



OFFICE of INSPECTOR GENERAL
NATIONAL RAILROAD PASSENGER CORPORATION

Information Technology:

Opportunities Exist to Improve the Company's Ability to Restore IT Services After a Disruption

Certain information in this report has been redacted due to its sensitive nature.


OIG-A-2018-010 | September 10, 2018

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Memorandum

To: Christian Zacariassen
Executive Vice President/Chief Information Officer

From: Stephen Lord 
Assistant Inspector General, Audits

Date: September 10, 2018

Subject: *Information Technology: Opportunities Exist to Improve the Company's Ability to Restore IT Services After a Disruption (OIG-A-2018-010)*

Since 2015, Amtrak (the company) has spent more than \$12 million to minimize the possibility and impact of disruptions to its information technology (IT) services, which support the company's business functions. The company's IT department is responsible for restoring IT services after a disruption—whether they result from human error or from large-scale events such as natural disasters, cyber attacks, or physical attacks. To prepare for such events, the IT department is responsible for developing IT business continuity and disaster recovery plans and testing its applications in accordance with these plans to ensure that it can quickly restore IT services. For the purposes of this report, we refer to these plans as “business continuity” plans because the company uses these terms interchangeably.¹ The IT department also oversees the contracts that support its business continuity efforts.

Our objective was to assess the company's ability to restore IT services after a disruption. To do so, we analyzed the company's business continuity planning and testing efforts and compared them to private- and public-sector IT management controls standards issued by the National Institute of Standards and Technology and ISACA (formerly the Information Systems Audit and Control Association). We also visited the company's two data centers, analyzed IT service disruptions, and reviewed the company's IT business continuity contracts. For more information on our scope and methodology, see Appendix A.

¹ When describing its IT business continuity and disaster recovery capabilities, the company also refers to the resiliency and availability of its IT applications.

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SUMMARY OF RESULTS

The company has opportunities to improve its efforts to restore IT services after a disruption. The IT department has developed and tested business continuity plans for the applications hosted in its mainframe environment, which is consistent with IT management control standards. However, it has not done so for the applications in other environments where most of the company's applications are hosted. As a result, the IT department does not have IT business continuity plans for [REDACTED] of the company's [REDACTED] applications ([REDACTED] percent), including [REDACTED] that are mission-critical—such as those used to sell tickets, maintain train equipment and railroad infrastructure, and for accounts payable except for providing limited ticketing capability during a disruption. By not fully developing and testing its IT business continuity plans, the company does not have assurance that it is prepared to restore service after a disruption. It is also accepting a risk that it will experience additional service disruptions similar to those that occurred in recent years. Over the next three years, additional service disruptions could result in an estimated \$3 million in revenue and potential productivity losses.

In 2016, the company recorded a greater number of “critical service outages”—disruptions that the IT department deemed most severe—than in 2015. The number of service disruptions decreased in 2017 and is projected to stabilize in 2018. Some of these disruptions resulted in revenue and productivity losses. In 2017, for example, 50 service disruptions affected [REDACTED] of the company's applications and caused an estimated \$1 million in revenue losses. These disruptions may have been mitigated or avoided with additional IT business continuity design and testing, consistent with private- and public-sector IT management control standards, which call for regular and periodic business continuity testing for applications hosted internally or in the cloud.

To help mitigate these risks and avoid the associated revenue loss, the company is planning to move most of its applications to the cloud environment over the next several years. However, the company does not have comprehensive plans and timelines to guide this migration or the supporting analysis to prioritize the migration of the most critical applications. Because this migration will be a multi-year effort, the company will remain exposed to the risks of continued service disruptions without additional IT business continuity planning and testing. For example, the [REDACTED] applications that the IT department has not tested include [REDACTED] that the company considers mission-critical, including those used to sell tickets, maintain train equipment and railroad infrastructure, and pay employees and vendors. Further, although moving to the cloud

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would reduce the risk of a disruption, it will not eliminate it, and the company has not developed plans for testing its applications once they are moved to the cloud.

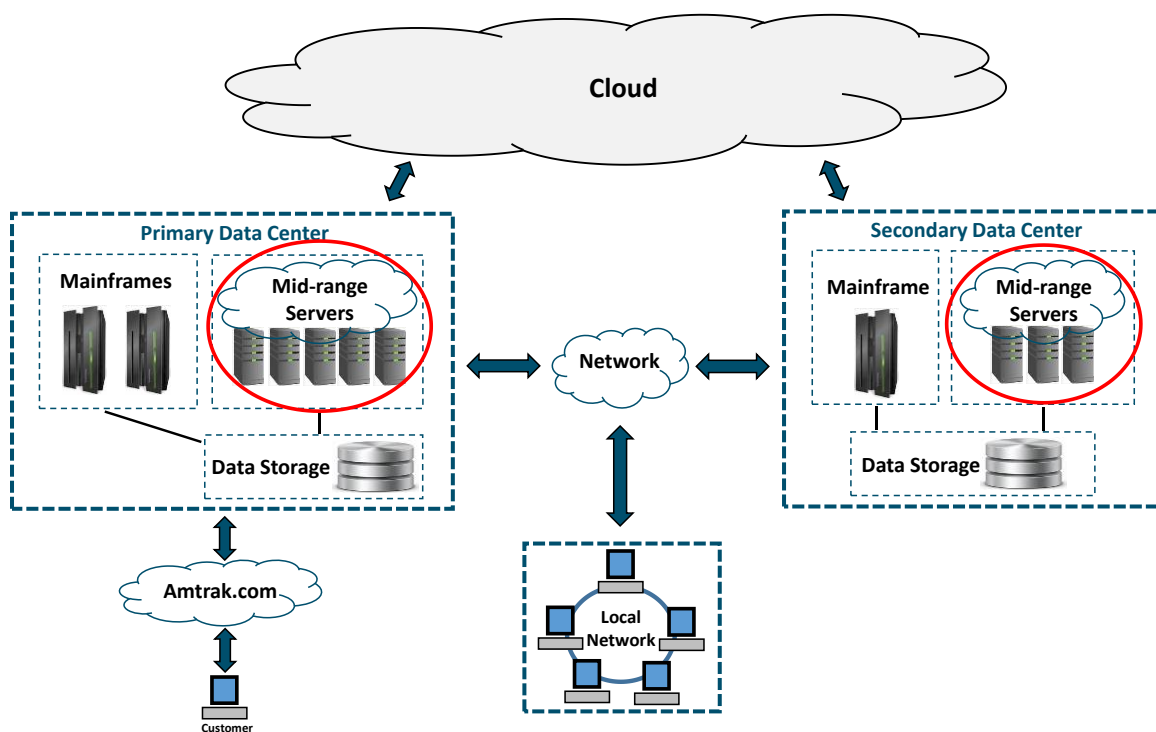
To improve the company's management of its IT recovery planning efforts, we recommend that the company's Chief Information Officer analyze how to mitigate the risks of continued service disruptions until these applications are moved to the cloud, and develop comprehensive plans and priorities for migrating the company's applications to the cloud environment, including plans for testing these applications once they are moved to the cloud. The Chief Information Officer agreed with our recommendations and identified specific actions and planned completion dates to address the risks identified in our report. For management's complete response, see Appendix C.

BACKGROUND

The company hosts its [REDACTED] IT applications in 3 computing environments: the mainframe, mid-range server, and cloud. Most of these applications ([REDACTED]) are hosted in the mid-range server environment. Data and voice networks connect these three environments (see Figure 1). The IT department has outsourced responsibility for restoring most of the company's IT infrastructure in a disruption. The IT department is responsible for overseeing these contractors.

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Figure 1. Amtrak IT Infrastructure



Source: Amtrak IT Department as of May 2018

Note: The red circle highlights the mid-range server environment, where most of the company's application reside. Contractors such as [REDACTED], [REDACTED], and [REDACTED] provide these cloud services.

IT business continuity plans are a key component of the company's overall business continuity plan. The company's Emergency Management and Corporate Security (EMCS) department has overall responsibility for developing the company's business continuity plan, including working with IT and other departments. EMCS plans to establish a business continuity plan by the end of calendar year 2020 that encompasses all of the company's departments and business functions. For more information about how IT planning and testing efforts fit into the company-wide business continuity plan, see Appendix B.

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LIMITED PLANNING AND TESTING INCREASES THE RISK OF IT SERVICE DISRUPTIONS

The IT department has not developed or tested IT business continuity plans for most of the company's applications. This may have contributed to an increase in IT service disruptions over the last three years.

IT Business Continuity Plans for Most Applications Have Not Been Developed or Tested

The IT department has developed and tested IT business continuity plans for the applications hosted in the mainframe environment but [REDACTED], where most of the company's applications are hosted:

- The IT department has developed business continuity plans for the [REDACTED] applications in its mainframe environment. Each of these applications supports one or more business functions, such as reservations and ticketing. The department also regularly tests these plans, consistent with IT management control standards. The tests include restoring back-up data at the company's data centers to ensure that mainframe services and their associated business functions can be restored in a timely manner after a service disruption.
- The IT department has not developed comprehensive IT business continuity plans for [REDACTED] of its [REDACTED] applications ([REDACTED] percent) hosted in the mid-range server environment and cloud environment.² These applications include [REDACTED] that the company considers mission-critical, including those used to sell tickets, maintain train equipment and railroad infrastructure, and pay employees and vendors. However, for the Amtrak.com application hosted in the mid-range server environment, the IT department has developed an application in the cloud, Internet Booking Lite, to provide limited ticketing capability during a disruption. Without plans, the department [REDACTED] and has conducted only limited testing for [REDACTED] of the [REDACTED] applications hosted in the [REDACTED].³

² This includes [REDACTED] applications hosted in the [REDACTED] and [REDACTED] applications hosted in the [REDACTED].

³ The IT department conducted limited simulated testing of these applications.

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The status of the company's IT business continuity planning and testing is shown in Figure 2.



Source: Application inventory as of May 2018

The IT department regularly backs up mid-range server data, but it cannot fully test its ability to recover these data and restore the associated business functions without comprehensive IT business continuity plans. This is a significant vulnerability because most of the company's applications are hosted in the mid-server environment—
■ applications (■ percent).

As we reported in 2013,⁴ the company eliminated business continuity testing for the applications hosted in the mid-range server environment in its IT service contracts to accommodate budget shortfalls and mitigate escalating contract costs. Although the

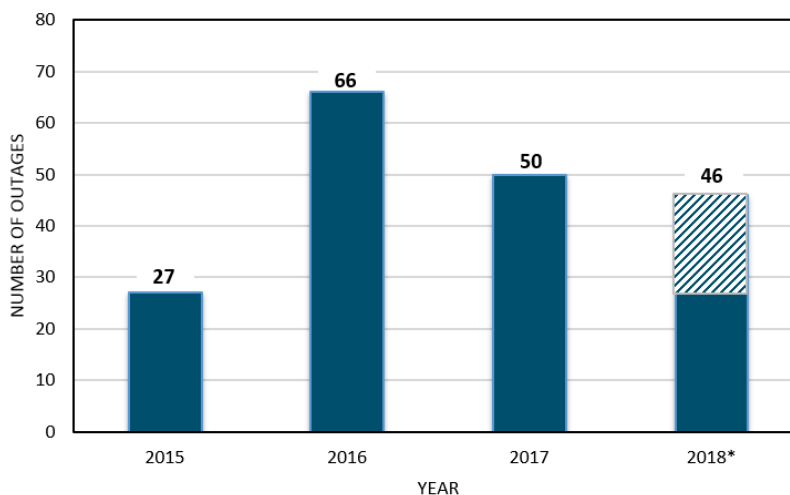
⁴ *Information Technology: Opportunities Exist to Improve Services, Economies, and Contract Performance* (OIG-A-2013-013), April 16, 2013.

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company increased its capability to back up critical data for these servers, it accepted a higher risk of operational disruptions through these actions.

In 2016, the company recorded a greater number of "critical service outages"—disruptions that the IT department deemed most severe—than in 2015.⁵ The number of service disruptions decreased in 2017 and is projected to stabilize in 2018. Some of this increase may be attributable to the department's decision to assign a higher criticality to some disruptions; however, IT officials could not distinguish the portion attributable to this reclassification. According to IT officials, changes in the incident management process allowed for better visibility and tracking of IT service disruptions, resulting in an increase in 2016. Figure 3 shows the number of disruptions that IT department considered to be critical service outages from 2015 through 2018.

Figure 3. Critical IT Service Outages, 2015–2018



*2018 Outages:

- [REDACTED]
- [REDACTED]

Source: IT Department

The impact of these disruptions can significantly affect business operations, and some led to revenue and productivity losses. For example, in September 2016, a [REDACTED] service disruption prevented customers from making reservations and purchasing tickets on Amtrak.com, which we estimate resulted in about \$160,000 in lost revenue using an hourly revenue loss estimate provided by the company. Further, 50 critical

⁵ The company defines critical outages as those with the highest impact on business operations.

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outages in 2017 affected [REDACTED] applications in the mid-range server environment. Using the same hourly revenue loss estimate, we estimated that 6 of these outages—which lasted from [REDACTED]—caused about \$1 million in revenue loss. In addition, this disruption that affected Amtrak.com also affected many of the company's internal applications, which resulted in significant productivity losses, according to IT department officials.

These disruptions may have been mitigated or avoided with additional IT business continuity design and testing, consistent with private- and public-sector IT management control standards, which call for regular and periodic business continuity testing. Further, by not addressing these testing weaknesses, the IT department is accepting the continued risk of service disruptions and their associated losses in revenue and productivity. Based on the losses in 2017, these disruptions could lead to revenue losses of more than \$1 million annually over the next three years, as well as associated productivity losses, that could be avoided.

Plans for Moving Applications to the Cloud Are Not Complete

To mitigate the risk of disruptions, the IT department is planning to move most of its mid-range server applications to the cloud environment to enhance resiliency and reduce cost.⁶ According to IT department officials, the cloud environment is more resilient and cost-effective than the mid-range server environment because the cloud includes more redundant computer and networking hardware than the company could house at its two data centers. They also stated that the cloud environment provides for more automated and regular data back-ups at a lower cost than the company's data centers. Further, the cloud environment provides stronger controls, including higher levels of security at lower costs, according to IT industry experts. As of June 2018, the IT department had moved [REDACTED] of the company's [REDACTED] applications to the cloud environment ([REDACTED] percent) and identified another [REDACTED] to consider moving by the end of 2019.

However, this is a multi-year effort, and the company has not developed comprehensive plans and timelines for moving these applications, and it has not performed a business impact analysis to prioritize the migration of the remaining [REDACTED] applications,⁷ as IT management control standards suggest. A business impact

⁶ In addition, the IT department plans to build new applications in the cloud environment to the maximum extent possible.

⁷ IT officials told us that not all of the applications hosted in the mainframe and mid-range server environments will move to the cloud: some will be retired or consolidated with other applications.

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analysis would link IT plans to the company's overall business continuity plans (see Appendix B) and prioritize the company's mission-critical assets for restoring IT services. Without a business impact analysis, the IT department cannot completely prioritize its migration to the cloud.

Further, the IT department has conducted only limited recovery testing for ■ of the ■ applications it has already moved to the cloud, as discussed above. IT department officials told us they are relying on the cloud's better built-in resilience to minimize the risk of service disruptions. However, although moving to the cloud reduces the risk of a disruption, it does not eliminate it. For example, in May 2018, one of the company's cloud service providers experienced an outage. Although relatively short (about an hour), the outage disrupted services for at least ■ company applications and their associated business functions, according to the IT department's analysis.⁸ In addition, the IT department may still be responsible for recovering applications after a cloud service disruption and restoring the associated business functions, depending on the level of services included in specific contracts. Without IT business continuity plans and regular testing, the IT department cannot ensure that it will be able to recover from a cloud service disruption with a minimal effect on company operations and revenue.

CONCLUSIONS

The company has opportunities to improve its ability to restore IT services after a disruption. Because the IT department has not developed or tested business continuity plans for most of its applications, the company does not have assurance that the department is prepared to restore IT service after a disruption. Establishing comprehensive IT business continuity and disaster recovery plans would help mitigate the risk of additional service disruptions that could result in an estimated \$3 million in revenue and potential productivity losses over the next three years. Although the company is planning to move its applications to the cloud, it does not have comprehensive plans and timelines to guide this migration or the supporting analysis to prioritize the migration of the most critical applications. Further, once these applications are migrated to the cloud, planning and testing will still be necessary to ensure that IT services can be restored after a disruption.

⁸ Some of the other applications in the cloud that were implemented with better resiliency were not affected during this outage, according to IT officials.

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RECOMMENDATIONS

To improve the company's management of its IT business continuity efforts, we recommend that the company's Chief Information Officer take the following actions:

1. Conduct and document an analysis to determine how the risks of continued service disruptions for applications hosted in the mid-range server environment could be mitigated until these applications are moved to the cloud.
2. Develop and document comprehensive plans and priorities for moving existing applications to the cloud environment, including plans for how applications will continue to be tested once they are moved to the cloud.

MANAGEMENT COMMENTS AND OIG ANALYSIS

In commenting on a draft of this report, the company's Executive Vice President/Chief Information Officer agreed with our recommendations and identified planned actions and implementation dates to address our recommendations. In addition, we updated the draft report, where appropriate, to incorporate technical comments provided by the company. The company's planned actions are summarized below:

- **Recommendation 1:** Management agreed with our recommendation to conduct and document an analysis to determine how the risks of continued service disruptions for applications hosted in the mid-range server environment could be mitigated until these applications are moved to the cloud. Management stated that it has requested capital funding to begin the analysis and planning for this recommendation. The target completion date for these actions is March 2019.
- **Recommendation 2:** Management agreed with our recommendation to develop and document comprehensive plans and priorities for moving existing applications to the cloud environment, including plans for how applications will continue to be tested once they are moved to the cloud. Management stated that they are taking actions to develop a schedule to migrate mid-range servers and applications to the cloud. The target completion date for these actions is September 2019.

For management's complete response, see Appendix C.

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APPENDIX A

Objective, Scope and Methodology

This report provides the results of our audit focused on Amtrak's business continuity capability as it relates to IT services. Our objective was to assess the company's ability to restore IT services after a disruption. The scope of our audit included the following:

- the company's mainframe, mid-range server, and cloud environments
- data storage
- ■■■ applications
- other IT infrastructure at the company's primary and back-up data centers, which are managed by a contractor

We performed our audit work from July 2017 through August 2018 in Washington, D.C., and at the company's primary and secondary data centers. Certain information in this report has been redacted due to its sensitive nature.

To assess the IT department's efforts, we reviewed its business continuity testing plans, processes, and procedures to ensure that these activities provided the capability to recover data and maintain business operations after a service disruption. We assessed these activities against IT management control standards regarding business continuity planning, testing, and data recovery practices. We also analyzed service disruptions during calendar years 2015 through 2018 and reviewed the company's processes and procedures for categorizing them and preparing root cause analysis reports. In reviewing these reports, we identified the disruptions the company defines as "critical service outages" and estimated the associated revenue losses for calendar year 2017 using hourly revenue loss estimates provided by the company. We also reviewed the costs of the company's IT business continuity contracts.

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.

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Internal Controls

We reviewed the controls the IT department uses to manage its business continuity efforts, including whether the appropriate management controls are in place to ensure the successful implementation of the requirements detailed in their support contracts. In addition, we assessed the company's management controls to determine whether they were adequate to identify and mitigate risk, and the extent to which the company was following them to execute its IT business continuity efforts.

We did not review the company's overall business continuity controls or the IT department's overall system of controls.

Computer-Processed Data

We did not rely on computer-generated data from any company information systems to develop our findings and recommendations.

Prior Audit Reports

In conducting our analysis, we reviewed the following reports:

- *Amtrak IT Security Assessment–Accenture*, March 15, 2017
- Government Accountability Office, *Cloud Computing: Agencies Need to Incorporate Key Practices to Ensure Effective Performance* (GAO-16-325), April 2016
- U.S. Department of Transportation OIG, *Multiple DOT Operating Administrations Lack Effective Information System Disaster Recovery Plans and Exercise* (FI-2016-024), March 3, 2016
- *Amtrak: Information Technology: Opportunities Exist to Improve Services, Economies, and Contract Performance* (OIG-A-2013-013), April 16, 2013

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APPENDIX B

Business Continuity Plan

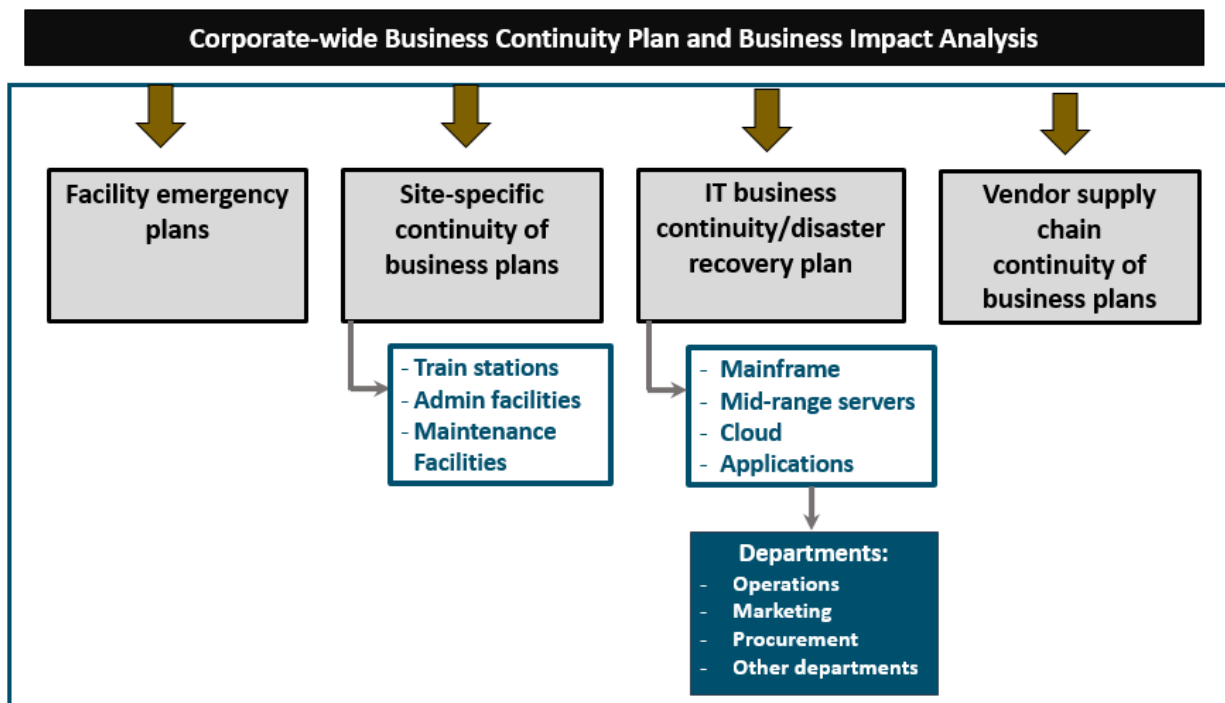
The company’s EMCS department plans to establish a business continuity plan by the end of June 2020 encompassing all departments and functions, including IT. In addition to IT business continuity plans, other components of the company’s business continuity plan and business impact analysis include the following (see Figure 4):

Facility emergency plans are designed to protect the lives and safety of company employees and passengers during an emergency.

Site-specific continuity of business plans are independent, facility-specific plans for train stations and other operating facilities that identify mission-critical functions and the resources needed to complete these functions.

Vendor supply chain continuity of business plans are designed to ensure that key vendors such as fuel suppliers have plans that give the company priority in restoring services during a disruption.

Figure 4. Company-wide Business Continuity Plan Structure



Source: EMCS as of March 2018

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APPENDIX C

Management Comments

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Memo



Robert Hutchison, for C2
9/6/18

Date	<i>September 4, 2018</i>	From	<i>Christian Zacariassen, EVP/CIO</i>
To	Stephen Lord, Assistant Inspector General, Audits	Department	<i>Information Technology</i>
cc		cc	<i>Mark Benedict, Director Amtrak Controls</i> <i>James Cook, Director IT Risk & Compliance</i> <i>Bill Feidt, EVP Finance</i> <i>Carol Hanna, VP Finance</i> <i>Bill Heinrich, AVP Information Security</i> <i>Robert Hutchison, AVP Technology Operations</i> <i>Ghazal Parsa, Senior Director IT</i> <i>Mark Richards, Senior Director Amtrak Controls</i>
Subject	Management Response to Information Technology: Opportunities Exist to Improve the Company's Ability to Restore IT Services After a Disruption (Draft Audit Report for Project No. 012-2017)		

This memorandum provides Amtrak's response to the audit report for project no. 012-2017 entitled, "**Information Technology: Opportunities Exist to Improve the Company's Ability to Restore IT Services After a Disruption**". Management appreciates the opportunity to respond to the OIG recommendations. We agree with each of the OIG recommendations and have initiated actions to address each in a timely manner.

Recommendation 1:

"Conduct and document an analysis to determine how the risks of continued service disruptions for applications hosted in the mid-range server environment could be mitigated until these applications are moved to the cloud."

Management Response/Action Plan:

Management agrees with the OIG recommendation. Amtrak's IT department has requested Capital funding for the following project, **C.IT.100238 Business Continuity and Resiliency**, to begin the analysis and planning for this recommendation. This project will accomplish the following:

1. Implement a new System Criticality framework, Criticality level 1 to Criticality level 5, which will clearly establish a discrete Recovery Time Objective (RTO) and Recovery Point Objective (RPO) for each application. This framework will also define the criticality levels for which regular failover / recovery testing is required.

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2. Assign a Criticality level (level 1 to level 5) for each application in the IT portfolio based on business function and the business impact resulting from a service disruption to that application.
3. Conduct a gap assessment of current RTO/RPO recovery capabilities for each application.
4. Prioritize the gaps and develop a remediation plan / roadmap with funding as needed to raise the resiliency capabilities to the required level.

After the remediation plan is accepted and funding is approved, Amtrak IT will undertake the following activities for all Criticality level 1 and level 2 applications.*

- Implement technical remediation plans and develop and document Standard Operating Procedures (SOPs) for system recovery steps where applicable.
- Develop resiliency/failover test plans including Data Center and Cloud hosted applications.

* Criticality level 3 applications may also be included depending on the final System Criticality matrix specifications.

Responsible Amtrak Official(s):

Robert Hutchison

Target Completion Date:

- The first four tasks and the remediation plan / roadmap will be completed by 03/31/19.

Recommendation 2:

“Develop and document comprehensive plans and priorities for moving existing applications to the cloud environment, including plans for how applications will continue to be tested once they are moved to the cloud.”

Management Response/Action Plan:

Management agrees with the OIG recommendation. Amtrak's IT department renegotiated the Data Center Services contract with our service provider, [REDACTED], in June 2018. To support implementation of the new agreement, a capital project, **C.IT.100201 Data Center Transformation**, was created and funded. This project will optimize the existing data center footprint and migrate mid-range servers and applications to the Cloud. This project includes the following activities:

1. Server Migration to [REDACTED] with Amtrak support for testing and validation
2. Server Migration to [REDACTED], led by Amtrak

Amtrak and IBM are currently analyzing workloads and applications in order to develop a prioritized migration schedule. At the conclusion of these activities, most of the applications currently running on mid-range servers in the data center will be migrated to the Cloud.

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A gap assessment of RTO/RPO recovery capabilities for Cloud hosted applications will be addressed in the Department's response to Recommendation 1. Any additional technical remediation activity beyond Cloud migration will occur after the initial Cloud migration is complete.

Ongoing failover testing for Cloud hosted applications will be addressed in the Department's response to Recommendation 1.

Responsible Amtrak Official(s):

Robert Hutchison

Target Completion Date:

- The Cloud migration activity will be completed by 09/30/19.

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APPENDIX D

Acronyms and Abbreviations

EMCS	Emergency Management & Corporate Security department
GAO	Government Accountability Office
IT	Information Technology
OIG	Amtrak Office of Inspector General
the company	Amtrak

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APPENDIX E

OIG Team Members

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Ernest Ekiti, Contractor

Jason Gordon, Contractor

OIG MISSION AND CONTACT INFORMATION

Mission

The Amtrak OIG's mission is to provide independent, objective oversight of Amtrak's programs and operations through audits and investigations focused on recommending improvements to Amtrak's economy, efficiency, and effectiveness; preventing and detecting fraud, waste, and abuse; and providing Congress, Amtrak management, and Amtrak's Board of Directors with timely information about problems and deficiencies relating to Amtrak's programs and operations.

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