Activity 2: SOC Analyst Simulation

Enterprise Incident Response with AI Partnership (Grades 9-12)

Dr. Ryan Straight

2025-12-07

> **!** Instructor Overview
>
> Students operate as a Security Operations Center (SOC) team responding to a realistic enterprise security incident. This simulation mirrors authentic SOC workflows where analysts coordinate with AI-powered Security Orchestration, Automation, and Response (SOAR) platforms. Students experience the NICE Framework's incident response work roles while developing critical thinking about human-AI collaboration in high-stakes situations.
> **Duration**: 55-60 minutes **Grade Levels**: 9-12 **Group Size**: Teams of 4-5 students **Technology**: One device per student recommended; minimum one per team

Learning Objectives

Students will:

- Execute **incident response procedures** aligned with industry frameworks (NIST, SANS)
- Operate within **NICE Framework Work Roles** during crisis response
- Leverage AI as a **SOC analyst partner** while maintaining human decision authority
- Analyze **technical indicators** and correlate evidence across multiple sources
- Practice **stakeholder communication** during active incidents
- Evaluate **AI recommendations** critically against organizational context

CYBER.org Standards Alignment (9-12)

- **9-12.SEC.INFO**: Information security principles and incident response
- **9-12.SEC.DATA**: Data security and forensics fundamentals
- **9-12.SEC.NET**: Network security monitoring and analysis
- **9-12.DC.THRT**: Advanced threat analysis

NICE Framework Alignment (v2.0.0)

Primary Work Roles (Protection and Defense category):

- Incident Response
- Defensive Cybersecurity
- Digital Forensics

Supporting Work Roles:

- Threat Analysis
- Vulnerability Analysis

Simulation Environment

TechCorp Industries Security Operations Center

Organization Profile: - Mid-size manufacturing company (2,500 employees) - IT infrastructure: Hybrid cloud (Azure/on-premises) - Security stack: CrowdStrike EDR, Splunk SIEM, Microsoft Defender - AI Capability: "SentinelAI" SOAR platform with automated detection and response

Your Role: SOC Team working the 7AM-3PM shift

Context: SentinelAI has flagged a series of alerts requiring immediate human analysis and response. As the human operators, you must interpret AI findings, make critical decisions, and coordinate response across the organization.

Key Constraint: SentinelAI can detect patterns and recommend actions, but all containment, escalation, and communication decisions require human authorization.

SOC Team Roles

Incident Commander (IC)

NICE: Incident Response - Coordinates overall response effort - Makes final containment and escalation decisions - Manages communication with leadership - Balances technical response with business impact

Lead Analyst

NICE: Defensive Cybersecurity - Performs deep technical analysis of indicators - Correlates data across multiple sources - Develops attack timeline and scope assessment - Works directly with SentinelAI for pattern analysis

Threat Intelligence Analyst

NICE: Threat Analysis (Protection and Defense) - Researches threat actor TTPs - Provides context from threat intelligence feeds - Identifies attack campaign characteristics - Uses AI to correlate with known threat patterns

Communications Specialist

NICE: Related to Cybersecurity Management - Drafts internal and external communications - Coordinates with legal and PR teams - Documents incident timeline - Prepares executive briefings

Evidence Coordinator (Optional 5th role)

NICE: Digital Forensics (Investigation) - Ensures evidence preservation - Maintains chain of custody documentation - Coordinates with law enforcement if needed - Manages forensic data collection priorities

The Incident

Initial Alert: 7:12 AM

SentinelAI Priority: CRITICAL

Multiple high-confidence alerts detected across manufacturing floor network segment:

```
ALERT CLUSTER #7291
Timestamp: 07:12:03 UTC
Severity: CRITICAL
Confidence: 94%

Indicators Detected:
- Lateral movement patterns (MITRE ATT&CK T1021)
- Unusual service account authentication (T1078.002)
- Large data staging activity on file server MFG-FS-01 (T1074)
- C2 beaconing to known malicious infrastructure (T1071)

Affected Systems:
- MFG-WORKSTATION-042 through MFG-WORKSTATION-089 (47 systems)
- MFG-FS-01 (file server, 2.3TB sensitive data)
- HVAC-CONTROLLER-01 (OT/IT bridge system)

Automated Actions Taken:
- Alert generation: COMPLETE
- Network traffic logging: ENABLED
- Endpoint isolation: AWAITING HUMAN AUTHORIZATION

Recommended Human Actions:
1. Authorize endpoint isolation (Impact: Manufacturing operations)
2. Activate incident response protocol
3. Escalate to CISO and Operations leadership
```

Evidence Packages

Evidence Package A: Network Logs

```
TIME           SRC_IP          DST_IP          PORT    PROTOCOL  BYTES     FLAGS
07:02:15       10.50.42.102    10.50.42.103    445     SMB       1.2MB     SYN
07:02:18       10.50.42.102    10.50.42.104    445     SMB       1.1MB     SYN
07:02:21       10.50.42.102    10.50.42.105    445     SMB       1.3MB     SYN
[Pattern repeats for 47 workstations]
07:08:44       10.50.42.102    185.234.XX.XX   443     HTTPS     256KB     ENCRYPTED
07:08:47       10.50.42.102    185.234.XX.XX   443     HTTPS     512KB     ENCRYPTED
07:09:02       10.50.42.102    185.234.XX.XX   443     HTTPS     1.1MB     ENCRYPTED
[Beaconing every ~20 seconds continues]
```

Evidence Package B: Authentication Logs

```
TIMESTAMP       USER                    SYSTEM              RESULT      METHOD
```

```
06:58:22        svc_backup              MFG-FS-01          SUCCESS     Kerberos
06:58:24        svc_backup              MFG-WORKSTATION-042 SUCCESS     Kerberos
06:58:26        svc_backup              MFG-WORKSTATION-043 SUCCESS     Kerberos
[Continues for all affected systems]

Note: svc_backup account normally runs at 02:00 AM for nightly backups
Last password change: 847 days ago
Service account owner: IT Operations (no specific owner assigned)
```

Evidence Package C: Endpoint Detection Data

```
MFG-WORKSTATION-042:
- Process: cmd.exe spawned by outlook.exe (07:01:44)
- File Drop: C:\Users\jsmith\AppData\Local\Temp\update.exe
- Hash: 3a4b5c6d7e8f... [MATCHES KNOWN THREAT: APT29 TOOLING]
- Registry: HKLM\Software\Microsoft\Windows\CurrentVersion\Run [PERSISTENCE]
- Network: Connection to 185.234.XX.XX:443 every 20 seconds

User jsmith:
- Role: Manufacturing Floor Supervisor
- Email received: 06:55:12 - Subject: "URGENT: Updated Shift Schedule"
- Attachment opened: 07:01:41 - schedule_update.docm
```

Evidence Package D: Threat Intelligence

```
IP: 185.234.XX.XX
- First seen: 2024-09-15
- Attribution: SUSPECTED APT29/Cozy Bear
- Campaign: MANUFACTURING-AUTUMN targeting industrial sector
- TTPs: Spearphishing → Service account abuse → Data staging → Exfiltration
- Past targets: Automotive, aerospace, manufacturing organizations
- Objective: Industrial espionage, supply chain intelligence

File Hash: 3a4b5c6d7e8f...
- Malware family: SUNSPOT variant
- Capabilities: Keylogging, credential harvesting, file staging
- Evasion: Living-off-the-land techniques, encrypted C2
```

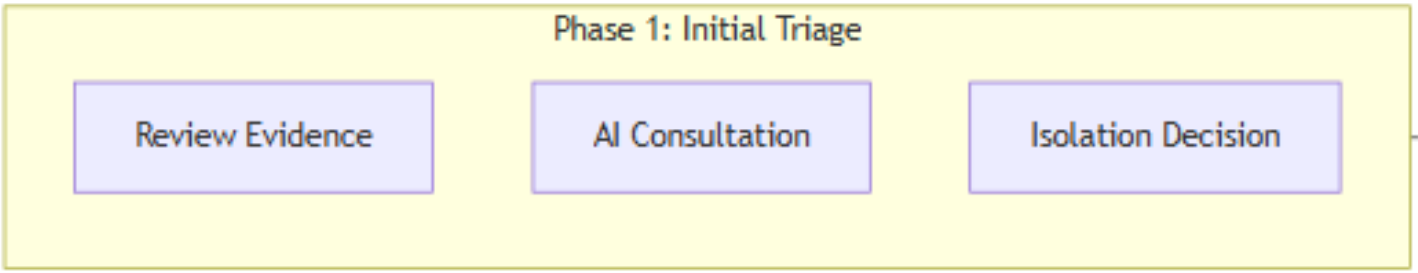
Evidence Package E: Business Context

```
OPERATIONAL CONTEXT:
- Manufacturing floor runs 24/7, current shift change at 07:00
- MFG-FS-01 contains: Product designs, supplier contracts, pricing data
- HVAC-CONTROLLER-01 manages climate control for sensitive equipment
- Q4 production deadline in 2 weeks - high pressure environment
- Recent layoffs created employee morale concerns
- CEO presentation to board scheduled for Friday

PREVIOUS INCIDENTS:
```

```
- Phishing attempt blocked 3 weeks ago (similar TTP)
- Service account audit recommended 6 months ago (not completed)
- OT/IT segmentation project delayed due to budget
```

Response Framework



SOC Incident Response Workflow

Phase 1: Initial Triage (10 minutes)

All Team Members: 1. Review assigned evidence package 2. Document initial observations 3. Prepare briefing for team

SentinelAI Consultation (Lead Analyst):

> "Analyze these network patterns [paste logs]. What attack progression do they indicate? Map to MITRE ATT&CK framework."
>
> "Compare this hash and IP against your threat intelligence. What campaign does this align with? What typically comes next in this attack chain?"

Key Decision Point:

- **Authorize endpoint isolation?** 47 manufacturing workstations offline = production impact
- SentinelAI recommends: YES (93% confidence attack in progress)
- Human consideration: Shift change happening, 200 workers need workstations

Phase 2: Analysis and Scoping (15 minutes)

Lead Analyst Tasks:

- Build attack timeline
- Identify patient zero and attack vector
- Assess scope of compromise
- Determine if data exfiltration occurred

Threat Intel Tasks:

- Research APT29 TTPs
- Identify likely objectives
- Predict next attack phases
- Assess attribution confidence

IC Tasks:

- Prioritize response actions
- Assess business impact of containment options
- Prepare leadership notification
- Coordinate team activities

Communications Tasks:

- Draft executive summary
- Prepare manufacturing leadership notification
- Document decision log
- Track timeline

Phase 3: Response Execution (15 minutes)

Critical Decisions Required:

Decision	Options	AI Recommendation	Business Impact	Risk if Delayed
Endpoint Isolation	Full / Partial / None	Full isolation	High - production stops	Very High - data loss
Network Segmentation	Activate / Monitor	Activate	Medium - IT overhead	High - lateral movement
Credential Reset	Immediate / Scheduled	Immediate	Medium - user disruption	Critical - persistence
Law Enforcement	Notify / Wait	Wait for scope	Low	Medium - evidence
Executive Escalation	Now / After containment	Now	Low	Medium - trust

Team must document:

- Decision made
- Rationale
- AI input considered
- Human factors that modified AI recommendation

Phase 4: Communication (10 minutes)

Draft required communications:

1. **Executive Flash Report** (for CEO/CISO)
    - Incident severity and scope
    - Immediate actions taken
    - Business impact assessment
    - Next steps and timeline

2. **Operations Notification** (for Manufacturing VP)
    - Operational impact
    - Workaround procedures
    - Expected resolution timeline
3. **IT Staff Directive**
    - Technical containment actions
    - Evidence preservation requirements
    - Coordination instructions

Phase 5: Debrief (10 minutes)

Team Discussion:

1. **What did SentinelAI do well?**
    - Pattern detection speed
    - Threat intelligence correlation
    - Attack chain mapping
    - Risk quantification
2. **Where did human judgment matter most?**
    - Business context interpretation
    - Stakeholder communication
    - Trade-off decisions
    - Ethical considerations
3. **What would happen without AI?**
    - Detection delay (hours vs. minutes)
    - Analysis depth limitations
    - Correlation challenges
    - Response speed impact
4. **What would happen without humans?**
    - Context-blind automation
    - Business disruption from over-response
    - Stakeholder communication gaps
    - Ethical oversight absence

Assessment Rubric

Criterion	Developing (1-2)	Proficient (3)	Advanced (4)
Technical Analysis	Surface-level review	Solid evidence correlation	Deep technical understanding with attack chain mapping
AI Partnership	Used AI as answer machine	Collaborated with appropriate skepticism	Strategic consultation with critical evaluation

Criterion	Developing (1-2)	Proficient (3)	Advanced (4)
Decision Quality	Decisions without clear rationale	Documented reasoning for decisions	Sophisticated trade-off analysis with business context
Role Execution	Unclear responsibilities	Fulfilled role requirements	Leadership within role, supported teammates
Communication	Unclear or missing documentation	Clear documentation produced	Professional-quality stakeholder communications
NICE Alignment	No connection to work roles	Basic awareness of career paths	Articulated how roles connect to industry careers

Assessment Connection

This table shows how activity elements connect to assessment rubric criteria:

Rubric Criterion	Developed Through	Evidence Source
AI Partnership Framing	Phase 1: SentinelAI consultation with role-specific prompts	Quality of AI queries and response interpretation
Complementary Strengths	Phase 5 Debrief: "What did AI do well?" vs. "Where did human judgment matter?"	Debrief discussion responses and documentation
AI Limitation Awareness	SentinelAI "LIMITATION NOTICE" and human decision authority requirement	Phase 3 decision rationale showing where AI recommendations were modified
Synthesis Quality	Decision Matrix: integrating AI recommendation with business impact and risk analysis	Completed decision documentation with rationale
Human Context Application	Evidence Package E: Business Context informing response decisions	How business context modified purely technical AI recommendations
Decision Justification	Phase 3 documentation: Decision, Rationale, AI input, Human factors	Quality and depth of documented decision rationale
NICE Framework Application	Role Cards with explicit NICE Work Role alignment, Career Connections section	Debrief "career insights" responses and role execution quality

Applicable Rubrics: Human-AI Collaboration Rubric, Decision-Making Quality Rubric, NICE Framework Application Rubric

Career Connections

This Simulation Reflects Real SOC Work

What you experienced today:

- Alert triage from SIEM/SOAR platforms → Real SOC analysts do this continuously
- AI-assisted analysis → CrowdStrike, Splunk, Palo Alto all have AI capabilities
- Team coordination → SOCs have tiered analysts and specialized roles
- Executive communication → Critical skill for career advancement

NICE Framework Career Pathways

Work Role	Starting Salary	Growth Rate	Your Simulation Role
SOC Analyst (Entry)	$55-75K	33% (2022-2032)	All roles
Incident Responder	$75-100K	35%	Incident Commander
Threat Intelligence Analyst	$80-110K	31%	Threat Intel
Security Engineer	$90-130K	35%	Lead Analyst
CISO (Executive)	$200-400K	28%	IC → Long-term path

Certifications That Prepare You

- **CompTIA Security+** → Foundation for all roles
- **CompTIA CySA+** → SOC Analyst focus
- **GIAC GCIH** → Incident Handler certification
- **CISSP** → Advanced/Management roles

Low-Resource Adaptation

If AI access is unavailable, provide this SentinelAI analysis report as handout:

> **SentinelAI Analysis Report #7291-A**
>
> Pattern analysis indicates lateral movement consistent with credential-based attack. Service account svc_backup shows authentication pattern anomaly: normal operation 02:00-03:00, current activity 06:58-07:12. Statistical deviation: 99.7th percentile.
>
> Attack chain mapping: Initial Access (T1566.001) → Execution (T1204.002) → Persistence (T1547.001) → Credential Access (T1078.002) → Lateral Movement (T1021.002) → Collection (T1074.001) → Command and Control (T1071.001)
>
> Confidence assessment: 94% probability active compromise in progress. Recommended action: Immediate containment. Risk if delayed 2 hours: Estimated 800GB additional data staging, potential OT system access.
>
> **LIMITATION NOTICE:** This analysis does not account for: manufacturing production schedules, employee shift patterns, business-critical deadlines, stakeholder communication requirements, or reputational impact assessment. Human decision authority required.