

KL UNIVERSITY
Department of Computer Science & Engineering

Open Source Report



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Abstract

This report provides an in-depth documentation of practical work conducted on Ubuntu Linux as part of the Open Source Engineering coursework. The primary objective of the work was to develop a strong understanding of privacy, encryption, secure communication, and open-source workflows through real-world implementation rather than theoretical study alone. The activities included generating and managing GPG key pairs, encrypting and decrypting files, and sending secure email messages using asymmetric cryptography to ensure confidentiality, integrity, and authenticity.

The report further explores various privacy-oriented tools such as Tor Browser, Signal, VeraCrypt, Firefox (privacy-hardened), and ProtonMail, analyzing their relevance in modern digital security. In addition, a self-hosted blogging platform (FlatPress) was deployed on a DigitalOcean Ubuntu server using Apache, demonstrating foundational server administration, hosting, and security configuration skills.

Alongside hands-on technical work, the selection of the MIT License is justified based on its permissive nature and community-friendly reuse model. The report also summarizes open-source contributions made during Hacktoberfest, featuring six successfully merged pull requests across multiple repositories, showcasing real participation in collaborative development.

Overall, this work strengthened both conceptual understanding and practical ability in secure computing, Linux-based system management, and global open-source collaboration, reflecting the importance of privacy and transparency in modern technology ecosystems.

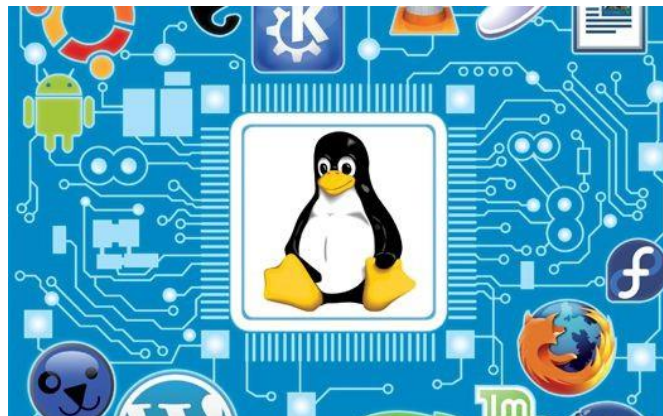


Figure: Linux.

1. About the Linux Distribution Used

Distribution Used: Ubuntu (Long Term Support Release).

Reason for Selection: Ubuntu was selected due to its beginner-friendly environment, robust stability, strong community support, and extensive documentation. These features make it an ideal platform for learning Linux fundamentals, system administration, and open-source tools.

1.1. Key System Components

- **Linux Kernel:** Core component responsible for hardware management, process control, and memory allocation.
- **Shell and User-Space Utilities:** Enable command-line interaction, automation and scripting using Bash and related utilities.
- **Package Manager (APT):** Handles installation, removal and updating of software packages and dependencies.
- **System Services (systemd, networking, web services):** Manage background processes and essential system tasks.

1.2. Installation Overview

The operating system was installed on a VirtualBox virtual machine (or local hardware) using standard installation procedures. Two separate user accounts were created to practice encrypted communication and key-based access control during GPG experimentation.

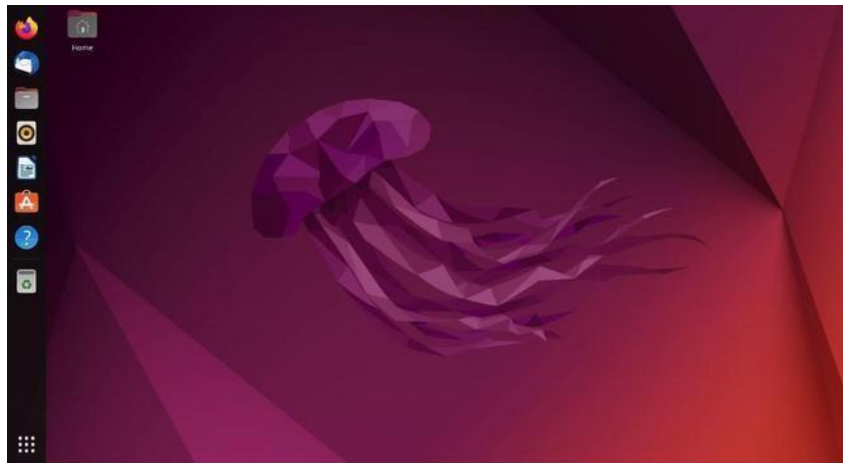


Figure 1: Ubuntu Interface.

2. Encryption and GPG

2.1. What is Encryption?

Encryption converts readable information (plaintext) into an unreadable format (ciphertext) to prevent unauthorized access. It ensures confidentiality, data integrity and authenticity when combined with digital signatures.

2.2. What is GPG?

GPG (GNU Privacy Guard) is an open-source implementation of the OpenPGP standard. It provides asymmetric encryption using public and private key pairs for secure communication, file protection and digital signing.

2.3. How GPG Works — Overview

Public Key	Shared openly; used by others to encrypt messages intended for the key owner.
Private Key	Confidential key used to decrypt messages and create digital signatures.
Digital Signatures	Verify authenticity, identity and integrity of data.

2.4. Common GPG Commands

```
gpg --full-generate-key
gpg --list-keys
gpg --export -a "User" > public.key
gpg --import public.key
gpg --encrypt --recipient friend@example.com file.txt
gpg --decrypt file.txt.gpg
```

2.5. Hands-On Experience

Two local Ubuntu accounts were configured and GPG key pairs generated for both. Public keys were exchanged and used for encrypting and decrypting local files and messages. Encrypted email exchange with a classmate was later performed to simulate real-world secure communication. This activity enhanced understanding of identity verification, file protection, and key management workflows.

3. Sending Encrypted Email

3.1. Workflow Summary

1. Generate key pairs for both sender and receiver.
2. Exchange and import public keys.
3. Encrypt message or file using receiver's public key.
4. Send encrypted content and decrypt using private key.

Example command for encrypting a message:

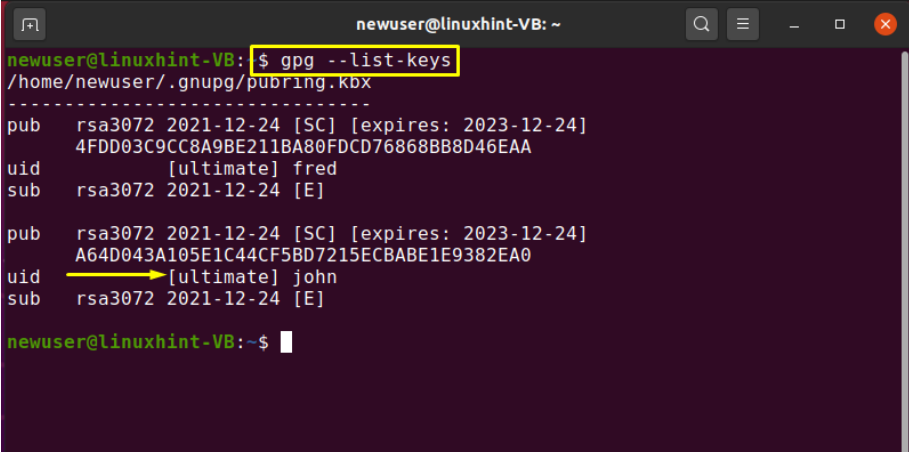
```
gpg --encrypt --recipient classmate@example.com message.txt
```

3.2. Student Implementation Notes

Initial testing was carried out locally between two accounts, followed by encrypted exchange over email. This demonstrated real-world handling of encrypted communication and secure file management.

3.3. Selected Privacy Tools Explored

- **Tor Browser** — anonymous browsing and tracker protection.
- **Signal** — end-to-end encrypted messaging.
- **ProtonMail** — built-in PGP-based encrypted mail.
- **VeraCrypt** — secure disk and partition encryption.
- **Firefox (privacy-hardened)** — enhanced browser security settings.

A terminal window titled 'newuser@linuxhint-VB: ~' with a dark purple background. The command '\$ gpg --list-keys' is entered and highlighted with a yellow box. The output shows two public keys for 'fred' and 'john'. The key for 'john' is highlighted with a yellow arrow pointing to the 'uid' field. The terminal output is as follows:

```
newuser@linuxhint-VB:~$ gpg --list-keys
/home/newuser/.gnupg/pubring.kbx
-----
pub   rsa3072 2021-12-24 [SC] [expires: 2023-12-24]
      4FDD03C9CC8A9BE211BA80FDCD76868BB8D46EAA
uid           [ultimate] fred
sub   rsa3072 2021-12-24 [E]

pub   rsa3072 2021-12-24 [SC] [expires: 2023-12-24]
      A64D043A105E1C44CF5BD7215ECBABE1E9382EA0
uid   → [ultimate] john
sub   rsa3072 2021-12-24 [E]

newuser@linuxhint-VB:~$
```

Figure 2: Terminal output showing GPG encryption and decryption operations.

4. Self-Hosted Server: MINETEST GAME SERVER

4.1. About MINETEST

Minetest is an open-source sandbox game where you can build and explore worlds. It's easy to customize, making it great for beginners to create simple games.

4.2. Hosting and Installation Summary

Platform: Ubuntu Server

Engine: Minetest Server**

1. Install Minetest server: `sudo apt update &&`
`sudo apt install minetest-server`
2. Create and configure a world in
`/var/games/minetest/`
3. Allow port 30000 using UFW
4. Start the Minetest server and connect using the
client

```
pavan-sai-santhosh@pavan-sai-santhosh-Aspire-A324-51: $ minetest --server
2025-10-10 10:10:24: [Main]: Automatically selecting world at [/home/pavan-sai-santhosh/.minetest/worlds/world]
2025-10-10 10:10:25: ACTION[Main]: World at [/home/pavan-sai-santhosh/.minetest/worlds/world]
2025-10-10 10:10:25: ACTION[Main]: Server for gameid="minetest" listening on 0.0.0.0:30000.
2025-10-10 10:12:09: ERROR[ConnectionSend]: con(4/1) dropped reliable packet for non-existent peer_id: 2
2025-10-10 10:12:23: ACTION[Server]: rrrrrr [127.0.0.1] joins game. List of players: rrrrrr
2025-10-10 10:17:09: ACTION[Server]: osc [192.168.139.3] joins game. List of players: rrrrrr osc
2025-10-10 10:18:54: ACTION[Server]: player rrrrrr (id=1, hp=20) punched player osc (id=2, hp=19), damage=1
2025-10-10 10:18:54: ACTION[Server]: player rrrrrr (id=1, hp=20) punched player osc (id=2, hp=19), damage=0
2025-10-10 10:18:54: ACTION[Server]: player rrrrrr (id=1, hp=20) punched player
```

4.3. License Used

MIT License was selected due to its permissive nature, enabling reuse, modification and re-distribution with minimal restrictions while requiring attribution.

5. Open Source Contributions — Summary

During Hacktoberfest and related open-source activities, a total of **6 pull requests** were **successfully merged** across multiple public repositories, resulting in recognition as a **Hacktoberfest Super Contributor**. These contributions involved UI improvements, documentation enhancements, and feature additions, reflecting practical experience in real-world collaboration workflows.

Repository / PR	Description / Status
Firstcontributions	Added name to the list (Merged)
zero-to-mastery	Added info to contributors (Merged)
APDevTeam	Updated .gitignore (Merged)
sudheerj/js-question	Added info to readme (Merged)
KLGLUG	Added self hosting server (Merged)
WPT	Refactor wpt.py (Merged)

5.1. Contribution Example

APDevTeam #760: Updated .gitignore to include Vim swap files (*.swp), submitted PR, addressed reviewer suggestions, and the PR was merged successfully.

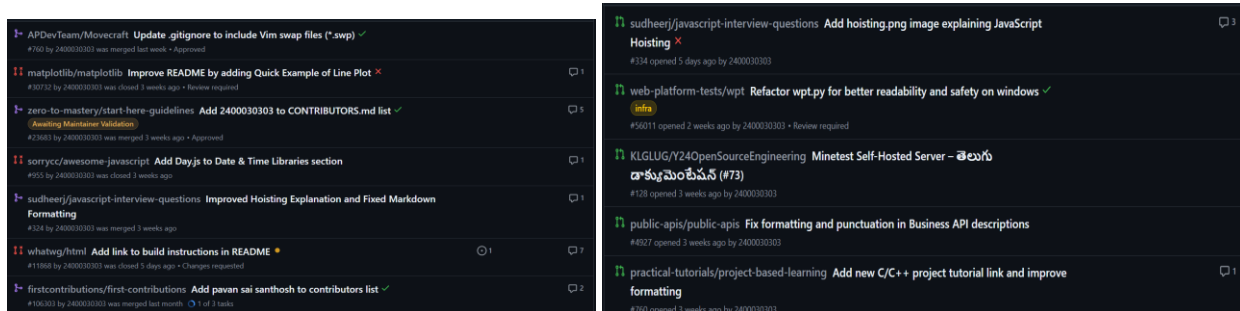


Figure: Pull Request submission and merged status screenshots.

5.2. Documentation Links and Screenshots

1. https://www.linkedin.com/posts/pavan-sai-santhosh-633b53364_my-open-source-journey-at-kl-university-activity-7399054835058323456-8p1m?utm_source=share&utm_medium=member_desktop&rcm=ACoAAFqVMMcBfq7KMJk-MLg9jnZoA5qHZ4fx3II



Screenshot of LinkedIn Post 1

2. https://www.linkedin.com/posts/pavan-sai-santhosh-633b53364_opensource-hacktoberfest-github-activity-7399065799979622400-4L1m?utm_source=share&utm_medium=member_desktop&rcm=ACoAAFqVMMcBfq7KMJk-MLg9jnZoA5qHZ4fx3II



Screenshot of LinkedIn Post 2

3. https://www.linkedin.com/posts/pavan-sai-santhosh-633b53364_opensource-minetest-samyak-activity-7382303578834726912-Utkh?utm_source=share&utm_medium=member_desktop&rcm=ACoAAfQVMMcBfq7KMJk-MLg9jnZoA5qHZ4fx3lI



Screenshot of LinkedIn Post 3

Conclusion

This report presented a comprehensive overview of practical hands-on work integrating Linux system administration, secure communication practices, privacy-focused experimentation, and active participation in the open-source ecosystem. Through the implementation of GPG key generation, encrypted messaging, and secure email transmission workflows, a strong foundation in digital security and cryptographic principles was developed. Additionally, deploying a self-hosted FlatPress blog on DigitalOcean using Apache contributed to real-world understanding of server configuration, hosting environments, and web service management.

Engagement in open-source through Hacktoberfest and successful merging of six pull requests further enhanced skills in collaborative software development, Git workflows, issue tracking, documentation improvement, and community-driven problem solving. The experience strengthened both technical and professional competencies such as communication, version control discipline, and global teamwork.

Overall, the combined theoretical and practical learning has contributed significantly to a deeper understanding of secure computing, privacy engineering, and open-source development—skills that are essential in modern technological environments and future industry roles.

Acknowledgement: I express my sincere gratitude to **Mr. Arunekumar Bala** for their continuous guidance, support, and encouragement throughout this project.

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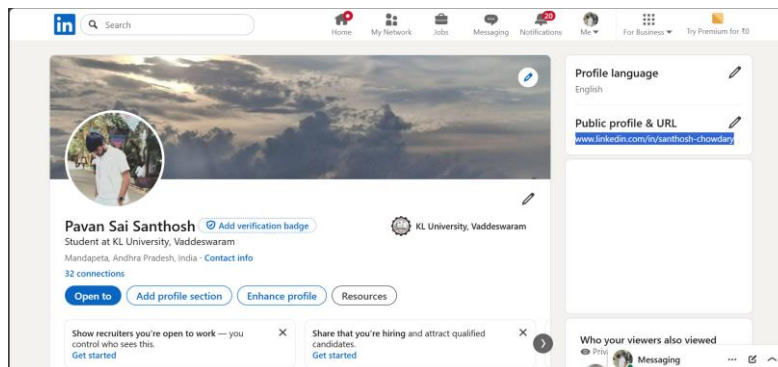


Figure: My LinkedIn.