



## WHITE PAPER

# Fax over IP: What is the Right Way to Implement it for Your Organization?

### [About This White Paper](#)

There is a lot of 'buzz' these days about Fax over IP (FoIP) and every faxing organization that implements Voice over IP (VoIP) should indeed take a close look at IP-based faxing. As the acknowledged world leader in fax server technology for many years with its Captaris® RightFax® brand, Captaris along with its partners together have a tremendous amount of practical experience with enterprise faxing installations. In this paper, Captaris takes a look at the present state of FoIP and then offers pragmatic advice to organizations who are looking for a migration strategy that best suits their individual business requirements and best manages their document flow.

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## EXECUTIVE OVERVIEW

The convergence of data and communications networks via the Internet Protocol (IP) is occurring at an ever-increasing pace as organizations look to consolidate equipment and streamline management and administration overhead. The objectives behind this consolidation are simple: to reduce IT infrastructure costs and manage all data and communication applications more efficiently. Because communication technology is quickly standardizing on IP, there is a natural overlap between network applications that already rely on a traditional communications backbone, and the evolving IP-based environments of the future. The challenge for organizations today is to fully understand how existing network applications, including those that are distributed over an enterprise, can take advantage of newer IP-based approaches to data communications.

**Once voice systems have migrated to VoIP, fax communications are the next logical addition to an IP-based environment.**

Companies which have embarked on this new IP path have begun with voice communications. This is a logical starting point, since VoIP standards have been in place for many years, allowing next-generation telephony equipment to become “IP-enabled” and thus making it easy to adopt. Once voice systems have migrated to VoIP, fax communications are the next logical addition to an IP-based environment. Now, as FoIP technologies are progressing, organizations can gain additional benefits from their IP investments by consolidating a fax system into their IP communication backbone as well.

When it comes to fax, the communication backbone used to move the data from one place to another is only part of the story. The network-based fax server application is the true engine behind enterprise-wide electronic document delivery. The fax server acts as a centralized hub for securely and cost-effectively exchanging all types of documents, whether for general communications or for specific document-based business transactions. It captures business documents from a variety of desktop or back-office applications and then applies rules for processing, formatting, tracking and delivering fax documents over a telephone system. A fax server is also often deployed in a distributed environment to provide efficient and reliable faxing services to remote locations such as branch offices, datacenters and back up sites. Because of this proven ability to support a variety of business applications and remote locations, many organizations view their fax server as a mission-critical application.

**When it comes to enterprise fax management, the IP backbone used to move the data from one place to another is only part of the story.**

As IP technology advances, enterprise fax servers are advancing as well and are now beginning to support FoIP communications in much the same fashion as they support telephone-based systems. For organizations considering adopting or transitioning to an IP-infrastructure, the role of the fax server is stronger than ever.

This white paper discusses how fax servers and FoIP investments fit into an organization's overall document delivery strategy. It also calls attention to issues and challenges organizations should consider when determining how best to take advantage of traditional telephone-based systems, FoIP, or a mix of both, with their fax server.

## VOIP AND FOIP OVERVIEW

As organizations continue to build out and expand their new IP infrastructure, VoIP is moving into wider adoption with FoIP following close behind. Both technologies bring traditional telephony applications (voice and fax) into data network environments, allowing organizations to transport phone or fax calls over an IP data network (either a public Internet or an internal network).

Many organizations view this consolidation of data and communications resources as an opportunity for considerable savings and efficiencies because it will allow them to leverage a single, common broadband resource and employ the Internet and company intranets for cost-effective voice, fax and data transmissions.

### VoIP Adoption

Next-generation telephony equipment is now becoming become “IP-enabled”, offering customers the ability to easily adopt VoIP technology and begin deploying voice solutions that leverage their IP infrastructure. As a result, many organizations have begun to recognize the immediate benefits of using the Internet for all or part of their voice communications, replacing or complementing traditional PSTN-based deployments.

Today VoIP adoption is growing rapidly as technology and interoperability issues are being resolved and broadband connectivity has expanded. Now as never before, organizations of all sizes are turning to VoIP to consolidate their communications infrastructure. According to some industry estimates, adoptions of enterprise VoIP in North America will increase significantly in the near future.

#### VOIP SERVICE REVENUE GROWTH ESTIMATES FROM 2005 TO 2009

- \$2.6 billion to \$13.3 billion in North America
- \$2.3 billion to \$12.7 billion in Europe
- \$4.2 billion to \$12.9 billion in Asia Pacific<sup>1</sup>

This growth of VoIP is driven by several factors. According to Infonetics Research the top four drivers for VoIP adoption are:

1. Having an integrated phone system across multiple locations
2. Ensuring scalability
3. Reducing operational costs
4. Converging voice and data networks.<sup>2</sup>

### FoIP Adoption

Most organizations implementing VoIP also need to provide their users with reliable faxing capabilities. If voice communications can be effectively deployed with an IP foundation, then it is logical that fax communications can take advantage of it as well. After all, organizations have benefited from the consolidation of fax with voice systems in various unified messaging applications for many years. Traditionally, these systems have been based on the time-tested and reliable PSTN and backed up by the T.30 fax protocol, which is used to establish and maintain communication between two fax devices.

#### Sales of FoIP will more than double by 2010.

Now FoIP standards have been developed which make it possible for fax transmissions to be transmitted over the Internet. As a result, traditional telephony manufacturers have begun developing communications equipment that can support fax data via FoIP as well. Although fax adoption will be slower than voice adoption, it is still expected to ramp up quickly. As fax industry analyst Pete Davidson of Davidson Consulting notes, “the market for FoIP systems started to show up in force in 2005...this led to a market that grew by 180% to \$31 million.”<sup>3</sup> He also

<sup>1</sup> *User Plans for VoIP: North America 2006*, Infonetics Research

<sup>2</sup> *User Plans for VoIP: North America 2006*, Infonetics Research

<sup>3</sup> *Computer-Based Fax Markets, 2005-2010*, Davidson Consulting

notes that, “FoIP sales actually seemed to keep the market from growing in 2005 as many customers kicked the tires and decided not to buy into what remains an immature market.” Nevertheless he estimates that FoIP sales will grow by a 50.7 percent compound annual growth rate (CAGR) to \$245 million in 2010.<sup>4</sup>

Which organizations will be the first adopt FoIP? In our estimation it will be organizations that are:

- Planning to transition to an all IP environment
- Planning to consolidate their voice, fax and data communications
- Striving to take advantage of existing network infrastructure investments
- Planning to reduce the total cost of ownership for their fax server

### FoIP Technology

There are two main types of FoIP technologies<sup>5</sup>: store-and-forward (T.37) and real-time (T.38). Both methods use the standard T.30 fax definition to recognize transferred data and to maintain compatibility with existing fax devices. The primary difference between these two approaches lies in method of delivery and confirmation receipts.

Real-time FoIP (T.38) is based on the International Telecommunications Union (ITU) standard T.38 and describes the technical features necessary to transfer facsimile documents in real-time between two standard Group 3 facsimile terminals over the Internet or other networks using IP protocols. T.38 is the preferred FoIP protocol as it aligns with the behavior of faxes over PSTN. As with T.30, the IP fax transmission is handled like a standard fax call and an end-to-end communication is established. Moreover, a fax server that sends or receives faxes using T.38 looks just like any other non-FoIP fax device to its partner. The two end points establish a session, send and verify the transmission of one or more pages and then complete the session with active confirmations from both sides. The difference with a FoIP-enabled server is that the first part of the communication session from the server to the network traverses an IP network rather than traversing directly over the PSTN. If the partner device is directly addressable on the same network, the session can use T.38 for the entire transmission. But if the devices are separated by the telephone line, the IP switch manages the “unwrapping” of T.38 packets into standard T.30 fax transmissions over the PSTN.

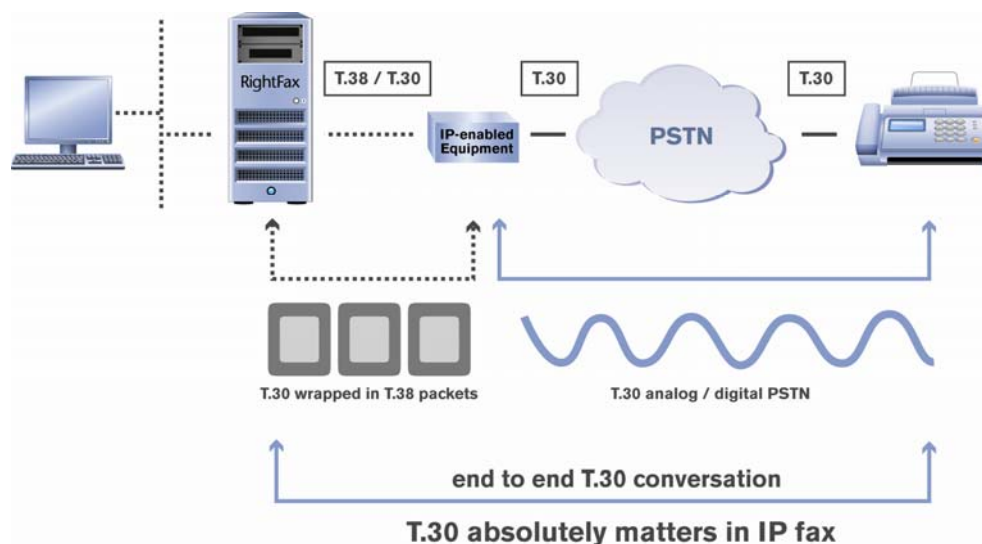


Figure 1. T.38 encapsulates the time-proven T.30 fax standard.

T.38 is the main driver of today’s advancements in IP faxing and is the protocol of choice for organizations seeking to use their IP infrastructure to reap the benefits of real-time fax communications. T.38 protocol support is built into almost every leading manufacturer of IP routers, IP-PBXs or media gateways. It can be supported via a class of intelligent fax boards that can provide either T.30 PSTN or T.38 FoIP output or via the fax server software directly without using intelligent fax boards.

<sup>4</sup> *Computer-Based Fax Markets, 2005-2010*, Davidson Consulting

<sup>5</sup> *A third technology, G.711, also exists but has become technically inferior to T.38 and is no longer widely used.*

T.37 is the other FoIP protocol. T.37 is an ITU standard for sending fax across IP networks in a store and forward mode. Fax messages are sent as Multipurpose Internet Mail Extensions (MIME) encoded using SMTP. When using T.37 as a transportation mechanism, the fax is sent over IP as an email attachment and delivered to an email address or via a gateway to a fax device using a standard PSTN. No matter which protocol is used, the best place to support any FoIP environment is with a network-based fax server application that supports any transport layer necessary to meet the wide variety of document delivery requirements.

## OVERVIEW OF FAX SERVER USAGE WITHIN AN ORGANIZATION

**The best place to support any FoIP environment is within a network-based fax server application that supports any transport layer necessary to meet the wide variety of document delivery requirements.**

Organizations conduct many business transactions that involve the official use of paper documents. Faxed documents represent unalterable, legally binding transactions that are essential for business processes such as invoicing, purchasing, finance, legal and supply chain management. And while email has become the dominant medium for *ad hoc* business messaging, fax traffic continues to grow in support of key business transactions because fax communications are more tamper-resistant, more secure and provide more reliable delivery and delivery notification options when compared to email. To manage the high volume of inbound and outbound faxes that are part of normal business activities, for years companies have relied on the horsepower of a client-server application known as a network or enterprise fax server. Users on the organization's local area network (LAN), wide area network (WAN), internal intranet, or virtual private network (VPN) can access the fax server through an email client such as Microsoft Outlook or Lotus Notes, through a Web browser, or using specialized fax programs. Network-based fax server applications long ago replaced fax machines as the most cost-effective, secure and efficient way to electronically deliver and receive documents. In addition, some fax servers are capable of extracting data from host or mainframe applications and automatically delivering thousands of invoices or purchase orders to individual recipients.

Today the network-based fax server is the hub of many document-centric business applications and is considered a mission-critical application for a variety of reasons including the ability to:

- Integrate with essential business applications such as CRM, general office programs, document management, email, ERP and host systems as well as MFPs
- Provide proven, reliable and secure electronic document delivery, receipt, tracking and management
- Consolidate faxing services for an enterprise
- Distribute fax and electronic document delivery services across the enterprise, including remote locations

### Benefits of Fax Servers using FoIP

Organizations that are adopting an IP Telephony environment may further streamline their messaging infrastructure and enhance the benefits of their existing fax server by enabling it to support FoIP communications. More than 500 fax server users and potential users were surveyed on their IP fax needs and expectations. They listed the following benefits as the most significant when implementing an FoIP solution:

1. Total Cost of Ownership (TCO) savings due to network consolidation
2. Ability to push consistent fax solution throughout the entire network including remote locations
3. Improved IT management
4. Device/application integration
5. Toll bypass
6. Better utilization of new IP equipment
7. Eliminate the fax boards<sup>6</sup>

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<sup>6</sup> IP Solutions Research 2006, Phinney Bischoff

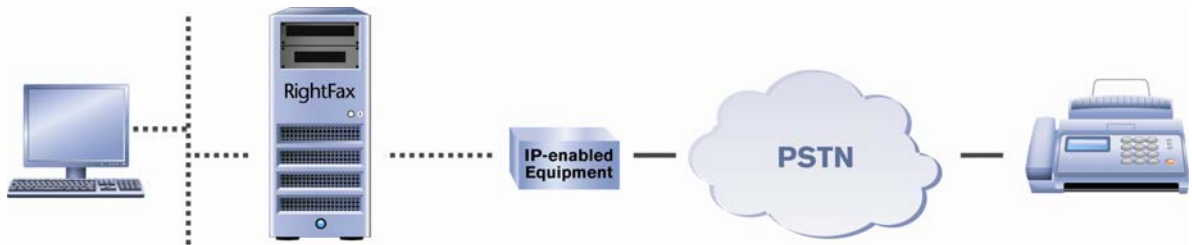
## RIGHTFAX AND FOIP

RightFax is the proven market leader in fax server and document delivery software. It delivers the most reliable and robust fax software solutions to integrate and automate the flow of a full range of fax, paper and electronic documents and data, enabling enterprises to achieve significant cost reductions. By using a RightFax Server, companies can securely and efficiently deliver business information from virtually any application via fax, email, print devices or over the Internet.

### Transport Methods Supported by RightFax

Today, RightFax offers the flexibility needed by organizations that are expanding their communication infrastructure to readily adopt IP support, offering choices that include hardware-based PSTN; hardware-based FoIP and software-based FoIP (T.37 or T.38) options.

Traditionally the RightFax application has used hardware devices known as intelligent fax boards, to function as an interface between itself and the PSTN. In order to support FoIP however, RightFax can use hardware or software to accomplish this goal, only this time it can place the fax data out onto an IP-based network using the T.38 FoIP standard. The fax server will now “talk” to network equipment such as IP-PBX, routers, or media gateways that must be able to support FoIP protocols.



**Figure 2. End to end communications using RightFax and FoIP.**

In the scenario shown in Figure 2 the fax document originates from the RightFax Server “endpoint” and travels as IP packets using FoIP software as a transport mechanism. It transports the packets to FoIP-enabled communications equipment. At this point the fax packet may travel over the Internet for all or part of its lifecycle, much like a regular VoIP call. In some scenarios a fax transmission may never touch the PSTN at all, although in most business settings the fax must eventually end up on a recipient’s PSTN-based fax machine.

### Why RightFax is Important in an Evolving IP Environment

RightFax was designed as a flexible centralized document delivery hub which can support FoIP, traditional PSTN or both. With the advent of T.38 IP faxing and ever-changing communications requirements, the RightFax application is even more critical for developing a reliable, robust and adaptable document delivery environment.

#### 1. RightFax is integrated with a variety of mission-critical applications.

Integration to office programs, document management, email, ERP, workflow, MFPs and other applications used in ad hoc communications is essential to business operations. A RightFax Server can manage thousands of faxes a day generated from those applications, and it can manage all the faxes received from suppliers, customers or partners outside the organization, all of which need to be received and processed in a timely manner.

#### 2. RightFax is an effective on-ramp to FoIP.

As a relatively new technology, FoIP will continue to evolve and go through transitions in performance and updates to standards. As with all new technologies, organizations are advised to migrate carefully. Captaris and its partners are committed to make this transaction as smooth as possible to our customers. If you are not quite ready to move to FoIP, then RightFax offers a wide selection of PSTN solutions plus the migration path to FoIP as you become more familiar and comfortable with this technology. RightFax is an effective on-ramp to an FoIP environment for several reasons:

FoIP represents one transport mechanism among the many that fax servers can support. Industry analysts agree that FoIP is a relatively new technology and like all new technologies, organizations are advised to migrate carefully. Most organizations will still need a reliable method of exchanging faxes electronically that is already leveraging the Internet and which is poised for the coming future of IP-based communications. RightFax fits this role and is an effective on-ramp to an FoIP environment for several reasons:

- RightFax has been a network-based data application for many years, leveraging LAN/WAN Internet protocols both inside and outside the company firewall to integrate with other business applications and support distributed deployments across company enterprises. Now with FoIP support, RightFax easily integrates this new method of transport to leverage a company's IP-telephony investments.
- The ROI proposition of a traditional fax server that is PSTN-based now can be future-proofed against changing communication trends towards IP, with the potential of even further raising the ROI.
- RightFax provides the flexibility to integrate with hardware or software FoIP solutions, enabling users to choose the best fit for their operations.

### 3. RightFax provides reliable fax availability in a distributed environment.

RightFax can be distributed across many enterprises and continues to advance with the needs of large and small enterprise customers. Multiple RightFax application servers can share databases in a central location, no matter where the distributed offices or workers are located. Furthermore, RightFax supports remote offices or datacenters by distributing various services across a company LAN/WAN so remote office workers can seamlessly create, send and receive faxes from their applications locally. As a result, companies with multiple offices or distributed locations are

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easily served by the networking abilities available with a RightFax including satellite servers, remote processing services and a wide range of client applications tailored to specific business needs.

The capacity of a RightFax Server can be multiplied by combining two or more servers to share a common RightFax database. Furthermore, a RightFax Server can support offsite locations by distributing various server services that can run remotely. The most popular remote service is called the Captaris *DocTransport* service (patent-pending), which can be configured to transport RightFax documents over a PSTN via fax boards or over an IP backbone as FoIP packets. This means that remote DocTransports can operate at off-site locations and can be linked to the centralized RightFax database while at the same time providing a local telephony presence

without the need for a full-blown RightFax Server installation. Another benefit is that DocTransport resources can be shared by any RightFax Server operating on the network allowing for load-balancing and high-availability. In a topology such as this, faxes being received at a remote site are captured locally by the service, and then sent to a centralized RightFax Server for processing. In the event of a network failure, the doctransports will store the received faxes and forward them when the network is restored.

## DEPLOYING A RIGHTFAX AND FOIP SOLUTION

Today, a RightFax Server can support an ever-changing set of communications requirements and should be included in any IP consolidation initiative so there is a well-thought out strategy for how to take advantage of existing PSTN-based communications protocols and FoIP. Some organizations may choose a cautious path to migrate fax to their IP infrastructure, as there are significant differences between voice and fax data that will factor into decisions about how, where and when to deploy FoIP, PSTN, or both.

The difference between voice and fax data spans both the business usage of the fax data and the specific nature of the content inside the data packet. Faxes, unlike voice exchanges, represent legal and binding business documents that are the lifeblood of business. Documents such as invoices, applications, orders and claims are typically captured by a fax server and then delivered internally and externally. Because delivery of these documents is essential to business operations, the fax server must use a robust and reliable communications backbone. Without a reliable communications backbone, a fax server could not function properly. Traditionally PSTN-based networks have served this function well because of their years of proven reliability. IP-based faxing on the other hand is a new technology.

Does this mean the IP backbone is less reliable than the time-tested PSTN? Not when it is managed by a RightFax Server. Since the RightFax Server is doing the heavy lifting to ensure documents are delivered, routed and tracked, the underlying telecommunications protocols and network infrastructure play a secondary role. The good news is the FoIP standards that have been adopted today actually encapsulate the PSTN-based T.30 fax protocol that has been used for many years. This means IP consolidation of fax does not sacrifice the time-tested, reliable protocol. Business decision makers have the assurance of document security and transactional integrity, while IT and telephony administrators realize the benefits of IP consolidation: a single point of administration, efficiency gains, and the ability to gain more from their IP network investment.

FoIP brings many benefits, and when deployed properly with a RightFax Server it can be the right transport mechanism for an organization. Other organizations may choose to remain with a PSTN-driven approach, or choose a hybrid PSTN/FoIP approach. In this latter scenario, most fax documents will still travel along PSTN networks for some or part of their journey from source to destination. This is especially recommended when documents are exchanged with third-parties such as customers and suppliers, who may send and receive faxes using traditional standalone fax machines.

## RIGHTFAX AND FOIP CONSIDERATIONS

When considering FoIP communications as part of an organization's RightFax Server strategy, there are some important factors to be taken into account when weighing the tradeoffs between traditional deployments using PSTN or those using an IP solution. One of the challenges is navigating the variety of possible configurations and topologies that might exist to support a wide range of individual environments. Another challenge is to understand the amount of extra equipment that may be required. FoIP-enabled routers, media gateways and switches need to be considered right alongside fax servers and intelligent fax boards.

**Trade-offs of hardware versus software** Intelligent fax boards have been deployed side-by-side with fax server software for many years and are the time-tested, proven configuration of choice. Intelligent fax boards use on-board Digital Signal Processing (DSP) technology with some advantages over their software-based counterparts. DSP does not burden the application server's CPU, thus leaving the majority of a server's processing power for the fax server application software. In a software-based FoIP implementation T.38 fax data packets are not processed with the DSP chips but now add to the processing load of the fax application's server. On the other hand, intelligent fax boards require additional server hardware and space, as typically they are placed in a remote server or placed at a different location.

**An organization should carefully consider all the information before selecting a software-only FoIP backbone.**

It is widely assumed that using a software-driven FoIP backbone automatically means that other hardware requirements will decrease or that the path a fax data packet traverses is lessened or made simpler because the intelligent fax board is eliminated. That is not always the case, and an organization should carefully consider the following information before selecting a software-only FoIP backbone. While it appears that software-based FoIP may reduce the need for certain hardware assets such as specialized fax boards, it may increase the need for other hardware assets in other elements of a telecommunication system. Many types of network equipment designed to support faxing still require some type of fax card in order to properly support fax traffic. Furthermore, data traveling along a FoIP path may actually take more steps to reach its final destination since it must go through PSTN switches, IP-enabled switches, routers and gateways—all of which must be enabled or configured to accept and pass through T.38 fax data. This means the amount of hardware required to process a fax that is using FoIP for all or part of its transmission may actually increase rather than decrease. In this scenario, the only decrease in hardware is removing the intelligent fax board from the equation.

**Voice-integrated features and faxing speed** At the time we wrote this paper, some of the familiar features enabled by a fax board connected to a PSTN were not yet fully implemented in a comparable FoIP solution. For example, voice-integrated features such as support for Dual-tone Multiple-frequency (DTMF) and human-answered fax may not be available with FoIP. Moreover, hardware-based fax boards today support bidirectional transfer speeds as high as 33.6 kilobits per second under the popular V.34 standard, something that is not available with FoIP today due to current limitations in FoIP-enabled network equipment. If voice-integrated features or higher faxing speeds are required in an application, considerations should be made to include fax boards and PSTN as part of the total solution; RightFax can do that. As FoIP continues to evolve, we expect that feature parity with fax boards will become the norm.

**Capacity, bandwidth and supporting remote sites** Because T.38 FoIP sessions remain open for the length of the fax transmission, FoIP does not eliminate the need for dedicated fax channel connections between the IP network and the fax server. Therefore the channel capacity requirements for a FoIP-based RightFax Server are no different than if the system is configured to support traditional PSTN. Another consideration is network bandwidth requirements. If the RightFax DocTransport service is running locally on the same machine as the RightFax Server, then FoIP may have little impact on network bandwidth. However, many organizations with remote locations will need to take into consideration that open T.38 sessions need to be supported end-to-end while traversing over the LAN/WAN, including calls originating from a remote location. This means a remote site with any significant volume of faxes may consume greater bandwidth since it must connect to the central RightFax Server with a T.38 session per channel. On the other hand, a RightFax system running a DocTransport service at the remote site can receive fax calls and send the documents directly to the centralized RightFax database without the need for a T.38 packet session. This means it will not require the high amounts of bandwidth needed to support end-to-end T.38 sessions for the length of a fax call since it is using a process that copies fax data to a database, rather than a session-based IP transaction. And finally, it is important to remember that remote DocTransports offer the additional advantages of fax data preservation, load-balancing, and communicating directly to the centralized database. Therefore, it is recommended to utilize doctransports in conjunction with FoIP equipment to fax-enable any remote location.

## SUMMARY

VoIP and FoIP are gaining acceptance as maturing technologies enable organizations to transition to a unified IP infrastructure for voice, fax and data communications. FoIP is a good option for organizations that want to compound the existing benefits of their fax server and maximize the payback from consolidating voice, fax and data traffic on an IP network. Before transitioning to FoIP as a fax communications backbone, organizations are advised to carefully evaluate their faxing environment and just as important, their long-term document delivery strategy.

### **The enterprise fax server remains the cornerstone of any faxing environment including FoIP.**

The enterprise fax server remains the cornerstone of any faxing environment because of its ability to integrate with business applications and provide a centralized hub to ensure documents are delivered, routed and tracked in a secure, efficient and reliable manner. Because the documents delivered by fax servers are essential to business operations, organizations should carefully consider reliability, bandwidth, processing overhead and the ability to support distributed or high-volume environments among other factors when determining which fax communications backbone to use with their fax server. PSTN and IP both have pros and cons. As a result, hybrid scenarios may become the norm and organizations may choose to transition to a FoIP backbone when the right opportunities exist.

## ABOUT CAPTARIS, INC.

Captaris, Inc. is a leading provider of software products that automate business processes, manage documents electronically and provide efficient information delivery. Our product suite of Captaris RightFax, Captaris Workflow and Captaris Alchemy® is distributed through a global network of leading technology partners. We have customers in financial services, healthcare, government and many other industries, and our products are installed in all of the Fortune 100 and many Global 2000 companies. Headquartered in Bellevue, Washington, Captaris was founded in 1982 and is publicly traded on the Nasdaq National Market under the symbol CAPA. For more information, please visit [www.Captaris.com](http://www.Captaris.com).

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