



OFFICE OF INSPECTOR GENERAL

Audit Report

2015-IT-B-017

# The Board Continues to Follow a Structured Approach to Planning and Executing the Relocation of the Data Center

September 16, 2015

BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM  
CONSUMER FINANCIAL PROTECTION BUREAU

## Report Contributors

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## Abbreviations

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Board	Board of Governors of the Federal Reserve System
Division of IT	Division of Information Technology
FRB Richmond	Federal Reserve Bank of Richmond
IT	information technology
MOU	memorandum of understanding
OIG	Office of Inspector General

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## ***Executive Summary:***

# **The Board Continues to Follow a Structured Approach to Planning and Executing the Relocation of the Data Center**

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### **Purpose**

The Board of Governors of the Federal Reserve System (Board) has undertaken a project to relocate its data center from the Board's Martin Building in Washington, DC, to the Baltimore Branch of the Federal Reserve Bank of Richmond. We previously issued reports on the data center relocation in February 2014 and January 2015. The primary objective of this third audit was to review the production migration of servers and applications to the Baltimore Data Center. Additionally, we reviewed the ongoing operation strategy at Baltimore, including the procurement, inventorying, and disposal processes for IT equipment. We also reviewed the commissioning of the data center and followed up on open recommendations from the prior audits.

### **Background**

The Board's data center relocation is a major element of the third theme in the Board's *Strategic Framework 2012–15*. The multiyear data center project is composed of four overlapping phases, with completion scheduled for December 2015. Construction of the new data center is now complete, and production migration of servers and applications was fully planned and underway as of the end of our fieldwork.

### **Results of Audit**

Overall, we observed that the Board is continuing to follow a structured approach to planning and executing the relocation of the data center, and Board staff members are actively engaged in planning and decisionmaking for the project. We found that controls have been implemented to ensure successful migration of all servers and residing applications. We verified that commissioning validated all major equipment functionality against the design specifications. We also observed that ongoing operations are governed by appropriate policies and procedures and that controls are in place to segregate duties for the procurement, inventorying, and disposal of IT equipment at the data center.

We followed up on three prior open recommendations and determined that sufficient corrective action has been taken to close the recommendations. We found that tracking and monitoring of the budget has continued, and the budget continues to be updated to reflect the information currently available regarding actual costs. The project is on schedule for a December 2015 completion, and the Division of Information Technology has taken steps throughout the duration of the project to monitor the timeline closely and to update the Chief Operating Officer about the project and delays that have occurred. Additionally, the data center relocation team has documented the physical and environmental controls for the Baltimore Data Center, and the Chief Information Officer's office has conducted a review and accepted the Federal Reserve Bank of Richmond's authorization to operate.



## OFFICE OF INSPECTOR GENERAL

BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM  
CONSUMER FINANCIAL PROTECTION BUREAU

September 16, 2015

### MEMORANDUM

**TO:** Sharon Mowry  
Chief Information Officer and Director, Division of Information Technology  
Board of Governors of the Federal Reserve System

**FROM:** Peter Sheridan *Peter Sheridan*  
Assistant Inspector General for Information Technology

**SUBJECT:** OIG Report No. 2015-IT-B-017: *The Board Continues to Follow a Structured Approach to Planning and Executing the Relocation of the Data Center*

The Office of Inspector General (OIG) has completed its report on the subject audit. This audit is a follow-on to [OIG Report No. 2015-IT-B-001](#), *Audit of Planned Physical and Environmental Controls for the Board's Data Center Relocation*, January 30, 2015, and [OIG Report No. 2014-IT-B-002](#), *Audit of the Board's Data Center Relocation*, February 7, 2014. The primary objective of this third audit was to review the production migration of servers and applications to the Baltimore Data Center. Additionally, we reviewed the ongoing operation strategy at Baltimore, including the procurement, inventorying, and disposal processes for information technology. We also reviewed the commissioning of the data center and followed up on the budget and project schedule recommendations from the February 2014 audit and the physical and environmental control reconciliation recommendation from the January 2015 audit.

Because we make no formal recommendations in this report, we did not request an official management response. We appreciate the cooperation that we received from Board personnel during our audit. Please contact me if you would like to discuss this report or any related issues.

cc: Donald Hammond, Chief Operating Officer  
William Mitchell, Chief Financial Officer  
Michell Clark, Director, Management Division  
Raymond Romero, Senior Associate Director, Division of Information Technology  
Glenn Eskow, Associate Director, Division of Information Technology  
Jonathan Shrier, Assistant Director, Division of Information Technology  
Charles Young, Information Security Officer  
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# Introduction

## Objective

The Board of Governors of the Federal Reserve System's (Board) project to relocate its data center is a major element of the third theme in the Board's *Strategic Framework 2012–15*. This multiyear project is composed of four overlapping phases, with completion scheduled for December 2015. We issued our initial report on the data center relocation in February 2014<sup>1</sup> and our second report in January 2015.<sup>2</sup>

The primary objective of this third audit was to review the production migration of servers and applications to the Baltimore Data Center. Additionally, we reviewed the ongoing operation strategy at the Baltimore Data Center, including the procurement, inventorying, and disposal processes for information technology (IT) equipment. We also reviewed the commissioning of the data center and followed up on the budget and project schedule recommendations from our February 2014 audit and the physical and environmental control reconciliation recommendation from our January 2015 audit.

## Background

The Board's data center provides the infrastructure that makes data and IT available to the Board and to the Federal Reserve System to support monetary policy, financial supervision, consumer protection, and economic research. The data center is currently relocating from the Board's Martin Building to the Baltimore Branch of the Federal Reserve Bank of Richmond (FRB Richmond). The Board approved the scope and funding for this project in June 2012 as part of its strategic plan.

According to the January 2013 memorandum of understanding (MOU) and the service-level agreement between the Board and FRB Richmond, FRB Richmond is responsible for the build-out of the data center and for the operation and maintenance of the mechanical, electrical, and plumbing systems. Construction of the data center is complete, and production migration of IT was fully planned and underway as of the end of our fieldwork.

As part of our initial audit, we reviewed the budget for the data center relocation and the MOU between the Board and FRB Richmond, as well as obtained background information on the project, including schedules and the interdependencies of the data center relocation and the Martin Building renovation projects. We determined that the planning for the data center relocation was effective and that the Board had considered several options in choosing to relocate

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1. Office of Inspector General, *Audit of the Board's Data Center Relocation*, [OIG Report No. 2014-IT-B-002](#), February 7, 2014. This initial report contains additional background information on the data center relocation project.
  2. Office of Inspector General, *Audit of Planned Physical and Environmental Controls for the Board's Data Center Relocation*, [OIG Report No. 2015-IT-B-001](#), January 30, 2015.

to the Baltimore Branch of FRB Richmond. While we noted that tracking of the budget and the schedule could be improved, project management has resolved these concerns in a timely manner.

Next, we reviewed and assessed the planned physical and environmental controls for the data center, the change order and procurement processes, and the contract with the general contractor. We found that the data center relocation team and FRB Richmond were effectively managing the construction phase and resolving any issues as they arose. While we identified potential improvements regarding documenting the physical and environmental controls for the data center and reconciling the Board's standards with the Federal Reserve System's standards, these concerns have similarly been actively resolved through project management.

In our current audit, we reviewed the production migration of servers and applications along with the ongoing operations strategy, the commissioning process, and the fraud risk for the purchase and disposal of IT equipment. We found that the Board's strong management of the data center relocation project has kept the project on schedule; the project is expected to be completed on time.

# Results of Audit

Overall, we believe that the Board has established an appropriate control environment around the data center relocation, particularly with respect to the design and planning, construction and build-out, and migration of data and servers. This control environment, when continuously enforced, should facilitate a successful and on-time completion of the data center relocation.

While unanticipated events can have a negative affect on any major project, the Board's planning and execution of the data center relocation has led to effective progress. Based on our review, the project appears to be on track for successful completion by December 2015.

## Production Migration of Servers and Applications

Production migration of servers and applications to the Baltimore Data Center began in July 2014. During this phase of the relocation, servers and applications are migrated from the data center in the Board's Martin Building to the Baltimore Data Center. It was determined that migration would be conducted via a low-risk strategy—rather than moving each application separately, the data center is being moved server by server, and all applications on a specific server are migrated simultaneously. Therefore, rather than reinstalling individual applications on the destination servers, the data center relocation team is copying complete server images to the destination servers, which adds an extra control to ensure that the resulting server is logically identical to the originating server. Virtual machines are being moved electronically over the wire, and physical servers are either being moved electronically through data center migration software or manually by forklift. While the data center relocation team is responsible for migrating the servers, the application owners are responsible for assisting in coordinating timing and for testing their applications post migration to ensure successful migrations.

To create the migration schedule, the data center relocation team compiled a Master Provisioning List, which includes all physical assets in the Martin Building data center and the Eccles Temporary Martin Automation Room. In March 2013, the team identified IT Lead Providers for each of the servers on the Master Provisioning List, thereby tying applications and application owners back to the servers. The data center relocation team then created the Application Provisioning List, and in June 2014, the team finished verifying that the IT Lead Providers were associated with the correct servers. From June to November 2014, the team created a move group schedule that states which month in 2015 each server, along with all its associated applications, would be migrated. The team then obtained feedback and approval from application owners on the dates selected. There are 12 deployment waves,<sup>3</sup> one per month, scheduled in 2015, with the final wave in December 2015. This last wave is reserved as time to resolve any issues that might arise in migrating any servers. The schedule was finalized in November 2014, and a test row was moved in December 2014. As of the end of our fieldwork in July 2015, six waves had been completed and one was in progress.

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3. Each wave consists of smaller components known as *move groups*. Each move group may consist of multiple applications to server inventory mappings with groupings based on specific technical criteria.



We selected two servers for which to review the production migration process, one housing a user-facing application and one housing an infrastructure-facing application. The selected user-facing application is a central system for the Division of Banking Supervision and Regulation and is run on a physical server. The selected infrastructure application is a tool that connects two servers to facilitate data transfer and is run on a virtual server.

For both servers, we reviewed e-mail documentation from the application owners showing their involvement in approving the migration dates and move schedule. Although the user-facing application's migration had to be rescheduled due to technical issues, we noted that the application owners were heavily involved in setting and approving all changes to the migration schedule to ensure that migration would not conflict with business needs.

We also reviewed the Data Center Relocation SharePoint site to ensure that test plans were created and executed successfully for both servers. We found that test plans and certifications of completion were completed by the IT Lead Providers, verifying that the application moves, and therefore the server moves, were successful. IT Lead Providers represent their business units and provide business or technical subject-matter expertise to the data center relocation project.

## **Commissioning of the Data Center**

A commissioning agent was contracted by FRB Richmond to conduct commissioning on the major mechanical, electrical, and plumbing systems. The commissioning included functional performance testing of the equipment and full integration testing of the data center and was performed in October and November 2014. During this phase, the general construction contractor carried out performance tests in conjunction with the commissioning firm, and deficiencies were identified, fixed, and verified as resolved through retesting. The commissioning then included off-season testing of equipment, to test functionality of equipment that could not be tested in the colder months. This testing was performed in July 2015. Lastly, the commissioning includes 10-month warranty testing, which incorporates a site visit and testing prior to warranty expiration to identify any items that need to be repaired or replaced under warranty by the contractors.

We reviewed the commissioning of the data center to ensure that all major mechanical, electrical, and plumbing equipment was included in the testing and that the parameters for the testing met the design specifications. We compared the equipment tested in the commissioning report with the major Bank-purchased equipment. We noted that while the commissioning report's scope only included the testing of four power distribution units, because six were ultimately purchased and installed when the Board decided to build out the right-of-first-refusal space, the commissioning was expanded to include all six units.

## **Ongoing Operations**

Ongoing operations of the Baltimore Data Center IT equipment are the responsibility of the Baltimore Data Center Operation Center staff, and these positions are held by contractors. According to the data center relocation team, maintenance of the mechanical, electrical, and plumbing systems has been delegated to FRB Richmond. This includes the street outside the facility to the transformers to the power distribution units to the power strip on each IT equipment rack. All the IT equipment plugged into those power strips is the responsibility of the Board, specifically, the Baltimore Data Center Operation Center contractor staff.

Although the Operation Center staff members are contractors, we determined that the Board has a service-level agreement with FRB Richmond for equipment support and that the Board's Division of Information Technology (Division of IT) has developed standard operating procedures and policies governing ongoing operations of the data center's IT equipment. We were also informed that the contractor personnel have both Board and FRB Richmond security clearances. Onsite support hours for both the contractor staff and for FRB Richmond maintenance staff were determined and documented, and after-hours staff recall was also arranged in the event of an emergency.

## **Procurement, Inventorying, and Disposal of Information Technology Equipment**

We reviewed the processes for procurement, inventorying, and disposal of IT equipment to confirm appropriate segregation of duties and control against misappropriation of Board assets. We found that the data center relocation team has implemented strong controls to protect these processes. During the relocation, requests for procurement of IT equipment are handled through the Data Center Relocation SharePoint site. Two members of the relocation team, including one Board employee and one contractor staff member, are able to initiate purchases of equipment. The request is then routed to the procurement department, which places the order, and the Baltimore Data Center Operation Center staff is notified of the upcoming delivery. Upon delivery, the Operation Center contractor staff receive, enter into inventory, and install the new equipment. This process ensures that a single employee does not have the ability to make unauthorized purchases for his or her own benefit.

Disposal of IT equipment is requested by authorized system administrators. Following such a request, Operation Center staff remove the device and ship it to the disposal site determined by the Division of Financial Management. Similar to the procurement process, this segregation of duties restricts any one employee from misappropriating existing IT equipment. Hard drives and other storage devices are wiped and are disposed of through a destruction firm contracted by FRB Richmond, ensuring confidentiality of data.

# Follow-Up on Prior Audit Recommendations

Our February 2014 audit report<sup>4</sup> included two recommendations, one regarding the data center relocation project budget and the other regarding the project schedule. Our January 2015 audit report<sup>5</sup> maintained the project schedule recommendation and closed the budget recommendation, noting that we would continue to monitor the budget. The January 2015 report also included one new recommendation, regarding ensuring that all physical and environmental controls will be implemented in accordance with Board requirements. The Director of the Division of IT agreed with our recommendations and outlined actions to address them. As part of this audit, we followed up on these recommendations and determined that all three recommendations have been satisfactorily dispositioned and can be closed. The results of our follow-up work are below.

## Budget Recommendation

In our February 2014 audit report, we recommended that the Director of the Division of IT reevaluate the data center relocation budget, taking into consideration the design changes that have occurred, and implement a process for updating the budget as additional cost information is available. We further recommended that the updated budget clearly separate build-out and operations expenses to allow for separate tracking and monitoring through the duration of the project. In our January 2015 audit report, we closed the budget recommendation but noted that we would continue to monitor the budget. This recommendation remains closed.

The overall 10-year budget remains \$201.5 million, which was the funding amount approved by the Board of Governors. We found that the tracking and monitoring of this budget has continued and that figures have been adjusted to reflect updated information regarding actual costs.

Initially, the Management Division was responsible for maintaining the Master Tracker, a document that consolidates all projected expenses to be charged against the total \$201.5 million budget, including design and construction, transition and migration, and operations expenses. Responsibility for this tracker transitioned to the Division of IT prior to our January 2015 audit, and expenses continue to be updated to reflect new cost information that has become available. As of the end of our fieldwork, the Master Tracker showed that both the overall data center relocation project and the design and construction component were under budget.

In addition to the Board's Master Tracker, the Board's Management Division is maintaining a capital budget tracker for build-out costs. This document contains actual build-out expenses, including FRB Richmond's project management fees and prepurchased equipment, design, and contract administration fees; general contractor fees; commissioning costs; and change order

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4. Office of Inspector General, *Audit of the Board's Data Center Relocation*, [OIG Report No. 2014-IT-B-002](#), February 7, 2014. This initial report contains additional background information on the data center relocation project.
  5. Office of Inspector General, *Audit of Planned Physical and Environmental Controls for the Board's Data Center Relocation*, [OIG Report No. 2015-IT-B-001](#), January 30, 2015.

costs. By delegating responsibility for the Master Tracker to the Division of IT, the Management Division has reduced its responsibility to monitoring only costs toward the build-out budget, which is the sole portion of the budget that the Management Division is responsible for meeting.

## **Project Schedule Recommendation**

In our February 2014 audit report, we recommended that the Director of the Division of IT continue to closely monitor data center relocation project schedule risks and identify and analyze possible approaches for responding to potential delays that could affect the Martin Building renovation project. In our January 2015 audit report, we noted that the Division of IT has taken steps to monitor the timeline closely and to update the Chief Operating Officer to ensure that interdependencies are known and mitigated; however, we kept our recommendation open while the project remained active.

The Chief Operating Officer continues to be provided with a *Capital Construction Update* report every other month, which contains updates on the Martin Building renovation and the 1801 K Street, New York Avenue, and data center relocation projects. This report contains a timeline that compares all four projects and makes specific note of the six-month overlap between the start of the Martin Building construction and the end of the data center relocation.

During this third audit, we found that strong project management has mitigated potential schedule conflicts posed by the six-month overlap between the data center relocation and the Martin Building renovation and by unanticipated events that occurred during construction. To avoid potential adverse effects on the Martin Building renovation project, the data center relocation completion was scheduled for December 2015. Currently, in the fourth and final phase of the relocation, the production migration of data and servers schedule has been built out, with December 2015 as the month for the final wave. Further, this is a reserve month for completing any final migrations that run into technical issues during earlier move groups. We reviewed the progress of the migration and noted that the migration is moving forward on schedule and all issues experienced thus far during the migration have been resolved.

Overall, project management has continued to monitor the project schedule and update the Chief Operating Officer on the project schedule. Further, since project management has brought the project on schedule for a December 2015 completion, we are closing this recommendation.

## **Physical and Environmental Control Reconciliation Recommendation**

In our January 2015 audit report, we recommended that the Director of the Division of IT compare the Board's control baselines and planned controls for the data center with the Federal Reserve System's requirements and baselines, document the planned controls in a security plan, and conduct a risk assessment to formally accept or facilitate the mitigation of any identified risks or deviations from Board requirements.

The data center relocation team has created a security plan spreadsheet documenting responses as to how each physical and environmental control is being met. These responses were obtained from the responsible parties, including the Board, the Division of Reserve Bank Operations and Payment Systems, FRB Richmond, and the data center relocation team, and also include a listing of supporting artifacts.

The Information Security Compliance section within the Division of IT subsequently conducted a Security Assessment Report review, evaluating the security plan and the review of the Baltimore Branch facilities by the Division of Reserve Bank Operations and Payment Systems. The team also analyzed the Baltimore Data Center's authorization to operate, which was granted by FRB Richmond. The Information Security Compliance section had no findings or concerns with the physical and environmental controls, and therefore no risk assessment was needed to accept deviations.

Because the physical and environmental controls have been documented and analyzed for the data center, no deviations from Board standards were identified, and an authorization to operate has been granted for the data center, we are closing this recommendation.

# Appendix A

## Scope and Methodology

The scope of this third audit of the data center relocation included reviewing the production migration of servers and applications to the Baltimore Data Center; the ongoing operation strategy at the Baltimore Data Center; the procurement, inventorying, and disposal processes for IT equipment; and the commissioning of the data center. Our scope also included following up on the budget and project schedule recommendations from the February 2014 audit and the physical and environmental control reconciliation recommendation from the January 2015 audit.

To accomplish our objectives, we reviewed the migration strategy documentation and evidence surrounding the migration of two sampled servers, including documentation of schedule approval, test plans, and certification of successful migration. We also reviewed the move group schedule and the Master Provisioning List and Application Provisioning List. We obtained and reviewed standard operating procedures and policies for ongoing operations and for procurement, inventorying, and disposal of equipment. We further obtained and reviewed the commissioning statement of work and the commissioning report. We also interviewed Division of IT and FRB Richmond personnel who are involved in the data center relocation, and we conducted a site visit to the Baltimore Branch of FRB Richmond to conduct a walk-through of the data center and to inquire about the commissioning process.

To follow up on previous recommendations, we reviewed the Master Tracker, capital budget tracker, and *Capital Construction Update* documents. We also obtained and reviewed the physical and environmental control security plan documentation, along with the Security Assessment Report and authorization to operate. Further, we interviewed Division of IT and Management Division personnel regarding corrective actions. We conducted our fieldwork from May 2015 to July 2015.

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 objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.



## OFFICE OF INSPECTOR GENERAL

BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM  
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