



TSP Systems Modernization

September 11, 2007

Executive Summary

- The FRTIB IT infrastructure has been successful in enabling us to provide uninterrupted service to TSP participants through the Katrina disaster, major market volatility and in a environment of increased threats.
- However, we do not rest on our laurels. As we plan for continued growth in TSP assets and participants, we look for better ways to ensure our ability to serve these participants.
- This presentation outlines a proposed strategic initiative for systematic implementation of leading edge technology and process improvement for the TSP information technology architecture, which will provide for a continuous, high-level of operations for the TSP.

Executive Summary (continued)

- A comprehensive review of the TSP IT infrastructure has been performed and we find that;
 - TSP IT infrastructure is sufficient to handle our current workload. We do not have an emergency situation. However:
 - Most of the Agency's computing platforms are at, or approaching the end of their lifecycle;
 - Opportunity exists to eliminate potential failure points within the TSP infrastructure; and
 - Current system architecture results in less than fully efficient processing times.

Executive Summary (continued)

- We propose a comprehensive and strategic approach toward refreshing the TSP infrastructure, focused on:
 - More efficient use of IT computing resources;
 - Improving redundancy across the enterprise; and
 - Providing sufficient levels of computing and storage capacity needed to meet unplanned, catastrophic events, and perform full end-to-end testing, improving software delivery and minimizing application failure.

- Capital investments are required to ensure the system meets needs now and in the future:

■ Storage Subsystem	\$5,400,000 (FY 07, 08)
■ Server Consolidation	\$1,500,000 (FY 08, 09)
■ Network Modernization	\$1,986,000 (FY 08)
■ Mainframe replacements	\$6,300,000 (FY 07, 08)

Background

- For this discussion, TSP Processing centers around the following critical support processes:
 - The “Unified” nightly batch processing
 - Early PreNote and second PreNote
 - Asset Manager Interface (AMI)
 - Share price calculation
 - Participant Web Access
 - Call Center support
 - Data Entry
 - Payroll submission processing
- These elements, both independently and collectively, represent the core TSP processing functions.
- All are critical to ensure service to participants and to meet required financial deadlines.

Business Assurance - The Foundation for Success

- *Business Assurance* is the set of planned, systematic actions that allow the agency to accomplish its business objectives during commonplace, severe, and catastrophic events, and to:
 - Ensure the capability to support TSP functions and systems that, based on an unpredictable scenario:
 - Survive emergencies, natural disasters, cyber attacks or accidents,
 - Are robust and adaptable enough to continue delivery of most important TSP products and services,
 - Have sufficient, on-demand capacity to ensure critical processes can be performed in a timely manner in the event of a significant market event, and
 - Ensure the security of TSP and FRTIB data, assets and people

Deliver *critical* TSP services *no matter what!*

Forces Against Business Assurance

- Threats

- Adversarial actions: *Terrorist acts, Cyber attacks*
- Force Majeure: *Major weather events, flood, fire, earthquake, tornado, hurricane*
- Pandemic events: *Major epidemic that spreads across a large region*
- Inadvertent IT Malfunctions: *Computer/Communications malfunction, Stupid human tricks, Poor CM/QA*
- Building Environmental Failures: *Power, HVAC, Mechanical Infrastructure*
- Major international/domestic market events
- Poorly defined/followed processes

- Impacts

- Degraded/Loss of business effectiveness
- Unavailability or loss of personnel
- Induced panic, loss of public confidence
- Loss of systems, data and intellectual capital
- Inability to perform critical functions in a timely manner

It's a scary world out there...

How we get there

- Implement a robust, scalable, and survivable infrastructure with sufficient capacity to meet unexpected needs driven by crisis.
- Improve our processes and capabilities to ensure that all system changes are thoroughly tested for accuracy, reliability, and efficacy.
- Continue to improve our Continuity of Operations posture and plans to ensure support of the Agency's Recovery Time and Recovery Point objectives.
- Continue to improve our corporate decision-making process for responding to disaster.

Taking TSP technology to the next level.

Activities to Date

- Performed a comprehensive engineering review of TSP mainframe computing environment
 - Included a specialized test, adding 5 more processors to current mainframe to validate findings from analysis.
 - Status – complete
- Engaged consultant to perform comprehensive review of TSP server environment
 - Status – In progress
- Examined the entire TSP communications infrastructure for bottlenecks and single points of failure (SPOF)
 - Status – 80% complete
- Analyzed storage subsystem infrastructure for capacity, throughput and scalability.
 - Status - complete

Findings

- We have grouped our findings into the following broad categories
 - Mainframes
 - Servers
 - Storage
 - Network
 - Security
 - People

Findings: Mainframes

- Reston Mainframe
 - Purchased in 2004, but 2000 technology
 - Processors capable of handling current workload (including 4x number of interfund transfers), but do not have sufficient processing capacity necessary to perform end-to-end testing necessary to improve program delivery.
 - Memory constraints prevent us from reducing TSP processing windows.
- Pittsburgh Mainframe
 - Purchased in 2005, but 2000 technology
 - Less than half the processing power, two-thirds the memory and two thirds the I/O capacity of the Reston mainframe
 - Borderline on meeting trading deadlines.

The existing mainframes are no longer upgradeable.

Findings: Distributed Servers

■ Reston Distributed Servers

- Too many “point solution” devices with direct attached storage.
 - Several areas where only one server supports an application. This is inefficient and requires manual intervention in case of server failure.
- 78% will be end-of-lifecycle by FY08 end.

■ Pittsburgh Distributed Servers

- Too many “point solution” devices with direct attached storage.
 - Most were brought up from NFC, and are beyond end of lifecycle
 - Many are undersized to provide timely processing in the event of a disaster.
 - Several areas where only one server supports an application. This is inefficient and requires manual intervention in case of server failure.
- 82% will be end-of-lifecycle by FY08 end.

Findings: Storage Subsystem

- Reston & Pittsburgh Storage Systems
 - Quickly nearing capacity and (floor) space limitations.
 - Slow by today's standards.
 - Difficult (if not impossible) to encrypt data at rest.
 - Data housed across multiple device types.
 - Large volume of data requires faster access and less contention (wait time).
 - Technology supports efficient mainframe data synchronization with Pittsburgh, but server data synchronization falls short of recovery objectives.
 - Migration to same media and capability will correct this.

Input/Output operations create processing bottlenecks.

Findings: Network & Telecom

- Reston & Pittsburgh

- Network

- Existing networks routers and switches don't support IPV6.
 - IPv6 migration is mandatory and will afford better security.
 - Current version (IPv4) running out of addresses.
 - Inadequate redundancy in some areas.
 - Many components reaching end-of-lifecycle.

- Telecommunications

- Bandwidth (capacity) is adequate in most areas, but some segments need improvements.
 - Inadequate redundancy in some areas.

Findings: Security

- Web passwords implemented in May 2007
- Account numbers will be implemented Oct.1, 2007
- Firewalls, intrusion detection, antivirus all in place, but building redundant capabilities is prudent.
- 2 independent penetration tests conducted in FY 2007
 - No external vulnerabilities; all internal issues resolved
 - More tests planned for FY08
- Procurements in progress for:
 - Fraud Detection and Mitigation software
 - “Brand Monitoring” and Anti-Phishing service
 - Social Engineering (Testing, Review, and Training)
- All data “in motion” encrypted.
- Change to new storage network will include encrypting data at rest.

TSP security remains an area for continued focus.

Findings: People

- Parallel call centers provide excellent backup and dispersal
- SI contract accommodates reasonable dispersal
- FRTIB employees still centrally located. Possible improvements include:
 - Better utilization of Fair Oaks space
 - Telecommuting arrangements that support agency business assurance goals

The people supporting TSP are our most important assets.

Planned Procedural Solutions

- Ensure end-to-end functional testing utilizing load commensurate with production on all significant changes
- Continue to improve business continuity plans, and continue regular testing
- Proactively monitor/manage the TSP network and servers with appropriate tool sets to ensure fast problem recognition and resolution
- Continue to build on improvements and investments made in configuration management during FY07

Continual process improvement will take place no matter what

Recommendations

- Replace both mainframes with newer technology; more memory, faster processors.
- Replace storage subsystems in Reston and Pittsburgh with high-speed, scalable solution.
- Consolidate and replace servers in both Reston and Pittsburgh with new Blade virtual server technology, which is scalable, and configured for redundancy and high availability.
- As part of transition to IPv6, eliminate all single points of failure associated with critical network hardware and paths.

Where we're holding back...

- Moving Pittsburgh site within 100km (as the "wire flies") would create "Parallel Sysplex"
 - Both sites would share workload actively
 - Recovery point and time objectives would be instantaneous
- But
 - We would lose geographic dispersal benefits, and
 - Costs would be an additional \$10-15m annually

Possible Phase 2 Consideration

Questions

