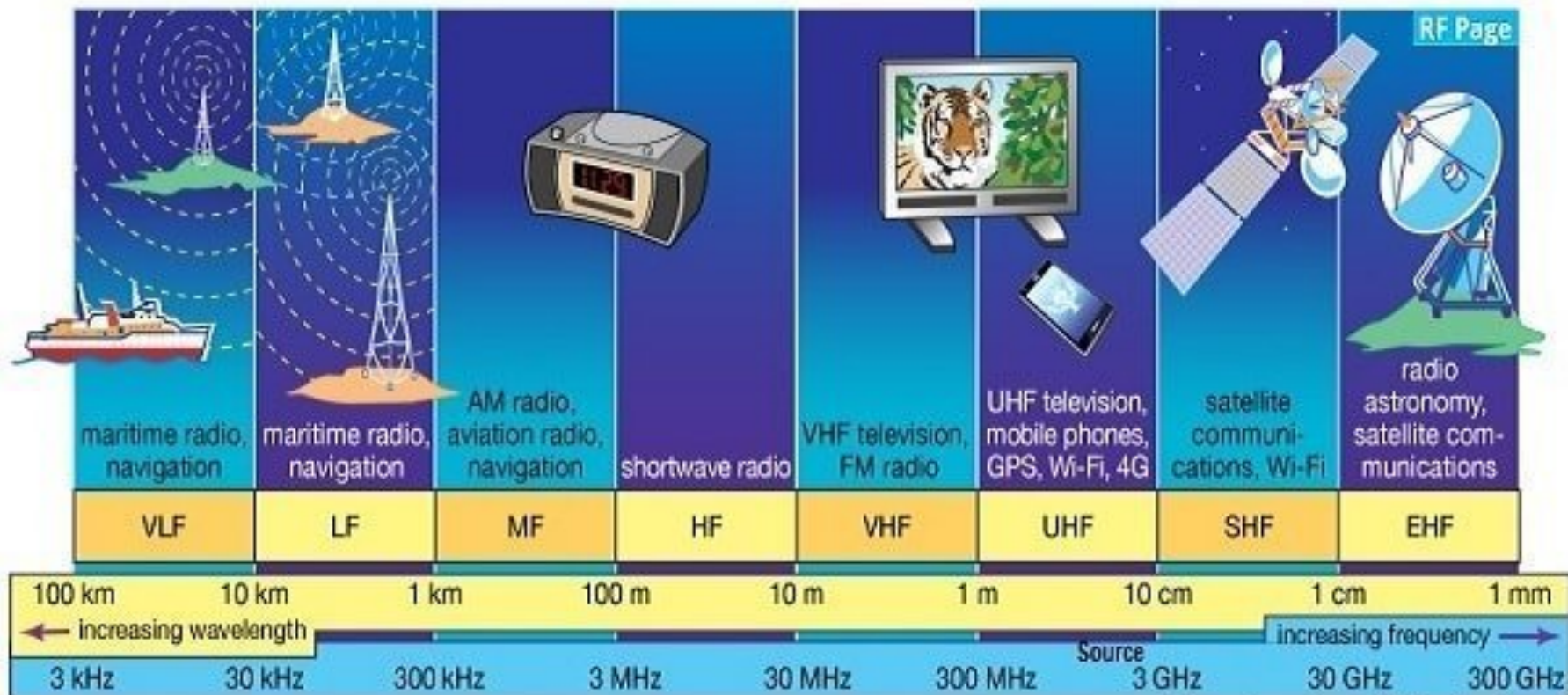
**Radio Frequency Range**

**Different Propagation Modes**

## How Wireless Communication Occurs?

- Wireless communication generally works **through electromagnetic signals** that are broadcast by an enabled device within the air, physical environment or atmosphere.
- The sending device can be a sender or an intermediate device with the ability to propagate wireless signals.
- The communication between two devices occurs when the destination or receiving intermediate device captures these signals, creating a wireless communication bridge between the sender and receiver device.

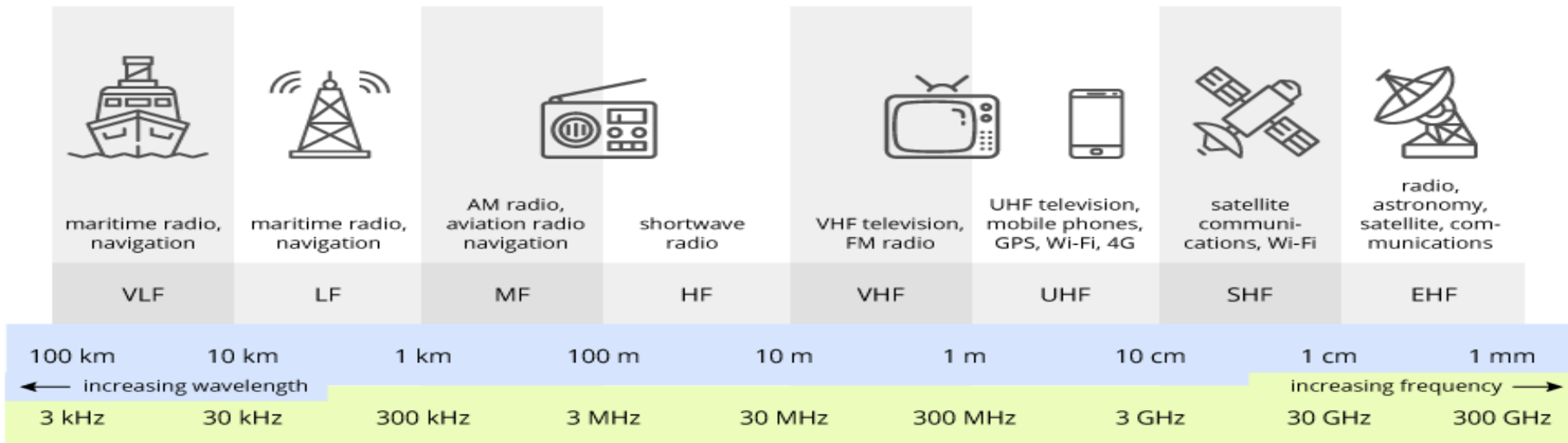
# Radio Frequency bands and its uses



Source: Encyclopaedia Britannica, Inc.



# General Frequency Ranges



**VLF** Very Low Frequency

**LF** Low Frequency

**MF** Medium Frequency

**HF** High Frequency

**VHF** Very High Frequency

**UHF** Ultra High Frequency

**SHF** Super High Frequency

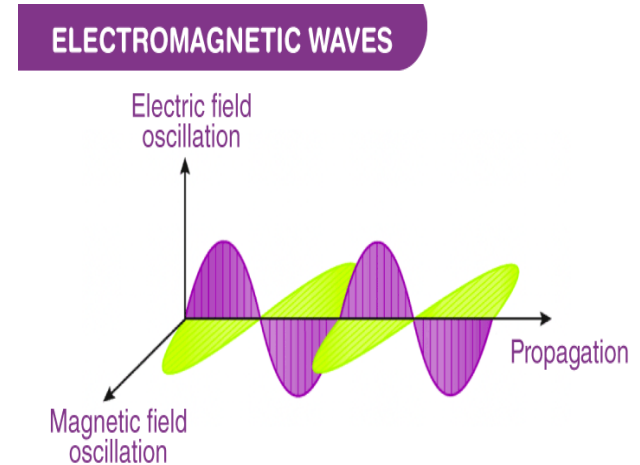
**EHF** Extremely High Frequency

*Frequency and wavelength are inversely proportional to each other.*



## ❑ What is propagation?

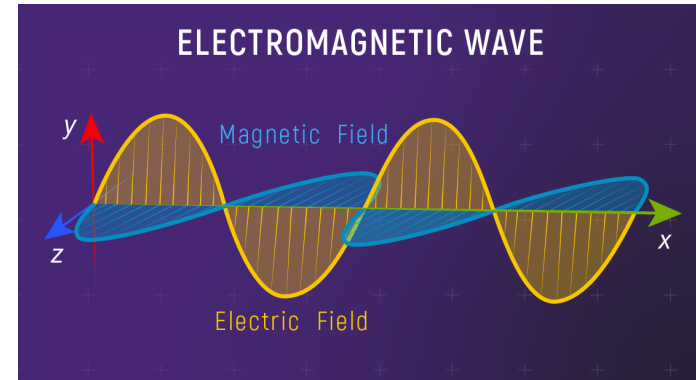
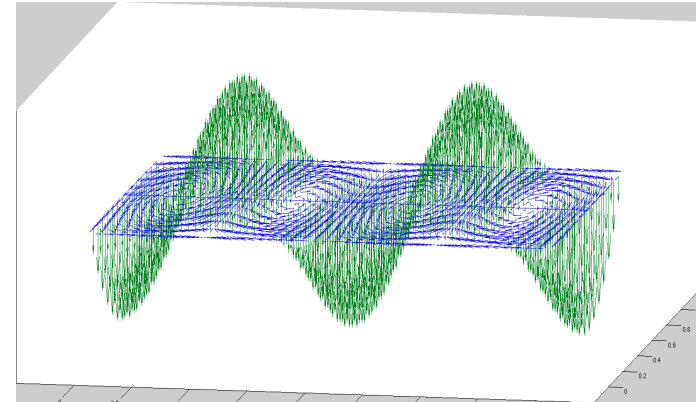
- **Propagation:** The radiated power *propagates* in space in the form of *electromagnetic waves*.
- The radiation and propagation of the radio waves cannot be seen.
- There are 3 types of propagation
  1. **Ground**-wave propagation
  2. **Sky**-wave propagation
  3. **Line-of-sight** propagation



# Different Propagation Modes

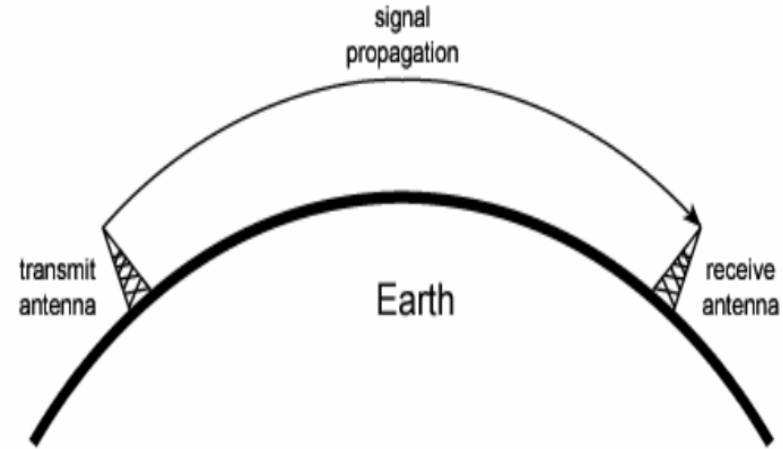
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# Ground Wave Propagation

- The **EM waves** leaves antenna and remains **close** to the earth surface.
- It follows the **curvature** of the earth surface and uses lower frequency.
- The ground wave propagation is **strongest** at low and medium frequency ranges i.e. between **30kHz** and **3MHz**.
- While passing over the earth surface, the ground waves **induce** some **current** in to it. Thus they loose some energy due to **absorption**.
- Due to **diffraction** EM wave **tilt** over the surface of the earth and this angle increases with distance and frequency so, ground wave propagation should be used up to MW (Medium Wave) frequency band.
- E.g. AM FM Radio, TV broadcasting.

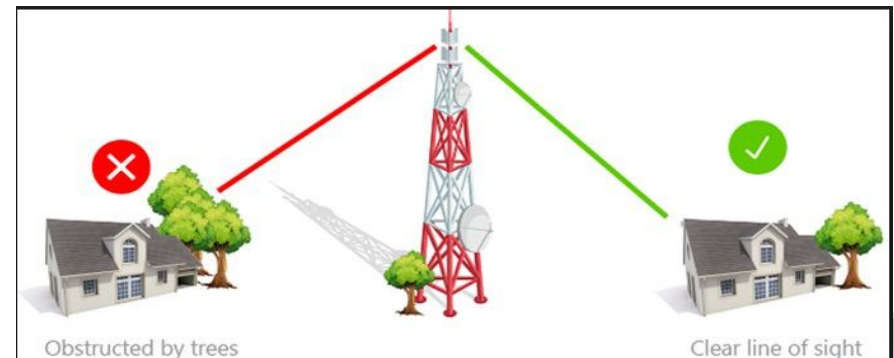
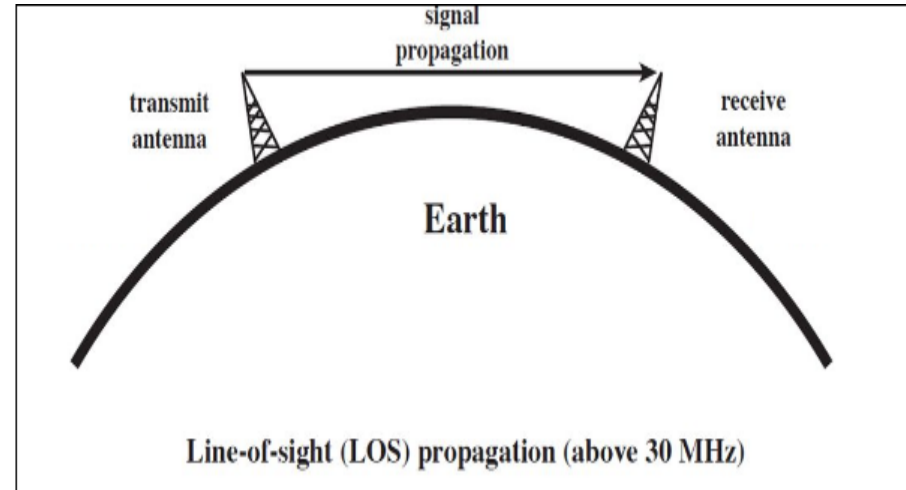


Ground-wave propagation (below 2 MHz)



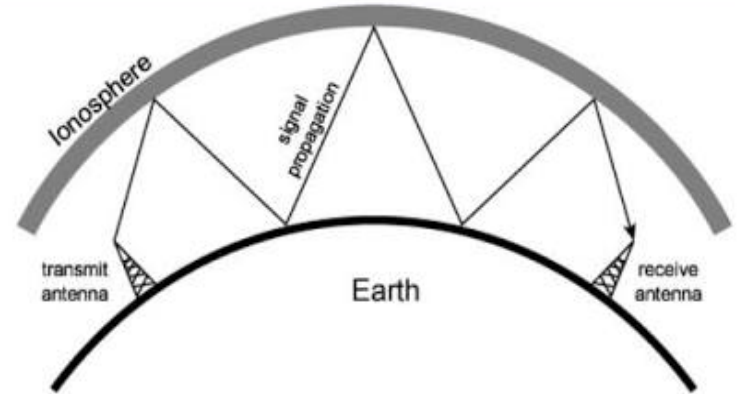
# Line-of Sight Wave Propagation -Short distance

- As the name implies, the wave travels a **minimum distance** of sight.
- **Ground communication** - Antennas within effective line of site due to refraction.
- **Satellite communication** - Signal above 30 MHz is not reflected by ionosphere.
- Therefore it can be transmitted between an **earth station** and **satellite**.
- We need to employ an **amplifier/transmitter** to amplify the signal and transmit again.
- Application
  1. **Infrared** transmission
  2. **Microwave** transmission

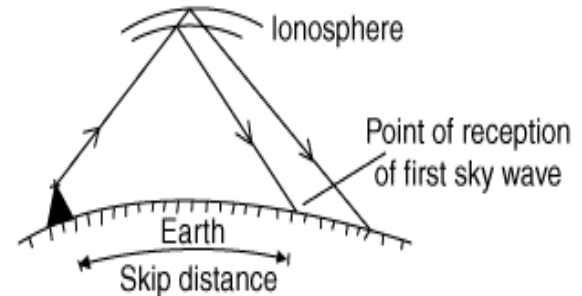


# Sky Wave Propagation- Long distance communication

- Signal reflected from **ionized layer** of atmosphere back down to earth.
- Signal can travel a number of hops, back and forth between **ionosphere** and **earth's surface**.
- Ionosphere is the **ionized layer** around the Earth's atmosphere, which is **suitable** for sky wave propagation.
- **Reflection** effect caused by **refraction**.
- With this propagation mode, a signal can be picked up **thousands of kilometers** from the transmitter.
- Examples
  1. Amateur radio (Ham radio)
  2. CB radio (Citizen Band Radio)



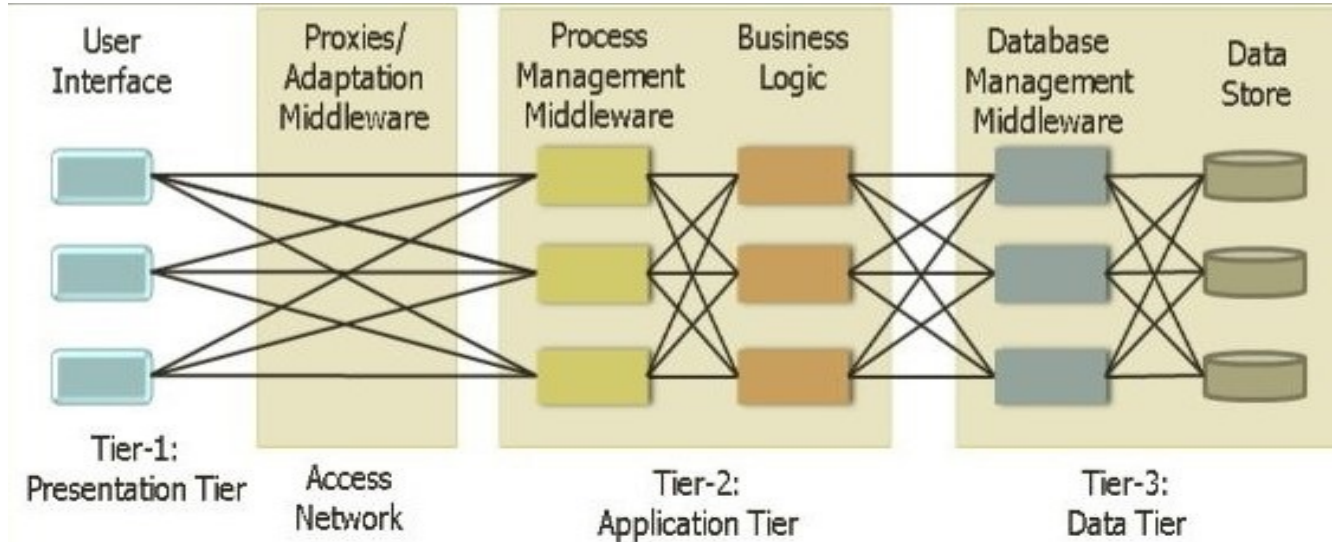
Sky-wave propagation (2 to 30 MHz)



# Architecture of Mobile Computing



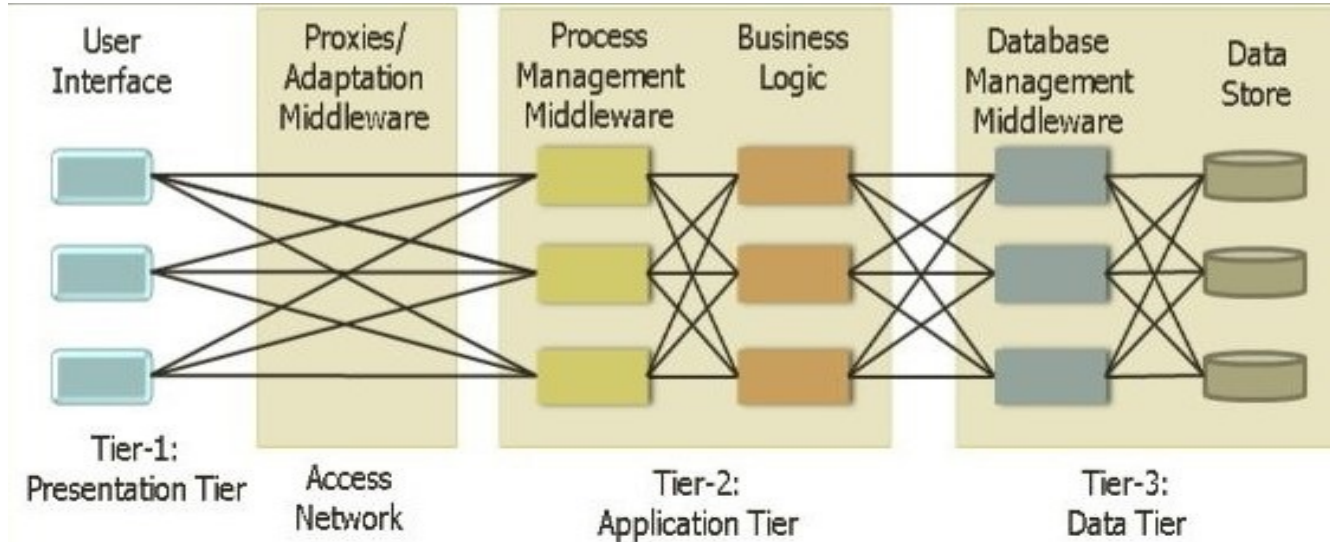




- **Each tier is distributed to a different place or places in a network.** These tiers do not necessarily correspond to physical locations on various computers on a network, but rather to logical layers of the application.

## 1. Presentation Layer (UI):

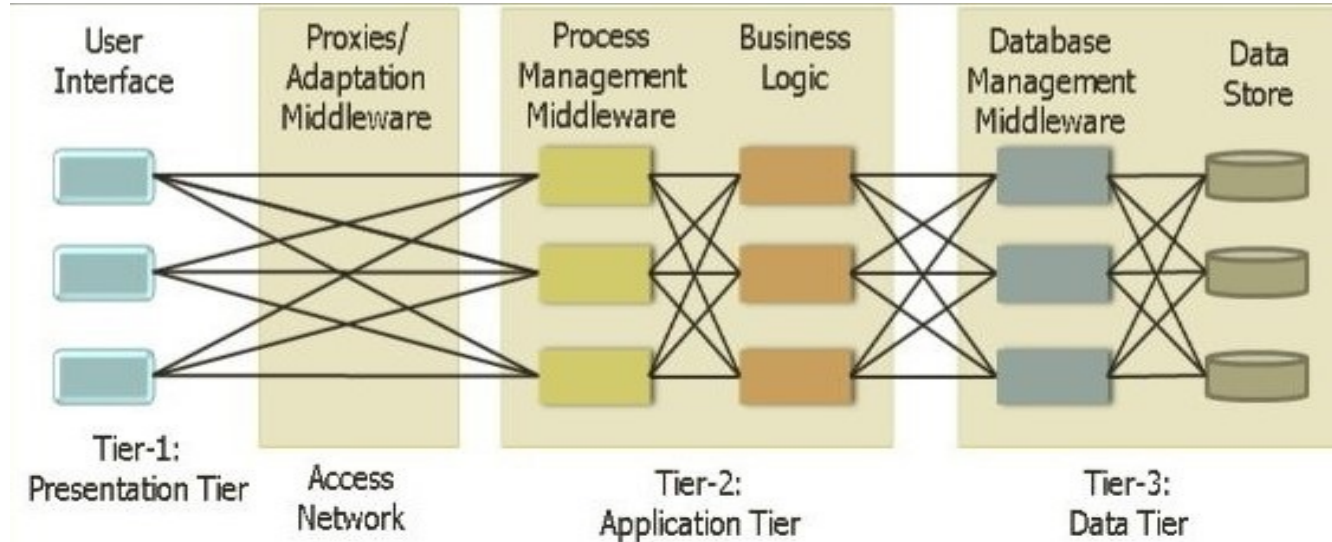
1. This layer presents data to the user and optionally permits data manipulation and data entry, also this layer requests the data form Business layer.
2. This layer accomplished through use of Dynamic HTML and client-side data sources and data cursors.



## 2. Application Layer (AL):

1. The business logic acts as the server for client requests from workstations. It acts according to Business rules to fetch or insert data through the Data Layer.
2. In turn, it determines what data is needed (and where it is located) and acts as a client in relation to a third tier of programming that might be located on a local or mainframe computer.
3. Because these middle-tier components are not tied to a specific client, they can be used by all applications and can be moved to different locations, as response time and other rules require.





### 3. Data Access Layer (DA):

1. The third tier of the 3-tier system is made up of the DBMS that provides all the data for the above two layers.
2. This is the actual DBMS access layer.
3. Avoiding dependencies on the storage mechanisms allows for updates or changes without the application tier clients being affected by or even aware of the change.

# Needs of Mobile User



- Seamless connectivity for better Quality of Service
- Portability with devices and networks
- Interactivity with different users with different types of devices
- Individuality for making user identifiable among number of users
- Security with respect to data as well as communication
- Easier Human interface for making it's usage user friendly

**THANK YOU!**