

The Cyber Threat Defender K-12 Program: A New Approach to Teaching Cybersecurity

Game Development by
Center for Infrastructure Assurance and Security
The University of Texas at San Antonio





Cyber Program National Ranking

- Ranked No. 1 in the nation for Cybersecurity Program in 2013
- 2016 ranked as one of the top two graduate cybersecurity programs

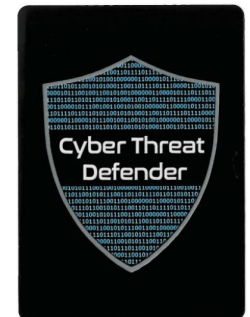
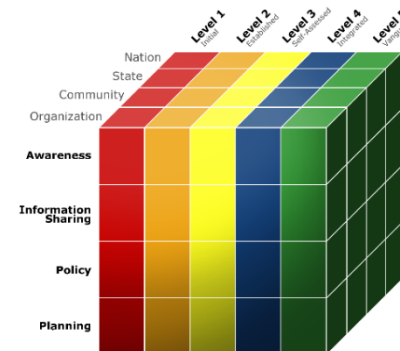




Center for Infrastructure Assurance & Security



- Established in 2001
- The Center for Infrastructure Assurance and Security (CIAS) is developing the world's foremost center for **multidisciplinary education** and development of operational capabilities in the areas of infrastructure assurance and cybersecurity.
- Vision - to become the leader in the advancement of state and **community cybersecurity** capabilities and collaboration.





Focus Areas of the CIAS

The CIAS is engaged in several areas:

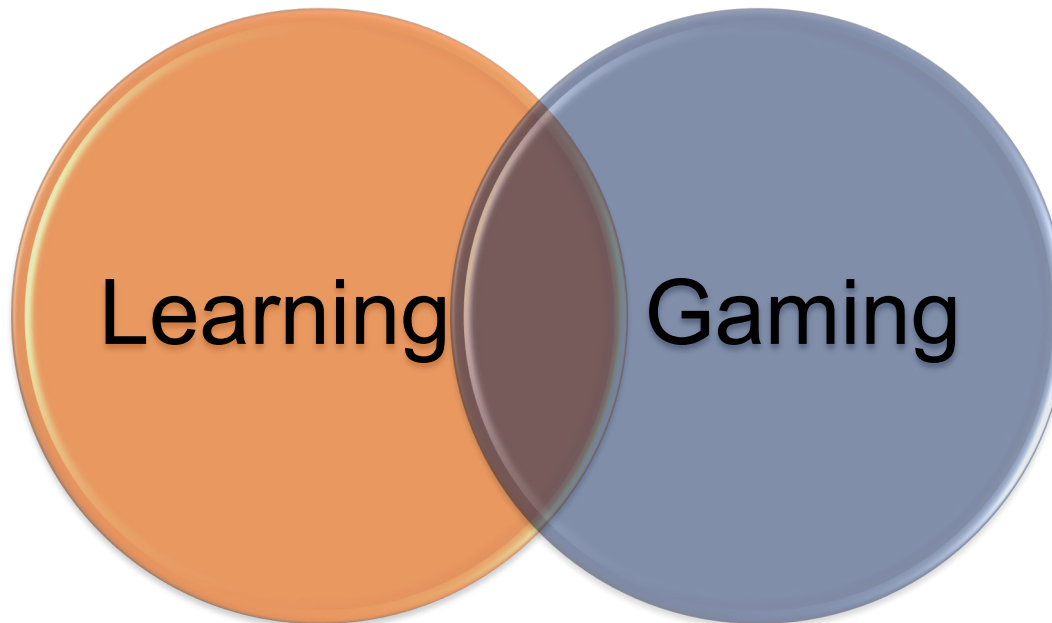
- Cyber Competitions
 - CyberPatriot; 2009 (middle & high school)
 - National Collegiate Cyber Defense Competition; 2005 (collegiate)
 - Panoply; 2009 (professional)
- Cybersecurity Training
 - Professional Certifications
 - Custom Built Courses
- Educational Cybersecurity Game Development
 - Developed Games for the AFA/CyberPatriot Elementary School Cyber Education Initiative (ESCEI); 2015-2016
 - Cyber Threat Defender Program: 2016 card game, 2018 PC game



Learning & Gaming

Repetition for Retention

- All CIAS games are designed around this concept
- Games need to be **fun**
 - Need a game with replay value
 - The more a student plays, the greater the ability to learn





Cyber Threat Defender Program



CTD Program

- Cyber Threat Defender: the collectible card game
 - Released in early 2016
 - Objective is to teach basic cybersecurity principles
- Cyber Threat Defender - PC
 - Released in summer 2018
 - Objective is to reach students beyond the classroom





CTD Program Development Goals

Cyber Threat Defender Goals

- Playable by various target audiences
 - Grade 6 and up (11+ years, but 8-10 years old playing now)
 - No technical experience needed
 - Engaging – Players want to continue to play
- Functional in a STEM classroom environment
 - Low cost, low tech method of teaching a high-tech subject
 - Adds a social interaction between students
 - Quick games: 10 to 20 minutes each
- Extending Game Play
 - Increase difficulty and complexity with booster packs
 - Game becomes customized for students interests and knowledge base



Program Educational Outcomes

Student learning outcomes

- Stresses DEFENSE vs “Hacking / Attacks”
- Basic Network Structure
- Cyber Relationships between cyber-attacks and defensive counter measures
- Cyber Attacks such as Hacks, Phishing, DOS, Malware, and Data Breaches
- Cyber Threats / Actors
- Cyber Defenses such as Hardware, Policies and Training
- Real World challenges to maintaining a protected network
- Cybersecurity Facts and Historical Information



Anatomy of a Card

Card Name

Attend Security Conference

0

Point Value

Card Type

Event

Card Description

You attend one of the largest cybersecurity conferences in the world. While there, you meet insightful security professionals, learn about some of the latest technologies, and gather some useful free resources.

Card Effect Instructions

Draw three cards and then discard this card.



Core Concept of Cyber Threat Defender

- Create a network of **Assets** to gain points
- Build **Defenses** to prevent undesirable **Events** and malicious **Attacks** against your **Assets**

Asset

Laptop Computer 1



Asset - Wireless System

A typical laptop computer that can be used to connect to the Internet via a Wireless Router.

You must have a Wireless Router in play before playing this card. You receive 1 point each round this card is in play.

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Defense

Encryption 0



Defense - Encryption

You activate encryption on your wireless device. This scrambles the signal so that attackers can't listen to your wireless traffic.

Select a Wireless Router that you have in play and attach this card to it. That Wireless Router is now encrypted. While encrypted, it cannot be the target of Wireless Sniffing cards. Remove from play any Wireless Sniffing cards that affect the encrypted Wireless Router.

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Event

Hardware Failure 0



Event

The failure of critical computer and network equipment causes your opponent to lose the use of an asset.

Select an Asset - System card that an opponent has in play. Both the target card and this card are discarded.

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Attack

Spear Phishing -2



Attack - Phishing

Your opponent's company was targeted by a special phishing attack known as Spear Phishing. They received emails created specifically to look more convincing to fool them into revealing sensitive information.

Select an opponent. That opponent loses 2 points per round for 3 rounds. Remove this card from play after 3 rounds.

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Learning Basic Concepts

Wireless Router is vulnerable to Wireless Sniffing

- Not vulnerable if you use Encryption on Wireless Router

Wireless Router 0



Asset - Wireless Network

This wireless router allows laptop computers and other wireless systems to be connected to the Internet through an Internet Service Provider (ISP).

You must have this card in play before you put any Laptop Computers into play. This card allows you to put an unlimited number of Laptop Computers into play.

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Encryption 0



Defense - Encryption

You activate encryption on your wireless device. This scrambles the signal so that attackers can't listen to your wireless traffic.

Select a Wireless Router that you have in play and attach this card to it. That Wireless Router is now encrypted. While encrypted, it cannot be the target of Wireless Sniffing cards. Remove from play any Wireless Sniffing cards that affect the encrypted Wireless Router.

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Wireless Sniffing -2



Attack - Information Gathering

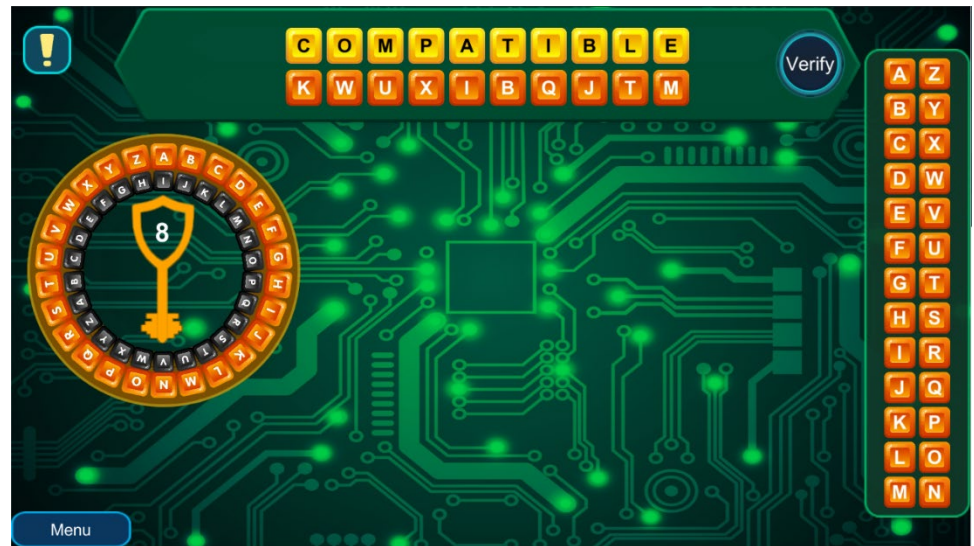
An attacker has been listening to the wireless transmissions of your opponent. The attacker has collected critical files and login data and can now access your opponent's systems.

Select an Wireless Router card that your opponent has in play. Your opponent loses 2 points each round for 2 rounds. Remove this card from play after 2 rounds.

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Using Cards as a Teaching Tool

- Use individual cards to introduce cyber strategies, such as Encryption, and how that correlates to ciphers and encryption keys. Then introduce Project Cipher.





Extending The Game's Value

Booster Packs

- Focus on particular themes / concepts of cybersecurity
- Additional informational / educational material





Extending The Game's Value

Booster Packs as a Teaching Tool

- Students investigate one job from Personnel Booster Pack, then share with class and one cool fact
- Students customize CTD Starter Deck with Booster Pack, with a max number of cards






Extending The Game's Value

Booster Packs as a Teaching Tool

- Students create own cards that can be incorporated into the game

 Cyber Threat Defender (CTD)
Custom Card Challenge

Your Task
Your task will be to build a total of four new CTD cards. You will design a new: asset, defense, attack, and event card that does not currently exist in the game. You want to make sure that you don't build a card that is too "overpowered" but that it is also worthwhile in the game. For each of the three cards you need to find/make the following:

- Card Name
- Card Type (ex. "Asset - Server")
- Short technical description of the card
- A short description of how it impacts the game.

You can check out the official "[card list](#)" for a high-res photo of all the cards, and a chance for you to even use Google Drawings to design your own. If you don't use Google Drawings you should **get creative** as to how you 'design' your card.

Building Your Cards
Build your custom cards below

Type your Asset Card here, or paste in the photo	Type your Attack Card here, or paste in the photo

Type your Defence Card here, or paste in the photo	Type your Event Card here, or paste in the photo

Reflection
In the game, why were you not safe even if you had every single defense card in play? What could your opponent do? Consider how this is true of real life security.

[Type your response here]

Should we use this card game as a learning tool next year with students? Why or why not? What did you personally think of the game?

[Type your response here]



Sponsor Support

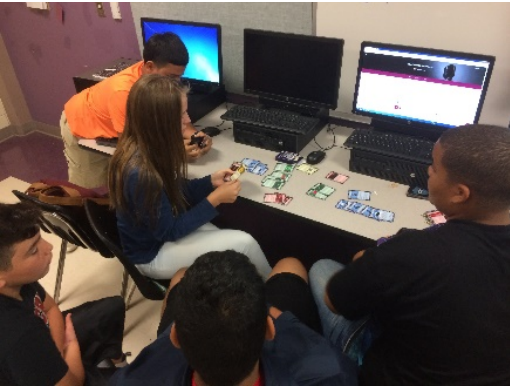
The CTD Program exists through individual and organizational sponsorships

- Sponsor the production and shipment of card decks
- Enables schools / teachers to receive the decks for free





Teachers / Instructors Feedback



“It gives students a ‘real world application’ of concepts they are learning. It also helps them understand just how important a good defense is when maintaining a network.”

~ *Jacob Rodriguez, cyber camp instructor*



“I love the principle behind the game: teaching future cybersecurity professionals attack and counter-attack concepts in a highly interactive game environment.”

~ *Nicky DeBolt, CyberPatriot coach, high school technology department chair*





Who is Using CTD?

35 States

- 400+ Schools
- 50,000 decks distributed

10 Countries

- USA, Canada, Mexico, United Kingdom, Japan, Hong Kong, Estonia, Sweden, France and Germany



Universities, Colleges, Middle & High Schools,
Cyber Clubs and Various Organizations



City Wide Tournaments

- Space Limited to 64 Spots
- Players 9+ years old
- \$5 Registration (\$54 Value)
- Family Activities Too!





City Wide Tournaments

Winner was a 12-year-old who went undefeated throughout the tournament!



All three winners were middle grade students!





Cyber Threat Defender - PC

- Released June 4th, 2018
- Free Download on CyberThreatDefender.com
- 4,000+ downloads to date





CTD-PC Branding Opportunities

- Game format is the same as the physical card game
- Allows students/players to continue playing (...and learning) outside the classroom.





Deck Building in CTD - PC

- Players can gain cyber-bytes (currency) to purchase new cards and updates via watching sponsor videos and playing the game.

The screenshot displays the Cyber Threat Defender PC interface. On the left, a card titled "Denial of Service (DoS)" is selected. The card's text reads: "An attacker has launched a Denial of Service (DoS) attack against your opponent's systems. One system is now not functioning and no work can be accomplished on it. Select an Asset - System card that your opponent has in play. That Asset - System cannot generate any points for 1 round. Remove this card from play after 1 round." Below the card, there are controls for adding and removing cards to a deck, with buttons for "New Deck", "Save Deck", "Load Deck", and "Delete Deck".

The main interface shows a "Sort By: Alphabetical" dropdown menu. Below it, a grid of cards is displayed, each with a small icon and a text box. The cards are arranged in two rows. The top row contains 7 cards, and the bottom row contains 7 cards. The cards are sorted alphabetically by name.

At the bottom of the interface, there is a "New Deck" section and a "Deck: 59" indicator. Below these, a grid of cards is shown, each with a quantity multiplier (e.g., x4, x3, x2) indicating the number of copies of that card in the deck. The cards are arranged in two rows, with 8 cards in each row.



Cyber Threat Defender - PC

- Great companion piece to the physical card game.
- Players play against various AI difficulty levels.
- Future plans call for a true multi-player, ONLINE experience where players compete against one another.

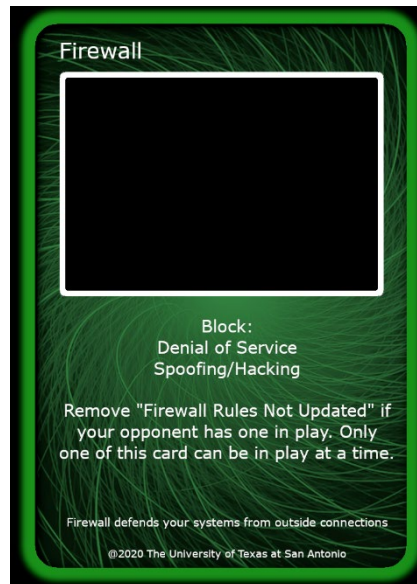




What's Next?

Cyber Threat Protector!

- Targeting 3-5 Grades
- Beta Testing Now
- Similar to Cyber Threat Defender, with simple rules and styling





What's Next?



Ada (Lovelace)
CyBear



Alan (Turing)
CyBear



Grace (Hopper)
CyBear



Vint (Cerf)
CyBear

Meet the CyBear Family! *(Cybersecurity Mascots)*

- Grades K-5: Introduced to Cyber Concepts
- Grades 6-12: Comprehend Cyber Defense Strategies
(using Cyber Threat Defender and Project Cipher)



What's Next?

Cyber Threat Defender

CIA S

name is _____

verb is an action word. It tells what someone or something is doing.

line to match each sentence with an action verb. Then the action verbs on the lines to finish the sentences.

A desktop computer _____ electricity to work.

Laptop computers can _____ to the Internet.

A computer mouse _____ users navigate Web pages.

Passwords _____ your personal information.


Smart phones can _____ your location.

Parents _____ family photos on social media.

Vint _____ video games with friends.

post
plays
track
helps
connect
protect
uses

think of three more verbs to describe Vint? write your answers on the lines below.



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CIA S

Grace CyBears Need Your Help!

You unscramble the words below to help decipher what Grace CyBear needs to keep her electronic devices safe from bad guys?

1. NTUARVSII _____

2. AILFLWRE _____

3. ECNONPRITY _____

4. OTPEYHON _____

5. ASRPOWDS _____

6. SROTAEFW UDEPTA _____

ANSWERS: 1. Antivirus; 2. Firewall; 3. Encryption; 4. Honeypot; 5. Password; 6. Software Update

Now, Alan CyBear needs cyber sleuths like you to help him understand the words you just unscrambled. Use the context to find the answers!

Logging into an electronic device, you use this **secret word** to gain access to the system.

a. Firewall b. Password c. Encryption

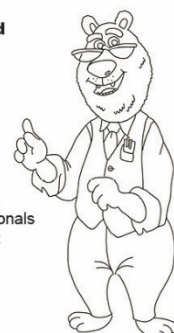
A _____ computer system that is designed to **block** unauthorized access to important information.

a. Anti-Virus b. Honeypot c. Firewall

A _____ decoy used to **attract** cyber attackers and capture them "handed" in a crime. This trap helps cybersecurity professionals learn more about the attacker's activities and prevent their crimes.

a. Fake Software b. Anti-Virus c. Honeypot

ANSWERS: 1. b; 2. c; 3. c



Developing Vocabulary

Smart Homes

Do you live in a smart home? That's where electronic devices are connected to the Internet to help you and your family stay connected at home. You can use your laptop computer or mobile phone to connect to smart devices like webcam. You can also use your computer or mobile phone to turn on the coffee maker, change the channel on the radio, or turn light on and off with the Internet!

Use the code below to learn what some of the words in the story mean by the matching letters in the blanks.

Internet _____

Laptop computer _____

Webcam _____

Mobile phone _____

C D E G H I L M N O P R S T U V W Y

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Icons from icons8.com

- Kids Activities
- Downloadable Games
- Tips for the Whole Family!

All Free!



Questions?

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Cyber Defense Competitions. Educational Game Development.
Cybersecurity Training and Exercises. Information Sharing.

