



*Management Practices Over End-user  
Computer Server Storage Need Improvement  
to Ensure Effective and Efficient Storage  
Utilization*

**July 3, 2007**

**Reference Number: 2007-20-103**

This report has cleared the Treasury Inspector General for Tax Administration disclosure review process and information determined to be restricted from public release has been redacted from this document.

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TREASURY INSPECTOR GENERAL  
FOR TAX ADMINISTRATION

DEPARTMENT OF THE TREASURY  
WASHINGTON, D.C. 20220

July 3, 2007

**MEMORANDUM FOR CHIEF INFORMATION OFFICER**

A handwritten signature in black ink, appearing to read "Michael R. Phillips".

**FROM:** (for) Michael R. Phillips  
Deputy Inspector General for Audit

**SUBJECT:** Final Audit Report – Management Practices Over End-user Computer Server Storage Need Improvement to Ensure Effective and Efficient Storage Utilization (Audit # 200620023)

This report presents the results of our review of the Internal Revenue Service's (IRS) end-user<sup>1</sup> computer server storage management. The overall objective of this review was to assess the effectiveness and efficiency of the IRS management practices over the end-user computer server storage environment for employees using the IRS Microsoft Windows computer networks.

*Impact on the Taxpayer*

The IRS needs to improve management practices over end-user computer server storage to ensure effective and efficient utilization of storage and budget resources. In Fiscal Years 2003 through 2006, the Modernization and Information Technology Services (MITS) organization spent \$19.9 million to purchase server storage capacity and support. However, only 27 percent of the available storage was being used on the 2,253 servers we reviewed. In addition, the IRS had not established policies and procedures for monitoring end-user computer server storage usage, including both end-user infrastructure and application server storage. As a result, it may not have most efficiently used its resources.

*Synopsis*

The IRS requires a large and complex computer environment, which includes computer servers managed by several functions within the MITS organization to process and store taxpayer,

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<sup>1</sup> See Appendix V for a Glossary of Terms.



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financial, and administrative data. On May 14, 2006, the MITS organization began centralizing under the Enterprise Operations organization the management of all servers in both the Enterprise Operations and the End User Equipment and Services organizations. Other MITS organizations continue to manage their own servers. In Fiscal Years 2003 through 2006, the MITS organization spent \$19.9 million to purchase server storage capacity and support. It planned to spend an additional \$9.3 million in Fiscal Years 2006 and 2007; however, the \$9.3 million was redirected and put to better use on higher priority information technology infrastructure needs (see Appendix IV).

We identified storage management practices that could be improved to provide more effective and efficient server storage utilization and better informed storage purchasing decisions.

- The MITS organization does not assign server storage space to end-users based on industry best practices. The IRS assigns 500 megabytes of server storage space to each end-user, while industry best practices recommend 200 megabytes of storage for each user. In addition, storage space used by former employees was not always made available for other uses; we identified 2,098 former employees with storage space still assigned.
- Only 27 percent of the available storage was being used on the 2,253 servers we reviewed. Based on the unused storage rate of 73 percent, \$14.6 million<sup>2</sup> of the \$19.9 million spent on the purchase of storage capacity and support during Fiscal Years 2003 through 2006 represents an inefficient use of resources (see Appendix IV).
- MITS organization management did not have an accurate inventory of all available server storage space. The number of servers shown in the different systems varied, with 2,256 servers in the Tivoli<sup>®</sup> inventory system, 3,478 servers in the Enterprise Systems Management Organization Master Server Database, and 4,783 servers in the Information Technology Asset Management System. In a prior audit report,<sup>3</sup> we recommended mismatches between records on the Tivoli<sup>®</sup> inventory system and the Information Technology Asset Management System be resolved. The IRS closed the corrective action on March 3, 2006; however, only 47 percent<sup>4</sup> of the servers inventoried in the

***Although the MITS organization began centralizing server management and reallocated budgeted storage funds, policies and procedures did not ensure effective and efficient storage utilization. In Fiscal Years 2003 through 2006, the MITS organization spent \$19.9 million to purchase server storage and storage support. However, only 27 percent of storage capacity was being used.***

<sup>2</sup> Total storage costs of \$19,936,816 x 73 percent unused storage rate = \$14,553,876 (rounded).

<sup>3</sup> *Progress Has Been Made in Using the Tivoli<sup>®</sup> Software, Although Enhancements Are Needed to Better Distribute Software Updates and Reconcile Computer Inventories* (Reference Number 2006-20-021, dated December 2005).

<sup>4</sup> The 2,256 servers in the Tivoli<sup>®</sup> inventory system/4,783 servers in the Information Technology Asset Management System = 47 percent (rounded).



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Information Technology Asset Management System were identified in the Tivoli<sup>®</sup> inventory system records during this review.

IRS management advised us that automated inventory tools should be used to create reports that link the Information Technology Asset Management System data to the data gathered from those tools. In addition, the contractor assisting the IRS in the Sustaining Infrastructure Initiative is recommending the IRS implement an Asset Discovery Tool to provide a more complete set of data by recognizing all assets through network addresses. The contractor is also recommending a modification of the current Information Technology Asset Management System infrastructure to support more robust data fields. Therefore, it appears various IRS organizations are pursuing different computer inventory solutions that may be inconsistent and duplicative.

In addition, the Server Consolidation and Virtualization project was not following required project management procedures because a business case and cost-benefit analysis had not been prepared. Following required project management procedures will help minimize the risks of cost overruns, schedule delays, and inadequate executive governance and oversight.

### *Recommendations*

We recommended the Chief Information Officer (1) centralize management of all MITS organization storage servers, where appropriate, to improve the effectiveness and efficiency of storage management; (2) periodically analyze storage utilization to ensure storage space is efficiently used prior to purchasing any additional storage capacity; (3) ensure the MITS organization establishes formal policies and procedures over the assignment and monitoring of end-user computer server storage space; (4) resolve server mismatches between records on the Tivoli<sup>®</sup> inventory system and the Information Technology Asset Management System and reopen the prior corrective action regarding resolution of such mismatches until it is completed; (5) define the future inventory system design requirements to meet all user needs and implement one reliable computer inventory system; and (6) ensure required project management procedures, such as preparing a formal business case, feasibility study, and cost-benefit analysis, are followed by the Server Consolidation and Virtualization project.

### *Response*

IRS management agreed with all recommendations except the first part of Recommendation 3 and plans to take an alternative corrective action to the second part of Recommendation 4. The corrective actions to be implemented include centralizing management of storage servers where appropriate; analyzing storage utilization quarterly; and defining policies and procedures to enforce end-user storage limits, govern file retention for exiting employees, and standardize file management processes. Also, operational databases will be synchronized with the Information Technology Asset Management System as much as possible, and Information Technology Asset



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Management System functionality will be improved and automated efficiencies introduced. The Server Consolidation and Virtualization project will follow management procedures.

For Recommendation 3, management did not agree to assign storage space to users based on industry best practices because the IRS standard, which assigns shared storage space based on employees' business needs, increases employee efficiency. For Recommendation 4, management plans to open a new corrective action based on the closing action to the prior corrective action. Management's complete response to the draft report is included as Appendix VI.

### *Office of Audit Comment*

We continue to believe management could reduce storage costs by using the industry best practice of 200 megabytes for most employees and allowing exceptions to this policy for employees who have a business need for additional storage based on their assigned duties. We concur with not reopening the prior corrective action because the proposed actions should reduce the mismatches between records on the Tivoli<sup>®</sup> inventory system and the Information Technology Asset Management System.

Copies of this report are also being sent to the IRS managers affected by the report recommendations. Please contact me at (202) 622-6510 if you have questions or Margaret E. Begg, Assistant Inspector General for Audit (Information Systems Programs), at (202) 622-8510.



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*Abbreviations*

EUES	End User Equipment and Services
IRS	Internal Revenue Service
ITAMS	Information Technology Asset Management System
MITIS	Modernization and Information Technology Services



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## *Background*

The Internal Revenue Service (IRS) requires a large and complex computer environment to process and store taxpayer, financial, and administrative data. A significant portion of the computer processing workload is performed by the IRS' mid-range<sup>1</sup> and mainframe computer systems. The workload is also processed by the end-user computing environment, which consists of desktop and laptop computers and network servers. The end-user computer server storage environment supports tax return processing, compliance applications, internal management applications, and enterprise storage and retrieval. We have previously reported on the storage management practices of the mid-range<sup>2</sup> and mainframe computers.<sup>3</sup> The focus of this review was on the end-user computer server storage environment for employees using the IRS Microsoft Windows computer networks, including both end-user infrastructure and application servers.

In Fiscal Years 2003 through 2006, the Modernization and Information Technology Services (MITS) organization spent \$19.9 million to purchase end-user server storage and storage support for the Enterprise Operations, End User Equipment and Services (EUES), and Enterprise Services organizations. Figure 1 presents the yearly expenditures.

**Figure 1: End-user Server Storage Expenditures**

<b>Fiscal Year</b>	<b>Amount Expended</b>
<b>2003</b>	\$1,241,061
<b>2004</b>	\$9,909,778
<b>2005</b>	\$8,727,492
<b>2006</b>	\$58,485
<b>Total</b>	\$19,936,816

*Source: The Enterprise Operations and Enterprise Services organizations.*

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<sup>1</sup> See Appendix V for a Glossary of Terms.

<sup>2</sup> *Mid-range Computer Storage Resources Need Better Administration to Ensure Effective and Efficient Utilization and Accurate Reporting* (Reference Number 2005-20-098, dated July 2005).

<sup>3</sup> *Improvements in Mainframe Computer Storage Management Practices and Reporting Are Needed to Promote Effective and Efficient Utilization of Disk Resources* (Reference Number 2006-20-056, dated May 2006).



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This review was performed in MITS organization offices at the IRS National Headquarters in New Carrollton, Maryland, and the Enterprise Computing Center in Memphis, Tennessee, during the period January 2006 through February 2007. The audit was conducted in accordance with *Government Auditing Standards*. Detailed information on our audit objective, scope, and methodology is presented in Appendix I. Major contributors to the report are listed in Appendix II.



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## *Results of Review*

### ***Management of the End User Equipment and Services Organization's Servers Was Centralized Under the Enterprise Operations Organization***

The Clinger-Cohen Act of 1996<sup>4</sup> states the Chief Information Officer is responsible for promoting the effective and efficient design and operation of all major information resources management processes for the executive agency. The Internal Revenue Manual states the Chief Information Officer and the Director, Enterprise Operations, within the MITS organization are responsible for ensuring the effective and efficient use of the IRS automated information processing environment.

Prior to May 14, 2006, MITS organization end-user servers were managed by several MITS organizations (e.g., Enterprise Operations, EUES, Applications Development [formerly Business Systems Development], and Enterprise Services). The IRS determined that managing servers across multiple organizations was ineffective and, in May 2006, centralized server management of all Enterprise Operations and EUES organization servers under the Enterprise Operations organization. However, some MITS organizations, such as the Applications Development (54 servers) and Enterprise Services (22 servers) organizations, continue to manage their own servers. The EUES organization indicated end-user server management was not centralized completely because the agreement to centralize servers was only between the EUES and Enterprise Operations organizations. As a result of not centralizing the management of all servers, it is more difficult for the MITS organization to ensure servers are managed effectively and efficiently.

### ***Recommendation***

***Recommendation 1:*** The Chief Information Officer should centralize management of all MITS organization storage servers into the Enterprise Operations organization, where appropriate, to improve the effectiveness and efficiency of storage management.

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<sup>4</sup> Federal Acquisition Reform Act of 1996 (Information Technology Management Reform Act of 1996), Pub. L. No. 104-106, 110 Stat. 642 (codified in scattered sections of 5 U.S.C., 5 U.S.C. app., 10 U.S.C., 15 U.S.C., 16 U.S.C., 18 U.S.C., 22 U.S.C., 28 U.S.C., 29 U.S.C., 31 U.S.C., 38 U.S.C., 40 U.S.C., 41 U.S.C., 42 U.S.C., 44 U.S.C., 49 U.S.C., 50 U.S.C.).



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**Management's Response:** IRS management agreed with the recommendation. The MITS organization will centralize management of storage servers into the Enterprise Operations organization, where appropriate, to improve the effectiveness and efficiency of storage management.

### ***Storage on Servers Was Not Effectively Managed to Ensure Efficient Use of Resources***

The Internal Revenue Manual requires electronic copies of records, including copies maintained by individuals in personal files or directories, that have no further administrative value to be deleted within 180 calendar days after the recordkeeping copy has been produced. The Department of the Treasury *Information System Life Cycle Manual* (TD P 84-01, dated March 2002) states one of the benefits of data management is that it avoids the cost of redundant data collection and storage. File (data) management includes controlling the creation, deletion, access, and use of data files and programs.

We received storage utilization information on 2,292 (48 percent) of 4,783 servers shown in the Information Technology Asset Management System (ITAMS) as of September 29, 2006. Storage usage information for the remaining servers was not readily available and obtained due to the impact the data gathering might have had on storage management personnel. Our analysis of the information for 2,253 servers (2,292 servers less 39 newly installed servers) determined only 27 percent of the 484.1 terabytes of storage space on the servers was used. Based on the unused storage rate of 73 percent, \$14.6 million of the \$19.9 million<sup>5</sup> spent on the purchase of storage capacity and support during Fiscal Years 2003 through 2006 represents an inefficient use of resources (see Appendix IV).

In the two prior audits of the IRS' storage management practices, we reported the IRS needed to improve the efficiency of its storage utilization and should consider storage utilization when assessing the need to purchase additional storage. In Fiscal Years 2006 and 2007, the IRS budgeted \$9.3 million to purchase end-user server storage and storage support for the Enterprise Operations, EUES, and Enterprise Services organizations. However, the MITS organization decided not to spend the budgeted funds. These funds were redirected and put to better use on higher priority information technology infrastructure needs (see Appendix IV).

The storage utilization rate is comparable to industry results reported by Gartner, Inc.,<sup>6</sup> which showed that only 28 percent to 45 percent of installed storage was actually holding data. The

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<sup>5</sup> Total storage costs of \$19,936,816 x 73 percent unused storage rate = \$14,553,876 (rounded).

<sup>6</sup> Gartner, Inc. is the leading provider of research and analysis to the global information technology industry. [Source: SANZ (*smarter about storage*)<sup>®</sup> industry white paper entitled, "Building a Tiered Storage Architecture-Because Not All Data is Created Equal".]



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IRS storage utilization rate was low, in part, because storage utilization rates were not a determining factor in deciding whether to buy more storage space.

In addition, our review of the MITS organization's end-user server storage management controls determined that existing policies and procedures do not:

- Assign storage space to users based on industry best practices.

The IRS established a policy that end-users can be assigned 500 megabytes of server storage space (called home directory space). However, industry best practices recommend 200 megabytes of storage for each user. As a result, the IRS is incurring additional costs to maintain unneeded storage space. In addition, while the IRS assigns 500 megabytes of storage space to each end-user, no formal policy is in place to ensure storage limits are enforced.

- Make the storage space assigned to former employees available for other users.

A total of 2,098 former employees had files using approximately 0.138 terabytes (equivalent to 70,000,000 pages of text) of storage on the end-user servers managed by the MITS organization. Decentralized management of end-user server storage contributed to the lack of procedures for removing the files of former employees.

***Use of storage resources  
is not considered for  
managing files and  
identifying needs.***

- Establish standardized file management processes for server storage space. These processes include ensuring:
  - a) Certain files and file types are removed from servers.
  - b) Files that have not been accessed or modified for a specified period of time (e.g., more than 1 year) are removed and archived.
  - c) A review of the server storage space is completed at regular intervals (e.g., every 6 months) to determine whether only those files with a business purpose and immediate need are being stored.

IRS management indicated use of one set of standards for file management and the enforcement of users' storage limits were currently not possible because different software platforms (e.g., Microsoft Windows 2003 Server Operating System, Microsoft Windows NT) exist. However, IRS management also stated uniform standards and policies for managing files and the enforcement of storage limits could be established after an ongoing server operating system upgrade is completed.

Management indicated system administrators are also hampered in monitoring files because they do not have the authority to look for or remove nonwork-related files or



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adequate software to identify old, unused, and nonwork-related files. The IRS developed draft policies and procedures for file management of storage shared by multiple users and issued guidelines to educate employees on “good housekeeping” practices for file management of personal storage. Management commented that these procedures and guidelines are targeted for inclusion in the Internal Revenue Manual; however, they did not provide us with a scheduled completion date.

Without efficient and effective storage management controls to review storage utilization, implement standardized policies and procedures for managing files, and enforce users’ storage limits, the IRS runs the risk of not effectively using current storage capacity and unnecessarily purchasing additional storage capacity.

### ***Recommendations***

***Recommendation 2:*** The Chief Information Officer should periodically analyze storage utilization to ensure storage space is efficiently used prior to purchasing additional storage capacity.

***Management’s Response:*** IRS management agreed with the recommendation. The MITS organization will develop a process to analyze storage utilization quarterly to ensure storage space is efficiently used prior to purchasing additional capacity.

***Recommendation 3:*** The Chief Information Officer should ensure the MITS organization establishes formal policies and procedures to:

- Assign storage space to users based on industry best practices.
- Use the new operating system capability to enforce end-user storage limits.
- Define a reasonable time period for determining the business need of files being stored for former employees. Once the business need of the files is determined, archive, transfer, or remove the files.
- Standardize file management processes.

***Management’s Response:*** The Chief Information Officer disagreed with the recommendation that storage space be assigned to users based on industry best practices, stating that, while the industry best practice recommendation is for 200 megabytes, the IRS has found it necessary to assign 500 megabytes per user. The IRS standard assigns shared storage space based on employees’ business needs. This standard was determined by reviewing industry best practices, assessing available (current and projected) storage space, monitoring current user usage, and working to meet business requirements. The Chief Information Officer also stated this standard increases employee efficiency.



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Management agreed with the three remaining parts of this recommendation and indicated the Enterprise Operations organization will:

- Implement defined policies and procedures regarding shared storage policies.
- Define a process for business organizations to identify additional requirements of file retention for exiting staff. System administrators will implement appropriate archival and removal of those files.
- Review, update, and distribute the current standardized file management process document.

**Office of Audit Comment:** A 2004 study conducted by the IRS to determine the amount of storage space to assign to users indicated that only 4 percent of the employees were using more than 500 megabytes of storage. The study did not indicate the percentage of employees using more than the industry best practice of 200 megabytes. In addition, the study identified music, picture, and other files dating back to 1993 that were using storage space. We recognize that some employees may need more than 200 megabytes of storage space to accomplish their assigned duties; however, establishing a standard 2.5 times the industry best practice will not lead to the most efficient use of storage resources. Therefore, we continue to believe management could reduce storage costs by using the industry best practice of 200 megabytes for most employees and allowing exceptions to this policy for employees who have a business need for additional storage based on their assigned duties.

### ***Management Did Not Have an Accurate Inventory of All Available Server Storage Space***

The Government Accountability Office *Standards for Internal Control in the Federal Government* state information should be recorded and communicated to management and others within the entity who need it and in a form and within a time period that enables them to carry out their responsibilities.

Management provided us with server inventory numbers from three sources.

- ITAMS – the official IRS computer equipment database used to record all computer inventories.
- Tivoli® inventory system – software implemented by the Enterprise Systems Management project to perform several tasks including asset management. On a weekly basis, the Tivoli® inventory system performs reconciliation between its records and the ITAMS inventory information.



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- Enterprise Systems Management Organization Master Server Database – A database created and maintained by the Enterprise Operations organization containing information specifically related to end-user server systems that is not included in the ITAMS. The information is used in conjunction with all available data from other sources when making end-user server storage purchasing decisions. The Enterprise Systems Management organization creates management reports with information from both the Master Server Database and the ITAMS.

Figure 2 shows the server inventory numbers varied depending on the source of the information.

**Figure 2: Server Inventories**

Server Inventory System	Number of Servers
ITAMS	4,783
Tivoli <sup>®</sup> Inventory System	2,256
Enterprise Systems Management Organization Master Server Database	3,478

Source: MITS organization storage management personnel.

In a prior audit report,<sup>7</sup> we recommended the Chief Information Officer ensure the EUES organization resolves mismatches between records on the Tivoli<sup>®</sup> inventory system and the ITAMS. The IRS' planned corrective action was to include developing appropriate procedures by March 1, 2006, to resolve the mismatches. The IRS closed the corrective action on March 3, 2006. However, during this audit, only 2,256 (47 percent) of the 4,783 MITS organization-managed servers in the ITAMS inventory were identified in the Tivoli<sup>®</sup> inventory system records. The Tivoli<sup>®</sup> inventory system was not complete and accurate because not all servers had Tivoli<sup>®</sup> software installed on them or servers with Tivoli<sup>®</sup> software installed were not properly configured to be recognized as servers. Storage management personnel advised us that all devices are not always labeled properly and consistently in the ITAMS.

**Management cannot timely and effectively identify the server storage environment. Therefore, the IRS may overestimate storage needs and unnecessarily purchase storage hardware, software, maintenance, and other support.**

In addition, the Enterprise Systems Management organization was manually maintaining the Master Server Database to record information the ITAMS does not record. As of October 4, 2006, 158 people could access and modify the Master Server Database. Based on the

<sup>7</sup> Progress Has Been Made in Using the Tivoli<sup>®</sup> Software, Although Enhancements Are Needed to Better Distribute Software Updates and Reconcile Computer Inventories (Reference Number 2006-20-021, dated December 2005).



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information in Figure 2, the database does not contain information on all computer equipment in the ITAMS. Manually maintaining a database outside of the official computer inventory database (i.e., the ITAMS) may be an inefficient use of resources.

IRS management advised us the ITAMS is the official equipment inventory and that other automated inventory tools should be used to create reports that link the ITAMS data to the data gathered from those tools. In addition, the contractor assisting the IRS in the Sustaining Infrastructure Initiative is recommending the IRS implement an Asset Discovery Tool to provide a more complete set of data by recognizing all assets through network addresses. The contractor is also recommending a modification of the current ITAMS infrastructure to support more robust data fields. Therefore, it appears various IRS organizations are pursuing different computer inventory solutions that may be inconsistent and duplicative.

Without an accurate inventory of all available storage and the effective coordination of computer inventory initiatives, the IRS may not know how much storage it has; be unable to make reliable investment and resource decisions; and purchase unnecessary storage hardware, software, maintenance, and other support.

### ***Recommendations***

***Recommendation 4:*** The Chief Information Officer should resolve the end-user server mismatches between records on the Tivoli<sup>®</sup> inventory system and the ITAMS and reopen the prior corrective action regarding resolution of such mismatches until it is actually completed.

***Management's Response:*** IRS management agreed with the recommendation. The ITAMS inventory database should be the authoritative source for updates to operational databases such as the Tivoli<sup>®</sup> and Server databases. Since the audit, the IRS has taken several steps to ensure these operational databases are synchronous with the ITAMS as much as possible. The IRS is also developing perpetual inventory controls that will involve new software and processes. The Chief Information Officer plans to open a new corrective action because the closing action to the prior corrective action stated the EUES organization would develop a process to identify systems that were not being mapped by Tivoli<sup>®</sup> software and indicated that additional enhancements were needed for the data exchange between the Tivoli<sup>®</sup> inventory system and the ITAMS.

***Office of Audit Comment:*** We concur with not reopening the prior corrective action. The corrective actions proposed for Recommendation 4 should reduce the mismatches between records on the Tivoli<sup>®</sup> inventory system and the ITAMS.

***Recommendation 5:*** The Chief Information Officer should assess the current computer inventory systems and initiatives and define the future inventory system design requirements to meet all user needs. Once the requirements are defined, one reliable computer inventory system should be implemented.



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**Management's Response:** IRS management agreed with the recommendation. The current ITAMS is the one standard inventory system for IRS computer equipment; however, the IRS is taking steps to improve its functionality and introduce automated efficiencies. Two initiatives underway will result in significant improvements to the ITAMS: (1) implementation of the "One Inventory" concept and process enhancements toward perpetual inventory controls and (2) initiation of a Business Process Reengineering group to develop best practice asset management processes. There are also other general actions in progress to facilitate this goal.

### ***A Storage Management Improvement Initiative Was Not Following Required Project Management Procedures***

The Department of the Treasury *Information System Life Cycle Manual* states general standardization of life cycle management ensures systems are developed, acquired, evaluated, and operated efficiently, within prescribed budget and schedule constraints, and are responsive to mission requirements. In addition, the IRS system development guidelines (currently, the Enterprise Life Cycle – Lite) stipulate that, as part of the information system life cycle management process, project management should identify project risks early and manage them before they become problems.

The Clinger-Cohen Act of 1996 requires agencies to use a disciplined Capital Planning and Investment Control process to acquire, use, maintain, and dispose of information technology. In addition, Office of Management and Budget Circular A-11, *Preparation, Execution, and Submission of the Budget*, requires each agency to include an Agency Information Technology Investment Portfolio (Exhibit 53) with its annual budget submission to the Office of Management and Budget. The IRS classifies a project as a major information technology investment if the annual investment exceeds \$5 million or if the total life cycle cost exceeds \$50 million. Major investments require increased executive oversight and preparation of a detailed Capital Asset Plan and Business Case (Exhibit 300).

In April 2004, IRS management prepared a Tier III Master Server Consolidation Plan outlining a server consolidation strategy. Management indicated that additional servers were to be purchased following the principles of this Plan. However, the Plan did not assess the existing end-user server storage environment or the proposed network storage design and did not provide cost estimates for the new storage design, which was to include storage virtualization. In addition, a formal business case, feasibility study, and cost-benefit analysis were not prepared.

Therefore, the server consolidation initiative was not following required project management procedures, although it met the Capital Planning and Investment Control cost thresholds for a major information technology investment. Specifically, the MITS organization spent \$9.9 million in Fiscal Year 2004 and \$8.7 million in Fiscal Year 2005 on end-user server storage.



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The IRS considered the server consolidation strategy to be a plan of action to achieve its goals of reducing the number of servers in inventory and consolidating the location of servers to the campus sites. In July 2006, management advised us that a formal Server Consolidation and Virtualization project had been approved. The Enterprise Operations organization is sponsoring the project and a Project Manager has been assigned.

When information technology initiatives do not follow required project management procedures, the IRS increases the risks of cost overruns and schedule delays. In addition, projects may not have adequate executive governance and oversight.

### ***Recommendation***

***Recommendation 6:*** The Chief Information Officer should ensure required project management procedures, such as preparing a formal business case, feasibility study, and cost-benefit analysis, are followed by the Server Consolidation and Virtualization project.

***Management's Response:*** IRS management agreed with the recommendation. The MITS organization has assigned a project manager and will ensure completion of management procedures, including a business case, feasibility study, and cost-benefit analysis.



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## **Appendix I**

### *Detailed Objective, Scope, and Methodology*

The overall objective of this review was to assess the effectiveness and efficiency of the IRS management practices over the end-user<sup>1</sup> computer server storage environment for employees using the IRS Microsoft Windows computer networks. Specifically, we:

- I. Determined whether the IRS developed and implemented policies and procedures for managing end-user server storage.
  - A. Reviewed Treasury Directives, Office of Management and Budget Circulars, the Internal Revenue Manual, and other guidelines governing storage management.
  - B. Obtained and evaluated the policies and procedures for establishing and managing the size of home directories. We also reviewed the IRS process and best practices for establishing home directory size and compared best practices to the IRS policy and procedures. We interviewed IRS personnel to obtain procedures for managing storage size.
  - C. Obtained and evaluated the procedures and guidelines to remove and/or archive duplicate, old, unused, and nonwork-related files.
  - D. Obtained and evaluated the IRS data retention requirements for home directories of separated and inactive employees.
  - E. Identified the amounts the MITS organization expended to add or replace capacity for, maintain, and support end-user server storage space during Fiscal Years 2003 through 2006 and the amount included in the budget request for Fiscal Year 2007.
  - F. Determined whether a design flowchart for the end-user network server storage environment was prepared.
- II. Determined the status of the end-user server storage consolidation initiatives and whether selected project management controls were implemented.
  - A. Identified the end-user server migrations made between Fiscal Years 2003 and 2006 and determined their status.
  - B. Determined whether a business case, consolidation plan, or other related plans were developed for the end-user server storage consolidation effort and whether a feasibility study was prepared.

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<sup>1</sup> See Appendix V for a Glossary of Terms.



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- C. Evaluated the adequacy of all consolidation plans, justifications, and need assessments, including whether a cost-benefit or impact analysis was performed.
- III. Determined whether end-user server storage utilization was effectively and efficiently managed.
  - A. Interviewed storage management personnel and Computing Center and campus management to obtain an accurate inventory of MITS organization-owned end-user servers as of September 29, 2006. Storage utilization-related information was obtained on 2,292 (48 percent) of 4,783 servers to determine the utilization of the server storage space. We also interviewed MITS organization personnel to identify the number of separated and inactive employees, obtained a list of separated employees from the Treasury Integrated Management Information System, and determined how to match employees' identifying information to the server information to determine whether employees' home directories still resided on the servers after the employees had separated from the IRS.
  - B. Analyzed the data obtained in Step III.A. to determine whether the IRS was effectively managing end-user server storage and whether excess storage was allocated to servers.

**Validity and reliability of data from computer-based systems**

We used computer-based data to determine the amounts spent and planned to be spent on replacement and additional disk storage capacity. The IRS provided Integrated Financial System information regarding the end-user server storage expenditures in Fiscal Years 2004 through 2006. We relied on the Government Accountability Office's assessment of the reliability of the computer-processed data from the Integrated Financial System. During a review of the IRS' financial statements,<sup>2</sup> the Government Accountability Office concluded the expense and reimbursable revenue information processed through the System for Fiscal Years 2005 and 2006 was reliable in all material respects. We also used computer-based data to analyze end-user server storage utilization. The storage data were validated by working with IRS storage personnel to ensure completeness and accuracy. IRS personnel provided storage utilization-related information identified through a Tivoli<sup>®</sup> scan of the servers; identified end-user servers installed from July 9, 2006, through August 9, 2006; and identified retired (out-of-service) servers.

The data used to determine the number of separated/inactive employees with home directories residing on end-user servers were validated by comparing a list of authorized storage server users to the IRS personnel system. We attempted to validate the end-user server inventory by comparing the information received from three different inventory systems (the ITAMS, the

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<sup>2</sup> *Financial Audit: IRS's Fiscal Years 2006 and 2005 Financial Statements* (GAO-07-136, dated November 2006).



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Tivoli<sup>®</sup> inventory system, and the Enterprise Systems Management Organization Master Server Database). For the identified differences in the server inventory counts, we conducted discussions with storage management personnel that had expertise with the inventory systems. Our attempt to validate the server inventory was unsuccessful, and the results are presented in detail in the Results of Review section of the report.



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**Appendix II**

*Major Contributors to This Report*

Margaret E. Begg, Assistant Inspector General for Audit (Information Systems Programs)  
Gary Hinkle, Director  
Danny Verneuille, Audit Manager  
Mark Carder, Lead Auditor  
Louis Zullo, Senior Auditor  
Linda Screws, Auditor



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**Appendix III**

*Report Distribution List*

Acting Commissioner C  
Office of the Commissioner – Attn: Chief of Staff C  
Deputy Commissioner for Operations Support OS  
Deputy Chief Information Officer OS:CIO  
Associate Chief Information Officer, End User Equipment and Services OS:CIO:EU  
Associate Chief Information Officer, Enterprise Operations OS:CIO:EO  
Director Stakeholder Management OS:CIO:SM  
Chief Counsel CC  
National Taxpayer Advocate TA  
Director, Office of Legislative Affairs CL:LA  
Director, Office of Program Evaluation and Risk Analysis RAS:O  
Office of Internal Control OS:CFO:CPIC:IC  
Audit Liaisons:  
    Deputy Commissioner for Operations Support OS  
    Associate Chief Information Officer, End User Equipment and Services OS:CIO:EU  
    Associate Chief Information Officer, Enterprise Operations OS:CIO:EO  
    Director, Program Oversight Office OS:CIO:SM:PO



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## **Appendix IV**

### *Outcome Measures*

This appendix presents detailed information on the measurable impact that our recommended corrective actions will have on tax administration. These benefits will be incorporated into our Semiannual Report to Congress.

#### **Type and Value of Outcome Measure:**

- Inefficient Use of Resources – Potential; \$14,553,876 spent on the purchase of storage capacity and support (see page 4).

#### **Methodology Used to Measure the Reported Benefit:**

In Fiscal Years 2003 through 2006, the MITS organization spent \$19.9 million to purchase end-user<sup>1</sup> server storage (including both end-user infrastructure and application server storage and storage support) for the Enterprise Operations, EUES, and Enterprise Services organizations. We received storage utilization information on 2,292 (48 percent) of 4,783 servers shown in the ITAMS as of September 29, 2006. Storage usage information for the remaining servers was not readily available and obtained due to the impact the data gathering might have had on storage management personnel. Our analysis of the information for 2,253 servers (2,292 servers less 39 newly installed servers) determined only 27 percent of the 484.1 terabytes of storage space was used. Based on the unused storage rate of 73 percent, \$14.6 million (\$19,936,816 storage costs x 73 percent) spent on the purchase of storage capacity and support during Fiscal Years 2003 through 2006 represents an inefficient use of resources.

IRS storage management personnel were unable to provide information regarding the specific amount of end-user server storage capacity purchased in Fiscal Years 2003 through 2006. As a result, we could not determine whether the entire \$19.9 million spent to purchase end-user server storage was unnecessary. Therefore, we estimated the amount of unnecessary storage (i.e., inefficient use of resources) by multiplying the \$19.9 million spent on storage by the 73 percent unused storage rate. Figure 1 shows the cost of unused end-user server storage capacity.

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<sup>1</sup> See Appendix V for a Glossary of Terms.



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**Figure 1: Cost of Unused End-user Server Storage Capacity**

Category	Fiscal Years 2003-2006 Totals	Fiscal Year 2003	Fiscal Year 2004	Fiscal Year 2005	Fiscal Year 2006
<b>Total server storage and storage support costs</b>	\$19,936,816	\$1,241,061	\$9,909,778	\$8,727,492	\$58,485
<b>Total server infrastructure costs</b>	\$33,898,492	\$2,815,578	\$14,043,529	\$16,980,900	\$58,485  Budgeted funds totaling \$5,734,025 were withdrawn by the IRS and spent on other information technology needs.
<b>Percentage the server storage and storage support costs are of server infrastructure costs</b>	58.8%	44.1%	70.6%	51.4%	Unknown (but immaterial).
<b>Unused storage space rate</b>	73%				
<b>Inefficient use of resources (\$19,936,816 x 73%)</b>	\$14,553,876				

Source: MITS organization-provided expenditure and budget information for Fiscal Years 2003 through 2006 and storage utilization information. If MITS organizations other than the Enterprise Operations, EUES, and Enterprise Services organizations had end-user server storage funding, it is not included in the expended amounts in Figure 1.

**Type and Value of Outcome Measure:**

- Funds Put to Better Use – Actual; \$9,345,125 (see page 4).

**Methodology Used to Measure the Reported Benefit:**

In our two prior audits of the IRS’ storage management practices, we reported the IRS needed to improve the efficiency of its storage utilization and should consider storage utilization when assessing the need to purchase additional storage. In Fiscal Years 2006 and 2007, the IRS budgeted \$9.3 million to purchase end-user server storage and storage support for the Enterprise Operations, EUES, and Enterprise Services organizations. However, the MITS organization decided not to spend the budgeted funds. These funds were redirected and put to better use on higher priority information technology infrastructure needs. Figure 2 shows the budgeted storage funds withdrawn and reassigned.



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**Figure 2: End-user Server Storage Capacity and Support Costs  
Withdrawn and Reassigned**

Category	Amounts	Total Amounts
<b>Fiscal Year 2006 end-user server infrastructure funded amount withdrawn</b>	\$10,742,500	
<b>Fiscal Year 2006 infrastructure funded amount withdrawn representative of server storage and storage support costs</b>		\$5,734,025
<b>Fiscal Year 2007 end-user server infrastructure funded amount withdrawn</b>	\$6,734,187	
<b>Fiscal Year 2007 infrastructure funded amount withdrawn representative of server storage and storage support costs</b>		<u>\$3,611,100</u>
<b>Funds put to better use</b>		\$9,345,125

*Source: MITS organization-provided budget information for Fiscal Years 2006 and 2007.*



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**Appendix V**

*Glossary of Terms*

Agency Information Technology Investment Portfolio (Exhibit 53)	A document covering information technology investments for the agency as a whole that is to be submitted to the Office of Management and Budget if the agency (1) is subject to executive branch review and is requesting information technology funding via a Capital Asset Plan and Business Case (Exhibit 300) or (2) has budget authority of \$500,000 or more for financial management systems.
Campuses	The data processing arm of the IRS; they process paper and electronic submissions, correct errors, and forward data to the Computing Centers for analysis and posting to taxpayer accounts.
Capital Asset Plan and Business Case (Exhibit 300)	Used as a one-stop document for a myriad of information technology management issues such as business cases for investments, Clinger Cohen Act of 1996 <sup>1</sup> implementation, agency's modernization efforts, and overall project (investment) management.
Computing Centers	Support tax processing and information management through a data processing and telecommunications infrastructure.
End-user	For this audit report, defined as an employee who uses the IRS Microsoft Windows computer network to accomplish assigned duties.

<sup>1</sup> Federal Acquisition Reform Act of 1996 (Information Technology Management Reform Act of 1996), Pub. L. No. 104-106, 110 Stat. 642 (codified in scattered sections of 5 U.S.C., 5 U.S.C. app., 10 U.S.C., 15 U.S.C., 16 U.S.C., 18 U.S.C., 22 U.S.C., 28 U.S.C., 29 U.S.C., 31 U.S.C., 38 U.S.C., 40 U.S.C., 41 U.S.C., 42 U.S.C., 44 U.S.C., 49 U.S.C., 50 U.S.C.).



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Enterprise Life Cycle – Lite	A system development methodology for all nonmodernization projects.
Enterprise Systems Management Organization Master Server Database	An information source for the Enterprise Operations organization server support functions; it is populated with data that are related specifically to server systems support, enhance support of the server environment, and are not required in the ITAMS.
Home Directory	A directory that contains the personal files of a particular user of the system.
Information Technology Asset Management System	The official IRS computer equipment database used to record all computer inventories.
Integrated Financial System	The system intended to address administrative financial management weaknesses. The first release of the system will include the Accounts Payable, Accounts Receivable, General Ledger, Budget Execution, Cost Management, and Financial Reporting activities. A future release will be needed to fully resolve all administrative financial management weaknesses.
Mainframe	A powerful, multiuser computer capable of supporting many hundreds of thousands of users simultaneously.
Megabyte	A unit of measure used to describe memory and disk capacity that is equal to approximately 1 million bytes or 1,024 kilobytes. It is also equivalent to approximately 500 pages of text.
Microsoft Windows NT	A family of operating systems produced by Microsoft, the first version of which was released in July 1993.
Microsoft Windows 2003 Server Operating System	The Windows server software version used by the IRS.
Mid-range Computers	File servers and related hardware, software, maintenance, and services; they support enterprise application systems and are located at the Computing Centers.
Server	A computer that carries out specific functions (e.g., a file server stores files, a print server manages printers, and a network server stores and manages network traffic).



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Server Virtualization	The masking of server resources, including the number and identity of individual physical servers, processors, and operating systems, from server users. The server administrator uses a software application to divide one physical server into multiple, isolated virtual environments.
Storage Device	A device (e.g., server) capable of storing data.
Terabyte	A unit of measure used to describe memory and disk capacity that is equal to approximately 1 trillion bytes or 1,024 gigabytes. It is also equivalent to approximately 500,000,000 pages of text.
Tier III Computing Environment	The IRS computing environment that consists of desktop and laptop computers as well as end-user servers. Specifically, these devices support tax return processing, postfiling, compliance, and internal management applications; infrastructure servers supporting network access; enterprise storage and retrieval; enterprise infrastructure; and Commercial Off-the-Shelf software.
Tivoli <sup>®</sup>	Tivoli <sup>®</sup> is a registered trademark owned by IBM. The implementation of Tivoli <sup>®</sup> is part of the IRS Enterprise Systems Management project encompassing help desk operations, network and systems management, software distribution, asset management, and performance measures analysis and reporting.
Treasury Integrated Management Information System	The official automated personnel and payroll system for storing and tracking all employee personnel and payroll data.
Virtualization	Transforms physical hardware—servers, hard drives, and networks—into an infinitely flexible pool of computing resources (e.g., storage) that businesses can expand, reallocate, and use as needed.



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**Appendix VI**

*Management's Response to the Draft Report*



CHIEF INFORMATION OFFICER

DEPARTMENT OF THE TREASURY  
INTERNAL REVENUE SERVICE  
WASHINGTON, D.C. 20224

JUN 01 2007

RECEIVED  
JUN - 4 2007

**MEMORANDUM FOR DEPUTY INSPECTOR GENERAL FOR AUDIT**

**FROM:** Richard A. Spires  
Chief Information Officer

**SUBJECT:** Draft Audit Report - Management Practices Over End-user Computer Server Storage Need Improvement to Ensure Effective and Efficient Storage Utilization (Audit #200620023) (i-trak #2007-24186)

Thank you for the opportunity to review and respond to the subject draft audit report. The IRS' Modernization and Information Technology Services (MITS) organization strives to improve the effective management of our information technology resources; and as such, we select servers based on all system requirement criteria and procure the most cost-effective servers through the current contract vehicle. We are undertaking an engineering study and are in the process of establishing a project office to run a server consolidation and virtualization initiative. An outcome of such an initiative should result in more efficient use of server resources, to include storage utilization.

We agree with, and will implement, all of your recommendations with the exception of one. Specifically, the IRS allocates individual storage space based on well-researched employee business requirements. This approach enables us to better meet our employees' needs. Reducing individual storage space to 200 megabytes per user would be a detriment to employee efficiency and would negatively impact customer service.

Thank you for your continued support and guidance. We look forward to working with your staff throughout the year to develop appropriate measures. Our corrective actions are included in the attachment. If you have any questions, please contact me at (202) 622-6800. Members of your staff may also contact Perry Robinett, Director of Program Oversight Coordination, at (202) 283-6283.

Attachment



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**RECOMMENDATION #1:** The Chief Information Officer should centralize management of all MITS organization storage servers into the Enterprise Operations organization where appropriate to improve the effectiveness and efficiency of storage management.

**CORRECTIVE ACTION #1:** We agree with this recommendation. MITS will centralize management of storage servers into Enterprise Operations where appropriate to improve the effectiveness and efficiency of storage management.

**IMPLEMENTATION DATE:** October 1, 2010

**RESPONSIBLE OFFICIAL:** Associate Chief Information Officer, Enterprise Operations

**CORRECTIVE ACTION MONITORING PLAN:** This corrective action will be completed in three phases.

Phase 1: Data and Storage Management Process Re-Engineering Team will develop a new process for managing storage servers by July 1, 2008;

Phase 2: Re-organization of resources and equipment to Enterprise Operations by October 1, 2009; and

Phase 3: Implementation by October 1, 2010.

**RECOMMENDATION #2:** The Chief Information Officer should periodically analyze storage utilization to ensure storage space is efficiently used prior to purchasing additional storage capacity.

**CORRECTIVE ACTION #2:** We agree with this recommendation. MITS will develop a process to analyze storage utilization on a quarterly basis to ensure storage space is efficiently used prior to purchasing additional capacity.

**IMPLEMENTATION DATE:** October 1, 2007

**RESPONSIBLE OFFICIAL:** Associate Chief Information Officer, Enterprise Operations

**CORRECTIVE ACTION MONITORING PLAN:** We enter accepted corrective actions into the Joint Audit Management Enterprise System (JAMES). These corrective actions are monitored on a monthly basis until completion.



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**RECOMMENDATION #3:** The Chief Information Officer should ensure the MITS organization establishes formal policies and procedures to:

- A. Assign storage space to users based on industry best practices.
- B. Use the new operating system capability to enforce end-user storage limits.
- C. Define a reasonable time period for determining the business need of files being stored for former employees. Once the business need of the files is determined, archive, transfer, or remove the files.
- D. Standardize file management processes.

**CORRECTIVE ACTION #3A:** We disagree with the recommendation that the CIO should ensure the MITS organization establishes formal policies and procedures to assign storage space to users based on industry best practices. While the industry best practice recommendation is for 200 megabytes, we have found it necessary to assign 500 megabytes per user. The IRS standard assigns shared storage space based on employees' business needs. This standard was determined by reviewing industry best practices, assessing available (current and projected) storage space, monitoring current user usage, and working to meet business requirements. We have found that this standard increases employee efficiency.

**IMPLEMENTATION DATE:** N/A

**RESPONSIBLE OFFICIAL:** Associate Chief Information Officer, Enterprise Operations

**CORRECTIVE ACTION MONITORING PLAN:** N/A

**CORRECTIVE ACTION #3B:** We agree with the recommendation that the CIO should ensure the MITS organization establishes formal policies and procedures to use the new operating system capability to enforce end-user storage limits. Enterprise Operations will implement defined policies and procedures regarding shared storage policies.

**IMPLEMENTATION DATE:** October 1, 2007

**RESPONSIBLE OFFICIAL:** Associate Chief Information Officer, Enterprise Operations

**CORRECTIVE ACTION MONITORING PLAN:** We enter accepted corrective actions into the Joint Audit Management Enterprise System (JAMES). These corrective actions are monitored on a monthly basis until completion.

**CORRECTIVE ACTION #3C:** We agree with the recommendation that the CIO should ensure the MITS organization establishes formal policies and procedures to define a reasonable time period for determining the business need of files being stored for former employees. Once the business need of the files is determined, archive, transfer, or remove the files. Enterprise Operations will define a process for business organizations to identify additional requirements of



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file retention for exiting staff. Systems administrators will implement appropriate archival and removal of those files.

**IMPLEMENTATION DATE:** February 1, 2008

**RESPONSIBLE OFFICIAL:** Associate Chief Information Officer, Enterprise Operations

**CORRECTIVE ACTION MONITORING PLAN:** We enter accepted corrective actions into the Joint Audit Management Enterprise System (JAMES). These corrective actions are monitored on a monthly basis until completion.

**CORRECTIVE ACTION #3D:** We agree with the recommendation that the CIO should ensure the MITS organization establishes formal policies and procedures to standardize file management processes. Enterprise Operations will review, update, and distribute the current standardized file management process document.

**IMPLEMENTATION DATE:** February 1, 2008

**RESPONSIBLE OFFICIAL:** Associate Chief Information Officer, Enterprise Operations

**CORRECTIVE ACTION MONITORING PLAN:** We enter accepted corrective actions into the Joint Audit Management Enterprise System (JAMES). These corrective actions are monitored on a monthly basis until completion.

**RECOMMENDATION #4:** The Chief Information Officer should resolve end-user server mismatches between records on the Tivoli® inventory system and the ITAMS and reopen the prior corrective action regarding resolution of such mismatches until it is actually completed.

**CORRECTIVE ACTION #4:** We agree with this recommendation. The Chief Information Officer recommends that server mismatches between records from Tivoli and ITAMS should be a new corrective action and does not agree with opening the prior corrective action from a previous TIGTA audit. When the previous corrective action was closed in March 2006, the Associate Chief Information Officer of End User Equipment and Services (EUES) stated that EUES would develop a process to identify systems that were not being mapped by Tivoli software. An acknowledgment was made that additional enhancements were needed for the data exchange between Tivoli and ITAMS. There is no reason to reopen that corrective action at this time. The Chief Information Officer also agrees that the ITAMS inventory database should be the authoritative source for updates to operational databases such as the Tivoli® and Server databases. Since the audit, the following steps have already been taken to ensure these operational databases are synchronous with ITAMS as much as possible.

1. Software has been installed which prevents server records from being added to the Server database unless the record flows from the ITAMS inventory system.



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2. Requirements have been defined to ensure that any server record retirements in the ITAMS inventory system flow to the Server database.
3. Requirements have been defined to develop software and processes to periodically compare the ITAMS inventory database to the Server and Tivoli® databases. Anomaly reports and ITAMS work tickets will be generated to update the Server and Tivoli® databases when inventory changes occur.

These requirements are being integrated into the IRS' automation initiatives for its perpetual inventory controls. Funding and contractor support to accomplish this are being identified and we plan to develop and implement the new software and processes.

**IMPLEMENTATION DATE:** October 1, 2008

**RESPONSIBLE OFFICIAL:** Associate Chief Information Officer, End User Equipment and Services

**CORRECTIVE ACTION MONITORING PLAN:** We enter accepted corrective actions into the Joint Audit Management Enterprise System (JAMES). These corrective actions are monitored on a monthly basis until completion.

**RECOMMENDATION #5:** The Chief Information Officer should assess the current computer inventory systems and initiatives and define the future inventory system design requirements that meet all user needs. Once the requirements are defined, one reliable computer inventory system should be implemented.

**CORRECTIVE ACTION #5:** We agree with this recommendation. Our current ITAMS is the one standard inventory system for IRS computer equipment; however, we are taking steps to improve its functionality and introduce automated efficiencies. There are two initiatives underway that will result in significant improvements to ITAMS:

1. The CIO-sponsored Spend-To-Save Initiative to implement a "One Inventory" concept and process enhancements towards perpetual inventory controls for deployment at the end of calendar year 2007; and
2. End User Equipment and Services is initiating a senior manager-led Business Process Reengineering (BPR) group in July 2007 to develop best practice asset management processes for implementation at the end of calendar year 2008.

Other general actions in progress to facilitate this goal are:

1. The IRS has engaged a contractor to evaluate and make recommendations for improving inventory control processes for telecommunications equipment.



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2. The Treasury Department has an active task force evaluating the development of a standard Asset Management System for use at their bureaus.

We plan to have definite recommendations and requirements for improving our inventory system from these various initiatives and then implement them to create the one improved reliable inventory system as recommended.

**IMPLEMENTATION DATE:** January 2, 2009

**RESPONSIBLE OFFICIAL:** Associate Chief Information Officer, End User Equipment and Services

**CORRECTIVE ACTION MONITORING PLAN:** This corrective action has two milestones.

Milestone 1: Implementation of Spend-to-Save Improvements by December 1, 2007.

Milestone 2: Implementation of BPR Improvements by January 2, 2009.

**RECOMMENDATION #6:** The Chief Information Officer should ensure required project management procedures, such as preparing a formal business case, feasibility study, and cost-benefit analysis, are followed by the Server Consolidation and Virtualization project.

**CORRECTIVE ACTION #6:** We agree with this recommendation. MITS has assigned a project manager and will ensure completion of management procedures, including a business case, feasibility study, and cost benefit analysis.

**IMPLEMENTATION DATE:** February 1, 2008

**RESPONSIBLE OFFICIAL:** Associate Chief Information Officer, Enterprise Operations

**CORRECTIVE ACTION MONITORING PLAN:** We enter accepted corrective actions into the Joint Audit Management Enterprise System (JAMES). These corrective actions are monitored on a monthly basis until completion.