2N®EasyRoute Fax over T.38 theory and troubleshooting

Discussed topics

- Theory
  - Analog fax, fax terminals V.21 – V.29, protocol T.30
  - Fax over IP, protokol T.38
    - SIP, SDP T38 handshake
    - UDPTL, T38
- EasyRoute Fax
  - Parameters analysis
  - Analytic tools
  - Troubleshooting

Theory, analog fax

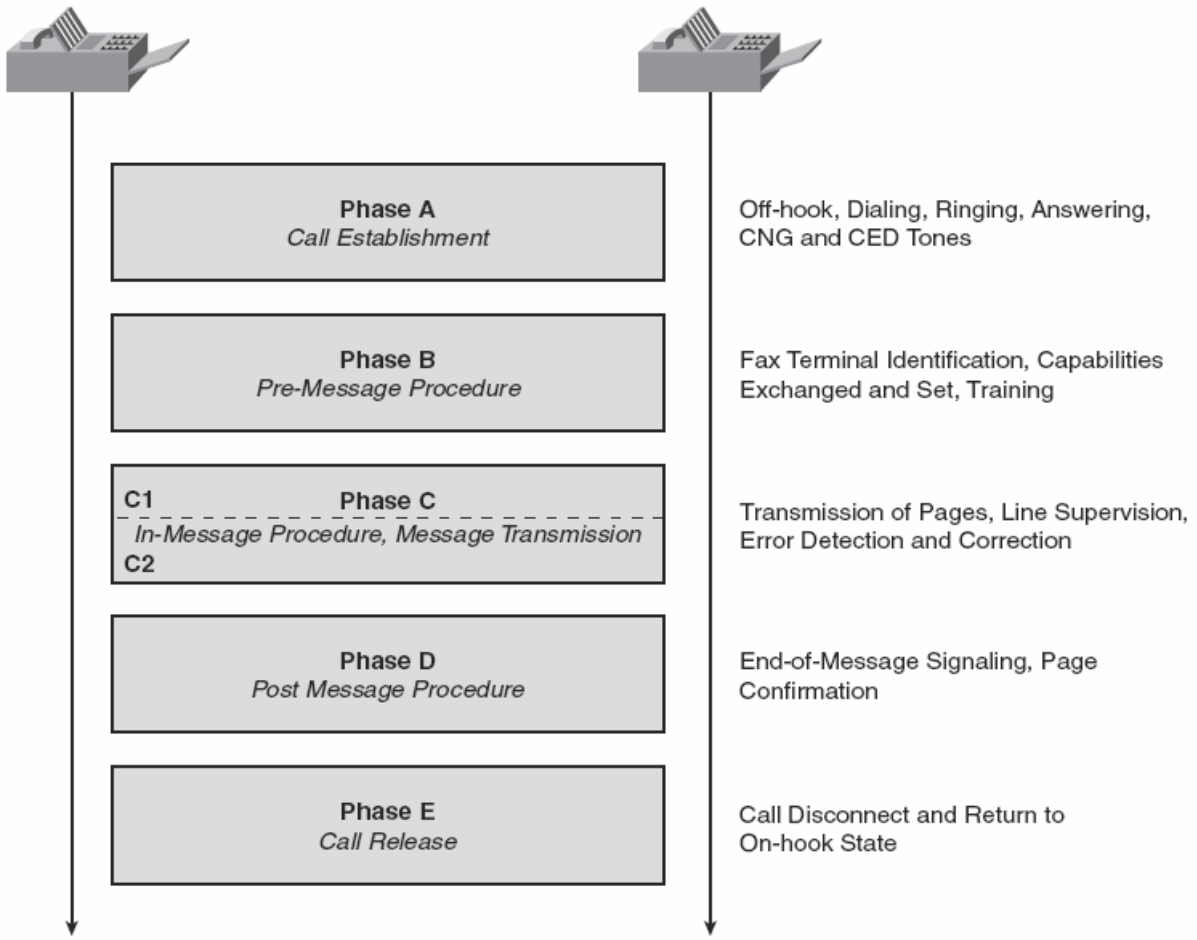
T.4
Picture coding

Protocol T.30
Fax control protocol
Transmitting by HDLC frames
Training and transmission speed arrangement between terminals

HDLC

V.21	V.27ter	V.29	V.17
300bps FSK	2400bps, 4800bps DPSK	4800, 7200, 9600 bps QAM	7200, 9600, 12200, 14400 bps TCM

Theory, analog fax, T.30



Theory, T.30, frame structure

- T.30 properties
  - Half duplex
  - Frames are transmitted by HDLC protocol
  - Frames are always transferred by V.21 terminal

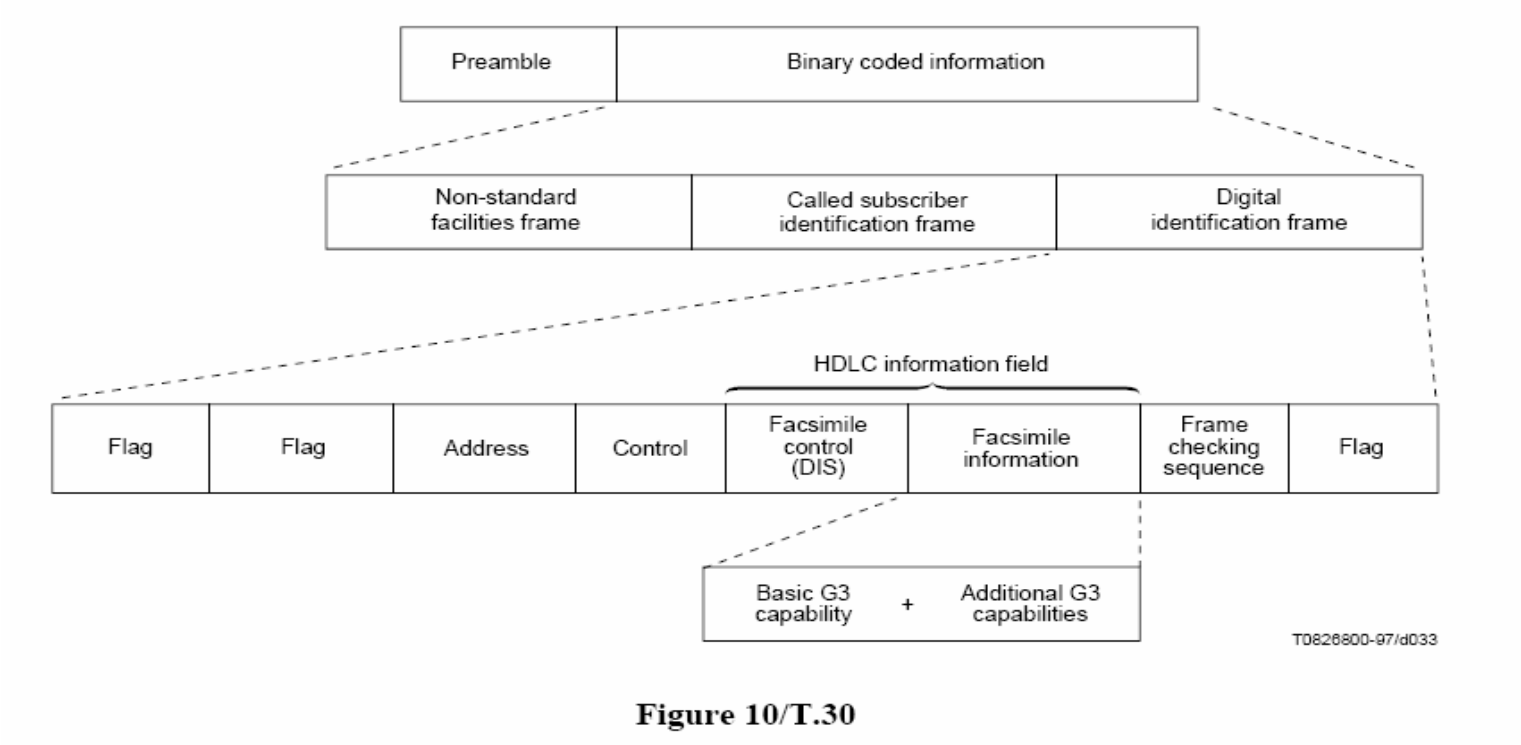
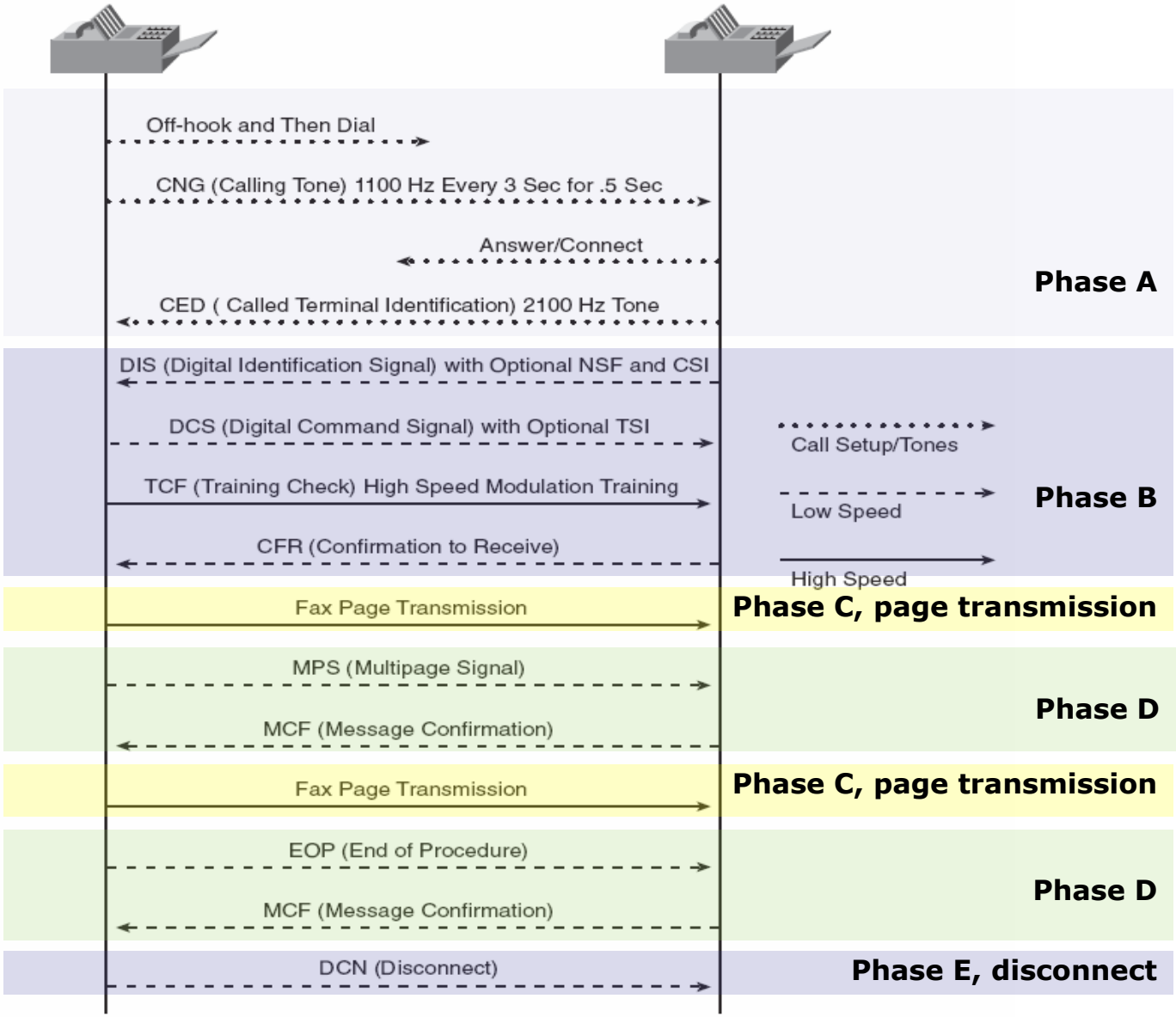
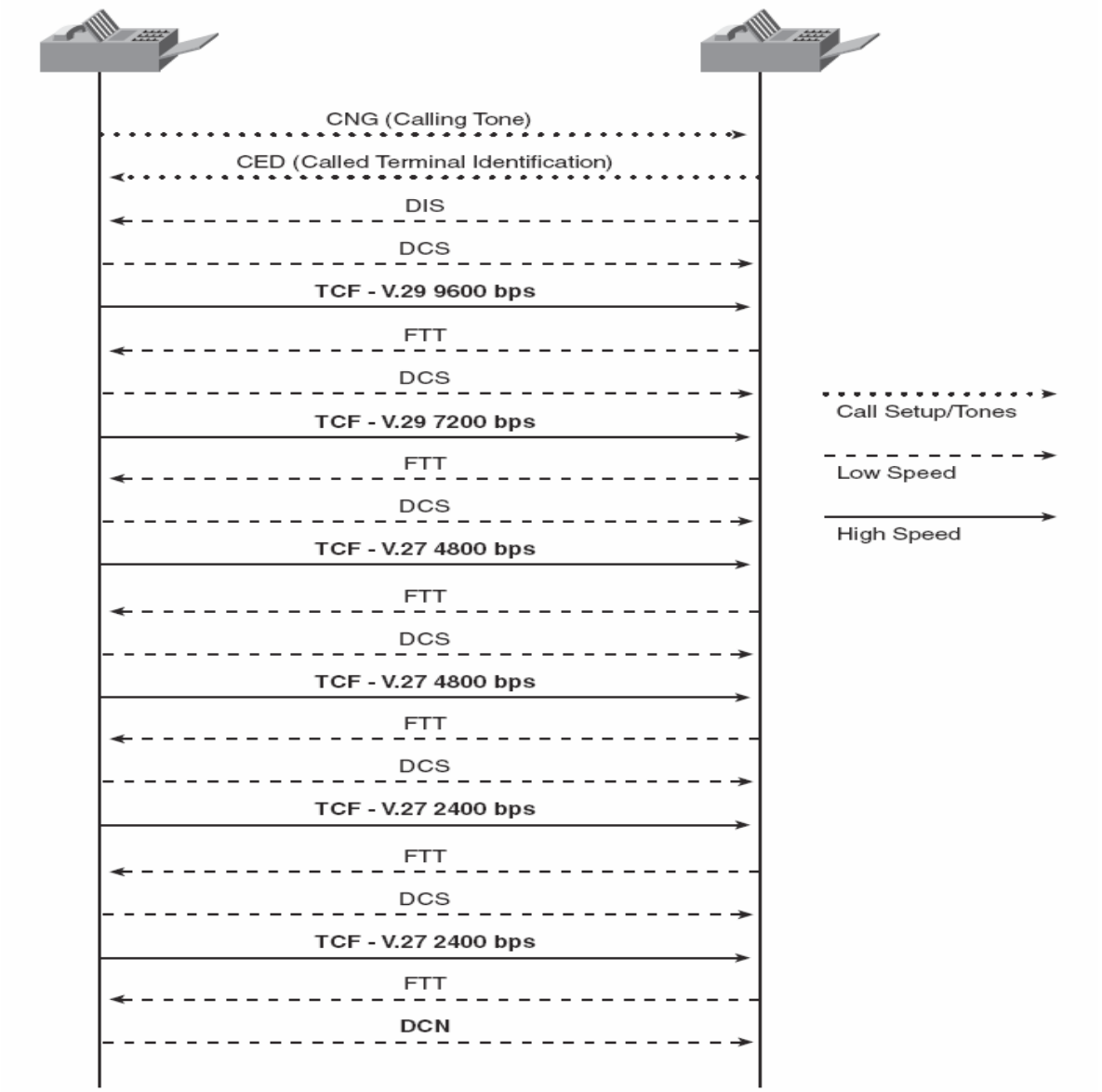


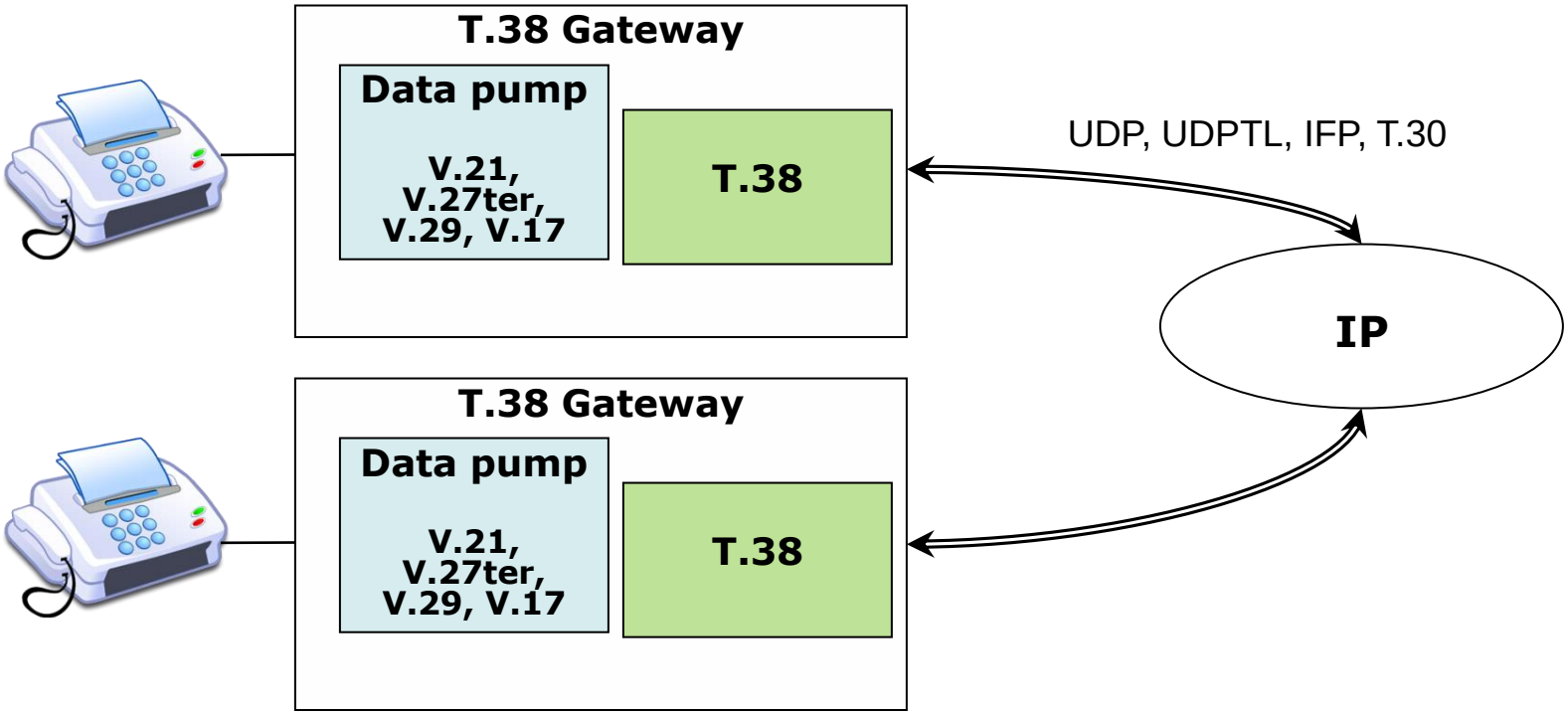
Figure 10/T.30


Off-hook and Then Dial
CNG (Calling Tone) 1100 Hz Every 3 Sec for .5 Sec
Answer/Connect
CED (Called Terminal Identification) 2100 Hz Tone
Phase A
DIS (Digital Identification Signal) with Optional NSF and CSI
DCS (Digital Command Signal) with Optional TSI
Call Setup/Tones
TCF (Training Check) High Speed Modulation Training
Low Speed
CFR (Confirmation to Receive)
High Speed
Phase B
Fax Page Transmission
Phase C, page transmission
MPS (Multipage Signal)
MCF (Message Confirmation)
Phase D
Fax Page Transmission
Phase C, page transmission
EOP (End of Procedure)
MCF (Message Confirmation)
Phase D
DCN (Disconnect)
Phase E, disconnect


CNG (Calling Tone)
CED (Called Terminal Identification)
DIS
DCS
TCF - V.29 9600 bps
FTT
DCS
TCF - V.29 7200 bps
FTT
DCS
TCF - V.27 4800 bps
FTT
DCS
TCF - V.27 4800 bps
FTT
DCS
TCF - V.27 2400 bps
FTT
DCS
TCF - V.27 2400 bps
FTT
DCN
Call Setup/Tones
Low Speed
High Speed

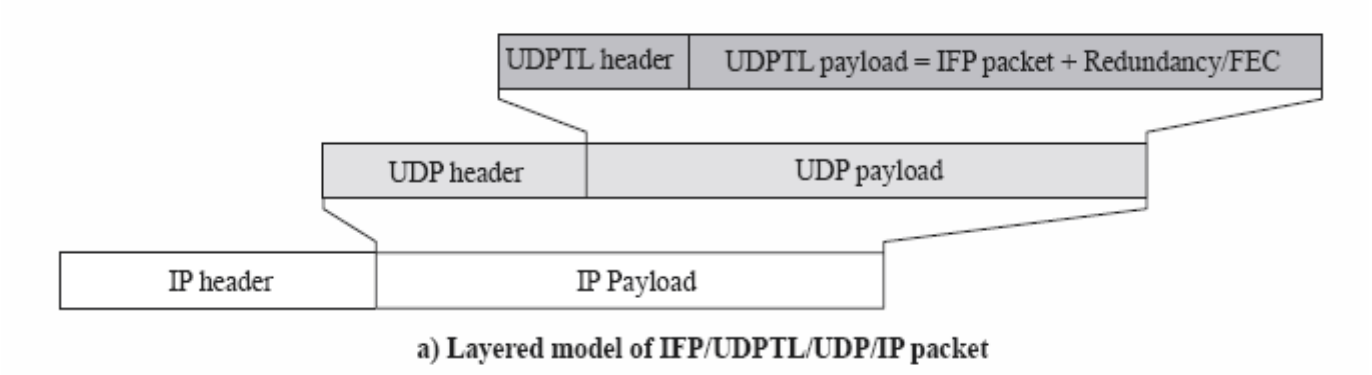
Fax over IP, protokol T.38

- T.38 purpose: transfer all fax phases (T.30, training and image data) va IP network
- Connection initiation via SIP or H323



T.38 packet

- T.38 structure
  - UDPTL – redundancy security mechanism
    - Primary packet
    - Secondary packet (doubling of -n last packets)
  - IFP – encapsulation of T.30 data

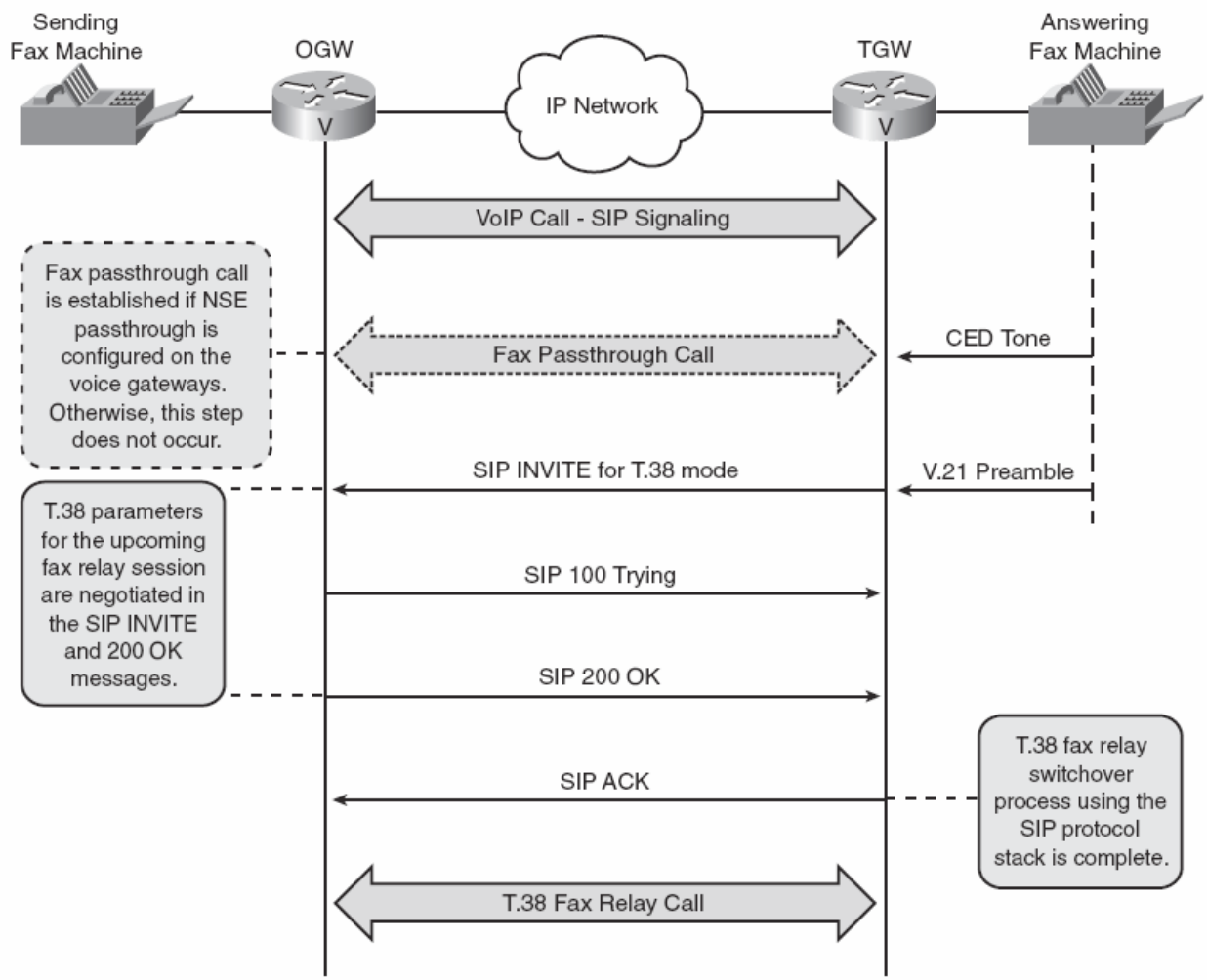


a) Layered model of IFP/UDPTL/UDP/IP packet

T.38 Transmission

- Normal SIP – VoIP call
- Phase A (CNG, CED) via RTP stream
- After CNG, CED tones SIP T.38 reinvite
- After successful T.38 reinvite (OK 200) RTP stream is finished transmission of T.38 is started

Figure 5-12 *T.38 Fax Relay Switchover for SIP*



Important T.38 terms

- T38 Data Rate Management:

  Method of training frequency transmission

  - Transferred TCF : training frequency is sent as an image data also via IP network.
  - Local TCF: training is proceed on the gateways separately and only the indicator is transferred via IP network
- T38 UDP EC:

  Error correction mechanizm of UDPTL protocol.

  - Correction by redundancy packets: the copy of previous packets is sent to the secondary IFP packet
  - FEC: Forward Error Correction. Function XOR is applied on the added packet

Important parameters of the EasyRoute T.38

- TCF

  Handling of training signal. Almost always Transferred
- Error Correction

  Error correction of UDPTL protocol. Almost always Redundancy
- Reinvite tone

  For which tone EasyRoute should proceed T.38 reinvite (CNG, CED or DIS frame)
- Reinvite direction

  Who should send T.38 reinvite. Caller or callee. According to the ITU T.38 it should be callee.
- Always DIS reinvite

  No matter what was the previous determination flow EasyRoute will always try to send T.38 reinvite always after DIS frame
- UDP Flood

How to make T.38 working

- Set up default parameters
- Set up call routing to VoIP (in default everything is to GSM)
- Set up SIP account
- Try SIP call in both directions. In case of problems try to disable Firewall
- Try T.38 Fax in both directions

  common problem: we didn’t get to the T.38 reinvite step. Try another reinvite direction or another reinvite tone.

Troubleshooting

- SIP
  - If SIP call was initiated properly?
  - Network quality evaluation
    - Ping response time
    - Quality of VoIP call (jitter buffer is fulfilled)
  - If phase A of RTP stream is finished (you can hear CNG, CED in the handset)?
  - If the both-sides RTP stream is seen in the Wireshark?
  - If the proper T.38 reinvite was proceed?
    - Response OK 200
    - UDPTL protocol is agreed
    - Media parameters T38FaxRateManagement and T38FaxUdpEc are agreed for the same value

Troubleshooting

- T.38
  - Is T.38 stream seen on the same agreed UDP ports?
  - On which phase fax stopped working?
    - Didn’t get DCS therefore it’s sending DIS repeatedly
    - Didn’t get the training confirmation (CFR, FTT) therefore it resends DCS and training sequence repeatedly
    - …
- Fax listening: Incoming and outgoing frames could not be overlapped. That’s the result of the bad synchronization.