
ESP DOCS

How to Install and Configure ESP 3.5
on Ubuntu and Red Enterprise Linux (rhel)

Revision History

Version Number	Modification Date	By	Description of Changes
1.0	16 Sep 2012	R. Schaaf	Initial version
1.1	18 Sep 2012	R. Schaaf	Create the /srv/esp30/data/fake directory
1.2	01 Feb 2013	B. Zambarano	Minor updates
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2.5	June 2020	J. Boyer J. Miller	Consolidated document containing instructions for multiple environments

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1 Document Formatting

Instructions in this document are color-coded to indicate which environment the instructions apply to. Instructions for are in normal black text, but will be preceded by the appropriate OS and DB as needed. Color coding is below

UBUNTU

RHEL

POSTGRES

MS SQL

2 Installation Overview

This document describes the procedure for configuring ESP on an Ubuntu or Redhat Linux Server.

The versions of software used to prepare these instructions were:

UBUNTU Linux: 18.04 Server Edition (64-bit)

RHEL Linux: 7.7 (64-bit)

PostgreSQL: 9.6

--or--

UBUNTU Linux: 18.04 Server Edition (64-bit)

MS SQL Server 2017 (2019)

Common:

Apache2: 2.4

ESP: 3.5.x running in a virtual environment using

Python 3.6

Django 2.1.15

The Linux server should have ssh, git, and access to a local SMTP service.

These Installation steps are covered in Chapters 1 - 9:

- Create the esp user and system prerequisites
- Download the esp project and run the install system dependencies shell script
- Create the esp database and esp database user
- Create directories and files expected by ESP
- Configure the application settings and create the UI user
- Configure the Apache web server
- Database Backups

Additional topics for configuration once the system is running are covered starting at Chapter 10. These include the following:

- Setting up the data import to ESP
- ESP Basics
- Daily Status Reports
- Daily Cron job setup
- Basic disease detection setup
- Deleting test data

This document may be used a guide for installing ESP on other Linux systems, but keep in mind that there are differences between Linux systems, particularly in package management and user creation and permissions.

Unless otherwise specified, all commands are executed from the Linux bash shell prompt. It is assumed the installer has sudo privileges.

3 Prerequisites

This installation is for a Linux server with SSH for remote logins. The bash shell should be the default.

This installation expects that the git software version control system is installed. To install git, run the following command:

```
sudo apt install git
```

The ESP installation will require either a local SMTP service, or an email account on an accessible SMTP server.

Ensure firewall rules permit the following inbound connections on the application server:

Port: 22 (needed for SSH by sysadmins)

Ports: 443, 80 (needed for HTTP/HTTPS access for ESP user interface)

Ensure firewall rules permit the following inbound connections on the database server:

Port: 5432 (needs to be open from the application server)

NOTE: The ESP database will contain PHI once data has been loaded for a participating site. Every precaution should be taken to ensure that the Server is not directly accessible to anyone outside of that Organization. The Server and the Network where it is located should be locked down to only allow access from certain Internal hosts or networks and/or VPN connections.

4 Create the ESP User and setup prerequisites

1. As the system administrator, create the esp user.

Standard ESP installation will be to /srv/esp/prod.

Use /srv/esp as the esp home directory.

Enter a password for the ESP user and account details when prompted.

```
sudo adduser --home /srv/esp/ --shell /bin/bash esp
```

2. Add the user to the 'sudo' group. Add www-data to the esp group so that while running under Apache, the esp app can write to the esp data folders

UBUNTU:

```
sudo usermod -aG sudo esp
```

RHEL:

```
sudo usermod -aG wheel esp
```

3. Make the /srv/esp directory readable for other users (like postgres or www-data)

```
sudo chmod 755 /srv/esp
```

```
sudo usermod www-data -aG esp
```

5 Download the ESP project and run the esp install

1. Switch to the esp user

```
sudo su - esp
```

2. Clone the ESP Project to /srv/esp/prod

```
cd /srv/esp  
git clone https://gitlab.com/ESP-Project/ESP.git prod
```

3. Checkout the desired branch and give it a “local” branch name. Unless you specifically require an earlier release, use the latest tagged release branch.

To see the latest tagged release enter the following commands:

```
cd /srv/esp/prod  
git tag
```

To checkout the desired branch:

```
git checkout v*BRANCH NUMBER HERE* -b version*BRANCH NUMBER HERE*  
  
as in:  
git checkout v3.5.1 -b version3.5.1
```

4. Run the install-system-dependencies.sh script to install the packages that ESP depends on.

MS SQL Note: The installation script require the `mssql` argument when doing an `mssql` install – see below

UBUNTU/POSTGRES:

```
sudo ./install-system-dependencies.sh
```

RHEL/POSTGRES:

```
sudo ./install-system-dependencies-rhel7.sh
```

UBUNTU/MS SQL:

```
sudo ./install-system-dependencies.sh mssql
```

RHEL/MS SQL:

TBD - Instructions not available yet

If errors are encountered, manually edit the file and make modifications to the versions as required. (For unsupported systems, inspect this script to determine what dependencies to install manually).

5. Run the ESP install.sh script.

UBUNTU:

```
./install.sh
```

RHEL:

```
./install-rhel7.sh
```

If errors are encountered, manually edit the file and make modifications to the versions as required. (For non-Ubuntu Linux systems, inspect this script to determine what dependencies to install manually).

6 For MS SQL ONLY - Add ODBC drivers and support software

UBUNTU/MS SQL:

```
sudo su
curl https://packages.microsoft.com/keys/microsoft.asc | apt-key add -
```

UBUNTU (18.04) :

```
curl https://packages.microsoft.com/config/ubuntu/18.04/prod.list >
/etc/apt/sources.list.d/mssql-release.list
exit
```

```
sudo apt-get update
sudo ACCEPT_EULA=Y apt-get install msodbcsql17
sudo ACCEPT_EULA=Y apt-get install mssql-tools
echo 'export PATH="$PATH:/opt/mssql-tools/bin"' >> ~/.bash_profile
echo 'export PATH="$PATH:/opt/mssql-tools/bin"' >> ~/.bashrc
source ~/.bashrc
sudo apt-get install unixodbc-dev
```

Modify lib/python3.6/site-packages/sql_server/pyodbc/base.py - the sql_server_version section to look like:

```
_sql_server_versions = {
    9: 2005,
    10: 2008,
    11: 2012,
    12: 2014,
    13: 2016,
    14: 2017,
    15: 2019,
}
```

Modify lib/python3.6/site-packages/sql_server/pyodbc/base.py

and change line 240 to:

```
driver = options.get('driver', 'ODBC Driver 17 for SQL Server')
```

RHEL/MS SQL:

TBD - Instructions not available yet

7 Initialize and create the ESP Database and ESP Database User

1. POSTGRES ONLY:

Enter the following commands to initialize and start the PostgreSQL Database:

To verify the service name – type `sudo systemctl | grep postgres`
(the name will appear as `postgresql.service` or `postgresql9-6.service` use the name before the `.service`)

```
sudo systemctl enable postgresql
sudo systemctl start postgresql
```

2. Create the “esp” role in the database

POSTGRES:

```
sudo -u postgres createuser -P -s esp
```

First enter in the current user’s password for sudo if required

then in response to the “Enter password for new role” prompts enter the password for the new esp user.

MS SQL:

```
sqlcmd -S [servername] -U [existing username] -P [existing password] -Q "CREATE
  USER esp WITH PASSWORD '[new esp user password goes here]'"
```

The password for the esp db user will also need to be entered in the `etc/secrets.ini` file as specified later in these instructions.

NOTE: If the database will contain databases other than those managed by ESP, you may choose for security reasons to not provide a superuser. However, some distributed ESP SQL reports that use the COPY command will not work.

3. Create the “esp” database

MS SQL:

Use an existing username and password for the following commands:

```
sqlcmd -S [servername] -U [username] -P [password] -Q "CREATE DATABASE esp"
sqlcmd -S [servername] -U [username] -P [password] -Q "ALTER AUTHORIZATION ON
  database::esp TO esp"
```

POSTGRES:

```
sudo -u postgres createdb -O esp esp      ## Capital O ##
```

NOTE: the `-O` option sets the esp: database owner (to esp) user to own the new database.

If received, ignore the error “could not to change to directory “/srv/esp/prod”: permission denied”

Optional: Verify the database was created by connecting to it via psql:

```
psql -d esp -c '\l'      # that is a slash lowercase l in the single quotes
```

you should see output similar to below:

Name	Owner	Encoding	Collate	Ctype	Access privileges
esp	esp	UTF8	en_US.UTF-8	en_US.UTF-8	
postgres	postgres	UTF8	en_US.UTF-8	en_US.UTF-8	
template0	postgres	UTF8	en_US.UTF-8	en_US.UTF-8	=c/postgres +
template1	postgres	UTF8	en_US.UTF-8	en_US.UTF-8	=c/postgres +

POSTGRES ONLY:

3a. Update the postgres pg_hba.conf to allow esp user to connect locally.

Configure pg_hba.conf for connections

NOTE: this file may be in a different location – use “sudo find / -name pg_hba.conf” to find it

```
sudo su postgres
cd /etc/postgresql/9.6/main/
vi pg_hba.conf
```

Replace the contents at the bottom of the file with the following:

```
# "local" is for Unix domain socket connections only
#local all      all          trust
local all      postgres    ident
local esp      esp          ident
local all      all          md5

# IPv4 local connections:
#host all      all          127.0.0.1/32  trust
host all      all          127.0.0.1/32  md5
host all      all          0.0.0.0/0     md5

# IPv6 local connections:
#host all      all          ::1/128       trust
host all      all          ::1/128       md5
```

3b. Restart the Database

POSTGRES only:

```
sudo systemctl restart postgresql
```

8 Create the Directories and Files Expected by ESP

As the ESP user, create the directories and files expected by ESP by entering:

```
mkdir -p /srv/esp/data/{case_reports,epic,load_reports}
mkdir -p /srv/esp/data/epic/{archive,incoming,error}
mkdir -p /srv/esp/data/cda/{archive,incoming,error}
mkdir -p /srv/esp/data/fake
mkdir -p /srv/esp/scripts
mkdir -p /srv/esp/logs
```

Use of the folder name “epic” for inbound data is vestigial.
These folders are used for text data from any source.

1. Create the ESP Log File

```
sudo touch /var/log/esp.log
sudo chown esp:esp /var/log/esp.log
sudo chmod 666 /var/log/esp.log
```

9 Configure the ESP Application and create the UI user

1. Create initial versions of ESP's **application.ini** and **secrets.ini** configuration files:

```
cd /srv/esp/prod
./bin/esp makeini
```

These files will be created in the /srv/esp/[prod or test]/etc/ folder.

2. Edit the secrets.ini file:

```
vi ./etc/secrets.ini
```

For the **database_password**, enter the password for the “esp” database role.

For the **secret_key**, enter a random string of at least 32 characters.

**NOTE: Use only Alpha-Numeric characters (a-z A-Z 0-9)
Do not use any special chars like \$ or # or quotes**

3. Edit the **application.ini** file:

```
vi ./etc/application.ini
```

You should confirm, modify, or enter details for the attributes listed here.

In the **[General]** section, edit the following settings:

```
site_name = Your Site Name
data_folder = /srv/esp/data
admins = your_email@your_host.com, another_email@your_host.com
managers = your_email@your_host.com, another_email@your_host.com
icd10_support = True
```

In the **[Database]** section, edit the following settings as needed:

```
db_name = esp
username = esp
```

In the **[Web]** section, edit the following settings:

```
allowed_hosts = localhost, <***Add the ESP server hostname here***>
** this should match the VirtualName you configure in Apache. See Section 8 **
```

In the **[ETL]** section, edit the following settings:

```
load_report_dir = /srv/esp/data/load_reports/
archive = False
```

In the **[Email]** section, edit the following settings:

```
host = <enter your corporate mail server here>
server_email = esp-no-reply@your_host.com
default_from_email = esp-no-reply@your_host.com
```

In the **[Logging]** section, edit the following settings:

```
log_level_console = info
log_level_file = info
log_level_syslog = info
```

In the **[Site]** section, edit the following settings:

```
site_header = ESP-YOURSITE
```

```
case_report_site_name = YOURSITE
site_clia = <enter your primary site CLIA here>
site_last_name = Jones
site_first_name = Bob
site_address1 = 133 AnyStreet Avenue
site_city = Boston
site_state = MA
site_zip = 02215
site_country = USA
site_email = bjones@yourhost.org
site_area_code = 617
site_tel_numeric = 1234567
site_app_name = ESP
site_sending_facility = YOURSITE
```

Other settings may be modified as necessary.

4. As the ESP user, from the ESP installation directory, populate the media/static folder:

```
./bin/esp collectstatic
```

5. As the ESP user, from the ESP installation directory, initialize the ESP database by entering:

```
./bin/esp migrate
```

NOTE: If you receive migration errors, reach out to CII at esp_support@commoninf.com for assistance.

6. Install the Disease Detection Plugins you require:

```
./setupPlugins.sh
```

7. Create an ESP UI superuser:

```
./bin/esp createsuperuser
Username (Leave blank to use 'esp'): esp
E-mail address: <your email address>
Password: <password for the esp superuser> enter secure password
Password (again): <password for the esp superuser>
```

Test that basic web services are working by running the web server built into Django by entering:

```
./bin/esp runserver
```

Browse to `http://localhost:8000` and verify that you are able to log into the ESP application using the superuser account created earlier.

Exit the server using Ctrl-C

10 Configure the httpd web server

Set up the Apache web server following the steps specified below. These steps should be executed from an interactive shell that is running as root. These steps are specific to Ubuntu Linux distributions.

The following pkgs should already be installed: `apache2 libapache2-mod-wsgi`

1. Make a copy of `django.wsgi.sample` located in the `$ESP_HOME/share` folder and copy it to the `$ESP_HOME/etc` directory and then edit it as described below:

```
sudo su esp
cp /srv/esp/prod/share/django.wsgi.sample /srv/esp/prod/etc/django.wsgi
vi /srv/esp/prod/etc/django.wsgi
```

2 - Update the contents of the file to match the following. Replace directory paths to match your environment if necessary.

```
import os
import sys

os.environ['DJANGO_SETTINGS_MODULE'] = 'ESP.settings'

# Enable this to prepend your ESP src folder to the beginning of PYTHONPATH,
in
# case an older version of Django is installed system-wide.

sys.path.insert(0, '/srv/esp/prod/')

exec(compile(open('/srv/esp/prod/bin/activate_this.py').read(),
'/srv/esp/prod/bin/activate_this.py', 'exec'))

from django.core.wsgi import get_wsgi_application
application = get_wsgi_application()
```

3 - Create the Apache configuration file. The name should match the name of your server

```
sudo vi /etc/apache2/sites-available/ServerName.domain.com.conf
```

For example:

```
sudo vi /etc/apache2/sites-available/esp-server@site.org.conf
```

Add the following contents and update highlighted sections as necessary to match your environment:

```
# ~~~~~
#
#           Sample Apache configuration file for ESP Health
#
# ~~~~~
WSGIRestrictStdout Off

WSGIDaemonProcess esp

WSGIScriptAlias / /srv/esp/prod/etc/django.wsgi

# Change "yourdomain.com" and "youremail" to match your environment
<VirtualHost yourdomain.com:80>
    ServerName hostname.yourdomain.com
    ServerAdmin youremail@yourdomain.com
```

```

Alias /static/ /srv/esp/prod/ESP/media/static/
Alias /media /srv/esp/prod/ESP/media

#
# WSGI
#
<Location "/media/">
    SetHandler None
    Require all granted
</Location>

<LocationMatch "\.(jpg|gif|png)$">
    SetHandler None
    Require all granted
</LocationMatch>

### Block all trace requests (all vHosts need this!!)
### The following code should be included every VirtualHost.
### It returns a Forbidden on any TRACE or TRACK request.
### TRACE requests are used for debugging, they tell the server
### to return a text version of the REQUEST. This is not
### needed and can be used for abuse/cross-site-scripting
###
### See: http://www.w3.org/Protocols/rfc2616/rfc2616-sec9.html
### for more about TRACE
###
RewriteEngine On
RewriteCond %{REQUEST_METHOD} ^(TRACE|TRACK|CONNECT)
RewriteRule .* - [F]

<Directory proxy:*>
    Require all denied
</Directory>

<IfModule mod_proxy.c>
    ProxyRequests Off
</IfModule>

</VirtualHost>

```

4 - Add required directory configurations to apache.conf

```
sudo vi /etc/apache2/apache2.conf
```

Beneath the following default section:

```

<Directory /var/www/>
    Options Indexes FollowSymLinks
    AllowOverride None
    Require all granted
</Directory>

```

Add the following:

```

<Directory /srv/esp/prod/etc/>
    Options Indexes FollowSymLinks
    AllowOverride All
    Require all granted
</Directory>

```

```
<Directory /srv/esp/prod/ESP/media/>
  Options Indexes FollowSymLinks
  AllowOverride All
  Require all granted
</Directory>
```

5 - Enable the required Apache modules.

```
sudo a2enmod wsgi
sudo a2enmod rewrite
sudo a2ensite hostname.yourdomain.com.conf
```

Note: The site name has to match the server name defined above

If ESP will be running encrypted over HTTPS run the following:

```
sudo a2enmod ssl
```

6 - Restart Apache

UBUNTU:

```
sudo service apache2 restart
```

RHEL:

```
sudo systemctl restart httpd
```

11 Configure Database Backups

1. As the ESP user - Create the backup directory (modify steps as needed for a different location)

```
sudo mkdir -p /srv/esp/backup
```

2. Create the logrotate configuration file

POSTGRES:

```
cp /srv/esp/share/postgres-esp.logrotate /srv/esp/backup/db-esp.logrotate
```

MS SQL:

```
cp /srv/esp/share/mssql-esp.logrotate /srv/esp/backup/db-esp.logrotate
```

Specify the MS SQL Server, database name and credentials so that mssql is able to connect to the database

```
vi /srv/esp/backup/db-esp.logrotate
```

3. Modify the permissions on the file and directory

```
chmod -R 644 /srv/esp/backup/
```

4. Create initial versions of the “log” files

```
cd /srv/esp/backup
touch esp.daily.dump
touch esp.weekly.dump
touch esp.monthly.dump
```

5. Create the `/srv/esp/scripts/db_backup.sh` file

```
cp /srv/esp/share/db_backup.sh /srv/esp/backup/db_backup.sh
```

6. Set the permissions on script as follows:

```
chmod 755 /srv/esp/scripts/db_backup.sh
```

7. Create the crontab file entry for the db backup

POSTGRES:

As the postgres user-

Add the following entry to the postgres user crontab to run the database backups. Choose a time that does not conflict with daily ESP processing. The example below is set to run at 11pm each day.

```
crontab -e

# m h dom mon dow command
0 23 * * * /srv/esp/scripts/db_backup.sh
```

8. Prime each of the three files by running a backup manually for each period

POSTGRES:

```
/usr/bin/pg_dump esp -F c > /srv/esp/backup/esp.daily.dump
/usr/bin/pg_dump esp -F c > /srv/esp/backup/esp.weekly.dump
/usr/bin/pg_dump esp -F c > /srv/esp/backup/esp.monthly.dump
```

MS SQL:

```
sqlcmd -S db_server -U db_user -P db_password -Q" BACKUP DATABASE db_name TO
DISK = '/srv/esp/backup/esp.daily.dump'"
sqlcmd -S db_server -U db_user -P db_password -Q" BACKUP DATABASE db_name TO
DISK = '/srv/esp/backup/esp.daily.dump'"
sqlcmd -S db_server -U db_user -P db_password -Q" BACKUP DATABASE db_name TO
DISK = '/srv/esp/backup/esp.daily.dump'"
```


12 Configure Log Monitoring

This process will monitor the files for specific strings that are known to represent a possible error and send an email to the specified recipients with the line from the log file that triggered the error.

When an error message is received, the recipient should access the full log file for more details and information as only a snippet of the error message may be received.

Mail Prerequisite

Please note that your ESP server must be configured and capable of sending email. Prior to following the setup instructions, you should verify that the server is configured with a mail program. If it isn't, you will need to do this or reach out to your IT staff for assistance.

One way to test this is by issuing the following from the command line (replace the email address with a valid email address):

```
mail -s "This is a test mail" myname@mycompany.com  
this isa test
```

When you have finished composing the e-mail enter <CTL>-D on a new line to send it.
Verify that the email is received.

1. Install swatch (or swatch-dog)

UBUNTU:

```
sudo apt-get install swatch
```

RHEL:

```
sudo yum install swatch
```

2. Install xtail

UBUNTU:

```
sudo apt-get install xtail
```

RHEL:

```
sudo yum install xtail
```

If the yum or ap-get failed – manually download and install xtail

```
sudo wget http://www.unicom.com/files/xtail-2.1.tar.gz  
gunzip xtail-2.1.tar.gz  
tar -xvf xtail-2.1.tar  
cd xtail-2.1
```

```
sudo sh configure
sudo sh make
sudo sh make install (you can ignore any errors about creating the man file)
```

3. Create the esp.log conf file

```
cd /etc
sudo vi swatch_esp.conf
```

Add the following: (customize email addresses as appropriate – separated by a colon)

```
watchfor /CRITICAL/
    mail addresses= testemail1\@test.org:testemail2\@test.org,
subject=CRITICAL_Error_In_ESP_Log_File
    threshold track_by=CRITICAL, type=limit, count=1, seconds=60
```

4. Create the cron log conf file

(Note: this will monitor all files in the ESP cron log directory.)

```
cd /etc
sudo vi swatch_cron.conf
```

Add the following: (customize email addresses as appropriate – separated by a colon)

```
ignore /spiffymcgee|records with 0 errors|Errors:/
watchfor /ERROR|error|Error|No such file|Permission denied|Traceback/
    mail addresses= testemail1\@test.org:testemail2\@test.org,
subject=ERROR_Found_In_Cron_Log_File_Directory
    threshold track_by=ERROR, type=limit, count=1, seconds=60
```

5. Create the esp startup script.

```
cd /etc/init.d
sudo vi swatch_esp
```

Copy the below text into the new file - update the location of the esp.log file, the path to xtail and the name of the swatch command as needed.

Use the command `which xtail` to confirm the path

Use the commands `which swatch` or `which swatchdog` to confirm which command and path to use.

```
#!/bin/sh
# chkconfig: 2345 80 20
# Simple Log Watcher Program

case "$1" in 'start')
```

```
    /usr/bin/swatch --daemon --config-file=/etc/swatch_esp.conf --tail-  
file='/var/log/esp.log' --pid-file=/var/run/swatch_esp.pid --tail-program-  
name /usr/bin/xtail
```

```
        ;;  
'stop')  
    PID=`cat /var/run/swatch_esp.pid`  
    kill $PID  
        ;;  
*)  
    echo "Usage: $0 { start | stop }"  
        ;;  
esac  
exit 0
```

a. Set the Permissions:

```
sudo chmod 755 swatch_esp
```

6. Create the cron startup script.

```
cd /etc/init.d  
sudo vi swatch_cron
```

Copy the below text into the new file

Update the location of the cron log files, the path to xtail and the name of the swatch command as needed.

Use the command `which xtail` to confirm the path

Use the commands `which swatch` or `which swatchdog` to confirm which command and path to use.

```
#!/bin/sh  
# chkconfig: 2345 80 20  
# Simple Log Watcher Program  
  
case "$1" in 'start')  
    sudo /usr/bin/swatchdog --daemon --config-file=/etc/swatch_cron.conf --  
tail-file='/srv/esp/log/' --pid-file=/var/run/swatch_cron.pid --tail-program-  
name /usr/bin/xtail  
  
        ;;  
'stop')  
    PID=`cat /var/run/swatch_cron.pid`  
    kill $PID  
        ;;  
*)
```

```
        echo "Usage: $0 { start | stop }"
    ;;
esac
exit 0
```

a. Set the Permissions:

```
sudo chmod 755 swatch_cron
```

7. Start the monitors

```
sudo /etc/init.d/swatch_esp start
sudo /etc/init.d/swatch_cron start
```

8. Test it

(NOTE: update file names and locations as appropriate)

- a. sudo su esp
- b. echo "CRITICAL This is a TEST of the ESP Log Monitor. If this was a real error you would see it here" >> /var/log/esp.log
- c. echo "ERROR - This is TEST of the Cron Log Monitor. If this was a real error you would see it here" >> /srv/esp/logs/daily_log_cron.test

You should receive an email with the errors above.

9. Add it to system startup

UBUNTU:

```
cd /etc/init.d
sudo update-rc.d swatch_esp defaults 98 02
sudo update-rc.d swatch_cron defaults 98 02
```

RHEL:

```
cd /etc/init.d
sudo chkconfig --add swatch_esp
sudo chkconfig --add swatch_cron
```

13 Setting up the data feed/Importing data to ESP

Each site requires an extract that provides data to ESP in the standard text file format. Please see the document `ESP_Filespec.xlsx` for details. For Epic sites, Commonwealth informatics can share SQL-based extract scripts for Epic Clarity, or MUMPS scripts for Epic Cache.

These must be modified to conform to site-specific Epic configuration.

There are two data feed steps:

Set up the historic data extract and load. The ESP database should have at least two years of data going back from the present in order to make good determinations of disease states for conditions that may be chronic.

Set up the nightly data extract and load. This is for ongoing data extraction and loading

The ESP command "load_epic" is used to load the data file. ESP was developed around Epic systems, and this name is vestigial.

These are highly site-specific activities and must be designed, developed and tested at each site. Using Commonwealth-provided scripts will greatly reduce the time for this task, but for systems starting from the ESP filespec Excel spreadsheet, expect at least 4 weeks of person-effort.

Sample commands for loading files:

```
/srv/esp/prod/bin/esp load_epic --file /srv/esp/data/epic/incoming/epicmem.esp.03112019
/srv/esp/prod/bin/esp load_epic --input /srv/esp/data/epic/incoming/ --reload
```

14 Using ESP Basics – loading data & case reporting

ESP Commands

All ESP commands take this form:

```
$ $ESP_HOME/bin/esp command [--argument_one {optional parameters}] [--argument_two]
(Most commands have single character versions of arguments, used with a single dash)
```

For a full listing of available commands:

```
$ $ESP_HOME/bin/esp help
```

For help with a specific command:

```
$ $ESP_HOME/bin/esp command --help
```

Load EMR data

A typical command to load data might look like this:

(NOTE: file names need to follow this format)

```
$ $ESP_HOME/bin/esp load_epic --file
/srv/esp/data/epic/incoming/epicmem.esp.20190301
```

The use of the name epic in the command name is vestigial. This command loads text data from a set of files in the ESP defined input format. See the document "ESP_Filespec.xlsx".

This command will take files from the configured data directory `./epic/incoming` and load them to the ESP database tables. Details are written to the `esp.log` file, and table specific load results are written to reports in `load_reports` directory.

Code mapping

Each individual EMR system uses a unique set of codes to designate tests. We refer to these as abstract labs. Once EMR lab data is loaded to ESP, the native codes of relevant lab tests must be mapped to the named abstract labs used by ESP's disease detection logic. Mapping is stored in the table `conf_labtestmap`.

To perform lab mapping, run:

```
$ $ESP_HOME/bin/esp concordance
```

The concordance command populates a table `emr_labtestconcordance`, which lists all unique native lab test names and code currently loaded in the ESP `emr_labresults` table. These are available for efficient searches for mapping. A tool is provided in the Administrative web interface, (setup described in next section), In the menu bar, look under *Administration* --> *Unmapped Lab Tests Report*. This form page uses the set of search strings provided for each disease detection plugin to detect potentially unmapped lab tests. In the Unmapped Lab Tests Report interface, the user can either map a lab, or mark it to be ignored. Mapped and ignored labs do not appear in the Report again.

Detecting cases

Once all labs are mapped using the Admin UI interface, ESP divides the task of detecting disease cases into two distinct parts. First, a uniform table of events is generated from raw medical record data by *HEF*, the Heuristic Events Framework.

```
$ $ESP_HOME/bin/esp hef
```

Second, a table of cases is generated by searching the events table for patterns indicating disease. This function is carried out by *Nodis*, the NOTifiable DISeases framework.

```
$ $ESP_HOME/bin/esp nodis
```

Additional options for both commands are available by passing the '--help' flag.

Reporting cases

The process for electronically reporting cases is heavily dependent upon the requirements, both technical and functional, of the intended recipient. ESP provides two report generation commands: `case_report` and `lab_report`. The `case_report` command generated hl7 2.3.1 version lab report message, the `lab_report` command generated hl7 2.5.1 version lab report messages. Both require extensive coding for specific recipient requirements. Unfortunately, this mapping process is not currently well documented. We are working on developing a document set for this purpose.

```
/srv/esp/prod/bin/esp case_report --mdph --transmit --status 'Q'
```

```
    /srv/esp/prod/bin/esp case_requeue --status=RS
```

15 Load CDA Data

The CDA REST web service will accept CDAs via a REST endpoint and place them in `/srv/esp/data/cda/incoming`.

To consume these CDAs and import the data into the ESP database, execute the following command:

```
$ $ESP_HOME/bin/esp load_cda --proc=16
```

The `--proc` (abbreviation for processing threads) is optional and indicates the number of processing threads to use. If not specified the default value of 1 will be used.

CDAs will be read from the `/srv/esp/data/incoming` folder, consumed, and then moved to the `/srv/esp/data/archive` folder.

16 Configure ESP Daily Status Reports

ESP will send a daily email showing information about the cases created and transmitted. Additionally, it will show unmapped lab tests and other information related to ESP.

1. Configure the `application.ini` file

```
sudo su esp
sudo vi /srv/esp/prod/etc/application.ini
```

In the **[General]** section at the top of the file, configure the managers to match your desired recipients.

```
# Managers are emailed a copy of the daily status report, if it is enabled in
the Batch section
managers = recip1@youreemail.com, recip2@youreemail.com,
```

****Note the ending comma****

In the **[Email]** section, configure your parameters. Set the host, port, `server_email`, and `default_from_email` to match your configuration.

```
[Email]
host = your_mail_server_or_ip_address
port = your_port_number (i.e. 25)
username = ""
use_tls = False
server_email = esp-no-reply@youreemail.com
default_from_email = youreemail@youreemail.com
subject_prefix = "[ESP] "
```

****Note: If your server requires authentication, you will want to enter the username here and the password in the `secrets.ini` file**

In the **[Batch]** section, set:

```
mail_status_report = True
```

2. To test if it is working, run the following command from the command line. It just sends the email and doesn't change any data, etc.

```
/srv/esp/prod/bin/esp status_report --send-mail
```

17 Configure crontab to run Daily jobs

A sample `daily_batch.sh` script can be found within the core system repository. If using the default paths, this file will be found in the `/srv/esp/prod/share` folder. This is the script that is utilized to perform the daily processes for ESP (data load, event creation, case creation, etc).

This is just a sample script and should be modified/customized for your environment.

To enable daily data loading and processing, please the customized `daily_batch.sh` file in the `/srv/esp/scripts` folder.

As the ESP user, add a cron entry in your system:

```
sudo su esp
crontab - e
```

Add a similar text to the crontab with your desired time to run:

```
# ESP Production Daily Run
#
30      22      *      *      *      /srv/esp/scripts/daily_batch.sh
```

Save and quit

To verify the new crontab entry type:

```
crontab -l
```

18 Setting Up Basic Disease Detection

ESP is distributed with a number of Python plugins for disease detection. Each disease has a separate plugin. These plugins are installed via an interactive text-based screen started from the bash shell prompt:

```
$ /srv/esp/prod/setupPlugins.sh
```

This is also described in section 3 above. The plugins are installed into `~/esp/src/[disease name directories]`

Configuring the disease plugins is a four-step process:

1. Run the `esp concordance` command

```
$ $ESP_HOME/bin/esp concordance
```

2. The concordance command populates a table `emr_labtestconcordance`, which lists all unique native lab test names and codes currently loaded in the ESP `emr_labresults` table. These are available for efficient searches for mapping. A tool is provided in the Administrative web interface. From the menu bar, browse to *Administration --> Unmapped Lab Tests Report*. This form page uses the set of search strings provided for each disease detection plugin to detect potentially unmapped lab tests. In the Unmapped Lab Tests Report interface, the user can either map a lab or mark it to be ignored. Mapped and ignored labs do not appear in the report again.

The lab concepts required by the plugin must be mapped to the appropriate local labs. The required lab concepts

are determined by inspection of the plugin file [disease_name].py. This step requires site support from staff familiar with local lab naming and the corresponding lab test.

3. Run the esp commands hef and nodis:

```
$ $ESP_HOME/bin/esp hef  
$ $ESP_HOME/bin/esp nodis
```

4. Review the resulting cases and perform appropriate clinical validation to confirm that data configuration is correct and working. Cases are available for review in the ESP administrative web interface. Case validation requires site support from staff with the ability to do case review in the EHR.

19 How to Clean Up and Reload ESP Data

Sometimes it is helpful to know how to clean all the data loaded and start over again. There are several procedures that can be run to accomplish this task but the simplest is to delete all the provenance entries from the administration UI except the first two. This method will automatically delete all of the related records in the db.

Below are the steps and screen shots to perform this task:

1. From the ESP UI Select Administration -> Site Administration from the menu

2. Click on “Provenances” from the “Emr” section



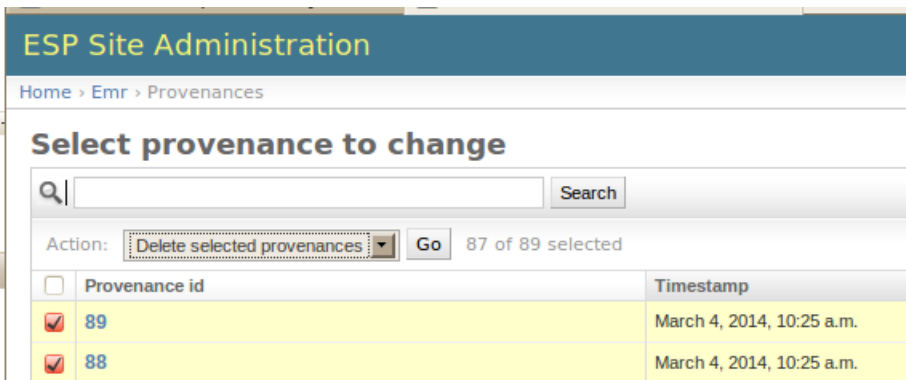
Vaccine manufacturer maps	+ Add	Change
Emr		
Allergys	+ Add	Change
Encounter type maps	+ Add	Change
Encounters	+ Add	Change
Hospital_problems	+ Add	Change
Immunizations	+ Add	Change
Lab Orders	+ Add	Change
Lab Specimen Observations	+ Add	Change
Lab Specimens	+ Add	Change
Lab Test Results	+ Add	Change
Lab infos	+ Add	Change
Order_id infos	+ Add	Change
Patient_addrs	+ Add	Change
Patient_extra datas	+ Add	Change
Patient_guardians	+ Add	Change
Patients	+ Add	Change
Pregnancys	+ Add	Change
Prescriptions	+ Add	Change
Problems	+ Add	Change
Provenances	+ Add	Change

3. Select all records by clicking on the top left check box next to the Provenance id label and then **unselect the two checkboxes for the record 1 and 2 corresponding to CLEANUP and SYSTEM**

<input checked="" type="checkbox"/>	7	Feb. 24, 2014, 7:22 p.m.	epicvis.esp.02282012
<input checked="" type="checkbox"/>	6	Feb. 24, 2014, 6:12 p.m.	epicres.esp.02242012
<input checked="" type="checkbox"/>	5	Feb. 24, 2014, 6:12 p.m.	epicord.esp.02282012
<input checked="" type="checkbox"/>	4	Feb. 24, 2014, 6:12 p.m.	epicmem.esp.02282012
<input checked="" type="checkbox"/>	3	Feb. 24, 2014, 6:12 p.m.	epicpro.esp.02282012
<input type="checkbox"/>	2	Jan. 1, 1900, midnight	CLEANUP
<input type="checkbox"/>	1	Jan. 1, 1900, midnight	SYSTEM

89 provenances

4. From the same screen, select “Delete selected provenances” from the “Action” drop down. Next, click “Go” via the button to the right of the dropdown.



5. This will calculate all the related records and elements in the database related to those loaded files and will display a summary of all the records that will be deleted.

A confirmation window with the prompt “Are you sure you want to delete the selected provenances? All of the following objects and their related items will be deleted.” will appear.

To continue, scroll down to the bottom and click on the “Yes, I am sure” button:

