Microsoft

Microsoft CISO Workshop
4b - Threat Protection Strategy (DETECT-RESPOND-RECOVER)

Microsoft Cybersecurity Solutions Group

Threat protection (Detect-Respond-Recover)

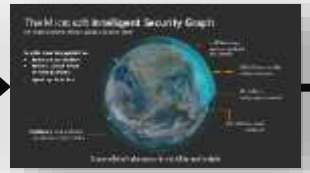
TRENDS

THREAT EVOLUTION

SOC MISSION EVOLUTION

EVOLUTION OF MICROSOFT SOC

STRATEGY



INTELLIGENCE

SUCCESS CRITERIA

RECOMMENDED APPROACH

APPLYING TO OPERATIONS

TYPICAL KILL CHAIN

INTEGRATION

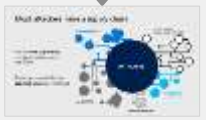
COMMUNITY EFFECT

INTEGRATED AUTOMATION

DEEP DIVES

BEHAVIOR ANALYTICS

MACHINE LEARNING



DARK MARKETS

SIEM & INTEGRATION

Observations and challenges

Threats increasing in volume and sophistication

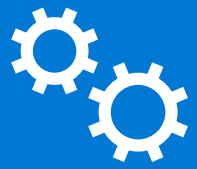
Attacker business models evolve to maximize attacker return on investment (ROI)

Attack automation and evasion techniques evolving along multiple dimensions

Can't Stop All Attacks

Must balance investments across prevention, detection, and response

Prevention investments must be focused on real world attacks



Integration is required, but complex and costly

Threat Detection requires context from a diverse signal sources and high volumes of data

Efficient operations requires integration of tools and technology like machine learning

Humans and Automation

Need human expertise, adaptability, and creativity to combat human threat actors

Automation can reduce toil and repetitive tasks, enabling people to make their best contributions

Evolution trajectory of SOCs

Improved responsiveness & remediation by empowering humans with technology

Assistance from AI bots and augmented reality

ACT – Speed up response with Orchestration and Automation

DECIDE – Increase speed and quality with embedded guidance

ORIENT – Extract Context from mountain of data with AI, ML, UEBA, and Human Expertise

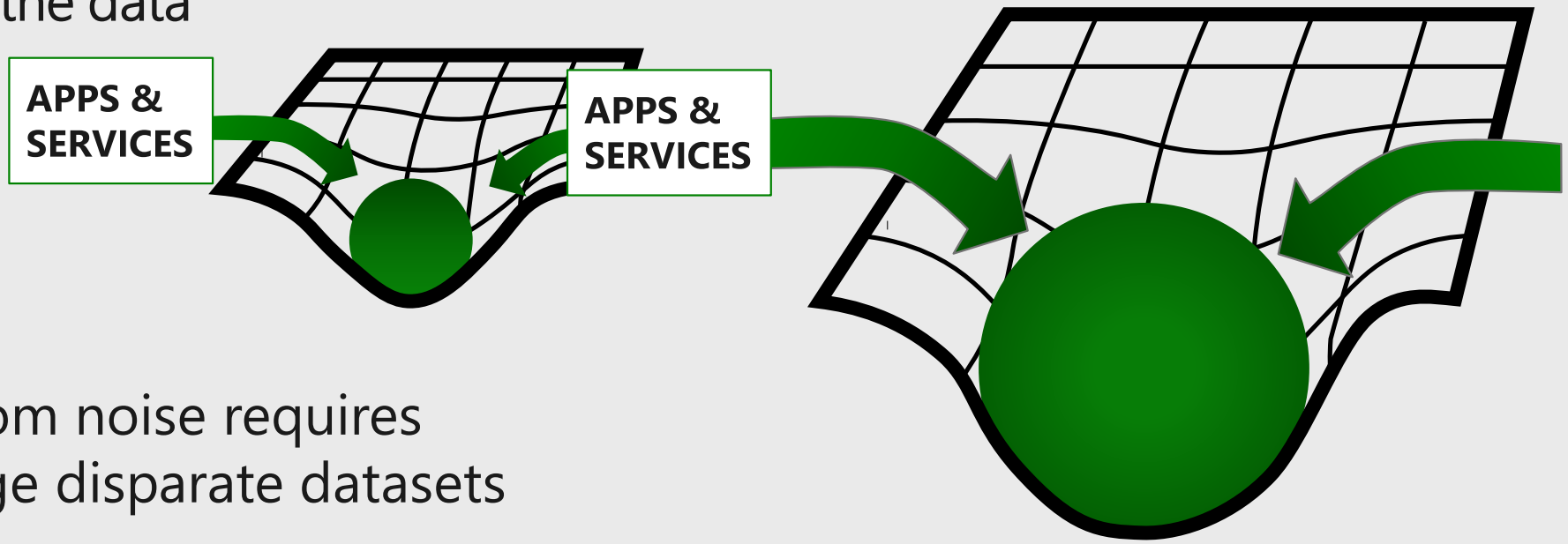
OBSERVE – Increase Field of view with vast intelligence data

Available Today

Near Future

Data Gravity

Pulls analytics to the data



Getting signal from noise requires context from large disparate datasets

Can't copy all needed data to one location because of bandwidth

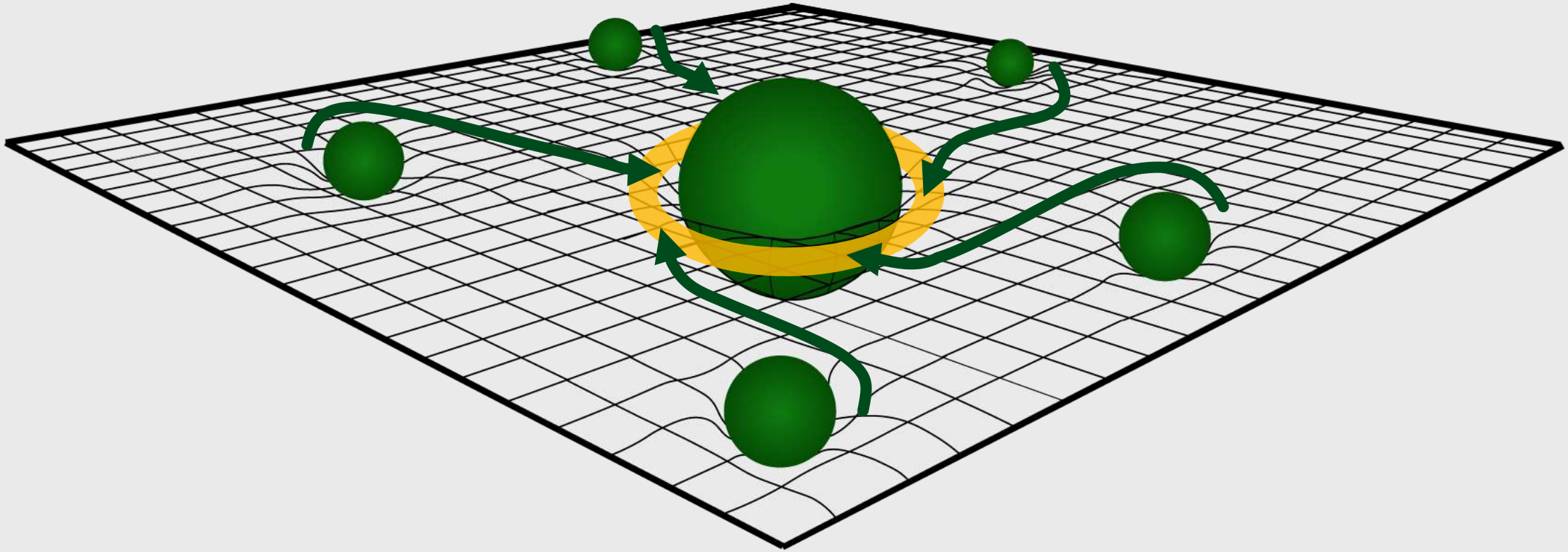
→ Need to leverage analytics from anywhere and centrally integrate

Data Gravity

$$\frac{\left(\text{Data Mass} \times \text{Application Mass}\right) \times \text{Number of Requests per second}}{\left(\text{Latency in seconds} + \left(\text{Average Request Size in MBs} \,/\, \text{Bandwidth in MBs per second}\right)\right)^2}$$

SOC Signal Rationalization

Many data sources in a SOCs today



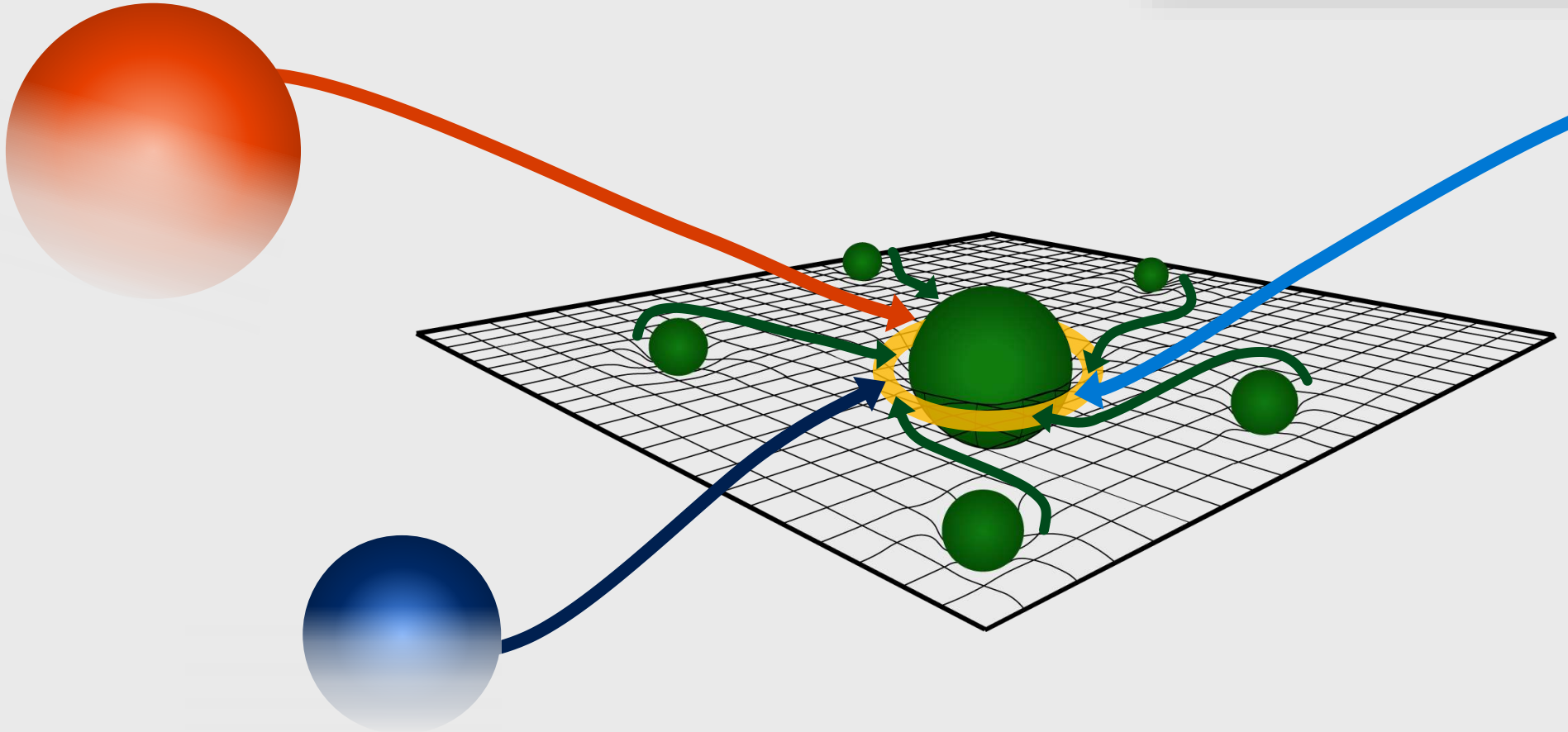
Microsoft Graph Security API allows analysts to get insights across local security datasets

Graph Security API – Signal Unification

Allows analysts to get insights and context across
Local datasets and

Cloud hosted security datasets

Microsoft's Intelligent Security Graph
Massive dataset + analytics powering
Microsoft threat detection capabilities



Threat evolution is accelerating

Malware-Less Attacks

'File-less' Malware

Tailored/Targeted Malware

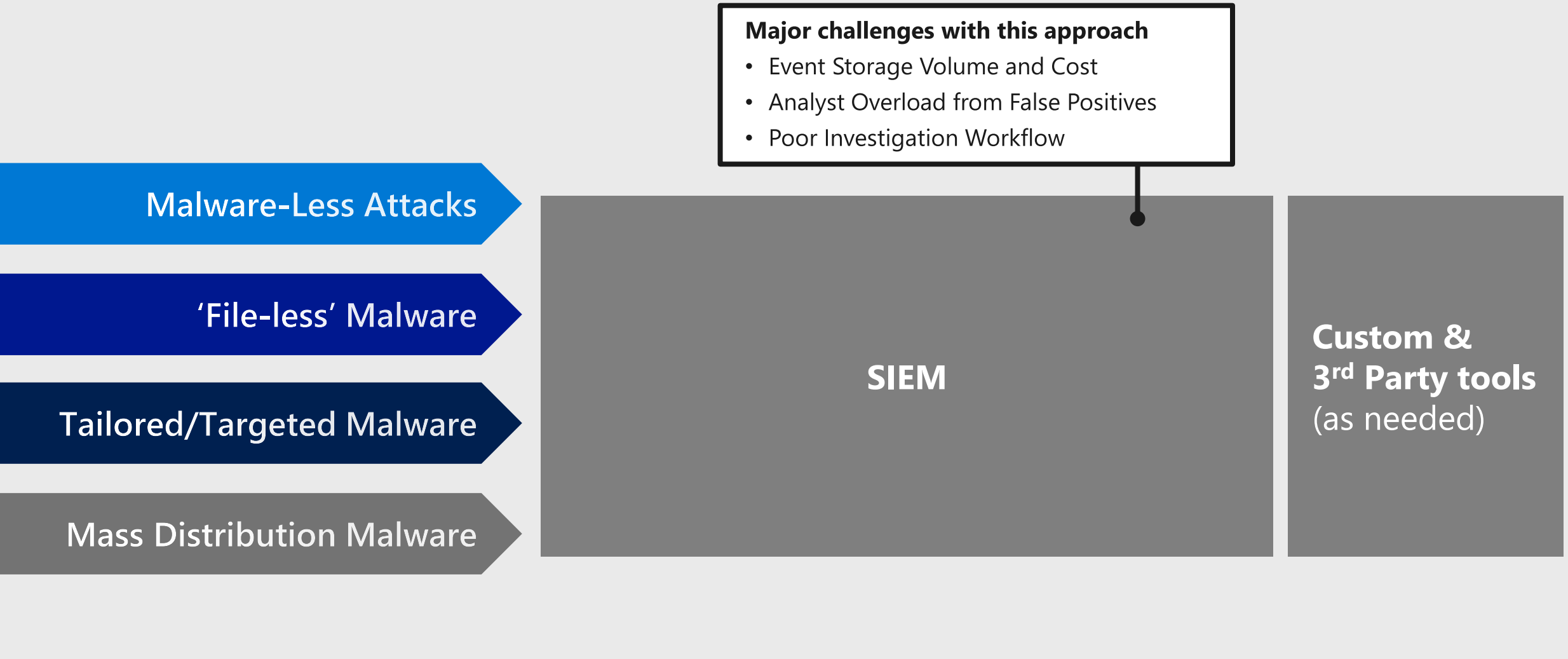
Mass Distribution Malware

THREAT AGES

Malware and Infrastructure

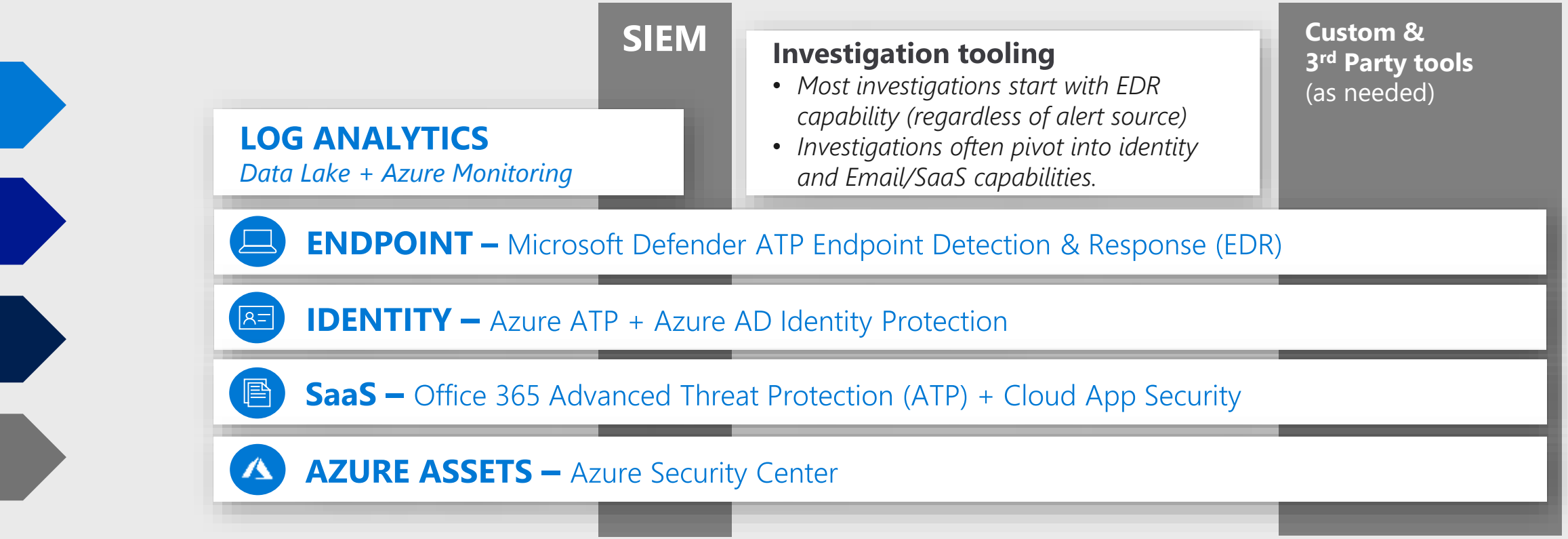
Identity and Apps

Corporate IT SOC – Started with Classic SIEM model



Corporate IT SOC – Evolved

Adopted specialized tooling + Cloud Native Analytics



Generate Alerts | Alert Queue | Investigation | Pivot and Remediate

Corporate IT SOC – Upgrading to Cloud Native SIEM

Breadth: Unified View
- *Unified Alert Queue*
- *Log Detections (UEBA/ML/Manual)*

SIEM + SOAR as a Service
Azure Sentinel (Pilot)

Custom & 3rd Party tools
(as needed)

ENDPOINT – Microsoft Defender ATP Endpoint Detection & Response (EDR)

IDENTITY – Azure ATP + Azure AD Identity Protection

SaaS – Office 365 Advanced Threat Protection (ATP) + Cloud App Security

AZURE ASSETS – Azure Security Center

Depth: Specialized Tools
- *High quality alerts*
- *End to end investigation and remediation*

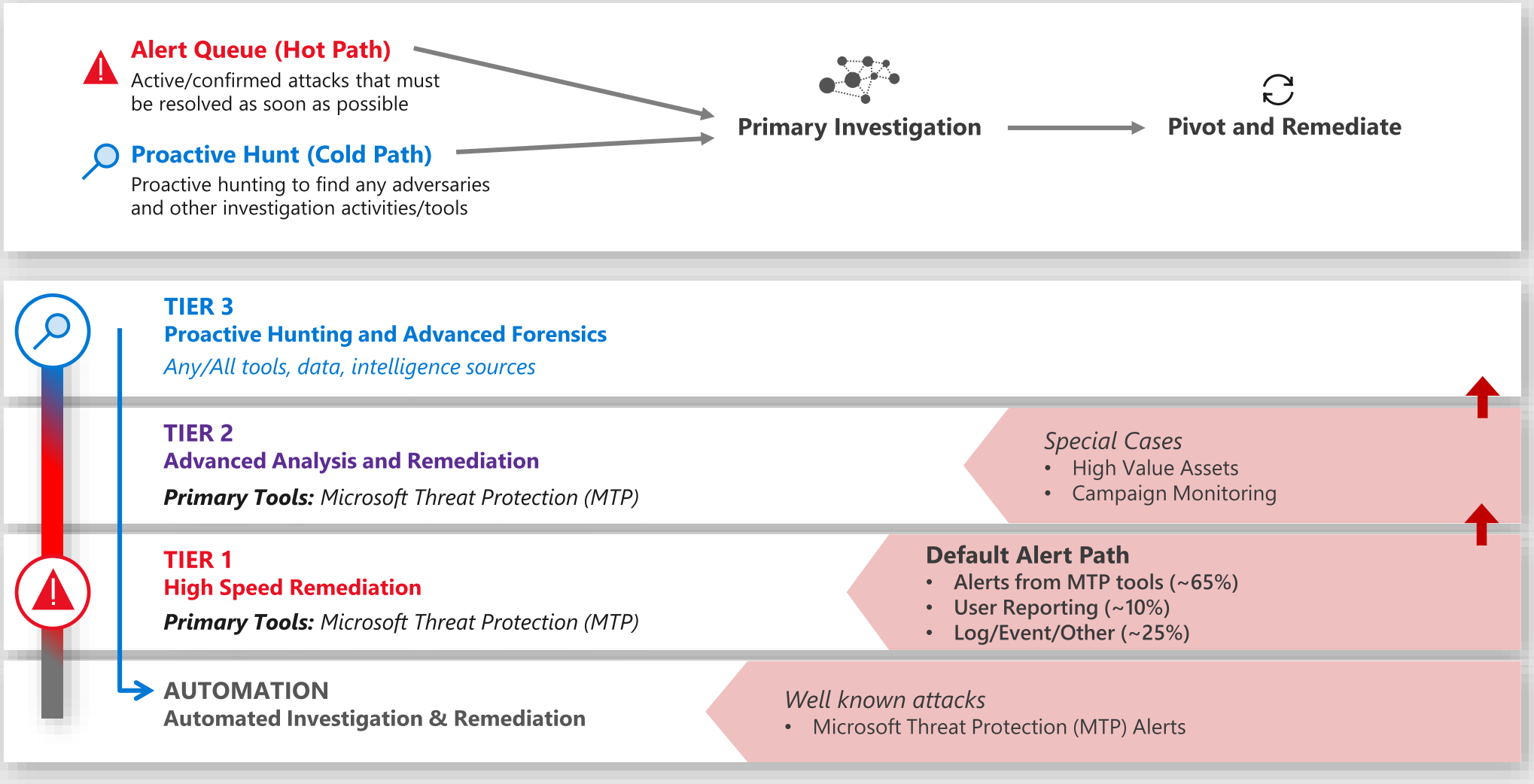
NETWORK – 3rd party Logs and Tools

SERVERS – 3rd party and Microsoft Logs and Tools

OTHERS – 3rd party and Microsoft Logs and Tools

Built on Azure Monitor, Logic Apps, and Microsoft's UEBA/ML Technology

Microsoft's Corporate IT SOC – Tiers and Tools



SOC Reference Operational Model

THREAT INTELLIGENCE

Provide External Context to inform decisions

Investigations | Hunting | Leadership | Technical Detections and Defenses

Mean Time to Acknowledge (MTTA) / Remediate (MTTR)

INCIDENT MANAGEMENT

Coordinate Data Breaches and Major Incidents with:

Leadership | Legal | Communications | Risk Management | Others

SOC ANALYSTS

Tier 3
Tier 2
Tier 1

Reactively remediate incidents and proactively hunt for attackers
Escalate to higher tier as needed

Lower tiers may be automated and/or outsourced to MSSP

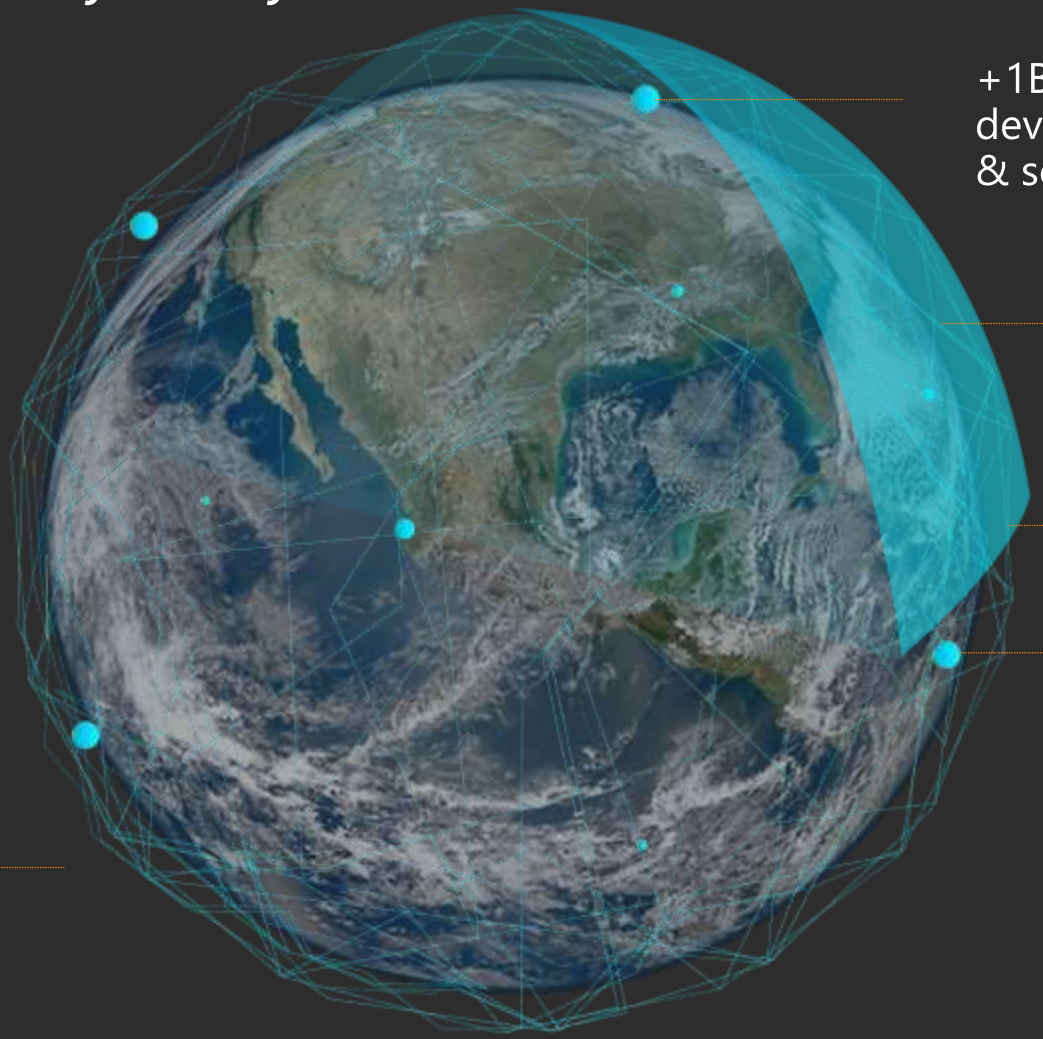
DETECT 〉 RESPOND 〉 RECOVER

The Microsoft **Intelligent Security Graph**

6.5 trillion diverse threat signals analyzed daily

Machine learning applied to:

- Reduce manual effort
- Reduce wasted effort on false positives
- Speed up detection



+1B Windows devices updated & scanned

630 billion monthly authentications

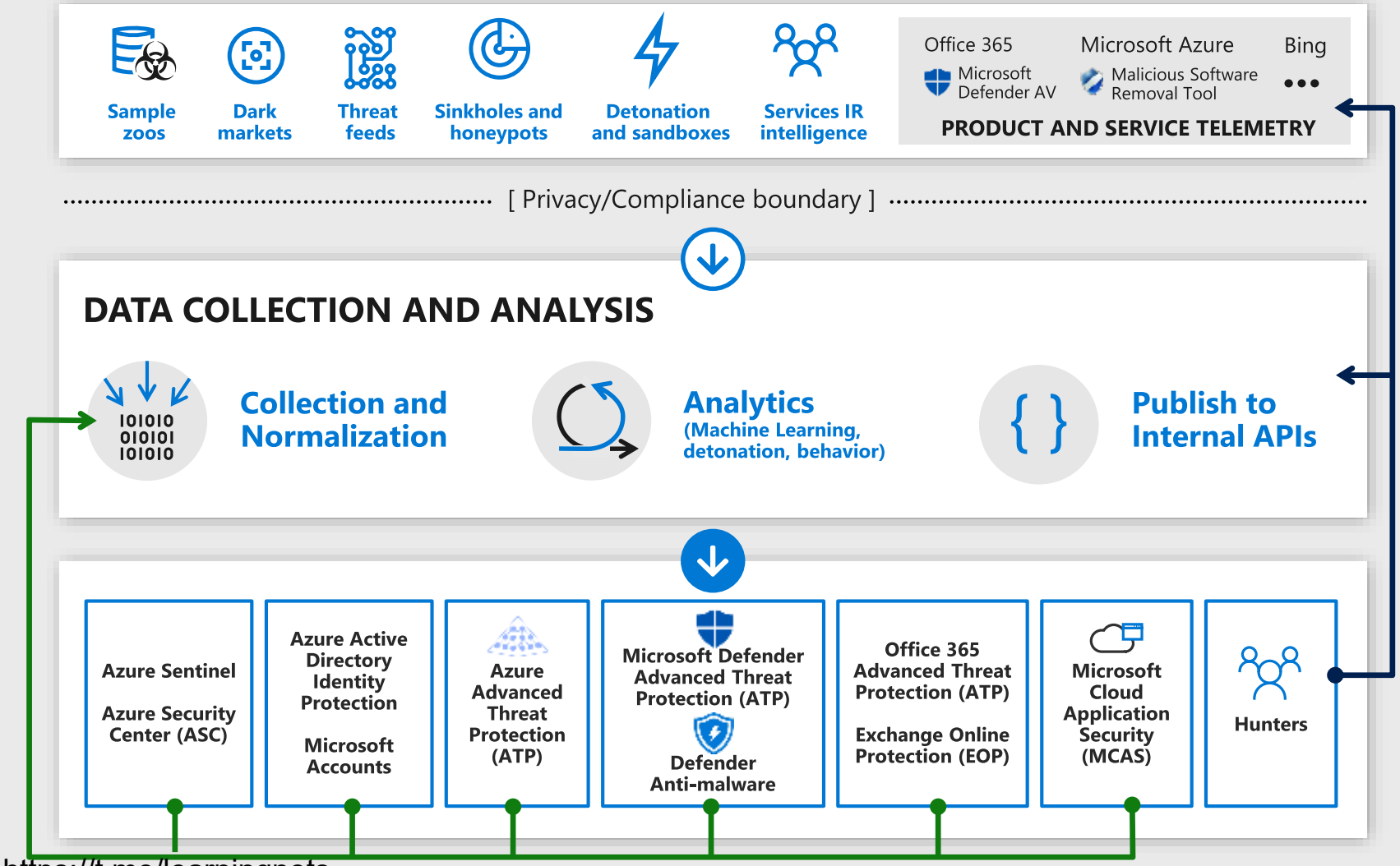
18+ billion web pages scanned

470 billion e-mails analyzed

5 billion threats detected on devices every month

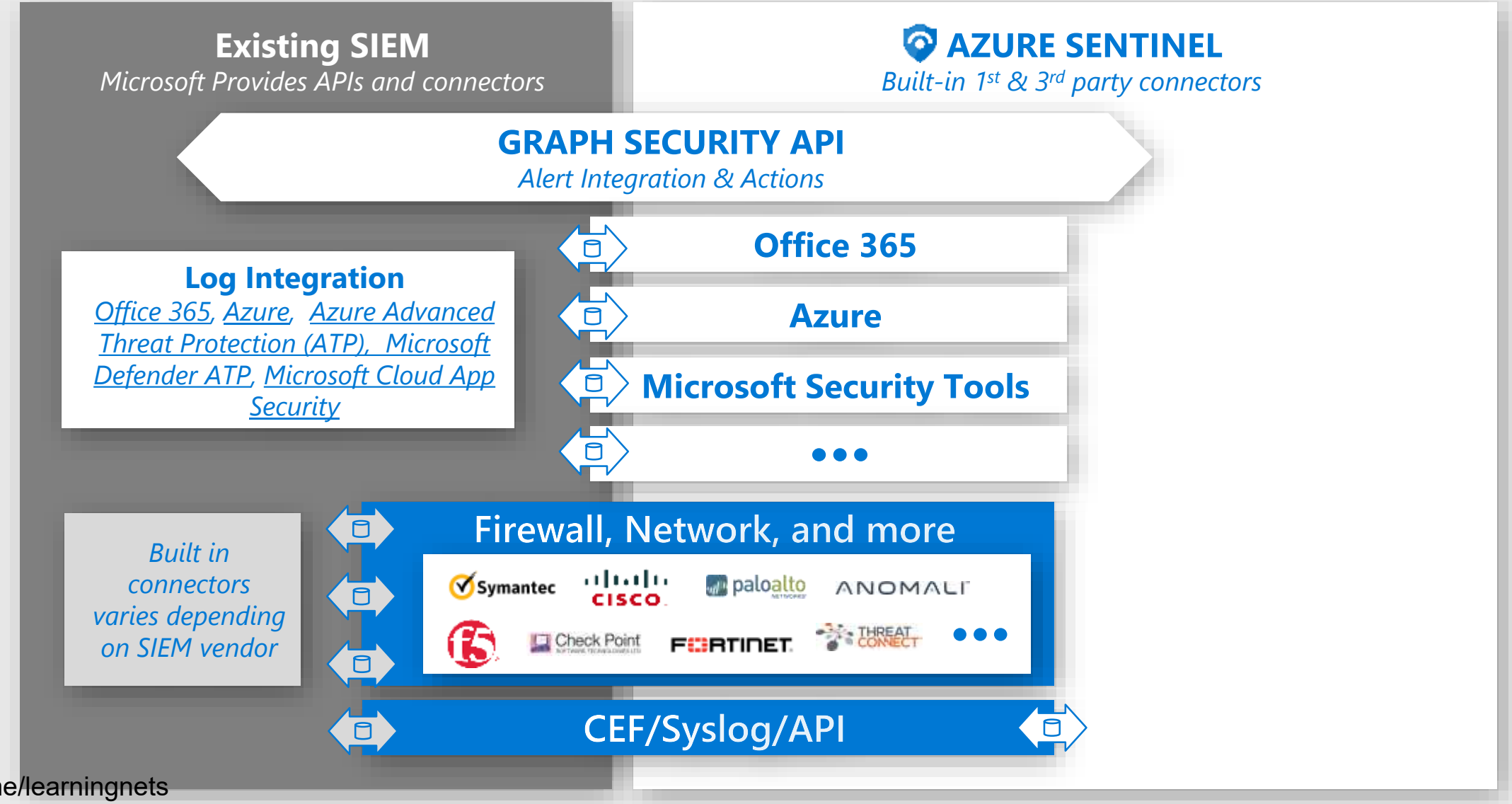
Unparalleled cybersecurity visibility and insight

Inside The Intelligent Security Graph



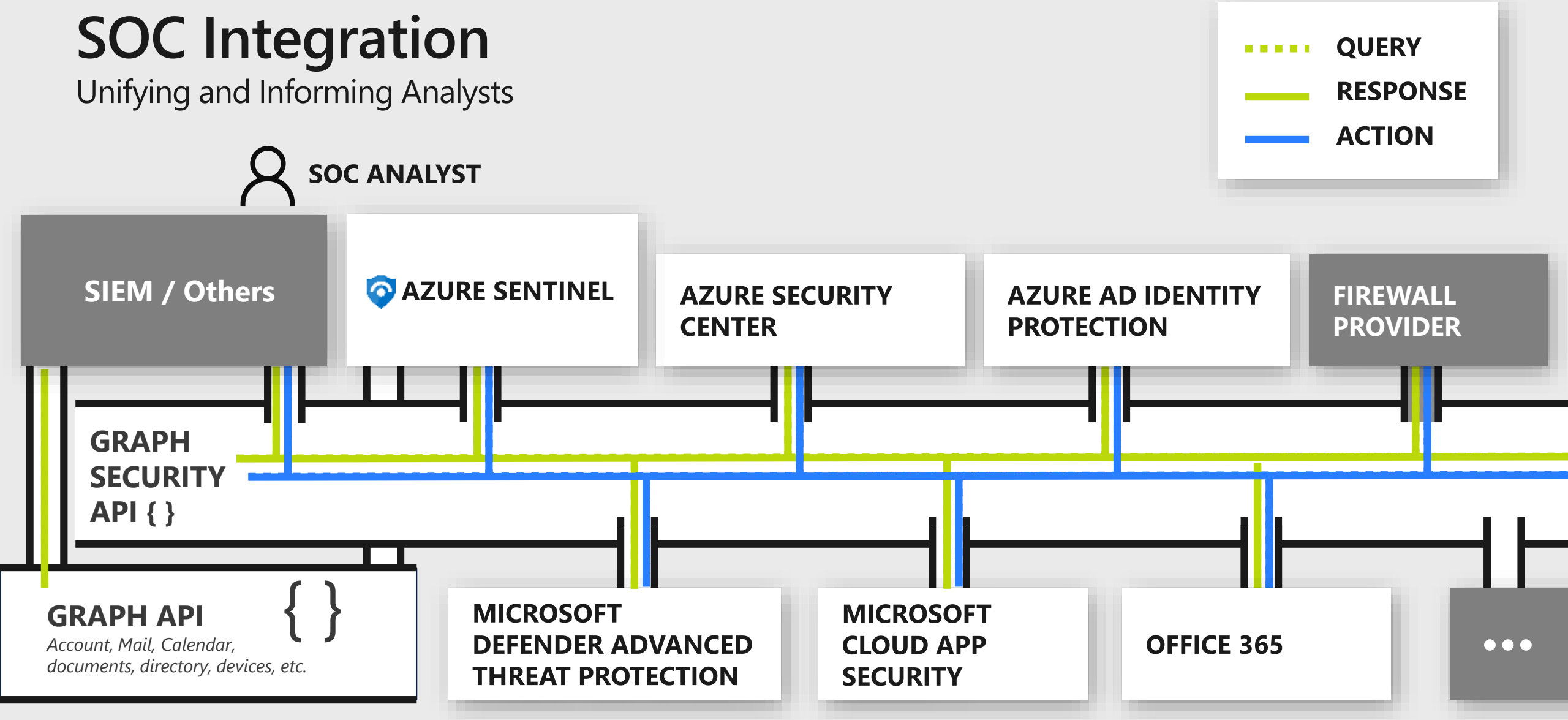
- Products instrumented to strict privacy/compliance standards
  See Microsoft Trust Center
- Analytics help fuel new discoveries
- Products send data to graph
- Products use Interflow APIs to access results
- Products generate data which feeds back into the graph
- Hunters identify attacks, improve analytics, feed back into product design

SIEM Integration



SOC Integration

Unifying and Informing Analysts



http://aka.ms/graphsecurityapi | https://aka.ms/graphsecuritydocs

AZURE SENTINEL
Core capabilities

Collect

Microsoft Services

Apps, users, infrastructure

Public Clouds

Security solutions

Analyze & detect threats

Machine learning, UEBA

Investigate & hunt suspicious activities

Interactive Attack Visualization, Azure Notebooks

Automate & orchestrate response

Playbooks

Enrichment with Intelligence (Geo location, IP Reputation)

Data Ingestion

Data Repository

Data Search

Azure Monitor (log analytics)

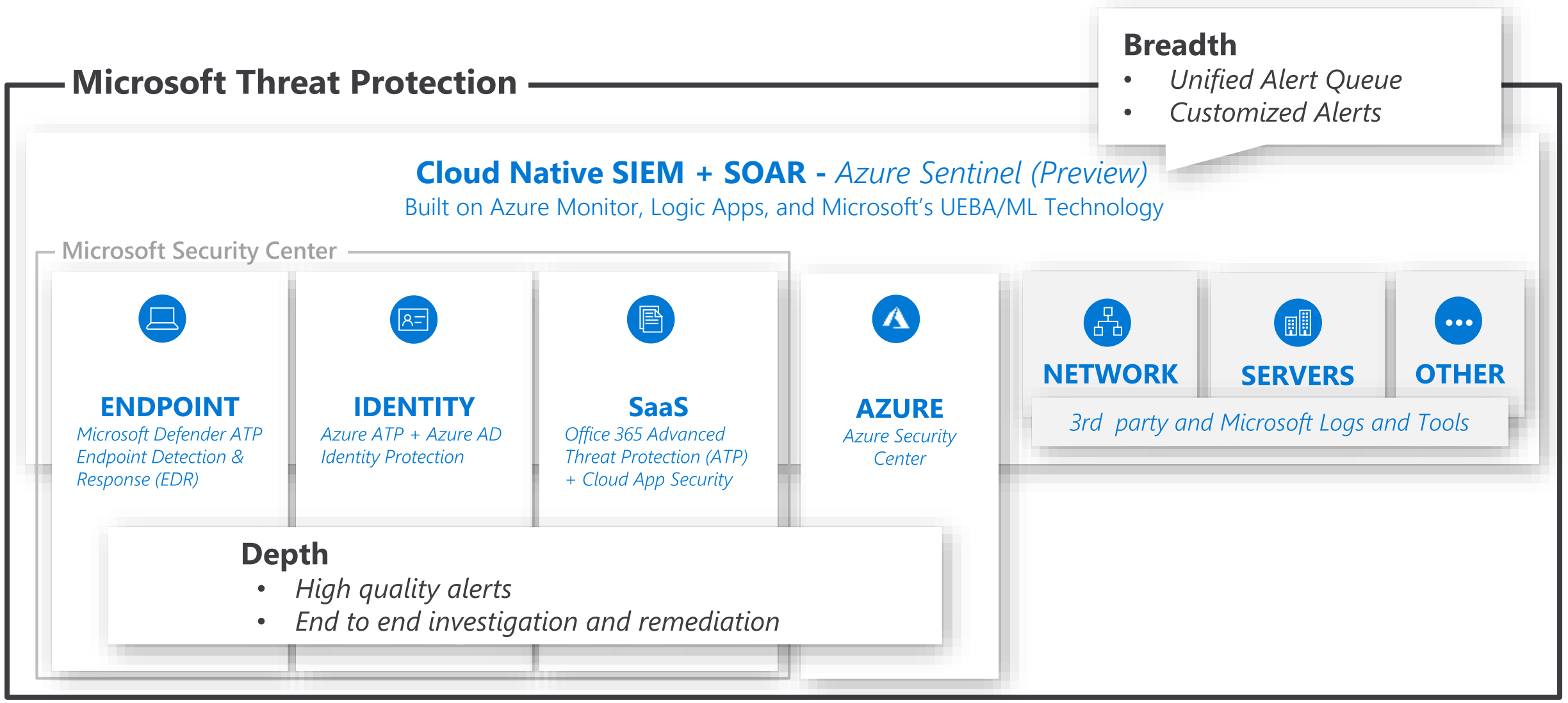
Integrate

ServiceNow

Other tools

Community

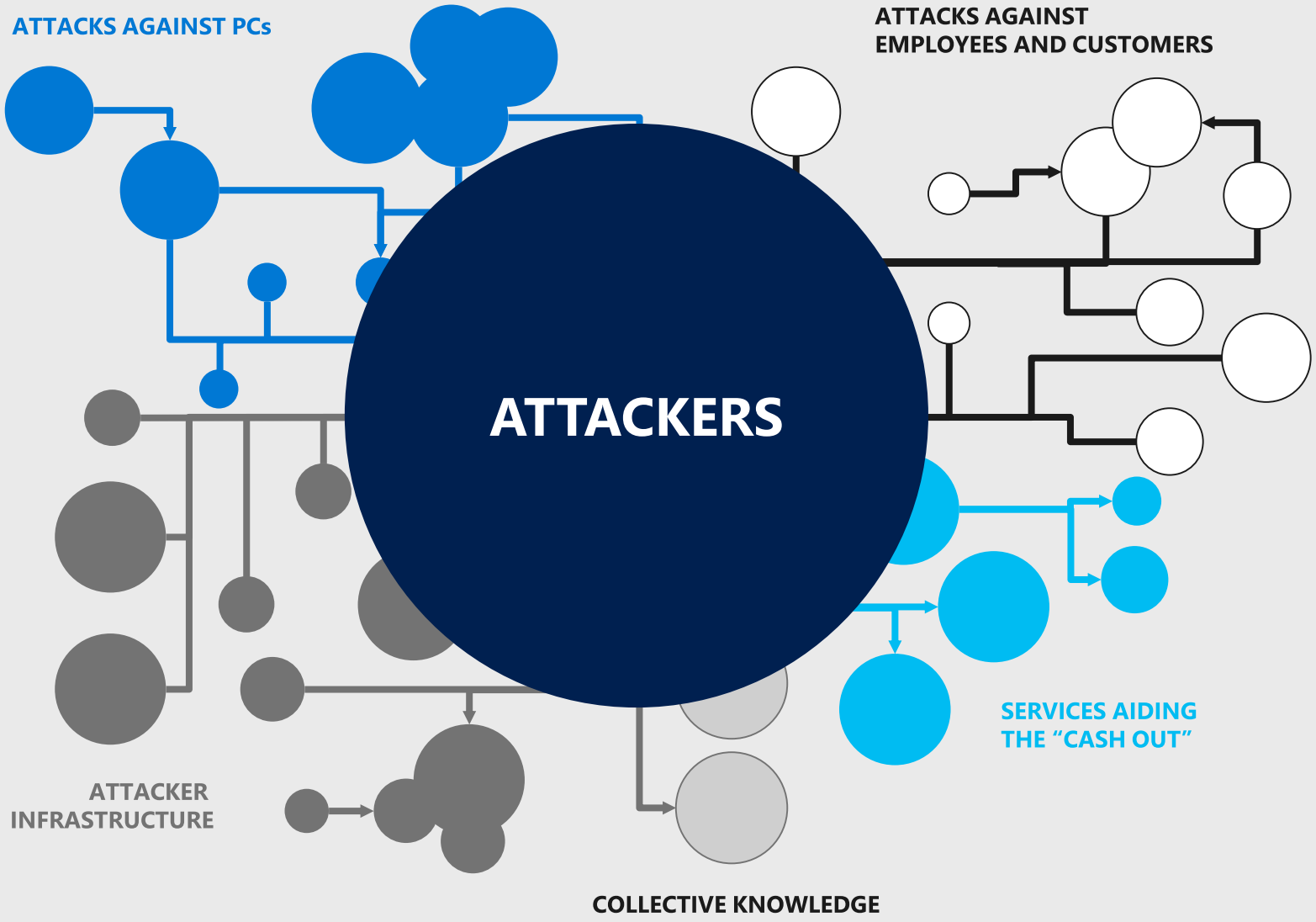
Integrated toolset for rapid threat remediation



Most attackers have a supply chain

You face **ecosystems**, not just hackers and malware

Defenses must address ***current*** attacker methods



Yes, attack services are inexpensive

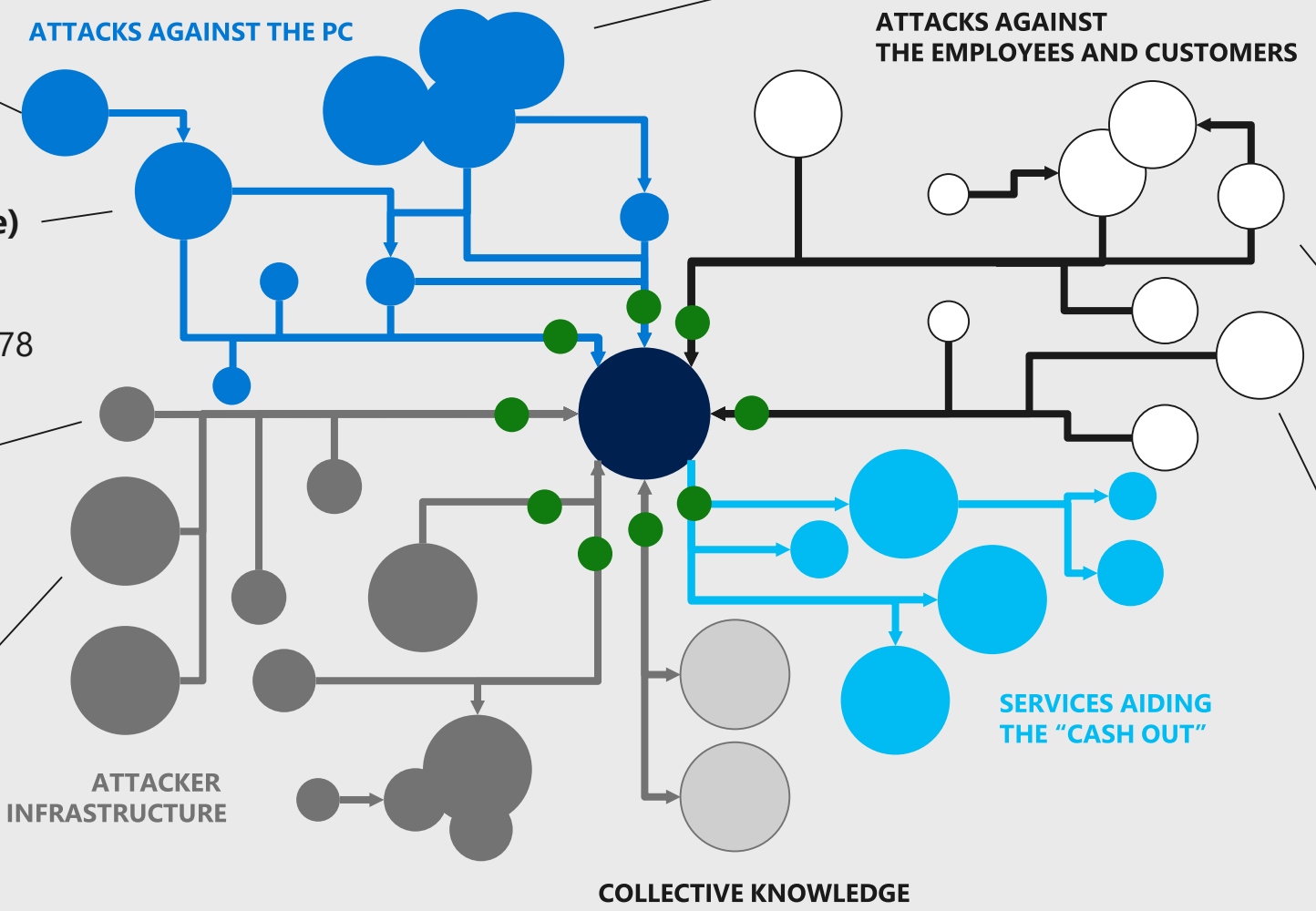
Ransomware:
$66 upfront
Or
30% of the profit (affiliate model)

0days price range varies from $5,000 to $350,000

Loads (compromised device) average price ranges
- **PC** - $0.13 to $0.89
- **Mobile** - from $0.82 to $2.78

Denial of Service (DOS) average prices
day: $102.05
week: $327.00
month: $766.67

Proxy services to evade IP geolocation prices vary
As low as $100 per week for 100,000 proxies.



Spearphishing services range from $100 to $1,000 per successful account take over

Compromised accounts
As low as $150 for 400M.
Averages $0.97 per 1k.

Yes, attack services are inexpensive

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PRIORITIZE HYGIENE OVER 'ZERO DAY' DEFENSES

Zero day vulnerabilities are expensive and impractical for many attacks. Focus first on critical security hygiene like rapidly applying security updates/patches (which have much lower cost to attackers) https://aka.ms/CyberHygiene has guidance from Microsoft + NIST + CIS + DHS NCCIC

SHIFT FROM NETWORK TO ZERO TRUST STRATEGIES

Attackers can easily evade traditional network defenses. You should shift security strategy towards 'zero trust' of your network that focuses on
- Endpoint and Identity security capabilities as the front line
- Data centric security that prioritizes highest value assets
- Application / SaaS protections
- Centralized access control (such as Microsoft's Conditional Access)

LIMIT EFFORTS TO RESTRICT TRAFFIC BY GEOGRAPHY

Blocking IP addresses by geography (e.g. hostile countries) can be easily and cheaply evaded, so focus your security efforts elsewhere.

DDoS Protection FOR CRITICAL SERVICES

Ensure that your business critical services have DDoS protection from Azure platform or a capable 3rd parties

Ransomware:
$66 upfront
Or
30% of the profit (affiliate model)

Spearphishing services
range from $100 to $1,000 per successful account take over

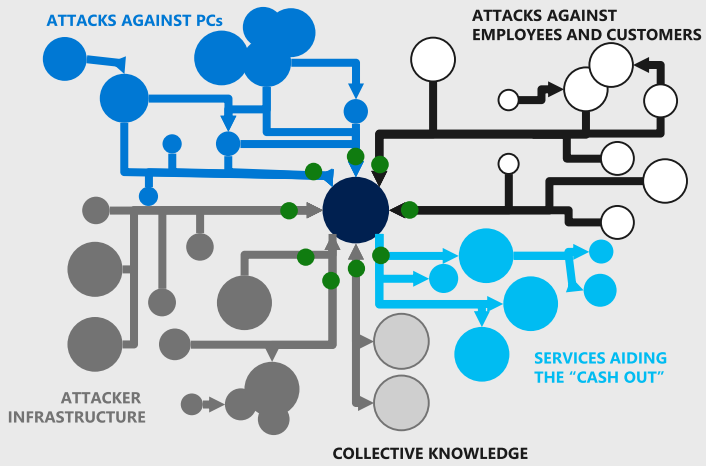
Compromised accounts
As low as $150 for 400M.
Averages $0.97 per 1k.

Pragmatic intelligence investment

Attacks are commoditized and cheap

Complicates attack attribution

Enables new entrants with affiliate models



Recommend a two part strategy

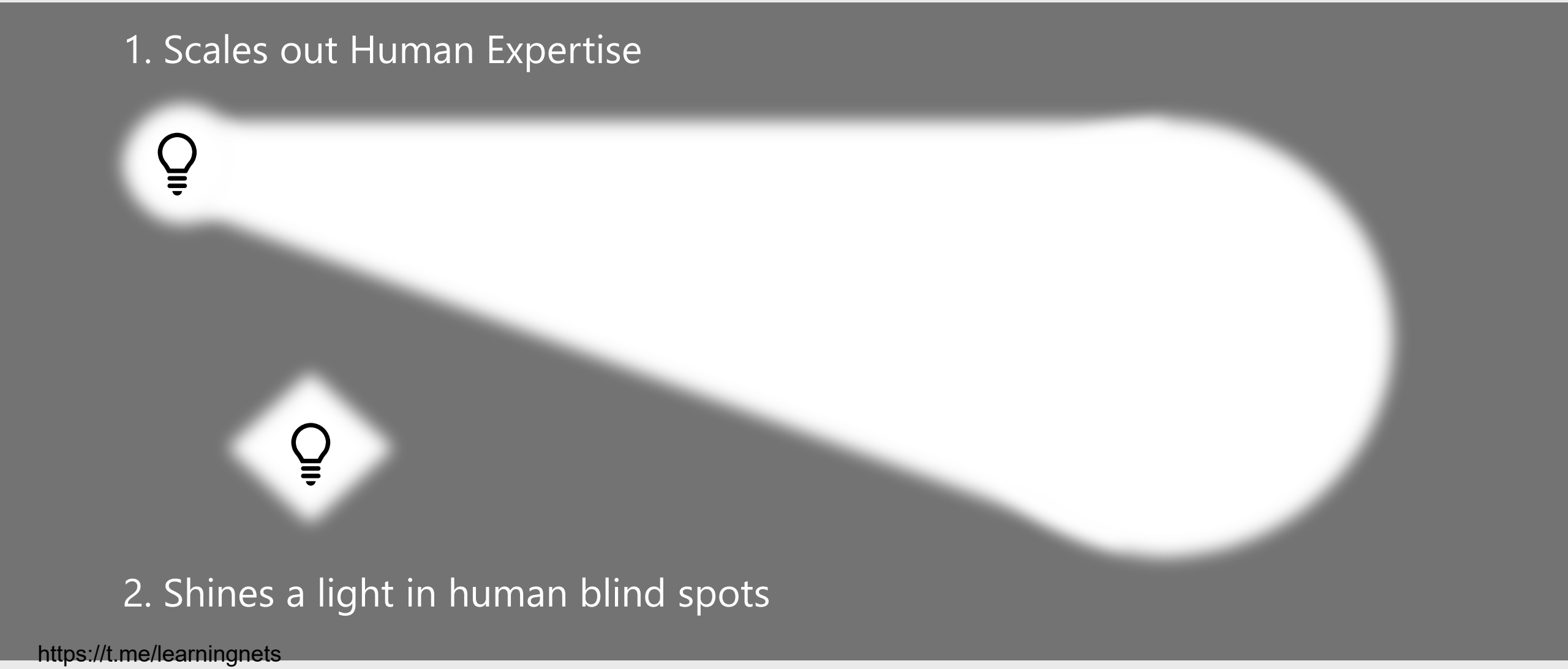
1. **"Outsource" commodity threat intelligence**
2. **Focus on developing your unique intelligence**
   1. Which attackers would be interested in you
   2. What they would target
   3. What would damage your business/mission most

Microsoft's intelligent security graph includes actionable dark market threat intelligence

Machine Learning

Helps overcome human limitations using large datasets

1. Scales out Human Expertise



2. Shines a light in human blind spots

Machine Learning also brings risks

Must manage potential negative consequences

1. Can amplify human bias

2. Can inadvertently reveal private/secret information

3. Can miss critical context and implications

(e.g. Confuse innocent "John Smith" with another "John Smith" with criminal record and same birthdate)

4. Can be fed false/malicious data

Microsoft Mitigation Approach – https://aka.ms/ProtectingML

Machine Learning in Microsoft Security

We use machine learning extensively to

- Reduce manual effort
- Reduce wasted effort on false positives
- Speed up detection

Examples:

- Defender ATP Antivirus - rapid detection and blocking of new threats
- Azure - Rule recommendations for Application whitelisting
- Azure - Threat detection via Malicious User Profiling, Compromised VM behavior

Results from Machine Learning

A former rules-based Microsoft system scored

28% of logins as suspicious

With 1 billion logins per day
=280 million "suspicious" logins

Noisy Results

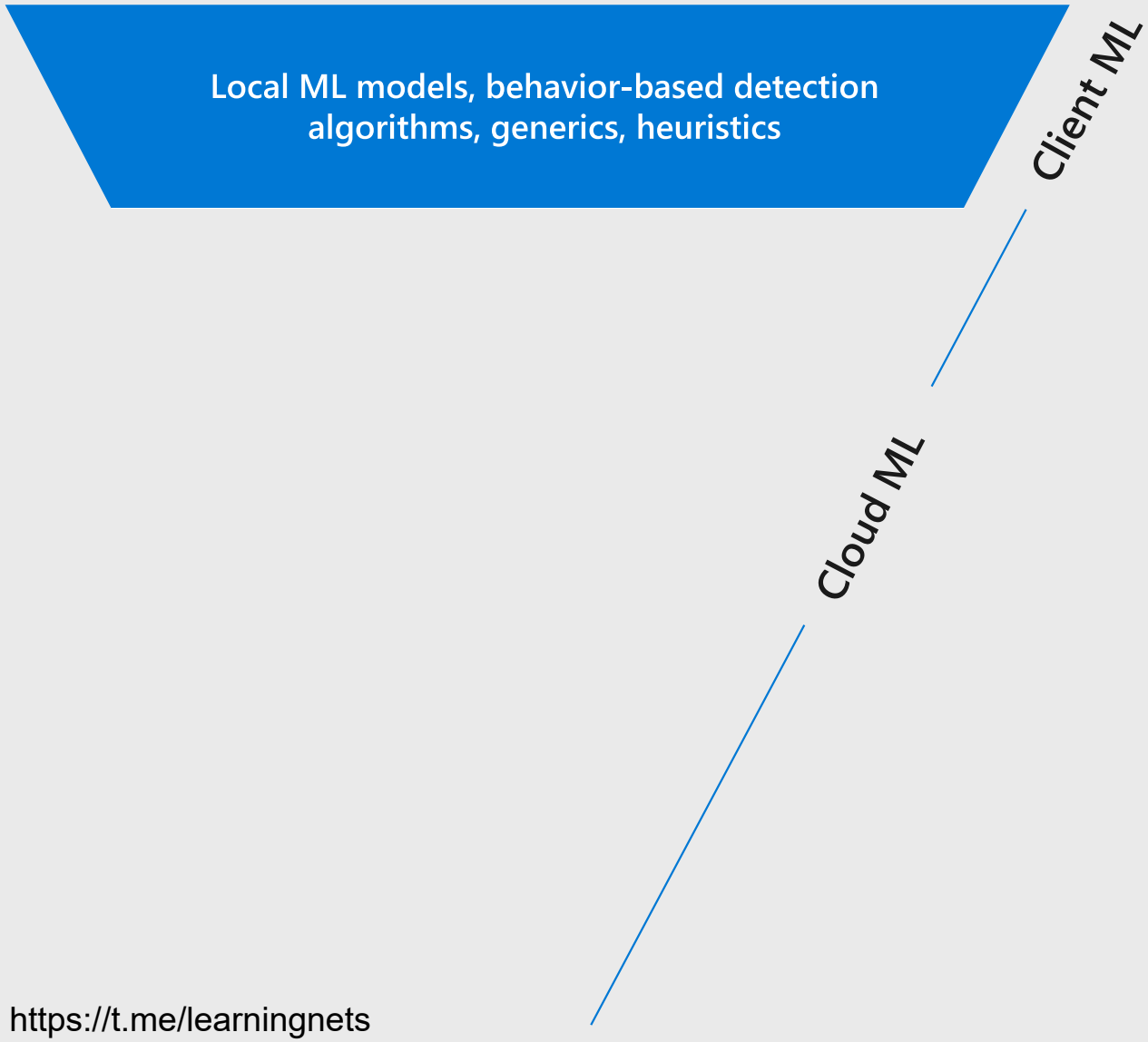
- Company Proxy
- Cellphone networks
- Vacations/Travel

After applying Machine Learning with rules, the rate dropped to less than

0.001%

Work by Mace et. al, Microsoft

Machine Learning in Microsoft Defender AV



Protection in milliseconds

Most common malware blocked by high-precision detection on the client

Protection in milliseconds

ML powered cloud rules evaluate suspicious files based on metadata

Protection in seconds

A sample is uploaded for inspection by multi-class ML classifiers

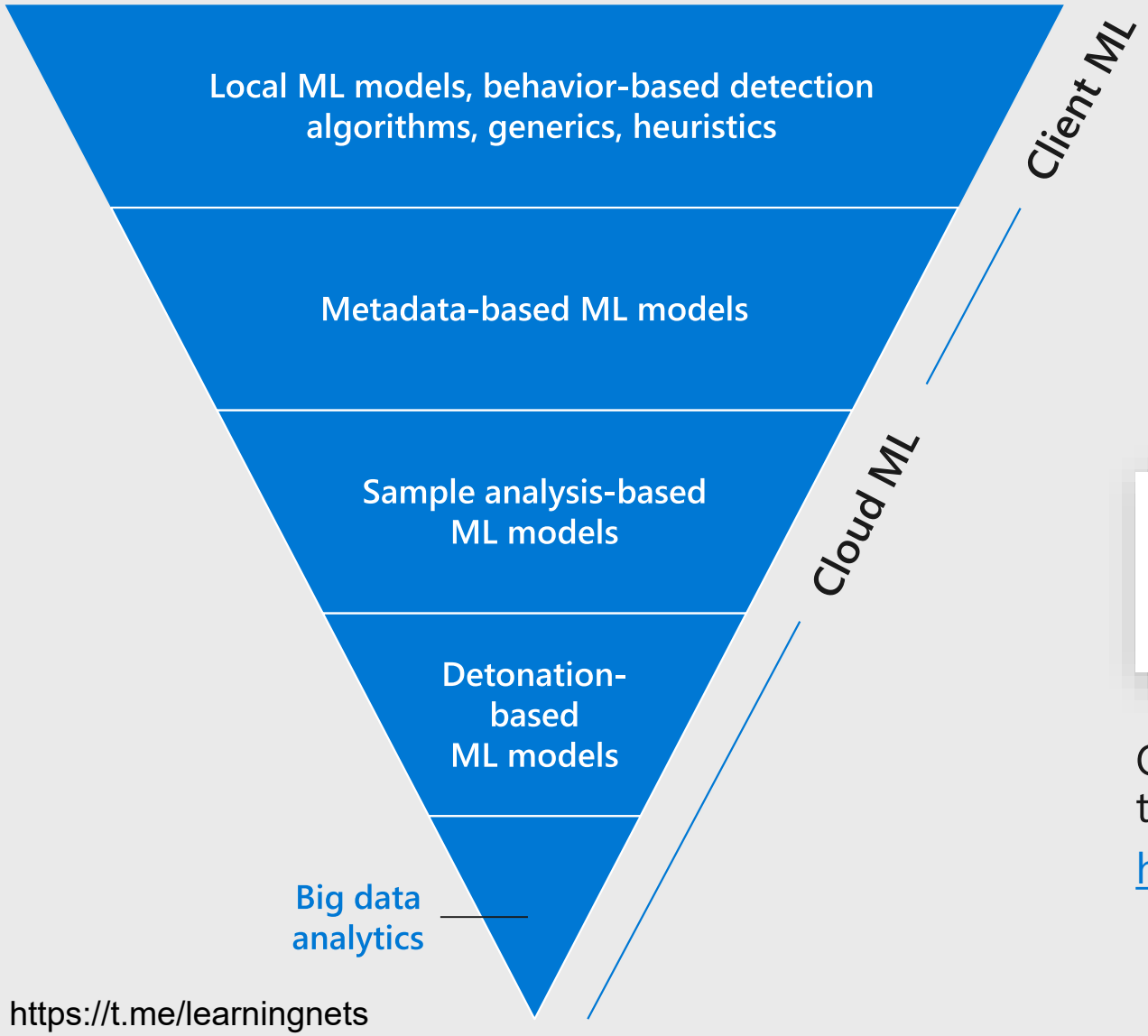
Protection in minutes

Sample run in sandbox for dynamic analysis by multi-class ML classifiers

Protection in hours

ML models and expert rules correlate signals from a vast network of sensors to classify threats

Real world example – Dofoil / Smoke Loader



Protection in milliseconds

Just before noon, behavior-based algorithms detected a massive campaign

Protection in milliseconds

Most components of the attack were blocked at first sight by metadata-based ML models

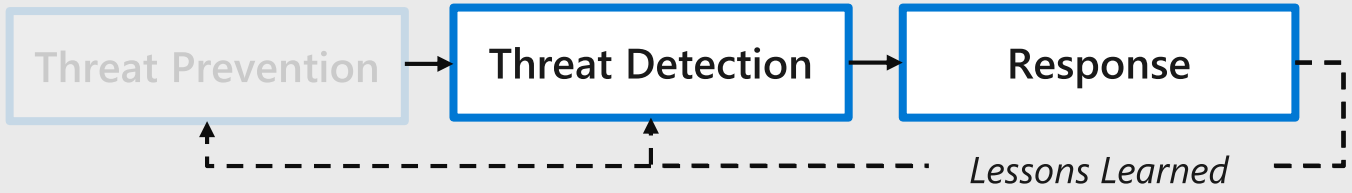
Protection in seconds

Additional Protection was provided by sample analysis-based ML models for some components

On March 6, Microsoft Defender Antivirus blocked more than 400,000 instances of several sophisticated trojans

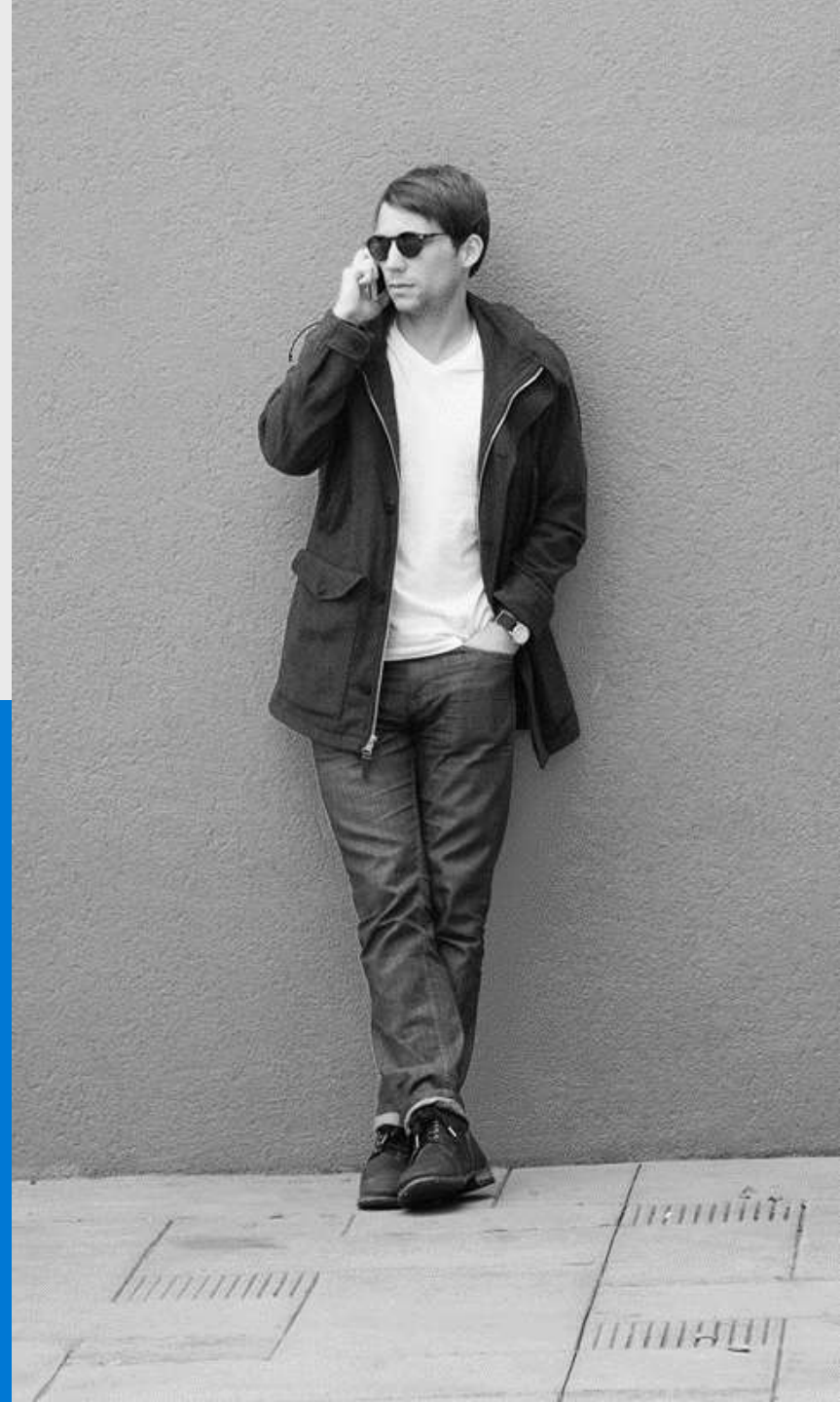
http://aka.ms/dofoil

Other recent cases: Emotet | Bad Rabbit

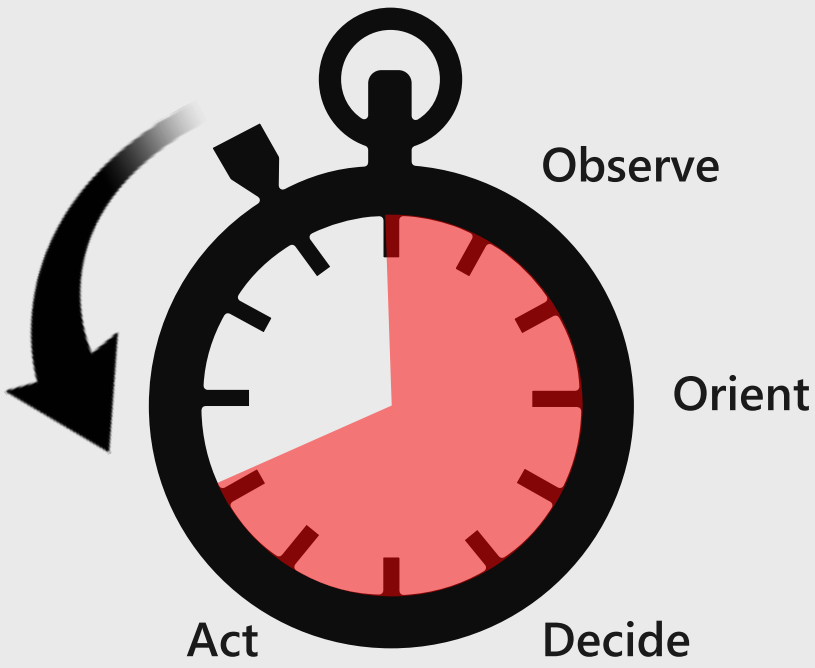


At some point the adversary has to do something anomalous—

You have to be able to spot that and quickly take action on it



Making better decisions faster



1. **Maximize Visibility**
   - **Internal –** Sensor coverage completeness and diversity
   - **External** – Threat Feed Diversity and fidelity
2. **Reduce manual steps (and errors)**
   - **Automate** detection and response tasks
   - **Integrate** investigation tools
3. **Maximize human impact**
   - Provide analysts with access to **deep expertise and intelligence**
   - **Continuous Learning–** Observe attacks and integrate learnings into defenses

DEFENDER DECISION CYCLE

DETECT	RESPOND	RECOVER
Observe	*Orient*	*Decide*	*Act*

Maximize internal visibility

Apply Threat Insights Across Your Hybrid Cloud Estate

Cloud App Security

DATA ON SAAS

Office 365 ATP
- Email gateway
- Anti-malware

Office 365
Threat Intelligence

Microsoft Defender ATP

Microsoft Defender AV

IDENTITY

Azure AD
- Identity Protection

Powered by the Intelligent Security Graph

Azure Advanced Threat Protection

CLOUD INFRASTRUCTURE

Azure SQL
- Threat Detection

Azure Security Center
- **Threat Protection**
- Threat Detection

Security Appliances

PRIVATE CLOUD AND ON-PREMISES INFRASTRUCTURE

Microsoft Defender ATP

INTELLIGENCE AND ANALYSIS

Cybersecurity Operations Service (COS)

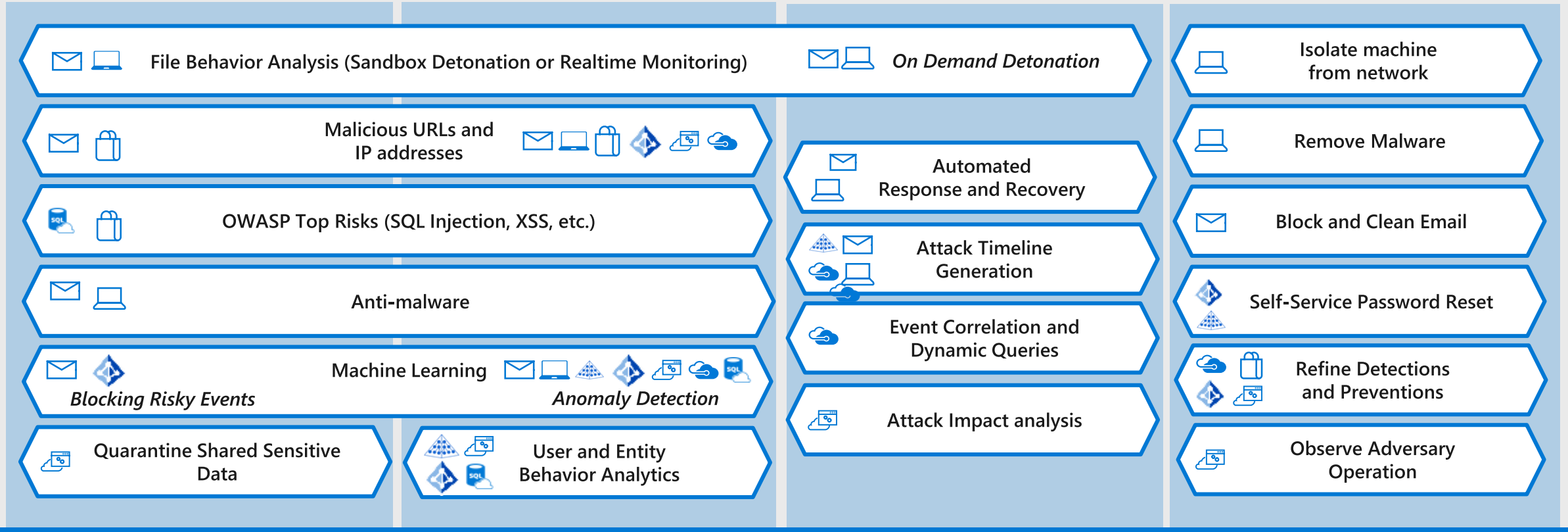
Incident Response and Recovery Services

Hunt for threats and persistent adversaries in your environment

Respond to Threats with seasoned professionals and deep expertise

Professional Services

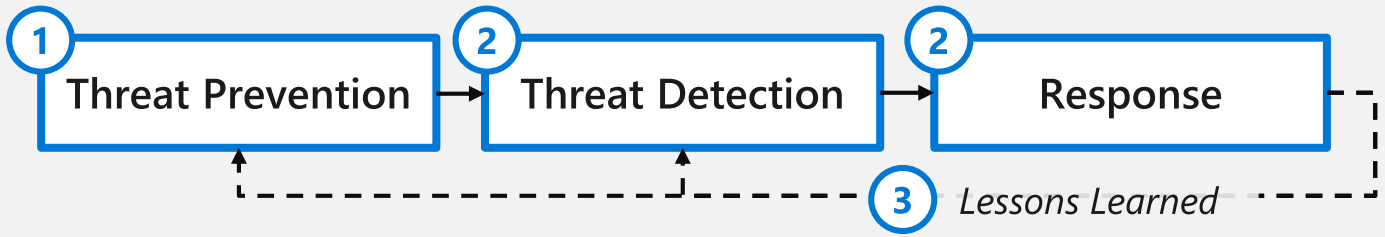
Automate and enable threat protection



- Azure AD Identity Protection
- Azure ATP / Identity Manager
- Office 365 ATP
- Microsoft Defender ATP / Defender AV
- Microsoft Cloud App Security
- Azure Security Center
- Azure Web App Firewall / SQL Threat Detection
- Azure Marketplace Partner Capability

Threat protection

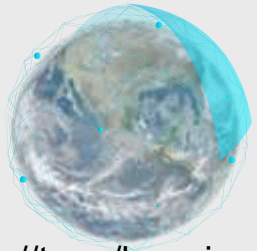
THREAT PROTECTION LIFECYCLE



Goal: *Increase attacker cost as rapidly and efficiently as possible*

STRATEGIC IMPERATIVES

1. **Prevent as many threats as possible**
   (Best Security ROI when available)
2. **Rapidly Detect and Respond**
   (highest coverage of assets/scenarios)
3. **Continually apply learnings**
   (continuous attack cost increase)



Committed to your success

Accelerate your ability to manage threats by providing secure platforms and products, security capabilities, services, and recommendations

Microsoft

Questions?

References

Additional Resources – Threat Protection

Incident Response Reference Guide (IRRG) - https://Aka.ms/IRRG

Updates to Windows Hello for Business – Video

Updates to Microsoft Defender ATP's EDR - Blog

Office 365 Attack Simulation - Video | Documentation

Privileged Access Management in O365 – Video

Shielded VMs for PAWs

https://blogs.technet.microsoft.com/datacentersecurity/2017/11/29/why-use-shielded-vms-for-your-privileged-access-workstation-paw-solution/

Microsoft Azure Security Response in the Cloud

https://gallery.technet.microsoft.com/Azure-Security-Response-in-dd18c678

Advanced Threat Protection Videos

1. WDATP Automated investigation and response [YouTube link]
   Animation shows how Microsoft Defender ATP frees up time for them to do more advanced hunting and strategic work by automating investigation and response tasks

2. WDATP Secure Score [YouTube link]
   Animation shows how Windows Secure Score helps organizations to stay more secure using PowerBI reports to easily looks for CVE's and automatic pushing of Emergency Outbreak Updates.

3. WDATP & Azure AD & Intune integration [YouTube link]
   Animation shows how Microsoft Intune will receive the device risk level from Microsoft Defender ATP and CA will block access to data until threat is remediated (and device conforms with policy again).

4. OATP & WDATP detection sharing [YouTube link]
   Video It shows how Microsoft 365 Threat Protection shares signals through the Intelligent Security Graph (ISG) to better protect our customers.

Cybersecurity Reference Architecture

May 2018 – https://aka.ms/MCRA | Video Recording | Strategies

Security Operations Center (SOC)

Microsoft Threat Experts | Incident Response, Recovery, & CyberOps Services

Azure Sentinel – Cloud Native SIEM and SOAR (Preview)

Vuln Mgmt | MSSP | Cloud App Security | Azure Security Center | Windows Defender | Office 365 | Azure

Advanced Threat Protection (ATP)

Graph Security API – 3rd Party Integration

Alert & Log Integration

This is interactive!

1. Present Slide
2. Hover for Description
3. Click for more information

Roadmaps and Guidance

1. Securing Privileged Access
2. Office 365 Security
3. Rapid Cyberattacks (Wannacrypt/Petya)

Software as a Service

Office 365

- Secure Score
- Customer Lockbox

Dynamics 365

Identity & Access

Azure Active Directory

Conditional Access – Identity Perimeter Management

- Azure AD Identity Protection
  - Leaked cred protection
  - Behavioral Analytics
- Azure AD PIM
- Multi-Factor Authentication
- Azure AD B2B
- Azure AD B2C
- Hello for Business
- MIM PAM

Azure ATP

Active Directory

ESAE Admin Forest

Information Protection

Cloud App Security

Azure Information Protection (AIP)

- Discover
- Classify
- Protect
- Monitor

Hold Your Own Key (HYOK)

AIP Scanner

Classification Labels

Office 365

- Data Loss Protection
- Data Governance
- eDiscovery

Azure SQL Threat Detection

SQL Encryption & Data Masking

Azure SQL Info Protection

Microsoft Defender ATP

Clients

Unmanaged & Mobile Devices

Intune MDM/MAM

Managed Clients

System Center Configuration Manager

Microsoft Defender ATP

Secure Score | Threat Analytics

Hybrid Cloud Infrastructure

On Premises Datacenter(s) | 3rd party IaaS | Microsoft Azure

Azure Security Center – Cross Platform Visibility, Protection, and Threat Detection

- Configuration Hygiene
- Just in Time VM Access
- Adaptive App Control

Extranet

- NGFW
- Edge DLP
- SSL Proxy
- IPS/IDS

Azure Firewall | **Security Appliances**

Express Route

Intranet Servers

Windows Server 2019 Security

Window 10 + Just Enough Admin, Hyper-V Containers, Nano server, and more...

Shielded VMs | Azure Stack | VMs

Privileged Access Workstations (PAWs)

- Azure Policy
- Azure Key Vault
- Azure WAF
- Azure Antimalware
- Application & Network Security Groups
- Backup & Site Recovery
- Disk & Storage Encryption
- Confidential Computing
- DDoS attack Mitigation+Monitor

Windows 10 Enterprise Security

Network protection | App control
Credential protection | Isolation
Exploit protection | Antivirus
Reputation analysis | Behavior monitoring
Full Disk Encryption
Attack surface reduction

S Mode

IoT and Operational Technology

Windows 10 IoT | Azure IoT Security | Azure Sphere | IoT Security Maturity Model | IoT Security Architecture

Included with Azure (VMs/etc.) Premium Security Feature

Compliance Manager

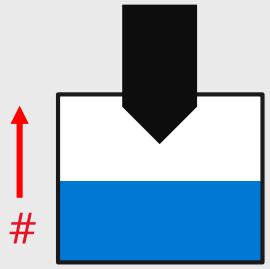
Security Development Lifecycle (SDL)

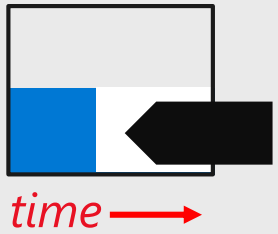
Trust Center | Intelligent Security Graph

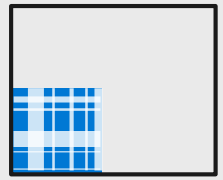
Microsoft

Platform security approach

← BACK TO TIMELINE







REDUCE VULNERABILITY COUNT AND SEVERITY

Security Development Lifecycle (SDL)

SD3+C: Secure in
- Design
- Development
- Deployment

+ Communications

https://www.microsoft.com/SDL
http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=44378

+

REDUCE TIME OF EXPOSURE

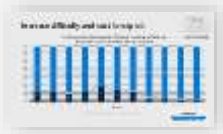
Rapid Response
- → Bug Bounty
- → Rigorous Testing
- → Response Center
- → Automatic Updates

https://technet.microsoft.com/en-us/security/dn440717.aspx

+

INCREASE DIFFICULTY AND COST TO EXPLOIT

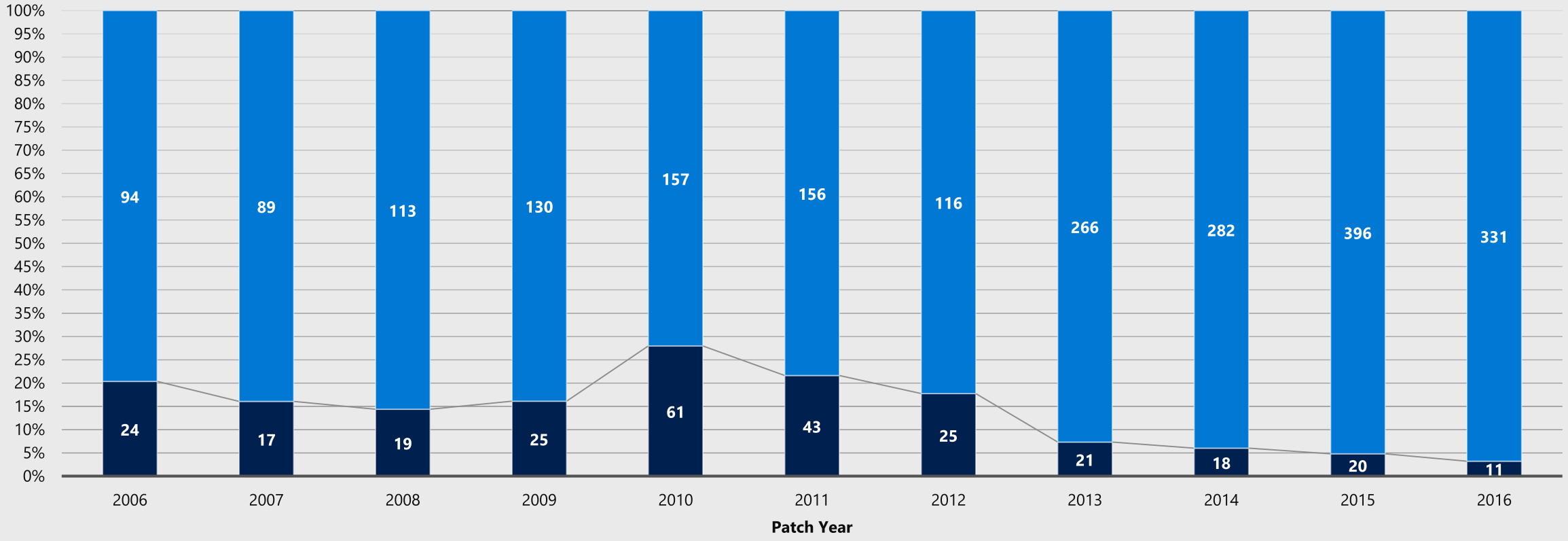
Platform Mitigations
- Eliminate classes of vulnerabilities
- Break exploit techniques
- Contain damage
- Prevent persistence
- Limit exploit opportunity window



Increase difficulty and cost to exploit

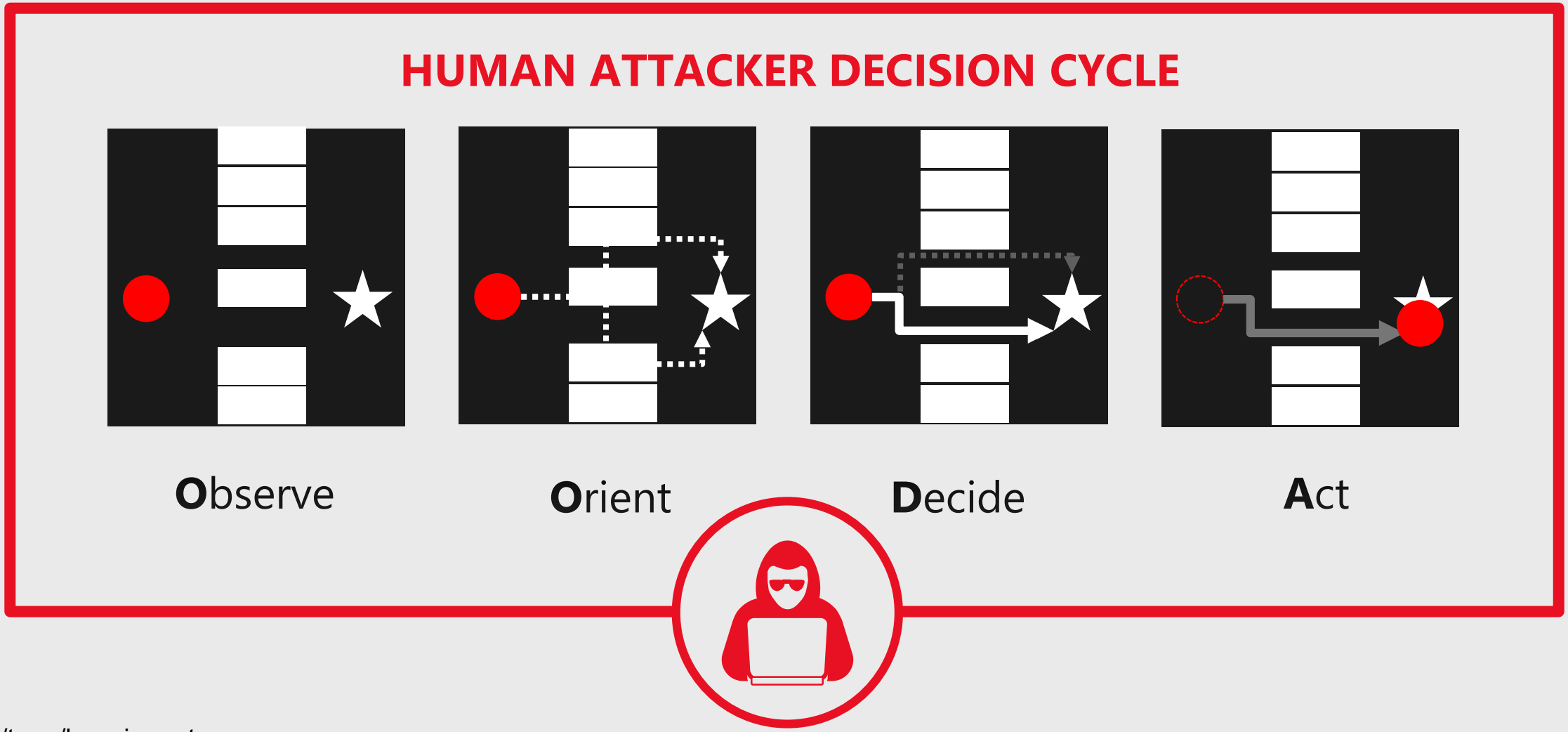
← BACK TO TIMELINE

% of Remote Code Execution (RCE) and Elevation of Privilege (EOP) CVEs exploited within 30 days of patch



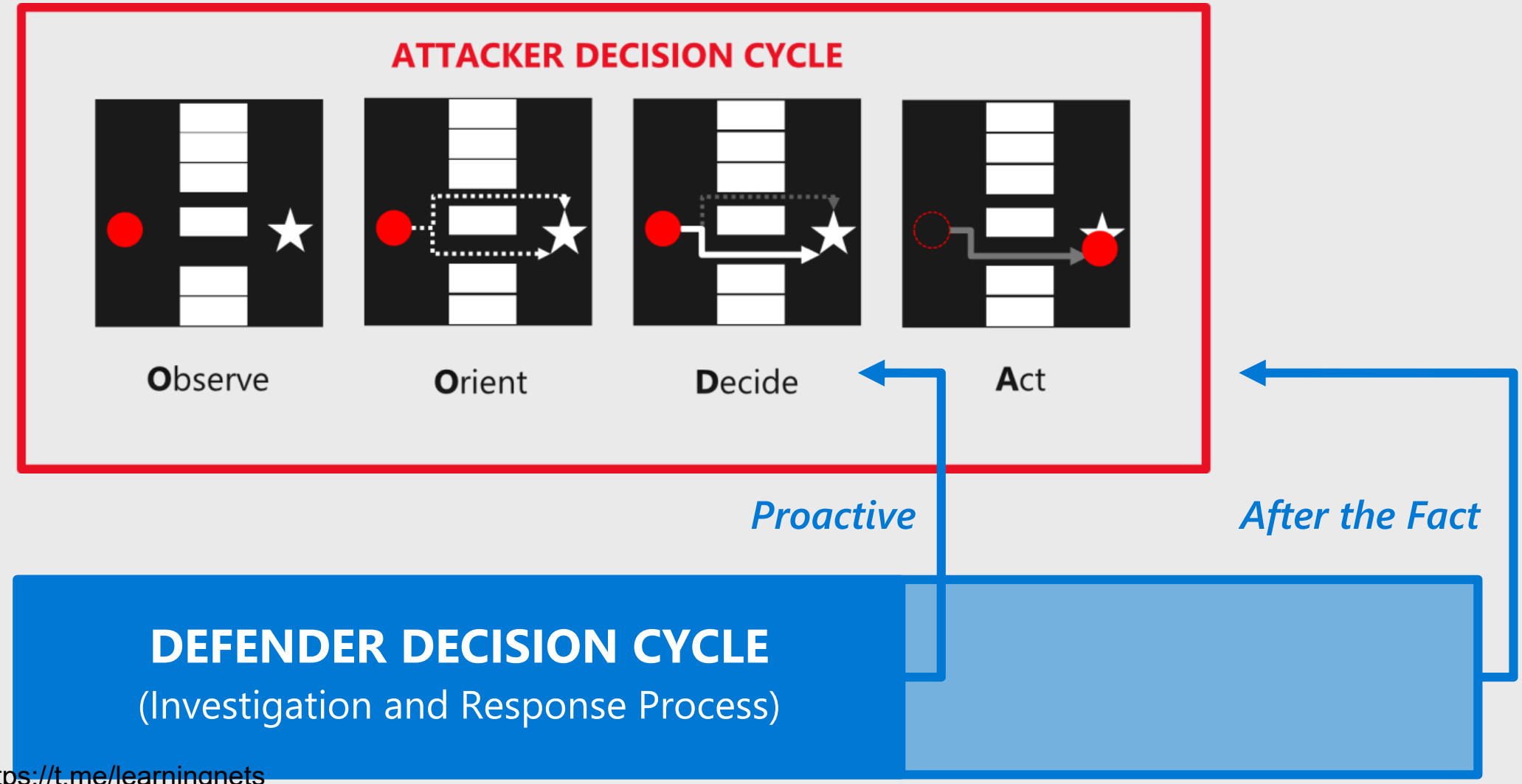
FROM BLOG:
[Mitigating arbitrary native code execution in Microsoft Edge]

Rapidly detect and respond



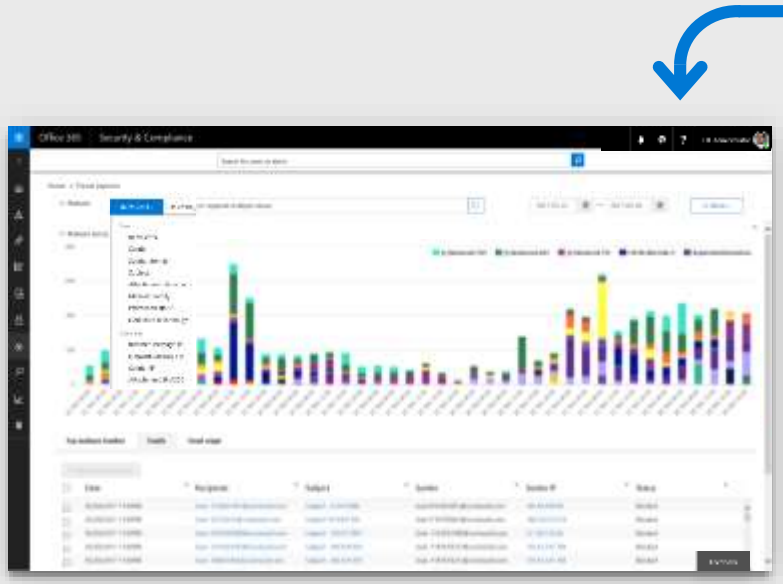
Get inside their OODA loop

Better and Faster Investigation and Response Decisions

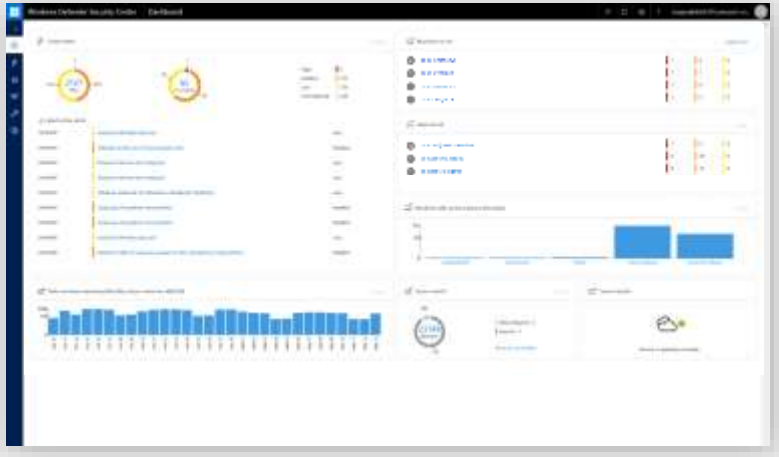


Analyst Workflow Integration

- Analyst use an integrated experience for rapid and accurate investigations and remediation
- Analysts quickly pivot from detection to deep investigation of host/identity/email to rapid remediation (blocking email, cleaning malware, resetting credentials, and more)



Office 365 Threat Explorer

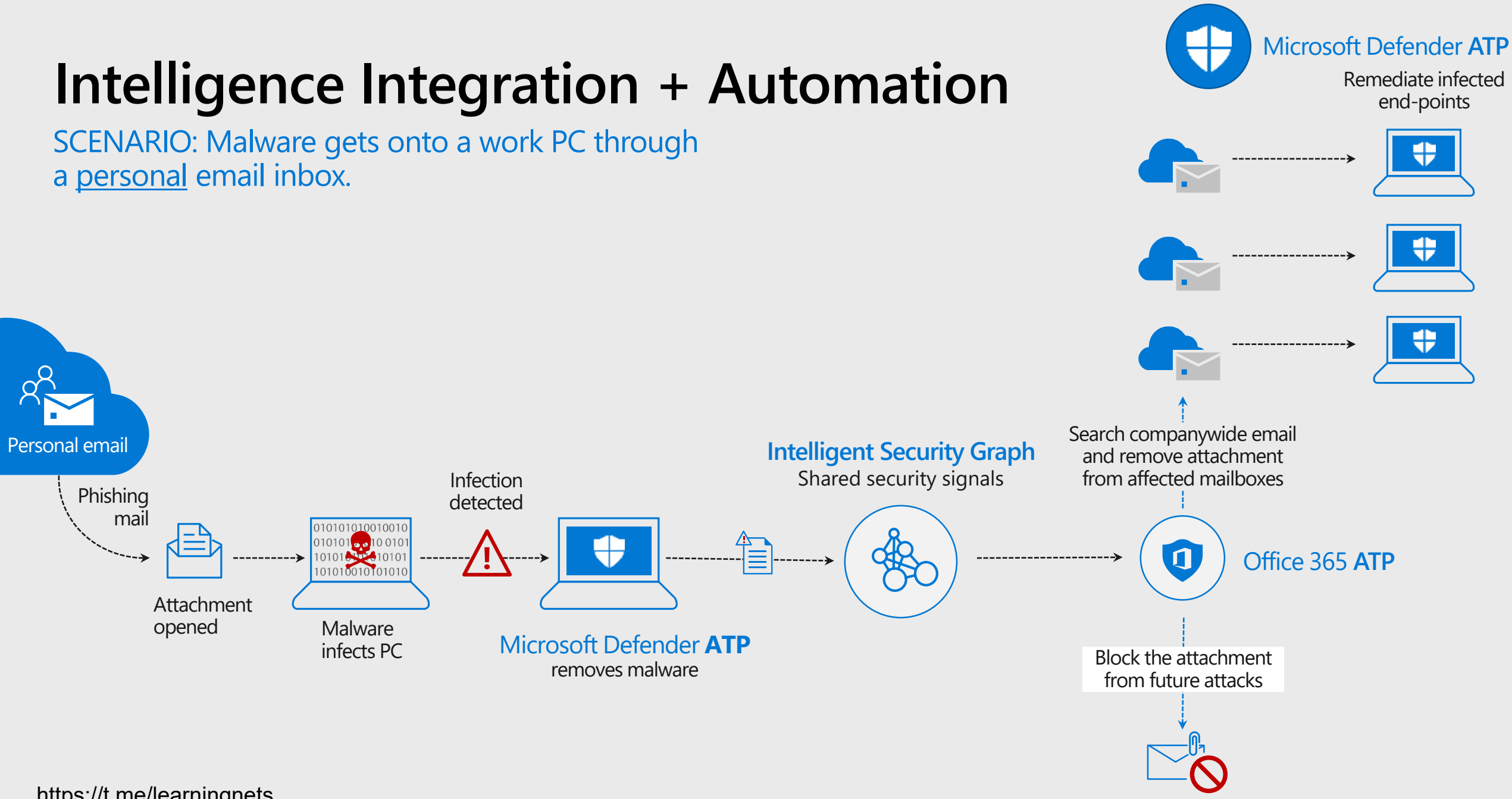


Microsoft Defender Security Center

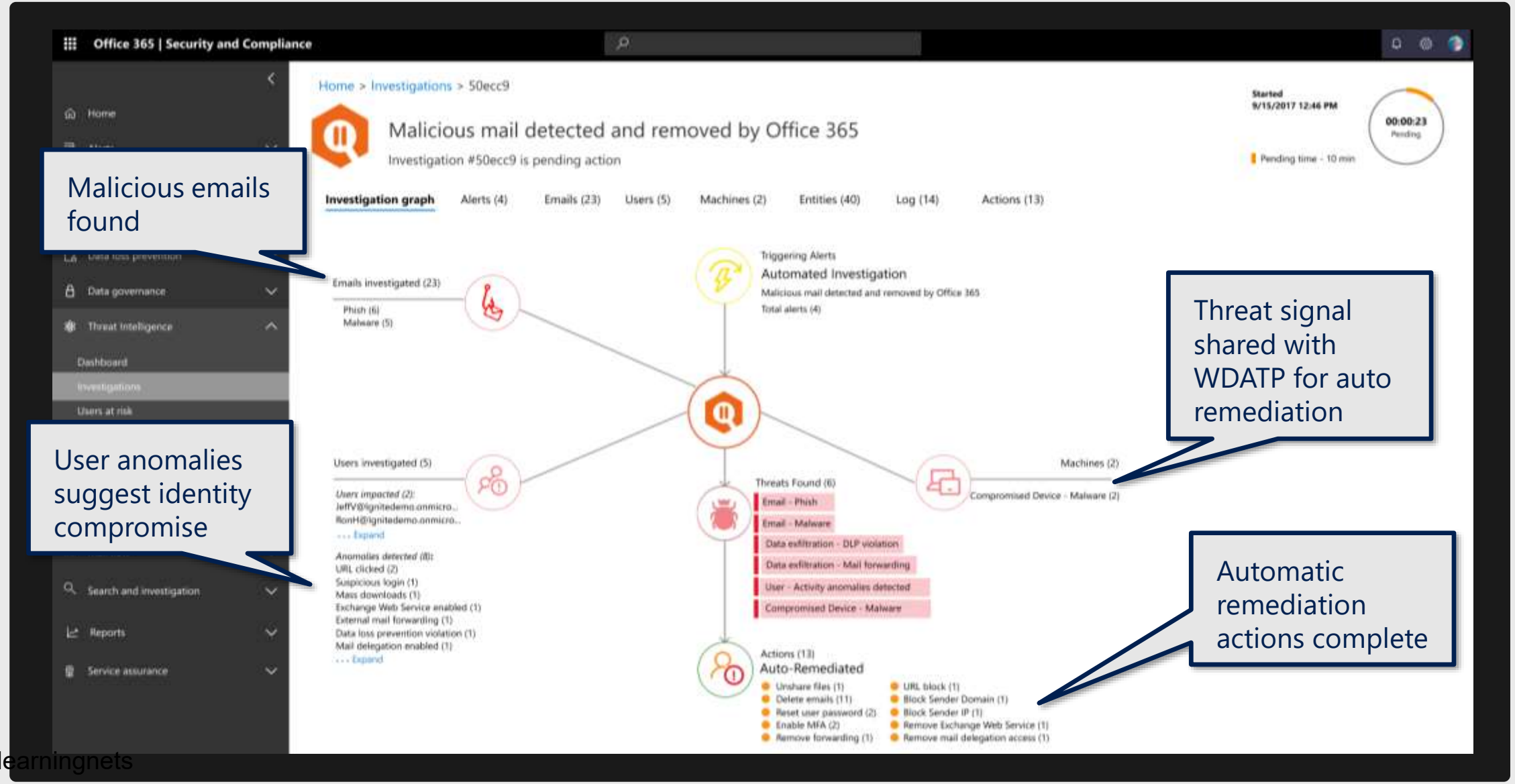
Azure Advanced Threat Protection (ATP)

Intelligence Integration + Automation

SCENARIO: Malware gets onto a work PC through a personal email inbox.

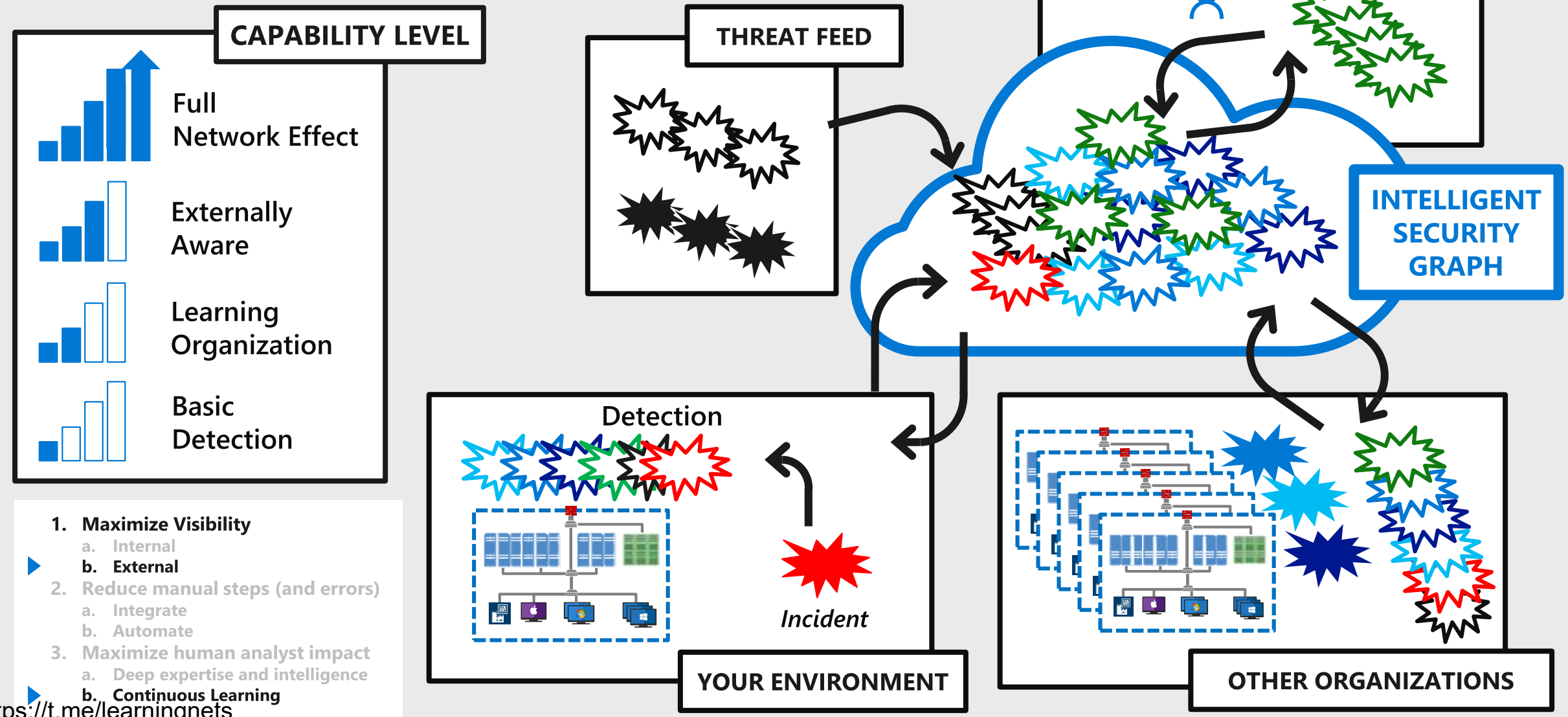


Because Minutes Matter



Integrating external context

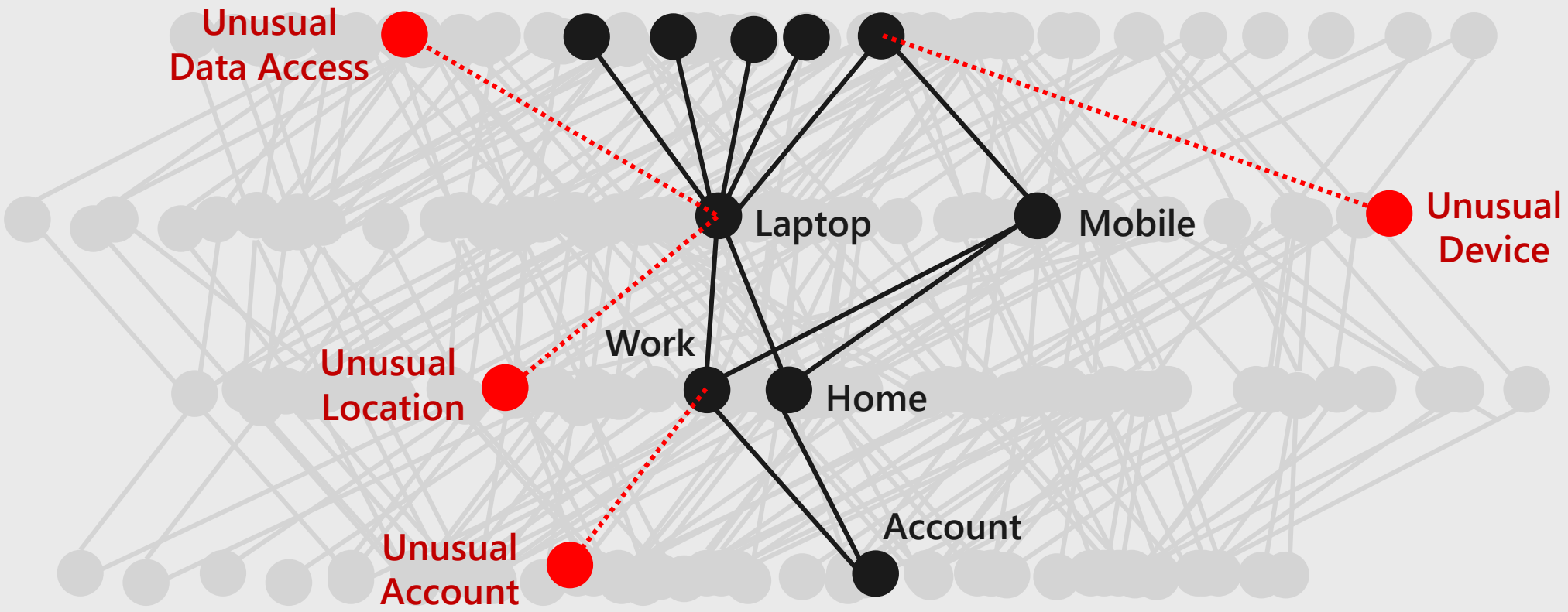
With a connected defender community



1. **Maximize Visibility**
   a. Internal
   b. **External**
2. Reduce manual steps (and errors)
   a. Integrate
   b. Automate
3. Maximize human analyst impact
   a. Deep expertise and intelligence
   b. **Continuous Learning**

Behavior Analysis

- Unusual behavior lost gets lost in aggregate
- Easier to spot anomalies in individual behavior



DESIGN

Microsoft incident response services

INCIDENT RESPONSE (IR)
Discreet onsite engagement to investigate, identify affected systems, and report findings

ALREADY 'ON RETAINER' WITH PREMIER SUPPORT

EXISTING INVESTIGATION

CYBERSECURITY OPERATIONS SERVICE (COS)
Proactive engagement to hunt for adversary presence

COMPROMISE RECOVERY
Develop and Execute a Recovery plan to:
- Rapidly Evict attacker
- Perform Critical Hardening (Limited)
- Set up Tactical Monitoring

YES

Attacker Present?

NO

NO KNOWN ADVERSARY
Immediate threat is evicted

Feed learnings into strategic security and modernization plans

1. Maximize Visibility
   a. Internal
   b. External
2. **Reduce manual steps (and errors)**
   a. Integrate
   b. Automate
3. **Maximize human analyst impact**
   a. **Deep expertise and intelligence**
   b. **Continuous Learning**

Learnings and Recommendations
Microsoft, EY, Edelman, Orrick

Incident Response Reference Guide
http://aka.ms/IRRG

Protection across an attack kill chain