Mobile Computing Architecture– an overview

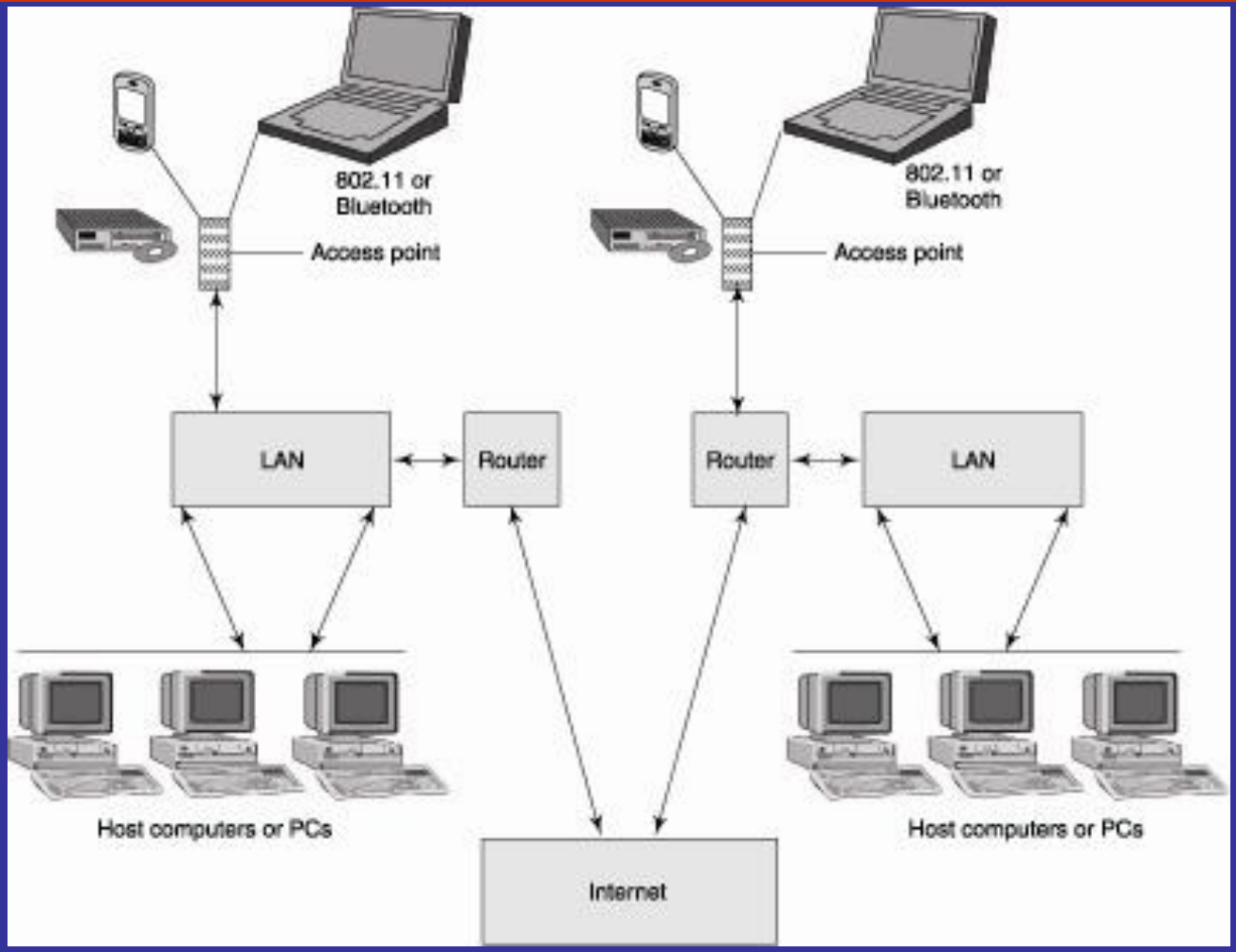
Lesson 02

Introduction to Mobile networks, WLANs, WPANs and Enterprise Networks

Mobile Networks

- Mobile device connects to an access point, called hot spot
- The access point, in turn, connects to a host LAN which links up to the Internet through a router
- Mobile IP connectivity of LANs, mobile devices, and computers

Communication between mobile devices using a WLAN network through hot-spots



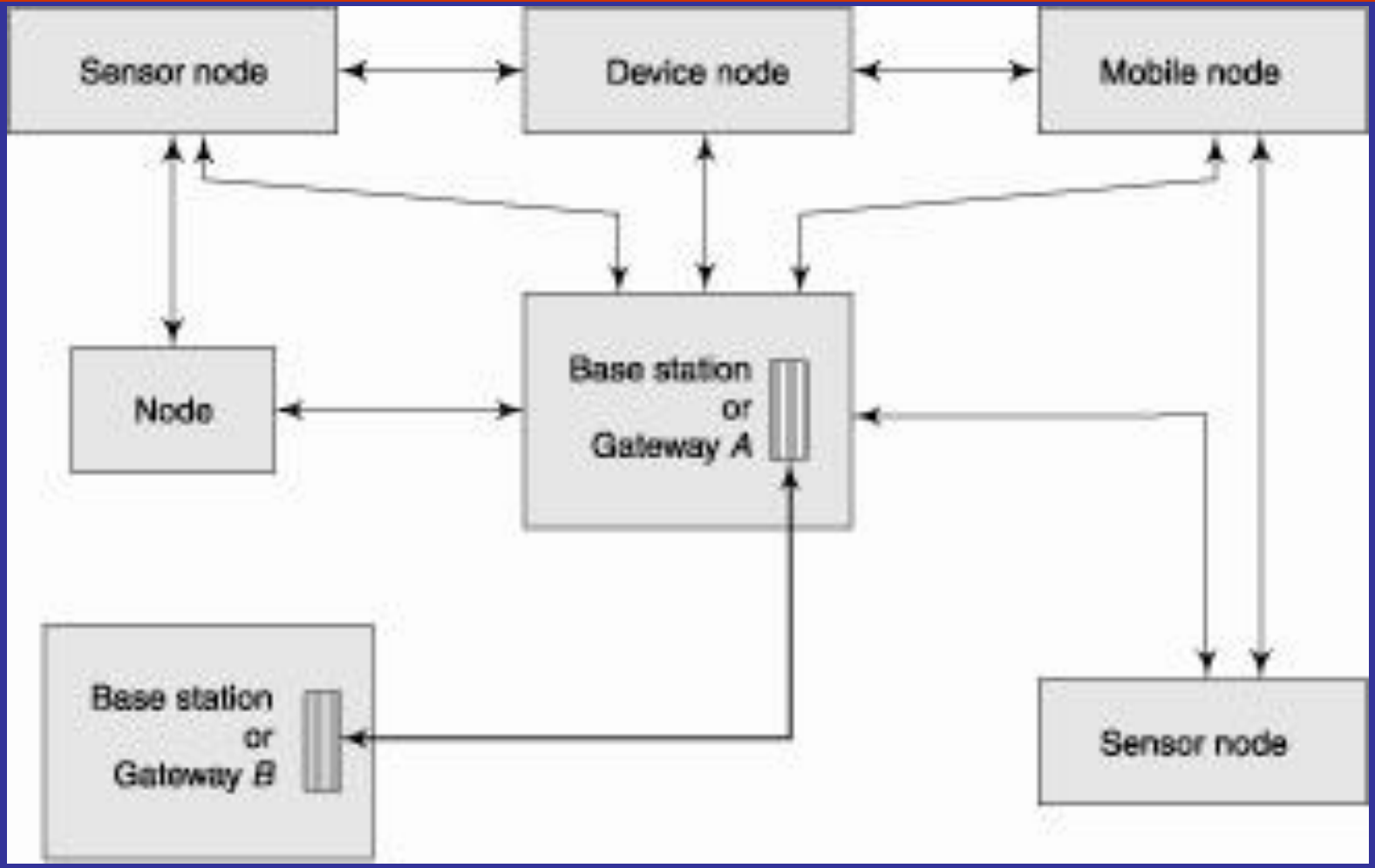
Mobile IP

- An open standard based on the IP (internet protocol)
- Mobile IP network provides the mobile IP service using home agents and foreign agents

Ad hoc Networks

- The nodes, mobile nodes, and sensor nodes communicate among themselves and to an access point (base station)
- Base stations function as gateways
- The ad hoc networks deployed for routing, target detection, and service discovery

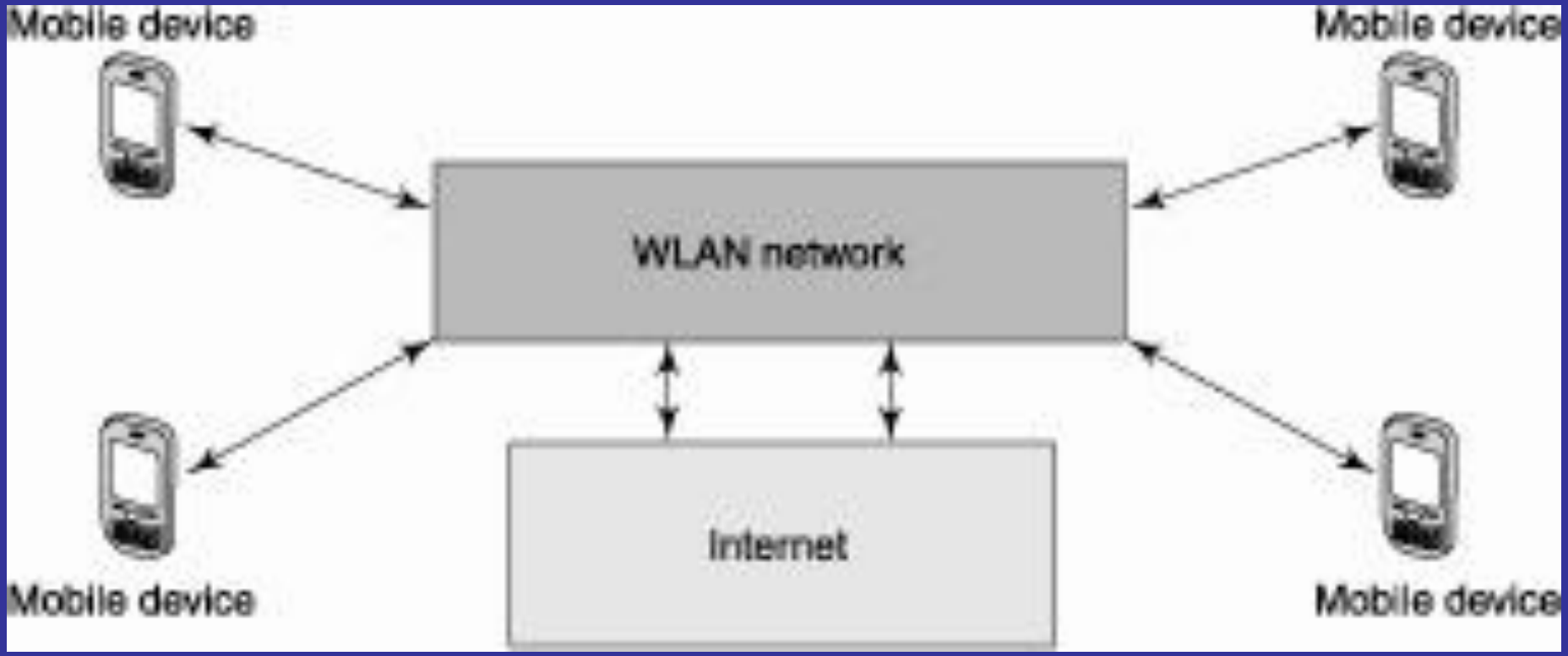
Communication between mobile nodes, Sensor nodes and using a gateway



WLAN and Internet Access

- WLAN communication standards– IEEE 802.11a, 802.11b, and 802.11g standards
- WLAN connectivity and routing with WiFi (Wireless Fidelity) standard

Mobile communication using an 802.11 WLAN standard



IEEE 802.11 based standards for WLANs

- 802.11a– MAC layer operations such that multiple physical layers in 5 GHz (infrared, two 2.4 GHz physical layers)
- Infrastructure based architecture as well as Mobile ad hoc network (MANET) based architecture [Chapter 9]

802.11a

- OFDM at data rates of 6 Mbps, 9 Mbps,… [Section 1.7.2]
- Data rates from 54 kbps to a few Mbps

802.11b

- 54 Mbps data rates using 2.4 GHz carriers
- Modulation DSSS /FHSS [Section 1.7.1]
- Supports short-distance wireless networks using Bluetooth (IEEE 802.15.1) and HIPERLAN2 (HIPERformance LAN 2)

802.11b

- OFDMA physical layer
- Provides protected Wi-Fi access.
- The data rates are 1 Mbps (Bluetooth), 2 Mbps, 5.5 Mbps, 11 Mbps, and 54 Mbps (HIPERLAN 2).

802.11g

- Operates at 54 Mbps and at 2.4 GHz
- Used for many new Bluetooth applications
- Compatible to 802.11b
- Uses DSSS in place of OFDMA

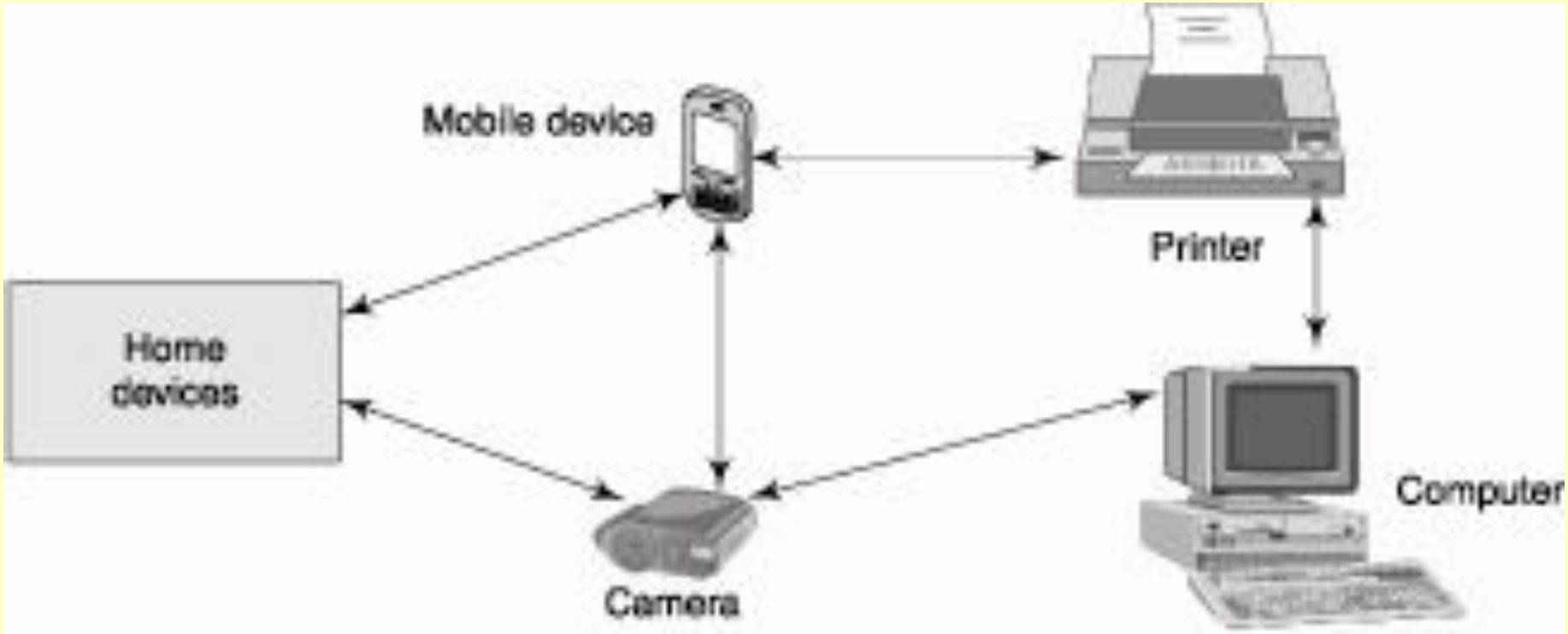
802.11i

- Uses AES and DES security standards

WiMax IEEE 802.16

- **WiMax (worldwide interoperability for microwave access)**
- New generation innovative technology
- Delivers high-speed, broadband, fixed, and mobile services wirelessly to large areas with much less infrastructure

WPAN using Bluetooth, ZigBee, or IrDA protocol



Bluetooth IEEE 802.15.1

- WPAN (wireless personal area network standard
- Operates at a frequency of 2.4 GHz radio spectrum which is identical to that of the IEEE 802.11b WLAN standard

Bluetooth IEEE 802.15.1

- Bluetooth provides short distance (1 m to 100 m range as per the radio spectrum) mobile communication
- Data rates between the wireless electronic devices are up to 1, 2 and 4 Mbps for Bluetooth 1.2, 2.0 and 4.0

Bluetooth

- Between the mobile phone handset and headset for hands-free talking
- Between the computer and printer,
- Computer and mobile phone handset

Bluetooth

- Enables user mobility in a short space with other Bluetooth enabled devices or computers in the vicinity
- Uses FHSS (frequency hopping spread spectrum)

Bluetooth

- Facilitates object exchanges
- Object can be a file, address book, or presentation

ZigBee WPAN standard (IEEE 802.15.4)

- Lower stack size (28 KB) in the protocol
- Lower network-joining latency when compared to Bluetooth (250 KB).
- Low transmitting power systems
- Interoperable standard based on RF wireless communication

ZigBee

- Provisions for large-scale automation and the remote controls up to a range of 70 m
- Data rates of 250 kbps, 40 kbps, and 20 kbps at the spectra of 2.4 GHz, 902 MHz to 928 MHz, and 868 MHz to 870 MHz, respectively
- Uses DSSS

ZigBee

- Designed for robotic control,
- industrial,
- home, and
- monitoring applications.

ZigBee Applications

- ZigBee enabled electric meter communicates electricity consumption data to the mobile meter reader
- A ZigBee enabled home security system alerts the mobile user of any security breach at the home

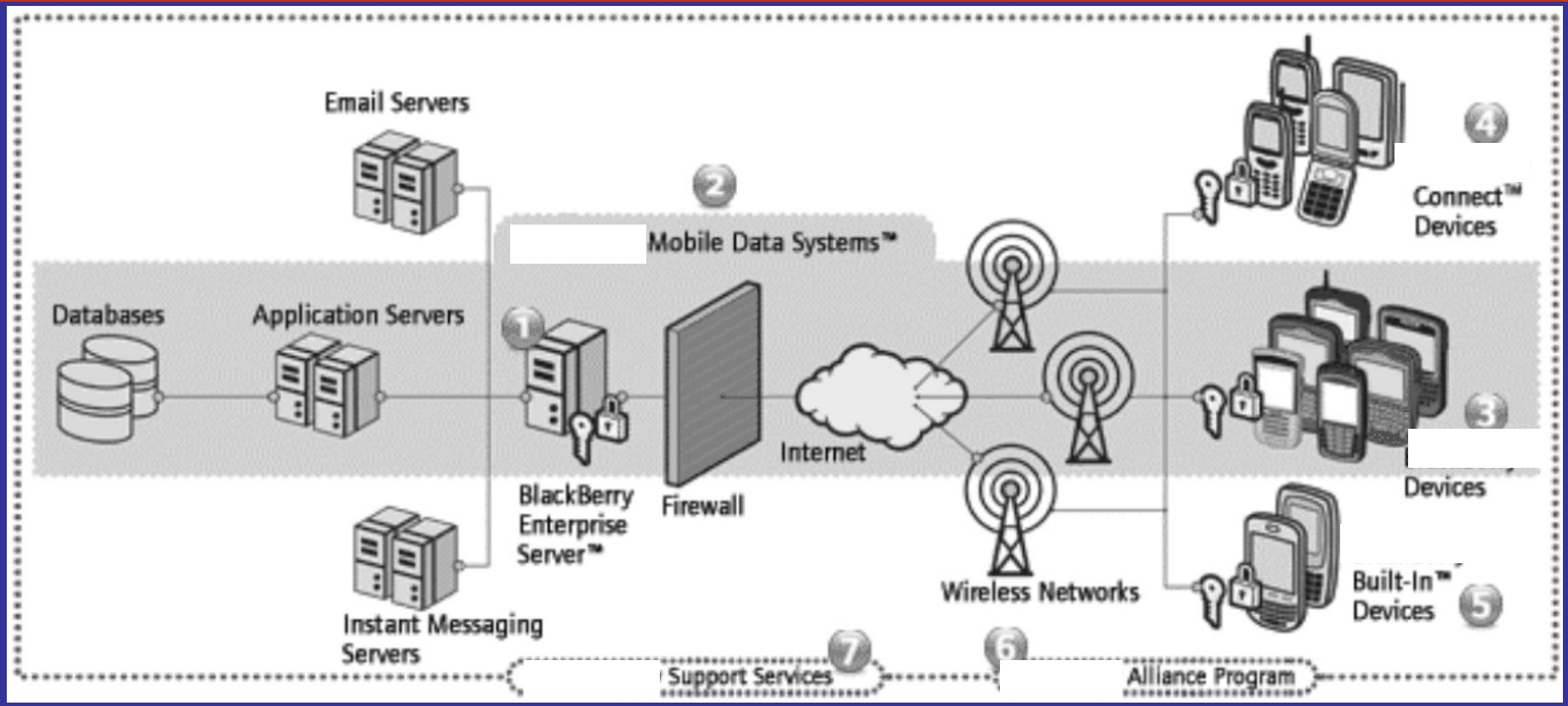
IrDA (infrared data association) 1.0 and 1.1

- Protocol for data rates up to 115 kbps
- **IrDA** 1.1 supports data rates of 1.152 Mbps to 4 Mbps

Enterprise Networks using Mobile Networks

- Enterprises or large business networks
- Huge database and documentation requirements
- Business solutions for corporations or enterprises

An enterprise solution architecture



Summary

- Mobile Computing Systems Networks
- Mobile IP network
- Access points
- Ad hoc network
- Sensor networks
- WLANs

Summary

- Wireless LAN 802.11 standards
- Wi-Fi
- WiMax
- Wireless personal area standards: Bluetooth
- ZigBee, IrDA
- Enterprise Solutions

End of Lesson 02
Introduction to Mobile networks, WLANs, WPANs and Enterprise Networks