

4th Year IT-IS-SW

**Routing with High  
Mobility  
(Lecture 7)**

## Questions (True - False)

- Home network give MS a care of address in case of mobility with indirect routing **False** (Foreign network)
- The correspondent gets foreign address of mobile and sends directly to mobile in direct routing. **True**
- Anchor foreign agent is the first visited network **True**
- GSM is an example of direct mobility routing **False** (indirect)
- Reporting cell is used to detect MS that entered a new cell based on paging scheme **True**
- Cost of paging is more than cost of location update **False**
- Network where mobile user is currently residing is known as home network **False** (Foreign)
- Static location update means that subscriber chooses when and where to update location **False** (local)

## Location Management

- How does the network track a user's current cell to deliver a call

- We have **Two main operations** to management location:

كل ما ترسله لل BS هو **Location update** (MS sends location to BS) - Control

رسالة - Cost on user

كل اند اد Cost يحيط على ال BS

- Paging (cellular network sends location request to BSs)

- Control Message to BS - Network Overhead and Cost

BS و يتورطها اناتي به متبرأ الشبكة تسئل على "انتي يا BS انتي على" دلالة

- Number of cells to be paged depends on how location update is performed

عدد ال cel الل يتيتم له Paging يستمد على

11

اد location update يتعارض

بعض

Techniques of Location update

Paging

• Techniques of Location update

➤ Global: all subscribers update their location

يُعلن عن المكان الذي يدخل فيه المُستخدم

➤ Local: subscriber chooses where to update location

رسالة موجهة إلى المُستخدم لبيان المكان

➤ Static: predetermined set of cells at which location updates must be performed

under the

➤ Dynamic: location update is generated by MS based on its mobility

## Location Management Scheme

### 1. Never Update Scheme

location update = 0 درجة  
مبيغولت هو نيه (مبيغولت هو نيه)

- MS never tells its home MSC where it is

لو الشبكة تتطلب مسارات تتعلق بمكانة جديدة، تدور على اثنين من الارقام

- When network needs to forward new call to MS, it pages all service area

• Very expensive for network in terms of bandwidth use

### 2. Always Update Scheme

- Paging = 0
- Whenever MS detects that it entered a new cell, it sends a location update to MSC

وإذاً عارف هو قياس المسافة

- Network always knows where the MS is

- Expensive to MS

انتكلاع على الـ user

الشكل على الادسنج لود خلست location بديهيا اما الى صلة لولس ستركتور الشبكة التي تدور علينا

### 3. Location Area Scheme (LAs)

- Divide service area into **location areas (LAs)**

- Each LA consists of a number of adjacent cells

- Each LA has a unique ID

كل location area له خاصية

- Each BS broadcasts the ID of the LA to which it belongs

- When an MS enters a new LA, it updates its location with MSC (usually the manager of the LA)

كل الموبايل يدخل location area الجديدة update

- When the network needs to find an MS, it pages its current LA

لما يتزلج يبلغ لومي عن كل الموبايل يدعى على جهوده

فيه كل الموبايل يخبر عن كل الموبايل

### 4. Reporting Cell Scheme

هختار مجموع من ار الـ هـا الى يذكر

- Select subset of cells as reporting cells

كل الموبايل الى لا يزور

- Vicinity is all non reporting cells reachable from reporting cell

على اجل بطيء location

- MS update location when it moves to new reporting cells

- Cellular network pages MS in reporting cell and its vicinity

الكلمة عالي الـ user

Cost of paging increases with size of vicinity

والكل ازيد اد reporting cell

يندو على اي اخر update

### 5. Time based Scheme

(على حسب الوقت)

كل كام دخليه او تابعه (الحد و وقت)

الموبايل يسجل كل اماكن location

- MS updates its location every T units of time

يجعل على الموبايل اخذ اماكن

- When Cellular system has incoming call from MS, it pages cell where last update was made

و ملحوظه ان خبر وردي على الاتصال قد يصل

- If MS is not found, Cells with the previous update is paged Until MS is found

dynamic بناءً على لحظة

### 6. Movement Based Scheme

يزيد بقدر واحد لاتت عددة الخط

- MS keeps counter that is increased by 1 when MS crosses the boundary to a new cell

يعرفة كل بلدي او تم بناءه الى مستوي

Boundary crossing can be detected by comparing BS IDs

لعدد سطح خط واحد

- When counter reaches a predetermined threshold M, MS updates its location and resets counter to zero

- MS is guaranteed to be within distance M from its last reported cell (residing area)

تعود عليه من الواحد اعلى بعد اداة counter الى حوال

واخراجها من اسفل

ایہ ایسکالا ملکی کے

## Mobility Models

Models for the movement of mobile users, and how their location, velocity and acceleration change over time

### Examples of Models

- Random Walk سطحول
- Random Waypoint قیاسیہ میںی میں نظری
- City Section → علی صب تسمیم الشارع
- Cell Residence Time-based
- Markov Walk
- Activity-based بنا دینی → انسٹاگرام ای ایت بچھے

### Random Walk

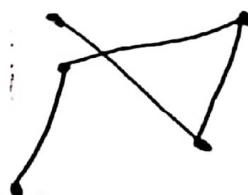
At each time slot  $\Delta t$  کل Time  $\Delta t$  میں ہو بیکرہ ہی مبتلا کی لگتے ولا ہی متمنی دے لگتے

- Subscriber decides to either stay at cell or move to adjacent cell
- MS moves from current location to new location by randomly choosing a direction and speed of travel اتجاه سفر و سرعت سفر
- Random Direction and Random Speed

جیسا کہ  
وہیں

### Random Waypoint

- node selects a random destination & a random speed. Node moves to destination and pauses for a fixed period



مکانی و مسیریت مکانی

## City Section



- Nodes are located in intersections
- From source to destination there are many paths, Path with least amount of travel time is found, and node moves along it (node chooses destination intersection)
- Based on speed and time to move , path can be computed
- There is no randomly values

Random <sup>Chance</sup>

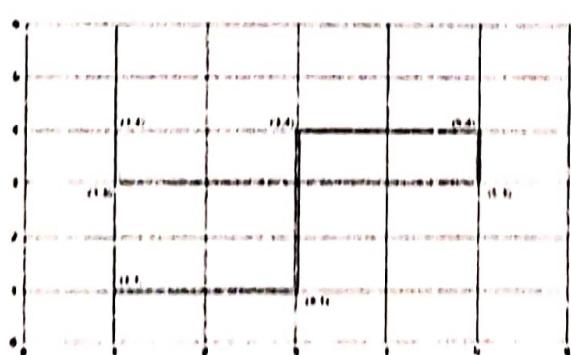
## Markov Walk

### At fixed interval Time

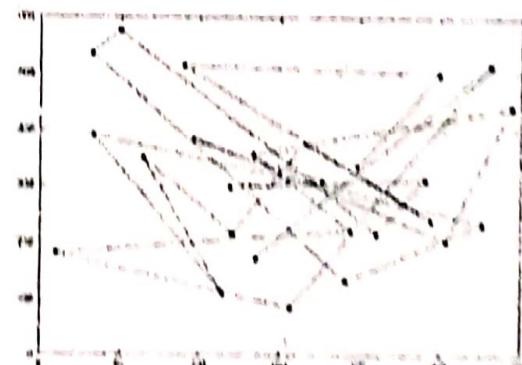
- Movement is determined by updating current speed and direction of MS based on the previous speed and direction
- Need Previous Speed and direction
- No Random Values

Speed  
direction

### Determine mobility model based on next activity by user s

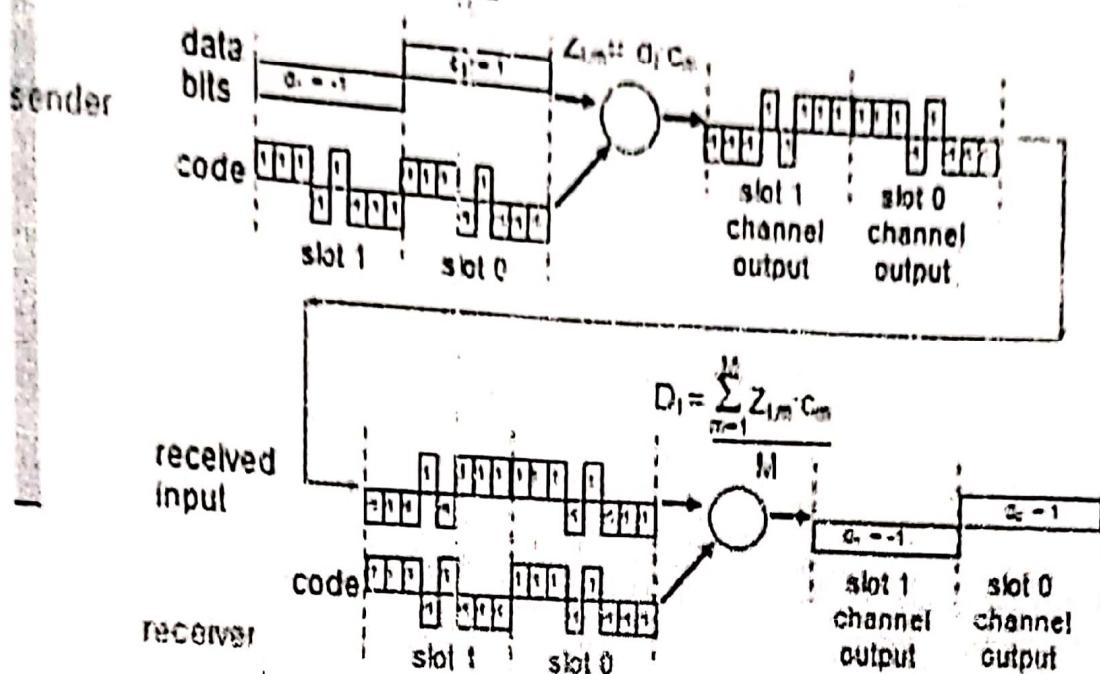


City section



Random way point

## CDMA Encode and Decode



## 802.11 Packet Header

→ wireless LAN

checksum

Frame Control	Duration ID	Address 1	Address 2	Address 3	Sequence Control	Address 4	Network Data	FCS
2 Bytes	2 Bytes	6 Bytes	6 Bytes	6 Bytes	2 Bytes	6 Bytes	0 to 2312 Bytes	4 Bytes

$$2 \times 6 = 12 \text{ bit}$$

**Frame Control:** Indicates the type of frame (control, management, or data) and provides control information.

**Duration ID:** If used as a duration field, indicates the time (in microseconds) the channel will be allocated for successful transmission of a MAC frame.

**Addresses:** The number and meaning of the 48-bit address fields depend on context. The transmitter address and receiver address are the MAC addresses of stations joined to the BSS that are transmitting and receiving frames over the wireless LAN.

جاري ادخال

**Sequence Control:** Contains a 4-bit fragment number subfield, used for fragmentation and reassembly, and a 12-bit sequence number used to number frames sent between a given transmitter and receiver.

**Frame Check Sequence:** A 32-bit cyclic redundancy check.

Frame Control, Data frame, from STA to DS (to AP)	Duration	Receiver address (MAC of AP)	Transmitter address (MAC of source STA)
08 01	30 00	e4 ce 8f 66 b2 42	e4 ce 8f 5b a1 f6
Destination address (MAC of dest. STA)	e4 ce 8f 5a 0c 5e	f0 00 aa aa 03 00 00 00 08 00	
Sequence control	45 00 00 37 59 33 40 00 40 06 60 1a c0 a8 00 10 c0 a8 00 13 e0 1c 11 5c f4 6d 68 b2 cf a7 ee 49 80 18 00 e5 2d eb 00 00 01 01 08 0a 00 00 33 f5 00 00 33 85 48 69 0a		Frame body

### Single hop VS Multi hop

	Single hop	Multi hop
Infrastructure (e.g. AP) ↳ Access Point ↳ Connect Internet	Hosts connects to base station which connects to internet (e.g. wifi, cellular) ↳ base station	Hosts may have to relay through several wireless nodes to connect to internet
No Infrastructure	No base station and no connection to internet (e.g. Bluetooth)	No base station and no connection to internet. But, may have to relay to each other (e.g. MANET, VANET)

↳ Connect  
via Bluetooth

نحوه  
کامپیوٹر  
wireless (B)  
متصل تو مدار  
net