

Introduction to V.34 High-Speed Fax

Recent advancements in fax technology have resulted in a renewed interest in fax in the business environment. One such advancement is the introduction of the V.34 fax standard, which can help businesses increase productivity and reduce costs.

This white paper discusses the unique features of the V.34 facsimile standard, which delivers higher performance and reliability, and how the rapid adoption of high-speed fax results in increased economy and efficiency for businesses.

Dubbed "V.Fast", the V.34 fax standard is heralded as an important development in fax technology. Fax devices supporting the V.34 protocol also can deliver more reliable fax transmission, requiring fewer resends, under a wider range of line conditions than those supporting older fax standards such as V.17 and 9.6 kbps.

The adoption of the V.34 standard allows:

- Data rate of up to 33.6Kbps, more than twice the speed of its predecessor, V.17 (14.4Kbps)
- Support fast handshaking, which can cut call setup and session-management time by one-third.
- High-speed transmission enables transport of color fax data

In addition, fax devices supporting V.34 offer more robust and reliable fax transmissions for varied line conditions as a result of the mandatory ECM protocol and the more sophisticated modulation/demodulation scheme. These improvements result in cost savings from reduced fax phone bills especially for long-distance scenarios.

The ITU-T V.34 Fax Standard

The V.34 fax standard was derived from the V.34 data modem standard established by the International Telecommunications Union (ITU). The V.34 data modem standard is a full-duplex implementation for sending and receiving data across telephone lines with a maximum data rate of 33.6Kbps. Certain elements of the V.34 data modem standard were eliminated for V.34 fax while new features, such as a control channel and mandatory ECM, were added to enable fast and reliable fax transmission.

Data Rates Supported (Kbps)	ITU Standard		
	V.27&V.29	V.17	V.34
2.4	✓		✓
4.8	✓		✓
7.2	✓	✓	✓
9.6	✓	✓	✓
12		✓	✓
14.4		✓	✓
16.8			✓
19.2			✓
21.6			✓
24			✓
26.4			✓
28.8			✓
31.2			✓
33.6			✓

Fig1. Comparison between Fax Modulation Speeds

Source www.gaoresearch.com

The V.34 Fax Connection and Session

In order to understand the benefits of the V.34 fax standard, it is first necessary to understand how a fax transmission works. V.34 session management and setup were designed with a similar mechanism to legacy handshaking procedures. The first step of a fax session is to establish a "handshake" between the sending and the receiving devices. During handshaking, the sending and receiving devices negotiate key parameters for how the fax call should be set up such as determining what is the highest transmission speed supported by both devices. The handshaking process itself is performed at 300bps in legacy devices. In V.34 fax capable devices, handshaking is performed at a much faster data rate of 1.2Kbps. The result is a handshake time that is reduced from approximately 16 seconds of legacy systems to 9 seconds for V.34.

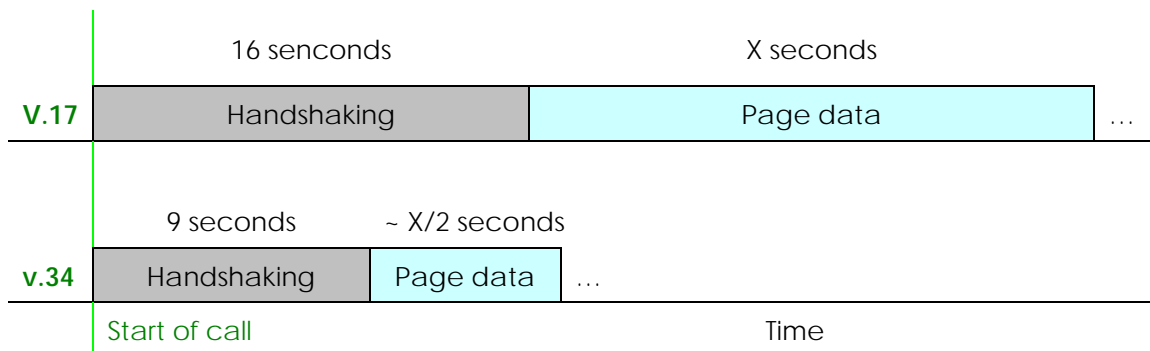


Fig2. Time-wise Comparison Between V.34 and V.17 Fax
(Source www.gaoresearch.com)

After handshaking is complete, the next stage of a fax session is the transmission of the actual fax page data. The retraining and re-synchronization process takes place after each page is transmitted in legacy schemes, where capabilities such as supported modulation and transfer are renegotiated. In case of error in the transmission, entire pages may need to be retransmitted. This cycle of page data retrain and retransmit repeats until the fax call is completed, and account for significant inefficiency of legacy fax machines. V.34 provides the most extensive range of supported data transmission rates, allowing it to optimize both speed and reliability over a wide range of line conditions. With V.34, fax page data is transmitted at 33.6Kbps, twice the speed of V.17. In addition, V.34 uses ECM (Error Correction Mode) as a mandatory feature that handles page transmission error in a much more efficient way.

ECM as a Mandatory Feature

ECM, Error Correction Mode, is a mandatory feature for V.34 fax as opposed to V.17, where it is optional. The ECM protocol was designed to automatically detect and correct errors in the fax transmission process caused by factors such as telephone line noise. The page data to be transferred is divided into small blocks of data called Octets. Once all octets are received, they are examined using check-sums.

JBIG Compression

JBIG is the most effective compression (up to 80% better), and an average document when compressed using JBIG becomes 1/20th of the original size.

The main features of JBIG are:

- Lossless compression of one-bit-per-pixel image data.
- Ability to encode individual bitplanes of multiple-bit pixels.
- Progressive or sequential encoding of image data.

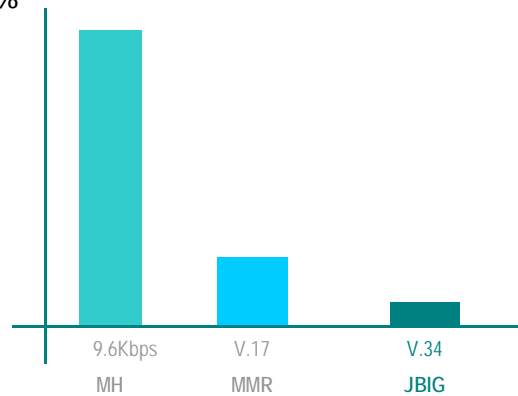


Fig3 . Relative transmission times
(compression effect varies on content type)
Source www.mainpine.com

Transmission times

In seconds	9.6 kbps	V.17	V.34
Handshake	16	16	7
Page 1 (3%)	18	12	5
Retraining	6	6	0.25
Page 2 (6%)	27	18	7
Retraining	6	6	0.25
Page 3 (6%)	27	18	7
Retraining	6	6	0.25
Page 4 (12%)	54	36	14
Retraining	6	6	0.25
TOTAL	166 seconds	124 seconds	41 seconds

Fig4. Average Fax Transmission Times (4-Page Fax)
Source www.brooktrout.com

Fig3. shows the anatomy of an enterprise fax phone call and compares the time each step in the process takes for each fax transmission rate.

For the fax being sent using V.34, once the handshaking is completed, the first page is transmitted at 33.6 Kbps. This means that the first page of a typical four-page fax will transmit in nine seconds, versus 16 seconds with the older technology. For the example of the four-page fax transmission, the transmission time can vary from 166 seconds with a 9.6 Kbps modem, to only 43 seconds using V.34 fax technology, saving more than two minutes per call on average.

Conclusion

V.34 is an important development in fax technology, not only because it can send fax data more than twice the speed of the older fax standards, but also because it supports fast handshaking which can cut call setup and session-management time by one-third. Fax devices supporting the V.34 protocol also deliver more reliable fax transmissions, with less requirement for resends, under a wider range of line conditions. The V.34 protocol is highly adaptive, automatically and intelligently applying the optimum combination of modulation methods and impairment-compensation techniques for each fax call. The result is faster fax transmissions and significant cost savings over time.

Source:

www.google.com www.gaoresearch.com www.mainpine.com www.brooktout.com

myFAX Network Fax Server



The myFAX Network Fax Server is a complete, highly economical, easy-to-use network fax server. It was designed to meet the needs of small to mid-sized businesses or workgroups, and comes with all the necessary hardware and software to allow network users to send and receive faxes from the desktop or browser.

myFAX is a turnkey solution that connects to PSTN fax lines. It provides both software and web management interface, and allows you to receive faxes wherever you are as e-mails and send faxes from any applicaiton that can print. The system provides distributed faxing capabilities, over a WAN, from a corporate office to small remote offices as well as to field sales people. By S series myFAX V.34 Network Fax Server, it offers V.34/33.6K Super G3 fax and JBIG fax compression, reduces fax transmission time by more than half when compared to traditional fax modems. The result is faster fax transmissions and significant cost savings over time.

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