Managing Cybersecurity Risk

An Integrated Approach to Building a Risk-Based Cybersecurity Program

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The current landscape.

- We are vulnerable because our information technology is fragile and susceptible to a wide range of threats including:
  - natural disasters.
  - structural failures.
  - cyber attacks.
  - errors.

Advanced Persistent Threat

An adversary that —

- Possesses significant levels of expertise / resources.
- Creates opportunities to achieve its objectives by using multiple attack vectors (e.g., cyber, physical, deception).
- Establishes footholds within IT infrastructure of targeted organizations:
  - **To exfiltrate information;**
  - **To undermine / impede critical aspects of a mission, program, or organization; and**
  - **To position itself to carry out these objectives in the future.**

Classes of Vulnerabilities

A 2013 Defense Science Board Report described—

- Tier 1: Known vulnerabilities.
- Tier 2: Unknown vulnerabilities (zero-day exploits).
- Tier 3: Adversary-created vulnerabilities (APT).

Complexity.

An adversary's most effective weapon in the 21st century.

Good cyber hygiene is necessary…
But not sufficient.

You can't count, configure, or patch your way out of this problem space.

Difficult decisions ahead.

Today, in cybersecurity, we are doing a lot of things right…

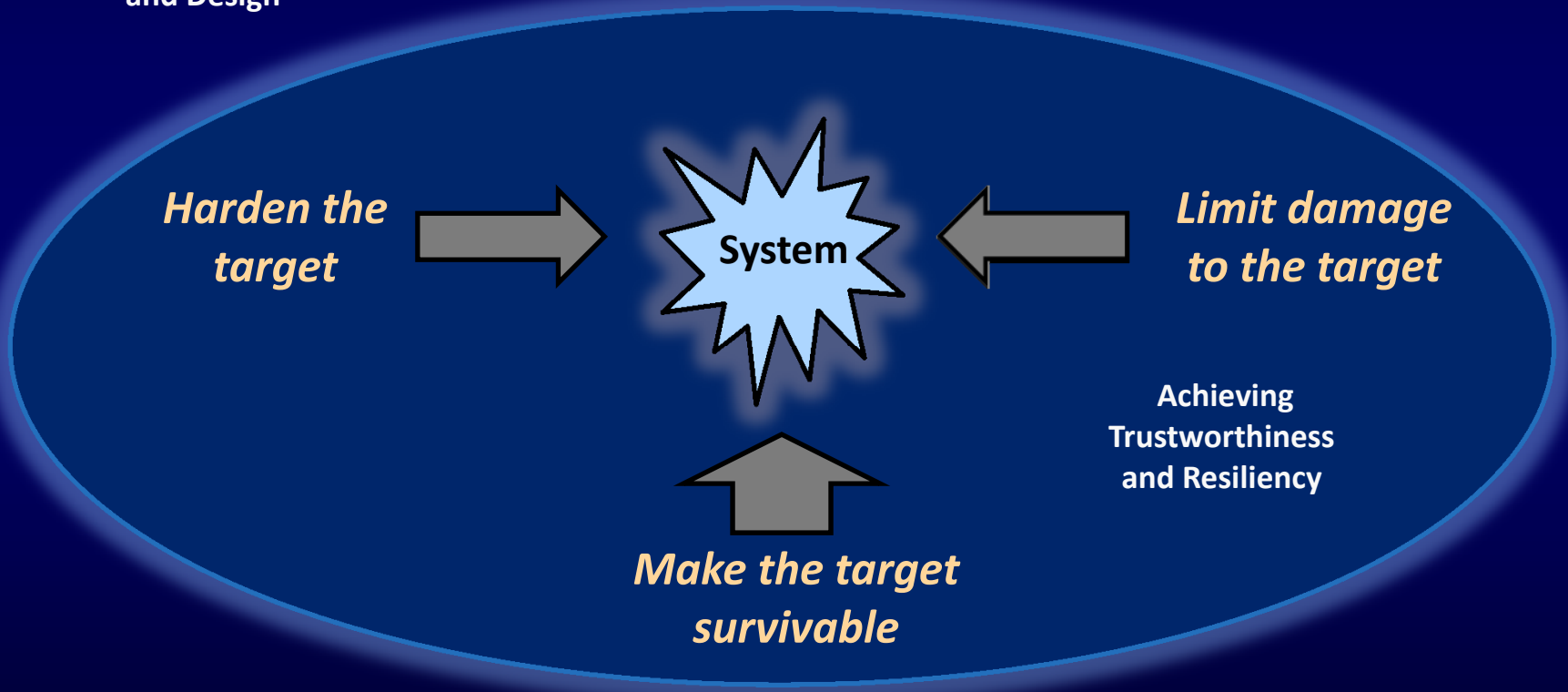
But we are not doing enough.

The hard cybersecurity problems are buried below the water line…

In the hardware, software, and firmware.

Security Architecture and Design

Reducing susceptibility to ***cyber threats*** requires a multidimensional systems engineering approach.



Getting the attention of the C-Suite.

TACIT Security

- **T**hreat
- **A**ssets
- **C**omplexity
- **I**ntegration
- **T**rustworthiness

Threat

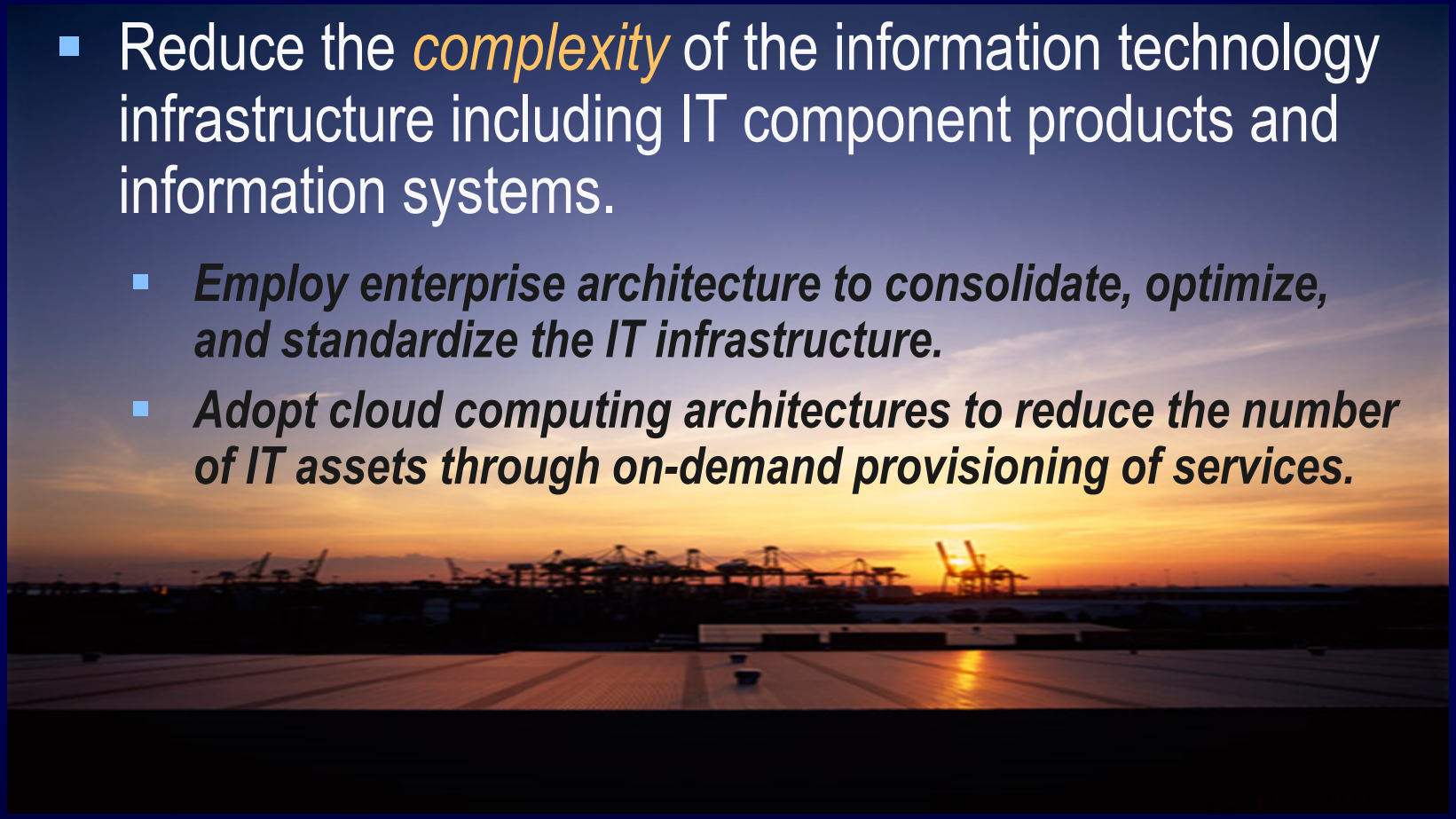
- Develop a better understanding of the *modern threat space*, including the capability of adversaries to launch sophisticated, targeted cyber-attacks that exploit specific organizational vulnerabilities.
  - ***Obtain threat data from as many sources as possible.***
  - ***Include external and insider threat analysis.***

Assets

- Conduct a comprehensive criticality analysis of *organizational assets* including information and information systems.
  - ***Focus on mission/business impact.***
  - ***Use triage concept to segregate assets by criticality.***

Complexity

- Reduce the *complexity* of the information technology infrastructure including IT component products and information systems.
  - ***Employ enterprise architecture to consolidate, optimize, and standardize the IT infrastructure.***
  - ***Adopt cloud computing architectures to reduce the number of IT assets through on-demand provisioning of services.***



Integration

- Integrate information security requirements and the security expertise of individuals into organizational *development* and *management processes*.
  - ***Embed security personnel into enterprise architecture, systems engineering, SDLC, and acquisition processes.***
  - ***Coordinate security requirements with mission/business owners; become key stakeholders.***

Trustworthiness

- Invest in more *trustworthy* and *resilient* information systems supporting organizational missions and business functions.
  - ***Isolate critical assets into separate enclaves.***
  - ***Implement solutions using modular design, layered defenses, component isolation.***

Summary – TACIT Security

- Understand the cyber threat space.
- Conduct a thorough criticality analysis of organizational assets.
- Reduce complexity of IT infrastructure.
- Integrate security requirements into organizational processes.
- Invest in trustworthiness and resilience of IT components and systems.

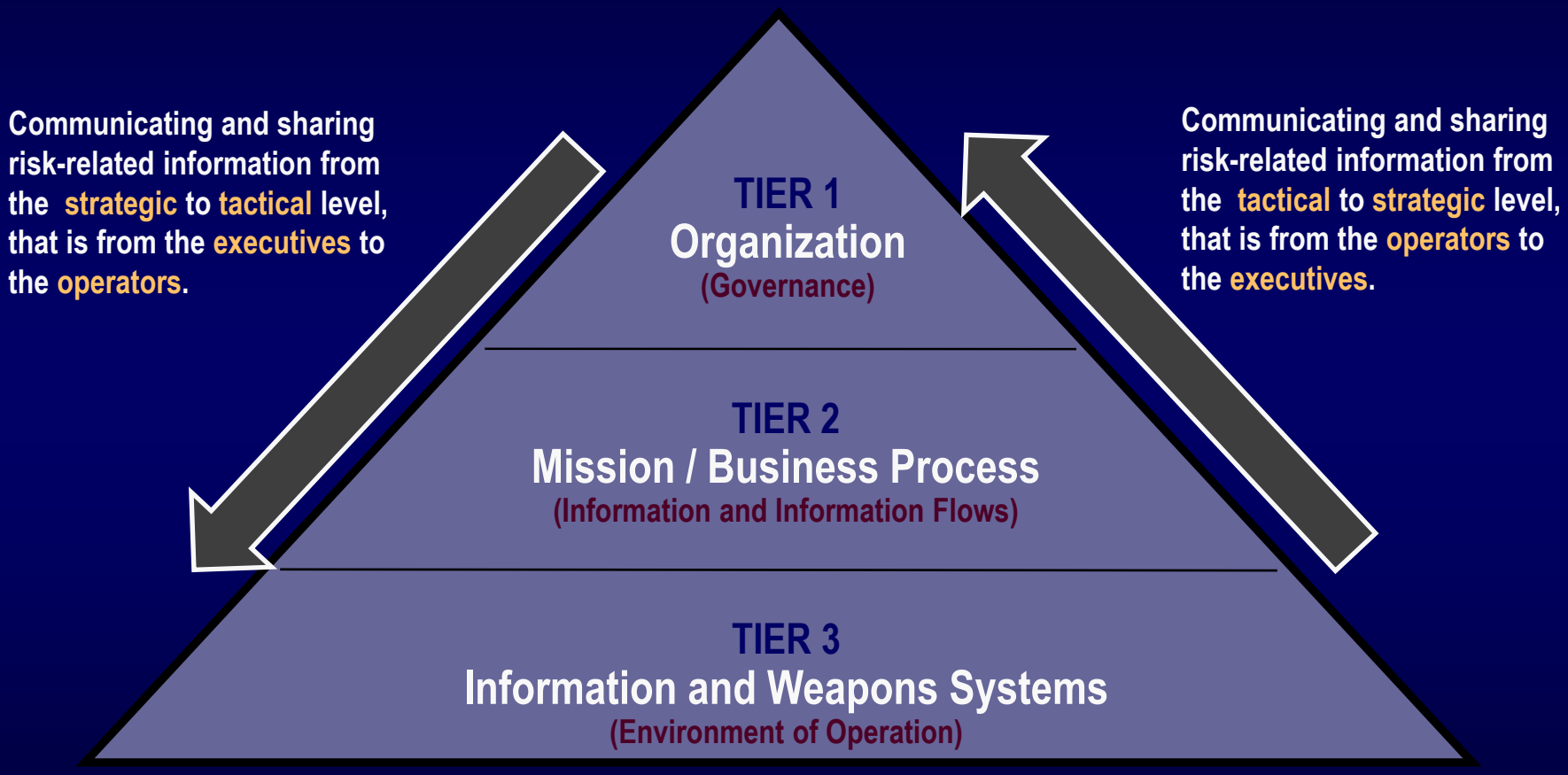
Getting immediate help.

Joint Task Force

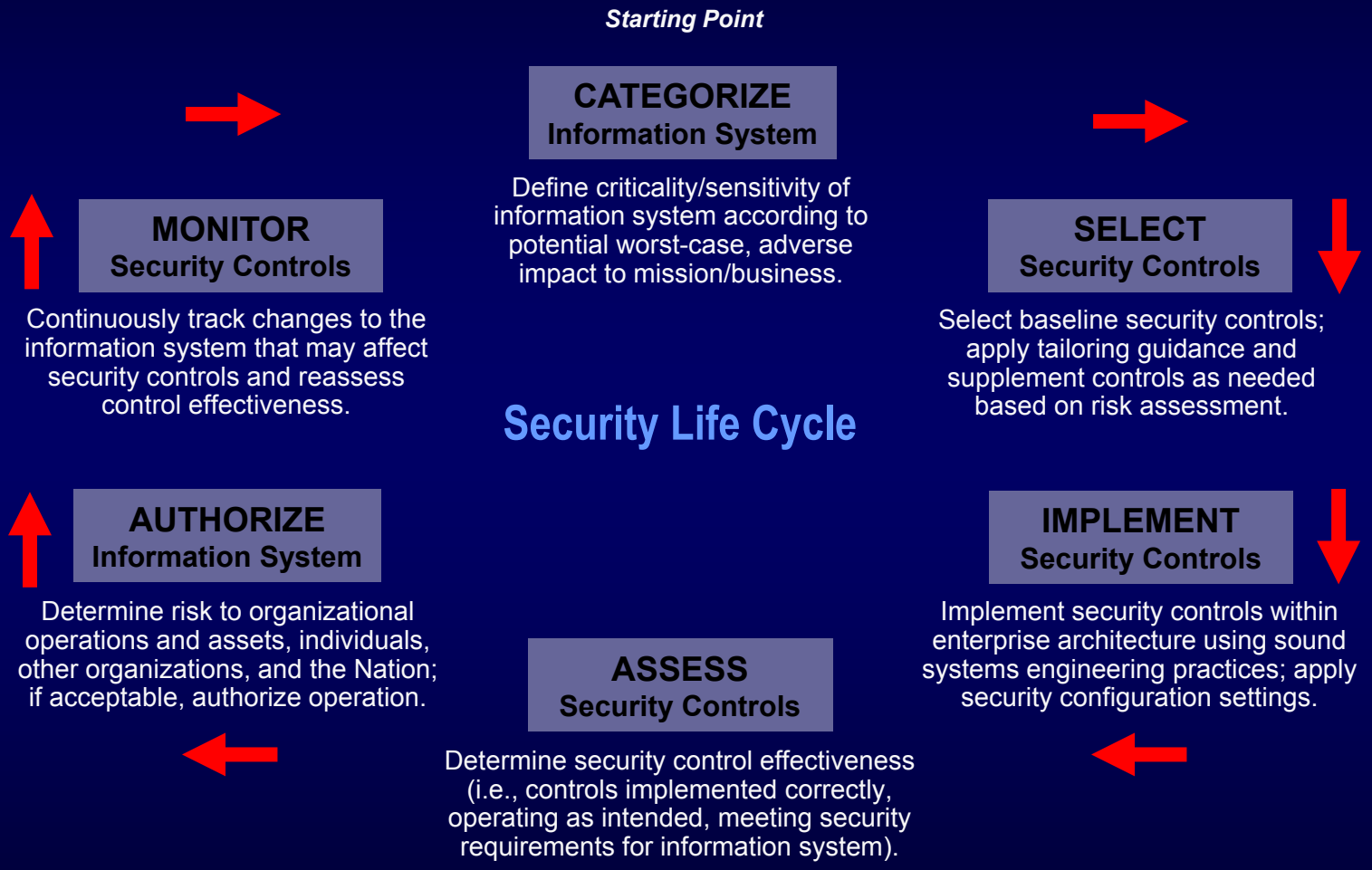
Cyber Security Toolset

- **NIST Special Publication 800-39**
  Managing Information Security Risk: Organization, Mission, and Information System View
- **NIST Special Publication 800-30**
  Guide for Conducting Risk Assessments
- **NIST Special Publication 800-37**
  Applying the Risk Management Framework to Federal Information Systems
- **NIST Special Publication 800-53**
  Security and Privacy Controls for Federal Information Systems and Organizations
- **NIST Special Publication 800-53A**
  Guide for Assessing the Security Controls in Federal Information Systems and Organizations

Cybersecurity Command and Control

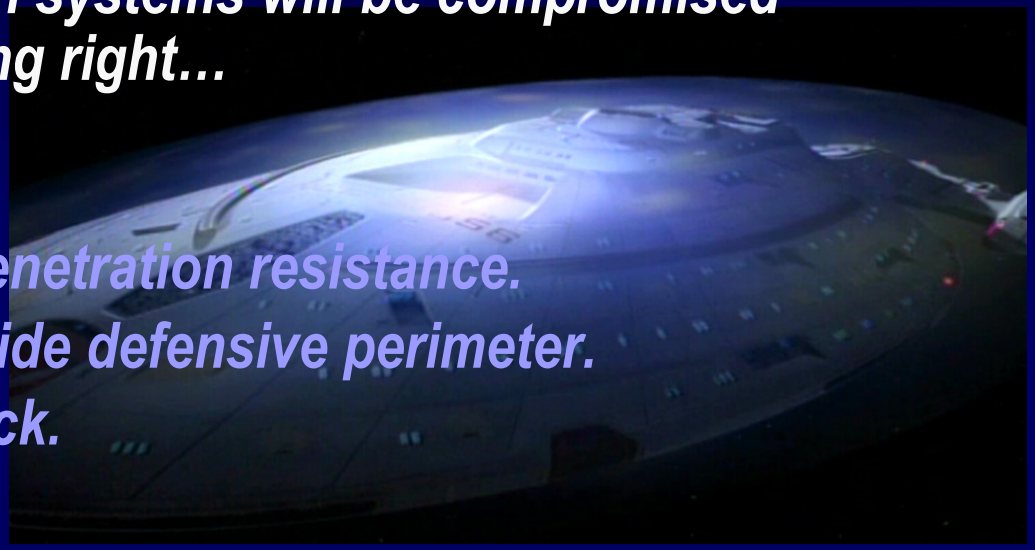


Risk Management Framework



Dual Protection Strategies

Sometimes your information systems will be compromised even when you do everything right…



- **Boundary Protection**

  Primary Consideration: ***Penetration resistance.***
  Adversary Location: ***Outside defensive perimeter.***
  Objective: ***Repel the attack.***

- **Agile Defense**

  Primary Consideration: ***Information system resilience.***
  Adversary Location: ***Inside defensive perimeter.***
  Objective: ***Operate while under attack, limit damage, survive.***

The road ahead.

Institutionalize.

The ultimate objective for security.

Operationalize.

On the Horizon…

NIST Special Publication 800-160

Systems Security Engineering

An Integrated Approach to Building Trustworthy Resilient Systems

Multidisciplinary integration of security best practices.

Command and control of the security space.

Technical Processes

- Business or mission analysis
  - Stakeholder needs and requirements definition
    - System requirements definition
      - Architecture definition
        - Design definition
          - System analysis
            - Implementation
            - Integration
          - Verification
        - Transition
      - Validation
    - Operation
  - Maintenance
- Disposal

ISO/IEC/IEEE 15288:2015

Systems and software engineering — System life cycle processes

Nontechnical Processes

- Project planning
  - Project assessment and control
    - Decision management
      - Risk management
        - Configuration management
          - Information management
            - Measurement
              - Quality assurance
            - Acquisition and Supply
          - Life cycle model management
        - Infrastructure management
      - Portfolio management
    - Human resource management
  - Quality management
- Knowledge management

ISO/IEC/IEEE 15288:2015

Systems and software engineering — System life cycle processes

Some final thoughts.

A Winning Strategy

To survive in the digital age of total IT dependence…

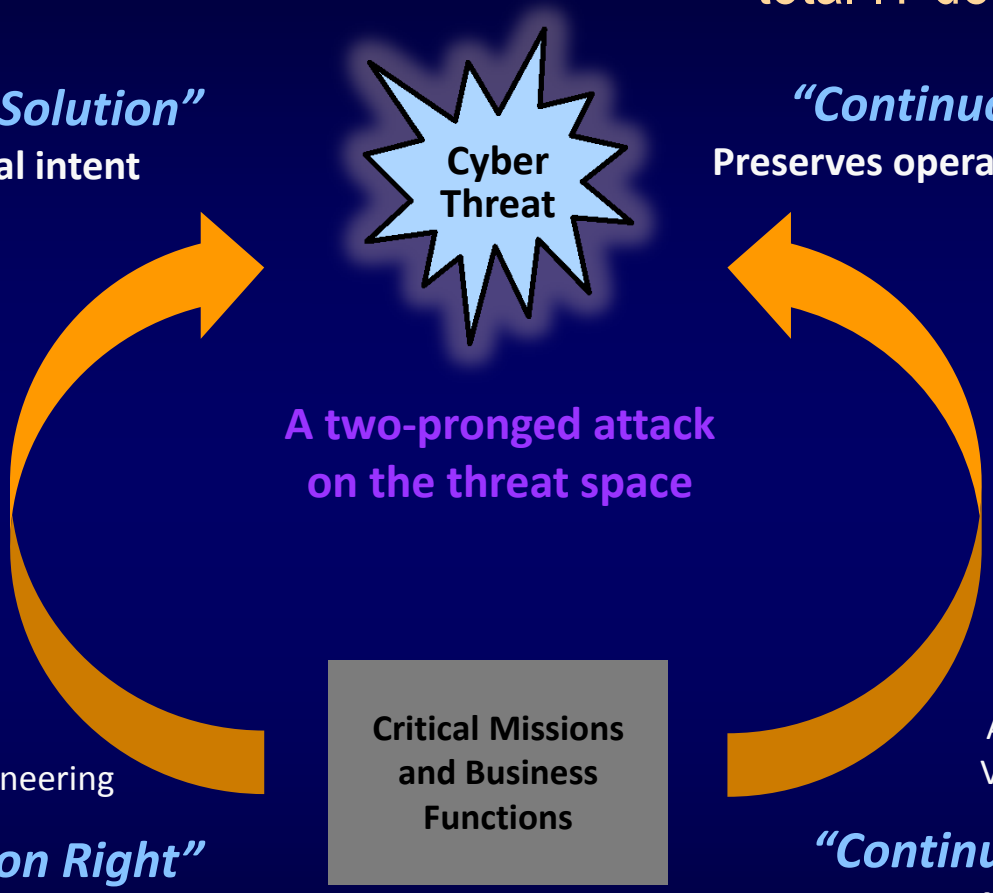
"Build the Right Solution"

Meets operational intent

Systems Engineering
Software Assurance
System Life Cycle
Testing/Evaluation
Trustworthiness
Resiliency
Design
Architecture
Acquisition
Secure Coding
Static Code Analysis
Systems Integration
Systems Security Engineering

"Build the Solution Right"

Meets design intent



"Continuously Monitor"

Preserves operational intent over time

Security Configurations
Ongoing Authorization
Separation of Duties
Software Patching
Traffic Analyses
Security State
Asset Inventory
Network Sensors
Incident Response
Threat Assessment
Situational Awareness
Administrative Privileges
Vulnerability Assessment

"Continuously Maintain"

Preserves design intent over time

Foundation of Components, Systems, Services

Security should be a by-product of good design and development practices—integrated throughout the organization.

Be *proactive*, not *reactive* when it comes to protecting your organizational assets.

Government

Academia

Security is a team sport.

Industry


We The People

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