Students Who Don’t Understand Information Flow Should be Eaten: An Experience Paper

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Students Act Like Wolves
Our Missions

Games are pedagogically effective learning environments.

Werewolves (Mafia) is a sustainable game.

Danger of trusting system isolation is not fully understood.

Our UNIX-based version can make a difference in your classes.
Our Missions

Games are pedagogically effective learning environments [1,2,3].

Our Missions

Werewolves (Mafia) is a sustainable game [4,5].

Our Missions

Danger of trusting system isolation is not fully understood [6,7,8,9].

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Our UNIX-based version can make a difference in your classes.

werewolves@cs.unm.edu
Understanding Information Flow

- Information flow example:
  - If $L \leq H$, flows from $L$ to $L$, from $H$ to $H$, and $L$ to $H$ would be allowed, while flows from $H$ to $L$ would not.

- Covert channel.

- Inference channel.

- Read [10,11,12].

Understanding Information Flow

- Information flow example:
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- Read [10, 11, 12].

Werewolves of Miller’s Hollow
Werewolves of Miller’s Hollow

- Members:
Sample Round of Werewolves

Begin:
There are 2 wolves, and 8 townspeople.

Townspeople: [ Alice, Bob, David, Joe, Mike, Jonas, Roya, Tooba ]

Werewolves: [ Mike, Jonas ]

Witch: [ David ]
Sample Round of Werewolves
Sample Round of Werewolves

Werewolves, time to vote.

Mike: lets eat Roya
Jonas: no, I love her :) 
lets vote for Bob

Jonas & Mike vote for Bob. Werewolves, you selected to eat Bob, close your eyes.
Sample Round of Werewolves
Sample Round of Werewolves

Witch, open your eyes & Vote: [pass, poison, save]

Witch: I pass.

Witch, close your eyes.
Sample Round of Werewolves
Sample Round of Werewolves

The werewolves ate Bob.

Bob:
I was townspeople, I think Mike is werewolves. Goodbye, cruel world.

Mike: Lets kill Alice.
Alice & Bob always talked.

Everyone open your eyes. You have 240" to discuss who the werewolves are, and 60" to vote....
Werewolves of Miller’s Hollow

“Detective” is removed for the sake of pushing our students to use inference channels.
UNIX-based Version of Werewolves

- Werewolves Server
- Group 1 @office
- Group 2 @lab 209
- Group 15 @library

SSH connection
Werewolves to Teach Covert Channels
Acknowledgements

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UNIX-based Version of Werewolves

- Introduction to Cybersecurity (CS 444/544)
  - Spring 2012 at UNM/CS
- 45 students
- 3 credits course, every Mon/Wed/Friday
- Link to class website:
  - http://www.cs.unm.edu/~royaen/teaching.html
UNIX-based Version of Werewolves

Werewolves Server

Group 1 @office

Group 2 @lab 209

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SSH connection

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Our Werewolves Program Architecture

- **server.py** (Automated moderator)
- **client.py** (Run by players)
  - Can be written in any language
- **communication.py** (Consists of helper methods)

Talk to Mike Jacobi for details.
Strategies Students Discovered

- **Silent werewolves**
  - Successful Werewolves strategy
  - Solution: Shift the balance of powers using knob

- **Create many system calls**
  - Unsuccessful Werewolves strategy to hide their identities

- **Find shadow file**
  - “If you are not cheating, you are not trying”.

- **Chang identity**
  - During chat phase, make a town person look like a werewolf.
Lessons Learned

- Server design
- Great student enthusiasm
  - All students were challenged, but still able to contribute.
- Continuously engaging students
  - Feedback loop
  - Interesting discussions about info. flow, and game theory
Examples of Information Leaks

Live demo ...
WILL you use our UNIX-based werewolves in your class?

why or why not?
Links and Email

- Link to class materials:  
  - (www.cs.unm.edu/~royaen/teaching/)

- Email:  
  - werewolves@cs.unm.edu

- Don't hesitate to ask us for help