



CSols
laboratory systems integration

Extending the Reach of LIMS
through Remote Data Collection

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Extending the Reach of LIMS through Remote Data Collection

EXECUTIVE SUMMARY

This White Paper discusses:

- Paper-based data collection: the problems and pitfalls
- Remote data collection: the possibilities and benefits
- CSols Remote Sampler System: realizing the vision

The CSols Remote Sampler System can help large organizations to extend the reach of their analytical data collection all the way to the point of sample collection, no matter how geographically remote it may be.

The system is designed to interface directly with LIMS and provides significant cost and efficiency benefits, while simultaneously improving both the accuracy and objectivity of the remote data collection process.

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INTRODUCTION

Companies across a wide variety of industries all around the world use Laboratory Information Management Systems (LIMS) to store their business critical laboratory data. Many analytical laboratories analyze materials that have been collected off-site, and as such, have processes that require the collection of data from environments outside the laboratory. Some analyses must be performed on-site wherever the sample is collected from because the test may be time-critical and this data is often just as important as laboratory data when it comes to quality and regulatory compliance. However, many companies who collect data from out in the field tolerate inefficient paper-based workflows that expose the process to wholly avoidable causes of error.

Mobile computing technology has progressed dramatically over recent years with a proliferation of powerful, affordable, tablet-based computers. It is now both technically feasible and cost-effective to extend the reach of your LIMS system to the point of sample collection by implementing a suitable mobile data-collection system.

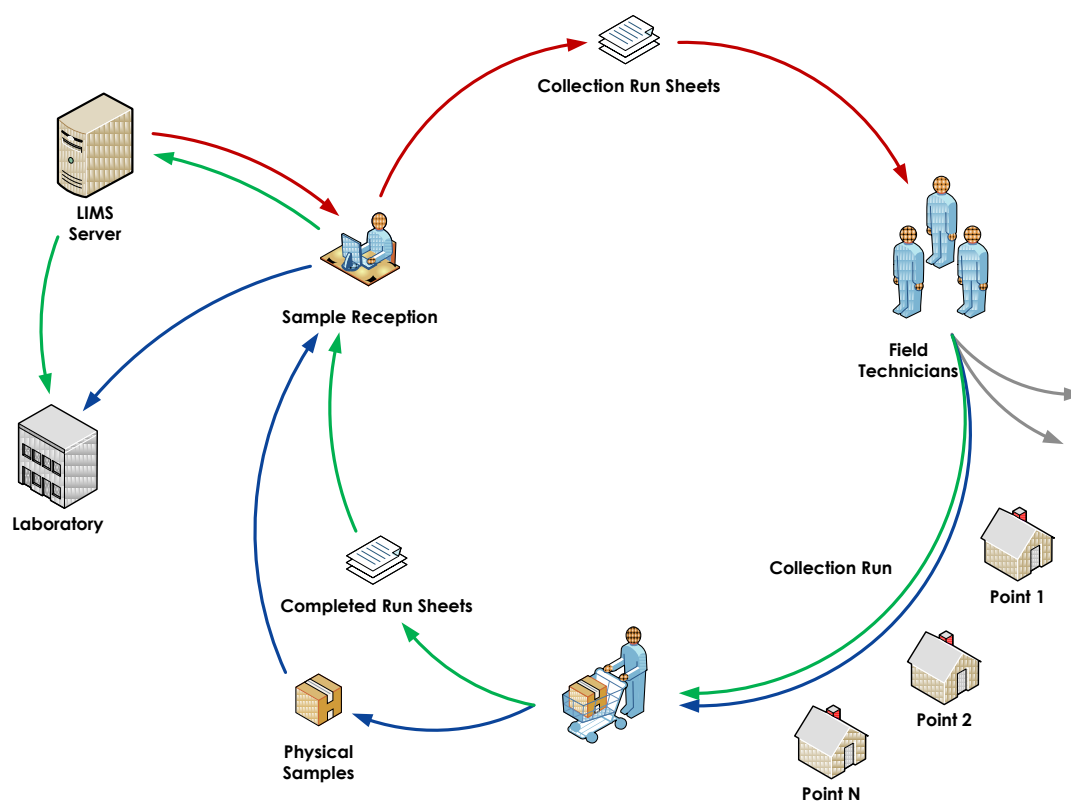
This White Paper discusses the problems such a system solves, the tremendous benefits that such a system can help an organization realize, and provides an introduction to the **CSols Remote Sampler** system that has been designed and built for this very purpose.



Paper-Based Workflows

Overview

The existing data-collection process used by many organizations relies on paper-based workflows completed by teams of field technicians. A typical example of this sort of process is shown in the diagram below.



In a traditional paper-based system, scheduled work for a team of field technicians is extracted from a LIMS in the form of printed sheets and assigned to the individuals in the sampling team. The sampling team then completes their separate sampling rounds for the day, each visiting a number of points while both collecting physical samples and recording on-site data. The samples are returned to the laboratory and the on-site data is then painstakingly transcribed manually into the LIMS. Often by a different person or team.

For many, this process or a close analog may seem very familiar. It is far from optimal when it comes to efficiency, cost and data quality. Paper-based systems can leave a host of problems in their wake and in their most serious forms, failure to comply with regulatory requirements or accredited methods can lead to significant fines or loss of accreditation.

Problems and Pitfalls with Paper



Quality

- Transcription errors arise from manually data entry to LIMS.
- Paper sheets may be lost or damaged.
- Bad handwriting and technician error affect data quality.



Regulatory Compliance

- Weak chain of custody for samples and data.
- Accredited methods may not always be followed on-site.
- Substantial data archival and retrieval burden.



Cost

- Dedicated resource required for entering data to LIMS.
- Manual route planning increases overall fleet mileage.
- Mistakes mean resamples that drive costs up.



Efficiency

- Manual data transcription unnecessarily duplicates effort.
- Badly planned sample collection routes reduce output.
- Retaking incorrectly taken samples impacts productivity.



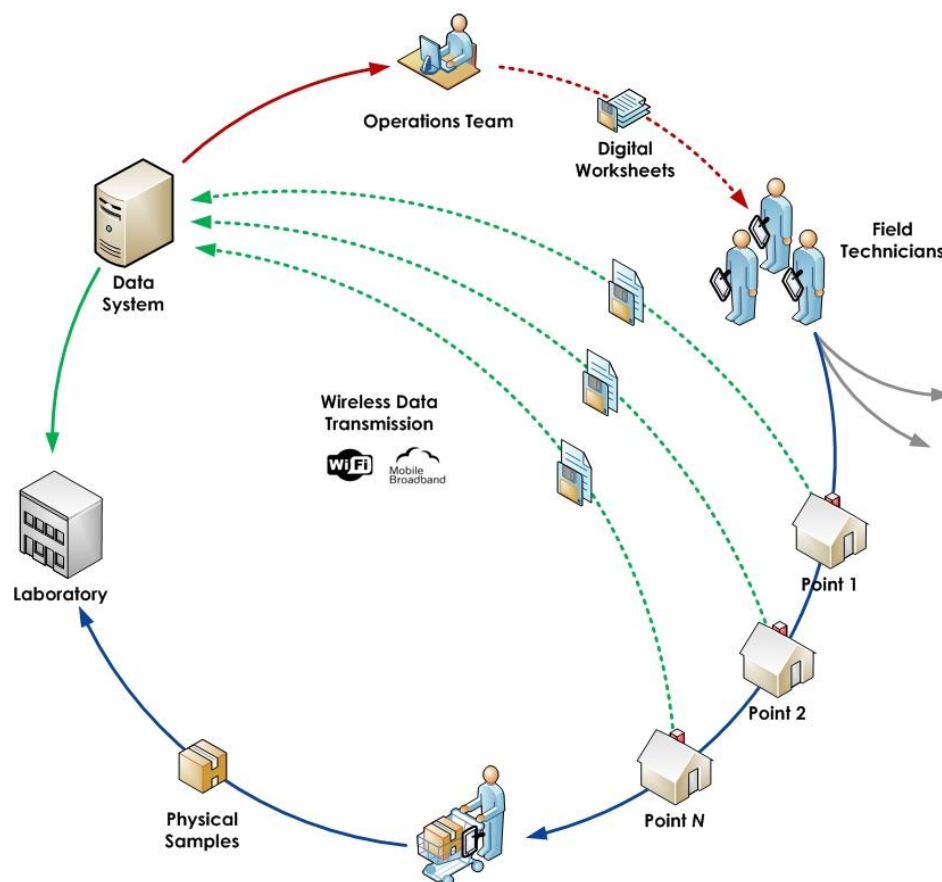
Flexibility

- New work must be handed out physically to the team.
- Work transferred between team-members requires them to physically meet.
- Unexpected scenarios are very hard to manage.

Remote Data Collection

The Digital Workflow

With a digital remote data collection system in place, each field technician is given a mobile device, this may be a phone or a tablet. In place of receiving physical paper copies of their day's work, a centralized operations team can wirelessly assign work to each of their devices regardless of where the technician may currently be.



Each technician can then perform their sample collection round, sending back the data from each sample point as soon as it is collected. Additional work can be assigned while the team is still out in the field and work can be flexibly reassigned in real-time. Problems can be identified at the time the data is entered onto the tablet before the field technician leaves the sample point reducing the likelihood of needing to resample the point later.

CSols Remote Sample



Overview

CSols Remote Sampler is a remote data collection system designed to address and overcome the problems associated with traditional paper-based sample collection processes. It allows businesses to securely and reliably extend the reach of their LIMS to the point of sample collection and maintain complete control over the quality and integrity of their critical data at all times.

How it Works



Operations Team

- Use desktop **Remote Sampler** on workstation
- Manage remote field team wirelessly
- Work assigned and approved
- Generate reports for internal use or external audit



Field Technicians

- Use **Remote Sampler** on mobile devices
- Sample data collected
- Accredited sampling methods followed
- Technician can work regardless of signal quality



LIMS

- Collected sample data updates LIMS wirelessly
- Existing LIMS reporting unaffected
- Seamless LIMS integration



Laboratory

- Data available in LIMS before physical samples arrive
- On-site results have been validated at point of entry
- AQC checks can be carried out on-site

The Benefits



Quality

- Transcription errors entirely eliminated.
- Data double-checked at the point of entry.
- Bad handwriting and technician error affect data quality.



Regulatory Compliance

- Full independent audit trail on the mobile device.
- Accredited methods and workflows can be configured.
- All historical data is stored and immediately available.



Cost

- No need for dedicated manual LIMS data entry.
- Automated route planning and guidance reduces overall fleet mileage.
- Minimise the potential for resamples.



Efficiency

- No more duplication of effort, data entered once only.
- Additional data can be captured on every sample.
- Fewer resamples reduces the overall workload.



Flexibility

- New work can be assigned wirelessly to users in the field.
- Work can be moved around the team easily.
- Unexpected scenarios are easily dealt with.



Quality

- Transcription errors entirely eliminated.
- Data double-checked at the point of entry.
- Bad handwriting and technician error affect data quality.

Field technicians will use the daily or weekly sampling runs downloaded to Remote Sampler mobile software running on their individual tablet devices, to guide them to each sampling location. A set of configurable screens based on the sampling standard operating procedures are used to prompt, in logical order, for relevant field measurements for each location and to record the sampling event. The wizard design and data entry and validation options ensure error free and simple entry in any weather conditions. An asynchronous communication design means that the software will still operate without any signal, so that field technicians can complete their work without interruption, at any location.





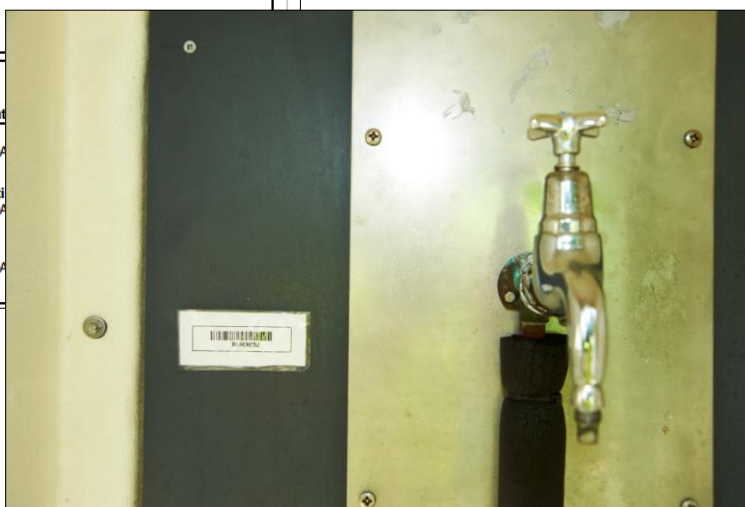
Regulatory Compliance

- Full independent audit trail on the mobile device.
- Accredited methods and workflows can be configured.
- All historical data is stored and immediately available.

Everything that is done on the mobile devices is captured and stored in a comprehensive audit trail as well as being transferred back to LIMS. Data includes all field entry, text comments, time/date stamps, GPS co-ordinates, signatures and photographs. Secondary workflows such as vehicle and fridge checks and instrument calibrations can also be configured to extend the custody trail.

A vertical audit report showing every detail of a sample can be generated at any time.

Comprehensive Sample Report			
Sample ID: 348044			
Sample Information			
Worklist Name	ROUND_O(Sampler for NWL Horsley _ Whittle Dene Area)_19		
Sample Description	Jul 12_1 07-10-2012 17-23-25		
Location Type	Horsley Final (Birney Hill SP)		
Sampling Start Time	TreatmentWorks		
Sampling End Time	07/10/2012 17:19:01		
Target Sample Location	07/10/2012 17:20:29		
Target Latitude	HORSLEY FINAL (BIRNEY HILL SP)		
Target Longitude	54.9848880012 ° N		
Actual Sample Location	-1.852655502 ° E		
Actual Latitude	HORSLEY FINAL (BIRNEY HILL SP)		
Actual Longitude	51.21201776 ° N		
Out of Service	-0.48623427 ° E		
No Access	False		
Sample Was Aborted	True		
Sample Abort Reason Code	No flow event		
Sample Bottles			
Bottle ID	Type	Scan Time	Lat
250ml disposable PET food grade. Purple Cap			
1326065	YAQ	N/A	N/A
N/A			
350ml Plastic disposable (pre-sterilised) bottle. Basic bacteriological			
1326064	YBN	N/A	N/A
N/A			
500ml Disposable PET food grade. Blue cap			
1326066	YPH	N/A	N/A
N/A			



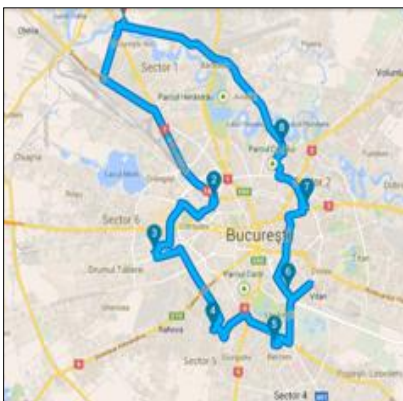


Cost

- No need for dedicated manual LIMS data entry.
- Automated route planning and guidance reduces overall fleet mileage.
- Minimise the potential for resamples.

As Remote Sampler takes care of all sample registration electronically, there is no need for a primary bottle scan, nor manual entry of all field measurements. Samples can be routed directly to individual laboratory sections saving a significant amount of valuable laboratory time and resources.

Area	Num
✗ Belford High nu109342	
✗ Blakelaw Road	
✗ Elford nu188312	
✗ Glorum nu169335	
✗ Harlaw Hill SR Combined	
✗ Stoneyhills nu184123	
✗ Wandylaw SR Outlet 1 and 2	
✗ West Swansfield Reservoirs	
✗ Whinney Hill nu218203	



Physical co-ordinates of all of the daily scheduling locations downloaded from LIMS to the Remote Sampler mobile software, can be automatically read by satellite navigation software. This allows field technicians to be efficiently guided to individual locations without further data entry, saving time and fleet mileage.



Efficiency

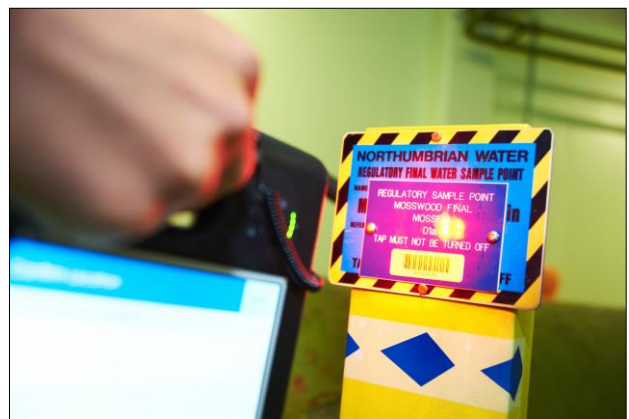
- No more duplication of effort, data entered once only.
- Additional data can be captured on every sample.
- Fewer resamples reduces the overall workload.

As there is no paperwork to constrain data entry, other plant asset, location or customer information can be configured for entry. Clean and treated water workflows for discrete or composite samples mean the software can be used for all compliance sampling. Ad-hoc sampling options also provide for operational sample collection after pipe bursts or other incidents.

The screenshot shows a mobile application interface for 'Onsite Tests'. The top navigation bar includes 'Back', a home icon, 'Onsite Tests', and 'Next'. On the left, there is a status bar showing '98%' battery, 'FTP' (checked), and 'GPS' (unchecked). Below this, it displays 'User: SAMG', '15:09', and '10 Dec'. The main content area is a table with two columns: 'Test' and 'Result'. The table contains the following data:

Test	Result
✓ Risk Assessment Carried Out	Yes
✓ Method	L6
✓ Turbidity Tube Reading	45
✓ Time Taken	10 December 2012 15:9

On the right side of the table, there are four vertical navigation arrows: two pointing up and two pointing down.

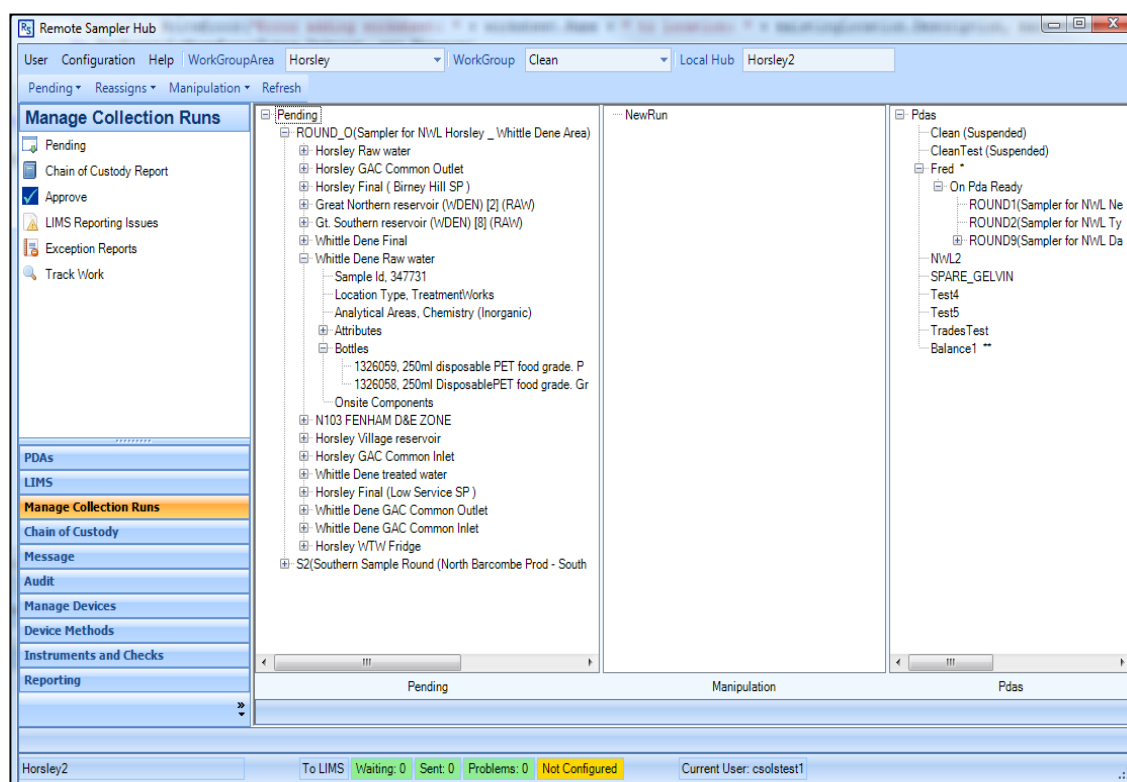




Flexibility

- New work can be assigned wirelessly to users in the field.
- Work can be moved around the team easily.
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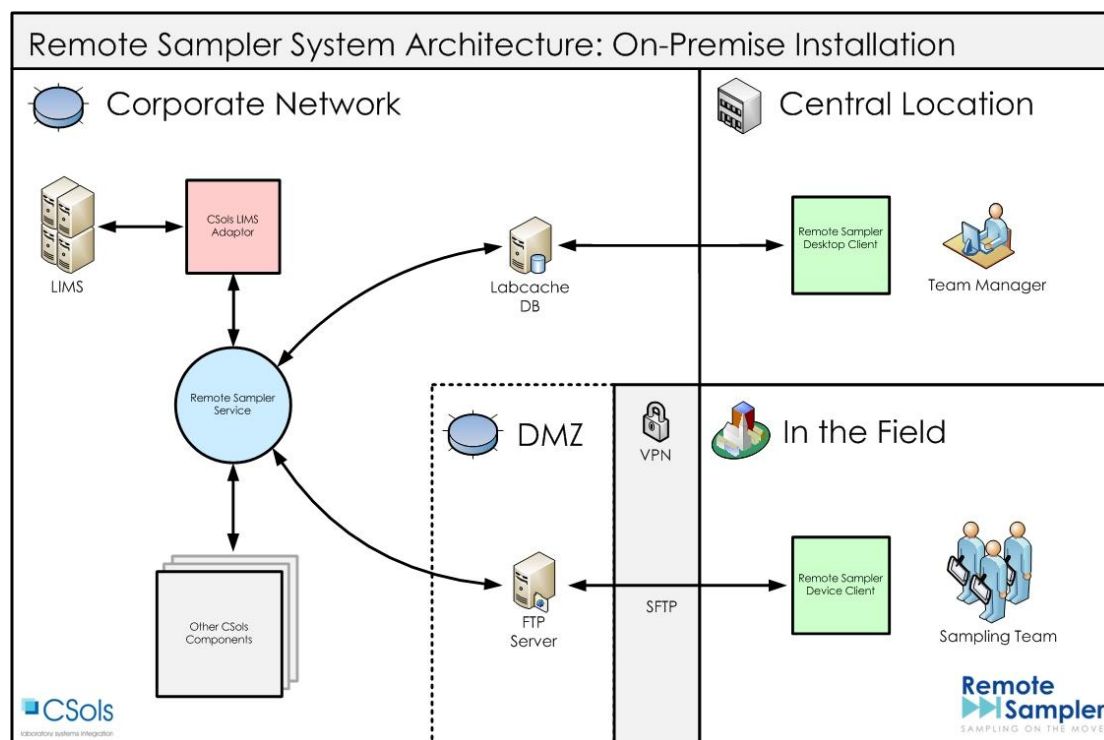
The Remote Sampler desktop software sits between LIMS and the field technicians. This provides team managers the ability to configure daily or weekly schedules to take into account planned or unplanned variations in sampling personnel, vehicles, sites or routes without having to change the annual sampling plan or manually edit collection sheets.



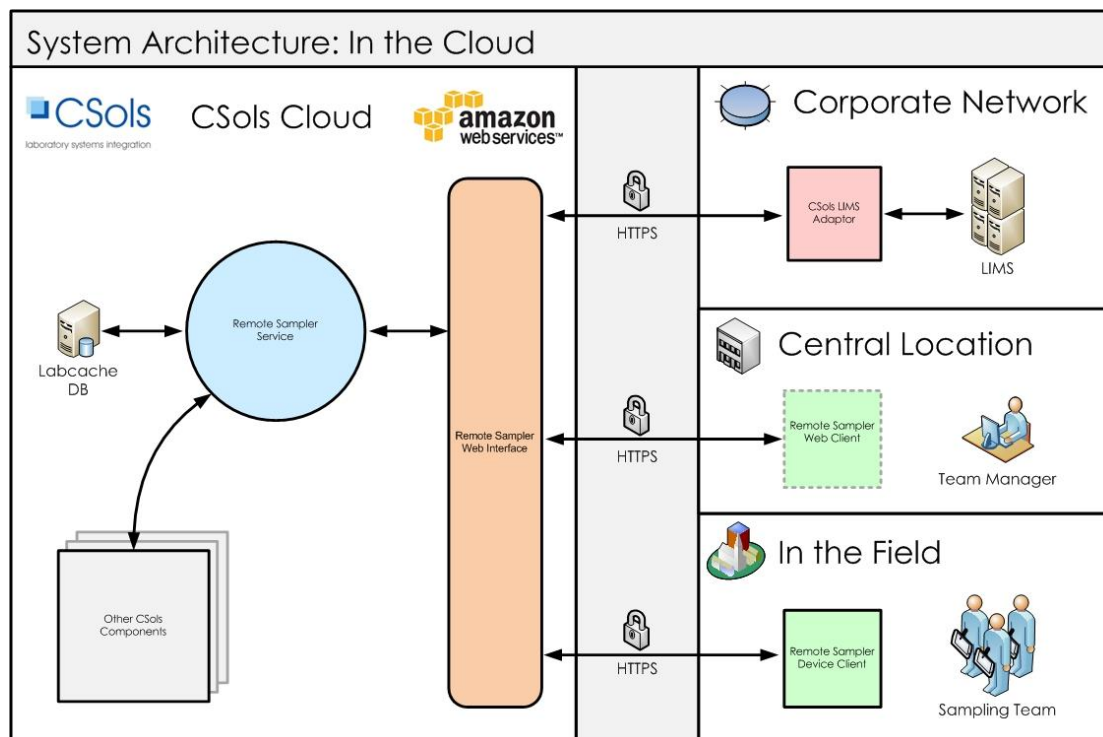
Sampling Team Managers can access the details of collection runs for their team at any time and freely reassign one or more sample locations between field technicians, and then update them while they are still in the field.

The Implementation

Remote Sampler can be installed 'On-Premise' using existing business infrastructure or in the cloud. High level architectural diagrams for example configurations are shown below. Key elements of the system include:



1. **CSols LIMS Adaptor** – This is a Microsoft Windows service that runs on the corporate network and handles all aspects of the integration between LIMS and Remote Sampler to provide a seamless user experience.
2. **Remote Sampler Service** – This is the heart of the Remote Sampler system and performs all processing and communications tasks.
3. **Labcache Database** – A Microsoft SQL Server database that stores all data that passes through the Remote Sampler system.
4. **Remote Sampler Desktop Client** - A desktop Microsoft .NET application that acts as a thin client. It allows managerial users to administer the system, manage the teams of field technicians and generate reports.
5. **The SFTP Server** – Any commercially available 3rd party SFTP server located in the network DMZ to facilitate secure data transfer to and from the mobile devices in the field.
6. **Remote Sampler Device Client** – A Microsoft .NET application that runs on Windows tablet devices for use by the field technicians for remote data collection activities.



The above cloud configuration uses a cloud based Remote Sampler server and communication protocols. The only on-premise facility is the LIMS interfacing service. Support of the mobile devices and software updates can be done using the SOTI MobiControl application

CONCLUSIONS

Moving from a paper-based data collection process to CSols Remote Sampler can help organizations to improve the quality of the data they collect from remote locations while helping to increase efficiency and drive down costs. This can be readily achieved using existing business infrastructure to minimize implementation effort and cost.

There has never been a better time to consider using remote data collection technology to extend the reach of your LIMS system.

FOR MORE INFORMATION

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