TREASURY INSPECTOR GENERAL FOR TAX ADMINISTRATION

# *Improvements in Mainframe Computer Storage Management Practices and Reporting Are Needed to Promote Effective and Efficient Utilization of Disk Resources*

**May 2006**

**Reference Number: 2006-20-056**

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

May 10, 2006

**MEMORANDUM FOR** CHIEF INFORMATION OFFICER

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

**SUBJECT:** Final Audit Report – Improvements in Mainframe Computer Storage Management Practices and Reporting Are Needed to Promote Effective and Efficient Utilization of Disk Resources (Audit # 200520024)

This report presents the results of our review of the Internal Revenue Service's (IRS) mainframe computer storage management. The overall objective of this review was to assess the effectiveness and efficiency of the IRS' mainframe computer storage management practices.

## Synopsis

The 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 mainframe computer systems. These systems are managed by the Enterprise Computing Center[1] organization that is part of the Modernization and Information Technology Services (MITS) Enterprise Operations organization. Between October 2001 and September 2005, the IRS' mainframe computer disk storage capacity more than doubled.

Effective October 2005, the Enterprise Operations organization, including the Enterprise Computing Center, restructured operations based on a Competency Based Organization, giving management the opportunity to create a uniform disk storage operating environment with standardized management practices. However, our review identified improvements in management practices and reporting that are needed to promote effective and efficient disk storage utilization.

Current disk storage capacity exceeds needs, but additional capacity is being purchased. In our opinion, additional storage capacity continues to be purchased based on storage allocation

[1] See Appendix VII for a Glossary of Terms.

instead of actual usage, as evidenced by the fact that actual storage usage information is not included in storage purchase justifications. Based on the storage usage rate, the $626,866 spent to purchase 21 terabytes of additional disk storage in August 2005 represents an inefficient use of resources, and the $1,423,140 planned expense to lease 38.4 terabytes of additional disk storage beginning in Fiscal Year 2006 represents funds that could be put to better use.

Purchases of disk storage capacity also continue because Enterprise Operations organization management allows project owners to determine how the storage capacity is to be allocated and how long the data will remain on the disks. In addition, disk storage usage information is not regularly shared with the project owners, and Enterprise Computing Center management has been unsuccessful in obtaining from project owners approvals that would allow more effective management of storage capacity.

***The IRS purchased additional disk storage capacity although only 41 percent to 69 percent of existing disk storage capacity was being used. Procedures for monitoring actual storage usage could improve overall utilization, postpone the purchasing of unnecessary capacity, and save resources for other needs.***

Disk data retention procedures for removing unused data are not standardized and consistently implemented. Our analysis of 18 judgmentally selected applications that run on the IBM - Master File, IBM - Other, and Unisys systems showed inconsistencies in data retention practices for the same file types. In addition, the applications running on IRS mainframe computers include batch processes and, as a result, receive and process data in cycles (e.g., daily, weekly, monthly) that the Computing Centers are storing on disk. The storage administrators manage the disk storage by the number of cycles kept on disk for each file. We believe storing data on disk after the cycles are processed is an inefficient use of disk storage.

File transfer procedures require duplicate disk storage capacity. The IRS' target Enterprise Architecture requires storage virtualization, which is the consolidation of multiple network storage devices into what appears to be a single storage unit (i.e., a virtual storage pool). However, the IRS' mainframe disk storage devices are each connected to a mainframe computer system and are used by only that system. Consequently, files created and stored on one system must be transferred (i.e., copied) to another system for additional processing, tax account research, or other use, and storage capacity for the files must be provided on the originating and receiving storage devices. The Associate Chief Information Officer (CIO), Enterprise Operations, advised virtualization is something the IRS wants to implement and she has tried for several years to obtain funding. However, funding is not available and virtualization across systems cannot be implemented.

In Fiscal Year 2005, the Capacity Management Branch published reports that included high-level disk storage capacity and assignment charts and future capacity requirements based on assignments. However, the reports did not analyze disk storage usage and base future capacity requirements on the historic usage trends because IRS management gave greater priority to assessing computer processor needs. In addition, storage usage assessment responsibilities were

moved to another organizational unit. We also found inconsistencies in Enterprise Computing Center disk storage usage report frequencies, measurement units, and terminologies that have not been reconciled to provide a corporate view of disk storage usage. The incomplete, untimely, and inconsistent disk storage usage and capacity planning reports resulted in MITS organization management not having corporate disk usage information to monitor and ensure resources were used effectively.

## Recommendations

We recommended the CIO ensure the Enterprise Operations organization develops and implements standardized procedures to operate and manage disk storage capacity as a corporate asset, includes storage usage information in disk storage purchase justifications, removes unused copies of files and database records from disk storage, conducts annual capacity planning assessments including the assessment of disk storage usage, and develops standardized storage allocation and usage reports that are shared with MITS organization management and project owners. We also recommended the CIO ensure the Business Systems Development organization effectively sets application data retention parameters based on an application's processing cycles, to improve mainframe computer disk storage efficiency.

## Response

IRS management agreed with all of the recommendations in the report and will implement several corrective actions, including standardizing procedures to manage disk storage capacity as a corporate asset and data retention. The storage request process will be amended to include a capacity analysis to prevent spending on unneeded disk storage. Reports will be generated by the Enterprise Operations organization and analyzed by the Applications Development organization[2] to confirm current data retention periods or provide new retention periods, revalidate projected storage need, and/or release storage for use by other projects. The Enterprise Operations organization will take necessary actions to release any unneeded disk storage space and will conduct annual capacity planning assessments for all mainframe computers based on standardized disk storage reports. The reports will be shared with MITS organization management and project owners.

IRS management disagreed with our cost savings estimates identified in Appendix IV based on concerns that consideration was not given to all cost-related factors in arriving at the savings estimates. Management's complete response to the draft report is included as Appendix VIII.

[2] The Business Systems Development and the Business Systems Modernization organizations are being merged to create a new Applications Development organization.

## *Office of Audit Comment*

IRS management disagreed with the outcome measures included in Appendix IV and stated we did not include in our calculations all cost-related factors, such as maintenance and/or environmental factors including power and air conditioning. We discussed the cost savings and the methodology for calculating the savings with IRS management and revised the audit report based on management's comments. In addition, we revised Appendix IV based on Management's Response to the draft report to show the consideration of the maintenance cost savings from the replaced storage.

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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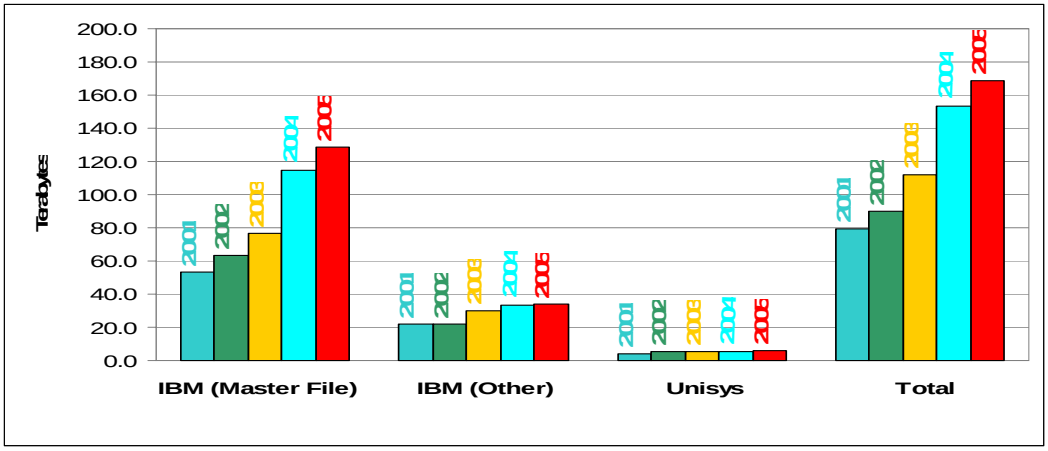
# Background

The Internal Revenue Service (IRS) requires a large and complex computer environment to process and store taxpayer, financial, and administrative data. The computer environment includes mainframe,[1] mid-range, and end user computer systems, disk and tape storage devices, and data communication networks. A significant portion of the computer processing workload is performed by the IRS' mainframe computer systems managed by the Enterprise Computing Center organization and located at the Computing Centers in Detroit, Michigan; Martinsburg, West Virginia; and Memphis, Tennessee. The Enterprise Computing Center organization is part of the Modernization and Information Technology Services (MITS) Enterprise Operations organization.

The mainframe computer systems support the administration of the internal revenue laws and provide services and products to the taxpaying public and the IRS' business operating divisions. The systems generate a significant amount of data that are stored on disk and tape storage devices. In Fiscal Years (FY) 2003 – 2005, the IRS spent $9,006,745 to replace older disk storage devices and to purchase and lease 56.4 terabytes of additional disk storage capacity. Between October 2001 and September 2005, the IRS' mainframe computer disk storage capacity increased from 79 terabytes to 168.5 terabytes. Figure 1 highlights the significant growth in mainframe computer disk storage capacity for FYs 2001 – 2005. Figure 2 lists the International Business Machines (IBM) and Unisys mainframe computer systems and the disk storage capacity by location.

***Figure 1: Mainframe Computer Disk Storage Capacity***




*Source: Enterprise Computing Center and Capacity Management Branch reports.*

[1] See Appendix VII for a Glossary of Terms.

### Figure 2: Mainframe Computer System Locations and Disk Storage Capacity

| Systems | Capacity (in terabytes) | | | |
|---|---|---|---|---|
| | **Detroit** | **Martinsburg** | **Memphis** | **Total by System** |
| **IBM - Master File** | | 128.4 | | 128.4 |
| **IBM - Other [includes the Integrated Collection System, Automated Collection System, Printer Replacement to Integrate New Tools System, Security and Communications System, and Administrative systems]** | 15.6 | 9.4 | 8.8 | 33.8 |
| **Unisys - Service Center Replacement System and Integrated Data Retrieval System** | | 3.4 | 2.9 | 6.3 |
| **Total by Location** | 15.6 | 141.2 | 11.7 | 168.5 |

*Source: The IRS' As-Built Architecture dated October 25, 2005, discussions with Computing Center personnel, and Enterprise Computing Center and Capacity Management Branch reports.*

This review was performed in the Enterprise Operations organization at the IRS National Headquarters in New Carrollton, Maryland, and in Detroit, Michigan; Martinsburg, West Virginia; and Memphis, Tennessee, during the period May through December 2005. 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. A Glossary of Terms is presented in Appendix VII.

# Results of Review

## The Competency Based Organization Provides Management the Opportunity to Create a Uniform Disk Storage Operating Environment With Standardized Management Practices

The Clinger-Cohen Act of 1996[2] states the Chief Information Officer (CIO) is responsible for promoting the effective and efficient design and operation of all major information resources management processes for the executive agency. Prior consultant studies and Treasury Inspector General for Tax Administration reviews[3] identified opportunities to improve management processes and reduce operating costs. The opportunities and declining budgets caused the Enterprise Operations organization, including the Enterprise Computing Center, to restructure its operations effective October 2005, based on a Competency Based Organization. The Competency Based Organization combined similar functions (e.g., storage management) from all three Computing Centers under a single management chain to eliminate duplication and standardize work processes.

Prior to implementation of the competency based organizational structure, the three Computing Centers were independent organizations with mainframe computer storage management roles and responsibilities distributed among several Computing Center operational and managerial layers. The restructured organization should result in a single mainframe computer data storage management operating environment that uses standard policies, practices, and procedures to manage the three Computing Centers. The elimination of duplication and standardization of work processes should result in improved operational efficiency.

## Current Disk Storage Capacity Exceeds Needs, but Additional Capacity Is Being Purchased

The Internal Revenue Manual states the Associate CIO, Enterprise Operations, is responsible for ensuring the effective and efficient use of the IRS automated information processing environment. Enterprise Computing Center management is responsible for mainframe storage

[2] 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.).

[3] *Mainframe Computer Operations Efficiency and Effectiveness Should Be Improved* (Reference Number 2003-20-117, dated May 2003) and *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).

management. Systems software personnel install and configure mainframe disk storage devices, while storage administrators assign storage capacity to applications and monitor and report storage performance and usage.

Our review of the January 1, 2005, January 3, 2005, and September 12, 2005, usage reports for the IBM - Master File and/or Unisys disk storage devices showed that, compared to the Industry - Average and Industry - Best Practice metrics used by the Enterprise Computing Center organization to measure performance, disk storage capacity is effectively assigned to applications. The Industry - Average for the storage assigned as a percentage of capacity metric is 64.5 percent, and the Industry - Best Practice is 86.1 percent. As of September 12, 2005, IRS data:

- For the IBM - Master File disk storage capacity showed 85.2 percent of the Modernization Projects storage was assigned as a percentage of capacity.
- For the IBM - Master File disk storage capacity showed 79 percent of the Current Processing Environment storage was assigned as a percentage of capacity (see Appendix V).

However, assigned storage is not effectively used. The Industry - Average for the storage in use as a percentage of capacity assigned metric is 81.8 percent, and the Industry - Best Practice is 93.7 percent. As of September 12, 2005, IRS data:

- For the IBM - Master File disk storage capacity showed 47.7 percent of the Modernization Projects storage was in use as a percentage of capacity assigned.
- For the IBM - Master File disk storage capacity showed 69.3 percent of the Current Processing Environment storage was in use as a percentage of capacity assigned (see Appendix V).
- For the Unisys disk storage capacity showed 58.8 percent of the Martinsburg capacity was in use as a percentage of capacity assigned.
- For the Unisys disk storage capacity showed 41.2 percent of the Memphis capacity was in use as a percentage of capacity assigned (see Appendix VI).

***The IRS purchased additional disk storage capacity although only 41 percent to 69 percent of existing disk storage capacity was being used. Procedures for monitoring actual storage usage could improve overall utilization, postpone the purchasing of unnecessary capacity, and save resources for other needs.***

Comparable disk storage capacity and usage reports for the IBM - Other systems were not available during the review.

During FYs 2003 – 2005, the IRS spent $9,006,745 to replace older disk storage devices and to purchase and lease 56.4 terabytes of additional disk storage capacity, including software and maintenance. Justifications supporting the $5,500,416 spent to purchase 51.7 terabytes of new

storage capacity for the Master File stated that additional capacity was needed to meet capacity requirements.

Enterprise Computing Center management advised that these purchases provided significant benefits, such as current disk storage technology that stores more data faster, reduces Computing Center environmental costs, and eliminates the maintenance costs on the existing storage. In addition, the increased storage capacity was paid for with the maintenance cost savings, and management advised limiting the storage purchases to the existing capacity would not have been cost effective. Additional and planned IBM - Master File disk storage purchases or leases include:

- In August 2005, 40.2 terabytes of disk storage were purchased for $1,200,000, including 19.2 terabytes of replacement disk and optical storage and 21 terabytes of additional disk storage capacity. We prorated the total cost and estimate the additional disk storage capacity cost $626,866. The justification for this purchase identified $369,451 annual maintenance costs; therefore, we estimate the $1,200,000 purchase cost would be repaid in 39 months. However, the additional disk storage capacity purchase may not have been necessary because, as of September 12, 2005, only 69.3 percent of the 53.5 terabytes of Current Processing Environment-assigned disk storage capacity was used and 14.2 terabytes were being held in reserve.
- In FY 2006, IRS management plans to lease 69.9 – 116.5 terabytes of disk storage for 4 – 5 years that will cost $560,400 – $1,000,560 per year, including 31.5 terabytes of replacement disk storage and 38.4 – 85 terabytes of additional disk storage capacity. As of the end of our audit work, the capacity and cost details had not been completed. Therefore, we prorated the total lease costs (annual cost times lease period) and estimate the additional disk storage capacity will cost $1,423,140 – $3,144,927. However, the lease may not be necessary because, as of September 12, 2005, only 47.7 percent of the 51.8 terabytes of Modernization-assigned disk storage capacity was used and 9 terabytes were being held in reserve.

Management did not provide documentation of alternate proposals that would have provided the maintenance, performance, and Computing Center environmental cost benefits without increasing disk storage capacity. Therefore, based on the storage usage rate, the $626,866 spent to purchase 21 terabytes of additional disk storage in August 2005 represents an inefficient use of resources, and the $1,423,140 planned expense to lease 38.4 terabytes of additional disk storage beginning in FY 2006 represents funds that could be put to better use (see Appendix IV).

In our opinion, additional storage capacity continues to be purchased based on storage allocation instead of actual usage, as evidenced by the fact that actual storage usage information is not included in storage purchase justifications. For example, the purchase of 12 terabytes for the IBM - Master File Current Processing Environment was approved March 22, 2005. The justification stated the purchase was needed because ". . . in 2004 [the Master File] will

experience a 20 percent growth in all of its established workloads . . .” and was “. . . currently experiencing [disk storage] resource shortages and . . . space reserves are at all time low levels.” As of January 1, 2005, the IBM - Master File usage report indicated 2.2 terabytes of the total 58.5 terabytes of capacity assigned to the Current Processing Environment was reserved for growth, while 69.4 percent of the assigned Current Processing Environment capacity was in use. By September 12, 2005, the reserve had increased to 14.2 terabytes, while usage decreased to 69.3 percent.

Purchases of disk storage capacity also continue because Enterprise Operations organization management has viewed disk storage capacity as owned by the projects and allows project owners to determine how the storage capacity is to be allocated (e.g., development, test, or production assignments) and how long the data will remain on the disks. Enterprise Operations organization management advised that the Information Technology Investment Account funds the purchase of disk storage for Modernization projects and limits the Enterprise Computing Center’s authority to effectively manage the IBM - Master File disk storage. However, Enterprise Operations organization management’s authority to manage storage used in everyday tax processing and administration and maintained with the Enterprise Computing Center operations’ budget is not clear. For example, in Appendix V, the usage reports showed that 34.5 terabytes of the IBM - Master File disk storage capacity was assigned to Modernization production (i.e., applications developed by the Business Systems Modernization Program that are in everyday use by IRS employees and customers). Maintenance on the disk storage that the Modernization production applications use is funded by the Enterprise Operations organization budget, not Information Technology Investment Account funds. In addition, the disk storage that will be replaced during FY 2006 was purchased with Information Technology Investment Account funds, yet the Enterprise Computing Center operating funds used to maintain the existing storage will be used to replace it. IRS management has not yet determined at what point Information Technology Investment Account-purchased computer assets used in day-to-day operations and maintained with operations funds will be managed as part of the Current Processing Environment.

In addition, disk storage usage information is not regularly shared with the project owners, and Enterprise Computing Center management has been unsuccessful in obtaining approvals from project owners that would allow more effective management of storage capacity. For example:

- An August 2005 usage analysis of 1 Modernization project’s disk storage showed that, of the 9.9 terabytes of disk capacity, 6.8 terabytes (68.7 percent) were not used, including 4.7 terabytes that were not allocated and 2.1 terabytes that were idle (i.e., allocated storage that did not contain data). An email message indicated the analysis was sent to the project through a liaison because there was no single individual responsible for the disk storage. In December 2005, Enterprise Computing Center management advised the Modernization project planned to retain the disk storage for future use.

- Management advised that a Modernization project cancelled in early 2005 owned about 39 terabytes of disk capacity. A disk storage usage management report dated September 12, 2005, showed 33 terabytes were still assigned to this project, including 15.2 terabytes that were in use. Enterprise Computing Center management explained that the In Use capacity still contained data and their requests to the project owner for instructions on whether to archive or delete the data had received no response. While MITS organization management has designated the future assignments of the capacity, the capacity cannot be reassigned until the data are removed.

The above conditions indicate the Enterprise Operations organization has not yet achieved its goal of managing the disk storage capacity as a corporate asset because storage administrators are not allowed to reassign unused or underused disk capacity to applications that need additional capacity. Procedures for managing the disk storage as a corporate asset and monitoring actual storage usage could improve overall utilization, postpone the purchasing of unnecessary capacity, and save resources for other needs.

## Recommendations

***Recommendation 1:*** The CIO should ensure the Enterprise Operations organization develops and implements standardized procedures to operate and manage disk storage capacity as a corporate asset, including disk storage capacity purchased with Information Technology Investment Account funds and used in production, and ensures the procedures give storage administrators the authority to increase or decrease the capacity assigned to applications based on storage usage to improve utilization.

> ***Management's Response:*** IRS management agreed with the recommendation. The Enterprise Operations organization has developed and implemented standardized procedures to operate and manage disk storage capacity as a corporate asset in the Master File Legacy[4] and Modernization environments and has initiated plans and assigned staff to standardize procedures for the remaining mainframe systems. All disk storage capacity purchased with Information Technology Investment Account funds is being reviewed from a corporate perspective for the most efficient utilization of resources.

***Recommendation 2:*** The CIO should ensure Enterprise Computing Center management's and project owners' justifications for disk storage purchases include storage usage information that shows the need for additional capacity, to prevent spending on unneeded disk storage.

[4] Information systems and technology using older generation design approaches and technology.

***Management's Response:*** IRS management agreed with the recommendation. The Enterprise Operations organization will amend the storage request process to include a capacity analysis to prevent spending on unneeded disk storage. The updated process will be communicated to customers to ensure justifications adequately address the business need for additional capacity.

***Office of Audit Comment:*** IRS management disagreed with the outcome measures included in Appendix IV and stated we did not include in our calculations all cost-related factors, such as maintenance and/or environmental factors including power and air conditioning. We discussed the cost savings and the methodology for calculating the savings with IRS management and revised the audit report based on management's comments.

In calculating the first outcome measure, we considered the maintenance cost savings for the replaced storage in our calculation of the cost of the replacement storage. We revised Appendix IV to show the consideration of the maintenance cost savings. We claimed the cost of the additional storage as an inefficient use of resources because, as of September 12, 2005, only 69.3 percent of the 53.5 terabytes of Current Processing Environment-assigned disk storage capacity was used and 14.2 terabytes were being held in reserve. Because much of the existing storage was not being used, the purchase of additional disk storage may have not been necessary.

In calculating the second outcome measure, we based the cost of the planned additional storage capacity on the information provided to us during the audit. We were provided with a cost of $2,590,560 for acquiring future disk storage and calculated $1,423,140 as the cost of additional storage capacity. Similar to the calculation for the first outcome measure, the maintenance cost savings from the replaced storage lowered the cost of the replacement storage. As of the end of our audit work, the capacity and cost details for the storage purchase had not been completed. In addition, no costing information was provided to us for the environmental factors such as power and air conditioning mentioned in management's comment.

## Management Actions Are Needed to Improve Disk Storage Utilization for Mainframe Computers

Office of Management and Budget Circular A-130, *Management of Federal Information Resources,* dated November 28, 2000, requires the CIO to ensure the implementation and enforcement of applicable records management policies and procedures, including requirements for archiving information maintained in electronic format, particularly in the planning, design, and operation of information systems. In addition, the Internal Revenue Manual states the CIO and the MITS organization have the responsibility for evaluating and monitoring data administration.

One of the benefits anticipated from the Competency Based Organization for the Enterprise Computing Center organization was increased effectiveness and efficiency through standardization of policies, practices, and procedures across the three Computing Centers. However, we identified three issues that hinder the effective and efficient utilization of disk storage capacity for mainframe computers:

- Disk data retention procedures for removing unused data are not standardized and consistently implemented.
- File transfer procedures require duplicate disk storage capacity.
- Disk storage management information is not consistent and complete.

## ***Disk data retention procedures for removing unused data are not standardized and consistently implemented***

Data management best practices indicate data have a life cycle and are not permanent. Therefore, an organization should determine how important the data are to its business customers (i.e., availability and access frequency) and establish procedures to move data that do not require immediate access from online disk storage to near-line or offline storage. The Enterprise Computing Center has implemented procedures to move unused data from disk to tape storage, but the procedures are not standardized and could be improved.

The Systems Standards Manual, which was developed for Master File system users, lists factors to consider in determining if and how long data should reside on disk and includes procedures to automate disk management (e.g., establishing expiration dates for data files). However, comparable reference manuals for other IBM and Unisys system users do not exist. Our analysis of 18 judgmentally selected applications that run on the IBM - Master File (6 applications), IBM - Other (5 applications), and Unisys (7 applications) systems showed inconsistencies in data retention practices for the same file types (see Appendix I for a list of the sampled applications).

Our review of 11 IBM - Master File and IBM - Other applications showed:

- Stored data files for four IBM - Master File applications contained expiration dates that the storage management software uses to determine whether data should be removed from the disk.
- Stored data files for four IBM - Other applications did not contain expiration dates, which prevents the storage management software from automating the process for removing unused data from the disk.
- Stored data files for two IBM - Master File and one IBM - Other database applications were not required to contain expiration dates.

While the Systems Standards Manual procedures for establishing expiration dates on data files do not apply to the other IBM systems, the storage management software is the same; therefore, storage administrators could follow similar procedures to improve storage management.

Procedures followed by Unisys system storage administrators and application developers were also not standardized. The applications running on the Unisys mainframe computers include batch processes and, as a result, receive and process data in cycles (e.g., daily, weekly, monthly) that the Computing Centers are storing on disk. The storage administrators manage the disk storage by the number of cycles kept on disk for each file. The Martinsburg and Memphis storage administrators followed different procedures for moving data from disk storage. At Martinsburg, data are moved from disk to tape if not accessed within 45 days, while at Memphis the data are moved after 30 days.

In addition, application developers can set the maximum number of cycles that will be stored on disk for each file before the earliest cycle is removed to tape, with 32 cycles being the default setting. Our review of the stored data files for seven Unisys applications indicated efficient disk storage usage might be hampered by the number of cycles retained on disk. For example:

- For the 7 applications, we identified 8,863 files with the default 32-cycle setting.
- Of the 8,863 files, 69 had 32 cycles of data stored on disk (a total of 2,208 cycles of data, which was 6 percent of the total 36,578 cycles of data stored on disk).
- For the 69 files, disk storage contained 800 cycles of data for 25 Electronic Funds Transfer files and 704 cycles of data for 22 Electronic Filing System files. The Electronic Funds Transfer and Electronic Filing System are batch applications running on the Unisys systems and create a daily cycle(s) of data that is processed into the weekly Master File batch processes. Further, Electronic Filing System processing has multiple output files, including acknowledgements to tax preparers and data extracts to other tax processing systems. Therefore, we believe storing data on disk after the cycles are processed is an inefficient use of disk storage.

The Systems Standards Manual requires application owners to review database and file access activity to ensure databases do not remain on disk past their intended life cycles. However, the procedure may not be effective. After we requested file retention data, application owners stated 1 Master File application had obsolete files and the programmers deleted 90 (63 percent) of the 144 database files listed for this application.

## ***File transfer procedures require duplicate disk storage capacity***

Data files transferred from other systems must be stored initially on disk for additional processing, tax account research, or other use and archived to tape storage when no longer

needed for immediate access. Our review of file transfer logs maintained for 2-week periods in mid-2005[5] identified the following:

- The file transfer logs listed 77,044 transfers for 27,127 file names.
- The total size of the 77,044 transfers was 713.7 gigabytes, which represents the capacity needed if all the files are retained for at least 2 weeks.

The data reviewed did not identify how long these files would remain on disk; however, the results indicate the disk capacity used could be substantial if unused files are retained on disk.

Data retention rules have not been standardized because, prior to the IRS' October 2005 restructuring to a Competency Based Organization, the three Computing Centers operated independently and the procedures were not updated during the restructuring. However, without effectively implemented standardized data retention procedures and application developers effectively setting data retention parameters based on an application's processing cycles, excess copies of data files and databases will remain on disk storage, resulting in the inefficient use of mainframe disk storage resources.

As a long-term solution to this problem, the IRS' target Enterprise Architecture requires computer data storage to be centrally managed through a concept called storage virtualization, where multiple network storage devices are consolidated into what appears to be a single storage unit (i.e., a virtual storage pool). Virtualization should result in the optimal placement of files to achieve the highest performance and availability. However, the IRS' mainframe disk storage devices are currently connected to specific mainframe computer systems (e.g., the IBM - Master File, IBM - Other, or Unisys system) and are used by only that system. Consequently, files created and stored on one system must be transferred to another system for additional processing, tax account research, or other use. As a result, storage capacity must be provided on both the originating storage device and the receiving storage device to store the duplicate copies of the file. By implementing storage virtualization and reducing the need to transfer files between systems, the IRS could save resources by eliminating the creation of duplicate files.

The Associate CIO, Enterprise Operations, advised virtualization is something the IRS wants to implement and she has tried for several years to obtain funding for a virtual tape solution to resolve disaster recovery issues. However, funding is not available and virtualization across systems cannot be implemented.

We understand the difficulties in obtaining the necessary funds to implement various information technology initiatives and, therefore, are making no recommendations to address this issue.

[5] The review included file transfer log data for June 26, 2005, through July 9, 2005, except for File Transfer Protocol data received for the Detroit IBM systems reviewed for the period July 31, 2005, through August 13, 2005 (see Appendix I).

However, if the IRS had a business case documenting the potential return on investment that could be realized from the implementation of virtualization, funding support might be justified.

## *Disk storage management information is not consistent and complete*

Prior to the recent reorganization, the Capacity Management Branch was responsible for the application of capacity planning and performance management tools, techniques, and analytical methods to improve the efficiency and productivity of existing and planned computer systems and applications. Effective October 2005, the Enterprise Operations organization's Information Technology Infrastructure Division has these responsibilities. The Capacity Management Branch published annual capacity assessment reports for each of the mainframe computer systems. However, the Branch did not complete assessments for the IBM - Master File and IBM - Other (Administrative) systems in FY 2005 because Capacity Management Branch staff that left the organization were not being replaced, resulting in insufficient staff to complete the assessments. The Associate CIO, Enterprise Operations, advised that the Capacity Management Branch staff positions were not filled because the duties and responsibilities of those positions were moved to the Enterprise Operations organization's Information Technology Infrastructure Division effective October 2005 as part of the implementation of the Competency Based Organization. As of December 14, 2005, only two staff positions remained to be filled.

The published capacity reports for the other IBM systems and the Unisys systems included high-level disk storage capacity and assignment charts and future capacity requirements based on the assignments. However, the assessments did not analyze disk storage usage and based future capacity requirements on the historic usage trends. Although disk storage usage data are collected by the Computing Centers, a Capacity Management Branch manager explained that usage was not assessed because IRS management had given greater priority to assessing computer processor needs because processor costs are significantly more expensive than storage costs and storage costs have historically declined.

We also found inconsistencies in Enterprise Computing Center disk storage usage report frequencies, measurement units, and terminologies that have not been reconciled to provide a corporate view of disk storage usage. Figure 3 illustrates the inconsistencies among selected reports.

### Figure 3: Inconsistencies Among Management Reports

| | IBM - Master File | IBM - Administrative | Unisys |
|---|---|---|---|
| **Report Frequency** | Daily | Monthly | Weekly |
| **Measurement Unit** | Byte | Byte | Track |
| **Capacity and Usage Categorized By** | Project (e.g., Production, Test Groups, Non-Assigned)<br>Subgroup (e.g., Modernization projects, applications) | Group (e.g., Production, Development, Available)<br>Application | Production, Non-Production<br>Pool (storage groups (e.g., applications)) |
| **Capacity and Usage Measured By** | Assigned (i.e., disk space allocated to each Subgroup)<br>In Use (i.e., database and file sizes defined)<br>Available (i.e., not "In Use")<br>Percentage In Use (i.e., "In Use" divided by "Assigned") | Disk Space (i.e., assigned to each application)<br>Space Used (i.e., database and file sizes defined)<br>Free Space (i.e., assigned space not used) | Allocated (i.e., assigned to pools)<br>In Use (i.e., tracks containing data)<br>Available (i.e., tracks not "In Use") |

*Source: Enterprise Operations organization management.*

In addition, usage reports for the Memphis disk storage devices attached to other IBM mainframe computer systems were manually prepared, while those for the other systems were automated. A Memphis manager stated that personnel worked part time over a 2-week period to manually prepare a report given to us in September 2005 because management had not identified a need for the usage information. Enterprise Computing Center management has not standardized the disk storage usage reports because, prior to implementation of the Competency Based Organization, the systems were operated independently.

The incomplete, untimely, and inconsistent disk storage usage and capacity planning reports resulted in MITS organization management not having corporate disk usage information to monitor and ensure the resources were used effectively.

## Recommendations

***Recommendation 3:*** The CIO should ensure the Enterprise Operations organization develops and implements standardized data retention procedures requiring unused copies of files and database records to be removed from disk storage, to improve mainframe computer disk storage efficiency.

***Management's Response:*** IRS management agreed with this recommendation. The Enterprise Operations organization uses standardized data retention procedures for Master File Legacy and Modernization systems and will implement this process on the other mainframe systems.

***Recommendation 4:*** The CIO should ensure the Business Systems Development organization effectively sets application data retention parameters based on an application's processing cycles, to improve mainframe computer disk storage efficiency.

***Management's Response:*** IRS management agreed with this recommendation. The Enterprise Operations organization will implement a process to generate reports across all mainframe systems including project data retention and usage information. These reports will be analyzed quarterly with the Applications Development organization.[6]

Based upon customer data retention and retrieval requirements and application processing timeframes, the Applications Development organization will confirm the correctness of current retention periods or provide new retention periods. If the reports show significant amounts of dedicated storage that remain unused by a project, the Applications Development organization will review the project's needs and revalidate the future need or release appropriate amounts of storage for use by other projects. The Enterprise Operations organization will then take all necessary actions to release unneeded disk storage.

***Recommendation 5:*** The CIO should ensure the Enterprise Operations organization conducts annual capacity planning assessments (and the assessments measure disk storage usage) that provides MITS organization management objective information for disk storage investment planning.

***Management's Response:*** IRS management agreed with this recommendation. The Enterprise Operations organization will conduct annual capacity planning assessments for all mainframe systems. The assessments will be based on standardized disk storage reports that indicate the amount of storage allocated to and actually used by applications. These reports will be used for disk storage investment planning.

***Recommendation 6:*** The CIO should ensure the Enterprise Operations organization disk storage reports are standardized and indicate the amount of storage allocated to and actually used by applications and the reports are shared with MITS organization management and project owners to ensure complete, consistent, and corporate-level storage capacity usage reporting and management.

[6] The Business Systems Development and the Business Systems Modernization organizations are being merged to create a new Applications Development organization.

***Management's Response:*** IRS management agreed with this recommendation. The Enterprise Operations organization will standardize disk storage reports across all corporate assets to indicate the amount of storage allocated to and actually used by applications. The Enterprise Operations organization will share the reports with MITS organization management and project owners to ensure complete, consistent, and corporate-level storage capacity usage reporting and management. The reports will be rolled up annually for a yearly assessment.

## Appendix I

# *Detailed Objective, Scope, and Methodology*

The overall objective of this review was to assess the effectiveness and efficiency of the Internal Revenue Service's (IRS) mainframe[1] computer storage management practices. To accomplish this objective, we:

I. Determined whether mainframe computer storage management information (such as capacity, usage, and growth projections) was accurate, complete, consistent, and timely.

- A. Reviewed Federal Government and IRS guidelines to identify storage management information reporting requirements.
- B. Interviewed Enterprise Computing Center storage administrators and reviewed Fiscal Year (FY) 2005 capacity, usage, and growth reports to determine whether the Computing Centers report accurate, complete, consistent, and timely storage management information.
- C. Determined the effect that inaccurate, incomplete, inconsistent, or untimely storage management information reports had on management decisions.

II. Determined whether mainframe storage management resources were allocated and operated effectively.

- A. Reviewed IRS guidelines to identify storage management procedures and standards.
- B. Interviewed Enterprise Computing Center managers and storage administrators and reviewed storage usage reports generated in FY 2005 to determine how storage was allocated and operated.
- C. Reviewed documents for storage capacity purchased in FYs 2003 – 2005 and requested for FYs 2006 – 2007 to determine the effect of ineffective storage allocations and operations.

III. Determined whether mainframe storage management resources were used efficiently.

- A. Reviewed IRS storage management guidelines to identify file retention, migration, and transfer procedures.
- B. Interviewed Enterprise Computing Center managers and storage administrators and reviewed sampled file data to determine whether unused data were removed from

[1] See Appendix VII for a Glossary of Terms.

disk storage. We reviewed the IRS' As-Built Architecture to select a judgmental sample of 18 mainframe computer applications running on the International Business Machines (IBM) and Unisys mainframe computers at the 3 Computing Centers. We selected a judgmental sample because we did not plan to project the results and based the sample on our knowledge of tax return and payment processing, tax account administration, and financial accounting and reporting. The 18 applications selected were:

IBM - Master File:
1) Business Master File On-Line Processing.
2) Business Master File Returns Transaction File Processing.
3) Customer Account Data Engine - Individual.
4) Individual Master File On-Line.
5) Individual Master File Returns Transaction File.
6) National Account Profile.

IBM - Other:
7) Automated Collection System.
8) Automated Financial System.
9) Currency and Banking Query System.
10) Integrated Collection System.
11) Security and Communications System.

Unisys:
12) Daily Taxpayer Information File Update.
13) Electronic Filing System.
14) Electronic Funds Transfer.
15) Error Resolution System.
16) Generalized Mainline Framework.
17) Generalized Unpostable Framework.
18) Weekly Taxpayer Information File Update.

For each of the 18 applications, we identified the stored file names and reviewed data extracts listing each file's disk storage retention and migration parameters to determine whether copies of the files were removed when no longer used.

C. Interviewed Enterprise Computing Center storage administrators to identify file transfer procedures and reviewed sample file transfer data to determine whether disk storage was used efficiently. We reviewed data extracts for the two primary file transfer processes (File Transfer Protocol[2] and CONNECT:Direct®[3]) used in the IRS'

[2] File Transfer Protocol is a specification designed to facilitate electronic data transfer between computers.
[3] CONNECT:Direct® is secure file transfer software published by Sterling Commerce.

mainframe computing environment. The data extracts included the file name, size, and date and the originating and retrieving systems for files transferred by the 3 Computing Centers in the 2 weeks of June 26, 2005, through July 9, 2005.[4]

IV. Determined the validity and reliability of data from computer-based systems. We used computer-based data for background information to determine the amount spent and planned to be spent on replacement and additional disk storage capacity and to assess data retention and file transfer procedures. We reviewed documentation supporting the disk storage purchases. We also assessed the completeness and accuracy of the data relating to data retention and file transfers and compared file transfer data obtained from different computer systems to determine the data's reliability as they pertain to the objectives of the audit.

[4] The exception to this period was for File Transfer Protocol transfers at one Computing Center that did not generate log data during the review period. This Computing Center captured and we reviewed data for July 31, 2005, through August 13, 2005.

## 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
Van Warmke, Acting Audit Manager
Frank Greene, Lead Auditor
Mark Carder, Senior Auditor
Beverly Tamanaha, Senior Auditor
Kim McManis, Auditor
Robert Carpenter, Information Technology Specialist
Judith Harrald, Information Technology Specialist

## Appendix III

# *Report Distribution List*

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, Business Systems Development OS:CIO:BSD
Associate Chief Information Officer, Business Systems Modernization OS:CIO:B
Associate Chief Information Officer, Enterprise Operations OS:CIO:EO
Director, Stakeholder Management OS:CIO:SM
Director, Enterprise Computing Center OS:CIO:EO:EC
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 Management Controls OS:CFO:AR:M
Audit Liaisons:
    Deputy Commissioner for Operations Support OS
    Manager, Program Oversight Office OS:CIO:SM:PO

## 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 – Actual; $626,866 (see page 3).

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

In August 2005, the Internal Revenue Service (IRS) spent $1,200,000 to purchase 40.2 terabytes[1] of new disk storage capacity for the International Business Machines (IBM) - Master File system, including software and maintenance. The storage was purchased to add additional storage and to replace existing storage. The cost per terabyte of the additional and replacement storage was calculated as follows:

- Cost of new storage – 40.2 terabytes purchased for $1,200,000 (average cost of $29,850.75 per terabyte).
- Cost of additional storage (21 terabytes multiplied by $29,850.75 per terabyte = $626,866).
- Cost of replacement storage (19.2 terabytes multiplied by $29,850.75 per terabyte = $573,134) ($573,134 minus maintenance cost for replaced storage $322,491 = $250,643).

However, the purchase of the additional storage may not have been necessary because, as of September 12, 2005, only 69.3 percent of the 53.5 terabytes of Current Processing Environment-assigned disk storage capacity was used and 14.2 terabytes were being held in reserve.

[1] See Appendix VII for a Glossary of Terms.

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

- Funds to Be Put to Better Use – Potential; $1,423,140 (see page 3).

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

Starting in Fiscal Year 2006 and continuing 4 years, the IRS plans to spend at least $1,423,140 to lease 38.4 terabytes or more of additional disk storage capacity. Figure 1 shows the methodology used to determine the cost of the additional storage.

***Figure 1: Cost of Planned Additional Storage Capacity***

| | |
|---|---|
| Funded Amount for Disk Storage | $2,590,560 |
| Planned Leased Storage Capacity | 69.9 terabytes |
| Cost per Terabyte ($2,590,560 divided by 69.9 terabytes) | $37,060.94 |
| Planned Replacement Capacity | 31.5 terabytes |
| Planned Additional Capacity | 38.4 terabytes |
| Cost of Additional Capacity ($37,060.94 multiplied by 38.4 terabytes) | $1,423,140 |

*Source: Enterprise Operations organization management.*

The maintenance cost savings of $288,000 from the replaced storage lowered the cost of the replacement storage. As of the end of our audit work, the capacity and cost details had not been completed. However, the lease may not be necessary because, as of September 12, 2005, only 47.7 percent of the 51.8 terabytes of Modernization-assigned disk storage capacity was used and 9 terabytes were being held in reserve.

## Appendix V

# International Business Machines - Master File Disk Storage Capacity Assignment and Usage Metrics

| | January 1, 2005 | | | September 12, 2005 | | |
|---|---|---|---|---|---|---|
| **Projects** | **Capacity Assigned (in terabytes[1])** | **In Use[2] (in terabytes)** | **In Use As a Percentage of Capacity Assigned** | **Capacity Assigned (in terabytes)** | **In Use (in terabytes)** | **In Use As a Percentage of Capacity Assigned[3]** |
| **Internal Revenue Service (IRS) Modernization Projects** | | | | | | |
| **Production** | 37.0 | 17.3 | 46.8% | 34.5 | 16.2 | 47.1% |
| **Other (Temporary, System, Test, etc.)** | 12.2 | 6.8 | 55.7% | 17.3 | 8.5 | 49.2% |
| **Totals** | 49.2 | 24.1 | 49.0% | 51.8 | 24.7 | 47.7% |
| **Reserve** | 7.0 | | | 9.0 | | |
| **Totals** | 56.2 | | | 60.8 | | |
| | Assigned As a Percentage of Capacity | In Use As a Percentage of Capacity Assigned | | Assigned As a Percentage of Capacity | In Use As a Percentage of Capacity Assigned | |
| **Modernization Projects** | 87.5% | 49.0% | | 85.2% | 47.7% | |
| **Industry - Average** | 64.5% | 81.8% | | 64.5% | 81.8% | |
| **Industry - Best Practice** | 86.1% | 93.7% | | 86.1% | 93.7% | |

*Source: Enterprise Computing Center Project Allocated Space Tracking Analyzer reports and Master File Metrics report.*

[1] See Appendix VII for a Glossary of Terms.
[2] For purposes of the disk storage reports, "in use" means the assigned maximum database and file sizes.
[3] The percentages reflected in the table may not exactly equal the result from dividing the two numbers because the numbers in the table are rounded.

# International Business Machines - Master File Disk Storage Capacity Assignment and Usage Metrics – (Continued)

| | January 1, 2005 | | | September 12, 2005 | | |
|---|---|---|---|---|---|---|
| **Projects** | **Capacity Assigned (in terabytes)** | **In Use[1] (in terabytes)** | **In Use As a Percentage of Capacity Assigned** | **Capacity Assigned (in terabytes)** | **In Use (in terabytes)** | **In Use As a Percentage of Capacity Assigned[2]** |
| **IRS Current Processing Environment** | | | | | | |
| **Production** | 30.2 | 24.7 | 81.8% | 31.9 | 22.5 | 70.6% |
| **Other (Temporary, System, Test, etc.)** | 26.1 | 14.4 | 55.2% | 21.6 | 14.6 | 67.6% |
| **Totals** | 56.3 | 39.1 | 69.4% | 53.5 | 37.1 | 69.3% |
| **Reserve** | 2.2 | | | 14.2 | | |
| **Totals** | 58.5 | | | 67.7 | | |
| | Assigned As a Percentage of Capacity | In Use As a Percentage of Capacity Assigned | | Assigned As a Percentage of Capacity | In Use As a Percentage of Capacity Assigned | |
| **Current Processing Environment** | 96.2% | 69.4% | | 79.0% | 69.3% | |
| **Industry - Average** | 64.5% | 81.8% | | 64.5% | 81.8% | |
| **Industry - Best Practice** | 86.1% | 93.7% | | 86.1% | 93.7% | |
| **Total Capacity** | 114.7 | | | 128.5 | | |

*Source: Enterprise Computing Center Project Allocated Space Tracking Analyzer reports and Master File Metrics report.*

[1] For purposes of the disk storage reports, "in use" means the assigned maximum database and file sizes.
[2] The percentages reflected in the table may not exactly equal the result from dividing the two numbers because the numbers in the table are rounded.

## Appendix VI

# Unisys Disk Storage Capacity Assignment and Usage Metrics

| | January 3, 2005 | | | September 12, 2005 | | |
|---|---|---|---|---|---|---|
| | **Capacity Assigned (in terabytes)** | **In Use[1] (in terabytes)** | **In Use As a Percentage of Capacity Assigned** | **Capacity Assigned (in terabytes)** | **In Use (in terabytes)** | **In Use As a Percentage of Capacity Assigned** |
| Martinsburg | | | | | | |
| **Production** | 1.8 | 0.9 | 50.0% | 1.7 | 1.0 | 58.8% |
| **Reserve** | 0.4 | | | 0.5 | | |
| **Total Capacity** | 2.2 | | | 2.2 | | |
| | Assigned As a Percentage of Capacity | In Use As a Percentage of Capacity Assigned | | Assigned As a Percentage of Capacity | In Use As a Percentage of Capacity Assigned | |
| **Martinsburg** | 81.8% | 50.0% | | 77.3% | 58.8% | |
| Memphis | | | | | | |
| **Production** | 1.7 | 0.7 | 41.2% | 1.7 | 0.7 | 41.2% |
| **Reserve** | 0.0 | | | 0.0 | | |
| **Total Capacity** | 1.7 | | | 1.7 | | |
| | Assigned As a Percentage of Capacity | In Use As a Percentage of Capacity Assigned | | Assigned As a Percentage of Capacity | In Use As a Percentage of Capacity Assigned | |
| **Memphis** | 100% | 41.2% | | 100% | 41.2% | |
| **Industry - Average** | 64.5% | 81.8% | | 64.5% | 81.8% | |
| **Industry - Best Practice** | 86.1% | 93.7% | | 86.1% | 93.7% | |
| Martinsburg and Memphis - Development and Test | | | | | | |
| **Development and Test** | 2.3 | 1.2 | 52.2% | 2.2 | 1.2 | 54.5% |
| **In Use As a Percentage of Capacity Assigned** | | | | | | |
| **Industry - Average** | | | 81.8% | | | 81.8% |
| **Industry - Best Practice** | | | 93.7% | | | 93.7% |
| | | | | | | |
| **Total Capacity** | 6.2 | | | 6.1 | | |

*Source: Capacity Management Branch Mass Storage Reports and Enterprise Computing Center Metrics report.*

[1] For purposes of the disk storage reports, "in use" means the assigned maximum database and file sizes.

## Appendix VII

# Glossary of Terms

| | |
|---|---|
| **Administrative** | The Administrative systems include human resources, financial reporting, currency transaction reporting, and other applications. |
| **As-Built Architecture** | The As-Built Architecture presents an enterprise view of the Internal Revenue Service's (IRS) Information Technology and Business environments and is an integral part of the IRS' Enterprise Architecture. |
| **Byte** | A byte is one data character. |
| **Campus** | The IRS campuses are the data processing arm of the IRS. |
| **Computing Center** | The Computing Centers support tax processing and information management through a data processing and telecommunications infrastructure. |
| **Enterprise Architecture** | The Enterprise Architecture defines the target business practices, the systems that enable these practices, and the technology that will support it. |
| **Enterprise Computing Center (ECC)** | The ECC is responsible for maintaining and operating the enterprise information technology systems which support the nation's tax administration. The ECC is organized to operate under the "corporate utility" concept (i.e., one organization with a uniform operating environment which employs standard policies, practices, and procedures to manage three physical computing centers). |
| **Gigabyte** | One gigabyte equals approximately 1 billion bytes or 500,000 typewritten pages. |
| **Integrated Collection System, Automated Collection System, Printer Replacement to Integrate New Tools System** | The Integrated Collection System, Automated Collection System, and Printer Replacement to Integrate New Tools System support the balance-due and nonfiler tax enforcement operations. |

# Glossary of Terms - Continued

| | |
|---|---|
| **Integrated Data Retrieval System (IDRS)** | The IDRS supports the retrieval and updating of stored information, including taxpayer account records. |
| **International Business Machines (IBM)** | The IRS uses IBM mainframe computers to host Master File processing, collection processing, and other nationwide applications and data processing. |
| **Mainframe** | A mainframe is a powerful multiuser computer capable of supporting many hundreds or thousands of users simultaneously. |
| **Master File** | The Master File system supports the databases that store individual, business, and employee plans and exempt organizations taxpayer account information and includes Current Processing Environment applications and Modernization Projects. |
| **Security and Communications System** | The Security and Communications System provides security, communications, and terminal management for the IDRS. |
| **Service Center Replacement System** | The Service Center Replacement System supports receiving, capturing, and perfecting tax payment and third-party information. |
| **Terabyte** | One terabyte equals approximately 1 trillion bytes or 500 million typewritten pages. |
| **Track** | A track is the part of a disk that passes under one read/write head while the head is stationary. A Unisys disk storage track contains 7,168 bytes of data. |
| **Unisys** | The IRS uses Unisys mainframe computers to host applications and specific data for the campuses. |

## Appendix VIII

# *Management's Response to the Draft Report*

CHIEF INFORMATION OFFICER

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

RECEIVED
MAR 27 2006

March 27, 2006

MEMORANDUM FOR DEPUTY INSPECTOR GENERAL FOR AUDIT

FROM: W. Todd Grams
Chief Information Officer

SUBJECT: Management Response to Draft Audit Report – Improvements in Mainframe Computer Storage Management Practices and Reporting Are Needed to Promote Effective and Efficient Utilization of Disk Resources (Audit #200520024)
**(I-trak #2006-08546)**

Thank you for the opportunity to review the subject report and respond to the recommendations. The Modernization and Information Technology Services (MITS) organization carefully reviewed the above referenced draft audit report. We appreciate the additional meetings held with your audit team to further discuss our concerns with issues contained in the report. As a result of those meetings, the audit team incorporated some of our recommended changes into the current draft report. We agree the recommendations in the report have merit and require corrective action by the Internal Revenue Service (IRS).

Following the methodology the Modernization and Information Technology Services (MITS) organization established for prioritizing corrective actions, we believe the recommendations in this audit are low risk control deficiencies.

We are in agreement with establishing processes and procedures to ensure compliance with the recommendations as identified in the report. One reason the IRS created the Competency Based Organization (CBO) was to increase effectiveness and efficiency through the standardization of policies, practices, and procedures.

Several measures are planned or currently underway to improve and manage disk storage as a corporate asset. Under the restructured CBO organization, increased monitoring and quality review of storage reports will be analyzed at the appropriate level to ensure actual spending on disk storage capacity needs. These measures will increase the internal awareness of data retention procedures as an important part of the organization's goals and objectives.

Business Systems Development (BSD) is in the process of merging with Business Systems Modernization to create Applications Development (AD), a new MITS organization. AD and Enterprise Operations (EOps) agree that application data retention parameters need to be controlled. As such, AD will use reports generated by EOps to review and, as needed, update data retention periods for disk Direct Attached Storage Device (DASD) files/data bases. The initial reports will be generated and acted upon quarterly beginning with the next quarter (April 1, 2006 – June 30, 2006) as reflected in the attached corrective action plan.

As we discussed with your audit team, the IRS disagrees with the outcome measures as stated in Appendix IV of the report. EOps reviews all requisitions and proposals for the best benefit to the Service, not only including disk space considerations and normal growth, but also environmental factors, such as footprint, power, and air conditioning. Additional factors considered are the cost savings realized for reduced maintenance of older and/or unsupported equipment; as well as new technology enhancements to increase efficiencies. Specifically:

> *Inefficient Use of Resources – Actual; $626,866:* This prorated amount does not take into consideration the savings of $322,491 in maintenance costs per year for the replaced storage.
>
> *Funds to be put to Better Use – Potential; $1,423,140*: We are in disagreement with the numbers used in the report for calculating the potential $1.4M for the cost of additional capacity. IRS storage capacity planning for FY2006 and beyond included all aspects of equipment life cycles, performance and enhancements, environmental factors, and maintenance costs.

The IRS agrees with the Treasury Inspector General for Tax Administration's recommendations for improvement on our monitoring, managing, and measuring storage utilization. Attached are our responses to the recommendations from this audit.

If you have questions, please call me at (202) 622-6800, or members of your staff may contact Judith Mills, Director, Program Oversight Office, at (202) 283-4915.

Attachment

**Attachment**

**Draft Report – Improvements in Mainframe Computer Storage Management Practices and Reporting Are Needed to Promote Effective and Efficient Utilization of Disk Resources -- Audit # 200520024**

---

**RECOMMENDATION #1:** The CIO should ensure the Enterprise Operations (EOps) organization develops and implements standardized procedures to operate and manage disk storage capacity as a corporate asset, including disk storage capacity purchased with Information Technology Investment Account (ITIA) funds and used in production, and ensures the procedures give storage administrators the authority to increase or decrease the capacity assigned to applications based on storage usage to improve utilization.

**CORRECTIVE ACTION #1:** We agree with this recommendation. EOps has developed standardized procedures to operate and manage disk storage capacity as a corporate asset. EOps has implemented these procedures in the Masterfile Legacy and Modernization environments and has initiated plans and assigned staff to complete the standardization process for the remaining mainframe systems. All disk storage capacity purchased with ITIA funds are being reviewed from a corporate perspective for the most efficient utilization of resources.

**IMPLEMENTATION DATE:** December 1, 2006

**RESPONSIBLE OFFICIAL:** ACIO, Enterprise Operations

**CORRECTIVE ACTION MONITORING PLAN:** The ACIO, EOps will 1) ensure implementation of procedures; 2) ensure that ITIA funding is used to buy storage based on the same standards utilized for Masterfile Legacy mainframe systems; and 3) ensure that administrators have the ability to monitor, evaluate, and increase/decrease capacity as needed.

**RECOMMENDATION #2:** The CIO should ensure Enterprise Computing Center management's and project owners' justifications for disk storage purchases include storage usage information that shows the need for additional capacity, to prevent spending on unneeded disk storage.

**CORRECTIVE ACTION:** We agree with this recommendation. Enterprise Operations will amend the storage request process to include a capacity analysis to prevent spending on unneeded disk storage. This updated process will be communicated to customers to ensure justifications adequately address the business need for additional capacity.

**IMPLEMENTATION DATE:** October 1, 2006

**Draft Report – Improvements in Mainframe Computer Storage Management Practices and Reporting Are Needed to Promote Effective and Efficient Utilization of Disk Resources -- Audit # 200520024**

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**RESPONSIBLE OFFICIAL:** ACIO, Enterprise Operations

**CORRECTIVE ACTION MONITORING PLAN:** EOps will review the justifications for disk storage usage information based on real-time capacity analysis to determine the feasibility for purchases of additional capacity.

**RECOMMENDATION #3:** The CIO should ensure the Enterprise Operations organization develops and implements standardized data retention procedures requiring unused copies of files and database records be removed from disk storage to improve mainframe computer disk storage.

**CORRECTIVE ACTION 3:** We agree with this recommendation. Enterprise Operations utilizes standardized data retention procedures for Masterfile Legacy systems and Modernization systems. EOps will implement this process on the other mainframe systems.

**IMPLEMENTATION DATE:** August 1, 2006

**RESPONSIBLE OFFICIAL:** ACIO, Enterprise Operations

**CORRECTIVE ACTION MONITORING PLAN:**
EOps will review the status to ensure that the corrective action is monitored until it is closed.

**RECOMMENDATION #4:** The CIO should ensure the Business Systems Development organization effectively sets application data retention parameters based on the application's processing cycles to improve mainframe computer disk storage efficiency.

**CORRECTIVE ACTION #4A**: We agree with this recommendation. Enterprise Operations will implement a process to generate reports across all mainframe systems including project data retention and usage information. These reports will be analyzed with the appropriate Applications Development (AD) organization on a quarterly basis beginning next quarter (April 1, 2006 – June 30, 2006).

**IMPLEMENTATION DATE:** August 1, 2006

**RESPONSIBLE OFFICIAL:** ACIO, Enterprise Operations

**Draft Report – Improvements in Mainframe Computer Storage Management Practices and Reporting Are Needed to Promote Effective and Efficient Utilization of Disk Resources -- Audit # 200520024**

---

**CORRECTIVE ACTION Monitoring Plan for #4A:** The ACIO, EOps will review the status and responses from Applications Development to ensure that corrective actions are monitored until all are closed.

**CORRECTIVE ACTION #4B:** Applications Development will review the reports provided by Enterprise Operations . Based upon customer data retention and retrieval requirements and application processing timeframes, AD will confirm the correctness of current retention periods or provide new retention periods. If the reports provided by EOps show significant amounts of dedicated storage that remain unused by a project, AD will review the project's needs and revalidate the future need or release appropriate amounts of storage for use by other projects. EOps will then take all necessary actions to release unneeded disk storage.

**IMPLEMENTATION DATE:** October 1, 2006

**RESPONSIBLE OFFICIAL:** ACIO, Applications Development

**CORRECTIVE ACTION MONITORING PLAN for #4B:** The ACIO, AD will provide a status in the normal monthly corrective action reporting process until the *first* complete set of reports from EOps has been reviewed and appropriate file retention and storage needs feedback has been provided to EOps.

**RECOMMENDATION #5:** The CIO should ensure the Enterprise Operations organization conducts annual capacity planning assessments (and the assessments measure disk storage usage) that provides MITS organization management objective information for disk storage investment planning.

**CORRECTIVE ACTION 5:** We agree with this recommendation. Annual planning assessments based on standardized disk storage reports are currently in place for Masterfile Legacy systems and Modernization systems. EOps will conduct annual capacity planning assessments for all mainframe systems. This assessment will be based on standardized disk storage reports that indicate the amount of storage allocated to and actually used by applications. These reports will show current storage usage and will be used for disk storage investment planning.

**IMPLEMENTATION DATE:** October 1, 2006

**RESPONSIBLE OFFICIAL:** ACIO, Enterprise Operations

**Draft Report – Improvements in Mainframe Computer Storage Management Practices and Reporting Are Needed to Promote Effective and Efficient Utilization of Disk Resources -- Audit # 200520024**

---

**CORRECTIVE ACTION MONITORING PLAN:** The ACIO, EOps will review the reports and determine the best disk storage investment planning strategy.

**RECOMMENDATION #6:** The CIO should ensure the Enterprise Operations organization disk storage reports are standardized and indicate the amount of storage allocated to and actually used by applications and the reports are shared with MITS organization management and project owners to ensure complete, consistent, and corporate-level storage capacity usage reporting and management.

**CORRECTIVE ACTION 6:** We agree with this recommendation. Enterprise Operations (EOps) has standardized disk storage reports on Masterfile Legacy systems and Modernization systems to indicate the amount of storage allocated to and actually used by applications. A plan for these reports to be standardized across all corporate assets is currently under way. EOps will share reports with MITS organization management and project owners to ensure complete, consistent, and corporate level storage capacity usage reporting and management. These reports will be rolled up annually for a yearly assessment.

**IMPLEMENTATION DATE:** September 1, 2006

**RESPONSIBLE OFFICIAL:** ACIO, Enterprise Operations

**CORRECTIVE ACTION MONITORING PLAN:** EOps will review all reports to ensure their efficiency and forward the reports across all corporate assets for increased effectiveness.