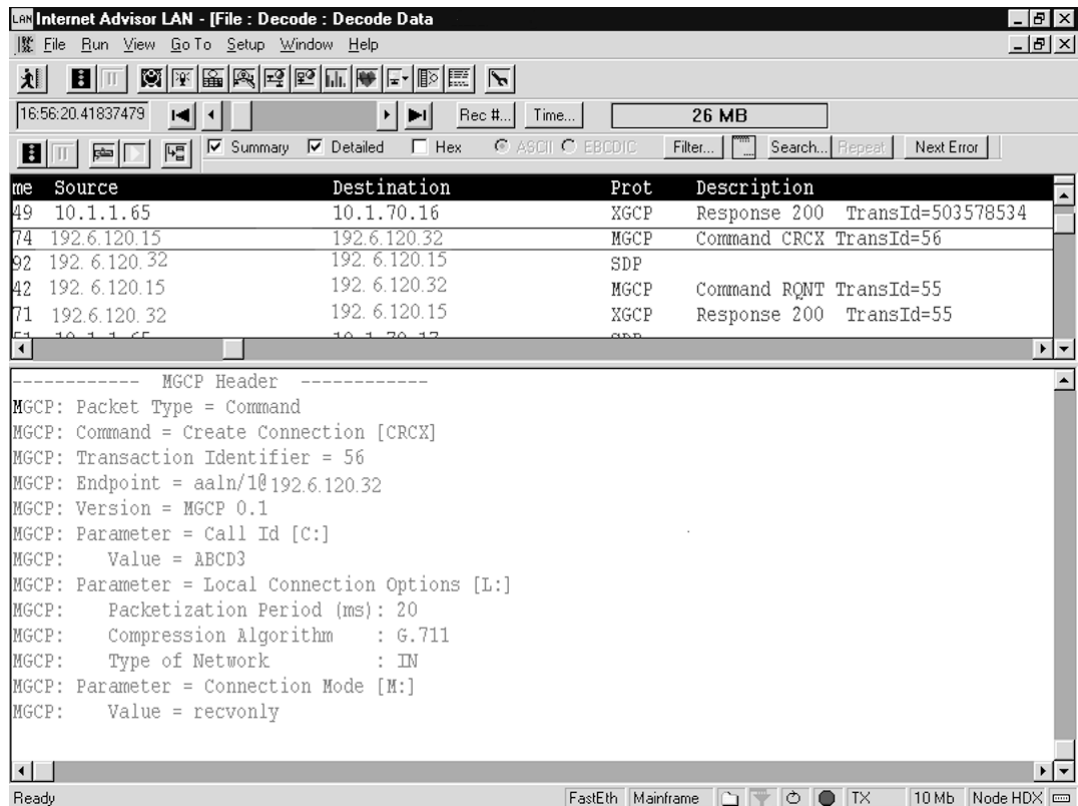


HP

Internet Advisor

Voice and Fax over IP Protocol Analysis



**Figure 1: MGCP decode.**

Windows® based software in the HP Internet Advisor offers an important troubleshooting tool for Voice Over IP (VoIP). ITU-T H.323, IETF SIP, and S/MGCP decodes allow early implementors of Voice and Fax over IP networks and services, such as Communications Equipment Manufacturers and Communications Service Providers, to test and troubleshoot initial network deployments and perform powerful analysis and protocol verification during field trials.

The decode helps you identify internetworking, interoperability, and performance problems and is especially useful in equipment evaluation and diagnostics during multi vendor integration and performance assessment. Specifically, you can analyze H.323 version 2 protocols H.245, H.225.0 (including Q.931 and RAS), H.261, H.263, IETF SIP, SAP and SDP, S/MGCP, T.38 for real-time Fax over IP, and RTP/RTCP whether captured via LAN, WAN, or ATM interfaces. This analysis can be performed in real-time or post-process.

## **The Tool for Network Deployment and Troubleshooting**

When deploying and testing any new technology, a variety of problems must be overcome. Voice and Fax over IP is no exception:

- H.323, SIP, and S/MGCP are far from complete and also contain optional functionality. Interoperability problems between equipment suppliers often occur, especially as vendors adhere to different releases of the same standards.
- Standards leave room for interpretation leading to connectivity problems between different vendor systems.
- IP networks today carry data, are connectionless, and do not require the complex signaling of the PSTNs. Voice services, on the other hand, need signaling to set up connections between parties. This is a new concept in IP networks, and because of this, connectivity and performance problems will arise.
- Voice traffic has limitations regarding the error rate, packet jitter, loss, and delay it can tolerate. IP networks must be analyzed and upgraded with mechanisms to ensure an acceptable quality of service.

### **How can the Internet Advisor VoIP decodes help?**

The following are just a few examples of how the Internet Advisor H.323, SIP, and S/MGCP decodes help to identify problems quickly.

#### **Interworking with other networks**

By monitoring the connection setup at the IP side of a VoIP gateway and comparing this with the number dialed on the PSTN, you can confirm correct interworking. Terminal and bearer capabilities from ISDN circuits, for example, can also be confirmed on the IP interface.

#### **Interoperability with other vendor equipment**

You can identify why a connection failed. Points of failure include:

- Routing table error.
- Phone number to IP address mis-translation.
- Connection setup via Q.931 timed out.
- Session parameter negotiation failed due to terminal capabilities mismatch.
- TCP/UDP port number incompatibility between UNIX®/NT.
- Configuration error - default set to transfer call out of reach of the address translator.

Monitoring the protocol exchange between VoIP terminal, gateway, and gatekeeper can address all of these issues.

## Performance

To measure performance, you can:

- Measure the call setup time, (the Q.931 messages from SETUP to CONNECT ACKNOWLEDGE) displaying the summary decode in the absolute timestamp mode. In fact, the summary decode output drops easily into a spreadsheet for further calculations such as maximum, minimum, and average call setup times.
- Measure the response time of gatekeepers and gateways, using the delta timestamp mode of the summary decode.
- Monitor RTCP to determine the number of packets lost and to analyze packet jitter (both important considerations for voice quality). Another possibility is to monitor and analyze RTP messages to determine the distribution of packet loss and individual packet jitter.

## VoIP decode functionality

### Protocol decodes

The following H.323 version 2 protocols are decoded:

- H.225.0 Version 2 (call set-up) - defines call setup, call control, and call termination between terminals, gateways, gatekeepers, and Multipoint Control Units. To do this, it specifies a subset of Q.931 and Q.932.
- H.225.0 Version 2 RAS (Registration, Admission, Status) - used to perform registration, admissions, bandwidth changes, status, and disengage procedures between end points and gatekeepers.
- H.245 Version 3 (Session Set-up) - used to establish logical channels for audio and video communication, to establish master/slave relationships in multipoint conferences, and to negotiate capabilities between terminals and MCUs.
- H.235 - used to control mechanisms for security authentication, integrity, privacy, and non-repudiation.
- H.261 and H.263 - determines the bandwidth and resolution to be used for video conferences. Both use the common intermediate format (CIF) for video encoding.

The following IETF protocols are decoded:

- SIP (Session Initiation Protocol from the IETF) – designed to create, modify, and terminate voice and video calls over an IP network. This Internet Advisor decode is supplied in accordance with ietf-mmusic-SIP-10.txt.
- SDP (Session Description Protocol according to RFC 2327) - describes multimedia sessions available, their addresses and tool-specific information necessary for participation.
- SAP (Session Announcement Protocol) - Advertises and describes the invitation process to multimedia conferences.
- RTP/RTCP - Real-time Transport Protocol (RTP) and the Real-time Transport Control Protocol (IETF RFC 1889, 1890).
- MGCP Media Gateway Control Protocol according to IETF MEGACO working group.

All layers of the protocol stack including Ethernet, IP, TCP/UDP, and the Voice and Fax protocols on page 3 are fully reassembled and decoded.

### **Capture**

All data can be captured in up to 64 Mbyte of buffer via all LAN, WAN, and ATM interfaces at full line rate. Each packet is stamped with a 100ns resolution timestamp representing the start of the packet. Timestamping is also used to indicate errored packets. Filtering on IP addresses or TCP/UDP port numbers allows only selected data to be captured.

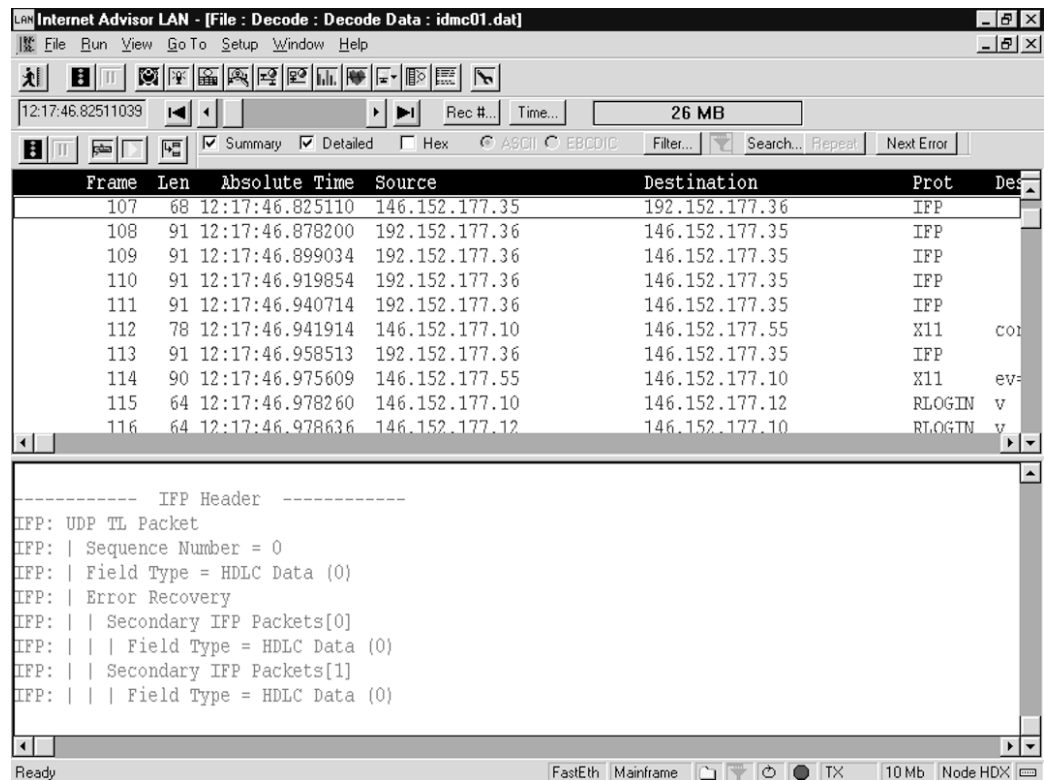
### **Real-time and post-process analysis**

As they are captured, packets are displayed during run-time. In addition, protocol packets can be displayed from the capture buffer after they have been captured (this is known as post-process analysis).

### **Presentation**

Decoded packets are displayed in summary, detailed, and hexadecimal format.

- The summary window shows timestamp, source and destination address, protocol type, and further information such as RTP-Payload G.723.
- The detailed format breaks out all header fields as well as the payload.
- Information is also represented in hexadecimal as defined in the standard.
- All data can be printed or stored to a file for later analysis. Search and display filter capabilities are supported for IP, TCP, and UDP data.
- Hex to detail mapping shows the user how the raw data relates to the actual field of the protocol.
- Display options allow all protocol fields to be viewed in the summary window or only the IP addresses with the top protocol layer eg. H.225, H.245, or SIP and SDP.
- Filters can be configured quickly by right clicking with the mouse on a packet and selection of a Mac layer or IP layer source and/or destination address.



**Figure 2: Protocol analysis of data implementing the T.38 real-time Fax over IP protocol.**

## Configuration Information

The HP J4617A Voice and Fax over IP protocol analysis software requires an HP Internet Advisor with system software release 10.0 or later. This software solution allows protocol analysis of Voice and Fax protocols on any LAN, WAN, or ATM interface. The Internet Advisor platform must be at least a 'C' model; i.e. HP J3446C, HP J2300C or HP J3754C.

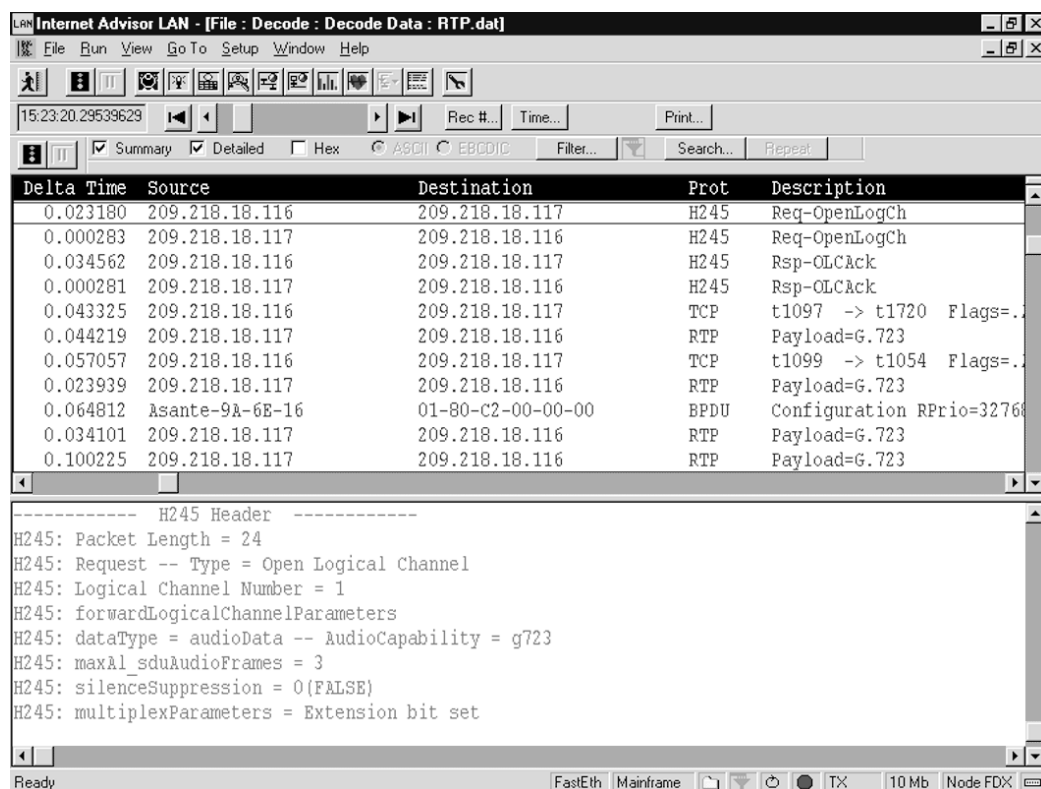


Figure 3: H.323 decode.

## Technical Specifications

The section defines the specification to which the decode solutions comply.

- ITU-T recommendation T.38, (June, 1998) Procedures for real-time Group 3 facsimile communication over IP networks.
- "Media Gateway Control Protocol (MGCP) Version 0.1" IETF Draft <draft-huitema-megaco-mgcp-v0r1-05.txt>, Internet Engineering Task Force, (February 21, 1999).
- "Simple Gateway Control Protocol (SGCP) Version 1.1 Draft", IETF Draft <draft-huitema-sgcp-v1-02.txt>, Internet Engineering Task Force, (July 30, 1998).

## Notes



Expanding Possibilities

## Ordering Information

HP J4617A Voice and Fax over IP protocol analysis  
HP J4617A+UAF Voice and Fax over IP protocol analysis software  
update service

## Platforms

HP J2300D HP Internet Advisor WAN  
HP J3446D HP Internet Advisor LAN — Fast Ethernet  
HP J3447A HP Internet Advisor LAN — Fiber Interface for HP J3446C  
HP J3444A HP Internet Advisor LAN — Fast Ethernet undercradle

## Related Literature

HP Internet Advisor LAN	Product Overview	5966-0828E
HP Internet Advisor LAN	Technical Specifications	5966-0829E
HP Internet Advisor LAN in Windows	Product Overview	5967-5562E
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HP Internet Reporter	Application Note	5964-2373E
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Hewlett-Packard on Troubleshooting H.323 Signaling	Whiter Paper	5968-3642E
HP Internet Advisor Troubleshooting H.323 Signaling	App Note	5968-4450E

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## Warranty

For hardware - three year warranty  
For software - 90 day replacement warranty only

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