Lab Hours

- We need to allocate 3 hours in this week for hands-on lab hours (March 23rd 09:10-12:00).
- The instructor will set up the SIP server.
- Every student will bring a labtop or desktop PC and install a SIP UA (softphone). It will be even better if you have a WiFi-phone.
- Packet analyzer will be utilized to capture and analyze the SIP messages.

SIP UAs and SIP Message Analysis

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National Chi Nan University
Email: solomon@ipv6.club.tw

Exercise 1: SIP UA operations

- Download & Install SIP UA
- Download & Install Ethereal
- Packet Analysis Using Ethereal
  - SIP signaling flow
  - RTP traffic
  - SIP headers
  - SDP Contents
  - Call Hold/Retrieve

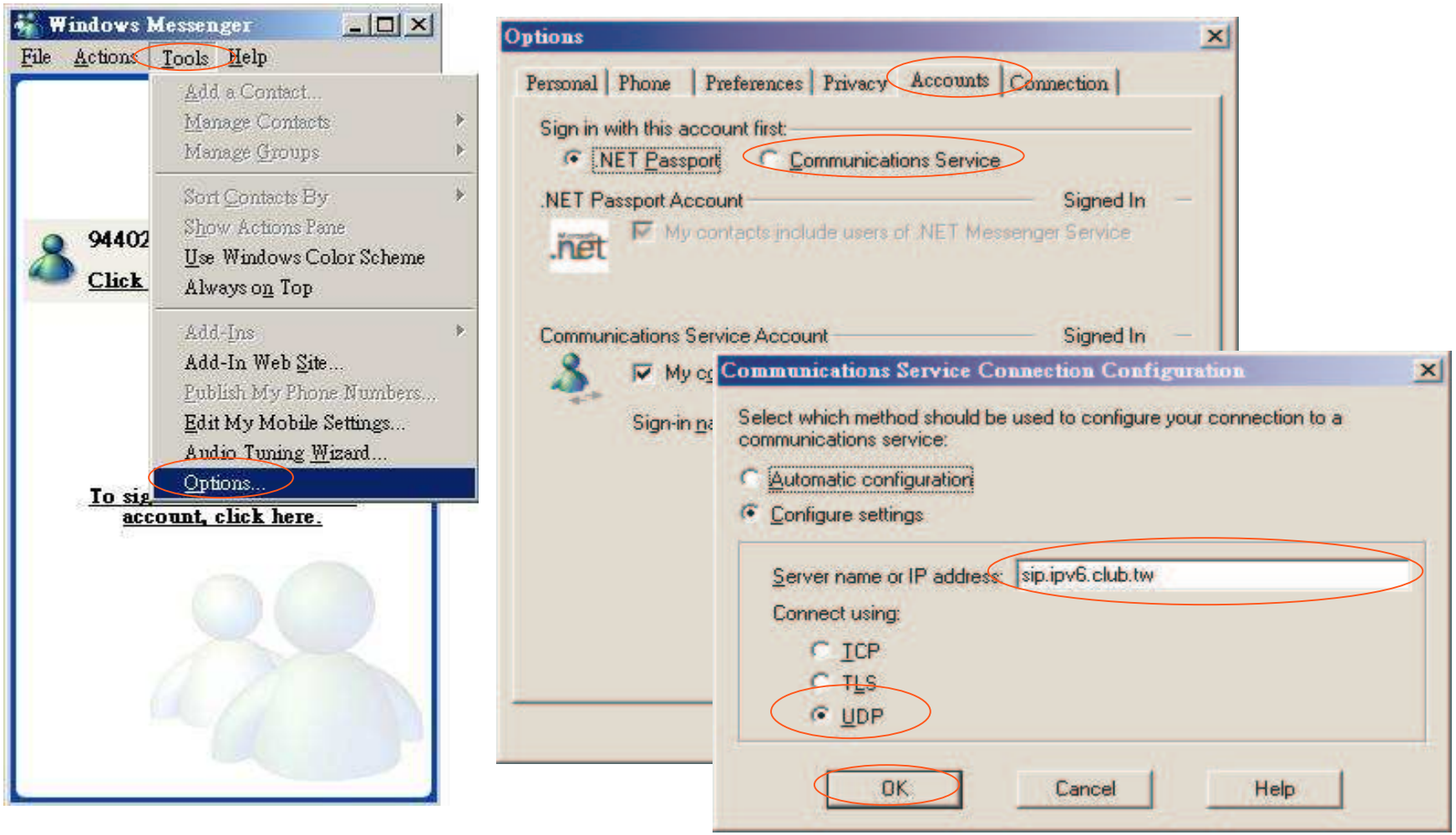
Windows-based SIP UA

- Microsoft Windows Messenger
- X-Lite

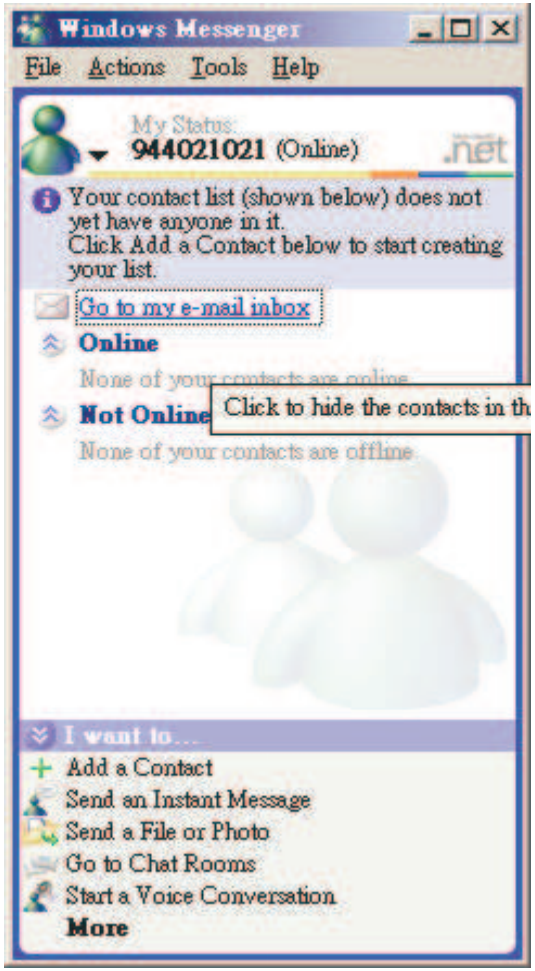
SIP UA – Windows Messenger

- By default, Windows XP installs Windows Messenger Version 4.7
- There are two messengers from Microsoft
  - MSN Messenger 6.2, 7.0
  - Windows Messenger 4.7, 5.1
- Inside Windows Messenger - How it Communicates
  - http://www.microsoft.com/technet/prodtechnol/winxppro/evaluate/insid01.mspx

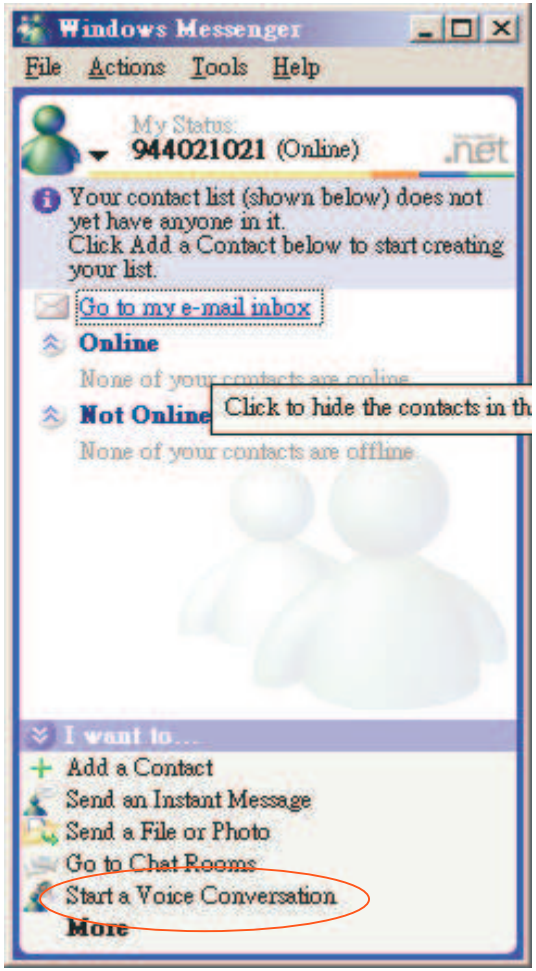
Step 1: Configure



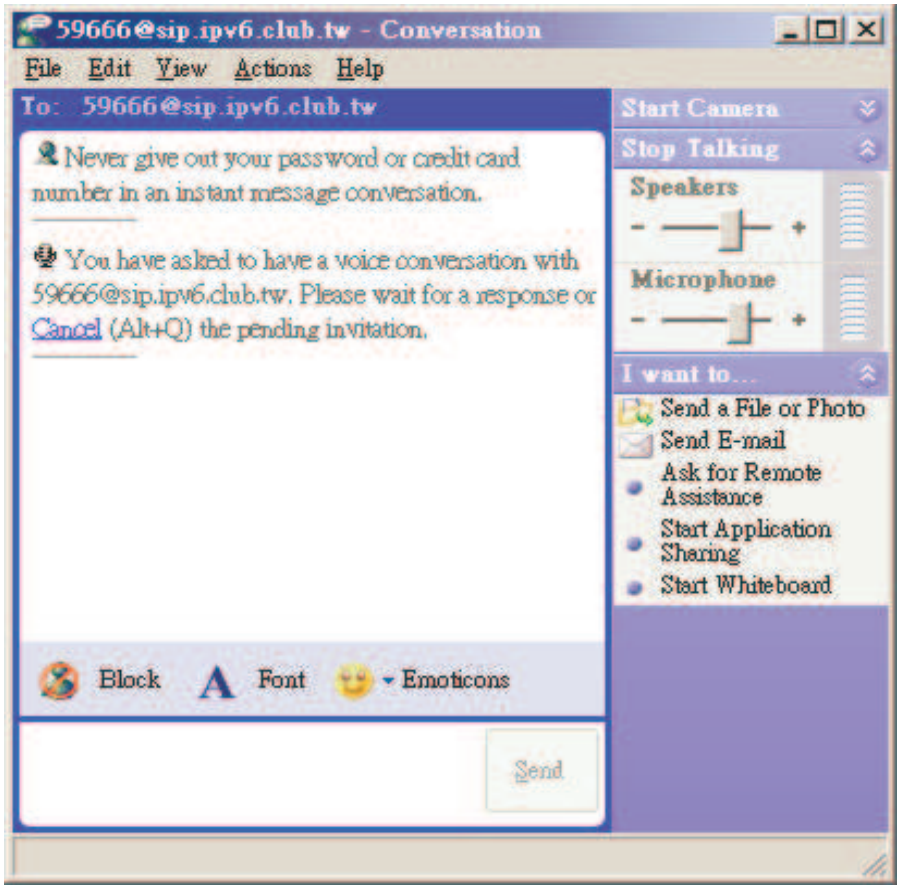
Step 2: REGISTER



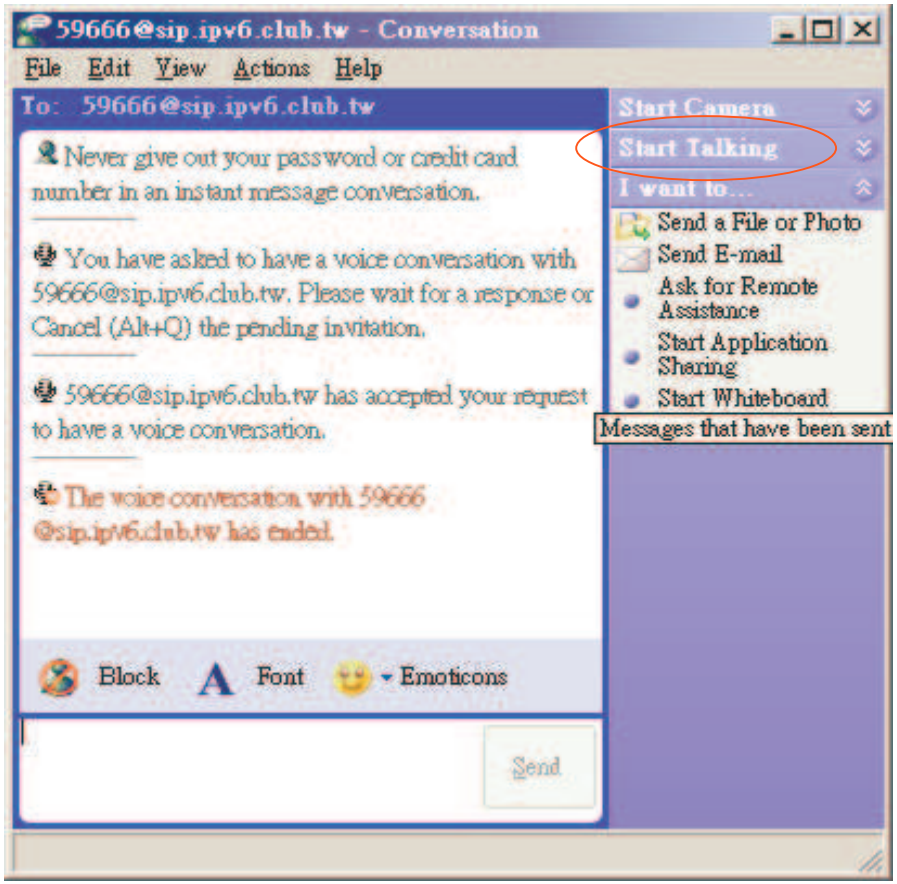
Step 3: Make A Call



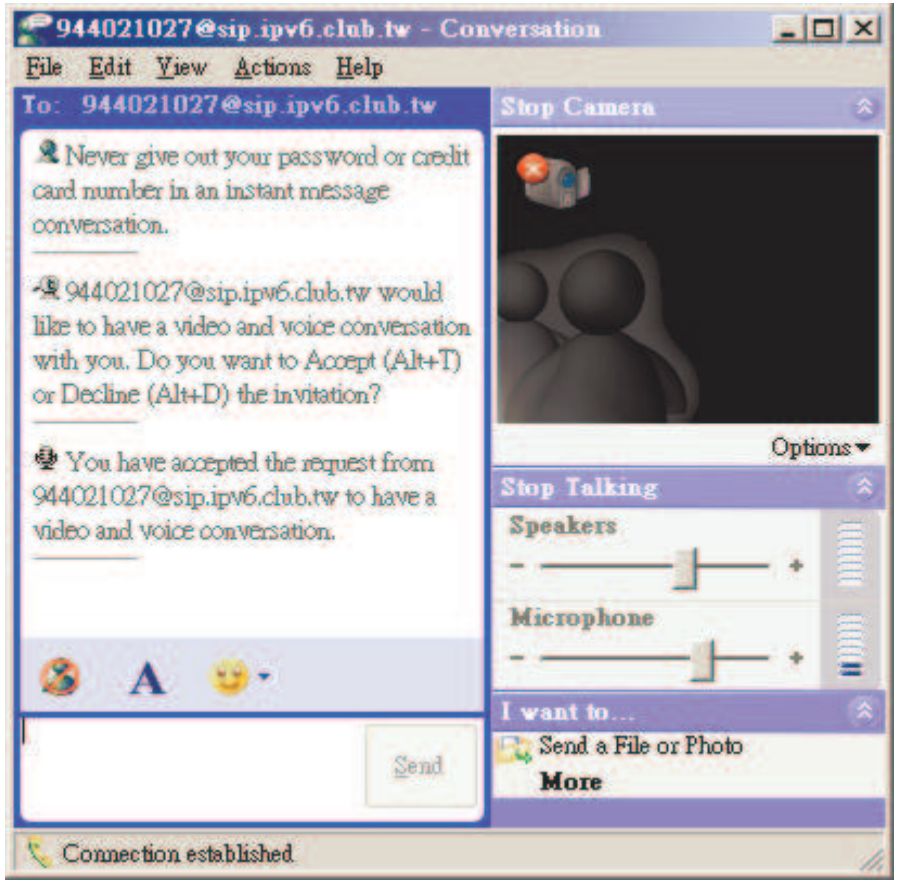
Step 4: Ringing



Step 5: Conversation



Step 6: Answer A Call



SIP UA - X-Lite

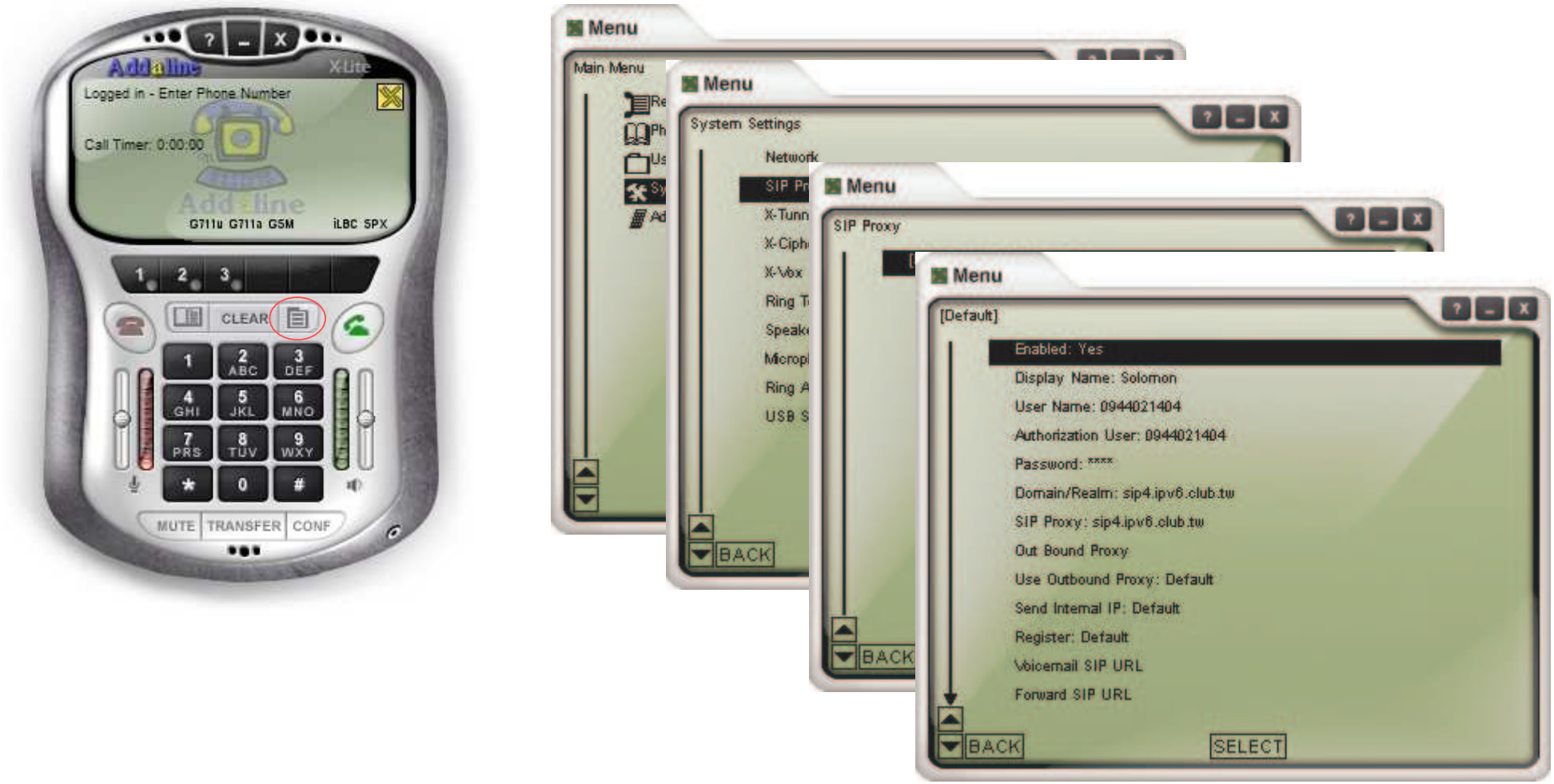
- X-Lite - The Best Free Softphone
- A FREE premium SIP softphone with many PBX-like features.
- Open standards-based design (SIP) allows for maximum network interoperation and integration.
- Download from http://www.xten.com/

Features

- Touch-tones [DTMF]
- 3 Lines, Multiple Proxies
- Line Hold
- Inbound Call 'Ignore'
- Inbound Call 'Go to Voicemail'
- Dial/ Redial/Hangup
- Caller ID [SIP ID]
- Call Timer
- Mute
- Microphone & Speakers Levels
- Microphone & Speakers Meters
- Recent Calls Dialed
- Recent Calls Received
- Speed Dial

- G.711u+a/iLBC/GSM codecs
- NAT/Firewall support
- Specify NAT IP to be written in SIP messages
- Supports Windows 98SE/NT4/ME/2000/XP

Step 1: Configuration



Step 2: Make/Receive Calls

- Automatically send a REGISTER request to registrar when the program starts up.
- Dial digits, and domain realm will be appended automatically.

Packets Capturing & Analyzing

Ethereal – What Is It?

- Every network manager at some time or other needs a tool that can capture packets off the network and analyze them.
- In the past, such tools were either very expensive, proprietary, or both.
- With the advent of Ethereal, all that has changed.
- *"A rose by any other name would smell as sweet."*
  - William Shakespeare

Features of Ethereal

- Available for UNIX and Windows.
- Capture and display packets from any interface on a UNIX system.
- Display packets captured under a number of other capture programs:
  - tcpdump
  - Network Associates Sniffer and Sniffer Pro
  - NetXray
  - Microsoft Network Monitor
- Filter packets on many criteria.
- Colorize packet display based on filters
- Allow people to add new protocols to Ethereal.

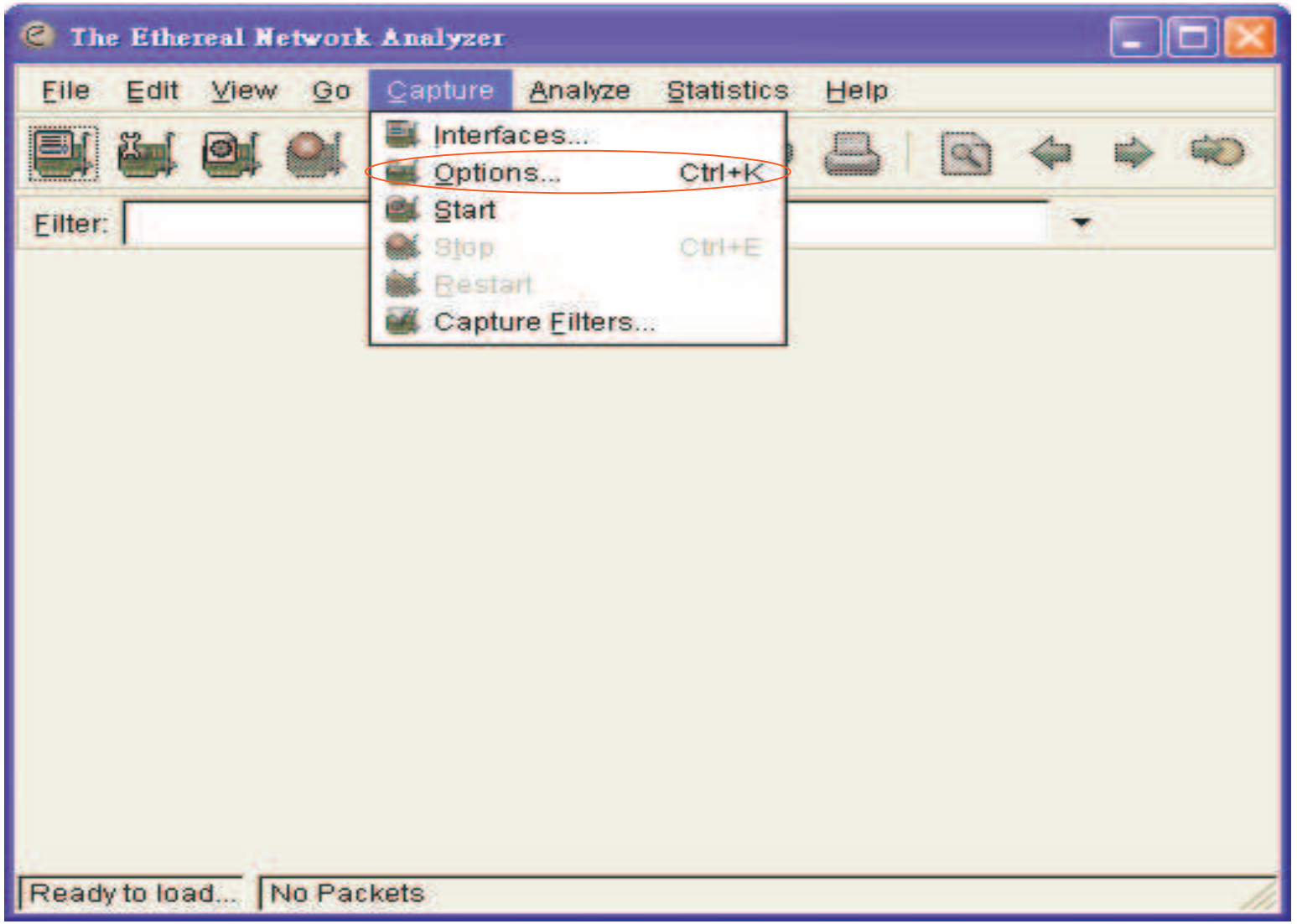
Where to Get Ethereal

- Official site: http://www.ethereal.com/

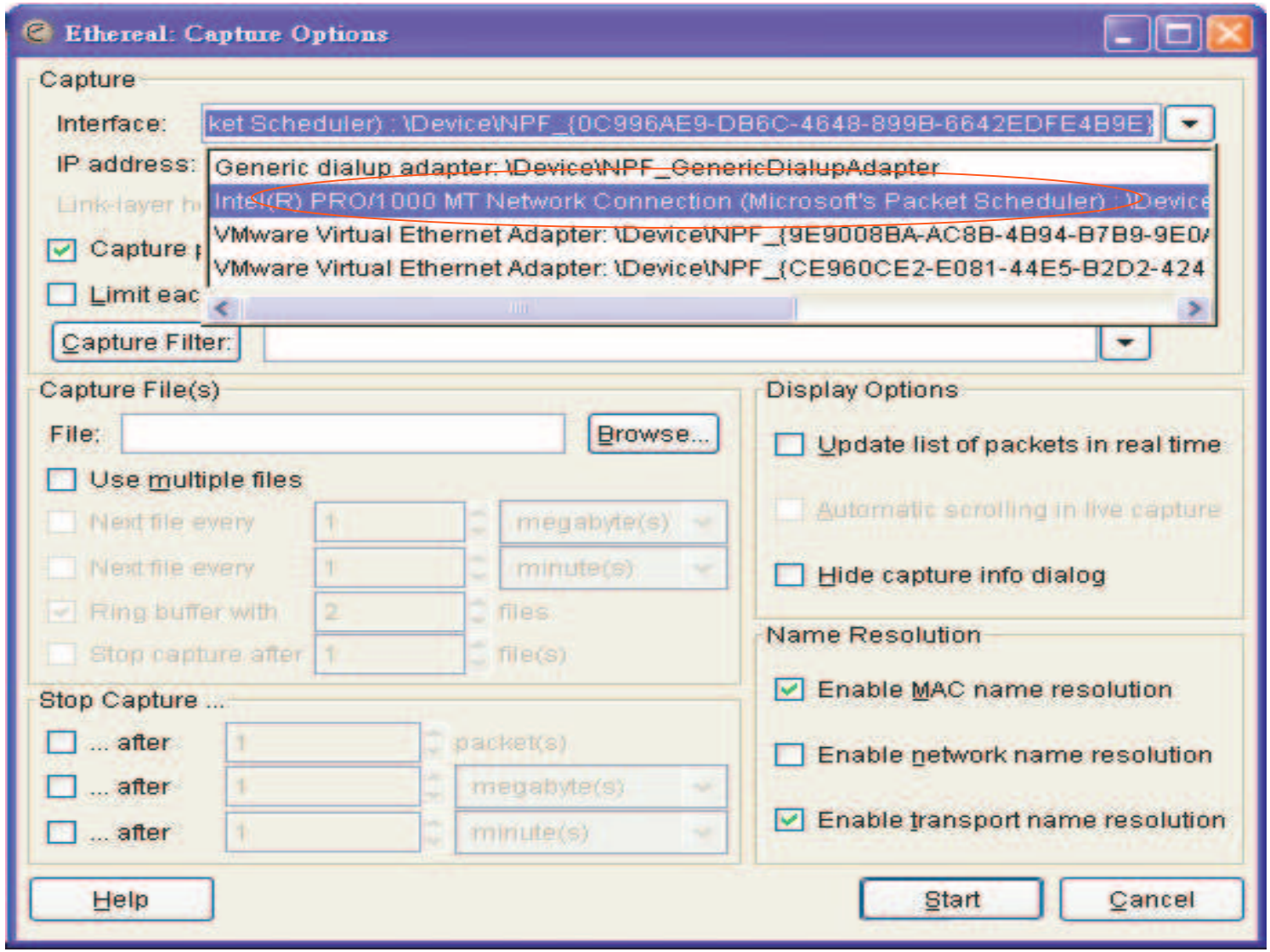
Install Ethereal under Windows

- Install WinPcap 3.1.
  - WinPcap is an architecture for packet capture and network analysis for the Win32 platforms.
  - It includes
    - ☞a kernel-level packet filter,
    - ☞a low-level dynamic link library (packet.dll), and
    - ☞a high-level and system-independent library (wpcap.dll, based on libpcap version 0.6.2)
- Install Ethereal 0.10.14.

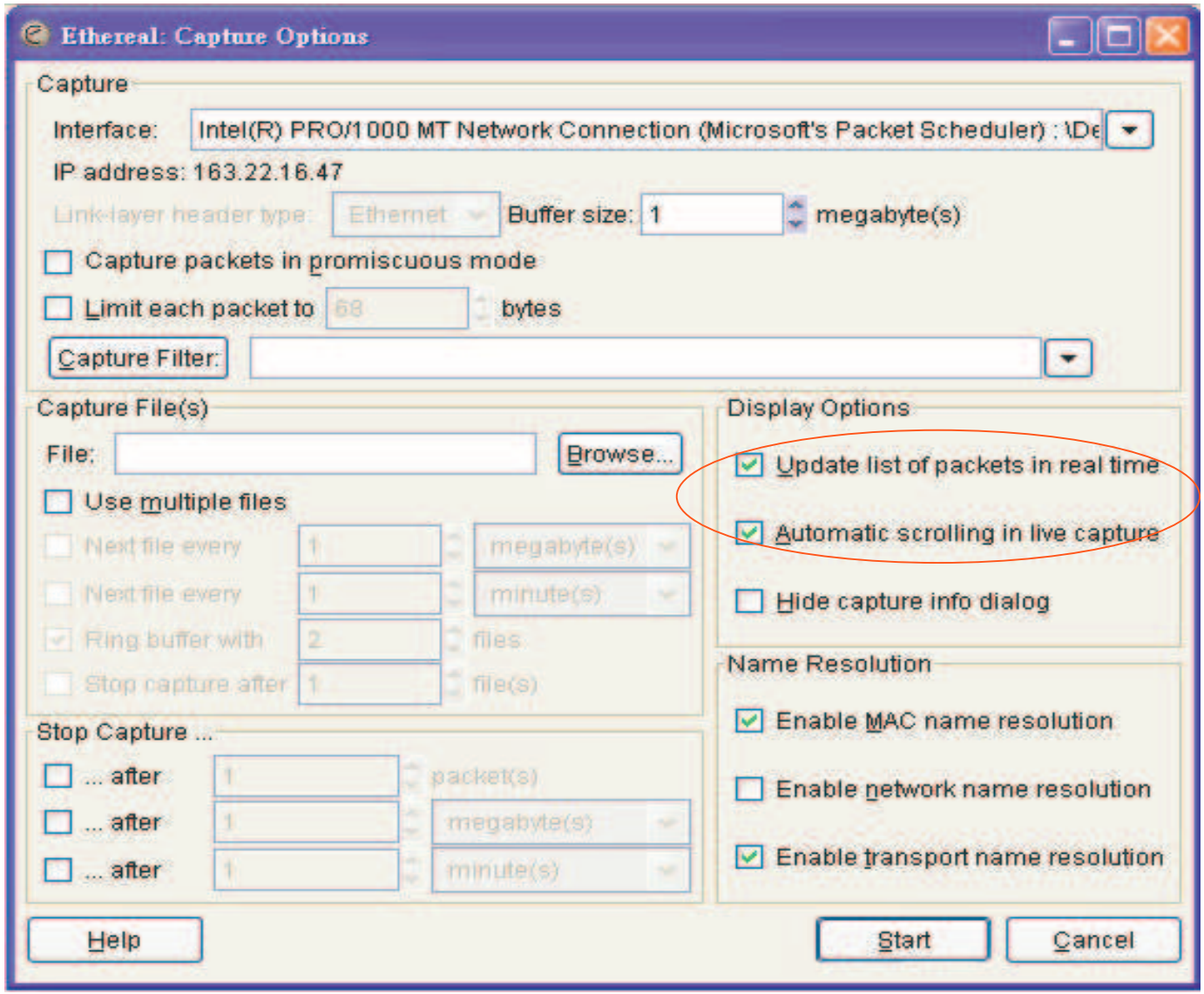
Capturing packets with Ethereal



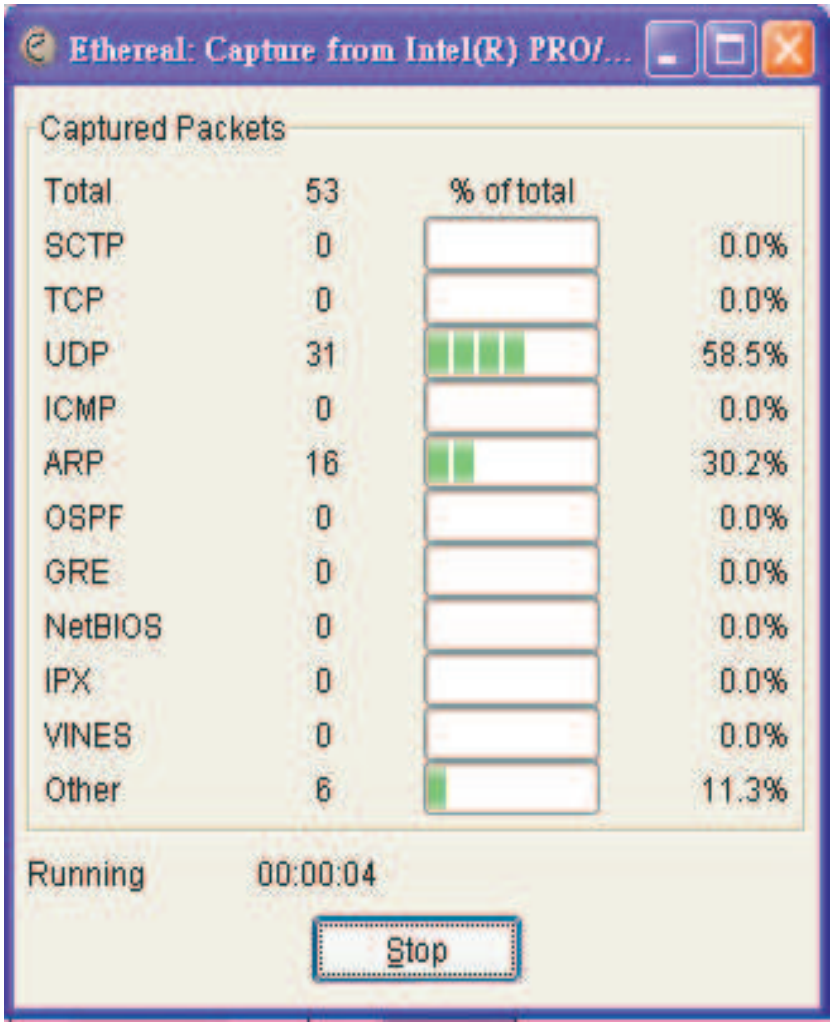
Capturing packets with Ethereal



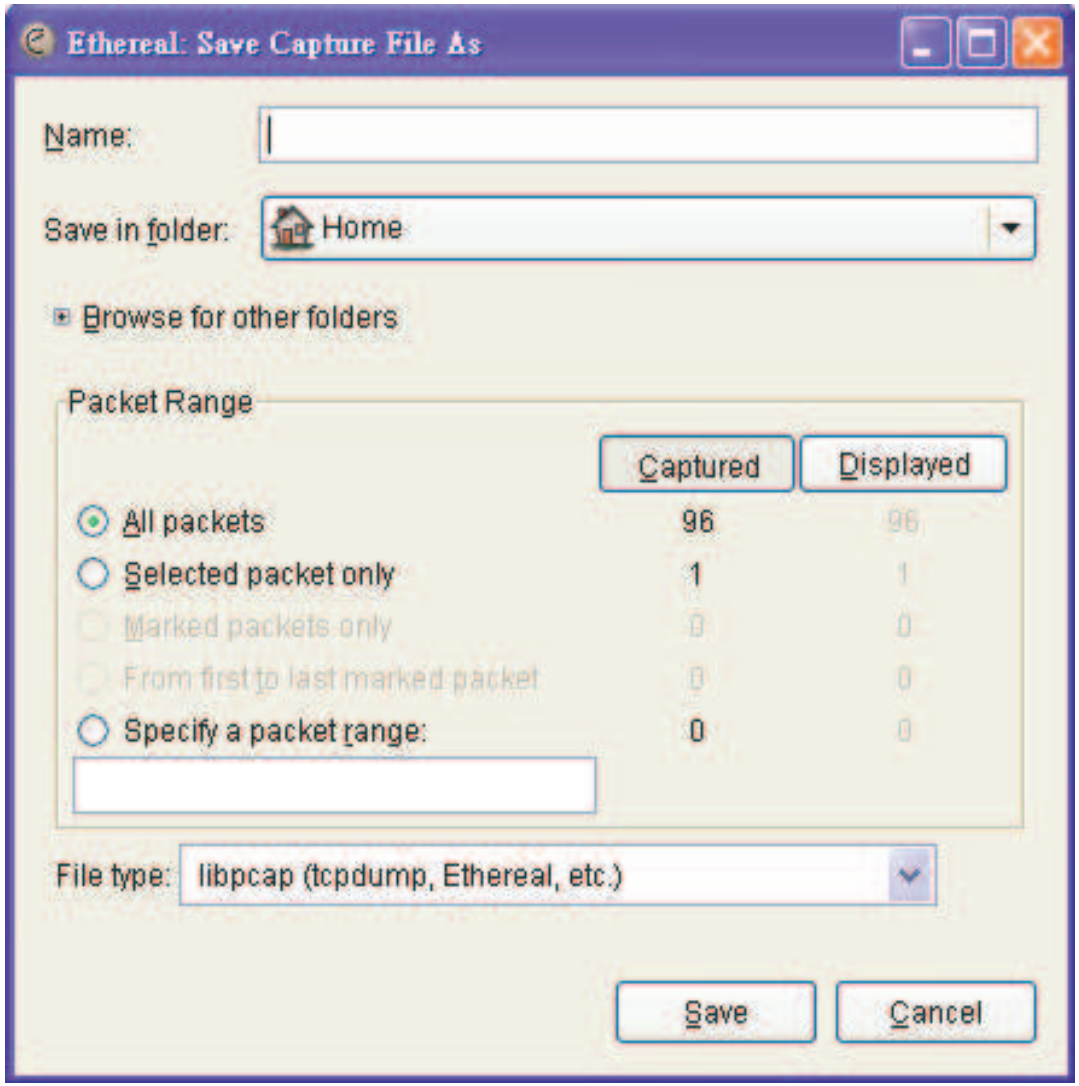
The Capture Preferences dialog box



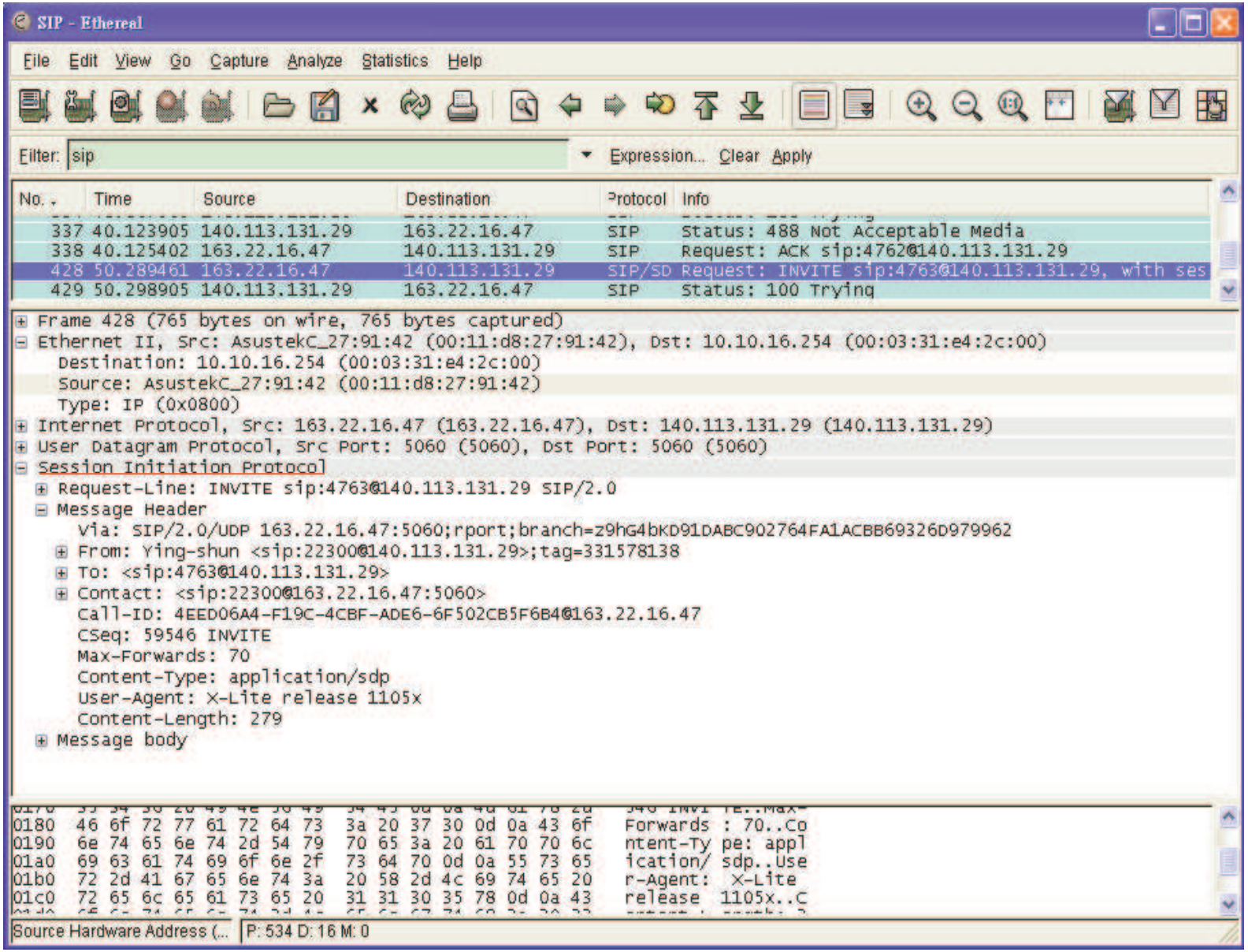
Stop after you have collected enough packets



File – Save As

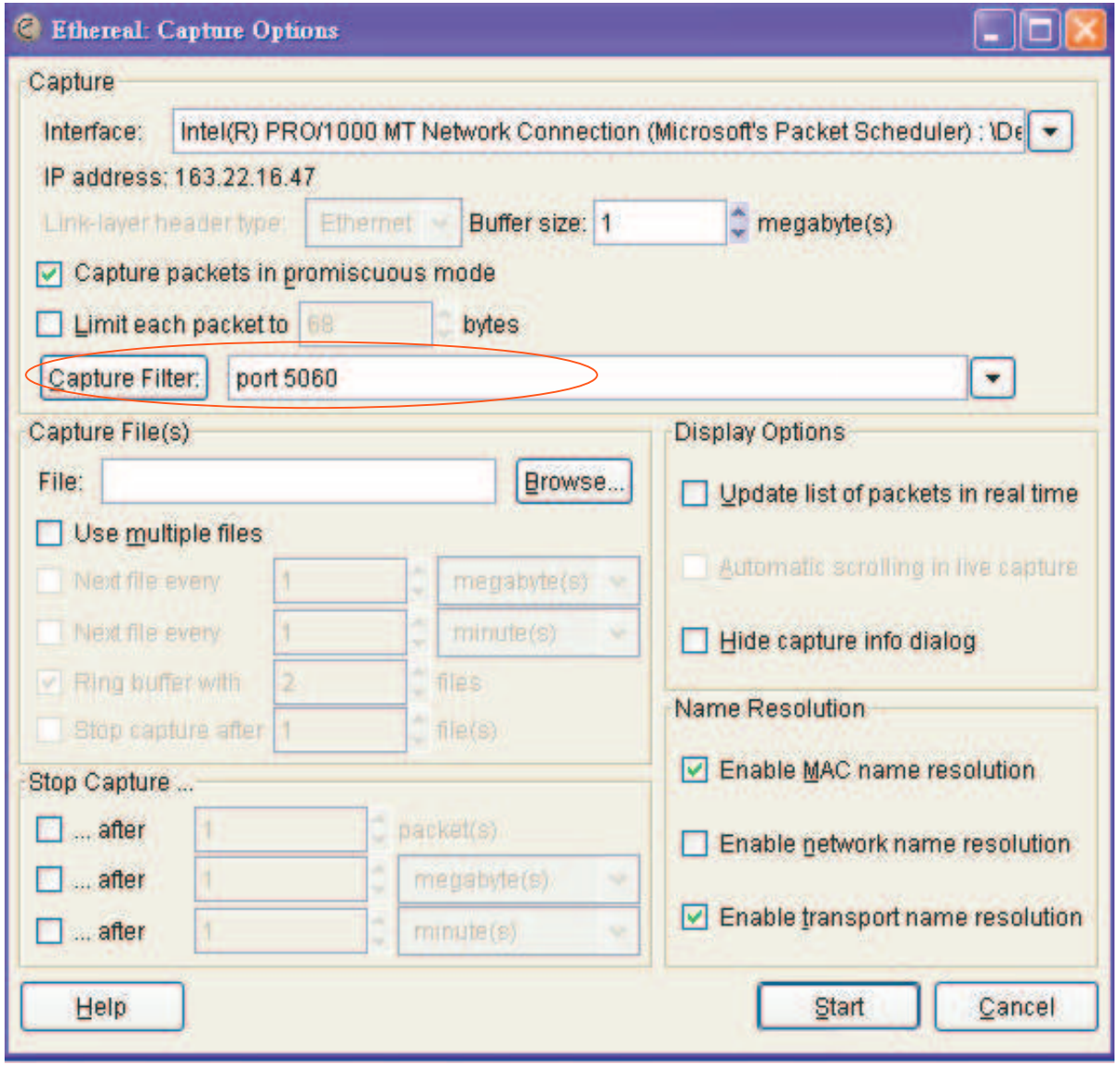

Ethereal: Save Capture File As
Name:
Save in folder:
Home
Browse for other folders
Packet Range
Captured
Displayed
All packets
96
96
Selected packet only
1
1
Marked packets only
0
0
From first to last marked packet
0
0
Specify a packet range:
0
0
File type:
libpcap (tcpdump, Ethereal, etc.)
Save
Cancel

Show Packet in New Window



Capture Filters

Filtering While Capturing

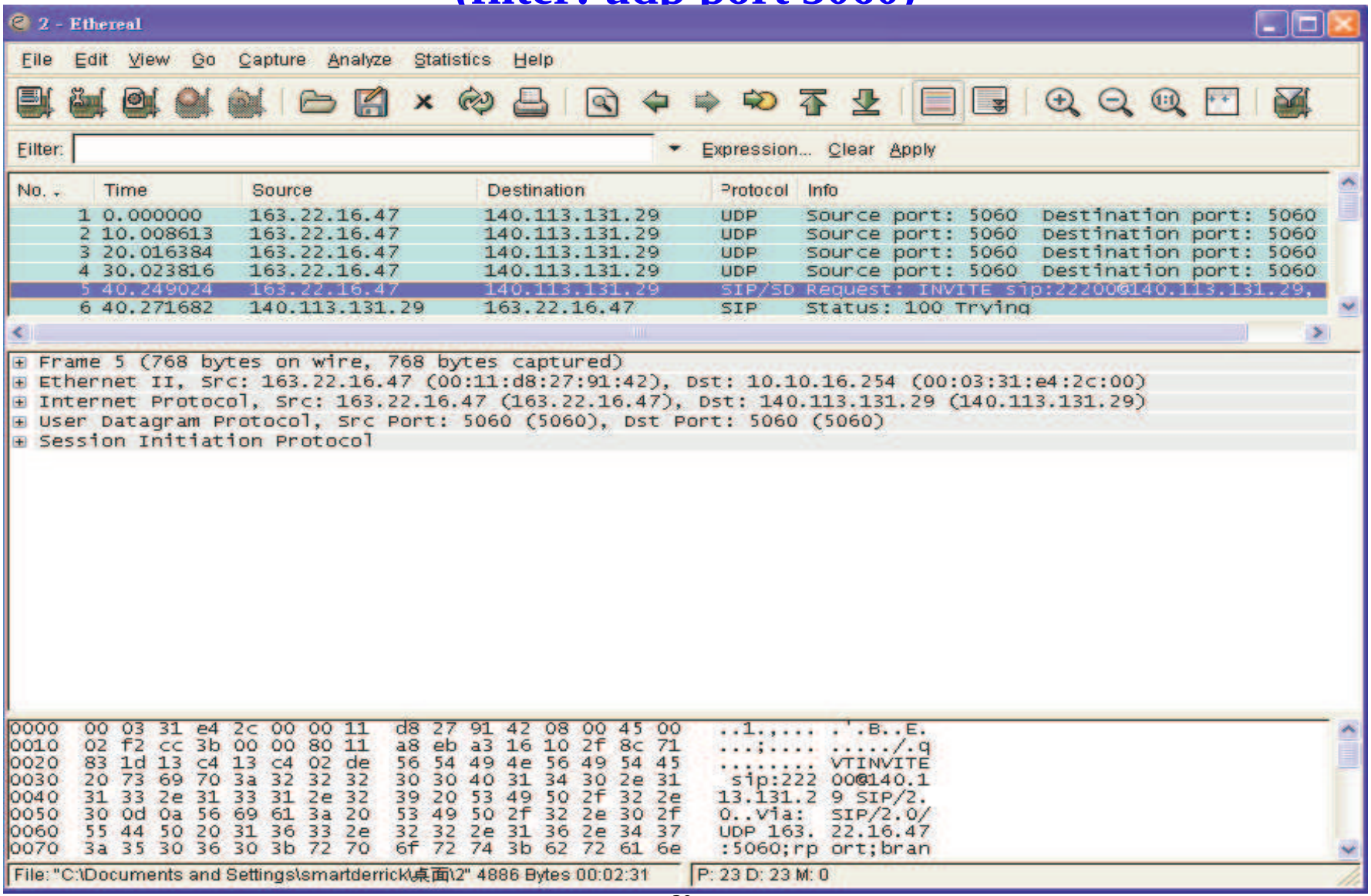


Syntax of the tcpdump capture filter language

- [not] **primitive** [and|or [not] **primitive** ...]
  - tcp port 23 and host 10.0.0.5
  - tcp port 23 and not host 10.0.0.5
- **tcpdump** filter language is explained in the man page.

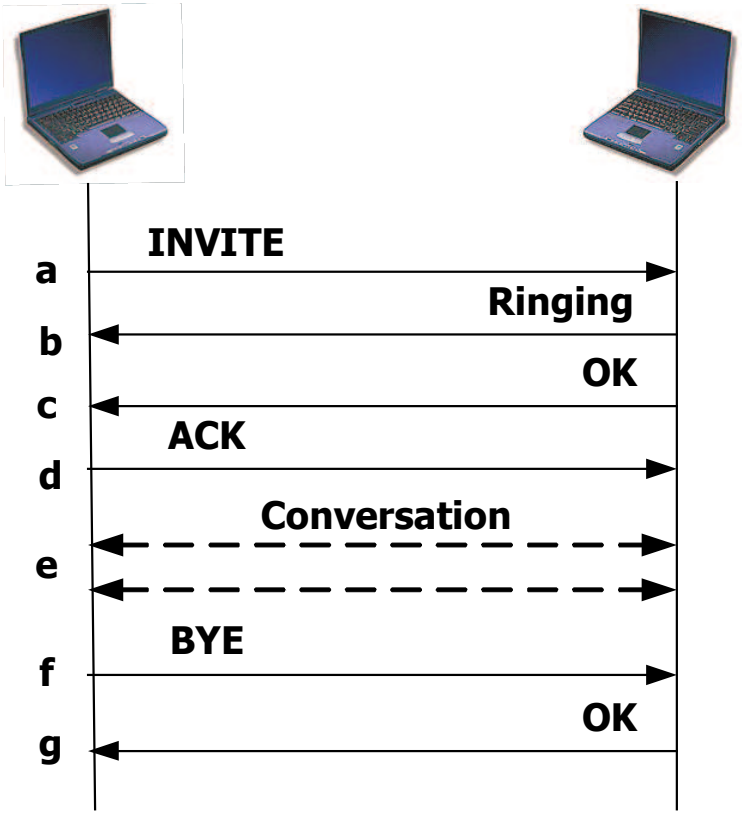
Capturing SIP signaling

(filter: udp port 5060)

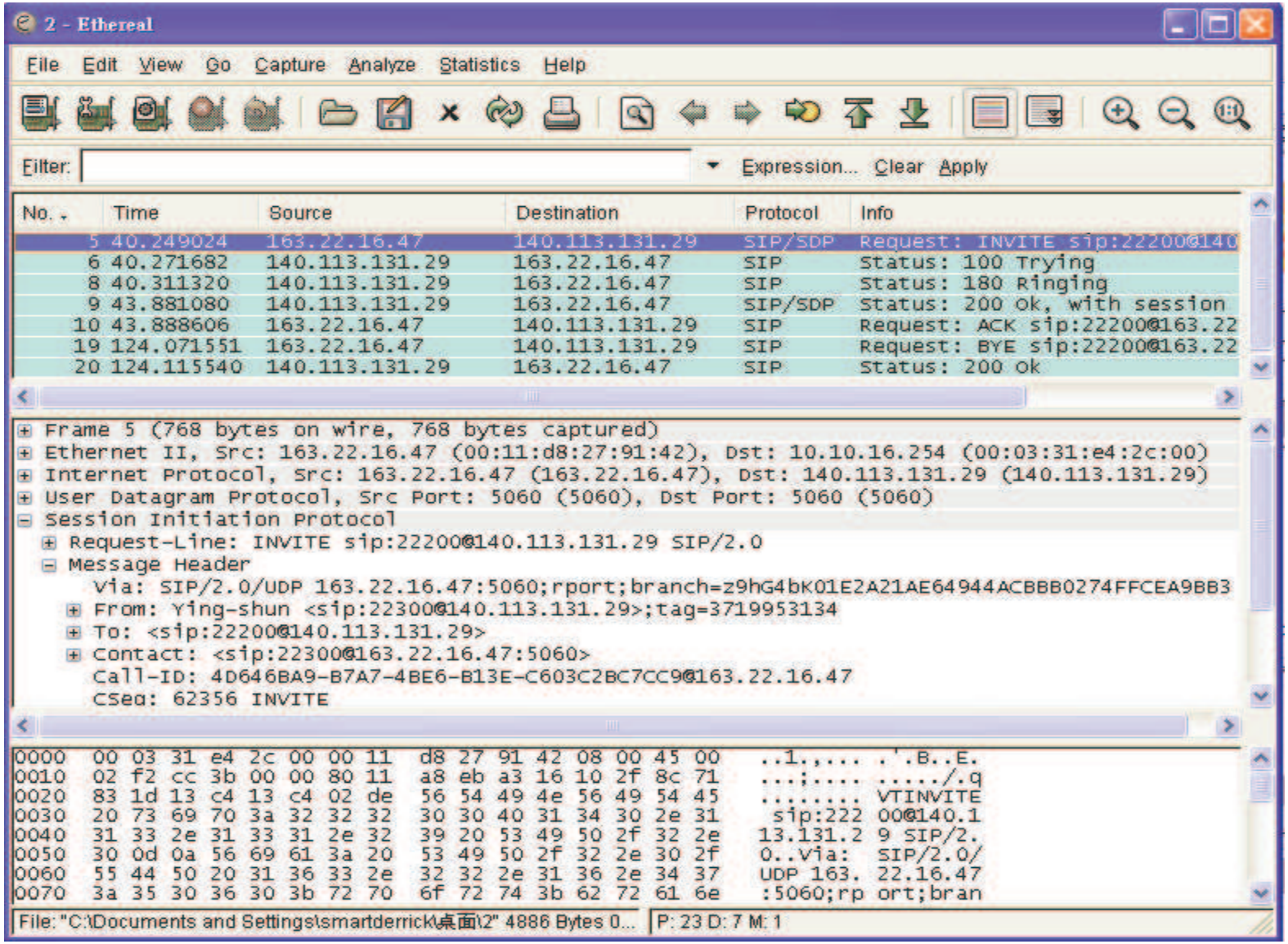


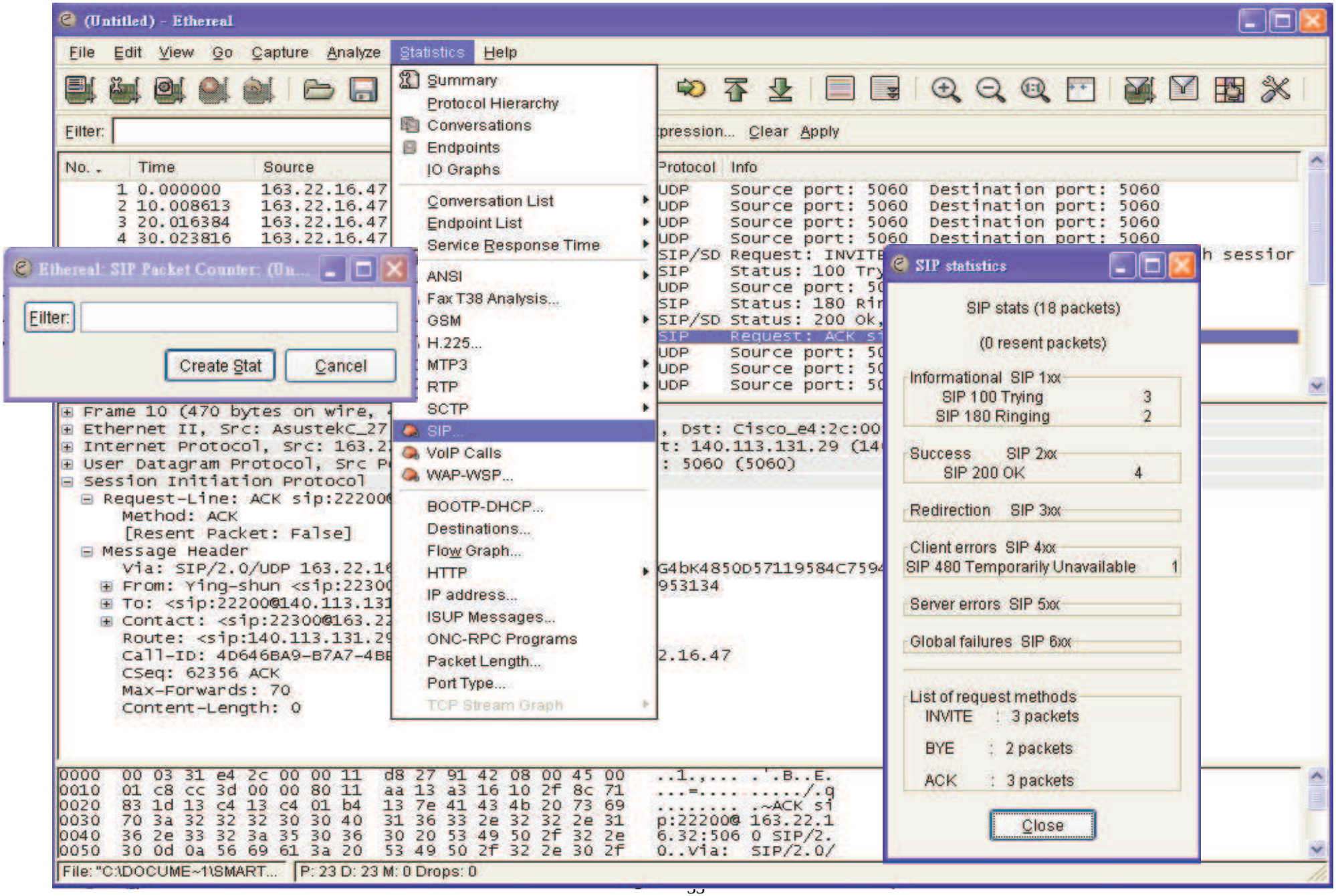
SIP Call Establishment

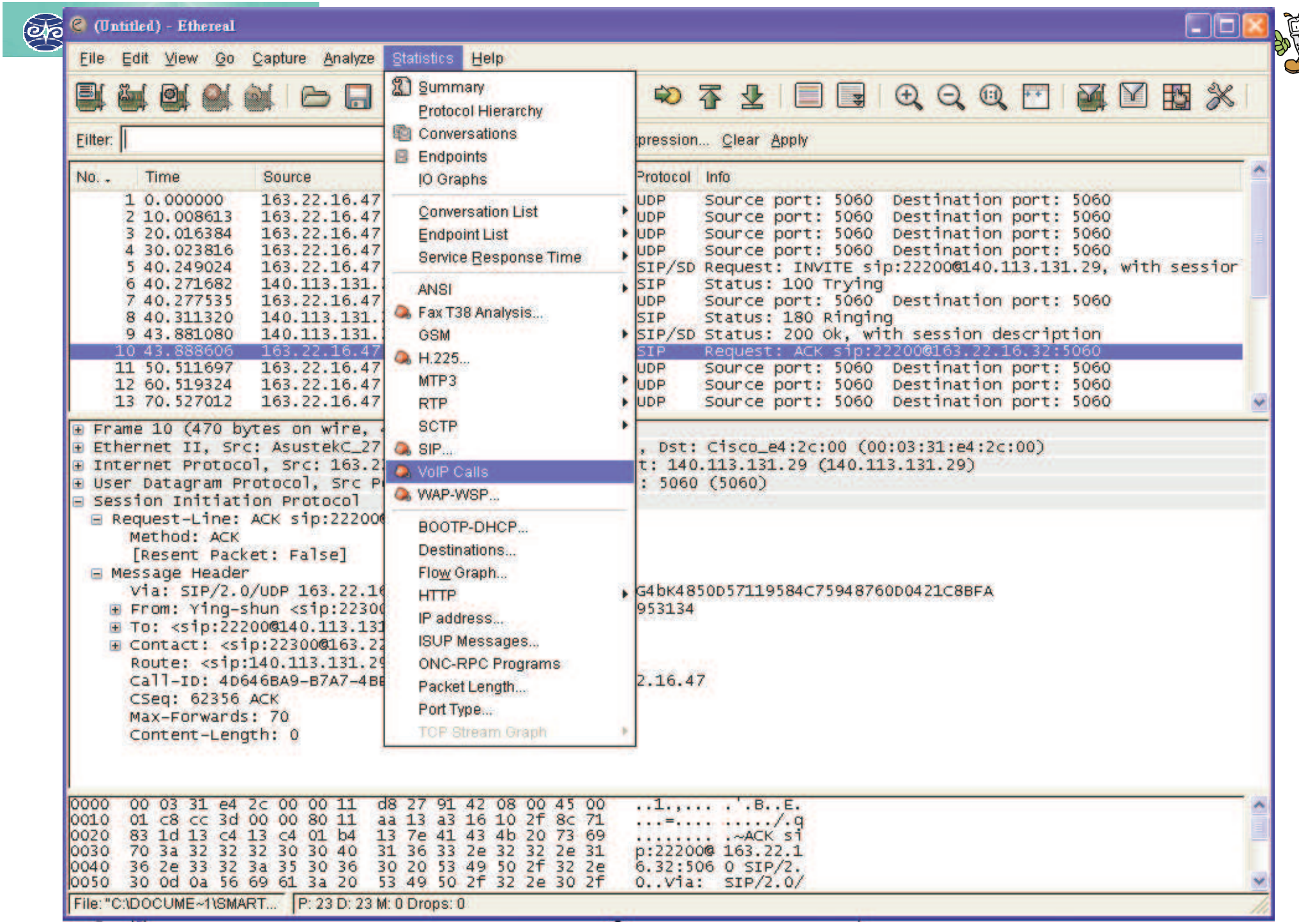
- It is simple, which contains a number of interim responses.



Basic Call Flow




(Untitled) - Ethereal
File Edit View Go Capture Analyze Statistics Help
Summary
Protocol Hierarchy
Conversations
Endpoints
IO Graphs
Conversation List
Endpoint List
Service Response Time
ANSI
Fax T38 Analysis...
GSM
H.225...
MTP3
RTP
SCTP
SIP...
VoIP Calls
WAP-WSP...
BOOTP-DHCP...
Destinations...
Flow Graph...
HTTP
IP address...
ISUP Messages...
ONC-RPC Programs
Packet Length...
Port Type...
TCP Stream Graph
Filter:
Clear Apply
No. Time Source
Protocol Info
Ethereal: SIP Packet Counter: (Un...
Filter:
Create Stat
Cancel
SIP statistics
SIP stats (18 packets)
(0 resent packets)
Informational SIP 1xx
SIP 100 Trying 3
SIP 180 Ringing 2
Success SIP 2xx
SIP 200 OK 4
Redirection SIP 3xx
Client errors SIP 4xx
SIP 480 Temporarily Unavailable 1
Server errors SIP 5xx
Global failures SIP 6xx
List of request methods
INVITE : 3 packets
BYE : 2 packets
ACK : 3 packets
Close
File: "C:\DOCUME~1\SMART...
P: 23 D: 23 M: 0 Drops: 0


(Untitled) - Ethereal
File Edit View Go Capture Analyze Statistics Help
Summary
Protocol Hierarchy
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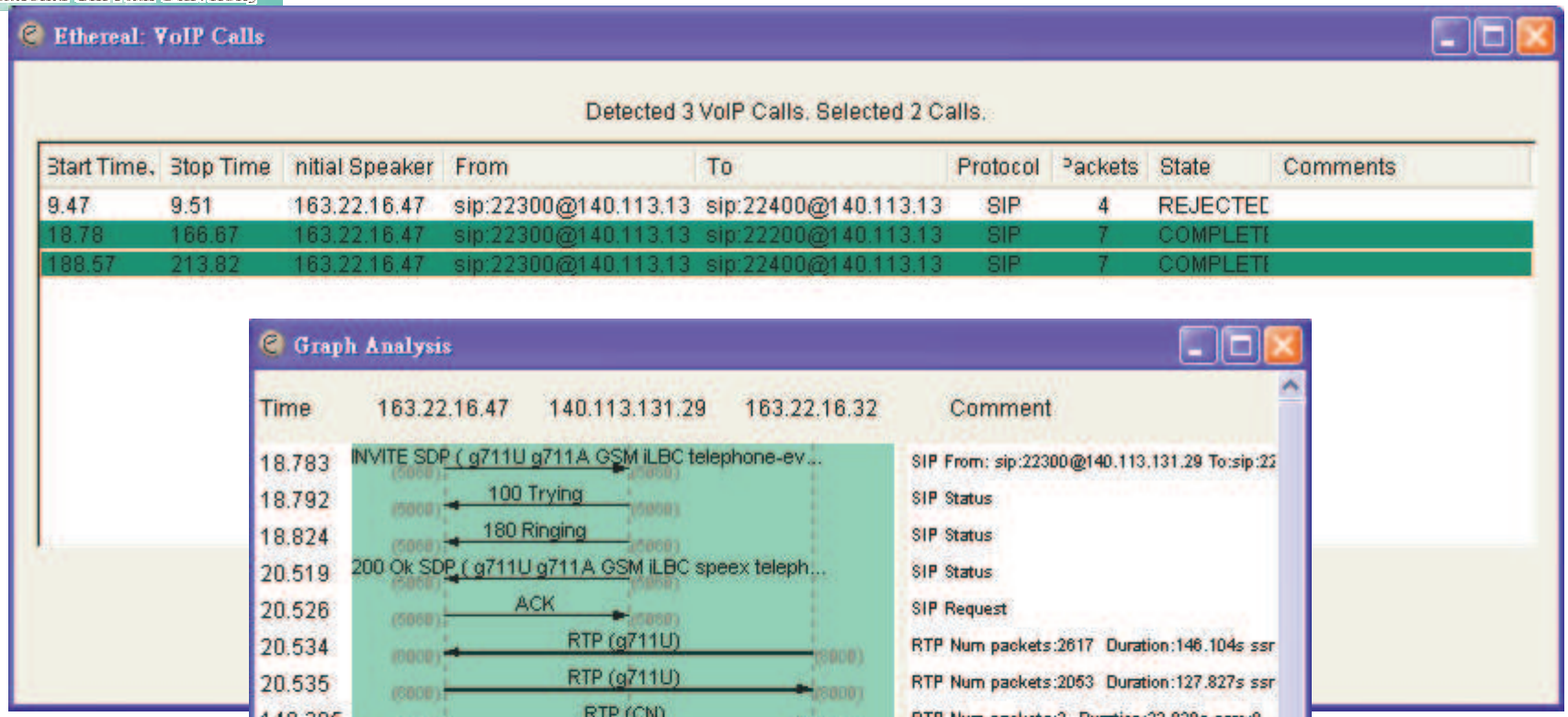
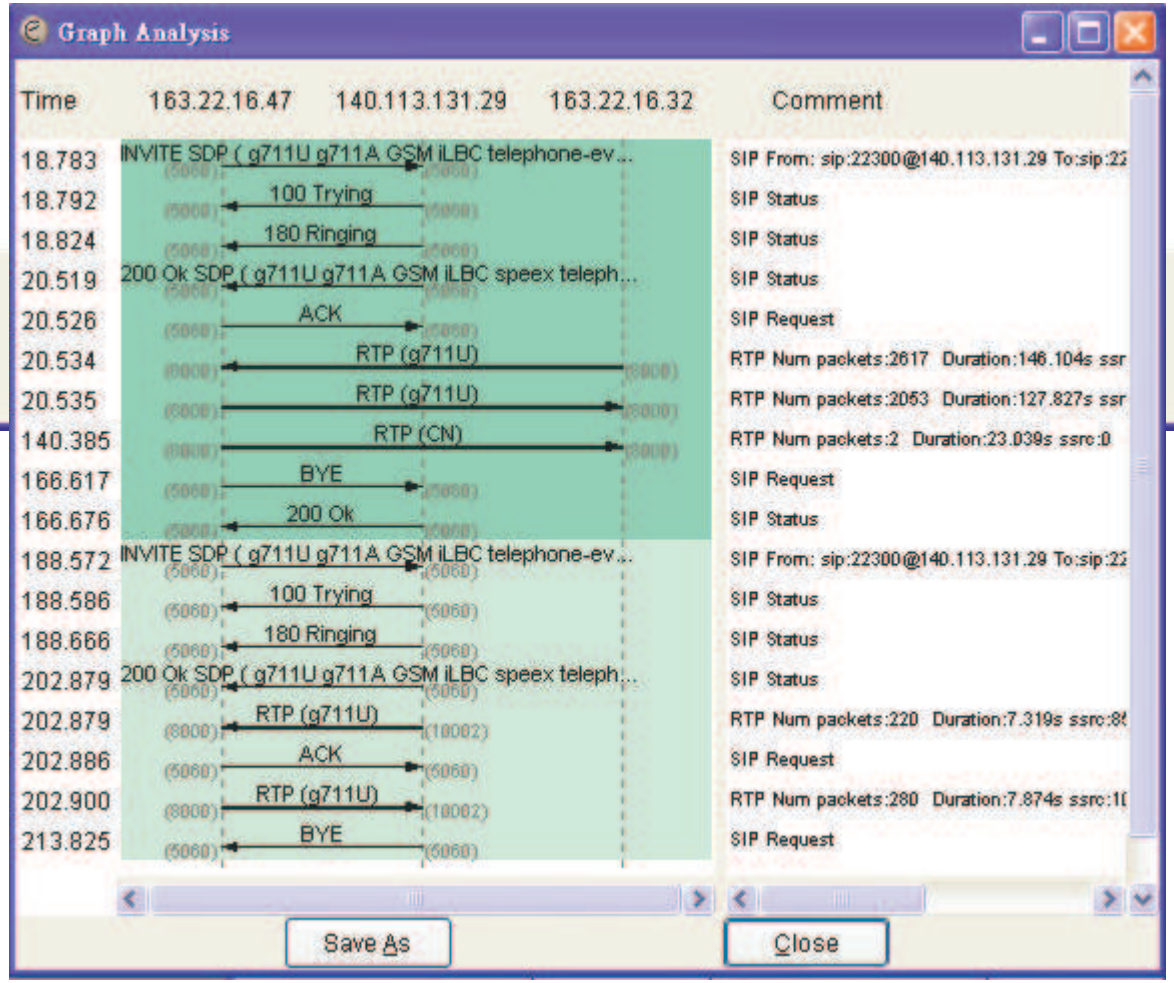
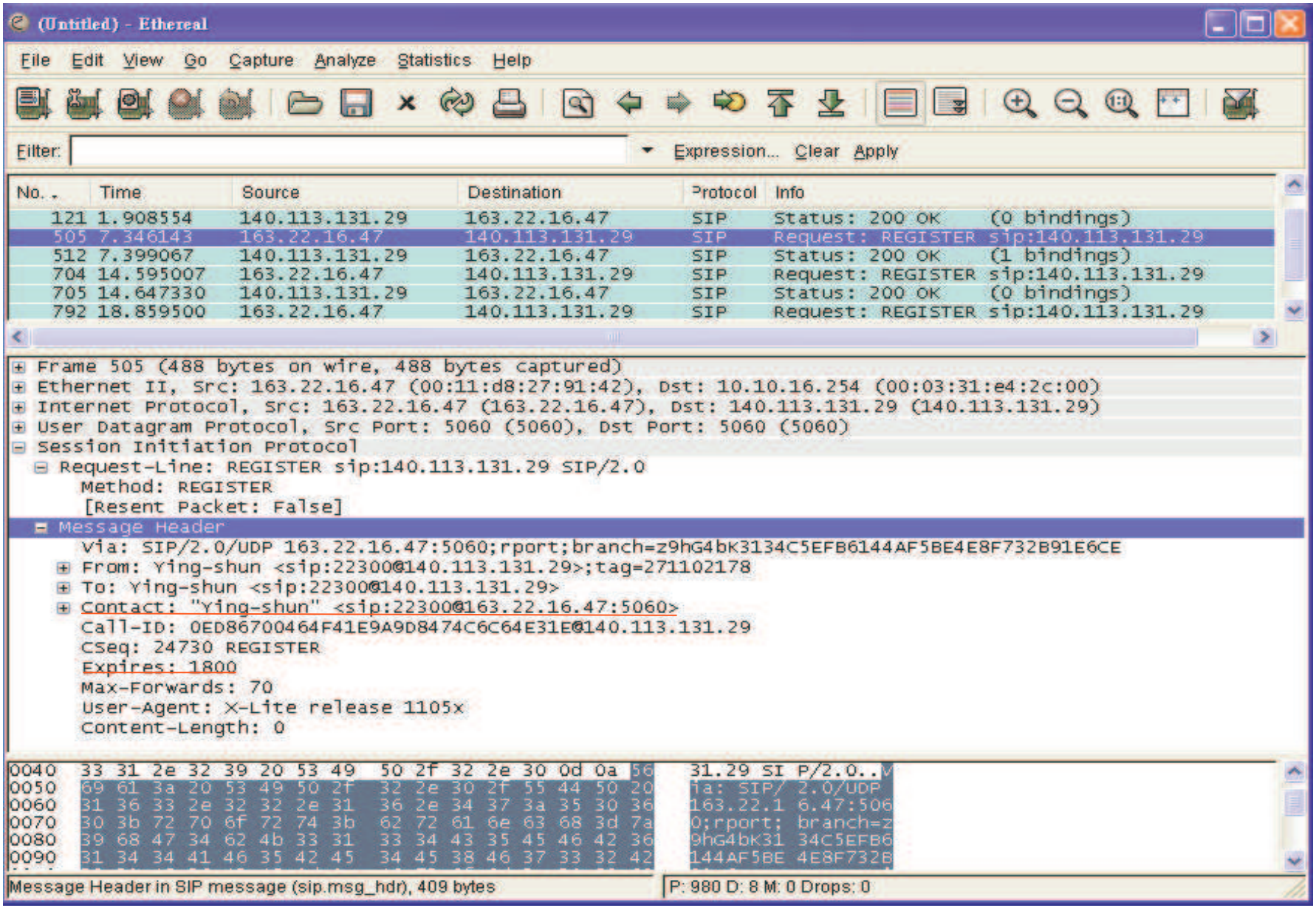
Endpoints
IO Graphs
Conversation List
Endpoint List
Service Response Time
ANSI
Fax T38 Analysis...
GSM
H.225...
MTP3
RTP
SCTP
SIP...
VoIP Calls
WAP-WSP...
BOOTP-DHCP...
Destinations...
Flow Graph...
HTTP
IP address...
ISUP Messages...
ONC-RPC Programs
Packet Length...
Port Type...
TCP Stream Graph
Filter:
pression... Clear Apply
No. Time Source Protocol Info
1 0.000000 163.22.16.47 UDP Source port: 5060 Destination port: 5060
2 10.008613 163.22.16.47 UDP Source port: 5060 Destination port: 5060
3 20.016384 163.22.16.47 UDP Source port: 5060 Destination port: 5060
4 30.023816 163.22.16.47 UDP Source port: 5060 Destination port: 5060
5 40.249024 163.22.16.47 SIP/SD Request: INVITE sip:22200@140.113.131.29, with session
6 40.271682 140.113.131. SIP Status: 100 Trying
7 40.277535 163.22.16.47 UDP Source port: 5060 Destination port: 5060
8 40.311320 140.113.131. SIP Status: 180 Ringing
9 43.881080 140.113.131. SIP/SD Status: 200 Ok, with session description
10 43.888606 163.22.16.47 SIP Request: ACK sip:22200@163.22.16.32:5060
11 50.511697 163.22.16.47 UDP Source port: 5060 Destination port: 5060
12 60.519324 163.22.16.47 UDP Source port: 5060 Destination port: 5060
13 70.527012 163.22.16.47 UDP Source port: 5060 Destination port: 5060
Frame 10 (470 bytes on wire,
Ethernet II, Src: AsustekC_27 , Dst: Cisco_e4:2c:00 (00:03:31:e4:2c:00)
Internet Protocol, Src: 163.2 t: 140.113.131.29 (140.113.131.29)
User Datagram Protocol, Src P : 5060 (5060)
Session Initiation Protocol
Request-Line: ACK sip:22200
Method: ACK
[Resent Packet: False]
Message Header
Via: SIP/2.0/UDP 163.22.16 G4bK4850D57119584C75948760D0421C8BFA
From: Ying-shun <sip:22300 953134
To: <sip:22200@140.113.131
Contact: <sip:22300@163.22
Route: <sip:140.113.131.29
Call-ID: 4D646BA9-B7A7-4BE 2.16.47
CSeq: 62356 ACK
Max-Forwards: 70
Content-Length: 0
0000 00 03 31 e4 2c 00 00 11 d8 27 91 42 08 00 45 00 ..1.,... .'.B..E.
0010 01 c8 cc 3d 00 00 80 11 aa 13 a3 16 10 2f 8c 71 ...=.... ...../.q
0020 83 1d 13 c4 13 c4 01 b4 13 7e 41 43 4b 20 73 69 ....~ACK si
0030 70 3a 32 32 32 30 30 40 31 36 33 2e 32 32 2e 31 p:22200@ 163.22.1
0040 36 2e 33 32 3a 35 30 36 30 20 53 49 50 2f 32 2e 6.32:506 0 SIP/2.
0050 30 0d 0a 56 69 61 3a 20 53 49 50 2f 32 2e 30 2f 0..Via: SIP/2.0/
File: "C:\DOCUME~1\SMART... P: 23 D: 23 M: 0 Drops: 0

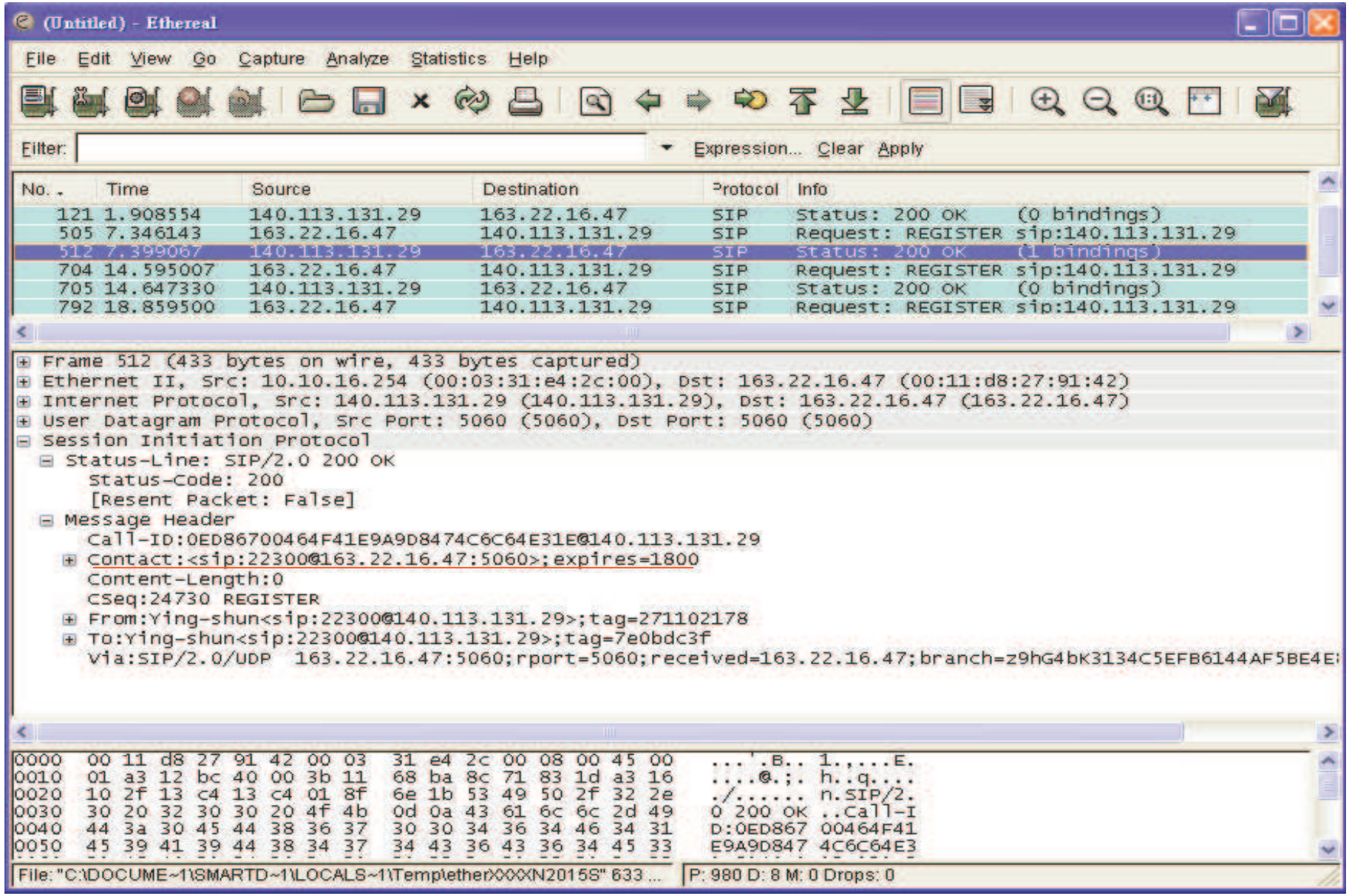

Ethereal: VoIP Calls
Detected 3 VoIP Calls. Selected 2 Calls.
Start Time. Stop Time nitial Speaker From To Protocol Packets State Comments
9.47 9.51 163.22.16.47 sip:22300@140.113.13 sip:22400@140.113.13 SIP 4 REJECTEI
18.78 166.67 163.22.16.47 sip:22300@140.113.13 sip:22200@140.113.13 SIP 7 COMPLETI
188.57 213.82 163.22.16.47 sip:22300@140.113.13 sip:22400@140.113.13 SIP 7 COMPLETI


Graph Analysis
Time 163.22.16.47 140.113.131.29 163.22.16.32 Comment
18.783 INVITE SDP (g711U g711A GSM iLBC telephone-ev... SIP From: sip:22300@140.113.131.29 To:sip:22
18.792 100 Trying SIP Status
18.824 180 Ringing SIP Status
20.519 200 Ok SDP (g711U g711A GSM iLBC speex teleph... SIP Status
20.526 ACK SIP Request
20.534 RTP (g711U) RTP Num packets:2617 Duration:146.104s ssr
20.535 RTP (g711U) RTP Num packets:2053 Duration:127.827s ssr
140.385 RTP (CN) RTP Num packets:2 Duration:23.039s ssrc:0
166.617 BYE SIP Request
166.676 200 Ok SIP Status
188.572 INVITE SDP (g711U g711A GSM iLBC telephone-ev... SIP From: sip:22300@140.113.131.29 To:sip:22
188.586 100 Trying SIP Status
188.666 180 Ringing SIP Status
202.879 200 Ok SDP (g711U g711A GSM iLBC speex teleph... SIP Status
202.879 RTP (g711U) RTP Num packets:220 Duration:7.319s ssrc:8
202.886 ACK SIP Request
202.900 RTP (g711U) RTP Num packets:280 Duration:7.874s ssrc:1
213.825 BYE SIP Request
Save As
Close

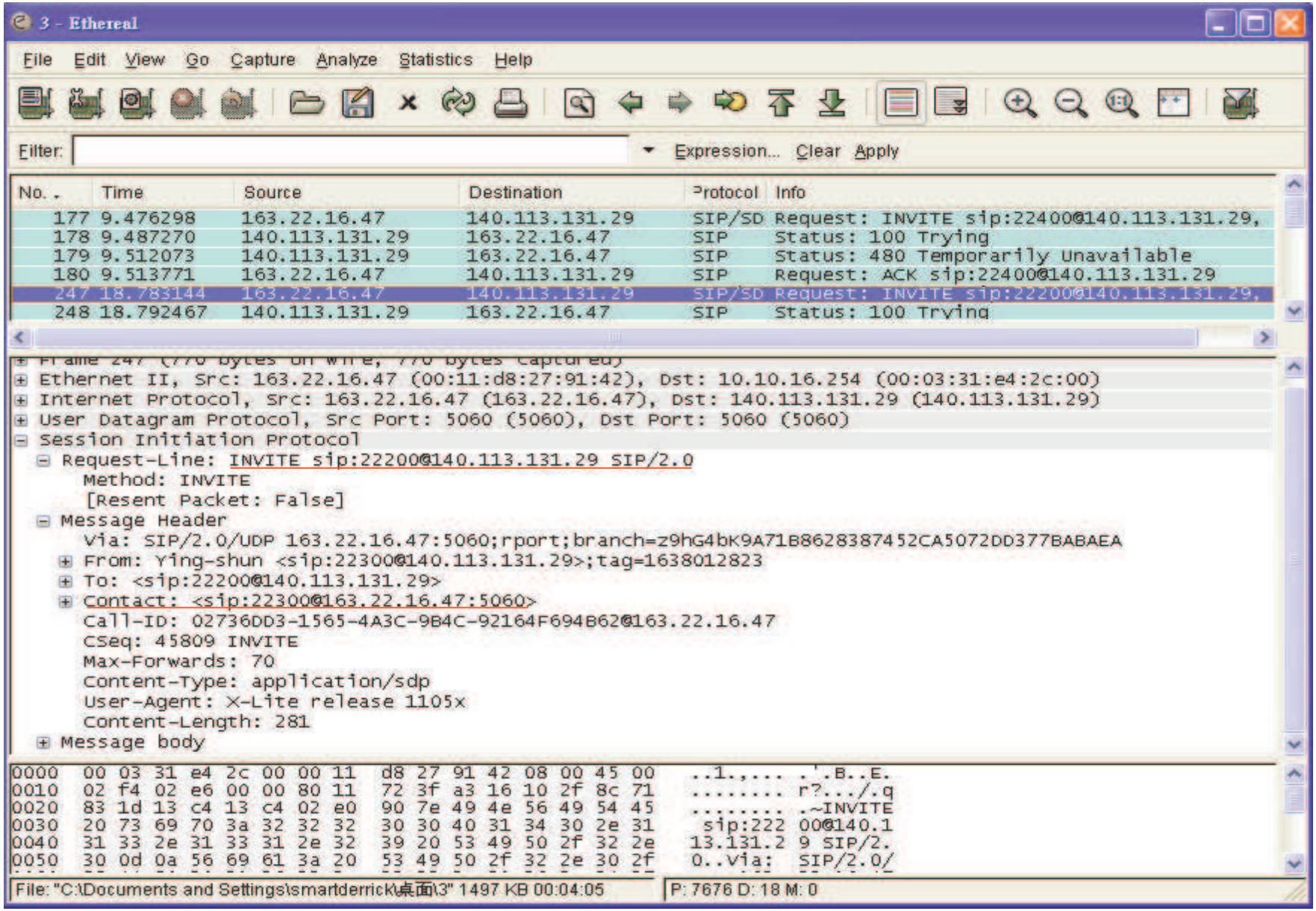
REGISTER


(Untitled) - Ethereal
File Edit View Go Capture Analyze Statistics Help
Filter: Expression... Clear Apply
No. Time Source Destination Protocol Info
121 1.908554 140.113.131.29 163.22.16.47 SIP Status: 200 OK (0 bindings)
505 7.346143 163.22.16.47 140.113.131.29 SIP Request: REGISTER sip:140.113.131.29
512 7.399067 140.113.131.29 163.22.16.47 SIP Status: 200 OK (1 bindings)
704 14.595007 163.22.16.47 140.113.131.29 SIP Request: REGISTER sip:140.113.131.29
705 14.647330 140.113.131.29 163.22.16.47 SIP Status: 200 OK (0 bindings)
792 18.859500 163.22.16.47 140.113.131.29 SIP Request: REGISTER sip:140.113.131.29
Frame 505 (488 bytes on wire, 488 bytes captured)
Ethernet II, Src: 163.22.16.47 (00:11:d8:27:91:42), Dst: 10.10.16.254 (00:03:31:e4:2c:00)
Internet Protocol, Src: 163.22.16.47 (163.22.16.47), Dst: 140.113.131.29 (140.113.131.29)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
Session Initiation Protocol
Request-Line: REGISTER sip:140.113.131.29 SIP/2.0
Method: REGISTER
[Resent Packet: False]
Message Header
Via: SIP/2.0/UDP 163.22.16.47:5060;rport;branch=z9hG4bK3134C5EFB6144AF5BE4E8F732B91E6CE
From: Ying-shun <sip:22300@140.113.131.29>;tag=271102178
To: Ying-shun <sip:22300@140.113.131.29>
Contact: "Ying-shun" <sip:22300@163.22.16.47:5060>
Call-ID: 0ED86700464F41E9A9D8474C6C64E31E@140.113.131.29
CSeq: 24730 REGISTER
Expires: 1800
Max-Forwards: 70
User-Agent: X-Lite release 1105x
Content-Length: 0
0040 33 31 2e 32 39 20 53 49 50 2f 32 2e 30 0d 0a 56 31.29 SI P/2.0..V
0050 69 61 3a 20 53 49 50 2f 32 2e 30 2f 55 44 50 20 ia: SIP/ 2.0/UDP
0060 31 36 33 2e 32 32 2e 31 36 2e 34 37 3a 35 30 36 163.22.1 6.47:506
0070 30 3b 72 70 6f 72 74 3b 62 72 61 6e 63 68 3d 7a 0;rport; branch=z
0080 39 68 47 34 62 4b 33 31 33 34 43 35 45 46 42 36 9hG4bK31 34C5EFB6
0090 31 34 34 41 46 35 42 45 34 45 38 46 37 33 32 42 144AF5BE 4E8F732B
Message Header in SIP message (sip.msg_hdr), 409 bytes
P: 980 D: 8 M: 0 Drops: 0

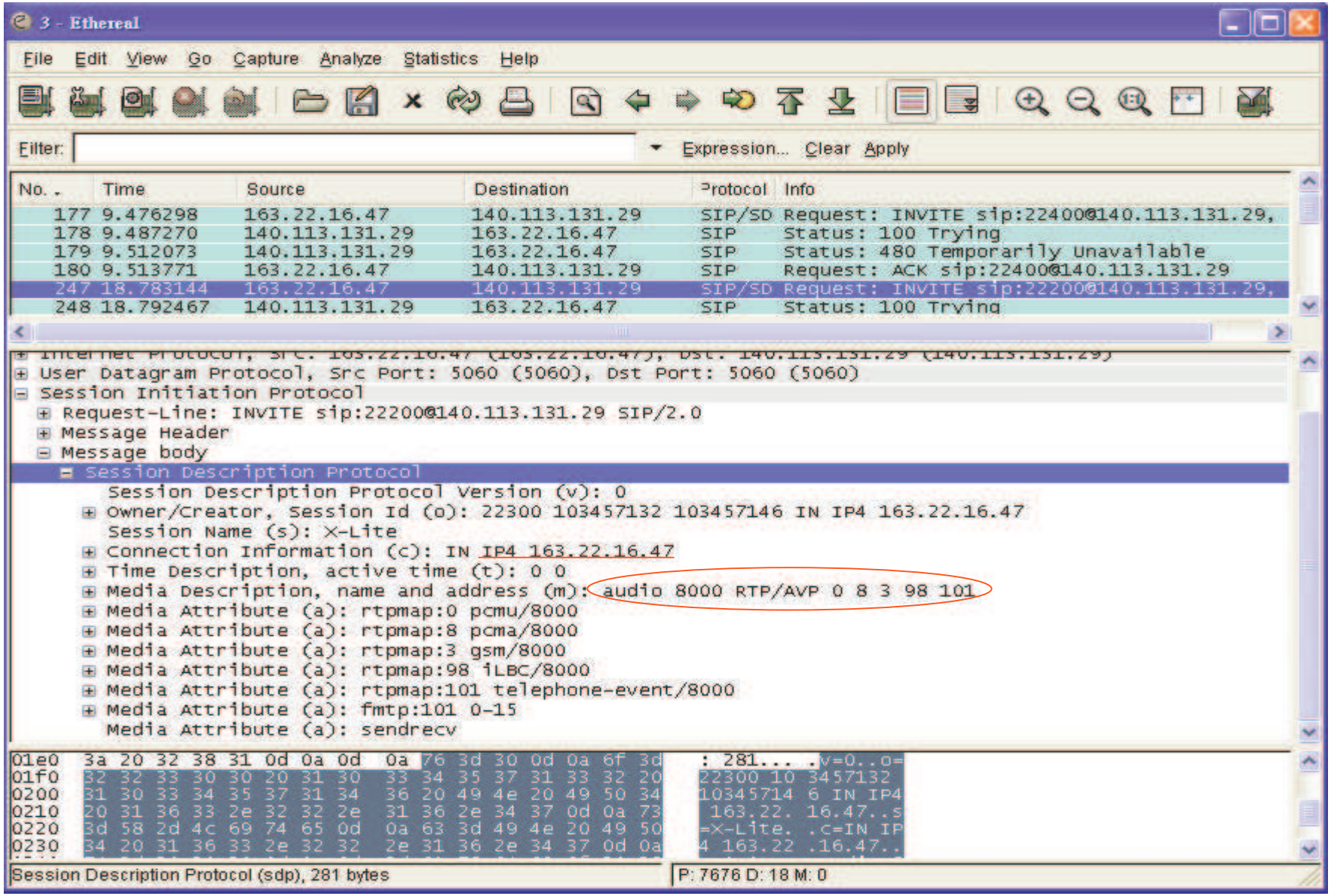
200 OK


(Untitled) - Ethereal
File Edit View Go Capture Analyze Statistics Help
Filter: Expression... Clear Apply
No. Time Source Destination Protocol Info
121 1.908554 140.113.131.29 163.22.16.47 SIP Status: 200 OK (0 bindings)
505 7.346143 163.22.16.47 140.113.131.29 SIP Request: REGISTER sip:140.113.131.29
512 7.399067 140.113.131.29 163.22.16.47 SIP Status: 200 OK (1 bindings)
704 14.595007 163.22.16.47 140.113.131.29 SIP Request: REGISTER sip:140.113.131.29
705 14.647330 140.113.131.29 163.22.16.47 SIP Status: 200 OK (0 bindings)
792 18.859500 163.22.16.47 140.113.131.29 SIP Request: REGISTER sip:140.113.131.29
Frame 512 (433 bytes on wire, 433 bytes captured)
Ethernet II, Src: 10.10.16.254 (00:03:31:e4:2c:00), Dst: 163.22.16.47 (00:11:d8:27:91:42)
Internet Protocol, Src: 140.113.131.29 (140.113.131.29), Dst: 163.22.16.47 (163.22.16.47)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
Session Initiation Protocol
Status-Line: SIP/2.0 200 OK
Status-Code: 200
[Resent Packet: False]
Message Header
Call-ID:0ED86700464F41E9A9D8474C6C64E31E@140.113.131.29
Contact:<sip:22300@163.22.16.47:5060>;expires=1800
Content-Length:0
CSeq:24730 REGISTER
From:Ying-shun<sip:22300@140.113.131.29>;tag=271102178
To:Ying-shun<sip:22300@140.113.131.29>;tag=7e0bdc3f
Via:SIP/2.0/UDP 163.22.16.47:5060;rport=5060;received=163.22.16.47;branch=z9hG4bK3134C5EFB6144AF5BE4E
0000 00 11 d8 27 91 42 00 03 31 e4 2c 00 08 00 45 00 ...'.B.. 1.,...E.
0010 01 a3 12 bc 40 00 3b 11 68 ba 8c 71 83 1d a3 16 ....@.;. h..q....
0020 10 2f 13 c4 13 c4 01 8f 6e 1b 53 49 50 2f 32 2e ./...... n.SIP/2.
0030 30 20 32 30 30 20 4f 4b 0d 0a 43 61 6c 6c 2d 49 0 200 OK ..Call-I
0040 44 3a 30 45 44 38 36 37 30 30 34 36 34 46 34 31 D:0ED867 00464F41
0050 45 39 41 39 44 38 34 37 34 43 36 43 36 34 45 33 E9A9D847 4C6C64E3
File: "C:\DOCUME~1\SMARTD~1\LOCALS~1\Temp\ether0000N2015S" 633 ...
P: 980 D: 8 M: 0 Drops: 0

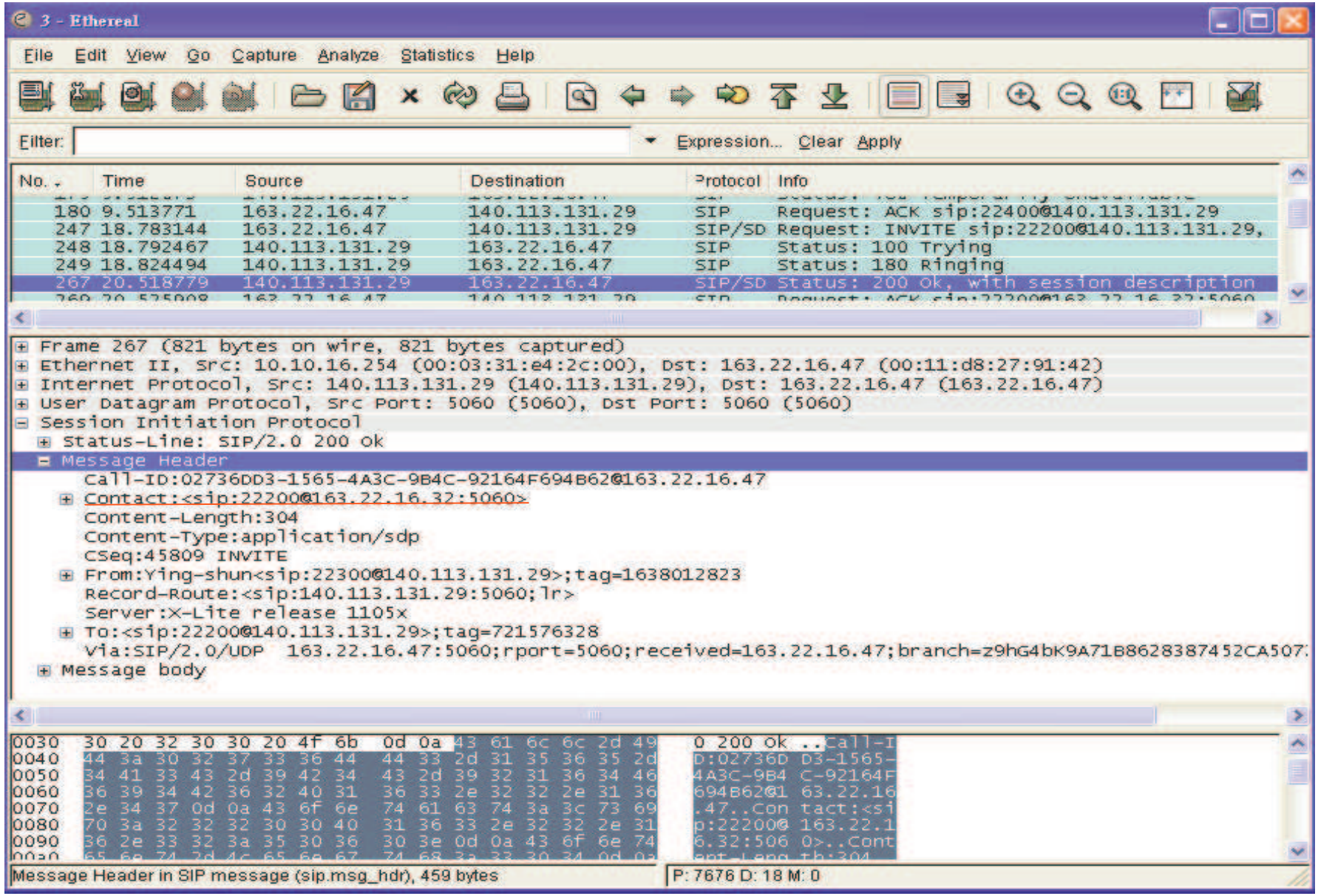
INVITE


3 - Ethereal
File Edit View Go Capture Analyze Statistics Help
Filter: Expression... Clear Apply
No. Time Source Destination Protocol Info
177 9.476298 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22400@140.113.131.29,
178 9.487270 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
179 9.512073 140.113.131.29 163.22.16.47 SIP Status: 480 Temporarily Unavailable
180 9.513771 163.22.16.47 140.113.131.29 SIP Request: ACK sip:22400@140.113.131.29
247 18.783144 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22200@140.113.131.29,
248 18.792467 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
Ethernet II, Src: 163.22.16.47 (00:11:d8:27:91:42), Dst: 10.10.16.254 (00:03:31:e4:2c:00)
Internet Protocol, Src: 163.22.16.47 (163.22.16.47), Dst: 140.113.131.29 (140.113.131.29)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
Session Initiation Protocol
Request-Line: INVITE sip:22200@140.113.131.29 SIP/2.0
Method: INVITE
[Resent Packet: False]
Message Header
Via: SIP/2.0/UDP 163.22.16.47:5060;rport;branch=z9hG4bK9A71B8628387452CA5072DD377BABAEA
From: Ying-shun <sip:22300@140.113.131.29>;tag=1638012823
To: <sip:22200@140.113.131.29>
Contact: <sip:22300@163.22.16.47:5060>
Call-ID: 02736DD3-1565-4A3C-9B4C-92164F694B62@163.22.16.47
CSeq: 45809 INVITE
Max-Forwards: 70
Content-Type: application/sdp
User-Agent: X-Lite release 1105x
Content-Length: 281
Message body
0000 00 03 31 e4 2c 00 00 11 d8 27 91 42 08 00 45 00
0010 02 f4 02 e6 00 00 80 11 72 3f a3 16 10 2f 8c 71
0020 83 1d 13 c4 13 c4 02 e0 90 7e 49 4e 56 49 54 45
0030 20 73 69 70 3a 32 32 32 30 30 40 31 34 30 2e 31
0040 31 33 2e 31 33 31 2e 32 39 20 53 49 50 2f 32 2e
0050 30 0d 0a 56 69 61 3a 20 53 49 50 2f 32 2e 30 2f
File: "C:\Documents and Settings\smartderrick\桌面\3" 1497 KB 00:04:05
P: 7676 D: 18 M: 0

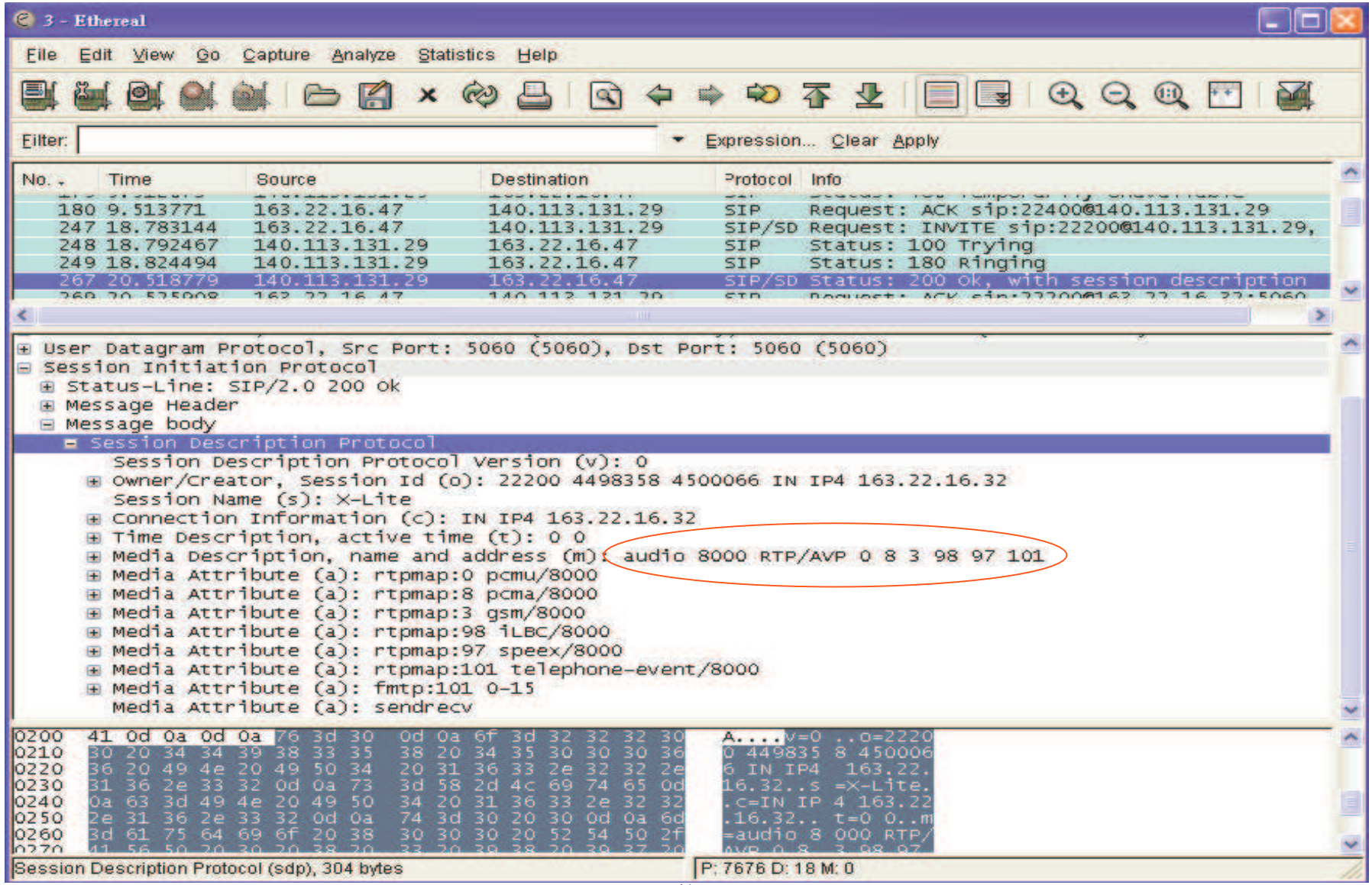
SDP in INVITE



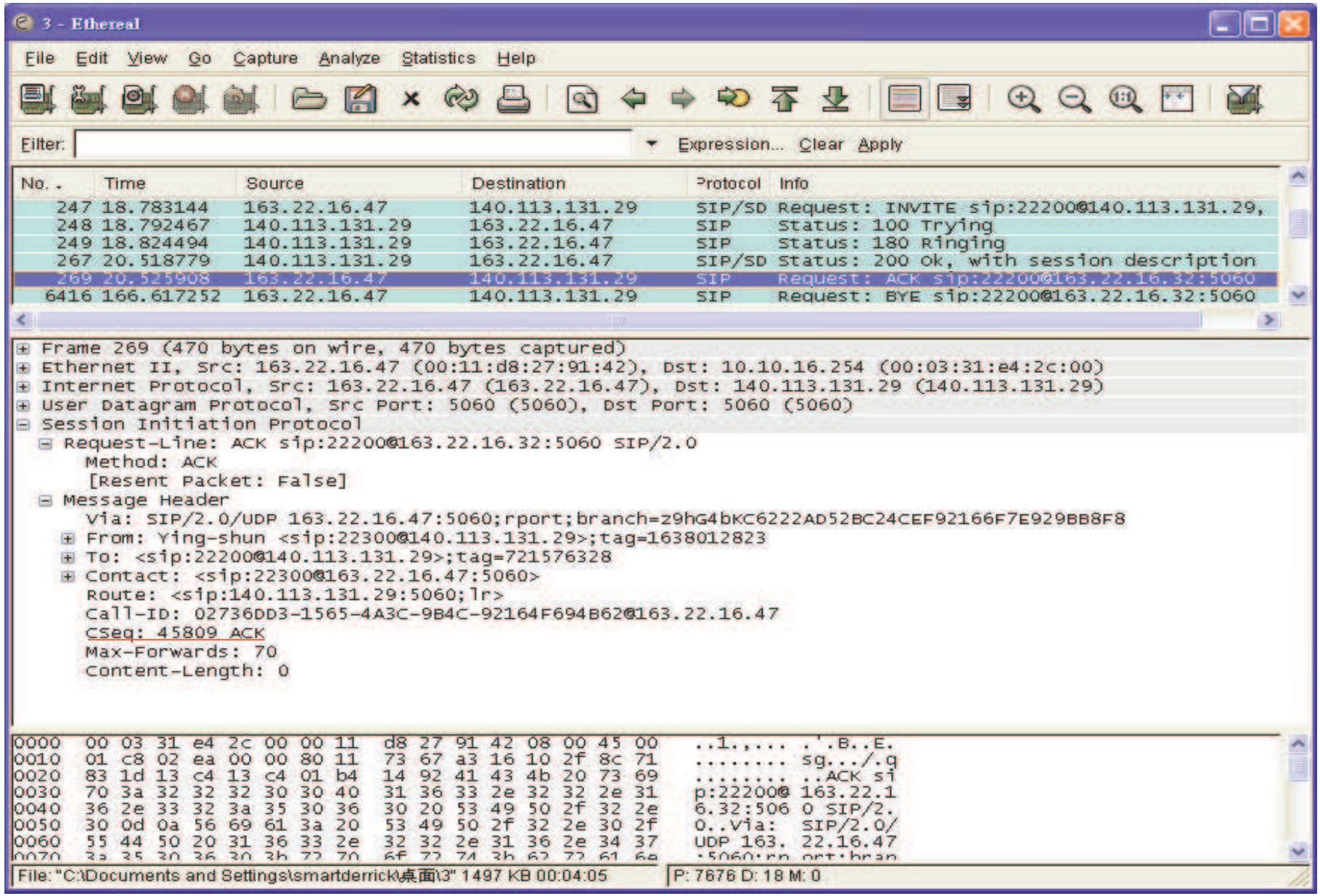
200 OK


3 - Ethereal
File Edit View Go Capture Analyze Statistics Help
Filter: Expression... Clear Apply
No. Time Source Destination Protocol Info
180 9.513771 163.22.16.47 140.113.131.29 SIP Request: ACK sip:22400@140.113.131.29
247 18.783144 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22200@140.113.131.29,
248 18.792467 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
249 18.824494 140.113.131.29 163.22.16.47 SIP Status: 180 Ringing
267 20.518779 140.113.131.29 163.22.16.47 SIP/SD Status: 200 ok, with session description
Frame 267 (821 bytes on wire, 821 bytes captured)
Ethernet II, Src: 10.10.16.254 (00:03:31:e4:2c:00), Dst: 163.22.16.47 (00:11:d8:27:91:42)
Internet Protocol, Src: 140.113.131.29 (140.113.131.29), Dst: 163.22.16.47 (163.22.16.47)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
Session Initiation Protocol
Status-Line: SIP/2.0 200 ok
Message Header
Call-ID:02736DD3-1565-4A3C-9B4C-92164F694B62@163.22.16.47
Contact:<sip:22200@163.22.16.32:5060>
Content-Length:304
Content-Type:application/sdp
CSeq:45809 INVITE
From:Ying-shun<sip:22300@140.113.131.29>;tag=1638012823
Record-Route:<sip:140.113.131.29:5060;lr>
Server:X-Lite release 1105x
To:<sip:22200@140.113.131.29>;tag=721576328
Via:SIP/2.0/UDP 163.22.16.47:5060;rport=5060;received=163.22.16.47;branch=z9hG4bK9A71B8628387452CA507
Message body
0030 30 20 32 30 30 20 4f 6b 0d 0a 43 61 6c 6c 2d 49 0 200 ok ..Call-I
0040 44 3a 30 32 37 33 36 44 44 33 2d 31 35 36 35 2d D:02736D D3-1565-
0050 34 41 33 43 2d 39 42 34 43 2d 39 32 31 36 34 46 4A3C-9B4 C-92164F
0060 36 39 34 42 36 32 40 31 36 33 2e 32 32 2e 31 36 694B62@1 63.22.16
0070 2e 34 37 0d 0a 43 6f 6e 74 61 63 74 3a 3c 73 69 .47..Con tact:<si
0080 70 3a 32 32 32 30 30 40 31 36 33 2e 32 32 2e 31 p:22200@ 163.22.1
0090 36 2e 33 32 3a 35 30 36 30 3e 0d 0a 43 6f 6e 74 6.32:506 0>..Cont
Message Header in SIP message (sip.msg_hdr), 459 bytes
P: 7676 D: 18 M: 0

SDP in 200 OK

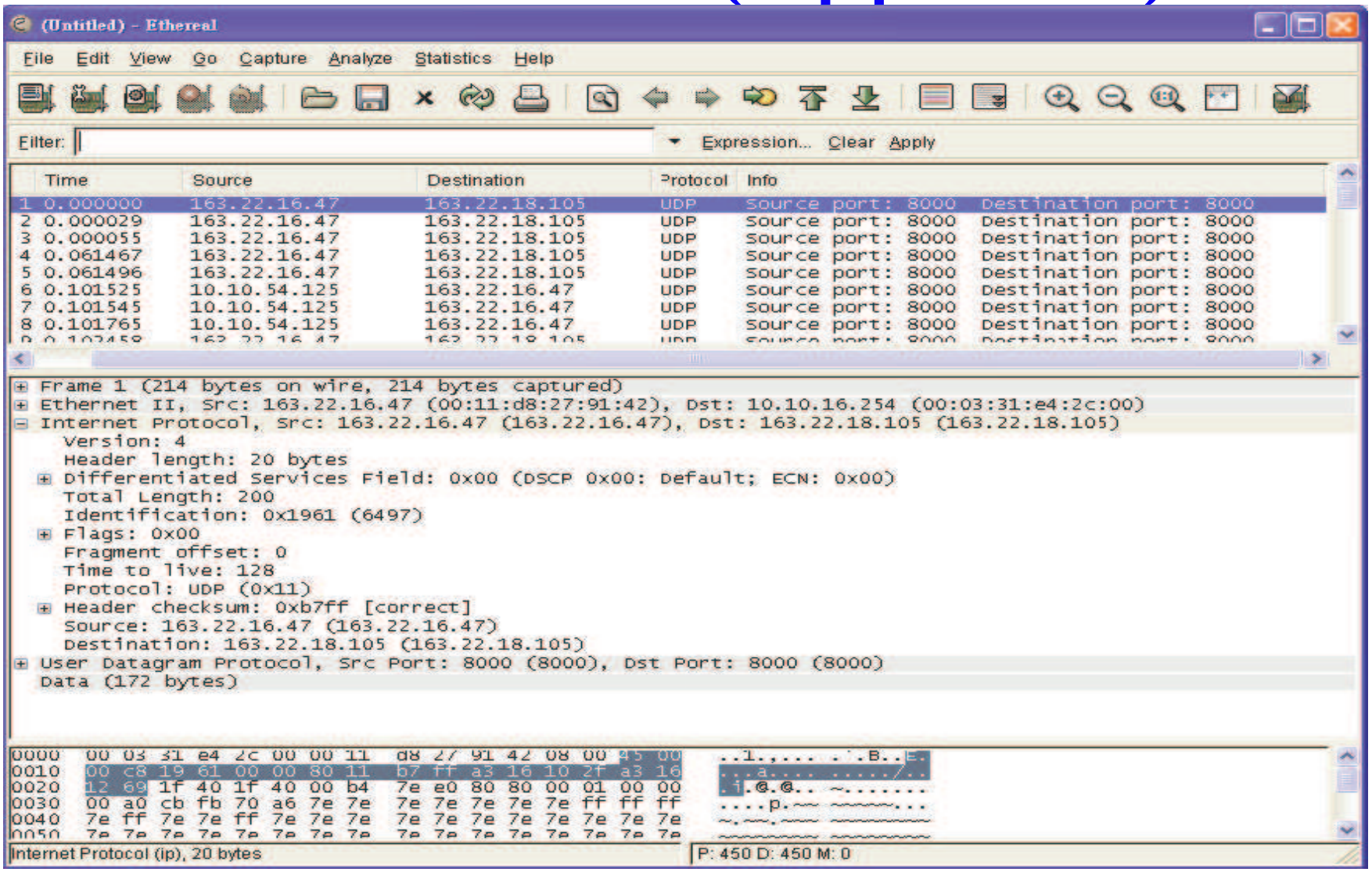

3 - Ethereal
File Edit View Go Capture Analyze Statistics Help
Filter: Expression... Clear Apply
No. Time Source Destination Protocol Info
180 9.513771 163.22.16.47 140.113.131.29 SIP Request: ACK sip:22400@140.113.131.29
247 18.783144 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22200@140.113.131.29,
248 18.792467 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
249 18.824494 140.113.131.29 163.22.16.47 SIP Status: 180 Ringing
267 20.518779 140.113.131.29 163.22.16.47 SIP/SD Status: 200 Ok, with session description
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
Session Initiation Protocol
Status-Line: SIP/2.0 200 Ok
Message Header
Message body
Session Description Protocol
Session Description Protocol Version (v): 0
Owner/Creator, Session Id (o): 22200 4498358 4500066 IN IP4 163.22.16.32
Session Name (s): X-Lite
Connection Information (c): IN IP4 163.22.16.32
Time Description, active time (t): 0 0
Media Description, name and address (m): audio 8000 RTP/AVP 0 8 3 98 97 101
Media Attribute (a): rtpmap:0 pcmu/8000
Media Attribute (a): rtpmap:8 pcma/8000
Media Attribute (a): rtpmap:3 gsm/8000
Media Attribute (a): rtpmap:98 iLBC/8000
Media Attribute (a): rtpmap:97 speex/8000
Media Attribute (a): rtpmap:101 telephone-event/8000
Media Attribute (a): fmtp:101 0-15
Media Attribute (a): sendrecv
0200 41 0d 0a 0d 0a 76 3d 30 0d 0a 6f 3d 32 32 32 30
0210 30 20 34 34 39 38 33 35 38 20 34 35 30 30 30 36
0220 36 20 49 4e 20 49 50 34 20 31 36 33 2e 32 32 2e
0230 31 36 2e 33 32 0d 0a 73 3d 58 2d 4c 69 74 65 0d
0240 0a 63 3d 49 4e 20 49 50 34 20 31 36 33 2e 32 32
0250 2e 31 36 2e 33 32 0d 0a 74 3d 30 20 30 0d 0a 6d
0260 3d 61 75 64 69 6f 20 38 30 30 30 20 52 54 50 2f
A....v=0 ..o=2220
0 449835 8 450006
6 IN IP4 163.22.
16.32..s =X-Lite.
.c=IN IP 4 163.22
.16.32.. t=0 0..m
=audio 8 000 RTP/
Session Description Protocol (sdp), 304 bytes
P: 7676 D: 18 M: 0

ACK


3 - Ethereal
File Edit View Go Capture Analyze Statistics Help
Filter: Expression... Clear Apply
No. Time Source Destination Protocol Info
247 18.783144 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22200@140.113.131.29,
248 18.792467 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
249 18.824494 140.113.131.29 163.22.16.47 SIP Status: 180 Ringing
267 20.518779 140.113.131.29 163.22.16.47 SIP/SD Status: 200 ok, with session description
269 20.525908 163.22.16.47 140.113.131.29 SIP Request: ACK sip:22200@163.22.16.32:5060
6416 166.617252 163.22.16.47 140.113.131.29 SIP Request: BYE sip:22200@163.22.16.32:5060
Frame 269 (470 bytes on wire, 470 bytes captured)
Ethernet II, Src: 163.22.16.47 (00:11:d8:27:91:42), Dst: 10.10.16.254 (00:03:31:e4:2c:00)
Internet Protocol, Src: 163.22.16.47 (163.22.16.47), Dst: 140.113.131.29 (140.113.131.29)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
Session Initiation Protocol
Request-Line: ACK sip:22200@163.22.16.32:5060 SIP/2.0
Method: ACK
[Resent Packet: False]
Message Header
Via: SIP/2.0/UDP 163.22.16.47:5060;rport;branch=z9hG4bKC6222AD52BC24CEF92166F7E929BB8F8
From: Ying-shun <sip:22300@140.113.131.29>;tag=1638012823
To: <sip:22200@140.113.131.29>;tag=721576328
Contact: <sip:22300@163.22.16.47:5060>
Route: <sip:140.113.131.29:5060;lr>
Call-ID: 02736DD3-1565-4A3C-9B4C-92164F694B62@163.22.16.47
CSeq: 45809 ACK
Max-Forwards: 70
Content-Length: 0
0000 00 03 31 e4 2c 00 00 11 d8 27 91 42 08 00 45 00 ..1.,... .'.B..E.
0010 01 c8 02 ea 00 00 80 11 73 67 a3 16 10 2f 8c 71 .... sg.../.q
0020 83 1d 13 c4 13 c4 01 b4 14 92 41 43 4b 20 73 69 ....ACK si
0030 70 3a 32 32 32 30 30 40 31 36 33 2e 32 32 2e 31 p:22200@ 163.22.1
0040 36 2e 33 32 3a 35 30 36 30 20 53 49 50 2f 32 2e 6.32:506 0 SIP/2.
0050 30 0d 0a 56 69 61 3a 20 53 49 50 2f 32 2e 30 2f 0..Via: SIP/2.0/
0060 55 44 50 20 31 36 33 2e 32 32 2e 31 36 2e 34 37 UDP 163. 22.16.47
File: "C:\Documents and Settings\smartderrick\桌面\3" 1497 KB 00:04:05
P: 7676 D: 18 M: 0

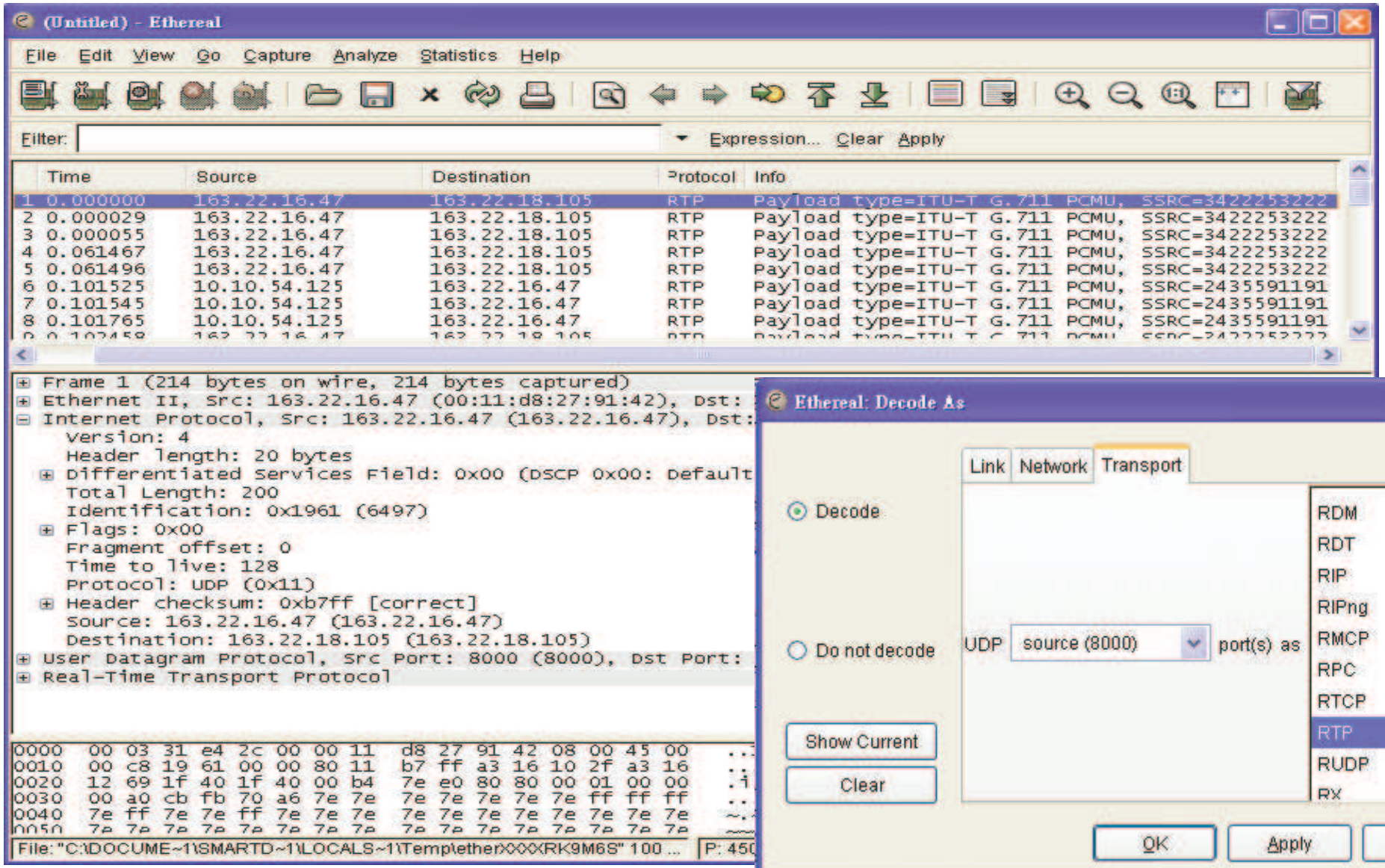
Capturing the packets of Media Data

RTP Traffic (udp port 8000)

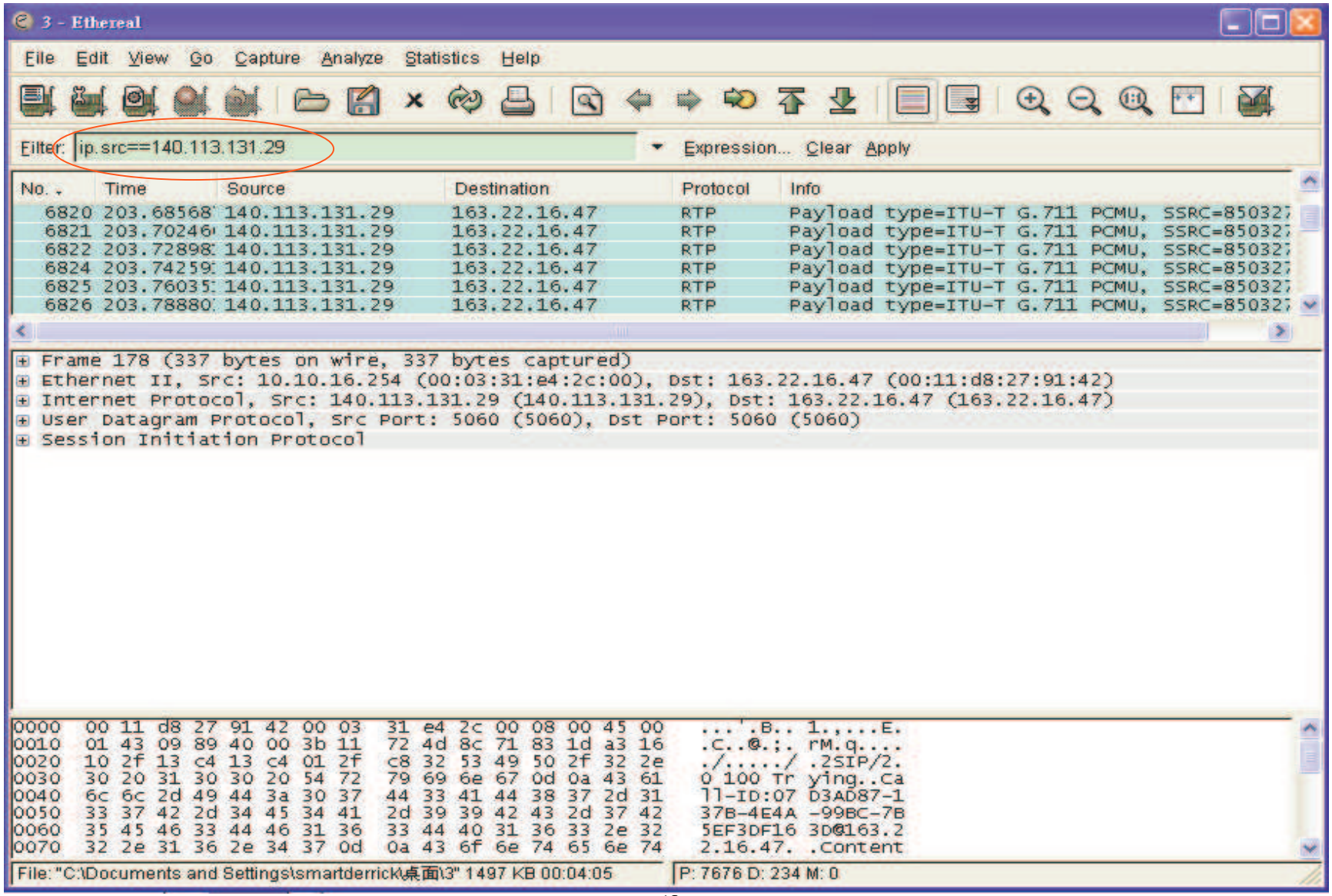


- What's wrong?

Tools – Decode As RTP

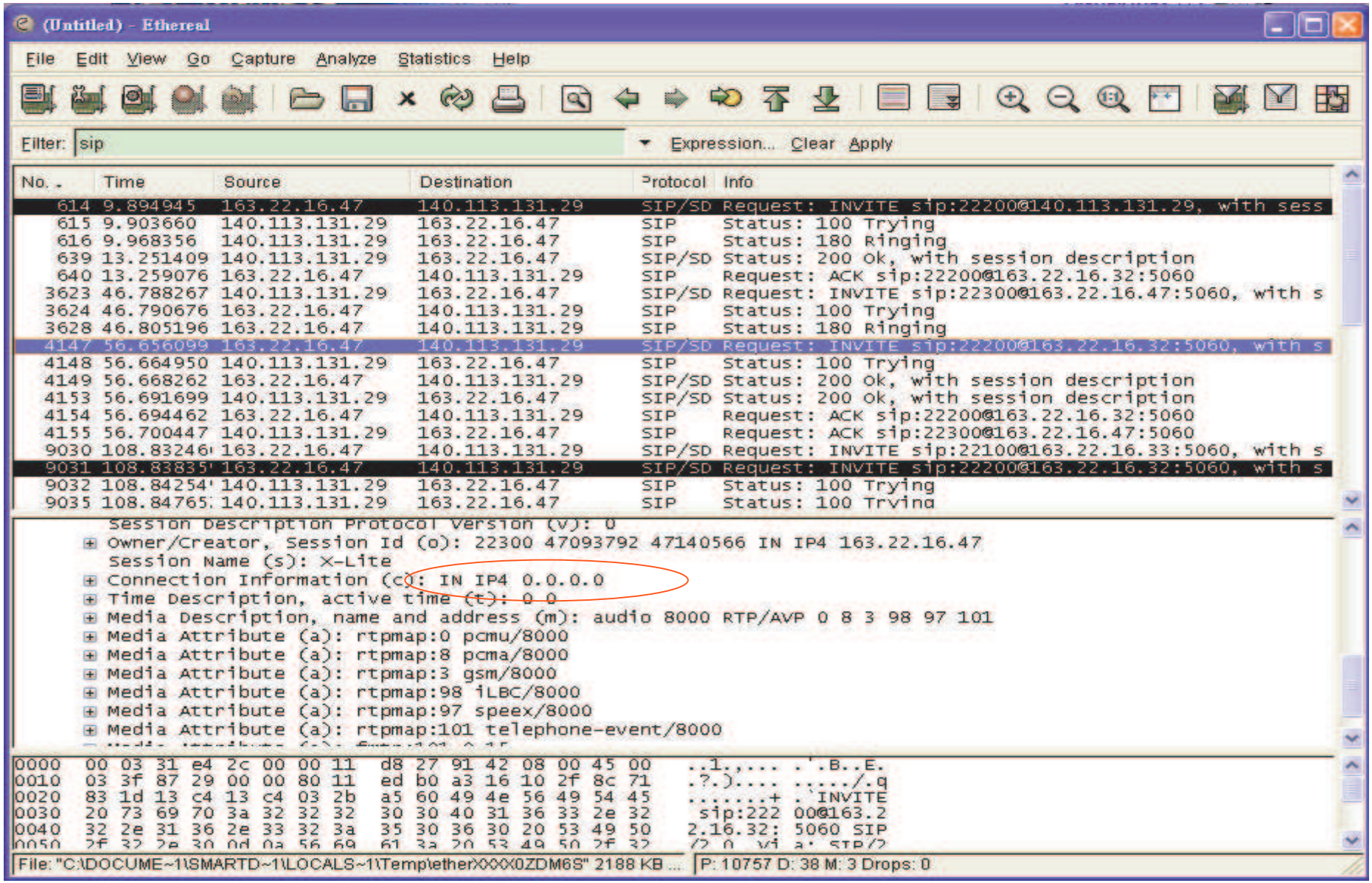


Display Filter

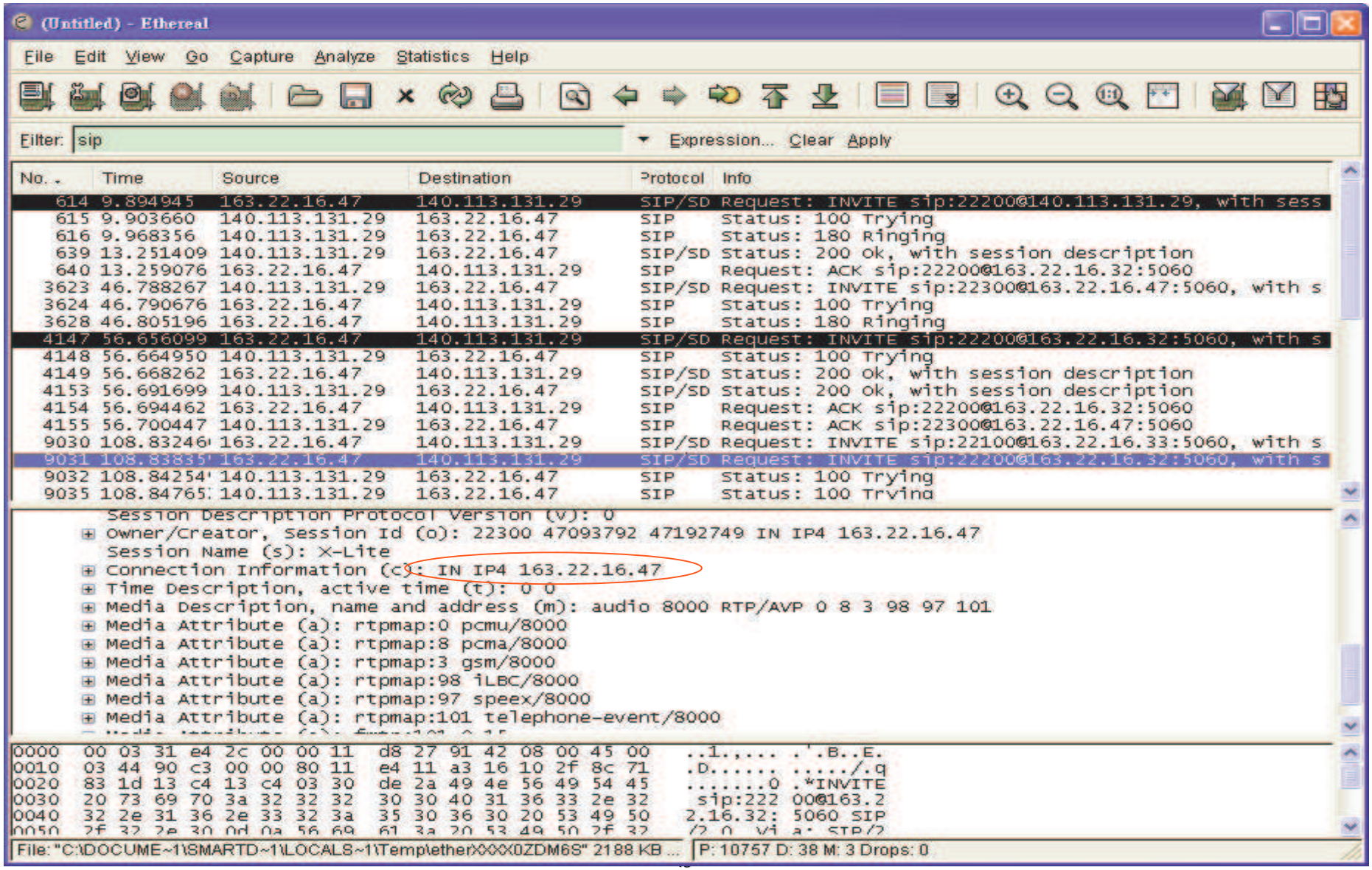


Hold/Unhold of X-Lite

Hold


(Untitled) - Ethereal
File Edit View Go Capture Analyze Statistics Help
Filter: sip
Expression... Clear Apply
No. Time Source Destination Protocol Info
614 9.894945 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22200@140.113.131.29, with sess
615 9.903660 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
616 9.968356 140.113.131.29 163.22.16.47 SIP Status: 180 Ringing
639 13.251409 140.113.131.29 163.22.16.47 SIP/SD Status: 200 Ok, with session description
640 13.259076 163.22.16.47 140.113.131.29 SIP Request: ACK sip:22200@163.22.16.32:5060
3623 46.788267 140.113.131.29 163.22.16.47 SIP/SD Request: INVITE sip:22300@163.22.16.47:5060, with s
3624 46.790676 163.22.16.47 140.113.131.29 SIP Status: 100 Trying
3628 46.805196 163.22.16.47 140.113.131.29 SIP Status: 180 Ringing
4147 56.656099 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22200@163.22.16.32:5060, with s
4148 56.664950 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
4149 56.668262 163.22.16.47 140.113.131.29 SIP/SD Status: 200 Ok, with session description
4153 56.691699 140.113.131.29 163.22.16.47 SIP/SD Status: 200 Ok, with session description
4154 56.694462 163.22.16.47 140.113.131.29 SIP Request: ACK sip:22200@163.22.16.32:5060
4155 56.700447 140.113.131.29 163.22.16.47 SIP Request: ACK sip:22300@163.22.16.47:5060
9030 108.83246 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22100@163.22.16.33:5060, with s
9031 108.83835 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22200@163.22.16.32:5060, with s
9032 108.84254 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
9035 108.84765 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
Session Description Protocol Version (v): 0
Owner/Creator, Session Id (o): 22300 47093792 47140566 IN IP4 163.22.16.47
Session Name (s): X-Lite
Connection Information (c): IN IP4 0.0.0.0
Time Description, active time (t): 0 0
Media Description, name and address (m): audio 8000 RTP/AVP 0 8 3 98 97 101
Media Attribute (a): rtpmap:0 pcmu/8000
Media Attribute (a): rtpmap:8 pcma/8000
Media Attribute (a): rtpmap:3 gsm/8000
Media Attribute (a): rtpmap:98 iLBC/8000
Media Attribute (a): rtpmap:97 speex/8000
Media Attribute (a): rtpmap:101 telephone-event/8000
0000 00 03 31 e4 2c 00 00 11 d8 27 91 42 08 00 45 00 ..1.,... .'.B..E.
0010 03 3f 87 29 00 00 80 11 ed b0 a3 16 10 2f 8c 71 .?.)..... ...../.q
0020 83 1d 13 c4 13 c4 03 2b a5 60 49 4e 56 49 54 45 ....+ .`INVITE
0030 20 73 69 70 3a 32 32 32 30 30 40 31 36 33 2e 32 sip:222 00@163.2
0040 32 2e 31 36 2e 33 32 3a 35 30 36 30 20 53 49 50 2.16.32: 5060 SIP
File: "C:\DOCUME~1\SMARTD~1\LOCALS~1\Temp\ether\XXX\0ZDM6S" 2188 KB ...
P: 10757 D: 38 M: 3 Drops: 0

Retrieve


(Untitled) - Ethereal
File Edit View Go Capture Analyze Statistics Help
Filter: sip
Expression... Clear Apply
No. Time Source Destination Protocol Info
614 9.894945 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22200@140.113.131.29, with sess
615 9.903660 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
616 9.968356 140.113.131.29 163.22.16.47 SIP Status: 180 Ringing
639 13.251409 140.113.131.29 163.22.16.47 SIP/SD Status: 200 ok, with session description
640 13.259076 163.22.16.47 140.113.131.29 SIP Request: ACK sip:22200@163.22.16.32:5060
3623 46.788267 140.113.131.29 163.22.16.47 SIP/SD Request: INVITE sip:22300@163.22.16.47:5060, with s
3624 46.790676 163.22.16.47 140.113.131.29 SIP Status: 100 Trying
3628 46.805196 163.22.16.47 140.113.131.29 SIP Status: 180 Ringing
4147 56.656099 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22200@163.22.16.32:5060, with s
4148 56.664950 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
4149 56.668262 163.22.16.47 140.113.131.29 SIP/SD Status: 200 ok, with session description
4153 56.691699 140.113.131.29 163.22.16.47 SIP/SD Status: 200 ok, with session description
4154 56.694462 163.22.16.47 140.113.131.29 SIP Request: ACK sip:22200@163.22.16.32:5060
4155 56.700447 140.113.131.29 163.22.16.47 SIP Request: ACK sip:22300@163.22.16.47:5060
9030 108.83246 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22100@163.22.16.33:5060, with s
9031 108.83835 163.22.16.47 140.113.131.29 SIP/SD Request: INVITE sip:22200@163.22.16.32:5060, with s
9032 108.84254 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
9035 108.84765 140.113.131.29 163.22.16.47 SIP Status: 100 Trying
Session Description Protocol Version (v): 0
Owner/Creator, Session Id (o): 22300 47093792 47192749 IN IP4 163.22.16.47
Session Name (s): X-Lite
Connection Information (c): IN IP4 163.22.16.47
Time Description, active time (t): 0 0
Media Description, name and address (m): audio 8000 RTP/AVP 0 8 3 98 97 101
Media Attribute (a): rtpmap:0 pcmu/8000
Media Attribute (a): rtpmap:8 pcma/8000
Media Attribute (a): rtpmap:3 gsm/8000
Media Attribute (a): rtpmap:98 iLBC/8000
Media Attribute (a): rtpmap:97 speex/8000
Media Attribute (a): rtpmap:101 telephone-event/8000
0000 00 03 31 e4 2c 00 00 11 d8 27 91 42 08 00 45 00 ..1.,.... .'.B..E.
0010 03 44 90 c3 00 00 80 11 e4 11 a3 16 10 2f 8c 71 .D..... ...../.q
0020 83 1d 13 c4 13 c4 03 30 de 2a 49 4e 56 49 54 45 ....0 .*INVITE
0030 20 73 69 70 3a 32 32 32 30 30 40 31 36 33 2e 32 sip:222 00@163.2
0040 32 2e 31 36 2e 33 32 3a 35 30 36 30 20 53 49 50 2.16.32: 5060 SIP
File: "C:\DOCUME~1\SMARTD~1\LOCALS~1\Temp\etherXXXX0ZDM6S" 2188 KB ...
P: 10757 D: 38 M: 3 Drops: 0

Summary

- We demonstrate the functions of Windows Messenger and X-Lite, which are two SIP User Agents with friendly user interface.
- We demonstrate the functions of Ethereal, which is a powerful tool for packets capturing & analyzing:
  - Capture Filters
  - Colorized Packets
- Practice using this tool to capture SIP signaling in the following call flows
  - REGISTER – 200 OK
  - INVITE – 200 OK - ACK
  - BYE – 200 OK
  - Hold/Retrieve

NTP VoIP Platform