

# The Essential Guide to

April 2006

# FAX

# OVER VoIP

By David Chernicoff

**C**onvergence of voice and data networking is no longer just a good idea; it is the future of telecommunications. As high-bandwidth networks become increasingly common, the advantages that can be gained by a converged data/voice networking infrastructure are becoming available to companies ranging from the smallest SMB to the largest enterprise. Converged networking solutions are available to fit companies of any size.

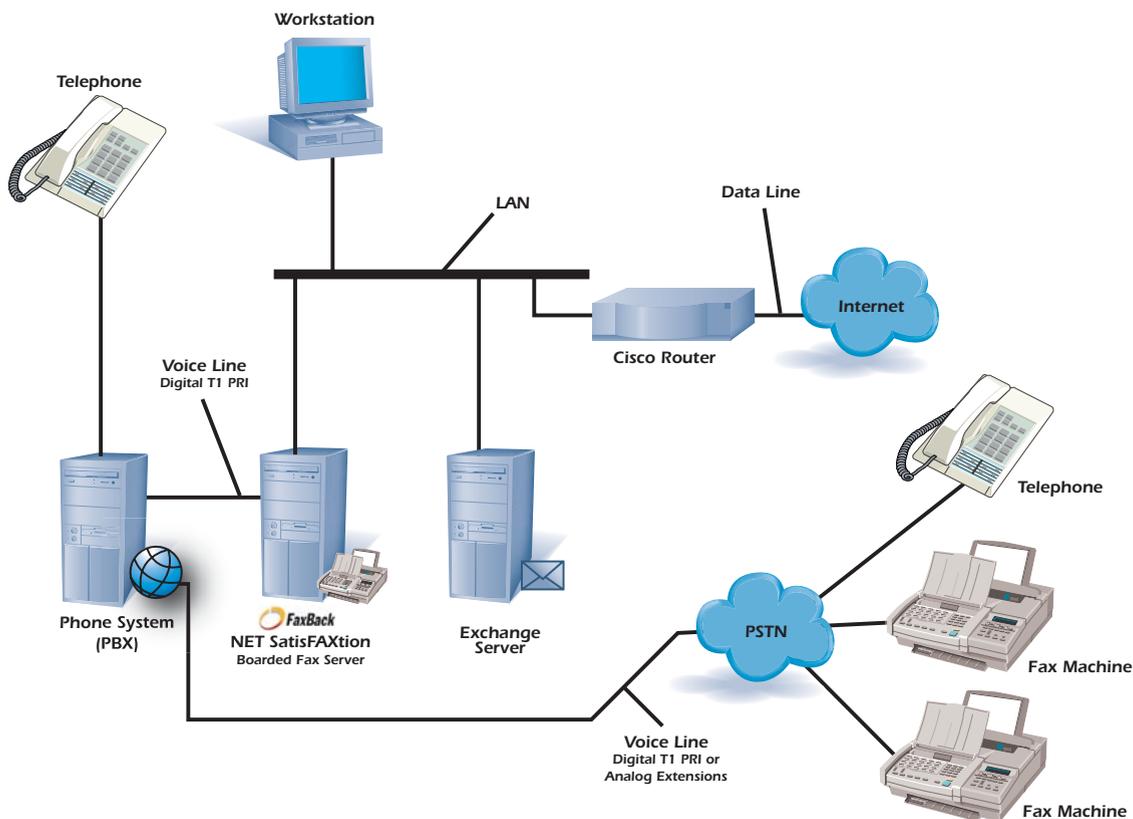
Faxing technology, thought by some critics as an outdated form of business communication, is here to stay. After all, businesses send and receive billions of faxes each year. For many businesses today, the current state of the art in fax technology is the network fax server. (See Figure 1.) With the traditional network fax server model, the IT department installs fax server software and the appropriate fax server hardware into a new or existing network server. Depending upon the needs of the organization,

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**Figure 1** Traditional Fax Server with Dedicated Fax Hardware

the fax server can range from an application sharing an existing server to a dedicated server set up expressly to handle fax transmission and reception. Whether large or small, every network fax server requires specific hardware configurations, fax hardware support, and installation, maintenance, and support of the connection between the fax server and the public telephone network.

But with the wide implementation of VoIP-capable network routers and switches, a new horizon opens up for companies to leverage network fax; Fax over IP (FoIP). (See Figure 2.) Almost every mid- to high-end network router has VoIP capabilities built in. As a result, you will likely find that most routers also offer full support of the ITU T.38 Standard for FoIP.

### The Realities of Fax over IP

If you are thinking that you can just plug your fax machine into your VoIP telephony system, you will likely be disappointed with the result. Despite claims you might have heard about all telephony devices working over a VoIP connection, voice codecs used for VoIP generally aren't fast enough for use with fax machines. VoIP voice codecs supporting data transmission rates of up

to 9.6 kbps are typically available in high-end VoIP hardware, but even those rates would support only low-end fax machines. Current fax technology, including the V.34bis (sometimes called SuperG3 faxing) requires support for bandwidth of 33.6 kbps. So the basic math makes it clear that you won't be plugging your old fax machines into your VoIP network and getting acceptable performance.

This, however, is where Fax over IP comes into play. Two FoIP ITU standards exist: T.38 Real-Time faxing and T.37 store and forward faxing. To maintain compatibility with existing fax machines that might be receiving faxed transmissions from a FoIP network, both T.37 and T.38 use the current standard T.30 fax definition to identify the data being transmitted by either method. The T.37 or T.38 fax transmissions carry the T.30 data, much as the V.34bis standard does in a traditional fax environment.

Services such as eFax make use of the store-and-forward capabilities of the T.37 standard, enabling users to send faxes as emails but not in real-time, nor with the expected legal standing that is associated with fax. (See Figure 3.) The fax is sent as email to an email server, which then transmits the fax as an email attachment to a fax device where

it is physically faxed. This method can also cut IT support requirements for fax servers, but can potentially introduce limitations, including higher costs.

Other service providers use their VoIP networks to support fax, but these require an Analog Terminal Adaptor (ATA) hardware device into which users must plug a traditional fax machine. (See Figure 4.) These services do not typically provide users the ability to fax straight to a recipient's desktop. Because of these limitations, many companies don't use their existing VoIP networks for faxing and when they think of the VoIP capabilities they have added to their infrastructure, they don't realize that in almost every case they have added FoIP capabilities, at no additional effort or expense. Alternatively, the fax could be routed to a fax machine at the recipient's location.

While this sounds simple enough, it does have a few drawbacks. For example, sending a fax via the T.37 standard means that you don't know the exact capabilities of the receiving device because no negotiation occurs between the sending and receiving devices. The T.37 standard offers no additional capabilities than exist with manual fax transmission.

Because of this lack of negotiation between devices, the fax gets sent at the lowest-quality setting and is unable to take advantage of advanced features that the receiving device may have, such as high resolution or color printing. This limits the types of docu-

ments that you can transmit using this method. Faxes sent over a T.37 connection also do not receive the legal protections that courts have awarded real-time faxes sent via traditional fax machines and T.38-capable network fax devices.

A connection via T.38 provides a user with an experience much more like a traditional fax machine. With a real-time fax over IP network, the originating fax device negotiates with the receiving device to determine what parameters to use, transmit the fax, and receive a confirmation. Using this real-time connection, the sender can transmit a fax to any type of fax-compatible device.

### Three Ways to Connect

You can connect to the outside world in three ways using network fax servers. The first is the traditional fax server hardware like you may already be using. For this type of setup, you would install fax server software and a dedicated fax board in the same network server. The fax server software uses the fax board to transmit and receive fax data. The board needs to be connected to the PSTN via dedicated phone lines or connections to your corporate PBX.

The other two network faxing methods make either partial or full use of FoIP potential. The first is almost identical to the previously described method. The user installs the fax software and a dedicated hard-

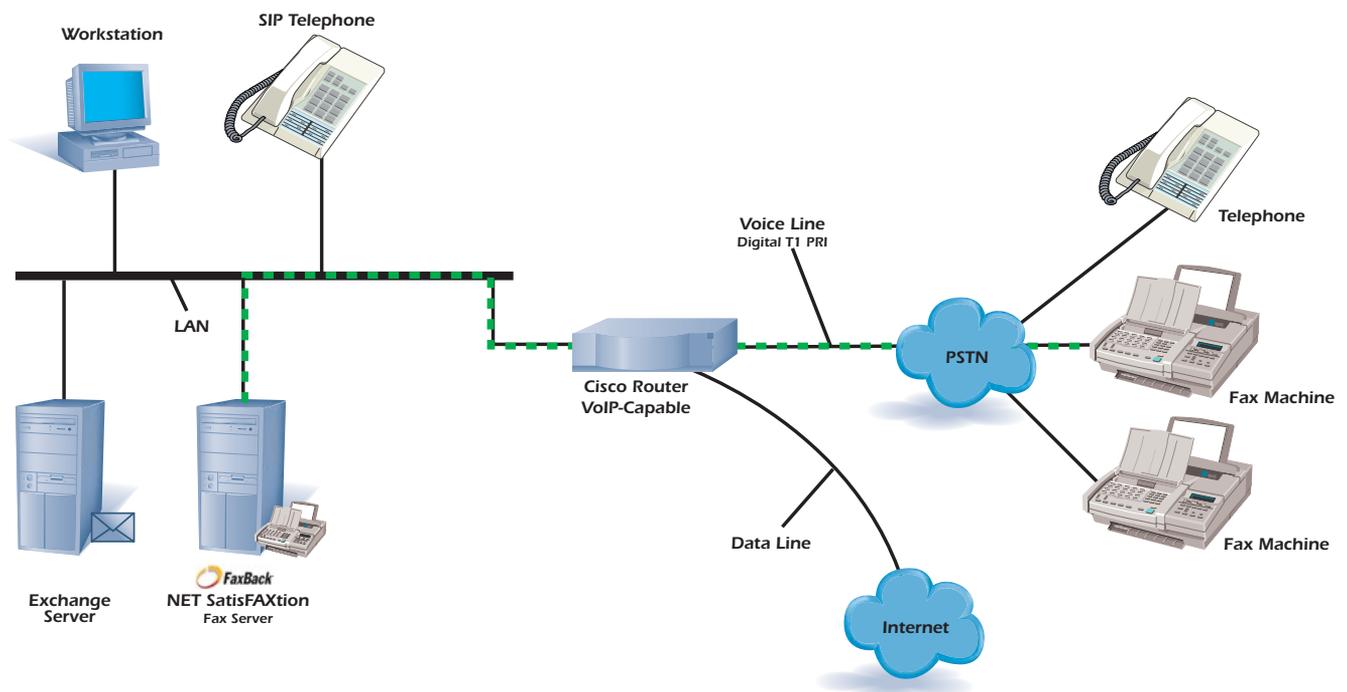
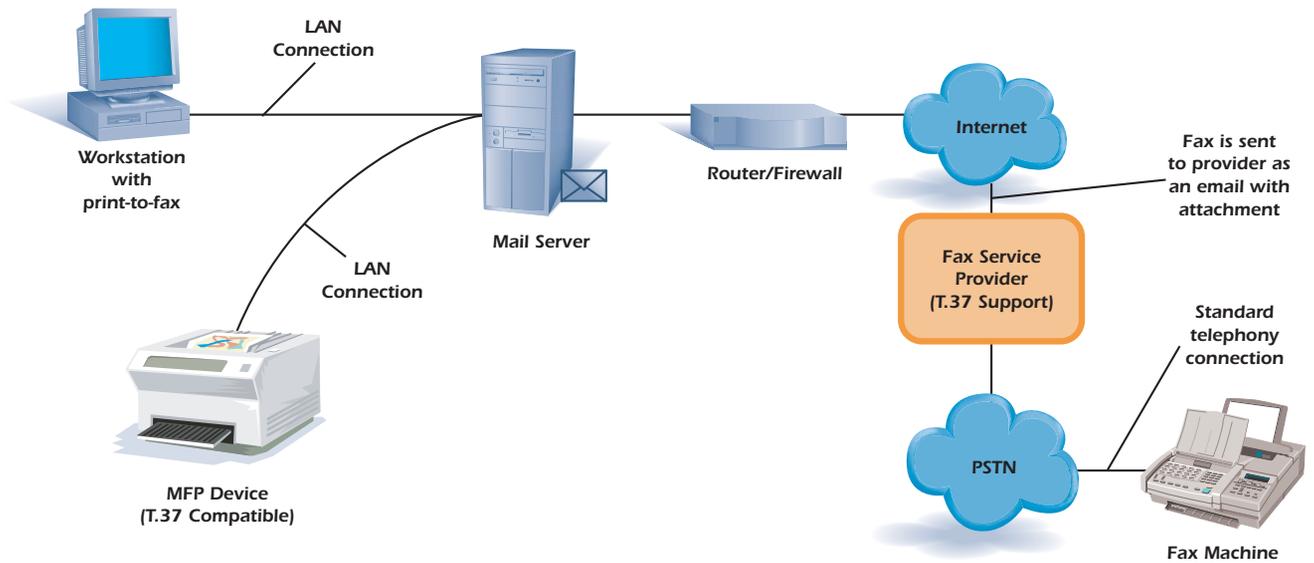
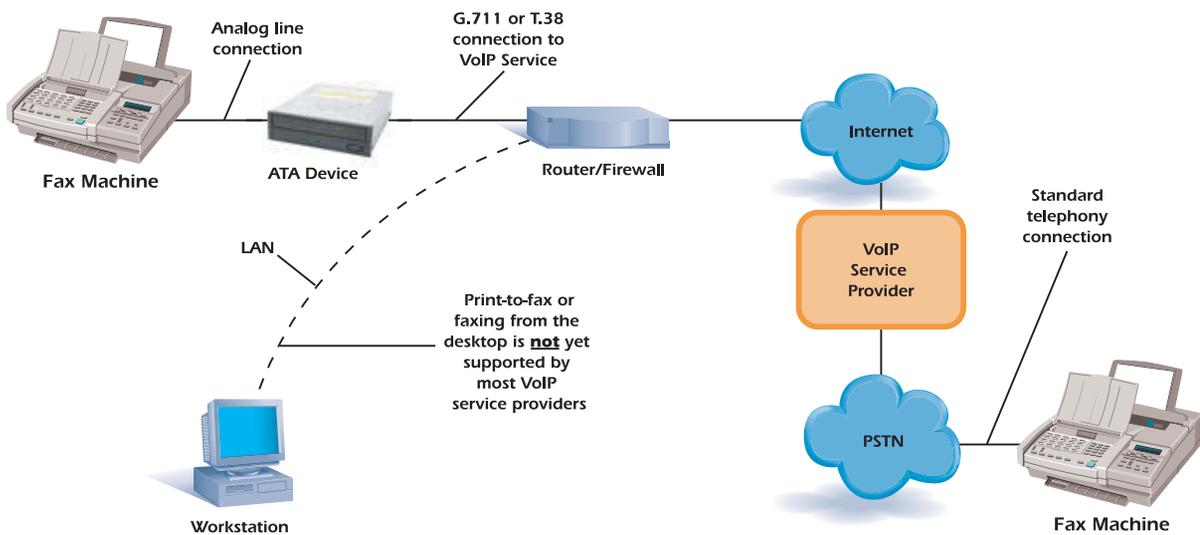


Figure 2 Boardless VoIP Fax Server



**Figure 3** Fax Service Provider (only T.37 store and forward)



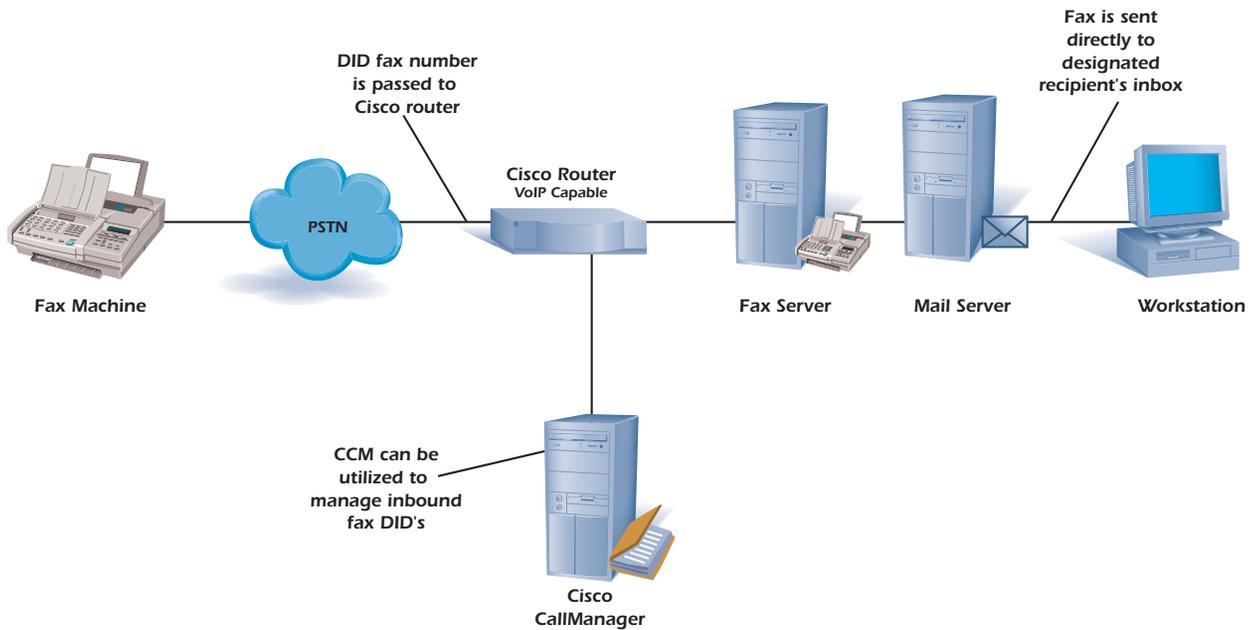
**Figure 4** VoIP Service Provider (fax support through fax machines connected to ATA devices)

ware device in their network server. The fax server software behaves exactly the same as in the first example, treating the fax board as if it were a dedicated analog fax transmission device. You can accomplish communications within the user's network and the dedicated board are made by using the T.38 protocol. Although a FoIP solution, this method doesn't make full use of the existing VoIP infrastructure. And, similar to the traditional network fax server, this solution requires the use of expensive hardware dedicated to supporting fax in your network.

The last method is known as boardless fax. In this case, no additional hardware is required to support the network fax server. The network fax software makes use of the T.38 support that is already available

in the VoIP/FoIP equipment installed in the network infrastructure. It uses the same connection to the PSTN that the voice telephony devices use. As a result, this system makes it possible to connect to any fax device that has a phone number.

The boardless fax solution takes full advantage of existing FoIP/VoIP hardware. (See Figure 5.) The company's investment in the VoIP infrastructure hardware is fully utilized because the FoIP capabilities are already included. Because you don't need to purchase and maintain dedicated fax hardware, boardless fax reduces the cost of faxing and also cuts IT support requirements for the fax servers. However, most companies rarely use these capabilities because fax is rarely considered to be cutting-edge.



**Figure 5** Inbound DID Fax Routing (utilizing Cisco VoIP connection to a fax server)

### Greater Flexibility

Integrating a FoIP solution can also provide you with additional flexibility in your business processes. Because you do not need to purchase additional hardware to support additional users, scaling the fax capabilities of your environment becomes a software issue (adding additional fax server software) rather than a hardware issue—unless your fax volume is sufficiently heavy to require additional dedicated fax servers. But even in that case, adding a dedicated fax server that communicates over FoIP is far simpler and less expensive than adding a server that requires dedicated hardware. When evaluating your business processes or planning your VoIP migration strategy, consider how you could benefit by adding fax capabilities at locations and to applications where they are not currently present.

It is also important to determine how fax fits into your company's overall messaging and communications strategy. While it is not a problem to provide standard network fax services while migrating to a FoIP solution, the IT evaluation needs to determine how and where fax is used within the business process. Because fax isn't going away anytime soon, it is important to consider the use of FoIP while performing the ground-up evaluation of networking infrastructure, especially if you are planning for a VoIP upgrade or migration within your environment. This means including FoIP capabilities in your basic shopping list for network infrastructure hardware, especially if you have not yet committed to VoIP/FoIP-capable infrastructure hardware. It's already built in to most products, though some may require a specific

software upgrade or version to fully support T.38 capabilities (as opposed to T.37 capabilities that have been available since the early 2000's).

Implementing a FoIP solution within your enterprise gives you the advantage of getting more out of something you have already paid for. By maximizing the value of your investment in VoIP-capable network infrastructure hardware, you can improve your bottom line. You can also add capabilities to your computing environment with only incremental software costs and without buying additional hardware and. The tightly integrated fax capabilities of Fax over IP can help to streamline all of your business processes that use fax as a document delivery mechanism.

Fax has come a long way. Not that long ago faxing meant that a person had to walk away from their desk, stand at a fax machine and send documents that would arrive at the recipient's fax machine as hard-to-read paper documents, easily lost amid piles of other faxes. Faxing in 2006 is an integral part of every company's business processes and the level of fax technology currently available makes the delivery of documents via fax a high-quality, secure, easily manageable aspect of the information delivery model for your business. ■

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