TREASURY INSPECTOR GENERAL FOR TAX ADMINISTRATION

The Internal Revenue Service Should Improve Mainframe Software Asset Management and Reduce Costs

February 20, 2014

Reference Number: 2014-20-002

THE INTERNAL REVENUE SERVICE SHOULD IMPROVE MAINFRAME SOFTWARE ASSET MANAGEMENT AND REDUCE COSTS

Highlights

Final Report issued on February 20, 2014

Highlights of Reference Number: 2014-20-002 to the Internal Revenue Service Chief Technology Officer.

IMPACT ON TAXPAYERS

Computer software is typically protected by Federal copyright law, which requires users of software programs to have a license authorizing such use. Software licenses are legal rights to use software in accordance with terms and conditions specified by the software copyright owner. Software license management at the IRS is not being adequately performed. Efficient and cost-effective management of the IRS's software assets is crucial to ensuring that information technology services continue to support the IRS's business operations and help it to provide services to taxpayers efficiently.

WHY TIGTA DID THE AUDIT

The overall objective was to determine whether the IRS is adequately managing mainframe software licenses. This audit was included in TIGTA's Fiscal Year 2013 Annual Audit Plan and addresses the major management challenge of Achieving Program Efficiencies and Cost Savings.

WHAT TIGTA FOUND

The IRS is not adequately performing mainframe software license management and is not adhering to Federal requirements and recommended industry best practices. The IRS does not have enterprisewide or local policies, procedures, and requirements for mainframe software license management and does not have a centralized, enterprisewide organizational structure for managing mainframe software licenses.

The IRS also does not use asset discovery, network scanning, license management, and license metering tools to identify current usage, deployment, and inventory of mainframe software and related licenses. The inadequate software license management has resulted in an estimated waste of $11.6 million and overutilization of $1.5 million in license and software subscription support fees.

WHAT TIGTA RECOMMENDED

TIGTA recommended that the Chief Technology Officer develop policies and guidance, an enterprisewide organizational structure, and roles and responsibilities for managing mainframe software assets and licenses; implement a specialized mainframe software license management tool(s) and develop detailed standard operating procedures for using those tools; develop an enterprisewide inventory of mainframe software licensing data and maintain the inventory with a specialized mainframe software license tool; and maintain data in the inventory system that the IRS can use to more effectively manage mainframe software spending.

In their response to the report, IRS management agreed with all seven recommendations with slight modifications to three of them. The IRS plans to enhance policies and guidance, and implement an Enterprise Software Governance Board; clarify the enterprisewide organizational structure including roles and responsibilities for mainframe software asset and license management; enhance standard operating procedures; continue working to identify and implement a standard enterprise toolkit that can discover, track, and manage software license deployment and usage; continue developing a mainframe software inventory and identifying and implementing a standard enterprise toolkit; and enhance the software inventory process by leveraging tools with the data collected, which will be consolidated and maintained in a central data repository.

DEPARTMENT OF THE TREASURY

WASHINGTON, D.C. 20220

TREASURY INSPECTOR GENERAL
FOR TAX ADMINISTRATION

February 20, 2014

MEMORANDUM FOR CHIEF TECHNOLOGY OFFICER

FROM: Michael E. McKenney
                 Acting Deputy Inspector General for Audit

SUBJECT: Final Audit Report – The Internal Revenue Service Should Improve
                 Mainframe Software Asset Management and Reduce Costs
                 (Audit # 201320025).

This report presents the results of our review of the Internal Revenue Service's (IRS)
management of mainframe software licenses. The overall objective of this review was to
determine whether the IRS is adequately managing mainframe software licenses. This review
was included in the Treasury Inspector General for Tax Administration's Fiscal Year 2013
Annual Audit Plan and addresses the major management challenge of Achieving Program
Efficiencies and Cost Savings.

Management's complete response is included in Appendix VI.

Copies of this report are also being sent to the IRS managers affected by the report
recommendations. If you have any questions, please contact me or Alan R. Duncan, Assistant
Inspector General for Audit (Security and Information Technology Services).

Table of Contents

Abbreviations

GSA	General Services Administration
IBM	International Business Machines
IRS	Internal Revenue Service
IT	Information Technology
ITIL®	Information Technology Infrastructure Library
TIGTA	Treasury Inspector General for Tax Administration

Background

Mainframe computing assets play a critical role in the daily operations of the Internal Revenue Service (IRS) and the administration of the tax code. The IRS mainframe computing environment provides the processing for mission-critical tax processing systems, including the Individual Master File, Business Master File, Customer Account Data Engine 2, and Integrated Data Retrieval System.[1] The IRS Information Technology (IT) organization has two sections of employees who manage the capacity of the mainframes: the International Business Machines (IBM) Corporation platform section and the Unisys Corporation platform section. The IRS runs approximately 200 different software products in its mainframe environment. The IRS purchases software and support for its mainframe environment through 12 vendor contracts— one contract for the Unisys mainframe computers and 11 contracts for the IBM mainframe computers.

In a previous Treasury Inspector General for Tax Administration (TIGTA) report,[2] we identified that for the desktop/laptop environment and enterprisewide policies, procedures, and requirements, the IRS did not adequately perform software license management and did not adhere to Federal requirements and recommended industry best practices. The IRS does not have enterprisewide or local policies, procedures, and requirements for software license management. TIGTA reported that the IRS does not have specialized software license tools designed to be the repository for software and software license deployment. These tools should be used to discover, track, manage, and detect inactive usage of software licenses. Finally, the IRS does not have an accurate inventory of software and related licenses that contains licensing models applicable to each software product which links data on the licenses purchased and deployed with the purchase costs, procurement information, and monitoring and usage data. The prior audit focused on the desktop/laptop environment and enterprisewide policies, procedures, and requirements for software license management. This audit focused on the software and license management of the IRS's mainframe environment.

Mainframe software license/asset management

Software asset management is a process for tracking and reporting the use and ownership of software assets. Forrester Research Inc. defines software asset management as:

> *The systematic automation of processes to reconcile software licenses and statements of entitlement, maintenance contracts, and original media with installed software and those processes for discovering deployed software assets; to reconcile the assets to their*

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[1] See Appendix V for a glossary of terms.
[2] TIGTA, Ref. No. 2013-20-025, *Desktop and Laptop Software License Management Is Not Being Adequately Performed* (Jun. 2013).

*licenses, maintenance contracts, and definitions of entitlement; and to report on
compliance and discrepancies in such a way as to minimize the risk of legal action by
software vendors as well as loss of service to users or of reputation in the wider world.*

A critical part of software asset management is mainframe software license management. The
objective of mainframe software license management is to manage, control, and protect an
organization's software assets, including management of the risks that arise from the use of those
software assets. Proper management of mainframe software licenses helps to minimize risks by
ensuring that licenses are used in compliance with licensing agreements and deployed
cost effectively, and that software purchasing and maintenance expenses are properly controlled.

Software license management can be difficult because:

- A large amount of information on software and hardware must be discovered and stored.

- These data need to be kept current on more than an annual basis.

- Identifying installed software and software license use may be affected by the
  complexities in which software is installed and licenses are used.

- Licensing models and definitions may significantly differ depending on the software
  product and vendor.

Federal requirements established by Executive Orders, the Federal Chief Information Officer
Council, the National Institute of Standards and Technology, and the Department of the
Treasury, as well as recommended industry best practices, govern the use and management of
software licenses. These sources provide guidance to ensure that software licenses are
1) efficiently purchased and are not being unused or underused, 2) used in compliance with
copyright laws, and 3) inventoried through the use of adequate recordkeeping systems which
control and track the use of licenses.

This review was performed at the Enterprise Computing Center in Martinsburg, West Virginia,
and by contacting IT organization and Agency-Wide Shared Services personnel located at
New Carrollton, Maryland; Oxon Hill, Maryland; and Austin, Texas, during the period
November 2012 to August 2013. We conducted this performance audit in accordance with
generally accepted government auditing standards. Those standards require that we plan and
perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our
findings and conclusions based on our audit objective. We believe that the evidence obtained
provides a reasonable basis for our findings and conclusions based on our audit objective.
Detailed information on our audit objective, scope, and methodology is presented in Appendix I.
Major contributors to the report are listed in Appendix II.

Results of Review

The Internal Revenue Service Does Not Effectively Manage Mainframe Software

Executive Order 13103, *Computer Software Piracy*, requires and Information Technology Infrastructure Library (ITIL®) best practices recommend the development of software license management policies and procedures and roles and responsibilities. The ITIL and industry best practices recommend a centralized, enterprisewide management structure for software asset management. These best practices indicate that some of the most significant benefits of software asset management, both cost and risk-management benefits, come from managing software on an enterprisewide basis. An enterprisewide management structure can actively manage software assets to know the location, configuration, and usage history of every product. In addition, an enterprisewide management structure supported by an enterprisewide inventory and automated software license management tools can better provide procurement staff with the detailed and accurate information needed to negotiate flexible, cost-effective contracts and form the basis for cost reduction projects such as platform stabilization, volume bundling, securing longer term agreements, and vendor or hardware consolidation. In September 2010, the IRS's Chief Technology Officer outlined a goal to have the IT organization implement the ITIL best practices over the next several years. The IRS reported that the IT organization had achieved ITIL Maturity Level 3 in October 2012.

Executive Orders,[3] Department of the Treasury Directive 85-02, *Software Piracy Policy*,[4] and Internal Revenue Manual 10.8.2[5] require and ITIL and industry best practices recommend creating and maintaining accurate enterprisewide inventories of installed software and licenses. These inventories should contain licensing models applicable to each software product and link the data on licenses bought and deployed, including costs. This will help ensure that software purchased is not unused or underutilized and that software is used in compliance with copyright laws.

The National Institute of Standards and Technology Special Publication 800-53, *Recommended Security Controls for Federal Information Systems and Organizations*,[6] and Treasury Directive Publication 85-01, *Treasury IT Security Program*,[7] require and ITIL and industry best practices

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[3] Exec. Order 13103, *Computer Software Piracy* (1998) and Exec. Order 13589, *Promoting Efficient Spending* (2011).
[4] Dated May 4, 2010.
[5] Internal Revenue Manual 10.8.2 (Sept. 9, 2012).
[6] Dated Aug. 2009.
[7] Dated Nov. 3, 2006.

recommend implementing enterprisewide software asset discovery, network scanning, license management, and license metering tools. Software asset discovery tools are used to identify installed software and collect relevant details about each installed software product. Network scanning tools are used to detect and remove any unauthorized or unlicensed installed software. Software license management tools help to ensure compliance with licensing agreements by tracking license usage, linking upgrades to original licenses, linking licenses bought to licenses used, and managing the stock of unused licenses. Metering tools help to ensure that licenses are used cost effectively by detecting installed software that is not being used, is being underutilized, or is being overutilized so that the licenses can be managed effectively.

The IRS does not have defined policies and procedures or roles and responsibilities for mainframe software and license management

Several IRS organizations have mission statements that suggest those organizations have some responsibility for managing the mainframe software assets and licenses. The IT organization includes the following divisions with such mission statements:

- Mainframe Services and Support Division. The mission of this division is to design, develop, deploy, and maintain the IBM and Unisys mainframe systems.

- Security Operations and Standards Division. Part of the mission of this division is to oversee infrastructure inventory, asset management, and procurement.

- Vendor and Contract Management Division. The mission of this division is to maximize the value of information technology investments by implementing effective sourcing strategies, monitoring vendor performance and contract management, and facilitating strong acquisition governance processes.

We interviewed management and personnel from the previously mentioned divisions and found that none of the divisions are specifically responsible for maintaining an inventory of mainframe software assets and licenses in accordance with Federal requirements and industry best practices. In addition, none were monitoring software usage to ensure compliance with software license agreements. Management of the Mainframe Services and Support Division informed us that, while they do install software products on the mainframe systems, they do not have any responsibilities for maintaining or monitoring a mainframe software inventory that is part of an overall IRS enterprisewide software inventory in accordance with Federal requirements and industry best practices. They do not monitor software usage to detect noncompliance with software license agreements such as underutilization or overutilization of software licenses.

The Acquisition and Contracts Management section of the Security Operations and Standards Division processes software requisitions for most mainframe and server software products. To process software requisitions, the IT organization works with the customer in preparing, approving, and submitting requisitions to the Office of Procurement. While the Acquisition and Contracts Management section reviews all mainframe and server requisitions, including ones it

does not process, the section does not perform any analysis or report on software contracts or licensing. The section does not perform any comparative analysis of software requisitions to software inventory to determine if software purchases could be made more cost effectively.

Vendor and Contract Management Division personnel informed us that, in response to a prior TIGTA audit report recommendation,[8] they are in the process of developing roles, responsibilities, and standards for an enterprisewide software asset management program. However, they also informed us that the IRS has not invested in the resources to develop and implement an effective software asset management program. For example, the IRS does not have sufficient tools or the staffing necessary to identify software actually installed on its systems and to help audit compliance with software license agreements so that underdeployment, overdeployment, or discontinued use of software licenses can be identified and software contracts and inventory adjusted accordingly. Vendor and Contract Management Division personnel have developed a manual software and license contract management process for the IRS's Microsoft contract and are currently developing a similar process for the IBM software contract. However, these processes are not an enterprisewide software asset and license compliance management program in accordance with Federal requirements and industry best practices.

The IRS does not maintain an inventory of mainframe software in accordance with Federal requirements and industry best practices

The IRS does not have an inventory of mainframe software that it manages in accordance with Federal requirements and industry best practices. According to Federal requirements and industry best practices, an effective inventory contains licensing models applicable to each software product and links data on the licenses purchased and deployed with the purchase costs, procurement information, and monitoring and usage data.

Mainframe Services and Support Division personnel were unable to provide an accurate inventory with license information. The license information for each software product is maintained separately in the Office of Procurement contract files. In addition, software usage was not monitored to identify software products installed but not used or to verify compliance with software license agreements. We selected a judgmental sample[9] of 30 mainframe software products to determine if the software products were managed properly. License and usage information for the 30 software products was not readily available in a software asset management inventory. IRS personnel in the Acquisition and Contracts Management section of the IT organization first performed research to identify a contract to associate with each of the 30 software products. We then obtained information about the software products by manually researching contract files and interviewing technical points of contact and contract

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[8] TIGTA, Ref. No. 2013-20-025, *Desktop and Laptop Software License Management Is Not Being Adequately Performed* (Jun. 2013).
[9] A judgmental sample is a nonstatistical sample, the results of which cannot be used to project to the population.

representatives for each software requisition. Through interviews, we determined that the software products are used; however, due to the lack of readily available usage information, we could not verify the usage or determine if the IRS is in compliance with license agreements applicable to the 30 software products reviewed.

The IRS does not use asset discovery, network scanning, license management, and license metering tools to identify current usage, deployment, and inventory of mainframe software and related licenses. Without these tools and a software asset and license management structure in place, the IRS cannot effectively determine if the software contracts it enters into are reflective of its current or future projected mainframe software license and support needs. In addition, the IRS cannot, from an enterprisewide level, effectively manage its mainframe software and license compliance to the contract option-year renewals. In September 2007, the IRS entered into a five-year contract for the use and support of IBM software totaling $239 million. In September 2012, an external contractor hired by the prime contractor, *i.e.*, IBM, completed a compliance review of the IRS's contract for IBM software and related licensing. Using asset discovery, network scanning, license management, and license metering tools, this contractor found several issues that included overutilization and nondeployment of software products which the IRS had purchased under the contract. In turn, the IRS hired its own contractor costing $50,000 to evaluate the compliance review results and to assist the IRS in negotiating a new contract agreement. The original compliance review determined that the IRS did not deploy, *i.e.*, purchased but did not use, mainframe licenses and software support, resulting in the IRS wasting an estimated $11.6 million. Figure 1 provides a summary of the nondeployed software licenses and estimated General Services Administration (GSA) list price costs.

Figure 1: Nondeployed Software

Software	Licenses Owned	Total GSA List Price	Subscription and Support Paid	Total GSA List Price Subscription and Support	Total GSA List Price Value
Product 1	516	$848,820	516	$130,032	$978,852
Product 2	516	$2,167,200	516	$361,200	$2,528,400
Product 3	516	$1,590,312	516	$136,224	$1,726,536
Product 4	156	$171,132	156	$34,476	$205,608
Product 5	156	$571,896	156	$115,440	$687,336
Product 6	362	$722,190	362	$109,324	$831,514
Product 7	362	$1,444,380	362	$219,010	$1,663,390
Product 8	50	$47,400	50	$7,200	$54,600
Product 9	362	$595,852	362	$90,500	$686,352
Product 10	362	$722,190	362	$109,324	$831,514
Product 11	362	$1,263,742	362	$191,498	$1,455,240
Total	3,720	$10,145,114	3,720	$1,504,228	**$11,649,342**

*Source: TIGTA analysis of IRS and contractor records, 2012 GSA Price List, and discussions with
IRS IT organization management and personnel.*

The compliance review also found that the IRS overutilized contracted licenses and software support on six products with an estimated GSA list price value of $1.5 million. As a result, we estimate that the IRS owed an additional $1.5 million in licenses and software support fees at the time of the compliance review.

The IRS does not have enterprisewide or local mainframe software asset and license management policies and procedures, an asset and license management structure, or defined roles and responsibilities in accordance with Federal requirements and industry best practices. The IRS does not have an enterprisewide inventory of mainframe software assets and software licensing data in accordance with Federal requirements and industry best practices. Additionally, the IRS has not identified and implemented automated software license tools for the enterprisewide management of mainframe software assets and licenses. This is due, in part, to Internal Revenue Manual 2.14.1, *Asset Management, Information Technology (IT) Asset Management* (November 8, 2011), which states in Section 13.17 that software management is under development and that procedures are being defined.

The lack of an enterprisewide inventory with comprehensive data on all mainframe software assets and software licensing impedes the IRS's ability to more effectively analyze the relationships among its software license agreements and vendors to more cost effectively buy software licenses and maintenance. Until the IRS addresses the issues presented in this report, it is incurring increased risks in managing software licenses. In fact, these deficiencies have already resulted in an estimated waste of $11.6 million and overutilization of $1.5 million in licenses and software support fees on one mainframe software contract.

The conditions identified in the compliance review of the IBM mainframe software could exist in other mainframe software contracts. The IRS has 11 mainframe software contracts in addition to the IBM contract. If the IRS had the software asset and license management policies, procedures, and tools in place, the other mainframe software contracts could be analyzed for additional cost savings and license compliance.

Recommendations

To improve the management of mainframe software licenses based on Federal requirements and recommended industry best practices, the Chief Technology Officer should:

Recommendation 1: Develop policies and guidance in the Internal Revenue Manual to manage mainframe software assets and licenses using ITIL best practices.

> **Management's Response:** The IRS agreed with this recommendation. The IRS will utilize best practices, such as the ITIL, to enhance current policies and guidance for managing software licensing from an enterprise perspective in support of and aligned to Internal Revenue Manual 2.14.1, *Asset Management*. The IRS will ensure that policies and guidance are aligned to and include the protocols, functions, and decision making

outcomes across Associate Chief Information Officer and other enterprise units by implementing an Enterprise Software Governance Board.

Recommendation 2: Develop an enterprisewide organizational structure to manage mainframe software assets and licenses.

> **Management's Response:** The IRS agreed with this recommendation. The IRS will clarify the enterprisewide organizational structure, including roles and responsibilities, in the Internal Revenue Manual for mainframe software asset and license management.

Recommendation 3: Develop roles and responsibilities in the Internal Revenue Manual for all organizational entities responsible for mainframe software asset and license management.

> **Management's Response:** The IRS agreed with this recommendation. However, the IRS believes the efforts that will be carried out for Recommendation 2 of this audit will also achieve the necessary actions for Recommendation 3.

To help ensure that the IRS has enterprisewide processes for using mainframe software license tools that adhere to Federal requirements and recommended industry best practices, the Chief Technology Officer should:

Recommendation 4: Develop detailed standard operating procedures for using mainframe software licensing tools to manage software licenses.

> **Management's Response:** The IRS agreed with this recommendation. As part of its enterprise approach, the IRS will enhance standard operating procedures for using existing and/or other toolsets, as appropriate, to manage software licensing for the enterprise.

Recommendation 5: Implement a specialized mainframe software license tool(s) designed to discover, track, and manage mainframe software license deployment and usage. The implementation of the tool should include the development of an enterprisewide, centralized, systematic, and repeatable method to manage and track the deployment of mainframe licenses that can be uniformly used by all organizational entities responsible for managing licenses.

> **Management's Response:** The IRS agreed with this recommendation with a slight modification. Based on experience, there is no single tool that can discover, track, and manage software license deployment and usage. For a prior TIGTA recommendation (Ref. No. 2013-20-025, Recommendation 4), the IRS is already working to identify and implement a standard enterprise toolkit, which may include multiple tools. The IRS believes these efforts will accomplish this recommendation.

> **Office of Audit Comment:** During this audit, IRS officials requested that TIGTA report its findings and recommendations specific to the mainframe environment so not to repeat a prior TIGTA audit report's recommendations. The prior TIGTA report that the

IRS referred to is related to the desktop and laptop environment and does not specifically address the mainframe environment.

To help ensure that the IRS has enterprisewide processes for mainframe software license inventories that adhere to Federal requirements and recommended best practices, the Chief Technology Officer should:

Recommendation 6: Develop an enterprisewide inventory of mainframe software licensing data and maintain the inventory with a specialized software license tool designed to discover, track, and manage mainframe software license deployment and usage.

> **Management's Response:** The IRS agreed with this recommendation with a slight modification. Based on experience, there is no single tool that can discover, track, and manage software license deployment and usage. For a prior TIGTA recommendation (Ref. No. 2013-20-025, Recommendation 5), the IRS is already developing a mainframe software inventory and will leverage this as a starting point. The IRS is also already identifying and implementing a standard enterprise toolkit, which may include multiple tools. The IRS believes these efforts will accomplish this recommendation.

> **Office of Audit Comment:** During this audit, IRS officials requested that we report our findings and recommendations specific to the mainframe environment so not to repeat a prior TIGTA audit report's recommendations. The prior TIGTA report that the IRS referred to is related to the desktop and laptop environment and does not specifically address the mainframe environment.

Recommendation 7: Maintain data in the inventory system that the IRS can use to more effectively review mainframe software licensing agreements, purchases, deployment, usage, and other related aspects of mainframe licensing to identify additional savings in software spending.

> **Management's Response:** The IRS agreed with this recommendation with a slight modification. While the IRS is currently maintaining a software inventory, it will enhance this process by leveraging tools. Based on experience, there is no single tool that can discover, track, and manage software license deployment and usage. As such, the IRS will identify and implement a standard enterprise toolkit, which may include multiple tools, towards implementing this recommendation. Data collected via the toolkit will be consolidated and maintained in a central repository.

While the IRS agreed with all seven recommendations in the audit report to address the reported issues, in its response, the IRS disagreed with three of the audit's key findings and outcome measures. Specifically:

- The IRS stated its position that the IRS did not waste $11.6 million and demonstrated it was compliant with IBM software terms for the 11 products.

- The IRS stated that at the time of the Deloitte compliance review, the IRS discovered a miscalculation of IBM mainframe sub-capacity that was valued at $642,000 not $1.5 million, and it was immediately corrected.

- The IRS stated it installed IBM Tivoli Asset Discovery for System z in June 2011. The IRS also stated that it provided information to the audit team about this installation and its use of the tool to maintain a software asset discovery and inventory system for the mainframe environment.

IRS management and the audit team discussed the 11 products detailed in the report. During this discussion, IRS management agreed that these 11 products were paid for and were never deployed. The IRS was also unable to provide detailed procurement or operational documentation to determine the length and cost of the products' non-deployment. Additionally, there was only 1 product of the 11 that the IRS stated was recently purchased and in the process of deployment during the 2012 compliance review. IRS management was not able to provide any documents or evidence supporting this statement.

IRS management and the audit team also discussed, in detail, the overutilization of software that it says was valued at $642,000 not $1.5 million. We disagree with the IRS's estimate. The IRS did not have sufficient documentation to support its determination, or supporting documentation for how long this had been occurring. In our estimate of $1.5 million, we used the GSA IBM contract schedule pricing to estimate the value of the overutilization of this software.

Finally, we analyzed the IRS's use of the IBM Tivoli Asset Discovery tool for System z and we discussed its use with IRS management. The IRS only uses the information obtained by this tool when renegotiating mainframe software contracts. It is not routinely used as a mainframe software asset discovery, network scanning, license management, and license metering tool to identify current usage, deployment, and inventory of mainframe software and related licenses in accordance with Federal requirement and industry best practices. In its response to Recommendation 6, the IRS stated that it is already identifying and implementing a standard enterprise toolkit, which may include multiple tools. The IRS believes these efforts will accomplish this recommendation.

Detailed Objective, Scope, and Methodology

The overall objective of this review was to determine whether the IRS is adequately managing mainframe software licenses. To accomplish our objective, we:

I. Performed electronic research to identify and review Government criteria and requirements and non-Government best practices for software license management.

    A. Identified Government criteria and requirements.

    B. Identified non-Government best practices from recognized organizations.

    C. Identified Government criteria and requirements and previous IRS software license management findings from TIGTA audit reports.

    D. Reviewed, analyzed, and summarized the criteria and requirements found that were relevant to the IRS's management of software licenses.

II. Determined if the IRS developed adequate policies and procedures, and roles and responsibilities for the management of software licenses.

    A. Determined if the IRS had an enterprisewide policy for mainframe software license management that was consistent with the criteria, requirements, and best practices.

    B. Determined if the IRS had roles and responsibilities for mainframe software license management that were consistent with the criteria, requirements, and best practices.

    C. Determined if the IRS had business unit policies, procedures, and roles and responsibilities for mainframe software license management that were consistent with the criteria, requirements, and best practices.

III. Determined if the IRS had a centralized mainframe licensing inventory and manages and maintains the inventory with software tools designed for license management.

    A. Determined if the IRS had a centralized inventory of its mainframe software assets, including licensing data.

    B. Determined if the IRS had adequately used mainframe software asset discovery tools and usage monitoring tools.

IV. Determined if the IRS adequately managed mainframe software licenses on a sample of software products.

    A. Determined the inventory data the IRS has on its software products.

B. Developed a sampling methodology and selected a judgmental sample[1] of 30 mainframe software products for review. A judgmental sampling methodology was used because the IRS did not have an enterprisewide valid population of mainframe software from which to sample.

   1. To select a judgmental sample of software for review, we began with a universe of 211 IBM mainframe environment software products. We then generated a list of random integers to judgmentally select 25 products from this universe. We selected 25 products for review based on the staff resources available to review the sample. Also, when the selected software product was not suitable for review due to a lack of information about the product, we selected the next software product listed.

   2. We reviewed five Unisys software products that IRS management indicated may be candidates for cost savings.

C. Reviewed the sample of 30 mainframe software products to determine the scope of the IRS's mainframe software and licensing management and tracking activities.

D. On each of the selected software products, obtained additional documentation and interviewed IRS employees as necessary to substantiate the accuracy of the software licensing data being managed and tracked.

E. On each of the selected software products, determined if the IRS is managing and tracking licenses.

F. On each of the sampled mainframe software products, determined how exceptions or noncompliance with software licenses were resolved.

G. Determined if the software licensing data that are managed and tracked on each of the selected software products are shared with the Office of Procurement staff to help better negotiate software license purchases and maintenance agreements with vendors.

Internal controls methodology

Internal controls relate to management's plans, methods, and procedures used to meet their mission, goals, and objectives. Internal controls include the processes and procedures for planning, organizing, directing, and controlling program operations. They include the systems for measuring, reporting, and monitoring program performance. We determined the following internal controls were relevant to our audit objective: the IT organization's policies, procedures, and processes for managing and tracking mainframe software licenses. We evaluated these controls by interviewing IT organization management, identifying Federal requirements and

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[1] A judgmental sample is a nonstatistical sample, the results of which cannot be used to project to the population.

industry best practices for managing and tracking software licenses, and reviewing software license management and tracking on a sample of mainframe software products.

Major Contributors to This Report

Alan R. Duncan, Assistant Inspector General for Audit (Security and Information Technology Services)
Danny Verneuille, Director
John Ledford, Audit Manager
Ryan Perry, Lead Auditor
Joan Bonomi, Senior Auditor
Larry Reimer, Senior Auditor

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 for Operations OS:CTO
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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; $11,649,342 (see page 3).

Methodology Used to Measure the Reported Benefit:

On behalf of IBM, a third-party contractor conducted a compliance review of the IRS's software license agreements associated with its IBM software contract. The compliance review identified that the IRS had purchased but had not deployed software licenses and related software and subscription support. Specifically, the IRS paid for 11 IBM mainframe software products but did not have them deployed.

The IBM contract in effect when the compliance review was performed did not include itemized pricing information that TIGTA could use to determine the exact cost of the nondeployed software licenses and related subscription support. Using the 2012 IBM GSA Price List, the only itemized pricing information available, we estimated that the IRS had purchased and did not deploy $11,649,342 in licenses and software subscription support.

Type and Value of Outcome Measure:

- Funds Put to Better Use – Potential; $50,000 (see page 3).

Methodology Used to Measure the Reported Benefit:

Due to the lack of a mainframe software asset management program, including software asset and license management tools that would give the IRS insight into its IBM mainframe software license compliance, the IRS hired a contractor at a cost of $50,000 to evaluate and verify the results of the compliance audit performed by a contractor hired by IBM.

Glossary of Terms

Term	Definition
Best Practices	Proven activities or processes that have been successfully used by multiple organizations.
Business Master File	The IRS database that consists of Federal tax transactions and accounts for businesses. These include employment taxes, income taxes on businesses, and excise taxes.
Customer Account Data Engine 2	An IRS application that will replace the existing Individual Master File and Customer Account Data Engine applications. The Customer Account Data Engine 2 is designed to provide state-of-the-art individual taxpayer account processing and technologies to improve service to taxpayers and enhance IRS tax administration.
Executive Orders	Legally binding orders given by the President, acting as the head of the Executive Branch, to Federal Administrative Agencies. Executive Orders are generally used to direct Federal agencies and officials in their execution of congressionally established laws or policies.
Executive Order 13103, *Computer Software Piracy*	Requires Federal agencies to develop software license management policies and procedures. It also requires Federal agencies to prepare inventories of software present on computers to help ensure that software is used in compliance with copyright laws.
Executive Order 13589, *Promoting Efficient Spending*	Requires Federal agencies to take inventory of their information technology assets and ensure that they are not paying for unused or underutilized installed software.
Federal Chief Information Officer Council	As the principal interagency forum on Federal information technology, the purpose of the Federal Chief Information Officer Council is to foster collaboration among Federal Government Chief Information Officers in strengthening Governmentwide information technology management practices.
Forrester Research Inc.	A global research and advisory firm that provides research guidance to the information technology industry.
Individual Master File	The IRS database that maintains transactions or records of individual tax accounts.

Term	Definition
Information Technology Infrastructure Library	Provides guidelines for the use and management of software and licenses. The ITIL$^{®}$ is a widely accepted set of concepts and practices for information technology service management derived from user and vendor experts in both the private and public sectors. The ITIL focuses on the key service management principles pertaining to service strategy, service design, service transition, service operation, and continual service improvement with each principle being covered in a separate ITIL core publication. Software asset management is a key process described within the service transition core publication. The ITIL also has a separate publication entitled *Best Practice Software Asset Management* that covers software asset and license management best practices in more depth than the core publication. ITIL best practices recommend 1) the development of software license management policies and procedures, and roles and responsibilities, 2) a centralized, enterprisewide management structure for software asset management, 3) the use of software license management tools, and 4) the creation and maintenance of accurate enterprisewide inventories of software licenses.
Information Technology Infrastructure Library Maturity Levels	Maturity levels refer to an IT organization's ability to perform. An organization passes through five evolutionary levels as it becomes more competent. Level 1: Initial – Focuses on technology and technology excellence/experts. Level 2: Repeatable – Focuses on products/services and operational processes, *e.g.*, service support. Level 3: Defined – Focuses on the customer and proper service-level management. Level 4: Managed – Focuses on business/information technology alignment. Level 5: Optimized – Focuses on value and the seamless integration of information technology into the business and strategy making.
Integrated Data Retrieval System	IRS computer system capable of retrieving or updating stored information. It works in conjunction with a taxpayer's account records.
National Institute of Standards and Technology	A part of the Department of Commerce that is responsible for developing standards and guidelines for providing adequate information security for all Federal Government agency operations and assets.

Term	Definition
National Institute of Standards and Technology Special Publication 800-53, *Recommended Security Controls for Federal Information Systems and Organizations*	Requires that Federal agencies employ tracking systems, such as specialized fully automated applications depending on the needs of the organization, for software protected by quantity licenses to control copying and distribution and to help ensure that software is used in accordance with licensing agreements.
Software License Agreement	The legal contract between the owner and purchaser of a piece of software that establishes the purchaser's rights. A software license agreement provides details and limitations on where, how, how often, and when the software can be installed and used, and provides restrictions that are imposed on the software. The agreement includes the licensing model that will be used for defining and measuring the use of the software. For example, a common simple license model could be based on how many people can use the software and how many systems the software may be installed on. Software companies also make special license agreements for large business and Government entities that may be different from those provided to the general consumer.
Treasury Directive Publication 85-01, *Treasury IT Security Program*	Requires that bureaus periodically scan their networks to detect and remove any unauthorized or unlicensed software.
Treasury Directive 85-02, *Software Piracy Policy*	Issued to implement Executive Order 13103 and requires that bureaus establish and maintain an accurate software inventory to help ensure that software is used in accordance with software license agreements.

Management's Response to the Draft Report

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

CHIEF TECHNOLOGY OFFICER

January 14, 2014

MEMORANDUM FOR DEPUTY INSPECTOR GENERAL FOR AUDIT

FROM: Terence V. Milholland
                Chief Technology Officer

SUBJECT: Draft Audit Report – The Internal Revenue Service
                Should Improve Mainframe Software Asset
                Management and Reduce Costs
                (Audit # 201320025) (e-trak #2013-46310)

Thank you for the opportunity to review and respond to the subject audit report.

During the course of this audit, instances were identified that emphasize the need to
enhance the management of mainframe software licenses. The IRS recognizes the
significance of having proper controls in place to manage software assets and we
continue to maintain these controls.

The IRS has already taken several actions that not only improve controls but also
address the audit's recommendations which align with industry software management
best practices. For example, to help develop enterprise-wide roles and responsibilities
in the IRM for software asset and license management, the IRS has begun establishing
an Enterprise Software Governance Board (ESGB) along with an ESGB Working Group
(ESGB WG). This effort includes the development of an Integrated Process
Management (IPM) document that will ensure consistency in asset management across
enterprise processes. Through the ESGB WG, the Service is also establishing an
Integrated Project Team (IPT) to research and document software asset and lifecycle
management tool requirements which include license management.

To ensure an accurate picture of our operations is presented, we disagree with some of
the audit's key findings and outcome measures.

Underutilization and Non-Compliance with Licensing Terms and Conditions:

- TIGTA stated, "In September 2012, an external contractor hired by the prime
  contractor, i.e., IBM, completed a compliance review of the IRS's contract for IBM
  software and related licensing. Using asset discovery, network scanning, license
  management, and license metering tools, this contractor found several issues
  that included overutilization and non-deployment of software products which the
  IRS had purchased under the contract. In turn, the IRS hired its own contractor

2

costing $50,000 to evaluate the compliance review results and to assist the IRS in negotiating a new contract agreement. The original compliance review determined that the IRS did not deploy, i.e., purchased but did not use, mainframe licenses and software support, resulting in the IRS wasting an estimated $11.6 million."

- o Our position is that the Service did not waste $11.6 million. We provided documents to TIGTA that demonstrated the IRS was compliant with IBM software terms. Of the 11 products, we did not use five (products 6,7,9,10,11) and therefore had no obligation to pay for them, and the remaining six (products 1,2,3,4,5,8) were recently purchased and are in the process of deployment.

- TIGTA stated, *"The compliance review also found that the IRS over utilized contracted licenses and software support on six products with an estimated GSA list price value of $1.5 million. As a result, we estimate that the IRS owed an additional $1.5 million in licenses and software support fees at the time of the compliance review."*

- o The IRS shared with TIGTA that at the time of the compliance review the Service discovered a miscalculation of sub-capacity that was valued at $642 thousand not $1.5 million—this was immediately corrected. It is also important to note that the Service did not pay back support fees or compliance fees due to the miscalculation.

Asset Discovery and License Management:

- TIGTA states several times and specifically here *"The IRS does not use asset discovery, network scanning, license management, and license metering tools to identify current usage, deployment, and inventory of mainframe software and related licenses."*

- o IRS installed IBM Tivoli Asset Discovery for System z in June 2011. This tool compiles a complete report of all mainframe software products and which LPARS they are installed on. During the course of the audit, we informed TIGTA about our installation and use of this tool, and provided information to TIGTA from this process. IRS believes this report demonstrates the IRS has and maintains a software asset discovery and inventory system for the mainframe environment.

- TIGTA stated, *"Without these tools and a software asset and license management structure in place, the IRS cannot effectively determine if the software contracts it enters into are reflective of its current or future projected mainframe software license and support needs. In addition, the IRS cannot, from an enterprise wide level, effectively manage its mainframe software and license compliance to the contract option-year renewals."*

3

o The IRS takes the management of mainframe software licenses seriously and is vested in improving practices. IRS Information Technology will continue coordinating detailed reviews of mainframe agreements to assess whether upgrades are allowable under currently licensed levels or if an increase is required. This is a routine auditable practice that provides the controls the IRS has around the mainframe environment.

The IRS recognizes and supports the significance of ensuring complete accountability for mainframe software management through proper oversight of contracts and asset inventory records. We value your continued support and the assistance your organization provides. If you have any questions, please contact me at (240) 613-9373 or a member of your staff may contact Lisa Starr, Senior Manager, Program Oversight at (240) 613-4219.

Attachment

Attachment

Draft Audit Report – The Internal Revenue Service Should Improve Mainframe Software Asset Management and Reduce Costs (Audit # 201320025) (e-trak #2013-46310)

RECOMMENDATION #1: Develop policies and guidance in the Internal Revenue Manual to manage mainframe software assets and licenses using ITIL best practices.

CORRECTIVE ACTION #1: IRS agrees with this recommendation. IRS will utilize best practices, such as ITIL, to enhance current policies and guidance for managing software and licensing from an enterprise perspective in support of and aligned to IRM 2.14.1 Asset Management. IRS will ensure policies and guidance are aligned to and include the protocols, functions, and decision making outcomes across ACIO and other enterprise units by implementing an Enterprise Software Governance Board.

IMPLEMENTATION DATE: July 25, 2014

RESPONSIBLE OFFICIAL: Associate Chief Information Officer, Strategy and Planning, Vendor and Contract Management

CORRECTIVE ACTION MONITORING PLAN: We enter accepted Corrective Actions into the Joint Audit Management Enterprise System (JAMES) and monitor them on a monthly basis until completion.

RECOMMENDATION #2: Develop an enterprise-wide organizational structure to manage mainframe software assets and licenses.

CORRECTIVE ACTION #2: IRS agrees with this recommendation. IRS will clarify the enterprise-wide organizational structure, including roles and responsibilities, in the IRM for mainframe software asset and license management.

IMPLEMENTATION DATE: July 25, 2014

RESPONSIBLE OFFICIAL: Associate Chief Information Officer, Strategy and Planning, Vendor and Contract Management

CORRECTIVE ACTION MONITORING PLAN: We enter accepted Corrective Actions into the Joint Audit Management Enterprise System (JAMES) and monitor them on a monthly basis until completion.

1

Attachment

Draft Audit Report – The Internal Revenue Service Should Improve Mainframe Software Asset Management and Reduce Costs (Audit # 201320025) (e-trak #2013-46310)

RECOMMENDATION #3: Develop roles and responsibilities in the Internal Revenue Manual for all organizational entities responsible for mainframe software asset and license management.

CORRECTIVE ACTION #3: IRS agrees with this recommendation. However, we believe the efforts that will be carried out for recommendation #2 of this audit will also achieve the necessary actions for recommendation #3.

IMPLEMENTATION DATE: N/A

RESPONSIBLE OFFICIAL: N/A

CORRECTIVE ACTION MONITORING PLAN: N/A

RECOMMENDATION #4: Develop detailed standard operating procedures for using mainframe software licensing tools to manage software licenses.

CORRECTIVE ACTION #4: IRS agrees with this recommendation. As part of our enterprise approach IRS will enhance standard operating procedures for using existing and/or other toolsets, as appropriate, to manage software licensing for the enterprise.

IMPLEMENTATION DATE: September 25, 2014

RESPONSIBLE OFFICIAL: Associate Chief Information Officer, Strategy and Planning, Vendor and Contract Management

CORRECTIVE ACTION MONITORING PLAN: We enter accepted Corrective Actions into the Joint Audit Management Enterprise System (JAMES) and monitor them on a monthly basis until completion.

RECOMMENDATION #5: Implement a specialized mainframe software license tool(s) designed to discover, track, and manage mainframe software license deployment and usage. The implementation of the tool should include the development of an enterprise-wide, centralized, systematic, and repeatable method to manage and track the deployment of mainframe licenses that can be uniformly used by all organizational entities responsible for managing licenses.

CORRECTIVE ACTION #5: IRS agrees with this recommendation with a slight modification. Based on experience, there is no single tool that can discover, track and manage software license deployment and usage. For a prior TIGTA

2

Attachment

Draft Audit Report – The Internal Revenue Service Should Improve Mainframe
Software Asset Management and Reduce Costs (Audit # 201320025)
(e-trak #2013-46310)

recommendation (report #2013-20-025, recommendation #4), the IRS is already
working to identify and implement a standard enterprise toolkit, which may
include multiple tools. We believe these efforts will accomplish this
recommendation.

IMPLEMENTATION DATE: N/A

RESPONSIBLE OFFICIAL: N/A

CORRECTIVE ACTION MONITORING PLAN: N/A

RECOMMENDATION #6: Develop an enterprise-wide inventory of mainframe
software licensing data and maintain the inventory with a specialized software
license tool designed to discover, track, and manage mainframe software license
deployment and usage.

CORRECTIVE ACTION #6: IRS agrees with this recommendation with a slight
modification. Based on experience, there is no single tool that can discover,
track and manage software license deployment and usage. For a prior TIGTA
recommendation (report #2013-20-025, recommendation #5), the IRS is already
developing a mainframe software inventory and will leverage this as a starting
point. We are also already identifying and implementing a standard enterprise
toolkit, which may include multiple tools. We believe these efforts will accomplish
this recommendation.

IMPLEMENTATION DATE: N/A

RESPONSIBLE OFFICIAL: N/A

CORRECTIVE ACTION MONITORING PLAN: N/A

RECOMMENDATION #7: Maintain data in the inventory that the IRS can use to
more effectively review mainframe software licensing agreements, purchases,
deployment, usage, and other related aspects of mainframe licensing to identify
additional savings in software spending.

CORRECTIVE ACTION #7: IRS agrees with this recommendation with a slight
modification. While IRS is currently maintaining a software inventory, we will
enhance this process by leveraging tools. Based on experience, there is no
single tool that can discover, track and manage software license deployment and
usage. As such the IRS will identify and implement a standard, enterprise toolkit,

3

Attachment

Draft Audit Report – The Internal Revenue Service Should Improve Mainframe
Software Asset Management and Reduce Costs (Audit # 201320025)
(e-trak #2013-46310)

which may include multiple tools, towards this recommendation. Data collected
via the toolkit will be consolidated and maintained in a central data repository.

IMPLEMENTATION DATE: September 25, 2014

RESPONSIBLE OFFICIAL: Associate Chief Information Officer, Strategy and
Planning, Vendor and Contract Management

CORRECTIVE ACTION MONITORING PLAN: We enter accepted Corrective
Actions into the Joint Audit Management Enterprise System (JAMES) and
monitor them on a monthly basis until completion.

4