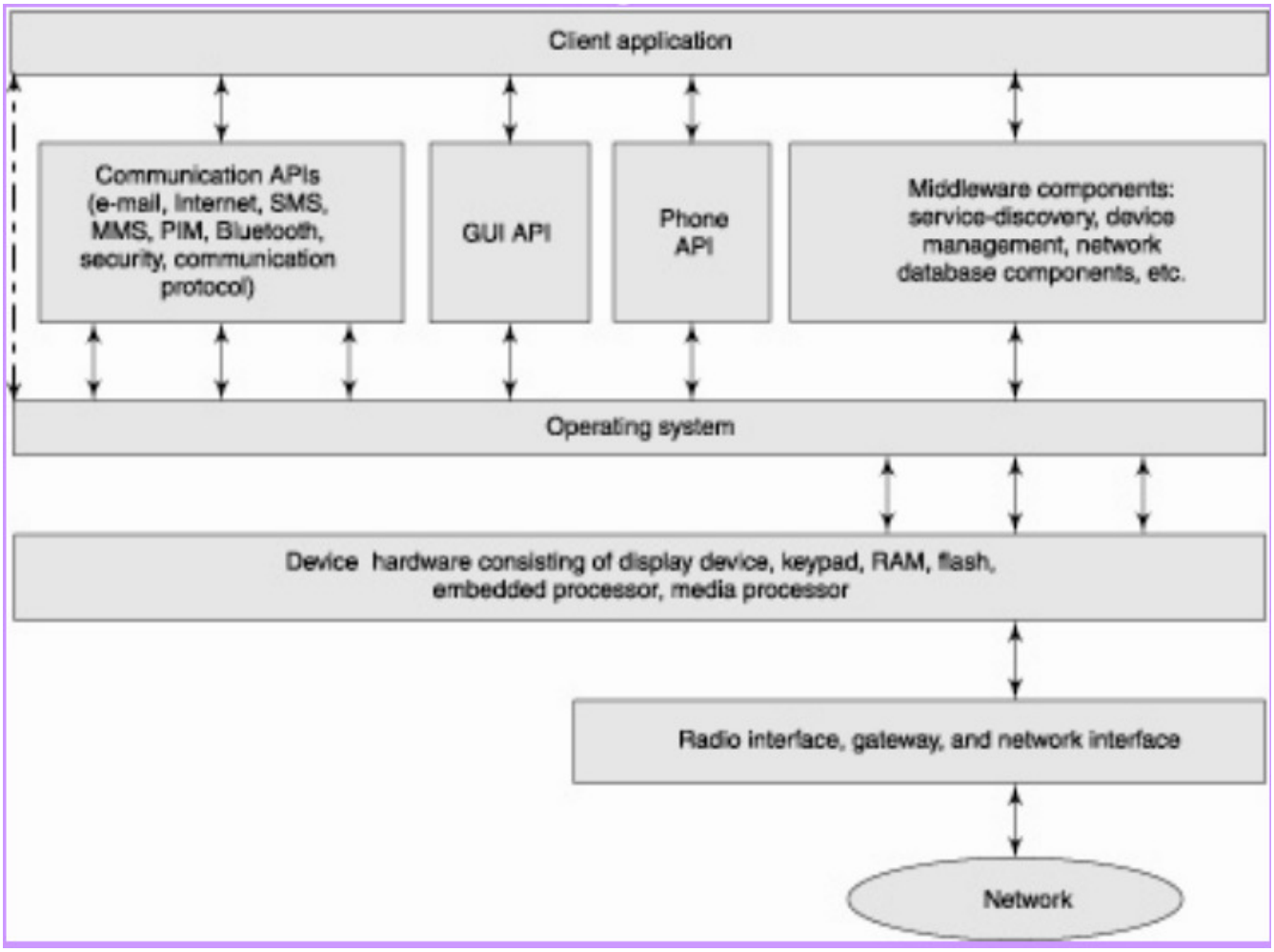
Mobile Databases

Mobile computing is a new dimension in data communication and processing; having characteristics like portable devices and geographically dispersed units.

Restrictions/challenges of mobile computing

- limited and intermittent connectivity afforded by wireless communications,
- the limited lire of the power supply(battery) of mobile units
- Changing topology of the network.

Mobile computing architecture



Infrastructure based mobile platform

Is a distributed architecture where a number of computers known as Fixed hosts and Base stations, are interconnected through a high speed wired network.

Fixed hosts are general purpose computers that are not typically equipped to manage mobile units but can be configured to do so.

Base stations are gateways of the Mobile Units to the fixed network. They are equipped with wireless interfaces and offer network access services of which mobile units are clients.

The wireless medium on which mobile units and base stations communicate have bandwidths significantly lower than those of a wired network.

To manage the mobility of units, the entire geographic mobility domain is divided into one or more smaller domains called CELLS each of which is supported by at least one Base station. The mobile discipline requires that the

movement of mobile units be unrestricted throughout the cells of a geographic mobility domain(intercell movement).

Infrastructure-less mobile platform

A mobile ad-hoc network(MANET); Co-located mobile units do not need to communicate via a fixed network, but instead, form their own network using cost-effective technologies such as Bluetooth.

Mobile units are responsible for routing their own data; Applications fall under the peer-to-peer paradigm – a mobile unit is simultaneously a client and a server.

Some main characteristics of MANET applications are:

- Frequent disconnections
- Frequent network partitions
- Centralized control is difficult
- Peer heterogeneity

Characteristics of mobile environments

- High communication latency
- Intermittent wireless connectivity
- Limited battery life
- Changing client location

Data management issues

From data management perspective, mobile computing may be considered a variation of distributed computing. Mobile databases can be distributed under two scenarios: 1. The database is distributed among wired components 2. The database is distributed among both wired and wireless components. Data management issues may be:

- Data distribution and replication
- Transaction models
- Query processing
- Recovery and fault tolerance
- Mobile database design
- Location based service
- Division of labor
- Security

Geographic Information Systems

GIS is defined as a symmetric integration of hardware and software for capturing, storing, displaying, updating and analyzing spatial data.

Spatial data support in database is important for efficiently storing, indexing and querying of data on the basis of spatial locations. GIS also relies greatly on spatial data handling.

Uses of GIS range from indigenous people, communities, research institutions, environmental scientists, health organisations, land use planners, businesses, and government agencies at all levels.

Uses range from information storage; spatial pattern identification; visual presentation of spatial relationships; remote sensing - all sometimes made available through internet web interfaces, involving large numbers of users, data collectors, specialists and/or community participants.

Data management requirements of GIS

Geographic data can be categorized into two types:

1. Raster data

Such data consists of bit maps or pixel maps in two or more dimensions. Raster data is often represented as tiles, each covering a fixed sized area. Raster data can be three dimensional – for example, the temperature at different altitudes at different regions.

2. Vector data

Vector data are constructed from basic geometric objects such as points, line segments, polylines, triangles and other polygons in 2d, and cylinders, spheres, cuboids, and other polyhedrons in three dimensions. Map data are often represented in vector formats. Roads are represented as polylines. Lakes, countries, states are represented as complex polygons.

Spatial Queries

Some queries that involve spatial locations are:

- Nearest queries
- Region queries
- Intersection and Union of regions