

# MyDelivery

---

**Frank Walker**

**Lister Hill National Center for Biomedical  
Communications**

**National Library of Medicine**

**National Institutes of Health/DHHS**



# Background

---

- Tools for using and communicating library information
  - DocView - 1995
  - DocMorph - 1999
  - MyMorph - 2002
- Tool for communicating biomedical or health information
  - MyDelivery

# Background

---

- Tools for using and communicating library information
  - DocView - 1995
  - DocMorph - 1999
  - MyMorph - 2002
- Tool for communicating biomedical or health information
  - MyDelivery

- **TIFF Viewer**
- **Ariel-compatible**
- **19,000 Downloads**
- **195 Countries**

# Background

---

- Tools for using and communicating library information
  - DocView - 1995
  - DocMorph - 1999
  - MyMorph - 2002
- Tool for communicating biomedical or health information
  - MyDelivery

- Convert 50 File Formats to TIFF, PDF, Text
- 21,000 Users
- 1,500 Conversions daily
- 1,300 Unique users monthly

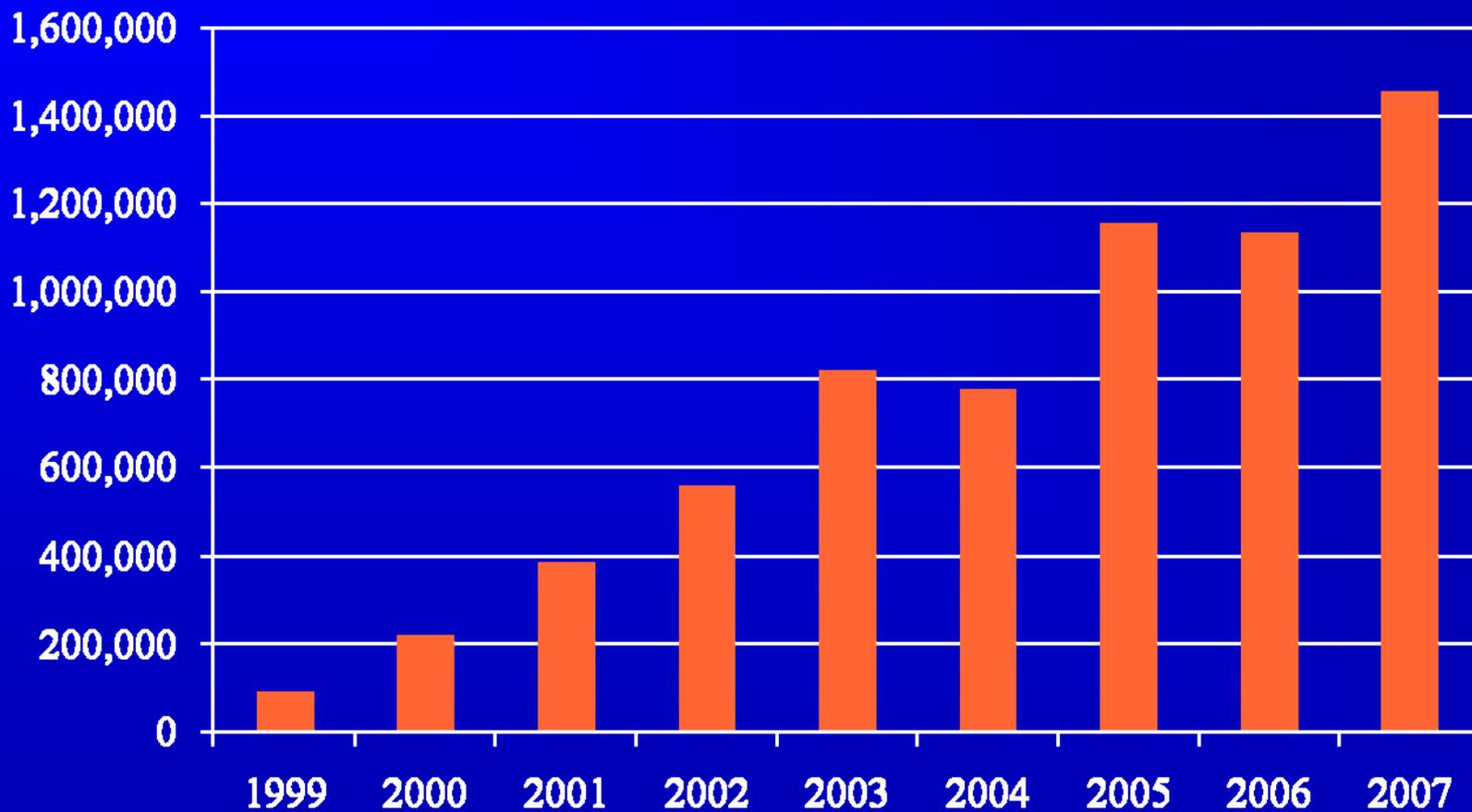
# Background

---

- Tools for using and communicating library information
  - DocView - 1995
  - DocMorph - 1999
  - MyMorph - 2002
- Tool for communicating biomedical or health information
  - MyDelivery

•Replaces Browser for mass conversions  
•PDF, TIFF, Text  
•11,000 Users

# DocMorph: Pages Processed Yearly



# MyDelivery – The Vision

---

- A tool that allows two individuals to easily and reliably communicate health and biomedical information of all sizes and quantities over the Internet for free.

# MyDelivery – The Vision

---

- A tool that allows **two individuals** to easily and reliably communicate health and biomedical information of all sizes and quantities over the Internet for free.

**This provides one-to-one  
information exchange  
between two people.**

# MyDelivery – The Vision

---

- A tool that allows two individuals to easily and reliably communicate health and biomedical information of **all sizes** and quantities over the Internet for free.

**Problem!**

**Many files are huge:**

**CT, MRI scans**

**Color images**

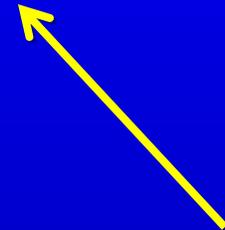
**Digitized x-rays**

**Digital video**

# MyDelivery – The Vision

---

- A tool that allows two individuals to easily and reliably communicate health and biomedical information of all sizes and **quantities** over the Internet for free.



**Problem!**

**Some tools limit number  
of file attachments.**

# MyDelivery – The Vision

---

- A tool that allows two individuals to **easily** and reliably communicate health and biomedical information of all sizes and quantities over the Internet for free.

**Problem!**

**It is possible to accomplish this, but it is not necessarily easy.**

# MyDelivery – The Vision

---

- A tool that allows two individuals to easily and reliably **communicate health** and biomedical information of all sizes and quantities over the Internet for free.

**Problem!**  
**Providers must be  
HIPAA-Compliant.**

# MyDelivery – The Vision

---

- A tool that allows two individuals to easily and **reliably communicate** health and biomedical information of all sizes and quantities **over the Internet** for free.

**Problem!**

**Wireless networks may be unreliable.**

# MyDelivery – The Vision

---

- A tool that allows two individuals to easily and reliably communicate health and biomedical information of all sizes and quantities over the Internet for **free**.



**Problem!**

**Commercial delivery services  
may not be not free.**

# Limitations of Current Tools

---

- It is often difficult for two individuals to electronically exchange biomedical or patient health information that may vary in size or quantity. Current tools often fall short in terms of:
  - Ease of use
  - Reliability
  - Safety
  - Security
  - Cost

# Conventional Internet Communication Tools

---

- Email, Secure Email
- FTP, FTPS
- Instant Messaging / P2P
- Web Delivery Services

# Email

---

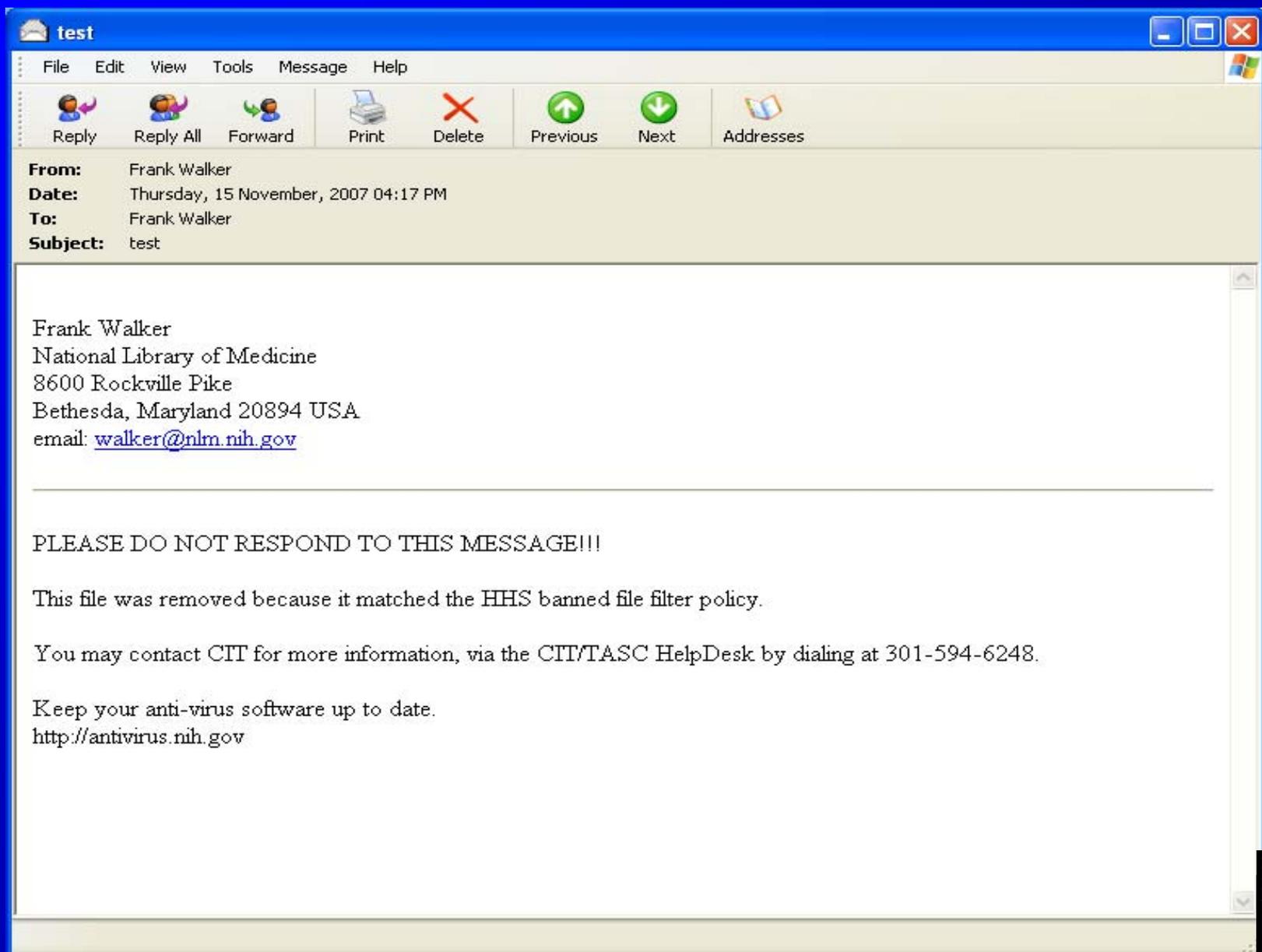
- Usually free to users, but restricts:
  - Attachment sizes
  - Number of attachments
  - File types
  - InBox size

# Secure Email

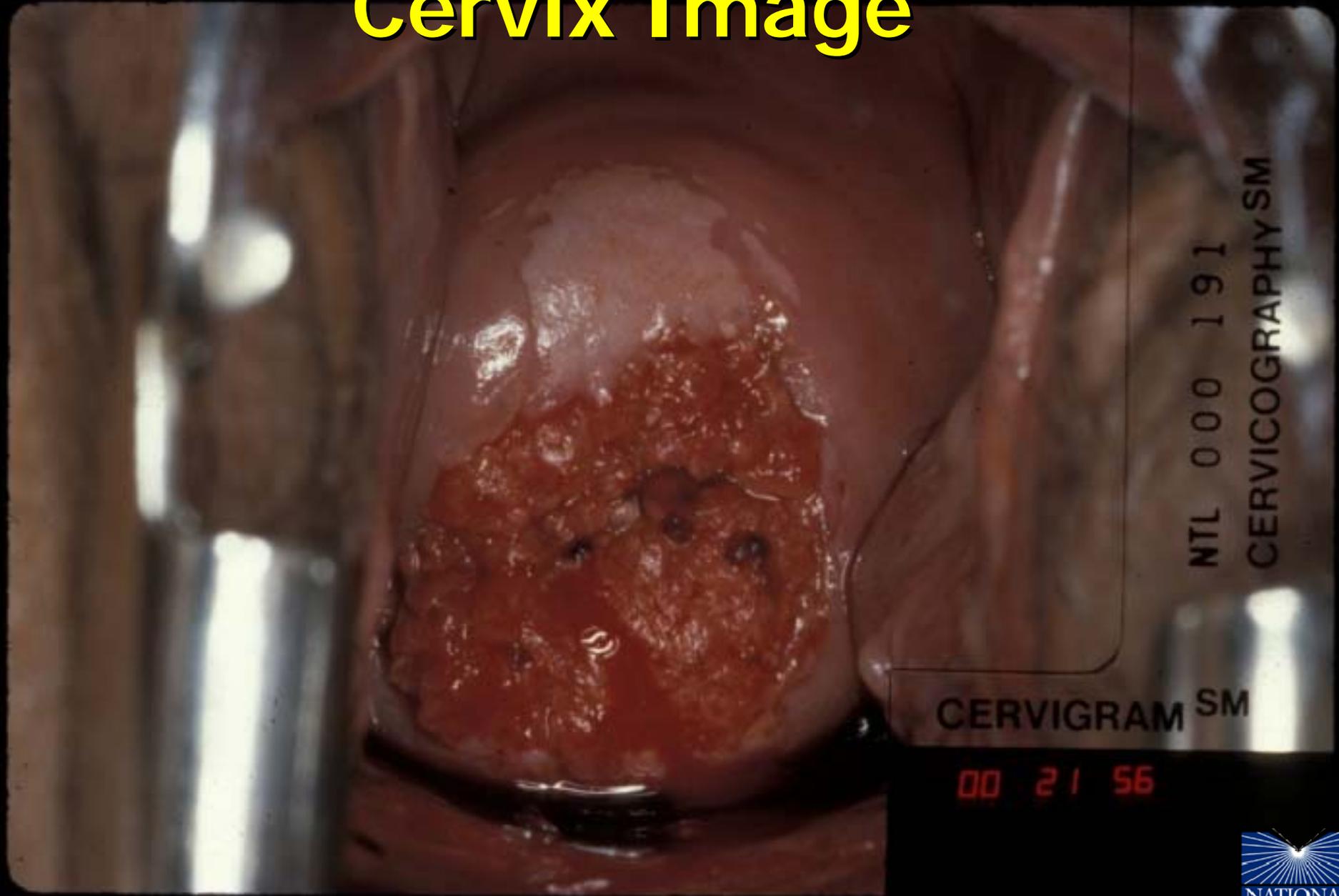
---

- Same problems as email with file attachments
- Works, but seldom used because certificates can be a hassle ...
  - Requires security certificates
  - Modest cost
  - Usually only good for 1 year
  - Users exchange public keys
  - Only 5 - 15% of email is encrypted

# Attachment Removed



# Cervix Image



NTL 000 191  
CERVICOGRAPHY SM

CERVIGRAM SM

00 21 56

# Attachment Too Large

Outlook Express

 Some errors occurred while processing the requested tasks.  
Please review the list of errors below for more details.

Tasks  Errors

-  The message could not be sent because its size exceeded the server's limit. You can use the option, located in Tools | Accounts | Properties | Advanced, to break messages into smaller parts. Subject 'testing file attachment size', Account: 'Work EMail', Server: 'mailfwd.nih.gov', Protocol: SMTP, Server Response: '552 #5.3.4 message size exceeds limit', Port: 25, Secure(SSL): No, Server Error: 552, Error Number: 0x800CCC6D

0 of 1 tasks have completed successfully

# Split Attachment Removed

**Inbox - Outlook Express**

File Edit View Tools Message Help

Create Mail Reply Reply All Forward Print Send/Recv Addresses Find Delete

**Inbox**

From	Subject	Received
Antigen_NIHCESSMTP	FragmentedMessage virus found!	11/05/2007 10:10 AM
Frank Walker	test - large attachment cervix4.tif [1/6]	11/05/2007 10:10 AM
Frank Walker	test - large attachment cervix4.tif [2/6]	11/05/2007 10:10 AM
Antigen_NIHCESSMTP	FragmentedMessage virus found!	11/05/2007 10:10 AM
Frank Walker	test - large attachment cervix4.tif [3/6]	11/05/2007 10:10 AM
Antigen_NIHCESSMTP	FragmentedMessage virus found!	11/05/2007 10:10 AM
Frank Walker	test - large attachment cervix4.tif [4/6]	11/05/2007 10:10 AM
<b>Antigen_NIHCESSMTP</b>	<b>FragmentedMessage virus found!</b>	<b>11/05/2007 10:10 AM</b>
<b>Frank Walker</b>	<b>test - large attachment cervix4.tif [6/6]</b>	<b>11/05/2007 10:10 AM</b>
<b>Antigen_NIHCESSMTP2</b>	<b>FragmentedMessage virus found!</b>	<b>11/05/2007 10:10 AM</b>
Antigen_NIHCESSMTP	FragmentedMessage virus found!	11/05/2007 10:10 AM
Frank Walker	test - large attachment cervix4.tif [5/6]	11/05/2007 10:10 AM

**From:** Antigen\_NIHCESSMTP **To:** walker@nlm.nih.gov  
**Subject:** FragmentedMessage virus found!

PLEASE DO NOT RESPOND TO THIS MESSAGE!!!

The NIH Central Email Service Virus Scanner found the FragmentedMessage virus in the attached file "Body of Message". The file was Removed.  
The email containing this file with the subject line of  
"test - large attachment cervix4.tif [1/6]", was sent from Frank Walker to Frank Walker .

You may contact CIT for more information, via the CIT/TASC HelpDesk by dialing 301-496-4357 (6-HELP)

Keep your anti-virus software up to date.  
<http://antivirus.nih.gov>

649 message(s), 3 unread Working Online

# FTP, FTPS

---

- Difficult to set up
- Usually requires firewall holes
- FTPS: files are exposed on the server
- Commercial FTP not free
- 1980's technology best suited for wired networks, or small file transfer over wireless networks

# Instant Messaging / P2P

---

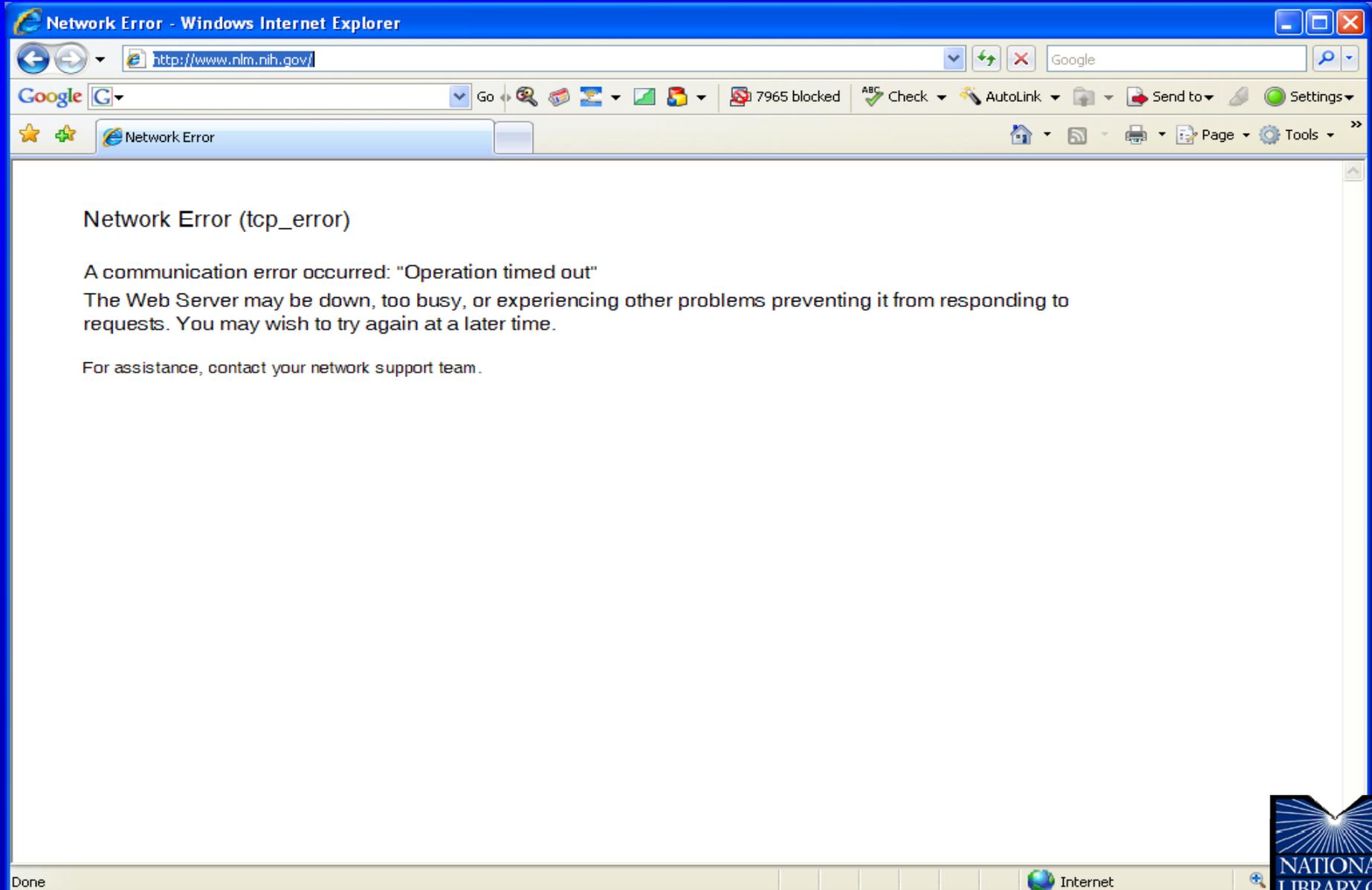
- Easy, fast and free, but ...
- Usually requires firewall holes
- Potentially unsafe; usage often banned
- Seldom secure
- No protection against intermittent networks

# Web Delivery Services

---

- Easy, but ...
- Many services charge a fee
- Intended for single file exchange
- Files are exposed on the server; server location is often unknown
- No protection against intermittent networks

# Web Server Lost Connection



The screenshot shows a Windows Internet Explorer browser window with the title "Network Error - Windows Internet Explorer". The address bar contains the URL "http://www.nlm.nih.gov/". The search bar has "Google" entered. The toolbar includes buttons for "Go", "7965 blocked", "Check", "AutoLink", "Send to", and "Settings". The main content area displays the following text:

Network Error (tcp\_error)

A communication error occurred: "Operation timed out"  
The Web Server may be down, too busy, or experiencing other problems preventing it from responding to requests. You may wish to try again at a later time.

For assistance, contact your network support team.

The status bar at the bottom left shows "Done" and the bottom right shows "Internet".

# MyDelivery: Vision Realized

---

- **Prototype tool meets all design goals**
  - Falls under Web Delivery Service
    - Smart client and server
  - Exchange large files, large numbers of files
  - Reliable over unreliable networks
  - HIPAA-compliant
  - Easy: manages certificates invisibly
- <http://mydelivery.nlm.nih.gov>
- Entered early beta testing January 2009



# MyDelivery

---

**What can you do with a  
tool like MyDelivery?**

# MyDelivery Applications

---

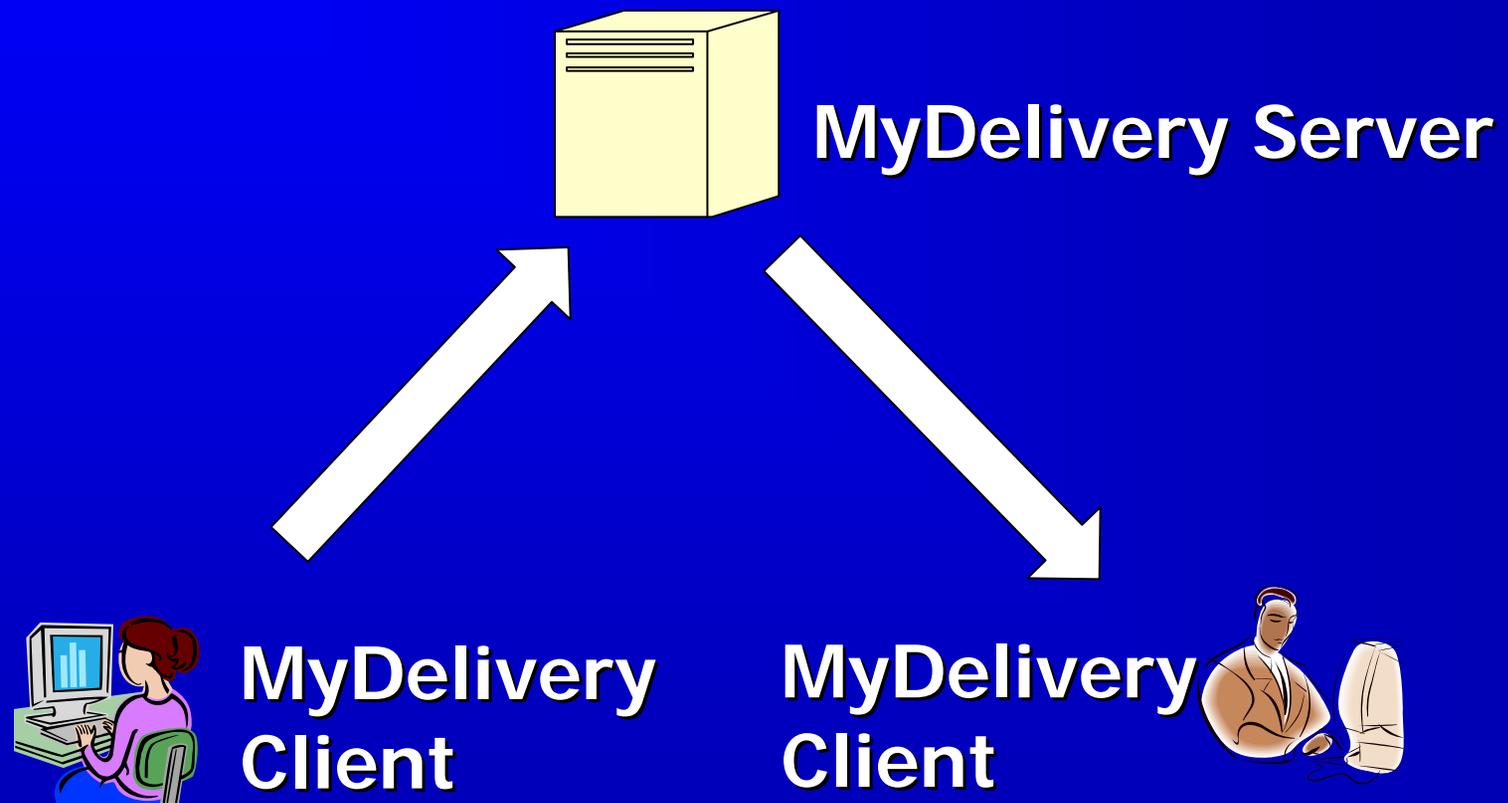
- Could be used to exchange health information outside of PACS or EHR systems
- Secure messaging alternative to secure email for exchanging patient health information
- Biomedical Research – data exchange
- Large file document delivery for ILL
- Interactive publications
- Useful for civilian office secure data exchange

# MyDelivery: Green Technology

---

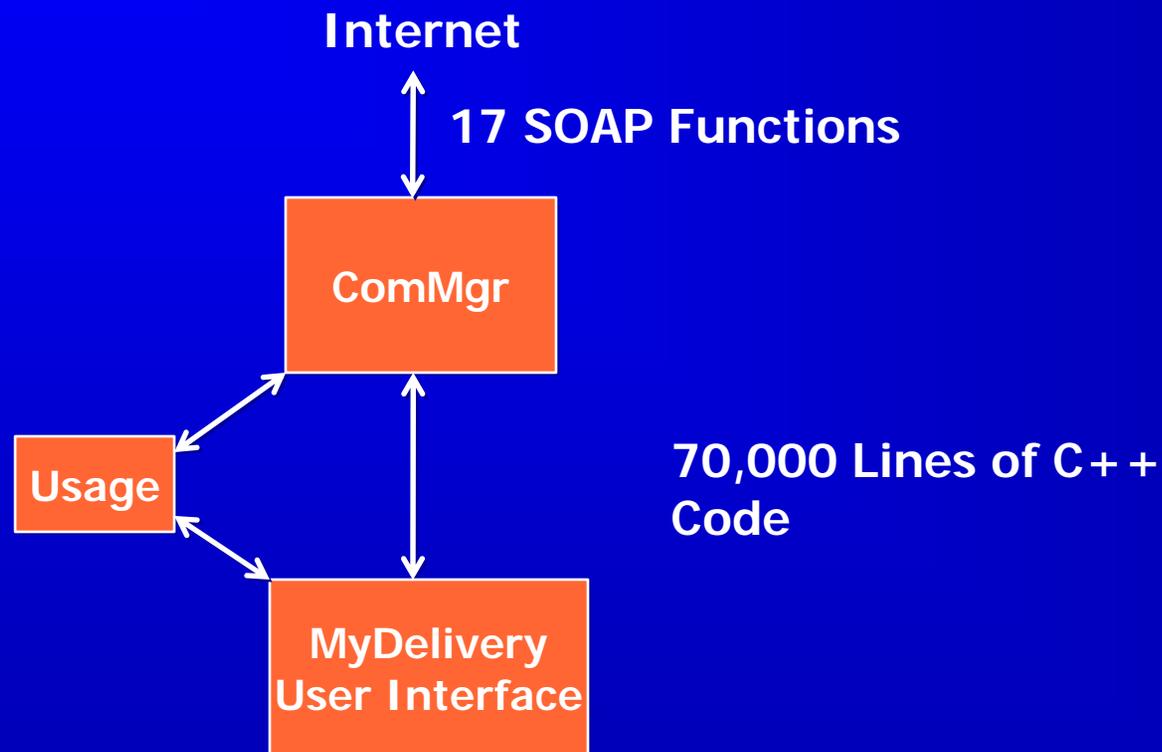
- Reduces the need to mail large datasets
  - CD, DVD disks
- Aids telecommuters

# MyDelivery Architecture

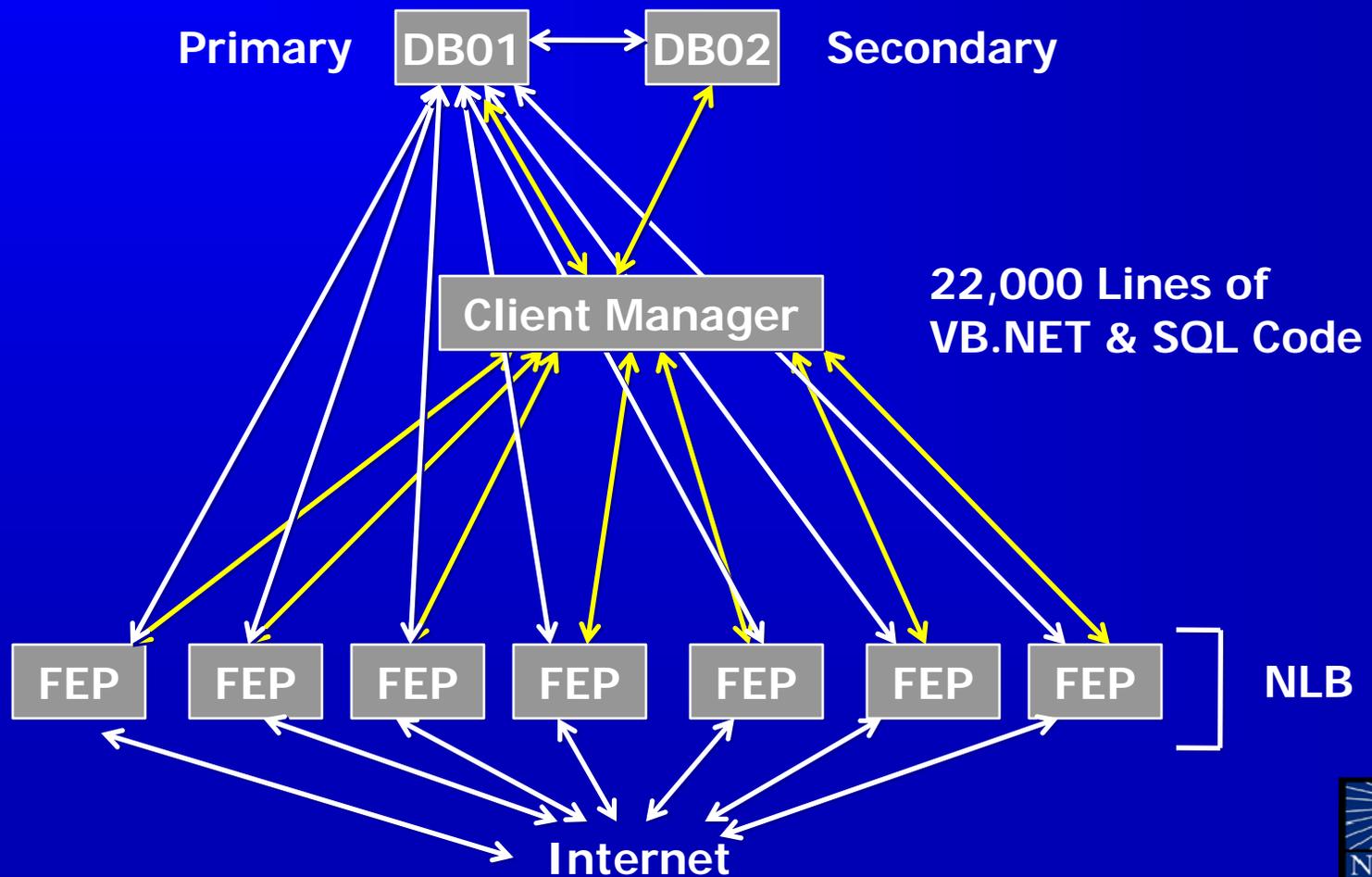


# Client Architecture

---



# Server Architecture



# MyDelivery Features

---

- **Client: combines functionality of secure email and FTP**
  - Interface looks and feels like email
  - Sends large numbers of files as if FTP

# MyDelivery Client

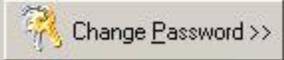
**MyDelivery Login**

Please enter your MyDelivery ID, password and passphrase

MyDelivery ID:

Password:

Passphrase:  



# MyDelivery Client

**New Delivery - MyDelivery** [minimize] [maximize] [close]

File Edit Help

 Send  Attach

 To:

Subject:

Attachments:

Text Message

John Smith  
130 Main Street  
Washington, D.C. 20374

MyDelivery ID: jsmith

# MyDelivery Client

**Add Attachments** [X]

Select Folder:

- [-] Certificate for Serve
- [-] CLR Profiler
- [-] Deliveries
- [-] Dell
  - [-] drivers
  - [-] Images
- [-] DistributedCode
- [-] Documents and Sett

Select File:

Name	Size	Type	Modified
drivers		File Folder	6/30/2008 12:36:
IMAGES		File Folder	7/22/2003 11:35:
ATAPI.EXE	28 KB	Application	9/3/2002 8:31:44
COO.MIF		Status File	7/22/2003 11:36:
D8400A09.EXE	548 KB	Application	6/15/2007 8:25:4
DELLBUTN.HTM	1 KB	HTML Document	9/3/2002 2:41:40

Add Remove OK Cancel Help

Selected Folders:

- MyDelivery
  - a

Attachments:

Name	Size	Type	Modified
a		File Folder	5/22/2006 2:42:2...
DELLBUTN.HTM	1 KB	HTML Document	9/3/2002 2:41:40...

# MyDelivery Client

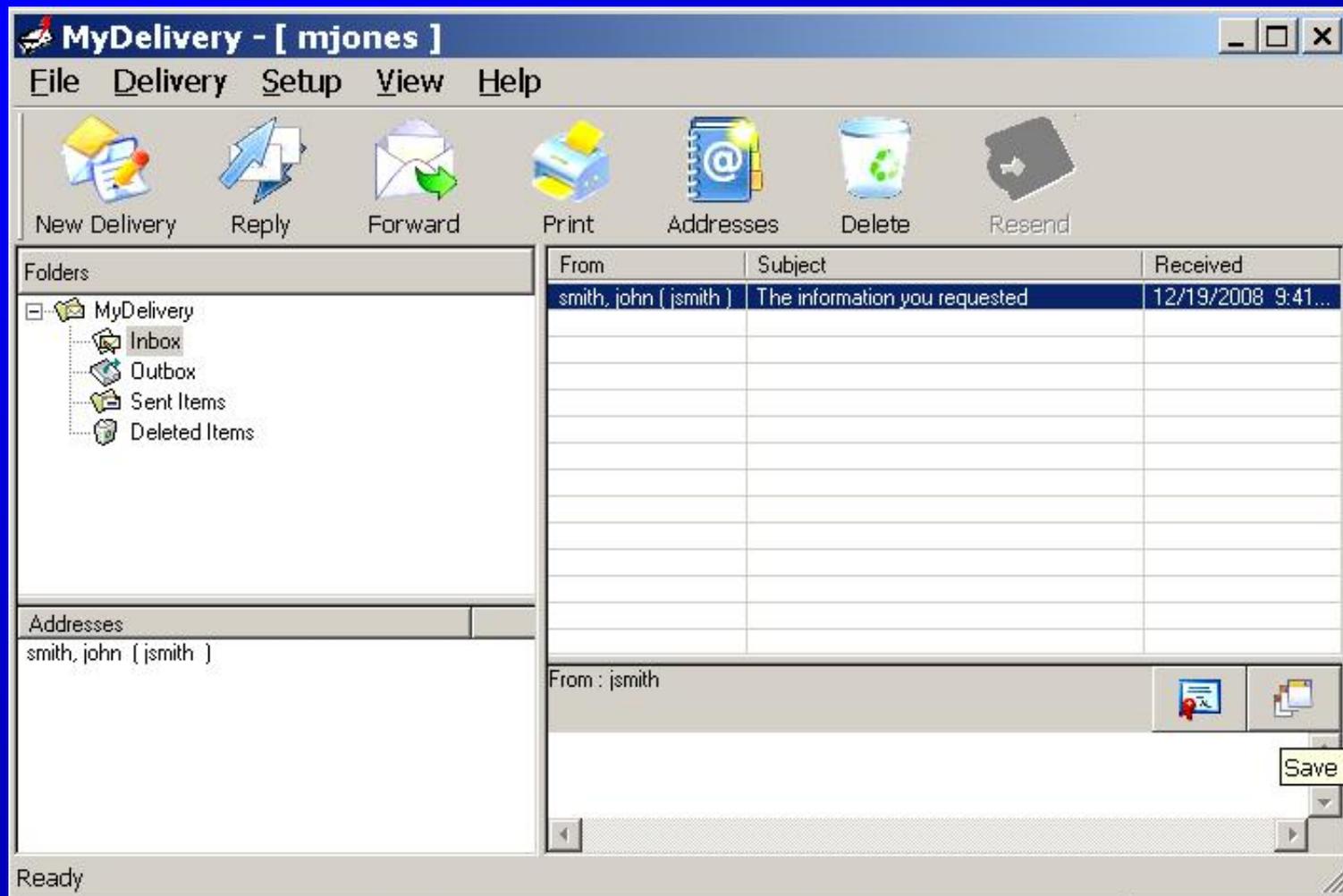
The screenshot shows the MyDelivery Client interface. At the top is a menu bar with 'File', 'Delivery', 'Setup', 'View', and 'Help'. Below the menu bar is a toolbar with icons for 'New Delivery', 'Reply', 'Forward', 'Print', 'Addresses', 'Delete', and 'Resend'. On the left side, there are two panes: 'Folders' and 'Addresses'. The 'Folders' pane shows a tree view with 'MyDelivery' expanded, containing 'Inbox', 'Outbox (1)', 'Sent Items', and 'Deleted Items'. The 'Addresses' pane shows a single entry: 'Jones, Mary (mjones2)'. The main area on the right displays a message preview with the following content:

To	Subject	Date Sent	Status
Jones, Mary (mjones2)	test	1/12/2009 3:16:38 PM	Queued

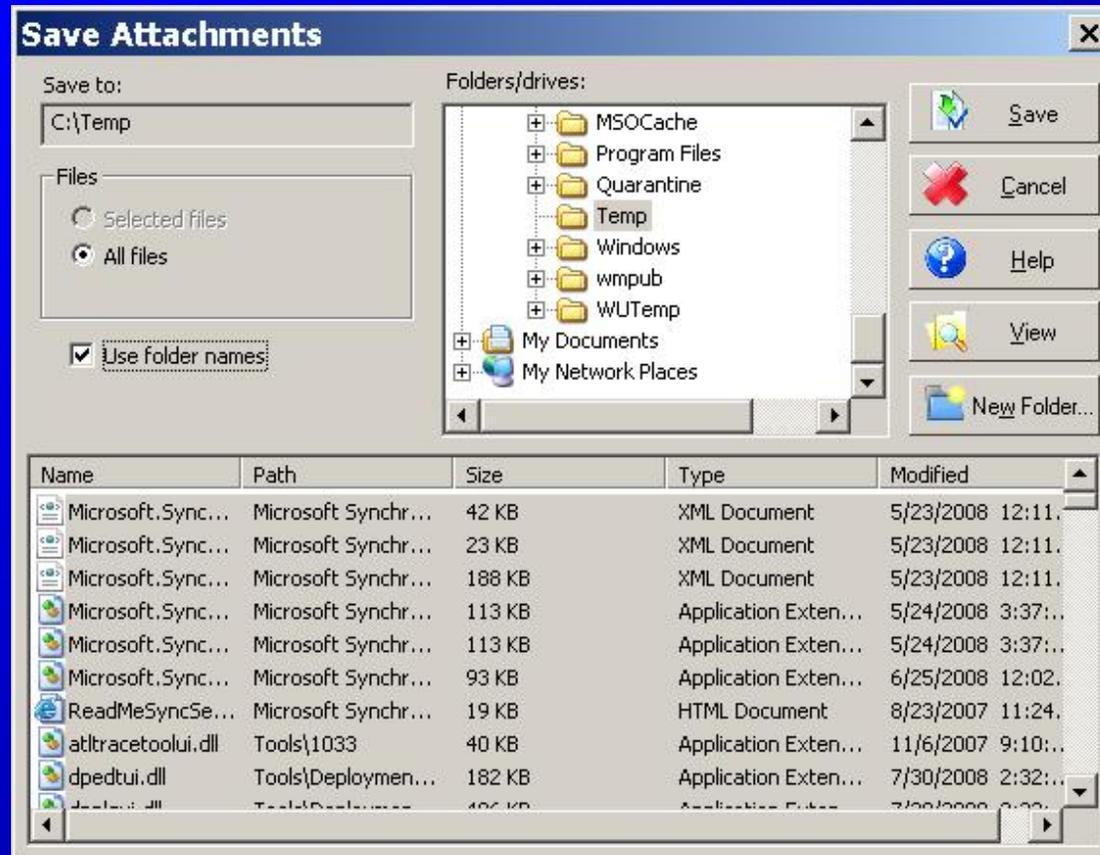
Mary,  
This is a test delivery.  
Please let me know if you receive it.  
Thanks,  
John Smith

Ready

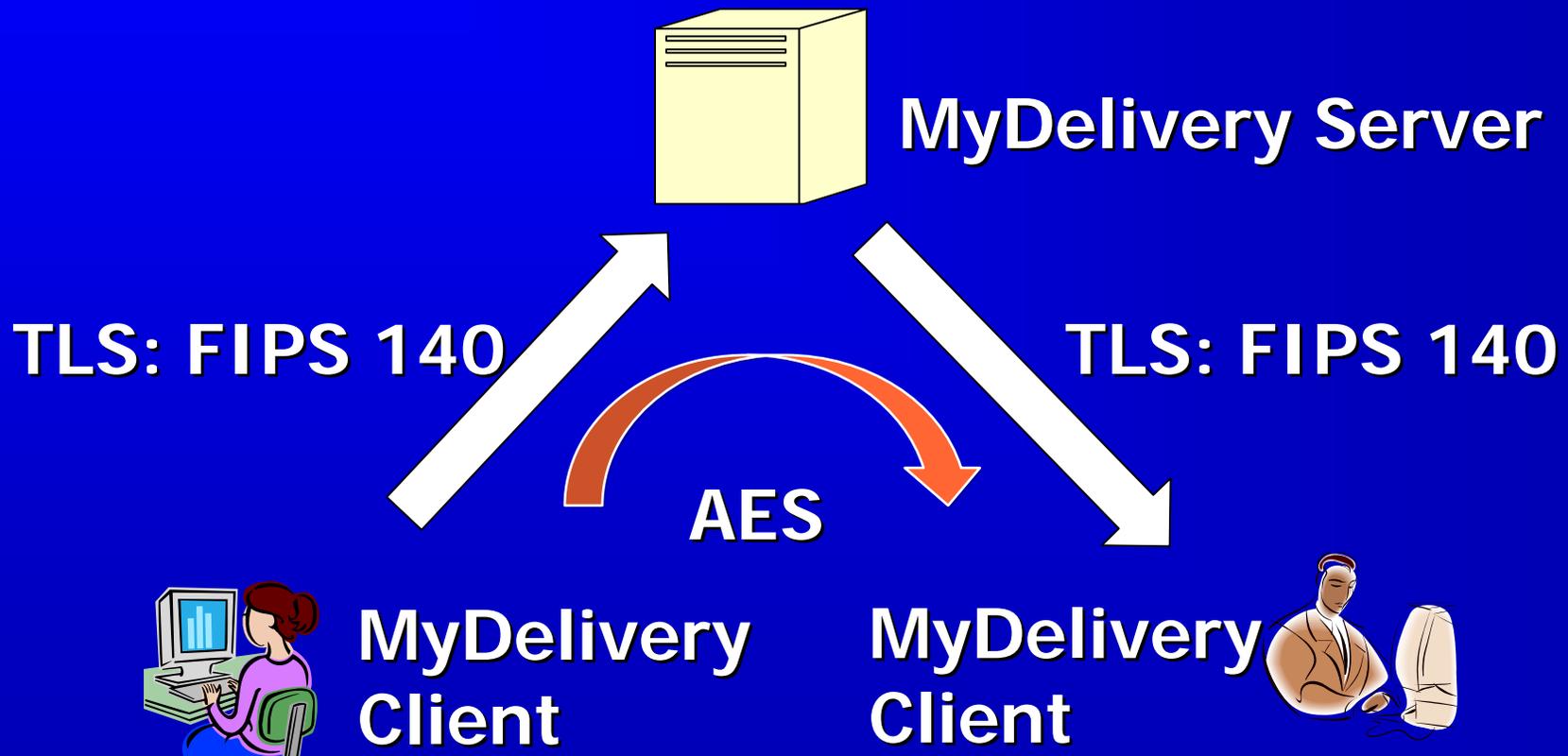
# MyDelivery Client



# MyDelivery Client



# HIPAA-Compliant Encryption and Verification



# MyDelivery Features

---

- **Generates & manages certificates invisibly, using Gnu Privacy Guard (GnuPG)**
  - **Free version of OpenPGP standard, defined in RFC4880**
  - **Certificate is generated on first login**
  - **Encrypted certificates maintained on server**
  - **Uses Asymmetric key encryption**
  - **Public keys passed to senders for encryption**

# More MyDelivery Features

---

- **User Authentication: based on user trust**
  - **MyDelivery does not authenticate user identity**
  - **No third-party user authentication**
  - **Users required to identify/trust each other**
  - **Groups of users may implement different policies for identification/authentication**
  - **MyDelivery ensures that two unique user IDs communicate with each other**

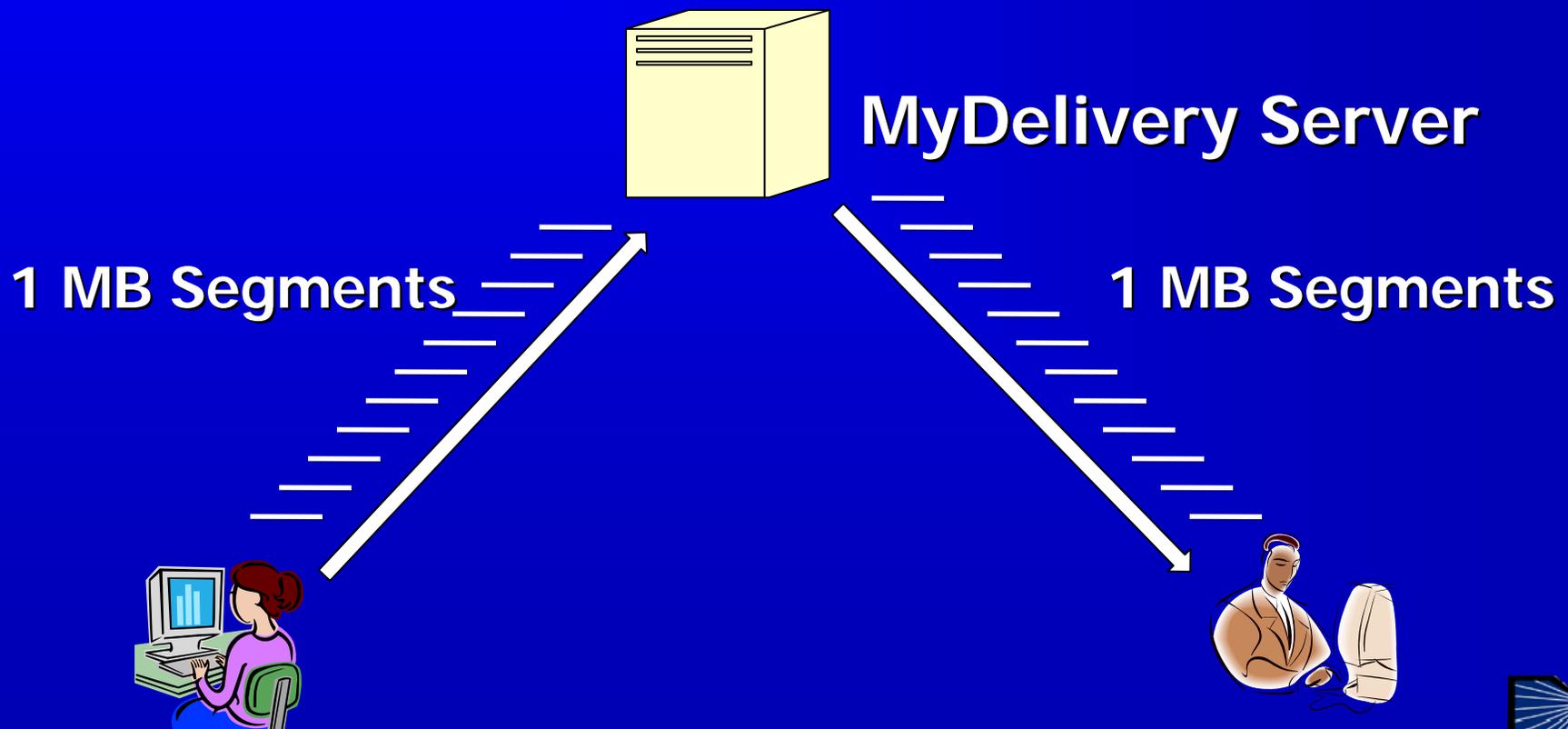
# MyDelivery Operation

---

- Logon
  - Generate, distribute certificates
- Send Delivery
  - Make backup copy of files
  - Zip compression
  - Recipient's public key encrypts: AES
  - Sender's private key signs
  - Transmit 1 MB segments

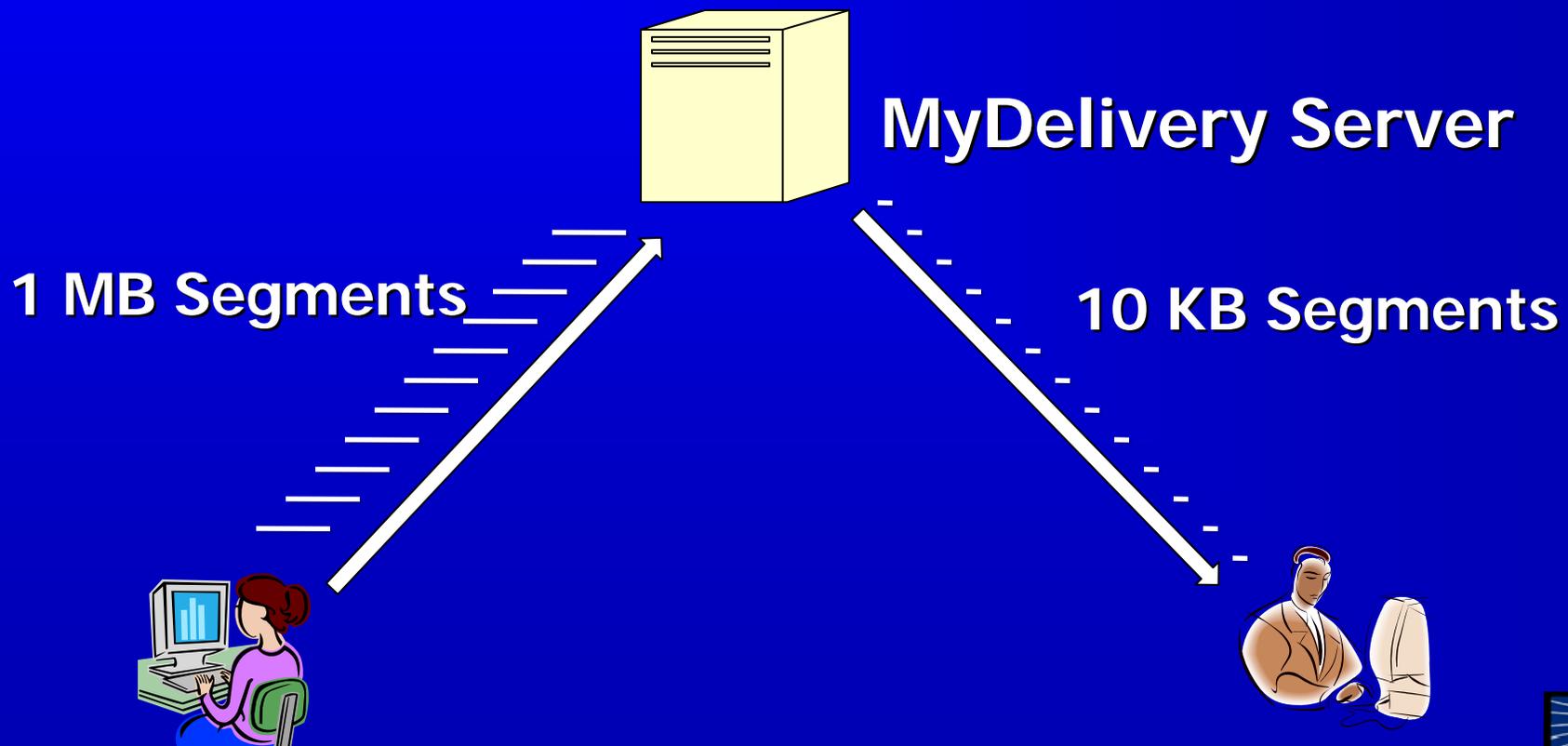
# Segmented Transmission

- Start/stop operation using data segments



# Two-Sizes of Segments

- Small segments for intermittent/slow networks



# MyDelivery Operation

---

- Client polls server periodically
- Receive Delivery
  - Receive 1 MB segments
  - Assemble the files
  - Sender's public key verifies
  - Recipient's private key decrypts: AES
  - ZIP decompression
- Speed: Transfer 1 GB file from desktop to desktop in NLM: 12 minutes

# More MyDelivery Features

---

- Each client's free disk space is reported to server
- Deliver large files
  - Tested: 28 GB (takes about 5 hours)
- Deliver thousands of files
  - Tested: 17,000 100KB files
- Attach directory structures
  - Useful for data backup over the Internet

# More MyDelivery Features

---

- Passes through firewalls
- Roaming address book
- Address book whitelisting
- Deliveries kept for 7 days
- Optional email notification of deliveries
- Free

# MyDelivery Status

---

- **Design and Development:** all project goals have been met
- **Alpha Testing:** 300+ issues discovered and fixed
- **Beta Testing**
  1. Underway!
  2. Research tool usefulness

# Beta Test

---

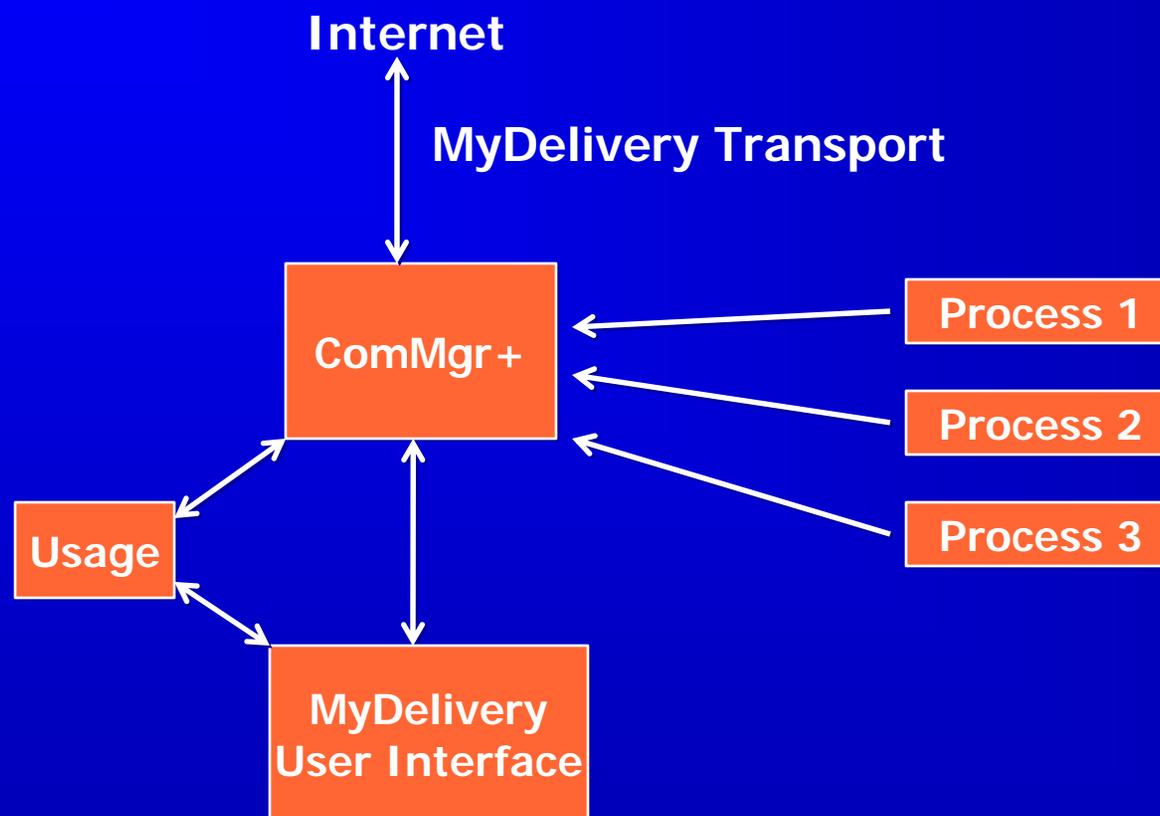
- **Identify groups for the test: Physicians, Clinics, Hospitals, Insurance Companies, Biomedical and life science researchers, Library, Government, University**
- **Objective measurements: Delivery speed; Reliability; File size; File quantity**
- **Subjective measurements: Ease of use; Ability to learn; User interface feature set; Adaptability to user workflow**

# Next Step: MyDelivery API

---

- Permit outside developers to use MyDelivery as a building block technology
- MyDelivery provides the transport
  - Secure, HIPAA-compliant
  - Reliable, Start/Stop operation
  - Large file exchange
- The API enables external software or devices to plug in and use the transport
  - Initial API will be send only, command line interface
  - A MyDelivery client will be the recipient

# Enhanced Client Architecture



# Applications for the API

---

- Networked Electronic Health Records
- Portable, wireless diagnostic medical devices
- Remote sensors

# Why EHRs?

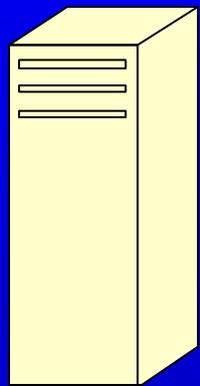
---

- **Benefits:**
  - **Reduce the cost of medical care**
  - **Improve medical care**
  - **Track diseases**
- **President Bush: National goal by 2014**
- **ARRA: \$19B to make it happen**
- **Problem: Only 9% of hospitals use EHRs; 17% of physicians use EHRs**

# MyDelivery API

---

- Networked Electronic Health Records



EHR  
System



MyDelivery Transport



MyDelivery Client

# MyDelivery API

---

- Portable, wireless diagnostic medical devices
- Application: Rural health care, telemedicine
- Use wireless MyDelivery for remote diagnosis



Wireless MyDelivery  
Transport



MyDelivery Client

# MyDelivery API

---

- Remote sensor
- Application: Remote patient monitoring



# Summary

---

- A prototype collaborative tool
- Future MyDelivery API provides potential for wider variety of new uses
- Beta testing is underway
- <http://mydelivery.nlm.nih.gov>
- Contact: [walker@nlm.nih.gov](mailto:walker@nlm.nih.gov)