HOW TO

Aim

To setup up an environment that will enable ordering from EMR or IBLIS and results reporting from IBLIS to EMR, with IBLIS having interface with machine for auto results saving within it, all to be happening through a local National LIMS which is to be set at a site, thereby the local National LIMS sharing data to a centralized National LIMS which is residing at CHSU.

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Key Systems

These are the system that are expected to be available at a site in order to achieve the above aim

CATEGORY	ACTUAL SYSTEM	URL	LANGUAGE
EMR	EMR-API	https://github.com/HISMalawi/BHT-EMR-API.git	Ruby on rails (2.5.3)
EMR	EMR-Core	https://github.com/HISMalawi/BHT-Core.git	JavaScript
LIMS	nlims_controller	https://github.com/HISMalawi/nlims_controller.git	Ruby on rails (2.5.3)
LIMS	Lims_websocket	https://github.com/EGPAFMalawiHIS/lims-websocket.git	Node js
LIMS	iblis	https://github.com/HISMalawi/iBLIS.git	PHP Laravel (>= 5.6)
LIMS	nlims_data_syncroniser	https://github.com/HISMalawi/nlims_data_syncroniser.git	Ruby on rails (2.5.3)
LIMS	GeneXpert Driver	https://github.com/HISMalawi/GeneXpert_Machine_Driver.git	Node js

Other

In addition to the above systems, will also need COUCH-DB available at a site.

- Couch-db

This how to, will not cover on how to setup up the EMR modules, rather will concentrate on the LIMS modules only.

LIMS WEB SOCKET

1. clone the application
2. check out to branch → master
3. check if node is already installed with, **which node**
    1. having such **/usr/bin/node** means node is already installed.
    2. Having nothing as a result of the **which node** command, tells you that node is not installed.
        1. Therefore to install node
            1. sudo apt-get install nodejs
4. check if pm2 is already installed with, **which pm2**
    1. having such **/usr/bin/pm2** means pm2 is already installed
    2. having nothing as a result of the **which pm2** command, tells you that the pm2 is not installed
        1. therefore to install pm2
            1. firstly install the npm package
                1. sudo apt install npm
            2. then install pm2
                1. npm install pm2 -g

Having done this, the lims web socket can now run, to verify it, please issue this command inside the lims web socket folder

- node serverb.js, if you have **listening on port 3011**,then you are good to go

Lastly we need to hook this service to be running automatically on events like server reboot, in order to do so, pm2 will assist by doing the following;

1. pm2 start serverb.js
2. pm2 save
3. pm2 startup, once you do this, you will be provided with a link, copy it and execute it, this makes the service auto start on server reboots. The link starts with **sudo env PATH=$PATH**

NLIMS CONTROLLER

1. clone the application
2. check out to branch → sqa2
3. rename all “**.yml.example**“ files found in the config folder to “**.yml**” file only
4. open **application.yml** file found in the config folder, edit the district, facility name and the facility code to match the site you are setting up
5. open the **database.yml** file found in the config folder, edit the password and username used by the mysql found at the site.
6. open the **couchdb.yml** file found in the config folder, edit the username and password to match with the ones couchdb is using at that site.
7. check ruby version, assuming you are using rvm, then do rvm list
    1. if ruby 2.5.3 is not available, then install it
        1. rvm install 2.5.3
        2. gem install bundler
        3. bundle install
    2. if ruby 2.5.3 is available, then switch to use it, rvm use 2.5.3
8. then run rake tasks
    1. rake db:create
    2. rake db:migrate
    3. rake db:seed

Lastly, we need to configure this National Lims to broadcast results in real time for consumption by consumers who shall subscribe to it. To do so, follow the steps below

1. open **results_channel_socket.yml** file found in the config folder, edit the host and the port to match **LIMS WEB SOCKET** is running at. Having edit these will allow National Lims to broadcast results immediately it receives any result.

Having done all the above steps, the application is ready to run. This application is the one that will act as mirror National LIMS at every site.

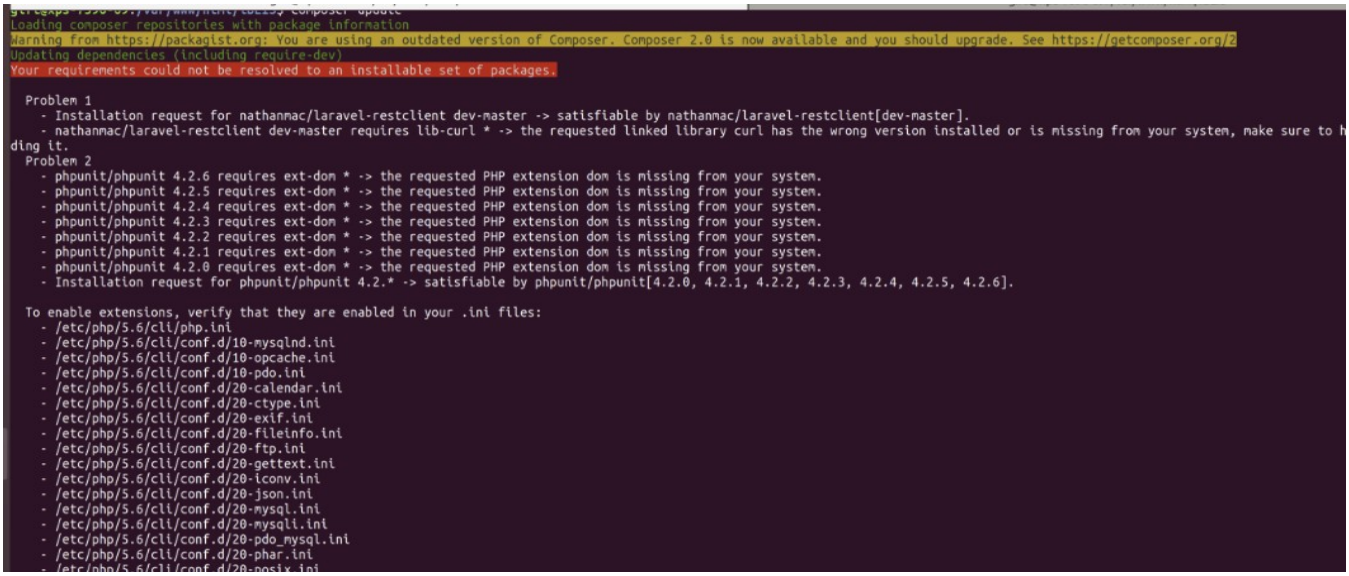
It logs its transactions both to mysql for CRUD functions at the site and to couchdb in order to synchronize with the National LIMS at central

IBLIS

1. clone the application
2. check out to branch → development_1.0
3. rename all “**.php.example**“ files found in the config folder to “**.php**” file only. Config folder in found in the **app** folder.
4. open **kblis.php** file found in the config folder, edit the organization, address info and the facility code to match the site you are setting up
5. open the **database.php** file found in the config folder, edit the password and username used by the mysql found at the site. Edit on the mysql block
6. install php (preferable 7.0 version)
    1. sudo apt-get install php
    2. sudo apt-get install composer
    3. composer update self
        1. this will install the dependencies, just the same as bundle install in rub
7. then run rake tasks
    1. php artisan create
    2. php artisan migrate
    3. php artisan db:seed

NOTE

Before you complete step 6, you will encounter problems as stipulated below in the image, disregard the php version on the image, as you will still face it with php 7.0



Therefore, in order to solve these two problems, do the following

1. sudo apt-get install php7.0-curl
2. sudo apt-get install php7.0-mcrypt php7.0-intl php7.0-xsl php7.0-mbstring php7.0-zip php7.0-soap php7.0-gd

Having run these, re-run the **composer update self,** after successfully installation of the dependencies, you can then do **STEP 7** above

Upon successful completion of step 7, the application is now ready to run. In order to run it, you can simply do so by

- php artisan serve –host localhost –port 8001

NOTE

After it has run, you might face another problem concerning with mysql adapter. In order to resolve this simple run the following, this should now allow you to do transactions with the mysql

- sudo apt-get install php7.0-mysql

This should successfully enable iblis to function properly.

Finally, on iblis, we need to configure the ability of syncing its data to national LIMS. In order to do so, follow the steps below;

1. rename all “**nlims_connection.php.example**“ files found in the config folder to “**.php**” file only. Config folder in found in the **app** folder
2. edit the file with the following settings

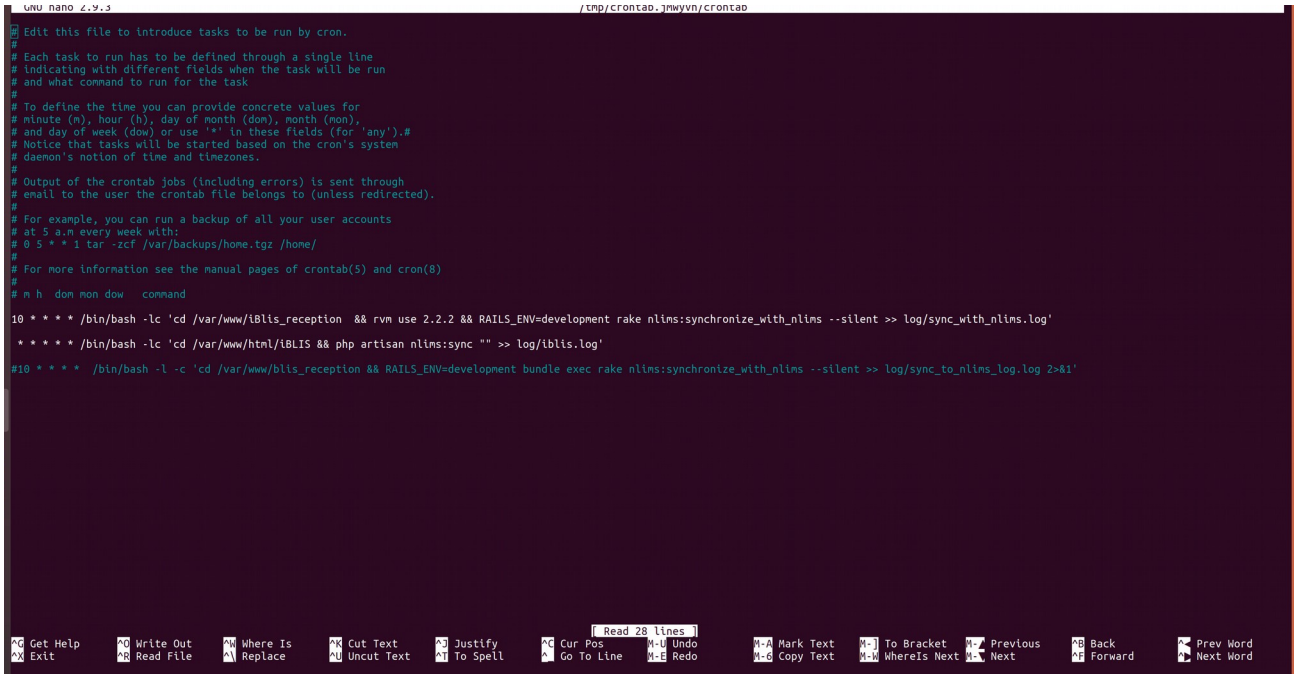
1. nlims_controller_ip, this should point to IP and Port to which nlims_controller is running at
2. nlims_custome_username, this you can set it to any of your choice
3. nlims_custome_password, this you can set it to any of your choice as well
4. app name, this should be the site name at which iblis is running, not very important
5. partner name, this should always be EGPAF, not very important

Having edit the above, we then need to run the following tasks with the aim of creating an account for our iblis system at National Lims. Without having an account, iblis system can not use National Lims resources. The tasks are as follows;

- php artisan nlims:authenticate ""
- php artisan nlims:create_user ""
    - if username is not yet available at National Lims, your account will successfully be created, if the username is available, then National Lims will prompt for such hence does not create the account.

3. Having done this, we now need to set a cron job that will help in pushing data to National Lims at an interval we shall select. The cron job needs to be set on executing this below file
    - php artisan nlims:sync “”

In order to set up such, we need to open the crontab file by executing this command “crontab -e” File like below will open on your terminal.



Good, we have to insert the line below to this file

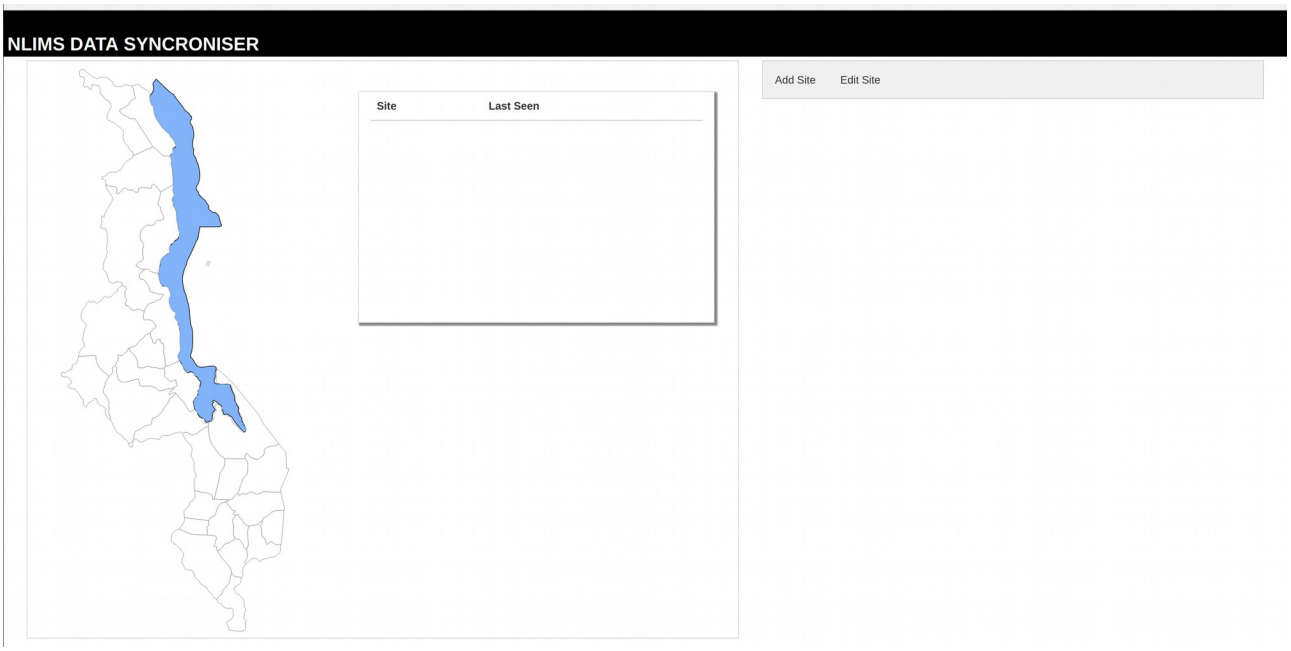
```
* * * * * /bin/bash -lc 'cd /var/www/html/iBLIS && php artisan nlims:sync "" >> log/iblis.log'
```

Having this line into your crontab file, it will execute the command every one minute, at the same time, for every execution, it will log into the iblis.log file which will be located in the log folder at iblis system root directory.

NATIONAL LIMS DATA SYNCRONISER

1. clone the application
2. check out to branch → sqa2
3. rename all “**.yml.example**“ files found in the config folder to “**.yml**” file only
4. open **application.yml** file found in the config folder, edit the district,site name and site code to match the site you are setting up
5. open the **database.yml** file found in the config folder, edit the password and username used by the mysql found at the site. For database, it uses the database used by the National Lims application, therefore make sure its the same as the one used by National Lims.
6. open the **couchdb.yml** file found in the config folder, edit the username and password to match with the ones couchdb is using at that site.
7. check ruby version, assuming you are using rvm, then do rvm list
    1. if ruby 2.5.3 is not available, then install it
        1. rvm install 2.5.3
        2. gem install bundler
        3. bundle install
    2. if ruby 2.5.3 is available, then switch to use it, rvm use 2.5.3
8. then run rake tasks
    1. rake db:migrate
    2. rake db:seed

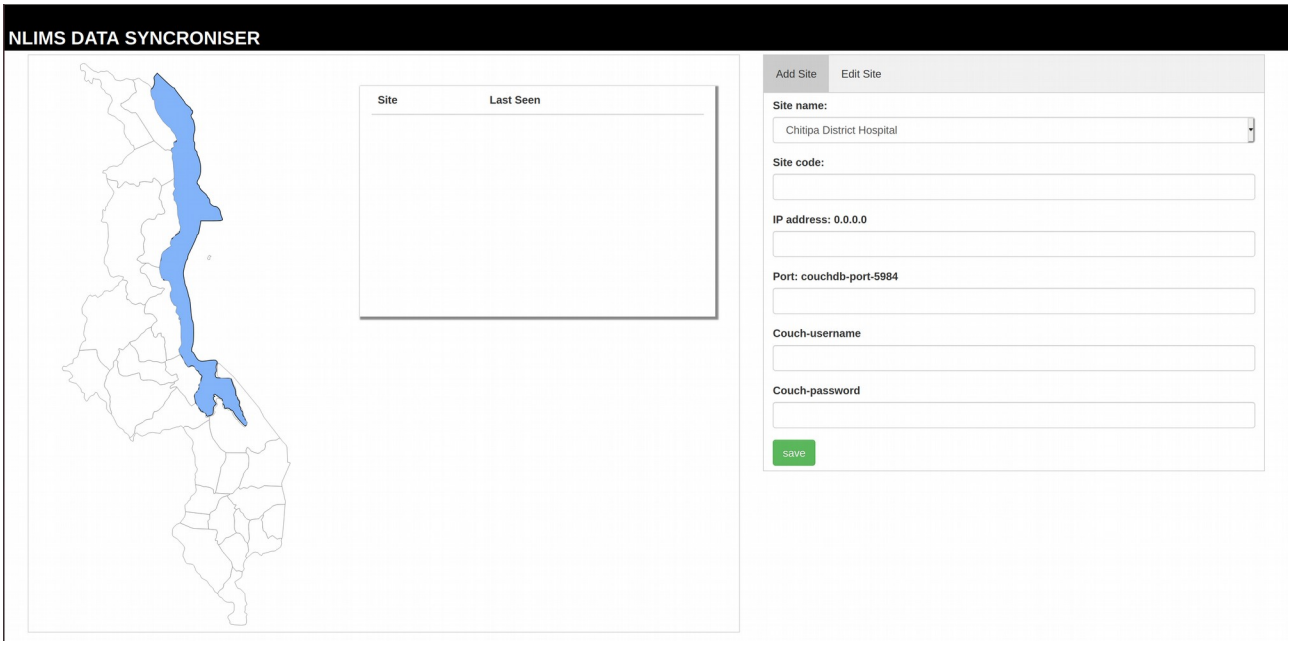
Having this done, the application is ready for run. Run it and pull it from the browser. A window below will load up



From this UI, you are expected to add two sites,

1. First site being the site at which you are
2. Second site being CHSU were the actual National Lims is located.

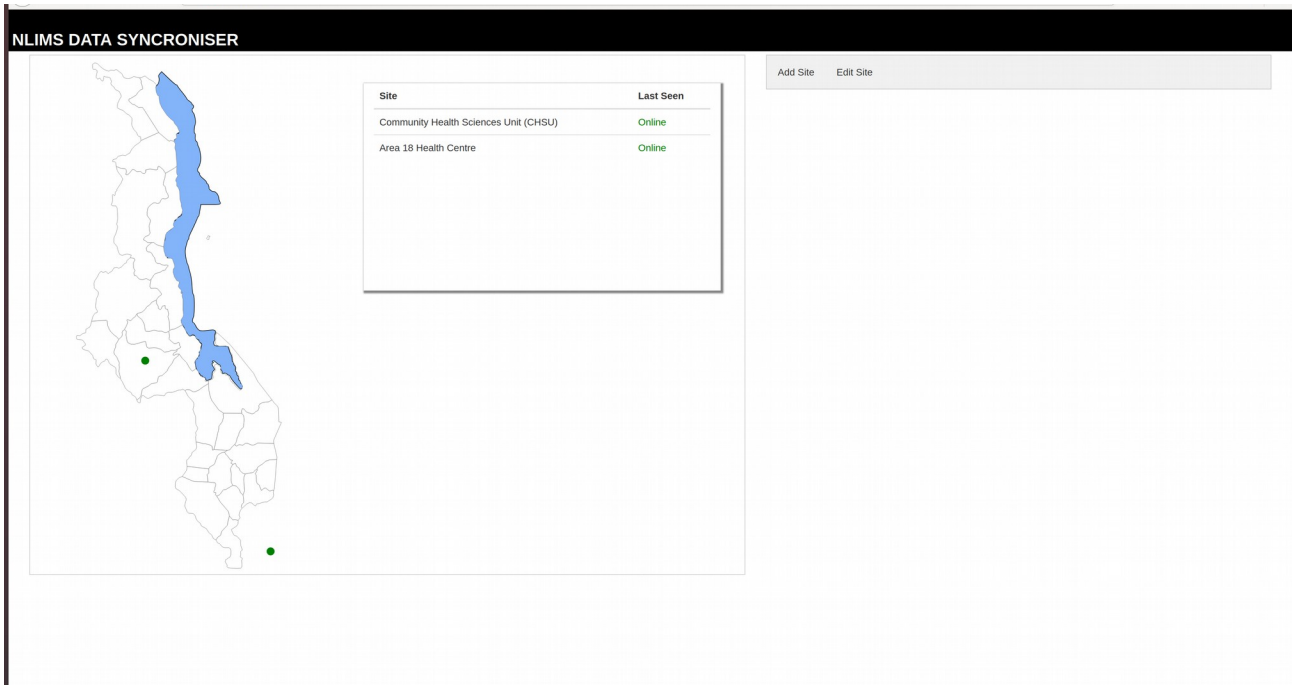
You can add the sites by clicking the “ADD SITE” button



For every site, you need to add up the following parameters

- **site name**, thus selecting from the list of the sites
- **site code**, for the site
- **ID address**, at which the site is hosted
- **Port Couchdb**, the port at which couchdb is running, at that site
- **Couchdb Username**, the username for the couch running at that site
- **Couch password**, the password for the couchdb running at that site

Having added the sites, you should be able to see the following on the UI.



This shows that for example Area 18 is able to communicate with CHSU in order to be sharing data. Take note, having done this does not mean data will be synchronizing, what we have done is setting up the data source and the destination to which the data will be synchronizing.

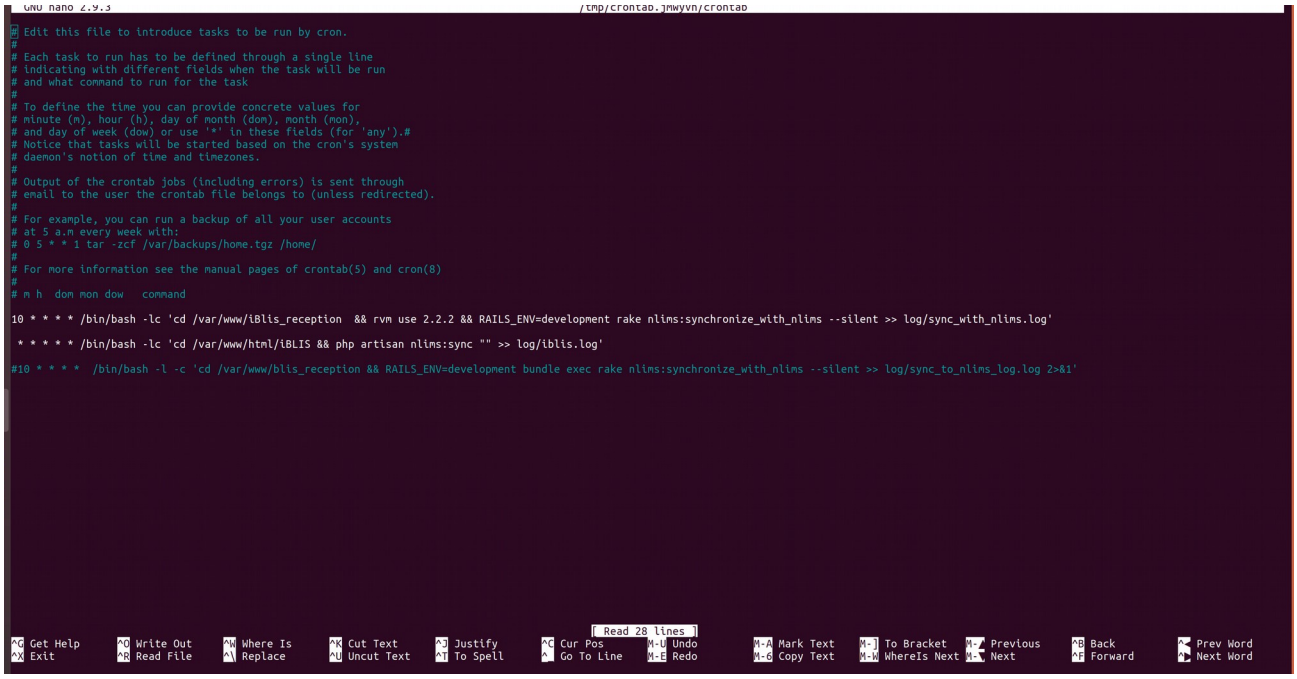
Therefore, to actually enable the data synchronization, National Lims Data Synchronize has a rake task which actually handles the syncing of the data from the source to the destination.

The rake task and how to run it, is;

- bundle exec rake nlims:sync_from_couchdb_to_couchdb

This needs to be set as a cron job in order to allow it run at expected intervals as per set. Therefore, in order to run it as a job,we need to open the crontab file by executing this command

“crontab -e”, hence a file like below will open on your terminal.



Then need to add the line below into this crontab file

```
0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58 * * * *  /bin/bash -l -c 'cd /var/www/nlims_data_syncroniser/ && rvm use 2.5.3 && RAILS_ENV=development bundle exec rake nlims:sync_from_couchdb_to_couchdb --silent >> log/sync_couchdb_to_couchdb.log 2>&1'
```

Having this line into your crontab file, it will execute the command every two minutes, at the same time, for every execution, it will log into the sync_couchdb_to_couchdb.log file which will be located in the log folder at national lims data syncroniser system root directory.

Once the job is set, then data will be synchronizing from the source to destination, according to our example, the source is Area 18 and destination is CHSU. During adding of the sites on the UI, no need to specify that this site is source or destination, the application knows that on your behalf.

GENEXPERT MACHINE DRIVER

2. clone the application
2. check out to branch → master
3. check if node is already installed with, **which node**
    1. having such **/usr/bin/node** means node is already installed.
    2. Having nothing as a result of the **which node** command, tells you that node is not installed.
        1. Therefore to install node
            1. sudo apt-get install nodejs
4. check if pm2 is already installed with, **which pm2**
    1. having such **/usr/bin/pm2** means pm2 is already installed
    2. having nothing as a result of the **which pm2** command, tells you that the pm2 is not installed
        1. therefore to install pm2
            1. firstly install the npm package
                1. sudo apt install npm
            2. then install pm2
                1. npm install pm2 -g

Having done this, the GeneXpert Driver can now run, to verify it, please issue this command inside the lims web socket folder

- node xpert.js, if you have **Server is listening on port 3050**,then you are good to go

Lastly we need to hook this service to be running automatically on events like server reboot, in order to do so, pm2 will assist by doing the following;

1. pm2 start xpert.js
2. pm2 save

3. pm2 startup, once you do this, you will be provided with a link, copy it and execute it, this makes the service auto start on server reboots. The link starts with **sudo env PATH=$PATH**

The above steps makes the driver able to run, but we need to do the followings steps in order for the driver to share the processed results to IBLIS and again in order for the driver to pull/receive results from the GeneXpert Machine.

1. Open the **settings.json** which is found in the config folder of the machine driver. Edit the following;
    1. port on the LisPath value, and put the port at which IBLIS is set to be running.
    2. LisUser, thus user within IBLIS to be used for authenticating at API level during results pushing by the IBLIS, use this **“superuser”**
    3. LisPassword,thus password within IBLIS to be used for authenticating at API level during results pushing by the IBLIS, use this **“superpassword”**

Having done this, will enable the driver to push the results it process to IBLIS for its consumption. The pushing is through an API which IBLIS exposes. As per seen on the LisPath value within the settings.json file.

2. We need to go at the Genexpert Machine Console, and do the following;
    1. log into the console (default credentials as per manufacture username: genexpert password:cepheid)
    2. navigate to the setup section
    3. click system configuration, screen will load, on the screen edit the followings
        1. select “enable host communication” it has to be selected in order to be permitted to edit the least.
        2. On communications settings section, do the followings
            1. protocol must be **ASTM,** so please make sure you select
            2. run as a host should be **Server**
            3. server IP address, should enter IP address at which the genexpert machine driver is running
            4. port #, should enter port number at which the genexpert machine driver is running.
        3. On the host test code, make sure you select all the parameters found.

3. Lastly, genexpert machine permits auto sending of results to LIS , immediately it finishes analyzing the test. But this has to be set. Therefor in order to set it up, click the **“Automatic results upload”** button thus to select it.

The setup section looks like below;