INPUT

DECEMBER 1991

PROGRESS TOWARDS A STANDARDIZED EDI PROTOCOL IN EUROPE AND NORTH AMERICA

For

NTT

FINAL REPORT

INPUT®

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PROGRESS TOWARDS A STANDARDIZED EDI PROTOCOL IN EUROPE AND NORTH AMERICA

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December 21, 1991

I INTRODUCTION

A
Purpose and Scope

The purpose of this study is to provide a comprehensive review of the evolutionary progress of standardized EDI protocols in Europe and North America. Special attention has been given to MHS Message Handling System (MHS) and File Transfer Access Management (FTAM) protocols.

B
Methodology

Research for this report included multiple telephonic interviews and a review of recently published data on the EDI protocol subject.

The companies interviewed for this report are:

- AT&T (ATT)
- MCI
- US Sprint (USS)
- BT/North America (BTNA)
- BT/United Kingdom (BTUK)
- GE Information Services (GEIS)
- Sterling Software (SSW)
- Telecom Canada (TCC)
- Transpac (France) (TPF)
- DBP Telekom Germany (DBP)

Each of these companies agreed to provide the information contained in this report with the understanding that it would be used by INPUT and its clients on a confidential basis. **The information is provided to NTT for their explicit use.**

The questionnaires used for this research were prepared based on the NTT specification dated August, 1991. Copies of the questionnaires were provided to NTT for review prior to the interview process. They are included in the appendix to this report.

C
Report Organization

Following the Introduction, the report is comprised of six sections and generally complies with the organizational model provided by NTT in their project specification dated August, 1991. The table of contents follows the specification.

In keeping with that model, much of the report has been compiled in tabular format. Where appropriate the question(s) used to obtain the information are presented prior to the findings in *italics*.

II EXECUTIVE SUMMARY

Most service vendors continue to use standard transfer protocols such as Async and Bisync, etc. These protocols will continue to prevail over the next 5 years to meet customer demand.

A majority of the carrier respondents offer MHS and believe there is a growing interest in the MHS X.400/X.435 protocols. None of the service vendors offer FTAM and many are not even aware of this file transfer protocol. Also, all service vendors are interconnected with each other using various protocol arrangements.

Planned expansion efforts of X.400 is defined well into 1992 and will be driven by customer demand. By comparison, only 2 service vendors will implement FTAM in late 1992 and, again, will let the customer define its necessity.

Over the long term, all service vendors will continue to support all major EDI formats including EDIFACT, ANSI X12, TDCC, etc.

Surveys comparing MHS to FTAM were conducted with EDI service vendors, EDI standards associations, and computer vendors. Each group reported unanimous preference for the MHS protocol over FTAM.

Relatively few users appear to have MHS capability at this time. Neither of the two case study organizations, Electronic Data Systems (the data processing subsidiary for General Motors) nor Illinois Department of Revenue (the government tax collection agency for the State of Illinois), use MHS protocol nor do they have any implementation plans.

Observations:

- The user market for MHS protocol is just beginning to emerge.
- Service and computer vendors are aware of this emerging demand are initiating efforts to implement MHS capabilities.
- Numerous factors indicate that MHS will ultimately be the EDI protocol standard of choice. FTAM appears to be considered less capable and is not as well known.
- The use of the many existing standard and proprietary protocols will continue to be consider more widespread than MHS for at least the next 5 years.

III Research Findings - Status of Protocols

A
Current Status of Protocols (Table 1 & 1a)

Table 1 and 1a present a summary of the findings for **current** status of transfer protocols for each EDI service vendor surveyed. The format of the table is based on that provided in the project specification. The information presented in these tables is drawn from questions in Section I of Questionnaire 1 in the appendix of this report.

Please see Tables 1 and 1a on the following pages.

Table 1.

Current Status of Transfer Protocols Offered by EDI Service Vendors

Vendors	Transfer Protocols 1	Reason for Offer	Problems	Evaluation	# of Users
AT&T	Bisync SDLC X.25 Async X.400 Proprietary	Meet customer needs	Bisync thru VAN has no end-to-end ACK	Each prot. needed Bisync next 20 yrs	No comment
MCI	Bisync SDLC X.25 Async	Customer demand	Info. unavailable	Emphasis on X.400 MHS	No comment
US Sprint	Bisync SDLC X.25 Async X.400	Variety of options offered to clients	No ACK from Bisync Dial-a-dump	No assessment	MacDonalds US Sprint
BT N. Amer.	Bisync SDLC X.25 Async X.400 UCS	Customer demand	Nothing significant	Async is worldwide Merge Bisync & X.25	80% Bisync 20% Async/X.25
BT U. K.	Bisync SDLC X.25 Async X.400	Customer driven	Still in start-up mode	Grow to X.435 & support existing prots	37: Bisync 18: X.25 19: Async
GE Info. Svcs.	Bisync SDLC X.25 Async X.400 ODETTE	Meet market needs	Need better understanding of X.400	Async strongest Bisync to SDLC/X.400	5K: Async 4K: Bisync 200: X.400
Ster. Softwr.	Bisync SDLC X.25 Async ANSI-Clear	Meet customer needs	X.25 corrects Async conversion problems	All prot req. now X.400 eventually	1.5K:Async 1.5K: Bisync 900: X.25
Telcom Can.	Bisync X.25 Async X.400	Variety of options offered to clients	Disco Bisync end 92 High overhead Xmodm	X.25 preferred prot Cust. int. Xmodem	150: X.25 120: Bisync 90: Async
Transpac Fr.	Bisync X.25 Async X.400 ODETTE X.28 X.32	Company strategy	No problems	EDIFACT being modified too much	100: X.25 50: proprietary
Dbp Tlcm Ger.	X.400	No response	No response	No assessment	No response

Table 1a.

Current Status of Transfer Protocols Offered by EDI Service Vendors

Vendors	MHS Used?	Customers	Network Vendors	FTAM Used?	Business Protocols	Interconnect Network
AT&T	84 P0,1,2	Yes-Specific	Yes-Specific	No market	All major protocols	Yes-All of them
MCI	84 P0,1,2	Yes-General	Yes-General	Unknown	All protocols	Yes-Via X.400
US SPRINT	84 P2	Yes-Specific	No	Not offered	All plus CEDEX, UCS & WINS	Yes-All of them
BT N. Amer.	84 P2	Yes-Specific	Yes-Specific	Not offered	All X12 protocols	Yes-About 12 to 20 connections
BT U. K.	84 P2	Yes-Specific	No	Not offered Use ODETTE	EDIFACT, TRADACOM, ODETTE, ANSI X12	Yes-All of them
GE Info. Svcs.	84 P0,1	Yes-General	No	Not offered	X12, EDIFACT, TDCC, AIAG, VICS, TRADACOM	Yes-19 networks
Ster. Softwr.	Not Offered	N/A	N/A	Not offered	X12, EDIFACT, TDCC, WICS, ORDERNET, UCS	Yes-17 networks
Telecom Can.	84 P0	Yes-General	Yes-Specific	Not offered	All including WINS	Yes -6 networks
Transpac FR.	84 P2	Yes-General	Yes-Specific	Not offered Use ODETTE	EDIFACT, only	Yes-12 networks via Infonet
Dbp Tlcm Ger.	84 P1,2	Yes-General	No	Not offered	No response	No

B
Future Trends of Protocols (Table 2, 2a & 2b)

Table 2, 2a, and 2b present a summary of the findings for the **future** status of transfer protocols used by each EDI service vendor surveyed. The format of the table is based on that provided in the project specification. The information presented in these tables is drawn from questions in Section II of Questionnaire 1 in the appendix of this report.

Please see Tables 2, 2a, and 2b on the following pages.

Table 2.

Future Trends of Transfer Protocols Offered by EDI Service Vendors

Vendors	Transfer Protocols	Schedule To Offer	Reason for Offer
AT&T	X.435 Driven by customer demand	No comment	Ratified official EDI X.400 standard
MCI	X.400 Plus others to meet customer demand	3 to 6 months	Strategic direction
US SPRINT	X.435 & Mailbag for ANSI X12 users	X.435 late '92 Mail 1st Qtr '92	Customer service enhancements
BT N. Amer.	X.400, X.25 & SNA SNA/OSI robust	X.400 & SNA	Large SNA base
BT U. K.	X.400	Early 1992 for Beta test	Use Frame Relay to speed up transfer
GE Info Svcs.	Offer many protocols FTAM (?) & CICS	Next 5 years FTAM & CICS- 1 to 2 years	Customer demand
Ster. Softwr.	X.400 & Mailbag	X.400 due mid '92 Mail due Jan '92	Industry trend towards X.400
Telecom Can.	SNA for IBM users	3rd Qtr '92	Customer demand & Phase out Bisync
Transpac Fr.	X.400 with '92 P7	Early '93	Proprietary now P7 intl. standard
Dbp Tlcm Ger.	X.435	2nd half '92	On request of many customers

Table 2a.

Future Trends of Transfer Protocols Offered by EDI Service Vendors—MHS Plans

Vendors	MHS Planned? Scheduled?	Future MHS Use*	Customers Using MHS	Inter connect Network Vendors using MHS
AT&T	Yes-Offered now	88 P0,1,2	Yes-Specific	Yes -Specific
MCI	Yes-Already offered	88 P0,1,2,7	Yes-General	Yes-General
US SPRINT	Yes-Currently use	88 P0,1,2,3,7	Yes-General	Yes-General
BT N. Amer.	Yes-3rd Qtr '92	84 P2	Yes-Specific	Yes-Specific
BT U. K.	Yes-Early '92	84 P2	Yes-General	Yes-General
GE Info Svcs.	Yes-Already offered	88 P0,1	Yes-General	No
Ster. Softwr.	Yes-Mid '92	84 P1	Yes-Specific	Yes-Specific
Telecom Can.	Yes-Already offered	88 Not sure	Yes-General	Yes-General
Transpac Fr.	Yes-Already offered	92 P7	Yes-Specific	Yes-Specific
Dbp Tlcm Ger.	Yes-Already offered	88 P1,2	Yes-General	Yes-Unknown

*Vendors responding with versions 88 or 92 represent upgrades from currently installed version 84.

Table 2b.

Future Trends of Transfer Protocols Offered by EDI Service Vendors

Vendors	Planning For FTAM?	Business Protocols	EDIFACT Plan?	Interconnect Network
AT&T	Unknown	All plus Mailbag	Will continue	Same standards used with customers
MCI	Yes-Available	All per customer demand	Will continue	X.400 plus customer demand
US SPRINT	Yes- No idea but project in queue	All provided now & ODETTE & TRADACOM	Will continue	Same as users
BT N. Amer.	Yes-To be determined	Same as now	Will continue	X.25,X.75,X.400 & Mailbag, TA3, ODETTE
BT U. K.	No	May use regional subsets of EDIFACT	Will continue	Use X.25 & ODETTE for FTP
GE Info. Serv.	No	No plans to add others	Will continue	X12, EDIFACT, TDCC, & AIAG Any public std
Ster. Softwr.	Yes-Late '92	Same as now	Will continue	Bisync, Mailbag, & a few MHS
Telecom Can.	No	Same..EDIFACT may have X12 subsets	Will continue	Customer driven Will use whatever needed
Transpac Fr.	Yes-Not sure but ODETTE due Dec 91	Same as now	Will continue	Continue X.400 European strategy
Dbp Tlcm Ger.	Yes- 2nd half '92	EDIFACT	Will continue	SDLC 2780/3780

IV Research Findings - Evaluation of Protocols

This section of the report provides the results of asking a series of questions designed to compare the qualities of MHS and FTAM protocols of three types of entities: EDI services vendors, EDI standards associations, and computer vendors.

The questions used for this evaluation are based on the project specification and are found in Section III of Questionnaire 1 as well as Questionnaire 2 .

A
MHS and FTAM Comparison

The following provides a summary of the reasons MHS is recieving significant support within the U.S. while FTAM is not receiving active support.

Reasons why MHS is more acceptable:

- Many U.S. companies have already made a considerable investment in their E-mail systems that use X.400 MHS (store and forward protocol). Note many of these E-mail systems are interconnected internationally.

- Much of this investment is in intra-company LAN systems.

- The X.400 standard allows different E-mail systems and LANS to communicate with each other.

- The X.435 standard is designed to combine EDI with E-mail messaging.

- This X.400/X.435 combination results in:

  - Minimized administrative costs and overhead
  - Simplified management of networks
  - User friendly environment
  - Improved secruity, audit and tracking features

- Message Handling System (MHS) was identified as being much more popular than FTAM as an E-mail/EDI protocol standard in this research. It must be noted that actual useage is modest but the investment is being made.

Reasons why FTAM is less acceptable:

- File Transfer Access Method (FTAM) is relatively unkown in general. Although most people in the EDI industry are aware of it, that awareness is only on a limited basis.

- EDI transactions have not typically required a real-time transmission. Although real-time EDI is expected to be a future requirement.

- FTAM protocol would be used on a real-time basis to transfer large files point-to-point.

- FTAM incurred negative publicity during test trials due to significant performance overhead which resulted in poor throughput using short messages.

- FTAM is best utilized when handling large size messages with long disk access and multiple read/write operations in a single connection. These are not the normal charcteristics of E-mail and EDI transmissions.

INPUT would note the following in regard to the Case Studies of EDI Used by North American Telecommunications Carriers report.

- Under the full intent of the 811 standard FTAM may become a more appropriate protocol if the detail record information is to be transmited on-line.

B
Evaluations

The individual evaluations follow.

- EDI Service Vendors (Table 3)
- EDI Standards Associations (Table 4)
- Computer Vendors (Table 5)

A comparison of the three evaluations is presented in the Chapter VII, Conclusions.

General Comments:

- The most diversity of opinion was expressed by the EDI Services Vendors, however this group favors MHS to a major degree.

- Of the EDI Services Vendors, DBP (Germany) declined to make a comparison.

- Of the EDI Standards Associations, EDIA declined to express opinions regarding the technical aspects of MHS and FTAM. EDIA did comment from a business perspective.

Table 3.

Evaluation of OSI Standard Transfer Protocols as Viewed by EDI Service Vendors

Vendors	Proto-col	Public Reputation	Service Reliability	Public Familiarity	Vendor Offering (Status)	User Interface	Intercon-nection	Problems and Comments
AT&T	MHS FTAM	1 -	1 -	3 4	2 -	3 -	1 5	Not enough users of FTA to have a reputation
MCI	MHS FTAM	1	3	2	3	4	2	Not aware of how customers using FTAM
US SPR	MHS FTAM	1 4	1 3	3 3	4 4	3 3	1 2	No comments
BTNA	MHS FTAM	2 -	2 -	1 2	2 3	2 3	1 3	Limited data available on FTAM
BTUK	MHS FTAM	2 4	3 3	3 4	- -	3 2	3 2	MHS is European solution ODETTE is answer to FTAM
GEIS	MHS FTAM	3 5	2 -	3 5	2 5	- -	4 -	FTAM is not popular
SSW	MHS FTAM	5 5	2 2	5 5	4 3	2 1	3 2	Higher demand for EDI in Europe than in US
TCC	MHS FTAM	2	2	3	3	2	2	Limited EDI public awareness of MHS
TRSPAC	MHS FTAM	2 3	1 1	2 2	1 3	- -	1 3	FTAM used between a few big mainframe
DBP	MHS FTAM							Declined to make comparison Not using FTAM now

Scale: Good = 1, Bad = 5

Table 4.

Evaluation of OSI Standard Transfer Protocols as Viewed by EDI Standards Associations

Vendors	Proto-col	Public Reputation	Service Reliability	Public Familiarity	Vendor Offering (Status)	User Interface	Intercon-nection	Problems and Comments
AIA	MHS	2	3	2	1	3	1	X.400 complex addressing Needs mature '88 version
	FTAM	2	2	1	4	1		FTAM simpler direct process Not user friendly
ANSI	MHS	2	1	2	1	2	1	Public not that aware of full benefits of X.400 &
	FTAM	3	3	5	3	4	2	FTAM Better interactive comparison is MHS to Re-mote Data Processing (RDP)
EDIA	MHS	-	-	-	-	-	-	Business oriented Can't provide technical info.
	FTAM	-	-	-	-	-	-	EDI stds. slow to arrive X.400 will ultimately be std. of choice FAX will cause delay of OSI plan

Scale: Good = 1, Bad = 5

Table 5.

Evaluation of OSI Standard Transfer Protocols as Viewed by Computer Vendors

Vendors	Proto-col	Public Reputation	Service Reliability	Public Familiarity	Vendor Offering (Status)	User Interface	Intercon-nection	Problems and Comments
DEC	MHS	3	3	3	2	2	2	MHS more widely known
	FTAM	3	4	3	3	3	3	FTAM used in IBM world
HP	MHS	1	1	1	1	3	1	MHS adopted by carriers and has enterprise-wide potential
	FTAM	3	3	3	1	1	2	FTAM use with large file in batch mode User inter face is simpler than MHS
IBM	MHS	2	3	2	3	2	2	No comments
	FTAM	3	3	4	3	4	3	No comments

Scale: Good = 1, Bad = 5

V Research Findings - OSI Protocol Diagrams & Protocol Usage Ranking

This chapter contains the OSI standard protocol stacks (OSI basic reference model) and the usage ranking analysis as provided by each company surveyed.

Question: III-7a. Using the OSI Basic Reference Model, please diagram each of the top 3 to 5 transfer protocols you currently offer.

OSI Protocol Diagrams

ATT	OSI Ref. Model	Example 1	Example 2
	Application	X.400	
	Presentation	X.226	
	Session	X.225	
	Transport	X.224	
	Network	X.25	3780
	Data Link	HDLC	BISYNC
	Physical	I.430/I.431	RS232C

ATT	OSI Ref. Model	Example 3	Example 4
	Application		
	Presentation		
	Session		
	Transport		
	Network	3780	MMP/XMODEM
	Data Link	SDLC	V.22 & v.22bis
	Physical	RS232/V.35	V.32 (9.6) FOR MMP

ATT	OSI Ref. Model	Example 5
	Application	
	Presentation	
	Session	
	Transport	
	Network	UUCP (UNIX)
	Data Link	(similar to
	Physical	ASYNC XMODEM)

MCI	OSI Ref. Model	Example 1	Example 2
	Application	X.400	
	Presentation	X.226	
	Session	X.225	
	Transport	X.224	
	Network	X.25	3780
	Data Link	HDLC	BISYNC
	Physical	I.430/I.431	RS232C

MCI	OSI Ref. Model	Example 3	Example 4
	Application		
	Presentation		
	Session		
	Transport		
	Network	X.25	SNA
	Data Link	HDLC	SDLC
	Physical	RS232C	RS232C/V.35

MCI	OSI Ref. Model	Example 5
	Application	
	Presentation	
	Session	
	Transport	
	Network	MMP ASYNC
	Data Link	KERMIT X/YMODEM
	Physical	V.22 & V.22BIS

USS	OSI Ref. Model	Example 1	Example 2
	Application	X.400	
	Presentation	X.226	
	Session	X.225	
	Transport	X.224	
	Network	X.25	3780
	Data Link	HDLC	BISYNC
	Physical	I.430/I.431	RS232C

USS	OSI Ref. Model	Example 3	Example 4
	Application		
	Presentation		
	Session		
	Transport		
	Network	X.25	SNA
	Data Link	HDLC	SDLC
	Physical	RS232C	RS232C/V.35

USS	OSI Ref. Model	Example 5
	Application	
	Presentation	
	Session	
	Transport	
	Network	YMODEM
	Data Link	ASYNC
	Physical	RS232C

BTNA	OSI Ref. Model	Example 1	Example 2
	Application	X.400	
	Presentation	X.226	
	Session	X.225	
	Transport	X.224	
	Network	X.25	2780/3780
	Data Link	HDLC	BISYNC
	Physical	I.430/I.431	RS232C

BTNA	OSI Ref. Model	Example 3	Example 4
	Application		
	Presentation		
	Session		
	Transport		
	Network	X.25	MMP/X.PC
	Data Link	HDLC	ASYNC
	Physical	X.21/X.21 BIS	RS232C

BTUK	OSI Ref. Model	Example 3	Example 4
	Application		
	Presentation		
	Session		
	Transport		
	Network	X.25	MMP
	Data Link	HDLC	ASYNC
	Physical	X.21/X.21 BIS	RS232C

GEIS	OSI Ref. Model	Example 1	Example 2
	Application	X.400	
	Presentation	X.226	
	Session	X.225	
	Transport	X.224	
	Network	X.25	2780/3780
	Data Link	HDLC	BISYNC
	Physical	I.430/I.431	RS232C/V.32

GEIS	OSI Ref. Model	Example 3	Example 4
	Application		
	Presentation		
	Session		
	Transport		
	Network	X.25	MMP/XMODEM/X.PC
	Data Link	HDLC	ASYNC
	Physical	X.21/X.21 BIS	RS232C/V.32

GEIS	OSI Ref. Model	Example 5
	Application	
	Presentation	
	Session	
	Transport	
	Network	3770/SNA
	Data Link	SDLC
	Physical	V.32 & V.22 RS232C

SSW	OSI Ref. Model	Example 1	Example 2
	Application		
	Presentation		
	Session		
	Transport		
	Network	X.25	2780/3780
	Data Link	HDLC	BISYNC
	Physical	RS232C	V.32 & 56KBPS

SSW	OSI Ref. Model	Example 3	Example 4
	Application		
	Presentation		
	Session		
	Transport		
	Network	3770	MMP/XMODEM
	Data Link	SDLC	ASYNC
	Physical	X.21/X.21 BIS	V.32 & V.22

SSW	OSI Ref. Model	Example 5
	Application	
	Presentation	
	Session	
	Transport	
	Network	ANSI/CLEAR
	Data Link	HAYES 212
	Physical	V.32 & V.22 RS232C

TCC	OSI Ref. Model	Example 1	Example 2
	Application	X.400	
	Presentation	X.226	
	Session	X.225	
	Transport	X.224	
	Network	X.35	3780
	Data Link	HDLC	BISYNC
	Physical	I.430/I.431	RS232C

TCC	OSI Ref. Model	Example 3	Example 4
	Application		
	Presentation		
	Session		
	Transport		
	Network	X.25	MMP/XMODEM
	Data Link	HDLC	ASYNC
	Physical	RS232C	RS232C

TPF	OSI Ref. Model	Example 1 Service Connection	Example 2
	Application	ODETTE/FTP	X.400 '84
	Presentation		X.400 '84
	Session		BAS SUBSET
	Transport		CLASS O
	Network	X.25	X.25
	Data Link	LEP/B	LEP/B
	Physical	V SERIES MODEMS	V SERIES MODEMS

TPF	OSI Ref. Model	Example 3 Proprietary like X.400 (MHS) P7	Example 4
	Application	ATLAS 440	TELETEL MINITEL
	Presentation		
	Session		
	Transport		
	Network	X.25	X.25
	Data Link	LEP/B	LEP/B
	Physical	V SERIES MODEMS	V SERIES MODEMS

Protocol Usage Ranking

The following table provides the ranking of the protocols based on usage and demand.

Question: III- 7b. Please rank the top 3 to 5 protocols by percentage of highest to lowest usage/demand.

STANDARD PROTOCOL USAGE/DEMAND SUMMARY - HIGHEST TO LOWEST

Ranking	Protocol
1st	Asynchronous
2nd	Bisynchronous
3rd	X.25
4th	Synchronous Data Link Control
5th	X.400
6th	All Others

Note: Proprietary protocols not included

Comments

- US EDI service vendors generally ranked Asynchronous as highest.
- TRANSPAC reported X.25 as the highest user.
- At this point, X.400 represents less than 1% of the usage.

VI Case Studies

Please note that the structure of these case studies follows the format of the questionnaire used (Questionnaire 3) in the interview process. The number by each of the statements in the case study report corresponds to the question in the survey. Also, each statement has been written to indicate the point of the question. The questionnaire (Questionnaire 3) is provided in Appendix C.

The Electronic Data Systems and Illinois Department of Revenue case studies meet the request for a review of two companies using the OSI standard transfer protocol.

A
Electronic Data Systems (EDS)

EDS is now a General Motors company and provides all data processing for America's largest automotive manufacturer as well as numerous major manufacturing and services organizations throughout the U.S. and Europe. Approximately 50% of EDS's revenue comes from customers other than General Motors Corporation.

1a EDS interacts with more than 6 major EDI applications.

1b They have no plans to develop any EDI systems with new strategic partners on a pilot project basis.

1c The following information identifies EDS' top 5 applications, number of users per system, and some of its major user names.

	Application Name	# of Users	Major Users
GM's	MATERIALS MGMT (Proprietary format)	4,000	
GM's	PURCHASING	800	
GM's	RAIL CAR TRACKING (TDCC Format)	1	Railroad Association
GM's	BANK PAYMENT (Banking format)	5	Banks
GM's	DIRECT DEPOSIT (Banking format)	100	Banks and Credit Unions
EDS'	ACCTS PAYABLE (Incoming invoice X12 format)	4	Internal to EDS

2a The following shows the primary computer and network vendors that support the applications noted above.

Application Name	Computer Vendor	Network Vendor
ALL Mainframe	IBM OR comparable	Most Applications first interface with the EDS Network

2b The protocols that support these applications are:

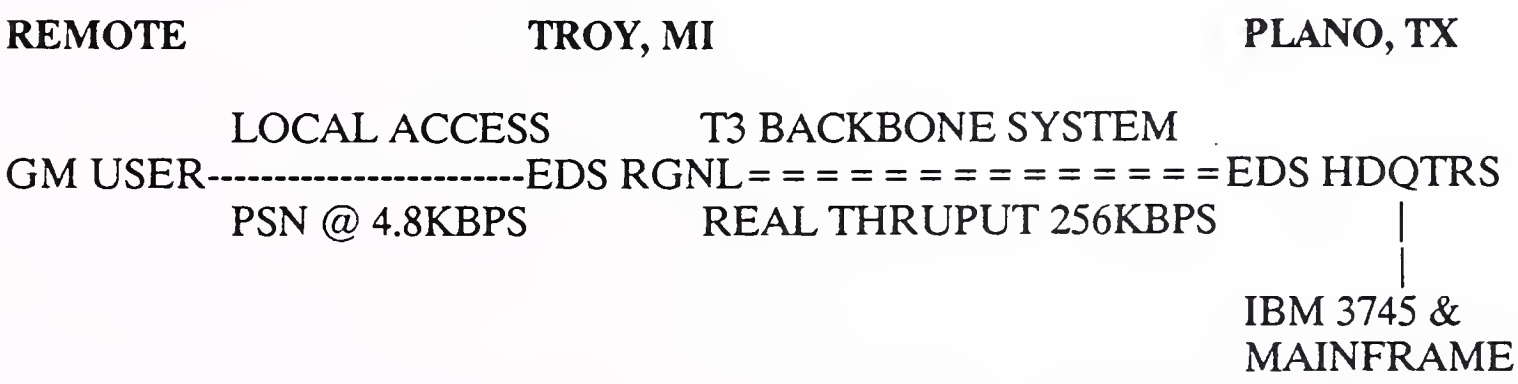
	Application Name	Network Vendor	Network Type*
GM's	MATERIALS MGMT (Proprietary format)	EDS	BISYNC 4.8 PSN
GM's	PURCHASING (General Stores X12 format)	EDS	BISYNC 4.8 PSN
GM's	RAIL CAR TRACKING (TDCC FORMAT)	EDS	BISYNC 4.8 P/L
GM's	BANK PAYMENT (Banking format)	EDS	BISYNC 4.8 PSN
GM's	DIRECT DEPOSIT (Banking format)	EDS	BISYNC 4.8 PSN
EDS'	ACCTS PAYABLE (Incoming invoice X12 format)	IBM	SDLC 56KBPS

* Network Type - communication protocol/data rate/network facility (PSN - public switched network, P/L - private line).

The top 3 applications by volume (All with GENERAL MOTORS) are:

1. MATERIALS MANAGEMENT
2. RAIL CAR TRACKING
3. PURCHASING

3a The following depicts the top 3 EDI application/network configurations including a simple diagram of the network design/layout and systems used



3.b The top 3 currently supported transfer protocols are shown below using the OSI Basic Reference Model. Each application is referred to by EDS by the name "ELIT" which stands for Electronic Information Transfer.

EDS	**OSI Ref. Model**	**Example 1** ELIT(MAT'L MGMT)	**Example 2** ELIT(RAIL CAR)
	Application		
	Presentation		
	Session		
	Transport		
	Network	3780	3780
	Data Link	BISYNC	BISYNC
	Physical	V.27BIS 4.8	V.27 4.8

OSI Ref. Model	**Example 3** ELIT(PURCHASING)
Application	
Presentation	
Session	
Transport	
Network	3770
Data Link	SDLC
Physical	V.35 56KBPS

4a MHS does not currently play a key role in the EDS environment. It is considered as something to be addressed in the future. EDS noted that government contracts are starting to include MHS as a requirement.

4b/c While MHS is not currently used, it is planned for use in 1992.

4d MHS would be more desirable if it became the envelope standard between networks, e.g., EDS and IBM or EDS and GEIS.

5a/b The EDS project leader is Dave Steinus (313) 370-1603. Please note that he is also on the committee to sponsor Mailbag.

6 Some of the more significant problems they have encountered with EDI applications are:

- Mainly having to do with interconnection with other networks via bisync
- Loose security with dial-a-dump. Mailbag may help this situation

7 There were no other vendors who participated in the development of the application. The ELIT (Electronic Information Transfer) product was first developed internally in 1975. But, the translation software was purchased from RMS.

8 As additional comments, EDS is:

- currently converting to X12
- plans to retain bisync
- can meet client requirements for X.25 when requested

B
Illinois Department of Revenue (IDR)

The Illinois Department of Revenue is the state agency responsible for all state tax collections within the state of Illinois.

1.a IDR has no EDI applications in place although several are under development.

1.b IDR currently has 2 active pilot projects and 1 in the planning stages.

1.c Here are the top 5 applications, number of users per system, and some of the major user names.

	Application Name	# of Users	Major Users
In Development			
	FEDERAL/STATE INFO EXCHANGE A	Expect 5	IDR & IRS
	FEDERAL/STATE INFO EXCHANGE B	Expect 5	IDR & IRS
Planned			
	ELECTRONIC FILING OF BUSINESS TAXES (The following standards are being developed: 813,151,820, 997,824,831,& 838)	Goal of 100,000	Tax Payers & Collection Agencies

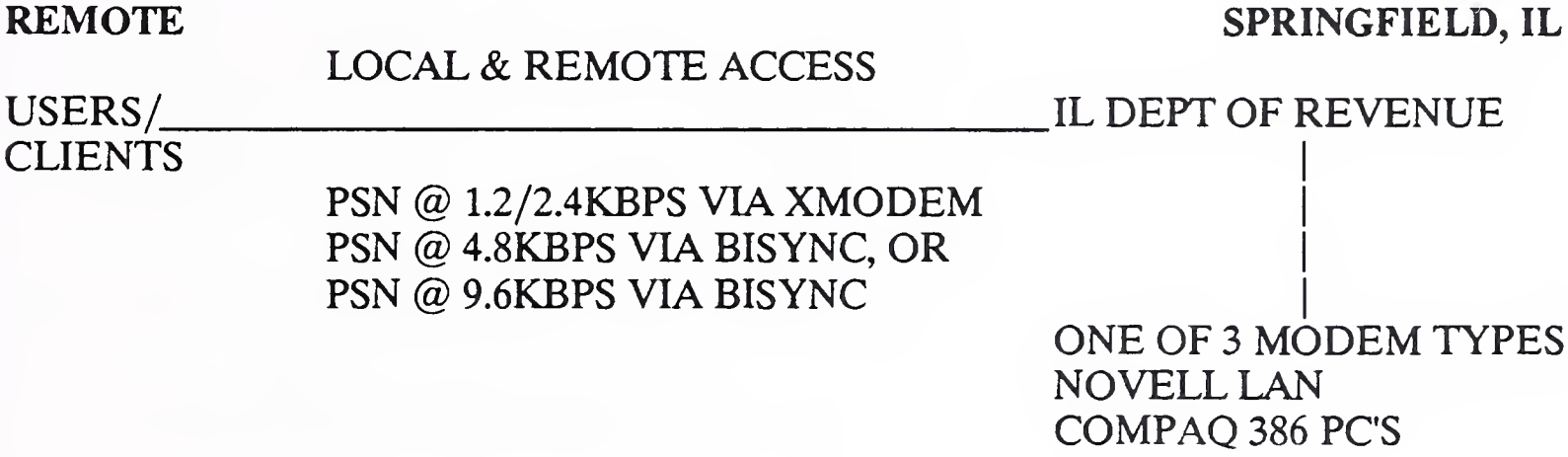
2.a Primary computer and network vendors that support the IDR applications noted above are:

Application Name	Computer Vendor	Network Vendor
INFORMATION EXCHANGE A & B	COMPAQ 386 PC'S, NOVELL LAN, & SUPPLY TECH'S STX 12 Software	PSN
ELECTRONIC FILING (Proprietary)	SAME AS ABOVE BUT IN-HOUSE SOFTWARE	PSN
ELECTRONIC FILING (via EDI)	PC NETWORK BASED	To be defined

2.b The types of protocols that support these applications vary and are subject to network vendors and those users wishing to interface with the IDR. It can be expected that IDR will use multiple networks and protocols (through services vendors) to reach the diverse audience of tax payers and collection agencies..

3a The following depicts the top 3 EDI application/network configurations including a simple diagram of the network design/layout and systems used.

NETWORK CONFIGURATION for ELECTRONIC FILING SYSTEM



3b The top 3 currently supported transfer protocols are noted below through the use of the OSI Basic Reference Model.

IDR	OSI Ref. Model	Example 1	Example 2
		ELECT FILING	INFO EXCHANGE A & B
	Application	ANSI X12	
	Presentation		
	Session		
	Transport		
	Network	UNDER	PROCOM/KERMIT/ X & Z MODEM
	Data Link	DEVELOPMENT	ASYNC
	Physical		V.32BIS/V.42BIS/V.42

IDR	OSI Ref. Model	Example 3A	Example 3B
	ELECT FILING	SYSTEM 1	SYSTEM 2
	Application	IN HOUSE	IN HOUSE
	Presentation	SOFTWARE	SOFTWARE
	Session		
	Transport		
	Network	3780	3780
	Data Link	BISYNC	BISYNC
	Physical	208B MODEM (4.8)	V.32 (9.6)

IDR	OSI Ref. Model	Example 3C
	ELECT FILING (Proprietary)	SYSTEM 3
	Application	IN HOUSE
	Presentation	SOFTWARE
	Session	
	Transport	
	Network	XMODEM
	Data Link	ASYNC
	Physical	RS232C

4a MHS does not play any role in their environment.

4b/c While MHS is not currently used, it could play an indirect role through a VAN providing protocol conversion.

4d The desirability of MHS has not been determined.

5a The IDR project leader is Dan Cornwell (217) 785-8798

6 Some of the more significant problems they have encountered with EDI applications are:

- the business issues, e.g., rules and regulations for receive posting dates are more important than the technical issues.
- the IDR has not placed priority on EDI application issues until the present time.

7 There are no vendors involved in the development of their application other than the providers of software and hardware products. No service vendors have been used to date.

8 As additional comments, IDR noted:

- up to 150,000 tax returns will be filed electronically in 1992 in Illinois with IDR.
- the federal system did 7,000,000 electronic tax filings in 1991.
- 10 states will start electronic filing in 1992.

X CONCLUSIONS

A
Current Status of Transfer Protocols Offered by Service Vendors

- Majority of service vendors use Async, Bisync, X.25, SDLC, and X.400

- Protocols are offered to meet customer demand and to stay competitive

- Few major problems--all being addressed

  - No acknowledgment using Bisync Dial-A-Dump through VAN
  - Need better understanding of X.400

- Evaluation assessment

  - All major transfer protocols will continue to prevail through the next five years
  - Interest is growing in X.400 and X.435
  - Bisync transitional to SDLC

- Protocol usage by users

  - Users outside the US favor X.25 and Bisync
  - US users prefer Async and Bisync

- Majority of service vendors offer 1984 version of MHS

  - Most selected P2 type (E-mail through P1's transport protocol)
  - All use MHS with customers but divided on whether it is used with all or just specific customers
  - Most use MHS with specific network service vendors

- FTAM is not offered by any carrier

  - Limited awareness of this file transfer protocol
  - European service vendors use ODETTE in place of FTAM

- All service vendors support all major EDI formats

  - ANSI X12, EDIFACT, TDCC
  - Including a variety of industry specific standards

- All service vendors interconnected with each other

B
Future Status of Transfer Protocols Offered by Service Vendors

- All service vendors will offer X.400 transfer protocols
  - Some will offer X.435, Mailbag, and SDLC
  - One may offer FTAM and CICS
  - Most offerings will occur in mid to late 1992
- It is apparent that customer demand is driving transfer protocol offerings
- Growth in MHS may be slow
  - Due to low cost personal computer IBM solutions
  - Until X.435 standards and software are available
- All service vendors will offer MHS
  - Most will support the 1988 version
  - Many still select the P2 type and several select P7
  - MHS will be used with customers on a general basis
  - Most will use MHS but are divided in whether it will be used generally or specifically with network service vendors
- Over half of service vendors will offer FTAM
  - Implementation driven by market demand
  - No indication of diminished importance of ODETTE
  - Two service vendors plan to implement FTAM in late 1992
- All service vendors will continue to support all major EDI formats
  - Customer demand continues to drive standards
  - EDIFACT may have ANSI X12 subsets--perhaps regional
  - No indication of diminished importance of industry specific standards
- EDIFACT will continue to be supported by all service vendors
- EDI service vendors will interconnect using:
  - All major standards
  - Same standards customers use

C
Evaluation of Protocols Summary

1. EVALUATION OF PROTOCOLS BY EDI SERVICE VENDORS - SUMMARY RESULTS

	Rankings	
Survey Area	**MHS**	**FTAM**
Public reputation	2.1	4.2
Service reliability/quality	1.9	2.3
Public familiarity	2.8	3.6
Status of vendor offering	2.6	3.6
User interface	2.7	2.3
Interconnection	2.0	2.8
Average Ranking	2.35	3.13

Scale: 1 = Good thru 5 = Bad

Note: 9 respondents

2. PROTOCOL EVALUATION BY EDI STANDARDS ASSOCIATIONS - SUMMARY RESULTS

	Rankings	
Survey Area	**MHS**	**FTAM**
Public reputation	2.0	2.5
Service reliability/quality	2.0	3.0
Public familiarity	2.0	3.5
Status of vendor offering	1.0	2.0
User interface	2.5	4.0
Interconnection	1.0	1.5
Average Ranking	1.75	2.75

Scale: 1 = Good thru 5 = Bad

Note: 2 respondents

3. PROTOCOL EVALUATION BY COMPUTER VENDORS - SUMMARY RESULTS

	Rankings	
Survey Area	**MHS**	**FTAM**
Public reputation	2.0	3.0
Service reliability/quality	2.3	3.3
Public familiarity	2.0	3.3
Status of vendor offering	2.0	2.3
User interface	2.3	2.7
Interconnection	1.7	2.7
Average Ranking	2.05	2.88

Scale: 1 = Good thru 5 = Bad

Note: 3 respondents

D
CASE STUDIES USING OSI STANDARD TRANSFER PROTOCOL

- Both Electronic Data Systems (the data processing arm of General Motors) and the Illinois Department of Revenue deal with extraordinary amounts of data.

- Neither respondent has MHS nor do they have any MHS implementation plans.

- Relatively few users appear to have MHS capability at this time (additional case studies would help define growth potentials).

- In contrast, the service vendors have created and are expanding their MHS capability in anticipation of real user demand.

Appendix A

Questionnaire 1

Questionnaire 1

Research Survey
Progress Towards a Standardized EDI Protocol in Europe and North America
October, 1991

Introductory remarks

My name is Marc Matheson. I am a Project Director for INPUT. We are a leading market research firm and are conducting a research study to evaluate the development of standard EDI protocols.

We are in the process of surveying principal EDI network service carriers, vendors, and standards associations who use/define standards for EDI systems. Your participation in this survey would provide the necessary information we need to determine industry trends.

In return for your participation, we will send you an executive summary of INPUT's annual assessment and forecast of the use of EDI in the U.S., entitled EDI MARKET 1991 - 1996, and a copy of our EDI newsletter.

The survey should take about 45 minutes to complete plus what ever time it may take to assemble system and network diagrams.

If this is acceptable, when would be a convenient time for us to call you? _____ What is your fax telephone number? _____

Your cooperations is greatly appreciated. Thank you very much for your time and consideration.

INPUT Research Survey
Progress Towards a Standardized EDI Protocol
in Europe and North America
October, 1991

Survey of principal EDI network carrier and services vendors

I. Current Status of Protocols

1.a. What kinds of EDI transfer protocol interfaces are offered to your users and other service vendors, e.g., telephone, X.25, SNA, MHS, etc.

1.b. Why are they offered?

2. Are you experiencing any problems with these protocols? (Please note any weaknesses and why they do not perform as well.)

3. What is your assessment of the EDI protocols you offer? (Please note the "why's behind your assessments)

4. Please note the number of companies using each protocol and identify the larger users if possible.

5. If you are offering MHS protocol:

a. What version of MHS protocol is used...'84 or '88? (Please circle)

b. What type of protocol is used...P0, P1, P2, P3, or P7 ('88)? (Please circle)

c. Is MHS protocol used with customers?
Yes___ No___

If yes, is it used in general or only with specific customers? _____

If specific, how many? _____ %

d. Is MHS protocol used with network services vendors?
Yes___ No___

If yes, is it used in general or only with specific vendors? _____

If specific, how many? _____ %

6. If you are offering FTAM protocol, what types of file options are used...Type 1, 2, or 3? (Please circle)

7. What industry standards (business protocols) do you support, e.g., ANSI X12, EDIFACT, TDCC, etc.?

_____
_____
_____
_____

8. Do you interconnect with other EDI networks?
Yes__ No__ If yes, please describe.

_____
_____
_____
_____

II. Future Trends of Protocols

1.a. What kinds of EDI transfer protocol interfaces are expected to be offered to users and other service vendors?

_____
_____
_____
_____

1.b. Why are you planning to offer these?

_____
_____
_____
_____

2. When is the scheduled role out for these offerings?

_____
_____
_____
_____

3.a. Are you planning to use MHS protocol? Yes__ No__

3.b. If yes, when would MHS be offered?

_____
_____
_____
_____

4. If you are planning to offer MHS protocol:

a. What version of MHS protocol will be used...'84 or '88? (Please circle one)

b. What type of protocol will be used...P0, P1, P2, P3, or P7 ('88)? (Please circle one)

c. Will MHS protocol be used with customers?
Yes___ No___

If yes, will it be used in general or only with specific customers?

_____

If specific, how many? _____ %

d. Will MHS protocol be used with network services vendors?
Yes___ No___

If yes, will it be used in general or only with specific vendors? _____

If specific, how many? _____ %

5.a. Are you planning to offer FTAM?
Yes__ No__

5.b. If yes, when would FTAM be offered?

_____
_____
_____
_____

6. What industry standards will be supported, e.g., ANSI X12, EDIFACT, TDCC, etc.?

_____
_____
_____
_____

7. If you are not planning to use EDIFACT, please note why?

_____
_____
_____
_____

8. What standards will you use if you interconnect with other vendors?

_____
_____
_____
_____

III. Ranking of Protocols

To better understand how you would compare MHS to FTAM transfer protocols, please rank each category noted below on a one (Good) to five (Bad) basis: Also, please note any problems or comments associated with each category.

1. Public reputation/popularity MHS___ FTAM___

2. Service reliability and quality MHS___ FTAM___

3. Public familiarity MHS___ FTAM___

4. Status of vendor offering MHS___ FTAM___

5. User interface MHS___ FTAM___

6. Interconnection MHS___ FTAM___

7. Protocol diagrams

a. Using the OSI Basic Reference Model, please diagram each of the top 3 to 5 transfer protocols you currently offer.

OSI Ref. Model	**Example A**	**Example B**
EDI		
Application		MHS
Presentation		X. 226
Session		X. 225
Transport		X. 224
Network	X.25	X. 25
Data Link	HDLC	HDLC
Physical	I.430/I.431	I.430/I.431

OSI Ref. Model	**Example 1**	**Example 2**
Application		
Presentation		
Session		
Transport		
Network		
Data Link		
Physical		

OSI Ref. Model	**Example 3**	**Example 4**
Application		
Presentation		
Session		
Transport		
Network		
Data Link		
Physical		

OSI Ref. Model **Example 5**

Application
Presentation
Session
Transport
Network
Data Link
Physical

b. Please rank these top 3 to 5 protocols by percentage of highest to lowest usage/demand.

Protocol Name	**Ranking by %**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

8. Other comments

_____

_____

_____

_____

Appendix B

Questionnaire 2

Questionnaire 2

Evaluation of OSI standard transfer protocols perceived by EDI standards associations (TDCC, EDIA, & ANSI), computer vendors, and EDI service vendors.

To better understand how you would compare MHS to FTAM transfer protocols, please rank each category noted below on a one (Good) to five (Bad) basis: Also, please note any problems or comments associated with each category.

1. Public reputation/popularity MHS___ FTAM___

2. Service reliability and quality MHS___ FTAM___

3. Public familiarity MHS___ FTAM___

4. Status of vendor offering MHS___ FTAM___

5. User interface MHS___ FTAM___

6. Interconnection MHS___ FTAM___

Appendix C

Questionnaire 3

Questionnaire 3

Questionnaire for case studies using OSI standard transfer protocol, identifying trends and perspectives.

INPUT is interested in evaluating the following EDI trend areas:

1.a. How many EDI applications does your organization currently interact with? ____

1.b. How many EDI systems are currently being developed with a new strategic partner on a pilot project basis? ____

1.c. What are the names of the top 5 applications, how many users per system, and what are the names of some of the major users on each of these?

Application Name	% of Users	Major Users

2.a. Please note the primary computer and network vendors that support the applications noted above.

Application Name	Computer Vendor	Network Vendor

2.b. Please note the protocols that support the applications noted above.

Application Name	Computer Vendor	Network Vendor

3.a. What do your top 3 EDI application/network configurations look like? Could you please give us a brief description now and then forward a more detailed description in the form of network design/layout diagrams which indicate the type of networks, systems used, etc.

3.b. Using the OSI Basic Reference Model, please diagram the top 3 transfer protocols which you currently support.

OSI Ref. Model	**Example A**	**Example B**
EDI		
Application		MHS
Presentation		X. 226
Session		X. 225
Transport		X. 224
Network	X.25	X. 25
Data Link	HDLC	HDLC
Physical	I.430/I.431	I.430/I.431

OSI Ref. Model	**Example 1**	**Example 2**
Application		
Presentation		
Session		
Transport		
Network		
Data Link		
Physical		

OSI Ref. Model	**Example 3**	**Example 4**
Application		
Presentation		
Session		
Transport		
Network		
Data Link		
Physical		

OSI Ref. Model **Example 5**

Application
Presentation
Session
Transport
Network
Data Link
Physical

4.a. What role does MHS play in your environment?

_____
_____
_____
_____
_____

4.b. Is MHS used? Yes No

4.c. If not, is it planned to be used?
Yes___ No___

If yes, when? _____

4.d. Any other comments on the desirability of MHS?

_____
_____
_____
_____
_____

5.a. If we have follow-on questions, may we speak with your project leader(s)?
Yes___No___

5.b. If yes, what is/are their name(s)?

_____
_____
_____
_____
_____

6. What are some of the more significant problems you have encountered with EDI applications and what methods or approaches are being used to solve them?

7. Who were some of the other vendors who participated in the development of your application?

8. Other comments?

Appendix D

Terms

1. AIAG - Automotive Action Group
2. EDIFACT - The ISO standard for Electronic Document Interchange for Administration, Commerce and Transportation.
3. FTAM - File Transfer Access Management
4. Mailbag - program that also addresses delivery of electronic mail messages.
5. MHS - Message Handling Service, a generic term applied to X.400.
6. ODETTE - Organization for data by telegraphic transfer within Europe.
7. PSN - Public Switched Network
8. SDLC - Synchronous Data Link Control
9. TDCC - Transportation Data Coordinating Committee
10. TRADACOMS - Message standard for data interchange between major United Kingdom retailers and suppliers.
11. UCS - Uniform Communication Standard for the grocery industry in the United States.
12. VAN - Value Added Network
13. X.400 - the international standard for electronic mail message transfer.
14. X.435 - electronic data interchange standard within X.400.
15. X.500 - address and directory services standard.

About INPUT

INPUT provides planning information, analysis, and recommendations for the information technology industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions.

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