Internet Security – COS80013 Lab - 8 Report

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Lab Name: COS80013 Lab 8 – Encryption, Telnet, SSH and One-Time PadsLab

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Title and Introduction

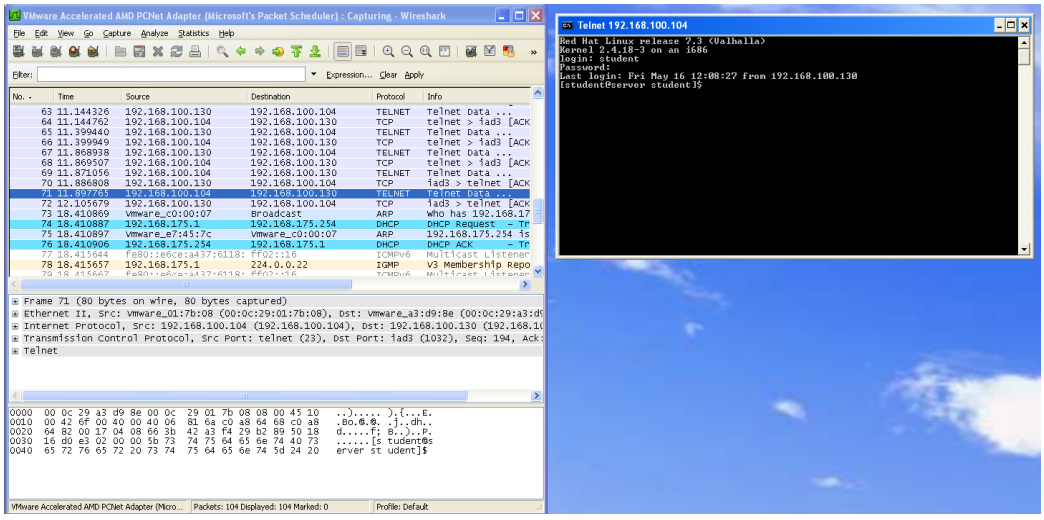
This lab was about seeing how data moves across a network and what can be seen when it's not protected. It showed how usernames, passwords, and session details can be picked up if encryption isn't used. It also showed what happens when encryption is used and how it hides the data from anyone watching the traffic. Telnet, SSH, HTTP, and HTTPS were tested using virtual machines. Some hands-on tasks with RSA and one-time pad tools were also done to see how those systems work.

Methodology

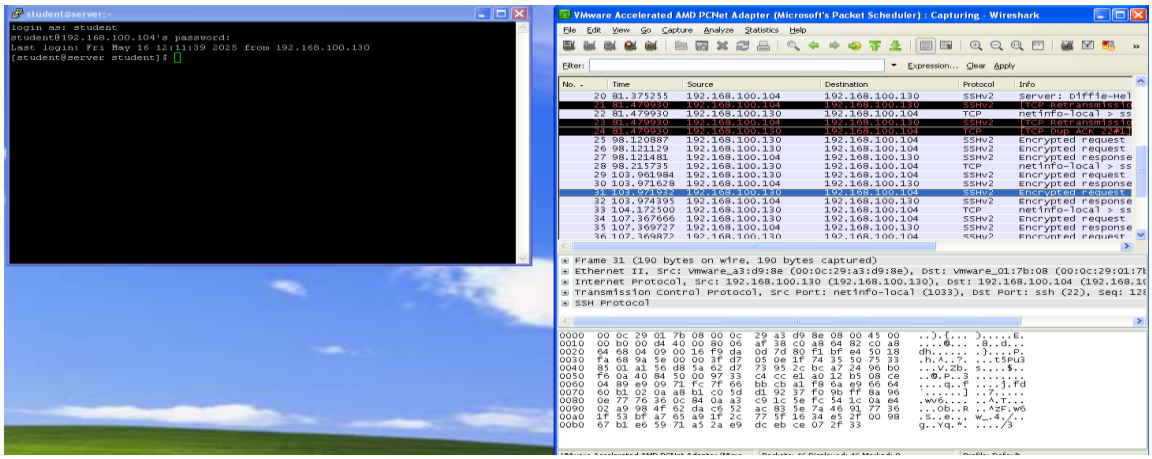
The lab began with the Windows XP virtual machine and Wireshark. A Telnet connection was made to the RedHat machine using telnet 192.168.100.104, and the login was done with "student" as both username and password. Wireshark showed each character clearly, confirming that Telnet sends data without any protection. Then, SSH was tested using Putty. The same login was done over SSH, and this time, Wireshark showed only encrypted packets. No readable data was found, proving that SSH encrypts and hides login information. Next, the HTTP login page http://www.server.com/safelogin.php was tested. The credentials "Warren" and "Eclipse" were used, and Wireshark captured them clearly along with the session ID. The HTTPS version of the same page was then used, and the traffic appeared encrypted, with no login info visible. An RSA demo tool was used to generate keys using 5 and 7 as primes. A short word "aced" was encrypted using the public key and decrypted using the private key. The original word was recovered successfully, confirming how RSA works. Lastly, a one-time pad program (otp4.exe) was run. A pad was created using the first six digits of the student ID. The first number worked for login, but reuse failed. Restarting the server continued from the next number. This showed that each code could be used only once, preventing reuse.

Data Recording and Screenshots

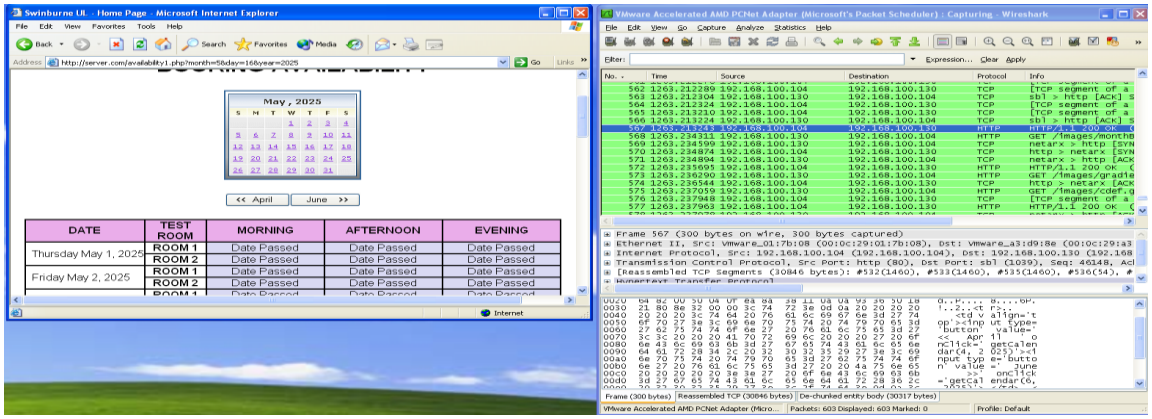
Wireshark showing the plain text packet transfer of telnet connection



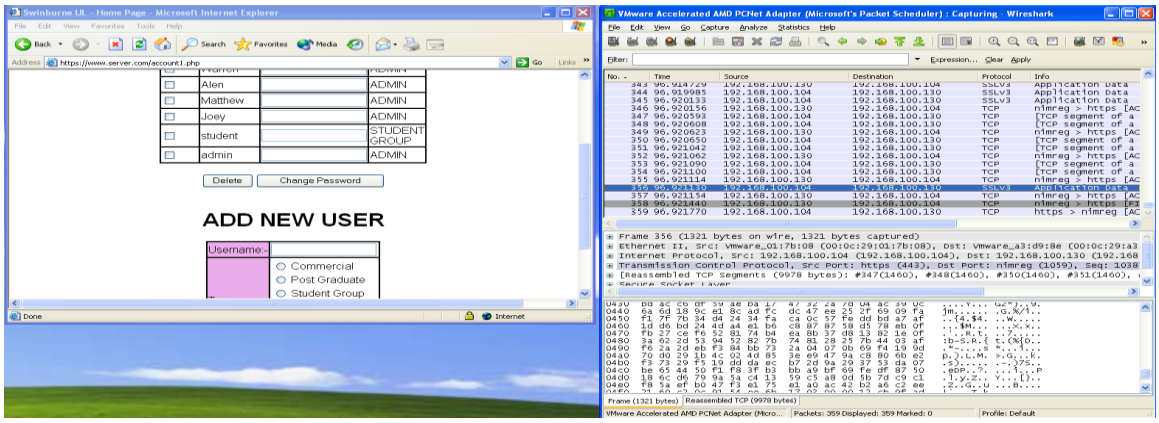
Wireshark showing the encrypted packets of SSH connection



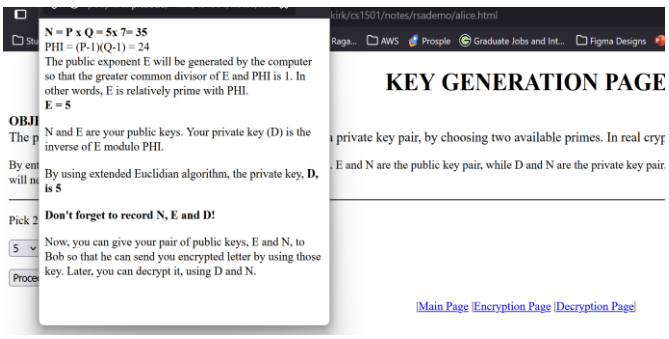
HTTP request to safelogin.php



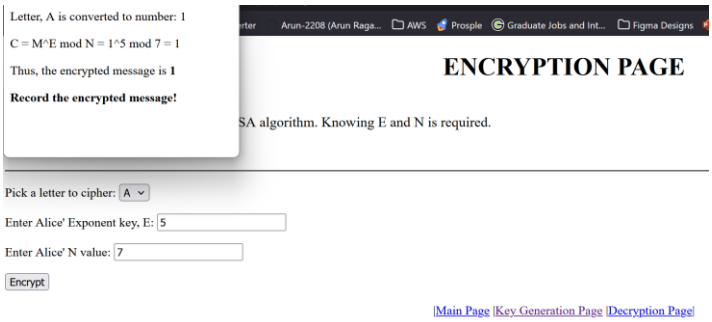
HTTPS secured request to safelogin.php



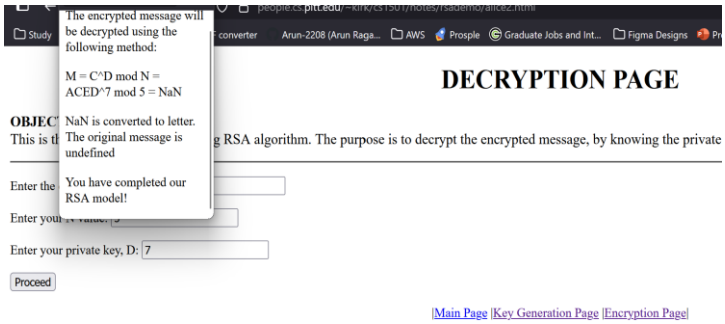
RSA demo - key generation



Encryption



Decryption



One Time Pad Program – Generating pad

```
OTP Authentication System
0 = exit
1 = Generate pad
2 = Start Server
command: 1
ONE-TIME PAD
============
Enter your 6-digit User number: 104837257

ONE-TIME PAD
============
Here is the pad. Write down/print these numbers and keep them safe.
 Use the numbers IN ORDER and only ONCE
After each successful log-in,
cross out the used number and move onto the next

104711847       104703001       104699507       104718053       104705720       104722216       104696522
104704094       104704678       104707651       104714822       104711279       104707559       104722362       10469622
6
104718216       104714052       104706807       104707121       104720117       104724959       104712472       10470982
7
104703196       104721477       104720991       104712408       104695927       104695862       104715664       10470147
4
104725585       104718348       104723715       104722109       104695981       104704065       104707629       10472126
5
104723096       104719165       104719139       104706375       104708821       104705556       104695842       10472271
8
104694253       104706803       104705370       104710743       104725803       104720173       104701054       10471621
7
104722626       104717601       104712410       104697082       104713826       104717337       104707931       10471100
```

An OTP once used to authenticate into the system, cannot be reused again

```
Welcome to The Server
 Type your 6-digit User number to Login
104837257
Type the next pad number to authenticate.
104711847
Access granted

JIMUX 0.10 Fake shell for demonstration

Available commands:
ls    exit    help
```

```
Welcome to The Server
 Type your 6-digit User number to Login
104837257
Type the next pad number to authenticate.
104711847
Access DENIED
```

Discussion and Application of Learnings

Learning 1
It was observed that Telnet is not secure. When the login was done through Telnet, all the characters of the username and password were seen clearly in Wireshark. This showed that Telnet sends everything as plain text and can easily be read by anyone watching the network.

Real-World Application
If any system still uses Telnet on a shared network, an attacker can capture usernames and passwords without needing any access to the system itself. This makes Telnet unsafe for any login or sensitive data.

Learning 2
When the same login was done using SSH, none of the login details were seen in the Wireshark capture. The traffic was encrypted, and no readable data appeared. This showed that SSH protects the session from being watched.

Real-World Application
Most servers now use SSH for remote access because it hides all the communication from network sniffers. If SSH is used, even if the network is being monitored, the attacker cannot see the login or commands.

Learning 3
During the website login test, HTTP showed the username, password, and session ID in plain text. But when HTTPS was used, the same data was hidden. The encrypted traffic could not be read in Wireshark.

Real-World Application
This shows why websites should always use HTTPS for forms, logins, and any personal data. Without it, anyone on the same network could steal passwords or take over sessions.

Learning 4
The RSA test helped to understand how a message can be encrypted using one key and decrypted only with the matching key. The message "aced" was successfully sent and recovered.

Real-World Application
RSA is used in secure websites, emails, and other online systems where the sender and receiver don’t share a common password. It allows safe communication by using public and private keys.

Learning 5
The one-time pad test showed that a password could only be used once. If someone tried to reuse the same code, it failed. Even after restarting the server, it continued from the next number in the pad.

Real-World Application
This is the basis for systems like token-based login or banking OTPs, where each code is valid only once. It prevents stolen or reused codes from being accepted, making attacks like replay harder.

Limitations

The lab used older systems and basic tools. Real systems use stronger encryption and updated protocols. Telnet is outdated, while SSH and HTTPS use more secure methods. RSA and OTP were simplified for learning. Still, the lab clearly showed how encryption protects data from being exposed.