Dialogic®

White Paper

T38FAX

How Does Fax over IP Work?

A Discussion of the T.30 and T.38 Protocols and the Dialogic® Brooktrout® Fax Products

NETWORK FUEL®

Executive Summary

This white paper briefly describes the T.30 and T.38 protocols, which enable fax to be sent over an IP network. The T.30 protocol describes procedures for sending faxes over a network that provides relatively smooth and uninterrupted data flows, and T.38 was created to describe the process for sending and receiving faxes in real-time over an IP network — an environment that can cause T.30 to fail.

This background paves the way for a discussion of how these protocols work in a Fax over IP (FoIP) implementation by comparing traditional fax technology — that is, plain old fax, which is a fax device that is not connected to an IP network — with the more advanced fax option of sending faxes over an IP infrastructure.

This white paper also provides examples of the Dialogic® Brooktrout® T.30 and T.38 stacks used in Dialogic® Brooktrout® Fax Products, followed by notable benefits of these enhanced protocols in Brooktrout Fax Products.

Table of Contents

Introduction

The T.30 fax protocol describes procedures for sending faxes over a switched telephone network that provides relatively smooth and uninterrupted data flows. The Dialogic® Brooktrout® T.30 Stack is one of the most robust in the industry, with over 20 years of deployment history. It has also been regularly updated to enhance interoperability as new fax machines and equipment have been introduced into the market.

Unfortunately, even having a first-rate T.30 fax protocol does not guarantee success when attempting to send facsimile traffic over an IP network. The T.30 fax protocol does not tolerate the latency, jitter, and packet-loss that are the norm in an IP network.

In addition, although the compression used by many VoIP implementations works well for speech (based on the limited frequency response of the human ear and our ability to "fill in the gaps" when certain sounds are missing from spoken words), the distortion caused by compression and packetization can be enough to cause a T.30 transmission to fail.

The T.38 fax protocol was created to describe the process for sending and receiving faxes in real-time over a packet network. T.38 preserves the traditional fax experience while allowing faxes to be successfully sent and received by making adjustments for jitter, latency, and packet loss.

Traditional and Advanced Fax Technologies

Traditional Fax Technology

Figure 1 shows a basic real-time fax over IP (FoIP) example implementation with a TDM fax server working with T.38 gateways to deliver a fax to a "plain old fax" machine that is connected to the PSTN. In this example, the fax transmission originates from the TDM-based fax server as a T.30 fax. The T.38 gateway then demodulates the fax transmission and sends it over the IP network to another T.38 gateway. This second gateway remodulates the transmission and sends it over the PSTN to the receiving fax machine.

Note that the two end point devices (the originating TDM fax server and the receiving fax machine) know nothing of the T.38 protocol. From the viewpoint of these devices, the entire transaction is just a T.30 session. The faxing intelligence required to negotiate, synchronize, and send the fax (defined by the T.30 protocol) still resides in the end-point devices. The T.38 protocol completely hides the IP portion of the transmission from the endpoints.

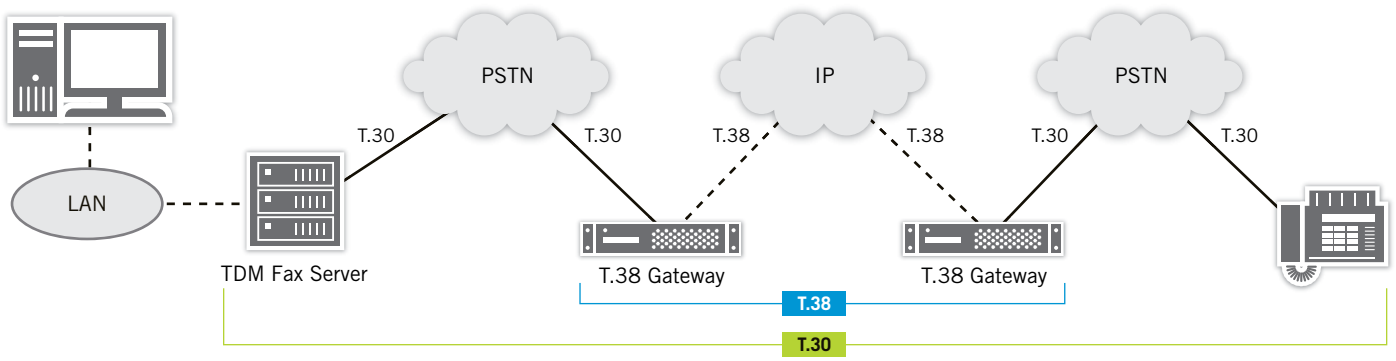

Figure 1. End-to-End T.30 Fax Across an IP Network

IP Fax Technology

Figure 2 shows another example of sending faxes over an IP infrastructure via an IP fax server using Dialogic® Brooktrout® fax technology. Because the fax server is IP-enabled, it can eliminate the need for a T.38 gateway on the originating side of the transaction. Note that even though there is no T.30-specific equipment on the originating side, the fax server still uses the T.30 protocol to create the fax transmission. It then demodulates the fax transmission and transmits it using the T.38 protocol. This is done so that the terminating fax machine can still receive the fax using T.30.

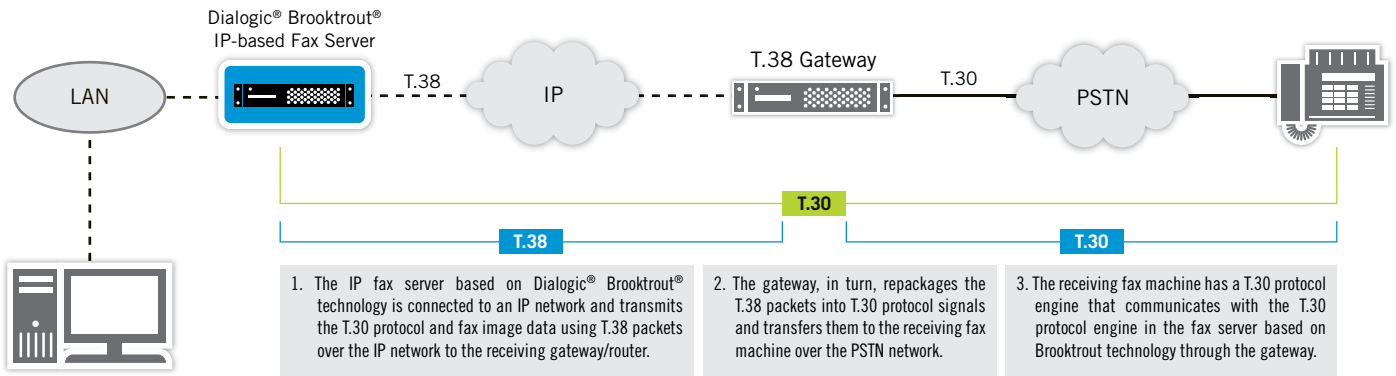

Figure 2. Sending an IP Fax to a T.30 End Point

Security and T.38 Real-Time Fax over IP

With a properly configured IP network, the security provided using "plain old fax" technology is also provided when performing real-time FoIP using Dialogic® Brooktrout® SR140 Fax Software (described in more detail in the following section). Brooktrout SR140 transmits information via the T.30 and T.38 protocol, which allow for the transfer of only T.4 and T.6 fax images. If a malicious packet reaches a Dialogic-based FoIP fax server, it will be dropped by the Brooktrout SR140.

To protect against internal attacks, the IP network can be configured to use Virtual Private Networks (VPNs) between the T.38 endpoint and gateway.

Dialogic® Brooktrout® FoIP Solutions

For companies looking for a pure software-based IP fax solution, Dialogic offers the Brooktrout SR140, a host-based FoIP platform. SR140 has the same renowned functionality — which includes the proven Brooktrout T.30 stack, Error Correction Mode, and MMR fax compression — that has made Dialogic a leading provider of intelligent fax boards. The SR140 is available in a variety of densities and is capable of supporting from two (2) to hundreds of channels per server, depending upon customer-specific operating system, host processor capacity, etc. To add channels as their needs grow, customers can simply purchase and install a new software license key to upgrade their solution. There is no hardware to buy, maintain, or upgrade.

For companies that still require TDM-based solutions, Dialogic continues to offer its line of Dialogic® Brooktrout® TR1034 Fax Boards in a variety of densities and form factors. When the transition is made to IP, companies can use gateways to connect the existing TDM-based fax servers to the IP network, and use the same application with SR140-based solutions for any future expansion.

Dialogic has earned its reputation for delivering value, including through the Brooktrout brand. Dialogic continues to deliver unparalleled value as the world moves to an all-IP network.

- **Trusted Market Segment Leader** — The intelligent fax board market segment leader with over 90% market share [Davidson]. Companies trust Dialogic's Brooktrout intelligent fax technology for their critical fax documents.
- **Outstanding Value** — Although other fax options, including some lower priced ones, have sought to position themselves alongside Dialogic's Brooktrout fax products, the Brooktrout products have long proven their worth by providing first rate quality, reliability, security, and customer service.
- **Reliability** —The Brooktrout T.30 stack has been deployed around the world for over 20 years. With such a large installed base, Dialogic has adjusted the Brooktrout T.30 stack to interoperate with virtually every T.30 variant, which allows faxes to be sent and received with confidence and reliability, while saving money on telephone tolls incurred using less reliable options.
- **Security** — The Brooktrout T.30 stack and T.38 stack allow only for the transfer of T.4 and T.6 fax images.
- **Broad Range of Products** — Brooktrout fax products span the range of fax platforms from low density to high density, from analog to T1/E1/ISDN to IP. Companies with diverse and complex hybrid telecommunications environments can rely upon on a single vendor platform to address all their needs.
- **One API for TDM and IP Fax Platforms** — Supporting varying platforms and applications costs money, but the Brooktrout fax products can enable companies to cut costs by consolidating on a single vendor platform.
- **Built and Supported by Dialogic** — Business-critical document management systems demand reliability and responsive customer service, which are achieved by maintaining full control over the core technologies that comprise the intelligent fax solution. The Brooktrout T.30 stack and T.38 stack — the heart of faxing over IP and TDM networks — are developed, tested, maintained, and supported by Dialogic.
- **Business Critical Fax Technology** — With the daunting risk of non-compliance posed by regulations such as Sarbanes-Oxley, HIPAA, Basel III, SEC-17a4, the role of the fax server has expanded from that of a business automation tool to include compliance enforcement. Brooktrout intelligent fax technology offers the level of security and reliability demanded by compliance solutions.
- **Industry Leading T.38 Expertise** — Dialogic has a long history in both real-time PSTN and packet-based fax. Brooktrout, which later became part of Dialogic, was the primary editor and contributing author of the T.38 real-time FoIP protocol specification.

References

[Davidson] Davidson Consulting, *Fax over IP Server Markets 2010-2015, April 2011.*

For More Information

Dialogic® Brooktrout® SR140 Fax Software — http://www.dialogic.com/en/products/fax-boards-and-software/foip/sr140.aspx

Dialogic® Brooktrout® TR1034 Fax Boards — http://www.dialogic.com/en/products/fax-boards-and-software/fax-boards/tr1034.aspx

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