Projects in Electrical & Computer Engineering 2007-2008

Optimize Mobile Biometrics Data Networking

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Sponsor: TISCOM, R&D Center, MLCA

Outline

- Background
- Biometrics-At-Sea
- Drawbacks of the current method
- Objectives
- Proposed System Design
- Results

Background

- Biometrics

- Biometrics-At-Sea since November 2006

Biometrics-At-Sea

- What: The Coast Guard's way of tracking migrants and/or wanted and dangerous persons.
- Why Optimize: Current method is expensive and time-consuming
- Impact: Save the CG time and money

Current Method

Via Microsoft exchange e-mail using ISDN service

2. Satellite

Via Microsoft exchange e-mail using ISDN service

1. USCG Cutter

US VISIT

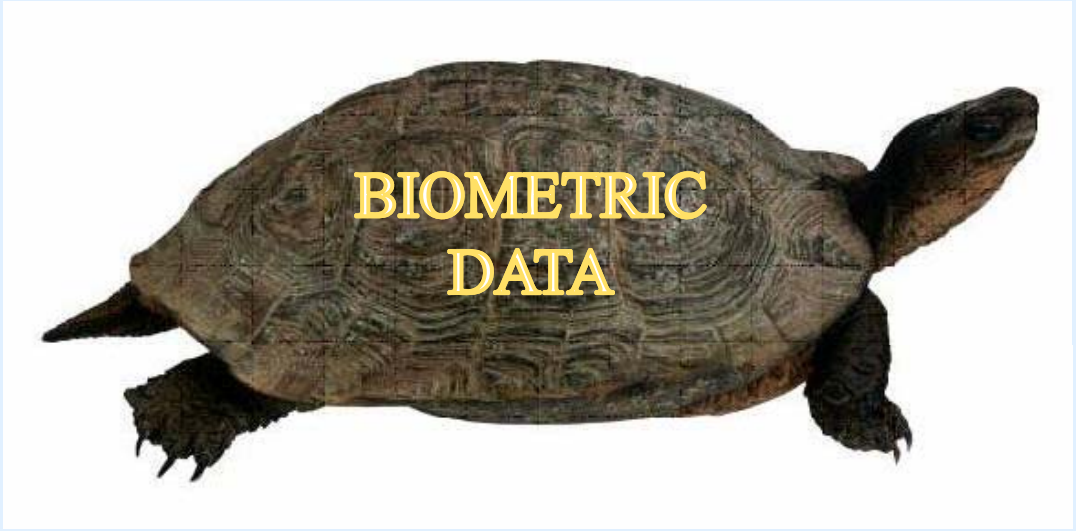
3. US Visit Software Program

Results after scanning and comparing biometric data from the cutter with the US Visit database files via Microsoft exchange e-mail

4. USCG Command Center

Results from the US Visit via radio communications

Drawbacks of the current method



- **Information Assurance**
- **Slow** speed of service
- **Expensive** - $20,833 per month per cutter for the ISDN connectivity

Objectives

- Optimize transfer by
  1. Decreasing satellite air time
  2. Increasing speed of service
  3. Information accountability
  4. Information privacy

A Typical Case

Proposed design

1. USCG Cutter

2. Satellite

3. Shore Side File Server

4. & 6. USCG Station

US VISIT

5. US VISIT Software Program

1. On the Cutter

- Encrypted thumb drive on biometrics laptop
- Encrypted and password protected zip file
- Send from ships workstation using Large File Transfer web application
- User notified through LFT Web application when file transfer is complete

2. Satellite

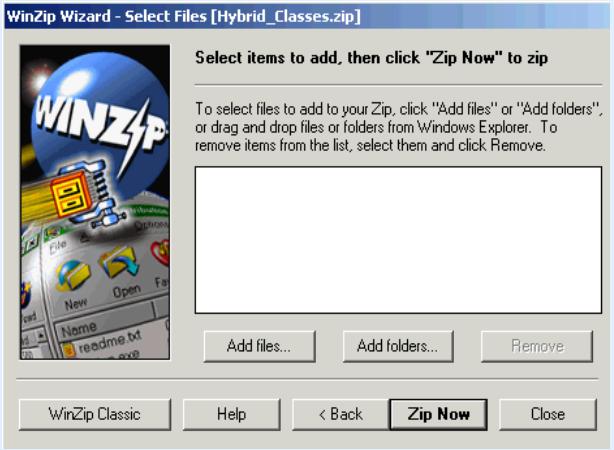
- Integrated Services Digital Network (ISDN)
- $5.60 per minute for satellite service

3. File Server

- Dell Poweredge 2950
- Front-end html automatically notifies cutter with confirmation
- Front-end html automatically email Command Center
- Save for 24 hours, then delete

4. Command Center

- Retrieve zip file from server
- Unzip with prearranged password
- Send each biometric in an individual e-mail to US VISIT



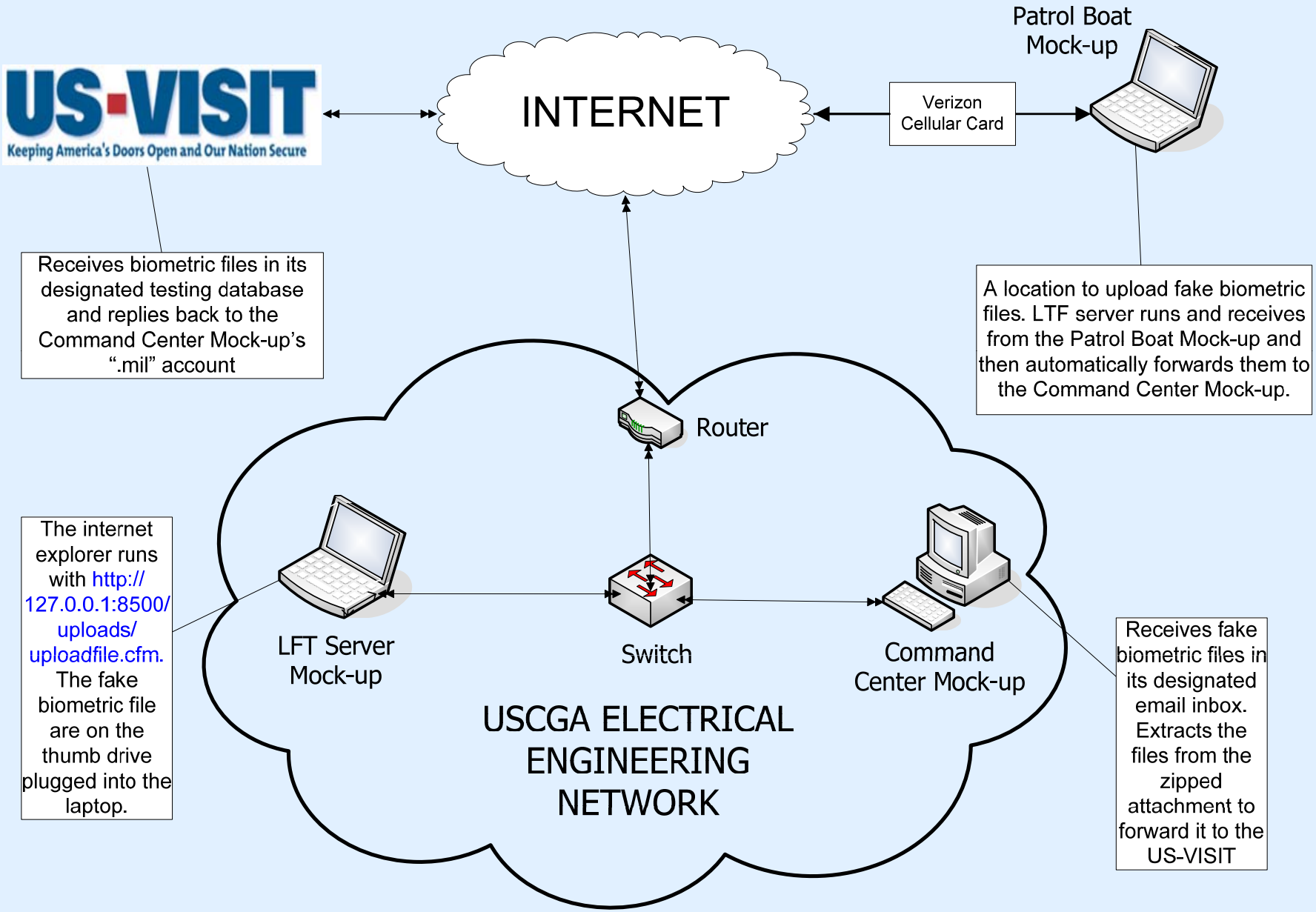
5. US-VISIT

- Biometric file's database
- Scans the received files
- Compares them to database files
- Sends the results back to Command Center

6. Command Center

- Receive reply from US Visit
- Communicate all results to ship via radio communications

TEST PLAN DIAGRAM



Test Results:
Cutter to File Server and Notification Email

Number of files	Size, kB	Zipping time before transfer, SEC	Cutter-file server transfer time, MIN:SEC	File server-CC notification time, MIN:SEC	Cutter-CC notification time, MIN:SEC
20	1,072	4	0:35	1:37	2:12
65	4,599	5	1:25	1:25	2:52
100	5,412	6	1:47	1:56	3:43
200	10,823	6	4:17	1:37	5:54

Time Comparison

Number of files	Cutter-file server transfer time, MIN:SEC
20	**0:35**
65	1:25
100	1:47
200	4:17

File #	Sent from Cutter (Local Time)	US-VISIT Response Received (Local Time)	Transmission Time Min:Sec
1	19:46	20:03	17:00
2	19:46	20:03	17:00
3	19:46	20:04	18:00
4	19:47	20:04	17:00
5	19:47	20:05	18:00
6	19:47	20:05	18:00
7	19:47	20:05	18:00
8	19:47	20:06	19:00
9	19:47	20:06	19:00
10	19:47	20:06	19:00
11	19:47	20:06	19:00
12	19:48	20:07	19:00
13	19:48	20:07	19:00
14	19:48	20:07	19:00
15	19:49	20:08	19:00

Price Cut!

Fleet Transmission Time = 22 minutes (from 12 Jan)
Proposed Method Time = 35 seconds

Time Difference = 21 minutes and 25 seconds

Time Difference * $5.60 (ISDN per min) = **$120.42!!**

Transferring data from CC to US VISIT

Email Number	Send time, (local time)	Received, (local time)
1	14:20	14:22
2	14:21	14:23
3	14:21	14:23
4	14:21	14:23
5	14:21	14:23
6	14:21	14:23
7	14:21	14:23
8	14:22	14:23
9	14:22	14:24
10	14:22	14:24

Testing in Lab: 12 Biometric Files

- 12:32:00 Click to zip 12 test biometric files into zip file
- 12:32:04 Zip complete
- 12:32:20 Open Large File Transfer web application
- 12:32:30 Browse to select zip file from 110’ cutter
- 12:33:10 Uploading files to shore side server mock-up
- 12:33:15 File upload complete
- 12:34:45 Verification in Command Center mock-up inbox
- 12:35:30 First email sent to US VISIT test database
- 12:36:42 First wrap back email received from US VISIT
- 12:37:20 Last Email sent to US VISIT test database
- 12:39:30 Last wrap back email received from US VISIT

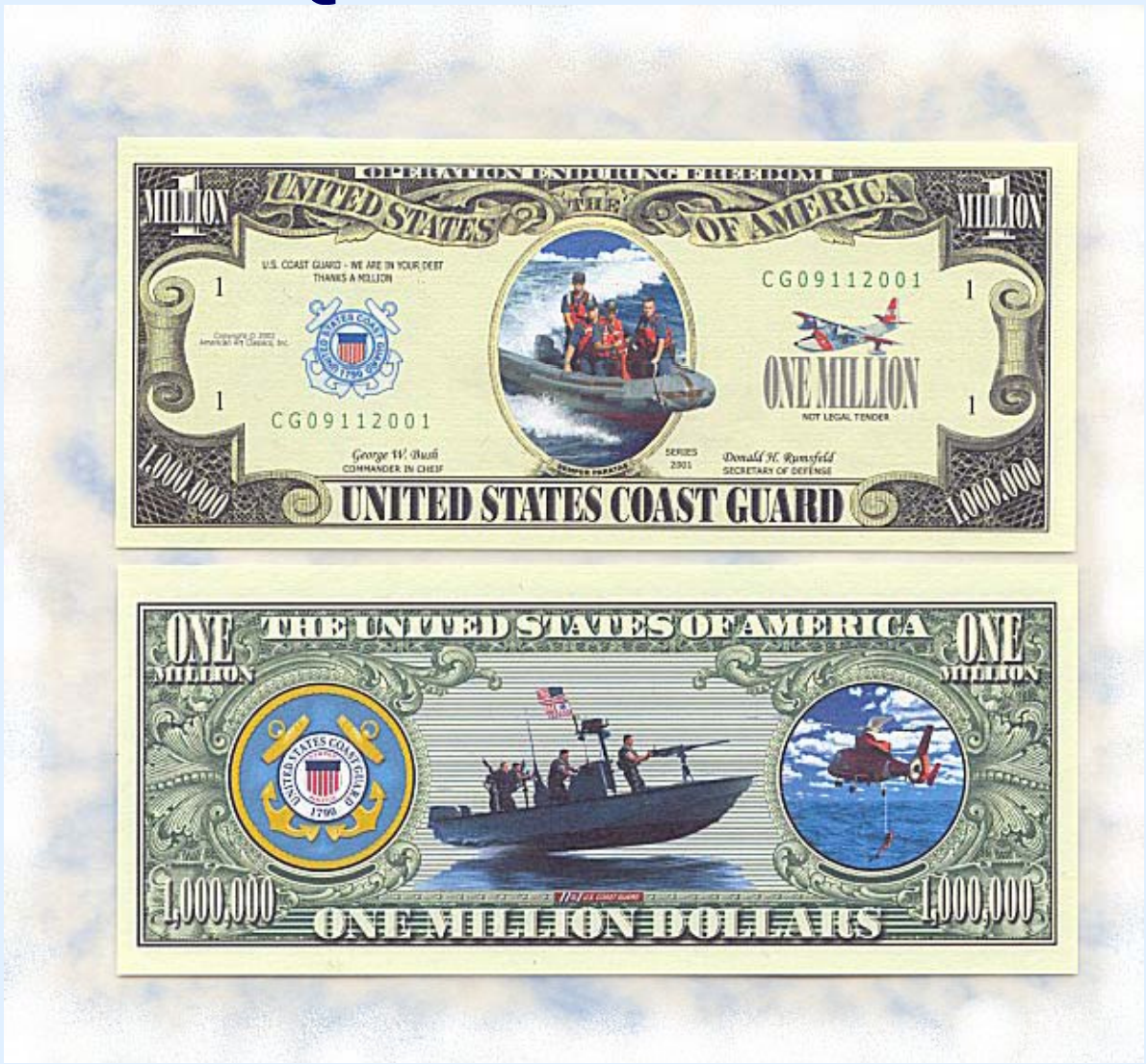
Future Vision for Biometrics

- 10 finger print scan
- Complete automation moved to US-VISIT to serve all Department of Homeland Security (DHS) agencies.
- Next generation satellite performance will not only radically speed up the transfer process and, subsequently, decrease recurring operating cost but also increase availability and simplicity of the transfer process.

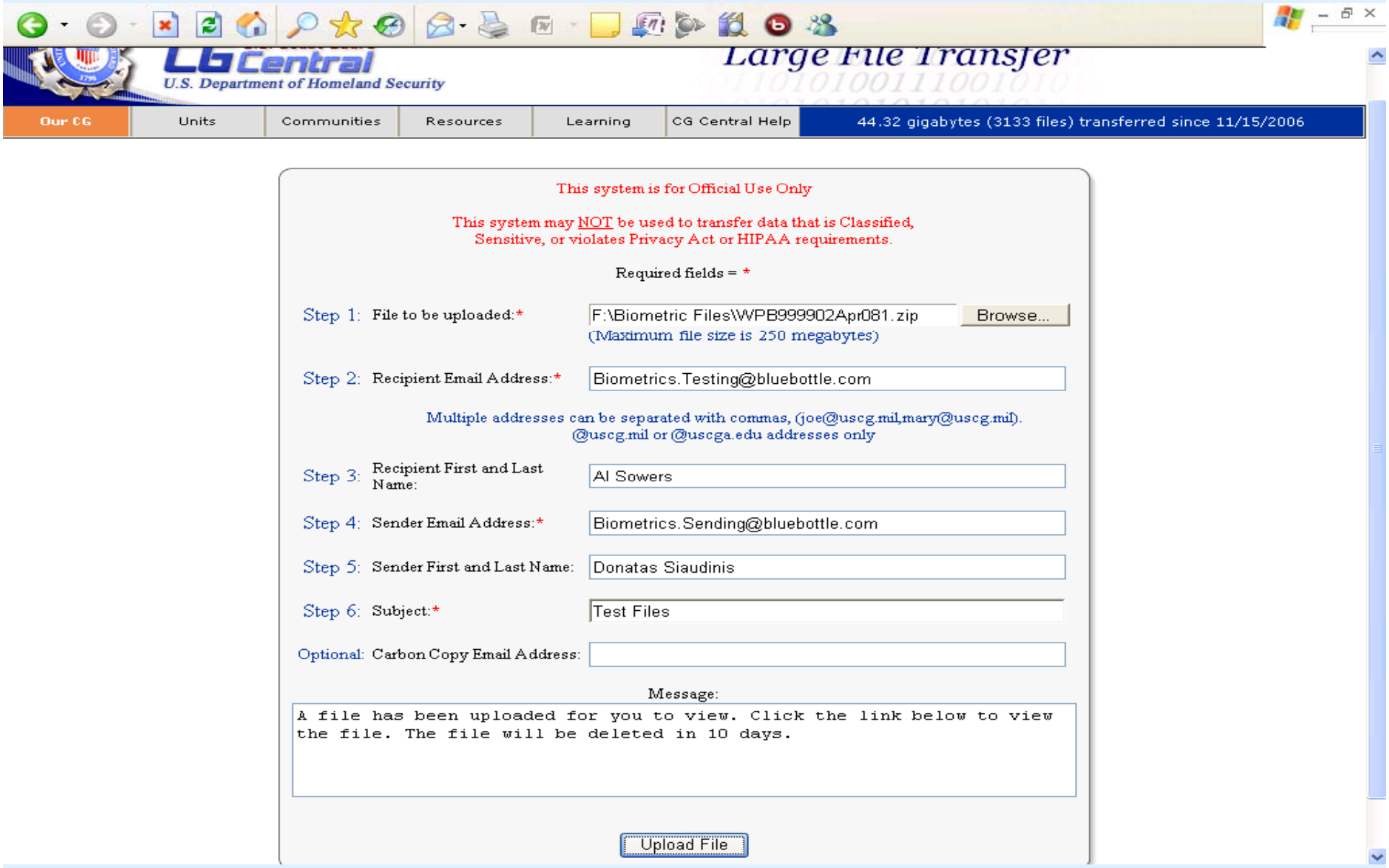
Conclusions

- Improved Information Assurance
  - File Transfer Complete Notification, Automatic Emails from Server
- Decrease Satellite Air Time
  - Send all emails to shore in one file
  - Terminate Satellite Connectivity upon transfer completion
- Save money
  - Less Satellite Air time = Less Money!!

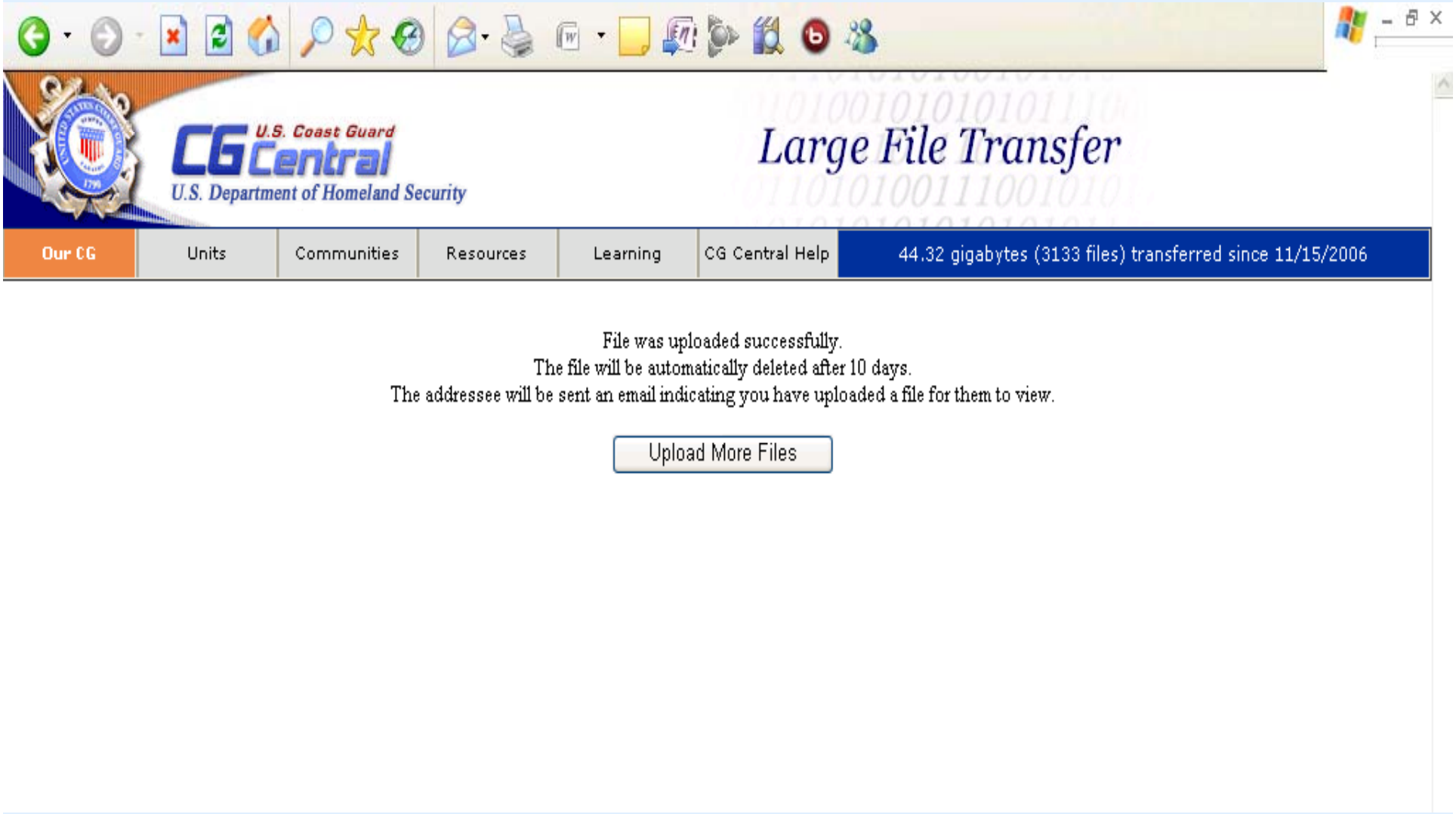
Questions?


OPERATION ENDURING FREEDOM
THE UNITED STATES OF AMERICA
ONE MILLION
U.S. COAST GUARD - WE ARE IN YOUR DEBT
THANKS A MILLION
CG09112001
ONE MILLION
NOT LEGAL TENDER
George W. Bush
COMMANDER IN CHIEF
Donald H. Rumsfeld
SECRETARY OF DEFENSE
1,000,000
UNITED STATES COAST GUARD
THE UNITED STATES OF AMERICA
ONE MILLION
1,000,000
ONE MILLION DOLLARS

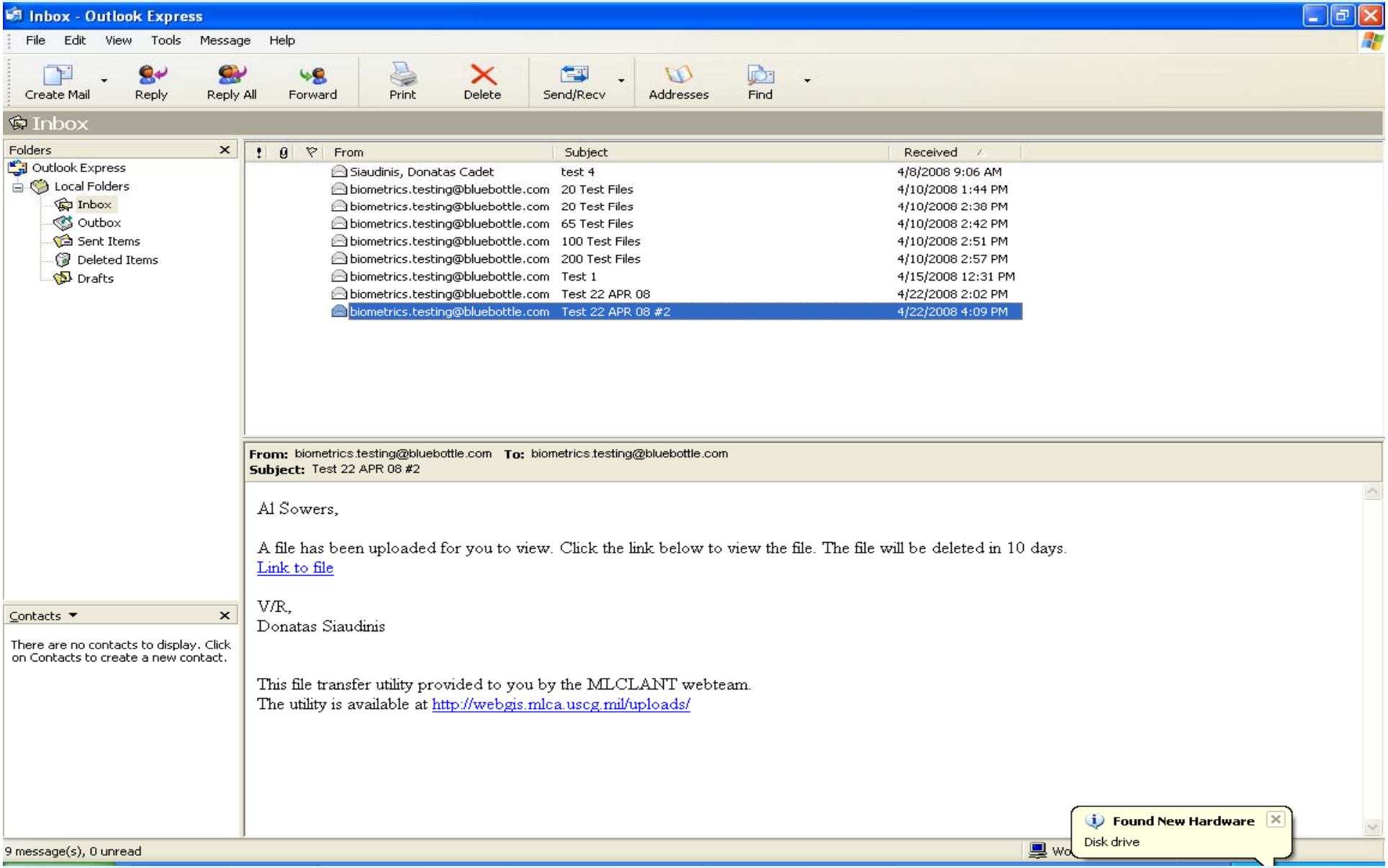
Large File Transfer Web App



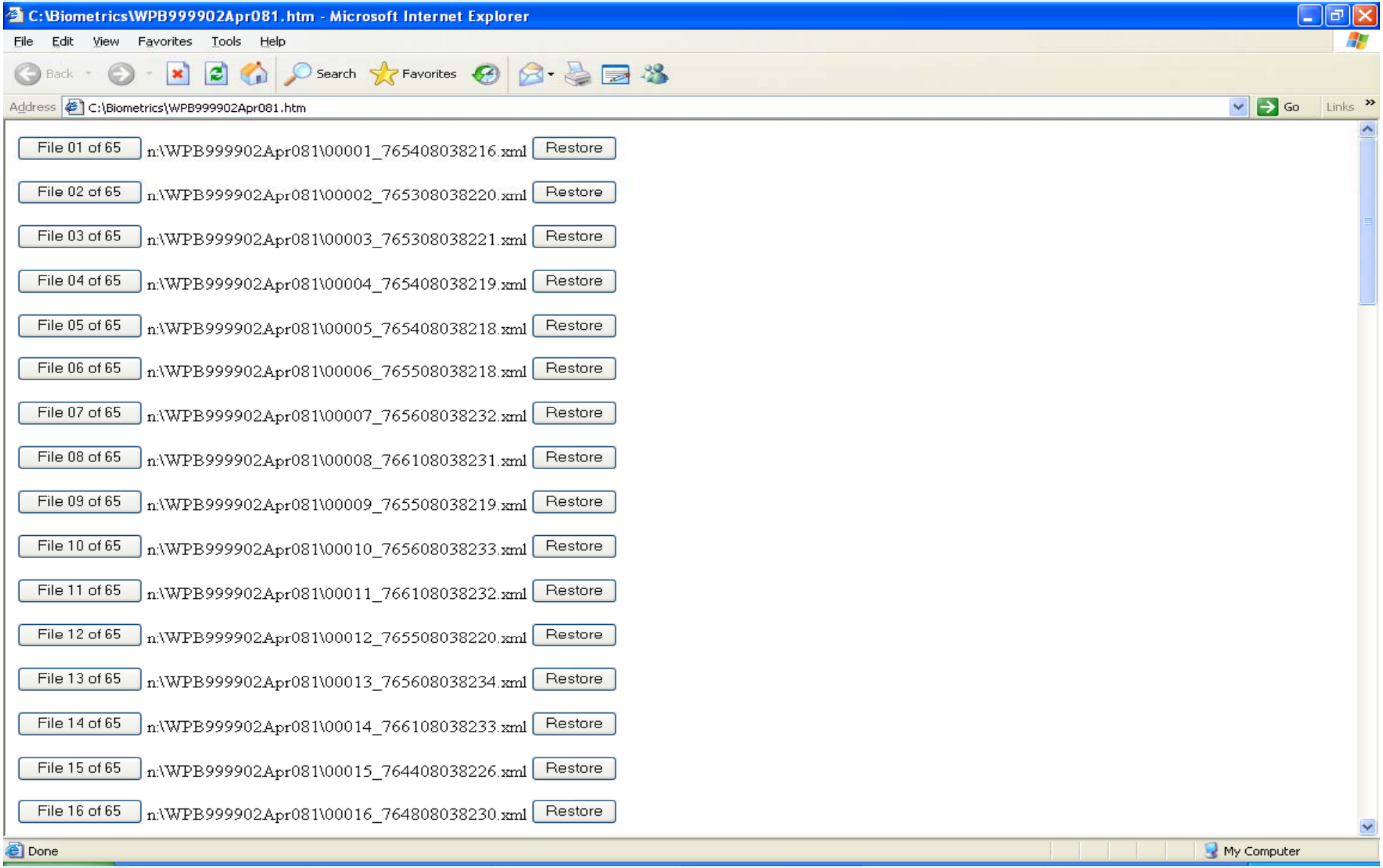
Upload Completion Notification



Mail Response from US VISIT



HTLM Document



Quick Facts:

- 1 Biometric file is between 80-100 kB
- Cutter Connectivity = 64 kbps

Cost Example

- 15 files at 100KB = 1.5MB X 8 = 12Megabits
- 12Mbits divided by 50Kbps = 240 sec = 4min
- 4min X $6 [ISDN PER MIN] =$24 + $12 [2min for route to be in place] = $36
- Vice 10-30min of satellite time that would equate to $60-180 [$120 on average] of satellite airtime costs for each Biometric transfer evolution.
- $36 = optimized vice $120 for MS Exchange transfers [or non optimal]
- Multiplied by X migrant interdictions per year = X savings per year