

GeneXpert

Machine Integration with IBLIS -

Setup Guide

This document serves as a step-by-step guide for integrating the GeneXpert machine with the IBLIS system

using the GeneXpert driver. The driver enables automated fetching and submission of test results from

GeneXpert to IBLIS.

Pre-Configuration Requirements

- Ethernet Cable (together with/without USB to Ethernet Adapter): Required for establishing a network connection between the GeneXpert machine computer and the IBLIS server.
- Node.js v18: Required to run the GeneXpert driver.
- Access to the GeneXpert software (on the computer controlling GeneXpert) and IBLIS server.

Step 1: Connect the GeneXpert Machine to the Network

Connect the GeneXpert machine's controlling computer (laptop or desktop) to your facility's network:

- Via Ethernet port, or
- Via an external Ethernet adapter (if the Ethernet port is in use).

If the GeneXpert machine is already connected to the GxAlert network, follow these steps

- A. Open Settings
- B. Click on Network & Internet
- C. Click on Status
- D. Click "Change Adapter options. "
- E. Right-click the network adapter you want to change the priority for and select its Properties:
- F. Select Internet Protocol Version 4 (TCP/IPv4)
- G. Click on the Properties button.
- H. Click Advanced. In this section, uncheck the box that says Automatic metric and enter a number in the Interface metric box.

The number you enter here is the priority of the network interface; the lower the number, the higher

the priority. A high number means low priority.

- I. Click OK to save the current dialog and the subsequent one. These steps should be repeated for any

other network adapters that need configuration. In this case, the Wi-Fi adapter is given a higher priority than the adapter used for the Internet. This configuration ensures that Windows attempts to

use the primary connection first to reach hosts and automatically switches to the secondary connection if the primary one

NB: Set priority 1 to the GxAlert network adapter and set the network (EGPAF) adapter to 100 so

that

GxAlert always has high priority.

Step 2: Verify Network Connectivity

1. Open Command Prompt (CMD) on the GeneXpert machine.
2. Ping the IBLIS server to check connectivity: ping <IBLIS_SERVER_IP>
 - If successful, proceed to the next step.
 - If unsuccessful, try another adapter or network port.

Tip: If the server is unreachable but another workstation (e.g., an All-in-One in the lab) is reachable, you can use the reachable workstation.

Step 3: Install the GeneXpert Driver

1. Check Node.js Version:

```
node --version
```

If Node.js is not installed, use nvm to install it:

```
nvm install 18
```

```
nvm use 18
```

2. Clone the Driver Repository:

```
git clone
```

```
https://github.com/HISMalawi/mlab_drivers.git
```

```
cd mlab_drivers/GeneXpert_Machine_Driver
```

3. Install Dependencies:

```
npm install
```

TIP: (Alternatively, since the servers do not have internet, install dependencies on a working machine, copy the node_modules folder into the driver folder on the server.)

4. Run the Driver:

```
node app.js
```

You should see: "Server is listening!"

Leave the driver running and proceed to the GeneXpert computer.

Step 4: Configure the GeneXpert Software

1. Log in to the GeneXpert software using:

- Username: genexpert
- Password: cepheid

2. Navigate to:

Setup → System Configuration → Host Communication Settings

3. In the Host Communication Settings:

- Enable Host Communication
- Enable Automatic Result Upload
- Under Communication Settings:

Protocol: ASTM

Run Host As: Server

Server IP Address: IP of the machine running the driver (either the server or All-inOne)

4. Ensure Check Status shows a green checkmark (✓).

Step 5: Configure Host Test Codes

For each enabled assay under Host Test Code, click Edit and update as follows:

- EID Assays (e.g., "HIV-1 Qual..."):

Set Result Test Code: EID

- Viral Load Assays:

Set Host Test Code: Viral Load or Viral Load 2 (if more than one exists)

- COVID-19 Assays:

Set Host Test Code: COV-2 or COV-2 2

- TB Assays (MTB-RIF):

Result Test Codes: MTB, Rif Resistance

Add suffix (e.g., MTB-RIF-1) if more than one is enabled

- HPV Assays:

Result Test Codes: HPV 16, HPV_18_45, OTHER HR HPV

After updating all assays, click OK to save changes.

Step 6: Edit Driver Configuration Files

Navigate to: cd

config/

1. settings.json

Update the following:

```
{  
  "lisPath": "http://<IBLIS_SERVER_IP>:8005/api/v1/interfacer",  
  "lisUser": "<IBLIS_USERNAME>",  
  "lisPassword": "<IBLIS_PASSWORD>",  
  "port": 3031  
}
```

2. mapping.json

Match the measure names to their corresponding IDs from the IBLIS database: Inspect the page by right-clicking and clicking select inspect, then click on the selector

Navigate to the GeneXpert result field and get the ID.

Get the ID and add it to the corresponding values in the mapping.json

Step 7: Run and Test Integration

Start the driver:

```
node app.js
```

From the GeneXpert machine, click on View Results, which brings up the most recent generated result,

then click on Upload test

Select a test that was entered from the IBLIS reception, whose barcode was scanned when creating a test in

the genexpert machine, then click Upload

Check the process for the GeneXpert driver. Then type pm2 log [Gene-Xpert id] obtained for the first

command

Example:

```
http://192.168.200.100:8005/api/v1/interfacer?specimen_id=123&measure_id=456&result=Detected&dec=0
```

Ensure that the correct test type and result appear in IBLIS.

Step 8: Set Up Auto-Start with PM2

To ensure the driver starts automatically on reboot:

```
npm install -g pm2
```

```
pm2 start app.js --name genexpert-driver
```

```
pm2 save
```

```
pm2 startup
```

Run the generated command from the pm2 startup output in the terminal.

User Orientation for Successful Integration

- Users must scan the IBLIS specimen label (Sample ID) during test registration in the GeneXpert software.
- Ensure this is done at the point of creating a new test, where both the cartridge and sample ID are scanned.

GeneXpert Integration with CIHEB EID/VL System via IBLIS

To enable bidirectional integration between IBLIS and the CIHEB EID/VL system through the GeneXpert machine, follow the steps below.

1. Configure application.yml in mlab_api

Copy the ciheb_gex_subscription block from the application.yml.example to the application.yml and update the values as required:

The ciheb_gex_subscription block is like this;

```
ciheb_gex_subscription:  
  ciheb_eid_vl_endpoint: "http://<eid_vl_server_ip>:<genexpert_port>/api/v1/subscribe/genexpert"  
  app_name: "IBLIS"  
  organization_name: "EGPAF"  
  iblis_result_endpoint: "/api/v1/interfacer/genexpert"  
  iblis_ip_address: "192.168.1.1"  
  iblis_backend_port: 8005  
  iblis_username: "YourUsername"  
  iblis_password: "YourPassword"  
  client_type: "other"
```

3. Update the following values:

A. ciheb_eid_vl_endpoint: Replace eid_vl_server_ip with the actual IP address of the EID/VL server, and the port number, should be requested from CIHEB (Gift Malolo)

B. iblis_ip_address: Enter the IP address of the IBLIS server.

C. iblis_backend_port: Confirm that the backend (mlab_api) is running on port 8005. If different, update accordingly.

D. iblis_username and iblis_password: Use valid IBLIS credentials (the same used for logging into the system).

4. Subscribe IBLIS to the CIHEB EID/VL System

From within the mlab_api project directory, run the subscribe command provided, and it should not have

```
any errors: rake gex_sub:subscribe
```

This registers IBLIS with the CIHEB EID/VL system, enabling result synchronization.

5. Map Genexpert results sent through the subscription to CIHEB with IBLIS measures

- From mlab_api, tail this log: tail -f log/genexpert.log
- Try sending or uploading results from GenExpert, and the genexpert log should show this below:

Edit the mapping file: vim config/gx_mapping.json

```
{  
  "cov-2":{  
    "id": 190,  
    "aliases":[]  
  }  
}
```

- From the Genexpert log, locate the measure name under the processing data from CIHEB entry.

Add

this measure name to the aliases field in the mapping file. Next, navigate to the Enter Results page

in IBLIS to identify the corresponding measure mapping ID and assign this value under the id field in the mapping file (similar to the standard mapping process used with the machine driver).

Repeat this process for all possible test results generated by the Genexpert.

- Once the mapping updates are complete, restart the mlab_api service by running `sudo systemctl restart mlab_api.service`

- For troubleshooting and validation, refer to the Genexpert log to monitor the processing of incoming data.

Outcome

- Orders placed in IBLIS and tested on GeneXpert will have results automatically transmitted back to

IBLIS via the subscribe endpoint (`/api/v1/interfacer/genexpert`).

- Orders placed in the EID/VL system and tested on GeneXpert will likewise receive results automatically, ensuring seamless integration and synchronization between both systems.

Testing the Integration

- Register a test in IBLIS
- Scan the Sample ID in GeneXpert during test setup
- Run the test and allow it to complete
- Check IBLIS to verify if the result has been correctly fetched and matched

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