The MFP solution

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The MFP (Multi-Function Product/Printer/Peripheral) is a peripheral device for personal computers, containing two or more functions, such as a scanner, printer, fax and/or copier. It is also known as multifunction product. Although the MFP has been evaluated as a piece of office equipment with a high investment efficiency, the concept of the MFP has been greatly changing with the rapid development of the Internet, along with changes in the way information is transmitted, disseminated and exchanged. Further, "color implementation" is now spreading widely throughout MFP products.

Exactly ten years have passed since we introduced to the market our first multifunction product, Doc-it. During this time, development of the Fax/MFP equipment, intended as a peripheral device for personal computers, was under way through the fusing of our printer technology and fax technology. We would now like to introduce the MFPA, established to raise the capability levels of the MFP, as well as our MFP technology, developed with a focus on the Internet, which has been influencing the concept of the MFP.

Our involvement with the MFPA

(1) MFPA

The Multi-Function Products Association (MFPA) was established in 1993, with an intended focus on standardizing access, control and management of MFP equipment. As stated in the beginning of this paper, MFP products have been playing an important role as document workflow and management devices, in the midst of drastic changes in the office environment. As a matter of fact, the transmitting and processing of documents via the Internet, has become common practice in the collaborated business environment of today.

While considering such changes, the MFPA will provide, as their mission, recommendations for the conformance to the document workflow and the Internet and begin to conduct interoperability activities for the purpose of verifying this complex field.

Major milestones of the MFPA are shown in Table. 1.

(2) Our involvement with the MFPA

Our company has been a member of the MFPA since its founding and a core member since 1996. Since 1999 we have been filling the post of president of this organization.

The IS650 standard (MFPI), established in 1994, is a technical standard of the TIA (Telecommunications Industry Association) which is a U.S. organization established under the ISO (International Standards Organization). This standard allows for the access of individual MFP functions from personal computers, over a standard IEEE 1284 parallel port.

Table. 1 Table 1: Major milestones of the MFPA

Major milestones	Year	Remarks
MFPA is founded.	1993	Non-profit purposes.
IS650 technical standard (MFPI) is released.	1994	Giving access of individual scanner, printer, fax and copier functions, through a parallel port.
First regular conference is held.	1995	A jointly held conference with the Fax subcommittee of the ITU.
A joint conference, between the MFPA and CAP Ventures, is held.	1998	Conference entitled "Converging Digital Peripherals Conference".
An Oki Data Corporation representative was selected as president of the MFPA.	1999	Oki Data Corporation has been a member of the Board of Directors since 1996.
A color fax compatibility test is performed.	2000	Proposed and managed the compatibility test.
The SNMP MIB, for network scanners, is released.	2001	A network management tool for using the SNMP protocol.
The SNMP MIB, for the MFP, is released.	2001	Same as above.
The E-Flow initiative begins.	2001	A new workflow for the MFP.
The BrowseFax initiative begins.	2002	An embedded browser-based service for the MFP.

Extended functions, such as the transfer of binary files, are supported via the memory subsystem of the MFP. Fax and TWAIN scanning functions, which require real-time processing, are also supported. We are one of the very first manufacturers to implement the IS650 standard (MFPI) in MFP equipment. An example of such an implementation is shown in Fig. 1.

The IS650 MFPI standard can be said to offer an alternative to the proprietary technologies set forth by Hewlett-Packard or Microsoft. It also makes it possible to distinguish the functions of manufacturers in a flexible manner. For example, our proprietary functions, such as window printing or image compression, are supported via an MFPI interface.

It would not be an overstatement to say that the regular MFPA conference, held each year, is an industry event wherein we have made numerous contributions above and beyond the boundaries of technical standards. We provided the overall guidance for establishing the themes for conferences, as well as administration and organization of such conferences, while introducing a broad range of technologies and issues related to MFP products. In recent years, we have been promoting the conferences with cooperation obtained from a market research firm (CAP Ventures).
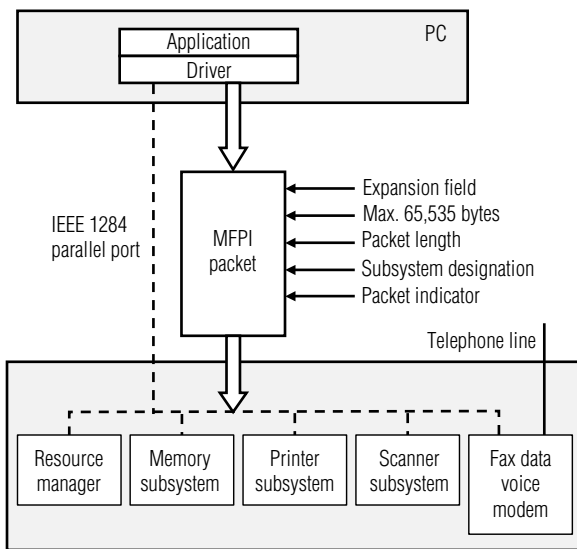

Fig. 1   Configuration of MFP

Status of the MFPA's activities

The BrowseFax, E-Flow (a new workflow of the MFP), as well as the T.30 color fax interoperability, are all projects currently being implemented.

It is now possible to make new requests to the MFPA via a web site (http://www.mfpa.org/projovw.htm).

(1) BrowseFax

BrowseFax [1] is the most active project at the moment. While the name may be slightly ambiguous, it is a project related to the MFP. The basic concept includes the provision of various services by making it possible to facilitate operations that are similar to those available on web browsers, from an operator panel simply by equipping the MFP with a microbrowser. For example, the MFP may be furnished with capabilities such as the ones listed below:

- Makes it possible to establish a simple and secure document distribution system that includes transmission verification and user authentication.
- Makes it possible to allow the MFP to make direct requests for the document processes of business process management (workflow) documents.
- Makes it possible to monitor the MFP equipment by placing the appropriate mediating data communication.
- Makes it possible to purchase consumables and perform maintenance from an operator panel.

Future standardization activities are expected with the cooperation of the IETF (Internet Engineering Task Force) and the AIIM (Association for Information and Image Management).

(2) Other projects

Status reviews of individual projects are held at the MFPA's regular quarterly conferences. Besides these, various opportunities are given to MFP technology suppliers and MFP manufacturers, as well as numerous firms participating in such activities.

Our Internet exploitation technology

We have been implementing the InternetFax function in our products, as an input/output solution that utilizes the Internet. There are two types of InternetFax: The mail-based-type (T.37) and the real-time-type (T.38). They are both described below:

(1) Mail-based-type (T.37) InternetFax

The IETF started evaluations in June 1996. Standardization of the Simple Mode I - Fax (RFC2301 to FRC2306) was completed in March, 1998 [2]. Further, the ITU-T (International Telecommunication Union) started standardization activities as a cooperative project at the same time and standardization resulted in June 1998, as the T.37 [3].

This standard involves the transfer of scanned images as an attachment file, in a TIFF (Tagged Image File Format) format, to electronic mail. It also involves periodical downloading of electronic mail from mail servers and the printing of TIFF files attached to electronic mail.
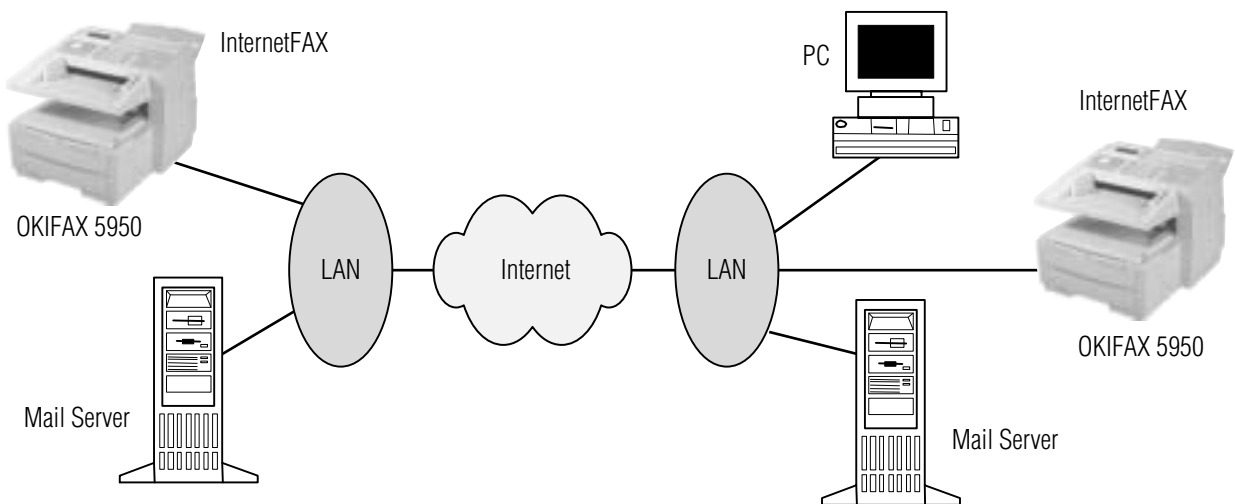
Fig. 2 Basic configuration of the T.37 InternetFax

Compression coding methods, such as MH (Modified Huffman), MR (Modified Read) and MMR (Modified Modified Read), recommended by ITU-T T.4, are already being used for images handled by fax machines. The TIFF file is a file format with the TIFF header information on the monochrome image files of MH, MR or MMR compressions. Apart from the above the MH, MR and MMR color images, available with JPEG and other formats, are also defined for TIFF files. In order to facilitate intercommunications, however, exchange of information must occur concerning capabilities (known as the "full mode") between the InterFax terminals. This is distinguished as the full mode, although a "simple mode" is also available. The simple mode only requires that the image file shall be in the A4 paper size stipulated by T.4, compressed by the MH compression code and meet a specified resolution level (3.85 lines/mm or 7.7 lines/mm). For this reason, communication terminals, compatible with this simple mode, can perform communications without the exchange of information concerning capabilities.

The T.37, usually compatible with ordinary electronic mail technology with the SMTP (Simple Mail Transfer Protocol), a protocol intended for transmission of electronic mail as defined by RFC821, is implemented for transmission. The POP (Post Office Protocol), a protocol intended for obtaining mail from servers that spool electronic mail (mail servers) as defined by RFC1939, is implemented for reception. These protocols are ordinarily used for the transmission and reception of electronic mail over the Internet and electronic mail client software, such as Microsoft's Outlook [*1), utilizes this protocol. Since the technology of the T.37 utilizes the electronic mail technology, communications can be made, not only between the InternetFax terminals, but electronic mail can be sent and received between an InternetFax and a personal computer. While the purpose of the InternetFax is to reduce communication costs, its high confluency with personal computers is its key for popularization. The

configuration of the InternetFax is shown in Fig. 2.

The InternetFax we offer comes with the following technical expansion capabilities:
1) PDF (Portable Document Format) file transfers.
2) Faxes received via a telephone line and redirected as electronic mail.
3) Files received via electronic mail and redirected as faxes via a telephone line.

The technology described under 1) involves the transmission of scanned documents in a PDF file format via electronic mail and is often used as a network scanner. The functions described in 2) and 3) are known as "OnRamp/OffRamp" and redirect fax images received via a telephone line to other InternetFax terminals or personal computers, or redirect received electronic mail to other terminals via a telephone line.

The future trends of the T.37 may include "the exchange of information concerning capabilities" also known as the "full mode", "transmission verification", color implementation and encryptions such as S/MIME.

(2) Real-time-type (T.38)

This was prepared as the T.38 recommendation at the ITU-T in June 1998 which is a recommendation [4) concerning real-time communications using fax signals over the Internet. The IFP (Internet Facsimile Protocol) is defined as its protocol of use.

The real-time transmission of a G3 fax signal, recommended by the T.30, is conducted over the Internet in IFP packets, in a similar manner to that of fax communications over a telephone line. The H.323 procedure, which is used for VoIP (Voice Over IP), is also used for the call control. The H.323 is a standard established to standardize multimedia communications, for the real-time transmission of multimedia data over a network that does not offer a guarantee of for quality of service (QoS).

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*1) Outlook is a registered trademark of Microsoft Corporation.
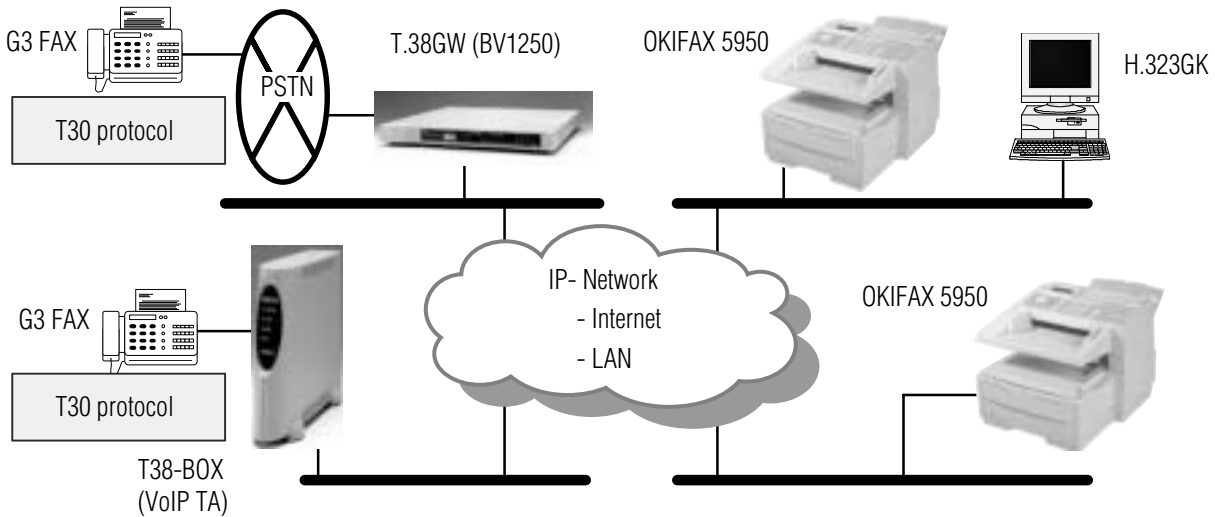
Fig. 3 Example of T.38 InternetFax configuration

The segments, relating to voice transmissions in particular, have already been implemented in many VoIP products. Further, the SIP (Session Initiation Protocol) is becoming a popular protocol for call control so it would be necessary to accommodate the SIP as a call control protocol for the T.38 (Annex D of the T.38 does address SIP compatibility). Furthermore, another call control method, the MGCP (Media Gateway Control Protocol: H.248), is in the recommendation of Annex E of the T.38, so evaluation on its future compatibility will be necessary as well.

With the T.38, it is possible to conduct communications with the TCP (Transmission Control Protocol) and the UDP (User Datagram Protocol), but these differ in message formats. As there is no data resend procedure with the UDP, incomplete UDP data cannot be completed. However, it is possible for the receiving side to restructure the data by utilizing the redundant data of the UDPTL (Facsimile UDP Transport Layer) message, including data sent just prior to that message.

The T.38 InternetFax has communication cost-reducing effects and it also has the capability to perform high speed communications. The OKIFAX [2] was the first fax terminal in the world to be loaded with the T.38 InternetFax function, while the Oki Group offers products such as the BV1250, which has a T.38 gateway function and a box-type VoIP TA. Both the BV1250 and the VoIP TA are VoIP products for transmitting voice over an IP network. They are also capable of communicating with existing G3 fax terminals. The contents of the G3 fax communications can be converted into the T.38 codes to conduct a T.38 InternetFax communication and the configuration of such a communication is shown in Fig. 3.

While a kind of confluence with personal computers, as seen in the T.37, does not exist in the T.38, high speed fax communications are possible if analog telephone lines of a corporation are made compatible with the VoIP and existing fax terminals are replaced by the T.38

InternetFax. Further, because fax communications of the T.38 are conducted directly by terminals, as is the case with existing telephone lines, the exchange of information concerning capabilities between terminals is possible, thereby making fax communications equivalent to fax communications conducted over existing telephone lines.

Conclusion

We have discussed the relevance of the Internet and it can be stated that the role of the Internet has continued to provide a significant influence over the design requirements of MFP products. With the changes taking place in office environments, the requirements of the MFP change and evolve, but issues, such as security, remain. We will, therefore, monitor such trends and create our own solutions.

References

1) BrowseFax Initiative White Paper (MFPA), Raymond Lutz, Aug. 27, 2001
2) RFC2301 - RFC2306, Internet Engineering Task Force
3) T.37, International Telecommunication Union
4) T.38, International Telecommunication Union

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*2) OKIFAX is a registered trademark of Oki Electric Industry Co., Ltd.