

**GISB Future Technology Task Force
Pilot Test Subcommittee**

Pilot Test Report

September 17, 1996

Table of Contents

- 1. EXECUTIVE SUMMARY..... 1**
- 2. TEST EXPERIENCE AND RESULTS..... 2**
 - 2.1. ISSUES..... 2
 - 2.1.1. *Participation and Industry Involvement*..... 2
 - 2.1.2. *Technical Skill Requirement*..... 2
 - 2.1.3. *Impact of Internet growth*..... 2
 - 2.1.4. *Bi-directional Communications Capability*..... 3
 - 2.1.5. *Server Side Software Development*..... 3
 - 2.1.6. *Custom Software Requirement for Fully Automated Batch Client*..... 3
 - 2.1.7. *Single Points of Failure*..... 3
 - 2.1.8. *Internal Network Security*..... 4
 - 2.1.9. *Increased Security Administration*..... 4
 - 2.1.10. *Security Management using Third Party Providers*..... 4
 - 2.2. PROGRESS ANDEXPECTATIONS..... 4
 - 2.2.1. *Performance of Transmission via the Internet*..... 4
 - 2.2.2. *Timeline for Implementation*..... 5
 - 2.2.3. *Clarification and Refinement of Standards*..... 5
 - 2.2.4. *Site-Specific Decisions*..... 5
 - 2.3. CONCLUSIONS..... 5
 - 2.3.1. *Reliability of Public Internet and HTTP Protocol*..... 5
 - 2.3.2. *Implementation Time Frame*..... 6
 - 2.3.3. *Cooperation and Communication During Implementation*..... 6
 - 2.3.4. *Scalability*..... 6
 - 2.3.5. *Strategic Aspect of FTTF Standards*..... 6
 - 2.3.6. *Need for Further Refinement and Testing*..... 6
 - 2.4. RECOMMENDATIONS..... 7
 - 2.4.1. *Implementation Subgroup*..... 7
 - 2.4.2. *Implementation Assistance*..... 7
 - 2.4.3. *Refinement of Formats and Standards*..... 7
- 3. PILOT TEST DESCRIPTION..... 8**
 - 3.1. PILOT TEST MISSION..... 8
 - 3.2. PILOT TEST PARTICIPANTS 8
 - 3.3. PILOT TEST SCOPE 9
 - 3.4. PILOT TEST OBJECTIVES..... 9
 - 3.5. PILOT TEST CRITERIA..... 9
 - 3.6. PILOT TEST DELIVERABLES10
 - 3.7. BACKGROUND ANDMETHODODOLOGY.....10
 - 3.8. TEST COORDINATOR10
 - 3.9. TEST ENVIRONMENT.....11
 - 3.10. TEST CASES.....11
 - 3.10.1. *TC-1: Environment Test*.....11
 - 3.10.2. *TC-2: Binary Pair Test with Sender and Receiver Identified*.....11
 - 3.10.3. *TC-3: Concurrency Test*.....11
 - 3.11. TEST DATA.....12

3.12. PILOT TEST TIMELINE:	12
3.12.1. Phase I (Basic HTTP transmission with timestamp).....	12
3.12.2. Phase II (HTTP realm security and PGP encryption with digital signature).....	12
4. SUPPORTING DOCUMENTS.....	13
4.1. TEST PLANS.....	13
4.1.1. Phase I Test Plan.....	13
4.1.2. Phase II Test Plan.....	19
4.2. PARTICIPANT CONFIGURATION PROFILES	23
4.2.1. El Paso.....	23
4.2.2. Enron.....	24
4.2.3. NGPL.....	25
4.2.4. NrG.....	26
4.2.5. PanEnergy.....	27
4.2.6. Tenneco Energy.....	28
4.3. TEST RESULTS FROM PHASE I.....	30
4.3.1. Phase I Timings by Client.....	30
4.3.2. Phase I Timings by Server.....	32
4.4. TEST RESULTS FROM PHASE II	35
4.4.1. Summary by Client and Server.....	35
4.4.2. Summary of Results by Time of Day.....	37
5. PILOT TEST PRELIMINARY SURVEY RESPONSES.....	38
5.1. SURVEY OF TRANSPORTERS OF NATURAL GAS.....	38
5.2. SURVEY OF SHIPPERS OF NATURAL GAS	42
5.3. SUMMARY OF COMMENTS FROM CUSTOMER SURVEY.....	44

1. Executive Summary

The pilot test of GISB Future Technology Task Force (FTTF) standards was accomplished in two phases. Phase I, complete as of July 26, 1996, addressed basic Internet connectivity and performance along with HTTP (HyperText Transport Protocol) protocol functionality. Phase II, ending August 14, 1996, was designed to test the security architecture and to refine procedures for implementing and administering public key cryptography for secure electronic commerce. A set of standard test files was created to simulate nominations transactions of various sizes. These files were used by all parties throughout both phases of the test.

In Phase I, six companies provided server facilities for receiving transactions via the Internet. Eight companies participated as transaction senders, including the six receivers. Approximately one month was required for the participants to develop, install, and test the basic client and server components targeted for the first phase. This process was facilitated by information sharing between companies. Most of the difficulties encountered were the result of local environmental constraints and differing interpretation of the GISB FTTF specifications. This afforded the opportunity to further refine and document the standards and related implementation procedures.

In Phase II, the same six servers were used, however there was one additional company posting transactions. HTTP basic authentication or realm security and PGP public key encryption with digital signatures were added to the architecture model that was tested in phase I. An additional month was necessary to add these features.

Throughout the testing the performance of the HTTP protocol and the public Internet infrastructure remained reliable and consistent. Minor variances were experienced; these are not significant for the transaction volumes expected by the industry. Performance of peak transaction loads during the nomination deadline period appeared acceptable. However, it must be pointed out that universities are a significant segment of the Internet user community, and all testing to date has been conducted during the summer recess. Continued implementation work by the task force will ensure that the impact of Internet traffic patterns is properly documented over a longer period of time.

Limited concurrency tests were conducted in which the effect of single input from a large number of trading partners was simulated by repeated simultaneous transmission of test files from the nine test participants. The role of receiver was rotated to allow for verification of this scenario against different platforms and configurations. Based on this testing, it is anticipated that today's public Internet and current commercially available server technology can handle projected transaction loads. Scaling the environment to handle an actual volume of business will be the responsibility of the individual companies during implementation. The architecture selected by the FTTF is extremely flexible. For a small company an average desktop computer might be adequate whereas a large corporation would need an industrial-strength server. Scalability, along with the fact that Internet access and related technologies have become a commodity, makes the solution accessible to large and small companies alike.

2. Test Experience and Results

2.1. Issues

2.1.1. Participation and Industry Involvement

Participation in the pilot test was less than anticipated and involved mostly pipelines and third party providers. Because of the time constraints on completing the proof of concept for the architecture, significant segments of the industry declined to participate. However the participation and intensity of testing were sufficient to prove the viability of the technology. The concurrency testing that was conducted simulated high data volumes from a small number of participants. While this demonstrated the ability of the Internet and the receiving site to handle a significant amount of data in a specific time period, the transaction arrival patterns will necessarily differ in a real-world production environment. This may present other concerns that did not arise during the test. However, those issues are most likely to involve a single site's specific implementation rather than the performance of the Internet and its protocols.

2.1.2. Technical Skill Requirement

The companies which implemented the HTTP client and server components for the pilot test assigned dedicated Information Technology staff members to the pilot project. It took approximately two months for those companies to develop those components to the point where they could provide all the functions required for the test. All participants needed a high level of understanding of Internet technologies, and frequent communication was necessary to exchange site-specific information. Certain issues arising from differing interpretation of the standards frequently had to be worked out between individual participants. For this reason, the solution proposed by the FTTF is not considered to be a trivial implementation. However, it is the objective of the pilot test team to standardize and document the technical details so that the industry can implement the solution more easily.

2.1.3. Impact of Internet growth

The current rate of growth in Internet access has prompted industry watchers to make dire predictions about the lack of adequate transmission capacity in the future. Today, telecommunications providers are upgrading their backbone networks to ensure that this capacity will remain available. With the development of multimedia applications and the entry of cable TV companies and others into high bandwidth data services, there is great commercial incentive for new providers, protocols, and technologies to extend the infrastructure. This process is expected to continue as demand escalates. It is recognized that this growth will not be entirely smooth and may at times have business impact. At this time, however, the growth of Internet use appears to present no risks greater than those associated with today's methods of communication using VANs (Value Added Networks) and proprietary EBBs. Implementers of GISB standards are expected to design their processing environments to provide a level of redundancy and fault tolerant appropriate to business needs.

2.1.4. Bi-directional Communications Capability

The HTTP file upload model implemented by the FTTF requires all trading partners to function as both a client and a server. The client component initiates the upload of the transaction dataset and the server is required in order to receive any transactions including functional acknowledgments. Maintaining a dedicated server on-site may entail considerable expense, which has given rise to many questions about the cost of installing and supporting the solution for small companies. The FTTF's mission has been to define and validate an open architecture for the electronic delivery of transactions. As such, the task force cannot presume to determine the cost to an individual company to implement the solution. Nor can the task force anticipate factors that might influence a company's selection of specific platforms for implementation. However, FTTF will identify a number of options for both client and server configurations and will provide detailed explanations of the alternatives in the implementation guide.

2.1.5. Server Side Software Development

All server implementations require a custom-written program using the Common Gateway Interface (CGI) or other Application Programming Interface (API) to store the uploaded file and to format and return the HTTP response. During the testing, several versions of this processing program were created for a variety of computing platforms using a number of programming languages. The fruits of this effort are a library of programs that could be made available to the rest of the industry as a starting point for implementation. However, this code would be distributed without warranties of any kind.

2.1.6. Custom Software Requirement for Fully Automated Batch Client

The original objective of the FTTF was to select technology that could be implemented using commercially available shrink-wrap software. While the file upload can be manually invoked with a standard, off-the-shelf World-Wide Web browser, the FTTF adopted a working assumption that it should be possible to initiate the transmission in an unattended, automatically scheduled batch mode. As of the time of the pilot test, this required the development of custom software or modification of readily available, public domain programs. During the testing, several versions of this "batch browser" were created for a variety of computing platforms using a number of programming languages. The fruits of this effort are a library of programs that could be made available to the rest of the industry as a starting point for implementation. However, this code would be distributed without warranties of any kind.

2.1.7. Single Points of Failure

A dedicated connection to the Internet is potentially a single point of failure that can cause a site to become inaccessible due to an outage caused by the Internet Service Provider or telecommunications provider. Redundant dedicated connections are an expensive proposition, although dial access to the Internet is a readily available and inexpensive commodity. Individual companies must weigh cost and benefits of providing alternate access. It is expected that communications procedures and alternatives will be detailed in the trading partner agreement.

2.1.8. Internal Network Security

Any connection to the public Internet mandates tighter network security for an organization as a whole. The FTTF proposed standards state that this is a site specific issue, since it depends on a company's own network use policy as well as the way in which a site is connected to the Internet. However, because of these differences, it is expected that those sites employing firewall machines to protect their internal networks will have to coordinate closely with trading partners to work out configuration details for the HTTP protocol and socket numbers that may affect transmissions.

2.1.9. Increased Security Administration

Coordination of security measures such as HTTP Realm I Security (also referred to as Basic Authentication) and PGP (Pretty Good Privacy) encryption keys will require administrative overhead beyond that which is needed for the current EDI trading partner arrangements using VANs. A common industry "trust model" is desirable to assure authenticity of transactions and verify the identities of trading partners. In order to fully implement a trust model for electronic commerce, the industry should utilize an external authority that will certify PGP keys. At this point in time there is no commercial source for this service. Until such source is available, the industry should develop a process that includes self-certification of keys. At a minimum, key exchanges should be handled directly between individual trading partners. This is the recommendation of the EDI working subgroup of the Internet Engineering Task Force (IETF), an international body which sets standards for Internet services and protocols.

2.1.10. Security Management using Third Party Providers

Companies may elect to use third party providers as their "designated site" for EDM transactions. According to this definition, transmissions handled by the third party on behalf of the company will follow the FTTF standards, but the back end interface between the company and the third party is outside the scope of the standards. Thus it will be necessary for the company and the third party to define roles and responsibilities regarding data transfer, encryption, digital signatures, and security management.

2.2. *Progress and Expectations*

2.2.1. Performance of Transmission via the Internet

The public Internet infrastructure with existing traffic loads successfully accommodated transmission of several megabytes of nominations transactions during the concurrency test in the 10 minute interval from 11:20-11:30 Central Clock Time (CCT). This time period was chosen because it represents both a peak activity time on the Internet and the daily nominations deadline under the GISB standards. This will allow companies to meet the nominations and confirmations deadlines based on anticipated volumes as indicated by responses to the pilot test survey. Each individual company must scale its Internet connection and processing environment to provide sufficient capacity to meet the deadlines. Ongoing efforts of the Implementation Team will be aimed at further evaluating the impact of performance factors such as university-related traffic and the long-term growth of Internet use.

2.2.2. Timeline for Implementation

It is reasonable to expect that the industry will be able to implement the proposed FTTF standards for data transmission via the Internet by the target dates identified in FERC Order No. 587. The FTTF will publish detailed specifications for the HTTP request and response formats as part of an implementation guide designed to assist the industry.

2.2.3. Clarification and Refinement of Standards

The communications methods and formats were selected because of their flexibility and portability as open standards. It is expected that these standards will be well-positioned to evolve with changes in technology and business practices. The FTTF and the Pilot Test Subgroup developed and published clear specifications of the required formats for the pilot test. Nevertheless, several incomplete and inaccurate implementations surfaced during the test. The FTTF must therefore design its implementation guide to specify all details of the architecture and its data elements in a way that cannot be misinterpreted. It will be critical for all companies adopting the standards to follow the specifications exactly.

2.2.4. Site-Specific Decisions

Successful use of the public Internet for data transmission depends heavily on the way in which a company interfaces with the Internet; specifically, the use of a reliable Internet Service Provider (ISP), the proper selection and sizing of hardware and software components, and the implementation of appropriate security measures.

2.3. Conclusions

2.3.1. Reliability of Public Internet and HTTP Protocol

Test experience indicated that the Internet and the HTTP protocol were reliable for the delivery of X12 transactions during the entire test period. The overall transaction error rate, exclusive of problems related to initial startup, was 1.4%. It should be noted that errors caused by program defects that were identified and fixed during the test period were not included in this figure. Of those that were reported in the final statistics (see the error transaction chart under Test Results from Phase II, Summary by Client and Server), the majority appear to be related to the method that was used to simulate multiple concurrent transmissions from different trading partners and would not occur in a production environment. This level of reliability is considered comparable to those of current EBB communications and VAN based EDI.

2.3.2. Implementation Time Frame

It is reasonable to assume that the industry should be able to implement the FTTF solution in the required time frame even though this will not be a trivial task.

2.3.3. Cooperation and Communication During Implementation

Successful implementation of the EDM architecture requires a great amount of direct communication between individual trading partners. In this respect the current effort parallels the industry's initial implementation of EDI.

2.3.4. Scalability

The architecture proposed by FTTF can be implemented using a variety of configurations ranging from a desktop workstation to a multiprocessing server. During Testing, the client component ran on desktop PC and server alike. A wide range of server platforms was used for the pilot test. For the server component, it possible to provide the "designated site" HTTP server through an ISP or external web hosting company. The standard web browser client was tested repeatedly during the pilot using a 486 PC. Server implementations with a 486 PC would only handle a very small transaction load. Memory appeared to be a limiting factor, especially on the server. The scenario of using an ISP hosting service for the server component has not yet been tested, but is targeted as one of the next activities for the Implementation Subgroup.

2.3.5. Strategic Aspect of FTTF Standards

The technologies chosen by FTTF and the work accomplished by the pilot test team have laid the groundwork for the next phase of standardization in the gas industry. HTTP and World-Wide Web technologies can be employed to make information available in formats other than ANSI X12 and can be used to develop interactive applications. Companies that are using web servers today for a corporate Internet presence can implement the FTTF architecture with minimal additions to existing infrastructure. Those who are considering such a presence should be able to share the resources installed for this implementation with other business functions.

2.3.6. Need for Further Refinement and Testing

Because of the short period of time allowed for the pilot test, a number of procedural items have not been completely defined. For these items, the Pilot Test Subgroup has adopted a set of "working procedures" that have been used during the test phase but are not recommended as part of the final implementation. Further experience with the architecture will be needed to refine those procedures and document them in the implementation guide. Additional standards may be proposed to the FTTF and Business Practice Subcommittee (BPS) if necessary.

2.4. Recommendations

2.4.1. Implementation Subgroup

The Pilot Test Subgroup recommends that further deployment of the architecture proceed continuously as the industry moves towards a production implementation. The Pilot Test Subgroup would be chartered as an Implementation Subgroup which would immediately address the following goals:

1. Involve other participants to benchmark the proposed FTTF implementation guide.
2. Establish a common process for PGP key certification.
3. Develop a set of procedures for PGP key distribution and maintenance.

4. Test the interfaces with X12 translation and identify related implementation issues.
5. Develop a cost and technology model for using a dial-up ISP account to establish a "designated site" as defined in the GISB standards.

2.4.2. Implementation Assistance

The FTF should identify a strategy for assisting the industry with the technical aspects of implementation. The Implementation Subgroup would be a primary resource for such assistance. The creation of private newsgroups, and scheduled conferences and training sessions under GISB auspices is being pursued.

2.4.3. Refinement of Formats and Standards

Several changes to the FTF's HTTP transaction formats have been considered by the Pilot Test Subgroup as a result of test experience and were accepted by the FTF at the meeting on August 20, 1996. These changes are intended to add functionality and flexibility to the architecture. Any changes which affect the proposed BPS standards must be returned as comments to the BPS standards prior to September 5, 1996, so as to be incorporated for the Executive Committee vote on September 12-13.

3. Pilot Test Description

3.1. Pilot Test Mission

The GISB Future Technology Task Force (FTTF) Pilot Test Team will identify pilot test participants, establish proper test procedures and implement and test the technology as defined by the FTTF. Upon completion of testing, the group will document the findings and recommend technology guidelines for sending and receiving GISB HPDR (High Priority Data Requirements) datasets in ANSI ASC X12 format using the public Internet.

3.2. Pilot Test Participants

The Pilot Test was conducted by numerous companies representing multiple segments of the gas industry. Companies who attended meetings and assisted with the development of test plans are:

- Amoco
- Altra Energy
- CNG
- Defense Fuel Supply Center
- El Paso Energy Corporation
- Energy Tracs
- Enersoft Corporation
- Enron Interstate Pipelines
- Florida Power & Light
- Gas Industry Standards Board
- Mobil Natural Gas
- National Fuel
- Natural Gas Pipeline Company of America
- Nova Gas Transmission
- NrG Information Services
- Pacific Gas and Electric Company
- Pacific Gas Transmission Company
- PanEnergy Corporation
- Southern California Gas Company
- Tenneco Energy
- TransCapacity

The following companies actually installed prototypes of the architecture and tested the transmission of transactions across the public Internet:

- Client and Server:
- El Paso Natural Gas
- Enron Interstate Pipelines
- Natural Gas Pipeline Company of America
- NrG Information Services
- PanEnergy Corporation
- Tenneco Energy

Client only:
Amoco
Pacific Gas Transmission Company
Southern California Gas Company

3.3. Pilot Test Scope

The GISB FTTF Pilot Test will implement and test all components of the EDM (Electronic Delivery Mechanism) architecture proposed by the FTTF. The test will validate the technology and document any factors that may affect the industry's implementation. The test will concentrate solely on the use of the Public Internet to transmit X12 formatted datasets and will not address the creation of content or application processing of the X12 data.

3.4. Pilot Test Objectives

The Pilot team has set several objectives for the pilot test:

- Prove the feasibility of using the Public Internet for reliable and timely transmission of HPDR datasets according to the timing requirements specified in the GISB standards.
- Validate the protocol and security components of the architecture.
- Identify performance and scalability guidelines for implementation.
- Discover and document limitations of the architecture.

3.5. Pilot Test Criteria

The pilot test has identified five timestamps to be used in the measurement of test transactions for reporting test results. These are:

- (a) the time that the sender (HTTP client) initiates the connection with the server
- (b) the time that the receiver's CGI process receives control from the HTTP Server
- (c) the time that the sender transmits "end of file"
- (d) the time that the receiver's CGI process receives the end of the file
- (e) the time that the sender receives the HTTP response from the receiver.

The pilot test will cover the following scenarios using standard, clearly defined test cases with a common set of test data:

- (a) One to one transmission between two trading partners.
- (b) Concurrent transmission to and from many trading partners.

These scenarios will be tested with various configurations, including communication directly between trading partners and communication facilitated by third parties. Additionally, testing will include direct and dial-up access to the Public Internet.

Each set of test cases will be repeated at peak and off-peak hours as related to GISB transaction deadlines several times during a full business month to provide a representative set of results. Variance data will be a key element in the reporting.

The broadest possible representation in the pilot test is desired to encompass all segments of the industry in terms of company size, business role, geographic location, hardware and software platforms. This is deemed necessary for identification of issues relating to implementation, particularly interoperability.

3.6. Pilot Test Deliverables

The Pilot Team will provide several deliverables from testing.

Full documentation of test including:

- the test plan
- measurement criteria
- test data description
- test case definition
- the configuration of hardware, software, and network test results

A performance matrix for configurations tested showing transmission times for specified file sizes and connection speeds.

Recommendations for FTTF's implementation guidelines document.

3.7. Background and Methodology

Based on an industry survey conducted by the FTTF Pilot Test Subgroup in May 1996, future EDI activity is estimated at 10-fold increase over present EDI volumes. While most transporters expected to receive EDI nominations from 50 companies or less, one respondent expected to receive from 350+ companies once GISB standards are implemented.

In preliminary research, statistics derived from the major US telecommunications hubs confirmed that the Internet's peak network traffic coincides with 11:30 AM nominations deadline.

The stated objective of the test was to involve companies from all industry segments to determine the impact of the standards on the greatest variety of environments and business functions. This was not achieved, and the majority of test participants represented pipelines and third-party providers. Also, because of the limited participation in the pilot, some simulation of loads was required to determine the ability of the Infrastructure to handle a large number of concurrent transactions. The Pilot Test Subcommittee acknowledges that this does not constitute a true stress test and that further validation will be required.

3.8. Test Coordinator

A Test Coordinator was appointed to coordinate test activities and organize the test documentation. The Test Coordinator's responsibilities were defined as follows:

- Maintain testing schedule, ensuring cases are covered.
- Maintain, consolidate, and report test results.
- Act as the communication focal point for test activities.
- Collate test result data. (Organizations should supply all raw data in a spreadsheet readable format. i.e., comma separated values in ASCII)

Cynthia Johnson of NGPL served as the Test Coordinator for Phase I.
Lyle Schenher of NrG Information Services served as the Test Coordinator for Phase II.

3.9. Test Environment

Each participant documented machine and network configurations used for clients and servers. Separate client and server profiles were defined, and every set of test results indicated the profiles of the sender and receiver. This allowed participants to use a variety of machines and configurations. The technology used by (Hardware, Software, Communication) Assumption that the Technology (Hardware) is Medium) of any given profile remained constant through the Pilot Test cycle.

Since all timestamps will be recorded by the sender, all machines used in the test are to be synchronized with the National Institute of Standards and Technology (NIST) time in order to mitigate discrepancies between the clocks of the sender and receiver. This can be accomplished manually or via Network Time Protocol (NTP) or other automated means.

3.10. Test Cases

3.10.1. TC-1: Environment Test

Description: One File Sent, Received, Timestamp Response Sent.
Purpose: Prove communications is available
Data: Smallest standard test file
Time: (Any)
Parties: All

3.10.2. TC-2: Binary Pair Test with Sender and Receiver Identified.

Description: One-to-One Single Transaction Trading Partner Simulation
Files: Mutually Agreed Upon, Variable Files
Times: Determined by Test Schedule
Peak: 11:00 AM CT to 12:00 PM.
Secondary Peaks: 4 to 5 PM CT.
Off Peak: Remainder of day.

3.10.3. TC-3: Concurrency Test

Description: Multiple parties simultaneously sending to a single designated site
Files: Mutually Agreed Upon, Variable Files
Times: Determined by Test Schedule
Peak: 11:00 AM CT to 12:00 PM.
Secondary Peaks: 4 to 5 PM CT.
Off Peak: Remainder of day.

3.11. Test Data

Standard test data files to be used by all participants for all test cases. Files are derived from actual data but have trading partner specific information removed.

File Name	Transaction Type	Size in Bytes
smallnom.bin	Nomination	4854
mednom.bin	Nomination	15561
bignom.bin	Nomination	40684
bigmvs.bin	Meter Volume Statement	564640
bigcaprl.bin	Capacity Release	3008724

3.12. Pilot Test Timeline:

3.12.1. Phase I (Basic HTTP transmission with timestamp)

- 5/15-5/31 - Prepare test environment
- 6/1-6/15 - Setup and preliminary testing
- 6/15-7/15 - Run test cases for one full business month
- 6/24-7/1 - Feasibility checkpoint
- 7/15-7/26 - Concurrency testing

3.12.2. Phase II (HTTP realm security and PGP encryption with digital signature)

- 7/15-7/26 - Prepare test environment
- 7/29-7/31 - Setup and preliminary testing
- 8/1-8/2 - Run binary pair test case
- 8/5-8/9 - Concurrency testing
- 8/13-8/14 - Run special test cases and validate error detection
- 8/15 - Submit final results to test coordinator

4. Supporting Documents

4.1. Test Plans

4.1.1. Phase I Test Plan

GISB Future Technologies Task Force
EDM Pilot Test Phase I Test Plan

The Phase I Pilot Test will begin on Monday, June 17 and end on Monday, July 15, 1996. Every participant in the Pilot Test will act as a trading partner client, or communication initiator, as well as a trading partner server, or communication receiver, at some time during the testing.

The Test Coordinator for Phase I is:

Cynthia Johnson
Natural Gas Pipeline Company
(713) 963-3376 (phone)
(713) 964-5781 (fax)
Cynthia_Johnson@oxy.com (e:mail)

The Backup Test Coordinator for Phase I is:

David Calvin
Natural Gas Pipeline Company
(918) 561-2904 (phone)
David_Calvin@oxy.com (e:mail)

Phase I Test Participants and Location

Altra Energy	Houston, TX
CNG	West Virginia
El Paso Natural Gas	El Paso, TX
Enersoft Corp.	Houston, TX
Enron Interstate Pipelines	Houston, TX
GISB	Houston, TX
KN Energy	Colorado
Natural Gas Pipeline Company	Tulsa, OK (server), Houston, TX (client)
NrG Information Services	Calgary
Pacific Gas Transmission Co.	Portland, OR
PanEnergy	Houston, TX
Southern California Gas Company	Los Angeles, CA
Tenneco Energy	Houston, TX

TEST MACHINE PROFILES

Every participant in the pilot test must supply a client profile and a server profile to the test coordinator. Participants are allowed to have more than one profile for clients and servers. Each participant should create a unique profile ID for each client and server profile. The ID should identify the company name (a reasonable one-word name or acronym), 'CL' for client or 'SE' for server, and a number. For example, the server profile id for NGPL will be NGPL-SE-1, the 1st client profile id for NGPL will be NGPL-CL-1, and the 2nd client profile id for NGPL will be NGPL-CL-2.

When multiple server profiles will be used with one IP address, please specify the date and time each profile will take effect. If a server profile changes during the testing, please notify the coordinator of the revised profile with date and time as soon as possible after the change. If a client profile change must take place after testing has begun, please provide the testing coordinator with the revised profile and newprofile ID. Reference the ID of the revised profile in further testing.

The client profile must include the following information:

- Communication to Internet Service Provider
- Name of Internet Service Provider
- Processor, Memory, Model of PC
- PC Operating System
- HTTP Browser
- HTTP Custom Utility
- HTTP Language/Style
- TCP/IP Stack
- IP Address
- Other Machines Used and How

The server profile must include the following information:

- Communication to Internet Service Provider
- Name of Internet Service Provider
- Processor, Memory, Model of PC
- PC Operating System
- HTTP Server Software
- CGI Implementation
- TCP/IP Stack
- IP Address
- Other Machines Used and How

TEST RESULTS

Every participant must provide test results in the form of an electronic spreadsheet for each test. If you are using Lotus 1-2-3, save the spreadsheet with a ".WK1" file extension. If you are using Microsoft Excel, save the spreadsheet using the lowest version of Excel spreadsheet available in the 'Save As Filetype' list box (do not save as a 'workbook') and ensure that the file extension is "XLS". The information in the spreadsheet should be in the following format:

A	B	C
Client/Profile ID		
Test ID		
Server ID		
File Size		
Test Date		
Time-I		
Time-C		
Time-R		
Time-S		
Time-E		
Test Environment Factors		
Test pass/fail at client		
Test pass/fail at server		

Client/Profile ID: Client profile ID as defined earlier in this document.

Test ID: Sequential number defined by the tester.

Server ID: Server profile ID as defined earlier in this document which was the recipient.

File Size: File Size of the X12 data included in the transfer

Test Date: Date test is conducted

Time-I: Initiation of transfer at client** (reported in CST)

Time-C: Transfer is complete from client (reported in CST)

Time-R: Receipt of response from server by client (reported in CST)

Time-S: Start of receipt at server (CGI initiation) (reported in CST)

Time-E: End of receipt at server ("TIMESTAMP") (reported in CST)

Test Environment Factors: Notes of factors which may affect the test but are not included in the profile. Type the notes into one cell even though the spreadsheet will only display the first 15 characters or so. If you need to include more characters than the cell will hold, indicate a footnote and use cells after the end of results fields.

Test pass/fail at client: Indicate pass or fail from your perspective as the client, ie was the file transferred successfully as far as I can tell?

Test pass/fail at server: Indicate whether or not the server received the complete file. This may have to be filled in by the test coordinator at a later time.

** All time fields should be stated in 24-hour time, eg 2:00 pm is 14:00

Also, please convert all times to Central Standard Time (CST)

TEST SCHEDULE

The test schedule is intended to provide a guideline for test participants. The daily schedule below identifies testing partners. The testing partners were identified to ensure that cross-country transfers are performed as well as transfers within Houston. Each testing partner should be transferring to the other partner so that both parties act as client and server. All test participants are encouraged to initiate additional transfers to additional servers and/or additional times as desired and submit the results.

Five testing intervals have been identified to ensure that transfers occur during off-peak, peak, and secondary peak network traffic hours, including network traffic across the public Internet as well as network traffic for gas industry business. Each test participant should initiate transfers as close to possible to these five intervals, plus random times as desired. Note that the times are stated in Central Standard Time (CST).

8:30 AM CST

9:30 AM CST

11:25 AM CST

2:00 PM (14:00) CST

4:30 PM (16:30) CST

June 17 - 24 Basic Connectivity and Binary Pair Testing, one file size.

Each client will transfer the pre-defined 'smallnom.bin' file to the specified primary server, repeated three times, at each of the 5 test intervals on each day.

Once transfer is determined to be successful with a server, add two or more additional server sites.

June 24 - 28 Basic Connectivity and Binary Pair Testing, four file sizes.

Each client will transfer each of the four pre-defined nomination files to each of three specified servers, repeated three times, at each of the 5 test intervals on each day.

July 1 - 3 Many to 1, all file sizes.

All clients will transfer each of the four pre-defined nomination files to each server requesting participation in the "many to 1" test, simulating an environment where many customers are transferring nominations to a pipeline. The transfers should occur at each of the 5 test intervals on each day and at least three transfers of each file size should be initiated. Each server to be involved in this test should be given to the test coordinator as soon as possible.

July 4 - 5 Holiday - no coordinated testing

July 8 - 12 1 to Many, all file sizes.

A specified group of clients send files to all other testing participants. The specified group of clients can be all participants, if all elect to do so.

Repeat transfers of June 24 - 28 and/or testing as needed.

July 15

Repeat transfers as desired.

Daily Schedule:

	Primary Server	Secondary Server#1	Secondary Server #2
June 17			
CNG	Altra	Southern Calif Gas	EIPaso
Altra	CNG	PGT	Tenneco
Enersoft	EIPaso	TransCapacity	Enron
EIPaso	Enersoft	CNG	PGT
EnergyTracs	Tenneco	NrG	NGPL
Enron	PGT	NGPL	Enersoft
GISB	PanEnergy	NGPL	Southern Calif Gas
KN Energy	TransCapacity	PanEnergy	NGPL
NGPL	Enron	GISB	EnergyTracs, KN Energy
NrG	<i>Southern Calif Gas</i>	<i>Tenneco</i>	<i>EnergyTracs</i>
PGT	<i>Enron</i>	<i>Altra</i>	<i>EIPaso</i>
PanEnergy	<i>GISB</i>	<i>KN Energy</i>	<i>TransCapacity</i>
SouthernCalif	<i>NrG</i>	<i>GISB</i>	<i>CNG</i>
Tenneco	<i>EnergyTracs</i>	<i>Altra</i>	<i>NrG</i>
TransCapacity	<i>KN Energy</i>	<i>Enersoft</i>	<i>PanEnergy</i>

June 18
repeat June 17

June 19			
CNG	<i>Enersoft</i>	<i>NrG</i>	<i>NGPL, Tenneco</i>
Altra	<i>GISB</i>	<i>Southern Calif Gas</i>	<i>EIPaso</i>
Enersoft	<i>CNG</i>	<i>KN Energy</i>	<i>Tenneco</i>
EIPaso	<i>NGPL</i>	<i>NrG</i>	<i>Altra</i>
EnergyTracs	<i>TransCapacity</i>	<i>Enron</i>	<i>KN Energy</i>
Enron	<i>NrG</i>	<i>PanEnergy</i>	<i>EnergyTracs</i>
GISB	<i>Altra</i>	<i>Tenneco</i>	<i>PGT</i>
KN Energy	<i>Southern Calif Gas</i>	<i>EnergyTracs</i>	<i>Enersoft</i>
NGPL	<i>EIPaso</i>	<i>PanEnergy</i>	<i>Southern Calif Gas, CNG</i>
NrG	<i>Enron</i>	<i>CNG</i>	<i>EIPaso</i>
PGT	<i>PanEnergy</i>	<i>TransCapacity</i>	<i>GISB</i>
PanEnergy	<i>PGT</i>	<i>Enron</i>	<i>NGPL</i>
SouthernCalif	<i>KN Energy</i>	<i>NGPL</i>	<i>Altra</i>
Tenneco	<i>TransCapacity</i>	<i>Enersoft</i>	<i>GISB, CNG</i>
TransCapacity	<i>EnergyTracs</i>	<i>Tenneco</i>	<i>PGT</i>

June 20
repeat June 19

June 21
repeat June 1

4.1.2. Phase II Test Plan

Future Technologies Task Force EDM Pilot Test Phase II Test Plan

- Purpose of The Test
- Participants
- Proposed Test Schedule
- Error Handling Process
- Test Results

1. Purpose of the Test

- To build on the experience gained in Phase 1 testing of the EDM Pilot.
- Phase II of the test will specifically add the following to the test configuration:
 - 1. Support for Realm Level 1 Security. (Server Basic Authentication)
 - 2. Support for PGP Data Encryption.

Note: See the Future Technologies Task Force Preliminary report, and meeting minutes from the FTTF and FTTF Pilot group for further detail regarding the purpose of this test.

2. Participants

Each participant company that I'm aware of is listed below with current status, if available. If your status is incorrect or if your company is participating and you were left off this list, please contact me at (403) 974-2629 or e:mail at lschenhe@nrginfo.com. As of July 23 the following participants have been identified:

Server Direction: Six servers are available. Any company wishing to implement a server is welcome to do so AT ANY TIME even though we are commencing Phase 2 testing. When your server can be available, please let the test coordinator know as soon as possible and whether you would like limited testing with one or two clients or full testing with all clients.

- The test coordinator will notify the participants of your URL.
- It is important that all servers be sync'd to NTP.
- All servers should implement Realm 1 security in a 2nd URL. The naming convention to be used is to keep the same CGI name and insert a path of 'secure' before it.
 - For example, NGPL URL without security: <http://x12.ngpl.com/cgi-bin/x12cgi.exe>
 - with security: <http://x12.ngpl.com/cgi-bin/secure/x12cgi.exe>
- Client Direction: It is important that all clients also be sync'd to NTP.
- See the test plan section below for the Concurrency testing days. When this testing takes place, Five 10-minute intervals have been identified and each client should send files to the server continuously throughout the 10 minutes. Any or all of the four file sizes can be sent. The five 10-minute intervals are stated in CST: 8:30 - 8:40 am , 9:30 - 9:40 am , 11:20 - 11:30 am , 2:00 - 2:10 pm , 4:30 - 4:40 pm

Status by Company:

Amoco

Tom Nuelle (713) 366-4034

Posting with interactive browser. Server not available but under consideration.

Altra Energy

Bec Wilson (713) 989-2850

A batch poster is available on the GISB home page for download. Proxy services are not available at this time but may be available in a later version.

CNG

Mike Shahan (304) 623-8938

CNG is in progress on making a server available. No URL available as of 7/18/96. CNG client testing will be developed once the server is available.

El Paso

Fred Norwood (915) 541-2389

server URL: <http://gisb.epng.com/cgi-bin/x12in.exe> accepts both std POST and multi-part form secure version to be available 7/22/96

Enersoft

Larry Stone

Enersoft is in the process of developing a client and server. No URL available as of 7/18/96.

Enron

John Tsucalas (713) 853-5451

Server URL: <http://x12.enron.com:713/scripts/gisb/cgisbpost.exe> accepts both mutli-part and standard post. Secure server URL to be available 7/22/96. Batch client std post: successful. Batch client multi-part post: to be available 7/22/96. Server to be sync'd to NTP by 7/22/96

GISB

Carl Caldwell 775-2140

KN Energy

Dave Harris (303) 763-3321

KN Energy is in the process of developing a client and server. No URL available as of 7/18/96.

NGPL

Cynthia Johnson (713) 963-3376

Server available at: <http://x12.ngpl.com/cgi-bin/x12cgi.exe> accepts both mutli-part form and standard POST sync'd to NTP secure server URL not yet available client batch browser using standard post successful client batch browser using multi-part form not yet available

NrG

Lyle Schenher (403) 974-2629 **PHASE II TEST COORDINATOR** lschenhe@nrginfo.com

Server URL: <http://199.185.109.100/scripts/edm/testedm.pl> client batch browser works for standard POST the client batch browser can be downloaded from the NrG home page by anyone who would like to use it. Server accepts standard POST format and multipart forms .

PG&E

Ryan Goldman (415) 973-4484

Will not be able to provide a server client batch browser in progress

PGT

Anatole Farci (503) 833-4304

Server connected to Internet at 28.8 KBPS may be available ?? Client successful with Enron as multipart form will continue testing client side

PanEnergy

Susan Crowley (713) 627-6021

Server URL: <http://eddie.panenergy.com:5000/pilot.cgi> w/ Realm 1 Security:

<http://eddie.panenergy.com:5000/secure/pilot.cgi> Server accepts multipart form and standard POST synchronized to NTP?
client multipart form successful.

Southern California Gas Co

Manuel Ley (213) 244-4685

Will not be able to participate in Phase I hopefully will be ready with a server for Phase II.

Tenneco Energy

Jim VanderNoot (713) 757-4784 Tim Davis 713-757-4979

Server available: <http://w3tgp.tenneco-energy.com/cgi-bin/x12edi.pl> w/realml sec: <http://w3tgp.tenneco-energy.com/cgi-bin/secure.x12edi.pl> accepts both multipart and standard post synchronized to NTP? client batch browser complete - std post? Multipart form?

TransCapacity

Jim Buccigross (508) 535-7500 Fa Huang (same #)

Expects to have client batch browser available soon server availability TBA

3. Proposed Test Schedule

July 29 - 31: Preliminary testing: Each tester should attempt to exchange keys, and test with as many servers as possible

August 1 - 2: Binary Pair Tests: Pairings to be determined.

August 5 - 9: Concurrency Testing: Each day a different server will be targeted as the designated site of the day. Sites to be determined.

August 13 - 14: Special Purpose tests: e.g. Null File Test, Extremely Large File Test, Security Violations test, Error Handling Test

4. Error Handling Process

If, during testing, problems are uncovered with the software or with a certain site, the following steps should be taken to resolve the problem:

- Notification of any problems uncovered by testers must be sent to the designated problem contact at the location that the problem occurred via E-mail with CC going to the test coordinator
- It is assumed that both the sender and recipient of the transaction will work together to resolve the problem.
- It is up to the discretion of the person who encounters the defect, whether to phone the site administrator directly in order to expedite problem resolution.
- At least one of the parties should follow up with an e-mail to the test coordinator describing the problem, and the actions taken to resolve it.

5. Test Results

With the Phase II test scheduled to complete on August 14, all test results should be forwarded to the test coordinator by end of day August 15. This will allow for preliminary consolidation of results prior to our August 19 meeting in Calgary.

¹In the case of EDM Phase II testing the test coordinator is Lyl Schenher who can be reached atlschenhe@nrginfo.com.

4.2. Participant Configuration Profiles

4.2.1. El Paso

Client ID: EPNG-CL1

Client Category	Configuration
Communications	1 hop to ISP where the slowest link is 1.5Mb via Network router. Frame Relay 1.5Mb full T1 Service Provider is PSI.
Processor	COMPAQ Prolinea 5120 Pentium 120MHZ single processor 32Mb RAM
Operating System	Windows NT 3.51 (Service Pack 3)
TCP/IP Stack	Microsoft
Browser Product(s) Used	N/A
Batch Browser Language/Style	Batch browser written in Microsoft Visual C++ 4.2
Batch Browser Style	(Winsock custom program)
Other Software	NTP Software: WinSNTP for NT. (Running as a NT Service)
Name of Internet Service Provider	PSI

Server ID: EPNG-SE1

Server Category	Configuration
Communications	1 hop to ISP where the slowest link is 1.5Mb via Network router. Frame Relay 1.5Mb full T1 Service Provider is PSI.
Processor	COMPAQ Prolinea 5120 Pentium 120MHZ single processor 32Mb RAM
Operating System	Windows NT 3.51 (Service Pack 3)
TCP/IP Stack	Microsoft
Server	Microsoft Internet Information Server (IIS) version 1.0
CGI Language	CGI written in Microsoft Visual C++ 4.2
CGI Style	N/A
Other Software	NTP Software: WinSNTP for NT. (Running as a NT Service)
Name of Internet Service Provider	PSI

4.2.2. Enron

Client ID: ENRON-CL1

<i>Client Category</i>	<i>Configuration</i>
Communications	Ethernet 10 Mb LAN (Compaq Netflex) 1 hop to T1 to ISP ISP connection via Sesquinet, T1
Processor	486/100 PC (Compaq Deskpro M) 48 Mb RAM
Operating System	Windows 95
TCP/IP Stack	Microsoft
Browser Product(s) Used	N/A
Batch Browser Language/Style	batch browser written in C
Batch Browser Style	(Winsock custom program)
Name of Internet Service Provider	Sesquinet

Server ID: ENRON-SE1

<i>Server Category</i>	<i>Configuration</i>
Communications	1 hop to T1 to ISP ISP connection via Sesquinet, T1
Processor	486/100 PC (Compaq Deskpro M) 48 Mb RAM
Operating System	Windows NT
TCP/IP Stack	Microsoft
Server	MS Internet Information Server
CGI Language	C
CGI Style	N/A
Other Software	N/A
Name of Internet Service Provider	Sesquinet

4.2.3. NGPL

Client ID: NGPL-CL1

<i>Client Category</i>	<i>Configuration</i>
Communications	Token-Ring 16 Mb network interface adapter Token-Ring 16 Mb LAN several hops to ISP via many routers ISP connection via Global Internet, T1
Processor	586/133 PC 20 Mb RAM
Operating System	Windows 95
TCP/IP Stack	Microsoft
Browser Product(s) Used	N/A
Batch Browser Language/Style	batch browser written in C
Batch Browser Style	(http-fetch)
Name of Internet Service Provider	Global Internet

Server ID: NGPL-SE1

<i>Server Category</i>	<i>Configuration</i>
Communications	SMC Ethernet network interface adapter ISP connection via Global Internet, T1 2 hops to ISP, via Network Router to ISP
Processor	486/66 PC 16 Mb RAM
Operating System	Windows NT
TCP/IP Stack	Microsoft
Server	Netscape Commerce Server
CGI Language	C
CGI Style	cgi-lib 2.1
Other Software	N/A
Name of Internet Service Provider	Global Internet

4.2.4. NrG

Client ID: NrG-CL1

<i>Client Category</i>	<i>Configuration</i>
Communications	Dialup to ISP, AGT Planet 28.8 modem connection -or- E>Connect ISP with ISDN 128K line
Processor	486/66 PC 16 Mb RAM
Operating System	Windows NT
TCP/IP Stack	Microsoft
Browser Product(s) Used	Netscape Commerce Server 1.12
Batch Browser Language/Style	Visual Basic
Batch Browser Style	N/A
Name of Internet Service Provider	E>Connect

Server ID: NrG-SE1

<i>Server Category</i>	<i>Configuration</i>
Communications	3 hops to ISP where slowest link is 128 kb/sec, via Firewall and Network Router to ISP ISP connection via E>Connect, ISDN at 128 kb/sec
Processor	DEC Alpha 1000 64 Mb RAM
Operating System	Windows NT
TCP/IP Stack	Microsoft
Server	Microsoft Internet Information Server
CGI Language	Perl 5
CGI Style	cgi-lib 2.1
Other Software	N/A
Name of Internet Service Provider	E>Connect

4.2.5. PanEnergy

Client ID: PE-CL1

<i>Client Category</i>	<i>Configuration</i>
Communications	Ethernet 10-Base-T LAN interface adapter Ethernet 10 Mb/sec LAN 3 hops to ISP where slowest link is 348 kb/sec, via Firewall and Network Router to ISP ISP connection via Sesquinet, fractional T1 at 348 kb/sec
Processor	HP 9000/D250 dual processor RISC 256 Mb RAM
Operating System	HP-UX 10.01
TCP/IP Stack	HP
Browser Product(s) Used	N/A
Batch Browser Language	Perl 5.02
Batch Browser Style	Custom Shareware
Other Software	NTP version 3
Name of Internet Service Provider	Sesquinet

Server ID: PE-SE1

<i>Server Category</i>	<i>Configuration</i>
Communications	Ethernet 10-Base-T LAN interface adapter Ethernet 10 Mb/sec LAN 3 hops to ISP where slowest link is 348 kb/sec, via Firewall and Network Router to ISP ISP connection via Sesquinet, fractional T1 at 348 kb/sec
Processor	HP 9000/D250 dual processor RISC 256 Mb RAM
Operating System	HP-UX 10.01
TCP/IP Stack	HP
Server	Netscape Commerce Server 1.12
CGI Language	Perl 5.02
CGI Style	cgi-lib 2.1
Other Software	NTP version 3
Name of Internet Service Provider	Sesquinet

4.2.6. Tenneco Energy

Client ID: TE-CL1

Client Category	Configuration
Communications	Ethernet, Cisco Router, CSU/DSU, T-1 via MCI to ANS POP.
Processor	Compaq Prosignia 4500 P90 48MB
Operating System	Windows NT 3.5.1
TCP/IP Stack	Microsoft
Browser Product(s) Used	Custom Shareware
Batch Browser Language/Style	Perl
Batch Browser Style	Interactive RFC 1867 form-based HTTP upload
Name of Internet Service Provider	ANS

Client ID: TE-CL2

Client Category	Configuration
Communications	Ethernet, Cisco Router, CSU/DSU, T-1 via MCI to ANS POP.
Processor	Compaq Prosignia 4500 P90 48MB
Operating System	Windows NT Server 3.5.1
TCP/IP Stack	Microsoft
Browser Product(s) Used	Netscape Navigator Gold (Interactive)
Batch Browser Language	N/A
Batch Browser Style	Interactive RFC 1867 form-based HTTP upload
Name of Internet Service Provider	ANS

Server ID: TE-SE-1

Server Category	Configuration
Communications	Ethernet, Cisco Router, CSU/DSU, T-1 via MCI to ANS POP
Processor	Compaq Prosignia 4500 P90 48MB
Operating System	Windows NT Server 3.5.1
TCP/IP Stack	Microsoft
Server	Microsoft Internet Information Server (IIS) Version 1
CGI Language	Perl 5.07
CGI Style	cgi-lib 2.1
Other Software	Time Synchronization via WinSNTP 2.7 Running as NT service
Name of Internet Service Provider	ANS

4.3. Test Results from Phase I

4.3.1. Phase I Timings by Client

ELPASO

Server		BIGNOM	MEDNOM	SMALLNOM
NrG	avg:	11.52	8.79	8.39
	max:	41	120	120

NGPL

Server		BIGMVS	BIGNOM	MEDNOM	SMALLNOM
EIPaso	avg:	436	219.84	148.73	114.78
	max:	1286	1286	1286	1286
Enron	avg:	116.62	110	103.93	98.49
	max:	1286	1286	1286	1286
NGPL	avg:	121.27	111.17	101.81	94.05
	max:	4195	4195	4195	4195
NrG	avg:	101.05	91.59	83.69	77.06
	max:	4195	4195	4195	4195
PanEnergy	avg:	82.41	77.73	73.4	69.6
	max:	4195	4195	4195	4195
Tenneco	avg:	74.14	70.4	67.12	64.17
	max:	4195	4195	4195	4195

NRG

Server		BIGMVS	BIGNOM	MEDNOM	SMALLNOM
El Paso	avg:	74.14	5.26	4.29	3.66
	max:	4195	11	11	11
Enron	avg:	74.14	4.15	4.18	4.13
	max:	4195	16	16	16
NGPL	avg:	74.14	16.12	19.74	22.61
	max:	4195	91	91	91
NrG	avg:	74.14	22.63	22.57	22.5
	max:	4195	91	91	91
PanEnergy	avg:	74.14	24.29	24.83	25.54
	max:	4195	91	91	91
Tenneco	avg:	74.14	24.48	23.35	22.26
	max:	4195	98	98	98

PanEnergy

<i>Server</i>		<i>BIGMVS</i>	<i>BIGNOM</i>	<i>MEDNOM</i>	<i>SMALLNOM</i>
Enron	avg:	n/a	37.77	15.85	17.23
	max:	n/a	305	80	65
EIPaso	avg:	55	11.75	7.08	8.57
	max:	84	45	17	100
NGPL	avg:	55	17.5	15.76	21.19
	max:	84	100	120	105
NrG	avg:	51.33	15.3	14.69	19.54
	max:	63	110	108	364
Tenneco	avg:	19	8.2	7.98	15.16
	max:	23	100	125	722

PGT

<i>Server</i>		<i>BIGMVS</i>	<i>BIGNOM</i>	<i>MEDNOM</i>	<i>SMALLNOM</i>
NrG	avg:	74.14	29.63	25.8	22.26
	max:	4195	37	37	98
PanEnergy	avg:	74.14	27.86	26.89	22.26
	max:	4195	37	38	98
Tenneco	avg:	74.14	27.86	26.7	24.45
	max:	4195	37	48	48

TENNECO

<i>Server</i>		<i>BIGMVS</i>	<i>BIGNOM</i>	<i>MEDNOM</i>	<i>SMALLNOM</i>
El Paso	avg:	47.18	10.44	7.11	5.55
	max:	84	84	84	84
Enron	avg:	7.41	6.84	6.33	5.87
	max:	92	92	92	92
NGPL	avg:	6.13	6.96	6.89	6.92
	max:	147	858	858	858
NrG	avg:	8.41	8.98	8.59	8.12
	max:	858	858	858	858
PanEnergy	avg:	8.49	8.14	7.63	7.16
	max:	858	858	858	858

4.3.2. Phase I Timings by Server

EL PASO

<i>Client</i>		<i>BIGMVS</i>	<i>BIGNOM</i>	<i>MEDNOM</i>	<i>SMALLNOM</i>
NGPL	avg:	436	22.48	9.67	14.42
	max:	1286	218	43	76
NrG	avg:	436	5.26	2.35	1.77
	max:	1286	11	5	6
PanEnergy	avg:	55	11.75	7.08	8.57
	max:	84	45	17	100
SCG-CL-2	avg:	852.2	6.07	4.33	3.53
	max:	873	8	8	6
Tenneco	avg:	47.18	5.35	3.39	2.22
	max:	84	32	15	10

ENRON

<i>Client</i>		<i>BIGMVS</i>	<i>BIGNOM</i>	<i>MEDNOM</i>	<i>SMALLNOM</i>
NGPL	avg:	171.33	8.5	4.75	4.17
	max:	192	31	13	11
NrG	avg:	171.33	11.75	5	2.5
	max:	192	16	9	3
PanEnergy	avg:	n/a	37.77	15.85	17.23
	max:	n/a	305	80	65
Tenneco	avg:	20.45	3.36	2.79	2.09
	max:	27	11	11	7

NGPL

<i>Client</i>		<i>BIGMVS</i>	<i>BIGNOM</i>	<i>MEDNOM</i>	<i>SMALLNOM</i>
NGPL	avg:	237.81	9.04	5.18	3
	max:	4195	68	46	8
NrG	avg:	237.81	48.63	46.58	45.93
	max:	4195	91	57	68
PanEnergy	avg:	55	17.5	15.76	21.19
	max:	84	100	120	105
SCG-CL-1	avg:	297	3.33	3	5
	max:	302	5	4	5
SCG-CL-2	avg:	3877.5	15.67	12	4.75
	max:	6281	43	48	8
Tenneco	avg:	100	20.53	5.54	7.62
	max:	147	858	49	193

NRG

		<i>BIGMVS</i>	<i>BIGNOM</i>	<i>MEDNOM</i>	<i>SMALLNOM</i>
El Paso	avg:	11.52	6.85	3.36	
	max:	41	120	5	
NGPL	avg:	158.36	4.67	3.21	2.83
	max:	185	7	5	8
NrG	avg:	158.36	24.5	8	4
	max:	185	32	8	4
PanEnergy	avg:	51.33	15.3	14.69	19.54
	max:	63	110	108	364
PGT-CL-1	avg:	158.36	29.63	10.5	4
	max:	185	37	12	4
SCG-CL-2	avg:	866.75	350	7.17	3.47
	max:	906	4046	44	4
Tenneco	avg:	94.14	13.78	5.29	3.02
	max:	197	841	33	26

PANENERGY

<i>Client</i>		<i>BIGMVS</i>	<i>BIGNOM</i>	<i>MEDNOM</i>	<i>SMALLNOM</i>
NGPL	avg:	158.56	6.47	3.19	4.11
	max:	477	40	6	24
NrG	avg:	158.56	39.23	34.87	39.47
	max:	477	78	76	76
PGT-CL-1	avg:	158.56	33	23.5	39.47
	max:	477	37	38	76
SCG-CL-2	avg:	822.47	4.47	3.6	2.87
	max:	901	6	5	4
Tenneco	avg:	29.9	5.13	2.75	2.22
	max:	52	33	24	26

TENNECO

<i>Client</i>		<i>BIGMVS</i>	<i>BIGNOM</i>	<i>MEDNOM</i>	<i>SMALLNOM</i>
NGPL	avg:	239.39	10.43	6.82	7.15
	max:	976	34	36	44
NrG	avg:	239.39	17.39	5.87	3.36
	max:	976	98	47	12
PanEnergy	avg:	19	8.2	7.98	15.16
	max:	23	100	125	722
PGT-CL-1	avg:	239.39	17.39	26.33	14.33
	max:	976	98	48	24
SCG-CL-2	avg:	871.83	39	5.5	3.5
	max:	970	215	19	5

4.4. Test Results from Phase II

4.4.1. Summary by Client and Server

Phase II Test Results
 From results gathered as of August 30th, 1996
 Summaries by Server and Client
 All submitted phase II test transactions

Total data volume (kilobytes) for successful transactions only

Server	Client							
	Total	Amoco	Enron	NrG	PanEnergy	PGT	SoCal	Tenneco
Enron	28,148	228		1,415	27	33		26,445
EIPaso	89,210	10,113	46,984	2,389	1,886	385	482	26,971
NGPL	35,889		31,574	35	24			4,256
NrG	74,854	3,625	52,079	7,009	340		723	11,080
PanEnergy	75,558	10,155	54,487	885			602	9,429
Tenneco	84,335	12,702	58,031	1,439	1,662		601	9,900
Totals	387,996	36,823	243,155	13,170	3,939	419	2,409	88,081

Transaction count for successful transactions only

Server	Client							
	Total	Amoco	Enron	NrG	PanEnergy	PGT	SoCal	Tenneco
Enron	1,340	52		197	6	7		1,078
EIPaso	3,505	239	1,551	329	405	12	16	953
NGPL	1,041		788	5	5			243
NrG	3,560	202	1,713	952	74		24	595
PanEnergy	2,359	259	1,510	129			20	441
Tenneco	2,848	288	1,651	215	362		20	312
Totals	14,653	1,040	7,213	1,827	852	19	80	3,622

Transaction count for error transactions (ie. no reported time-r or error status)

Server	Client							
	Total	Amoco	Enron	NrG	PanEnergy	PGT	SoCal	Tenneco
Enron	9							9
EIPaso	12							12
NGPL	5				1			4
NrG	171							171
PanEnergy	8							8
Tenneco								
Totals	205	0	0	0	1	0	0	204

Average transaction time (seconds) for successful transactions

Server	Client							
	Total	Amoco	Enron	NrG	PanEnergy	PGT	SoCal	Tenneco
Enron	13			18	5	21		12
EIPaso	4		4	3	4	41	3	4
NGPL	13		11	92	6			16
NrG	8		12	1	18		3	5
PanEnergy	6		3	41			4	4
Tenneco	6		2	43	3		13	3

Maximum transaction time (seconds) for successful transactions

Server	Client							
	Total	Amoco	Enron	NrG	PanEnergy	PGT	SoCal	Tenneco
Enron	197			197	18	38		107
EIPaso	84		34	54	32	84	11	34
NGPL	265		265	144	10			209
NrG	183		183	3	137		11	94
PanEnergy	178		78	178			17	114
Tenneco	8,220		31	8,220	64		53	37

4.4.2. Summary of Results by Time of Day

Phase II Test Results From results gathered as of August 30th, 1996

Summary for Testing Hour and Server

All test transactions submitted for phase II

Time of Day	Average	Enron	EIPaso	NGPL	NrG	PanEnergy	Tenneco
12 AM	5.40		3.60	4.90	8.10	6.10	2.20
6 AM	4.90				2.80	5.90	
7 AM	7.50			7.50			
8 AM	5.20	3.20	3.70	14.10	6.60	4.40	2.20
9 AM	5.20	4.70	3.90	8.70	6.00	6.60	2.70
10 AM	3.00	6.90	4.20	6.30	7.00	2.20	2.70
11 AM	9.60	7.00	4.70	14.60	7.90	9.00	12.00
12 PM	7.60	10.80	2.80	7.80	8.20	17.50	3.00
1 PM	8.80	7.40	4.00	55.10	2.20	2.60	1.50
2 PM	11.80	36.10	5.50	17.60	12.90	5.20	2.60
3 PM	8.90	9.50	4.10	5.90	7.50	19.70	2.10
4 PM	6.00	8.50	3.50	15.90	10.30	6.10	2.80
5 PM	6.30	13.30	4.00	7.60	11.00	2.50	3.10
6 PM	3.30	10.30	2.00	5.20	3.40	2.90	2.60
7 PM	3.50		3.50				
9 PM	28.80			32.70	28.80		4.00
10 PM	4.00						4.00

Time of Day	Maximum	Enron	EIPaso	NGPL	NrG	PanEnergy	Tenneco
12 AM	78.00		34.00	16.00	53.00	78.00	23.00
6 AM	9.00				8.00	9.00	
7 AM	11.00			11.00			
8 AM	144.00	11.00	28.00	144.00	35.00	50.00	18.00
9 AM	64.00	24.00	31.00	49.00	64.00	54.00	38.00
10 AM	42.00	12.00	24.00	28.00	42.00	13.00	9.00
11 AM	8,220.0	197.00	72.00	91.00	137.00	55.00	8,220.0
12 PM	54.00	52.00	22.00	36.00	54.00	49.00	11.00
1 PM	209.00	15.00	24.00	209.00	4.00	14.00	3.00
2 PM	170.00	111.00	84.00	110.00	170.00	65.00	53.00
3 PM	178.00	14.00	20.00	9.00	37.00	178.00	14.00
4 PM	265.00	32.00	26.00	265.00	114.00	114.00	37.00
5 PM	74.00	34.00	31.00	32.00	74.00	13.00	22.00
6 PM	23.00	14.00	18.00	10.00	23.00	13.00	7.00
7 PM	13.00		13.00				
9 PM	248.00			248.00	183.00		5.00
10 PM	4.00						4.00

5. Pilot Test Preliminary Survey Responses

In May, 1996 the GISB FTTF Pilot Test Subgroup performed a survey of the industry to determine the current use of EDI or batch transmission and obtain estimates of potential growth in this area. The information about future deployment of EDI and batch are projections based upon the industry's assumptions and expectations at the time, which are summarized in Section 5.3, Summary of Comments from Customer Survey . These responses were used as guidelines for determining the transaction rate and frequency for the pilot test.

5.1. Survey of Transporters of Natural Gas

Current

How many different shippers, agents, marketers, and others, submit nominations to your company per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	112	5	25
Average	60	3	10
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	500	24	100
Average	300	15	50

How many nomination transactions are submitted to your company per day? (Most companies submit multiple nominations, i.e. company XYZ submits 1 batch of nominations which contains 45 individual nomination transactions)

Average	Online	EDI or Batch	FAX or Other
Peak Day	1645	516	351
Average	919	183	109
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	13000	3500	2500
Average	8000	2000	1090

How many different companies do you receive confirmations from per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	26	1	48
Average	14	0.5	38
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	157	8	308
Average	98	5	254

How many confirmation transactions do you receive per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	247	18	273
Average	136	12	250
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	1661	255	2344
Average	1052	170	2838

How many different companies receive confirmations from you per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	2	12	50
Average	1	12	23
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	24	174	230
Average	5	174	164

How many confirmation transactions do you send per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	46	127	404
Average	42	26	82
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	545	1275	2000
Average	529	357	282

Future

What do you estimate the following to be in the future?

How many different shippers, agents, marketers, and others, will submit nominations to your company per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	122	49	14
Average	63	41	6
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	500	358	40
Average	300	338	14

How many nomination transactions will be submitted to your company per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	1031	1930	118
Average	486	1053	33
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	4914	10000	625
Average	3078	6000	147

How many different companies will you receive confirmations from per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	46	24	23
Average	29	18	18
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	233	116	116
Average	226	113	113

How many confirmation transactions will you receive per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	377	275	199
Average	226	195	141
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	3000	1500	1500
Average	2500	1250	1250

How many different companies will receive confirmations from you per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	12	30	33
Average	4	18	23
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	80	174	164
Average	20	174	164

How many confirmation transactions will you send per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	210	284	208
Average	59	84	56
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	2000	1600	1200
Average	529	357	282

5.2. Survey of Shippers of Natural Gas

Current

How many different transporters do you submit nominations to per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	11	2	4
Average	8	2	2
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	52	18	10
Average	36	18	8

How many nomination transactions are submitted by your company per day? (Most companies submit multiple nominations, i.e. each submission of nominations contains multiple individual nomination transactions)

Average	Online	EDI or Batch	FAX or Other
Peak Day	508	1109	47
Average	294	353	32
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	3800	6900	400
Average	2000	3600	300

Future

What do you estimate the following to be in the future?

How many different transporters do you submit nominations to per day?

Average	Online	EDI or Batch	FAX or Other
Peak Day	9	3	1
Average	5	1	1.00
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	25	12	10
Average	17	3	5

How many nomination transactions are submitted by your company per day? (Most companies submit multiple nominations, i.e. each submission of nominations contains multiple individual nomination transactions)

Average	Online	EDI or Batch	FAX or Other
Peak Day	271	609	1
Average	168	53	1
Maximum	Online	EDI or Batch	FAX or Other
Peak Day	1600	5000	10
Average	1500	300	5

5.3. Summary of Comments from Customer Survey

- LDC unbundling will increase transactions on LDCs systems. Adoption of GISB standards will reduce the number of transactions on those LDCs systems with the use of pooling. The use of upstream and downstream contract numbers and customer ids coupled with the package numbers will increase the number of transactions on interstate pipeline systems. The emergence of "powerful" marketing companies at the "points" will decrease the number of transactions across the points. The use of rollover nominations will have little or no affect on the transaction load. On balance, there seem to be offsetting forces in the future with respect to the number of transactions...
- Customers in our area do not have a high level of technical sophistication. Changes occur at a slower pace. EDI will require advances in both areas; therefore we expect limited initial use of EDI during the first heating season. On-line nominations via the EBB, when developed, are anticipated to receive greater use by the majority of our customers. Fax will continue to be an acceptable way of confirming scheduled volumes.
- GISB would not cause an increase in daily nominations providing the rules are not adopted by the state [of Missouri].
- As a result of the GISB standards, [we] must increase the usage of electronic noms, either on-line or via EDI. Confirmations with other interstate pipelines will be done electronically. LDC unbundling may increase the number of shippers and transactions. It may force LDCs into the use of electronic noms/cons. Use of EDI is not expected to be significant for nominations
- Due to adoption of GISB standards throughout the industry, we anticipate an increase in EDI/Batch nominations and confirmations. Confirmation faxes will be sent to non-EDI companies with a follow-up telephone call.
 1. Customers with larger transaction volumes will migrate to EDI.
 2. EDI nomination will be changes only.
 3. Rollover nominations will be used by more customers.
 4. Large volume customers will do confirmations via EDI.
 5. Industry consolidations will continue to occur.
- We are planning to replace or EBB with a regional EBB.
- [We] feel that the LDC unbundling will increase the amount of nominations on our system. From talking with our LDCs, [our] noms could double. The adoption of GISB will cause more noms to switch from on-line to EDI (we assume 60% will be EDI and 40% on-line in the future)... The use of rollover noms will not change the amount of transactions, it only changes the way they
 - are submitted.
- With intra-day nominations and pooling added, we expect these transactions to increase 2 1/2 times. The impact of rollover noms will be minimal.
- With adoption of standards and EDI, we are assuming we will eventually have about 10% on-line noms and the rest EDI.
- All transporters will conduct business on-line (EBBs) or on Internet. We also see an increase in day trading which will substantially increase transactions.

- The number of nominations is expected to increase at least three-fold. This increase will result from increased trading activities. LDC unbundling will most certainly increase the number of nominations submitted by our customers (as shippers).
- If GISB standards are approved, our volume of nominations will increase by approximately 20-25% due to intraday nominations. The number of confirmations probably won't change but the timing of confirmation will change.
- As LDCs unbundle, the need for accurate, reliable, and quick information becomes increasingly important. Our company is assuming that the industry will have developed the system to handle these changes. We are developing our own EBB in an effort to meet these changes. The deregulation of the industry has placed a greater emphasis on the Transmission and Exchange area. The need for EDI on all pipes is no longer a "nice to have" but a necessity.
- Rollover nominations and LDC unbundling will net out some of the transactions - but overall we believe the number of transactions will increase. Adoption of the GISB standards will enable more nominations to be handled by the same number of individuals. Nominations will also increase as more and more suppliers cater to the electricity market.