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Automatic Temperature Monitoring Proposal

[22 June 2018]

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Executive Summary

The automatic temperature monitoring proposal underlines the high level design of how the Verigo pod can be used to monitor the intransit temperature of specimens. An activity diagram is used to display the day to day workflow of a driver and field observations are used to clarify the actual temperature that will be monitored. The document stipulates the prerequisites and risks that must be considered for the successful implementation of the system.

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Prerequisites

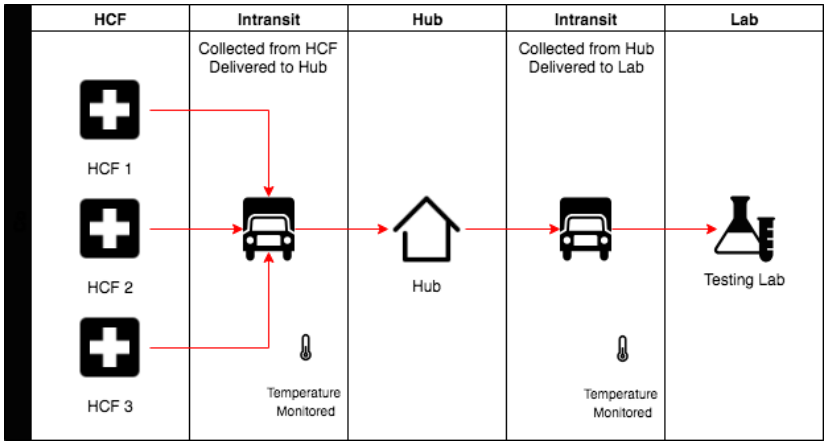
The following requirements are essential for successful temperature monitoring:

1. Drivers will travel with either one or two cooler boxes
2. Every cooler box will have a Verigo pod
3. The Verigo pod will be “married” to the cooler box (not removable)
4. Every cooler box will have a unique barcode (not removable)
5. The Verigo app as well as the eLABS app will be installed on all courier devices
6. As part of the courier SOP, drivers will:
    a. pair the Verigo pods with their mobile devices daily
    b. synchronize the Verigo app daily (a data connection will be required - the application will not be zero rated)
    c. not collect more samples than what their cooler boxes can carry
    d. not split batches between cooler boxes
7. A support process will be in place for pods that require replacement
8. Drivers will receive Verigo app training

Courier Workflow

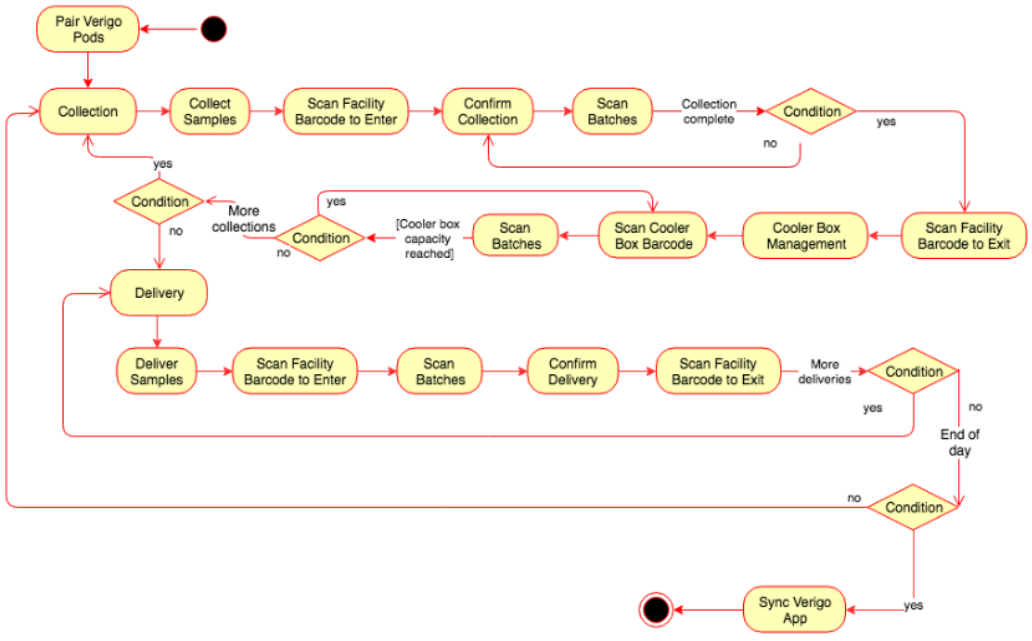
Temperature Monitoring Diagram

The picture diagram displays when temperature will be monitored.



eLABS Application Diagram

The Activity Diagram stipulates the eLABS app steps the driver will follow.

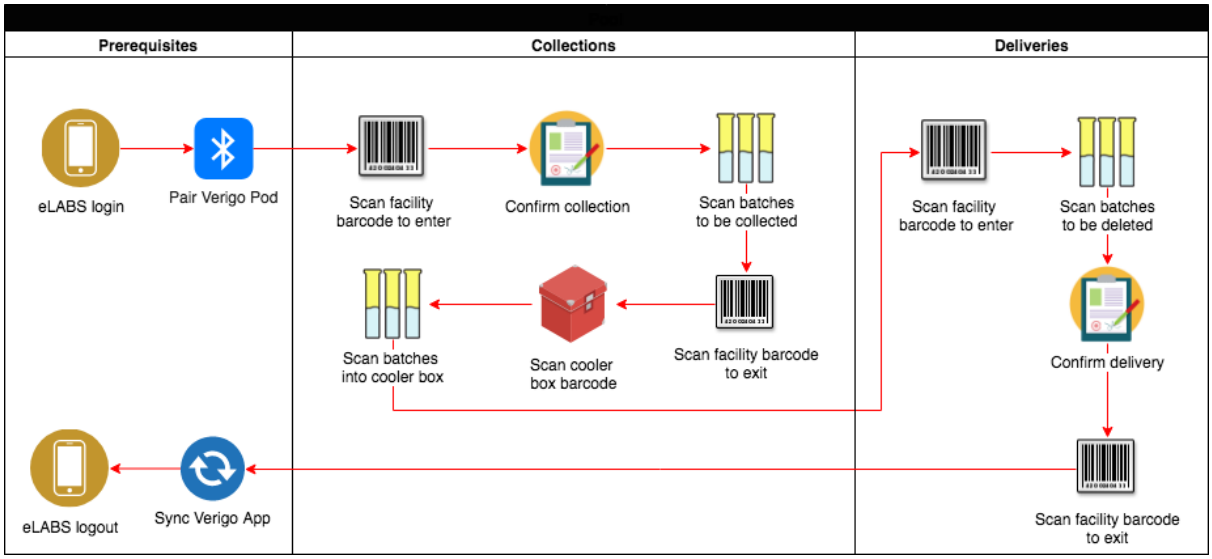


Driver Workflow Diagram

The driver will therefore follow the below steps:

1. Login to eLABS
2. Reminded to pair the Verigo device
3. For sample collection:
    a. Go to sample collections
    b. Scan the HCF barcode to enter the facility
    c. Retrieve a signature to confirm the collection
    d. Scan batches to collect them
    e. Scan the facility barcode to exit the facility
    f. Scan the cooler box barcode in which batches will be placed
    g. Scan the batches before placing them in the cooler box
4. For sample delivery
    a. Go to sample deliveries
    b. Scan the hub/lab barcode
    c. Scan the batches to deliver them
    d. Retrieve a signature to confirm the delivery
    e. Scan the hub/lab barcode to exit the facility
5. Reminded to synchronize the Verigo App
6. Logout of eLABS

The Picture Diagram displays the workflow the driver will follow.



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Verigo Integration

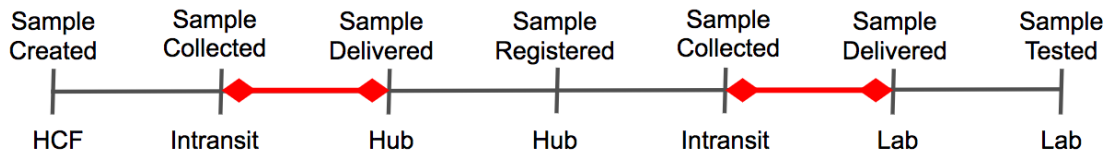
The Verigo pod will be integrated on a server to server basis. Couriers will have the Verigo application installed on their mobile devices. Verigo apps will not be zero-rated.

Temperature Monitoring

Planned temperature monitoring

The cold chain will only be monitored when samples are intransit. The temperature will be monitored in 5 min intervals from collection to delivery for the 1st and 2nd leg of a sample's journey.

Cold Chain Monitored



Actual temperature monitoring

If we look at the below field observation, the driver's first stop is at Macassa, this means that the temperature for a sample collected here will be monitored from:

- ➔ 10:30 - 12:30, and
- ➔ 17:30 - 19:40

NHLS Route 2 [observed by Nicola, Friday 4 May, driver Siphe]:

10:30 - Macassa
11:00 - Nomzamo
12:00 - Ikhwezi Clinic
12:15 - Gustrouw Clinic
12:20 - Strand DG
12:30 - Somerset Lab
12:40 - Somerset West Clinic
12:50 - Sir Lowry's Pass
13:00 - Gordon's Bay
13:45 - Strand DG
14:00 - Gustrouw Clinic
14:30 - Ikhwezi Clinic
15:00 - Nomzamo
16:00 - Somerset West Lab
17:00 - Stellenbosch Hospital
17:30 - Somerset West Lab
19:20 - Green Point Lab
19:40 - Tygerberg Lab

*Please note that Somerset Lab is a hub and not a final testing lab.

It will take 9 hours and 10 minutes for the sample to reach the testing lab (Tygerberg Lab) and the temperature of the sample will be monitored for 4 hours and 10 minutes, which means that at most, 45% of a sample's cold chain will be monitored.