

Year	Subject Title	Sem	Sub Code
2018 -19	Core: MOBILE COMPUTING	VI	18BIT62C
Onwards			

• **Objectives:**

- To make the students understand different technologies in mobile computing.
- To enable students to adapt to the requirements of next generation mobile networks and mobile applications.
- To help students to design and develop their own mobile applications.

UNIT I: Introduction: Mobility of Bits and Bytes –Wireless The Beginning –Mobile Computing –Dialogue Control – Networks – Middleware and Gateways – Application and services Developing Mobile computer Applications – security in mobile computing – Standards _ Why is it necessary –Standard bodies.

UNIT II: Mobile Computing Architecture: History of computers and Internet – Architecture for mobile computing – Three-tier architecture – Design considerations for mobile computing Mobile computing through Internet – Making exiting applications mobile enabled.

UNIT III: Mobile Computing Through Telephony: Evaluation of telephony – Multiple access procedures –Satellite Communication Systems-Mobile computing through telephone – Developing an IVR Application – Voice XML – Telephony application Programming Interface. Emerging Technologies: Introduction- Bluetooth – Radio Frequency Identification– Wireless Broadband– Mobile IP – Internet Protocol Version6 – Java Card.

UNIT IV: GSM: Global System for mobile communications – GSM Architecture – GSM Entities – Call routing in GSM – PLMN Interfaces – GSM Addresses and Identifiers – Network Aspects in GSM –Mobility Management-GSM Frequency allocations – Authentications and Security.

UNIT V: GPRS – GPRS and packet data network – GPRS network architecture – GPRS network operations– Data services in GPRS – Application for GPRS.SMS: Mobile Computing Over SMS-Short Message Service-Value Added Services through SMS.

TEXT BOOK: “Mobile Computing”, Asoke K Talukder ,Roopa R Yavagal, TMH, 2005.

REFERENCE BOOKS: 1. Raj Kamal, “Mobile Computing”, Second Edition, Pearson Education, New Delhi, 2007.

2. Ikvinderpalsingh, “Mobile Computing”, First Edition, Khanna book publications,2017.

Mobile Computing

UNIT I:

Introduction: Mobility of Bits and Bytes –Wireless The Beginning –Mobile Computing –Dialogue Control – Networks – Middleware and Gateways – Application and services Developing Mobile computer Applications – security in mobile computing – Standards _ Why is it necessary –Standard bodies.

TEXT BOOK

“Mobile Computing”, Asoke K Talukder ,Roopa R Yavagal, TMH, 2005.

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1. INTRODUCTION

MOBILITY OF BITS AND BYTES

- Even when we are on the move, we can access information from anywhere, anytime.
- This is called mobility of bits and bytes.
- Internet – communication, knowledge sharing, commerce and entertainment
- Internet led to Information and Communications Technologies (ICT)
- ICT has resulted in a information based society
- So there is a need to access data, information or knowledge from anywhere anytime

2. WIRELESS – THE BEGINNING

Evolution of Wireless Networks:

- A-Netz in Germany – 1958 – analog technology – 160 MHz – only outgoing
- B-Netz – receive incoming from a fixed telephone network
- 1979 – Tokyo – cellular telephone system
- AMPS (Advanced Mobile Phone Service) – America – 1983 – first cellular mobile network in the world

Evolution of wireless networks – contd.

- Cellular systems developed by each country were mutually incompatible
- A mobile subscriber of one network cannot use the same device in another network in another country
- To solve these problems, GSM(Groupe Special Mobile) was formed to develop a standard for mobile systems
- Later GSM was renamed as Global System for Mobile Communications
- Some of the GSM standards include
 - Inter networking between different vendors
 - International roaming between networks
 - SMS (Short Message Service)

Evolution of Wireless Data

First Generation - 1G – Analog technology – FDMA

Second Generation - 2G – Digital technology – FDMA and TDMA

2.5 G – voice is Digitized and data is packetized – eg GPRS

3G – both voice and data are packetized - CDMA

Evolution of Wireless LAN

- Used at homes, campuses, commercial establishments, trains and vehicles
- IEEE standards committee formed the IEEE 802.11 standard for WLAN

Evolution of Wireless PAN

- WPAN uses infrared and radio waves
- A laptop communicates with a PC or cellular phone through infrared waves.
- For this, standards are formulated by IrDA(Infrared Data Association)
- Another WPAN technology is Bluetooth. It uses radio waves.

3. MOBILE COMPUTING

- User is able to access data, information etc from any device in any network while on the move
- Different names for Mobile computing are
 - Anywhere Anytime information
 - Virtual Home Environment
 - Nomadic Computing
 - Pervasive Computing
 - Ubiquitous Computing
 - Global Service Portability
 - Wearable Computers

Mobile Computing Functions

- A mobile computing environment has the following characteristics or functions:
 1. User Mobility – User can move from one place to another and use the same service
 2. Network Mobility – Uer moves from one network to another Eg from WiFi to 4G
Network itself moves Eg MANETS (Mobile Adhoc Networks)
 3. Bearer Mobility – User moves from one bearer to another Eg using WAP in a city and after moving to a remote village using SMS or voice bearer
 4. Device Mobility – User moves from one device to another Eg using PC in office and laptop at home
 5. Session Mobility – User moves from one environment to another Eg using a service on a mobile device with CDMA. In the basement car parking CDMA gets disconnected. After reaching office room, user continues the same service on his PC with CDMA
 6. Agent Mobility – Applications move from one node to another Eg crawler software, virus etc
 7. Host Mobility – user device can change from client to server and vice versa

The Mobile Computing Functions can be logically divided into the following segments:

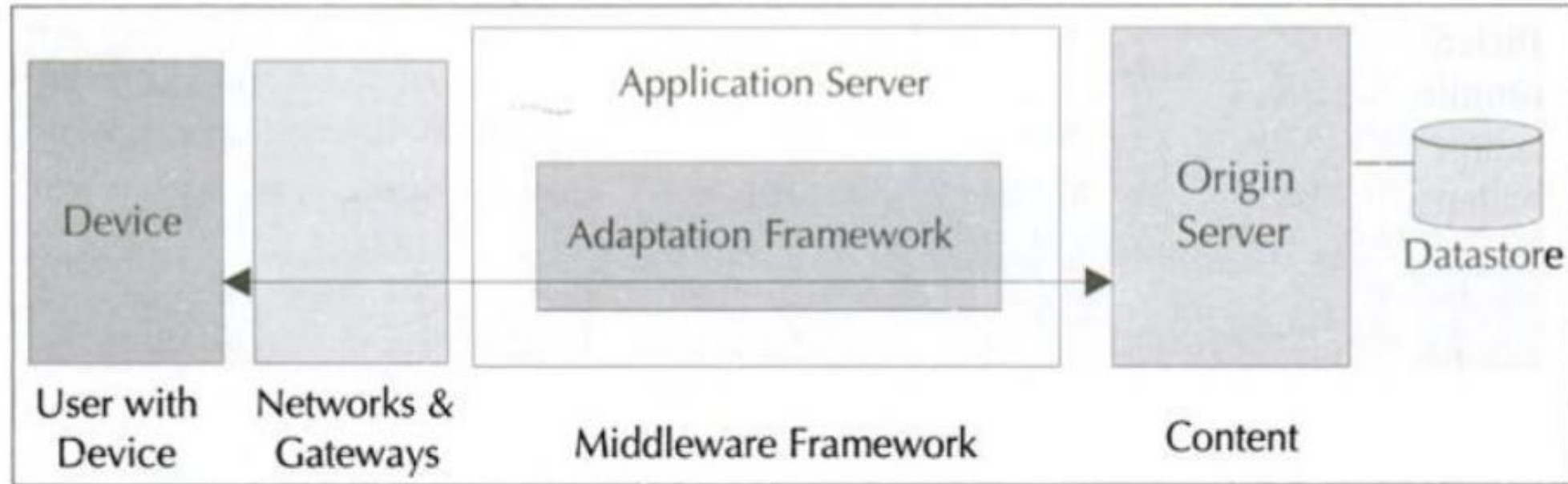


Figure 1.1 Mobile computing functions

Mobile Computing Functions

Mobile computing functions is divided into the following segments:

1. User with device – device may be desk top computers, laptops, mobile phones, hand held terminals etc
2. Network – A moving user may use different networks like wireless LAN, Bluetooth etc
3. Gateway – Interface between different transport bearers eg IVR gateway converts keypress into digital data to interface with a computer application
4. Middleware – used for the presentation and rendering of the content on a particular device
5. Content – domain where the server and the information is present

Mobile Computing Devices

Two types of devices – **Computing devices** and **Communicating devices**

Examples for Computing devices – desktop, laptop, palmtop etc

Examples for Communicating devices – fixed telephone, mobile telephone, digital TV etc

Device consists of hardware part and Software part.

Hardware part – called User Equipment (UE)

Software part – called User Agent (UA)

Dialog Control

During communication, there are two types of dialogues:

- session oriented transactions (ordinary devices with large screen and mouse can have continuous transactions)
- session less transactions (mobile devices with limited input/output can have short transactions with minimum dialogue)

Eg: Enquiring Bank Balance over Internet.

1. Enter URL of Bank
2. Login
3. Select Balance link and give account number to see balance
4. Log out

But in mobile devices, just SMS “mybal” from the registered phone number

Networks - Different types of networks used by Mobile Computing

1. Wireline or Wired networks:

- uses wires or conductors
- called fixed networks
- Eg telephone networks using copper and fiber optic wires, Broadband networks over Digital Subscriber Line (DSL)

2. Wireless Networks:

- Mobile networks with no cables
- Eg radio taxis, cellular phones etc

3. Adhoc Networks:

- Adhoc means “for this purpose only”
- Small area networks formed immediately
- New devices can be quickly added

4. Bearers:

- Different networks need different transport bearers
- Eg TCP/IP, HTTP, Dial up connection

Middleware and Gateways

Middleware – A Software layered between a user application and operating system

Different types of middleware are:

1. Communication Middleware – Used by the application to communicate with different nodes and services.
2. Transaction Processing Middleware – User may be using a device which uses SLD(Session less dialogue) while the service at the backend may be using SOD (Session Oriented Dialogue) This middleware is used to convert between SLD and SOD.
3. Behavior Management Middleware – Depending on different devices, same service will have different applications for web, SMS, WAP etc. Instead, this middleware will render the same application in different forms for different devices.
4. Communication Gateways – They occur between the device and the middleware. Eg IVR gateway to interface voice with computer, WAP gateway to access Internet over a mobile phone

Applications and Services

There are different types of Mobile Applications:

1. Personal – Wallet, medical records, diary etc
2. Perishable – Not permanent eg breaking news, weather, stock news etc
3. Transaction oriented – bank transactions, bill payment etc
4. Location specific – maps etc
5. Corporate – mail, inventory, business alerts, reminders, directory etc
6. Entertainment – social media

Examples :

1. News
2. Weather
3. M-Broker
4. Telebanking
5. M-Shopping
6. Interactive games and TV shows
7. Virtual Office
8. Applications for hearing/speech challenged people

Applications and Services – contd.

9. Agricultural information
10. Distance learning
11. Digital library
12. Telemedicine and Healthcare
13. Environmental Protection and management
14. E-Governance
15. Virtual laboratories
16. Law enforcements
17. Job facilitator
18. Alerts and notifications
19. Downloads
20. Community forums

Developing Mobile Computing Applications

In mobile applications, attributes associated with devices, network and users are constantly changing. So the context and behavior of applications need to adapt to suit the current environment.

1. New mobile applications – Suppose a bank offers customer service through telephone voice and Internet. The bank can develop two new applications
2. Making existing application mobile – This is done by the behavior management middleware

Security in Mobile Computing

- Security is very important in mobile computing environment.
- The security measures should be device independent, network independent and bearer independent
- End to end security is needed

Standards for Mobile Computing

- Standards ensure that materials, products, processes and services are fit for their defined and agreed purpose
- Without standards interoperability of goods and services will not be possible
- A standards process include the following steps:
 - Consensus on a proposed standard by a group or consensus body that includes representatives
 - Public reviews and comments
 - Consideration and response to the comments submitted by voting members
 - Incorporation of approved changes
 - Right to appeal by any participant

Examples of Standard Bodies:

1. IETF – Internet Engineering Task Force
2. IEEE – Institute of Electrical and Electronics Engineers
3. ISO – International Organization for Standardization
4. W3C – World Wide Web Consortium
5. ANSI – American National Standards Institute