Bridging the Gap Between Security and Modularity

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By

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FHI 360 CONFERENCE CENTER

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Agenda

- Introduction
- Problem Statement
- A Look at Program Protection
- Generic Modular Open System Example
- Security Concerns
- Research Outcomes and Next Steps
- Conclusion
- References

Introduction

- FY17 NDAA Section 805: Modular Open Systems Approach in Development of Major Weapon Systems
  - Requires design and development with MOSA, to the maximum extent practicable.
- Paradox: How do we design secure and trusted systems that are open and modular?
  - Are security and modularity/openness really at odds?
- Follow Systems Security Engineering (SSE) Principles to start bridging that gap

Problem Statement

- Modular Open Systems Approach and security principles seem to be at odds
- How can we reap the benefits of MOSA without compromising, maybe enhancing, security?
- Further research needed on:
  - Applying SSE to securing MOSA compliant systems
  - Establishing metrics to gage security vs modularity
  - Determining when is it better to go for a “closed” security approach

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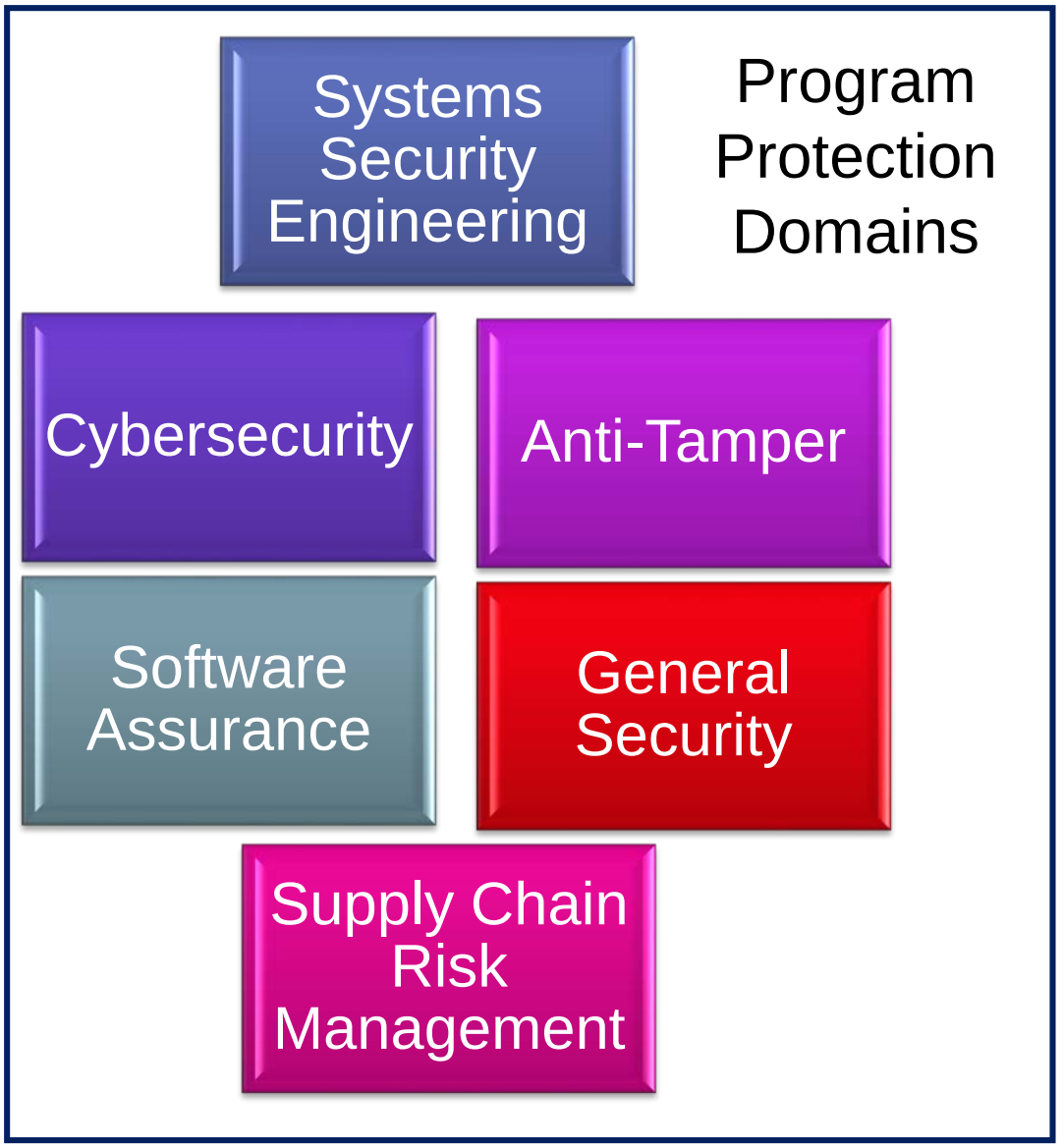
A Look at DoD Program Protection

- Protecting technology, components and denying access to information to unauthorized parties
- Identifying threats, vulnerabilities and mitigating consequence of loss
  - Throughout system lifecycle
- Multiple countermeasures can be employed: Cybersecurity, Supply Chain Risk Management, Anti-Tamper, Software Assurance, etc.
- Brought together by disciplined Systems Security Engineering



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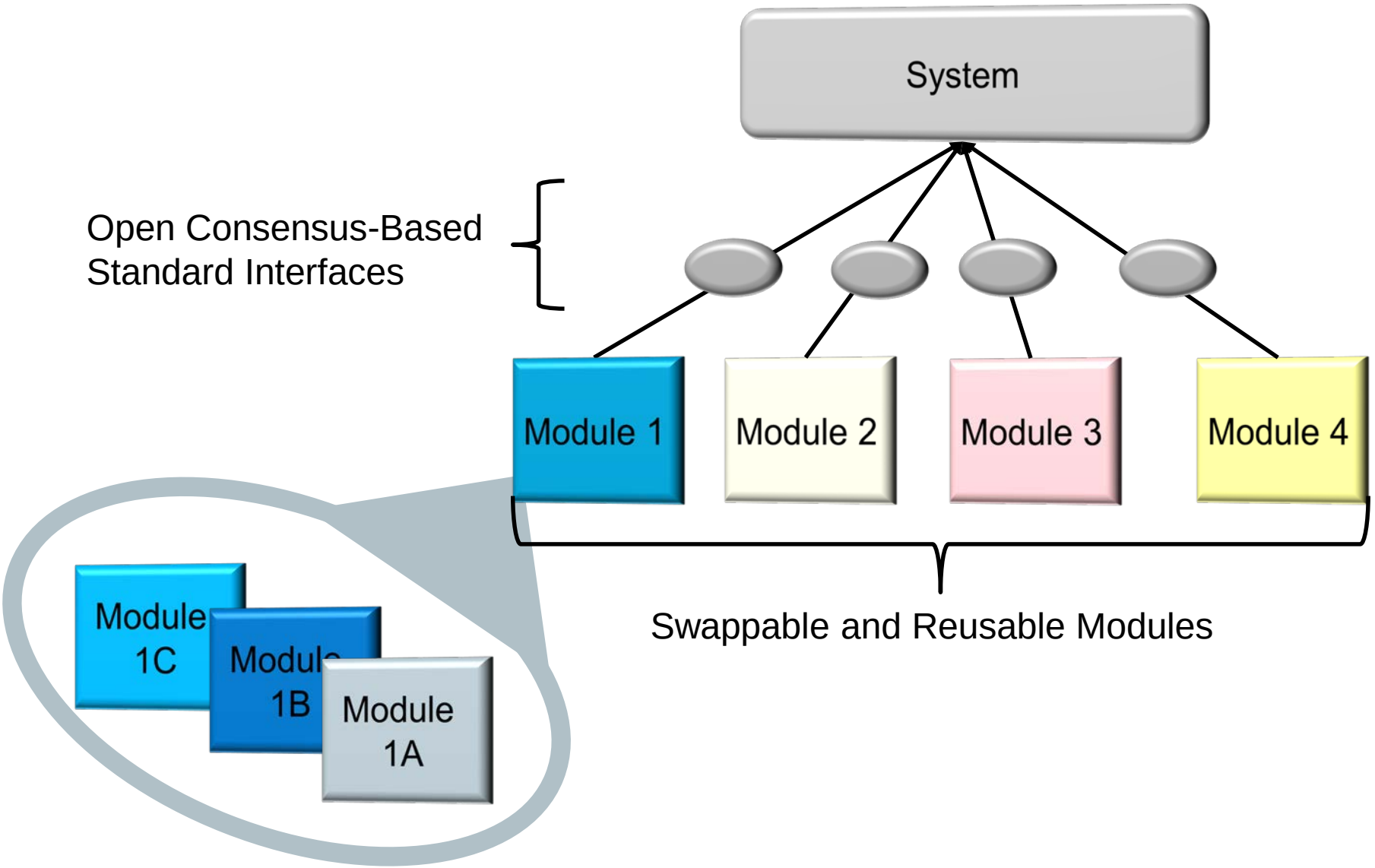
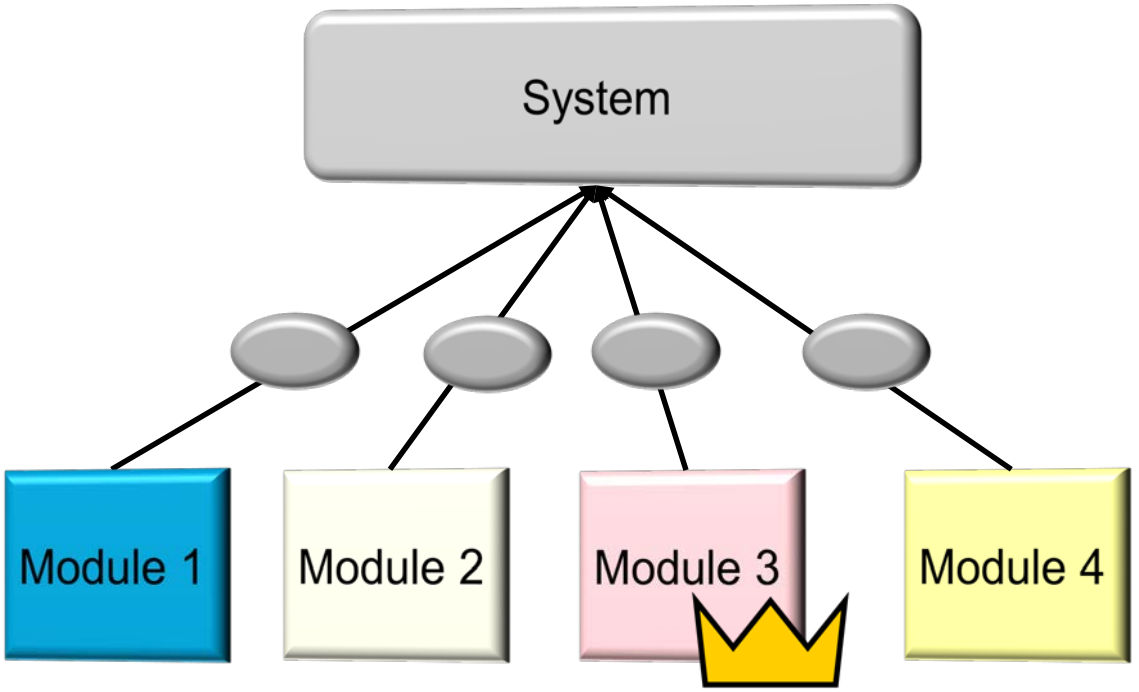
Generic Modular Open System Example



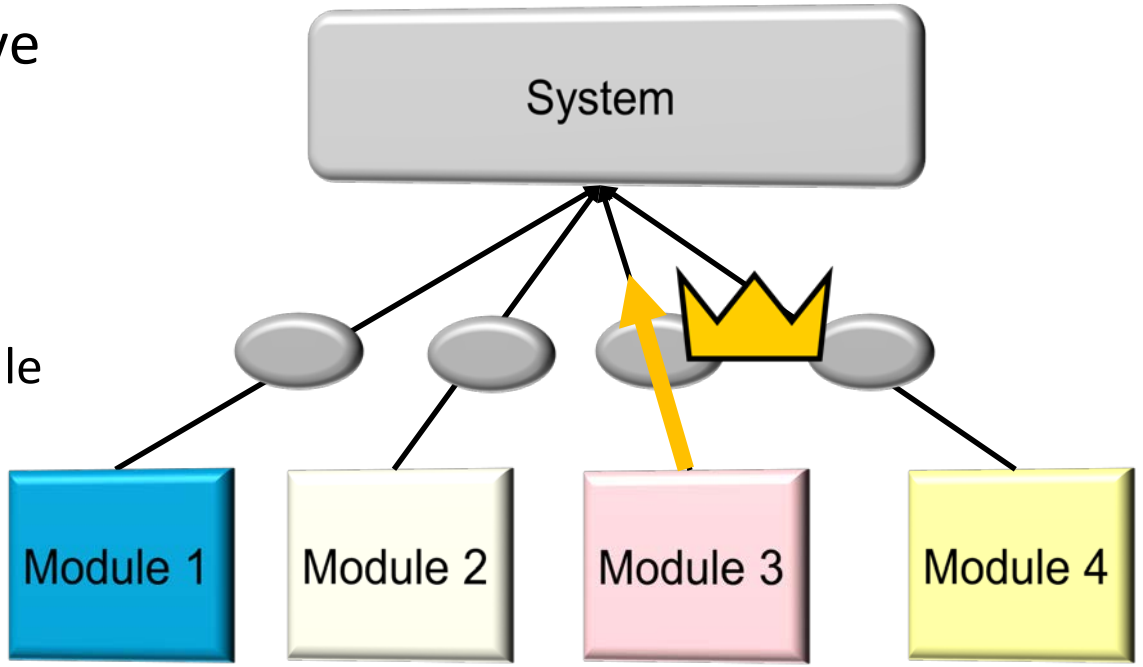
Security Concerns: Loss of Intellectual Property (IP) and Critical Program Information (CPI)

- What if Module 3 contains IP or CPI?
  - Each module should be designed capable of protecting IP and CPI
- Countermeasures:
  - Cybersecurity
  - Anti-Tamper



Security Concerns: Loss of Intellectual Property (IP) and Critical Program Information (CPI)

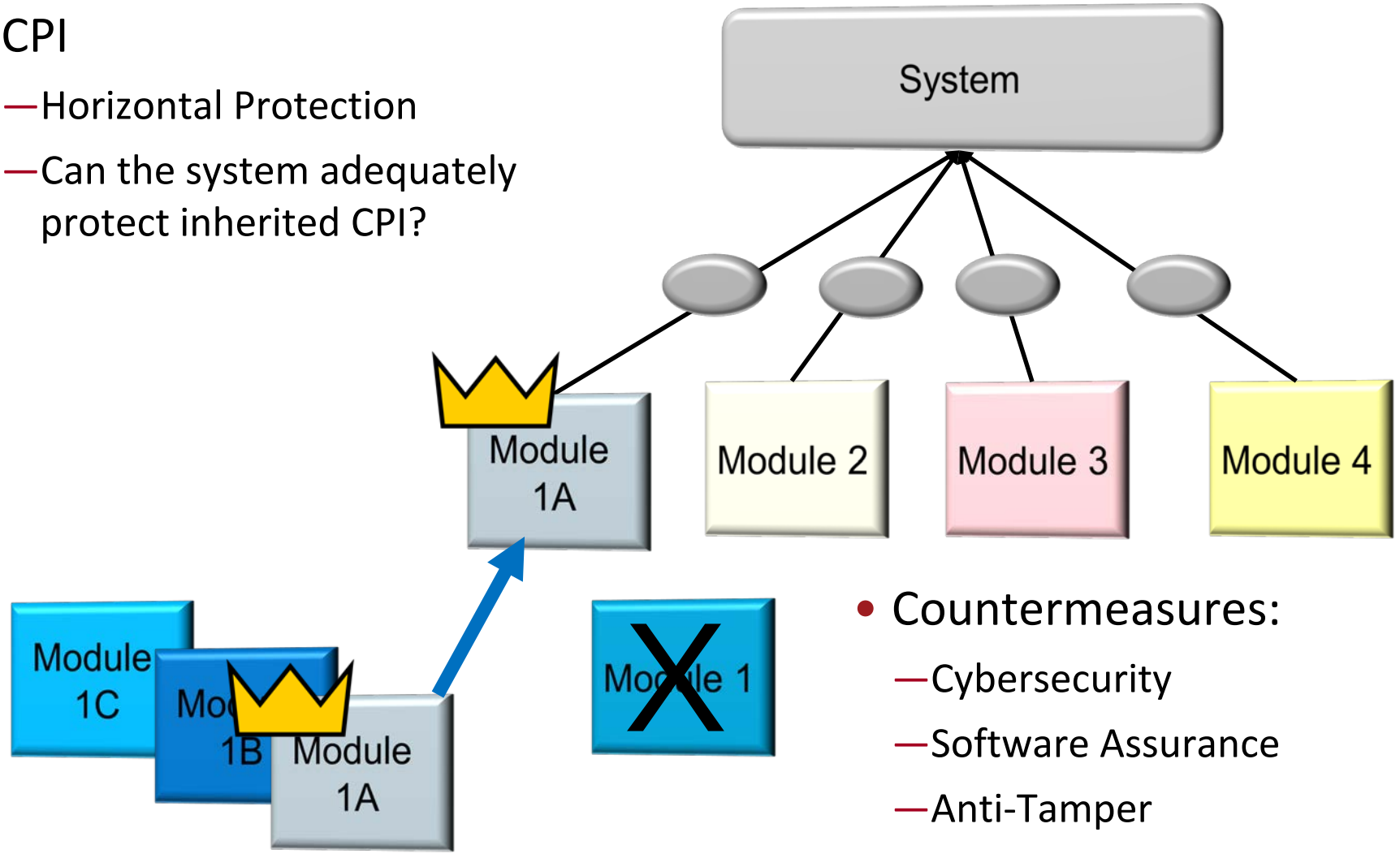
- What if system functionality requires IP or CPI to leave Module 3?
  - —Protection of interfaces
  - —Adequate handling and protection in receiving Module



- Countermeasures:
  - —Cybersecurity
  - —Anti-Tamper

Security Concerns: Loss of Intellectual Property (IP) and Critical Program Information (CPI)

- Swappable modules with IP or CPI
  - —Horizontal Protection
  - —Can the system adequately protect inherited CPI?



- Countermeasures:
  - —Cybersecurity
  - —Software Assurance
  - —Anti-Tamper

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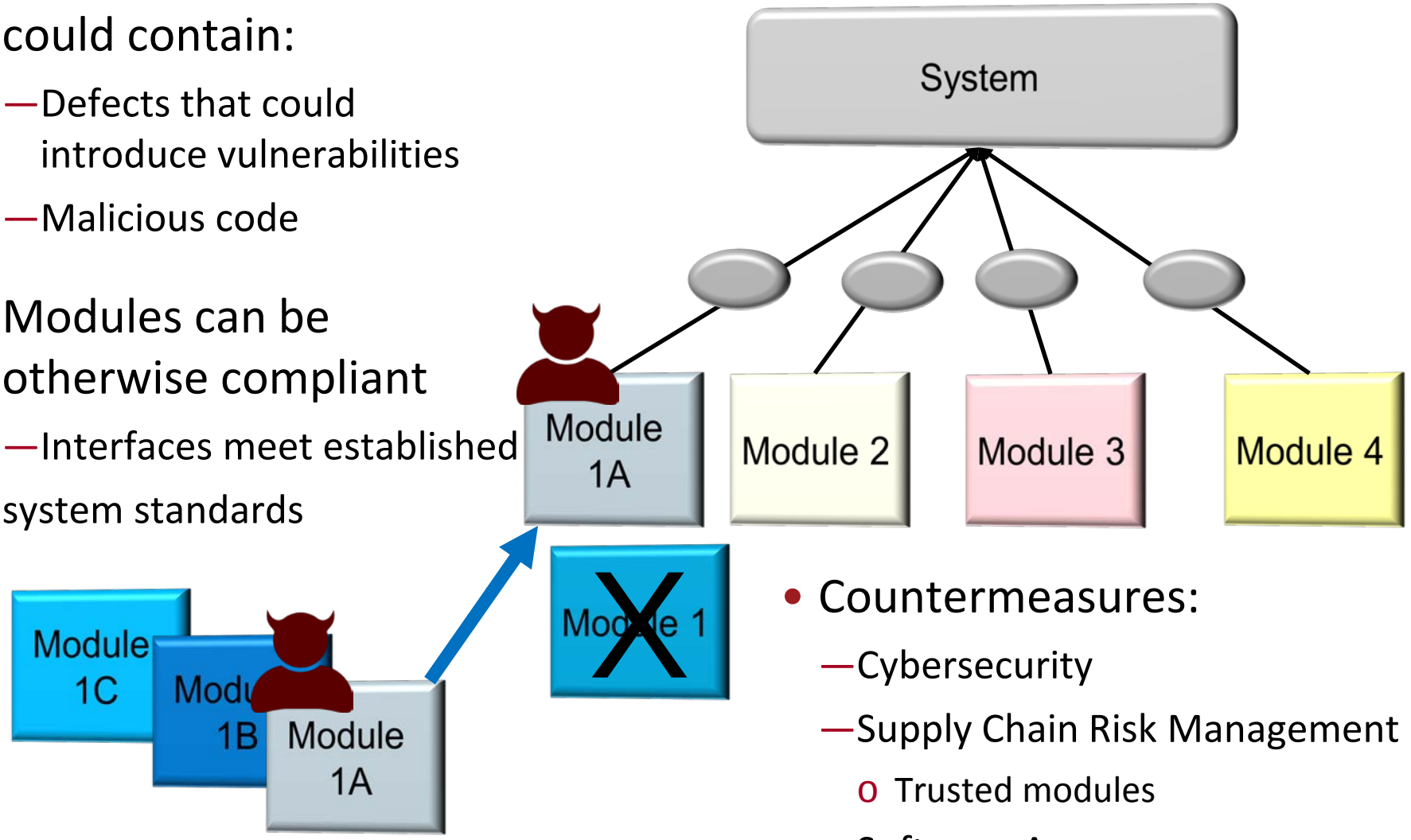
Security Concerns: Malicious Insertion

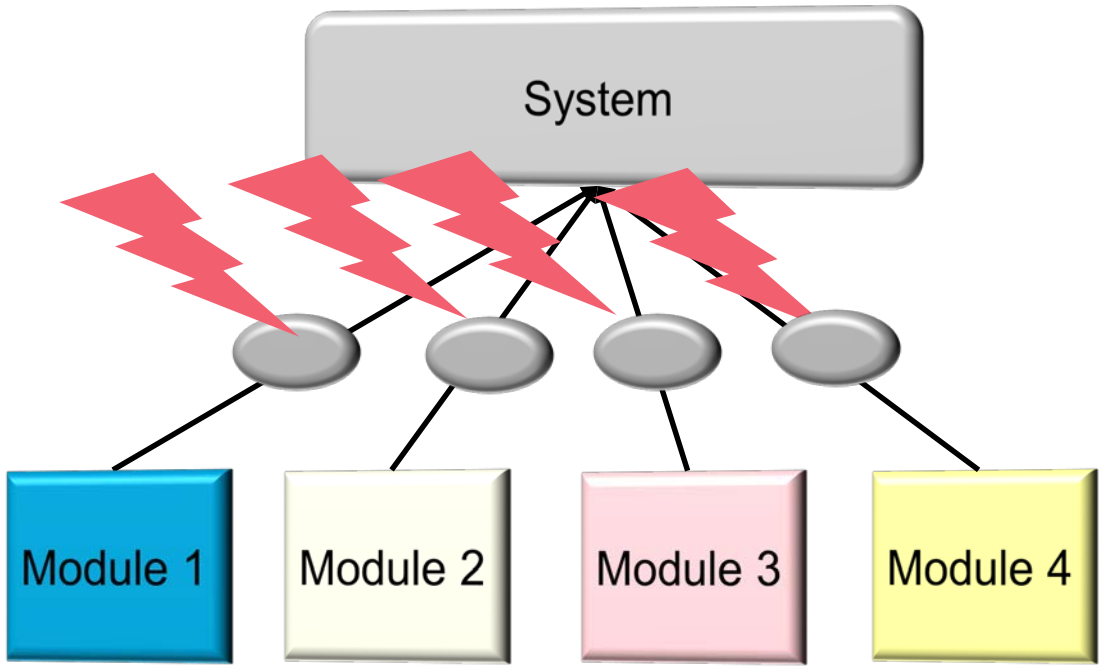
- Swappable modules could contain:
  - —Defects that could introduce vulnerabilities
  - —Malicious code
- Modules can be otherwise compliant
  - —Interfaces meet established system standards



- Countermeasures:
  - —Cybersecurity
  - —Supply Chain Risk Management
    - o Trusted modules
  - —Software Assurance

Security Concerns: Interface Attacks

- Interfaces compliant with Open Standards
  - One successful exploit could potentially affect multiple modules and interfaces
  - Need to understand how to protect critical data traversing through the interfaces
    - While still maintaining openness
  - Public disclosure of open standards or security mechanisms may be a risk to overall security architecture
  - Potential decrease in attacker's needed capability
  - Potential increase of attack vectors



- Countermeasures:
  - Cybersecurity
  - Software Assurance
  - Anti-Tamper

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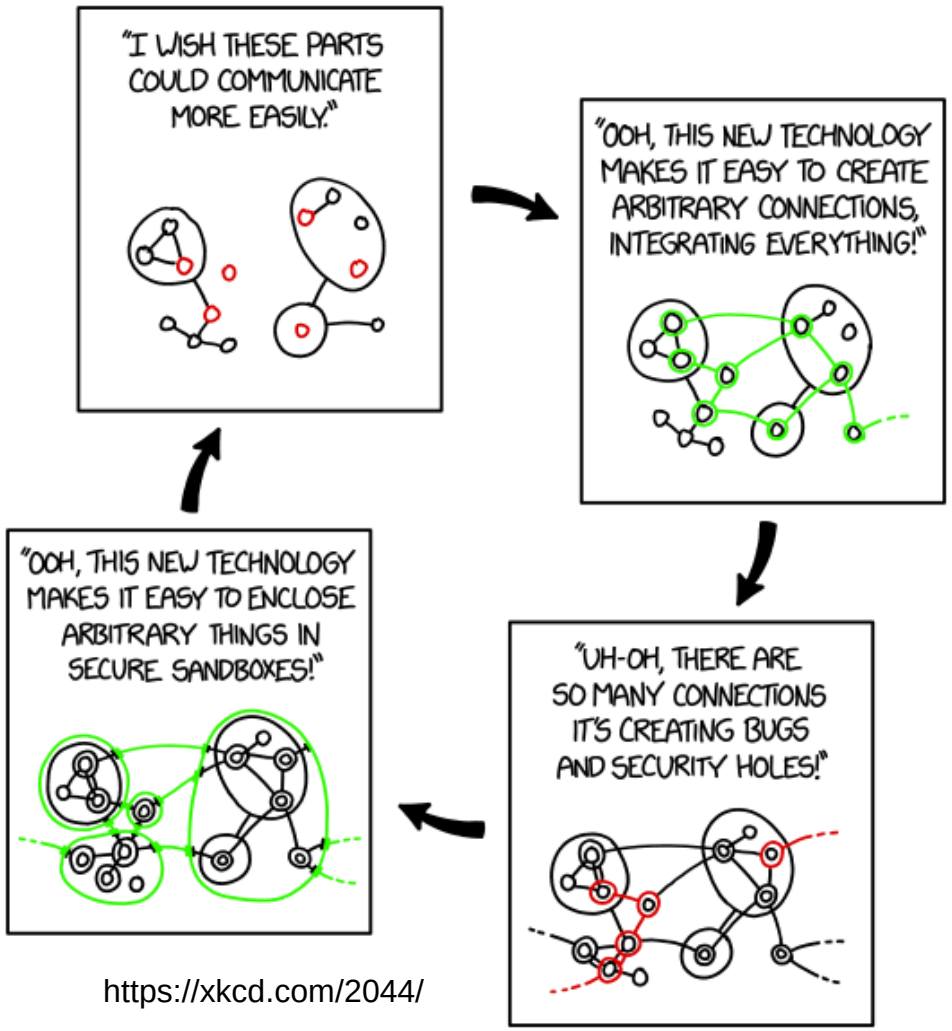
Research Outcomes and Next Steps

- Potential Outcomes of this Research
  - Processes
  - Metrics
  - Best Practices and Recommendations
  - Standards and Certification Processes for secure MOSA

- Next Step: Comprehensive Literature Review

Conclusion

- MOSA security cannot be a “snap-on” solution or an afterthought
- Need a holistic approach to understanding security implications and designing MOSA security architectures
  - —Systems Security Engineering can get us there
- This presentation is just the beginning
  - —Much to research and much to learn!



https://xkcd.com/2044/

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