

White Paper - Whither the Fax Server?

July 16, 2003

The fax server has been with us for over 15 years, but will it be around for another 15? Some would say that fax is dead. But don't count on that. It's difficult to overestimate the endurance of entrenched technologies, especially when they are affordable, useful, easy-to-use and serve a critical purpose. As long as there are paper documents with no electronic source available, there will be a need for fax or its equivalent. But what about the fax server and its hardware foundation, the multi-line fax board?

It also should prove to be enduring, but not, necessarily, in its present form. Because of its high cost, the enterprise fax server doesn't serve many smaller organizations, except for those where the function is business critical. And if the price is lowered to the point where it is affordable for the small-to-medium enterprise (SME), the margins in each sale don't support the traditional VAR-dealer distribution channel. Moreover, as a stand-alone system, a fax server typically requires on-site installation and training, moving it even further away from the SME. If the benefits of the enterprise fax server are to be affordable and widely available, fax, as a message medium, must become an integrated component of corporate communications systems. But how?

Over the next 10 years, the fax-server function will become widely available, but not as a stand-alone system; it will be a service. IP, SIP, and integrated-application hosted communications services will make it happen.

For service delivery of applications such as PBX and messaging, IP networks make the location of the equipment irrelevant. IP allows the choice of location to be weighted more towards other considerations, such as operations, service, and support costs. So, just as the advent of VoIP has given new life to the hosted PBX, Internet fax has the potential of eliminating the need for CPE fax servers, subsuming and then expanding a \$100-million-plus market in the process. What's more, a strong case can be made that the ultimate market winner in hosted communications will be the provider of a seamlessly integrated offering. To emphasize the market power of bundled applications, Larry Ellison, CEO of Oracle, says, "Best-of-breed is dead, except for dog shows." If this applies to the fax server then even as a hosted application, the stand-alone server will disappear, just as stand-alone word-processor and spreadsheet applications have disappeared.

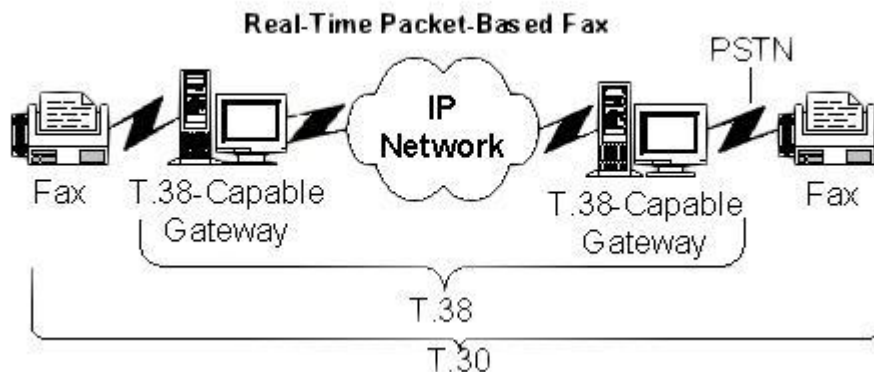
There are services being offered today from many companies that use the Internet to move the server from the enterprise to the facilities of the service provider. But there is one big difference between the function of these services being offered today and the current PSTN-based systems: they are all based on store-and-forward rather than real-time fax. The service provider's system is connected to the PSTN for non-subscriber fax transactions. Other fax documents

are exchanged with the subscriber using e-mail or some equivalent, so the real-time nature of PSTN fax is lost. This means faxes are sent from the client's PC or fax terminal to the service provider's server. From there, they are forwarded to the destination terminal.

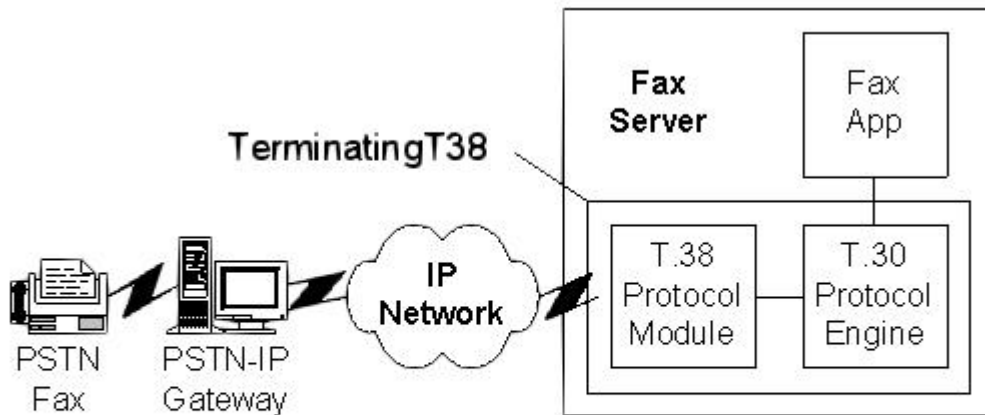
And what about those servers? Well, they are expensive. Multi-line fax boards haven't kept pace with the rest of techdom, or even telecom, in improvements in price/performance. So not only are CPE servers expensive, so are those being deployed by the service providers. At several-hundred dollars per port they don't compare very favorably with the under \$100 per-port price tag of other media technologies.

The non-real-time fax delivery model means an adjustment in behavior, even if none is desired. With classical fax, the paper is fed into the machine on one end and it comes out on the other end. That's real-time fax. You know what happened. If the received image isn't acceptable, you get a call in a few minutes requesting a resend. If there's a problem on the called-terminal end, you call. A store-and-forward model moves all of this to the service provider, which can have both good and bad points. The service provider (and they provide different levels of service) becomes responsible for the retries, and, possibly, even the phone calls. Regardless of diligence, the service provider will send an acknowledgement fax or e-mail to the subscriber.

So, why can't the industry completely duplicate and improve the functionality of the PSTN fax? Because, until recently there has been a missing technology ingredient: T.38.



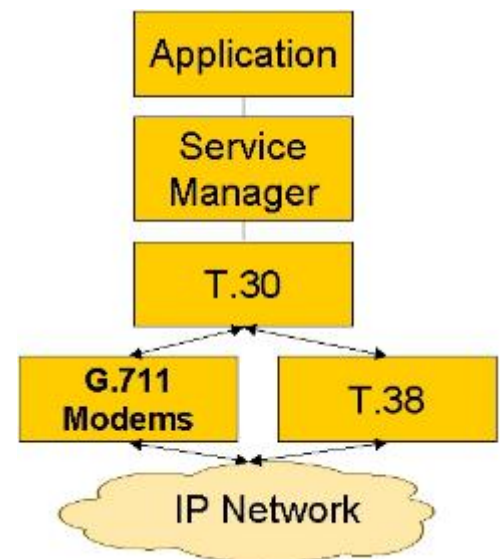
Approved in 1998, T.38 is the ITU interoperability recommendation for sending real-time faxes over IP transports. In the diagram above, the two IP-PSTN gateways use the T.38 protocol to make the IP network transparent to the T.30 protocol executing on the PSTN-connected terminals. T.30 is the ITU recommendation used by the fax terminal in your office to "talk to" another fax machine.



Real-Time Packet-Based Terminating T.38

Gateways send faxes on their way; servers terminate faxes. Hosted IP-based fax-server applications can't duplicate and then extend the function of PSTN faxes unless and until they can terminate T.38 (real-time) faxes. Call it "terminating T.38". It's pictured below.

Terminating T.38 is analogous to the "intelligent fax boards" used in traditional fax servers. Both have T.30; without it, they couldn't communicate with another fax terminal. But instead of the analog fax modems of the fax board, terminating T.38 has the T.38 protocol engine. No DSPs are required since T.38 is not a signal-processing task. With T.38, PCM stops at the gateway. The demodulated bits are what's sent across the IP network, not the PCM data, which requires 10 times the bandwidth.



We can take this a step further. Not all gateways are equipped with T.38. Those that don't have T.38 try to get faxes through by switching out low-bit-rate voice coders, if they are being used, and devote 128,000 bps of bandwidth to use "G.711 pass-through" to get the fax transaction across the IP network. If few packets are lost or arrive out of order this approach can actually keep the analog modems on each end locked onto the signal. But this method can't compete with the integrity of T.38 faxes. Regardless of which method is used, the server will have to cope with them. In that case, "multi-modal" terminating fax is required.

Multi-modal fax has one T.30 protocol engine, but the call stream takes one of two different routes to get there. For T.38-capable gateways the stream is routed through a T.38 protocol engine; for G.711 pass-through gateways the stream is routed through analog modems.

And there is yet another way to get faxes across an IP network, but it's not real-time. Some gateway vendors have added T.37, the ITU recommendation for store-and-forward (e-mail) fax, to their products. This means the gateway terminates the fax and sends it to an IP-connected server, which is then responsible for forwarding it on to another T.37-capable gateway. The gateway is then responsible for sending it over a PSTN connection to the destination machine.

The Service Providers

Service providers, the companies that will someday bring big-company integrated communications to the SME, differ in how far they extend the reach of their IP networks.

There is a new cohort of service providers, mostly voice related, springing up to take advantage of the service capabilities and cost effectiveness of IP telephony. These companies, such as Net2Phone, deploy extensive facilities to provide any-to-any terminal service, such as phone-to-phone and PC-to-phone. This means not only substantial investment in equipment but setting up peering arrangements with local-exchange carriers in each operating access area. Although some of these networks employ T.38-capable gateways, few of them have opened their networks to third-party fax service providers. When they do, fax-broadcast service providers will not need any "fax boards". Instead, they will utilize the facilities of these service providers to route the real-time T.38 session to the correct point-of-presence, through a T.38-capable media gateway, and, finally, to the PSTN-connected terminal.

Then there are the business models that don't require high-capacity gateways deployed in advance of subscribers. This includes companies providing dial tone, such as Vonage and C-Beyond, and hosted PBX services, such as Cinergy and CeriStar. The hosted-PBX service providers bring IP-based PBX to the premises over DSL, T1, or whatever high-speed connection is available. Their investment in access equipment is incremented on a per-subscriber basis since IP is extended to the premises, and the access device is sized to the needs of the residence (e.g., Cisco ATA-186 for Vonage). None of these providers offer hosted fax applications. (Try searching Google for "hosted PBX" ANDed with "hosted fax".)

The last category is the IP fax-service provider, such as J2 Global Communications, Venali, Protus, and Webley. These companies invest in fax servers to provide delivery to PSTN fax terminals. The servers generally employ high-capacity multi-line fax boards, sometimes in multiple locations, such as J2 Global, and concentrated, such as Webley. The back end of these systems is the store-and-forward e-mail-based connection with the subscriber client. Some of them, such as Venali, offer hosted enterprise fax.

Functional Equivalency in Hybrid Networks

The addition of IP-based fax-capable media servers to the mix of IP-based service platforms significantly broadens the commercial possibilities of the business models profiled above by finally providing functional equivalency with PSTN-only fax servers.

For many businesses where fax is a mission-critical function, relinquishing control of the server is not an option, but taking advantage of the economic advantages of IP-based fax transport remains attractive. This does not mean the server must be CPE; it only means the business maintains control. The server function can still be hosted by a service provider, but control remains with the user.

As IP-centric service providers add terminating-fax functionality and T.38-capable gateways, the nature and foundation of enterprise fax will change. Store-and-forward fax will remain a viable alternative. But, with the addition of terminating T.38, the seamless transport of real-time fax over IP will finally become a reality.