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INCIDENT RESPONSE IN THE CLOUD

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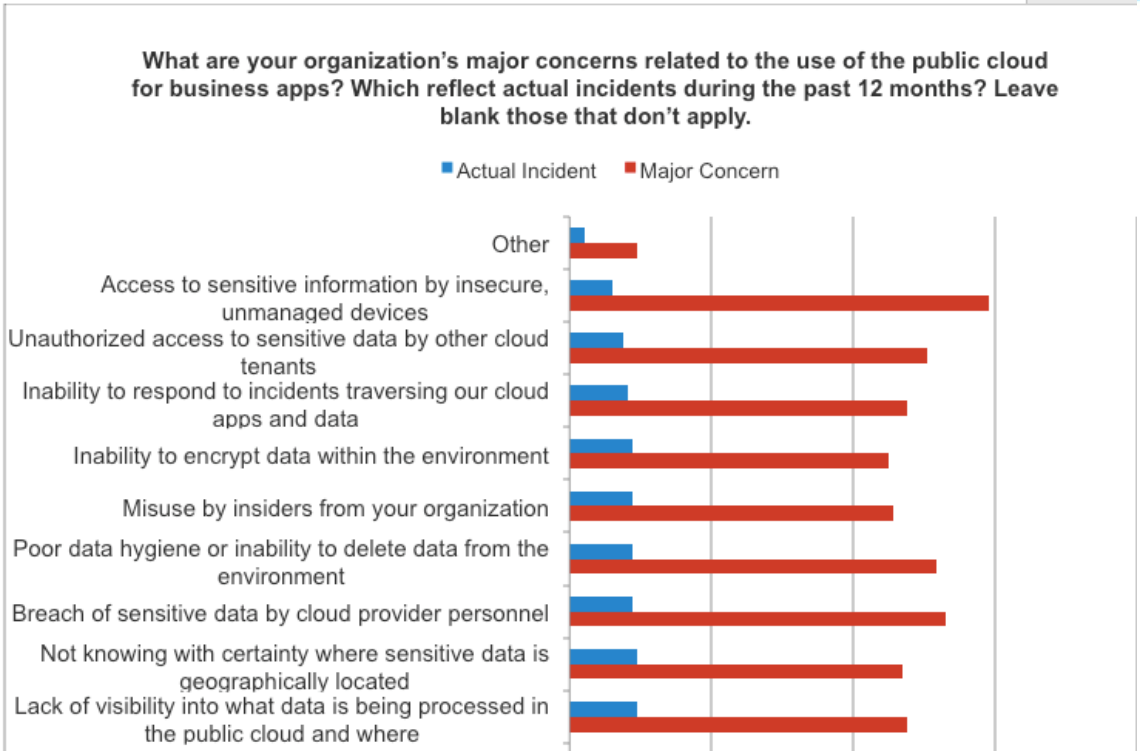
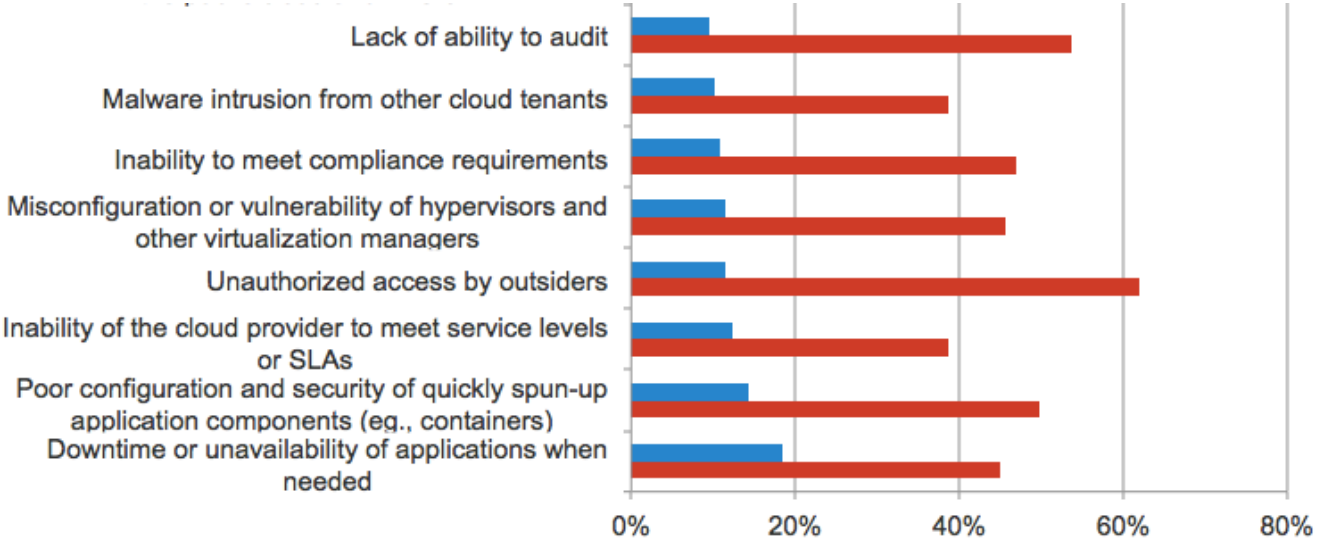
Top Cloud Threats/Concerns: 1



Source: SANS 2017 Cloud Security Survey

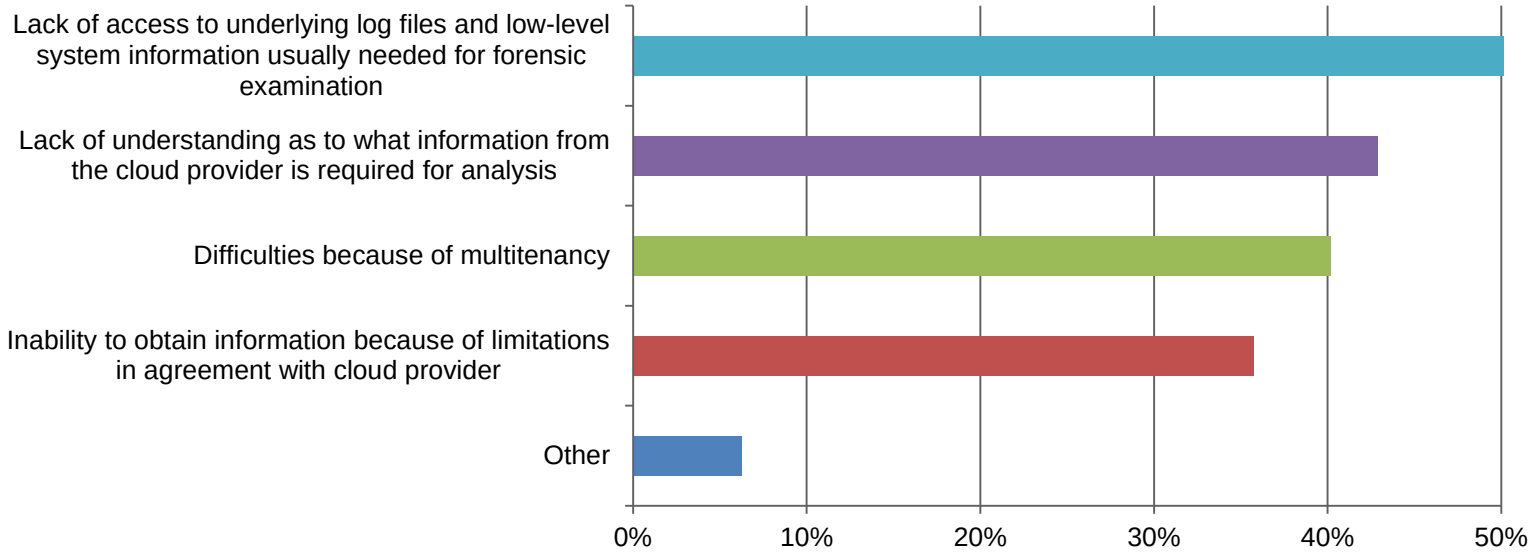
Top Cloud Threats/Concerns: 2



Source: SANS 2017 Cloud Security Survey

Cloud IR: Tough Problems

What challenges have you faced in adapting your incident response and forensic analysis to the cloud? Select all that apply.



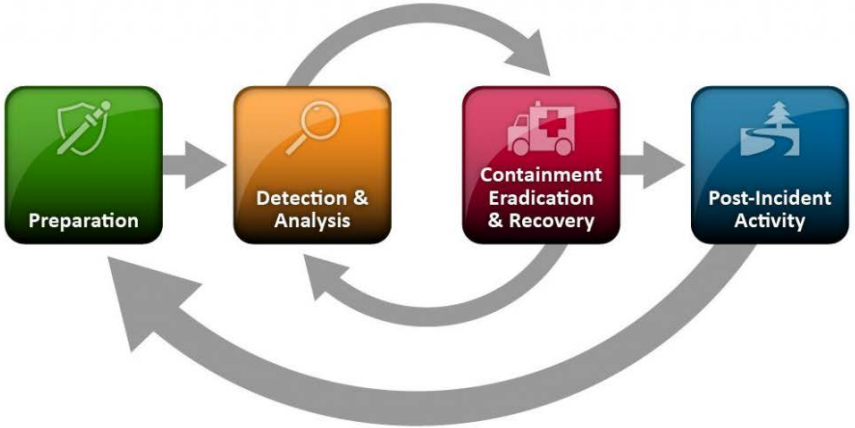
Source: SANS 2017 Cloud Security Survey

Why Is This So Tough?

- Cloud incident detection and response feels challenging for a few reasons:
  - Lack of visibility
  - Lack of event data
  - Lack of access to evidence
  - Missing controls and processes
  - Skills gaps

Updating Our IR Phases

- The news isn't all doom and gloom, fortunately
- There are many ways we can improve our detection and IR capabilities in the cloud today
- We'll follow the classic NIST 800-61R2 phases for our model



PREPARATION

Gather Info from Providers

- Evidence from CSPs and timeframes (SLAs)
- Do they have contacts in law enforcement?
- Can customers participate in IR and forensics investigations?
- What data retention/disposal lifecycles exist?
- What skills do CSP IR/forensics teams have?

More Info We Need from Providers

- What processes are in place for IR of virtual infrastructure?
- How are impacts to tenants minimized?
- How is network monitoring/tracking implemented?
- How do CSPs allow law enforcement access?

Planning for Cloud IR

- First, ensure you have IAM enabled for response teams when needed
  - Create least privilege accounts to perform specific actions in the cloud when needed (define a role for these, ideally, for “cross-account access”)
  - Enable MFA for these accounts
- Enable write-once storage for logs, evidence
  - Leverage S3 Bucket Versioning for secure retention
- Enable cloud-wide logging if available

Planning for Cloud IR (2)

- Create a new Security Group (AWS) or NSG (Azure) that only allows:
  - Inbound connections from responders
  - Outbound connections if absolutely necessary
  - You can adjust as needed
- Enable triggered metric-based alarms (AWS CloudWatch, for example)

DETECTION & ANALYSIS

What can we get from providers?

- What data types (evidence) can you get from providers?
  - Webserver logs
  - Application server logs
  - Database logs
  - Virtual Machine guest operating system logs
  - Virtualization hypervisor host access logs
  - Virtualization management platform logs and SaaS portal logs
  - Network captures
  - Billing records
  - Management portal logs
  - API logs
  - Cloud or network provider perimeter network logs
  - Logs from DNS servers

SaaS Incident Detection

- Some SaaS providers may agree to share the log and audit trail data with customers
  - Many, however, will not
- This leads to two scenarios:
  - Log data from the SaaS CSP triggers an incident response scenario internally using SIEM, Log Management, etc.
  - The CSP's internal incident response process is triggered, and they notify the consumer within some pre-specified SLA-defined period
- CASB solutions can also help with this

IaaS Incident Detection

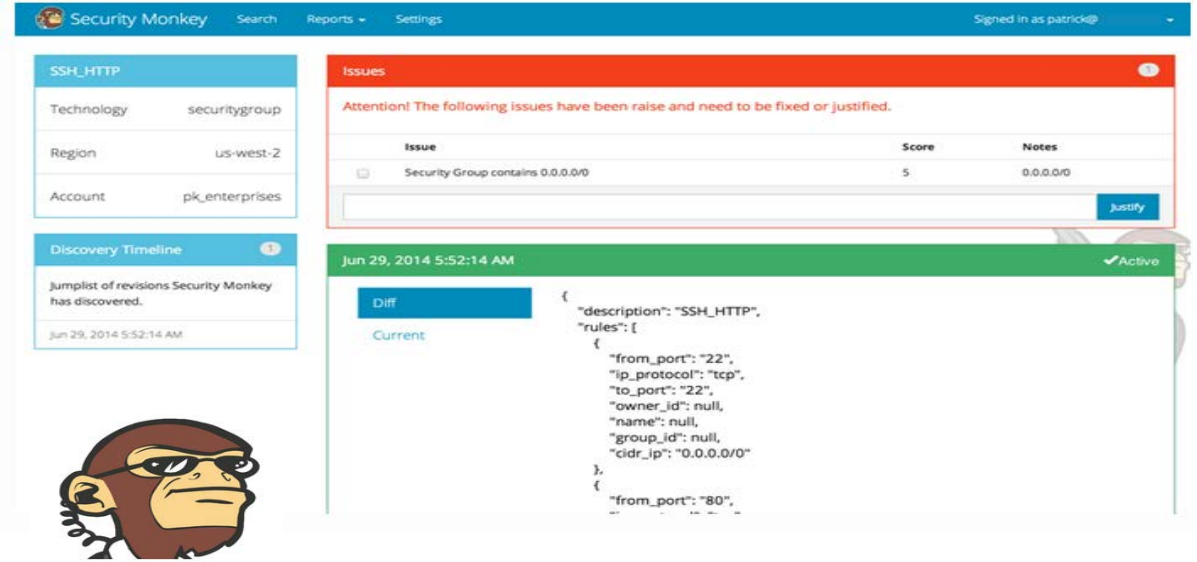
- There are two definitive elements of IaaS incident detection and response:
  - CSP Incident Response: This applies to backend storage, networks, servers, and virtualization infrastructure only
  - Consumer Incident Response: All consumer VMs and associated virtual networks should produce logs identical to internal events
- One advantage of the IaaS model is the ability to include security platforms in the CSP infrastructure
- Many IaaS providers like Amazon allow virtual appliances or other security-specific systems to be installed and managed by the consumer
- Some IaaS providers also provide a suite of security services as well

Example Controls: AWS CloudTrail

- CloudTrail is a logging service that records any API calls made to AWS:
  - Identity of the API caller
  - Time of the API call
  - Source IP address of the API caller
  - Request parameters
  - Response elements returned by the AWS service
- CloudTrail logging captures all requests made from the standard AWS management console, command line tools, any AWS Software Development Kits (SDKs) and other AWS services

Example Controls: Security Monkey

- Security Monkey is a monitoring tool created by the team at Netflix for monitoring AWS + GCP
- Monitors for changes to user accounts, VM configurations, and much more
- Cloud Custodian and Prowler are also great assessment tools



What Events/Indicators to Look For?

- There are many types of events and information that can help identify potential incidents in the cloud:
  - Incident notification from your CSP
  - Billing alarms
  - IAM activity (logins in particular)
  - Cloud environment logs (CloudTrail, for example)
  - CloudWatch Alarms (various other metrics)
- Using a hosted or managed logging service can aid in detection of unusual activity significantly

Log Details to Look For

- Suspicious user activity
- Federated user activity on behalf of others
- New resource creation by cloud services
- Specific time ranges that are suspicious
- Specific region activity
- Failed access to resources for user/group
- Skip any “read only” logs—“Get” or “Describe” or “List”
  - These provide little value, aside from “recon”

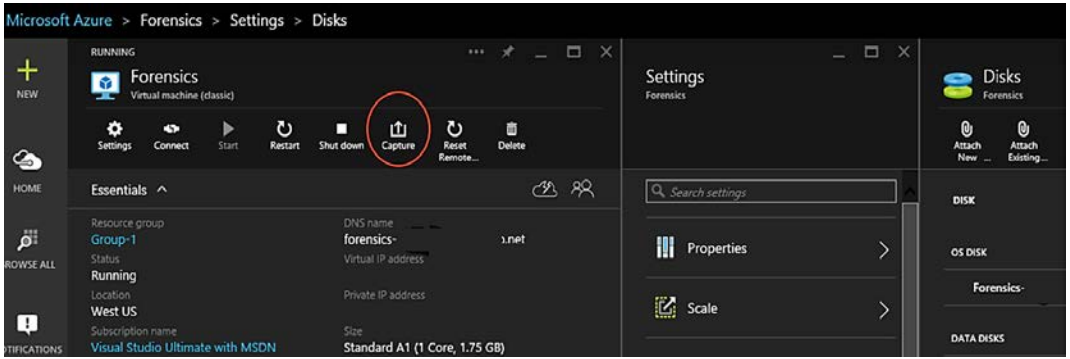
CONTAINMENT/ERADICATION/RECOVERY

Containment

- Apply a tag to assets under investigation
  - This can optionally be done automatically
- Move the affected system to a “quarantine” VPC, OR
- Apply the “quarantine” Security Group/NSG and monitor within the existing VPC/subnet
- Ensure any additional access controls are applied/adjusted as necessary

Planning for Forensics in the Cloud

- Planning for forensics in the cloud can be challenging
- Until recently, there have been very few tools available to help analysts inspect systems and acquire data
- When considering evidence acquisition and analysis, we should look for the following:
  - Network PCAPs for network forensics
  - Instance memory
  - Instance disk
  - Logs and other event data



Evidence Capture

- Capturing disk in a running instance is getting easier to do
  - In EC2, you perform a snapshot capture of EBS, then attach to a forensic workstation
  - In Azure, you can capture IaaS OS and Data drives directly from the portal
- Capturing memory in a shared environment will require some form of capture on a per-instance basis
- In other words, running memory of instances will need to be acquired with separate tools (remote or local)
  - Tools like Margarita Shotgun can help do this

Building a SANS SIFT Workstation in the Cloud

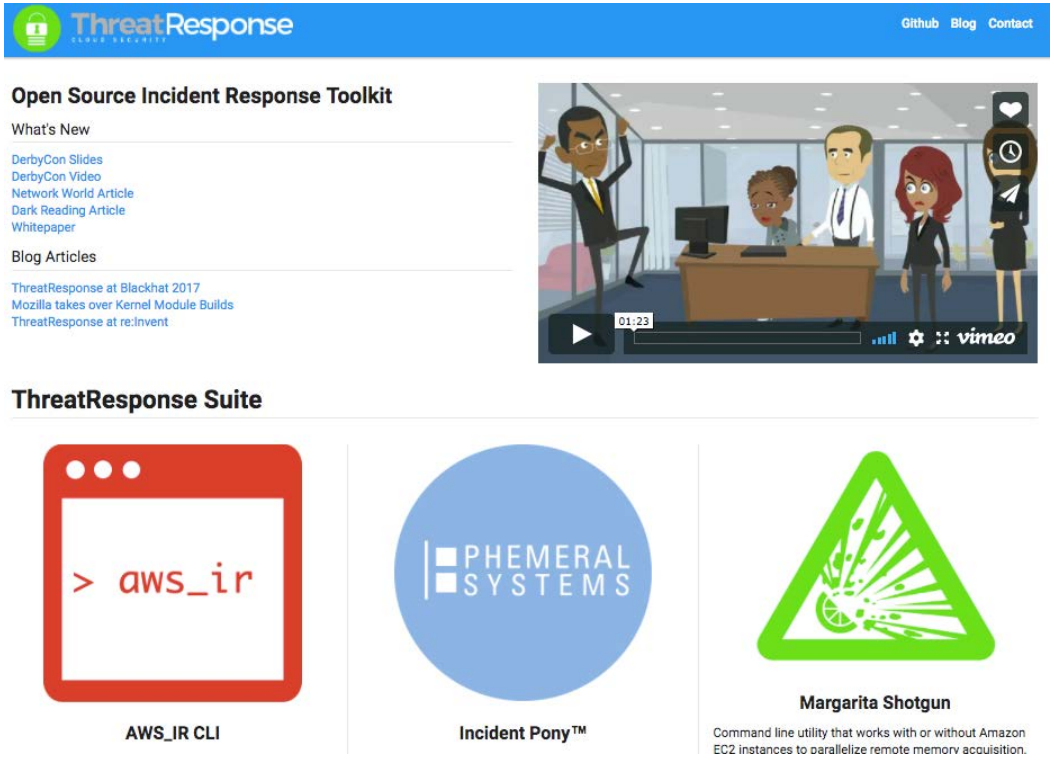
- Building a SANS Investigative Forensic Toolkit (SIFT) instance in the cloud is a GREAT plan for performing forensic investigations
- The process is simple:
  - Start a current 64-bit Ubuntu Linux image AMI and choose resource level
  - Configure your security keys for the forensics/IR team
  - Lock down SSH access to a known IP address or bastion host for IR
  - Run “apt-get update” and “apt-get upgrade”
  - Download SIFT: wget https://raw.github.com/sans-dfir/sift-bootstrap/master/bootstrap.sh
  - Run “sudo bash bootstrap.sh –i”

A Forensic Process for Disk Analysis in EC2

- Create a snapshot of the suspect disk volume in EC2:
  - Instances: Note the Instance ID of the suspect system
  - Volumes under Elastic Block Store: Note the Volume ID of the above Instance ID
  - Snapshots under Elastic Block Store: Click “Create Snapshot” and enter Volume ID, Name, and Description.
  - Right-click your snapshot and select “Create Volume”—match disk type, size, and AZ (where suspect system is). Note the Volume ID of this new one.
- Attach the volume to your SIFT workstation
  - Right-click this volume and select “Attach Volume”. Select your SIFT instance and choose “Attach”. Done!

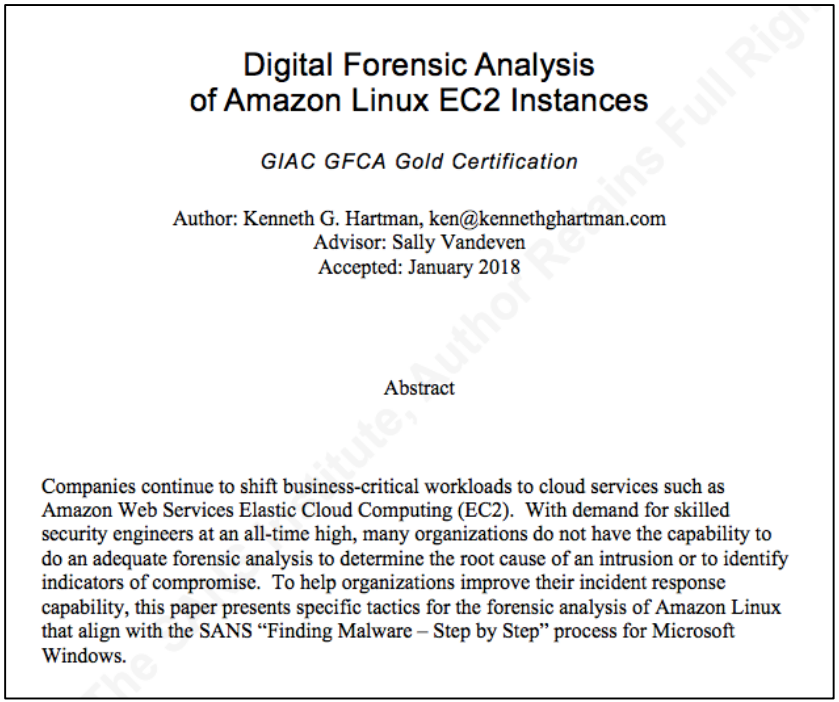
The ThreatResponse Suite

- The ThreatResponse Suite is a set of tools created by Andrew Krug, Alex McCormack, Joel Ferrier, and Jeff Parr
- Focused on forensics and response in AWS and include three components:
  - AWS_IR
  - Incident Pony
  - Margarita Shotgun



Need a Step-by-Step Guide?

- Ken Hartman hooked you UP
- His SANS Reading Room paper describes in detail how to set up a cloud forensics workstation, acquire evidence, and analyze it
- Find this at https://www.sans.org/reading-room/whitepapers/cloud/digital-forensic-analysis-amazon-linux-ec2-instances-38235



Digital Forensic Analysis
of Amazon Linux EC2 Instances

GIAC GFCA Gold Certification

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Accepted: January 2018

Abstract

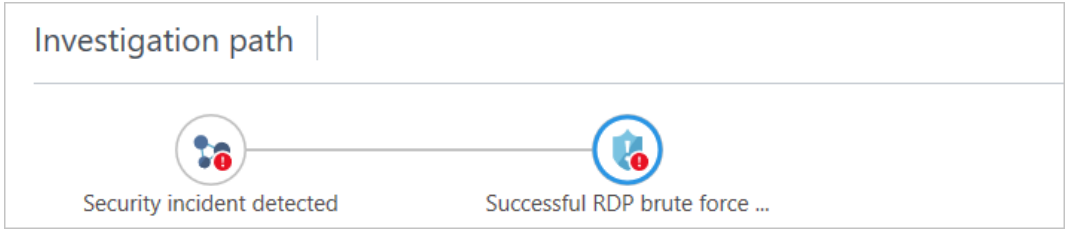
Companies continue to shift business-critical workloads to cloud services such as Amazon Web Services Elastic Cloud Computing (EC2). With demand for skilled security engineers at an all-time high, many organizations do not have the capability to do an adequate forensic analysis to determine the root cause of an intrusion or to identify indicators of compromise. To help organizations improve their incident response capability, this paper presents specific tactics for the forensic analysis of Amazon Linux that align with the SANS "Finding Malware – Step by Step" process for Microsoft Windows.

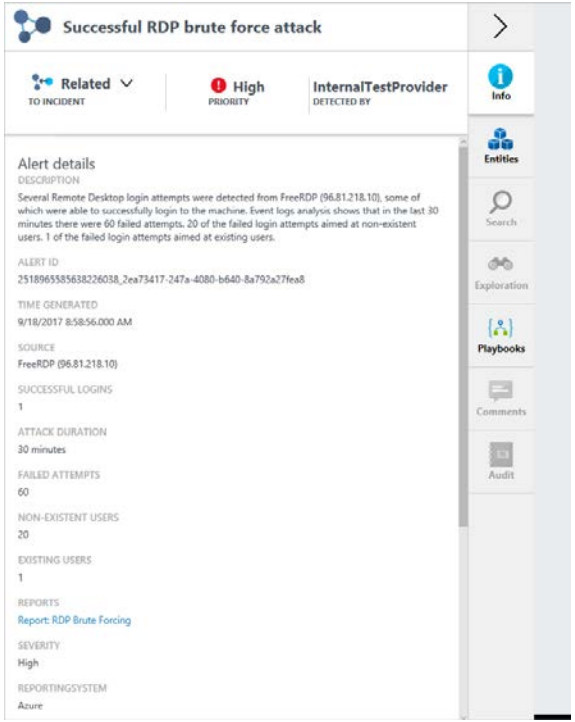
Eradication & Recovery

- From a system/content perspective, little changes
  - Assess ongoing system risk
  - Evaluate whether cleanup is possible or worth doing
- If possible, blow the system away once evidence is in place
- In a true DevOps workflow, this is simple – just initiate a new instance build
  - Can be done automatically, as well
- See Jonathon Poling's SecTor presentation for some additional ideas on log analysis in AWS:
  - https://sector.ca/sessions/incident-response-and-forensics-in-aws/

Some Tips for Microsoft Azure

- Much of DFIR in Azure focuses on Security Center
- Microsoft can detect events in your environment and produce alerts with remediation guidance
- Their Investigation capabilities are in Preview:





POST-INCIDENT ACTIVITY

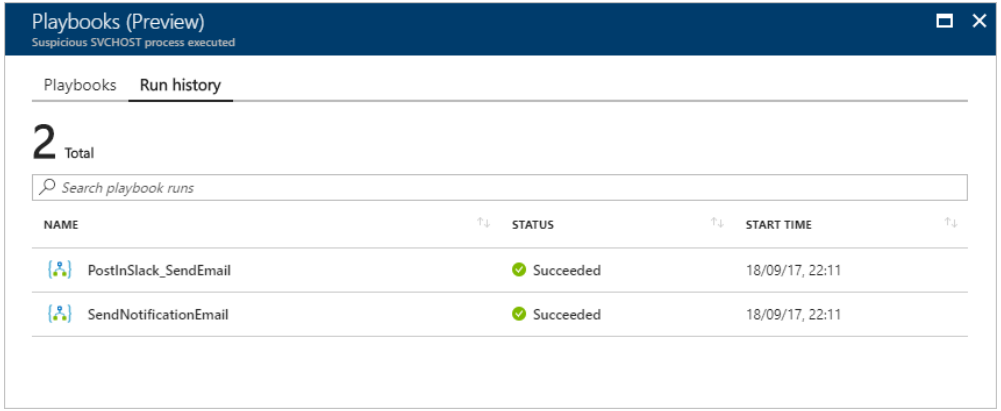
And Looking Ahead…

Looking Ahead: Cloud IR Automation

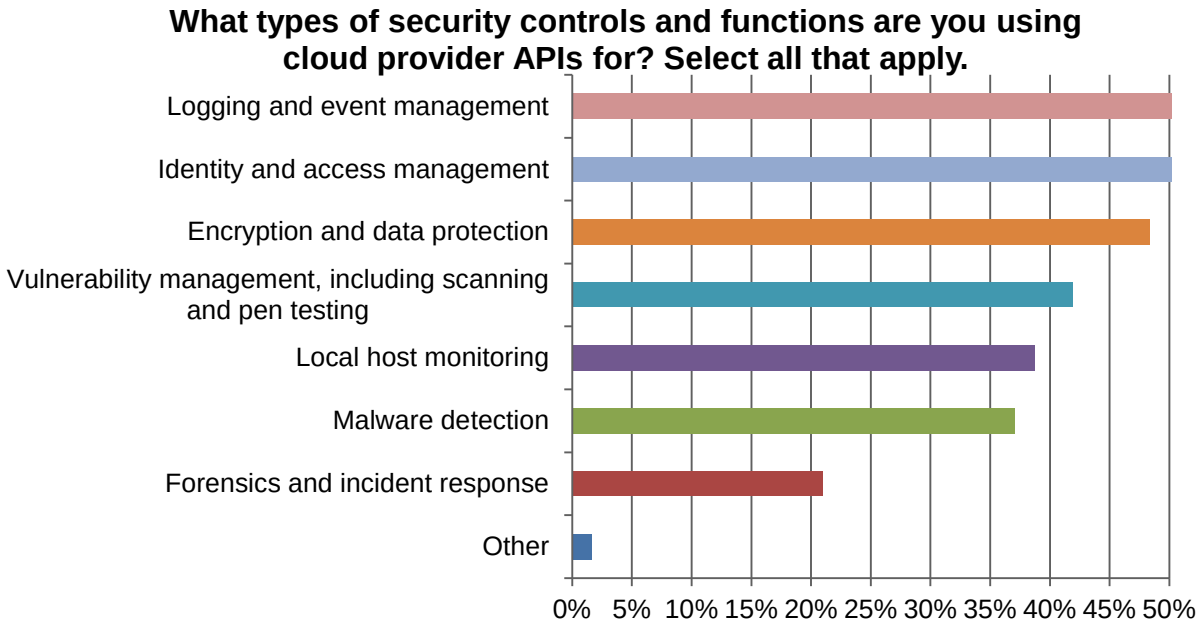
- Many are looking to script and automate IR activities in the cloud
- This may involve log collection, monitoring, and automated tools like AWS Lambda functions
- Teri Radichel has created the AWS Security Automation Framework to help with this: https://github.com/tradichel/AWSSecurityAutomationFramework
- A great talk on this at BlackHat 2016: https://www.blackhat.com/docs/us-16/materials/us-16-Krug-Hardening-AWS-Environments-And-Automating-Incident-Response-For-AWS-Compromises-wp.pdf

Azure IR Automation

- Azure has a feature in Preview called Security Center Playbooks
  - Leverages Azure Logic Apps (templates for automation/orchestration)
- Logic Apps can be designed around the IR Event Cycle:
  - Detect event
  - Trigger workflow
  - Send Alerts
  - (Optionally) Perform containment/remediation actions

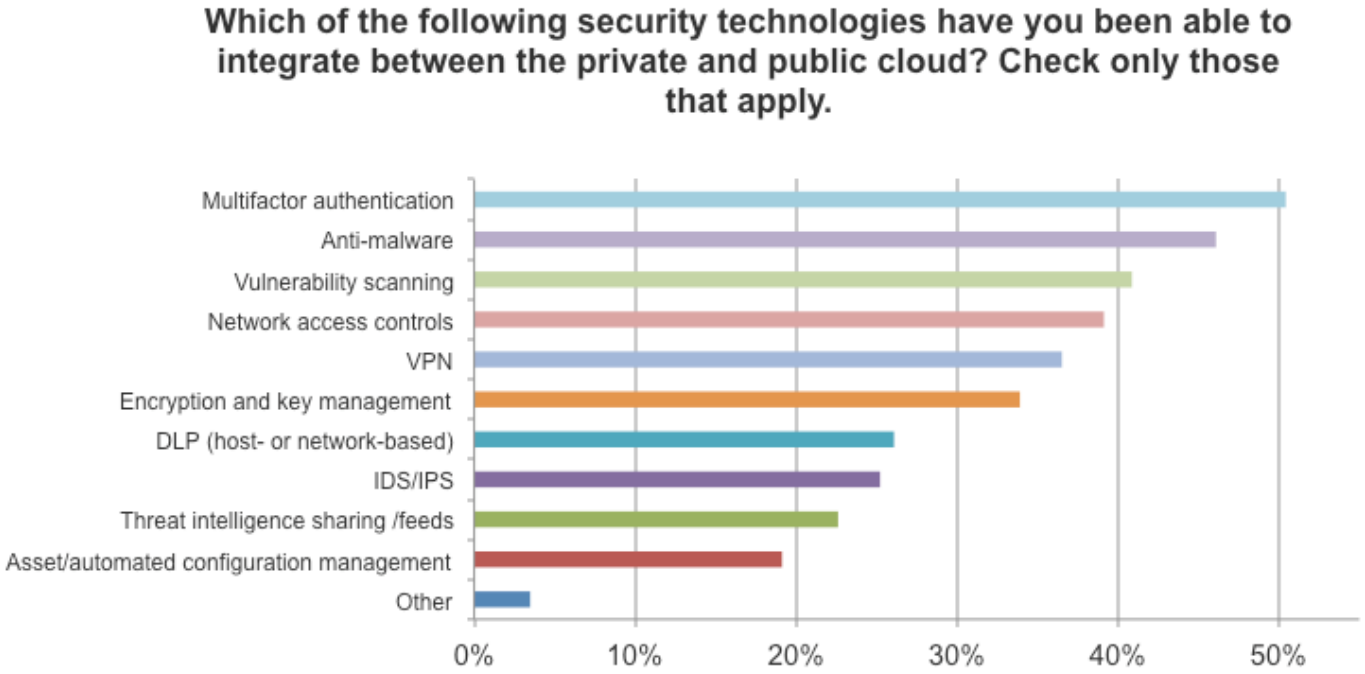


Cloud-Native Security Tools: API Integration



Source: SANS 2017 Cloud Security Survey

What's missing in this slide?



Source: SANS 2017 Cloud Security Survey

Wrapping Up

- We still have a lot of ground to cover in most cases:
  - Updating tools and processes
  - Waiting on DFIT vendors to truly adapt to cloud scenarios
- However, you can start preparing with IR “Game Days”
- Build “What If” scenarios:
  - An S3 bucket is exposed
  - A cloud instance starts mining Bitcoin unexpectedly
- DFIR teams will need to become comfortable with cloud, and soon!

Applying This Material

- In the next 30 days:
  - Look at your existing toolkits and processes for DFIR, and evaluate what can easily shift to cloud
  - Start looking at event data you can collect and analyze
- In the next 60 days:
  - Build test kits in your cloud environment, and work through sample scenarios
  - Educate IR and forensics teams on what they can do in the cloud
- In the next 90 days:
  - Update production toolkits and processes to incorporate cloud IR practices