Fax over IP

Contents

Intended Audience

This document describes how Fax over IP works in general and how it is implemented in MessagePlus/Open. It is intended to be read by system administrators, systems architects and engineers considering, planning or implementing a Voice over IP infrastructure. More detailed information on specific topics can be obtained by contacting Intercope through any of the addresses on the final page of the document.

Introduction

There are an estimated 200 million fax machines in use in the world today, with more than 6 million new units sold each year.

Fax continues to be an important method of business communications

Despite the rise of email and the Internet, fax continues to be an important method of business communications. One of the main reasons that fax has seen continued growth is its simplicity. Fax machines are omnipresent, easy to use and hence a simple way to send and receive documents quickly, safely and securely.

Recently, however, as businesses have started to migrate their voice traffic to IP (VoIP) networks, there has also been a natural inclination to want to migrate their fax traffic to IP (FoIP) as well.

- Up to now there have been two approaches for implementing FoIP networks: Store-and-forward methods, based on the T.37 network protocol and
- Real-time methods, based on the T.38 protocol

Fax over IP real-time or store and forward?

The primary difference in service between these two approaches lies in the delivery and means of receipt confirmation. Faxing is traditionally done in real-time over the Public Switched Telephone Network (PSTN), via the T.30 fax protocol and several modem standards, as defined by the International Telecommunications Union (ITU). The reasons for the popularity of real-time circuit-switched fax include the real-time receipt of a fax, immediate notification that the fax has been successfully sent, and notification to the receiver of the sender's telephone number and the time the fax was received. These features are essential elements of the fax experience and have set expectations that will continue to apply for advances in fax communication, including fax over IP. Indeed the real-time characteristics of fax transmission, and therefore the inherent difficulty of compromising fax messages, are a key component in its acceptability as a reliable and trusted method of communication, particularly for financial institutions. This is the reason why Intercope's FoIP strategy is focused on real-time methods rather than the store and forward model.

.

Why Fax over IP?

Today, most companies use conventional telephone networks (Public Switched Telephone Networks, or PSTN) and IP networks. Typically, telephone networks are dedicated to voice and fax communication, while IP networks are dedicated to data transfer such as file transfer, Web access, email etc.

Converging voice and data networks.

By implementing VoIP, the two networks can converge and companies benefit in many ways from having a single IP network providing voice and data services. In this scenario FoIP has an enormous potential to reduce communication costs, particularly in large organizations. Integrating fax servers with the IP network enables companies to simplify network management and to significantly reduce maintenance costs. The major benefits include:

- With FoIP faxes remain digital end-to-end over IP networks, until they reach the PSTN endpoint gateway closest to the destination. This way, fax-related long distance costs are reduced to virtually zero. Internal faxes can be routed between branch offices without incurring any long distance call charges

Integrating fax into IP networks.

.

- FoIP enables organizations that have already made investments in VoIP networks to break free from legacy PBX telephony, specialized hardware and the leased lines that traditional fax servers still require.

- Reduction of network management and maintenance costs with a single converged IP based fax, voice and data network.

- FoIP scales with your VoIP system to ensure easy upgrade paths that adjust to changing business needs, with no need for additional fax boards, lines and servers.

- FoIP provides centralized administration and management capabilities, as well as a single point of configuration for the IP telephony network.

.

How Real-time Fax over IP works

Let's look at a traditional PSTN based T.30-only fax transmission. Sending a fax this way requires three fax components:

- A **T.30 protocol engine**. While T.30 is a mature technology, an effective T.30 implementation is complex due in a large part to the challenge of connecting with the installed base of 200 million fax machines whose own compliance to the standard varies considerably.
- An **image conversion engine**. The sending device must adapt (scale and/or transcode) the image to meet the capabilities of the receiver. The receiver must check the received file for errors and try to correct ones that occur.
- A **modem** to transmit and receive the protocol and image data across the PSTN network.

With telephony based fax transmissions a fax server connects through fax boards either to the company's Private Branch Exchange (PBX) or directly to the Public Switched Telephone Network (PSTN):

Traditional PSTN based T.30-only fax transmission.

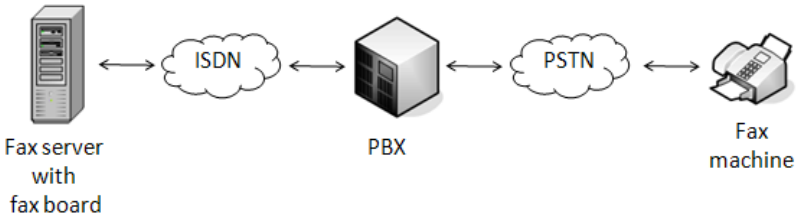

Figure 1. Traditional PSTN based T.30-only fax transmission

The functionality of these elements is still required in IP environments. With T.38, there are two types of devices used to for the implementation, an IP endpoint which is typically a fax server and a media gateway. Here's how they fit in a likely IP fax scenario:

Fax transmission based on T.38

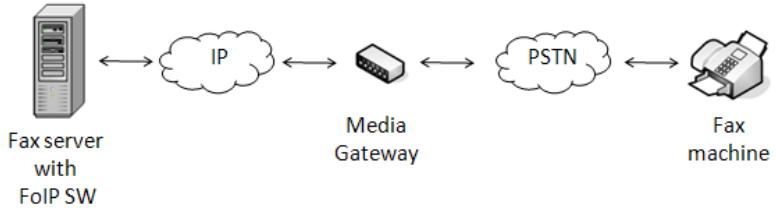

Figure 2: Fax transmission based on T.38

Fax over IP with Communication Manager

Instead of connecting directly to a specific media gateway a communication manager may be used (like a traditional PBX in the phone network) to connect the fax server to various media gateways for different calls:

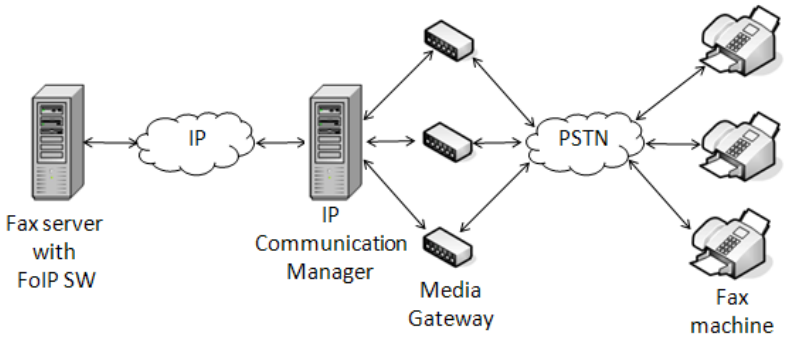

Figure 3: Fax over IP with communication manager

How real-time fax over IP works.

For outgoing faxes typically a fax server (the IP endpoint) transfers the fax via the T.38 protocol to a media gateway. The receiving media gateway, in turn, transform the T.38 transmission into T.30 protocol signals and then sends them to the receiving fax machine using standard modem modulation. The receiving fax machine has a T.30 protocol engine that communicates with the T.30 protocol engine in the fax server through the gateway.

Management of incoming calls.

For faxes originating from a remote fax machine, the sending fax machine sends a fax via the PSTN to a media gateway. The media gateway transforms the fax to IP packets using T.38 and sends those to the fax server (IP end point).

IP call control

In all cases the calls must be established first using an IP call control protocol such as the Session Initiation Protocol (SIP) or H.323. The call control protocol is responsible for the initial call set-up and tear-down.

Implementation hints

In general it should be considered that in an IP network delays may occur due to collisions and other factors. T.30 on the other hand is a time critical online protocol which may lead to aborted transmissions, when the IP delays are too long. Hence sufficient bandwidth and network quality is critical for any real-time Fax over IP implementation. Assuming an already existing and proven Voice over IP network infrastructure the additional load and peaks imposed on the network due to existing and/or planned fax message volumes need to be carefully considered and fully taken into account. In addition it has to be verified that the Media gateway supports the required fax transmission rates.

Real-Time Fax Over IP implementation of MessagePlus/Open

.

No fax boards required.

In MessagePlus/Open, real-time Fax over IP is implemented by exploiting the Brooktrout SR140 API. This API is a pure software based solution. No fax boards are required, only an Ethernet connection from the server running the MPO fax line class to the IP network through which fax calls are to be routed. This allows implementing a complete MessagePlus/Open system in virtualized environments such as VMware eliminating the need for a physical machine hosting fax boards.

A mature implementation of all relevant protocols.

The SR140 API provides a mature implementation of the standards recommended by the Internet Engineering Task Force (IETF) such as the Session Initiation Protocol (SIP) (RFC 3261), the Session Description Protocol (SDP) (RFC 2327), H.323, MGCP (Media-Gateway-Control-Protocol) and the standards of the International Telecommunication Union (ITU) such as T.38 and T.30.

Compatible with all major VoIP suppliers.

Based on this technology, MessagePlus/Open is compatible with any T.38 – T.30 gateway that meets these standards, in particular with

- CISCO Unified Communication Manager and Gateway Series
- Avaya Communication Manager and Media Gateway Series
- Nortel Communication Server
- Alcatel OmniPCX
- Siemens HiPath
- Ericsson Systems
- 3Com VCX platform and Media Gateway
- MultiVoIP MVP
- Mitel 3300 Mxe
- Quintum Tenor Series

A detailed list of IP PBXs, Gateways, SIP Trunking interfaces, and other devices which have been tested for Interoperability can be found here.

No effect for integrated applications

It should be noted that a migration to Fax over IP has no effect on all the other components that may be integrated with MessagePlus/Open no matter whether physical fax boards are used or a purely software-based solution is deployed. In one logical MessagePlus/Open system, physical and virtual fax boards can be used in combination with fax channel modules on different computers, or even on the same computer.

Summary

An ideal solution to migrate fax to VoIP infrastructure.

MessagePlus/Open includes a mature, reliable and powerful implementation of Fax over IP. As this is a pure software solution there is no need for fax boards reducing cost and allowing the implementation of the complete system in virtualized environments. The solution has been tested for interoperability with equipment from all the major VoIP suppliers.

For companies migrating their voice traffic to IP MessagePlus/Open offers the ideal solution for seamlessly integrating fax functionality into this new infrastructure.

Intercope GmbH
Himmelstrasse 12-16,
22299 Hamburg,
Germany

+49 40 514 52 0
info@intercope.com

The Intercope home page can be found at
www.intercope.com

MessagePlus/Open –
Support for Fax over IP V.6