Email and Email Servers

Jack Rosenthal

2017-10-19

Mines Linux Users Group

Optional: Want to follow along?

During the second part of the presentation, you'll have the optional opportunity to follow along in **setting up your own mail server** on Linux. If this means you want to **spin up a cheap VPS**, take a few minutes to do so.

Almost **any distro will work** (including FreeBSD), mine is running on Arch Linux.

Part 1: Email Concepts

What *is* Email?

With a friend(s)...

1. Define Email
2. Discuss what you think makes Email unique from other digital communication methods (e.g., IRC, Hangouts, Facebook, Slack, etc.)

Sorry this feels a bit like a lecture in a course... but hopefully you find this engaging.

[1] although, if Gmail went down, the world may as well just give up

What *is* Email?

- **Old:** Email is one of the oldest ways to communicate with others on a computer system (dates back to mid-60s).
- **Asynchronous:** Email replicates snail-mail's ability to respond on what you want when you want to.
- **Protocol:** Email is a protocol, not an implementation.
- **Decentralized:** Email is dependent on no single system[1].

[1] although, if Gmail went down, the world may as well just give up

What *is* Email?

- **Old:** Email is one of the oldest ways to communicate with others on a computer system (dates back to mid-60s).
- **Asynchronous:** Email replicates snail-mail's ability to respond on what you want when you want to.
- **Protocol:** Email is a protocol, not an implementation.
- **Decentralized:** Email is dependent on no single system[1].

[1] although, if Gmail went down, the world may as well just give up

What *is* Email?

- **Old:** Email is one of the oldest ways to communicate with others on a computer system (dates back to mid-60s).
- **Asynchronous:** Email replicates snail-mail's ability to respond on what you want when you want to.
- **Protocol:** Email is a protocol, not an implementation.
- **Decentralized:** Email is dependent on no single system[1].

[1] although, if Gmail went down, the world may as well just give up

What *is* Email?

- **Old:** Email is one of the oldest ways to communicate with others on a computer system (dates back to mid-60s).
- **Asynchronous:** Email replicates snail-mail's ability to respond on what you want when you want to.
- **Protocol:** Email is a protocol, not an implementation.
- **Decentralized:** Email is dependent on no single system[1].

[1] although, if Gmail went down, the world may as well just give up

Some Definitions

MUA Mail User Agent: What the user uses to send and receive Emails. Examples: Mutt, Claws Mail, Thunderbird, ...

MTA Mail Transfer Agent: An agent capable of delivering Emails from one system to another. Implemented by **SMTP** (Simple Mail Transfer Protocol).

MDA Mail Delivery Agent: An agent which delivers mails to a MUA. Implemented by **POP3** (Post Office Protocol 3) or **IMAP** (Internet Mail Access Protocol).

Some Definitions

MUA Mail User Agent: What the user uses to send and receive Emails. Examples: Mutt, Claws Mail, Thunderbird, ...

MTA Mail Transfer Agent: An agent capable of delivering Emails from one system to another. Implemented by **SMTP** (Simple Mail Transfer Protocol).

MDA Mail Delivery Agent: An agent which delivers mails to a MUA. Implemented by **POP3** (Post Office Protocol 3) or **IMAP** (Internet Mail Access Protocol).

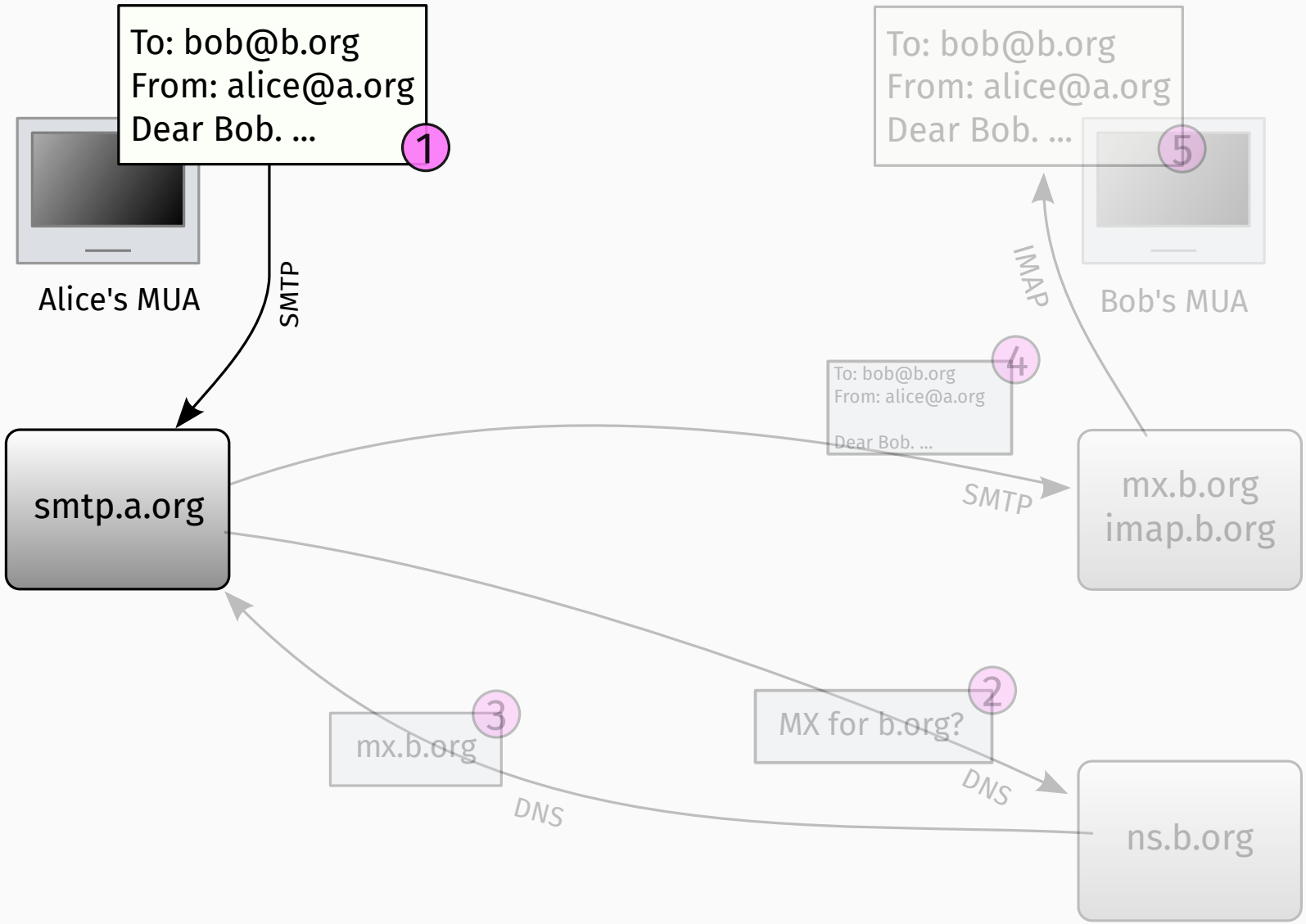
Some Definitions

MUA Mail User Agent: What the user uses to send and receive Emails. Examples: Mutt, Claws Mail, Thunderbird, ...

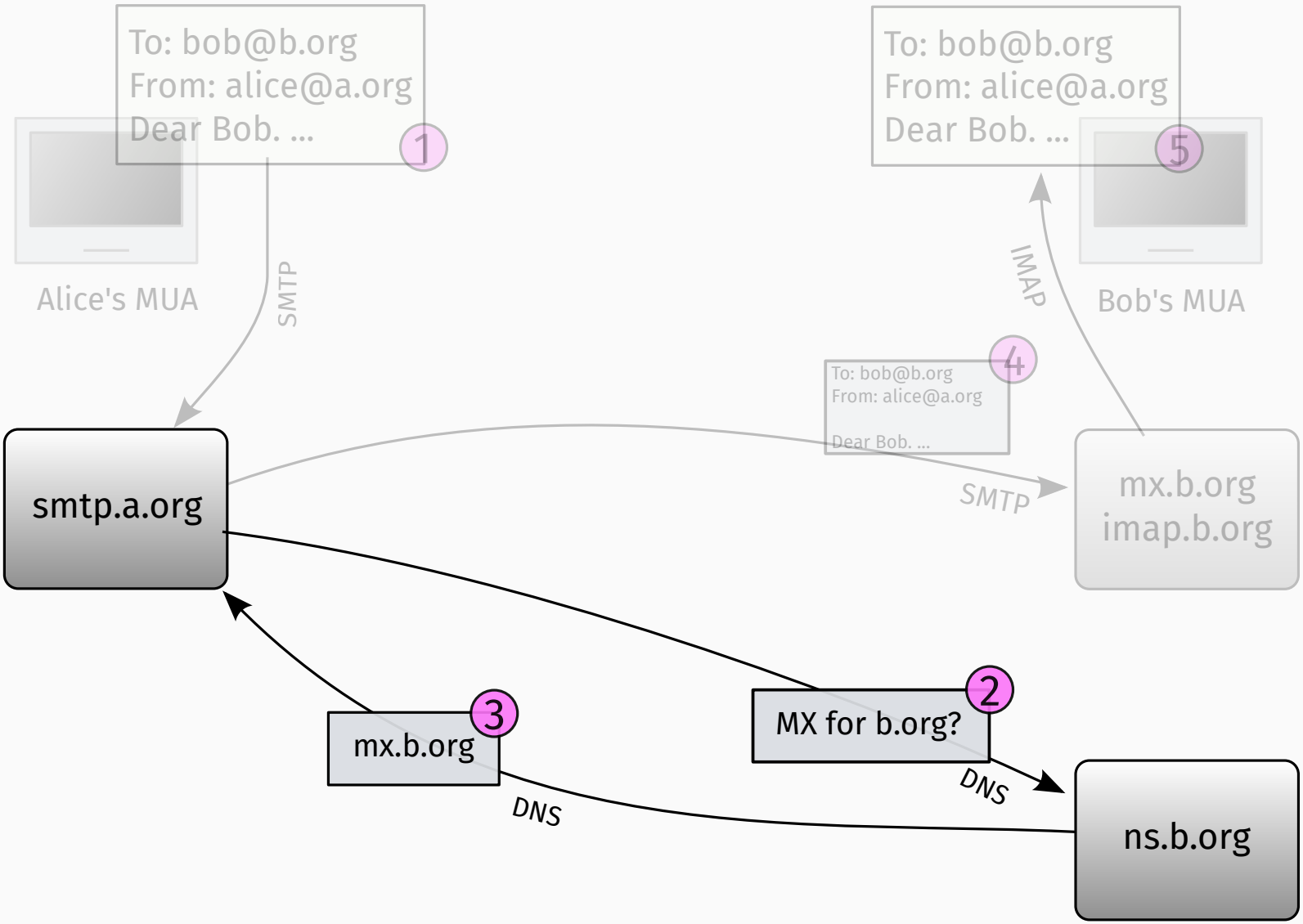
MTA Mail Transfer Agent: An agent capable of delivering Emails from one system to another. Implemented by **SMTP** (Simple Mail Transfer Protocol).

MDA Mail Delivery Agent: An agent which delivers mails to a MUA. Implemented by **POP3** (Post Office Protocol 3) or **IMAP** (Internet Mail Access Protocol).

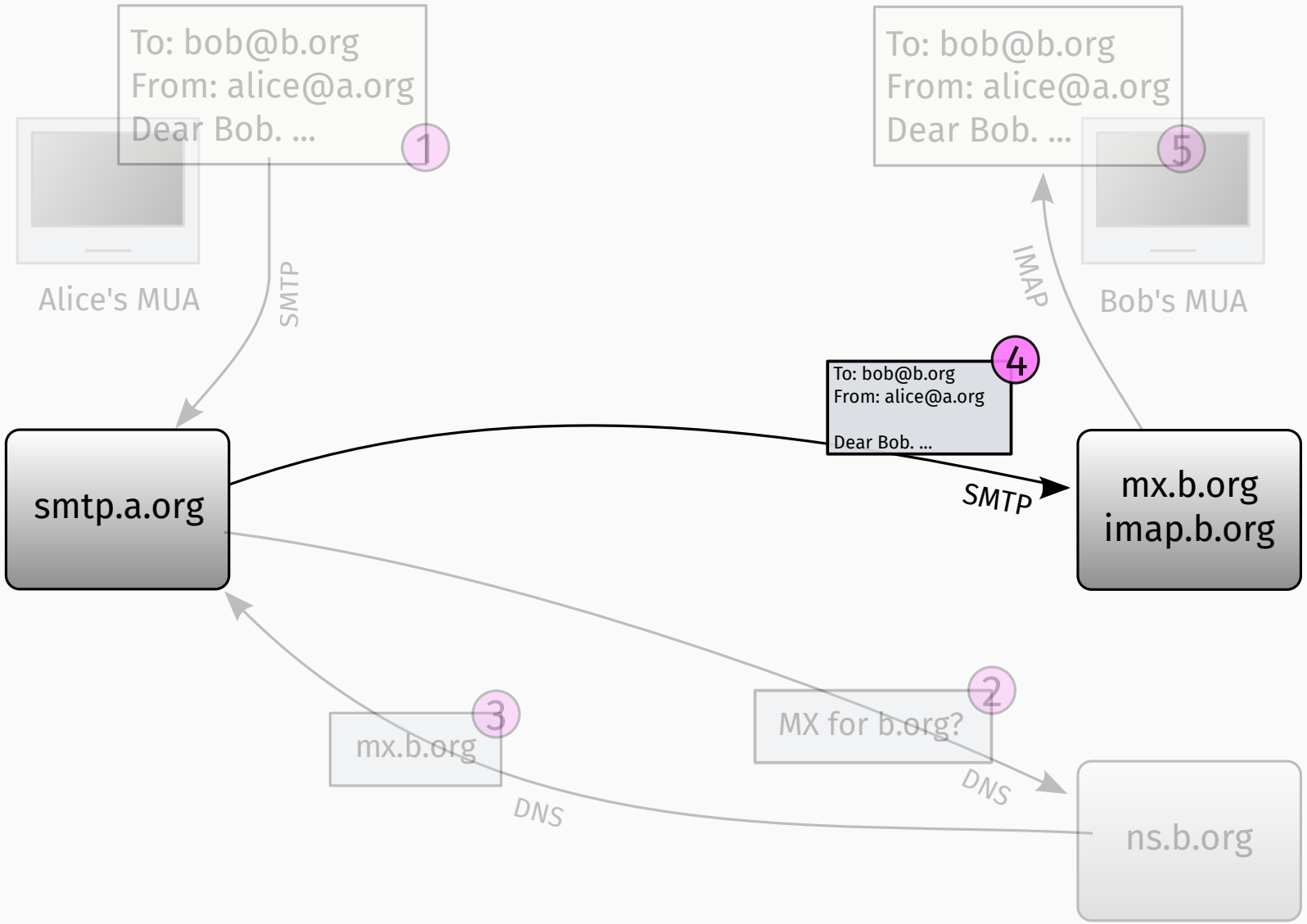
The Path of an Email



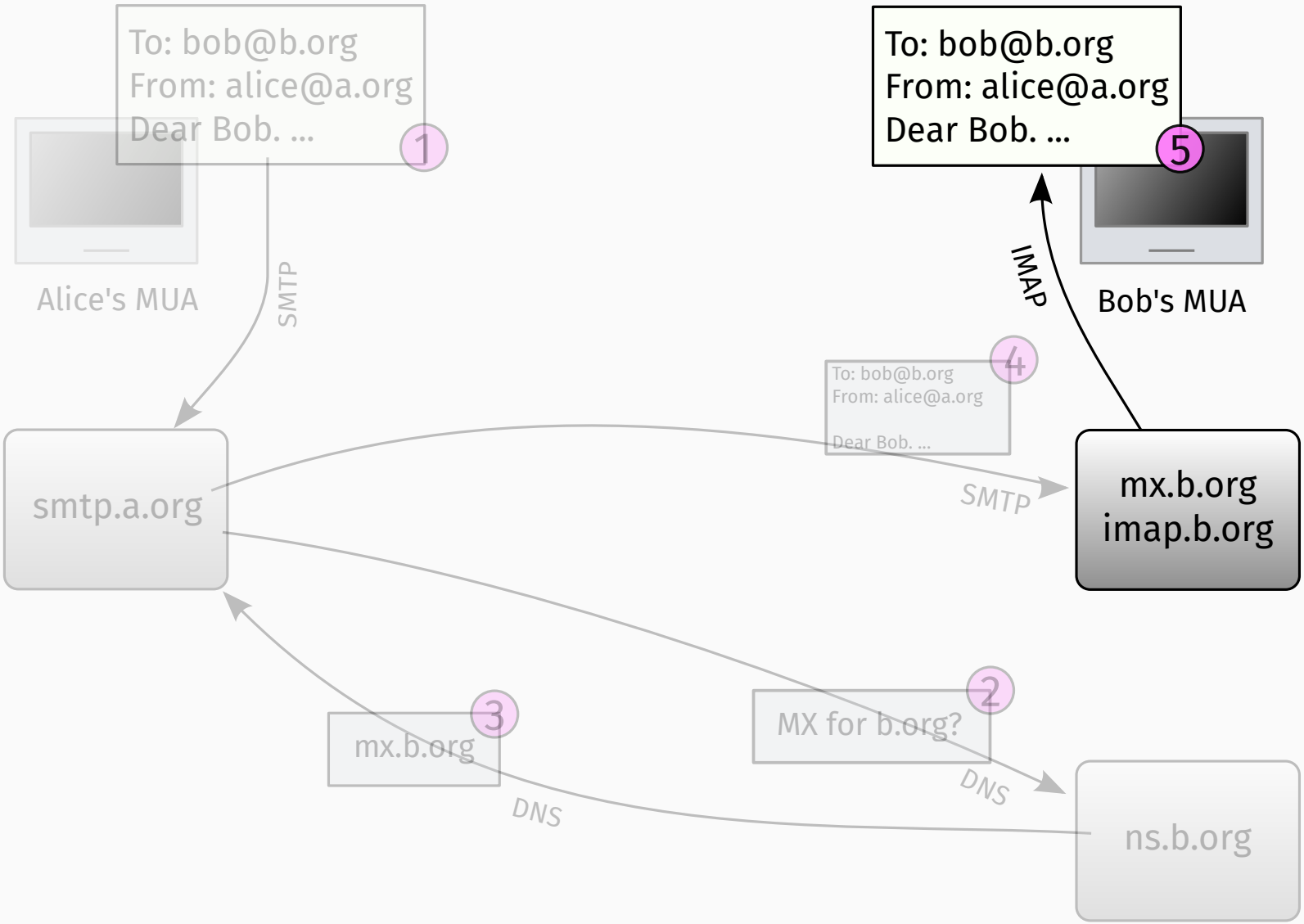
The Path of an Email



The Path of an Email



The Path of an Email



Let’s Send an Email (SMTP)

```
$ telnet smtp.mines.edu 25
220 izzard.mines.edu ESMTP Sendmail 8.14.4
HELO isengard
250 izzard.mines.edu Hello isengard, pleased to meet you
MAIL From:jrosenth@mines.edu
250 2.1.0 jrosenth@mines.edu... Sender ok
RCPT To:jack@rosenth.al
250 2.1.5 jack@rosenth.al... Recipient ok
DATA
354 Enter mail, end with "." on a line by itself
Subject: This is my Email

This is the message body
.
250 2.0.0 v9J0V6dW022526 Message accepted for delivery
QUIT
221 2.0.0 izzard.mines.edu closing connection
```

Let's Send an Email (SMTP)

```
$ telnet smtp.mines.edu 25
220 izzard.mines.edu ESMTP Sendmail 8.14.4
HELO isengard
250 izzard.mines.edu Hello isengard, pleased to meet you
MAIL From:jrosenth@mines.edu
250 2.1.0 jrosenth@mines.edu... Sender ok
RCPT To:jack@rosenth.al
250 2.1.5 jack@rosenth.al... Recipient ok
DATA
354 Enter mail, end with "." on a line by itself
Subject: This is my Email

This is the message body
.
250 2.0.0 v9J0V6dW022526 Message accepted for delivery
QUIT
221 2.0.0 izzard.mines.edu closing connection
```

Let's Send an Email (SMTP)

```
$ telnet smtp.mines.edu 25
220 izzard.mines.edu ESMTP Sendmail 8.14.4
HELO isengard
250 izzard.mines.edu Hello isengard, pleased to meet you
MAIL From:jrosenth@mines.edu
250 2.1.0 jrosenth@mines.edu... Sender ok
RCPT To:jack@rosenth.al
250 2.1.5 jack@rosenth.al... Recipient ok
DATA
354 Enter mail, end with "." on a line by itself
Subject: This is my Email

This is the message body
.
250 2.0.0 v9J0V6dW022526 Message accepted for delivery
QUIT
221 2.0.0 izzard.mines.edu closing connection
```

Let's Send an Email (SMTP)

```
$ telnet smtp.mines.edu 25
220 izzard.mines.edu ESMTP Sendmail 8.14.4
HELO isengard
250 izzard.mines.edu Hello isengard, pleased to meet you
MAIL From:jrosenth@mines.edu
250 2.1.0 jrosenth@mines.edu... Sender ok
RCPT To:jack@rosenth.al
250 2.1.5 jack@rosenth.al... Recipient ok
DATA
354 Enter mail, end with "." on a line by itself
Subject: This is my Email

This is the message body
.
250 2.0.0 v9J0V6dW022526 Message accepted for delivery
QUIT
221 2.0.0 izzard.mines.edu closing connection
```

Let's Send an Email (SMTP)

```
$ telnet smtp.mines.edu 25
220 izzard.mines.edu ESMTP Sendmail 8.14.4
HELO isengard
250 izzard.mines.edu Hello isengard, pleased to meet you
MAIL From:jrosenth@mines.edu
250 2.1.0 jrosenth@mines.edu... Sender ok
RCPT To:jack@rosenth.al
250 2.1.5 jack@rosenth.al... Recipient ok
DATA
354 Enter mail, end with "." on a line by itself
Subject: This is my Email

This is the message body
.
250 2.0.0 v9J0V6dW022526 Message accepted for delivery
QUIT
221 2.0.0 izzard.mines.edu closing connection
```

Let's Send an Email (SMTP)

```
$ telnet smtp.mines.edu 25
220 izzard.mines.edu ESMTP Sendmail 8.14.4
HELO isengard
250 izzard.mines.edu Hello isengard, pleased to meet you
MAIL From:jrosenth@mines.edu
250 2.1.0 jrosenth@mines.edu... Sender ok
RCPT To:jack@rosenth.al
250 2.1.5 jack@rosenth.al... Recipient ok
DATA
354 Enter mail, end with "." on a line by itself
Subject: This is my Email

This is the message body
.
250 2.0.0 v9J0V6dW022526 Message accepted for delivery
QUIT
221 2.0.0 izzard.mines.edu closing connection
```

Let's Send an Email (SMTP)

```
$ telnet smtp.mines.edu 25
220 izzard.mines.edu ESMTP Sendmail 8.14.4
HELO isengard
250 izzard.mines.edu Hello isengard, pleased to meet you
MAIL From:jrosenth@mines.edu
250 2.1.0 jrosenth@mines.edu... Sender ok
RCPT To:jack@rosenth.al
250 2.1.5 jack@rosenth.al... Recipient ok
DATA
354 Enter mail, end with "." on a line by itself
Subject: This is my Email

This is the message body
.
250 2.0.0 v9J0V6dW022526 Message accepted for delivery
QUIT
221 2.0.0 izzard.mines.edu closing connection
```

What did `izzard` do?

1. Lookup MX records for `rosenth.al` (`po.640k.net`)
2. Connect to `po.640k.net:25`…

```
HELO izzard.mines.edu
MAIL From:jrosenth@mines.edu
RCPT To:jack@rosenth.al
…
```

…then the MTA on `po` hands the message off to the MDA, and the MUA downloads the message from the MDA.

What did `izzard` do?

1. Lookup MX records for `rosenth.al` (`po.640k.net`)
2. Connect to `po.640k.net:25`…

```
HELO izzard.mines.edu
MAIL From:jrosenth@mines.edu
RCPT To:jack@rosenth.al
…
```

…then the MTA on `po` hands the message off to the MDA, and the MUA downloads the message from the MDA.

What did `izzard` do?

1. Lookup MX records for `rosenth.al` (`po.640k.net`)
2. Connect to `po.640k.net:25`…

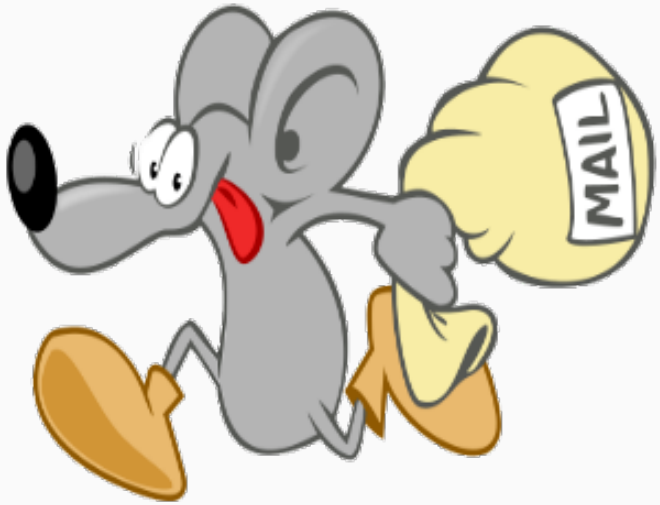
   ```
   HELO izzard.mines.edu
   MAIL From:jrosenth@mines.edu
   RCPT To:jack@rosenth.al
   ```

   …

…then the MTA on `po` hands the message off to the MDA, and the MUA downloads the message from the MDA.

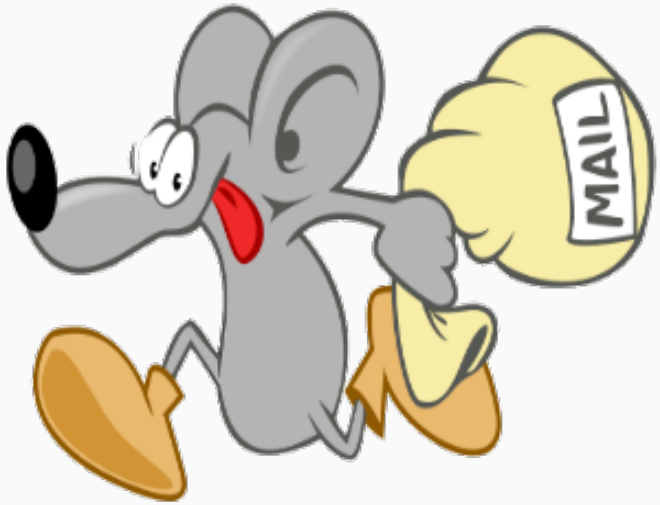
Part 2: Setting Up Your Own Mail Server on Linux

Postfix



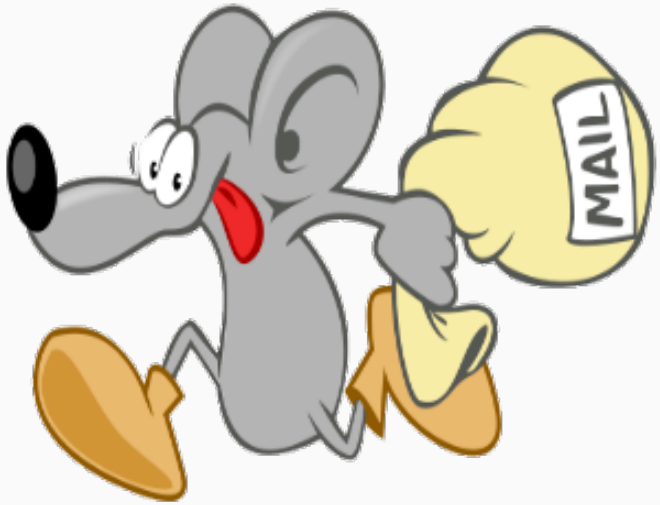
- Sendmail-compatible MTA
- 1998
- Knows how to speak LMTP (Local Mail Transport Protocol)
- *Does The Job™*

Postfix



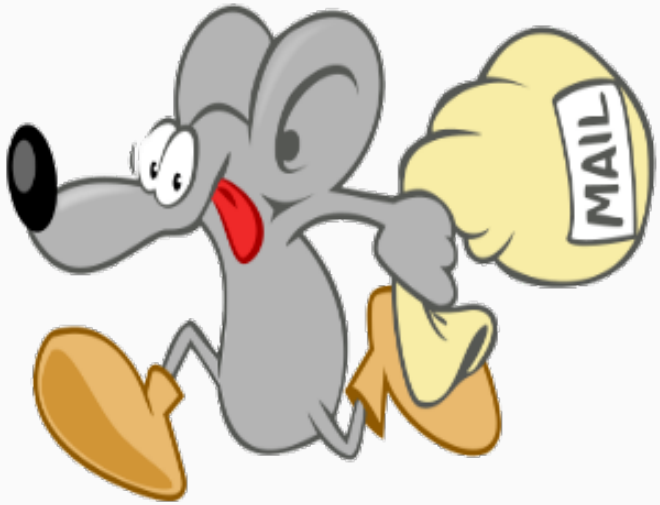
- Sendmail-compatible MTA
- 1998
- Knows how to speak LMTP (Local Mail Transport Protocol)
- *Does The Job™*

Postfix



- Sendmail-compatible MTA
- 1998
- Knows how to speak LMTP (Local Mail Transport Protocol)
- *Does The Job™*

Postfix



- Sendmail-compatible MTA
- 1998
- Knows how to speak LMTP (Local Mail Transport Protocol)
- *Does The Job*™

Dovecot

- MDA, provides POP3 and IMAP
- Stores your mail
- Accepts mail by providing LMTP
- Filter mail with Pigeonhole Sieve

Dovecot

- MDA, provides POP3 and IMAP
- Stores your mail
- Accepts mail by providing LMTP
- Filter mail with Pigeonhole Sieve

Dovecot

- MDA, provides POP3 and IMAP
- Stores your mail
- Accepts mail by providing LMTP
- Filter mail with Pigeonhole Sieve

Dovecot

- MDA, provides POP3 and IMAP
- Stores your mail
- Accepts mail by providing LMTP
- Filter mail with Pigeonhole Sieve

Configuring Postfix

/etc/postfix/main.cf

```
myhostname = po.640k.net
mydomain = po.640k.net

# what domains to consider ourselves
mydestination = po.640k.net, localhost

# listen on all network interfaces
inet_interfaces = all

# only allow mail to us or authenticated
smtpd_relay_restrictions = permit_mynetworks,
    permit_sasl_authenticated,
    reject_unauth_destination
```

Virtual Alias Maps

/etc/postfix/main.cf

```
# virtual domains should _not_ go
# under "mydestination"
virtual_alias_domains = rosenth.al
  steamboatnetworks.net steamboatnetworks.com
virtual_alias_maps = hash:/etc/postfix/virtual
```

/etc/postfix/virtual

```
jack@rosenth.al                 jrosenth
jack@steamboatnetworks.net      jrosenth
...
```

Then run `# postmap /etc/postfix/virtual`

SSL/TLS Thy Postfix

Let's Encrypt is my drug of choice:

```
# certbot certonly --standalone -d po.640k.net
```

/etc/postfix/main.cf

```
smtpd_tls_cert_file=
    /etc/letsencrypt/live/po.640k.net/fullchain.pem
smtpd_tls_key_file=
    /etc/letsencrypt/live/po.640k.net/privkey.pem
smtpd_use_tls=yes

# Settings for POODLE and the like
smtpd_tls_mandatory_protocols=!SSLv2,!SSLv3
smtp_tls_mandatory_protocols=!SSLv2,!SSLv3
smtpd_tls_protocols=!SSLv2,!SSLv3
smtp_tls_protocols=!SSLv2,!SSLv3
```

SSL/TLS Thy Postfix

Let's Encrypt is my drug of choice:

```
# certbot certonly --standalone -d po.640k.net
```

/etc/postfix/main.cf

```
smtpd_tls_cert_file=
    /etc/letsencrypt/live/po.640k.net/fullchain.pem
smtpd_tls_key_file=
    /etc/letsencrypt/live/po.640k.net/privkey.pem
smtpd_use_tls=yes

# Settings for POODLE and the like
smtpd_tls_mandatory_protocols=!SSLv2,!SSLv3
smtp_tls_mandatory_protocols=!SSLv2,!SSLv3
smtpd_tls_protocols=!SSLv2,!SSLv3
smtp_tls_protocols=!SSLv2,!SSLv3
```

SSL/TLS Thy Postfix

Let's Encrypt is my drug of choice:

```
# certbot certonly --standalone -d po.640k.net
```

/etc/postfix/main.cf

```
smtpd_tls_cert_file=
    /etc/letsencrypt/live/po.640k.net/fullchain.pem
smtpd_tls_key_file=
    /etc/letsencrypt/live/po.640k.net/privkey.pem
smtpd_use_tls=yes

# Settings for POODLE and the like
smtpd_tls_mandatory_protocols=!SSLv2,!SSLv3
smtp_tls_mandatory_protocols=!SSLv2,!SSLv3
smtpd_tls_protocols=!SSLv2,!SSLv3
smtp_tls_protocols=!SSLv2,!SSLv3
```

Postfix Services

Uncomment each of the following lines:

/etc/postfix/master.cf

```
smtp      inet  n       -       n       -       -       smtpd
submission inet  n       -       n       -       -       smtpd
smtps     inet  n       -       n       -       -       smtpd
 -o smtpd_tls_wrappermode=yes
```

If you enable `smtps` as above, Linux will not know what port to put it on. Add to `/etc/services`:

```
smtps           465/tcp
```

Postfix Services

Uncomment each of the following lines:

/etc/postfix/master.cf

```
smtp      inet  n       -       n       -       -       smtpd
submission inet  n       -       n       -       -       smtpd
smtps     inet  n       -       n       -       -       smtpd
 -o smtpd_tls_wrappermode=yes
```

If you enable `smtps` as above, Linux will not know what port to put it on. Add to `/etc/services`:

```
smtps           465/tcp
```

Start and Test Postfix

1. Start Postfix (change as needed for `init` systems):

   ```
   # systemctl start postfix
   ```

2. Send yourself an Email:

   ```
   $ fortune | mail jrosenth@mines.edu
   ```

Dovecot Setup

1. Copy sample configs from `/usr/share/doc/dovecot/example-config` to `/etc/dovecot`
2. Edit `/etc/dovecot/dovecot.conf`:

```
# Protocols we want to be serving
protocols = imap lmtp
```

3. `cd` to `/etc/dovecot/conf.d` and get ready to edit *a lot* of files

Dovecot Setup

1. Copy sample configs from `/usr/share/doc/dovecot/example-config` to `/etc/dovecot`
2. Edit `/etc/dovecot/dovecot.conf`:

```
# Protocols we want to be serving
protocols = imap lmtp
```

3. `cd` to `/etc/dovecot/conf.d` and get ready to edit *a lot* of files

Dovecot Setup

1. Copy sample configs from `/usr/share/doc/dovecot/example-config` to `/etc/dovecot`
2. Edit `/etc/dovecot/dovecot.conf`:

```
# Protocols we want to be serving
protocols = imap lmtp
```

3. `cd` to `/etc/dovecot/conf.d` and get ready to edit *a lot* of files

Mailbox Storage Format

You'll need to decide how you want to store mail:

`mbox` Traditional UNIX mailbox storage format: one file per mailbox.

`maildir` Directories with one file per message.

`sdbox` Dovecot's own high performance storage format (one message per file).

`mdbox` Dovecot's own high performance storage format (multiple messages per file).

Set your choice in `10-mail.conf`:

```
mail_location = mdbox:~/mdbox
```

Mailbox Storage Format

You'll need to decide how you want to store mail:

`mbox` Traditional UNIX mailbox storage format: one file per mailbox.

`maildir` Directories with one file per message.

`sdbox` Dovecot's own high performance storage format (one message per file).

`mdbox` Dovecot's own high performance storage format (multiple messages per file).

Set your choice in `10-mail.conf`:

```
mail_location = mdbox:~/mdbox
```

Mailbox Storage Format

You'll need to decide how you want to store mail:

`mbox` Traditional UNIX mailbox storage format: one file per mailbox.

`maildir` Directories with one file per message.

`sdbox` Dovecot's own high performance storage format (one message per file).

`mdbox` Dovecot's own high performance storage format (multiple messages per file).

Set your choice in `10-mail.conf`:

```
mail_location = mdbox:~/mdbox
```

Mailbox Storage Format

You'll need to decide how you want to store mail:

mbox Traditional UNIX mailbox storage format: one file per mailbox.

maildir Directories with one file per message.

sdbox Dovecot's own high performance storage format (one message per file).

mdbox Dovecot's own high performance storage format (multiple messages per file).

Set your choice in `10-mail.conf`:

```
mail_location = mdbox:~/mdbox
```

Mailbox Storage Format

You'll need to decide how you want to store mail:

`mbox` Traditional UNIX mailbox storage format: one file per mailbox.

`maildir` Directories with one file per message.

`sdbox` Dovecot's own high performance storage format (one message per file).

`mdbox` Dovecot's own high performance storage format (multiple messages per file).

Set your choice in `10-mail.conf`:

```
mail_location = mdbox:~/mdbox
```

Authentication

10-auth.conf

```
# given user@example.com, username is "user"
auth_username_format = %Ln
```

Need to ask PAM to let us check:

/etc/pam.d/dovecot

```
auth    required    pam_unix.so nullok
account required    pam_unix.so
```

Authentication

10-auth.conf

```
# given user@example.com, username is "user"
auth_username_format = %Ln
```

Need to ask PAM to let us check:

/etc/pam.d/dovecot

```
auth    required    pam_unix.so nullok
account required    pam_unix.so
```

Wiring-up Auth to Postfix

10-master.conf

```
service auth {
  unix_listener /var/spool/postfix/private/auth {
    mode = 0660
    user = postfix
    group = postfix
  }
}
```

/etc/postfix/main.cf

```
smtpd_sasl_type = dovecot
smtpd_sasl_path = private/auth
smtpd_sasl_auth_enable = yes
```

Wiring-up LMTP to Postfix

10-master.conf

```
service lmtp {
  unix_listener /var/spool/postfix/private/lmtp {
    mode = 0660
    user = postfix
    group = postfix
  }
}
```

/etc/postfix/main.cf

```
mailbox_transport = lmtp:unix:private/lmtp
```

SSL/TLS in Dovecot

10-ssl.conf

```
ssl = required
ssl_cert =
  </etc/letsencrypt/live/po.640k.net/fullchain.pem
ssl_key =
  </etc/letsencrypt/live/po.640k.net/privkey.pem
```

See config files for POODLE settings and the like.

SSL/TLS in Dovecot

10-ssl.conf

```
ssl = required
ssl_cert =
  </etc/letsencrypt/live/po.640k.net/fullchain.pem
ssl_key =
  </etc/letsencrypt/live/po.640k.net/privkey.pem
```

See config files for POODLE settings and the like.

Ready, Set, Email!

Fire up Dovecot and restart Postfix:

```
# systemctl start dovecot
# systemctl restart postfix
```

Now, *send some test emails*!

Ready, Set, Email!

Fire up Dovecot and restart Postfix:

```
# systemctl start dovecot
# systemctl restart postfix
```

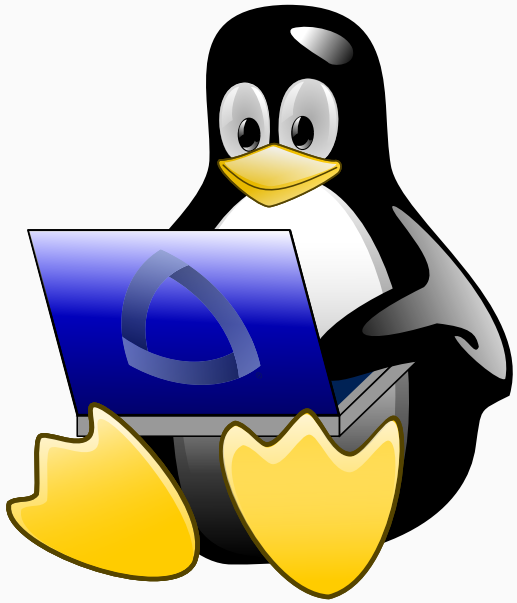
Now, *send some test emails*!

Questions?

Copyright Notice

This presentation was from the **Mines Linux Users Group**. A mostly-complete archive of our presentations can be found online at `https://lug.mines.edu`.

Individual authors may have certain copyright or licensing restrictions on their presentations. Please be certain to contact the original author to obtain permission to reuse or distribute these slides.



Colorado School of Mines
Linux Users Group