

# Fax Over IP — FOIP

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Using the Internet connection to your Acordex image server for sending and receiving faxes can substantially reduce your telecommunications costs as compared to using normal phone lines or T1 telephone lines for faxing. Security is provided inherently in the Fax Over IP protocol.

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## I. HOW FOIP WORKS

Fax Over IP (FOIP) is a method of using the Internet to send a fax.

Normally, a fax machine picks up a telephone line, dials the number of another fax machine and a conversation ensues. You can often hear the beginning of the conversation as a sequence of tones, commonly referred to as "fax squeals." The tones code data using a protocol, called T.30, that precisely defines a stream of data transmitted from one machine to another. That stream of data represents an image of the page being faxed.

With FOIP, the same data stream can be bundled up inside another protocol, called T.38. If we think of the original fax as one person handing a letter to another person, then T.38 is like putting that letter inside an envelope and handing the envelope to the post office. Even though the letter may be in a truck with many other envelopes, the envelope tells the post office where it's going. In the case of FOIP, the T.38 "envelope" carries the original fax data through the Internet. Once it gets to a fax machine or a normal telephone line, the envelope is "opened" and the T.30 data streams into the fax machine which can print the page.

## II. ACORDEX USE OF FOIP

When a user or an automated process wants to fax a document, the Acordex image server will retrieve the document, and digitally encode it using T.38 protocol. The document is then sent out the image server's Internet connection to an Internet Telephony Service Provider (ITSP) who connects us to a telephone line at the most cost effective location to reach the recipient of the fax.

Similarly, your image server can receive faxes from existing conventional fax machines. Those fax machines dial your fax number just like they dial any other phone number. The phone call is "answered" by the ITSP. The ITSP converts the document to T.38 protocol, efficiently sending it to your image server using the Internet.

## III. ADVANTAGES OF FOIP

Historically, sending and receiving faxes at the Acordex image server meant installing a phone line, either plain old telephone service (POTS) lines or T1 telephone lines. Installing a phone line incurs a cost for both the physical wire as well as the minutes used on that wire.

The primary advantage of FOIP is cost. Since it uses the same telecommunications wire already in

place for Internet connection, FOIP eliminates the cost of a second wire used just for faxing. Other differences inherent in using the Internet as compared to the telephone network provide additional efficiencies. The result is that FOIP will provide very significant reduction in your telecoms bill for faxes.

A second advantage of FOIP is that capacity planning is much easier. With traditional phone lines, you must decide how many lines you want to purchase, i.e. how many POTS lines or how many channels on a T1. Once installed, that number is very rigid. If there is a temporary need for more lines, callers get a busy signal, and outbound faxes wait. If you have too many lines, you're wasting money every month.

With FOIP, there is no rigid limit on the number of available fax lines. Instead, you just estimate two things, the maximum and the typical number of concurrent faxes required. The maximum number of concurrent faxes is a software setting that can be changed at any time. The typical number of concurrent faxes, combined with other communication needs, is used to plan the bandwidth requirement of the Internet connection available to your image server. If many faxes are being sent at one time, part of your Internet bandwidth is used to meet that need. Conversely, if fewer faxes are being sent at another time, more bandwidth is freed up for other data needs. Averaging multiple uses together like this is always more efficient than a rigid separation of each use.

#### IV. SECURITY

*Physical security.* Faxes leaving or entering your building on a normal telephone line can be intercepted by someone physically tapping into the wire and listening in (a "wire tap"). Obviously, this is illegal and extremely rare. FOIP does have the same exposure that a person who has physical access to the wires leaving your building could

intercept a fax. It is more complex to find a FOIP message amongst all the data on an Internet wire than it is to find a fax on a telephone wire, but the same opportunity exists in both cases.

*Store and forward security.* Another variation of FOIP, called T.37, moves faxes through the Internet exactly like an attachment to an email. This means that a fax leaving your building is stored on someone else's email server for a period of time as a readable file. It is then forwarded to the recipient's fax machine at a later time. Eventually, the email attachment will be deleted, but this raises the issue of security at the email server, particularly for faxes that contain HIPAA protected or other secure information. Acordex eliminates this security concern by not using T.37. Acordex uses the more complex T.38, which creates a live connection directly from your image server all the way through to your recipient's fax machine. Documents never exists as a file on any intervening equipment.

*Routing security.* Without going into the technical details, there is a type of TCP/IP security attack such as domain name spoofing that involves the very difficult task of corrupting or subverting Domain Name Servers (DNS). Acordex's implementation of T.38 is *not* vulnerable to DNS attack because it does not use TCP/IP. Instead, T.38 is sent over the Internet via UDP, which does not support domain names. UDP has IP addresses preset by the sender. IP addresses are directly interpreted by the Internet backbone providers (companies like Verizon, Sprint, AT&T, Level 3, etc.). Short of a break-in to an Internet backbone used by your Internet provider or the ITSP's Internet provider (which would wreak havoc with the entire Internet), the backbone routers' decision making is highly secure and T.38 messages will be delivered to the intended destination.

## V. IMPLEMENTATION

Acordex offers FOIP services on a monthly contract basis which is added to your normal support contract. The cost per month depends on the number of minutes used. Once the Acordex FOIP service is in place, you simply disconnect your existing POTS or T1 telephone lines currently connected to your image server, thus eliminating the telecoms cost associated with those lines.

Your existing fax phone number usually can be retained. It is moved from your existing telecoms vendor to your FOIP service.

Your Internet connection should be reviewed if you expect to send a large number of faxes at once. For each fax, about 25 Kbaud will be in use for optimal fax performance. This bandwidth will remain in use for roughly forty five seconds per page in the fax. For most companies, using FOIP for one to four faxes at a time will be an insignificant addition to your Internet traffic.

As a high volume example, let's say that you expect twenty concurrent faxes is typical and twenty four is the maximum for your environment (a task that would consume all of a T1 telephone line, or 24 POTS lines). Then you should plan on 500 Kbaud of your Internet connection being used for optimal performance of FOIP, i.e.  $20 \times 25 \text{ Kbaud} = 500 \text{ Kbaud}$ . This represents a third of the capacity of a T1 internet data connection, or about 1% of a T3 data connection.

Lastly, a note for network managers. If you use managed routers that restrict connections to your image server, you will need to permit communication between your image server and the ITSP. Although FOIP uses many ports, there will be only one IP address for sending and one address for receiving FOIP connections.

## VI. CONCLUSION

Acordex image servers are constantly sending faxes at the request of users and under automatic computer control for billing, document distribution and signature requests. Faxes are being received for import by automatic process and by user review.

FOIP provides the opportunity to both reduce costs and increase capacity flexibility in managing faxes.

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