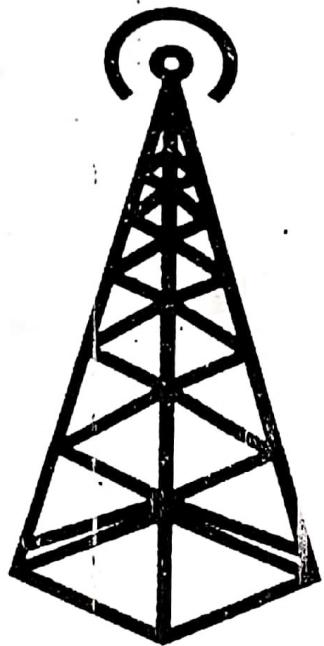


الدكتور هشام

الجيزا



4th Year IT-IS-SW

# Introduction to Mobile Computing - (Lecture 1)

## Mobile Computing Definition

Mobile Computing Systems are systems that physically moved in easy way and whose computing capabilities used while they are being moved.

Such as:

- Laptops
- PDA (Personal Digital Assistant)
- Smart Phones

Mobile computing is a two-word terminology

- Mobile means moving
- Computing means using computer

## Mobile Condition:

Things that make mobile applications different from stationary systems.

Mobile condition makes the difference between the mobile user and the stationary user.

1. The mobile user is moving, at least occasionally, between known or unknown locations.

2. The mobile user is typically not focused on the computing task.

3. The mobile user frequently requires high degrees of responsiveness from the system.

4. The mobile user is changing tasks frequently and/or abruptly.

5. The mobile user may require access to the system anywhere and at any time.

انك لازم تستخدم اى سسitem اى مكان فى اى وقت

جهاز حاسوب متنقل ينفرد به المستخدم المتنقل mobile من المستخدم

**Mobile Condition:** the set of properties that distinguishes the mobile user from the user of a typical stationary computing system.

حدود الموبايل

**Dimensions of Mobility:** the set of properties that distinguishes the mobile computing system and stationary computing system

ميزات بين الموبايل

**Mobility Includes:**

- ① Moving between different geographical locations
- ② Moving between different networks
- ③ Moving between different applications

**Mobility computing system differs from other systems in**

• Functionality requirements

- Tasks that they are designed to perform
- Way that they are designed
- Way in which they are operated

المهام التي يستعمل لها

والطريقة التي تدعى بها

**History:**

- |                      |                 |
|----------------------|-----------------|
| • Mainframes         | [1950s - 1960s] |
| • Personal Computing | [1980s - 1990s] |
| • Internet Computing | [1990s - 2000s] |
| • Mobile Computing   | [> 2010s]       |

**Advantages of mobile computing systems**

- Small size
- Wireless network connectivity
- Power sources
- Their functionalities are particularly suited to the mobile user

الوزانة التي يتحقق بها ميزة جدًّا للمتنقل الميتل

## Wireless Communication systems and Mobile Computing Systems

Mobile Computing	Wireless Communication
Perform process of computing with mobility (capability of moving)	The way or space that used to transfer signal over network
Devices of mobile computing need not to be connected over wireless	Wireless communication systems are often used in mobile computing systems to facilitate network connectivity, but they are not mobile computing systems.
Laptop computers, calculators, electronic watches, and many other devices are all mobile computing devices	الجهاز المحمول هو جهاز يتنقل بغير ملحوظة لغرض التحريك والاتصال بالإنترنت

### Note:

Though it is **not a requirement** for a mobile system to be wireless, most mobile systems are wireless

Any Mobile computing systems can be **stationary**. If we stop moving it

### Dimensions of Mobility:

1. Location awareness,
2. Wireless Connectivity,
3. Limited device capabilities (particularly storage and CPU),
4. Limited power supply,
5. Support a wide variety of user interfaces (Multimodal UIs),
6. Variety of Platforms, Android, iOS, ...
7. Active Behavior.

## 1. Location Awareness

تحقيق معلومات عن المكان بناءً على

Acquiring position information and need connectivity to some network-based infrastructure.

رئيسيات الاتصال

Localization	Location sensitivity
<p>Often required in <u>stationary</u> applications where users at different geographical locations can access a centralized system.</p> <p>Ability of mobile application to accommodate logic that allows the selection of different business logic, level of work flow and interfaces based on location information.</p> <p>يتعذر على المكانة بناءً على</p> <p>Uber, Careem</p>	<p>Ability to obtain location information and use this location information to offer features and functionality</p> <p>لقد رأينا ذلك تجربة</p> <p>للحصول على المكانة</p> <p>لذا نتج عن معلومات المكانة</p> <p>How to collect location information?</p> <ul style="list-style-type: none"> <li>Entry by user (Not user friendly)</li> <li>Triangulation</li> <li>Proximity</li> <li>Scene analysis</li> </ul>

### Location Sensitivity Methods:

- Triangulation

- ✓ Allow calculation of the location of a point that lies in the middle of three other points whose exact locations are known.

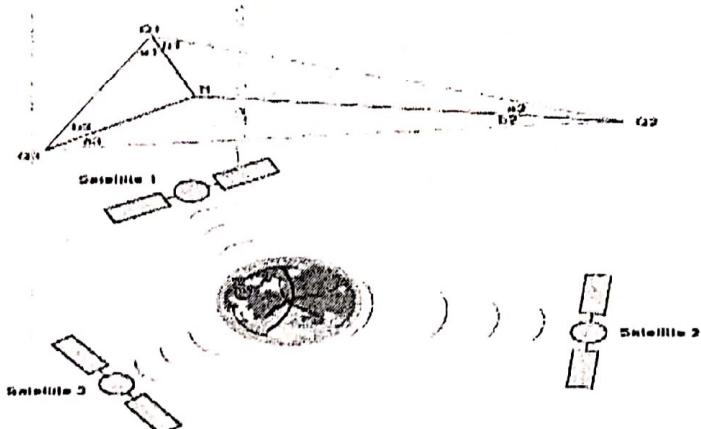


Figure 1.4. Determining Position Based on Triangulation.

ج ج ج

- Proximity

- ✓ Measure the relative position of the unknown point to some known point

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- Scene analysis

- ✓ Relies on image processing and graphical techniques

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- GPS

- ✓ Use Triangulation technique but with more satellites [Accuracy about 1 - 5 meters]

## 2. Connectivity Challenges

- QoS (Quality of Service) tools are managed by network operators

- ✓ Provide info on:

➤ Available bandwidth

➤ نسبة الفقد قد تؤثر

➤ Statistical traffic measurements

البيئة المحيطة بالجهاز

- Bad weather, solar flares, and variety of other climate conditions can negatively affect QoS.

All mobile applications should know how to stop working when the

application suddenly disconnects from the network and then resume working when it connects again.

لذلك يجب على التطبيقات متى انساقت لورجعت الى الشبكة تعلم

## 3. Limited Device (Challenges)

- Size matters, Size limits

المجتمع يواجه القيود

- Size contributes to mobility
- But it also affects memory and CPU capacities
- Limited CPU, RAM and Storage

#### 4. Power Challenges

- battery life is short
- For example, the brighter the display, the more battery power is used, so the user interface is indirectly coupled to the power supply.
- Mobility affect battery life
- Battery management is the OS job, not the App's job → مسؤولية التحكم في الطاقة هي وظيفة نظام التشغيل وليس التطبيق
- Platforms provide monitoring of the remaining power and other related power information
- Platforms allow multiprocessing and multithreading شغل الملفات متعددة النواة ومتعددة المسارات

#### 5. Multimodal UIs and varying user interfaces

- Stationary application users have more efficient user interface capabilities than mobile application design الجاهزون يمتلكون واجهات المستخدم أكثر كفاءة من الأجهزة المحمولة
- Mobile User interfaces are difficult to design and implement for the following reasons
  - Designers have difficulties learning the user's tasks.
  - The tasks and domains are complex.
  - The existing theories and guidelines are not sufficient.
  - A balance must be achieved among the many different design aspects, such as standards, graphic design, technical writing, internationalization, performance, multiple levels of detail, social factors, and implementation time.

#### 6. Variety of Platforms (platform proliferation)

- Due to commercial competence, every manufacture has his own platform (iOS, android) لغات برمجة مختلفة
- For implementation, writing native code is not recommended (use cross platforms)
- For designing, we use methodologies and tools, such as UML

## 7. Active transactions

- Mobile can act as active (online) or passive (offline) behavior
- Mobile always be in active and pushing mode within signal from base station

### Transactions

- Passive transaction
- Active transaction
  - Synchronous
  - Asynchronous

### Passive transactions

- The user must initiate all the transactions (stationary system)

### Synchronous active transactions

- Transaction is initiated by system
- Require timely response from the user
- Interaction between system and user in sequential and serial manner
- Transactions are established between system and single user and may replicated for many users

### Asynchronous active transactions

- Transaction work just like messaging systems
- May be a composition of 1-n receivers or 1-n topics or 1-n messages
- Interaction between system and user in sequential and serial manner
- Transactions are being successful if responses from users are not received within some time frame specified by the system

المعاملات تكون تابعة إذا لم يتلق ردود من المستخدمين خلال فترة زمنية محددة بـ واسطة المتقى