

**REDACTED PURSUANT TO CODE OF VIRGINIA
SECTION 2.2-3705.2(2)&(14) (IT SYSTEMS SECURITY)**

Internal Audit Report on Virtualization of Servers and Data Storage

County of Henrico



*Proud of our progress;
Excited about our future*

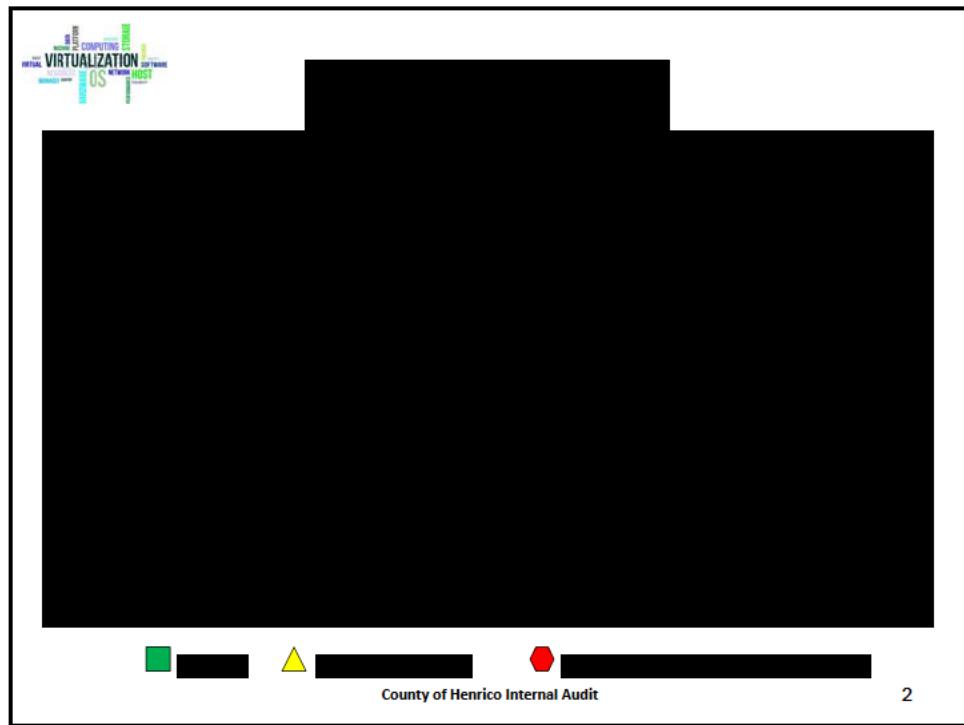
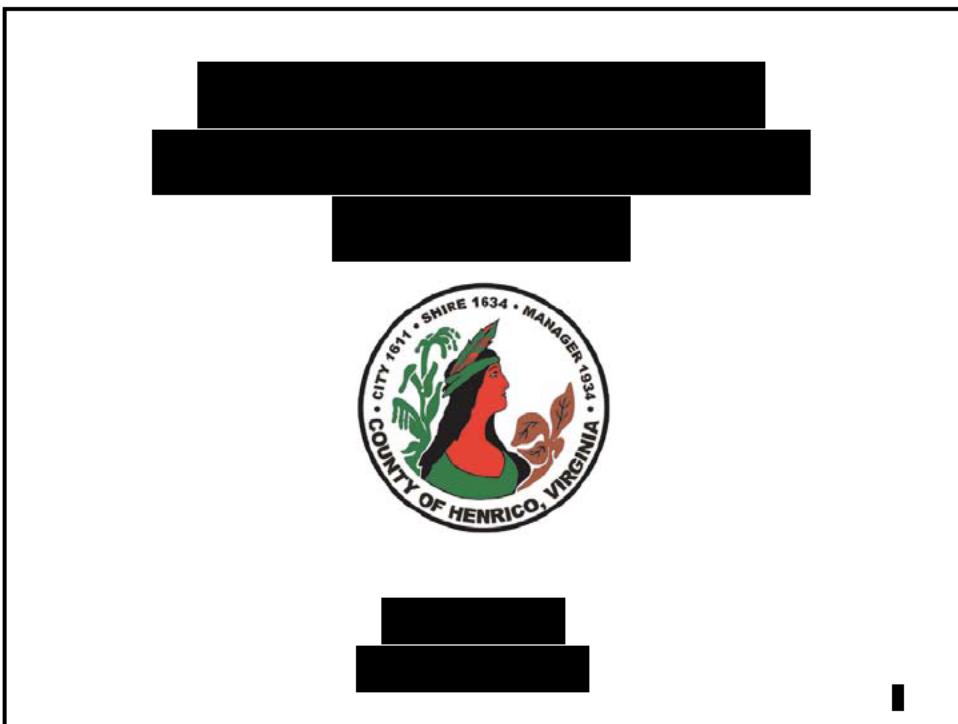
**Internal Audit Report #264
March 30, 2018**

HENRICO COUNTY INTERNAL AUDIT

<http://henrico.us/audit>

4301 EAST PARHAM ROAD

P.O. BOX 90775, HENRICO, VIRGINIA 23273-0775





Contents

- Introduction and Background
- Scope, Internal Controls, and Methodology
- Conclusions on Audit Objectives
- Issues and Management Action Plans
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- Closing and Report Distribution



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Introduction

- IT Auditor III, Sharon Thornton, performed audit work
- Used professional auditing standards
- Examined controls & tested for selective compliance
- All exceptions given to Agency
- Reported control design issues & significant test exceptions only
- Work for same Government we audit



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Virtualization of Servers Background

What is Virtualization of Servers?

Server virtualization software divides a single, physical resource (e.g. a computer server) into numerous, separate virtual resources called virtual machines (VMs).

- These VMs are able to act like separate computers with their own operating systems within one physical device.
- These VMs are connected to a Host which acts as resource manager to enable the sharing of processing power and memory.



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Virtualization of Servers Background

What are the goals/advantages?

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Virtualization of Servers Background

What are some of the risks?

Risks

Infection in one virtual machine can infect data stores that other virtual machines use, spreading infection and compromising additional systems and data.

One virtual machine can be used to “eavesdrop” on another’s traffic.

Cyber-gangs are targeting businesses. Malware creators are now writing code that targets both physical and virtual machines.

Some malware is designed to survive the “tear down” of a non-persistent virtual machine, allowing it to “return” when the virtual machine is re-commissioned.



Virtualization of Servers Statistics





Virtualization of Servers Background

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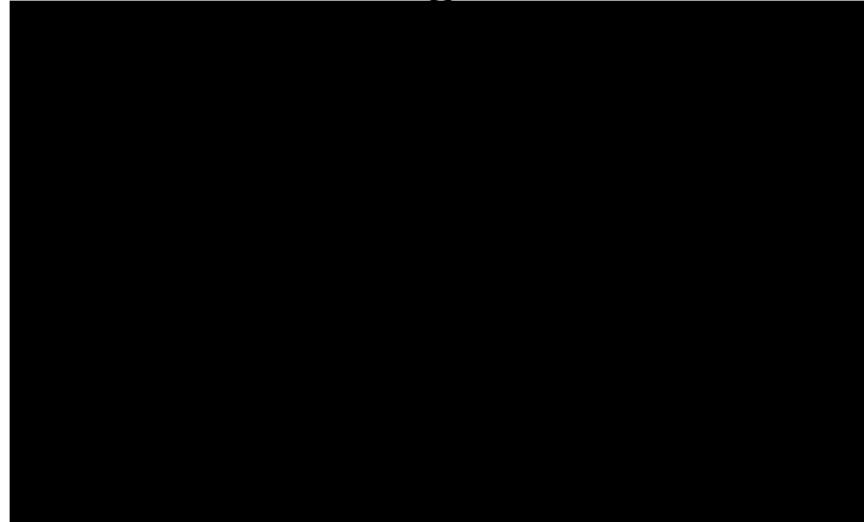
Virtualization of Servers Background

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Virtualization of Servers Background



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Audit Scope

In Scope:

Information Technology

- Virtualization Environment
- Data Storage
- KACE Tickets

Out of Scope:

All other agencies, divisions, departments, systems, and processes



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Internal Controls

Objectives

- Reliability and integrity of information
- Compliance with policies, procedures, laws and regulations
- Safeguarding of assets
- Effectiveness and efficiency of operations



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Internal Controls Cont'd

General Limitations of any Controls

- Errors and irregularities may go undetected
- Inherent limitations in any control structure
- Limitations include resource constraints, legislative restrictions, etc.
- Projection to future subject to risk of change in effectiveness
- Compliance may deteriorate



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Audit Methodology

1. Evaluated applicable regulations, policies and procedures and sample tested for compliance
2. Performed walkthroughs to obtain an understanding of the virtual environment and processes
3. Validated processes through observations, sample testing and securing evidence



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Conclusions on Audit Objectives

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Issues

1. Evaluate Antivirus Product Used in Virtual Environment
2. Retain Log File Support for Reviews of Security/Hardening Configurations
3. Document Procedures for Certain Virtual Environment Changes

Other Observation

OO1. Formalize IT Policies Related to Virtualization

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Issue 1

Evaluate Antivirus Product
Used in Virtual Environment



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Issue 1

Condition

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Issue 1

Cause



Criteria

ISACA's COBIT 5, A Business Framework for the Governance and Management of Enterprise IT, Manage Suppliers includes best practices:

- (1) Formalize and manage the supplier relationship for each supplier and ensure that new or changed contracts conform to enterprise standard and legal and regulatory requirements.
- (2) Identify and manage risk relating to suppliers' ability to continually provide secure, efficient and effective service delivery.

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Issue 1

Recommendation

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Issue 1

Management Action Plan

the first time in the history of the world, the people of the United States have been called upon to determine whether they will submit to the law of force, and give up the right of self-government, and become a part of the empire of a foreign nation. We have done so, and we shall not submit any longer. We are a free people, and we shall be free, or die in the attempt to maintain our freedom.

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Issue 2

Retain Log File Support for Reviews of Security/Hardening Configurations



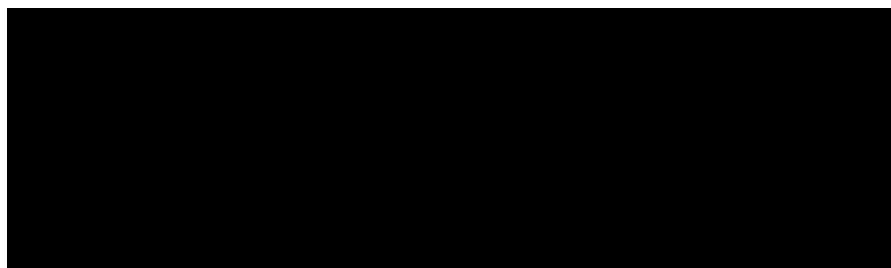
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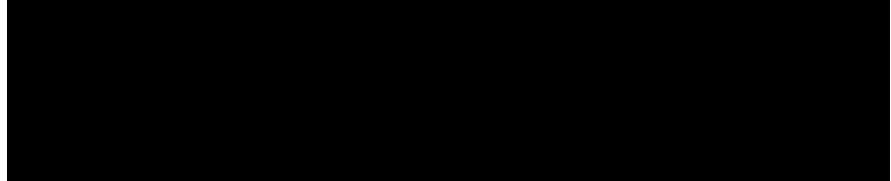


Issue 2

Condition



Effect



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Issue 2

Cause

Criteria

ISACA's COBIT 5, A Business Framework for the Governance and Management of Enterprise IT, Manage Configurations includes best practices to:

- define and produce configuration reports on status changes of configuration items
- periodically review configuration repository and verify completeness and correctness against a desired target.

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Issue 2

Recommendation

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Issue 2

Management Action Plan

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Issue 3

Document Procedures for Certain Virtual Environment Changes



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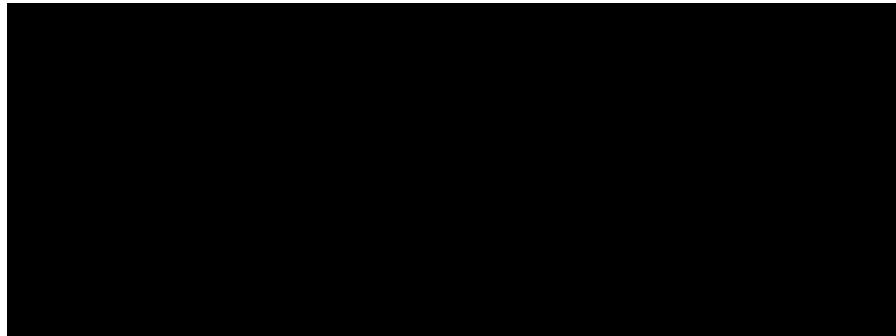
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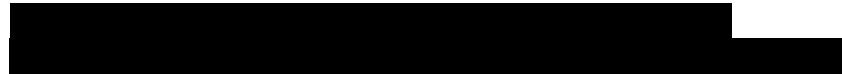


Issue 3

Condition



Effect



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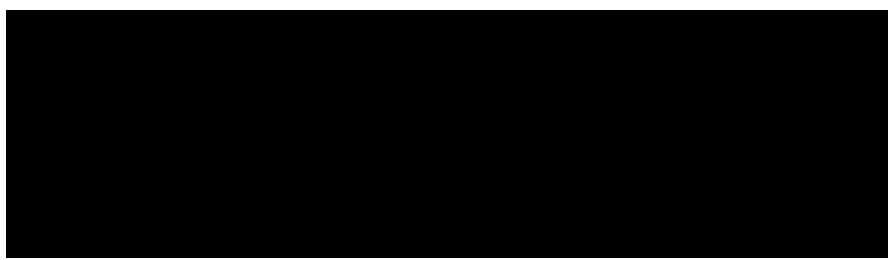


Issue 3

Cause



Criteria



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Issue 3

Recommendation

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Issue 3

Management Action Plan

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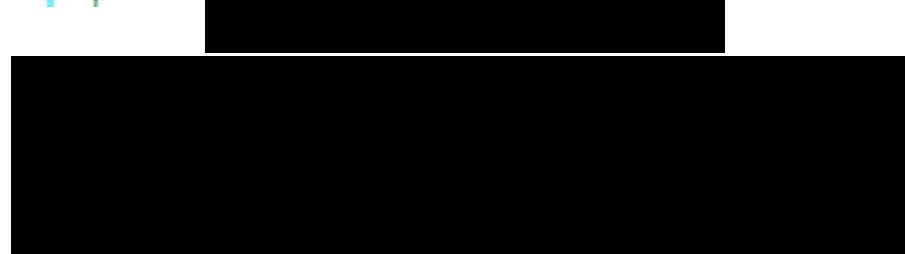


Other Observation

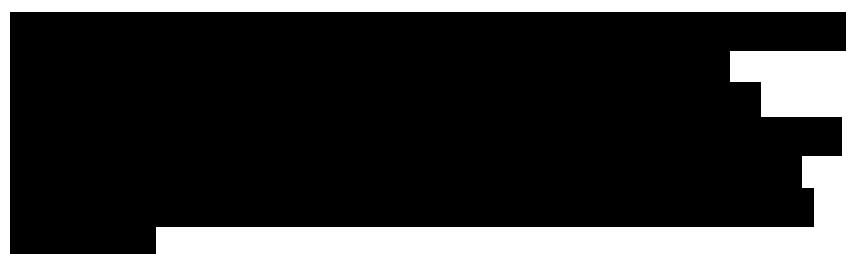
The following slides include an additional observation noted during our audit which was considered less critical in reaching our conclusions on the audit objectives.



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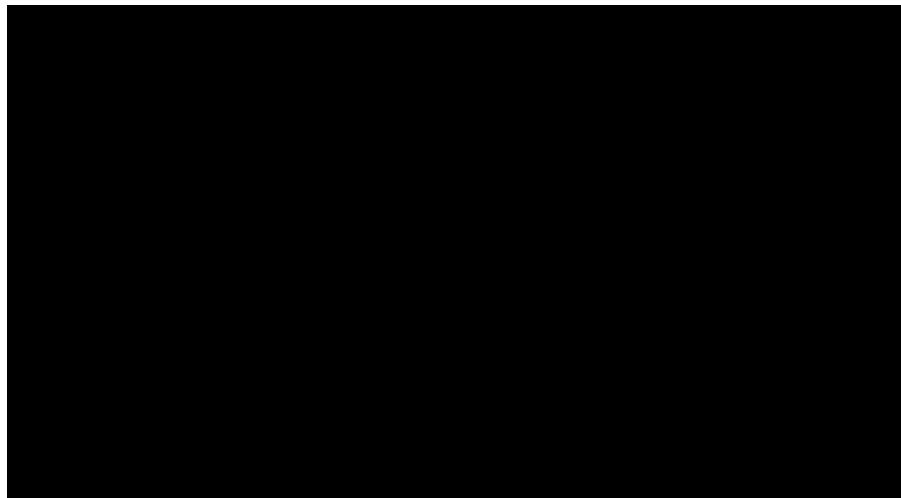
Recommendation





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Management Action Plan



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Implementation of a Control Improvement during the Audit



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Closing

- Appreciate Agency's cooperation
- Follow up on open Action Plans will be performed as completion dates are reached or after sufficient time has passed to ensure the actions are effective and on-going.



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Report Distribution

Audit Committee (Mrs. O'Bannon, Mr. Thornton, County Manager)	Board of Supervisors, Non-Committee Members
Deputy County Manager for Administration	Director of Information Technology
Internal Audit Staff	

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