

Managing The Insider Threat: What Every Organization Should Know

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Best Practices and Controls for Mitigating Insider Threats



George Silowash
Team Member, Technical Solutions

- Digital Forensic Investigations & Incident Response
- Information Assurance Risk Management
- Open Source Solutions



Alex Nicoll
Team Lead, Technical Solutions

- Information Assurance
- Operating System Design
- High Assurance Systems (MLS)



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Agenda

- Introduction
- Common Sense Guide to Mitigating Insider Threats, 4th Edition
 - 19 Best Practices
- Technical Demonstration(s)



CERT Insider Threat Center—Mission

Assist organizations in identifying indications and warnings of insider threat by

- performing vulnerability assessments
- assisting in the design and implementation of policies, practices, and technical solutions

based on our ongoing research of hundreds of actual cases of insider IT sabotage, theft of intellectual property, fraud, and espionage



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Definition of Insider Threat

The CERT Program's definition of a malicious insider is a current or former employee, contractor, or business partner who meets the following criteria:

- has or had authorized access to an organization's network, system, or data
- has intentionally exceeded or intentionally used that access in a manner that negatively affected the confidentiality, integrity, or availability of the organization's information or information systems



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Methods

- Research
- Empirical Evidence
- Control Hypothesis
- Control Implementation and Testing
- Control Pilot
- Revisions
- Release



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Common Sense Guide to Mitigating Insider Threats, 4th Edition



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Who does the CSG apply to?

- Information Technology / IT Security
- Physical Security
- Software Engineering
- Data Owners
- Legal
- Human Resources
-everyone across the organization



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New Features

- Mappings to other best practices / standards
 - NIST 800-53
 - ISO 27002
 - CERT RMM
- Quick wins & High Impact Solutions
- Quick reference guide



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Practices you are familiar with

Consider threats from insiders and business partners in enterprise-wide risk assessments.

Clearly document and consistently enforce policies and controls.

Institute periodic security awareness training for all employees.

Monitor and respond to suspicious or disruptive behavior, beginning with the hiring process.

Anticipate and manage negative workplace issues.

Track and secure the physical environment.

Implement strict password and account management policies and practices.

Enforce separation of duties and least privilege.

Consider insider threats in the software development life cycle.

Use extra caution with system administrators and technical or privileged users.

Implement system change controls.

Log, monitor, and audit employee online actions.

Use layered defense against remote attacks.

Deactivate computer access following termination.

Implement secure backup and recovery processes.

Develop an insider incident response plan.



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New Best Practices

- Practice 9: Define explicit security agreements for any cloud services, especially access restrictions and monitoring capabilities.
- Practice 16: Develop a formalized insider threat program.
- Practice 17: Establish a baseline of normal network device behavior.
- Practice 18: Be especially vigilant of emerging social media trends.
- Practice 19: Close the doors to unauthorized data exfiltration.



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Practice 9

Define explicit security agreements for any cloud services, especially access restrictions and monitoring capabilities.

- Conduct a Risk Assessment before entering into any agreement.
- Choose a cloud service provider that meets or exceeds the organization's own levels of security.
- Understand how the cloud provider protect data and other assets.



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Practice 16

Develop a formalized insider threat program.

- Work with Legal Counsel.
- Requires involvement from various departments across the organization.
- Share information.

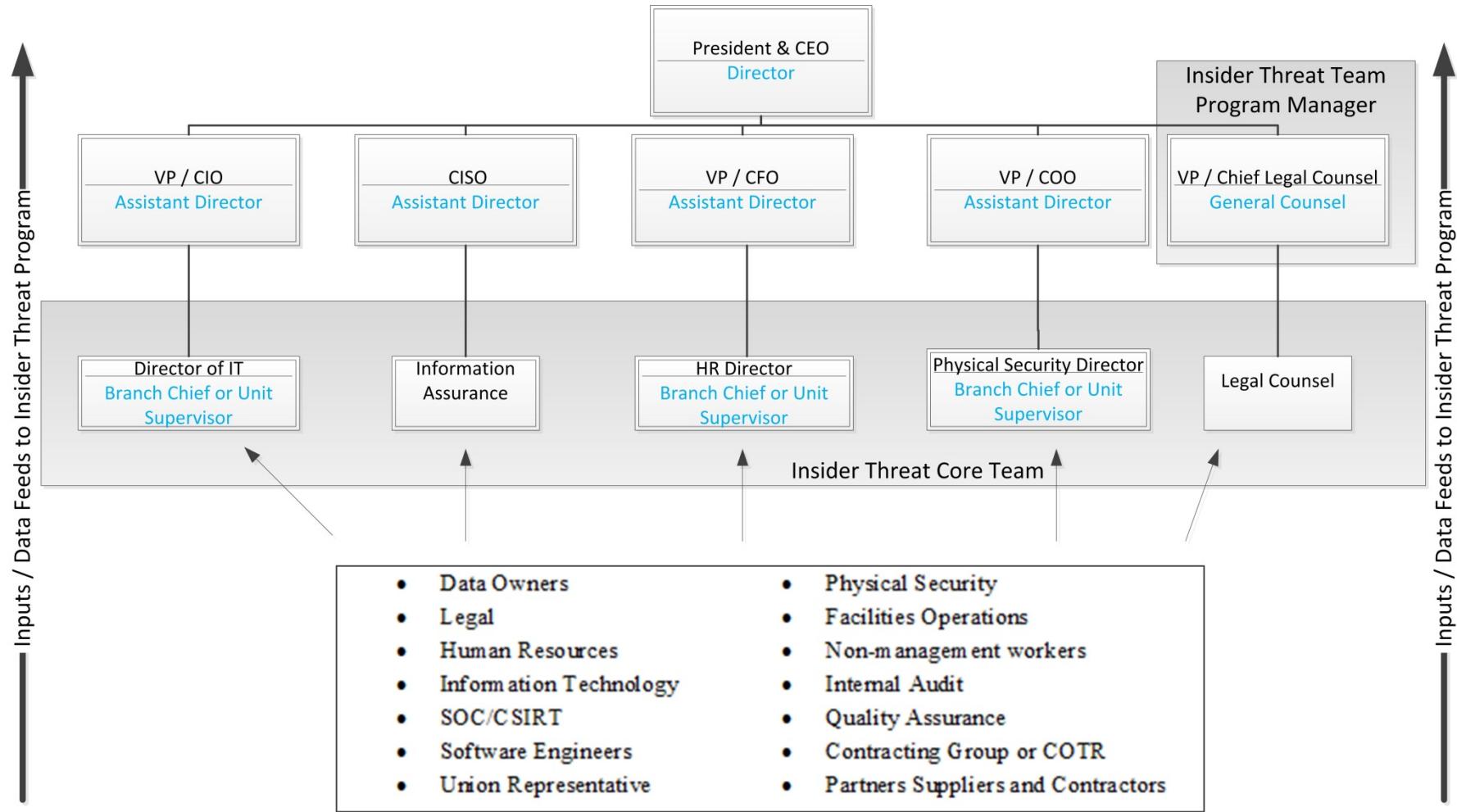


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Insider Threat Team



Note: Text below the separator in each box notes the federal government's equivalent position

Practice 17

Establish a baseline of normal network device behavior.

- Know what is normal and abnormal for a given system.
- Excessive traffic, Insufficient traffic
- Store logs for 60 days or longer



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Practice 18

Be especially vigilant regarding social media.

- Train users to be aware of what they post
- Small disclosures of information can create bigger problems
- Develop a social media policy



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Practice 19

Close the doors to unauthorized data exfiltration.

- Understand how data can leave the organization.
- Control removable media.
- Watch for “old school” methods: printers, copiers, etc.



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Technical Controls: Preventing Data Exfiltration



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The Problem

- Organizations need to use web based services on a daily basis for business needs. However, services that offer the ability to upload attachments present an opportunity for sensitive data to leave the organization.
- Communications that are secured with SSL encryption are difficult to inspect and therefore it is difficult to detect and prevent sensitive data from leaving the organization.



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Data Loss Through the Web

Difficult problem

Perfect exfiltration channel

- Encrypted
- Appears “normal”
- Send many files at once
- Possibly essential to operations



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What can be done to prevent this?

Options:

1. Implement policies regarding how sensitive information is disseminated
2. Full packet capture of all Internet traffic for further analysis
3. White listing
4. Block all webmail services
5. Allow all webmail services and cross your fingers
6. Or...



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CERT's Solution

- Allow proxied Internet access to any website
- Inspect encrypted communication sessions for sensitive documents
- Block sensitive attachments from being uploaded to the Internet



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Blocking Documents

Documents can be stopped based on three methods:

1. Block all attachments
2. Keywords
3. Tags



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The Proxy Server

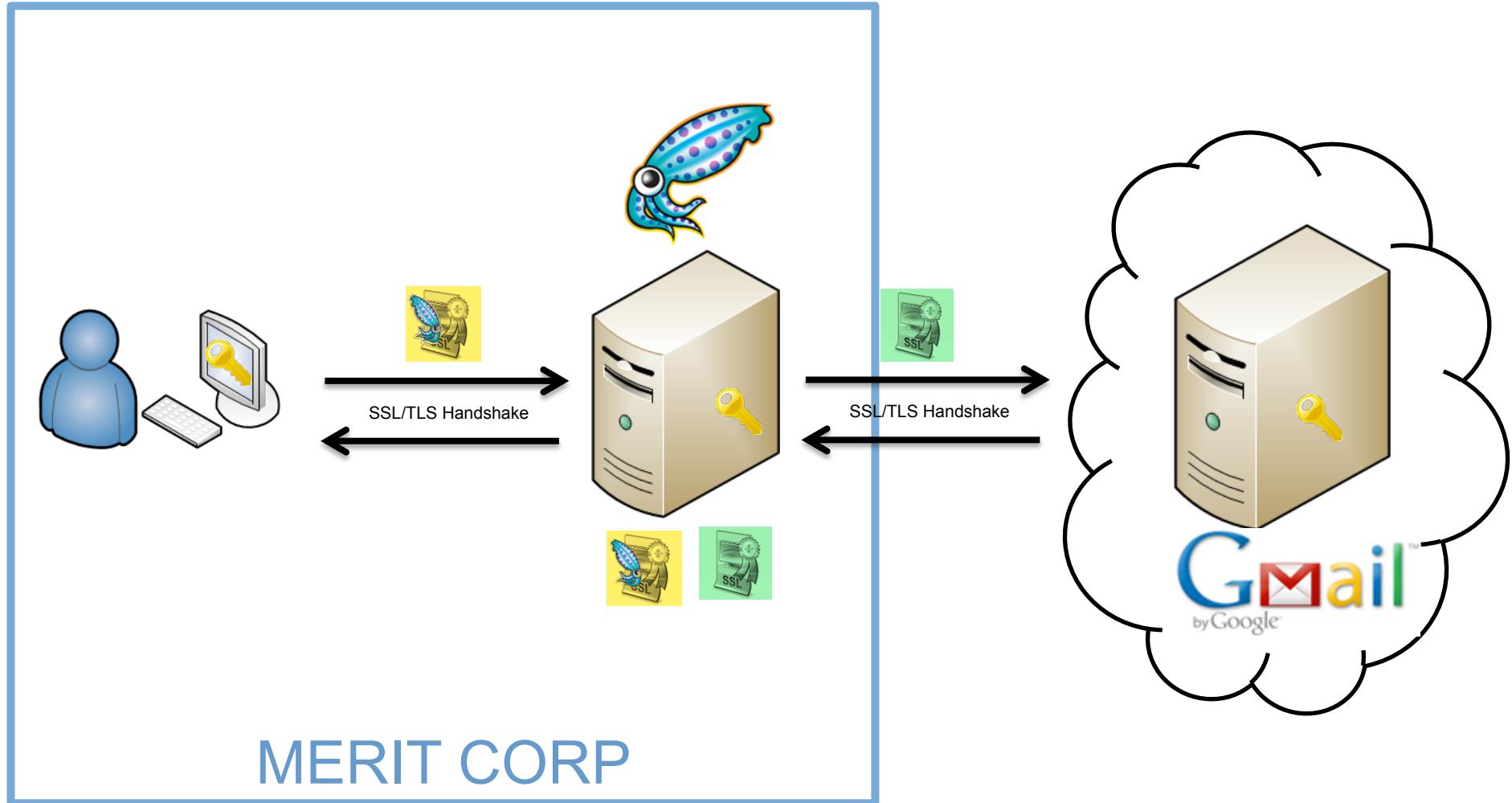


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Man-in-the-Middle (MITM) Proxy



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The Proxy Server Main Components

- Ubuntu Linux Version 10.04 LTS
- Squid Version 3.1.19
- C-ICAP
- Clam Antivirus (ClamAV)



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Client Configuration

- The Organization's Certificate needs installed in the Trusted Root Certificate Store on each client
- Internet Explorer needs to be configured to use the proxy on port 3128 for HTTP/S traffic

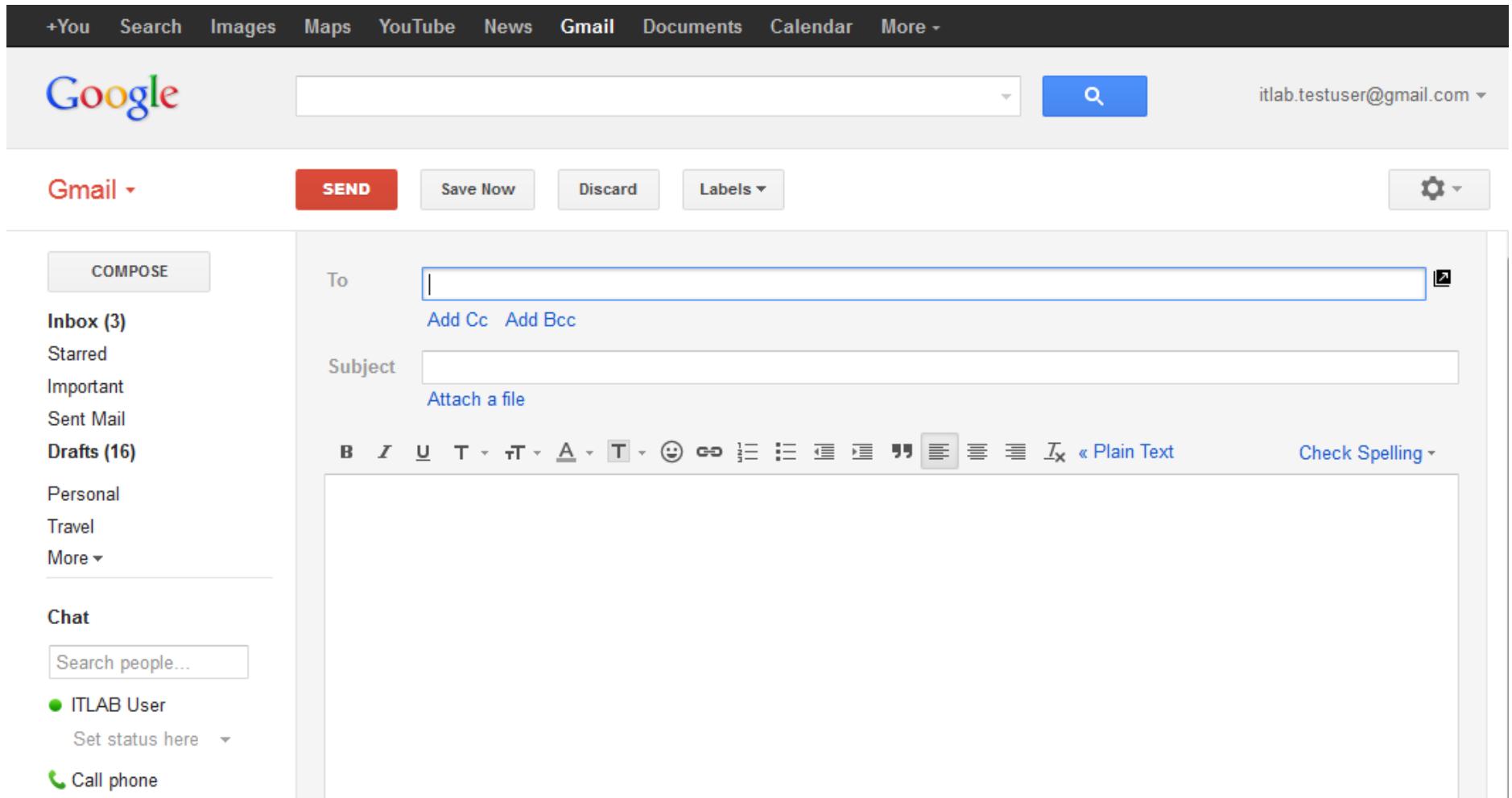
Both of these settings can be configured using
Group Policy



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Google itlab.testuser@gmail.com ▾

Gmail ▾ Draft autosaved at 12:49 PM (0 minutes ago)

COMPOSE

To

Add Cc Add Bcc

Subject

B **I** **U** **T** **rt** **A** **T** **Smiley** **Go** **File** **Print** **Help** **Plain Text** **Check Spelling ▾**

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Compose

Inbox (3)

Starred

Important

Sent Mail

Drafts (17)

Personal

Travel

More ▾

Chat

Search people...

ITLAB User

Set status here ▾

Call phone

SEND

Saved

To: someuser@co...

Add Cc Add Bcc

Subject: [Attach a file](#)

B I U T T

Here's the documents you...

Sincerely,
Joe User

Select file(s) to upload by mail.google.com

Look in: Intellectual Property

Name	Date modified	Type
Business Plans - FY2012	3/21/2012 12:52 PM	Microsoft

Recent Places

Desktop

Libraries

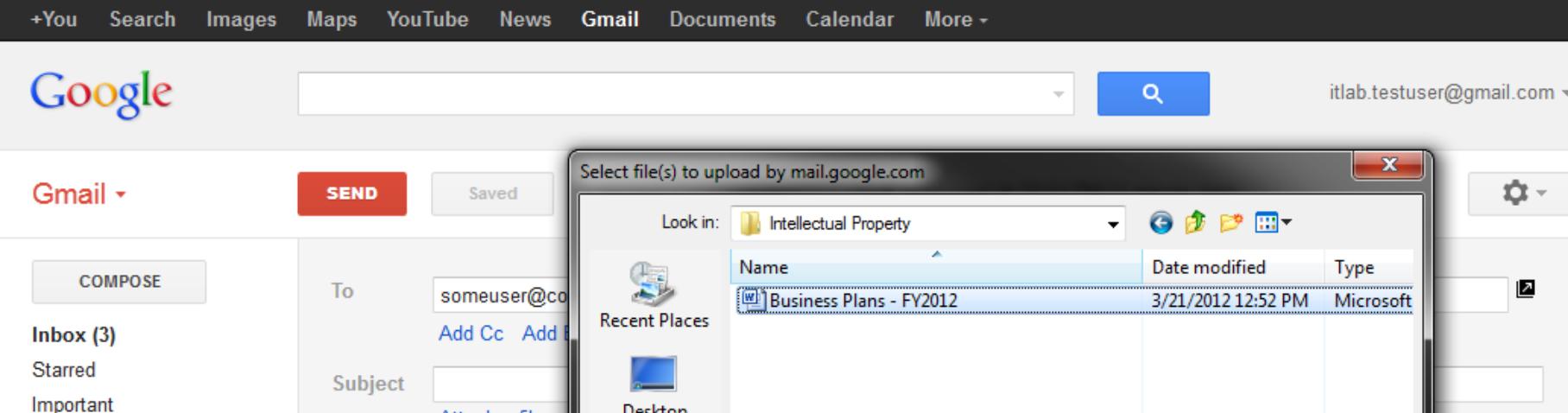
Computer

Network

File name: Business Plans - FY2012

Files of type: All Files (*.*)

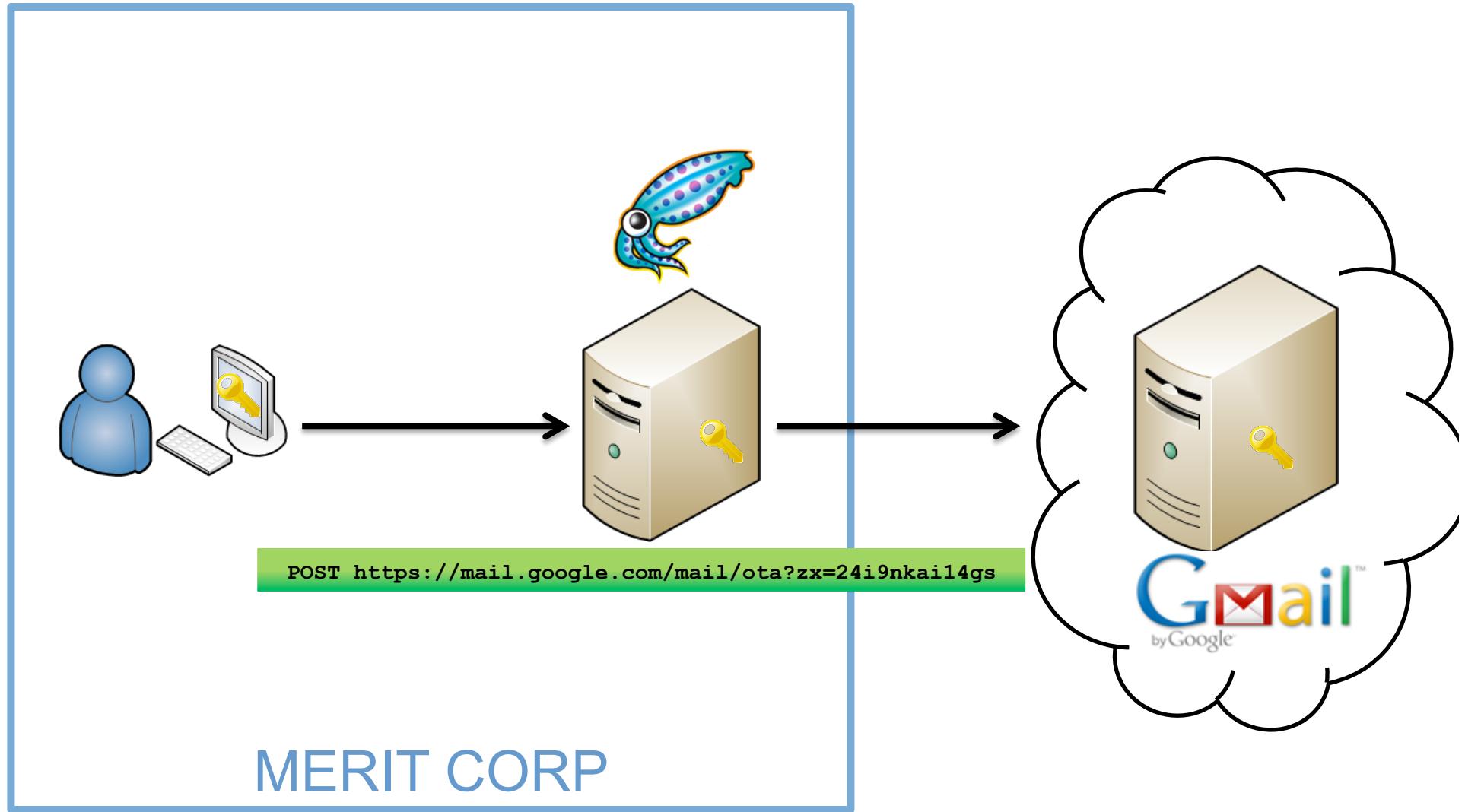
Open Cancel



URL	Status	Domain	Size	Remote IP	Timeline
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Man-in-the-Middle (MITM) Proxy



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Squid's HTTP Request Logging

```
image/gif
1331070430.915 101 10.0.3.100 TCP_MISS/200 491 GET https://mail.google.com/mail/images/c.gif? - DIRECT/74.125.225.86 image/gif
1331070432.096 160 10.0.3.100 TCP_MISS/200 502 POST https://mail.google.com/mail/ota? - DIRECT/74.125.225.86 text/plain
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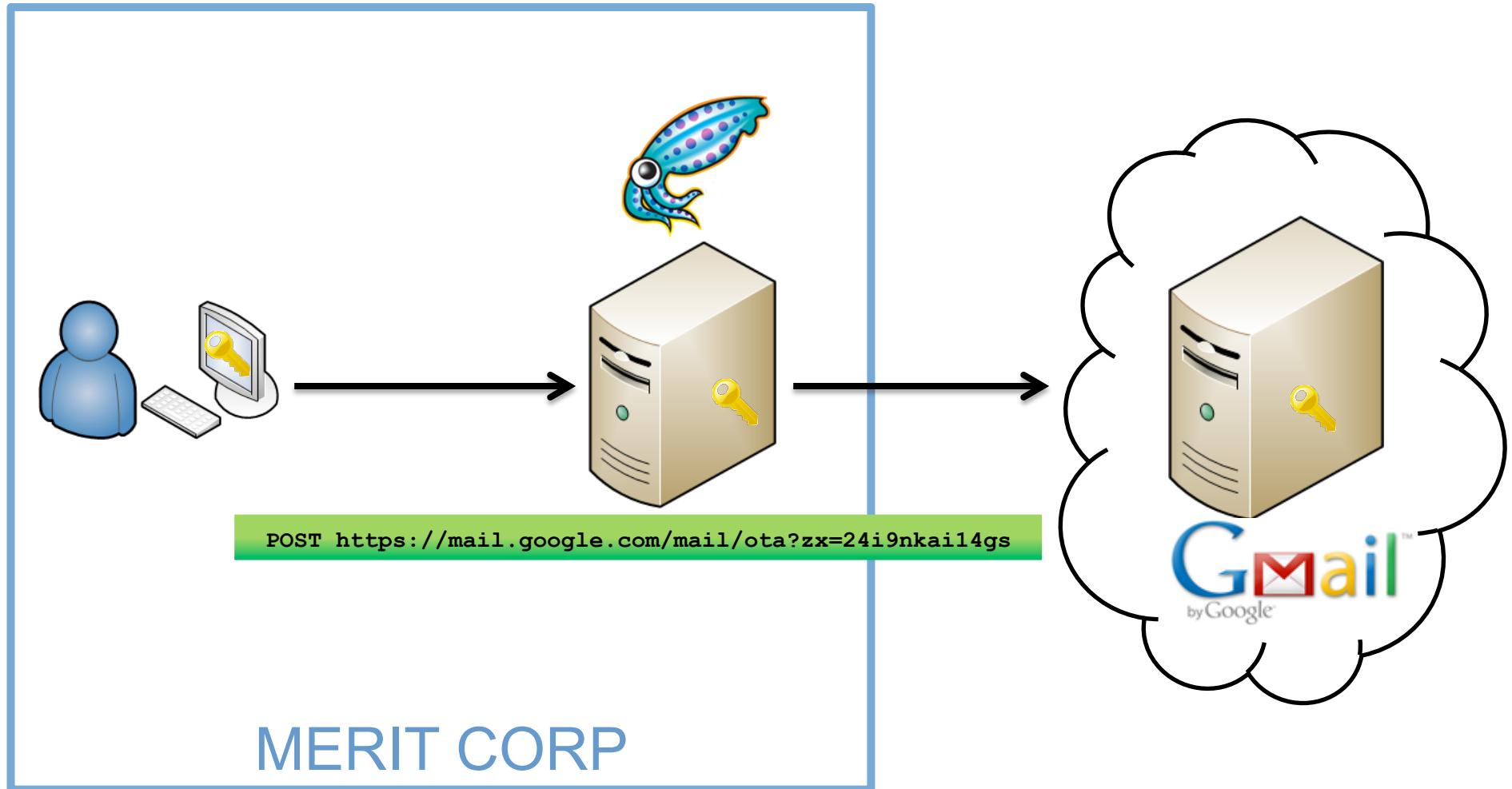


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Man-in-the-Middle (MITM) Proxy



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RegEx: mail.google.com/mail/ota*

```
POST https://mail.google.com/mail/ota?zx=24i9nkai14gs
```



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Success!

+You Search Images Maps YouTube News Gmail Documents Calendar More ▾

[\[REDACTED\]](#) [\[REDACTED\]](#)

Gmail ▾ [SEND](#) [Save Now](#) [Discard](#) [Labels](#) Draft autosaved at 10:10 AM (0 minutes ago)

[COMPOSE](#)

Inbox (3)
Starred
Important
Sent Mail
Drafts (21)
Personal
Travel
More

Chat

Search people...

ITLAB User [Try now](#)

To someuser@competitor.com
[Add Cc](#) [Add Bcc](#)

Subject [\[REDACTED\]](#)

Business Plans - FY2012.docx 10.00K - **Attachment failed.** [Retry](#) [Remove](#) [Help](#)
[Attach another file](#)

[« Plain Text](#)

Here's the documents you wanted. Now hire me!

Sincerely,
Joe User

Shortcomings

- Not very granular
- Doesn't account for the scenario where text is copied and pasted into an email



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Detection using ClamAV

testSig:0:*

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Detection using ClamAV

klasjdfho9w38ryi3ubsdkvjlaw3oy5423uihtgi
eaufsdlairst8230895r82375g2389q7r834789hf
kld3938fnf- ;
;33437383968666b
0C043339338000E000ZAI



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Detection using ClamAV

Document1 - Microsoft Word

File Home Insert Page Layout References Mailings Review View Acrobat

Save Save As Save as Adobe PDF Open Close

Info

Recent New Print Save & Send Help Options Exit

Information about Document1

Permissions

Anyone can open, copy, and change any part of this document.

Protect Document

Prepare for Sharing

Before sharing this file, be aware that it contains:

- Document properties and author's name

Check for Issues

Versions

There are no previous versions of this file.

Manage Versions

Properties

Size	Not saved yet
Pages	1
Words	0
Total Editing Time	0 Minutes
Title	Add a title
Tags	Add a tag
Comments	klasjdfh09w38yj3...
Template	Normal
Status	Add text
Categories	Add a category
Subject	Specify the subject
Hyperlink Base	Add text
Company	Software Engineer...

Related Dates

Last Modified	Never
Created	Today, 10:23 AM
Last Printed	Never

Related People

Manager	Specify the manager
Author	<input checked="" type="checkbox"/> Todd B. Lewellen Add an author



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Plagiarism Detection & DLP



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Solution:

- What if we could inspect all text flowing through the network?
- Rather than look for ‘tags’ or keywords, look for *similarity*
- How do we test document similarity?
- **Cosine similarity algorithms**
 - Laymen’s terms: Plagiarism Detection
 - Even though we’re not checking for plagiarism in academic papers, the process is virtually identical



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The Plagiarism Detection Method

- Rather than asking
 - “Does any text in this document sufficiently match anything within its cited references?”
- We’re asking
 - “Does any text in this outgoing network traffic sufficiently match anything within our repository of intellectual property?”
 - **If not** – send it through
 - **If so** – create an alert *and/or* actively block the traffic from leaving the organization’s perimeter

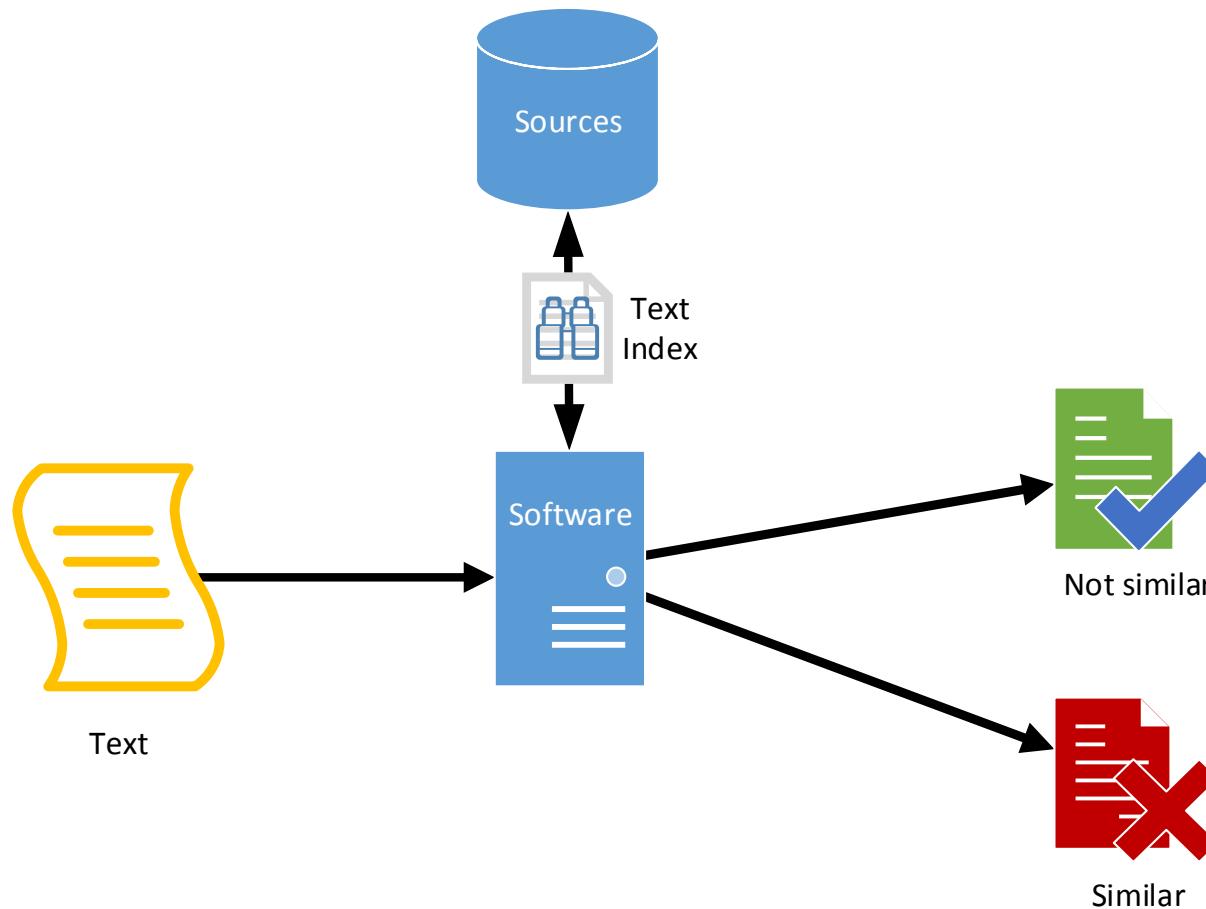


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Plagiarism Detection

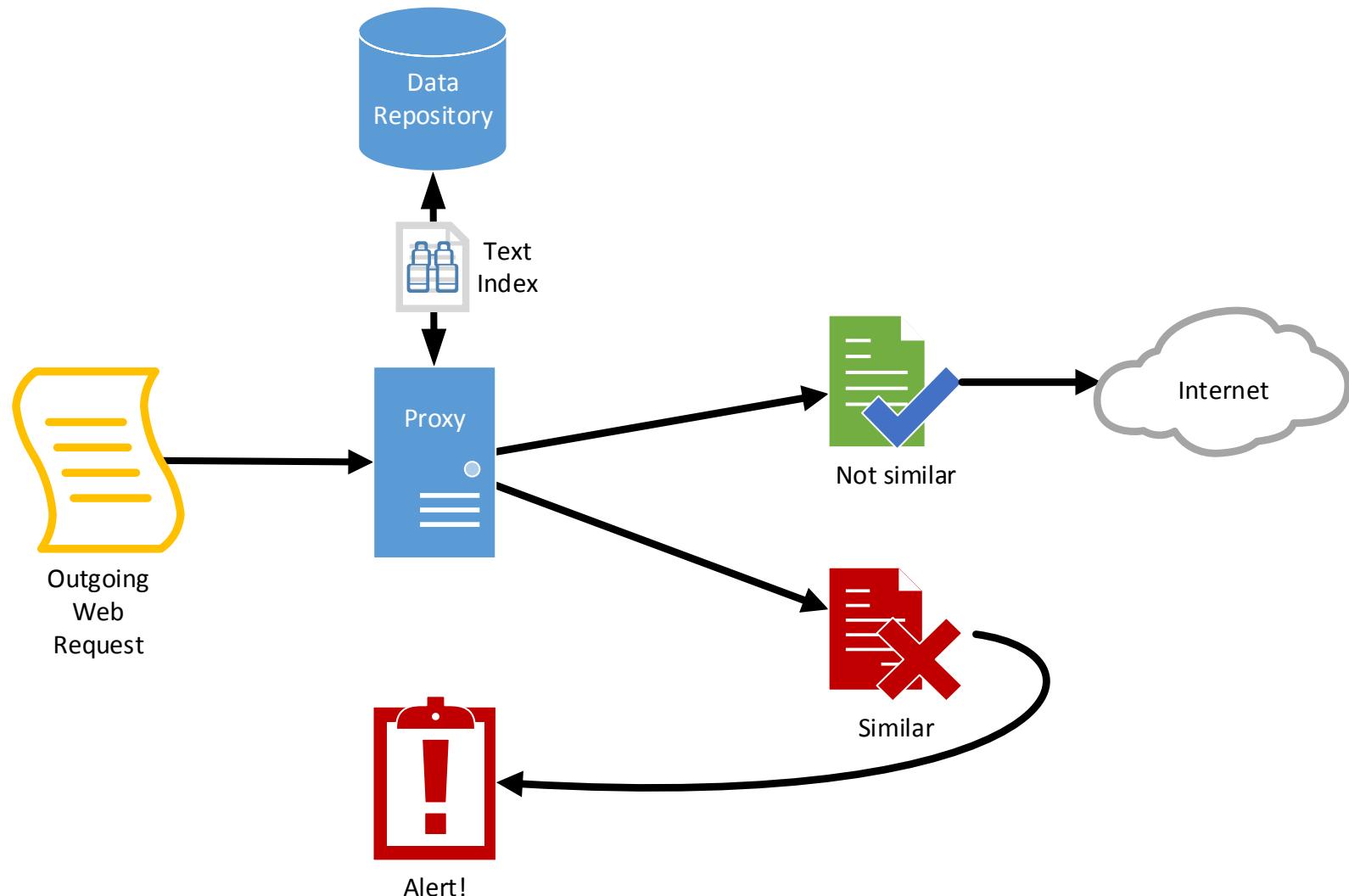


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Plagiarism Detection in DLP



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Open Source Tools

- Squid proxy server
- Apache Lucene
- Apache Tika
- GreasySpoon ICAP server



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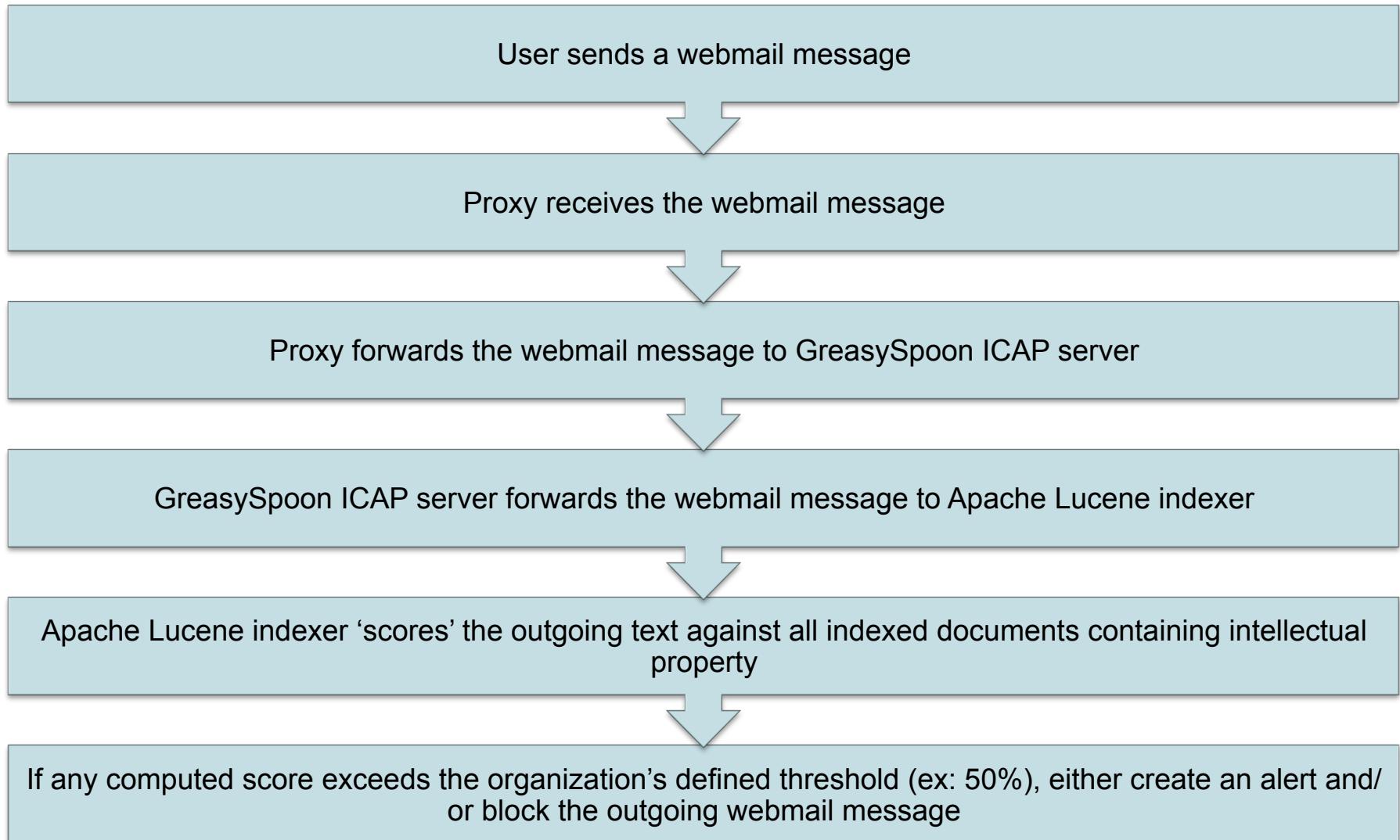
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Apache Lucene

- Powerful open-source text indexer and search engine
- Used in IBM's famous Watson AI system
- Scalable, fast, and mature
- Perfect for our needs



Order of Events



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Shortcomings

- Tuning the threshold is difficult
- Does not detect encodings other than ASCII or Unicode
- Processing intensive
- Large index (lots of duplicated data)
- Index contains sensitive information



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Future Work

- Create an efficient open-source DLP framework for correlating any given input data with any set of data, regardless of their type (i.e. text, image, raw)
- Tagging network traffic with usernames and other attribution information
- Improving our “Tagger” tool to automatically store file usage information within documents when they are created/accessible/modified



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Upcoming Control Topics

- Two Man Control For Operating Systems
 - Why is it so hard?
- Better Forensics for Insider Threat Indicators
 - How to use what we know more effectively



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Point of Contact

Randy Trzeciak
Technical Manager, CERT Insider Threat

CERT Division
Software Engineering Institute
Carnegie Mellon University
4500 Fifth Avenue
Pittsburgh, PA 15213-3890
+1 412 268-7040 – Phone
rft@cert.org – Email

http://www.cert.org/insider_threat/



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