Introduction to Network security

**Module Description:** This module introduces network security. In the first micro module, students will be given an overview of networks, and then move to network attacks, such as Denial-of-service attacks. The second micro module discusses network encryption and some network protocols, such as IPV6, SSH, SSL/TLS, HTTPS, IPSec. Network defense techniques are introduced in the third micro module. This micro module focuses on techniques such as firewalls, intrusion detection and prevention systems, honeypot.

**Prerequisite Knowledge:**  Students are expected to understand the introduction to cybersecurity concepts module and know network basics.

**Length of Completion:** This module includes 3 micro modules. The total length of the module is around 7 hours.

**Level of Instruction:** This module intended for upper division undergraduate students majoring in computer science or computer engineering.

**Learning Setting:** This module is suitable for many forms of delivery: online/in-class/hybrid.

**Lab Environment:** None

**Activity/Lab Tasks:** There will be in-class discussion and an out-of-class written assignment.

**Lab Files that are Needed:** None

# learning outcomes

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* Students will be able to understand network basics.
* Students will be able to describe Denial-of-Service attacks.
* Students will be able to explain Distributed DoS attacks.
* Students will be able to define Zombies and Botnets.
* Students will be able to understand some of the network protocols which have security features built in (such as SSH, SSL/TLS, HTTPS, IPSec).
* Students will be able to describe network data encryption.
* Students will be able to understand different types of firewalls and what are the advantages of each type.
* Students will be able to understand intrusion detection and prevention systems.
* Students will be able to describe honeypot and what is the purpose of setting up a honeypot.

# module Details

**Instructional Files and Online Resources that are Needed:**

Slides:

Lesson 1: Network basics and threats (CSP-M6-L1.pptx)

Lesson 2: Network encryption and protocols (CSP-M6-L2.pptx)

Lesson 3: Network defense technologies (CSP-M6-L3.pptx)

**Assessment:**

Written homework questions (CSP-HW6.docx)

# lessons

**Overview of Lessons:**

Lesson 1: Network basics and threats

Lesson 2: Network encryption and protocols

Lesson 3: Network defense technologies

**Lesson 1 Learning Outcomes:**

Upon completion of this lesson:

* Students will be able to understand network basics.
* Students will be able to describe Denial-of-Service attacks.
* Students will be able to explain Distributed DoS attacks.
* Students will be able to define Zombies and Botnets.

**Lesson 1 Details:**

**Warm Up:** Refresh students with an overview of network basics.

**Lesson:**

Topics to be covered in this lesson include:

* Basics of network (OSI model, DoD TCP/IP model)
* Network attacks
* Denial-of-Service attacks
* Distributed Denial-of-Service attacks
* Zombies and Botnets

**Active Learning Activity:**

In-class discussion:

What problems can Denial-of-Service attacks bring? How to avoid being attacked?

**Lesson 2 Learning Outcomes:**

Upon completion of this lesson:

* Students will be able to understand some of the network protocols which have security features built in (such as SSH, SSL/TLS, HTTPS, IPSec).
* Students will be able to describe network data encryption.

**Lesson 2 Details:**

**Warm Up:**

Ask students how data transfers from software/application, over the network, to the user at the other end.

**Lesson:**

Topics to be covered in this lesson include:

* Network encryption concepts and tools
* Network protocols (IPv4, IPv6, SSH, SSL/TLS, IPSec, HTTPS)

**Active Learning Activity:**

In-class discussion:

Ask students how encryption can be used to protect data being transferred over networks.

**Lesson 3 Learning Outcomes:**

Upon completion of this lesson:

* Students will be able to understand different types of firewalls and what are the advantages of each type.
* Students will be able to understand intrusion detection and prevention systems.
* Students will be able to describe honeypots and what is the purpose of setting up a honeypot.

**Lesson 3 Details:**

**Warm Up:**

Ask students: Do they have firewall installed on their computers? What are the purpose of having a firewall?

**Lesson:**

Topics to be covered in this lesson include:

* Different types of firewalls and what are the advantages of each one.
* Intrusion detection systems
* Intrusion prevention systems
* Honeypot

**Active Learning Activity:**

Discussion:

What are the advantage and disadvantage of using intrusion detection systems? Do you want to use sensitive alert or not? What are the pros and cons of having sensitive alert?

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