# 네트워크프로그래밍-3주
# 수업 자료

정인환교수

# 3주 수업 내용

- 과제확인- 네트워크 구성도
- Wireshark Capturing 복습/Q&A
  - ARP, IP, TCP, UDP/DNS
- Mongoose Web Server 추가 실습
  - PC/Mobile < WiFi > Web Server
  - Mobile < 4G/5G > Web Server
- 3주 강의 요약
  - Socket API
  - Socket Programming 실습 – Time Client/Server

# 과제확인 - 네트워크 구성도

- 5가지 예가 아닌 경우
  - HP을 Hot Spot 으로 공유기로 사용하는 예
- tracert -d 에서 * 로 나오는 경우 설명
  - 첫번째 router 를 확인하지 못하는 경우
  - KT 공유기 환경과 같은 경우
    - 172.30.1.254 다음 Router가 *로 안보이는 경우가 있다
  - IPTIME 공유기의 경우
    - 192.168.0.1 다음 Router가 *로 안보이는 경우가 있다

# Wireshark Capturing

- Wireshark 문제
  - Loopback이 안보인다
  - Interface 모두 안보인다
  - Network 이 안된다.
  - 해결방법 : npcap 을 재설치 (제거/reboot/설치)
  - https://nmap.org/npcap/dist/npcap-0.9997.exe

# Network Data 구조

- ARP

| Ethernet Header<br>Type = 0x0806 | ARP<br>Header + Data |
|---|---|
| 14 | 42 ~ 60 |

- IP

| Ethernet<br>Header | IP Header<br>Protocol ? | TCP/UDP<br>Header | DATA<br>(HTTP, FTP, DNS, RTP, ...) |
|---|---|---|---|
| 14 | 20 | 20/8 | 0 ~ 1472 |

- ICMP

| Ethernet Header<br>Type = 0x0800 | IP Header<br>Protocol 1 | ICMP<br>Header + Data |
|---|---|---|
| 14 | 20 | 0 ~ 1480 |

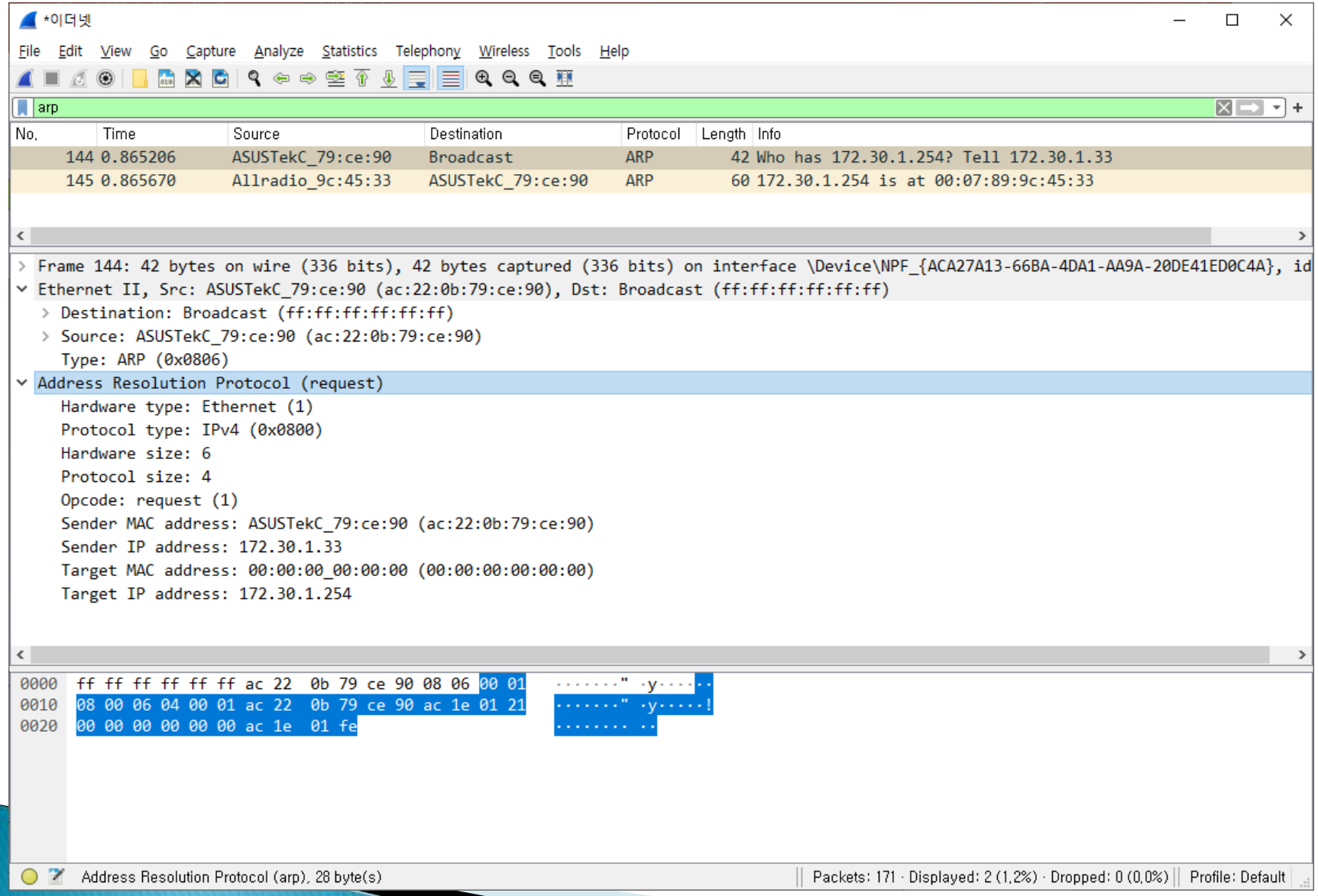
- TCP

| Ethernet Header<br>Type = 0x0800 | IP Header<br>Protocol 6 | TCP<br>Header | DATA<br>(HTTP, FTP, Telnet, ..) |
|---|---|---|---|
| 14 | 20 | 20 | 0 ~ 1460 |

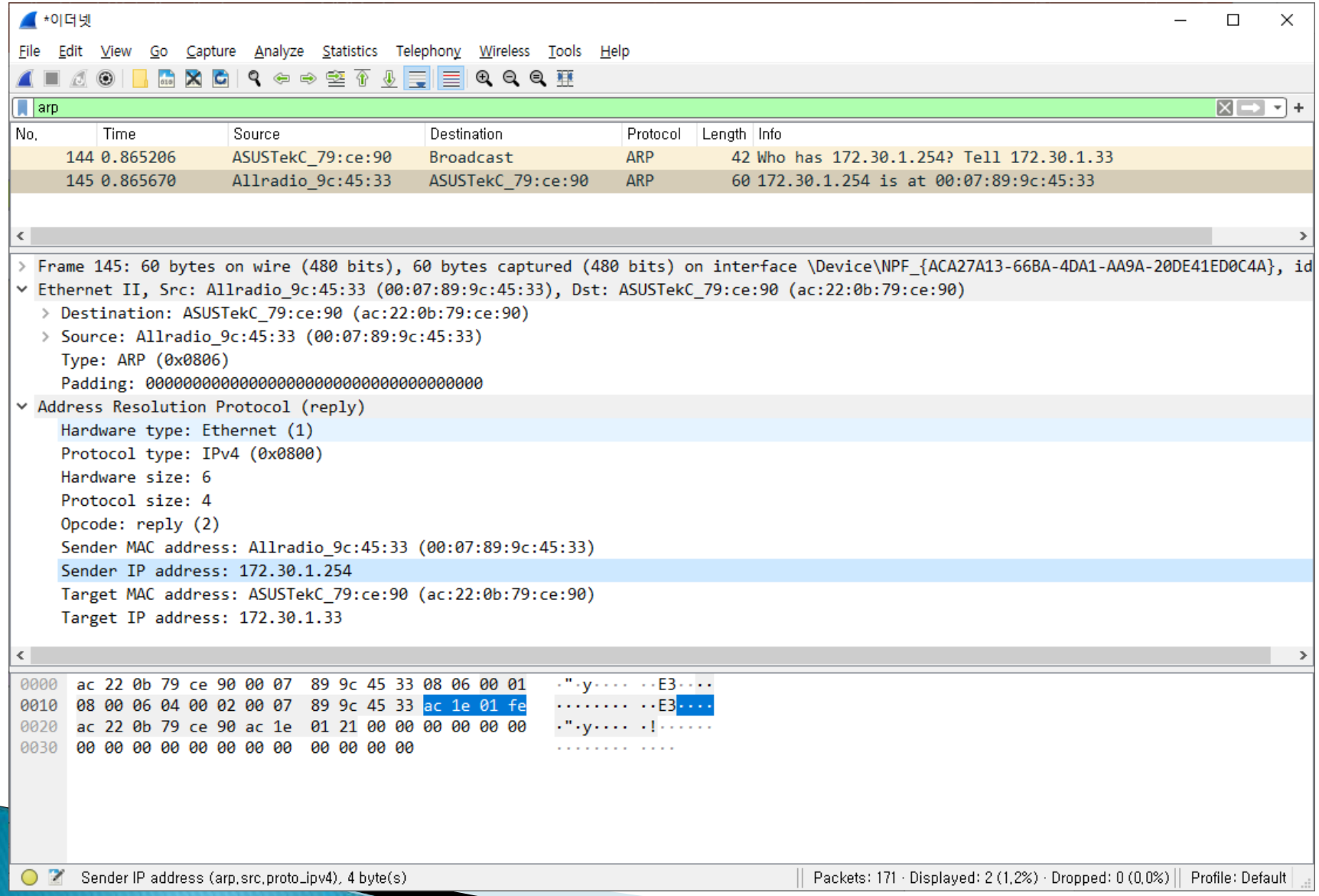
- UDP

| Ethernet Header<br>Type = 0x0800 | IP Header<br>Protocol 17 | UDP<br>Header | DATA<br>(DNS, RTP, ...) |
|---|---|---|---|
| 14 | 20 | 8 | 0 ~ 1472 |

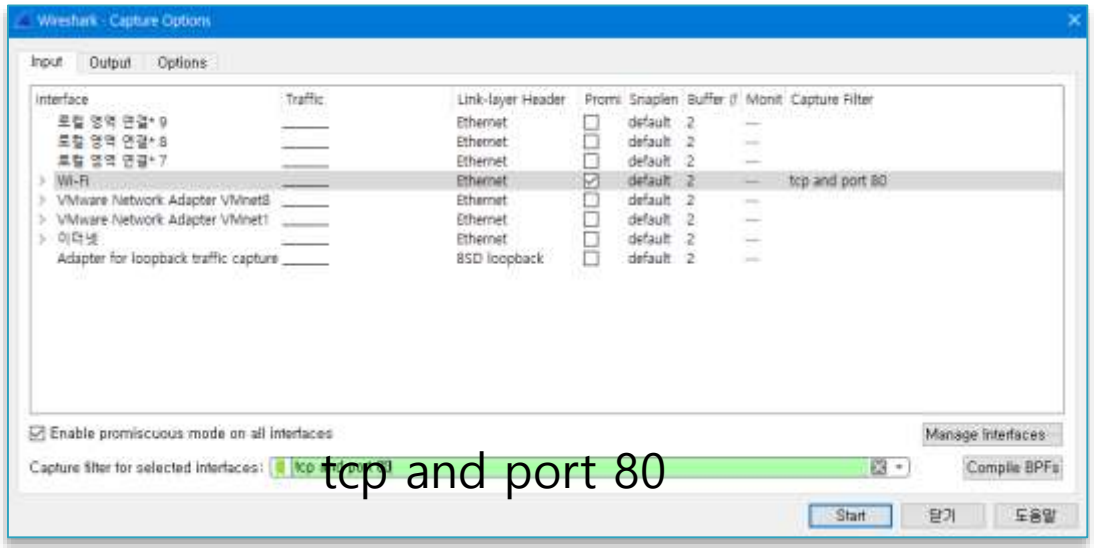
# ARP Request


*이더넷
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
arp
No. Time Source Destination Protocol Length Info
144 0.865206 ASUSTekC_79:ce:90 Broadcast ARP 42 Who has 172.30.1.254? Tell 172.30.1.33
145 0.865670 Allradio_9c:45:33 ASUSTekC_79:ce:90 ARP 60 172.30.1.254 is at 00:07:89:9c:45:33
Frame 144: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{ACA27A13-66BA-4DA1-AA9A-20DE41ED0C4A}, id
Ethernet II, Src: ASUSTekC_79:ce:90 (ac:22:0b:79:ce:90), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
Destination: Broadcast (ff:ff:ff:ff:ff:ff)
Source: ASUSTekC_79:ce:90 (ac:22:0b:79:ce:90)
Type: ARP (0x0806)
Address Resolution Protocol (request)
Hardware type: Ethernet (1)
Protocol type: IPv4 (0x0800)
Hardware size: 6
Protocol size: 4
Opcode: request (1)
Sender MAC address: ASUSTekC_79:ce:90 (ac:22:0b:79:ce:90)
Sender IP address: 172.30.1.33
Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)
Target IP address: 172.30.1.254
0000 ff ff ff ff ff ff ac 22 0b 79 ce 90 08 06 00 01
0010 08 00 06 04 00 01 ac 22 0b 79 ce 90 ac 1e 01 21
0020 00 00 00 00 00 00 ac 1e 01 fe
Address Resolution Protocol (arp), 28 byte(s)
Packets: 171 · Displayed: 2 (1.2%) · Dropped: 0 (0.0%)
Profile: Default

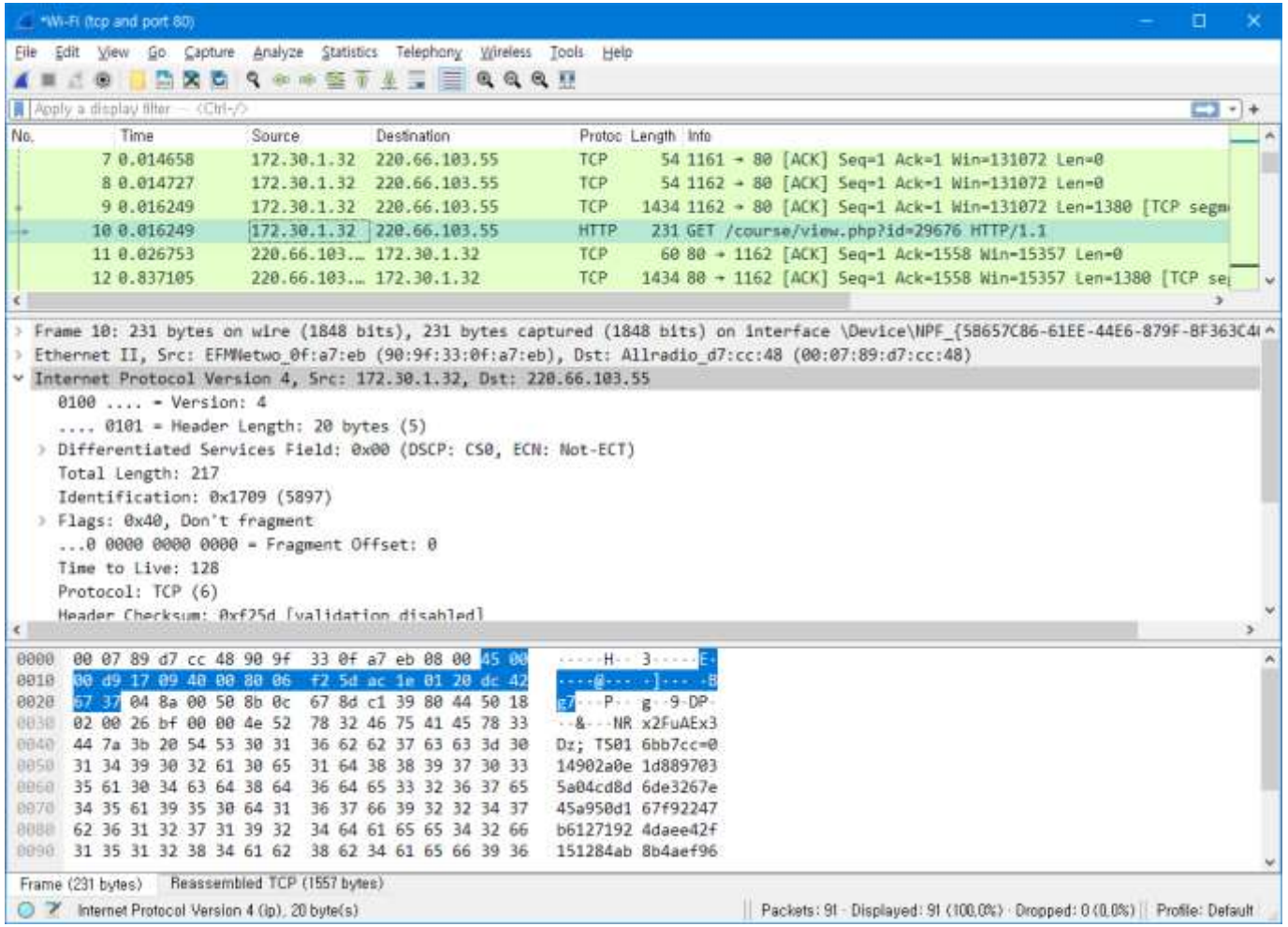
# ARP Reply


*이더넷
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
arp
No. Time Source Destination Protocol Length Info
144 0.865206 ASUSTekC_79:ce:90 Broadcast ARP 42 Who has 172.30.1.254? Tell 172.30.1.33
145 0.865670 Allradio_9c:45:33 ASUSTekC_79:ce:90 ARP 60 172.30.1.254 is at 00:07:89:9c:45:33
Frame 145: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface \Device\NPF_{ACA27A13-66BA-4DA1-AA9A-20DE41ED0C4A}, id
Ethernet II, Src: Allradio_9c:45:33 (00:07:89:9c:45:33), Dst: ASUSTekC_79:ce:90 (ac:22:0b:79:ce:90)
Destination: ASUSTekC_79:ce:90 (ac:22:0b:79:ce:90)
Source: Allradio_9c:45:33 (00:07:89:9c:45:33)
Type: ARP (0x0806)
Padding: 00000000000000000000000000000000000000
Address Resolution Protocol (reply)
Hardware type: Ethernet (1)
Protocol type: IPv4 (0x0800)
Hardware size: 6
Protocol size: 4
Opcode: reply (2)
Sender MAC address: Allradio_9c:45:33 (00:07:89:9c:45:33)
Sender IP address: 172.30.1.254
Target MAC address: ASUSTekC_79:ce:90 (ac:22:0b:79:ce:90)
Target IP address: 172.30.1.33
0000 ac 22 0b 79 ce 90 00 07 89 9c 45 33 08 06 00 01
0010 08 00 06 04 00 02 00 07 89 9c 45 33 ac 1e 01 fe
0020 ac 22 0b 79 ce 90 ac 1e 01 21 00 00 00 00 00 00
0030 00 00 00 00 00 00 00 00 00 00 00 00
Sender IP address (arp.src.proto_ipv4), 4 byte(s)
Packets: 171 · Displayed: 2 (1.2%) · Dropped: 0 (0.0%)
Profile: Default

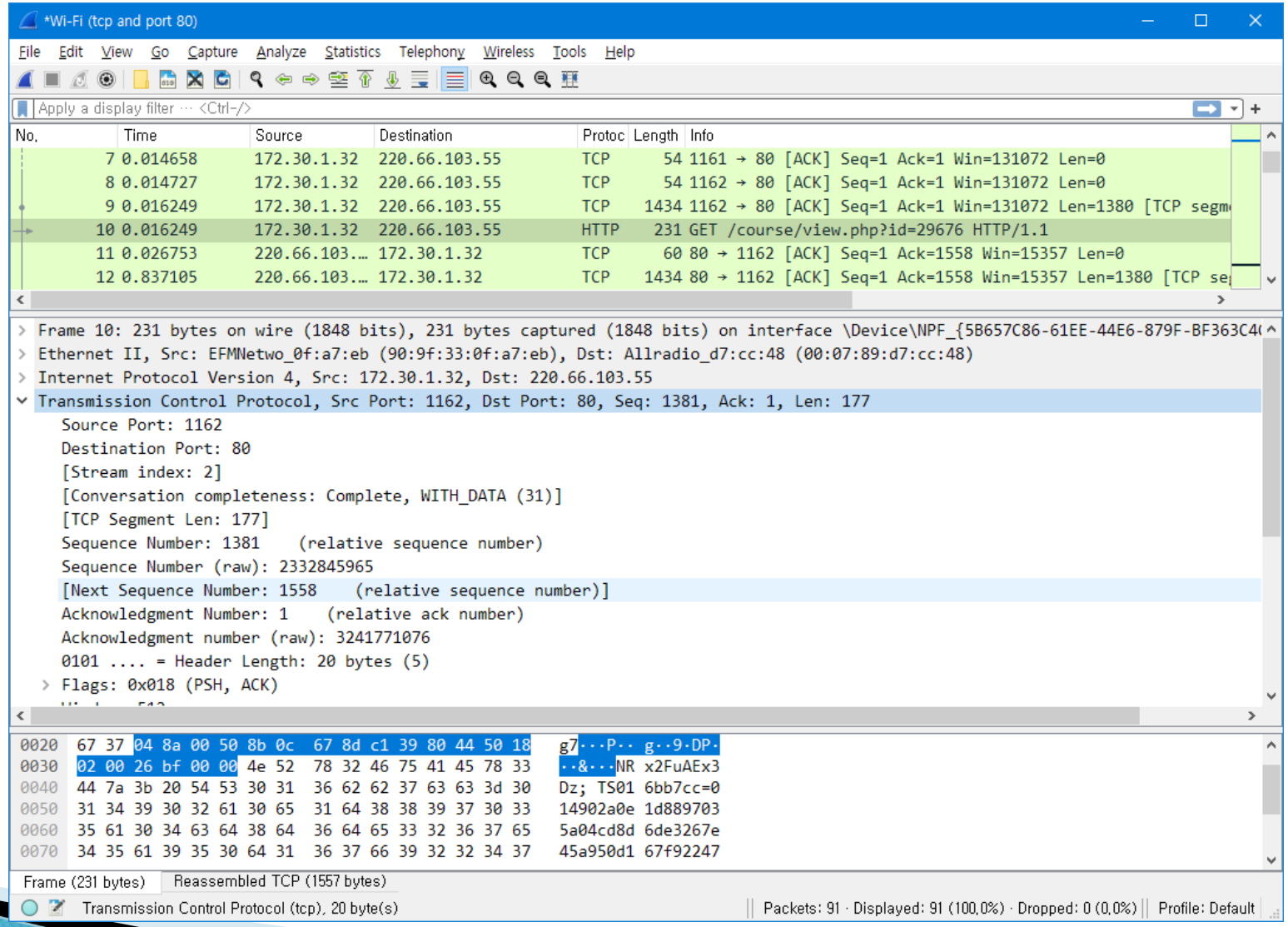
# IP Packet 예 (172.30.1.32 <-> learn.hansung.ac.kr 220.66.103.55)



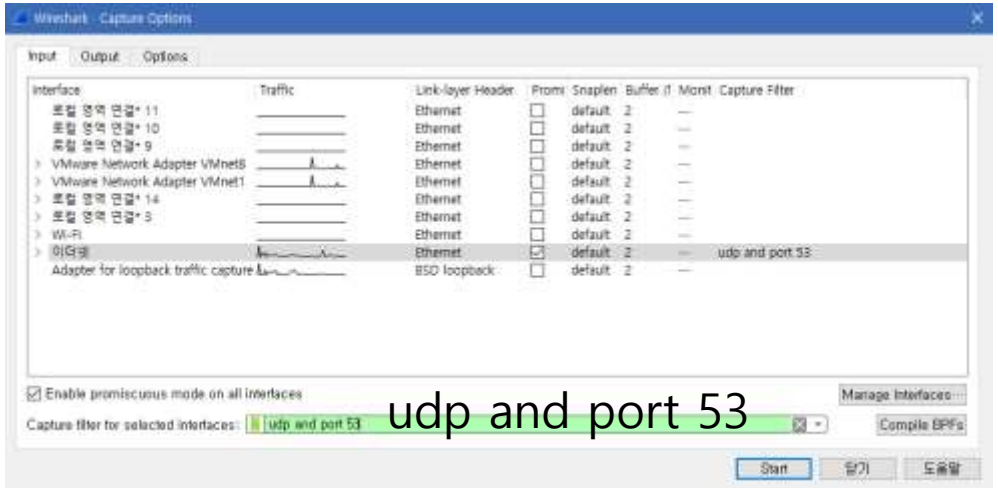

tcp and port 80



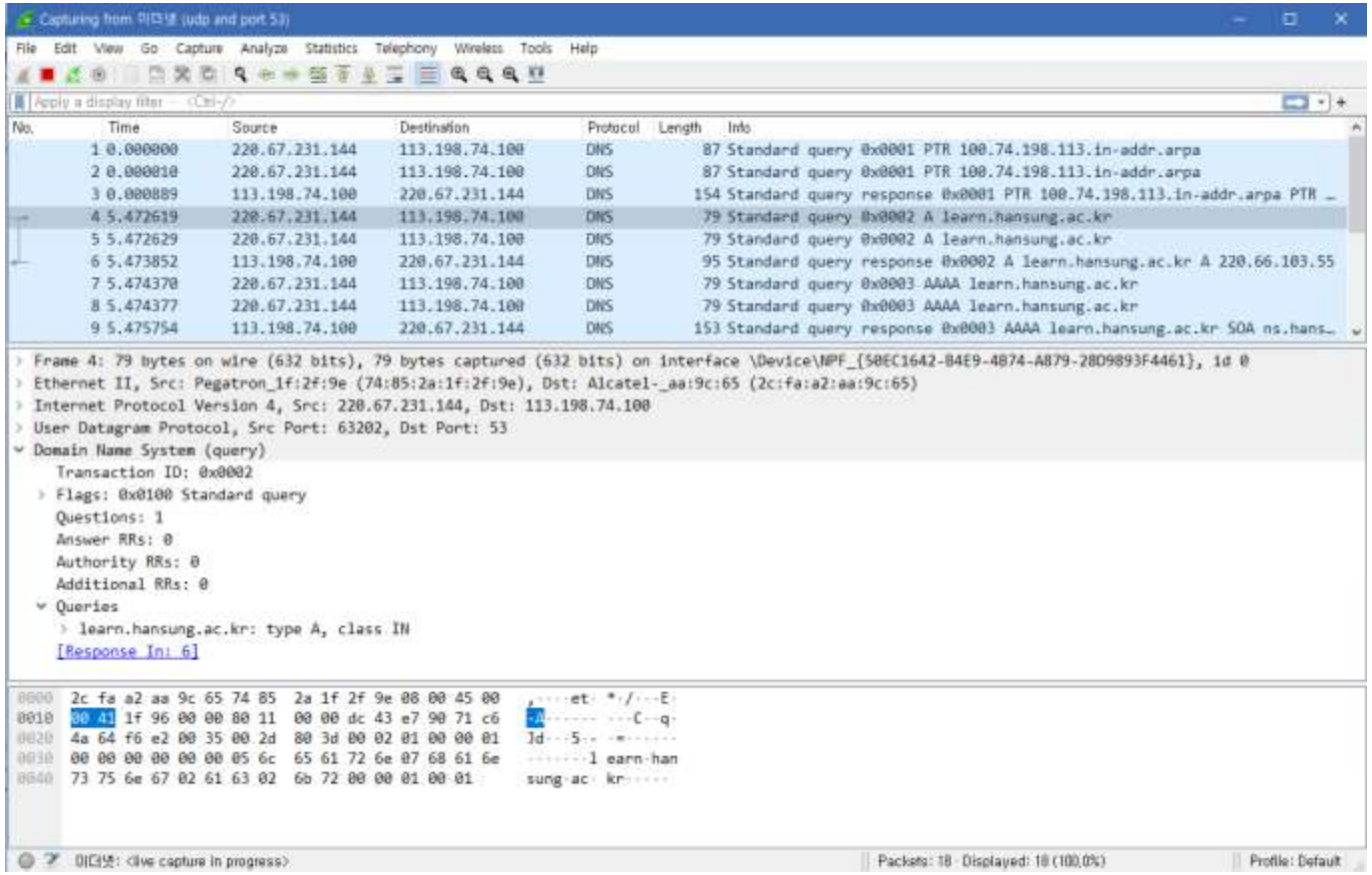
# TCP Packet 예 (172.30.1.32 <-> learn.hansung.ac.kr 220.66.103.55)

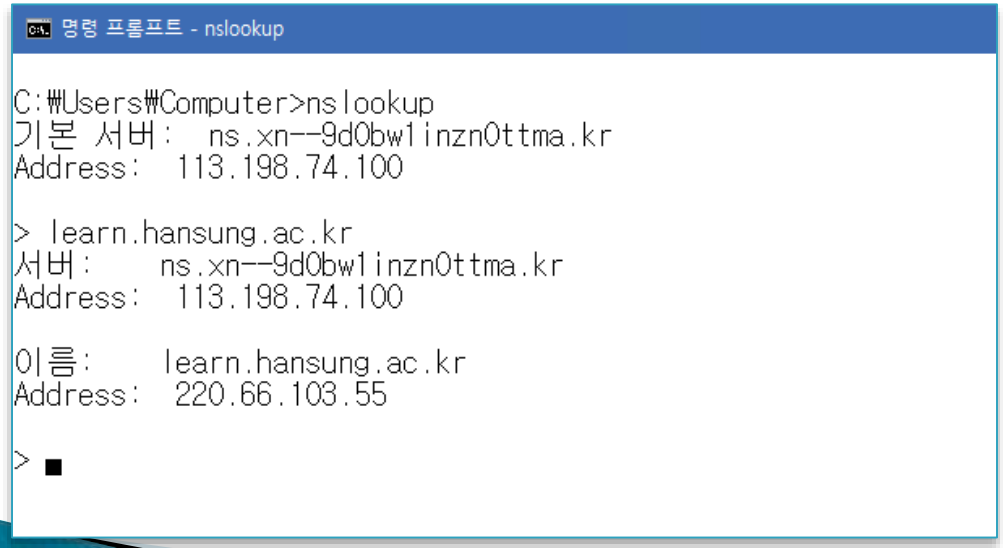


# DNS Query (learn.hansung.ac.kr ? )

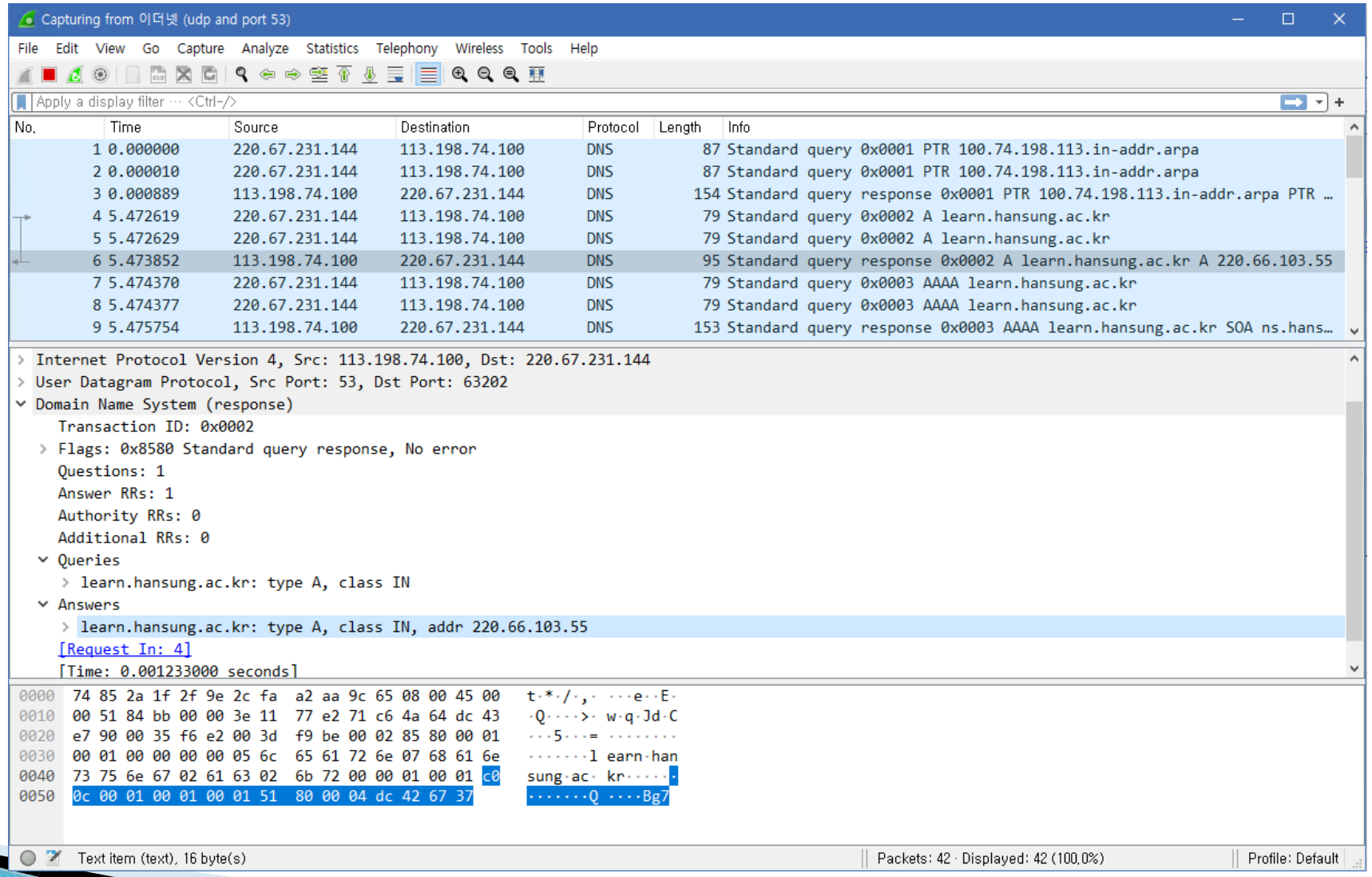



udp and port 53

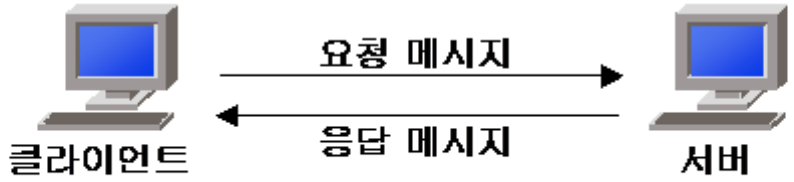


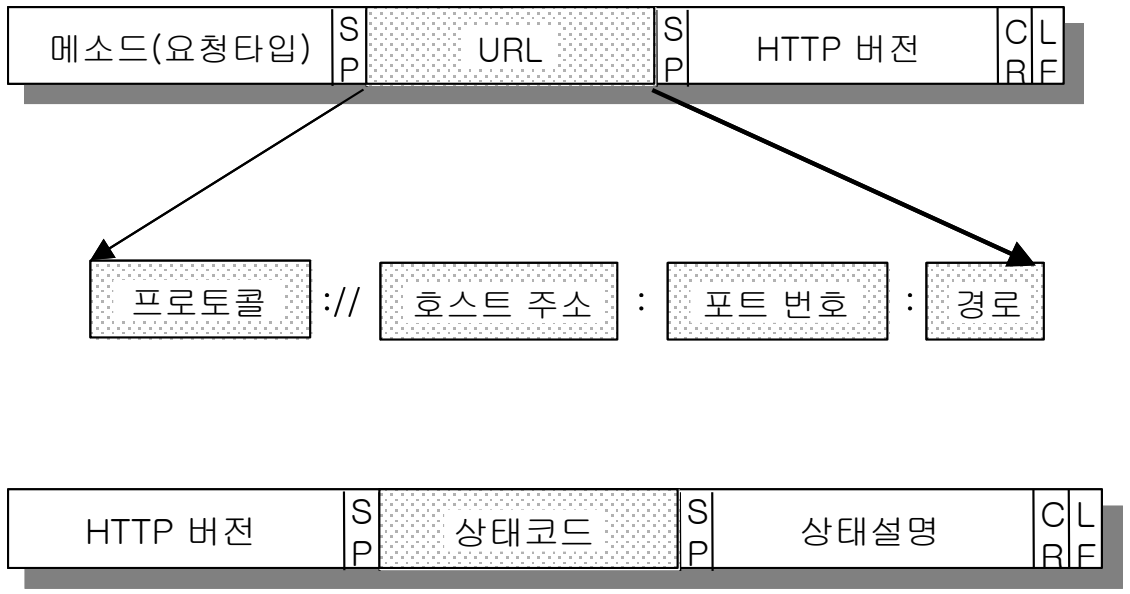
# DNS Response (learn.hansung.ac.kr ? )



# HTTP 프로토콜 분석


요청 메시지
응답 메시지
클라이언트
서버


요청 라인
헤더
(일반헤더 | 요청헤더 |
엔터티헤더)
공백 라인
본 문
(요청 메시지)
상태 라인
헤더
(일반헤더 | 요청헤더 |
엔터티헤더)
공백 라인
본 문
(응답 메시지)


메소드(요청타입)
SP
URL
SP
HTTP 버전
CR
LF
프로토콜
://
호스트 주소
:
포트 번호
:
경로
HTTP 버전
SP
상태코드
SP
상태설명
CR
LF

# Mongoose Webserver 실습

- Mongoose 설치 : c:\Mongoose
- Local to Local : 127.0.0.1, tcp and port 80
  - 실습 PC, Notebook 주소창 127.0.0.1
- 실습실 환경 실습 (PC/노트북/Mobile ←→ Web Server)
  - 실습 PC1~45 → HUB → 강사 PC (Mongoose Web Server)
  - 학생 노트북 → WiFi → 강사 PC (Mongoose Web Server)
  - Mobile → 4G/5G → 강사 PC (Mongoose Web Server)

# Mobile < 4G/5G > 실습실 Web Server

APN

175.223.44.140

KT 4G/5G 무선망

LGU+ 인터넷


index.html - Windows 메모장

```
<!DOCTYPE html>
<html>
<head>
<meta charset="UTF-8">
<title>Network Programming Home Page</title></head>
<body>
<h3>Network Programming Home Page Test
<hr>
<form name="fo" action="index.html" method="get">
학번 : <input name="id" type="text" size="20" value=""><br>
이름 : <input name="name" type="text" size="20" value=""><br>
H.P : <input name="number" type="text" size="20" value=""><br>
통신사 : <input name="telecom" type="text" size="20" value=""><br>
Model : <input name="model" type="text" size="20" value=""><br>
<input type="submit" value="제출">
</form>
</body>
</html>
```

Ln 7, Col 39 100% Windows (CRLF) UTF-8

Web Server

113.198.xxx.xxx Port 80

한성대학교
실습실