

MOBILE AD-HOC AND WIRELESS SENSOR NETWORKS

Lesson 01

Introduction to Mobile Ad-hoc Network (MANET)

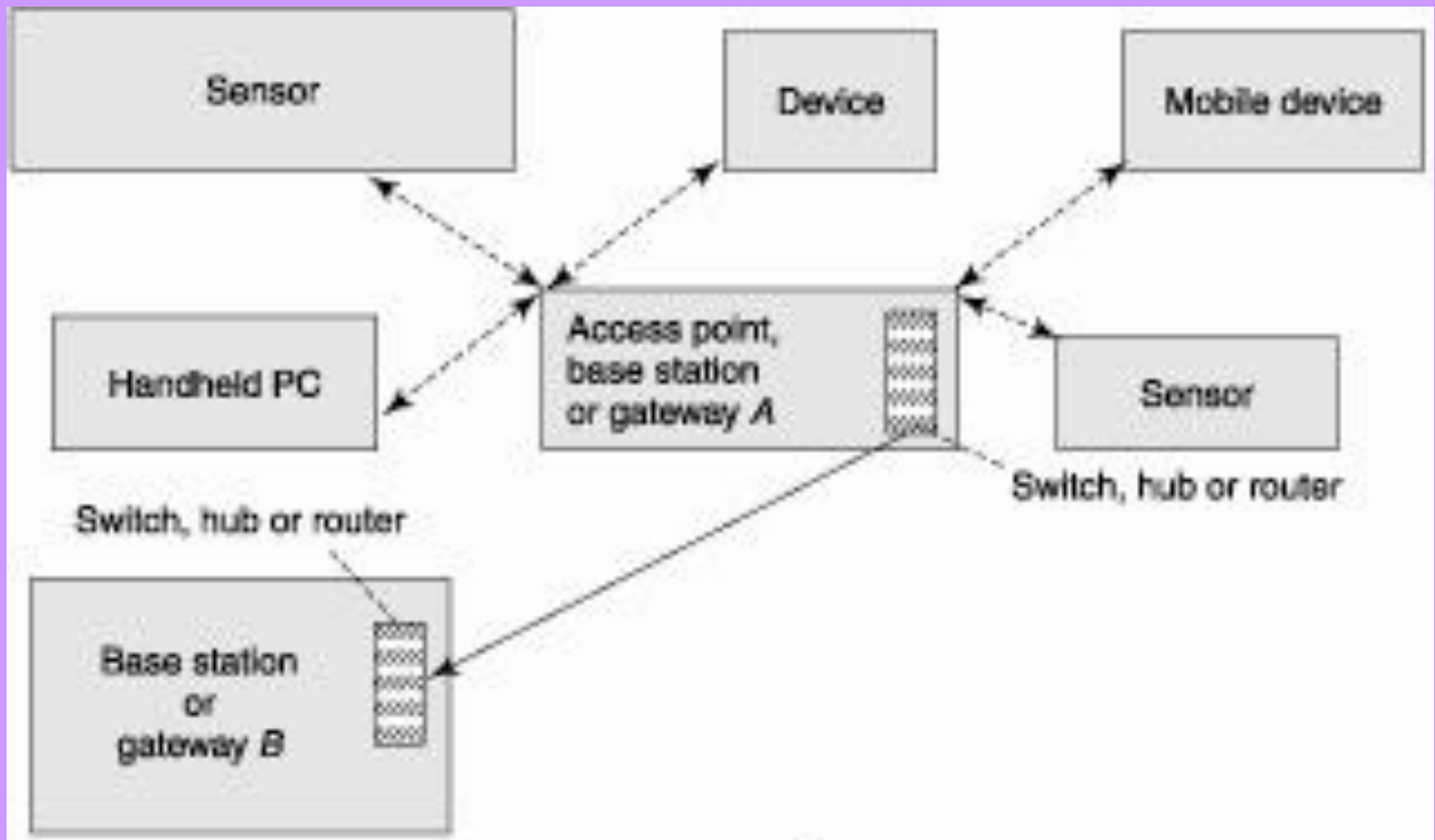
FIXED INFRASTRUCTURE NETWORK

- Networking using switches, hubs, routers, access-points, base stations, or gateways networked
- Locations of Switches, hubs or routers fixed

FIXED INFRASTRUCTURE NETWORK

- To connect to and access the network a mobile device or wireless sensor has to be moved in the vicinity (connectivity range) of an access-point
- Example— a cellular network

FIXED NETWORK INFRASTRUCTURE ARCHITECTURE



FIXED INFRASTRUCTURE

- Each mobile device or sensor connects to an access-point, base station, or gateway with a switch, hub, or router *A*

A SWITCH IN FIXED INFRASTRUCTURE

- Provides connectivity between the two, a hub functions as a central switching exchange

A ROUTER IN FIXED INFRASTRUCTURE

- Provide two or more paths to route a message or packet so that the available path can be used at an instant
- They function as the nodes of the network
- A mobile device or sensor has to acquire an access-point or node of the fixed infrastructure network before being able to connect to another

GSM CELLULAR PHONES IN A FIXED INFRASTRUCTURE NETWORK

- GSM system— A three-subsystems architecture consisting of radio subsystem (RSS), network subsystem (NSS), and operational subsystem (OSS)
- Each cellular phone has to first connect to a RSS of GSM public land mobile network

CELLULAR PHONES IN A FIXED INFRASTRUCTURE NETWORK

- The connectivity between two cellular phones is ensured through GSM public land mobile PSTN, ISDN, or PSPDN networks

PROBLEM WITH FIXED INFRASTRUCTURE NETWORK

- Disconnection from the network and thus unable to communicate through the network when a wireless sensor or mobile device moves out of the range of access-point, base station, or gateway having the switch or router
- Even though there may be another wireless device in its vicinity connected to network

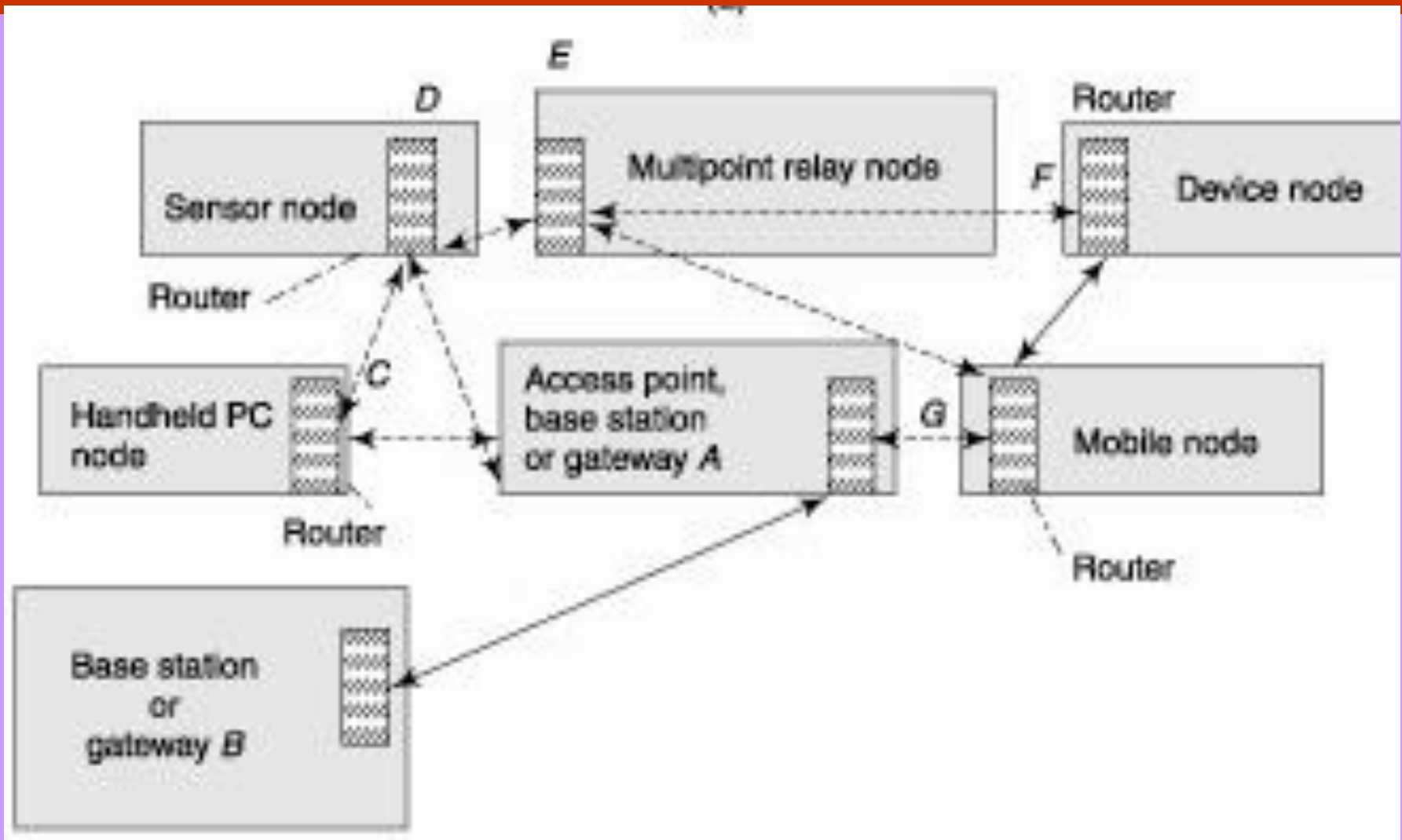
PROBLEM WITH FIXED INFRASTRUCTURE NETWORK

- Network not usable in operations like disaster relief

MOBILE AD-HOC NETWORK (MANET)

- A network in which the locations of the switches, hubs, or routers can be mobile
- The number of routers available at an instant can increase or decrease, and the available routing paths can change
- The mobile devices or wireless sensors as well as the access-points can have switches or routers

MOBILE AD-HOC NETWORK (MANET) ARCHITECTURE



MANET ORGANIZATION

- The ad-hoc network formed by the nodes *A*, *C*, *D*, *E*, *F*, and *G*
- Each mobile device or sensor functions as a node with a switch or router

THE NETWORK ORGANIZATION

- Change if D and E move away from each other such that they reach out of the range of wireless coverage
- Two new ad-hoc networks will then be formed by (i) A , C , and D and (ii) A , G , F , and E
- The devices on two networks can still connect to each other through the common node A

MANET ORGANIZATION

- An important characteristic of ad-hoc network architecture is that its organization can change due to movement of a device or sensor
- In other words, the ad-hoc networks are self-organizing

MANET

- The routes available to the mobile devices or wireless sensors can thus change at any time
- Depend on presence and locations of other wireless devices in their vicinity (connectivity range)

MANET ORGANIZATION

- Depends upon the location of the nodes, their connectivity, their service discovery capability, and their ability to search and route messages using nearest node or nearby nodes

EXAMPLE

- Network of mobile device, home computer and printer at office
- A Bluetooth-enabled mobile device, a Bluetooth-enabled computer, and Internet with WiFi connection at home
- Assume that there is a Bluetooth-enabled computer connected to TCP/IP Internet and also to JINI client printer at office

EXAMPLE

- Network of mobile device, home computer and printer at office
- Through intermediate nodes— WiFi, Internet, and office computer, an ad-hoc network establishment between the mobile device at home and printer at office when the user carrying the device moves from office to home and handheld PDA mobile device reaches near the home computer

NETWORK

- Mobile device, computer and printer
Using service discovery
- MANET establishes after the services of JINI, TCP/IP Bluetooth, and WiFi discovered
- When the user of same mobile device goes to an airport with WiFi connectivity, a MANET again established with the office printer

SUMMARY

- To connect to and access the network a mobile device or wireless sensor has to be moved in the vicinity (connectivity range) of an access-point in fixed infrastructure network

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... SUMMARY

- Mobile Ad-hoc network (MANET) connection depends upon the location of the nodes
- Their connectivity, their service discovery capability, and their ability to search and route messages using nearest node or nearby nodes

End of Lesson 01

Introduction to Mobile Ad-hoc Network