

Assignment 13

Aim: Explore the GPG Tool of linux to implement email security.

Lab Outcome: LO6

Theory:

1. What is Private Key Ring and Public Key Ring?

In the context of GPG (GNU Privacy Guard), a private key ring and a public key ring are essential components of the OpenPGP encryption and signing system. These key rings are used for managing cryptographic keys for secure communication.

- **Private Key Ring:** This is a collection of private keys owned by a user. Private keys are used for decrypting messages sent to you and for signing messages to ensure their authenticity. Each user typically has their private key ring, which should be kept confidential and protected at all costs. Only the owner of the private key ring should have access to it.
- **Public Key Ring:** This is a collection of public keys, which are meant to be shared openly. Public keys are used by others to encrypt messages meant for you and to verify the digital signatures you create with your private key. Public keys are freely distributed and can be obtained from a keyserver or directly from the person they belong to.

2. Write the commands used for key generation, export and import of keys and signing and encrypting the message in gpg tool.

Key Generation:

To generate private and public key pairs for sender and receiver, you can use the following commands:

```
gpg --gen-key
```

Export a Public Key:

To export your public key, which can be shared with others, use the --export command and redirect the output to a file:

```
gpg --output my_public_key.gpg --export your_email@example.com
```

Import a Public Key:

To import someone else's public key, use the --import command:

```
gpg --import their_public_key.gpg
```

Create a file containing sender's private key:

```
gpg --export -secret-key -a username>filename
```

Import the public key of the receiver:

```
gpg --import filename_containing_public_key_of_receiver
```

Signing Keys :

Sender can sign the public key of the receiver to establish trust:

```
gpg --sign-key receiver_email
```

Encrypting Data :

Encrypt a file for a specific receiver:

```
gpg --encrypt -r receiver_email name_of_file .gpg file created
```

Encrypt and sign a file (ASCII format):

```
gpg --encrypt --sign --armor -r receiver_email name_of_file ASCII file created
```

Encrypt and sign a file (.gpg format):

```
gpg --encrypt --sign -r receiver_email name_of_file .gpg file created
```

Decrypting Data :**Decrypt a file:**

```
gpg -o myfiledecrypted -d myfile.txt.gpg
```

Output:

```
teaflame@LAPTOP-P2FVIJDD:~$ gpg --gen-key
gpg (GnuPG) 2.2.19; Copyright (C) 2019 Free Software Foundation, Inc.
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.

gpg: directory '/home/teaflame/.gnupg' created
gpg: keybox '/home/teaflame/.gnupg/pubring.kbx' created
Note: Use "gpg --full-generate-key" for a full featured key generation dialog.

GnuPG needs to construct a user ID to identify your key.

Real name: athar
Email address: athar@gmail.com
You selected this USER-ID:
"athar <athar@gmail.com>"

Change (N)ame, (E)mail, or (O)kay/(Q)uit? 0
We need to generate a lot of random bytes. It is a good idea to perform
some other action (type on the keyboard, move the mouse, utilize the
disks) during the prime generation; this gives the random number
generator a better chance to gain enough entropy.
We need to generate a lot of random bytes. It is a good idea to perform
some other action (type on the keyboard, move the mouse, utilize the
disks) during the prime generation; this gives the random number
generator a better chance to gain enough entropy.
gpg: /home/teaflame/.gnupg/trustdb.gpg: trustdb created
gpg: key A023142A64B2E0C6 marked as ultimately trusted
gpg: directory '/home/teaflame/.gnupg/openpgp-revocs.d' created
gpg: revocation certificate stored as '/home/teaflame/.gnupg/openpgp-revocs.d/F552545DFF20C09D99C15685A023142A64B2E0C6.rev'
public and secret key created and signed.

pub   rsa3072 2023-10-15 [SC] [expires: 2025-10-14]
       F552545DFF20C09D99C15685A023142A64B2E0C6
uid           athar <athar@gmail.com>
sub     rsa3072 2023-10-15 [E] [expires: 2025-10-14]
```

```

-----BEGIN PGP PRIVATE KEY BLOCK-----
teaflame@LAPTOP-P2FVIJDD:~$ gpg --gen-key
gpg (GnuPG) 2.2.19; Copyright (C) 2019 Free Software Foundation, Inc.
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.

Note: Use "gpg --full-generate-key" for a full featured key generation dialog.

GnuPG needs to construct a user ID to identify your key.

Real name: gaobl
Email address: gaobl@gmail.com
You selected this USER-ID:
"gaobl <gaobl@gmail.com>"

Change (N)ame, (E)mail, or (O)kay/(Q)uit? o
We need to generate a lot of random bytes. It is a good idea to perform
some other action (type on the keyboard, move the mouse, utilize the
disks) during the prime generation; this gives the random number
generator a better chance to gain enough entropy.
We need to generate a lot of random bytes. It is a good idea to perform
some other action (type on the keyboard, move the mouse, utilize the
disks) during the prime generation; this gives the random number
generator a better chance to gain enough entropy.
gpg: key D9D3DF8A0D24318C marked as ultimately trusted
gpg: revocation certificate stored as '/home/teaflame/.gnupg/openpgp-revocs.d/8BE4092A007F24ECC5B96708D9D3DF8A0D24318C.rev'
public and secret key created and signed.

pub   rsa3072 2023-10-15 [SC] [expires: 2025-10-14]
       8BE4092A007F24ECC5B96708D9D3DF8A0D24318C
uid     gaobl <gaobl@gmail.com>
sub   rsa3072 2023-10-15 [E] [expires: 2025-10-14]

```

```

teaflame@LAPTOP-P2FVIJDD:~$ gpg --export -a athar>spub
teaflame@LAPTOP-P2FVIJDD:~$ gpg --export-secret-key -a athar>spri
teaflame@LAPTOP-P2FVIJDD:~$ gpg --export-secret-key -a athar spri
-----BEGIN PGP PRIVATE KEY BLOCK-----

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```



```
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PGpVnwCFV59m1yHRSQEyBAfXZnUX12RdqXDRhigAoWnf
=bRxr
-----END PGP PRIVATE KEY BLOCK-----
teaf@laptop-P2FVIJDD:~$ █
```

```
teaf@laptop-P2FVIJDD:~$ gpg --export -a gaobl>rpup
teaf@laptop-P2FVIJDD:~$ gpg --export-secret-key -a gaobl>rpri
teaf@laptop-P2FVIJDD:~$ gpg --export-secret-key -a gaobl>rpri
-----BEGIN PGP PRIVATE KEY BLOCK-----

lQWGBGUsGSIBDAC6bYldBn CZqgzgJuqJtiHSNG88IxLMAoP4pWU0QtXV6R7cVxm
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```



```

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XiB+Q2qHsngXIiy6cLtpdxRzp0WWz7+s1m7Apk/AXJWAYScvBA4c9A/BSKw7Ly
c6bgls32ZiWe7IgZdwcR0jZhpLcG3SnazhP4WMTdtDhXXYKAmWys+gC060r3iM60
IOLDKDICBpI3rBPf8PYWNsOCfVayepJQ4c2IWSUceIM2
=0Xot
-----END PGP PRIVATE KEY BLOCK-----
teaflame@LAPTOP-P2FVIJDD:~$ █

```

```

PGpVnwCFV59m1yHRSQEYBAfXZnUX12RdqXDRhigAoWnf
=bRxxr
-----END PGP PRIVATE KEY BLOCK-----
teaflame@LAPTOP-P2FVIJDD:~$ gpg --import rpub
gpg: key D9D3DF8A0D24318C: "gaobl <gaobl@gmail.com>" not changed
gpg: Total number processed: 1
gpg: unchanged: 1
teaflame@LAPTOP-P2FVIJDD:~$ gpg --encrypt -r gaobl hi
gpg: checking the trustdb
gpg: marginals needed: 3 completes needed: 1 trust model: pgp
gpg: depth: 0 valid: 2 signed: 0 trust: 0-, 0q, 0n, 0m, 0f, 2u
gpg: next trustdb check due at 2025-10-14
gpg: can't open 'hi': No such file or directory
gpg: hi: encryption failed: No such file or directory
teaflame@LAPTOP-P2FVIJDD:~$ gpg --allow-secret-key-import --import rpri
gpg: key D9D3DF8A0D24318C: "gaobl <gaobl@gmail.com>" not changed
gpg: key D9D3DF8A0D24318C: secret key imported
gpg: Total number processed: 1
gpg: unchanged: 1
gpg: secret keys read: 1
gpg: secret keys unchanged: 1
teaflame@LAPTOP-P2FVIJDD:~$ gpg --list-keys
/home/teaflame/.gnupg/pubring.kbx
-----
pub   rsa3072 2023-10-15 [SC] [expires: 2025-10-14]
      F552545DFF20C09D99C15685A023142A64B2E0C6
uid           [ultimate] athar <athar@gmail.com>
sub   rsa3072 2023-10-15 [E] [expires: 2025-10-14]

pub   rsa3072 2023-10-15 [SC] [expires: 2025-10-14]
      8BE4092A007F24ECC5B96708D9D3DF8A0D24318C
uid           [ultimate] gaobl <gaobl@gmail.com>
sub   rsa3072 2023-10-15 [E] [expires: 2025-10-14]

```

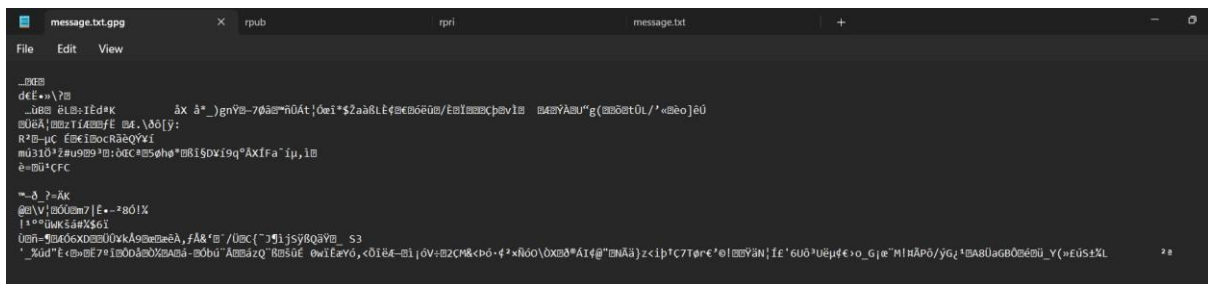
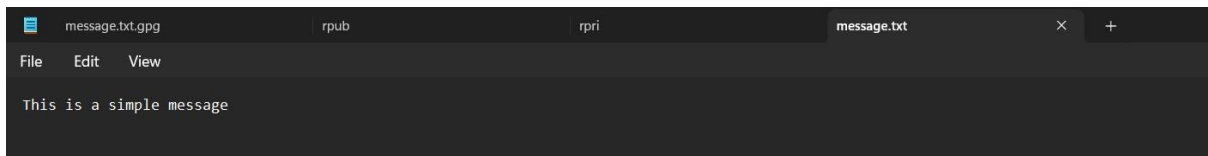
```

teafame@LAPTOP-P2FVIJDD:~$ gpg --list-keys
/home/teafame/.gnupg/pubring.kbx
-----
pub   rsa3072 2023-10-15 [SC] [expires: 2025-10-14]
      F552545DFF20C09D99C15685A023142A64B2E0C6
uid           [ultimate] athar <athar@gmail.com>
sub   rsa3072 2023-10-15 [E] [expires: 2025-10-14]

pub   rsa3072 2023-10-15 [SC] [expires: 2025-10-14]
      8BE4092A007F24ECC5B96708D9D3DF8A0D24318C
uid           [ultimate] gaobl <gaobl@gmail.com>
sub   rsa3072 2023-10-15 [E] [expires: 2025-10-14]

teafame@LAPTOP-P2FVIJDD:~$ nano msg.txt
teafame@LAPTOP-P2FVIJDD:~$ nano message.txt
teafame@LAPTOP-P2FVIJDD:~$ gpg -e -u athar -r gaobl message.txt
teafame@LAPTOP-P2FVIJDD:~$

```



Conclusion:

In summary, we explored GPG's private and public key rings, key management, and security processes. These are vital for secure communication and trust verification in digital exchanges.