

# **Draft – Setting up Email Server with EAI Support**

**Universal Acceptance of Domain Names and Email Addresses**

Name of Presenter

Event

Date



# Plan

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- ⦿ Understand basic components of an email system
- ⦿ Select software for setting up email system with EAI support
- ⦿ Representation formats used for international domain name
- ⦿ Taxonomy of international email address
- ⦿ Installation of software required to setup email system
- ⦿ Configuration of these software to support EAI

# Components of Email System

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- Protocols involved:
  - Simple Mail Transfer Protocol (SMTP):
    - SMTP is a push protocol used to send mail
  - Post Office Protocol(POP3):
    - POP3 is used to fetch mail from sever side to client side
    - Mail is moved to the end user's device when the mail client opens it and it is deleted from server side
  - Internet Message Access Protocol(IMAP):
    - IMAP is required to fetch mail from server side to client side like POP3
    - It doesn't delete mail from server side allowing login from multiple devices

# Components of Email System

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- ⦿ Mail User Agent (MUA):
  - The software used by the user to send and receive email
  - For sending mail:
    - Through MUA, a user create email messages for transfer to MSA(discussed later)
    - MUA uses SMTP to send mail to MSA
  - For receiving mail:
    - MUA is also used to receive messages from mailboxes on MDA(discussed later)
    - It uses IMAP/POP3 to fetch mail from mailboxes
  - MUA may be in form of webmail (that run in browser) or an application
  - Examples of some MUA are: Gmail, Microsoft Outlook, Mozilla Thunderbird, Roundcube

# Components of Email System

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- ⊙ Mail Submission Agent (MSA):
  - A software, usually on servers, which receives the email from the MUA
  - Typically, this function is bundled with an MTA(discussed later)
  - SMTP protocol is used to submit mail

# Components of Email System

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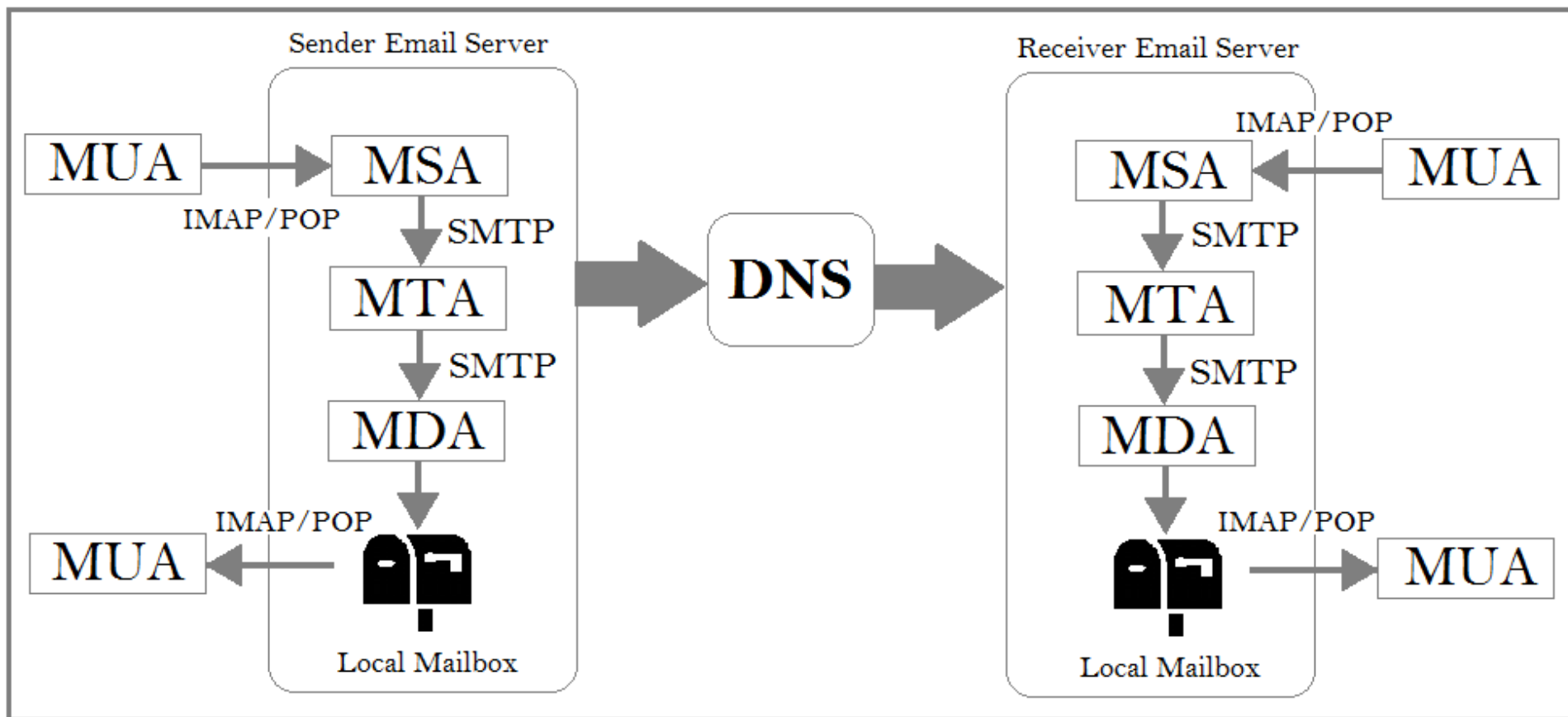
- ⦿ Mail Transfer Agent (MTA):
  - A software, usually on servers, which transfers mail on behalf of the user to another MTA
  - It may receive mail directly from MUA or from MSA
  - MTAs communicate with one another using SMTP protocol
  - MTA transfers mail to MDA(discussed later) on final recipient server

# Components of Email System

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- ⊙ Mail Delivery Agent (MDA):
  - A software, usually on servers, that receives mail from MTA and transfer it to local mailboxes on final destination MTA server
  - It is also called local delivery agent
  - Emails on MDA are retrieved using IMAP/POP3 protocol

# Components of Email System





# Software Available for Setting up Email System

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- ⦿ Several software are available for setting up email system
- ⦿ Available software are listed in document:
  - <https://uasg.tech/wp-content/uploads/documents/UASG021A-en-digital.pdf>
- ⦿ Some documents covering EAI essentials are:
  - <https://uasg.tech/wp-content/uploads/documents/UASG012-en-digital.pdf>
- ⦿ Some of available software are shown in next slide

# Software Available for Setting up Email System

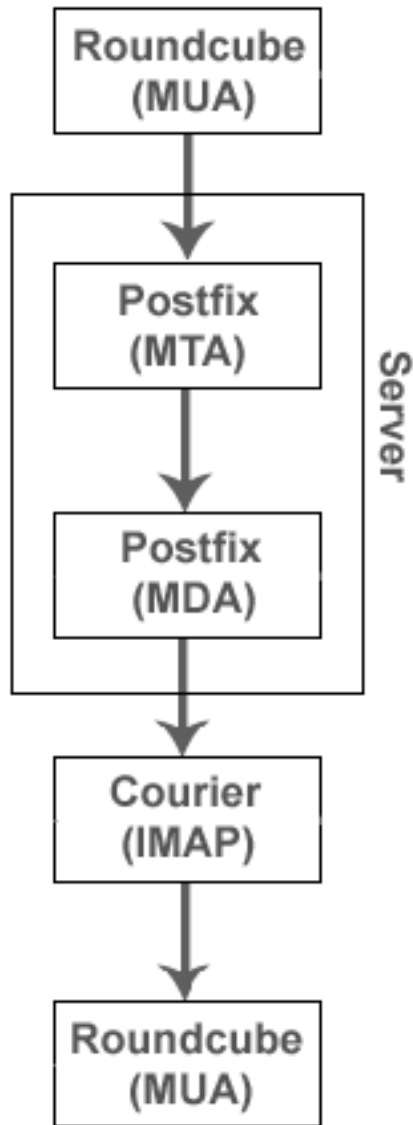
Software	MUA	MSA	MTA	MDA	MSP	Webmail	Region
XgenPlus Email Server	X	X	X	X	X	X	AP
Axigen Mail Server	X	X	X	X		X	EUR
MDaemon Email Server	X	X	X	X		X	NA
Oracle Beehive	X	X	X	X		X	NA
Zimbra	X	X	X	X		X	NA
Apple iCloud	X				X	X	NA
Coremail	X				X	X	AP
FastMail	X				X	X	AP
Gmail	X				X	X	NA

# Selecting Software for Setting up Email System

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- ⦿ From the above mentioned list select only those that support EAI
- ⦿ Some features that software must support are:
  - Extended simple mail transfer protocol(ESMTP)
  - IMAP/POP3 with UTF8 support
  - Complete list of features is present in the following document:
    - <https://uasg.tech/wp-content/uploads/documents/UASG021B-en-digital.pdf>

# Selected Software



- MUA: Roundcube 1.4.1
- MSA,MTA and MDA: Postfix 3.3.1
- IMAP/POP3: Courier-IMAP 5.0.8
- Sever Requirement: Ubuntu 18.04 LTS

# Representation Format

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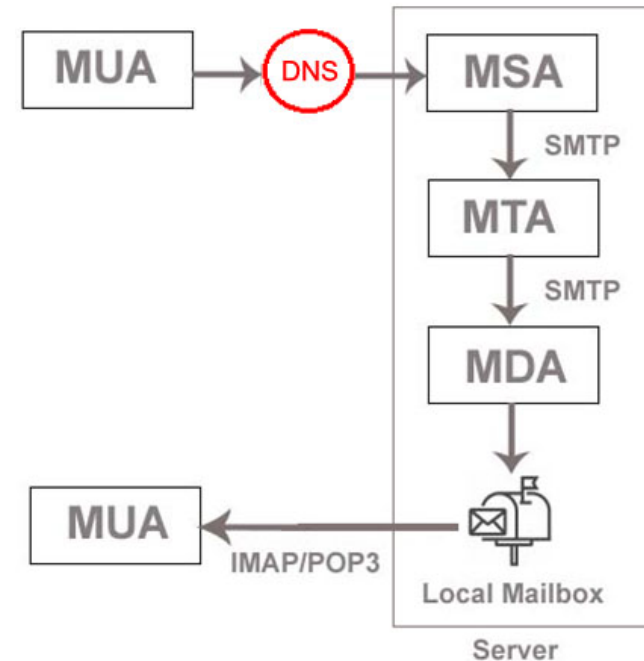
- ⊙ Different encoding formats are used for strings:
  - U-label: Unicode native representation of an Internationalized Domain Name (IDN) label, for example
    - لسانیات.ادارہ.پاکستان
  - Punycode: ASCII compatible representation of an IDN label
  - A-label: Punycode representation of an IDN label, for example
    - xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j

# Taxonomy of Email Address

- ⦿ Email Address Internationalization (EAI) allow Unicode characters in email addresses
- ⦿ Email address consist of two parts, local part and domain name, for example:
  - localpart@domainname
  - Local part is UTF8
  - Domain name can be A-label or U-label
  - Example of local part in UTF8 and domain name in U-label (format 1) is  
ثنا@لسانيات.اداره.پاکستان
  - Example of local part in UTF8 and domain name in A-label (format 2) is
    - ثنا @xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j

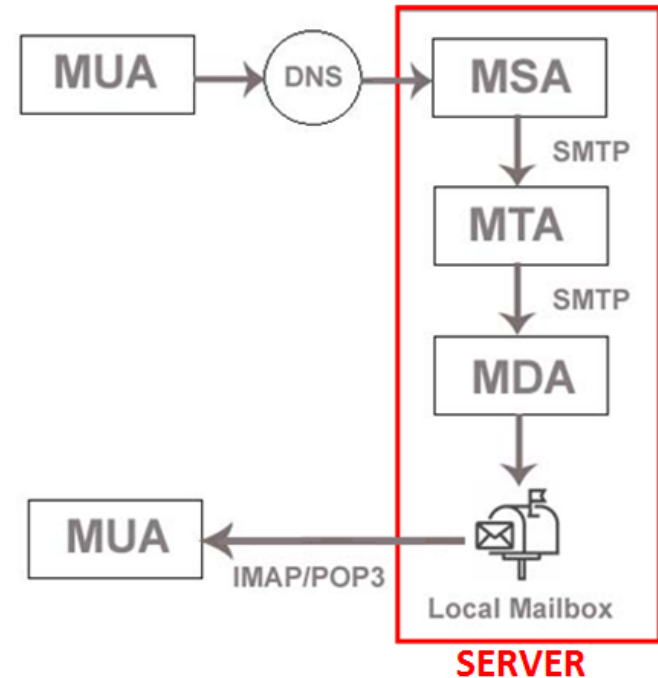
# Overview of Steps Involved in Installation

1. **Entering IP address in DNS Zone File**
2. Setting up SQLite database
3. Setting up Postfix
4. Setting up Courier-IMAP
5. Setting up Roundcube
6. Testing and operating final email system



# Overview of Steps Involved in Installation

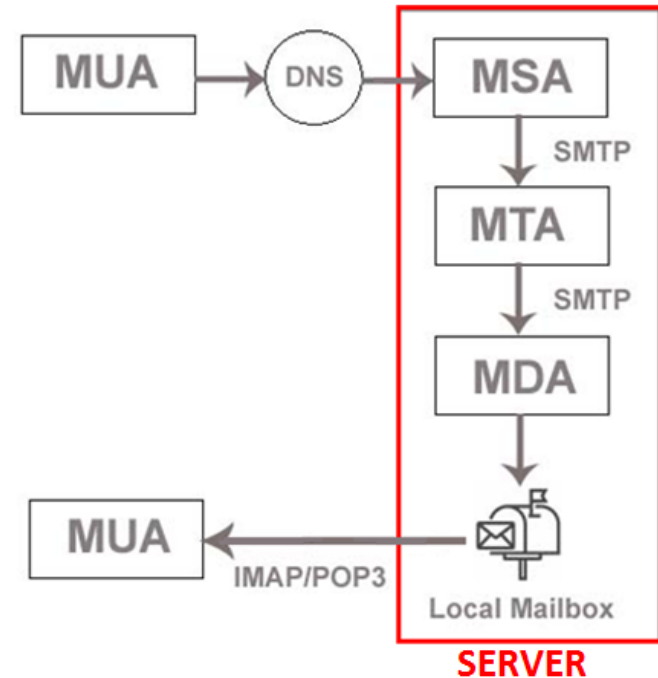
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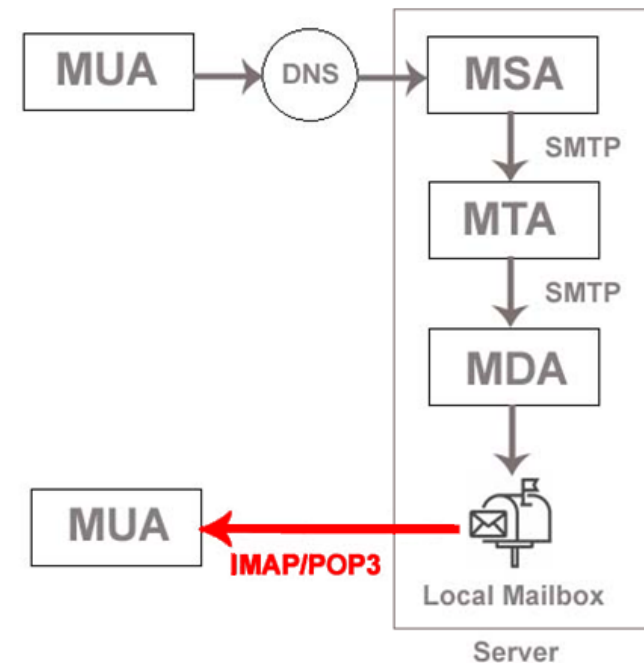
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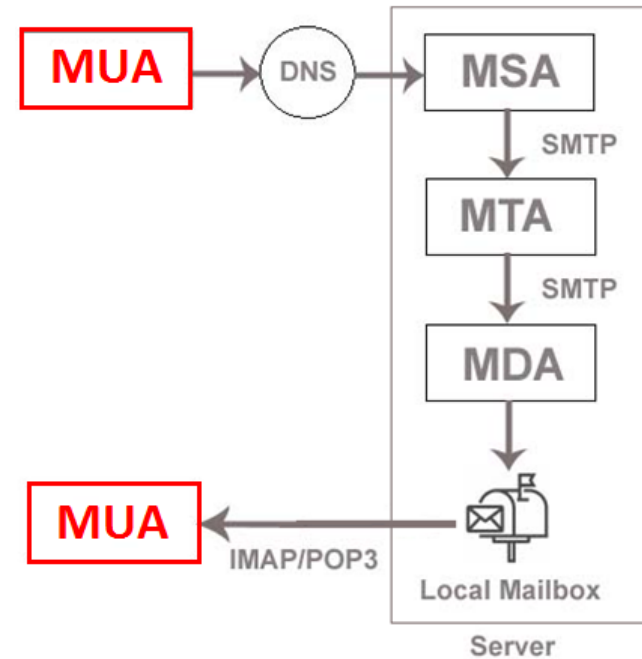
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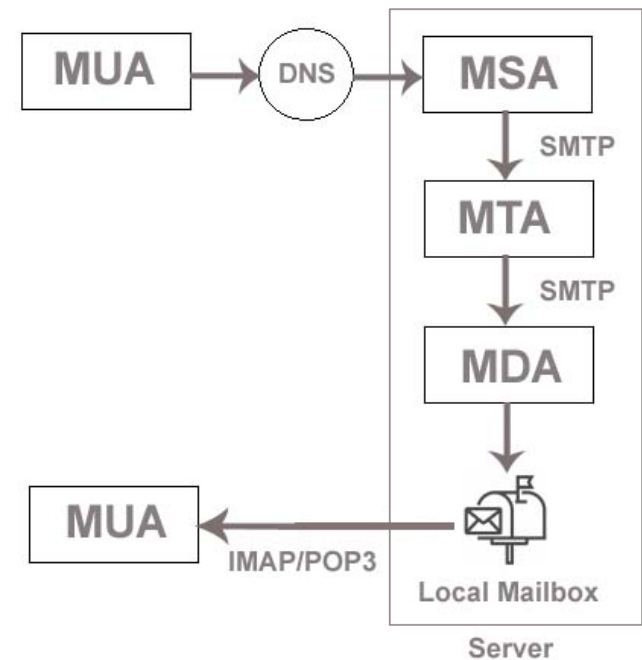
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# Overview of Steps Involved in Installation

1. Entering IP address in DNS Zone File
2. Setting up SQLite database
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4. Setting up Courier-IMAP
5. Setting up Roundcube
6. **Testing and operating final email system**



# Entering IP Address in DNS Zone File

# Entering IP Address in DNS Zone File

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- ⊙ Entry in DNS Zone File
  - A-record
  - MX-record
  - PTR record
  - SPF record
  - DKIM key record
- ⊙ Allow connections through firewall

# Entry in DNS Zone File

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- ⦿ Buy a static IP from your nearby ISP
- ⦿ Make sure following things about your static IP:
  - Your ISP has enabled port 25 for you IP
  - Your IP is not blacklisted
  - You can check this using MX Toolbox
    - Visit: <https://mxtoolbox.com/MXLookup.aspx>
    - Go to blacklist tab and type your IP address here
    - Results of search are shown in next slide
    - Contact your ISP if you are blacklisted

# Software Available for Setting up Email System

[MX Lookup](#)[Blacklists](#)[Diagnostics](#)[Domain Health](#)[Analyze Headers](#)[Free Monitoring](#)[DMARC](#)[Investig](#)

SuperTool Beta7

Blacklist Check

We notice you are on a blacklist.

[Click here for some suggestions](#)

Checking **202.142.159.38** against **93** known blacklists...

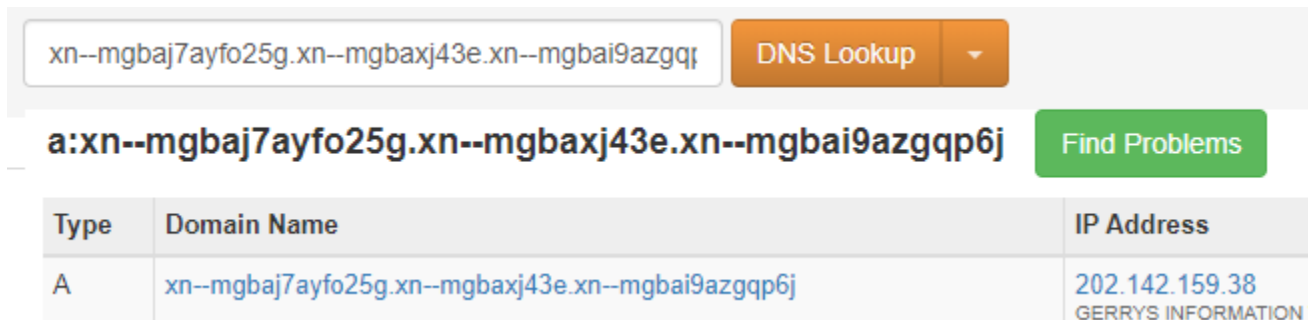
Listed **1** times with **0** timeouts

	Blacklist	Reason	TTL	ResponseTime
LISTED	SORBS SPAM	202.142.159.38 was listed <a href="#">Detail</a>	3600	0
OK	0SPAM			49
OK	Abuse.ro			136
OK	Abusix Mail Intelligence Blacklist			0
OK	Abusix Mail Intelligence Domain Blacklist			0
OK	Abusix Mail Intelligence Exploit list			0
OK	Anonmails DNSBL			108
OK	ASPEWS			31
OK	BACKSCATTERER			0



# Entry in DNS Zone File

- Following entries are required in DNS zone file:
  - A-record:
    - A-record points a domain name to IP address
    - Domain name should be in A-label
    - Once entered, confirm it using MX toolbox by going to tab named 'more', type your domain name (either A-label or U-label) and search for A-record
    - For example, your A-record entry in DNS zone file should look like this:



The screenshot shows a web interface for a DNS lookup tool. At the top, there is a text input field containing the domain name "xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j". To the right of the input field is an orange button labeled "DNS Lookup" with a dropdown arrow. Below the input field, the domain name is repeated in a larger font, followed by a green button labeled "Find Problems". Below this, there is a table with three columns: "Type", "Domain Name", and "IP Address". The table contains one row with the following data:

Type	Domain Name	IP Address
A	xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j	202.142.159.38 GERRYS INFORMATION

# Entry in DNS Zone File

- ⦿ MX-record:
  - MX-record tells which mail servers accept incoming mail for your domain
  - Domain name should be in A-label
  - Once entered, confirm it using MX toolbox
  - For example, your MX-record entry in DNS zone file should look like this:

xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j **MX Lookup**

**mx:xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j**

Pref	Hostname	IP Address
5	xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j	202.142.159.38 GERRYS INFORMATION

# Entry in DNS Zone File

- ⦿ PTR record:
  - PTR record points IP address to domain name
  - Domain name should be in A-label
  - Once entered, confirm it using MX toolbox
  - It is usually added by your ISP
  - For example, your PTR record entry should look like this:

202.142.159.38 Reverse Lookup

**ptr:202.142.159.38** Find Problems

Type	IP Address	Domain Name
PTR	202.142.159.38 GERRYS INFORMATION TECHNOLOGY PVT LTD. (AS23750)	xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j

# Entry in DNS Zone File

- ⦿ SPF record:
  - SPF record indicates which hosts are authorized to send mail for a domain
  - Domain name should be in A-label
  - Once entered, confirm it using MX toolbox
  - For example your SPF record entry should look like this:

لسانیات.اداره.پاکستان

SPF Record Lookup

spf:لسانیات.اداره.پاکستان

Find Problems

Solve Email Delivery Problems

```
v=spf1 a:xn--mgbaj7ayfo25g.xn--mgbaxj53e.xn--mgbai9azgqp6j ip4:202.142.159.38 -all
```

# Entry in DNS Zone File

- DKIM key record (Optional):
  - DKIM key record validate authenticity of mail messages
  - Record is a text file which is generated using OpenSSL
  - This link may be followed for generating text file
    - <https://www.digitalocean.com/community/tutorials/how-to-install-and-configure-dkim-with-postfix-on-debian-wheezy>
  - Name your text file as:
    - <selector>.\_domainkey.<domain\_name\_Alabel>
    - e.g. mail.\_domainkey.xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j
  - Once entered, confirm DKIM key record using MX toolbox. Enter name of your text file to check
  - Result of this search is shown in next slide

# Entry in DNS Zone File

Tag	TagValue	Name	Description
v	DKIM1	Version	The DKIM record version.
h	sha256	Hash algorithms	A colon-separated list of hash algorithms that might be used.
k	rsa	Key type	The type of the key used by tag (p).
p	MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAzQgt1oECOS4PaYe2CbKBFXg+PkYcsC4M8vpnUx61FB8fQAZqDXc6Q+FJgaC/wnwMkjQ3XHsOcq1QDCswh3QRO1MBmGp8X8d6twiEXIu50+PTAb9WbWmJic/oDR8pTbCbs0gQQJLffxK13JI2pnqvrqfySp9aELbbL3TgBrs6X8jMd+WveKMWlqk61VKo8LVBh+GkeuKJmWpmaalruGnIs1JSJEJ0Rs7TwCA1csAUK0a0tgpj3AED7qeX9e645BkTrncIofTNfkToyLbLUzZiOh9Z5B1i1aMMQklzzYrJsYWZ+w3CtRYVD1G5Qm5i2jQt1+MTNqZfdEKGjCGS58BP/iQIDAQAB	Public Key	Public-key data. The syntax and semantics of this tag value before being encoded in base64 are defined by the (k) tag.

# Entry in DNS Zone File

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- ⦿ DMARC record (Optional):
  - DMARC record is used to protect email from email spoofing
  - Record is a text file
  - This link may be followed for generating text file
    - <https://www.linuxbabe.com/mail-server/create-dmarc-record>
  - Name your text file as:
    - `_dmarc.<domain_name_Alabel>`
  - Once entered, confirm DMARC record using MX toolbox. Enter name of your text file to check
  - Result of this search is shown in next slide

# Entry in DNS Zone File

xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqj

DMARC Lookup

dmarc:xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j

Find Problems

Solve Email Delivery Problems

dmarc

```
v=DMARC1; p=none; pct=100; rua=mailto:ثنا@تسانیات.اداره.پاکستان; fo=1
```

Tag	TagValue	Name	Description
v	DMARC1	Version	Identifies the record retrieved as a DMARC record. It must be the first tag in the list.
p	none	Policy	Policy to apply to email that fails the DMARC test. Valid values can be 'none', 'quarantine', or 'reject'.
pct	100	Percentage	Percentage of messages from the Domain Owner's mail stream to which the DMARC policy is to be applied. Valid value is an integer between 0 to 100.
rua	mailto:ثنا@تسانیات.اداره.پاکستان	Receivers	Addresses to which aggregate feedback is to be sent. Comma separated plain-text list of DMARC URIs.
fo	1	Forensic Reporting	Provides requested options for generation of failure reports. Valid values are any combination of characters '01ds' separated by ' '.



# Entry in DNS Zone File

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- ⦿ Allow port 25 and port 143 to establish connection
- ⦿ This can be done by either updating iptables or typing following command at terminal:
  - `ufw allow 25`
  - `ufw allow 143`
- ⦿ Port 25 is used for SMTP connections
- ⦿ Port 143 is used for IMAP/POP3

# Setting up SQLite Database

# Setting up SQLite Database

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- ⊙ Need of database
- ⊙ Mailbox directory location
- ⊙ Installing SQLite
- ⊙ Structure of database
- ⊙ Creating database
- ⊙ Populating database

# Need of Database

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- ⊙ There are two ways to create user email accounts
- ⊙ System accounts:
  - Each email user corresponds to a system account in ubuntu
  - For example one can create system account using the commands `useradd` (for Unicode) and `adduser` (for ASCII)

# Need of Database

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- ⊙ Virtual mail accounts:
  - No system account for each user
  - Each user mailbox corresponds to a specific directory location
  - Information of users along with location of mailboxes is stored in database
  - Advantage of using such approach is that virtual mail accounts are easy to maintain as compared to system accounts when number of email users increase

# Mailbox Directory Location

- ⦿ Complete mailbox directory location looks something like this:
  - /var/vmail/ ثنا/لساتيات.اداره.پاکستان/
  - Here /var/vmail is the base location. You can change this location also
  - All read and write permissions of /var/vmail will be given to a specific user specified in section of Postfix
  - ثنا.لساتيات.اداره.پاکستان is the name of your domain
  - ثنا is the name of mailbox
    - It can be same as local part of email id or it can be different
    - Here for convenience, mailbox name is taken to be same as local part of email id

# Mailbox Directory Location

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- ⦿ You only need to specify the following sub-path in database

لسانیات.اداره.پاکستان /ثنا/

- ⦿ Base location will be specified by postfix as described later

# Installing SQLite

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- ⊙ MySQL or SQLite database can be used for creating virtual mail accounts (Here sqlite database is used)
- ⊙ Install sqlite by typing following command at terminal:
  - `sudo apt-get install sqlite3 libsqlite3-dev`
  - SQLite3 is required to build Postfix with sqlite map support



# Structure of Database

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- ⊙ Database with two tables needs to be created
- ⊙ 'Domain' table
  - Contains domain name in both U-label and A-label format
  - Has at least following columns
    - id
    - domain name ( **لسانیات.اداره.پاکستان** )

# Structure of Database

- ⊙ 'Email\_info' table
  - Contains email id of users in both format (slide 13)
  - Both format of email id correspond to same mailbox directory location
  - Has at least following columns
    1. id
    2. domain\_id that references id in Domain table
    3. email\_id ( ثنا@لسانیات.اداره.پاکستان )
    4. password (Any password in Unicode)
    5. maildir ( ثنا/لسانیات.اداره.پاکستان )

# Creating SQLite Database

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- ⦿ Open terminal and type:
  - `sqlite3 <directory_location/database_name>`
  - e.g. `sqlite3 /etc/EmailUsers.db`
- ⦿ Create tables by writing following queries at command prompt:
  1. `CREATE TABLE Domain(id INTEGER NOT NULL PRIMARY KEY, domain_name VARCHAR NOT NULL);`
  2. `CREATE TABLE Email_info (id INTEGER NOT NULL PRIMARY KEY , domain_id INTEGER NOT NULL, email_id VARCHAR NOT NULL UNIQUE, password VARCHAR NOT NULL, maildir VARCHAR NOT NULL, FOREIGN KEY (domain_id) REFERENCES Domain(id) ON DELETE CASCADE);`

# Populating SQLite Database

- ⦿ Populate your database with your desired entries. Remember to add both A-label and U-label of your domain name and Email IDs
- ⦿ Use this query to insert data into Domain table:
  - INSERT INTO Domain VALUES(1, 'لسانیات.اداره.پاکستان');
  - INSERT INTO Domain VALUES(2, 'xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j');
- ⦿ Your Domain table should look like this:

```
sqlite> select * from Domain;  
1|ن لسانیات.اداره.پاکستان  
2|xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j
```

# Populating SQLite Database

- Use this query to insert data into Email\_info table:
  - INSERT INTO Email\_info VALUES(1,1, 'ثنا@لسانیات.اداره.پاکستان', 'ثنا /لسانیات.اداره.پاکستان', 'ٹیسٹ');
  - INSERT INTO Email\_info VALUES(2,2,'ثنا @ xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j', 'ثنا /لسانیات.اداره.پاکستان', 'ٹیسٹ');

# Creating SQLite Database

- Your Email\_info table should look like this:

```
لث / ان لثرك پ.. ر ا د ات و ن س ر ل | ان لثرك پ.. ر ا د ات و ن س ر ل @ لث  
/ دمپس / ان لثرك پ.. ر ا د ات و ن س ر ل | ان لثرك پ.. ر ا د ات و ن س ر ل @ دمپس  
/ دمپس / ان لثرك پ.. ر ا د ات و ن س ر ل | ان لثرك پ.. ر ا د ات و ن س ر ل @ xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j  
/ لث / ان لثرك پ.. ر ا د ات و ن س ر ل | ان لثرك پ.. ر ا د ات و ن س ر ل @ xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j
```

- More readable version of Email\_info table is

```
1|1| /ثنا / لساتيات. اداره. پاكستان | ثيسٽ | ثنا @ لساتيات. اداره. پاكستان | 1|1|  
2|2| /ثنا / لساتيات. اداره. پاكستان | ثيسٽ | ثنا @ xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j | 2|2|
```

# Setting up Postfix

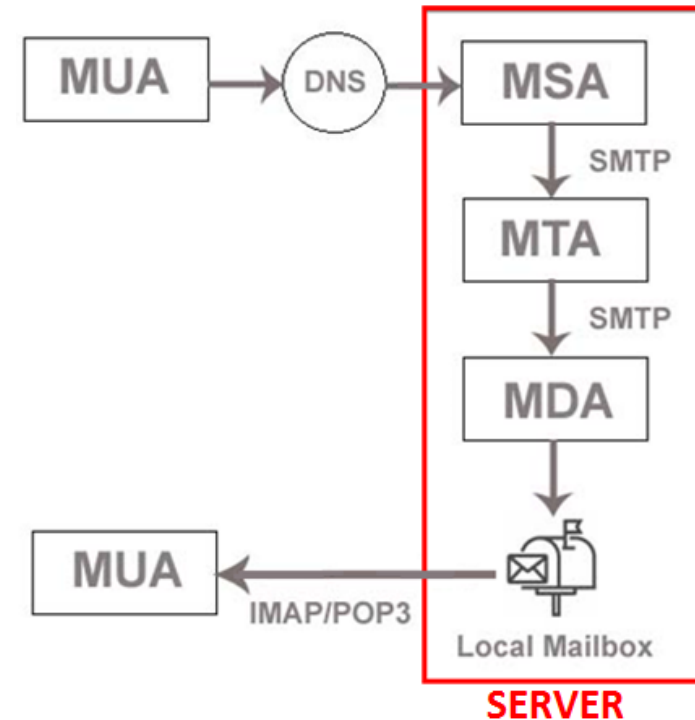
# Setting up Postfix

## ⦿ Postfix

- Setting hostname
- Adding user
- Installing Postfix
- Configuring Postfix
- Connecting SQLite database with Postfix
- Mailbox format
- Testing SQLite and Postfix
- Testing Postfix

## ⦿ SASL authentication

- Creating certificates
- Installing libpam-sqlite
- Configuring Postfix to use SASL authentication
- Testing SASL authentication





# Setting Hostname

- ⦿ Set hostname of your machine to your fully qualified domain name
  - Edit your /etc/hosts file. Add fully qualified domain name of your machine against your static IP

```
127.0.0.1    localhost
202.142.159.38 postfix.xn--mqbaj7ayfo25q.xn--mqbaxj43e.xn--mqbai9azqpp6j postfix
```

- Set your hostname using following command:
  - `hostnamectl set-hostname postfix.<Domain_name_in_A_label>`
- Restart your system to check hostname is set correctly (init 6)
- If hostname is set correctly, file/etc/hostname will contain hostname you set earlier

# Adding User

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- ⦿ Add a user to your system accounts
  - All read and write permission of email boxes will be given to this user
  - This user will be admin of emails
  
- ⦿ Add user using following commands:
  1. `groupadd -g 1001 vmail`
  2. `useradd -m -d /var/vmail -s /bin/false -u 1001 -g vmail vmail`
  3. `chown vmail:vmail /var/vmail/`
  4. `chmod 2770 /var/vmail/`
  
- ⦿ Note its uid and gid as it is required while configuring postfix (1001 as per the example above)

# Installing Postfix

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- ⦿ Support for EAI is introduced in version 3.0.1 of Postfix
- ⦿ Ubuntu package for Postfix is available
- ⦿ On Ubuntu 18.04 this will install Postfix version 3.3.0
- ⦿ Visit this site to check which version of Postfix will be installed on your system using Ubuntu package
  - <https://packages.ubuntu.com/>
- ⦿ Postfix will act as MTA and MDA

# Installing Postfix

---

- ⦿ Using Ubuntu package, Postfix can be installed with following command:
  - `sudo apt-get install postfix postfix-sqlite`
  - During installation, a box will appear asking for some configuration options
  - Select “internet site” for general type of mail configuration
  - Type domain name in A-label when asked for your system mail name (you can edit this later)

# Configuring Postfix

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- ⦿ To configure Postfix change following parameters in `/etc/postfix/main.cf` file
  - Edit parameter 'mynetworks' to receive mails from your desired servers. Like 'google.com' is added to receive mail from Gmail
  - Parameter 'virtual\_transport' acts as MDA
  - Parameter 'virtual\_mailbox\_domain' points to file that will connect Postfix with Domain table in database
  - Parameter 'virtual\_mailbox\_map' points to file that will connect Postfix with Email\_info table in database
  - Parameter 'virtual\_mailbox\_base' points to a base location (slide 35)
  - Parameter 'virtual\_uid\_maps' and 'virtual\_gid\_maps' point to uid and gid of email admin created previously

# Configuring Postfix

---

- ⦿ Parameter 'smtpUTF8\_enable' is set to yes to enable UTF8 functionality in Postfix
- ⦿ Parameter 'inet\_protocol' and 'inet\_interfaces' are set to all
- ⦿ More information on these parameters and their values is found here
  - [http://www.postfix.org/BASIC\\_CONFIGURATION\\_README.html](http://www.postfix.org/BASIC_CONFIGURATION_README.html)

# Configuring Postfix

---

- ⦿ Parameters with following values will be added in `/etc/postfix/main.cf` file:
  - `smtputf8_enable = yes`
  - `mynetworks = 127.0.0.0/8 [::ffff:127.0.0.0]/104 [::1]/128, 202.142.159.38, google.com`
  - `virtual_transport = virtual`
  - `virtual_mailbox_domains = sqlite:/etc/postfix/vdomain.cf`
  - `virtual_mailbox_maps = sqlite:/etc/postfix/vuser.cf`
  - `virtual_mailbox_base = /var/vmail`
  - `virtual_minimum_uid = 100`
  - `virtual_uid_maps = static:1001`
  - `virtual_gid_maps = static:1001`
  - `inet_interfaces = all`
  - `inet_protocol = all`

# Configuring Postfix

- ⦿ File `/etc/postfix/main.cf` will contain the following information:

```
smtputf8_enable = yes
mynetworks = 127.0.0.0/8 [::ffff:127.0.0.0]/104 [::1]/128,202.142.159.38,google.com
virtual_transport = virtual
virtual_mailbox_domains = sqlite:/etc/postfix/vdomain.cf
virtual_mailbox_base = /var/spool/mail/vhosts
virtual_mailbox_maps = sqlite:/etc/postfix/vuser.cf
virtual_minimum_uid = 100
virtual_uid_maps = static:1001
virtual_gid_maps = static:1001
```

- ⦿ To restart Postfix use:
  - `systemctl restart postfix`
- ⦿ Restart system(init 6)
  - It is better to restart your system after every configuration to apply them properly



# Connecting SQLite Database With Postfix

- ⦿ To allow Postfix to use data entered in SQLite database create two files with name vuser.cf and vdomain.cf in location /etc/postfix/ as referred in slide 52
- ⦿ Open file /etc/postfix/vdomain.cf and place following queries in it:
  - dbpath = /etc/EmailUsers.db (path where you created your database)
  - query = SELECT domain\_name FROM Domain WHERE domain\_name='%s'
- ⦿ Open file /etc/postfix/vuser.cf and place following queries in it:
  - dbpath = /etc/EmailUsers.db (path where you created your database)
  - query = SELECT maildir FROM Email\_info WHERE email\_id='%s'

# Mailbox Format

---

- ⦿ Two types of mail directory formats are used by Postfix
  - Mbox format in which all messages in mailbox are concatenated and stored as plain text in single file
  - Maildir in which there are three subdirectories(cur, tmp, new)
  - Postfix uses Maildir format due to slash present at the end of mail directory entered in database like

ثنا / لسانیات ادارہ پاکستان

- More on this is found in the following document
  - [http://www.postfix.org/postconf.5.html#home\\_mailbox](http://www.postfix.org/postconf.5.html#home_mailbox)
- The required mailbox will be created automatically when mail is first sent to user account. However if they are not created you can create them yourself

# Testing SQLite and Postfix

- ⊙ Test this setup using following commands:
  - `postmap -q "ثنا@لسانیات.اداره.پاکستان" sqlite:/etc/postfix/vuser.cf`
  - If everything is done correctly it will return mail directory location like

ثنا /لسانیات.اداره.پاکستان

- `postmap -q "لسانیات.اداره.پاکستان" sqlite:/etc/postfix/vdomain.cf`
- If everything is done correctly it will return domain name like

لسانیات.اداره.پاکستان

- ⊙ Now test Postfix using command
  - `telnet <1.2.3.4> 25`
  - Results are shown in next slide

# Testing Postfix

```
root@postfix:~# telnet 202.142.159.38 25
Trying 202.142.159.38...
Connected to 202.142.159.38.
Escape character is '^]'.
220 xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j ESMT
MAIL FROM:<ن لث @ ل ن س ر ل @ ل ن س ر ل > SMTPUTF8
250 2.1.0 Ok
RCPT TO:<ubuntu78600@gmail.com>
250 2.1.5 Ok
data
354 End data with <CR><LF>.<CR><LF>
Subject:Test Mail
Mail from:ن لث @ ل ن س ر ل @ ل ن س ر ل
To:ubuntu78600@gmail.com
Hello, this is test email.
.
250 2.0.0 Ok: queued as 4B534A029C7
quit
221 2.0.0 Bye
Connection closed by foreign host.
```

# SASL Authentication

---

- ⦿ SASL Authentication allows only authenticated clients to send email
- ⦿ Link covering essentials of SASL authentication is:
  - [http://www.postfix.org/SASL\\_README.html](http://www.postfix.org/SASL_README.html)
- ⦿ Install SASL module through following command:
  - `sudo apt-get install sasl2-bin libsasl2-modules libpam-modules libpam0g-dev`

# SASL Authentication

- ⦿ To enable SASL authentication, edit /etc/default/saslauthd:
  - set START=yes
  - Find OPTIONS parameter in this file and update it according to details mentioned above it
  - A chroot user should make directory as specified

```
""  
# Example for chroot Postfix users: "-c -m /var/spool/postfix/var/run/saslauthd"  
# Example for non-chroot Postfix users: "-c -m /var/run/saslauthd"  
#  
# To know if your Postfix is running chroot, check /etc/postfix/master.cf.  
# If it has the line "smtp inet n - y - - smtpd" or "smtp inet n - - - - smtpd"  
# then your Postfix is running in a chroot.  
# If it has the line "smtp inet n - n - - smtpd" then your Postfix is NOT  
# running in a chroot.  
OPTIONS="-c -m /var/spool/postfix/var/run/saslauthd -r"
```

# SASL Authentication

---

- ⦿ Now add following lines in `/etc/postfix/main.cf` for sasl authentication:
  - `smtpd_tls_key_file = /etc/postfix/smtpd.key`
  - `smtpd_tls_cert_file = /etc/postfix/smtpd.cert`
  - `smtp_use_tls = yes`
  - `smtpd_relay_restrictions = permit_mynetworks  
defer_unauth_destination permit_sasl_authenticated`
  - `smtpd_sasl_auth_enable = yes`
  - `broken_sasl_auth_clients = yes`
  - `smtpd_sasl_security_options = noanonymous`
  - `smtpd_recipient_restrictions = permit_auth_destination  
permit_mynetworks permit_sasl_authenticated`

# SASL Authentication

---

- ⦿ Your etc/postfix/main.cf will contain following lines

```
smtpd_tls_key_file = /etc/postfix/smtpd.key
smtpd_tls_cert_file = /etc/postfix/smtpd.cert
smtp_use_tls=yes
smtpd_tls_session_cache_database = btree:${data_directory}/smtpd_scache
smtp_tls_session_cache_database = btree:${data_directory}/smtp_scache

smtpd_relay_restrictions = permit_mynetworks defer_unauth_destination permit_sasl_authenticated
smtpd_sasl_auth_enable = yes
broken_sasl_auth_clients = yes
smtpd_sasl_security_options = noanonymous
smtpd_recipient_restrictions = permit_auth_destination,permit_mynetworks permit_sasl_authenticated
```



# Creating Certificate

---

- ⦿ Now you need to create certificate smtpd.cert and smtpd.key as specified previously
  
- ⦿ Type these command at terminal:
  - `cd /etc/postfix`
  - `openssl req -new -outform PEM -out smtpd.cert -newkey rsa:2048 -nodes -keyout smtpd.key -keyform PEM -days 365 -x509`
  - `chmod o= /etc/postfix/smtpd.key`

# Installing libpam-sqlite

- ⦿ You may download libpam\_sqlite from following site:
  1. [https://github.com/HormyAJP/pam\\_sqlite3](https://github.com/HormyAJP/pam_sqlite3)
  2. Extract it and go to folder
  3. Run ./configure
  4. make
  5. sudo make install
  
- ⦿ Now create /etc/pam.d/smtpp and paste following lines:
  - auth required pam\_sqlite3.so database=/etc/EmailUsers.db table=Email\_info user\_column=email\_id pwd\_column=password
  - account sufficient pam\_sqlite3.so database=/etc/EmailUsers.db table=Email\_info user\_column=email\_id pwd\_column=password

# Configuring Postfix to Use SASL Authentication

---

- ⦿ To tell postfix to use saslauthd create `/etc/postfix/sasl/smtpd.conf` and paste following lines:
  - `pwcheck_method: saslauthd`
  - `mech_list: plain login`
  - `allow_plaintext: true`
  - `auxprop_plugin: sqlite`
  - `sql_engine: sqlite`
  - `sql_database: /etc/EmailUsers.db`
  - `sql_select: select password from Email_info where email_id = '%u'`

# Testing SASL Authentication

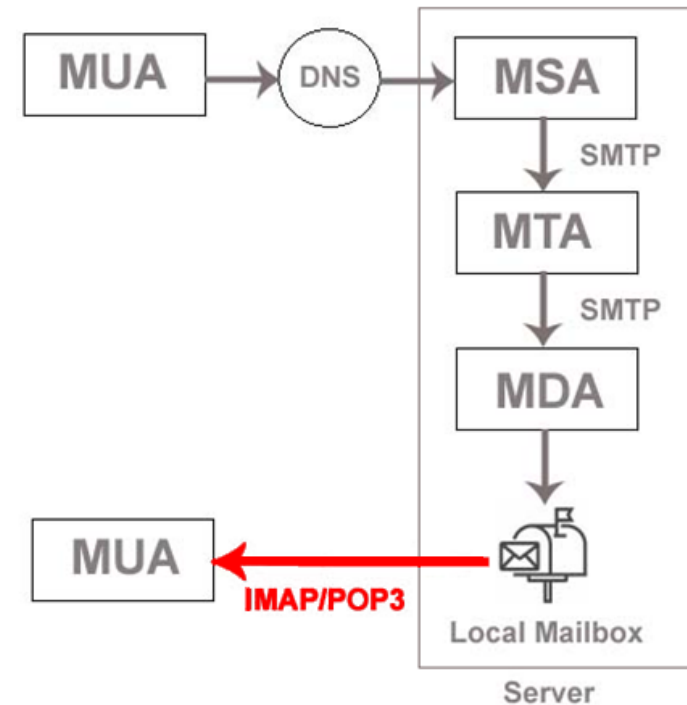
---

- ⦿ Type following command at terminal to start authentication:
  - `sudo /etc/init.d/saslauthd start`
- ⦿ Add user SASL to group 'postfix' using following command:
  - `adduser postfix sasl`
- ⦿ Restart both sasl and postfix
- ⦿ You can test this setup once roundcube is installed

# Setting up Courier-IMAP

# Setting up Courier-IMAP

- ⦿ Installing Courier-IMAP
- ⦿ Testing installation of Courier-IMAP
- ⦿ Configuring Courier-IMAP
- ⦿ Testing Courier-IMAP configuration
- ⦿ Configuring authsqlite
- ⦿ Testing final configuration



# Installing Courier-IMAP

---

- ⦿ Courier-IMAP version 5.0.8 supports EAI
- ⦿ Latest package available for Ubuntu 18.04 of Courier-imap is 4.18
- ⦿ So install it instead by following these steps:
  - Download courier-imap (current release) from the following website
    - <http://www.courier-mta.org/download.html#imap>
  - Download other required packages using following command:
    - `sudo apt-get install courier-authlib courier-authlib-sqlite libcourier-unicode-dev g++ libgcrypt-dev libidn11-dev idn2 libgnutls28-dev libperl-dev libtool`

# Installing Courier-IMAP

---

- ⦿ Download courier-unicode library from the following site:
  - <http://www.courier-mta.org/download.html#unicode>
  - Extract it and go to extracted folder
  - Open terminal here and type following at command prompt:
    - I. `./configure`
    - II. `make`
    - III. `sudo make install`
  
- ⦿ Download gdbm library from the following site:
  - <https://www.gnu.org.ua/software/gdbm/download.html>
  - Repeat the steps 2 to 6 described for installing courier-Unicode to install gdbm



# Installing Courier-IMAP

---

- ⦿ Download courier-authlib library from the following site:
  - <http://www.courier-mta.org/download.html#authlib>
  - Repeat the steps 2 to 6 described for installing courier-Unicode to install courier-authlib
  - Also run the following command:
    - `sudo make install-configure`

# Installing Courier-IMAP

---

- ⦿ Now extract courier-imap downloaded earlier
- ⦿ Go to folder extracted and type the following command at terminal:
  - `./configure --with-notice=unicode --with-authsqlite --with-sqlite=/usr/lib/x86_64-linux-gnu --with-gnutls`
- ⦿ `/usr/lib/x86_64-linux-gnu` is the path where library of sqlite is installed
- ⦿ `--with-gnutls` is used as alternative to `openssl`
- ⦿ You may need to download other packages for it to configure successfully

# Installing Courier-IMAP

---

- ⦿ Once configured successfully, type following at terminal:
  1. make
  2. make check
  3. sudo make install
  4. sudo make install-configure

# Testing Courier-IMAP

- ⦿ Start courier authdaemon(Courier authentication daemon) through following command
  - `sudo authdaemond start`
- ⦿ Start Courier-IMAP through following command
  - `sudo /usr/lib/courier-imap/libexec/imapd.rc start`
- ⦿ Now type following command in your terminal:
  - `telnet <1.2.3.4> 143` (Replace 1.2.3.4 with your IP address)
  - Results of this command are as follows

```
~$ telnet 202.142.159.38 143
Trying 202.142.159.38...
Connected to 202.142.159.38.
Escape character is '^'.
* OK [CAPABILITY IMAP4rev1 UIDPLUS CHILDREN NAMESPACE THREAD=ORDEREDSUBJECT THRE
AD=REFERENCES SORT QUOTA IDLE ACL ACL2=UNION STARTTLS ENABLE UTF8=ACCEPT] Courie
r-IMAP ready. Copyright 1998-2018 Double Precision, Inc. See COPYING for distri
bution information.
```

# Configuring Courier-IMAP

- ⦿ Connect Courier with sqlite database
- ⦿ For this open `/usr/local/etc/authlib/authdaemonrc` and add `authsqlite` in `authmodulelist`
- ⦿ Location of file may change depending on your installation

```
# The authentication modules that are linked into authdaemon. The
# default list is installed. You may selectively disable modules simply
# by removing them from the following list. The available modules you
# can use are: authuserdb authpwd authshadow authcustom authpipe

authmodulelist="authuserdb authsqlite"

##NAME: authmodulelistorig:4
#
# This setting is used by Courier's webadmin module, and should be left
# alone

authmodulelistorig="authuserdb authsqlite"

##NAME: daemons:0
```

# Testing Courier-IMAP Configuration

---

- ⦿ After adding this restart authdaemond
- ⦿ Go to `/var/log/mail.log` and check modules that are being installed
- ⦿ If everything is done correctly authsqlite module will be correctly installed

```
authdaemond: restarting authdaemond children
authdaemond: modules="authuserdb authsqlite", daemons=5
authdaemond: Uninstalling authuserdb
authdaemond: Uninstalling authsqlite
authdaemond: Installing libauthuserdb
authdaemond: Installation complete: authuserdb
authdaemond: Installing libauthsqlite
authdaemond: Installation complete: authsqlite
```

# Configuring Authsqli

- ⦿ Edit authsqliterc (file is found in same folder as authdaemonrc)
- ⦿ Replace default parameters with the following:
  - SQLITE\_DATABASE /etc/EmailUsers.db
  - SQLITE\_USER\_TABLE Email\_info
  - SQLITE\_CLEAR\_PWFIELD password
  - DEFAULT\_DOMAIN لسانیات.اداره.پاکستان
  - SQLITE\_UID\_FIELD 1001
  - SQLITE\_GID\_FIELD 1001
  - SQLITE\_LOGIN\_FIELD email\_id
  - SQLITE\_HOME\_FIELD '/var/vmail'
  - SQLITE\_MAILDIR\_FIELD maildir

# Testing Courier-IMAP Final Configuration

- ⦿ Add an email id in database that is in ASCII only
- ⦿ Make sure that corresponding mailbox exists
- ⦿ Try to connect to it using imap using following commands on terminal:
  - telnet <1.2.3.4> 143
  - X1 login <email\_id> <password>
  - Its output will be:

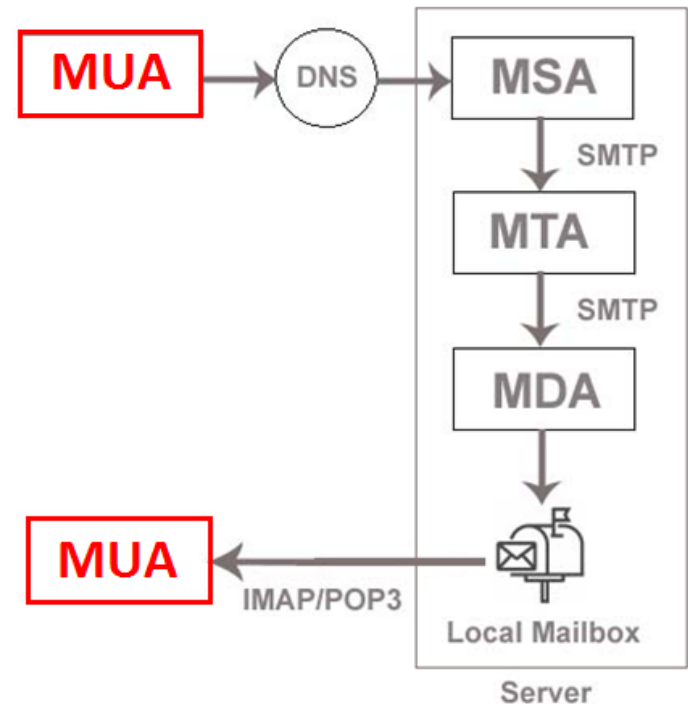
```
root@postfix:~# telnet 202.142.159.38 143
Trying 202.142.159.38...
Connected to 202.142.159.38.
Escape character is '^]'.
* OK [CAPABILITY IMAP4rev1 UIDPLUS CHILDREN NAMESPACE THREAD=ORDEREDSUBJECT THREAD=REFERE
TF8=ACCEPT] Courier-IMAP ready. Copyright 1998-2018 Double Precision, Inc. See COPYING f
x1 login sana@xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j sana123
x1 OK LOGIN Ok.
```



# Setting up Roundcube Webmail

# Setting up Roundcube Webmail

- ⦿ How webmail interpret email address
- ⦿ Installing Roundcube webmail
- ⦿ Configuring Apache
- ⦿ Configuring MySQL for Roundcube
- ⦿ Configuring Roundcube
- ⦿ Testing Roundcube
- ⦿ Adding new user



# How Webmail Interpret Email Address

- ⦿ Some MUA convert email addresses in U-label to equivalent A-label before sending them
- ⦿ When international email address is entered in Gmail, it takes email address in format 1 (slide 13)
  - For example, Gmail takes email address  
ثنا@لسانیات.اداره.پاکستان as ثنا@لسانیات.اداره.پاکستان
- ⦿ However, when international email address is entered in Roundcube, it takes email address in format 2
  - For example, Roundcube takes email address  
ثنا@لسانیات.اداره.پاکستان as ثنا@xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j

# Installing Roundcube Webmail

---

- ⦿ Download Roundcube version 1.4.1(complete) from website:
  - <https://roundcube.net/download/>
- ⦿ Extract it and name folder as 'roundcube'
- ⦿ Move this folder to /var/www/html/
- ⦿ Change ownership of folder using following commands:
  - `sudo chown -R www-data:www-data /var/www/html/roundcube/`
  - `sudo chmod 775 /var/www/html/roundcube/temp/`  
`/var/www/html/roundcube/logs/`
- ⦿ Install other required packages using following command:
  - `sudo apt-get install php-xml php-mbstring php-intl php-zip php-pear php-mysql apache2 libapache2-mod-php`

# Installing Roundcube Webmail

---

- ⦿ Open file `/etc/php/7.0/apache2/php.ini`
  - The path of file may change depending on your version of php installed
  - In this file, search for the section that contains many commented lines beginning with `'extension='`
  - Uncomment the lines for `php_mbstring.dll` and `php_xmlrpc.dll` extensions
  - Add following line to the bottom of the extension block
    - `extension=dom.so`
  - Search for `date.timezone` and add your relevant timezone
  - Timezone options are available at:
    - <https://www.php.net/manual/en/timezones.php>
    - For example for Pakistan
      - `date.timezone = Asia/Karachi`

# Configuring Apache

---

- ⦿ Now create file `/etc/apache2/sites-available/roundcube.conf` and paste following lines

```
<VirtualHost *:80>
    ServerName your_server_ip_or_domain
    DocumentRoot /var/www/html/roundcube
    ServerAdmin admin@domain_name
    ErrorLog ${APACHE_LOG_DIR}/roundcube-error.log
    CustomLog ${APACHE_LOG_DIR}/roundcube-access.log combined
    <Directory /var/www/roundcube>
        Options -Indexes
        AllowOverride All
        Order allow,deny
        allow from all
    </Directory>
</VirtualHost>
```

# Configuring Apache

---

- ⦿ Now type following commands at terminal:
  - `sudo a2dissite 000-default`
  - `sudo a2ensite roundcube`
  - `sudo a2enmod rewrite`
  - `sudo apache2ctl restart`

# Configuring MySQL for Roundcube

---

- ⦿ Install MySQL using following command:
  - `sudo apt-get install mysql-server`
  - Both Postfix and Roundcube cannot use same database
  - Sqlite is using Postfix and Roundcube is using MySQL
  
- ⦿ Type following at terminal to login into MySQL prompt:
  - `mysql -u root -p`
  - Enter root password and type following at MySQL command prompt:
    - `CREATE DATABASE roundcubedb;`
    - `CREATE USER 'roundcube'@'localhost' IDENTIFIED BY 'password';`
    - `GRANT ALL PRIVILEGES ON roundcubedb.* to 'roundcube'@'localhost';`
    - `FLUSH PRIVILEGES;`
    - `EXIT;`



# Configuring MySQL for Roundcube

---

- ⦿ Database roundcubedb is used to store login information of users
- ⦿ To load roundcubedb with required tables present in mysql.initial.sql, type following at terminal
  - `mysql -u roundcube -p roundcubedb < /var/www/html/roundcube/SQL/mysql.initial.sql`

# Configuring Roundcube

- ⦿ Visit:
  - [http://your\\_server\\_ip\\_or\\_domain\\_name/installer](http://your_server_ip_or_domain_name/installer)
- ⦿ A page will appear showing modules installed
  - If MySQL database is setup properly there will be green tick next to it
  - Click next button

## Roundcube Webmail Installer

1. Check environment    2. Create config    3. Test config

### Checking PHP version

Version: **OK** (PHP 7.2.24-0ubuntu0.18.04.1 detected)

### Checking available databases

Check which of the supported extensions are installed. At least one of them is required.

MySQL: **OK**

PostgreSQL: **NOT AVAILABLE** (See <http://www.php.net/manual/en/ref.pdo-pgsql.php>)

SQLite: **NOT AVAILABLE** (See <http://www.php.net/manual/en/ref.pdo-sqlite.php>)

SQLite (v2): **NOT AVAILABLE** (See <http://www.php.net/manual/en/ref.pdo-sqlite.php>)

SQL Server (SQLSRV): **NOT AVAILABLE** (See <http://www.php.net/manual/en/ref.pdo-sqlsrv.php>)

SQL Server (DBLIB): **NOT AVAILABLE** (See <http://www.php.net/manual/en/ref.pdo-dblib.php>)

Oracle: **NOT AVAILABLE** (See <http://www.php.net/manual/en/book.oci8.php>)

# Configuring Roundcube

---

- ⦿ Second page contains following configuration settings:
  - General configuration
  - Logging and debugging
  - Display settings & user prefs

# Configuring Roundcube

## ⦿ General configuration

**General configuration**

product\_name  
  
The name of your service (used to compose page titles)

support\_url  
  
Provide an URL where a user can get support for this Roundcube installation.  
**PLEASE DO NOT LINK TO THE ROUND\_CUBE.NET WEBSITE HERE!**  
Enter an absolute URL (including http://) to a support page/form or a mailto: link.

skin\_logo  
  
Custom image to display instead of the Roundcube logo.  
Enter a URL relative to the document root of this Roundcube installation.

temp\_dir  
  
Use this folder to store temp files (must be writeable for webserver)

des\_key  
  
This key is used to encrypt the users imap password before storing in the session record  
It's a random generated string to ensure that every installation has its own key.

ip\_check  
 Check client IP in session authorization  
This increases security but can cause sudden logouts when someone uses a proxy with changing IPs.

# Configuring Roundcube

- ⦿ Database Settings
  - Enter all credentials required to login into MySQL database created previously

**Database setup**

db\_dsnw

Database settings for read/write operations:

<input type="text" value="MySQL"/>	Database type
<input type="text" value="localhost"/>	Database server (omit for sqlite)
<input type="text" value="roundcubedb"/>	Database name (use absolute path and filename for sqlite)
<input type="text" value="roundcube"/>	Database user name (needs write permissions)(omit for sqlite)
<input type="text" value="password"/>	Database password (omit for sqlite)

db\_prefix

Optional prefix that will be added to database object names (tables and sequences).

# Configuring Roundcube

## ⦿ SMTP & IMAP Settings

**IMAP Settings**

**default\_host**  
The IMAP host(s) chosen to perform the log-in  
  
  
Leave blank to show a textbox at login. To use SSL/IMAPS connection, type ssl://hostname

**default\_port**  
  
TCP port used for IMAP connections

**username\_domain**  
  
Automatically add this domain to user names for login  
Only for IMAP servers that require full e-mail addresses for login

**auto\_create\_user**  
 Automatically create a new Roundcube user when log-in the first time  
A user is authenticated by the IMAP server but it requires a local record to store settings and contacts. WI  
If this option is disabled, the login only succeeds if there's a matching user-record in the local Roundcube

**sent\_mbox**

**SMTP Settings**

**smtp\_server**  
  
Use this host for sending mails  
To use SSL connection, set ssl://smtp.host.com.

**smtp\_port**  
  
SMTP port (default is 587)

**smtp\_user/smtp\_pass**  
   
SMTP username and password (if required)  
 Use the current IMAP username and password for SMTP authentication

**smtp\_log**  
 Log sent messages in {log\_dir}/sendmail or to syslog.

# Configuring Roundcube

- ① Enable virtual user query and any other desired plugins

Copy a new users identity and settings from a nearby Squirrelmail installation

- subscriptions\_option**  
A plugin which can enable or disable the use of imap subscriptions. It includes a toggle on the settings page under "Server Settings". The preference can also be locked.
- userinfo**  
Sample plugin that adds a new tab to the settings section to display some information about the current user.
- vcard\_attachments**  
Detects vCard attachments and allows to add them to address book. Also allows to attach vCards of your contacts to composed messages
- virtuser\_file**  
Plugin adds possibility to resolve user email/login according to lookup tables in files.
- virtuser\_query**  
Plugin adds possibility to resolve user email/login according to lookup tables in SQL database.

# Configuring Roundcube

## Testing SMTP

Sender

ثنا@لسانیات.اداره.پاکستان

Recipient

sanayounas110178@gmail.com

Send test mail

## Testing IMAP

### Test IMAP config

Server

لسانیات.اداره.پاکستان ▼

Port

143

Username

ثنا@لسانیات.اداره.پاکستان

Password

Connecting to لسانیات.اداره.پاکستان...

IMAP connect: **OK** (SORT capability: yes)

Check login





# Testing Roundcube

- ⦿ Now go to: `http://domain_name`
- ⦿ You would see login page

[nsa.gov.pk/?\\_task=logout&\\_token=KIGKffStWL6ueLsqfKW7kmp9tQjcw25C](http://nsa.gov.pk/?_task=logout&_token=KIGKffStWL6ueLsqfKW7kmp9tQjcw25C)



	<input type="text" value="nsa@nsa.gov.pk"/>
	<input type="password" value="*****"/>
<input type="button" value="LOGIN"/>	

nsa.gov.pk

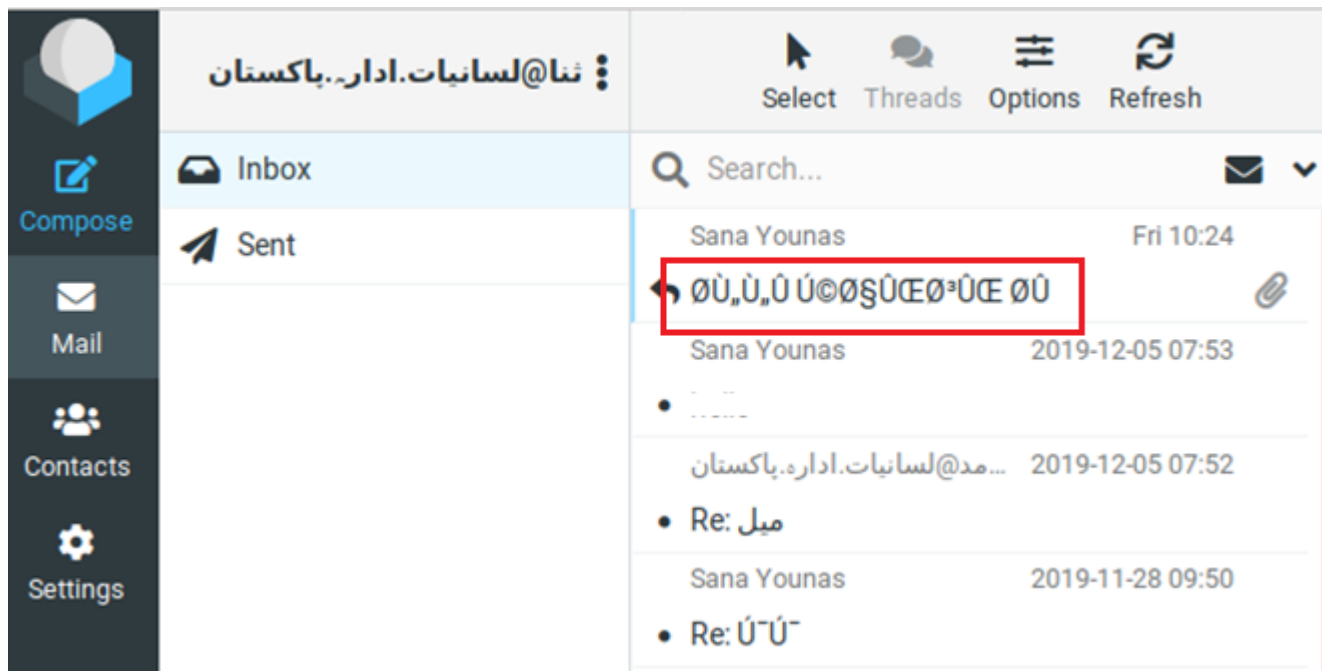
# Testing Roundcube

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- ⦿ Once login you will be able to send and receive email
- ⦿ Test by sending email from your ID
- ⦿ It may show authentication error(Error:535)
  - This will be the case where sasl authentication is not done properly
  - There will be no authentication error if all steps mentioned in sasl authentication previously are implemented properly

# Testing Roundcube

- Note:
  - Roundcube does not support utf8 in Email Subject
  - Version 1.4.1 support utf8 in passwords as well



# Adding New User in Roundcube

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- ⦿ Add new users by adding them in sqlite database
- ⦿ Make sure to create their corresponding mailboxes in correct mail directory location

# Appendix A

## EAI Support Check Toolbox

# EAI Support Check Toolbox

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- ⦿ Overview of EAI Support Check Toolbox
- ⦿ Explanation of toolbox code files
- ⦿ Complete Code
- ⦿ Additional changes
- ⦿ Challenges
- ⦿ Testing EAI Support Check Toolbox

# Overview of EAI Support Check Toolbox

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- ⦿ EAI Support Check Toolbox is used to test EAI readiness of an email server
- ⦿ Several tests are carried out on email ID entered by user
- ⦿ Toolbox is hosted at the following link:
  - [https://www.isa.gov.pk/eai\\_check.php](https://www.isa.gov.pk/eai_check.php)

# Explanation of Toolbox Code Files

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- ⊙ Toolbox is based on two files
  - eai\_check.php
  - eaitest.py
- ⊙ eai\_check.php
  1. A simple display page that takes input from user and runs python script that checks for EAI support
  2. Input entered by user is marked as valid or invalid
    - Input is parsed at '@'
    - If input contains two parts, one before @ and another after it then email is considered to be of valid format
    - Otherwise it is marked invalid and user is prompted to enter another email ID



# Explanation of Toolbox Code Files

3. Valid input is then passed to python script through the following line of code
  - `exec('LANG=en_US.utf8 LC_ALL=en_US.utf8 </usr/bin/python3></var/www/html/roundcube/eaitest.py> '.$email, $reply);`
    - `exec` is an inbuilt function in php which is used to execute external programs
    - `LANG=en_US.utf8 LC_ALL=en_US.utf8` is used to add environment variables to python script. Without this, your program may not be able to run for utf8 input
    - `/usr/bin/python3` is a complete path of python interpreter
    - `/var/www/html/roundcube/eaitest.py` is a complete path of your python file
    - `$email` is the input given by user
    - Output of `exec` function is placed in `$reply`

# Explanation of Toolbox Code Files

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- ⦿ eaitest.py
  1. Input entered by user is check for EAI support
  2. Domain name is extracted from input. It is first decoded as utf8 and then encoded in IDNA format
  3. Server then looks for MX record of domain name by carrying out a DNS query
  4. If MX record exists, it tries to connect to mail server
  5. If a connection is established it checks whether response from server includes smtputf8 support or not

# Explanation of Toolbox Code Files

- ⦿ If it supports smtputf8, the server then tests the target server by writing following email IDs in 'mail from' command in smtp connection
  - punycode@punycode
    - e.g, xn--mgbh5f@xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j
  - utf8@punycode
    - e.g: ثنا@xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j
  - utf8@U-Label
    - ثنا@لسانيات.اداره.پاکستان
  - Target server is said to support EAI only if it gives positive response (250 response code) for all these email ids
  - The email id mentioned above can be replaced by any internationalized email address

# Explanation of Toolbox Code Files

```
cle-178-nb@postfix:~$ telnet 202.142.159.38 25
Trying 202.142.159.38...
Connected to 202.142.159.38.
Escape character is '^]'.
220 xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j ESMTP Postfix (Ubuntu)
ehlo 202.142.159.38
250-xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j
250-PIPELINING
250-SIZE 10240000
250-VERFY
250-ETRN
250-AUTH PLAIN LOGIN
250-AUTH=PLAIN LOGIN
250-ENHANCEDSTATUSCODES
250-8BITMIME
250-DSN
250 SMTPUTF8
mail from:<xn--mgbh5f@xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j> SMTPUTF8
250 2.1.0 Ok
```



# Complete Code (eai\_check.php 1/2)

```
<!DOCTYPE HTML>
<html>
  <head>
    <style>.error {color: #FF0000;}</style>
  </head>
<body>
  <?php
    $emailErr = ""; $email = ""; $reply_str = "";
    if ( $_SERVER["REQUEST_METHOD"] == "POST" ) {
      if ( empty( $_POST["email"] ) ) {
        $emailErr = "Email is required";
      } else {
        $email = $_POST["email"];
        $parts = explode( '@' , $email );
        if ( sizeof( $parts ) !== 2 || strlen( $parts[1] ) === 0 )
          $emailErr = "Invalid email";
      }
    }
  ?>
```

# Complete Code (eai\_check.php 2/2)

```
<h2> EAI Check </h2>
<p> <span class="error"> * required field </span> </p>
<form method = "post" action="<?php echo
htmlspecialchars($_SERVER["PHP_SELF"]);?>">
    E-mail: < input type = "text" name = "email" value = "<?php echo $email;?>" >
    <span class = "error">* <?php echo $emailErr;?></span>
    <br><br>
    <input type="submit" name="submit" value="Submit">
</form>
<?php
    echo "<h2> Your Input: </h2>";
    exec('LANG=en_US.utf8 LC_ALL=en_US.utf8 /usr/bin/python3
/var/www/html/roundcube/eaitest.py '.$email, $reply);
    $reply_str = implode(", $reply);
    echo "$reply_str";
?>
</body>
</html>
```

# Complete Code (eaitest.py 1/4)

---

```
# -*- coding: utf-8 -*-  
#!/usr/bin/env python3
```

```
import sys  
import dns.resolver  
import smtplib
```

```
def error_paragraph(error):  
    print(error)
```

```
def test_server(addressToVerify):
```

```
    splitAddress = addressToVerify.split('@')  
    domain = splitAddress[1]  
    #works with python 3.6  
    domain = domain.encode('idna').decode('utf-8')  
    #try these lines instead if above dont work  
    #domain = domain.decode('utf-8')  
    #domain = domain.encode('idna')
```



# Complete Code (eaitest.py 2/4)

---

```
try:
    records = dns.resolver.query(domain, 'MX')
except:
    error_paragraph("No MX records found for domain.")
    return
mxRecord = records[0].exchange
mxRecord = str(mxRecord)

try:
    smtp = smtplib.SMTP(mxRecord)
except:
    error_paragraph("Unable to connect to mail server.")
    return

smtp.ehlo_or_helo_if_needed()
if not smtp.has_extn('SMTPUTF8'):
    error_paragraph("EAI support not declared by server.")
    return
error = False
```

# Complete Code (eaitest.py 3/4)

```
resp = smtp.doccmd('mail from:<xn--mgbh5f@xn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j>', 'SMTPUTF8')
```

```
if resp[0] != 250:  
    error = True  
    error_paragraph("<strong>ACE</strong> not supported.")
```

```
smtp.doccmd('rset')
```

```
resp = smtp.doccmd('mail from:<@شناxn--mgbaj7ayfo25g.xn--mgbaxj43e.xn--mgbai9azgqp6j>', 'SMTPUTF8')
```

```
if resp[0] != 250:  
    error = True  
    error_paragraph("<strong>Unicode@punycode</strong> not supported.</p>")
```

```
smtp.doccmd('rset')
```

# Complete Code (eaitest.py 4/4)

---

```
resp = smtp.docmd('mail from:<' , '<لسانیات.اداره.پاکستان>@سٹناSMTPUTF8')
if resp[0] != 250:
    error = True
    error_paragraph("<strong>Unicode</strong> not supported.")

if not error:
    print ('<strong>EAI</strong> is supported!')
```

```
email = sys.argv[1]
test_server(email)
```

# Additional Changes

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- ⦿ Change in SMTP library:
  - Go to `/usr/lib/python3.6/smtplib.py` and set `self.command_encoding = 'utf8'`
- ⦿ Change in Apache web server: (Optional):
  - Uncomment parameter `AddDefaultCharset UTF-8` in `charset.conf` found in Apache folder
- ⦿ Install DNS python library using following command:
  - `sudo apt-get install python3-dnspython`

# Challenges

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- ⦿ exec function may not be enabled on your php version. Follow this link to enable it:
  - <https://www.php.net/manual/en/ini.core.php#ini.disable-functions>
- ⦿ Change in Apache web server: (Optional):
  - Uncomment parameter AddDefaultCharset UTF-8 in charset.conf found in Apache folder
- ⦿ exec function, even enabled, is unable to run
  - To solve this assign correct permissions to python file (owner of webserver and your file should be same)
  - Make your python file executable
  - You may have to use sudo while calling exec

# Testing EAI Support Check Toolbox

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## EAI SUPPORT CHECK TOOLBOX

\* required field

E-mail:  \*

Submit

### Results:

**EAI is supported!**

# Engage with ICANN



## Thank You and Questions

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