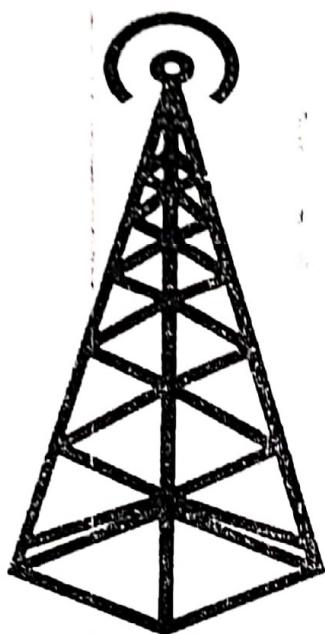


26/11
2019



4th Year IT-IS-SV /

Routing with High Mobility (Lecture 5)

Cellular Network Generations

newer

1G Systems

- Used for analog services (Radio broadcasting, Phone Voice Call)
- Use FDMA

2G Systems

GSM → *Voice* + *Data*

- Used for voice channel
- Combined use of FDMA and TDMA

- Use GSM (global system for mobile communication technology)

2.5G Systems

- Used for voice and data channel (2G extensions)
- Use CDMA-2000 with data rates up to 144K
- Use GPRS (general packet radio service) and EDGE (Enhanced data rates for global evolution) technologies that enhance modulation of GSM and increase data rates

GSM → *Voice* + *Data*

3G Systems

- Used for voice and data channel
- Use CDMA-2000 with TDMA with data rates up to 14Mbps
- Use UMTS (Universal Mobile Telecommunication Service) with high speed uplink and downlink packet access (3Mbps)

uplink

RevisonCSMA (carrier sense multiple access)

- Don't collide with ongoing transmission by another node
- But with no collision detection (problem)
- Can't sense all collisions in any cases like hidden terminal or fading

CSMA-CD (LAN) → wireless(Sender) \rightarrow collision detection

1. If sense channel is idle for DIFS then transmit entire frame
2. If sense channel is busy then

Random \rightarrow start random backoff time (delay or random time)

• Timer counts down while channel is idle

• Transmit when timer expires

• If no ack, increase random backoff interval and repeat step 2

(Receiver)

Collision \rightarrow ack frame

- SIFS 1. If frame received OK then return ACK after SIFS

• ACK needed due to hidden terminal problem

CSMA-CA (wireless)

Collision detection

(Sender)

Collision detection

- First transmit small packet RTS (request to send) to receiver or BS using CSMA

• RTS packets may collide with each other but they short

(Receiver)

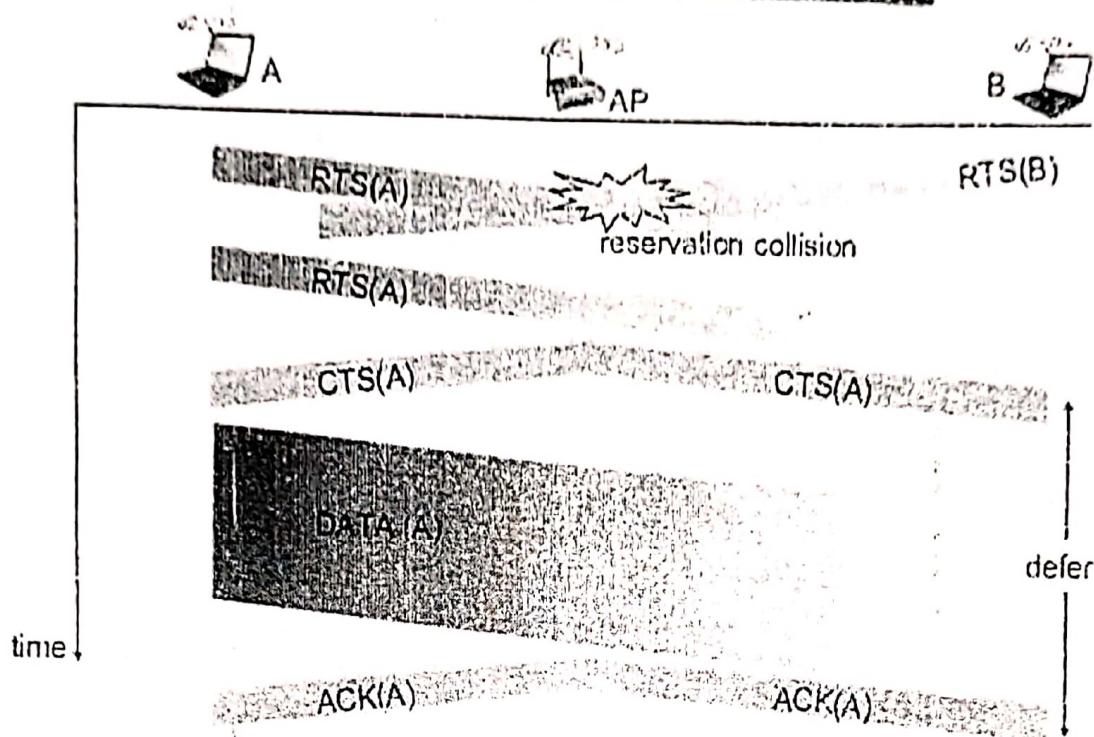
قبل ما ارسلي RTS اول

دبرت اتس كلها له يبي لرسالة

- BS or receiver broadcast CTS (clear to send) in response of certain RTS

- CTS heard by all nodes in the range of BS or receiver

Collision Avoidance: RTS-CTS exchange



Wireless Mobile Networks 6-27

Low Mobility (Mobility in same subnet)

+ P1 يكتسب اهتمام منطق في الـ Signal من H,

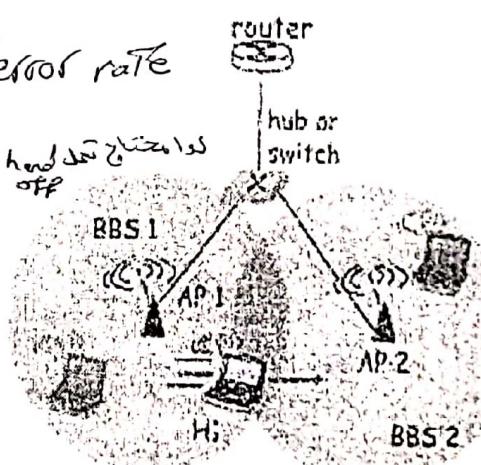
- H1 can detect weakening signal from AP1

الـ SNR
Signal to noise ratio
 BER

signal to noise ratio → bit error rate

- If SNR decreases, BER increases
- Because node moves away from BS

- handoff
- When BER becomes too high
 - Then, host must switch to lower transmission rates but with lower BER



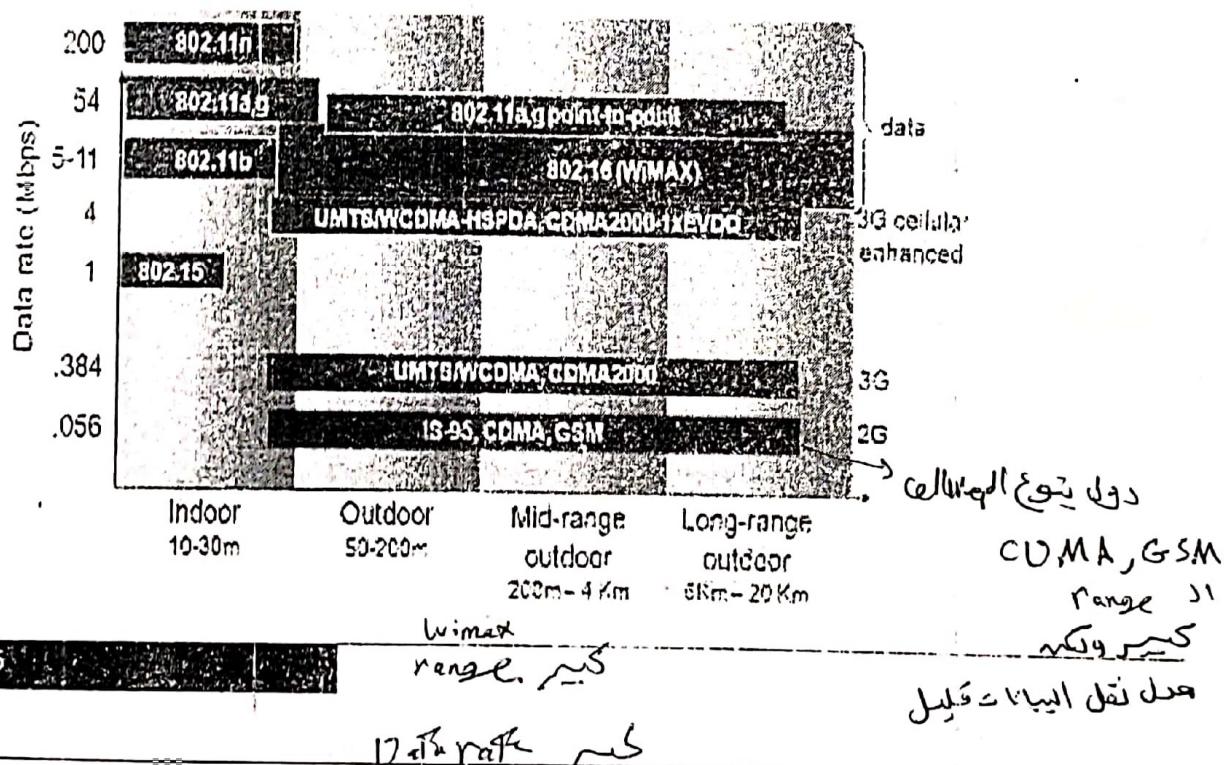
الـ انتقال اى انتقال على الـ هاب
نقل البيانات اول بس او سار سار
اعمل

Personal Area Network (PAN 802.15)Bluetooth

- ❖ less than 10 meters
- ❖ technology used to replace cables of mouse and keyboards
- ❖ used in ad-hoc (no infrastructure)
- ❖ Bluetooth involved (2.4-2.5GHz and up to 721 kbps)
- ❖ use master and slave model
- ✓ slave request permission to send to master
- ✓ master grants requests

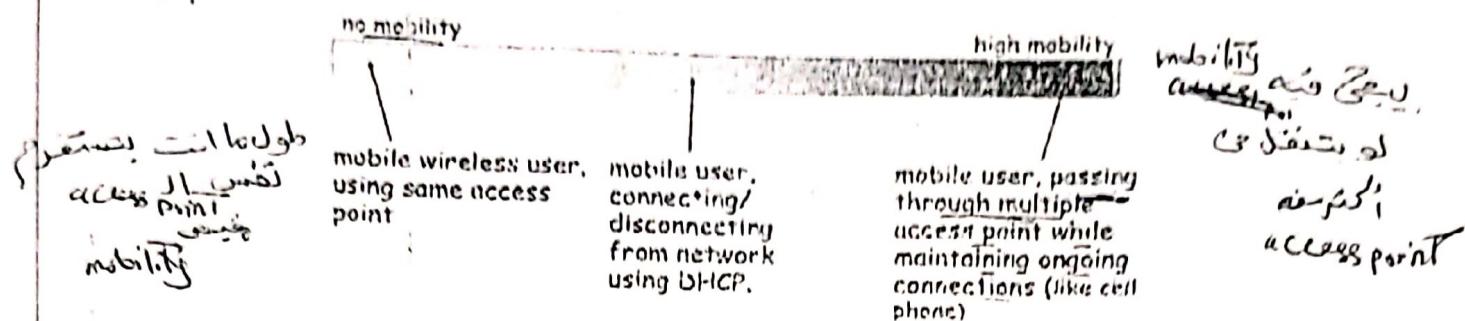
WiMax (802.16)like cellular like wider

- ❖ like cellular network
- ❖ transmission between hosts to/from BS using (omnidirectional antenna)
- ❖ transmission between BS each other using (point to point directional antenna)
- ✓ range 6 miles (city -- with 14Mbps)

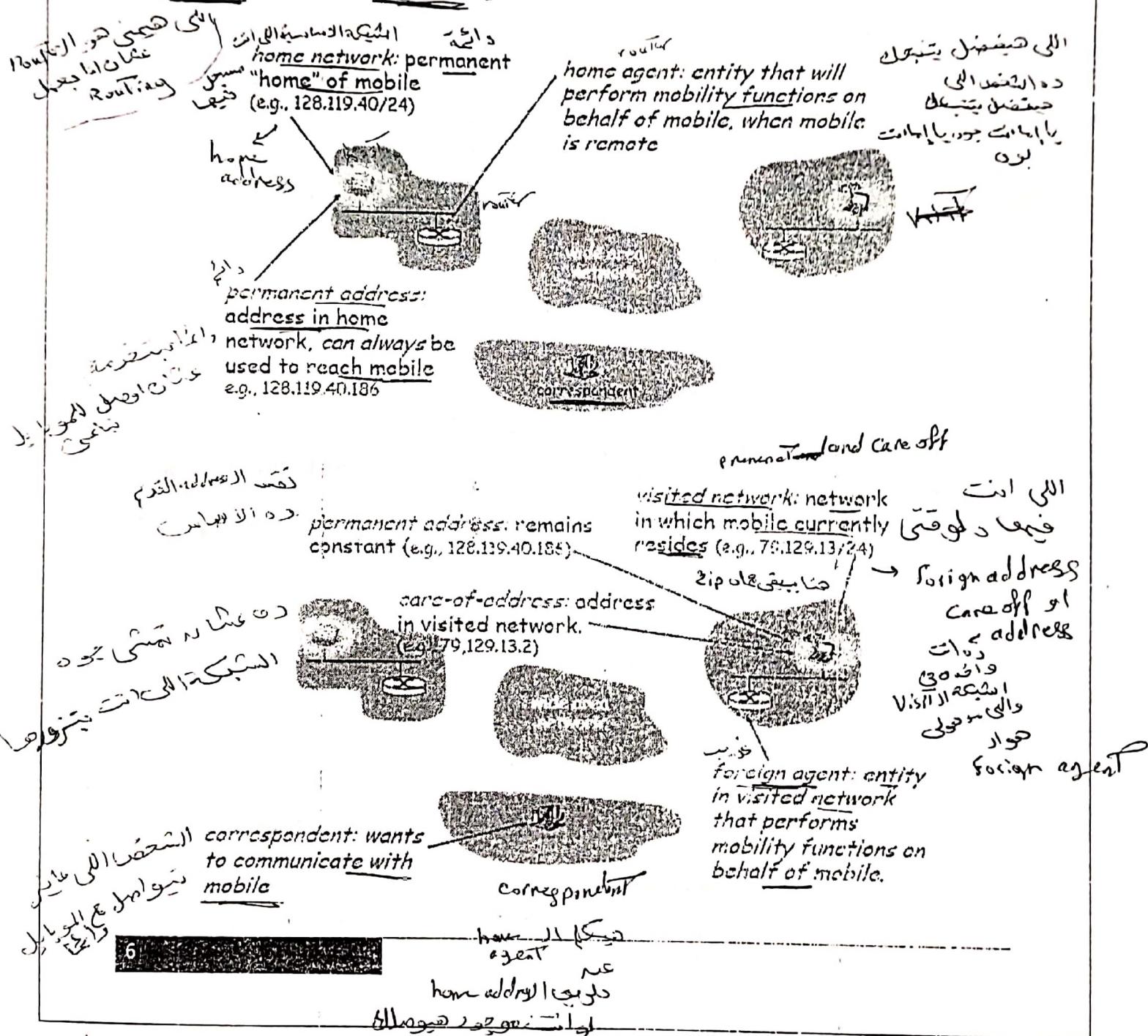
Comparison between Different wireless links

Wind الجهة تقويم Routing

Mobility from Network Perspective



Routing from Network Perspective



Home Net	Home Network address of host
Home Agent	Entity that will perform <u>mobility</u> and <u>routing</u> function when host or mobile is remote
Permanent Address	IP or address in home network and can always be used to reach mobile (remains constant)

foreign Net	Network address in which mobile currently resides
Foreign Agent	Entity that will perform mobility and routing function of visited host
Care-of add.	Address in visited networks

Routing Approaches

يحتاج ① ②
via Routers that advertise permanent address and care-of address of mobile nodes via routing tables (not scale well for billions of mobiles)

- via End systems (scale well) ②

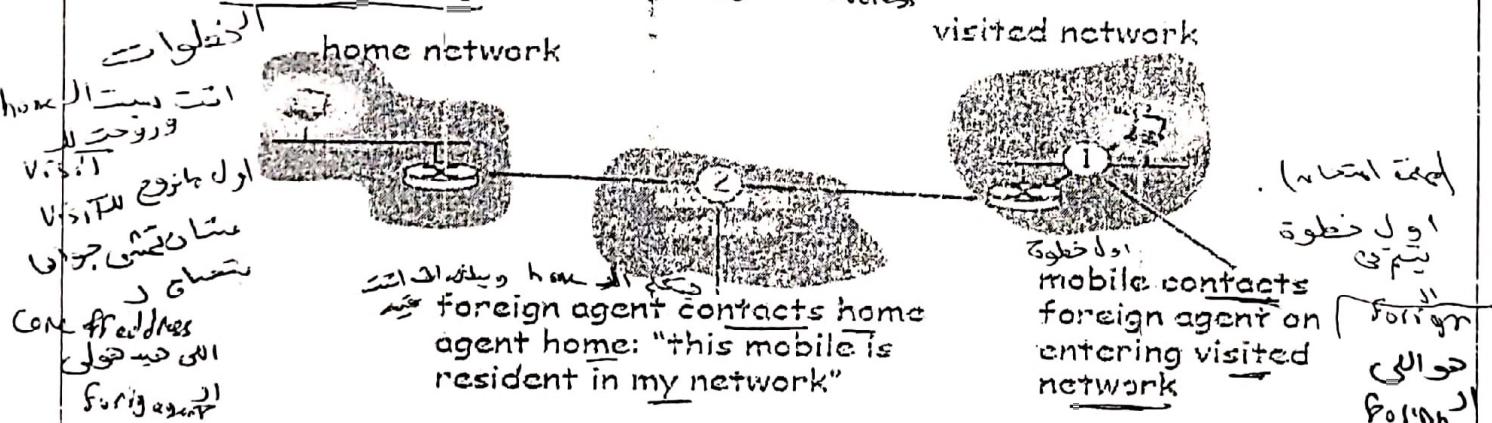
✓ In direct routing

- Communicating from correspondent to mobile
Goes through home agent and forwarded to foreign agent

Direct

- correspondent gets foreign address of mobile
• sends directly to mobile

Registration Step

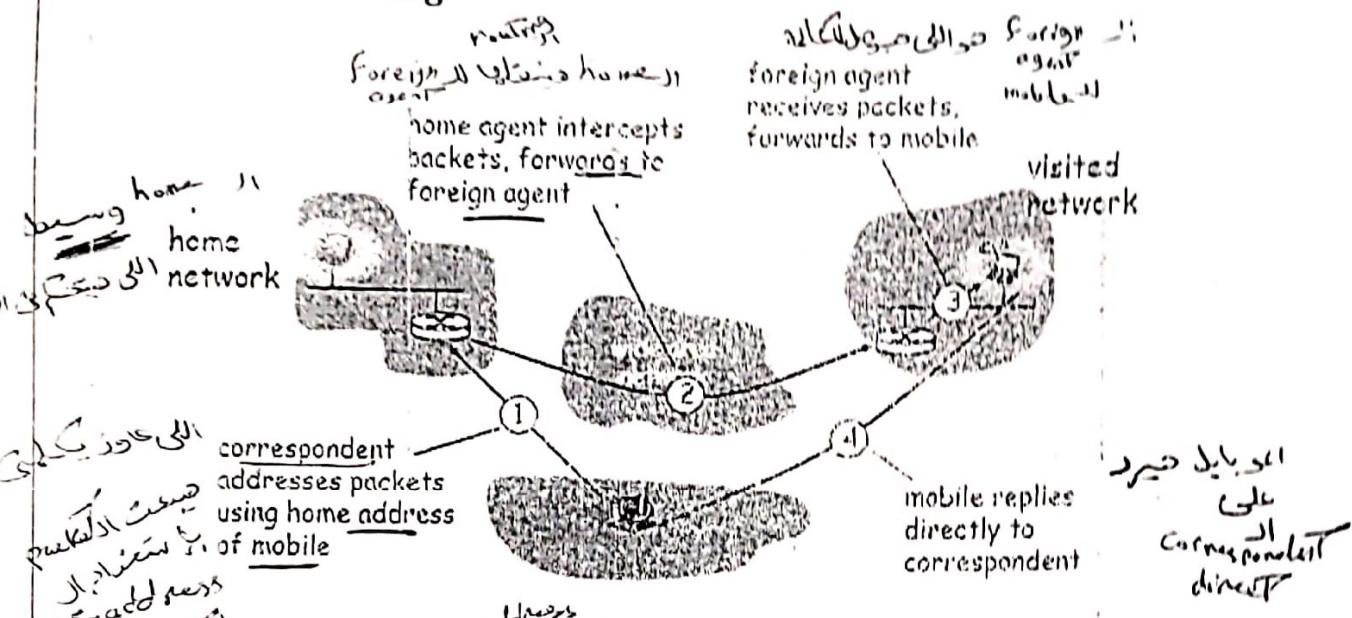


End result: عرف المترد في الشبكة بـ

- Foreign Agent (FA) knows about mobile
- Home Agent (HA) knows location of mobile

ورقة خرجت أنت موجودين في لوبي

Indirect Routing



• this routing named as triangle routing

- ✓ correspondent - home - foreign - mobile - correspondent
- ✓ inefficient if correspondent and mobile are in same network

• Steps

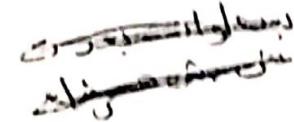
- ✓ registers with new foreign agent
- ✓ new foreign agent registers with home agent
- ✓ home agent update care-of address for mobile
- ✓ packets continue to be forwarded to mobile (but with new care - of - address)

Advantage

changing foreign networks (transparent): ongoing connections can be maintained!

لوجستي على أكثر من شبكة واحدة
Update Reg. (Care of) with domain

direct Routing



correspondent forwards to foreign agent

foreign agent receives packets, forwards to mobile

visited network

home network



correspondent requests, receives foreign address of mobile

حل مشكلة الـ triangle (الشكلة المثلثية)

mobile replies directly to correspondent

(4)

(3)

(2)

(1)

- overcome triangle routing problem

- non-transparent to correspondent:

- ✓ correspondent must get care-of address from home agent
- ✓ what if mobile changes visited network?

ادعى الى تغيير عرضي على home agent

مشكلة هنا لوال عاليه ان تكون متصلة بـ home ومتصله الى home

عن طريق home agent وسيطر

اول سبب في الـ مستبدلة anchor

لأنها بطيءه جداً
در
ارجع
تلعب
كره
بعض
او