EVALUATION-CEMS PERFORMANCE

M.P. Pollution Control Board
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REAL TIME DATA INTEGRITY

&

REMOTE CALIBRATION OF CEMS

May 2018

Why Remote Calibration

- The methodology of online real-time monitoring and the architecture of data flow is presently not supported by any legal backing and, therefore, there is fair possibility of tampering of data generated through automated monitoring systems and this can end up with the manipulated data reaching to the regulatory authorities. This ultimately defeats the basic purpose of monitoring and hinders **Government's efforts** for control of pollution.

- It is important to ensure that the monitoring data being received at regulator's end is reliable, meaningful and reproducible. This requires a periodic evaluation/check not only of analysers but entire CEMS as a whole. The analyser is the key part in the entire system, which can be checked remotely too, hence MPPCB has initiated process to check the CEMS performance remotely for correctness of monitoring data being received at ESC. The prime aim is to sensitize the industry people and, at the same time, verify the reliability of the monitoring system at industry end

Remote calibration of CEMS analyzer in 11 industries

- M/s Jaypee Rewa Cement, Dist. Rewa (08.02.2017)
- M/s Jaypee Sidhi Cement, Dist. Sidhi (09.02.2017)
- M/s Prism Cement, Dist. Satna (08.02.2017 & 18.08.2017)
- M/s ACC :Limited, Dist. Katni (23.02.2017)
- M/s Orient Paper Mill, Dist. Shahdol (19.04.2017 & 07.03.2018)
- M/s KJS Cement, Dist. Satna (05.05.2017)
- M/s Birla Corporation Ltd., Dist. Satna (23.05.2017)
- M/s Ultratech Cement, Dist. Neemuch (15.06.2017)
- M/s Reliance Cement Ltd., Dist. Satna (17.11.2017)
- M/s Heidelberg Cement, Dist. Damoh (16.01.2018 & 23.03.2018)
- M/s Grasim Industries, Dist. Ujjain (22.02.2018)

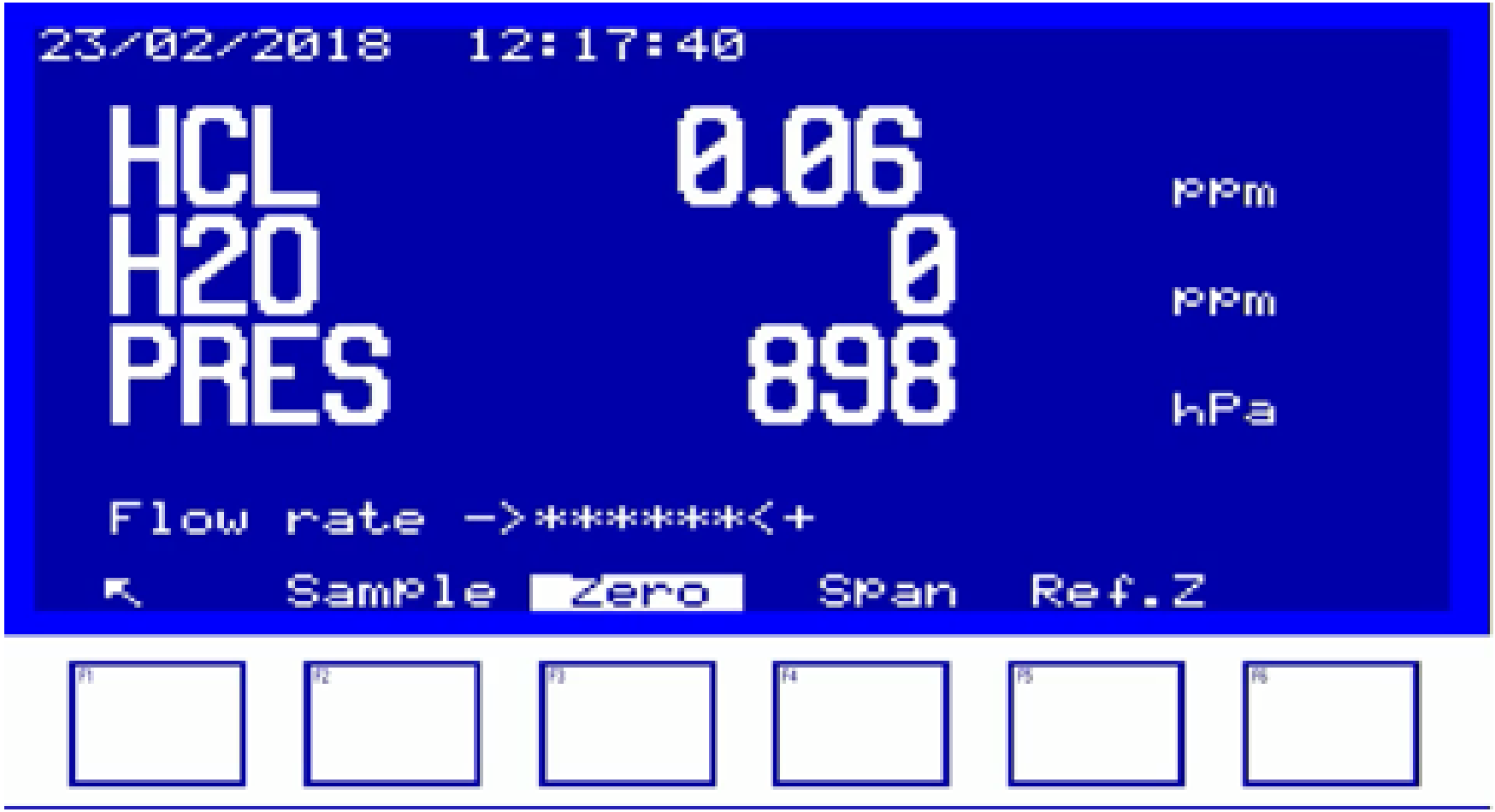
The calibration was successful in majority of the cases but in few cases the calibration process was partially successful/failed

Remote Calibration Process

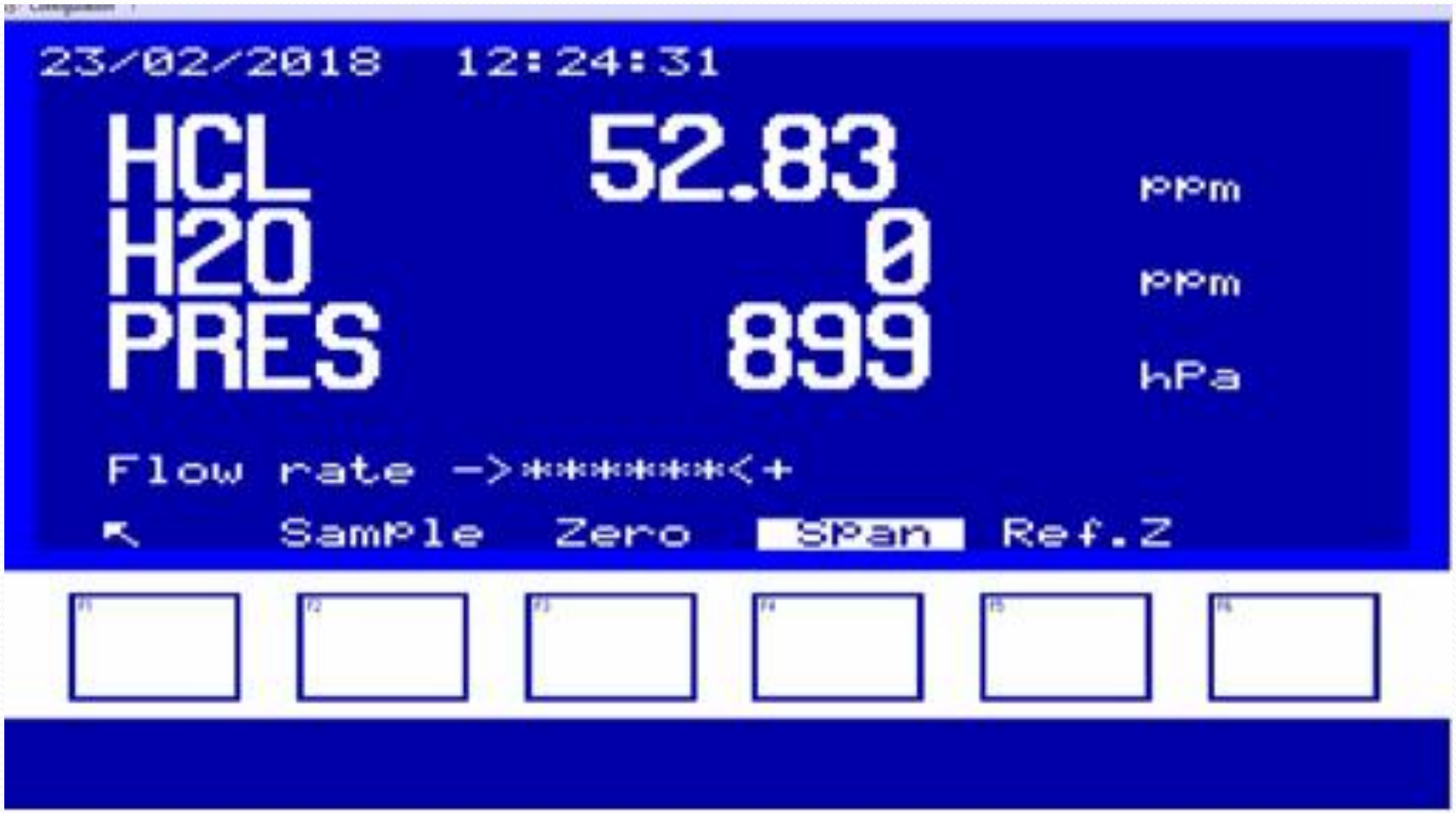
- The purpose of remote calibration of analyzers is to check the performance of CEMS as well as to ensure reliability and reproducibility of data and rectify the snags if any deviation is observed. Ideally the process takes about an hour for one cycle and during this period the sample line is cut off automatically.

The process involves Sample run, Zero Calibration and Span Calibration followed again by Sample run.

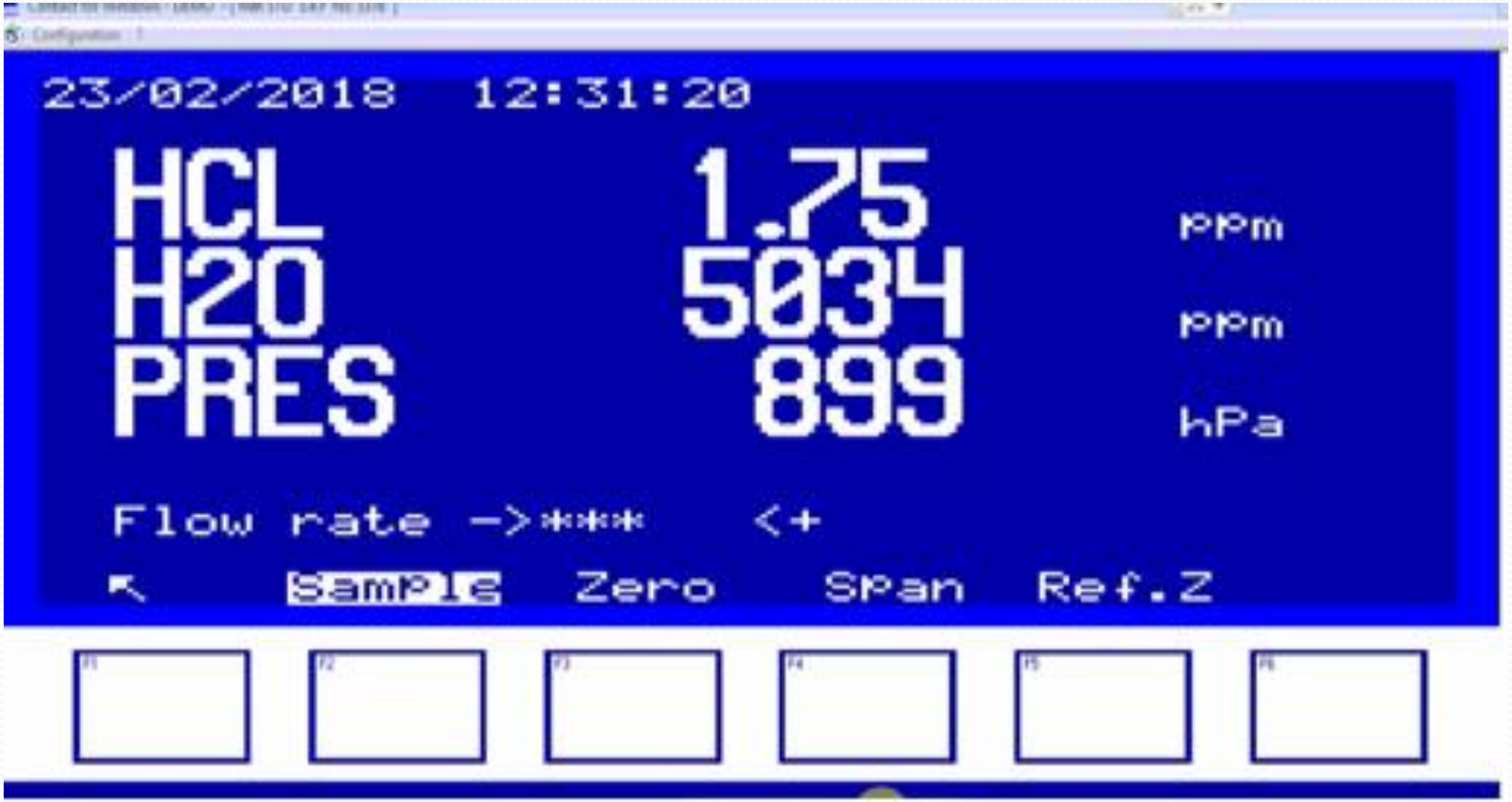
For zero cal. the command is given from server end which is executed by DAHS at the remote end.



- During Span calibration a known concentration of certified gas is passed through the system and the obtained value is compared with the span gas concentration to check the drift if it is within permissible range or not.



- As soon as the span calibration is over the analyzer automatically starts taking sample from the source. After stabilization the parameter concentration displayed on the screen is compared with the concentration observed before the calibration process



Validation of Report

Madhya Pradesh Pollution Control Board
Online Pollution Monitoring Portal

Online Pollution Monitoring Portal

Name of Industry: Kamal Sponge Steel & Power Ltd Average Dashboard
From Date: 1-4-2018 To Date: 30-4-2018

Time	SI_Kilns_2_100--PM (mg/m3)	AFBC_Boiler--PM (mg/m3)	SI_Kilns_2_50--PM (mg/m3)	AFBC_Boiler--NOx (mg/Nm3)	AFBC_Boiler--SO2 (mg/Nm3)	SI_Kilns_2_100--SO2 (mg/Nm3)	SI_Kilns_2_50--SO2 (mg/Nm3)
2018-04-01 05:30:00	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2018-04-02 05:30:00	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2018-04-03 05:30:00	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2018-04-04 05:30:00	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2018-04-05 05:30:00	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2018-04-06							

Madhya Pradesh Pollution Control Board
Online Pollution Monitoring Portal

Online Pollution Monitoring Portal

Name of Industry: TRIMULA INDUSTRIES LTD Average Dashboard
From Date: 1-4-2018 To Date: 30-4-2018

Time	Near_Substation--SO2	Near_Powerplant--SO2
2018-03-31	22.9	0.01
2018-04-01	22.37	0.01
2018-04-02	22.99	0.02
2018-04-03	24.38	0.02
2018-04-04	24.31	0.02
2018-04-05	23.93	0.01
2018-04-06	24.17	0.02
2018-04-07	23.42	0.01
2018-04-08	23.93	0.01
2018-04-09	23.94	0.01
2018-04-10	23.6	0.01
2018-04-11	23.18	0.01
2018-04-12	23.46	0.01
2018-04-13	23.55	0.01
2018-04-14	24.48	0.01
2018-04-15	23.99	0.01
2018-04-16	23.82	0.01

Sample Value of Cement Plant

Parameter	NO	SO2
Unit	mg/Nm3	mg/Nm3
Limit	0.00 - 0.00	0.00 - 0.00
01/04/2018 00:00	419.03	1200
02/04/2018 00:00	418.83	1200
03/04/2018 00:00	379.2	1200
04/04/2018 00:00	416	1200
05/04/2018 00:00	415.54	1200
06/04/2018 00:00	430.32	1200
07/04/2018 00:00	423.41	1200
08/04/2018 00:00	414.84	1200
09/04/2018 00:00	396.91	1200
10/04/2018 00:00	413.09	1200
11/04/2018 00:00	402.82	1200
12/04/2018 00:00	414.77	1200
13/04/2018 00:00	419.15	1200
14/04/2018 00:00	405.99	1200
15/04/2018 00:00	407.78	1200
16/04/2018 00:00	408.64	1200
17/04/2018 00:00	372.62	1200
18/04/2018 00:00	277.61	1200
19/04/2018 00:00	283.33	1200
20/04/2018 00:00	274.47	1200
21/04/2018 00:00	284.75	1200

There are two approaches for calibration

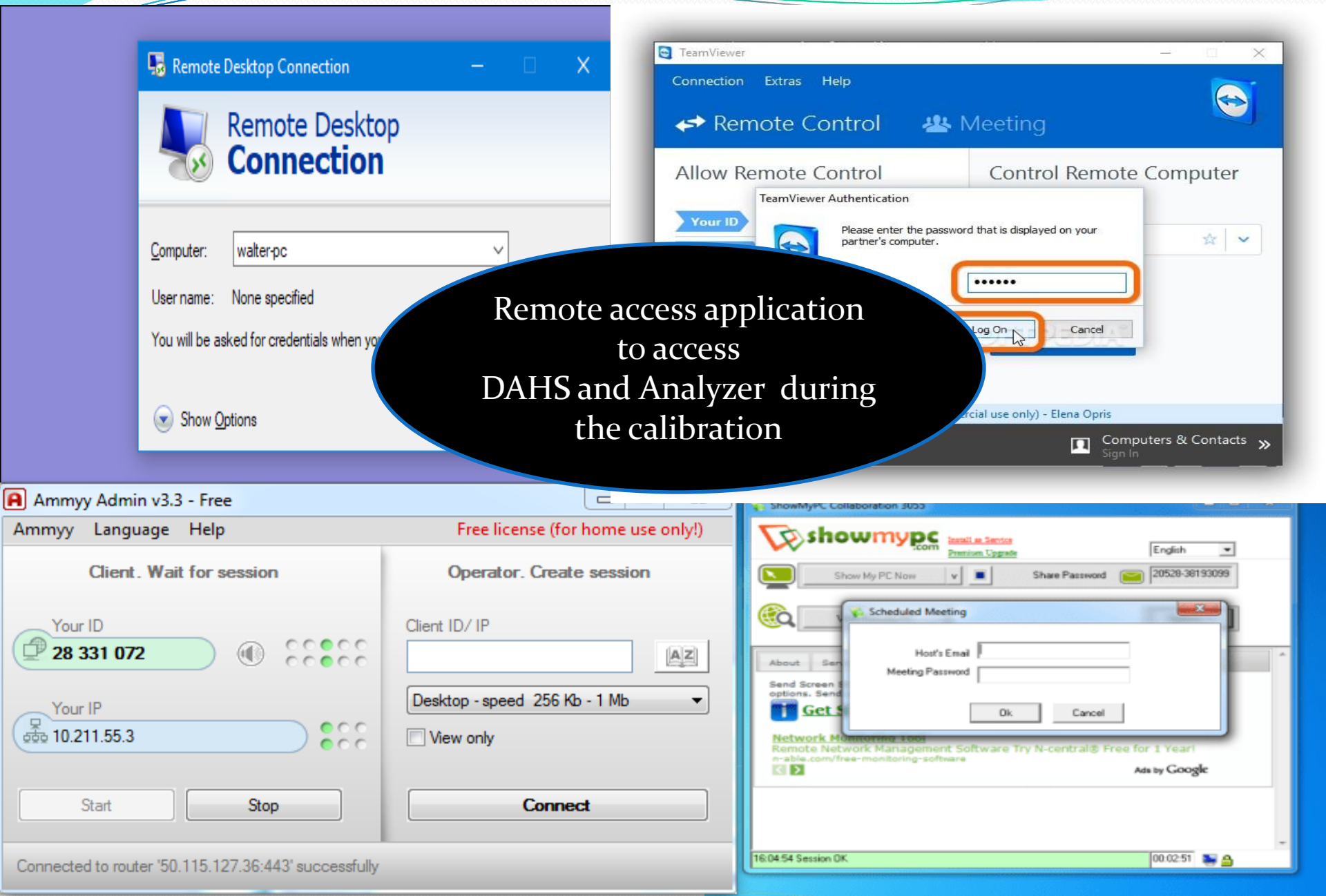
- Server based
- Cloud based.

Server based Process

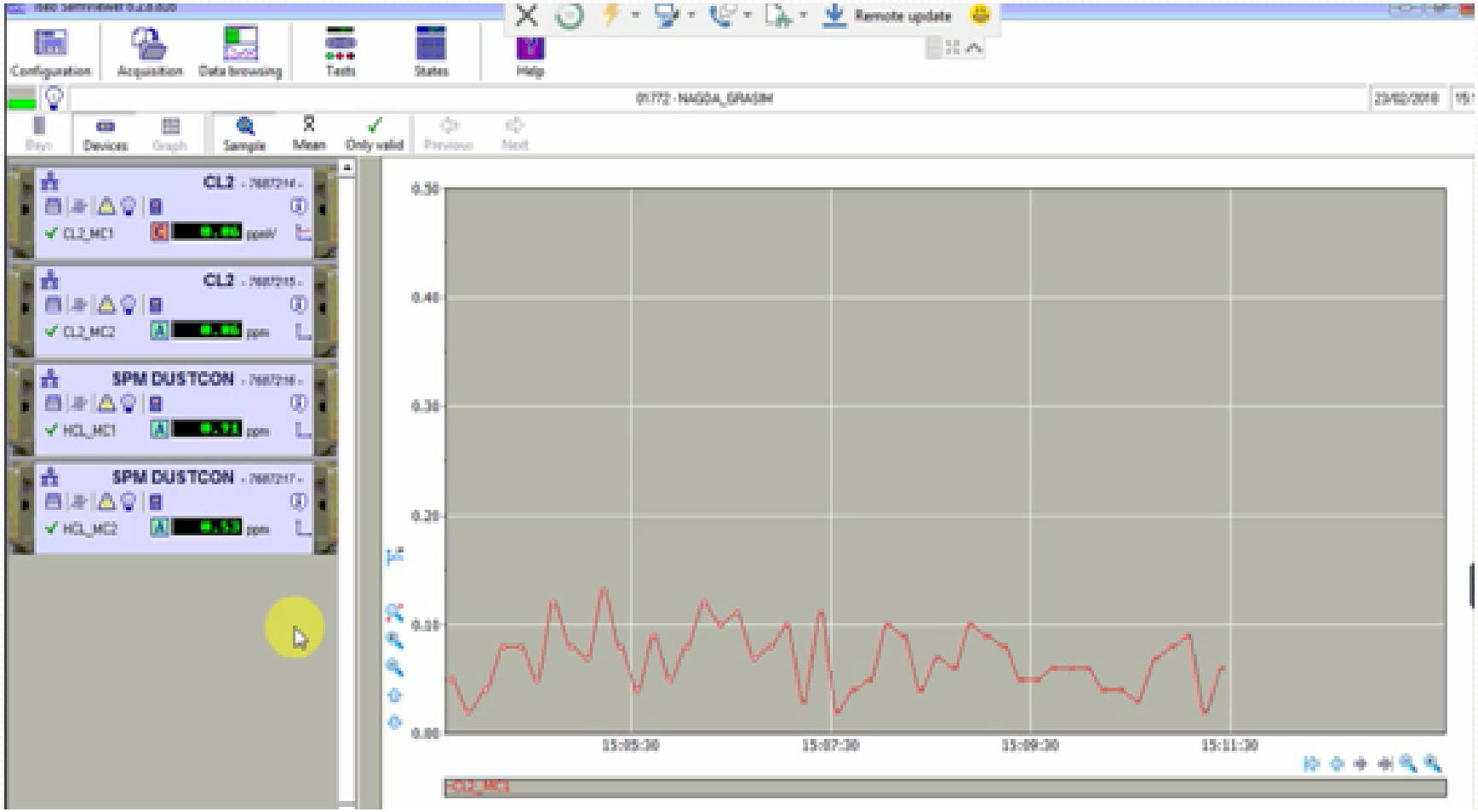
- In this process the command is given from server system to DAH system at industry end which in turn gives command to the analyzer for calibration. Prior to calibration entire course is defined to the server. To eliminate any possible chance of tampering with monitoring data, DAHS and analysers are also logged-in remotely from the server to watch the entire sequence and activity going at distant locations. This allows to view all the three screens at one place simultaneously and puts a check on any possible manipulation of data at any point

Tools Required

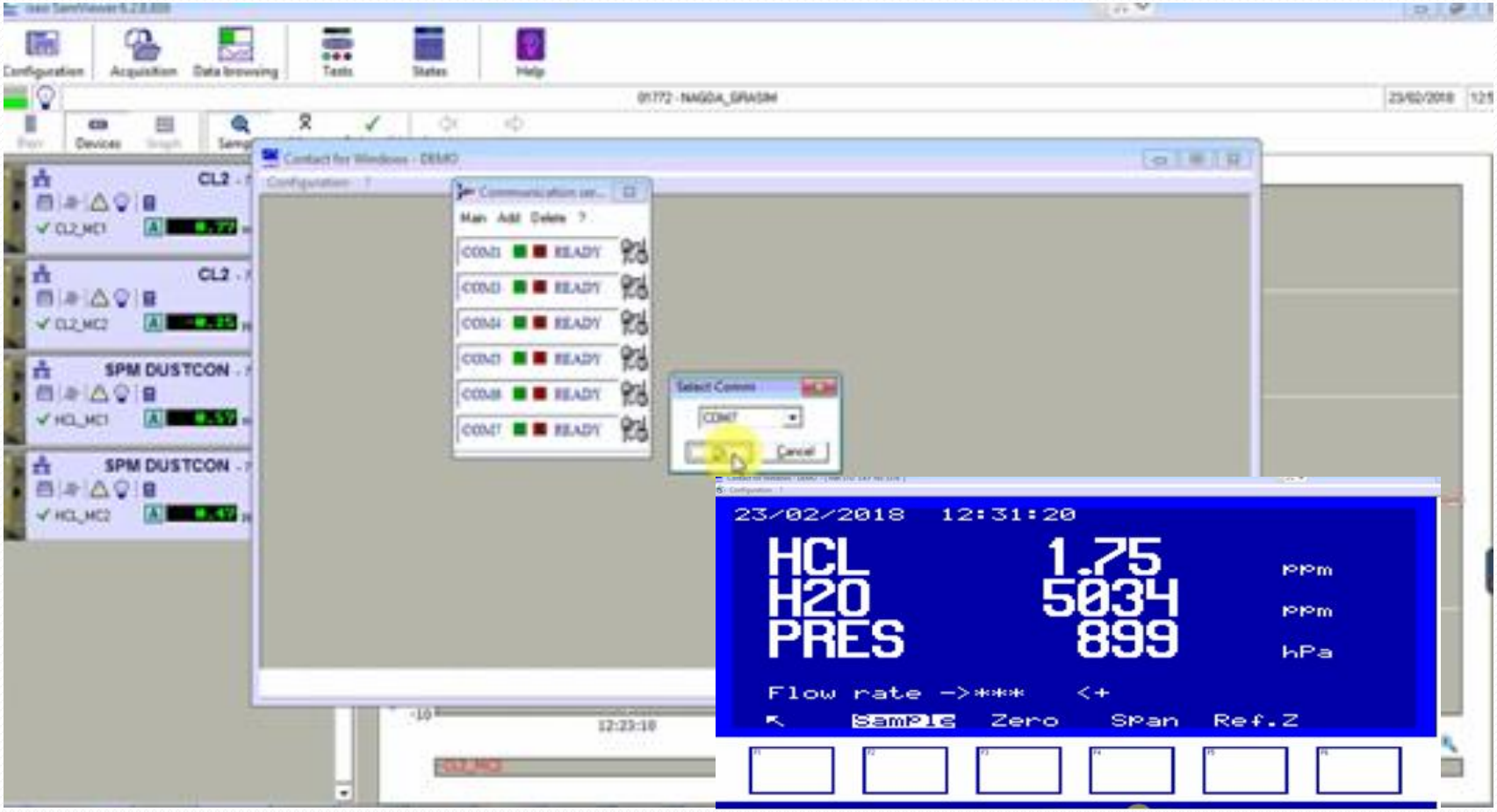
- Remote Access Application such as(Remote Desktop, Skype,Teamviewer, Ammy Admin etc.)
- Screen Recorder
- Snapshot of the RTM Site
- Verify the network architecture


Remote Desktop Connection
Remote Desktop Connection
Computer: walter-pc
User name: None specified
You will be asked for credentials when yo
Show Options
TeamViewer
Connection Extras Help
Remote Control
Meeting
Allow Remote Control
Control Remote Computer
Your ID
TeamViewer Authentication
Please enter the password that is displayed on your partner's computer.
Log On
Cancel
Computers & Contacts
Sign In
Remote access application to access DAHS and Analyzer during the calibration
Ammyy Admin v3.3 - Free
Ammyy Language Help
Free license (for home use only!)
Client. Wait for session
Operator. Create session
Your ID
28 331 072
Your IP
10.211.55.3
Client ID/ IP
Desktop - speed 256 Kb - 1 Mb
View only
Start
Stop
Connect
Connected to router '50.115.127.36:443' successfully
showmypc
Scheduled Meeting
Host's Email
Meeting Password
Ok
Cancel
Share Password
20528-38193099
Network Monitoring Tool
Remote Network Management Software Try N-central® Free for 1 Year!
Ads by Google
16:04:54 Session OK
00:02:51

Remote access to DAHS



Remote access to both Analyzer and DAHS



Back to diagram

Back

Screen Recorder
Record the event of remote calibration to review the process and store for training and records

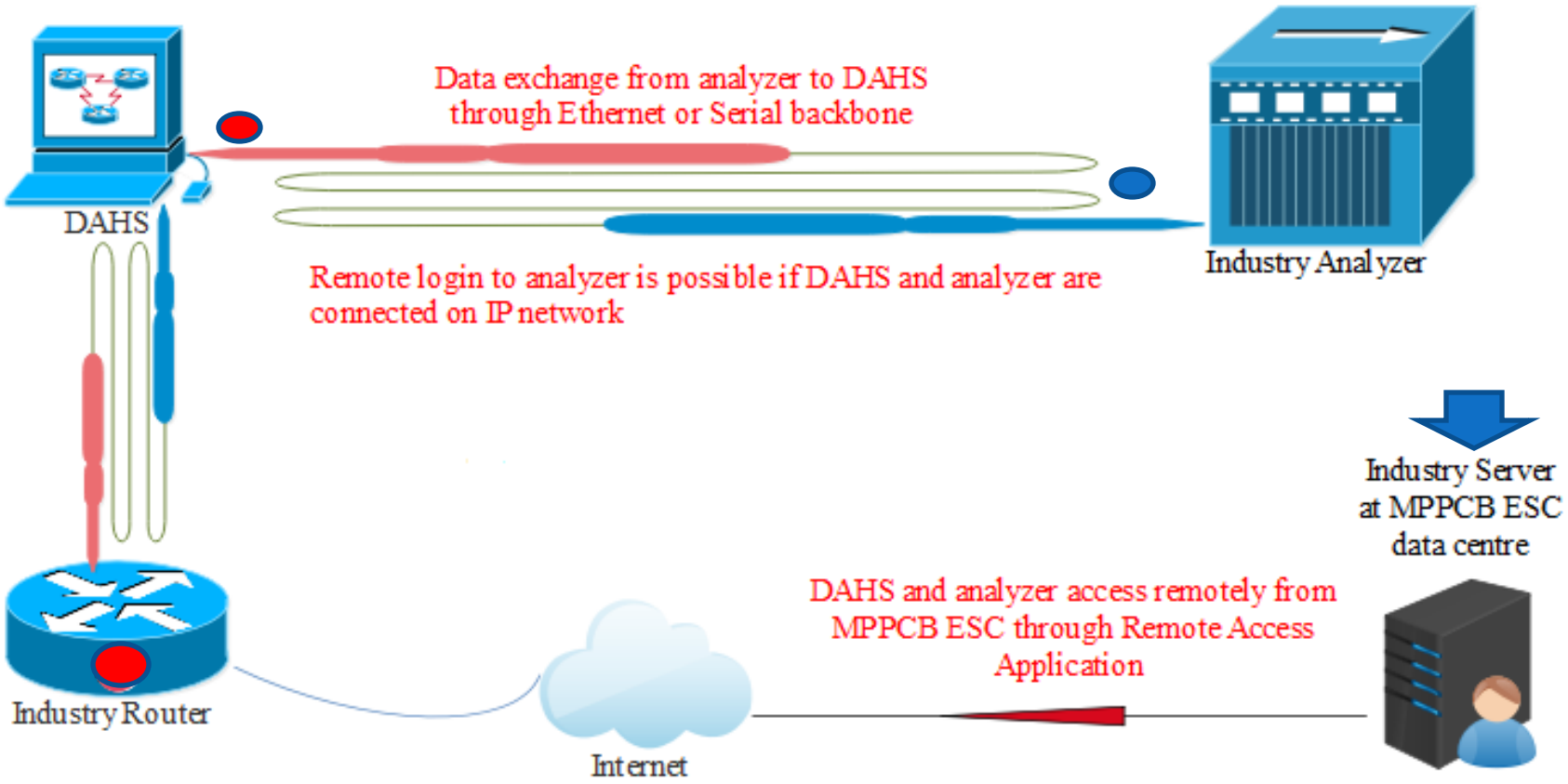
Back

Snap Shot of the RTM Site to verify the activity

Back

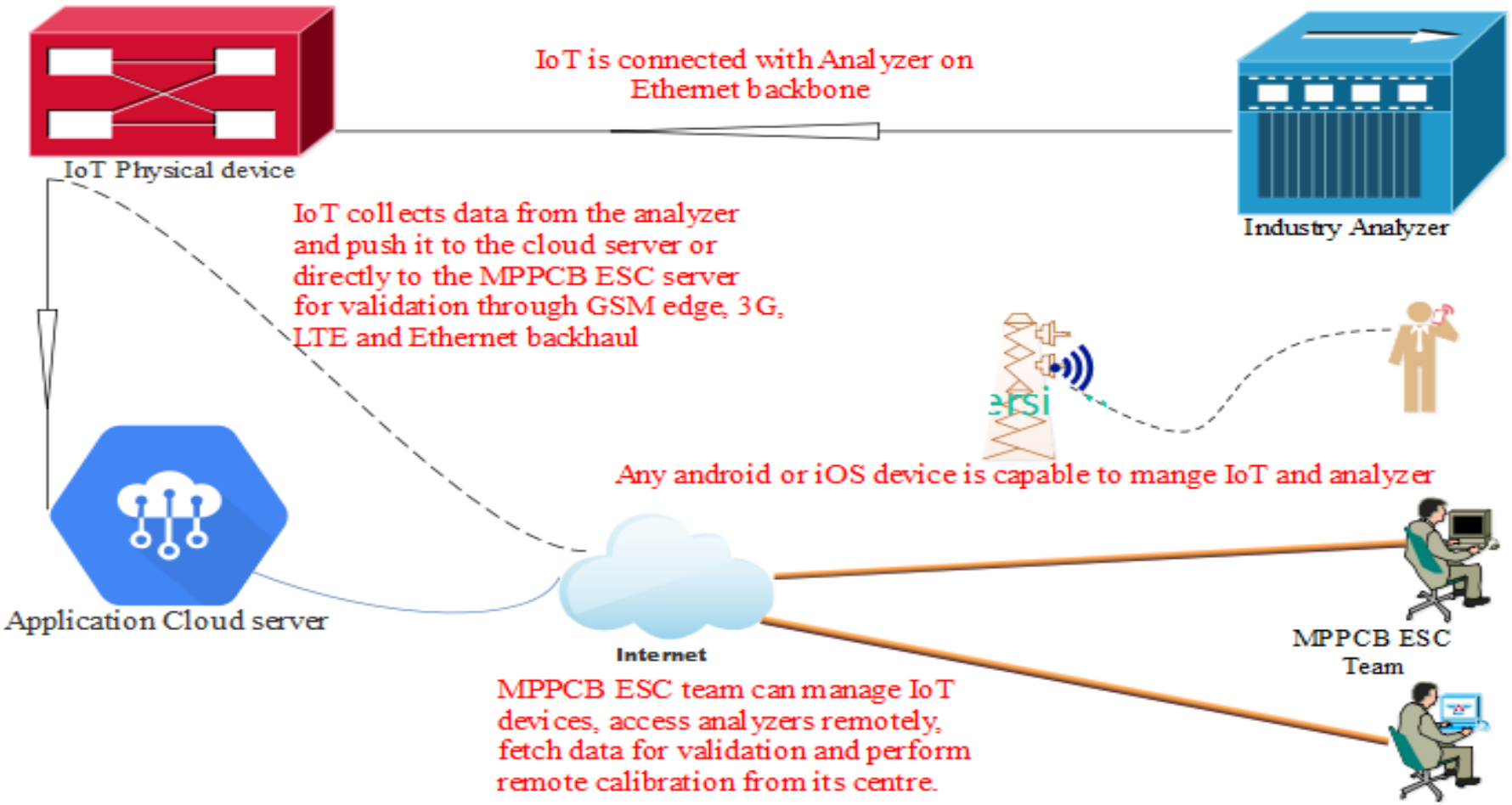
Present feasible Architecture for RTM

(Architecture to be followed by Industry)



IoT Based Network Solution

Which allows direct remote access and controls over analyzer across existing network infrastructure. It can be used to connect and exchange the data.

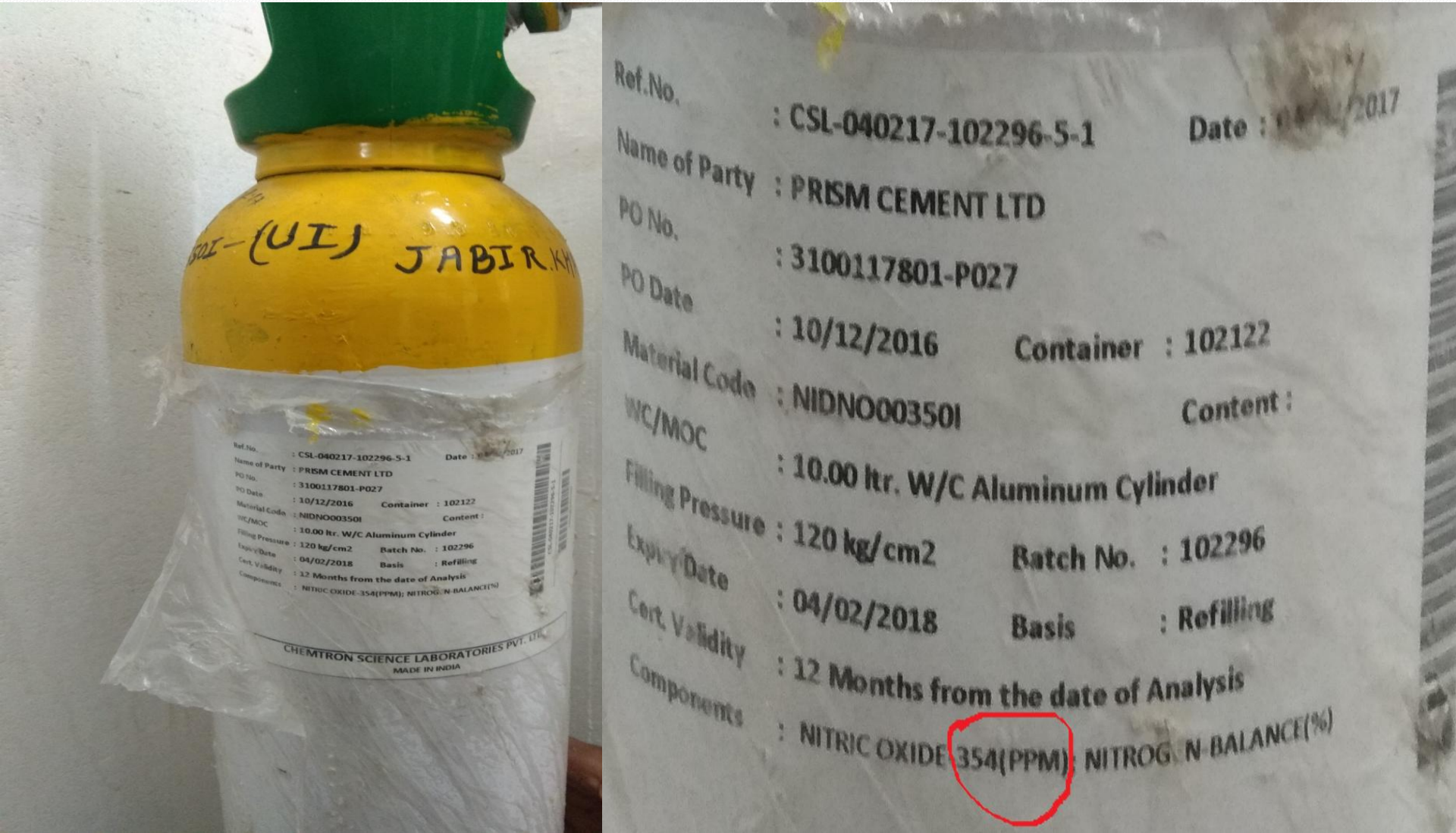


Important checkpoints before executing command

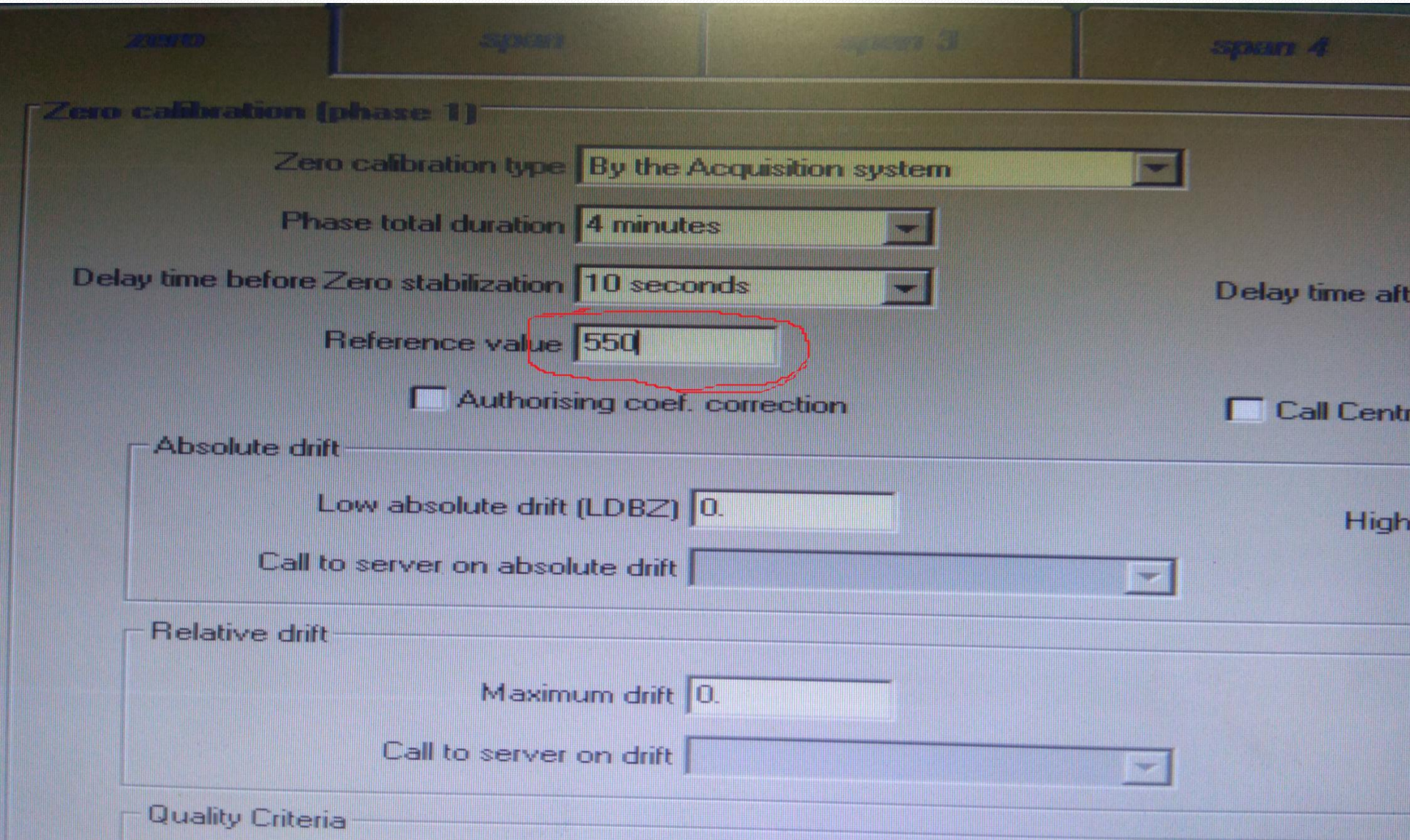
- To observe actual concentration value of the Cylinder and the input given in command server
- Unit Acquisition
- Date and Time
- Remote Calibration Time duration
- DAHS Login and Analyzer login

Actual Concentration value of the Cylinder and input given in command server

Cylinder Concentration is 354 PPM



We have given Concentration value is 550 PPM

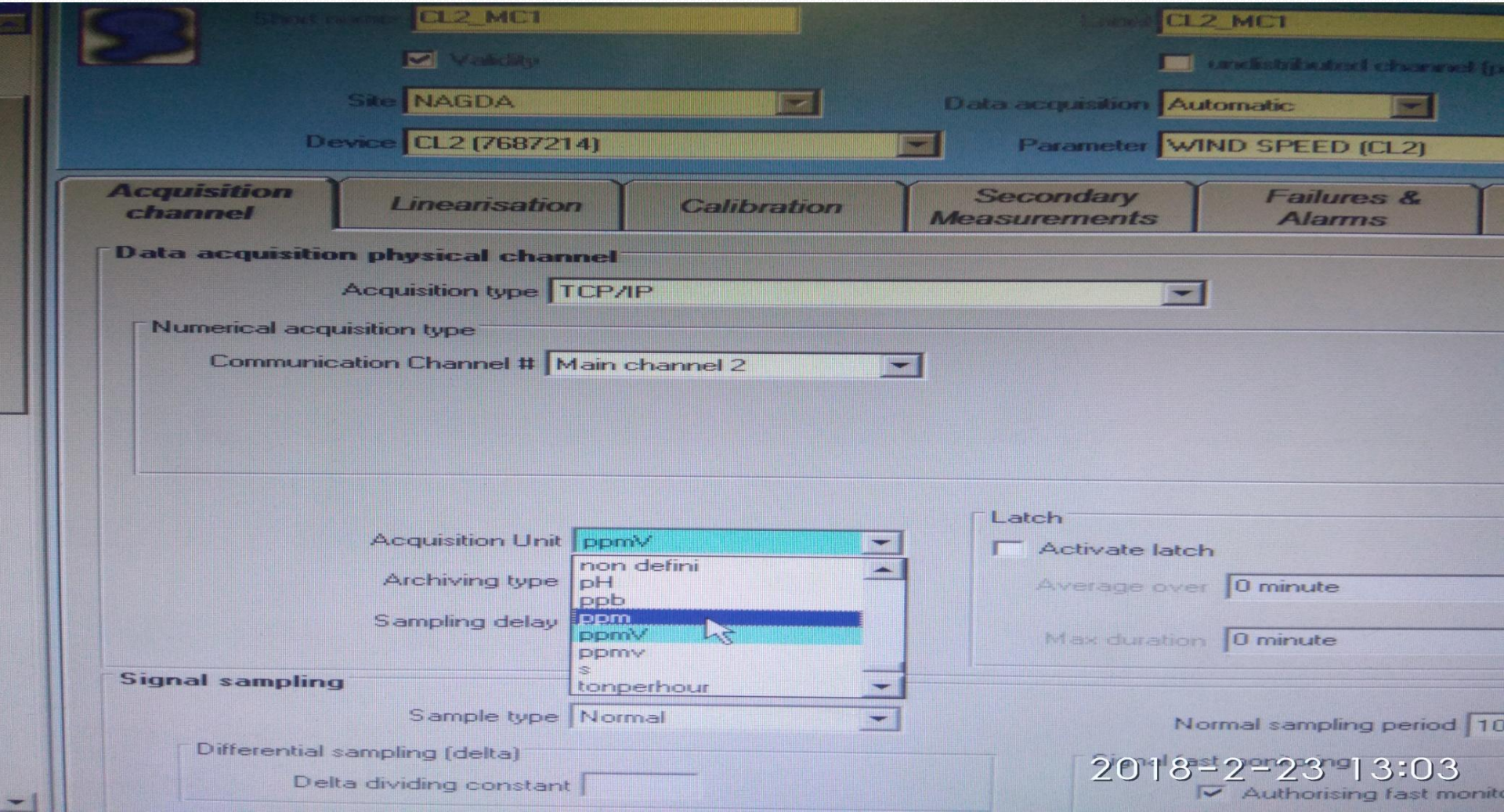


This is to observe that the concentration value of span gas was 350 PPM, whereas input given was bit higher, it actually helps to verify that analyzer is actually sensing the input sample and is not influenced/governed by the values set in the server. Any deviation, +/- 2% from the actual concentration, attracts attention and warns for necessary corrective measures.

Important checkpoints before executing command

- Actual Concentration value of the Cylinder and what is your input in command server
- Date and Time Unit Acquisition
- Remote Calibration Time duration
- DAHS Login and Analyzer login

Please make sure the unit acquisition would be same as analyzer UNIT

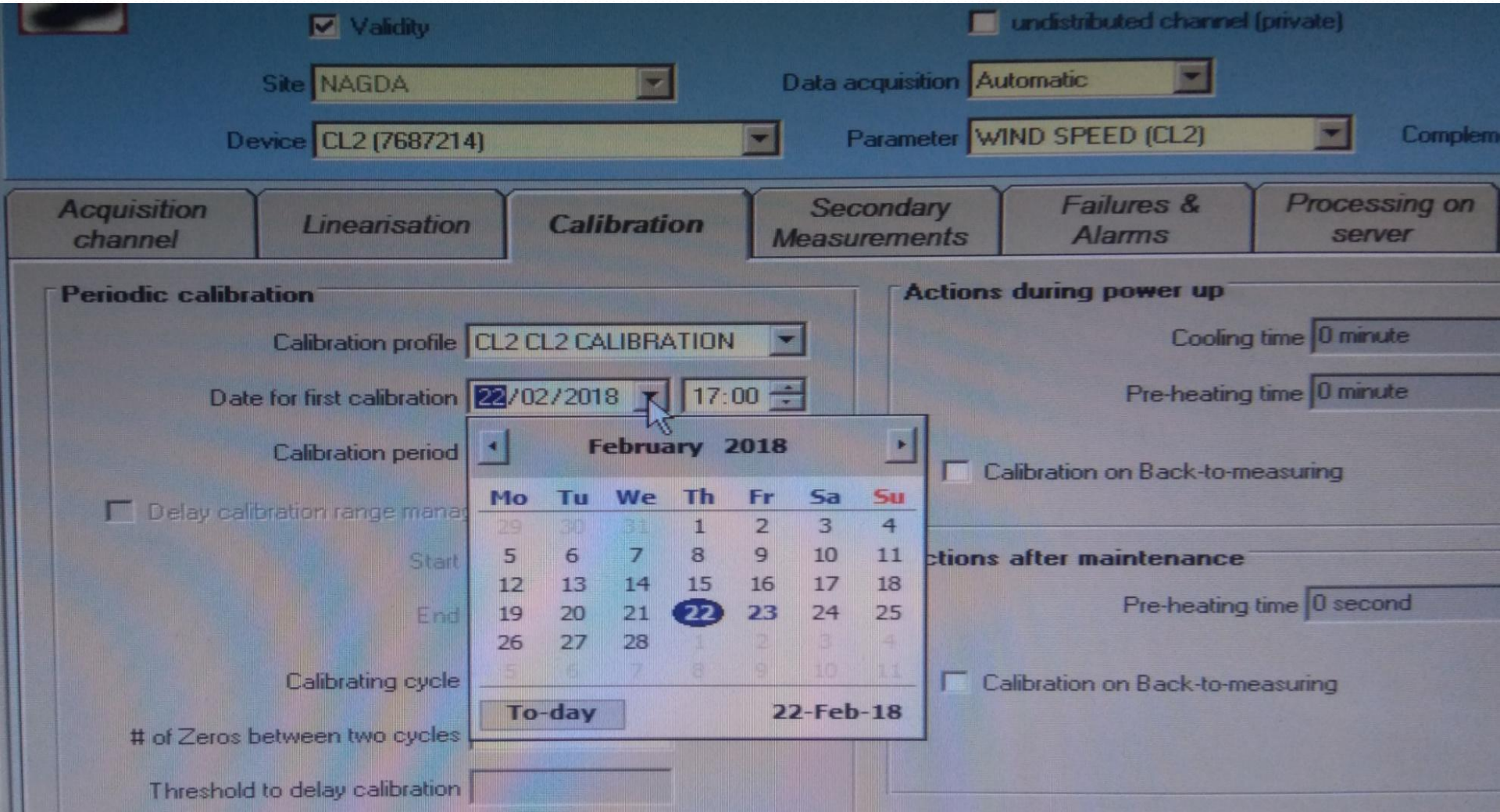


Before execution of command following points to be taken care

- Actual Concentration value of the Cylinder and what is your input in command server
- Unit Acquisition
- Remote Calibration Time duration
- DAHS Login and Analyzer login

Date and Time

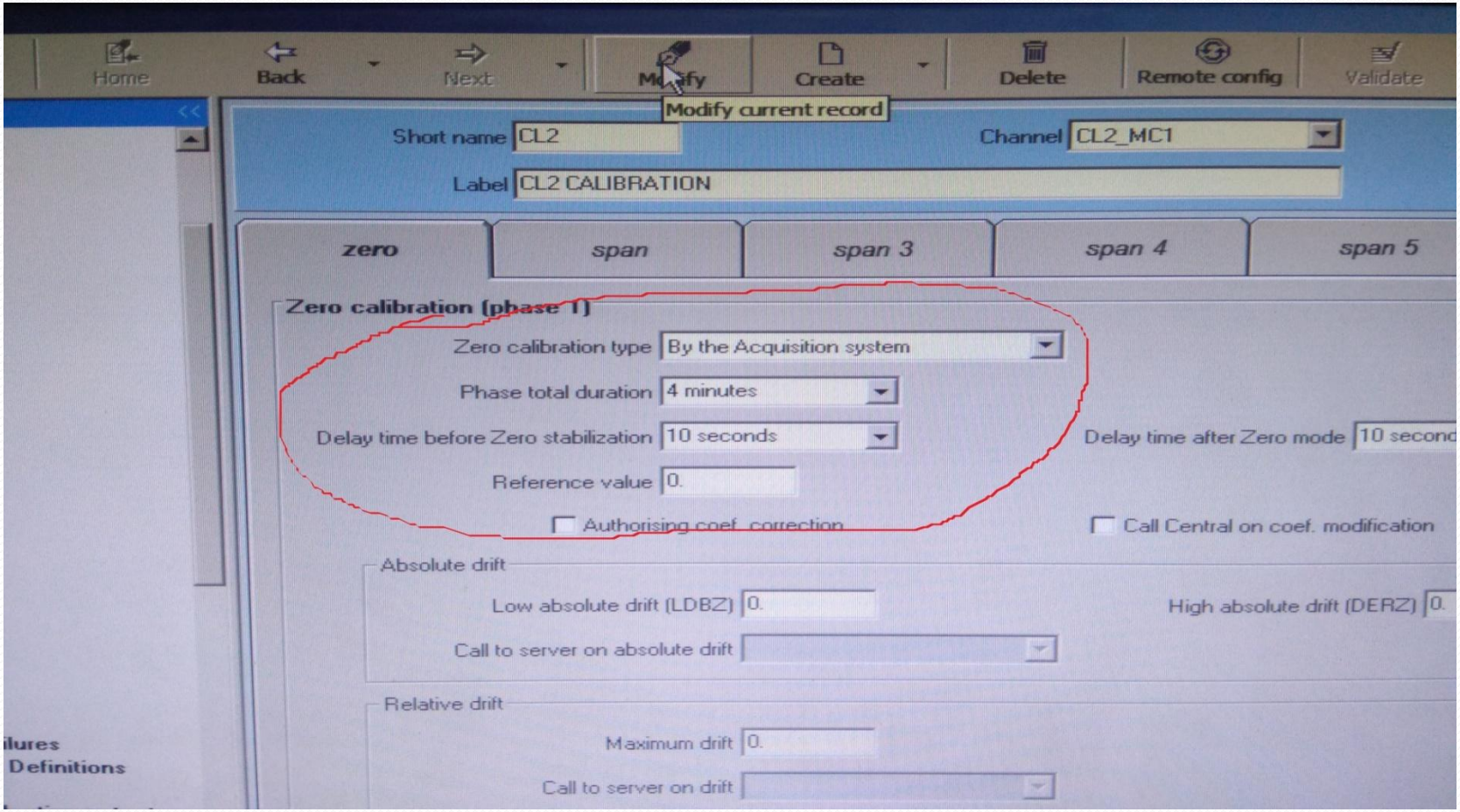
Analyzer date and time and command server time should be same



Important checkpoints before executing command

- Actual Concentration value of the Cylinder and what is your input in command server
- Unit Acquisition **Remote Calibration Time duration**
- Date and Time
- DAHS Login and Analyzer login

Select the time phase of the each calibration

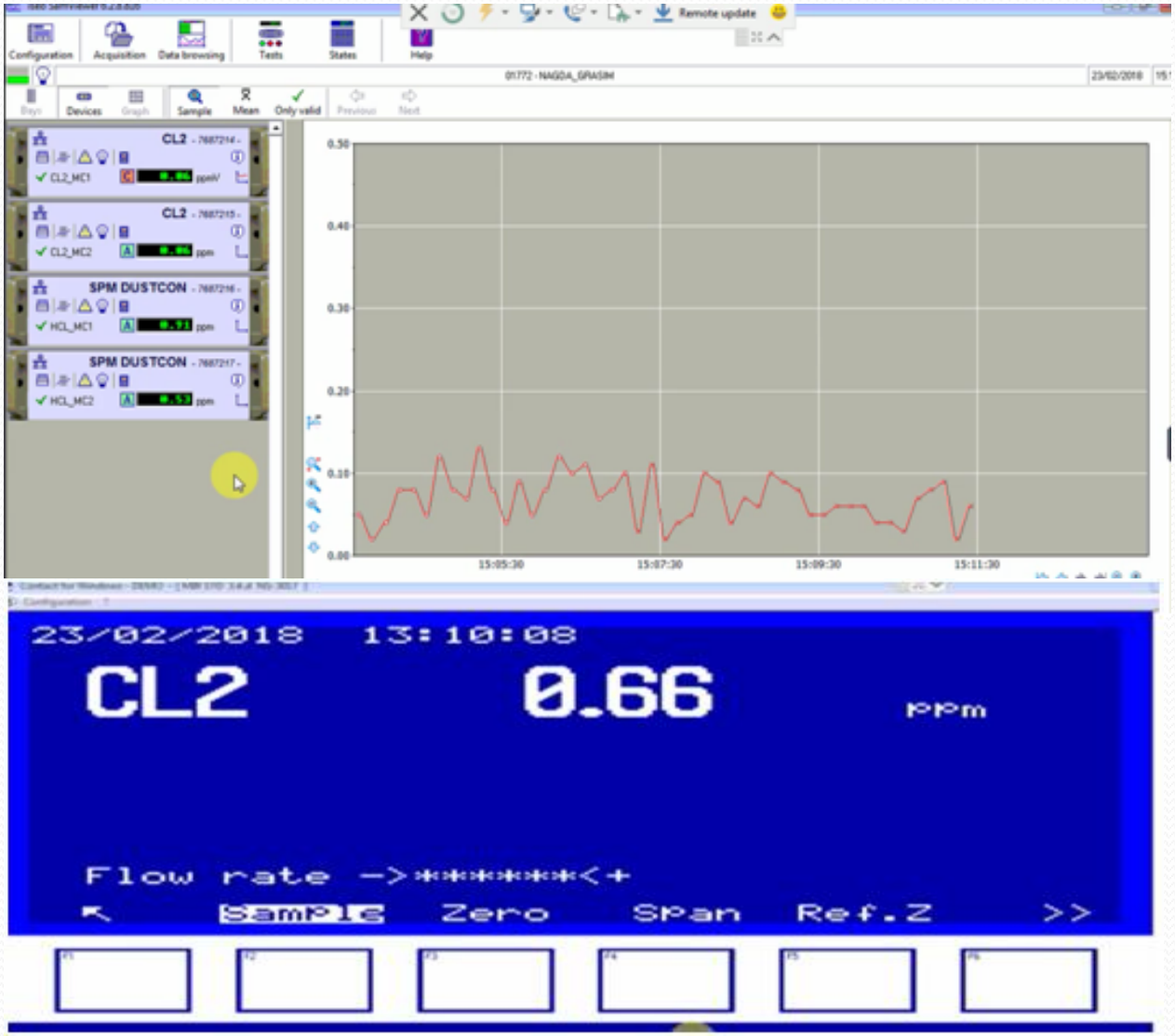


Important checkpoints before executing command

- Actual Concentration value of the Cylinder and what is your input in command server
- Unit Acquisition
- Date and Time
- Remote Calibration Time duration

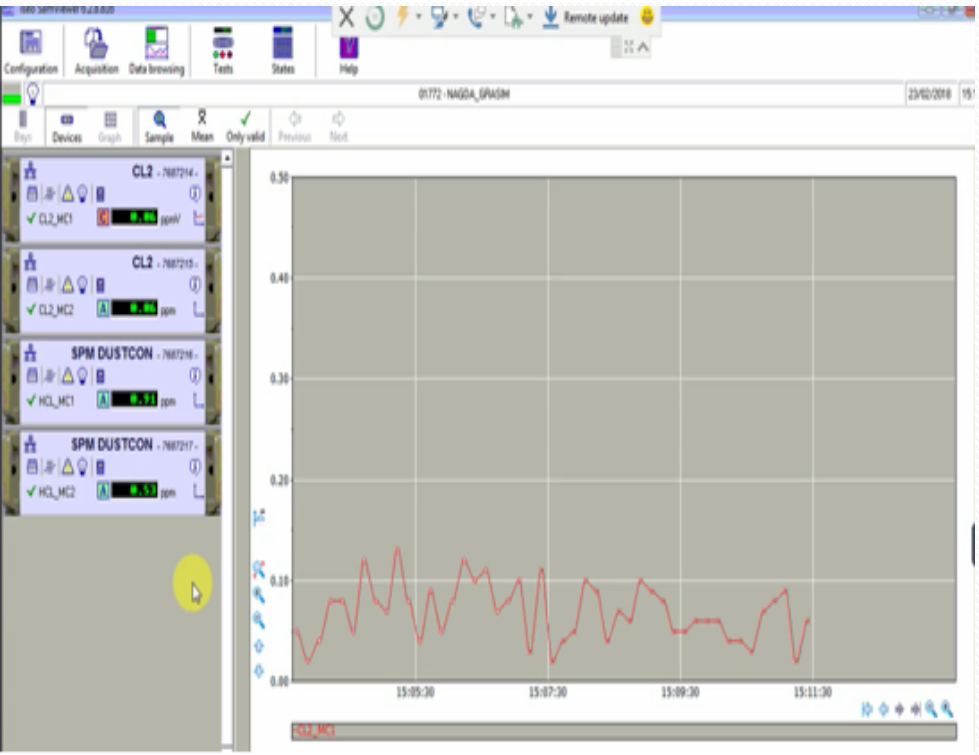
DAHS Login and Analyzer login

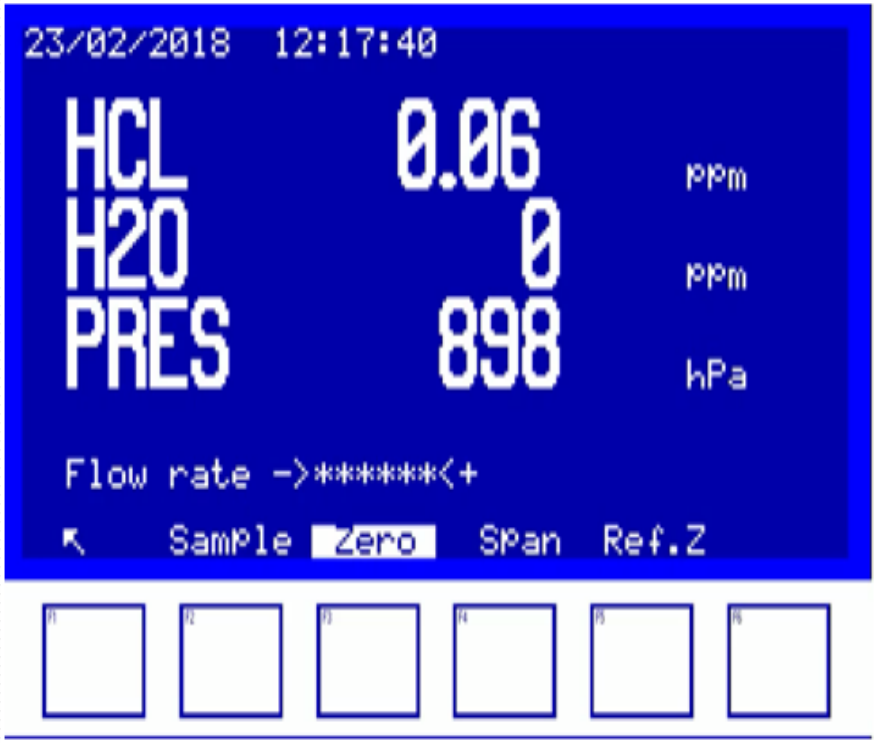
DAHS and Analyzer should be login remotely, through out the process



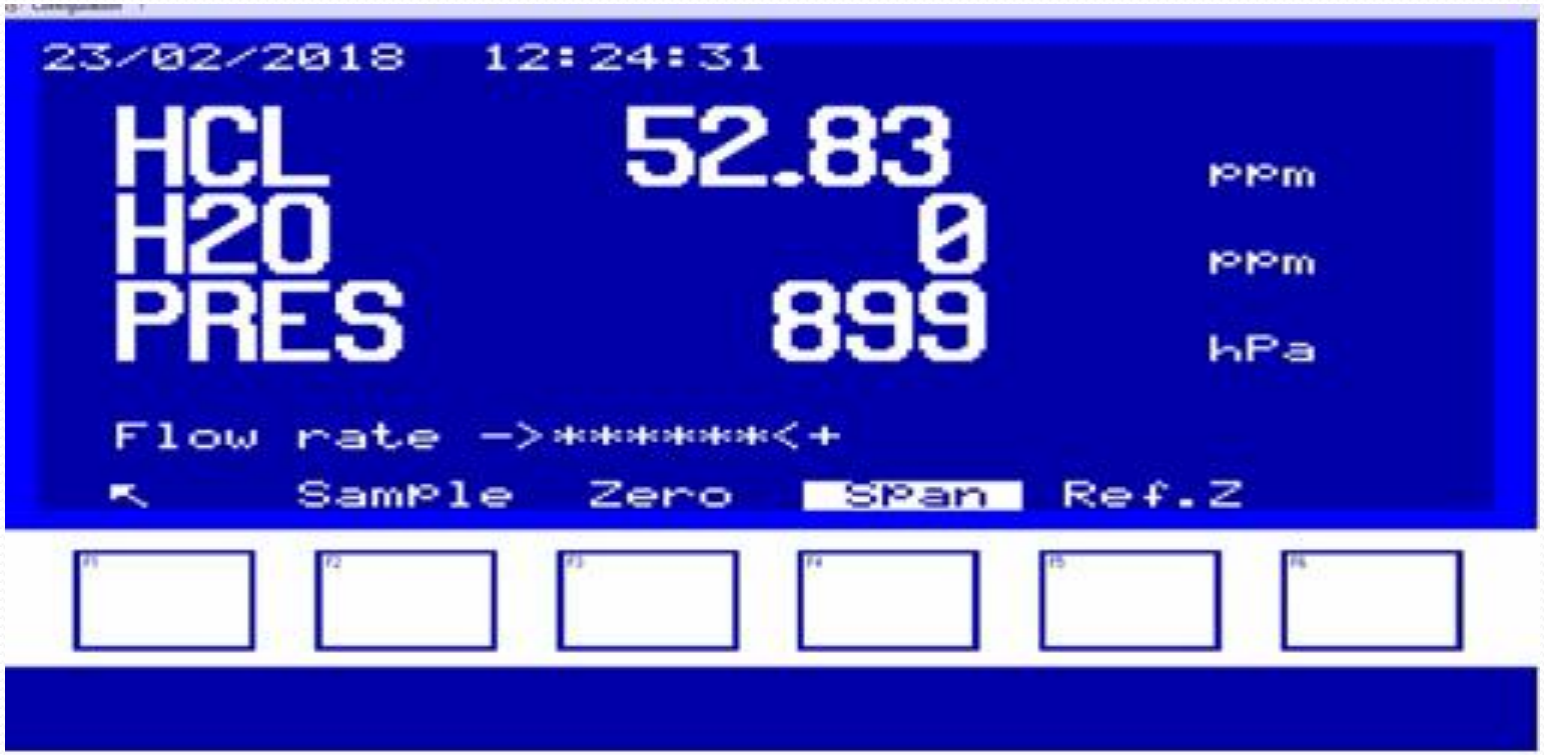
- Remote Calibration process is completed in three steps (Zero, SPAN and Sample)
- command for all the steps is given in single instance from the server

The process involves Sample run, Zero Calibration and Span Calibration followed again by Sample run. For zero cal the command is given from server end which is executed by DAHS at the remote end.





During Span calibration a known concentration of certified gas is passed through the system and the obtained value is compared with the span gas concentration to check the drift if it is within permissible range or not



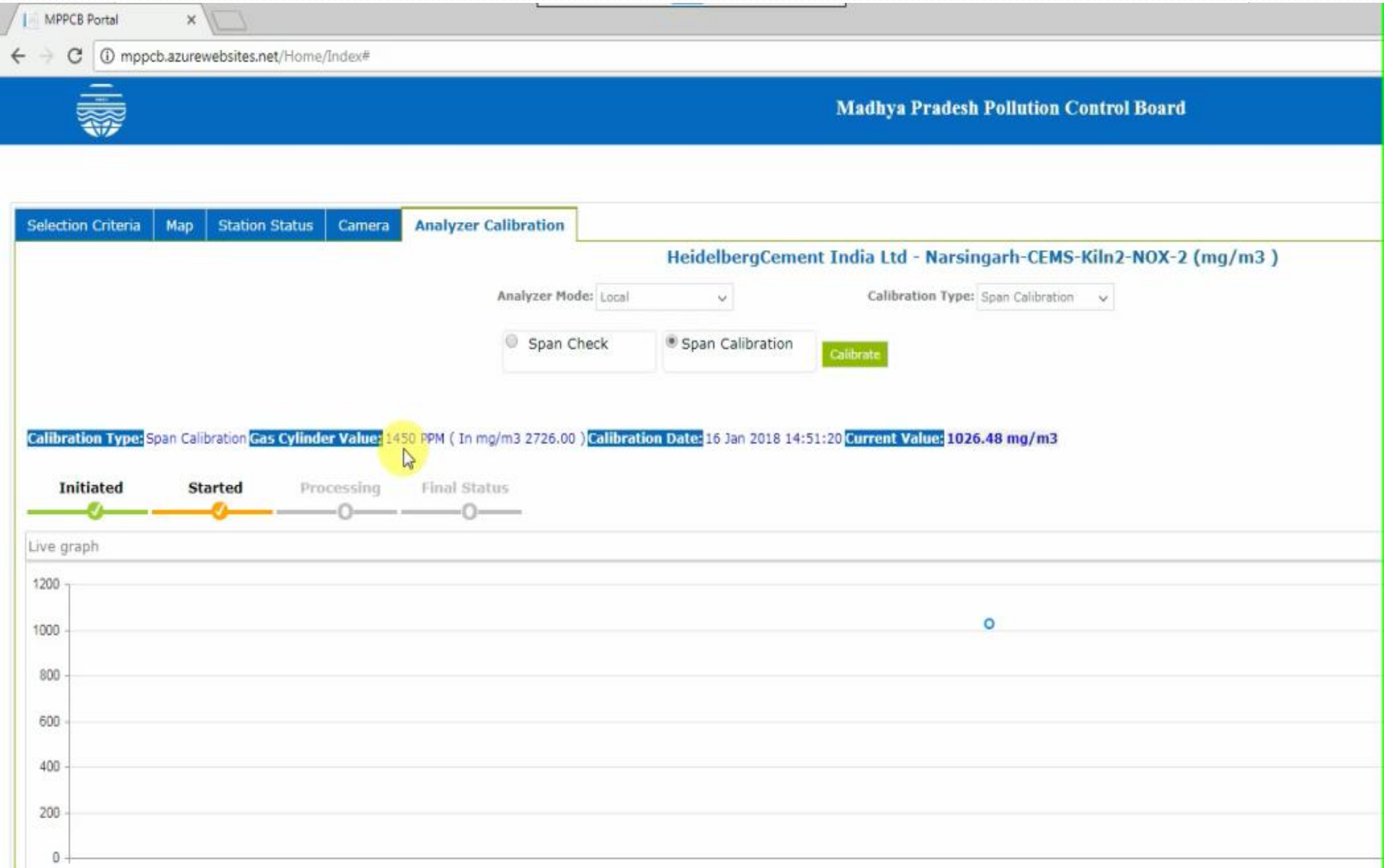
As soon as the span calibration is over the analyzer starts taking sample automatically from the source. After stabilization the parameter concentration displayed on the screen is compared with the concentration observed before the calibration process.

Back

Cloud Process for Calibration

- The Cloud based method of remote calibration seems to be very convenient and can be performed from any desk, but owing to few fatal flaws, which are avoidable, it is less acceptable.

- In this system the Cloud has its own database server to take data from DAHS at industry end and execute it on portal. While placing command to the analyzer for calibration the command goes to analyzer via cloud database and DAHS. The strange part is that, unlike in server based method, the command execution process can not be viewed as the entire process goes at backhand on the portal. The calibration parameters like span gas value, calibration time etc are also pre-assigned by the service provider and can not be changed at the time of calibration raising doubt on the integrity of the method. It is also not possible in the existing cloud based calibration method to ascertain whether command is going to the CEMS analyzer or not nor there is provision to see the analyzer behavior and its response during the process. This is shown sequentially as follows through screen-shots of actual remote calibration :


MPPCB Portal
mppcb.azurewebsites.net/Home/Index#
Madhya Pradesh Pollution Control Board
Selection Criteria
Map
Station Status
Camera
Analyzer Calibration
HeidelbergCement India Ltd - Narsingarh-CEMS-Kiln2-NOX-2 (mg/m3)
Analyzer Mode: Local
Calibration Type: Span Calibration
Span Check
Span Calibration
Calibrate
Calibration Type: Span Calibration Gas Cylinder Value: 1450 PPM (In mg/m3 2726.00) Calibration Date: 16 Jan 2018 14:51:20 Current Value: 1026.48 mg/m3
Initiated
Started
Processing
Final Status
Live graph
1200
1000
800
600
400
200
0

- In nutshell the cloud based remote calibration process goes automatically as per pre-programmed track with no control or checks at regulators' end.

- Thus, the existing Cloud based remote calibration process, as shown above, can not be trusted for the reasons mentioned. A cloud based operations can be driven by a software without even accessing the analyser. For this, once the process of calibration is initiated, a pre definite structure in software database for each different parameter is followed sequentially with specific steps and time duration for calibration. The following sample table structure can perform Zero and Span calibration automatically :

CEMS Performance Evaluation
(Remote Calibration)

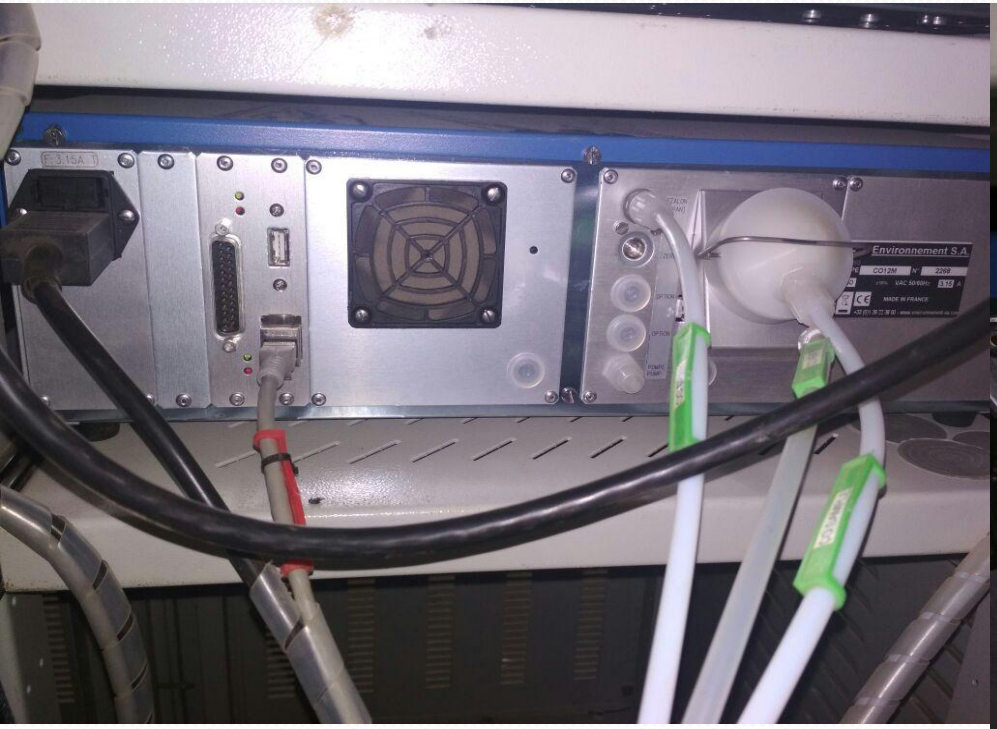
Emergency Response Centre
M.P. Pollution Control Board,
E-5, Sector, Paryawaran Parisar,
Arera Colony, Bhopal – 462 016
India

Phone : +91 755 2469 180
PBX : +91 755 2466191
FAX : +91 755 2469 180
E.mail : ercmppcb@nic.in
Web : www.erc.mp.gov.in

Connectivity on Serial Cable

Back

Connectivity on Ethernet Cable



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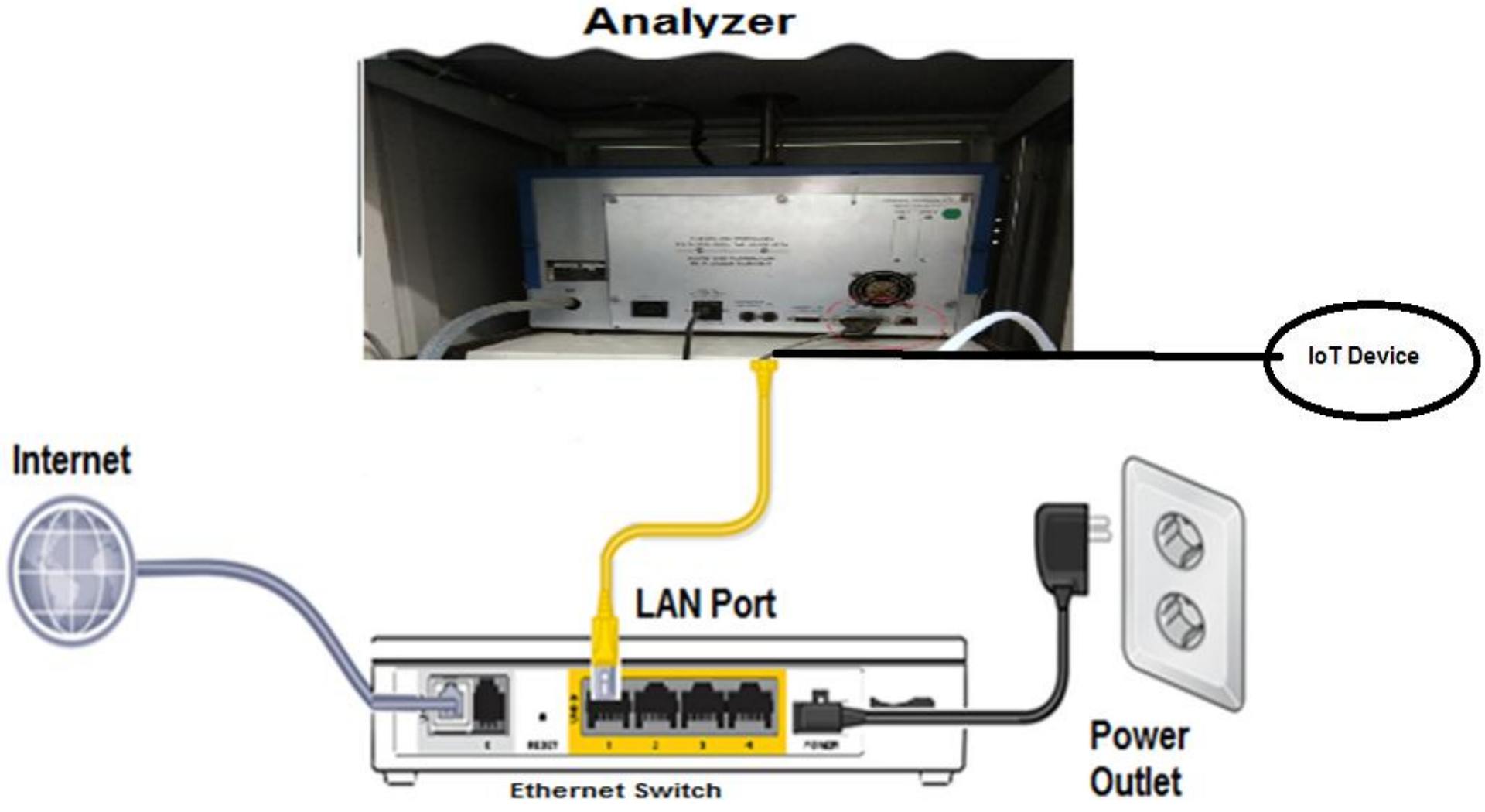
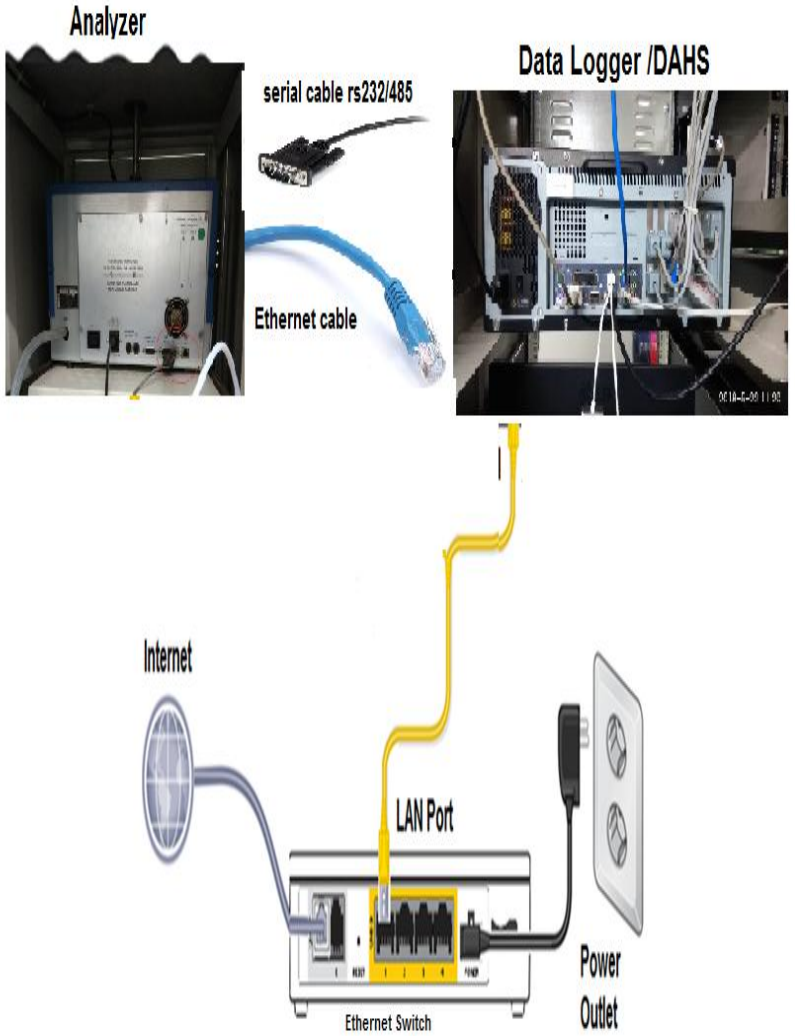
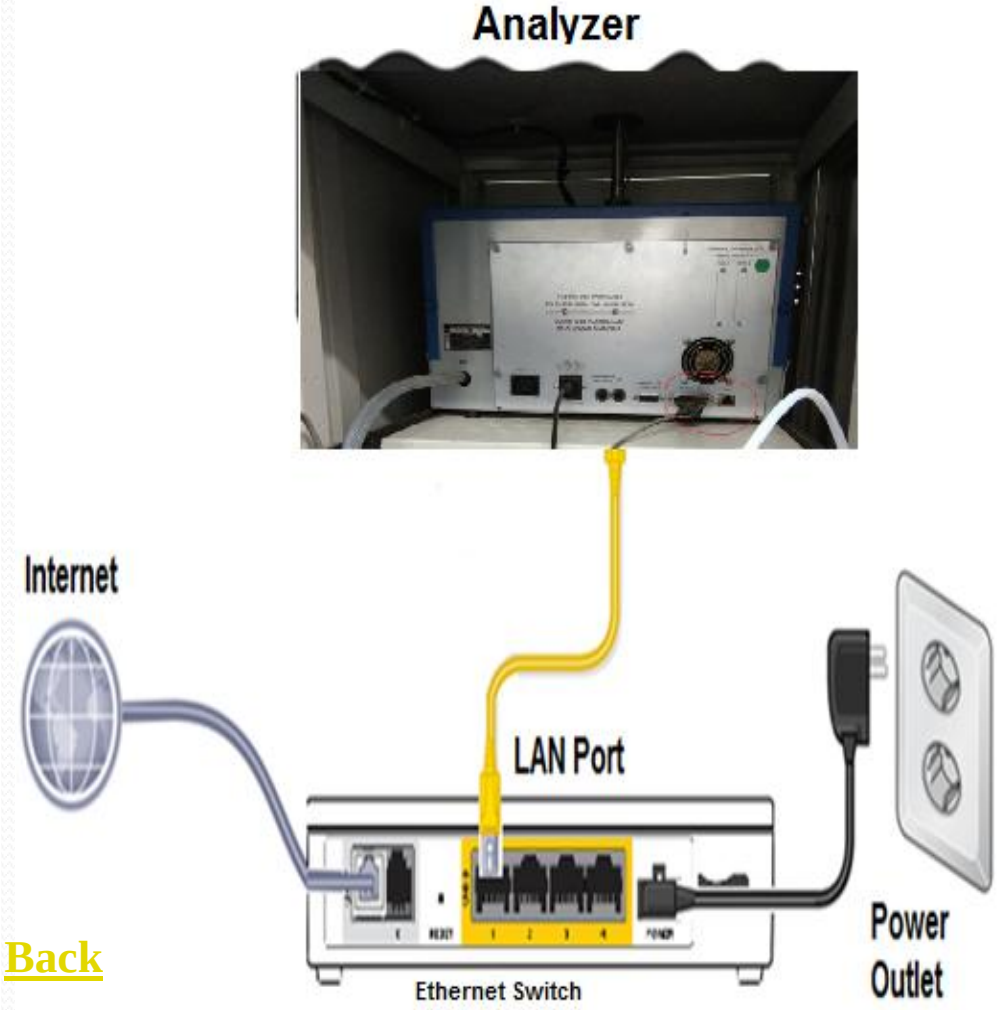
Proposed Architecture



Present v/s Proposed Architecture





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