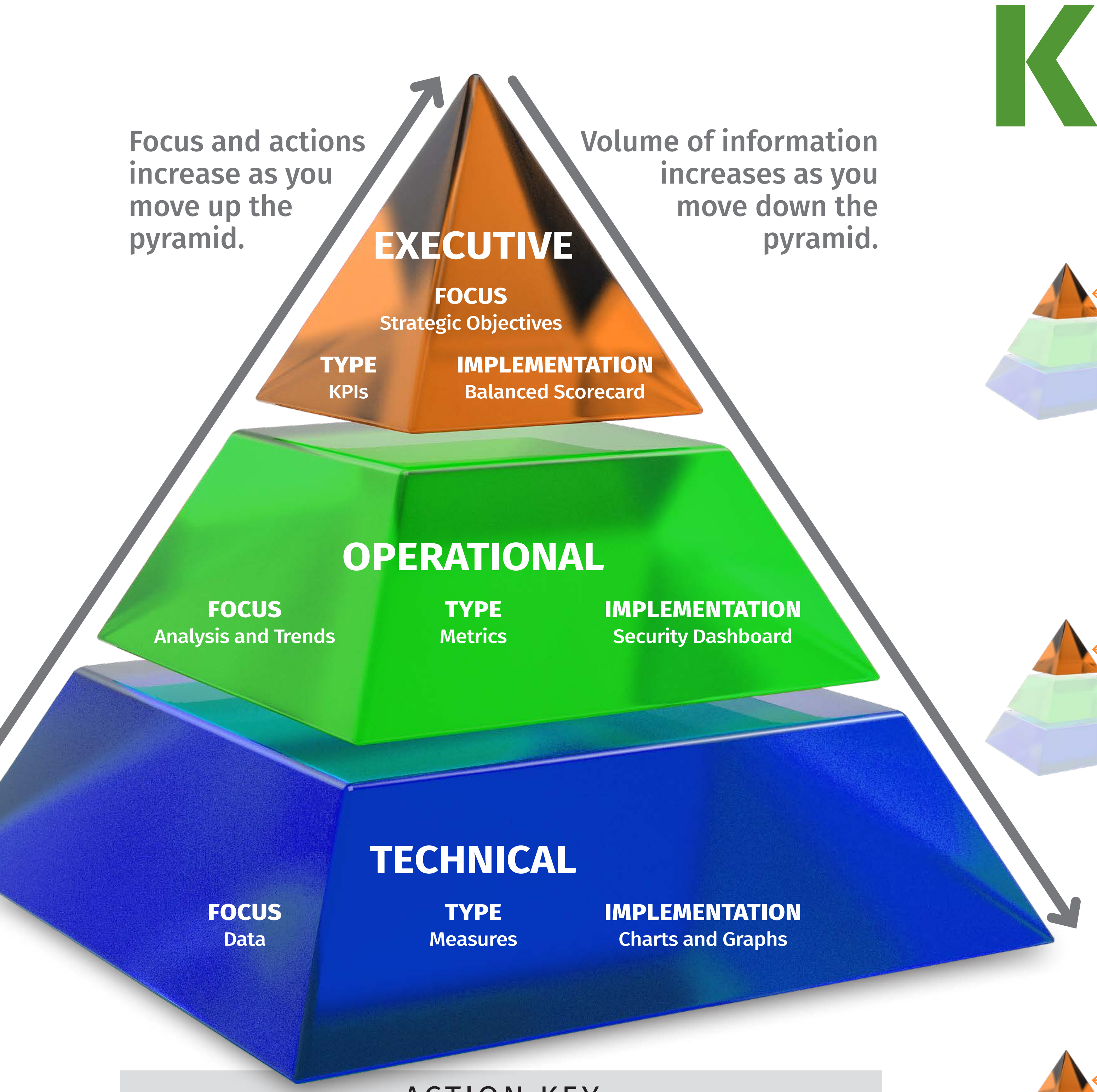
Key Metrics: Cloud and Enterprise



ACTION KEY

I	P	D	R
IDENTIFY	PROTECT	DETECT	RESPOND

SANS
CYBERSECURITY
LEADERSHIP

Key Metrics: Cloud and Enterprise

AND

Vulnerability Management Maturity Model

For Cyber Leaders of Today and Tomorrow

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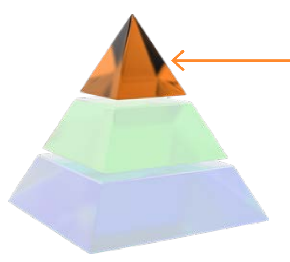
MGTPS_METRICS_v1.3_01-23



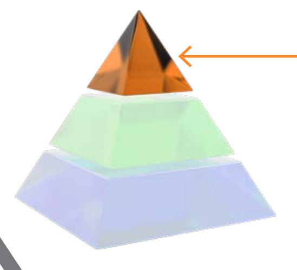
I Average Vendor Security Rating

Early stage programs

DESCRIPTION
This is the average vendor security rating from a solution such as SecurityScorecard, Bitsights, UpGuard or similar tools.

HOW TO CALCULATE
AVERAGE (SUM of all vendors security rating/total number of vendors rated)

WHAT IT HELPS SHOW/IDENTIFY
This helps inform the organization of the security posture of vendors that are critical to the organization delivering its services.



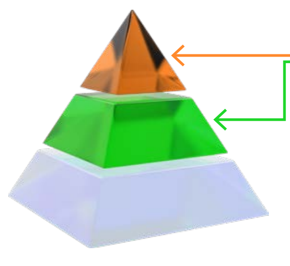
P Phishing Attack Success

Advanced programs

DESCRIPTION
Phishing Attack Success is the reported percentage of phishing simulation attacks that were successful over a period of time.

HOW TO CALCULATE
ABSOLUTE VALUE (Total employees that failed phishing test/Total employees X 100)

WHAT IT HELPS SHOW/IDENTIFY
This helps inform the organization whether or not users are trained and informed on cybersecurity best practices. incident.



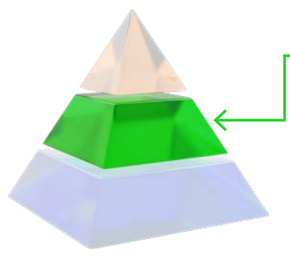
R Vulnerability Remediations Past Due Date

Advanced programs

DESCRIPTION
The remeidations that are not meeitng corporate policy requirements for remedation efforts that have not been granted an exception

HOW TO CALCULATE
(current date – first discovered date) > policy requirement (or if available, leverage due date field)

WHAT IT HELPS SHOW/IDENTIFY
Any remediation effort not meeting corporate requirements helps to show if there is a problem system or component, or potentially unrealistic remediation timeframes.



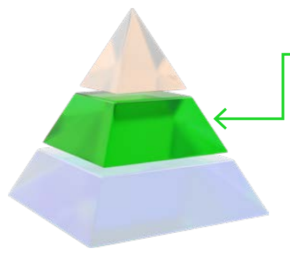
I Exclusions

Early stage programs

DESCRIPTION
Exclusions are the number of exemptions granted and the timeframes assocaited with the excemptions.

HOW TO CALCULATE
Number of vulnerabilities being excluded/exempted from rememdiation efforts

WHAT IT HELPS SHOW/IDENTIFY
There needs to be a central repository for tracking and managing these exclusions, so stakeholders and VM participants can monitor them over time, and risk managers can determine if any categories of exclusions need to be reported on as a risk finding.



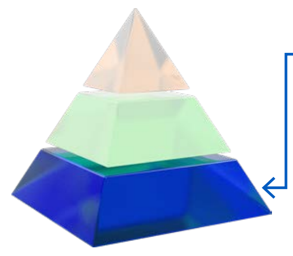
P Administrator's Density

Advanced programs

DESCRIPTION
Administrator's Density is the percentage of employees with administrator access.

HOW TO CALCULATE
ABSOLUTE VALUE (Total administrators/Total employees X 100)

WHAT IT HELPS SHOW/IDENTIFY
This helps inform the organization on whether or not there are a large number of administrators as it relates to the total number of employees in the organization. This metric can prove if the orgnization is not following a principle of least privilege.



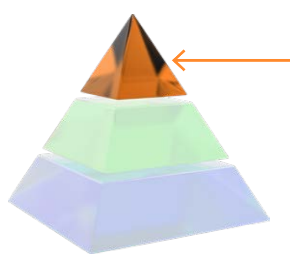
P Patch Velocity

Advanced programs

DESCRIPTION
Patch Velocity counts patches applied per day.

HOW TO CALCULATE
ABSOLUTE VALUE (Patches applied on each date when the host was patched)

WHAT IT HELPS SHOW/IDENTIFY
This helps inform the organization how many patches were applied on each date when the host was patched. It can serve as a way to measure how frequently patching is happening in the environment.



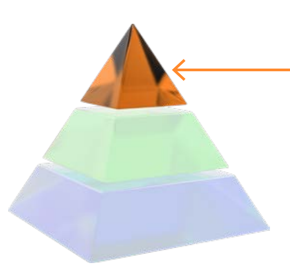
P # of Security Incidents Reported

Early stage programs

DESCRIPTION
# of Security Incidents Reported is the number of security incidents that have been reported over a period of time.

HOW TO CALCULATE
ABSOLUTE VALUE (Number of security incidents over a period of time)

WHAT IT HELPS SHOW/IDENTIFY
This helps inform the organization about how many times an attacker breached your information assets or networks. This metric helps inform leadership on the return on investment on cybersecurity tools and processes.



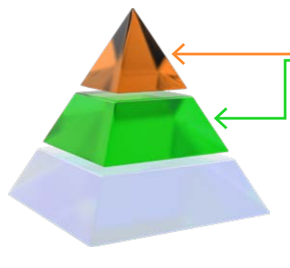
I Cloud Spend Trends

Early stage programs

DESCRIPTION
Cloud Spend Trends is a report on whether or not cloud resources have increased or decreased over time.

HOW TO CALCULATE
ABSOLUTE VALUE (Current cloud spend – Past cloud spend [over a period of time])

WHAT IT HELPS SHOW/IDENTIFY
This helps inform the organization whether or not cloud spending has changed over a period of time which may indicate a potential compromise or development resources that increase the blast radius of a potential incident.



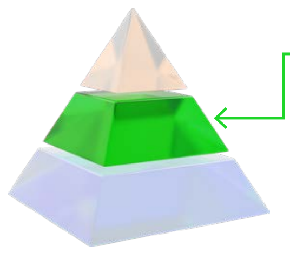
P Vulnerabilty Churn Rate

Advanced programs

DESCRIPTION
Vulnerabilty Churn Rate is the rate that vulnerabilities are being closed as well as new vulnerabilities being opened

HOW TO CALCULATE
ABSOLUTE VALUE (New Vulnerabilities – Closed Vulnerabilities [over specific period of time e.g., monthly])

WHAT IT HELPS SHOW/IDENTIFY
It shows if the vulnerability management program is making headway or is losing the battle.



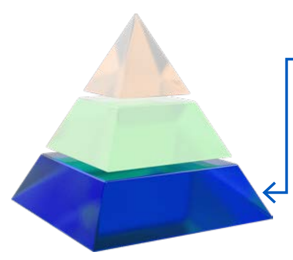
R Mean Time to Resolve

Advanced programs

DESCRIPTION
Mean Time to Resolve is the average time it takes the organization from discovering a vulnerability until the vulnerability is remediated.

HOW TO CALCULATE
AVERAGE (Vulnerability Closed date – First Discovered date)

WHAT IT HELPS SHOW/IDENTIFY
This informs the organization how long it is taking from the time a vulnerability is discovered until it is remediated. It can provide insights when new vulnerabilities arise and/or how long until these are validated findings using normal processes.



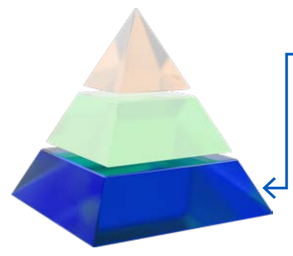
I Vulnerability Scanner Coverage

Early stage programs

DESCRIPTION
Vulnerability Scanner Coverage is the percentage of the system within your organization that is regularly scanned for vulnerabilities.

HOW TO CALCULATE
Assets being scanned for Vulnerabilities/Total Assets

WHAT IT HELPS SHOW/IDENTIFY
Knowing if systems are not regularly scanned is crucial to understanding the risk to the business and trend reports will not be as meaningful until coverage is stable.



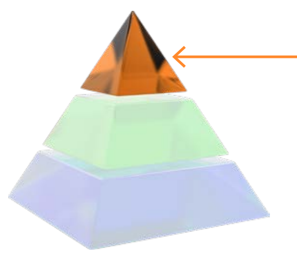
P Patch Age

Advanced programs

DESCRIPTION
Patch Age of a system is the number of days since the last patch was applied.

HOW TO CALCULATE
ABSOLUTE VALUE (The number of days which have elapsed since the last time a patch was installed on the system)

WHAT IT HELPS SHOW/IDENTIFY
This helps inform the organization of whether patching has happened recently. Stakeholders can understand the number of days which have elapsed since the last time a patch was installed on the system. A low Patch Age does not necessarily mean that the system is fully patched, but it does indicate that some patching activity has taken place recently.



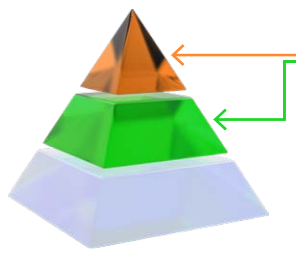
P # of Vendors with Cyber Incident

Early stage programs

DESCRIPTION
This is the number of vendors that have a reported cyber incident over a period of time.

HOW TO CALCULATE
ABSOLUTE VALUE (Total number of vendors that reported a security incident in a given priod)

WHAT IT HELPS SHOW/IDENTIFY
This helps inform the organization of the number of vendors that have experienced a cyber incident over a period of time which may indicate a weakness within the supply chain.



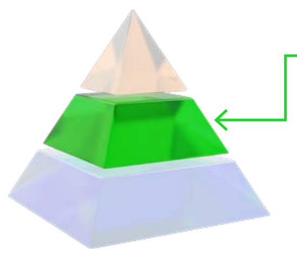
I Average Exposure Window

Advanced programs

DESCRIPTION
The Average Exposure Window is meant to show how long the vulnerabilities are known about prior to them being remediated.

HOW TO CALCULATE
AVERAGE (Vulnerability Closed date – Vulnerability Published date)

WHAT IT HELPS SHOW/IDENTIFY
It helps track performance against the policy standards for various vulnerabilities. The goal is to have this as close to Mean Time to Resolve as possible.



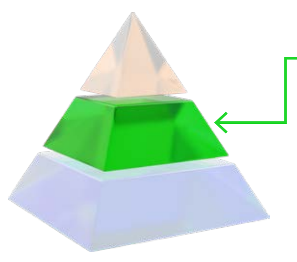
D Vulnerability Reopen Rate by XXX

Advanced programs

DESCRIPTION
Number of vulnerabilities within the environment that are being re-opened for any reason. (XXX can be specific systems, applicaiton, business owners, administrators)

HOW TO CALCULATE
Number of vulnerabilities that were previously closed

WHAT IT HELPS SHOW/IDENTIFY
Identifies vulnerabilities that were felt to be addressed that no longer are, that normally point to a remediation system problem or a unique system



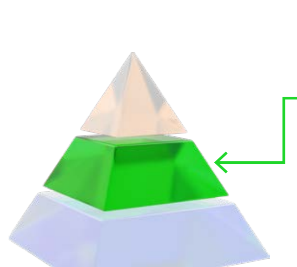
P Cybersecurity Awareness Training Results

Early stage programs

DESCRIPTION
This is a percentage of new employees that have completed cybersecurity awareness training within 30 days of hire.

HOW TO CALCULATE
ABSOLUTE VALUE (Total employees that completed security awareness training/Total employees X 100)

WHAT IT HELPS SHOW/IDENTIFY
This helps inform the organization whether or not their cybersecurity onboarding and training program is being implemented effectively.



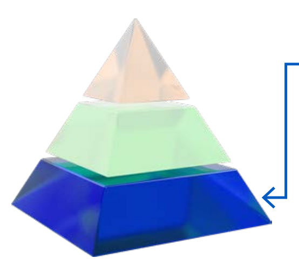
D Mean Time to Detect

Advanced programs

DESCRIPTION
Mean Time to Detect is the average time it takes the organization to discover a vulnerability from when it is first published, or the asset is added to the network.

HOW TO CALCULATE
AVERAGE (Vulnerability Publish date – Vulnerability Discovered date)

WHAT IT HELPS SHOW/IDENTIFY
This metric gives you information on the exposure that the organization has due to vulnerabilities that exist but have not yet been discovered.



D Intrusion Attempts

Advanced programs

DESCRIPTION
Intrusion Attempts display the number of intrusion attempts over a period of time.

HOW TO CALCULATE
ABSOLUTE VALUE (The number of intrusion attempts over a period of time)

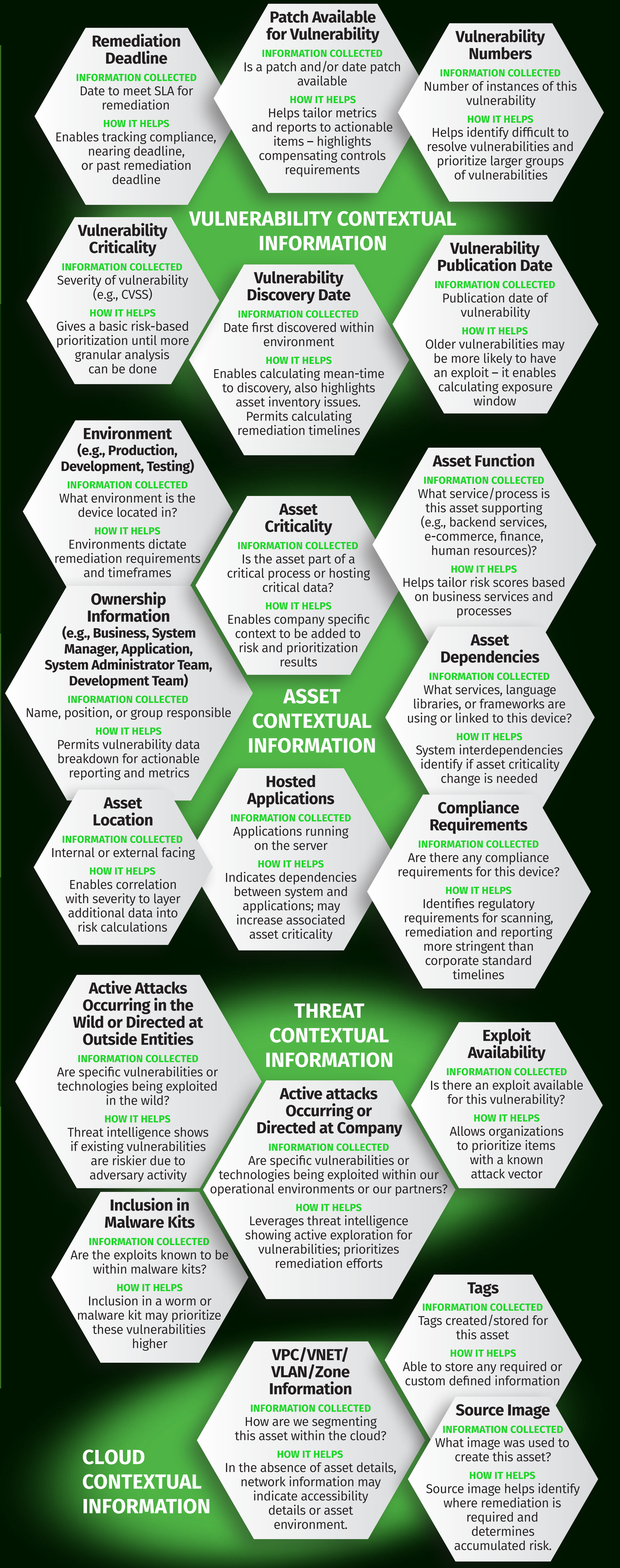
WHAT IT HELPS SHOW/IDENTIFY
This helps inform the organization on what the overall number of threats the business faces at any given time. This metric can help prove that cybersecurity threats continue to exists and are growing all the time.

SANS Vulnerability Management Maturity Model

		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
		Initial	**Managed**	**Defined**	**Quantitatively Managed**	**Optimizing**
Prepare	**Policy & Standards**	Policy and standards are undocumented or in a state of change.	Policy and standards are defined in specific areas as a result of a negative impact to the program rather than based on a deliberate selection of best practices or standards from recognized frameworks.	Policy and standards have been carefully selected based on best practices and recognized security frameworks and are updated as needed to fulfill the program's mission. Employees are made aware of standards and training on requirements is available.	Adherence to defined policy and standards is tracked and deviations are highlighted. Training of personnel on requirements is required at least annually.	Automated, proactive controls enforce policy and standards and provide input to regular updates and training requirements.
	Context	Contextual data (e.g., asset details, ownership, relationships) are available from multiple data sources with varying degrees of accuracy.	There is a central repository of contextual data that has some data for most systems and applications.	The central repository requires that certain contextual information be tracked and updated for each system and that it is based on program needs.	Reports show compliance with contextual information requirements and processes are in place to identify non-compliant, missing, or retired systems and applications.	Automated or technology-assisted processes and procedures exist to both create and remove systems and applications and associated attributes from the central repository, or data are correlated and reconciled with other systems that contain information about tracked systems and applications.
Identify	**Automated**	Infrastructure and applications are scanned ad-hoc or irregularly for vulnerability details, or vulnerability details are acquired from existing data repositories or from the systems themselves as time permits.	The process, configuration, and schedule for scanning infrastructure and applications is defined and followed for certain departments or divisions within the organization. Available technology may vary throughout the organization.	There are defined and mandated organization-wide scanning requirements and configurations for infrastructure and applications that set a minimum threshold for all departments or divisions. Technology is made available throughout the organization through enterprise licensing agreements or as a service.	Scanning coverage is measured and includes the measurement of authenticated vs. unauthenticated scanning (where applicable), the types of automated testing employed, false positive rates, and vulnerability escape rates.	Scanning is integrated into build-and-release processes and procedures and happens automatically in accordance with requirements. Scanning configurations and rules are updated based on previous measurements.
	Manual	Manual testing or review occurs when specifically required or requested.	Manual testing or review processes are established and some departments and divisions have defined requirements.	Manual testing or review occurs based on reasonable policy-defined requirements that apply to the entire organization and is available as a service where not specifically required by policy.	Deviations from manual testing or review requirements are tracked and reported.	Manual testing or review processes include focused testing based on historical test data and commonalities or threat intelligence.
	External	External vulnerability reports and disclosures are handled on a case-by-case basis.	Basic vulnerability disclosure policy (VDP) and contact information published, but backend processes and procedures not documented.	More comprehensive VDP in place, along with terms and conditions for external vendors and security researchers, that outlines rules of engagement, tracking, and feedback processes.	Compliance with VDP and terms and conditions is tracked and measured and information is used to streamline processes and evaluate vendors and researchers.	A mature external testing and research program is in place with specific goals and campaigns that may only be available to specific vendors or researchers.
Analyze	**Prioritization**	Prioritization is performed based on CVSS/Severity designations provided by identification technology or indicated in reports.	Prioritization also includes analysis of other available fields such as whether or not exploits or malware exist or confidence scores.	Prioritization includes correlation with the affected asset, asset group, or application to account for it's criticality in addition to the severity designation. This may require light to moderate customization depending on architecture and design.	Generic threat intelligence or other custom data, which may require additional products or services, are leveraged to perform prioritization.	Company-specific threat intelligence, or other information gathered from the operating environment, is leveraged to preform prioritization. This information may require human analysis or more extensive customization.
	Root Cause Analysis	Root cause analysis is performed based on out-of-the-box information such as standard remediation/patch reports or other categorized reports (e.g., OWASP Top 10 category).	Data are lightly customized to apply less granular or more meaningful groupings of data than CVE, CWE, or Top 10 identifiers to facilitate root cause analysis.	Data are also identified, grouped, and/or filtered by department or location to enable identification of location- or group-based deficiencies. This may require light to moderate customization depending on architecture and design.	Data are also identified, grouped, and/or filtered by owner or role. This may require more extensive customization and ongoing maintenance.	An executive dashboard is in place and includes the highest-risk root cause impediments, exclusions, project cost projections, etc. This will require more detailed analysis and customization to become meaningful and should integrate with existing executive business intelligence tools.
Communicate	**Metrics & Reporting**	Simple, point-in-time operational metrics are available primarily sourced from out-of-the-box reports leveraging minimal customization or filtering.	Filtered reports are created to target specific groups or prioritize findings. Specific divisions or departments have defined their own reporting requirements, including both program and operational metrics, and generate and release the corresponding reports at a defined interval.	Reporting requirements, including all required program, operational, and executive metrics and trends, are well-defined and baseline reports are consistent throughout the organization and tailored or filtered to the individual departments or stakeholders.	Reports and metrics include an indication of compliance with defined policy and standards, treatment timelines, and bug bars. Correlation with other security or contextual data sources allows for more meaningful grouping, improves accuracy, and allows for identification of faulty or inefficient design patterns.	Custom reporting is available as a service or via self-service options, or feedback is regularly solicited and reports are updated to reflect changing needs. Automated outlier and trend analysis along with exclusion tracking is performed to identify high/low performers and highlight systemic issues/successes.
	Alerting	Alerting is either not available or only available within security-specific technologies.	Integrations exist and alerts are being sent for specific divisions or departments or for users of specific non-security technologies already being leveraged by some stakeholders.	Alerting is available for most stakeholders in their technology of choice.	Visibility and both timing and detail of response to alerts is measured and tracked.	Data are analyzed to develop a standard or automated response to alerts for common issues that can be tied to a common response.
Treat	**Change Management**	Changes related to vulnerability management activities pass through the same workflow as any other change.	Some changes related to vulnerability management activities have a custom workflow or are treated as standard changes.	Most changes related to vulnerability management activities follow a custom workflow or are treated as standard changes.	Changes related to vulnerability management activities along with success rates are tracked. Timing is also measured for different stages of the change or subtasks related to the change.	Metrics from vulnerability management change activities are used to modify requirements or streamline future change requests. At least some standard changes are automated.
	Patch Management	Patches are applied manually or scheduled by admins and end-users.	There is a standard schedule defined and technology is available for some divisions or departments or for some platforms to automate patch testing and deployment.	All departments are required to patch within a certain timeframe and technologies are available to assist with testing and applying patches for all approved platforms.	Patch management activities are tracked along with compliance with remediation timelines and the success rate.	Data from patch management activities, security incidents, and threat intelligence are used to right-size remediation timelines and identify process or technology changes.
	Configuration Management	Configuration requirements are not well-defined and changes are either applied manually or the automatic application of configurations is only available for a subset of platforms.	Configurations are defined for some divisions or departments or for specific platforms.	Configurations are defined for all supported platforms and technologies are available to automate or validate configuration changes for all platforms.	Deviations from configuration requirements and associated service impacts are measured and tracked.	Data from the configuration process along with security incidents and threat intelligence are leveraged to strengthen or relax requirements as needed.

Contextual Information

Contextual information is key to helping us prioritize our vulnerability backlog and to understand where we might need more focus or help. Some examples of contextual information include:



VULNERABILITY CONTEXTUAL INFORMATION

Remediation Deadline
INFORMATION COLLECTED
Date to meet SLA for remediation
HOW IT HELPS
Enables tracking compliance, nearing deadline, or past remediation deadline

Patch Available for Vulnerability
INFORMATION COLLECTED
Is a patch and/or date patch available
HOW IT HELPS
Helps tailor metrics and reports to actionable items – highlights compensating controls requirements

Vulnerability Numbers
INFORMATION COLLECTED
Number of instances of this vulnerability
HOW IT HELPS
Helps identify difficult to resolve vulnerabilities and prioritize larger groups of vulnerabilities

Vulnerability Criticality
INFORMATION COLLECTED
Severity of vulnerability (e.g., CVSS)
HOW IT HELPS
Gives a basic risk-based prioritization until more granular analysis can be done

Vulnerability Discovery Date
INFORMATION COLLECTED
Date first discovered within environment
HOW IT HELPS
Enables calculating mean-time to discovery, also highlights asset inventory issues. Permits calculating remediation timelines

Vulnerability Publication Date
INFORMATION COLLECTED
Publication date of vulnerability
HOW IT HELPS
Older vulnerabilities may be more likely to have an exploit – it enables calculating exposure window

ASSET CONTEXTUAL INFORMATION

Environment (e.g., Production, Development, Testing)
INFORMATION COLLECTED
What environment is the device located in?
HOW IT HELPS
Environments dictate remediation requirements and timeframes

Asset Criticality
INFORMATION COLLECTED
Is the asset part of a critical process or hosting critical data?
HOW IT HELPS
Enables company specific context to be added to risk and prioritization results

Asset Function
INFORMATION COLLECTED
What service/process is this asset supporting (e.g., backend services, e-commerce, finance, human resources)?
HOW IT HELPS
Helps tailor risk scores based on business services and processes

Ownership Information (e.g., Business, System Manager, Application, System Administrator Team, Development Team)
INFORMATION COLLECTED
Name, position, or group responsible
HOW IT HELPS
Permits vulnerability data breakdown for actionable reporting and metrics

Asset Dependencies
INFORMATION COLLECTED
What services, language libraries, or frameworks are using or linked to this device?
HOW IT HELPS
System interdependencies identify if asset criticality change is needed

Asset Location
INFORMATION COLLECTED
Internal or external facing
HOW IT HELPS
Enables correlation with severity to layer additional data into risk calculations

Hosted Applications
INFORMATION COLLECTED
Applications running on the server
HOW IT HELPS
Indicates dependencies between system and applications; may increase associated asset criticality

Compliance Requirements
INFORMATION COLLECTED
Are there any compliance requirements for this device?
HOW IT HELPS
Identifies regulatory requirements for scanning, remediation and reporting more stringent than corporate standard timelines

THREAT CONTEXTUAL INFORMATION

Active Attacks Occurring in the Wild or Directed at Outside Entities
INFORMATION COLLECTED
Are specific vulnerabilities or technologies being exploited in the wild?
HOW IT HELPS
Threat intelligence shows if existing vulnerabilities are riskier due to adversary activity

Exploit Availability
INFORMATION COLLECTED
Is there an exploit available for this vulnerability?
HOW IT HELPS
Allows organizations to prioritize items with a known attack vector

Active attacks Occurring or Directed at Company
INFORMATION COLLECTED
Are specific vulnerabilities or technologies being exploited within our operational environments or our partners?
HOW IT HELPS
Leverages threat intelligence showing active exploration for vulnerabilities; prioritizes remediation efforts

Inclusion in Malware Kits
INFORMATION COLLECTED
Are the exploits known to be within malware kits?
HOW IT HELPS
Inclusion in a worm or malware kit may prioritize these vulnerabilities higher

CLOUD CONTEXTUAL INFORMATION

Tags
INFORMATION COLLECTED
Tags created/stored for this asset
HOW IT HELPS
Able to store any required or custom defined information

VPC/VNET/VLAN/Zone Information
INFORMATION COLLECTED
How are we segmenting this asset within the cloud?
HOW IT HELPS
In the absence of asset details, network information may indicate accessibility details or asset environment.

Source Image
INFORMATION COLLECTED
What image was used to create this asset?
HOW IT HELPS
Source image helps identify where remediation is required and determines accumulated risk.

MGT516: Building and Leading Vulnerability Management Programs

Stop treating symptoms. Cure the disease.

Whether your vulnerability management program is well established, or you are just getting started, this course will help you think differently about vulnerability management. You will learn how to move past the hype to successfully prioritize the vulnerabilities that are not blocked, then clearly and effectively communicate the risk associated with the rest of the vulnerabilities in your backlog that, for a variety of reasons, cannot currently be remediated. You'll also learn what mature organizations are doing to ease the burden associated with vulnerability management across both infrastructure and applications as well as across both their cloud and non-cloud environments. MGT516 is based on the Prepare, Identify, Analyze, Communicate, and Treat (PIACT) Model.

16 Cyber42 and lab exercises