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 |
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| 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 |
| 1.3 | 7/1/2014 | | C. Chacin | | Updates for 3.1 and merging all installation of prerequisites. |
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| 1.15 | 11 Mar 2019 | | J. Miller | | Minor updates |
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| 2.1 | August 15, 2019 | | J.Miller | | Added ESP log rotation and fixes to DB backup steps |
| 2.2 | August 28 2019 | | J Miller | | Updated Log Monitoring Instructions Redhat 7.6 v3 |
| 2.3 | October 21, 2019 | | J. Miller | | Added note about no special characters in Secret Key. |
| 2.4 | May 2020 | | J Miller | | Updated for ESP 3.5 |
| 2.5 | June 2020 | J. Boyer | | Consolidated document containing instructions for multiple environments | |
| 2.6 | July 2020 | J. Miller | | Minor updates from Bob Z’s feedback | |
| 2.7 | Sept 2020 | J.Miller | | Added section 13 – Configure esp log file rotation | |

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# Document Formatting

Instructions in this document are color-coded to indicate which environment the instructions apply to.

General instructions 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

# 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:

Apache (httpd) version 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 - 11:

* 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 or httpd Web server
* Database Backups

Additional topics for configuration once the system is running are covered starting at Chapter 12. 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.

# 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:

UBUNTU:

sudo apt install git

RHEL:

sudo yum 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)  
  
If the database is on a different server, or remote access to the database is required, ensure that firewall rules permit an inbound connection to the database server to the following port – depending on the Database:

POSTGRES  
 Default port is 5432

MS SQL

Default port is 1433

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.

# 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

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

sudo chmod 755 /srv/esp

# 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 requires 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

**NOTE:** For Postgres based systems, the Postgres database is installed and run on the same server. For MS SQL Server systems, a separate SQL Server database must be created for ESP access. This is not covered in this document.

**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).

**NOTE on SELinux:** SELinux security context enforcement is specific to how SELinux is configured on your system. If SELnux is enabled, you will need to update object security contexts as necessary.

1. 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).

# 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

# Initialize and create the ESP Database and ESP Database User

1. **POSTGRES ONLY**:   
     
    Enter the following commands to initialize and start the PostgreSQL Database:

sudo systemctl enable postgresql

sudo systemctl start postgresql

1. 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.

1. Create the “esp” database

**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 backslash and a 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 +

3a. **POSTGRES** 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

Restart the Postgres

systemctl restart postgresql

**MS SQL:**

Create the Database

sqlcmd -S [servername] -U [existing username] -P [existing password] -Q "CREATE DATABASE esp"

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

# Create the Directories and Files Expected by ESP

As the ESP user, copy and paste the following to create the directories expected by ESP:  
  
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

# 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.

1. 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

1. 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](mailto: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 depending on the Database you are using:

db\_name, username, engine, port, etc.. Standard configs details are below:

POSTGRES

db\_name = esp

username = esp

host = localhost

engine = django.db.backends.postgresql\_psycopg2

port = 5432

transaction\_row\_limit = 100

MS SQL

db\_name = esp

username = SA

host = localhost

engine = sql\_server.pyodbc

port = 1433

transaction\_row\_limit = 100

db\_options\_driver = ODBC Driver 17 for SQL Server

db\_options\_unicode\_results = True

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/httpd. See Section 10 \*\*  
  
 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 setttings:  
 host = <enter your corporate mail server here>

server\_email = esp-no-reply@your\_host.com

default\_from\_email = [esp-no-reply@your\_host.com](mailto: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.

1. As the ESP user, from the ESP installation directory, populate the media/static folder:  
     
    ./bin/esp collectstatic
2. 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](mailto:esp_support@commoninf.com) for assistance.

1. Install the Disease Detection Plugins you require:  
     
    ./setupPlugins.sh
2. 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

# Configure the Web server for http access

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:

UBUNTU:

**apache2 libapache2-mod-wsgi**

RHEL:

**httpd mod\_wsgi**

1. **WSGI setup**

1a. 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

1b. 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()

1. Create the Configuration files for the Web Server

2a. Create the configuration file. The name should match the name of your server

Copy the sample file from /srv/esp/prod/share to the appropriate directory   
  
UBUNTU:

sudo cp /srv/esp/prod/share/apache.conf.sample /etc/apache2/sites-available/server-name.conf

RHEL:

sudo cp /srv/esp/prod/share/apache.conf.sample /etc/httpd/conf.d/vhost\_server-name.conf

2b. Edit the Virtual Host conf file and modify the VirtualHost, ServerName and ServerAdmin values.

Also update the location of the path for the ESP install if different then /srv/esp/prod

UBUNTU:

sudo vi /etc/apache2/sites-available/server-name.conf

RHEL:

sudo vi /etc/httpd/conf.d/vhost\_server-name.conf

See sample excerpt from /etc/apache2/sites-available/esp-server.conf below:

….

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

# Change the VirtualHost and the Servername from "esp-server" to reflect your actual hostname

# this should match this filename - esp-server.conf or esp-server.org.conf

<VirtualHost server-name:80>

ServerName server-name

ServerAdmin your\_support@domain.org

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

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

….

2c. Edit the Web Server’s .conf file and Add the required directory configurations

UBUNTU:

sudo vi /etc/apache2/apache2.conf

RHEL:

sudo vi /etc/httpd/conf/httpd.conf

Beneath this 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>

2d. Enable the required Apache modules. (Ubuntu Only)

UBUNTU:

sudo a2enmod wsgi   
 sudo a2enmod rewrite  
 sudo a2ensite server-name.conf

Note: The site name (server-name.conf) has to match the file name created in step 2a.

1. Restart the Web Server/Verify it is setup to startup  
     
   **UBUNTU**:

sudo systemctl restart apache2

**RHEL:**

sudo systemctl restart httpd

# Configure the Web server for https access

TBD

# Configure Database Backups

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

sudo mkdir -p /srv/esp/backup

1. 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

Edit 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

1. Modify the permissions on the file and directory  
     
    chmod -R 644 /srv/esp/backup/
2. Create initial versions of the “log” files  
     
    cd /srv/esp/backup

touch esp.daily.dump  
 touch esp.weekly.dump  
 touch esp.monthly.dump

1. 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. The script referenced will be created in the next step.

crontab -e

*# m h dom mon dow command*

0 23 \* \* \* /srv/esp/scripts/db\_backup.sh

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

**POSTGRES:**

/usr/bin/pg\_dump -h db\_server -U db\_user -W esp -F c > /srv/esp/backup/esp.daily.dump

/usr/bin/pg\_dump -h db\_server -U db\_user -W esp -F c > /srv/esp/backup/esp.weekly.dump

/usr/bin/pg\_dump -h db\_server -U db\_user -W esp -F c > /srv/esp/backup/esp.monthly.dump

**MS SQL:**

NOTE:(usually run as the SA user, unless ESP user has permission to do backups )

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'"

1. Create the **/srv/esp/scripts/db\_backup.sh** file   
     
    sudo cp /srv/esp/prod/share/db\_backup.sh /srv/esp/scripts/db\_backup.sh
2. Set the permissions on script as follows:

chmod 755 /srv/esp/scripts/db\_backup.sh

# Configure ESP log file rotation

As the root user - copy the esp.logrotate configuration file from the /srv/esp/prod/share directory to /etc/logrotate.d/

sudo cp /srv/esp/prod/share/esp.logrotate /etc/logrotate.d/  
  
Note: Modify this file as necessary based on the location of the esp log file

The default is /var/log/esp.log

To test this - type the following commands to verify the log has been saved.

sudo logrotate -f /etc/logrotate.conf

ls -al /var/log/esp.log\*

# 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 is a 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

1. 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)

1. 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

1. 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

1. 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

* 1. Set the Permissions:

sudo chmod 755 swatch\_esp

1. 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

* 1. Set the Permissions:

sudo chmod 755 swatch\_cron

1. Start the monitors

sudo /etc/init.d/swatch\_esp start

sudo /etc/init.d/swatch\_cron start

1. Test it  
     
    (NOTE: update file names and locations as appropriate)
   1. sudo su esp
   2. 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
   3. 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.

1. 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

# 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](https://espnet.atlassian.net/wiki/download/attachments/42958879/ESP_Filespec_v1.7.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 configurations.

There are two types of files accepted for input to ESP, “epic” or flat files and CDA files.

This Chapter covers the load\_epic method, Chapter 16 covers the CDA method.

Either way, there are two data feed steps, historic and daily.

First, we need to 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.

Then we can set up the daily data extract and load. This is for ongoing data extraction and loading of data.

The ESP command “load\_epic” is used to load the flat ^ separated data file.   
 NOTE: 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

# 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**

**NOTE: I**f using CDA files, please refer to Chapter 16

A typical command to load data might look like this:  
(NOTE: file names need to follow this format epic*xyz*.esp.yyyymmdd – where xyz is the file type – see the latest [ESP FileSpec](https://espnet.atlassian.net/wiki/download/attachments/42958879/ESP_Filespec_v1.7.xlsx) for more information

$ $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 the table conf\_labtestmap.

To perform lab mapping, run:

$ $ESP\_HOME/bin/esp concordance

The concordance command populates a table emr\_labtestconcordnace, 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 generates hl7 2.3.1 version lab report message, the lab\_report command generates 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. Please contact CII for more information. Example case\_report and case\_requeue commands are below.

$ESP\_HOME/bin/esp case\_report --mdph --transmit --status 'Q'

$ESP\_HOME/bin/esp case\_requeue --status=RS

# Loading 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 as the esp user:

$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.

A daily cron job using logrotate will compress (zip) these .xml files and move them to the /processed sub-folder. The cron job also deletes the the old .gz files in /processed after 30 days.

The folder permissions must be set to allow the rest web service (which runs as user www-data under Apache2) and logrotate script (which runs as user esp). To read and write these files. Folder permissions must be set as follows:

$ cd ~/data/cda

$ sudo chown www-data:esp archive

The following commands will use the sample scripts to setup the scripts that should be run nightly as cron jobs.

$ cp ~/prod/ESP/cda/scripts/cda.logrotate.sample ~/scripts/cda.logrotate

$ sudo chown root:root ~/scripts/cda.logrotate

$ cp ~/prod/ESP/cda/scripts/cda\_ingest.sh.sample ~/scripts/cda\_ingest.sh

$ chmod +x ~/scripts/cda\_ingest.sh

$ cp ~/prod/ESP/cda/scripts/cda\_compress\_clean.sh.sample ~/scripts/cda\_compress\_clean.sh

$ chmod +x ~/scripts/cda\_compress\_clean.sh

These scripts are very simple and typically they will not need to be edited for an installation.

Cronjobs to run these scripts can be created by the following command:

sudo crontab -e

A sample of these cronjobs is listed below:

0 1 \* \* \* /srv/esp/scripts/cda\_ingest.sh

0 2 \* \* \* /srv/esp/scripts/cda\_compress\_clean.sh

At 0100 cda\_ingest.sh runs. This script will ingest all of the .xml CDAs in ~/data/cda/incoming and move them to ~/data/cda/archive

At 0200 cda\_compress\_clean.sh runs. This script will use logrotate to move all of the .xml files from ~/data/cda/archive and compress them to ~/data/cda/archive/compressed with an extension of .gz

# 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@youremail.com](mailto:recip1@youremail.com), [recip2@youremail.com](mailto:recip2@youremail.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@youremail.com](mailto:esp-no-reply@youremail.com)  
default\_from\_email = [youremail@youremail.com](mailto:youremail@youremail.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

# 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

# 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

1. 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.

1. Run the esp commands hef and nodis:

$ $ESP\_HOME/bin/esp hef

$ $ESP\_HOME/bin/esp nodis

1. 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.

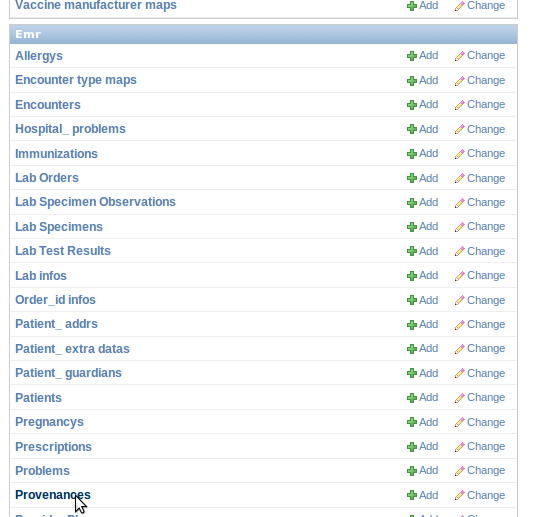
# How to Clean Up and Reload ESP Data

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.

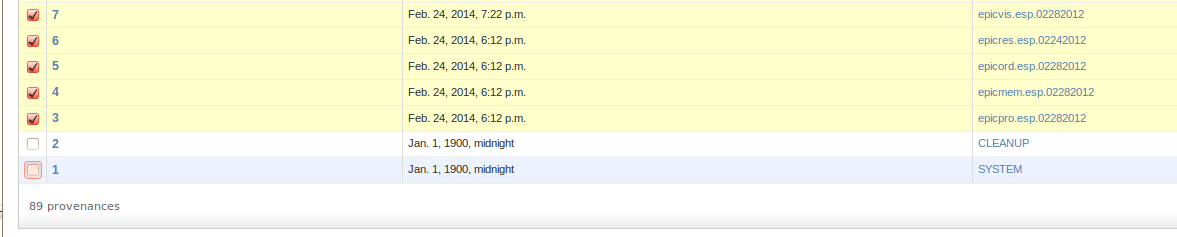
Below are the steps and screen shots to perform this task:

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

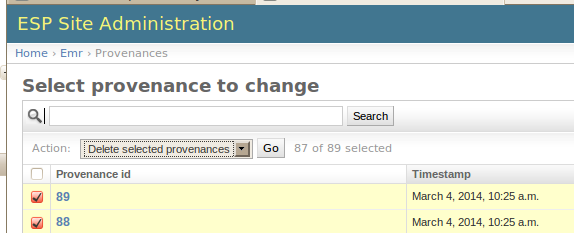
1. Click on “Provenances” from the “Emr” section



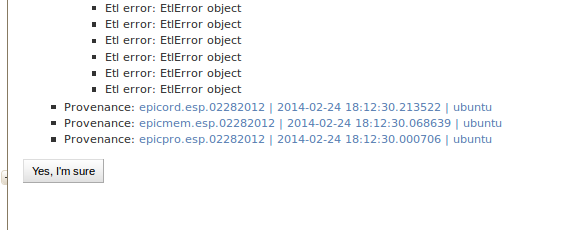
1. Select all records by clicking on the top left check box next to the Provenance id label and then **unselect the two checkboxes for the record 1 and 2 corresponding to CLEANUP and SYSTEM**



1. 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.



1. 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:

**