

Making Fax Play Nice with Unified Comms



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Abstract

A business migrating to an IP-based unified communications solution cannot simply assume that its faxing processes will integrate smoothly and easily into the new environment.

All evidence suggests that the analogue telephone network is in its final days. To cite just one example, according to UK communications regulator Ofcom, the number of fixed landlines in the UK dropped by tens of thousands per month between 2013 and 2014, in favour of newer technologies such as VoIP.¹

As more services become available via IP — voice, videoconferencing, instant messaging — businesses are moving to Unified Communications (UC) platforms, converging all voice and data into a centralised IP environment. But what happens to an organisation's fax processes in an IP migration?

Many of these businesses understandably assume that in their adoption of a UC platform, fax would also make a seamless transition. But these businesses often discover — usually only after the migration — that IP presents unique technological challenges for fax that make the newer systems even more trouble-prone than legacy, analogue fax infrastructures.

Fortunately, there is a cost-effective, convenient solution for businesses that have tried and failed to make fax work on their IP platform. That solution is digital cloud fax.

Executive Summary

According to a 2015 report by Transparency Market Research, businesses across the EMEA region (Europe, the Middle East and Africa) are rapidly migrating to unified communications (UC) platforms — switching to Internet Protocol for telephone usage (through VoIP), instant messaging, video conferencing, voice mail, desktop sharing and faxing.

In fact, the report forecasts that at the rapid rate these companies are moving their communications to the cloud — an estimated 21% compound annual growth rate through 2018 — EMEA businesses' adoption of UC platforms will “easily outpace the market's growth in North America.”

Although these companies can expect to realise significant benefits from migrating many of these communications to the cloud, one area where they will likely face compatibility issues is with faxing in their new IP environments.

Speaking with CTOs, IT Directors and other technology leaders at hundreds of corporations, we've learned that when businesses attempt to move an analogue fax infrastructure to their new IP networks — hoping to realise the same benefits their other communications have enjoyed — they frequently find more problems instead of benefits. Fax, it turns out, was not designed for a packetised transmission protocol, and the many problems that stem from this fundamental reality make IP-based faxing a larger problem for IT departments than maintaining their aging in-house fax infrastructure.

Businesses still dependent on faxing need a fax technology that leverages the cost-savings, enhanced security and simplified administration that IP offers over a traditional analogue fax system, but that is also designed specifically to work reliably over the Internet.

This paper discusses such a solution — digital cloud faxing. It uses secure email for sending and receiving faxes over the Internet as data transmissions over data (IP) networks. Simultaneously it leverages best practices in cloud technology to allow for automatic and secure archiving of faxes and detailed usage reporting for businesses and enterprises.



1. Comparison of year-over-year Communications Market Reports from UK communications regulator Ofcom:
http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr15/CMR_UK_2015.pdf and
http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr14/2014_UK_CMR.pdf



Background: the Technological Challenges of IP-Based Faxing

Perhaps the best way to understand the unique challenges IP poses for faxing is with a transportation analogy. A standard fax traversing the telephone network enjoys the same direct route and traffic-free trip of a motorcade for the Prime Minister as it makes its way across a city, with all road lanes cleared from start to finish.

By contrast, an IP network designed for sophisticated, multi-use UC frameworks is built like a 12-lane motorway. Traffic is frenetic and decidedly mixed with voice, video, and data all making the journey. And yet, this seemingly chaotic network offers enormous advantages. For example, US-based MICOM Communications Corporation, which in the 1990s manufactured wide area networking (WAN) products, used the tagline “Voice rides for free” for its convergence hardware. The idea was that a business sending large amounts of data over the Internet could realise cost savings by moving its voice communications to the same network and eliminating its phone lines.

A key advantage of IP for voice and data communications is consolidation and compression. Sending voice and data transmissions over an IP network — in compressed, packetised form — saves bandwidth and, more often than not, maintains high quality. Packetising data and voice and sending it over an IP network works well because data and voice efficiently handle delays, re-routes, and packets arriving out of sequence.

With a phone call, dropping a packet can be annoying, but the connection itself survives — and our amazing human brain interpolates the missing pieces without us even being aware of it. Worst case: You’re forced to ask, “Could you repeat your last sentence?” This is why VoIP is such a successful protocol. It benefits from the compression and packetising that is at the heart of IP technology — and it is quite forgiving of slight hiccups in delivery to the recipient.

These same advantages do not translate to fax, where even the smallest packet loss often leads to total transmission failure. No intelligent interpolation by our amazing human brain fills in the gap, so the lost data is gone for good. Added to this is the problem of fax compression — while

compression algorithms save bandwidth on voice and data calls, it is not possible to do the same with fax transmissions.

In addition to packet loss, another issue is jitter, or network delay. IP networks are not as reliable in terms of timing and delivery as is the analogue telephone network, but fine for voice and data, where timing is often not crucial. Unfortunately, fax does not deal well with delays, which means that in the case of a network delay, even a slight one, the entire fax transmission fails.

Finally, packets arriving out-of-sequence is another thorn in the side of IP fax. Because fax was designed for uncompressed transmission across the telephone network, fax machines cannot recognise or accept portions of a fax arriving out of order — a common occurrence when data is packetised and sent over IP. As a result, if a fax packet arrives out of order, the recipient’s fax machine might interpret the fax as only a partial transmission or a failed transmission — and not accept the fax at all.

While moving to an IP infrastructure makes sense for services like voice, data and messaging, fax is a different dynamic. It simply does not reap the full benefit of the IP platform, nor does it come anywhere close. This is why many businesses that fall into this fax-to-IP trap eventually relent and give faxing its own dedicated two-lane road (a £35-per-month telecom line) that travels in parallel with the organisation’s main IP motorway.

Protocol-Based Solutions Offer Success (and Failure)

It is tempting to look at these shortcomings (packet loss, jitter/delay, and out-of-sequence delivery) and think that fax is simply the ugly step-child that no one wants, and that many of these IP-based challenges have grown out of neglect (or worse, technology obsolescence). This is not the case. The various international standards bodies that mandate how



communications systems work and interoperate have spent a great deal of time and effort to bring fax into the IP fold through the creation and distribution of a number of faxing standards, or protocols.

While each of the following protocols introduced unique solutions for bringing fax into the digital age, each also brought with it unexpected challenges.

G-711 Protocol (Fax Pass-Through)

Originally designed for voice calls in the early 1970s, G.711 was adopted in the late 1980s for fax transmissions. It uses Pulse Code Modulation (PCM) to iron out the data loss that plagues IP fax. However, because G.711 uses an uncompressed format to transmit faxes, it requires high bandwidth, typically the same as an analogue phone call — about 64 Kbps. Another drawback is that G.711 converts faxes into voice data — which then needs to be converted back so that a readable fax is delivered. This necessary conversion adds to latency that can lead to data loss.

T.37 Protocol (Fax “Store & Forward”)

This protocol, introduced in 1998, significantly improved on G.711 technology by moving away from a reliance on standard phone network. Known as “Internet Fax” or “Store and Forward Fax,” T.37 enabled the sending of faxes via email. Under this protocol, T.37-enabled fax machines convert documents to images, generally .TIF files, attach the image to an email (using MIME format) and, send the email via SMTP. At the receiving end, another T.37-enabled machine accepts the email and prints the attached image as a fax.

While a giant step forward in getting fax onto the Internet, the protocol’s store-and-forward methodology meant that faxes were not actually delivered in real time. Sender and recipient fax machines were not truly communicating, since the connection was moderated by and completely dependent on the store-and-forward system in between. The result was spotty service plagued by security issues.

T.38 Protocol (Fax Relay)

An upgrade from an earlier fax-relay protocol T.30, (1988), T.38, (1998) allowed data to be carried directly over an IP network — meaning that fax transmissions need not be converted as with T.37.

T.38 was designed to complement to inexpensive Voice over IP (VoIP) networks and it soon became known as Real-Time FoIP, or Fax over Internet Protocol. Despite its promise, problems with FoIP transmissions quickly became evident. The acceptable “jitter” inherent in VoIP transmissions due to occasional dropped data packets that manifests as silence or poor call quality proved more than a simple nuisance to fax transmissions. Silence suppressors and Error Correction Methods (ECMs) used by the latest generation of fax machines compensate for this problem, but often with unsatisfactory results.

Suppression techniques can inadvertently block the fax signal by misjudging when the signal starts and stops. Machines employing ECM can request that a fax transmission be resent so that missing data makes it through, but this only raises the overall cost of the fax (and it does not ensure that the resent packets will be jitter-free).

Your Business Can Do Better – Explore Your Options

Given the idiosyncrasies of fax, and the fact that most faxing protocols were simply not designed with the packetised nature of IP in mind, as discussed above, it is important to find a reliable and efficient faxing alternative that your business can rely upon.

But what are those options?

What are the best, next-generation solutions available and will they provide enough value and reliability to make any migration effort worthwhile?

Assessing Your Options

If you are reading this white paper, chances are your organisation has either: 1) made the move to VoIP or a UC platform leveraging SIP networking, and has encountered mild to serious issues with faxing, or; 2) you have not yet migrated to UC platforms, or have upgraded most of your communications to SIP but decided to leave fax alone.

This latter option is, in many ways, a safe, though hedged, bet. You keep your old-fashioned analogue fax capability but you have committed to continued investment in upgrading and maintaining your dated fax infrastructure.

So What Are Your Options?

You Really Have Four Directions You Can Go:

1. **You can leave fax alone.** Safe, but expensive. As suggested previously, caring for an aging in-house fax infrastructure is an expensive, time-consuming endeavour for your business or IT department. It's also inefficient.
2. If you've migrated to VoIP or SIP networking, and find that fax is, well, lacking, then **you can roll-back to an analogue fax line for every fax number you need** (or to a full onsite network of fax servers and fax machines that also require their own numbers). This option is basically option 1 above, but in new clothes. The IT staff or service provider that did the migration work to get your business to this point will not be happy that they get to take a big step backwards. Your telecom partners will be very happy at all of the new fax lines you are purchasing, however.
3. **You can keep an eye on the standards bodies and their protocols and hope that a new technology is invented that provides a fax-over-IP platform** that eliminates the jitter, packet loss and other reliability issues already outlined in this paper. Keep in mind that G.711, T.37, T.38 and a host of other protocols are still in operation, decades after they were introduced. You might be waiting a long time for the perfect, standards-body solution.
4. **Move to a cloud fax model.** Digital cloud faxing solutions such as eFax provide a highly reliable platform for delivering faxes over **IP networks because they convert voice (fax transmissions) to data packets, a perfectly tailored solution for IP networks.** This platform thereby eliminates the technology clashes inherent in fax-over-IP solutions, such as those found in T.38, because the fax transmission is optimized for the IP motorway that it will be traveling on: data packets riding on a data network. Voila! Problem solved.

Choosing the Right Digital Cloud Fax Provider

So, if you're one of the businesses or IT managers in scenarios 1-3 above, still dealing with problematic fax-over-IP solutions or you're ready to explore unplugging telecom lines, fax machines and fax servers, read on. Smart business owners and IT managers know that selecting the right digital cloud fax provider is a process that should be treated with the same care and due diligence as migrating any other part of your infrastructure to the cloud — a serious undertaking.

After all, by outsourcing to any cloud service provider, the value should be at least as great as the service currently delivering the same solution. However, making a successful choice and seamless migration to digital cloud faxing is dependent on understanding the key characteristics of a best-in-class digital cloud fax platform and demanding these service levels, features and benefits from any prospective providers.



So What Are the Key Components of an Enterprise-Calibre Digital Cloud Fax Platform That You Should Be Looking For?

- **Reliability and Scalability.**

Best-in-class digital cloud fax providers have invested millions of dollars in their network and will have the robust infrastructure that can scale to handling millions of faxes each day. They will also have solved for fax-over-IP network issues with proprietary fax processes and algorithms that optimise fax transmissions for IP networks, enabling industry-leading delivery rates and reliability.

- **Security and Compliance.**

Cyber hacking and corporate security are huge issues for businesses and IT thought-leaders today. By upgrading to an enterprise-class digital cloud fax service, your business should enjoy a significant upside in security — with the latest TLS encryption for all faxes-by-email across IP networks, strong audit trails, and compliance with HSCIC, NHS and other privacy regulations. Furthermore, your data should remain in highly secure UK data centres at all times, which maintain current SOC 2 reports along with current SSAE16 Certifications, ensuring the strongest security and chain-of-custody controls for all of your business-critical fax transmissions.

- **Network Architecture.**

Hosted service providers know that their business model is predicated on the highest availability and service levels for their customers' data and applications hosted on the cloud. If they are not able to maintain adequate service levels due to interruptions, cyber events or compromises, their reputation will suffer. Top cloud providers will architect their network with strong failover and redundancy, with N+1 Architecture, hardware, software and systems. All of which can fail over to another should a service interruption occur.

- **Cost Model.**

A truly digital cloud-based fax provider should offer a pay-as-you-go pricing model that lets you pay only for what you use versus paying for both onsite and 'hosted' cloud infrastructure — a doubling up on costs and IT maintenance and upkeep for your organisation. If you're a small or medium enterprise (SME) with simple fax machines, you'll be able to immediately benefit from the elimination of telecom lines, fax machines and associated maintenance, along with reducing employee time wasted with the inefficient workflows associated with traditional faxing.

- **Fax Expertise and Intellectual Property.**

Top-notch digital cloud fax providers have made faxing-over-IP their core business. Whether it's an analogue fax being converted to data packets for delivery to an existing customer by email, or the patented fax-by-email technology that is the foundation of digital cloud faxing, the best-in-class will have mastered the faxing process for delivery over a robust and redundant worldwide digital cloud fax network. They will also have the patents to protect their proprietary network, processes and industry-leading delivery performance.

Serious Due Diligence

Smart business owners and IT managers know that selecting the right digital cloud fax provider is a process that should be treated with the same care and due diligence as migrating any other part of your infrastructure to the cloud — a serious undertaking.

The eFax Advantage for Digital Cloud Faxing

Ready to move to a tried-and-true enterprise cloud fax solution? eFax is a digital cloud-based fax service for sending and receiving faxes by email using PCs, laptops, smartphones, tablets or even multifunction printers. Our solutions replace expensive in-house systems with a predictable cost model and unlimited capacity that scales to the size of any organisation.

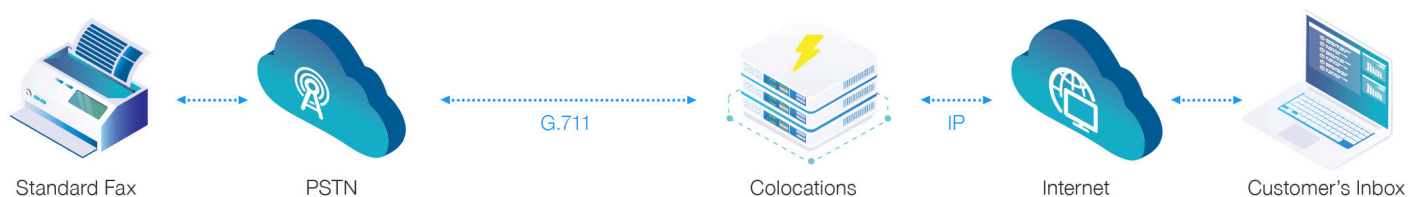
Additionally, eFax, part of J2 Global®, owns the patent for sending faxes by email, which is the core foundation of more efficient digital cloud faxing. We have developed numerous other patents over the last 20 years for sending and receiving faxes by email over IP networks better and more efficiently than workaround technologies discussed in this paper can.

So while FoIP and other technologies are inefficient in terms of bandwidth, frequently leading to fax errors, we leverage our patented digital cloud fax processes and global network to deliver your business-critical fax documents with TDM-level completion rates, compared to competitors using fax-over-IP technology stand-ins running over SIP-based networks.

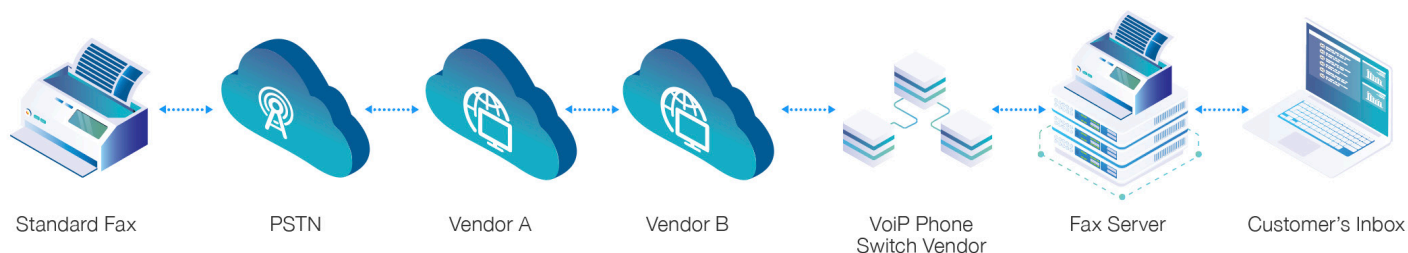
How Do We Do It Better?

It's simple: eFax processes faxes as efficient data-over-IP transmissions and not as voice transmissions, which can be prone to all of the errors and interoperability issues discussed earlier.

eFax Network Path



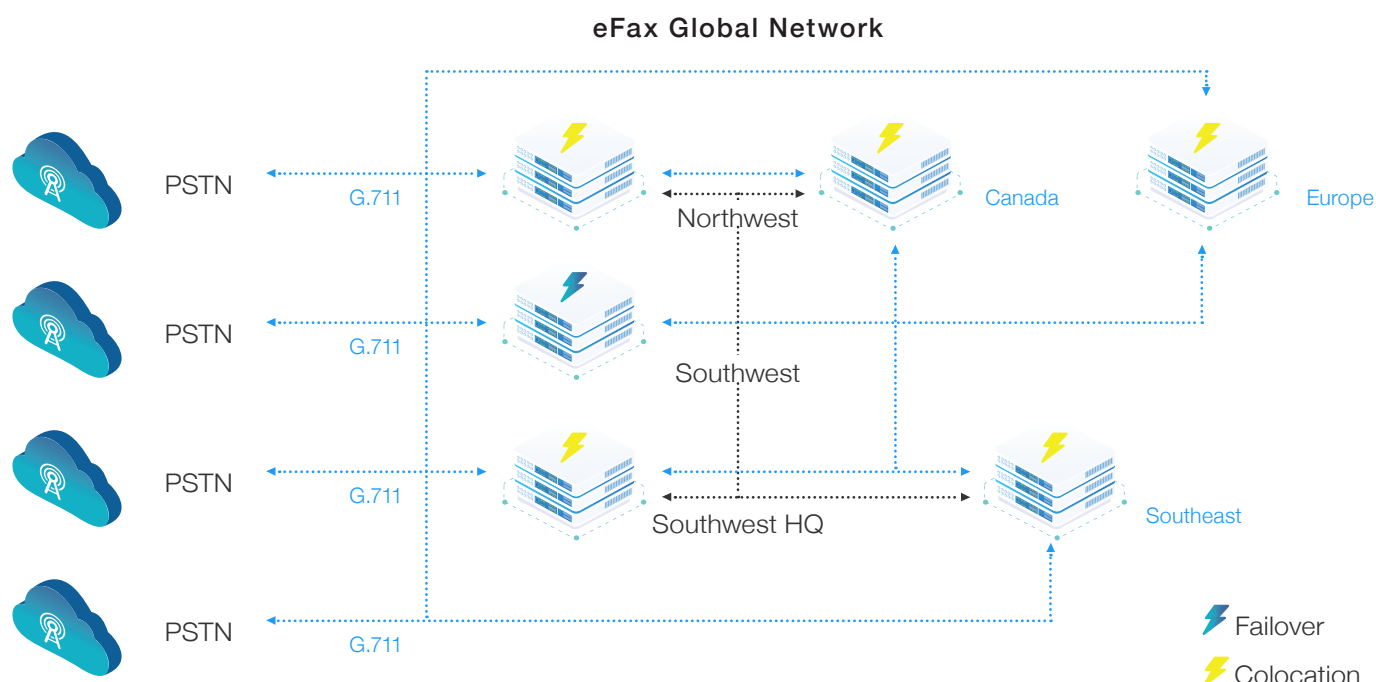
VoIP Vendor



The eFax digital cloud network optimises fax transmissions by converting them from analogue voice signals to data format so that they fit nicely into data-over-IP transmissions – a huge step toward high-quality faxing vs. workarounds such as FiP.

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- **We're constantly upgrading our software** to optimise fax performance across our global network as the industry continues to move from TDM (analogue phone lines) to SIP networking. We also use native print-driver technology for each document, so that each fax is processed as the originating file type — ensuring integrity of original look, feel, color and clarity.
- **Telecom leverage.** We work with major telecom providers and have the leverage to negotiate the highest SLAs, resulting in the highest quality and performance standards, industry-leading completion rates, along with a vast selection of Direct Inward Dialing numbers (DIDs) in over 4,000 cities worldwide available to our customers.
- **Geographically dispersed colocations and data centers.** Our secure data centres across the UK (and worldwide) are networked on N+1 Hardware and Systems so that should there be a service disruption, traffic is simply re-routed to one of our other UK-based colocations, resulting in industry-leading uptimes and unlimited scalability.
- **Unparalleled tracking capability** means that we have the ability to help you track all fax documents end-to-end, providing a clear 'chain-of-custody' audit trail, and giving you confidence that documents have not been altered or tampered with — crucial in legal or regulatory environments. The integrity of this data is taken seriously and audited on a quarterly basis.
- **Security and compliance.** J2 Global maintains a formal, documented security policy, approved by Senior Executive Management, consistent with multiple industry best-practice frameworks, including ISO 27002:2013, OWASP, NIST and SANS. The policy is integrated into all aspects of our operational model, with internal compliance guaranteed via regular audits. In addition, eFax helps users in industries such as healthcare and finance meet regulatory obligations such as HSCIC and NHS.



About eFax

eFax launched its digital cloud fax service with the goal of using the convenience of email and the speed of the internet to make it easier for people to send and receive faxes. eFax lets users and our 11 million customers receive, review, edit, sign, send and store faxes by email or through a web interface. Our appeal and success are built around three key features: the widest selection of phone numbers; an easy way to send and receive faxes and voicemail by email; and a fast, reliable and secure communications network.

To learn more about outsourcing to a digital cloud fax model with eFax, visit us at: eFaxCorporate.com



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